SIEMENS

SIMOVERT MASTER DRIVES

Operating Instructions
Part 1

Chassis units (Types E - H)
AC-AC

Edition: AB

Order No.: 6SE7087-6AH70

Overview of the MASTER DRIVES Operating Instructions:

Operating Instructions	consists of Part 1	Part 2
6SE708_-_AD10	6SE708_-_AD70	6SE708_-_XX10
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6SE708_-_BH10	6SE708_-_BH70	6SE708_-_XX10
6SE708_-_BH20	6SE708_-_BH70	6SE708_-_XX20
6SE708_-_BH30	6SE708_-_BH70	6SE708_-_XX30
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You will receive Parts 1 and 2 of the Operating Instructions when you use this Order No. Parts 1 and 2 can be individually ordered by specifying the particular Order No.

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

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

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

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

Contents

0 Definitions

- QUALIFIED PERSONAL

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

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

- DANGER

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

- WARNING

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

- CAUTION

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

- NOTE

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

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

CAUTION

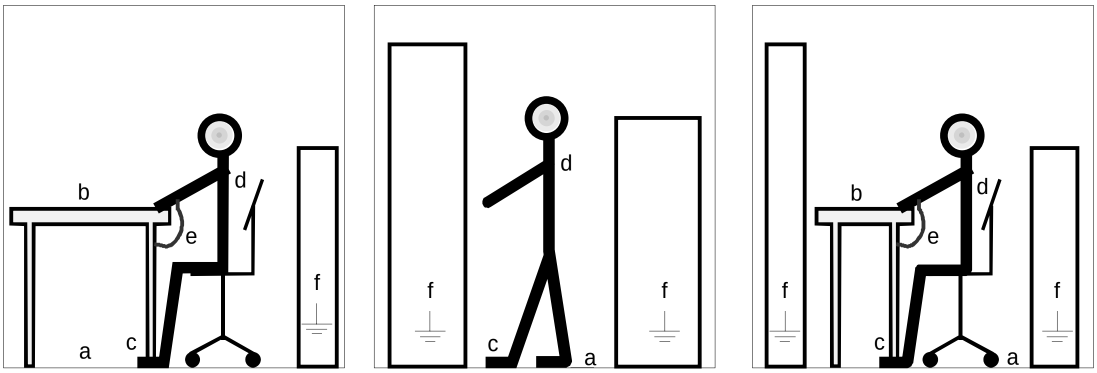
Components which can be destroyed by electrostatic discharge (ESD)

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

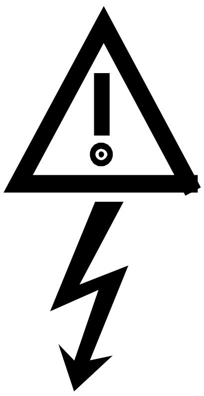
- Electronic boards should only be touched when absolutely necessary.
- The human body must be electrically discharged before touching an electronic board
- Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from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

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

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



Sitting Standing Standing / Siting



WARNING

Hazardous voltages are present in this electrical equipment during operation.

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

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

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

0.1 Safety and operating instructions for drive converters

Safety and operating instructions for drive converters

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

1. General

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

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

For further information, see documentation.

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

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

2. Intended use

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

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

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

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

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

3. Transport, storage

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

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

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

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

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

5. Electrical connection

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

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

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

6. Operation

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

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

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

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

Keep safety instructions in a safe place!

1 Description

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

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

There are three versions depending on the particular application

♦ Frequency control	FC	simple applications(e.g. pumps and fans)
♦ Vector control	VC	high demands regarding dynamic performance and accuracy
♦ Servo Control	SC	servo drives

1.1 Applications

Drive converter with three-phase current input

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

In the basic design, SIMOVERT MASTER DRIVES can be used for two-quadrant operation. Four-quadrant operation is possible using the braking unit option. SIMOVERT MASTER DRIVES are suitable for single-motor- and multi-motor drives.

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

1.2 Mode of operation

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

The converter is then ready for operation.

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

SIMOVERT FC

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

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

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

Some of the applications are, for example:

- ♦ Pump drives
- ♦ Fan drives
- ♦ Textile machines

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

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

SIMOVERT VC

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

SIMOVERT VC is suitable for:

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

Some of the applications are, for example:

- ♦ Winder drives
- ♦ Rolling mill drives.

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

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

SIMOVERT SC

The inverter open-loop control uses a microprocessor with field-oriented vector control, with a very fast secondary closed-loop current control. High drive dynamic performance is achieved as a result of the field oriented vector control. When the unit is shipped, the pulse frequency is preset to 5 kHz. It can be set in the range from 5 kHz to 7.5 kHz.

SIMOVERT SC is suitable for:

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

Some of the applications are, for example

- Winder drives,
- Foil machines,
- Packaging machines

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

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

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

The following encoders can be used:

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

1.3 Operator control- and open-loop control possibilities

The unit can be controlled via

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

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

1.4 Block diagram

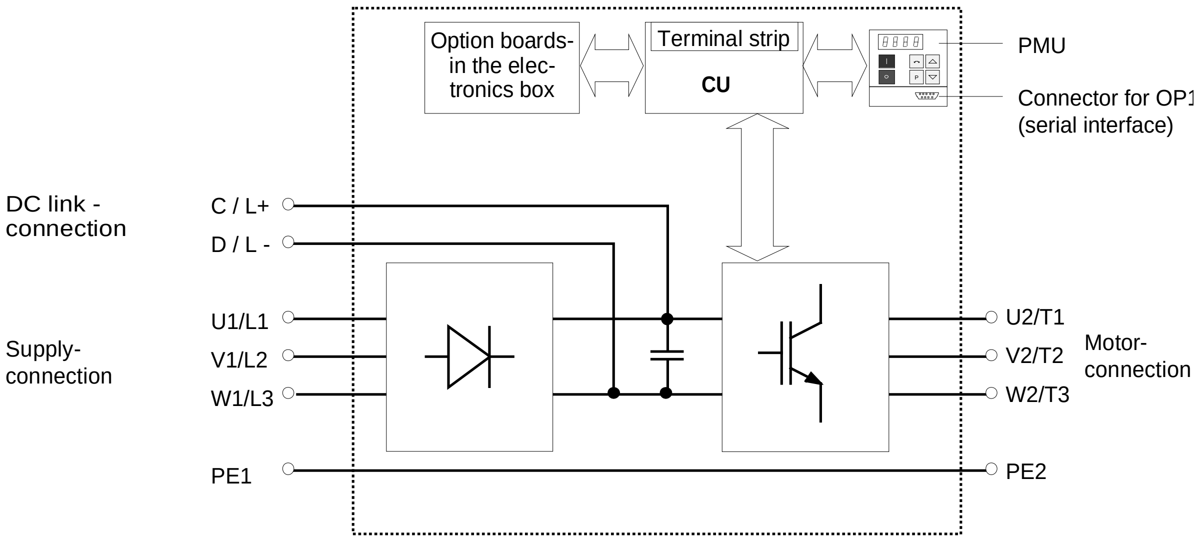


Fig. 1.1 Block diagram

2 Transport, Unpacking, Installation

2.1 Transport and unpacking

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

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

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

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

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

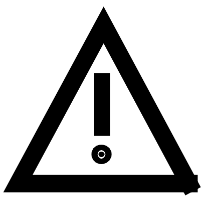
If the converter is damaged you must inform your shipping company immediately.

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

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

2.2 Storage

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



WARNING

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

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

2.3 Mounting

The following are required for mounting:

- M8 bolt(s)
- Dimension drawings: Fig. 2.2 for types of construction E, F, Fig. 2.3 for types of construction G and Fig. 2.4 for type of construction H.

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE) must be observed as well as the professional handling of tools and the use of personnal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

Chassis units do not provide any protection against direct contact. It is the users responsibility to ensure and provide the correct protection against contact according to the relevant accident prevention regulations VBG4, by appropriately designing the enclosure or enclosures around the chassis unit.

Remove shipping brace (marked).

Requirements at the point of installation:

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

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

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

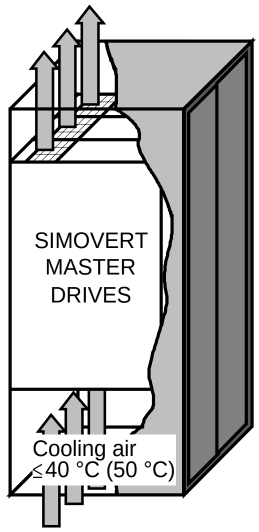


Fig. 2.1 Mounting the converters in cabinets

WARNING

When mounting in cabinets, a clearance of above and below must be provided so that the cooling air flow is not restricted (refer to dimension drawings, Section 2.4).

Dimension the cabinet cooling in line with the power loss! (☞ Section „Technical data“)

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

2.4 Dimension drawings

	Height	Width	Depth
Type E	1050	270	350
Type F	1050	360	350

Chassis units AC-A
Types E and F

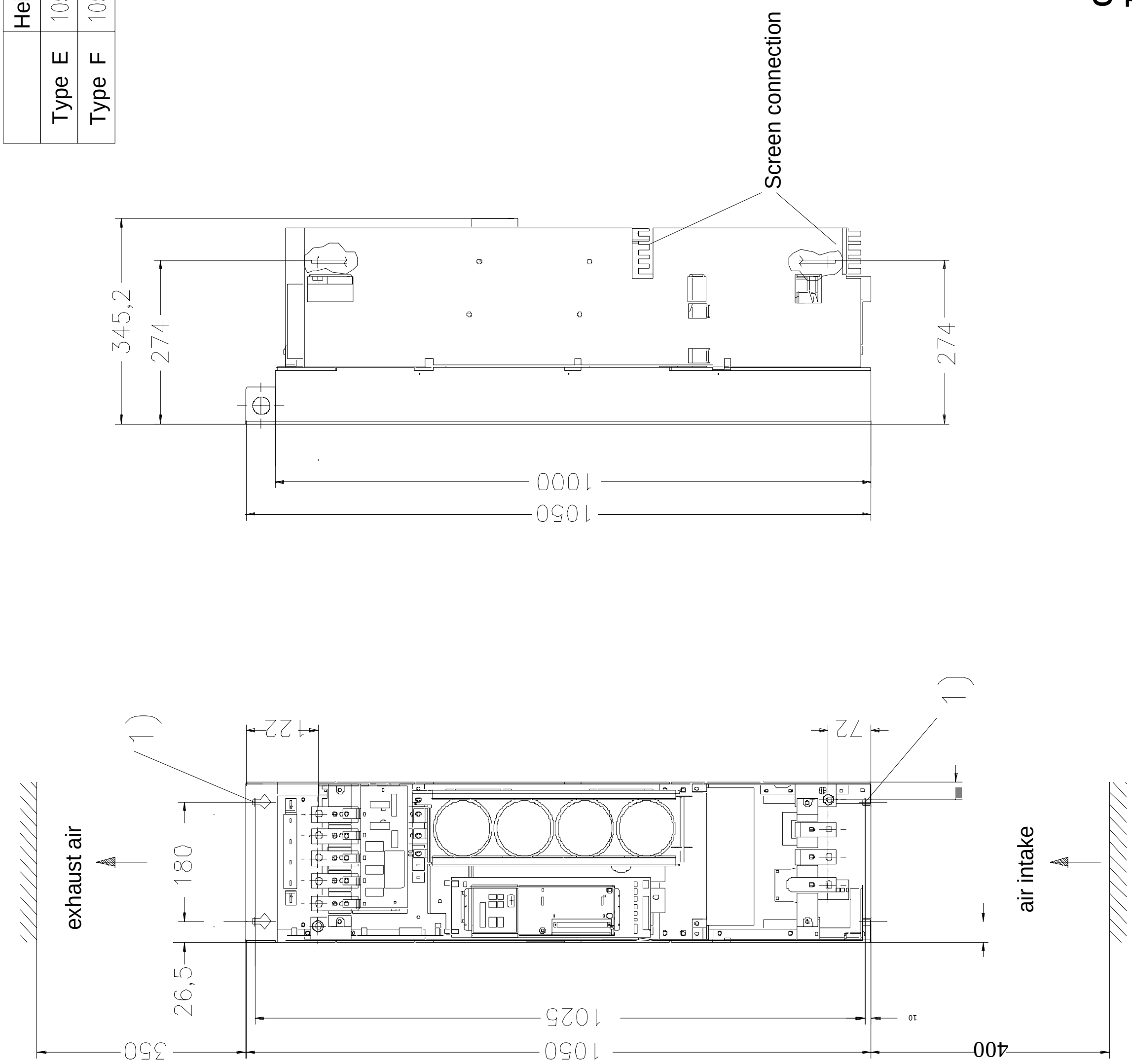
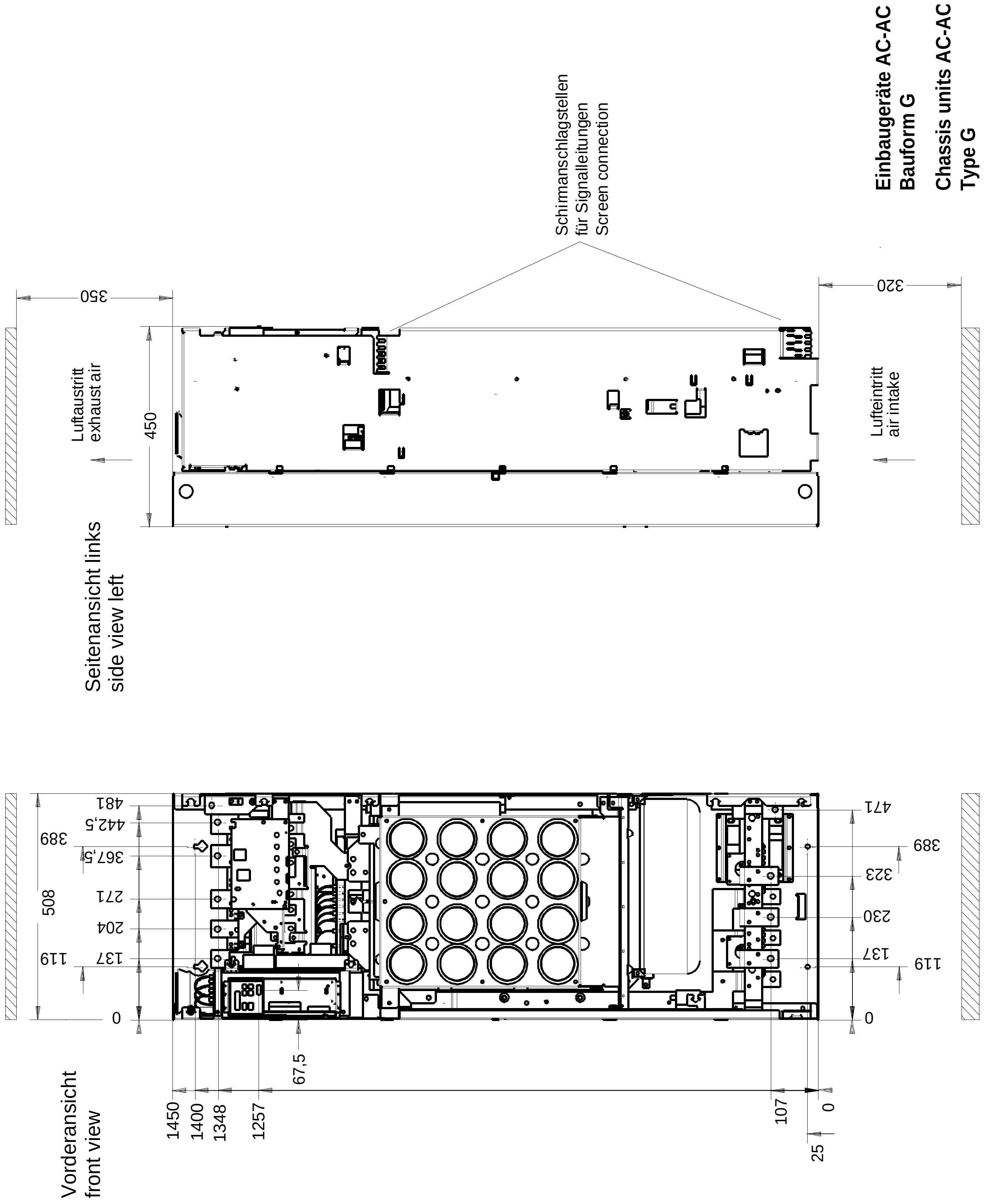


Fig. 2.2 Types E and F



Einbaugeräte AC-AC
Bauform G
Chassis units AC-AC
Type G
Schirmanschlagstellen
für Signalleitungen
Screen connection
350
320
450
Luftaustritt
exhaust air
Lufteintritt
air intake
Seitenansicht links
side view left
481
442,5
389
367,5
271
508
204
137
119
0
471
389
323
230
137
119
0
67,5
1450
1400
1348
1257
107
0
25
Vorderansicht
front view

Fig. 2.3 *Type G*

Einbaugeräte AC-AC
Bauform H

Chassis units AC-AC
Type H

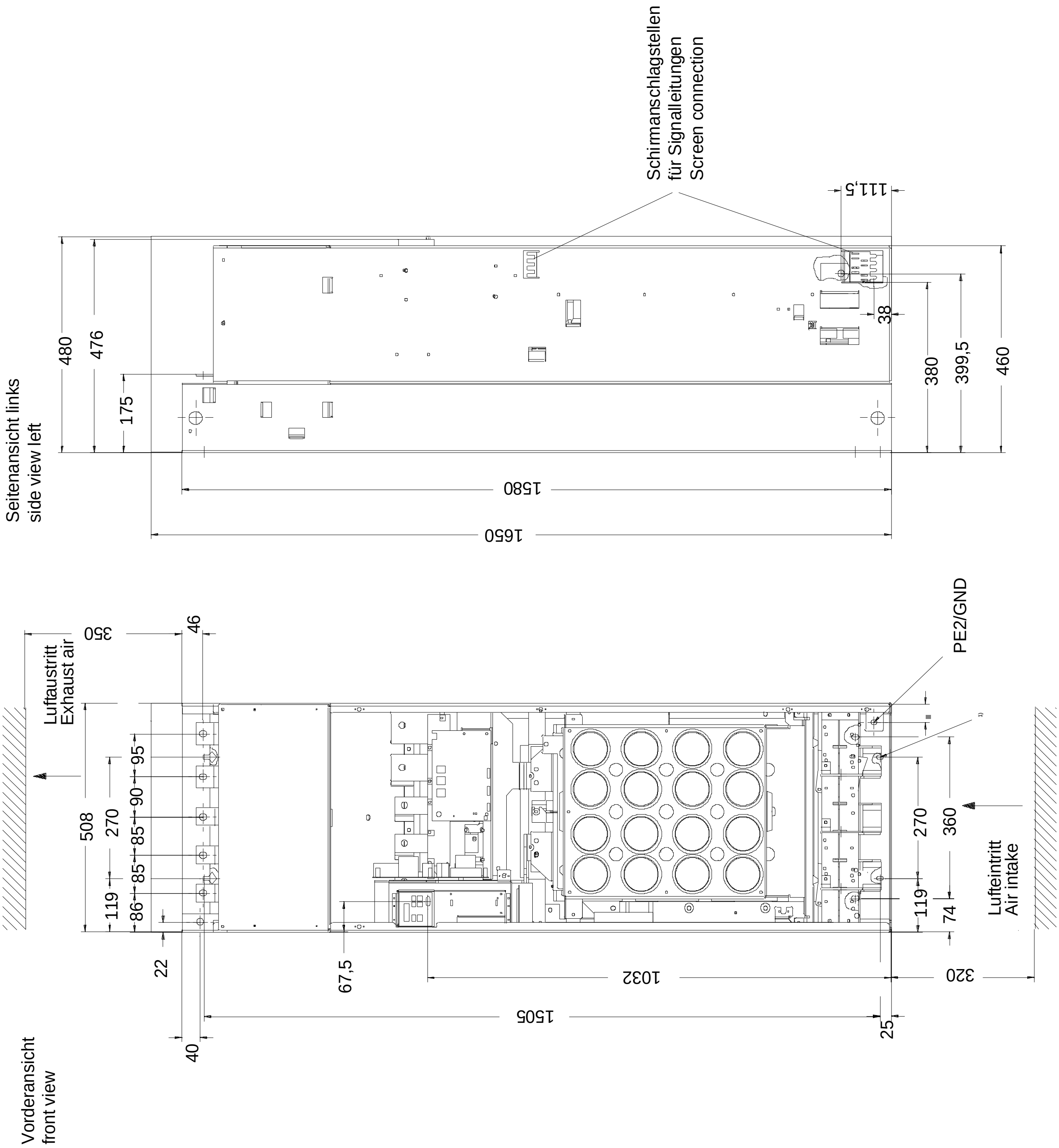
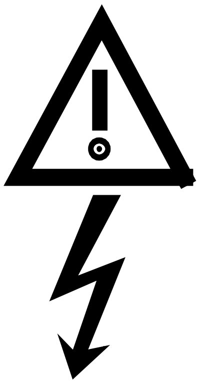


Fig. 2.4 *Type H*

3 Connecting-up



WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out!

Only professionally trained, qualified personnel must work on or with the unit.

Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.

Extreme caution should be taken when working-on the unit when it is open, as external power supplies may be connected. The power terminals and control terminals can still be at hazardous potentials even when the motor is stationary.

Hazardous voltages are still present in the unit up to 5 minutes after it has been powered-down due to the DC link capacitors. Thus, the appropriate delay time must be observed before opening-up the unit.

Forming the DC link capacitors:

The storage time should not exceed one year. The converter DC link capacitors must be formed at start-up if the unit has been stored for a longer period of time.

Forming is described in the Instruction Manual, Part 2.

The user is responsible, that the motor, converter and any other associated devices or units are installed and connected-up according to all of the recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be especially observed.

If a protective device trips in a current arm, then a fault current could have been interrupted. In order to reduce the danger of fire or electric shock, the live parts and over components of the converter should be checked and damaged components replaced.

INFORMATION

- Protection: Fuses must be incorporated in the equipment supply connection. For a list of the recommended fuses, refer to Table 3.1.
- Supply rating: The converter is suitable for connecting to supplies with a short-circuit rating (supply) $\leq 100 \times$ rated output (converter).
- The converter should be connected via a line reactor according to Table 3.1.
- Cabling/wiring: Connecting cables should be dimensioned according to the local regulations and according to Table 3.1. The insulation should be suitable for 75 °C.

3.1 Power connections

WARNING

- The unit will be destroyed if the input- and output terminals are interchanged!
- The converter will be destroyed if the DC link terminals are interchanged or short-circuited!
- The coils of contacts and relays which are connected to the same supply as the converter or are located in the vicinity of the converter, must be provided with overvoltage limiters, e.g. RC elements.
- It is not permisible that the converter is connected-up through an e.l.c.b. (ground fault circuit interrupter) (DIN VDE 0160).

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

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

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

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

Connections must be established using cable lugs with bolts according to Table 3.2.

NOTE

Converters type of construction H: The busbars of the motor connection are rotated through 90 °.

Due to the 230 V fan a transformer is integrated into the converters. The terminals on the primary side must be connected corresponding to the rated input voltage.

NOTE FC and VC

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

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

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

Order No.	Rated input curr.	supply side										Motor connection	
		Cross-section		Recommended fuse							Line reactor	Cross-section	
		VDE		gR (SITOR)		gL NH		North-America				VDE	
	(A)	(mm²)	AWG[1]	(A)	Type	(A)	Type	Type	(V)	(A)		(mm²)	AWG
6SE70					3NE1		3NA3				4E		
	Rated input-voltage 380 V to 460 V												
31-0EE	92	1x50	1x00	100	021-0	125	132	AJT, LPJ	600	125	P4000-2UK	1x35	1x0
31-2EF	124	2x35	2x0	160	224-0	200	140	AJT, LPJ	600	175	U2451-2UA00	2x25	2x2
31-5EF	146	2x35	2x0	160	224-0	200	140	AJT, LPJ	600	200	U2451-2UA00	2x25	2x2
31-8EF	186	2x50	2x00	200	225-0	250	144	AJT, LPJ	600	250	U2551-4UA00	2x35	2x0
32-1EG	210	2x50	2x00	315	230-0	315	252	AJT, LPJ	600	300	U2551-4UA00	2x50	2x00
32-6EG	260	2x95	2x(4/0)	315	230-0	315	252	AJT, LPJ	600	350	U2551-5UA00	2x70	2x000
33-2EG	315	2x120	2x(300)	350	331-0	400	260	AJT, LPJ	600	400	U2751-7UA00	2x95	2x4/0
33-7EH	370	2x120	2x(300)	400	332-0	500	365	AJT, LPJ	600	500		2x95	2x4/0
	Rated input-voltage 500 V to 575 V												
26-1FE	61	1x35	1x0	63	818-0	80	824	AJT, LPJ	600	80	P3900-1UK	1x25	1x2
26-6FE	66	1x35	1x0	100	021-0	100	830	AJT, LPJ	600	90		1x25	1x2
28-0FF	79	1x50	1x00	100	021-0	100	830	AJT, LPJ	600	100	P4000-1UK	1x35	1x0
31-1FF	108	2x25	2x2	160	224-0	160	136	AJT, LPJ	600	150		2x16	2x4
31-3FG	128	2x35	2x0	160	224-0	160	136	AJT, LPJ	600	175	U2451-1UA00	1x70	1x000
31-6FG	156	1x120	1x(300)	200	225-0	200	140	AJT, LPJ	600	200	U2551-2UA00	1x95	1x4/0
32-0FH	192	2x50	2x00	250	227-0	315	252	AJT, LPJ	600	250		2x35	2x0
32-3FH	225	2x70	2x000	250	227-0	315	252	AJT, LPJ	600	300	U2751-2UA00	2x50	2x00
	Rated input-voltage 660 V to 690 V												
26-0HF	60	1x35	1x0	80	820-0	80	824-6				P4000-3UK	1x25	1x2
28-2HF	82	1x50	1x00	100	021-0	100	830-6				U2551-3UA00	1x35	1x0
31-0HG	97	1x50	1x00	160	224-0	160	136-6					1x50	1x00
31-2HG	118	1x70	1x000	160	224-0	160	136-6				U2751-3UA00	1x70	1x000
31-5HG	145	1x95	1x(4/0)	200	225-0	250	244-6					1x95	1x4/0
31-7HG	171	1x120	1x(300)	200	225-0	250	244-6				U2751-6UA00	1x95	1x4/0
32-1HH	208	2x70	2x000	250	227-0	315	252-6					1x95	1x4/0

INFORMATION AND EXPLANATIONS

The cross-sections are determined for copper cables at 40 °C (104 °F) ambient temperature (in accordance with DIN VDE 0298 Part 4 / 02.88 Group 5) and the recommended cable protection according to DIN VDE 0100 Part 430.

The cables and semiconductors are protected using fuses with gR characteristics. Only the cables, but not the semiconductors, are protected using gL fuses.

1) American Wire Gauge

2) The specified fuses are valid for converters with a 3-ph AC 500 V input voltage. For converters with higher input voltage, fuses up to 660 V must be used. The Order Nos. of these fuses are obtained by attaching the suffix "-6" to the appropriate 500 V fuse Order No.

e.g.: 3NA3803 ≙ 500 V
3NA3803-6 ≙ 660 V

Table 3.1 Power connections acc. to DIN VDE

Type of construction	Order No.	Possible connection cross-section		Bolted joint
		(mm²) lt. VDE	AWG	
E	6SE70_._-._._E_0	2 x 70	2 x 00	M10
F	6SE70_._-._._F_0	2 x 70	2 x 00	M10
G	6SE70_._-._._G_0	2 x 150	2 x 300	M12
H	6SE70_._-._._H_0	2 x 240	2 x 500	M12

Table 3.2 Possible connection cross-sections and bolted joints

3.1.1 Protective conductor connection

The protective conductor should be connected-up on both the supply- and motor sides. It should be dimensioned according to the power connections.

3.1.2 DC link connection

The "braking unit" (6SE7087-6CX87-2DA0) and "dv/dt filter" (6SE7087-6CX87-1FD0) options can be connected at the DC link terminals C/L+ and D/L–.

3.2 Auxiliary power supply/main contactor

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

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

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

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

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

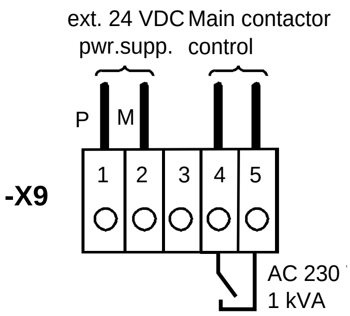


Fig. 3.1 Connecting an external auxiliary 24 V DC power supply and main contactor control

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

Table 3.3 Connector assignment for -X9

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

4 Operator control

The converter can be controlled via:

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

Operator control using the PMU is described in this section.

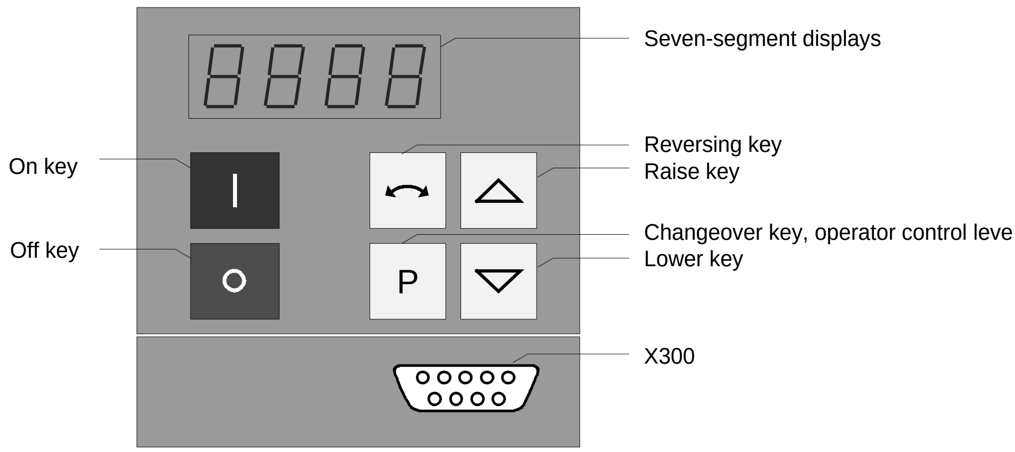


Fig. 4.1 Parameterization unit

4.1 Operator control elements

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

Table 4.1 Function of the operator control elements on the PMU

4.2 Displays 8.8.8.8.

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

Table 4.2 Displaying visualization- and setting parameters on the PMU

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

Table 4.3 Status display on the PMU

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

5 Maintenance

WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VBG4 in Germany).

Maintenance and service work may only be executed by qualified personnel.

Only spare parts authorized by the manufacturer may be used.

The specified maintenance intervals and also the instructions for repair and replacement must be adhered to.

The drive units have hazardous voltage levels up to 5 min after the converter has been powered-down due to the DC link capacitors so that the unit must only be opened after an appropriate delay time.

The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.

If it is absolutely necessary that the drive converter must be worked on when powered-up:

- never touch any live components.
- only use the appropriate measuring and test equipment and protective clothing.
- always stand on an ungrounded, isolated and ESD-compatible pad.

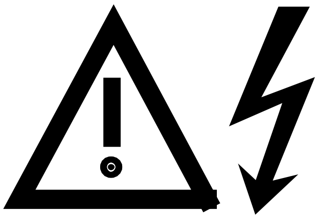
If these warnings are not observed this can result in death, severe bodily injury or significant material damage.

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

5.1 Maintenance requirements

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

5.2 Replacing components



WARNING

The fan may only replaced by qualified personnel.

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

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

5.2.1 Replacing the fan assembly

The fan assembly consists of:

- the fan housing
- a fan
- the starting capacitor, only for type of construction H

The fan is mounted for

- ♦ between the capacitors and the motor connection for **types of construction E to G**
- ♦ below the line supply- and DC link circuit connection for **type of construction H**.

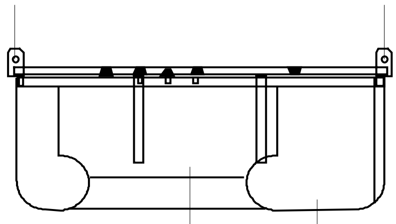


Fig. 5.1 Fan module for housing sizes E to G

- Remove connector X20
- Remove the cable ties
- Release the screw connections
- Remove the fan assembly towards the front
- Install the new fan assembly in the inverse sequence
- Before commissioning the drive check that the fan can run freely and check the airflow direction. The air must be blown upwards out of the unit.

5.2.2 Replacing the fan transformer

The fan transformer is mounted behind the motor connection.

- Mark the transformer connecting cables and disconnect them.
- Release the screw connections at the bottom on the transformer mounting panel and remove the transformer.
- Install a new fan transformer in the inverse sequence

5.2.3 Replacing the starting capacitor

The starting capacitor is mounted next to the fan connection.

- Remove the plug connections from the starting capacitor
- Unbolt the starting capacitor
- Install a new starting capacitor in the inverse sequence

5.2.4 Replacing the capacitor bank

The board consists of the DC link capacitors, the capacitor mounting element and the DC link connection.

♦ **Types of construction E to F**

- Release the electrical connection to the inverter busbars
- Release the mechanical locking
- Swing-out the capacitor bank towards the front and remove from the top.

♦ **Types of construction G to H**

- Remove the connection for the symmetrical resistor (cable lug M6)
- Release the mechanical mounting
- Swing-out the capacitor bank to the front and lift out of the converter at a 45 ° angle.

- Install a new capacitor bank in the inverse sequence.

5.2.5 Replacing boards

WARNING

The boards may only be replaced by qualified personnel.

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

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

CAUTION

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

5.2.5.1 Replacing the PCU

♦ **Types of construction E to F**

- Remove connector X39.
- Remove the M6 bolts at the busbar connection U1/L1;V1/L2;W1/L3; C; D and PE1
- Release the distance piece and remove the PCU

♦ **Types of construction G to H**

- Remove the PCC
- Remove connector X39.
- Remove bolts M6 at the bus connection U1/L1;V1/L2;W1/L3; C; D and PE1
- Release the distance piece and remove the PCU

- Install the new PCU in the invserse sequence.

5.2.5.2 Replacing the PCC

- Remove the PCU,
- Remove connector X11; X12; X13; X246 on the PCC,
- Remove the NUD cable,
- Remove the PCC mounting bolts,
- Release the distance piece and remove the PCC.
- Install a new PCC in the inverse sequence

5.2.5.3 Replacing the rectifier modules

- ♦ **Types of construction E to F**
  - Remove the PCU and PCC
  - Disassemble the input busbars and rectifier busbars
  - Release the bolts of the defective module and remove the module.
- ♦ **Types of construction G to H**
  - Remove the PCC with mounting panel
  - Remove the PCU, PSU and E-Box
  - Disassemble the DC link and inverter busbars
  - Release the bolts from the defective module and remove the module.

  - Install the new rectifier module
    - Coat the contact surfaces of the heatsink with a **thin and uniform** application of heat conducting paste.
    - Tighten-up the rectifier module mounting bolts with 4 Nm.
  - Re-install the components in the inverse sequence.

5.2.5.4 Replacing the IVI

IVI Inverter-Value Interface

The IVI is bolted to the rear of the electronics box

- ♦ Remove connector X205; X206; X208; X31; X33 from the IVI
- ♦ **Types of construction E to F**
  - Withdraw the fiber-optic cable connections
  - Remove the capacitor bank
- ♦ **Types of construction G to H**
  - Remove PSU with insulation
- ♦ **All types of construction**
  - Remove all boards from the electronics box
  - Remove both mounting bolts from the electronics box (Fig. 5.3)
  - Release the electronics box and remove towards the front.
  - Unbolt the IVI and remove
  - Install the new IVI in the inverse sequence

5.2.5.5 Replacing the PSU

PSU Power-Supply Unit (Power Supply)

- Remove connector X18; X258 and X70.
- Remove the Torx bolt with ground connection from the side panel.
- Shift the PSU from the locking bolts and remove towards the front under the input bar.
- Install the new PSU in the invserse sequence.

5.2.5.6 Replacing the IGD

IGD IGBT-Gate Drive

♦ **Types of construction E to F**

The IGD is directly mounted onto the IGBT modules.

- Remove the capacitor bank
- For type of construction E: Remove the electronics box with IVI
- Label the output wiring U2/T1;V2/T2;W2/T3 and disconnect
- Remove the inverter busbars after releasing the 12 M6 bolts
- Label the auxiliary connections of the defective module and remove
- Withdraw connector X295
- Release the mounting bolts and remove the IGD.

♦ Install the new IGD in the inverse sequence

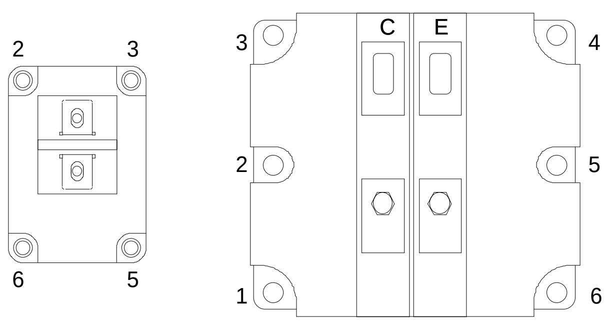
♦ **Types of construction G to H**

The IGD is located in the rear mounting plane on the heatsink betwen the inverter modules, i.e. behind the capacitor bank and the inverter busbars.

- Remove the capacitor bank
- Remove the SML- and SMU boards
- Remove the inverter busbars
- Remove the SIB board
- Remove the fiber-optic cable connections
- Remove connector X290
- Remove the mounting bolts and remove the IGD.

5.2.5.7 Replacing the IGBT modules

- Replace as for IGD, but additionally
- Remove the mounting bolts of the defective IGBT modules and remove the IGBT.
- Install the new IGBT module. Observe the following:
  – Coat the module mounting surface with a **thin and uniform** coating of heat conducting paste.
  – Tighten-up the IGBT module mounting bolts with 3 Nm, observe the sequence (Fig. 5.2).



Tighten-up the IGBT modules
1. By hand (≈ 0,5 Nm), sequence: 2 - 5 - 3 - 6 - 1 - 4
2. tighten-up with 3 Nm, sequence: 2 - 5 - 3 - 6 - 1 - 4

Fig. 5.2 Tighten-up IGBT modules

5.2.5.8 Replacing boards in the electronics box

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

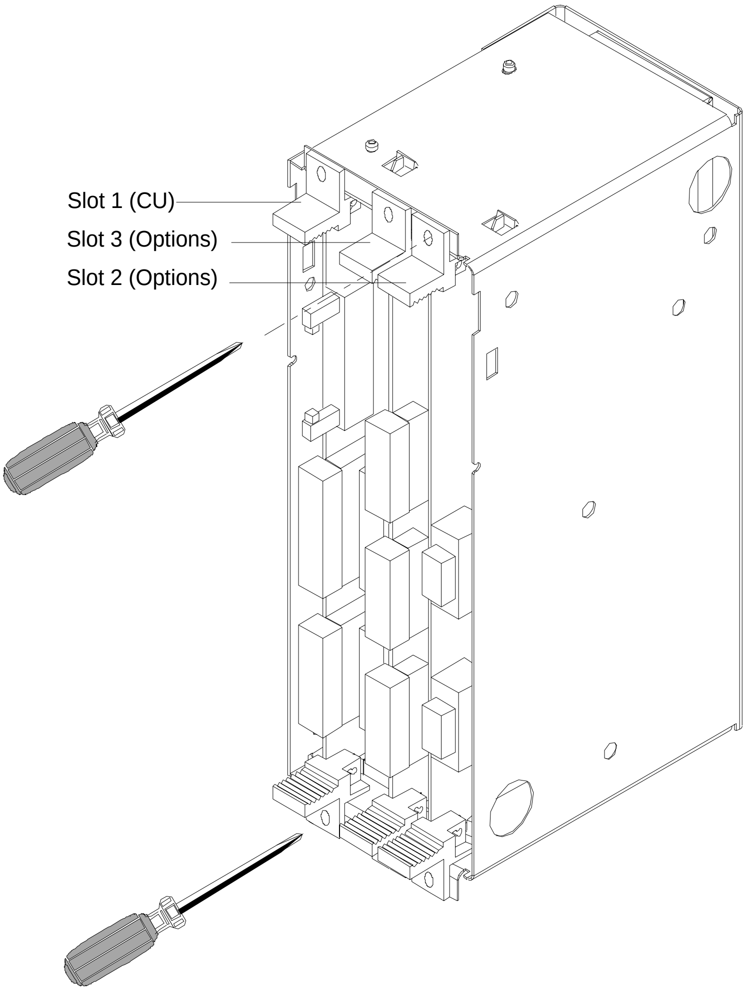


Fig. 5.3 Electronics box equipped with CU (slot 1) and options (slot 2 (right) and 3 (middle))

5.2.5.9 Replacing the PMU (Parameterization Unit)

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

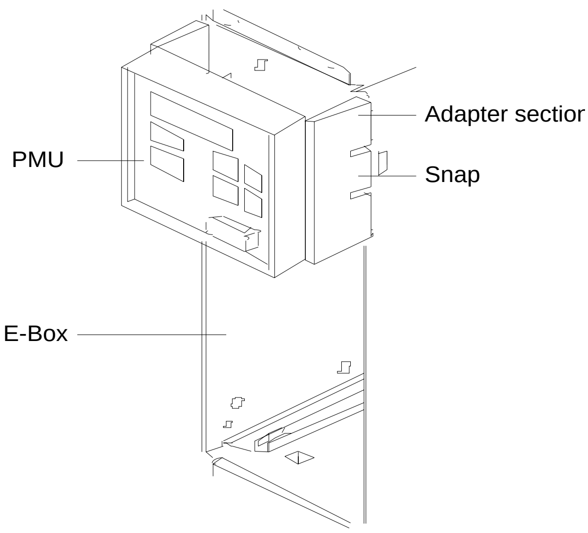


Fig. 5.4 PMU with adapter section on the E box

6 Options

6.1 Options which can be integrated into the electronics box

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

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

Install the LBA bus expansion:

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

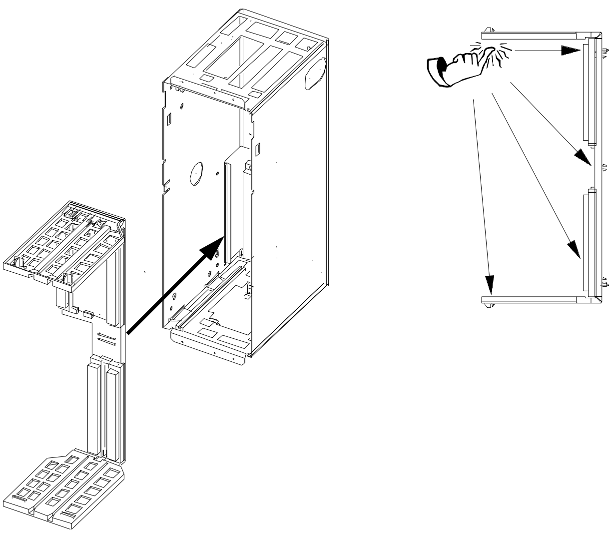


Fig. 6.1 Installing the Local Bus Adapter

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not for T300)
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE

Only one of each option board type may inserted in the electronics box.

TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.

If only one option board is used it must always be inserted at slot 2.

Table 6.1 Possible arrangements of boards in the electronics box

The options are supplied with the option description.

Desig-nation	Description	Order No.	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7087-6CX84-4HA0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7087-6CX84-0AH0
TSY	Synchronizing board	Board description	6SE7090-0XX84-0BA0 6SE7087-6CX84-0BA0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7087-6CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7087-6CX84-0BD0
	Use of the serial interface with USS protocol	Application description	6SE7087-6CX87-4KB0
CB1	Communications board with interface for SINEC- L2-DP, (Profibus)	Board description	6SE7090-0XX84-0AK0 6SE7087-6CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0

Table 6.2 Option boards and bus adapter

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

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

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

Table 6.3 Current drain of the option boards

6.2 Interface boards

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

Desig-nation	Description	Order No.	
SCI1	Serial I/O board (only in conjunction with SCB1). Analog and binary input and outputs for coupling to the SCB1 via fiber-optic cable	Board description	6SE7090-0XX84-3EA0 6SE7087-6CX84-0BC0
SCI2	Serial I/O board (only in conjunction with SCB1) Binary inputs and outputs for coupling to the SCB1 via fiber-optic cable.	Board description	6SE7090-0XX84-3EF0 6SE7087-6CX84-0BC0
DTI	Digital tachometer interface	Board description	6SE7090-0XX84-3DB0 6SE7087-6CX84-3DB0
ATI	Analog tachometer interface	Board description	6SE7090-0XX84-3DF0 6SE7087-6CX84-3DF0

Table 6.4 Interface boards

6.3 Power supplies

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

Table 6.5 Recommended power supply

6.4 Isolating amplifiers

Input	Output	Order number Option
Input isolating amplifiers for analog inputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–20 mA to +20 mA	–10 V to +10 V	6SX7010-0AC02
4 mA to +20 mA	4 mA to +20 mA	6SX7010-0AC01
Output isolating amplifiers for analog outputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–10 V to +10 V	–20 mA to +20 mA	6SX7010-0AC03
0 V to +10 V	4 mA to +20 mA	6SX7010-0AC04

Table 6.6 Overview of isolating amplifiers

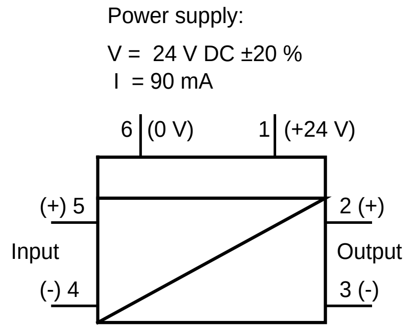


Fig. 6.2 Isolating amplifiers

6.5 Power section

Options	Description/function
Circuit-breaker	Power-up
Line fuses	Protects the motor feeder and limits the short-circuit current
Commutating reactor	Reduces harmonic feedback into the supply
Input filter, A1 or B1	Maintains the radio interference suppression level acc. to EN55011
Braking units	Converts regenerative power into heat
Braking resistors	Load resistor for the braking unit

Table 6.7 Power section options

6.5.1 Output reactor, dv/dt filter, sinusoidal filter

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

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

NOTE

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

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

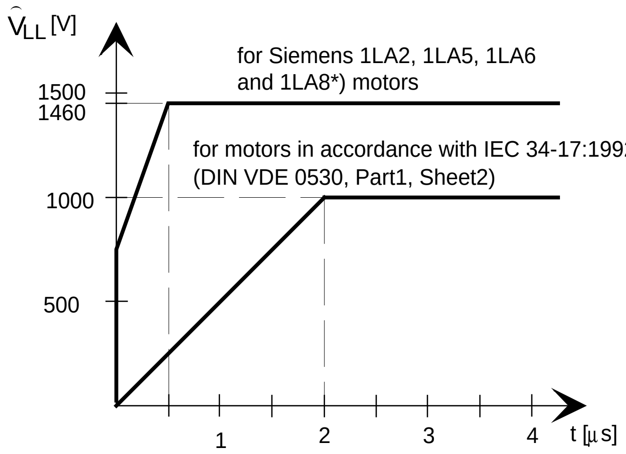


Fig. 6.3 Permissible limit values for the motor insulation

*) Standard 1LA8 motors;
1LA8 motors with improvedinsulation are available

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

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

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

Table 6.8

6.5.1.1 Output reactor

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

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

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

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

	V/f = constant		**V = constant**	
	3-ph. 380 V to 460 V AC	**3-ph. 500 V to 690 V AC**	**3-ph. 380 V to 460 V AC**	**3-ph. 500 V to 690 V AC**
Standard reactor (iron) $f_P \leq 3$ kHz				
V/f / Vector control	$f_{mot\ N} \leq 87$ Hz	$f_{mot\ N} \leq 200$ Hz	$f_{max} \leq 200$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\ N} = f_{max} \leq 120$ Hz	not possible	not possible	not possible
Ferrite reactor $f_P \leq 6$ kHz				
V/f / Vector control	$f_{mot\ N} \leq 150$ Hz	$f_{mot\ N} \leq 150$ Hz	$f_{max} \leq 300$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\ N} = f_{max} \leq 600$ Hz	not possible	not possible	not possible

Table 6.9 Output reactor design

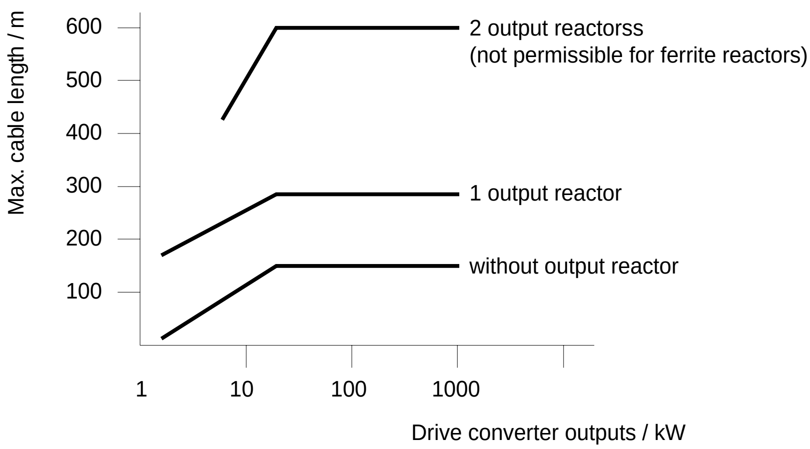


Fig. 6.4 Permissible cable lengths with and without output reactors

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

6.5.1.2 dv/dt filter

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

- ♦ Voltage gradient (rate of rise) dv/dt ≤ 500 V/µs
- ♦ Transient peak voltage at the motor terminals:

$\hat{U}_{typ.}$	≤ 800 V	for 380 V	≤ U_N ≤ 460 V	(3 ph. AC)
$\hat{U}_{typ.}$	≤ 1000 V	for 500 V	≤ U_N ≤ 575 V	(3 ph. AC)
$\hat{U}_{typ.}$	≤ 1250 V	for 660 V	≤ U_N ≤ 690 V	(3 ph. AC).

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

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

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

The dv/dt filter is suitable for use with

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

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

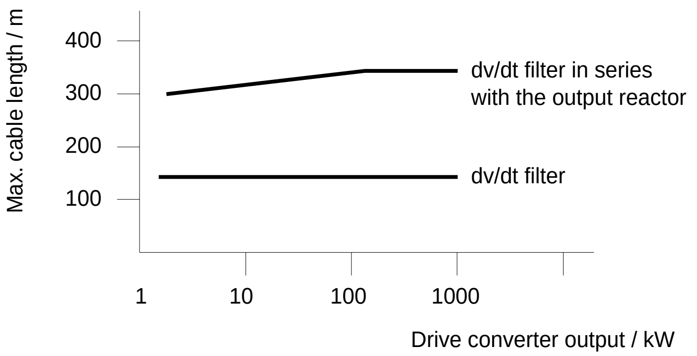


Fig. 6.5 Permissible cable lengths with dv/dt filter

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

6.5.1.3 Sinusoidal filter

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

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

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

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

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

The sinusoidal filter is suitable for use with

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

NOTE

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

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

P092 = 1 causes:	**Input voltage, drive converter/inverter**	
	3-ph. AC 380 V - 460 V	**3-ph. AC 500 V - 575 V**
Pulse frequency	P761 = 6 kHz	P761 = 3 kHz
Maximum frequency, RDF Maximum frequency, LDF	P452 ≤ + 400 Hz P453 ≥ – 400 Hz	P452 ≤ + 200 Hz P453 ≥ – 200 Hz
Pulse system enable	corresponding to P769 = 3 (no edge modulation systems)	
Firing angle limit	r180 < approx. 83 %	r180 < approx. 87 %

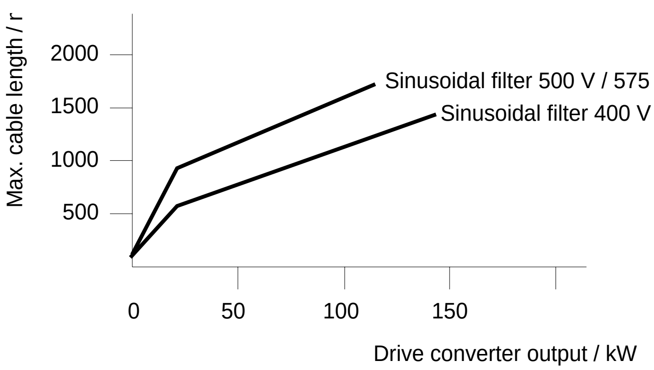


Fig. 6.6 Permissible cable lengths with sinusoidal filter

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

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

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

	Voltage range		
	380 V - 500 V (3AC)	**525 V - 575 V (3-ph. AC)**	**660 V - 690 V (3AC)**
Motors, acc. to IEC 34-17:1992 (DIN VDE 0530, Part 1, Sheet 2)	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.
Siemens motors 1LA2, 1LA5, 1LA6, 1LA8 ***)**.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.
***)** Standard 1LA8 motors; 1LA8 motors are available with a better insulation.			

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

6.6 Operator control

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

Table 6.11 Operator control options

Fig. 6.7 OP1

7 Spare Parts

7.1 Converter 380 V to 460 V 3 AC

Component code	Designation	Order number	Qty.	Used in
-A10	CU1 (FC)	6SE7090-0XX84-0AA1	1	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	1	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	1	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	1	6SE70_ _-_ _ _ _ _
-E1	230 V AC fan	6SY7000-0AB28	1	6SE70_ _-_ EE_ _
-E1	230 V AC fan	6SY7000-0AB30	1	6SE70_ _-_ EF_ _
-E1	230 V AC fan	6SY7000-0AB66	1	6SE7032-1/6EG_ _
-E1	230 V AC fan	6SY7000-0AB67	1	6SE7033-2EG_ _
-E1	230 V AC fan	6SY7000-0AB68	1	6SE70_ _-_ EH_ _
-E1#	Fan nozzle	6SY7000-0AB65	1	6SE70_ _-_ _H_ _
-C110	Starting capacitor 2,0 µF	6SY7000-0AA36	1	6SE70_ _-_ EE_ _
-C110	Starting capacitor 2,5 µF	6SY7000-0AA52	1	6SE70_ _-_ EF_ _
-C110	Starting capacitor 4,0 µF	6SY7000-0AB10	1	6SE7032-1/6EG_ _
-C110	Starting capacitor 5,0 µF	6SY7000-0AB15	1	6SE7033-2EG_ _
-C110	Starting capacitor 10 µF	6SY7000-0AA52	1	6SE70_ _-_ _H_ _
-T10	Fan transformer	6SY7000-0AA54	1	6SE70_ _-_ EE_ _
-T10	Fan transformer	6SY7000-0AA56	1	6SE70_ _-_ EF_ _
-T10	Fan transformer	6SY7000-0AB32	1	6SE7032-1/6EG_ _
-T10	Fan transformer	6SY7000-0AB60	1	6SE7033-7EG20
-T10	Fan transformer	6SY7000-0AB35	1	6SE7033-2EG_ _
-G25-F1 -G25-F2	Fuse 2 A / 600 V 5 A / 600 V	 6SY7000-0AA24 6SY7000-0AB62	 2 2	 6SE70_ _-_ _E/F_ _ 6SE70_ _-_ _G/H_ _
	Capacitor bank	6SY7000-0AB43	1	6SE7031-0EE_ _
		6SY7000-0AB44	1	6SE7031-2/5EF_ _
		6SY7000-0AB45	1	6SE7031-8EF_ _
		6SY7000-0AB46	1	6SE7032-1/6EG_ _
		6SY7000-0AB47	1	6SE7033-2EG_ _
		6SY7000-0AB48	1	6SE7033-7EH20
-G25	PSU1	6SE7031-7HG84-1JA0	1	6SE70_ _-_ E_ _ _
-A27	PCU1	6SE7031-7HF84-1HH0	1	6SE70_ _-_ EE_ _ 6SE70_ _-_ EF_ _

Component code	Designation	Order number	Qty.	Used in
-A27	PCU2	6SE7033-5HH84-1HH0	1	6SE70_ _-_ EG_ _ 6SE70_ _-_ EH_ _
-A24	PCC	6SE7031-7HH84-1HJ0	1	6SE70_ _-_ E_ _ _
-A20	IVI	6SE7031-2HF84-1BG0	1	6SE70_ _-_ EE_ _ 6SE70_ _-_ EF_ _
-A20	IVI	6SE7038-6GL84-1BG0	1	6SE70_ _-_ EG_ _ 6SE70_ _-_ EH_ _
-A29	IGD1	6SE7031-5EF84-1JC0	1	6SE7031-0EE_ _ 6SE7031-2EF_ _ 6SE7031-2/5EF_ _
-A29		6SE7031-8EF84-1JC0	1	6SE7031-8EF_ _
-A29	IGD5	6SE7031-6FG84-1JC0	1	6SE7032-1/6EG_ _
-A29	IGD6	6SE7033-2EG84-1JC0	1	6SE7033-2EG_ _
-A29		6SE7033-7EH84-1JC0	1	6SE7033-7EH20
-V1,-V2,-V3	Rectifier module	6SY7000-0AA87		6SE7031-0EE_ _
-V1,-V2,-V3		6SY7000-0AA86		6SE7031-2/5EF_ _
-V1,-V2,-V3		6SY7000-0AA85		6SE7031-8EF_ _
-V1,-V2,-V3		6SY7000-0AA88		6SE7032-1/6EG_ _
-V1,-V2,-V3		6SY7000-0AB17		6SE7033-2EG_ _
-V1,-V2,-V3		6SY7000-0AB00		6SE7033-7EH20
-A100 to -A310	IGBT	6SY7000-0AA44	6	6SE7031-0EE_ _
-A100 to -A310		6SY7000-0AA43	6 12	6SE7031-2/5EF_ _ 6SE7032-1/6EG_ _
-A100 to -A310		6SY7000-0AA34	6	6SE7031-8EF_ _
-A100 to -A310		6SY7000-0AB70	6	6SE7033-2EG_ _
-A100 to -A310		6SY7000-0AA81	6	6SE7033-7EH20
-A26	ABO	6SE7031-0EE84-1BH0	1	6SE7031-0EE_ _
-A26		6SE7031-5EF84-1BH0	1	6SE7031-2/5EF_ _
-A26		6SE7031-8EF84-1BH0	1	6SE7031-8EF_ _
-A26		6SE7032-6EG84-1BH0	1	6SE7032-1/6EG_ _
-A26		6SE7033-2EG84-1BH0	1	6SE7033-2EG_ _
-A26		6SE7033-7EH84-1BH0	1	6SE7033-7EH20

Table 7.1 Spare parts

7.2 Converter 500 V to 575 V 3AC

Part code No.	Designation	Order number	No.	Used in
-A10	CU1 (FC)	6SE7090-0XX84-0AA1	1	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	1	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	1	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	1	6SE70_ _-_ _ _ _ _
-E1	230 V AC fan	6SY7000-0AB28	1	6SE70_ _-_ _E_ _
-E1	230 V AC fan	6SY7000-0AB30	1	6SE70_ _-_ _F_ _
-E1	230 V AC fan	6SY7000-0AB66	1	6SE7031-3/6FG_ _
-E1	230 V AC fan	6SY7000-0AB68	1	6SE70_ _-_ _H_ _
-E1#	Fan nozzle	6SY7000-0AB65	1	6SE70_ _-_ _H_ _
-C110	Starting capacitor 2,0 µF	6SY7000-0AA36	1	6SE70_ _-_ EE1_ _
-C110	Starting capacitor 2,5 µF	6SY7000-0AA52	1	6SE70_ _-_ EF_ _
-C110	Starting capacitor 4,0 µF	6SY7000-0AB10	1	6SE7031-3/6FG_ _
-C110	Starting capacitor 10 µF	6SY7000-0AA52	1	6SE70_ _-_ _H_ _
-T10	Fan transformer	6SY7000-0AA55	1	6SE70_ _-_ FE_ _
-T10	Fan transformer	6SY7000-0AA57	1	6SE70_ _-_ FF_ _
-T10	Fan transformer	6SY7000-0AB16	1	6SE7031-3/6FG_ _
-G25-F1 -G25-F2	Fuse 2 A / 600 V 5 A / 600 V	 6SY7000-0AA24 6SY7000-0AB62	 2 2	 6SE70_ _-_ _E/F_ _ 6SE70_ _-_ _G/H_ _
	Capacitor bank	6SY7000-0AB50		6SE7026-1FE_ _ / 6SE7026-6FE_ _
		6SY7000-0AB51		6SE7028-0FF_ _ / 6SE7031-1FF_ _
		6SY7000-0AB52		6SE7031-3FG_ _
		6SY7000-0AB53		6SE7031-6FG_ _
		6SY7000-0AB54		6SE7032-0/3FH_ _
-G25	PSU1	6SE7032-8FH84-1JA0	1	6SE70_ _-_ F_ _ _
-A27	PCU1	6SE7031-7HF84-1HH0	1	6SE70_ _-_ FE_ _ 6SE70_ _-_ FF_ _
-A27	PCU2	6SE7033-5HH84-1HH0	1	6SE70_ _-_ FG_ _ 6SE70_ _-_ FH_ _
-A24	PCC	6SE7031-7HH84-1HJ0	1	6SE70_ _-_ F_ _ _
-A20	IVI	6SE7031-2HF84-1BG0		6SE7026-6FE_ _ / 6SE7028-0FF_ _ / 6SE7031-1FF_ _
-A20	IVI	6SE7038-6GL84-1BG0		6SE7031-3FG_ _ / 6SE7031-3FH_ _
-A29	IGD1	6SE7028-0FF84-1JC0		6SE7026-1FE_ _ / 6SE7031-1FF_ _ 6SE7026-6FE_ _ / 6SE7028-0FF_ _
-A29	IGD5	6SE7031-3FG84-1JC0		6SE7031-3FG_ _
-A29	IGD5	6SE7032-6EG84-1JC0		6SE7031-6FG_ _

Part code No.	Designation	Order number	No.	Used in
-A29	IGD6	6SE7032-3FH84-1JC0		6SE7032-0/3FH_ _
-V1,-V2,-V3	Rectifier module	6SY7000-0AB01	3 3	6SE7026-1FE_ _ / 6SE7031-1FF_ _ 6SE7026-6FF_ _ / 6SE7028-0FF_ _
-V1,-V2,-V3		6SY7000-0AB02	3	6SE7031-3FG_ _
-V1,-V2,-V3		6SY7000-0AB03	3	6SE7031-6FG_ _
-V1,-V2,-V3		6SY7000-0AB04	3	6SE7032-0/3FH_ _
-A100 ...	IGBT	6SY7000-0AA66	6 12	6SE7026-1FE_ _ / 6SE7026-6FE_ _ 6SE7031-3FG_ _
-A100 ...		6SY7000-0AA65	6 12	6SE7028-0FF_ _ / 6SE7031-1FF_ _ 6SE7031-6FG_ _
-A100 ...		6SY7000-0AB71	6	6SE7032-0/3FH_ _
-A26	ABO	6SE7026-1FE84-1BH0	1	6SE7026-1FE_ _0
-A26		6SE7028-0FF84-1BH0	1	6SE7026-6FE_ _ / 6SE7028-0FF_ _
-A26		6SE7031-3FG84-1BH0	1	6SE7031-3FG_ _ / 6SE7031-1FF_ _
-A26		6SE7031-6FG84-1BH0	1	6SE7031-6FG_ _
-A26		6SE7032-3FH84-1BH0	1	6SE7032-0/3FH_ _

Table 7.2 Spare parts

7.3 Converter 660 V to 690 V 3 AC

Part code No.	Designation	Order number	No.	Used in
-A10	CU1 (FC)	6SE7090-0XX84-0AA1	1	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	1	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	1	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	1	6SE70_ _-_ _ _ _ _
-E1	230 V AC fan	6SY7000-0AB28	1	6SE70_ _-_ _E_ _
-E1	230 V AC fan	6SY7000-0AB30	1	6SE70_ _-_ _F_ _
-E1	230 V AC fan	6SY7000-0AB66	1	6SE7031-0/2HG_ _
-E1	230 V AC fan	6SY7000-0AB67	1	6SE7031-5/7HG_ _
-E1	230 V AC fan	6SY7000-0AB68	1	6SE70_ _-_ _H_ _
-E1#	Fan nozzle	6SY7000-0AB65	1	6SE70_ _-_ _H_ _
-C110	Starting capacitor 2,0 µF	6SY7000-0AA36	1	6SE70_ _-_ _E_ _
-C110	Starting capacitor 2,5 µF	6SY7000-0AA52	1	6SE70_ _-_ _F_ _
-C110	Starting capacitor 4,0 µF	6SY7000-0AB10	1	6SE7031-0/2HG_ _
-C110	Starting capacitor 5,0 µF	6SY7000-0AB15	1	6SE7031-5/7HG_ _
-C110	Starting capacitor 10 µF	6SY7000-0AA52	1	6SE70_ _-_ _H_ _

Part code No.	Designation	Order number	No.	Used in
-T10	Fan transformer	6SY7000-0AA58	1	6SE70_ _-_ HF_ _
-T10	Fan transformer	6SY7000-0AB31	1	6SE7031-0/2HG_ _
-T10	Fan transformer	6SY7000-0AB61	1	6SE7031-5/7HG_ _
-G25-F1 -G25-F2	Fuse 6 A / 660 V	6SY7000-0AB63 6SY7000-0A???	2 2	6SE70_ _-_ _F_ _ 6SE70_ _-_ _G/H_ _
	Capacitor bank	6SY7000-0AB55		6SE7026-0HF_ _ 6SE7028-2HF_ _
		6SY7000-0AB56		6SE7031-0/2HG_ _
		6SY7000-0AB57		6SE7031-5/7HG_ _
		6SY7000-0AB58		6SE7032-1HH20
-G25	PSU1	6SE7031-7HG84-1JA0	1	6SE70_ _-_ H_ _ _
-A27	PCU1	6SE7028-2HF84-1HH0		6SE70_ _-_ HE_ _ 6SE70_ _-_ HF_ _
-A27	PCU2	6SE7032-3HH84-1HH0		6SE70_ _-_ HG_ _ 6SE70_ _-_ HH_ _
-A24	PCC	6SE7031-7HH84-1HJ0		6SE70_ _-_ H__ _
-A20	IVI	6SE7038-6GL84-1BG0		6SE70_ _-_ HF_ _ 6SE70_ _-_ HG_ _ 6SE70_ _-_ HH_ _
-A29	IGD2	6SE7026-0HF84-1JC0		6SE7026-0HF_ _ 6SE7028-2HF_ _
-A29	IGD5	6SE7031-2HG84-1JC0		6SE7031-0/2HG_ _
-A29		6SE7031-7HG84-1JC0		6SE7031-5/7HG_ _
-A29	IGD6	6SE7032-HH84-1JC0		6SE7032-1HH20
-V1,-V2,-V3	Rectifier module	6SY7000-0AB05	3	6SE7026-0HF_ _ 6SE7028-2HF_ _
-V1,-V2,-V3		6SY7000-0AB06	3	6SE7031-0/2HG_ _
-V1,-V2,-V3		6SY7000-0AB07	3 3	6SE7031-5/7HG_ _ 6SE7032-1HH20
-A100 ...	IGBT	6SY7000-0AA66	12	6SE7026-0HF_ _ 6SE7031-0/2HG_ _
-A100 ...		6SY7000-0AA65	6 12	6SE7028-2HF_ _ 6SE7031-5/7HG_ _
-A100 ...		6SY7000-0AB71	6	6SE7032-1HH20
-A26	ABO	6SE7026-0HF84-1BH0	1	6SE7026-0HF_ _
-A26	ABO	6SE7028-2HF84-1BH0	1	6SE7028-2HF_ _
-A26	ABO	6SE7031-2HG84-1BH0	1	6SE7031-0/2HG_ _
-A26	ABO	6SE7031-7HG84-1BH0	1	6SE7031-5/7HG_ _
-A26	ABO	6SE7032-3HH84-1BH0	1	6SE7032-1HH20

Table 7.3 Spare parts

8 Environmental friendliness

Environmental aspects during the development

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

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

Plastic components:

ABS:	PMU support panel LOGO
LDPE:	Capacitor ring
PA6.6:	Fuse holders, mounting rail, capacitor holder, cable retainer, connecting strips, terminal strip, supports, PMU adapter, covers
PC:	Covers
PP:	Insulating boards bus retrofit
PS:	Fan housing
UP:	Tensioning profile retaining bolts

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

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

Environmental aspects during production

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

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

ASIC devices and SMD devices were used on the boards.

The product is emission-free.

Environmental aspects for disposal

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

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

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

9 Technical Data

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

Switching at the input	No./min	2
Cooling medium temperature		0 °C to +40 °C
Storage temperature		– 25 °C to +70 °C
Transport temperature		– 25 °C to +70 °C
Environmental class	3K3	DIN IEC 721-3-3 Moisture condensation not permissible
Pollution level	2	DIN VDE 0110 Pert 1
Overvoltage category	III	DIN VDE 0110 Part 2
Overvoltage property class	1	E DIN VDE 0160
Degree of protection		DIN VDE 0470 Section 1 ≙ EN 60529
– standard	IP00	
– option	IP20	
Protection class	I	DIN VDE 0106 Section 1
Radio interference level		DIN VDE 0875 Section 11 ≙ EN 55011
– standard	without	
– option	A1	EN55011
Noise immunity		EN50082-2
Mechanical strength		DIN IEC 68-2-6 / 06.90

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

Drive converter types							
FC	**6SE70...**	**31-0EE10**	**31-2EF10**	**31-EF10**	**31-8EF10**	**32-1EG10**	**32-6EG10**
VC	**6SE70...**	**31-0EE20**	**31-2EF20**	**31-5EF20**	**31-8EF20**	**32-1EG20**	**32-6EG20**
SC	**6SE70...**	**31-0EE30**	**31-2EF30**	**31-5EF30**	**31-8EF30**	**32-1EG30**	**32-6EG30**
Rated voltage, rated frequency, rated current							
Rated voltage in V_n Input Output	V	 3 AC 380 ... 460 ± 15 % 3 AC 0 ... Rated input voltage					
Rated frequency f_n Input Output:	Hz	 50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 92 92	 124 124	 146 146	 186 186	 210 210	 260 260
DC link voltage V_{dn}	V	510...620					
Rated output	kVA	61...73	82...99	96...116	122...148	138...167	171...207
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	84	113	133	169	191	237
Base load time	s	240					
Overcurrent	A	126	169	199	254	287	355
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	84	113	133	169	191	237
Base load time	s	270					
Overcurrent	A	147	198	234	298	336	416
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0,97 0,97	 0,97 0,97	 0,97	 0,98	 0,98	 0,98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 1,27 1,42	 1,73 1,94	 2,12	 2,22	 3,32	 4,11
Required cooling air flow	m^3/s	0,10	0,14	0,14	0,14	0,31	0,31
Pressure drop Δp	Pa	160	230	230	230	130	130
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	71	71	71	71	84	84
Type		E	F	F	F	G	G
Width Height Depth	mm	270 1050 350	360 1050 350	360 1050 350	360 1050 350	508 1450 460	508 1450 460
Weight – IP00 – IP20	kg	 55 70	 65 82	 65 82	 65 82	 155 186	 155 186

Drive converter types								
FC	**6SE70...**	**33-2EG10**						
VC	**6SE70...**	**33-2EG20**	**33-7EH20**					
SC	**6SE70...**	**33-2EG30**	**33-7EH20**					
Rated voltage, rated frequency, rated current								
Rated voltage in V_n Input Output	V	3 AC 380 ... 460 ± 15 % 3 AC 0 ... Rated input voltage						
Rated frequency f_n Input Output:	Hz	50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400						
Rated current I_n Input Output	A	315 315	370 370					
DC link voltage V_{dn}	V	510...620						
Rated output	kVA	207...251	244...295					
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)						
Loading Class II acc. to EN 60146-1-1								
Rated current	A	287	337					
Base load time	s	240						
Overcurrent	A	430	503					
Overcurrent time	s	60						
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)								
Rated current	A	287	337					
Base load time	s	270						
Overcurrent	A	504	592					
Overcurrent time	s	30						
Losses, cooling, power factor								
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.					
Efficiency η – Pulse frequency 3 kHz		0,98	0,98					
Power loss – Pulse frequency 3 kHz	kW	5,19	6,83					
Required cooling air flow	m^3/s	0,41	0,57					
Pressure drop Δp	Pa	145	256					
Sound pressure level, dimensions, weights								
Sound pressure level	dB(A)	84	86					
Type		G	H					
Width Height Depth	mm	508 1450 460	508 1580 460					
Weight – IP00 – IP20	kg	165 196	220 240					

Drive converter types							
FC	**6SE70...**	**26-1FE10**	**26-6FE10**	**28-0FF10**	**31-1FF10**	**31-3FG10**	**31-6FG10**
VC	**6SE70...**	**26-1FE20**	**26-6FE20**	**28-0FF20**	**31-1FF20**	**31-3FG20**	**31-6FG20**
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	3 AC 500 ... 575 ±15 % 3 AC 0 ... Rated input voltage					
Rated frequency f_n Input Output:	Hz	50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	61 61	66 66	79 79	108 108	128 128	156 156
DC link voltage V_{dn}	V	675...780					
Rated output	kVA	53...61	57...66	68...79	94...108	110...127	135...155
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	55	60	72	98	117	142
Base load time	s	240					
Overcurrent	A	83	90	108	147	174	213
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	55	60	72	98	117	142
Base load time	s	270					
Overcurrent	A	98	106	126	173	205	250
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		0,97 0,97	0,97 0,97	0,97	0,98	0,97	0,97
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	1,06 1,32	1,16 1,45	1,50	2,0	3,38	4,18
Required cooling air flow	m^3/s	0,10	0,10	0,14	0,14	0,31	0,31
Pressure drop Δp	Pa	160	160	230	230	130	130
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	71	71	71	71	84	84
Type		E	E	F	F	G	G
Width Height Depth	mm	270 1050 350	270 1050 350	360 1050 350	360 1050 350	508 1450 460	508 1450 460
Weight – IP00 – IP20	kg	55 70	55 70	65 82	65 82	155 186	155 186

Drive converter types							
FC	**6SE70...**	**32-0FH10**	**32-3FH10**				
VC	**6SE70...**	**32-0FH20**	**32-3FH20**				
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 3 AC 500 ... 575 ±15 % 3 AC 0 ... Rated input voltage					
Rated frequency f_n Input Output:	Hz	 50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 192 192	 225 225				
DC link voltage V_{dn}	V	675...780					
Rated output	kVA		195 224				
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	174	205				
Base load time	s	240					
Overcurrent	A	262	307				
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	174	205				
Base load time	s	270					
Overcurrent	A	307	360				
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.				
Efficiency η – Pulse frequency 3 kHz		 0,98	 0,97				
Power loss – Pulse frequency 3 kHz	kW	 5,48	 6,50				
Required cooling air flow	m^3/s	0,57	0,57				
Pressure drop Δp	Pa	256	256				
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	86	86				
Type		H	H				
Width Height Depth	mm	508 1580 460	508 1580 460				
Weight – IP00 – IP20	kg	 220 240	 220 240				

Drive converter types							
FC	**6SE70...**	**26-0HF10**	**28-2HF10**	**31-0HG10**	**31-2HG10**	**31-5HG10**	**31-7HG10**
VC	**6SE70...**	**26-0HF20**	**28-2HF20**	**31-0HG20**	**31-2HG20**	**31-5HG20**	**31-7HG20**
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	3 AC 660 ... 690 ±15 % 3 AC 0 ... Rated input voltage					
Rated frequency f_n Input Output:	Hz	50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	60 60	82 82	97 97	118 118	145 145	171 171
DC link voltage V_{dn}	V	890...930					
Rated output	kVA	69...72	94...98	111..116	135...141	166...173	171...179
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	55	75	88	107	132	156
Base load time	s	240					
Overcurrent	A	82	112	132	161	198	233
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.
Efficiency η – Pulse frequency 3 kHz		0,98	0,98	0,98	0,98	0,98	0,97
Power loss – Pulse frequency 3 kHz	kW	1,27	1,76	2,54	3,10	3,84	4,54
Required cooling air flow	m^3/s	0,14	0,14	0,31	0,31	0,41	0,41
Pressure drop Δp	Pa	230	230	130	130	145	145
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	71	71	84	84	84	84
Type		F	F	G	G	G	G
Width Height Depth	mm	360 1050 350	360 1050 350	508 1450 460	508 1450 460	508 1450 460	508 1450 460
Weight – IP00 – IP20	kg	65 82	65 82	155 186	155 186	155 186	155 186

Drive converter types								
FC	**6SE70...**							
VC	**6SE70...**	**32-1HH20**						
SC	**6SE70...**							
Rated voltage, rated frequency, rated current, rated output								
Rated voltage in V_n Input Output	V	 3 AC 660 ... 690 ±15 % 3 AC 0 ... Rated input voltage						
Rated frequency f_n Input Output:	Hz	 50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400						
Rated current I_n Input Output	A	 208 208						
DC link voltage V_{dn}	V	890...930						
Rated output	kVA	238...249						
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)						
Loading Class II acc. to EN 60146-1-1								
Rated current	A	189						
Base load time	s	240						
Overcurrent	A	284						
Overcurrent time	s	60						
Losses, cooling, power factor								
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0,98 < 0,92 ind.						
Efficiency η – Pulse frequency 3 kHz		 0,97						
Power loss – Pulse frequency 3 kHz	kW	 6,50						
Required cooling air flow	m^3/s	0,57						
Pressure drop Δp	Pa	256						
Sound pressure level, dimensions, weights								
Sound pressure level	dB(A)	86						
Type		H						
Width Height Depth	mm	508 1580 460						
Weight – IP00 – IP20	kg	 220 240						

9.1 De-rating for an increased cooling medium temperature

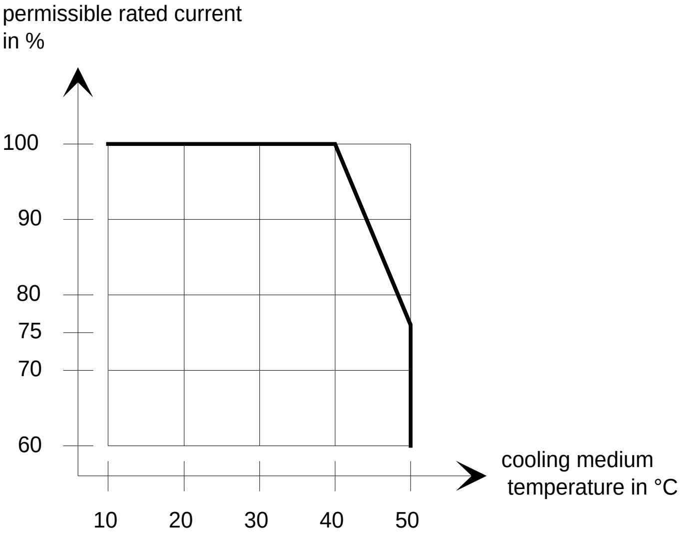


Fig. 9.1 Max. permissible rated current as a function of the cooling medium temperature

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

For installation altitudes > 1000 m above sea level, the rated current must be reduced. For installation altitudes > 2000 m above sea level, the rated voltage must be reduced (see Fig. 9.2). Installation altitudes > 4000 m above sea level are not permissible.

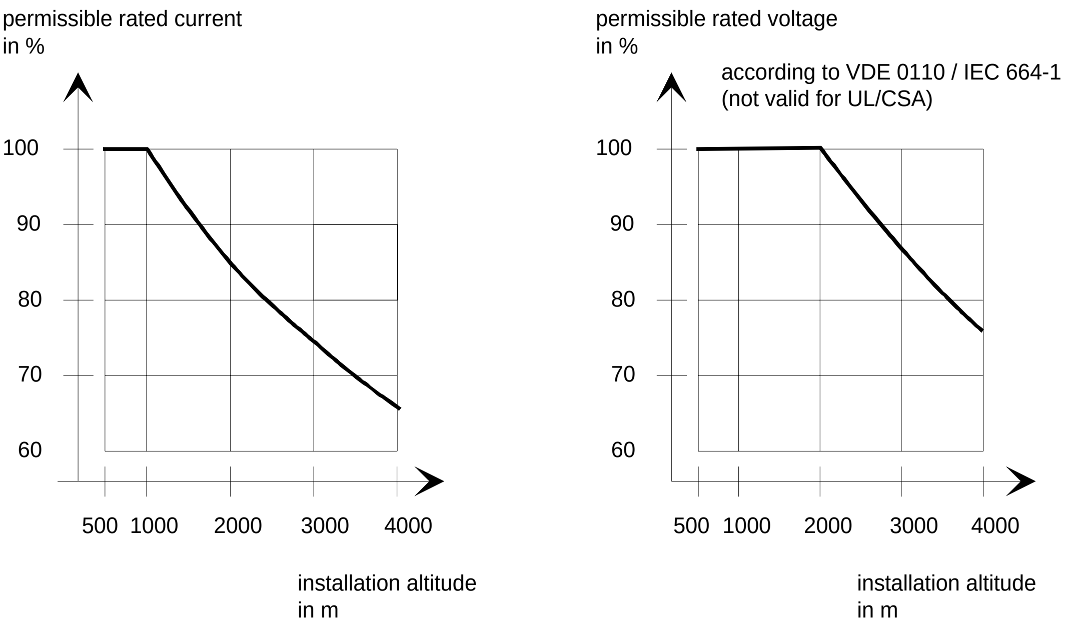


Fig. 9.2 Max. permissible rated current and rated voltage as a function of the installation altitude

9.3 De-rating as a function of the pulse frequency

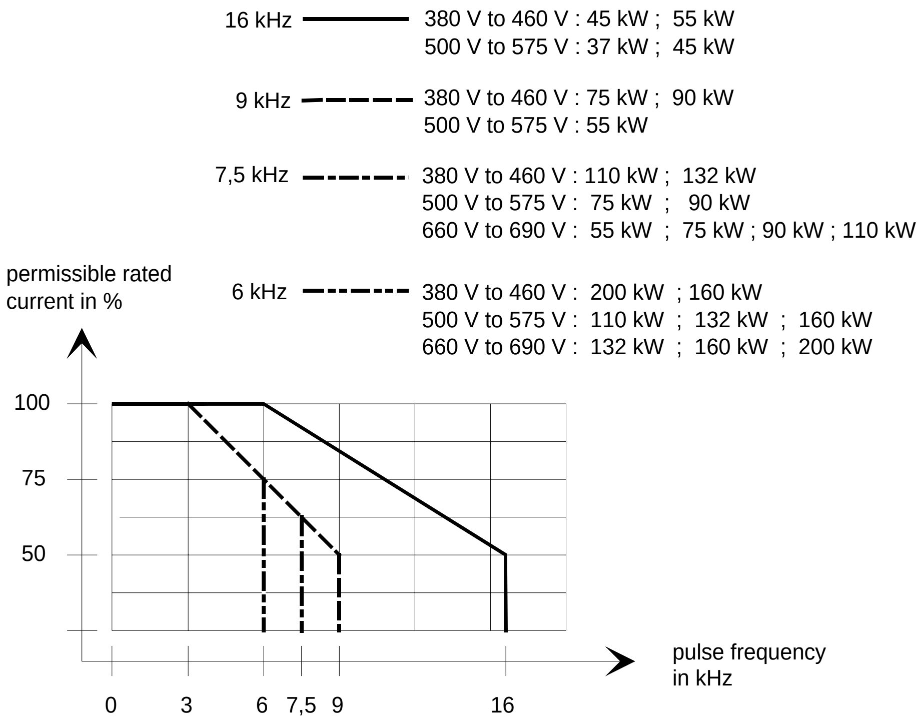


Fig. 9.3 Max. permissible rated current as a function of the pulse frequency

10 Appendix

10.1 Index

10.2 List of abbreviations

A	Alarm
AA	Analog output
AC	Alternating current
AE	Analog input
AFE	Active front end
AS	Sequence control
ASIC	Application specific integrated circuit
ASM	Asynchronous motor
ATI	Analog tacho-Interface
AWG	American wire gauge
BA	Binary output
BC	Bypass contactor
BE	Binary input
BF	Type of construction
CAN	Controller area network
CB	Communication board (option)
CU	Control unit
CUA	Control unit AFE (control unit of AFE)
DC	Direct current
DPR	Dual-port-RAM
DPRAM	Dual-port-RAM
EA	First run-up
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMF	Electromotive force
EPROM	Erasable programmable read-only memory
ESD	Electrostatic sensitive devices
F	Fault
FC	Frequency control (control version of SIMOVERT MASTER DRIVES)

FF	Fatal fault
FI	Fault current
FSW	Fixed setpoint
G/R	Basic/reserve
GSST(1/2)	Basic drive converter serial interface (1/2)
H	High (binary signal level)
HLG	Ramp-function generator
HTL	High-voltage transistor logic
HW	Hardware
I/O	Input/output
IGBT	Insulated gate bipolar transistor
IGD	IGBT gate drive
IVI	Inverter interface
KIP	Kinetic buffering
L	Low (binary signal level)
LBA	Local bus adapter (option)
LED	Light emitting diode
LSB	Least significant bit
MC	Main contactor
MDS	Motor data set
MLFB	Machine-readable product designation (machine-readable designation)
MSB	Most significant bit
NN	Sea level
OP(1)	Operation panel (1)
Par	Parameter
PC	Personal computer
PEU	Power electronic unit
PG	Programming unit (programmer)
PKW	Parameter ID value
PMU	Parameterization unit
PROFIBUS	Process field bus
PS	Power supply
PSU	Power supply unit
PWE	Parameter value
PZD	Process data
Q	Source
RC	Combination, resistor ® and capacitor (C)
RDS	Reserve data set

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

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12 Certificates

SIEMENS

Drive and Standard Products Group

Test certificate

Erlangen, 01.07.1995

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

The routine testing according to these test instructions

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

Tests performed:

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

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

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

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

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

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

ASI 1 PE D F

Schlögel

ASI 1
System-Based
Drive Technology

SIEMENS Drive and Standard Products Group

Confirmation

Erlangen, 01.07.1995

This confirms that

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

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

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

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

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

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

ASI 1 PE D T

Dr. Link

ASI 1
System-Based
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SIEMENS

EEC Manufacturer's Declaration

(acc. to Article 4, Section 2 of the EEC Directive 89/392/EEC MSR)

4SE.476 000 0000.00 HE

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	Drives and Standard Products Group
	Business Division Drive systems
	Sub-Division Variable-speed drives
Address:	Postfach 3269
	D-91050 Erlangen
Product name:	SIMOVERT
	Type 6SE70 chassis units AC-AC and DC-AC

The designated product is exclusively designed for installation in another machine. Start-up is absolutely prohibited until it has been determined that the final product conforms with the Directive 89/392/EEC of the Council.

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

EN 60204-1 (DIN EN 60204 Part 1 / VDE 0113 Part 1)

VDE 0160

VDE 0558 Part 1

Erlangen, 10. 02. 1995

Siemens Aktiengesellschaft

i. V.
H. Mickal
Head of the production unit
Variable-speed drives

i. V.
G. Löw
Head of the commercial department
Variable-speed drives

This declaration does not guarantee specific equipment characteristics and features.

The safety instructions provided with the product documentation must be observed.

ASI 1 D /U 4100 4SE.476 000 0000.00 HE Page 1 of 1

SIEMENS

EC Declaration of Conformity

(acc. to Article 10 of the EEC Directive 73/23/EEC with all revisions NSR)

4SE.476 000 0000.00 KE NSR

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

The designated product fulfills the regulations and rules of the following European Directives:

73/23/EEC Directive of the council for the harmonisation of the binding regulations of member states regarding electrical equipment for use within certain voltage limits, modified by RL 93/68/EEC of the Council.

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

EN 60204-1 Edition date 06/93

CE mark attached: 1996

Erlangen, 21.12.1995

Siemens Aktiengesellschaft

i. V.

H. Mickal	Dr. H. Preßl
Head of the Drive System Production Unit	Head of the commercial department

The LVD Appendix is part of this declaration.

This declaration does not guarantee specific equipment characteristics and features.

The information and instrucions in the product documentation must be observed.

ASI 1 D/U 4103 Page 1 of 1

SIEMENS

Factory certificate *

regarding electromagnetic compatability

4SE.476 000 0000.00 WB EMC

Manufacturer: Siemens Aktiengesellschaft
Drives and Standard Products Group
Business Division Variable-speed drives
Sub-Division Drive systems

Address: Postfach 3269
D-91050 Erlangen

Product name: SIMOVERT
Type 6SE70 chassis units AC-AC and DC-AC

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

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

EN 55011 (DIN VDE 0875 Part 11)

E DIN/IEC 22G /21/ CDV: 1995-10

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)

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

Erlangen, 21. 12. 1995

i. V.

H. Mickal
Head of the Drive System Production Unit

This declaration does not guarantee specific equipment characteristics and features.

*) acc. to EN 10204 (DIN 50049)

ASI 1 D/U 4102x Page 1 of 1

The following versions have appeared so far:

Version	Internal Item number
AB	476 957.4000.76 AB-76

Version AB consists of the following chapters

Chapters		Changes	Pages	Version date
0	General			12.96
1	Description	First Edition	4	08.96
2	Transport, Unpacking, Installation	First Edition	5	08.96
3	Connecting-up	First Edition	4	08.96
4	Operator control	First Edition	2	08.96
5	Maintenance	First Edition	6	08.96
6	Options	First Edition	10	08.96
7	Spare Parts	First Edition	5	08.96
8	Environmental friendliness	First Edition	1	08.96
9	Technical Data	First Edition	9	08.96
10	Appendix	First Edition	4	08.96
11	Adresses	First Edition	2	08.96
12	Certificates	Reviewed Edition	5	12.96

Drives and Standard Products Group
Variable-Speed Drives Division
PO Box 3269, D-91050 Erlangen

ASI 1
System-Based
Drive Technology

Siemens Aktiengesellschaft

Subject to change without notice

Order No.: 6SE7087-6AH70
Printed in the federal Republic of Germany
12.96

SIEMENS

SIMOVERT MASTER DRIVES

Operating Instructions
Part 1

Chassis units (Type K)
AC-AC

Edition: AB

Order No.: 6SE7087-6AK70

Overview of the MASTER DRIVES Operating Instructions:

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

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

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

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

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

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

Contents

0 Definitions

- QUALIFIED PERSONAL

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

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

- DANGER

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

- WARNING

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

- CAUTION

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

- NOTE

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

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

CAUTION

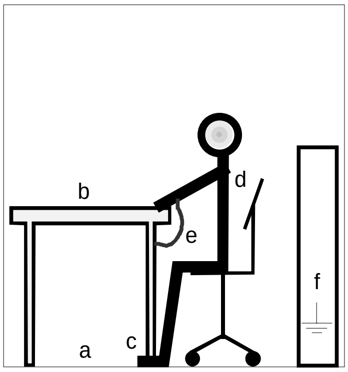
Components which can be destroyed by electrostatic discharge (ESD)

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

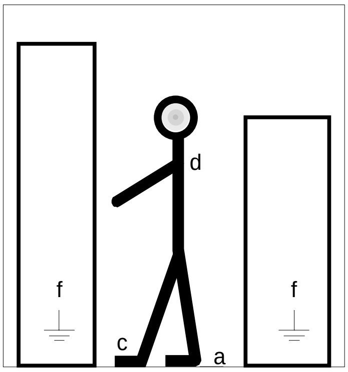
- Electronic boards should only be touched when absolutely necessary.
- The human body must be electrically discharged before touching an electronic board
- Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from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

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

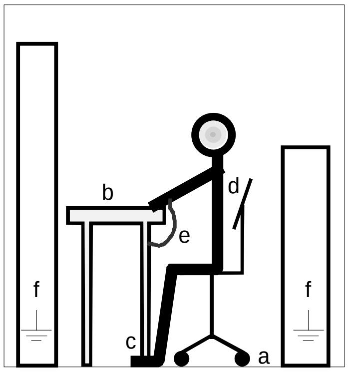
a	=	Conductive floor surface	d	=	ESD overall
b	=	ESD table	e	=	ESD chain
c	=	ESD shoes	f	=	Cubicle ground connection



Sitting



Standing



Standing / Siting

WARNING

Hazardous voltages are present in this electrical equipment during operation.

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

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

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

0.1 Safety and operating instructions for drive converters

Safety and operating instructions for drive converters

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

1. General

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

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

For further information, see documentation.

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

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

2. Intended use

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

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

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

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

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

3. Transport, storage

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

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

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

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

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

5. Electrical connection

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

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

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

6. Operation

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

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

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

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

Keep safety instructions in a safe place!

1 Description

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

- Compact units — with three-phase- or DC current input
  Output range: 2.2 kW to 37 kW
- Chassis units — with three-phase- or DC current input
  Output range: AC-AC: 45 kW to 400 kW
  DC-AC: 45 kW to 1500 kW
- Cabinet units — with three-phase- or DC current input
  Output range: 45 kW to 6.4 MW

The following control classes are available depending on the application conditions

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

1.1 Applications

Drive converter with three-phase current input

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

In the basic design, SIMOVERT MASTER DRIVES can be used for two-quadrant operation. Four-quadrant operation is possible using the braking unit option. SIMOVERT MASTER DRIVES are suitable for single-motor- and multi-motor drives.

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

1.2 Mode of operation

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

The converter is then ready for operation.

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

SIMOVERT VC

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

SIMOVERT VC is suitable for:

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

Some of the applications are, for example:

- Winder drives
- Rolling mill drives.

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

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

SIMOVERT SC

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

SIMOVERT SC is suitable for:

- Single-motor drives with induction motors

Some of the applications are, for example

- Winder drives,
- Foil machines,
- Packaging machines

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

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

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

The following encoders can be used:

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

1.3 Operator control- and open-loop control possibilities

The unit can be controlled via

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

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

1.4 Block diagram

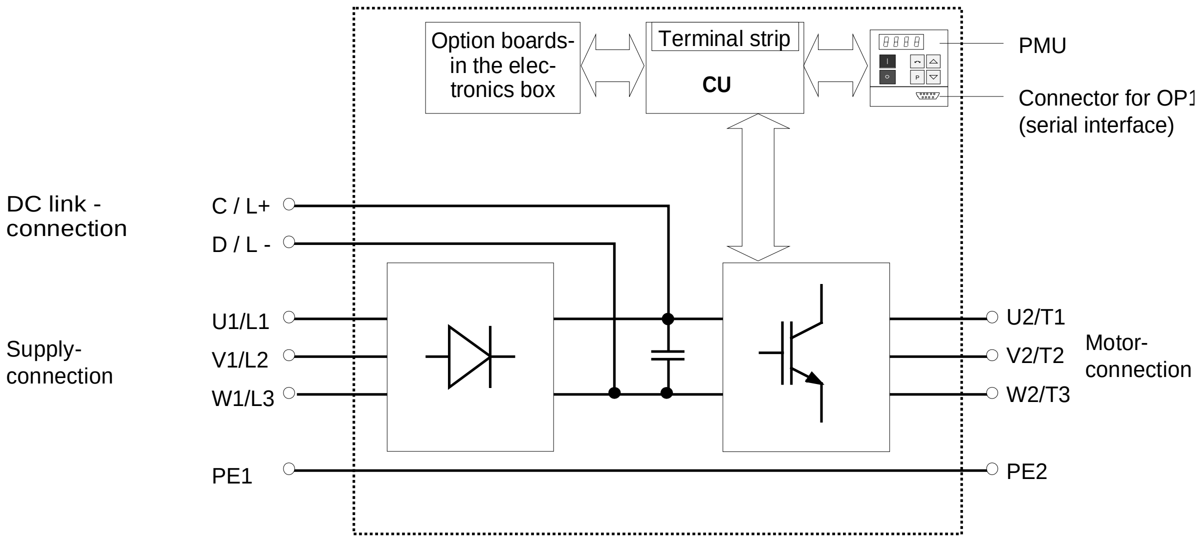


Fig. 1.1 Block diagram

2 Transport, Unpacking, Installation

2.1 Transport and unpacking

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

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

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

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

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

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

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

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

2.2 Storage

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

WARNING

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

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

2.3 Mounting

The following are required for mounting:

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

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE) must be observed as well as the professional handling of tools and the use of personnal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

Chassis units do not provide any protection against direct contact. It is the users responsibility to ensure and provide the correct protection against contact according to the relevant accident prevention regulations VBG4, by appropriately designing the enclosure or enclosures around the chassis unit.

Remove shipping brace (marked).

Requirements at the point of installation:

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

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

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

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

WARNING

When mounting in cabinets, a clearance of above and below must be provided so that the cooling air flow is not restricted (refer to dimension drawings, Section 2.4).

Dimension the cabinet cooling in line with the power loss and cooling air flow! (☞ Section „Technical data“)

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

Information for mounting a chassis unit in a cabinet:

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

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

Table 2.1

Door/roof section cut-outs

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

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

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

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

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

Mounting components in the roof section

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

Implementing the 24V DC-auxiliary power supply

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

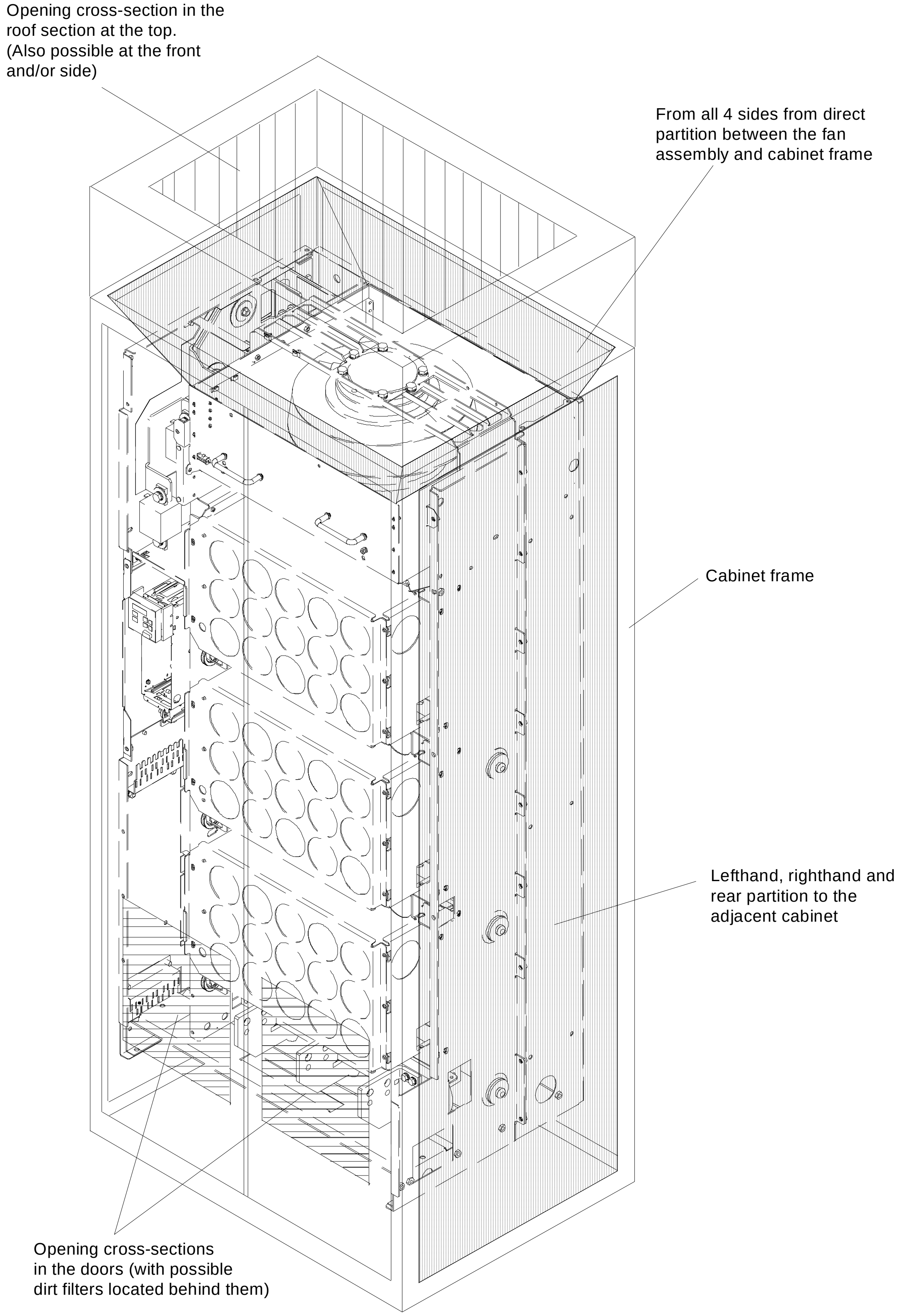
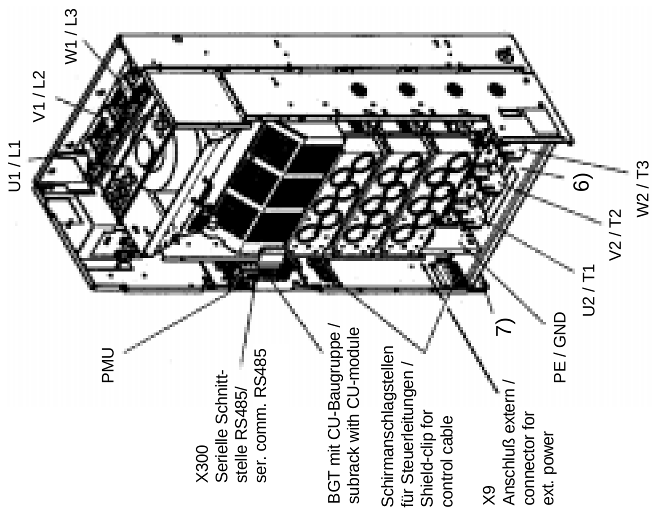
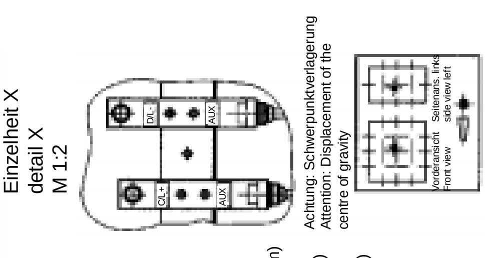
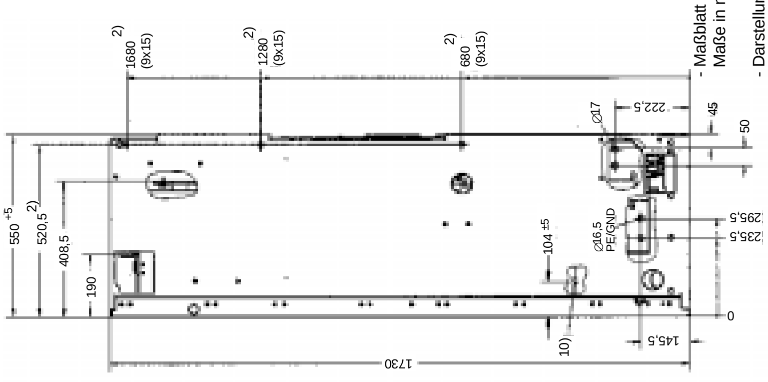

Opening cross-section in the
roof section at the top.
(Also possible at the front
and/or side)
From all 4 sides from direct
partition between the fan
assembly and cabinet frame
Cabinet frame
Lefthand, righthand and
rear partition to the
adjacent cabinet
Opening cross-sections
in the doors (with possible
dirt filters located behind them)

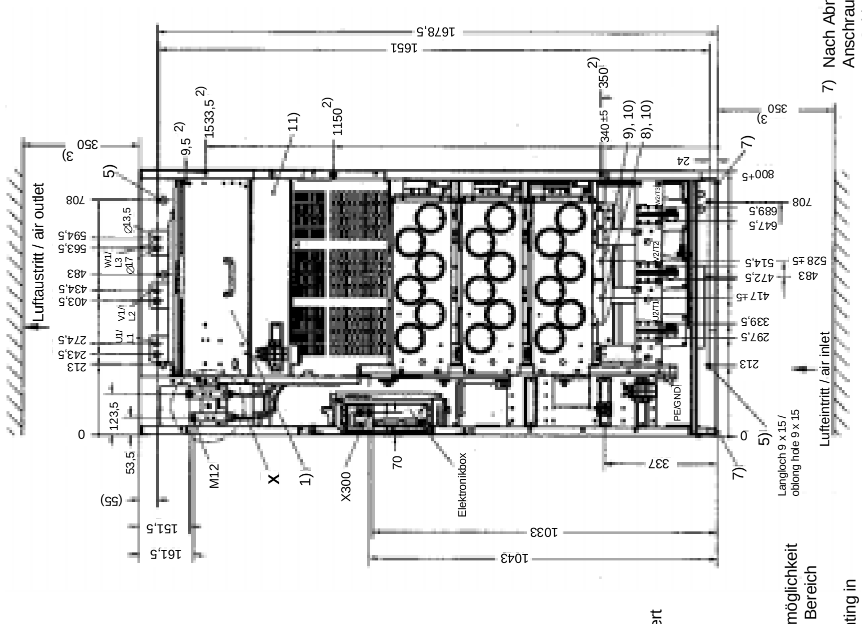
Fig. 2.1

2.4 Dimension drawing









- Maßblatt / Dimension drawing
  Maße in mm / Dimensions in mm
- Darstellung ohne Abdeckungen / view without covers
- Max. Umgebungstemp. = 40 °C / max. ambient temp. = 40 °C
- Anschlüsse:

U1 / V1 / W1	(M16/M12)	(max. 2 x 300 mm^{2}oder Stromschiene 45 x 10 mm)
U2 / V2 / W2	(M16)	(max. 4 x 300 mm^{2}oder Stromschiene 90 x 5 mm)
PE	(M16)	(max. 4 x 300 mm^{2}oder Stromschiene 90 x 5 mm)

connection:

L1 / L2 / L3	(M16/M12)	(max. 2 x 300 mm^{2}or busbar 45 x 10 mm)
T1 / T2 / T3	(M16)	(max. 4 x 300 mm^{2}or busbar 90 x 5 mm)
GND	(M16)	(max. 4 x 300 mm^{2}or busbar 90 x 5 mm)

- Geräuschpegel: 77 db A
  Noise level: 77 db A

Einbaugeräte AC-AC
Bauform K

1) Lüftereinschub muß zur Gerätemontage demontiert werden / ventilator unit must be removed before the chassis is to be mounted in a housing

2) zusätzliche Befestigungsmöglichkeit des Chassis im vorderen Bereich (z. B. Schrankholm) / additional holes for mounting in the front (e.g. on cubicle frame)

3) Luftraum für Kühlung
ACHTUNG:
Beim Einbau des Chassis beachten, daß kein Kurzschluß im Luftstrom entsteht! / space required for cooling
NOTE:
By mounting the chassis into a housing watch that there is no short-circuit of air-stream!

4) Gewicht: Netto ca. 455 kg
mit Transportteile ca. 475 kg
Weight: net weight app. 455 kg
with transport parts app. 475 kg

5) Schrank-/Wandbefestigung mit Sechskantschrauben M8/M10 / cabinet-/wall-mounting with hexagon head screws M8/M10

6) TRANSPORTBLECHE:
- Tragblech zum Einbau in Schrank mittels Gabelstapler
- ACHTUNG:
  Tragblech nach Einbau entfernen
- HINWEIS:
  Tragblech wird unter Umständen für späteren Aus-/Einbau wieder benötigt!

TRANSPORT PARTS:
- transport parts for moving the chassis unit in a cabinet with a fork lift truck
- ATTENTION:
  remove transport part after mounting
- NOTE:
  for perhaps later removing the chassis unit, the transport part needed also

7) Nach Abnahme der Transportbleche sind hier Anschraubmöglichkeiten (∅12) für Blechteile zur Schirmauflage der Motorleitungen. / After removing transport brackets, there are possibilities (∅12) for mounting sheet metal parts for sheeld connection of motor cables.

8) Wasserkühlung - Vorlauf / watercooling inlet

9) Wasserkühlung - Rücklauf / watercooling outlet (return flow)

10) Bei Wasserkühlung, Anschluß für Kühlkreislauf direkt am Kühlkörper - 1" Innengewinde (R1")/ If watercooled units the connections for cooling circulation are on the heatsink 1" internal thread (R1")

11) Entlüftung bei Wasserkühlung / dearation for watercooled unit

Fig. 2.2 Type of construction K

3 Connecting-up

WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out!

Only professionally trained, qualified personnel must work on or with the unit.

Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.

Extreme caution should be taken when working-on the unit when it is open, as external power supplies may be connected. The power terminals and control terminals can still be at hazardous potentials even when the motor is stationary.

Hazardous voltages are still present in the unit up to 5 minutes after it has been powered-down due to the DC link capacitors. Thus, the appropriate delay time must be observed before opening-up the unit.

Forming the DC link capacitors:

The storage time should not exceed one year. The converter DC link capacitors must be formed at start-up if the unit has been stored for a longer period of time.

Forming is described in the Instruction Manual, Part 2.

The user is responsible, that the motor, converter and any other associated devices or units are installed and connected-up according to all of the recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be especially observed.

If a protective device trips in a current arm, then a fault current could have been interrupted. In order to reduce the danger of fire or electric shock, the live parts and over components of the converter should be checked and damaged components replaced.

INFORMATION

- ♦ Protection: Fuses must be incorporated in the equipment supply connection. For a list of the recommended fuses, refer to Table 3.1.
- ♦ Supply rating: The converter is suitable for connecting to supplies with a short-circuit rating (supply) $\leq 100 \times$ rated output (converter).
- ♦ The converter should be connected via a line reactor according to Table 3.1.
- ♦ Cabling/wiring: Connecting cables should be dimensioned according to the local regulations and according to section „Power connections“. The insulation should be suitable for 75°C.

3.1 Power connections

	WARNING
	♦ The unit will be destroyed if the input- and output terminals are interchanged! ♦ The converter will be destroyed if the DC link terminals are interchanged or short-circuited! ♦ The coils of contacts and relays which are connected to the same supply as the converter or are located in the vicinity of the converter, must be provided with overvoltage limiters, e.g. RC elements. ♦ It is not permisible that the converter is connected-up through an e.l.c.b. (ground fault circuit interrupter) (DIN VDE 0160).

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

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

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

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

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

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

NOTE
Depending on the motor insulation strength and the length of the motor feeder cable, it may be necessary to install one of the following options between the motor and the converter: ♦ Output reactor ♦ dv/dt-filter only for VC, not permissible for SC Information regarding selection and dimensioning is provided in Section „Options“.

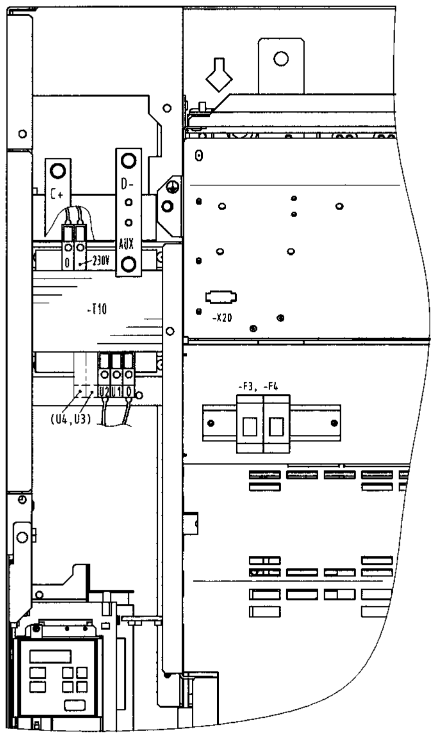


Fig. 3.1 Fan transformer (-T10), fan transformer fuses (-F3, -F4)

Order No.	Rated input cuerr.	supply side										Motor connection Cross-section	
		Cross-section		Recommended fuse							Line reactor		
		VDE		gR (SITOR)		gL NH		North-America				VDE	
	(A)	(mm^2)	AWG1)	(A)	Type	(A)	Type	Type	(V)	(A)		(mm^2)	AWG
6SE70					3NE1		3NA3				4E		
	Rated input-voltage 380 V to 460 V												
35-1EK20	510	2×300	2×800	560	435-0	630	372				U3051-5UA00	2×300	2×800
36-0EK20	590	4×300	4×800	630	436-0	710					U3051-6UA00	4×300	4×800
	Rated input-voltage 500 V to 575 V												
33-0FK20	297	2×300	2×800	315	230-0	400	260 2)	AJT, LPJ	600	400	U2751-3UA00	2×300	2×800
33-5FK20	354	2×300	2×800	400	330-0	500	260 2)	AJT, LPJ	600	500	U2751-4UA00	2×300	2×800
34-5FK20	452	2×300	2×800	500	334-0	630	3NE 1436-0	AJT, LPJ	600	600	U3051-2UA00	2×300	2×800
	Rated input-voltage 660 V to 690 V												
33-0HK20	297	2×300	2×800	315	230-0	400	260-6				U3051-3UA00	2×300	2×800
33-5HK20	354	2×300	2×800	400	330-0	500	365-6				U3051-4UA00	2×300	2×800
34-5HK20	452	2×300	2×800	500	334-0	630	3NE 1436-0				U3651-5UA00	2×300	2×800

INFORMATION AND EXPLANATIONS

The cross-sections are determined for copper cables at 40 °C (104 °F) ambient temperature (in accordance with DIN VDE 0298 Part 4 / 02.88 Group 5) and the recommended cable protection according to DIN VDE 0100 Part 430.

The cables and semiconductors are protected using fuses with gR characteristics. Only the cables, but not the semiconductors, are protected using gL fuses.

1) American Wire Gauge

2) The specified fuses are valid for converters with a 3-ph AC 500 V input voltage. For converters with higher input voltage, fuses up to 660 V must be used. The Order Nos. of these fuses are obtained by attaching the suffix "-6" to the appropriate 500 V fuse Order No.

e.g.: 3NA3803 ≙ 500 V
3NA3803-6 ≙ 660 V

Table 3.1 Power connections acc. to DIN VDE

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

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

3.1.1 Protective conductor connection

The protective conductor should be connected-up on both the supply- and motor sides. It should be dimensioned according to the power connections.

3.1.2 DC link connection

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

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

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

3.2 Auxiliary power supply/main contactor

The auxiliary power supply and the main contactor are connected through the 5-pin connector X9. Connector X9 is supplied together with the connectors for the control terminal strip. Cables from 0.2 mm^2 to 2.5 mm^2 (AWG: 24 to 14) can be connected to X9.

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

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

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

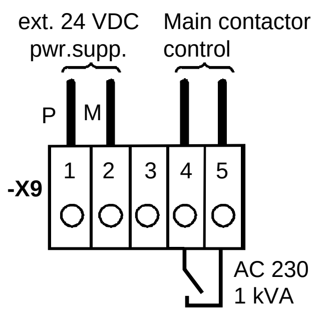


Fig. 3.2 Connecting an external auxiliary 24 V DC power supply and main contactor control

Term.	Function description
1	24 V DC external ≥ 1,8 A (max. 6,5 A dependent on the options)
2	Reference potential to DC
3	Unassigned
4	Main contactor control
5	Main contactor control

Table 3.3 Connector assignment for -X9

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

3.3 Instructions for EMC-correct installation

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

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

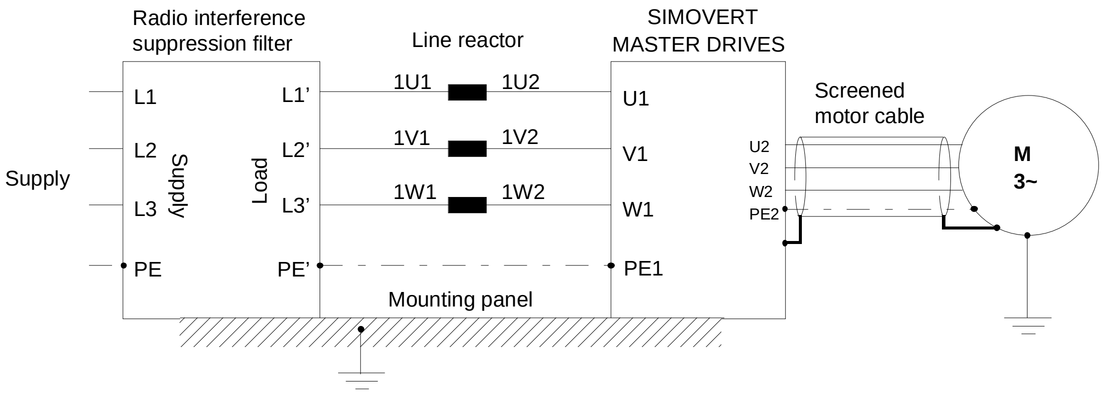


Fig. 3.3 Location of the components

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

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

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

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

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

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

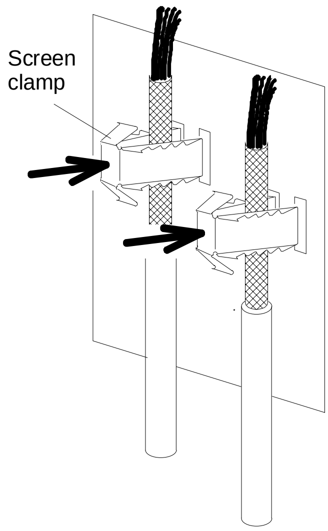


Fig. 3.4.1

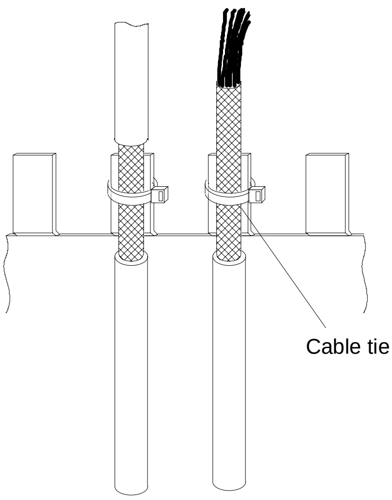


Fig. 3.4.2

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

4 Operator control

The converter can be controlled via:

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

Operator control using the PMU is described in this section.

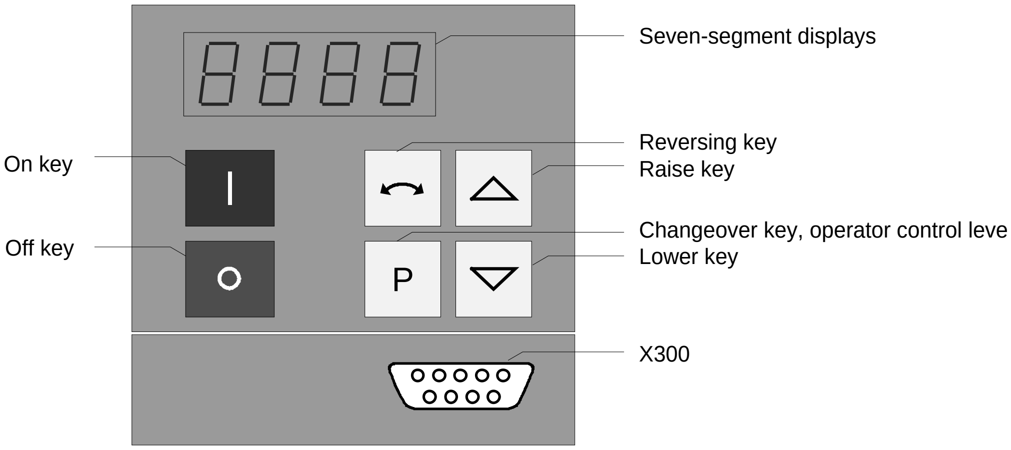


Fig. 4.1 Parameterization unit

4.1 Operator control elements

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

Table 4.1 Function of the operator control elements on the PMU

4.2 Displays 8.8.8.8.

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

Table 4.2 Displaying visualization- and setting parameters on the PMU

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

Table 4.3 Status display on the PMU

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

5 Maintenance

WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VBG4 in Germany).

Maintenance and service work may only be executed by qualified personnel.

Only spare parts authorized by the manufacturer may be used.

The specified maintenance intervals and also the instructions for repair and replacement must be adhered to.

The drive units have hazardous voltage levels up to 5 min after the converter has been powered-down due to the DC link capacitors so that the unit must only be opened after an appropriate delay time.

The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.

If it is absolutely necessary that the drive converter must be worked on when powered-up:

- ♦ never touch any live components.
- ♦ only use the appropriate measuring and test equipment and protective clothing.
- ♦ always stand on an ungrounded, isolated and ESD-compatible pad.

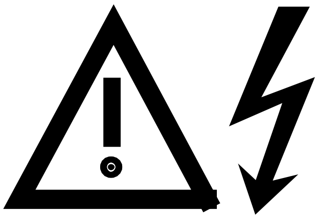
If these warnings are not observed this can result in death, severe bodily injury or significant material damage.

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

5.1 Maintenance requirements

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

5.2 Replacing components



WARNING

The fan may only replaced by qualified personnel.

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

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

5.2.1 Replacing the fan assembly

The fan assembly consists of:

- the fan housing
- a fan
- the starting capacitors

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

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

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

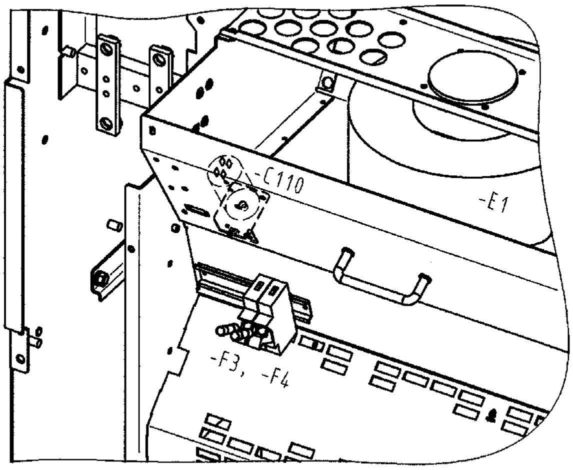


Fig. 5.1 Fan assembly -E1, fan transformer primary fuses, starting capacitor -C110

5.2.2 Replacing the fuses (-F101, -F102)

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

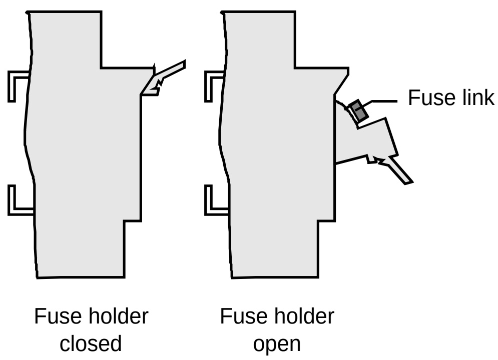


Fig. 5.2 Fuse holder

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

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

5.2.4 Replacing the fan transformer (-T10)

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

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

5.2.5 Replacing the starting capacitor

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

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

5.2.6 Replacing the capacitor bank

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

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

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

- Install a new capacitor bank in the inverse sequence.

5.2.7 Replacing SML and SMU

SML Snubber Module Lower
SMU Snubber Module Upper

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

Install the new board in the reverse sequence.

5.2.8 Removing and installing the module busbars

♦ Removal

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

♦ Installation

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

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

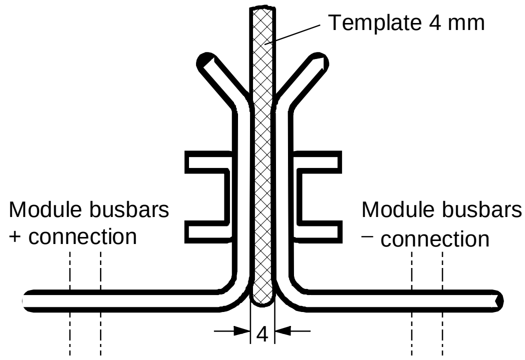


Fig. 5.3 Install the module busbars

5.2.8.1 Replacing the balancing resistor

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

♦ Remove the capacitors

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

Installation in the reverse sequence.

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

5.2.9 Replacing boards

WARNING

The boards may only be replaced by qualified personnel.

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

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

CAUTION

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

NOTE

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

5.2.9.1 Replacing the IVI

IVI Inverter-Value Interface

The IVI is bolted to the rear of the electronics box

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

5.2.9.2 Replacing the VDU and VDU resistor

VDU Voltage-Dividing Unit

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

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

  Install the new VDU in the inverse sequence.
- ♦ VDU resistor
  - Release the cable ties
  - Remove the plug connections
  - Unbolt the VDU resistor

  Install the new VDU resistor in the inverse sequence

5.2.9.3 Replacing the PSU

PSU Power-Supply Unit (Power Supply)

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

Install the new PSU in the inverse sequence

5.2.9.4 Replacing the IGD

IGD IGBT-Gate Drive

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

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

5.2.9.5 Replacing the TDB

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

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

- Remove the cover (release the screws, and then first release the righthand- and then the lefthand side).
- Remove connectors X246, X11, X12 and X13.
- Release the PUD and NUD connections of pre-charging resistors R_1 and R_2 (M4, Torx).
- Release the connections to phases U, V, W.
- Release connections NUD1, NUD2, NUD3.
- Remove the board.
- Insert the new TDB in the inverse sequence.

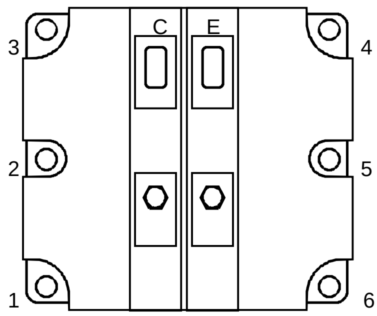
5.2.10 Replacing the snubber resistor

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

Install the new snubber resistor in the inverse sequence.

5.2.10.1 Replacing the IGBT modules

- Replace as for IGD, but additionally
- Remove the mounting bolts of the defective IGBT modules and remove the IGBT.
- Install the new IGBT module. Observe the following:
  - Coat the module mounting surface with a **thin and uniform** coating of heat conducting paste.
  - Tighten-up the IGBT module mounting bolts with 3 Nm, observe the sequence (Fig. 5.4).
  - Modules with the same type designation, e.g. FZxxxxRYYKF4 must be installed.



Tighten-up the IGBT modules
1. By hand (≈ 0,5 Nm), sequence: 2 - 5 - 3 - 6 - 1 - 4
2. tighten-up with 3 Nm, sequence: 2 - 5 - 3 - 6 - 1 - 4

Fig. 5.4 Tighten-up IGBT modules

5.2.11 Replacing pre-charging resistors (R_1, R_2)

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

- ♦ Remove the cover (lossen the screws, then release first the righthand- and then the lefthand side).
- ♦ Release the PUD and NUD connections of the pre-charging resistors (M4, Torx).
- ♦ Release and remove the pre-charging resistors.
- ♦ Install the new pre-charging resistor with a 20 Nm ± 10 % torque.

	CAUTION
	Don’t bend the pre-charging resistor!

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

5.2.12 Replacing the thyristor modules (V_1 to V_3)

Replace as for the TDB, in addition Fig. 5.5

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

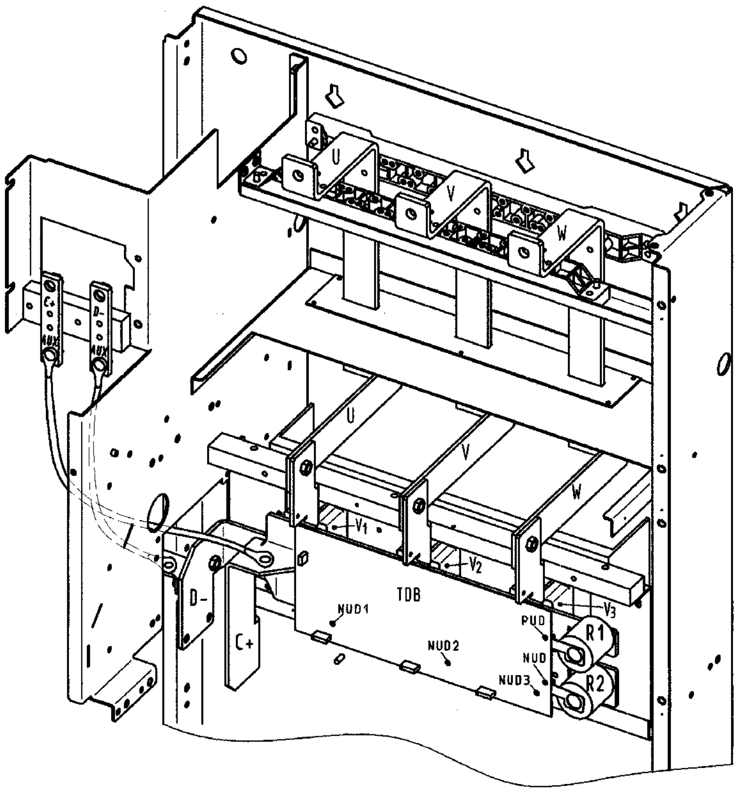


Fig. 5.5 TDB board, pre-charging resistors and thyristor modules V1, V2, V3

5.2.12.1 Replacing boards in the electronics box

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

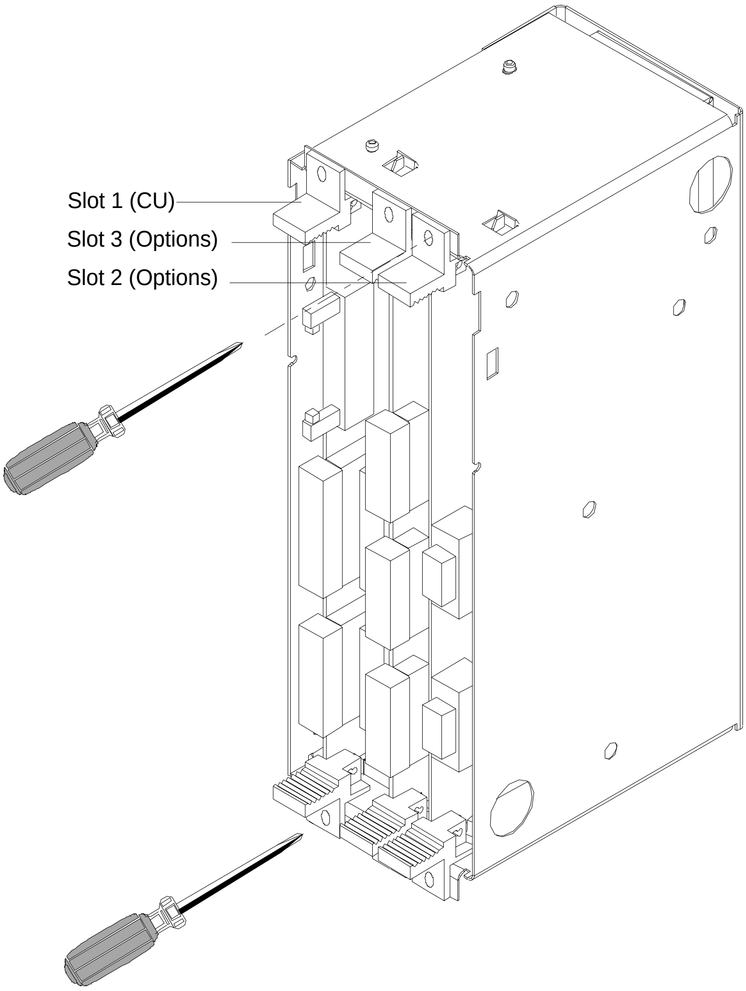


Fig. 5.6 Electronics box equipped with CU (slot 1) and options (slot 2 (right) and 3 (middle))

5.2.12.2 Replacing the PMU (Parameterization Unit)

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

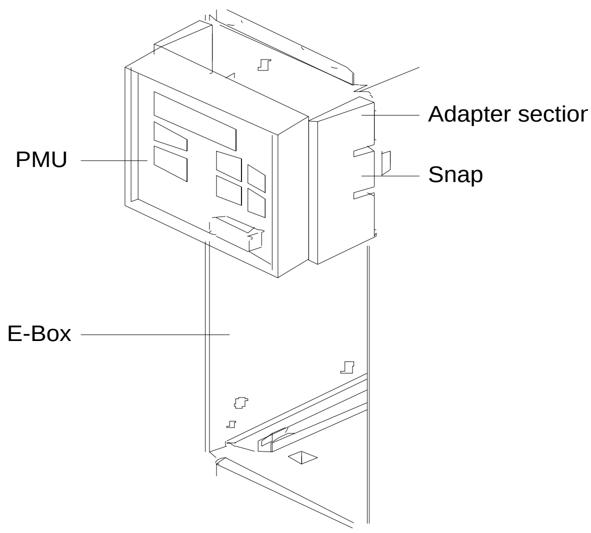


Fig. 5.7 PMU with adapter section on the E box

6 Options

6.1 Options which can be integrated into the electronics box

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

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

Install the LBA bus expansion:

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

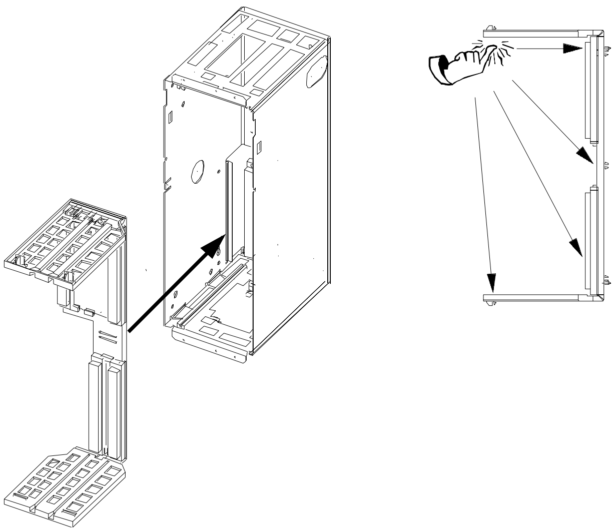


Fig. 6.1 Installing the Local Bus Adapter

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

NOTES

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

Table 6.1 Possible arrangements of boards in the electronics box

The options are supplied with the option description.

Desig-nation	Description	Order No.	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7087-6CX84-4HA0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7087-6CX84-0AH0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7087-6CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7087-6CX84-0BD0
	Use of the serial interface with USS protocol	Application description	6SE7087-6CX87-4KB0
CB1	Communications board with interface for SINEC- L2-DP, (Profibus)	Board description	6SE7090-0XX84-0AK0 6SE7087-6CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0
SSB	Safety OFF (Safe Stop Board) Option K80	Description	6SE7080-0AX87-1JB0

Table 6.2 Option boards and bus adapter

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

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

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

Table 6.3 Current drain of the option boards

6.2 Interface boards

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

Desig-nation	Description	Order No.	
SCI1	Serial I/O board (only in conjunction with SCB1). Analog and binary input and outputs for coupling to the SCB1 via fiber-optic cable	Board description	6SE7090-0XX84-3EA0 6SE7087-6CX84-0BC0
SCI2	Serial I/O board (only in conjunction with SCB1) Binary inputs and outputs for coupling to the SCB1 via fiber-optic cable.	Board description	6SE7090-0XX84-3EF0 6SE7087-6CX84-0BC0
DTI	Digital tachometer interface	Board description	6SE7090-0XX84-3DB0 6SE7087-6CX84-3DB0
ATI	Analog tachometer interface	Board description	6SE7090-0XX84-3DF0 6SE7087-6CX84-3DF0

Table 6.4 Interface boards

6.3 Power supplies

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

Table 6.5 Recommended power supply

6.4 Isolating amplifiers

Input	Output	Order number Option
Input isolating amplifiers for analog inputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–20 mA to +20 mA	–10 V to +10 V	6SX7010-0AC02
4 mA to +20 mA	0 V to +10 V	6SX7010-0AC01
Output isolating amplifiers for analog outputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–10 V to +10 V	–20 mA to +20 mA	6SX7010-0AC03
0 V to +10 V	4 mA to +20 mA	6SX7010-0AC04

Table 6.6 Overview of isolating amplifiers

Power supply:
V = 24 V DC ±20 %
I = 90 mA

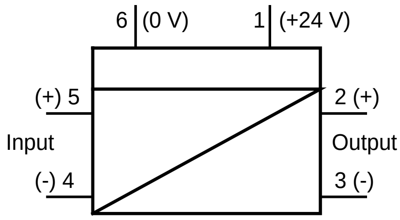


Fig. 6.2 Isolating amplifiers

6.5 Power section

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

Table 6.7 Power section options

6.5.1 Output reactor, dv/dt filter

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

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

NOTE

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

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

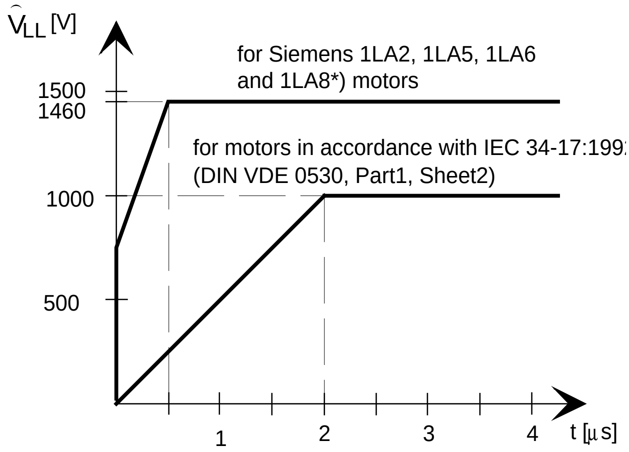


Fig. 6.3 Permissible limit values for the motor insulation

*) Standard 1LA8 motors;
1LA8 motors with improvedinsulation are available

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

Characteristics of the output reactors and dv/dt filters:

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

Table 6.8

6.5.1.1 Output reactor

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

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

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

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

	V/f = constant		**V = constant**	
	380 V to 460 V AC	**500 V to 690 V AC**	**380 V to 460 V AC**	**500 V to 690 V AC**
Standard reactor (iron) $f_P \le 3$ kHz				
V/f / Vector control	$f_{mot\,N} \le 87$ Hz	$f_{mot\,N} \le 200$ Hz	$f_{max} \le 200$ Hz	$f_{max} \le 300$ Hz
V/f textile	$f_{mot\,N} = f_{max} \le 120$ Hz	not possible	not possible	not possible
Ferrite reactor $f_P \le 6$ kHz				
V/f / Vector control	$f_{mot\,N} \le 150$ Hz		$f_{max} \le 300$ Hz	
V/f textile	$f_{mot\,N} = f_{max} \le 600$ Hz		not possible	

Table 6.9 Output reactor design

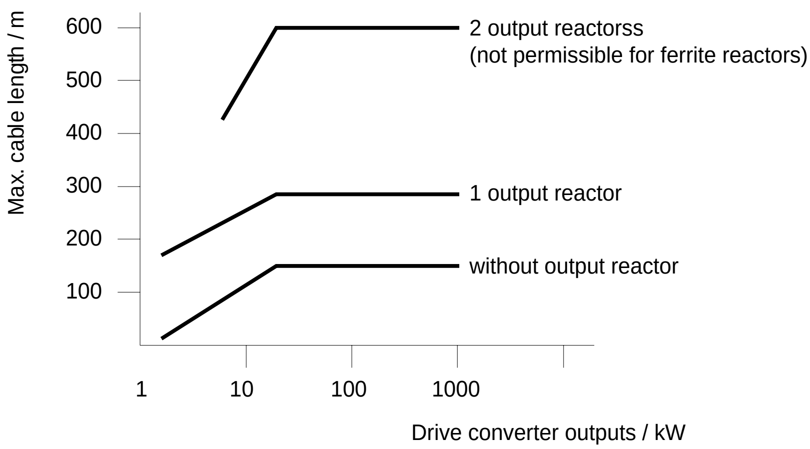


Fig. 6.4 Permissible cable lengths with and without output reactors

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

6.5.1.2 dv/dt filter

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

- Voltage gradient (rate of rise) dv/dt ≤ 500 V/µs
- Transient peak voltage at the motor terminals:

  $\hat{U}_{typ.}$ ≤ 800 V for 380 V ≤ U_N ≤ 460 V (3 ph. AC)

  $\hat{U}_{typ.}$ ≤ 1000 V for 500 V ≤ U_N ≤ 575 V (3 ph. AC)

  $\hat{U}_{typ.}$ ≤ 1250 V for 660 V ≤ U_N ≤ 690 V (3 ph. AC).

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

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

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

The dv/dt filter is suitable for use with

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

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

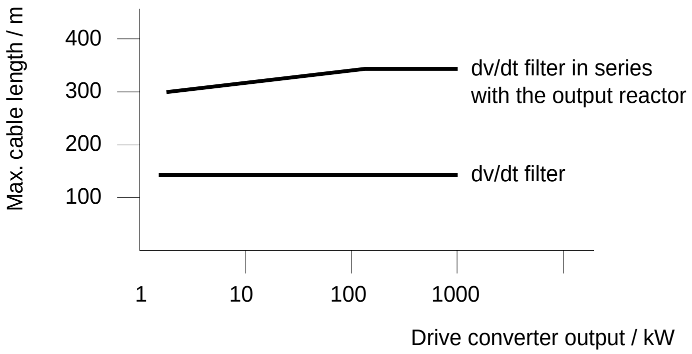


Fig. 6.5 Permissible cable lengths with dv/dt filter

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

6.5.1.3 Selection criteria for the output reactor or dv/dt filter

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

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

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

6.5.2 Basic noise suppression (option L03)

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

6.6 Operator control

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

Table 6.11 Operator control options

Fig. 6.6 OP1

7 Spare Parts

7.1 Converter 380 V to 460 V 3 AC

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

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

Table 7.1 Spare parts

7.2 Converter 500 V to 575 V 3AC

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

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

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

Table 7.2 Spare parts

7.3 Converter 660 V to 690 V 3 AC

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

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

Table 7.3 Spare parts

8 Environmental friendliness

Environmental aspects during the development

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

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

Plastic components:

ABS:	PMU support panel LOGO
LDPE:	Capacitor ring
PA6.6:	Fuse holders, mounting rail, capacitor holder, cable retainer, connecting strips, terminal strip, supports, PMU adapter, covers
PC:	Covers
PP:	Insulating boards bus retrofit
PS:	Fan housing
UP:	Tensioning profile retaining bolts

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

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

Environmental aspects during production

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

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

ASIC devices and SMD devices were used on the boards.

The product is emission-free.

Environmental aspects for disposal

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

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

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

9 Technical Data

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

Switching at the input	No./min	2
Cooling medium temperature		0 °C to +40 °C
Storage temperature		– 25 °C to +70 °C
Transport temperature		– 25 °C to +70 °C
Environmental class	3K3	DIN IEC 721-3-3 Moisture condensation not permissible
Pollution level	2	DIN VDE 0110 Pert 1
Overvoltage category	III	DIN VDE 0110 Part 2
Overvoltage property class	1	E DIN VDE 0160
Degree of protection		DIN VDE 0470 Section 1 ≙ EN 60529
– standard	IP00	
– option	IP20	
Protection class	I	DIN VDE 0106 Section 1
Radio interference level		DIN VDE 0875 Section 11 ≙ EN 55011
– standard	without	
– option	A1	EN55011
Noise immunity		EN50082-2
Mechanical strength		DIN IEC 68-2-6 / 06.90

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

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

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

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

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

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

9.1 De-rating for an increased cooling medium temperature

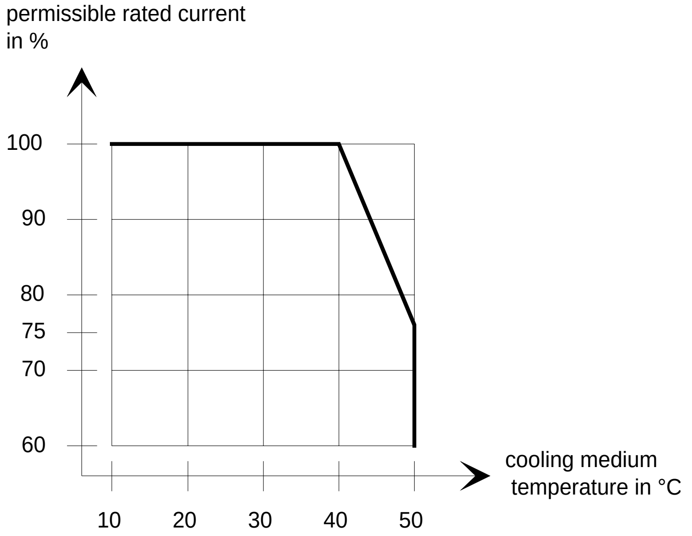


Fig. 9.1 Max. permissible rated current as a function of the cooling medium temperature

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

For installation altitudes > 1000 m above sea level, the rated current must be reduced. For installation altitudes > 2000 m above sea level, the rated voltage must be reduced (see Fig. 9.2). Installation altitudes > 4000 m above sea level are not permissible.

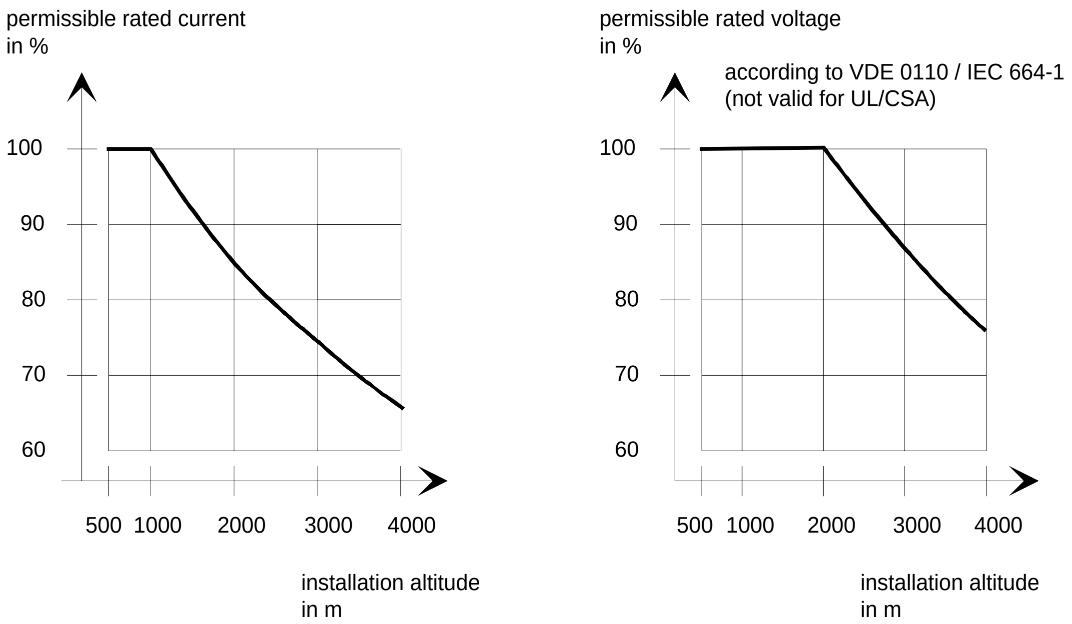


Fig. 9.2 Max. permissible rated current and rated voltage as a function of the installation altitude

9.3 De-rating as a function of the pulse frequency

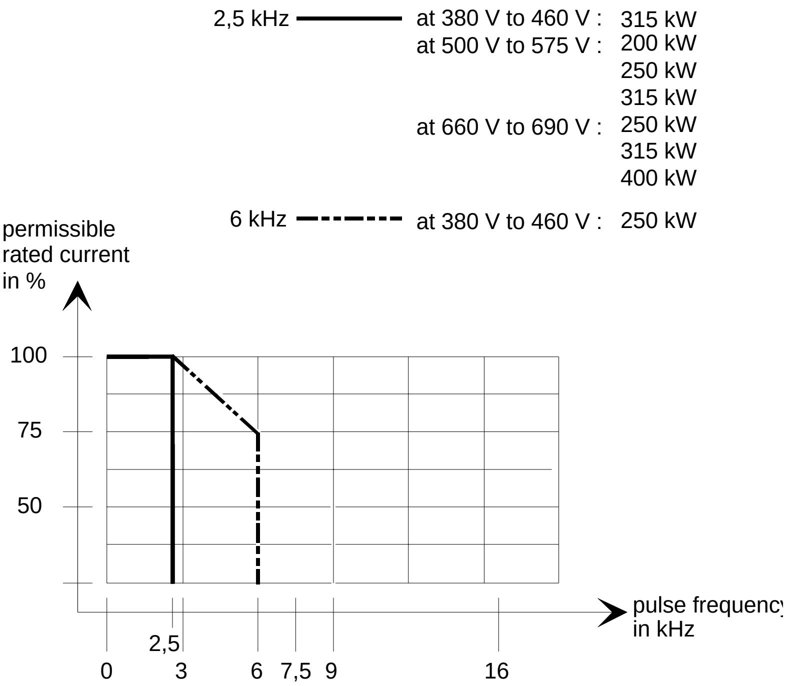


Fig. 9.3 Max. permissible rated current as a function of the pulse frequency

10 Appendix

10.1 Index

10.2 List of abbreviations

A	Alarm
AA	Analog output
AC	Alternating current
AE	Analog input
AFE	Active front end
AS	Sequence control
ASIC	Application specific integrated circuit
ASM	Asynchronous motor
ATI	Beliebig sinnvoll/sinnloser Kommentar
AWG	American wire gauge
BA	Binary output
BC	Bypass contactor
BE	Binary input
BF	Type of construction
CAN	Controller area network
CB	Communication board (option)
CU	Control unit
CUA	Control unit AFE (control unit of AFE)
DC	Direct current
DPR	Dual-port-RAM
DPRAM	Dual-port-RAM
EA	First run-up
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMF	Electromotive force
EPROM	Erasable programmable read-only memory
ESD	Electrostatic sensitive devices
F	Fault
FC	Frequency control (control version of SIMOVERT MASTER DRIVES)
FF	Fatal fault

FI	Fault current
FSW	Fixed setpoint
G/R	Basic/reserve
GSST(1/2)	Basic drive converter serial interface (1/2)
H	High (binary signal level)
HLG	Ramp-function generator
HTL	High-voltage transistor logic
HW	Hardware
I/O	Input/output
IGBT	Insulated gate bipolar transistor
IGD	IGBT gate drive
IVI	Inverter interface
KIP	Kinetic buffering
L	Low (binary signal level)
LBA	Local bus adapter (option)
LED	Light emitting diode
LSB	Least significant bit
MC	Main contactor
MDS	Motor data set
MLFB	Machine-readable product designation (machine-readable designation)
MSB	Most significant bit
NN	Sea level
OP(1)	Operation panel (1)
Par	Parameter
PC	Personal computer
PEU	Power electronic unit
PG	Programming unit (programmer)
PKW	Parameter ID value
PMU	Parameterization unit
PROFIBUS	Process field bus
PS	Power supply
PSU	Power supply unit
PWE	Parameter value
PZD	Process data
Q	Source
RC	Combination, resistor ® and capacitor (C)
RDS	Reserve data set
RFG	Ramp-function generator
SC	Servo control (control version of SIMOVERT MASTER DRIVES)
SCB(1/2)	Serial communication board (option)
SCI(1/2)	Serial communication Interface (1/2)

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

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12 Certificates

SIEMENS

Drive and Standard Products Group

Test certificate

Erlangen, 01.07.1995

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

The routine testing according to these test instructions

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

Tests performed:	I. Product check	• checking of presence of all components acc. to parts list
	II. Isolation test	• DIN VDE 0160 draft 04.91, par. 7.6.1 • CSA 22.2-14.M91, par. 6.8
	III. Functional test acc. to DIN VDE 0558, part1	• power supply • customer terminals and interfaces • power conversion section • protective and monitoring functions
	IV. RUN-IN	• Ambient temperature 55 °C cycled • Duration 24 up to 72 hours • Scampling 10 % to 100 %

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

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

ASI 1 PE D F

Schlögel

ASI 1
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Drive Technology

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Drive and Standard Products Group

Confirmation

Erlangen, 01.07.1995

This confirms that

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

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

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

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

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

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

ASI 1 PE D T

Dr. Link

ASI 1
System-Based
Drive Technology

SIEMENS

Factory certificate *

regarding electromagnetic compatability

4SE.476 000 0001.00 WB EMC

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

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

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

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

Note:

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

Erlangen, 20. 01. 1997

i. V.

H. Mickal
Head of the Drive System Production Unit

This declaration does not guarantee specific equipment characteristics and features.

*) acc. to EN 10204 (DIN 50049)

ASI 1 D/U 4102x Page 1 of 1

The following versions have appeared so far:

Version	Internal Item number
AB	476 962.4000.76 J AB-76

Version AB consists of the following chapters

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

Drives and Standard Products Group
Variable-Speed Drives Division
PO Box 3269, D-91050 Erlangen

ASI 1
System-Based
Drive Technology

Siemens Aktiengesellschaft

Subject to change without notice

Order No.: 6SE7087-6AK70
Printed in the federal Republic of Germany
08.97

SIEMENS

SIMOVERT MASTERDRIVES

Operating Instructions
Part 1

Compact units (Types A - D)
AC-AC

Edition: AD

Order No.: 6SE7087-6AD70

Overview of the MASTER DRIVES Operating Instructions:

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

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

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

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

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

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

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

Contents

0 Definitions

- QUALIFIED PERSONAL

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

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

- DANGER

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

- WARNING

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

- CAUTION

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

- NOTE

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

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

CAUTION

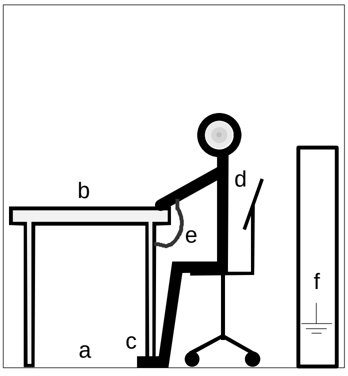
Components which can be destroyed by electrostatic discharge (ESD)

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

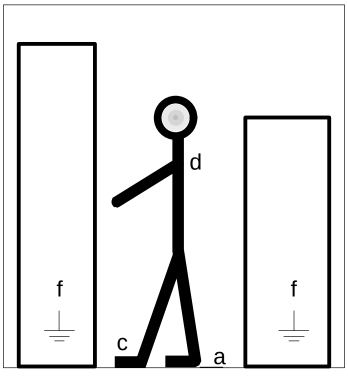
- ♦ Electronic boards should only be touched when absolutely necessary.
- ♦ The human body must be electrically discharged before touching an electronic board
- ♦ Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured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

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

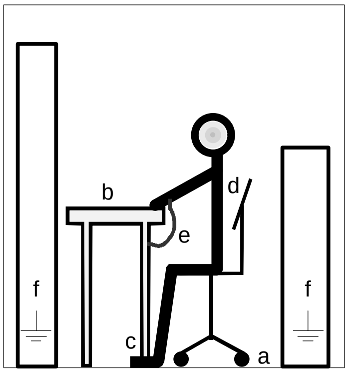
a	=	Conductive floor surface	d	=	ESD overall
b	=	ESD table	e	=	ESD chain
c	=	ESD shoes	f	=	Cubicle ground connection



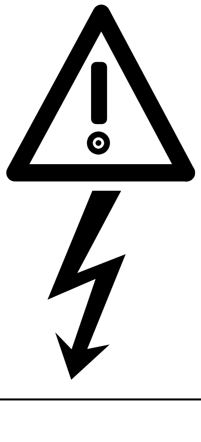
Sitting



Standing



Standing / Siting



WARNING

Hazardous voltages are present in this electrical equipment during operation.

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

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

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

0.1 Safety and operating instructions for drive converters

Safety and operating instructions for drive converters

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

1. General

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

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

For further information, see documentation.

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

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

2. Intended use

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

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

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

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

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

3. Transport, storage

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

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

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

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

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

5. Electrical connection

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

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

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

6. Operation

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

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

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

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

Keep safety instructions in a safe place!

1 Description

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

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

There are three versions depending on the particular application

- Frequency control FC simple applications(e.g. pumps and fans)
- Vector control VC high demands regarding dynamic performance and accuracy
- Servo Control SC servo drives

1.1 Applications

Drive converter with three-phase current input

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

In the basic design, SIMOVERT MASTER DRIVES can be used for two-quadrant operation. Four-quadrant operation is possible using the braking unit option. SIMOVERT MASTER DRIVES are suitable for single-motor- and multi-motor drives.

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

1.2 Mode of operation

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

The converter is then ready for operation.

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

SIMOVERT FC

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

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

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

Some of the applications are, for example:

- Pump drives
- Fan drives
- Textile machines

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

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

SIMOVERT VC

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

SIMOVERT VC is suitable for:

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

Some of the applications are, for example:

- Winder drives
- Rolling mill drives.

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

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

SIMOVERT SC

The inverter open-loop control uses a microprocessor with field-oriented vector control, with a very fast secondary closed-loop current control. High drive dynamic performance is achieved as a result of the field oriented vector control. When the unit is shipped, the pulse frequency is preset to 5 kHz. It can be set in the range from 5 kHz to 7.5 kHz.

SIMOVERT SC is suitable for:

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

Some of the applications are, for example

- ♦ Winder drives,
- ♦ Foil machines,
- ♦ Packaging machines

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

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

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

The following encoders can be used:

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

1.3 Operator control- and open-loop control possibilities

The unit can be controlled via

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

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

1.4 Block diagram

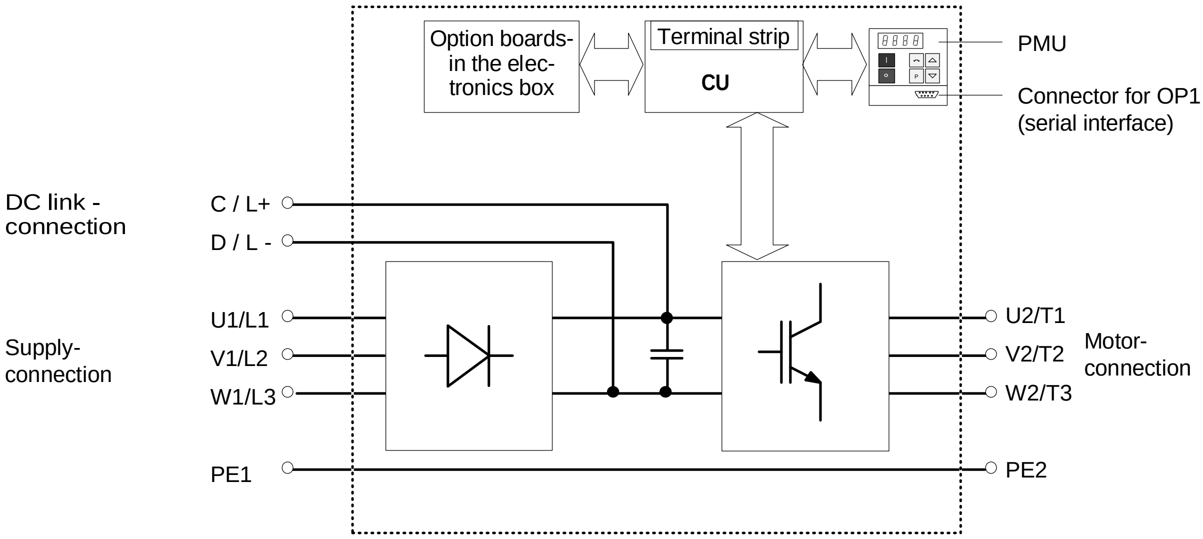


Fig. 1.1 Block diagram

2 Transport, Unpacking, Installation

2.1 Transport and unpacking

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

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

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

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

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

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

2.2 Storage

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

WARNING

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

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

2.3 Mounting

The following are required for mounting:

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

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE) must be observed as well as the professional handling of tools and the use of personnal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

The unit must be protected against the ingress of foreign bodies as otherwise the function as well as the operational safety cannot be guaranteed.

Requirements at the point of installation:

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

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

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

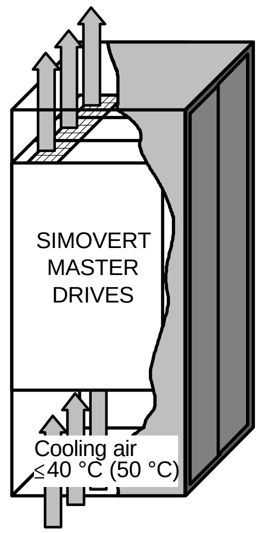


Fig. 2.1 Mounting the converters in cabinets

WARNING

When mounting in cabinets, a clearance of above and below must be provided so that the cooling air flow is not restricted
(refer to dimension drawings, Section 2.4).

Dimension the cabinet cooling in line with the power loss! (☞ Section „Technical data“)

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

2.4 Dimension drawings

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

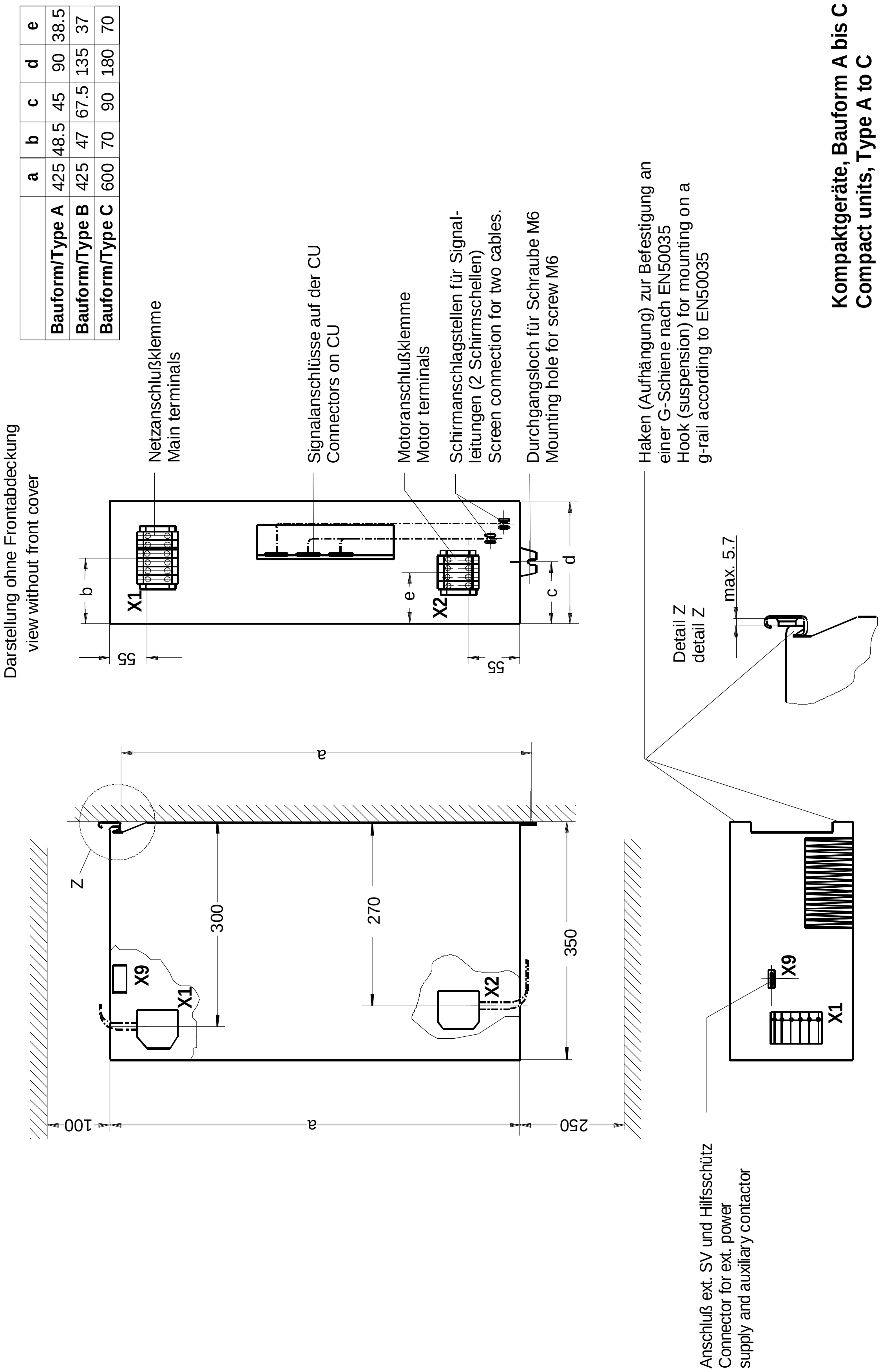


Fig. 2.2 Types A, B and C

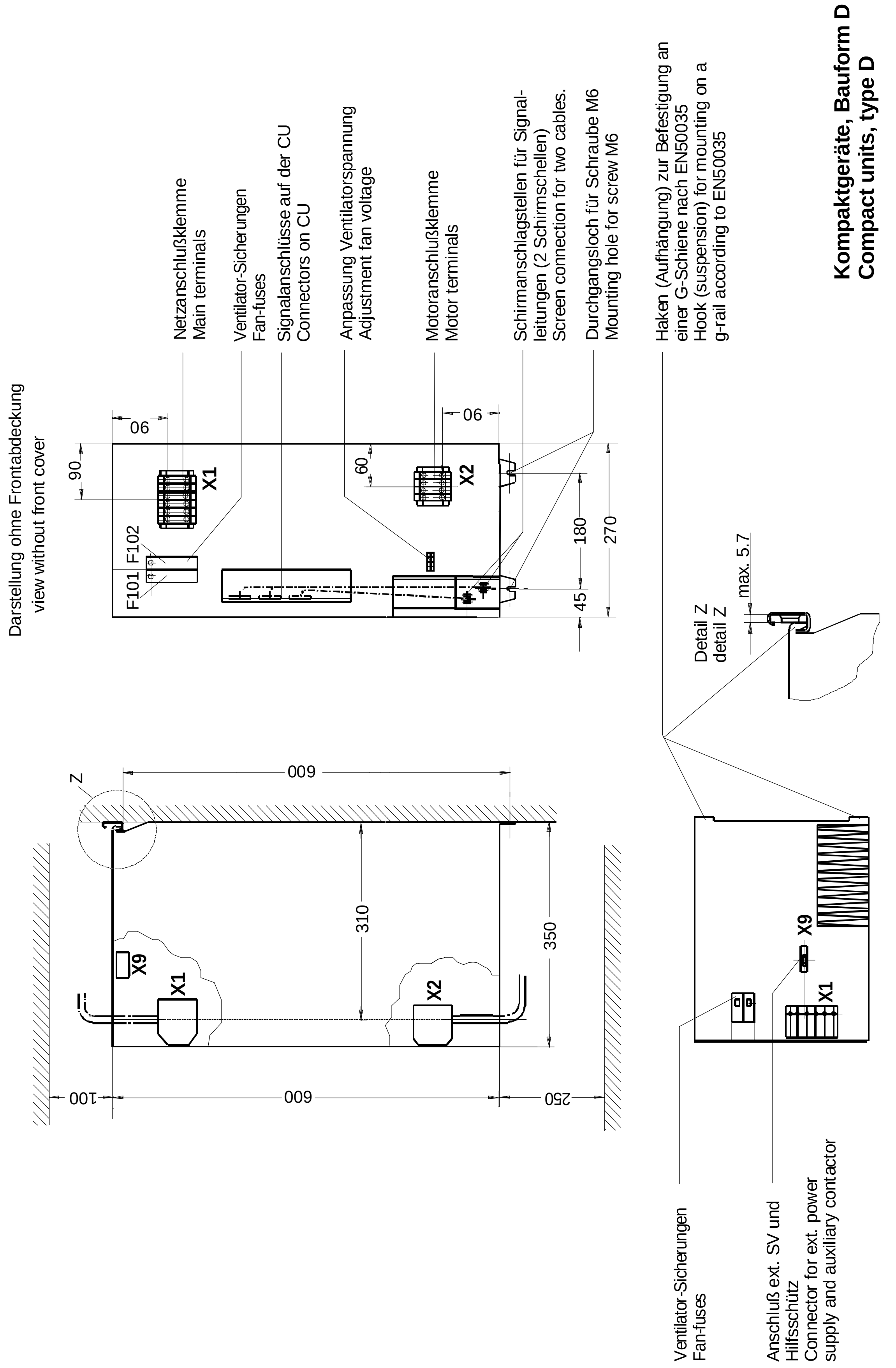
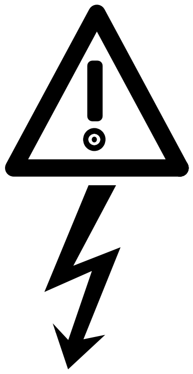

Kompaktgeräte, Bauform D
Compact units, type D
Darstellung ohne Frontabdeckung
view without front cover
Netzanschlußklemme
Main terminals
Ventilator-Sicherungen
Fan-fuses
Signalanschlüsse auf der CU
Connectors on CU
Anpassung Ventilatorspannung
Adjustment fan voltage
Motoranschlußklemme
Motor terminals
Schirmanschlagstellen für Signal-
leitungen (2 Schirmschellen)
Screen connection for two cables.
Durchgangsloch für Schraube M6
Mounting hole for screw M6
Haken (Aufhängung) zur Befestigung an
einer G-Schiene nach EN50035
Hook (suspension) for mounting on a
g-rail according to EN50035
Detail Z
detail Z
max. 5.7
X1
X2
X9
F101
F102
Z
90
90
90
60
180
270
45
600
600
310
350
100
250
Ventilator-Sicherungen
Fan-fuses
Anschluß ext. SV und
Hilfsschütz
Connector for ext. power
supply and auxiliary contactor

Fig. 2.3 Type D

3 Connecting-up



WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out!

Only professionally trained, qualified personnel must work on or with the unit.

Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.

Extreme caution should be taken when working-on the unit when it is open, as external power supplies may be connected. The power terminals and control terminals can still be at hazardous potentials even when the motor is stationary.

Hazardous voltages are still present in the unit up to 5 minutes after it has been powered-down due to the DC link capacitors. Thus, the appropriate delay time must be observed before opening-up the unit.

Forming the DC link capacitors:

The storage time should not exceed one year. The converter DC link capacitors must be formed at start-up if the unit has been stored for a longer period of time.

Forming is described in the Instruction Manual, Part 2.

The user is responsible, that the motor, converter and any other associated devices or units are installed and connected-up according to all of the recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be especially observed.

If a protective device trips in a current arm, then a fault current could have been interrupted. In order to reduce the danger of fire or electric shock, the live parts and over components of the converter should be checked and damaged components replaced.

INFORMATION

- ♦ Protection: Fuses must be incorporated in the equipment supply connection. For a list of the recommended fuses, refer to Table 3.1.
- ♦ Supply rating: The converter is suitable for connecting to supplies with a short-circuit rating (supply) ≤ 100 × rated output (converter).
- ♦ The converter should be connected via a line reactor according to Table 3.1.
- ♦ Cabling/wiring: Connecting cables should be dimensioned according to the local regulations and according to section „Power connections“. The insulation should be suitable for 75°C.

3.1 Power connections

	WARNING
	♦ The unit will be destroyed if the input- and output terminals are interchanged! ♦ The converter will be destroyed if the DC link terminals are interchanged or short-circuited! ♦ The coils of contacts and relays which are connected to the same supply as the converter or are located in the vicinity of the converter, must be provided with overvoltage limiters, e.g. RC elements. ♦ It is not permisible that the converter is connected-up through an e.l.c.b. (ground fault circuit interrupter) (DIN VDE 0160).

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

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

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

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

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

NOTE FC and VC

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

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

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

NOTE

A 230 V fan is incorporated in drive converters, type of construction D. The fan is supplied via a fan transformer. To supply the fan with 230 V, the primary side of the fan transformer must be adjusted to the particular line supply voltage using the plug connector (Connection 2) (☞ Fig. 3.1).

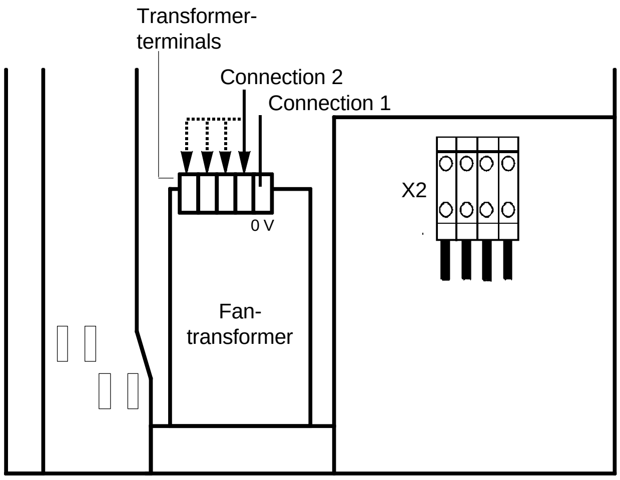


Fig. 3.1 Transformer location (only for converters, type of construction D)

Order No.	Rated input Current	Supply connection										Motor connection	
		Cross-section		Recommended fuse							Line - reactor	Cross-section	
		VDE		gR (SITOR)		gL NH		North-America				VDE	
	(A)	(mm^2)	AWG[1]	(A)	Type	(A)	Type	Type	(V)	(A)		(mm^2)	AWG
6SE70					3NE		3NA				4EP		
	Rated input-voltage 208 V to 230 V												
21-1CA_0	10.6	2.5	14	– –	– –	16	3805	AJT, LPJ	600	15	3400-1UK	1.5	16
21-3CA_0	13.3	4	10	– –	– –	20	3807	AJT, LPJ	600	17.5	3500-0UK	1.5	16
21-8CB_0	17.7	6	8	25	1815-0	25	3810	AJT, LPJ	600	25	3600-4UK	2.5	14
22-3CB_0	22.9	10	6	35	1803-0	35	3814	AJT, LPJ	600	30	3600-5UK	4	10
23-2CB_0	32.2	16	4	40	1802-0	50	3820	AJT, LPJ	600	40	3700-2UK	10	6
24-4CC_0	44.2	25	2	50	1817-0	63	3822	AJT, LPJ	600	60	3800-2UK	16	4
25-4CD_0	54	25	2	80	1820-0	80	3824	AJT, LPJ	600	70	3900-2UK	25	2
27-0CD_0	69	35	0	80	1820-0	80	3824	AJT, LPJ	600	90	3900-2UK	25	2
28-1CD_0	81	50	00	100	1021-0	100	3830	AJT, LPJ	600	100	3900-2UK	35	0
	Rated input-voltage 380 V to 460 V												
16-1EA_1	6.1	1.5	16	– –	– –	10	3803	AJT, LPJ	600	8	3200-1UK	1.5	16
18-0EA_1	8.0	1.5	16	– –	– –	16	3805	AJT, LPJ	600	12	3400-2UK	1.5	16
21-0EA_1	10.2	2.5	14	– –	– –	16	3805	AJT, LPJ	600	15	3400-1UK	1.5	16
21-3EB_1	13.2	2.5	14	25	1815-0	25	3810	AJT, LPJ	600	17.5	3500-0UK	2.5	14
21-8EB_1	17.5	4	10	25	1815-0	25	3810	AJT, LPJ	600	25	3600-4UK	2.5	14
22-6EC_1	25.5	10	6	35	1803-0	35	3814	AJT, LPJ	600	35	3600-5UK	10	6
23-4EC_1	34	16	4	40	1802-0	50	3820	AJT, LPJ	600	45	3600-5UK	10	6
23-8ED_1	37.5	16	4	63	1818-0	63	3822	AJT, LPJ	600	50	3700-5UK	16	4
24-7ED_1	47	25	2	63	1818-0	63	3822	AJT, LPJ	600	60	3800-2UK	16	4
26-0ED_1	59	25	2	80	1820-0	100	3830	AJT, LPJ	600	80	3800-2UK	16	4
27-2ED_1	72	50	00	80	1820-0	100	3830	AJT, LPJ	600	90	3900-2UK	25	2
	Rated input-voltage 500 V to 575 V (only for SC and VC)												
14-5FB_1	4.5	1.5	16	– –	– –	10	3803[2]	AJT, LPJ	600	6	3200-2UK	1.5	16
16-2FB_1	6.2	1.5	15	– –	– –	10	3803[2]	AJT, LPJ	600	8	3300-0UK	1.5	16
17-8FB_1	7.8	1.5	15	20	1814-0	20	3807[2]	AJT, LPJ	600	10	3400-3UK	1.5	16
21-1FB_1	11	2.5	14	20	1814-0	20	3807[2]	AJT, LPJ	600	15	3600-8UK	2.5	14
21-5FB_1	15.1	4	10	20	1814-0	20	3807[2]	AJT, LPJ	600	20	3600-2UK	2.5	14
22-2FC_1	22	10	6	35	1803-0	35	3814[2]	AJT, LPJ	600	30	3600-3UK	4	10
23-0FD_1	29	10	6	40	1802-0	50	3820[2]	AJT, LPJ	600	40	3700-6UK	10	6
23-4FD_1	34	16	4	40	1802-0	50	38202)	AJT, LPJ	600	45	3700-1UK	10	6
24-7FD_1	46.5	25	2	40	1802-0	63	3822[2]	AJT, LPJ	600	60	3800-1UK	16	4

INFORMATION AND EXPLANATIONS

The cross-sections are determined for copper cables at 40 °C (104 °F) ambient temperature (in accordance with DIN VDE 0298 Part 4 / 02.88 Group 5) and the recommended cable protection according to DIN VDE 0100 Part 430.
The cables and semiconductors are protected using fuses with gR characteristics. Only the cables, but not the semiconductors, are protected using gL fuses.

1) American Wire Gauge

2) The specified fuses are valid for converters with a 3-ph AC 500 V input voltage. For converters with higher input voltage, fuses up to 660 V must be used. The Order Nos. of these fuses are obtained by attaching the suffix "-6" to the appropriate 500 V fuse Order No.

e.g.: 3NA3803 ≙ 500 V
3NA3803-6 ≙ 660 V

Table 3.1 Power connections acc. to DIN VDE

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

Table 3.2 Possible connection cross-sections

3.1.1 Protective conductor connection

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

3.1.2 DC link connection

The "braking unit" (6SE7087-6CX87-2DA0) and "dv/dt filter" (6SE7087-6CX87-1FD0) options can be connected at the DC link terminals X1 C/L+ and X1 D/L–.
It is also permissible to input a DC voltage at this connection.

The connection is not suitable for connecting other inverter units (e.g. DC units).

3.2 Auxiliary power supply/main contactor

3.2.1 Drive converters for rated input voltages 208 V to 230 V AC

The auxiliary power supply and the main contactor are connected through the 5-pin connector X9. Connector X9 is supplied together with the connectors for the control terminal strip. Cables with cross-sections from 0.2 mm^2 to 2.5 mm^2 (AWG: 24 to 14) can be connected at X9.

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

The main contactor is controlled through floating contacts -X9.4 and -X9.5 (software pre-setting). More detailed information is provided in the Section „options“.

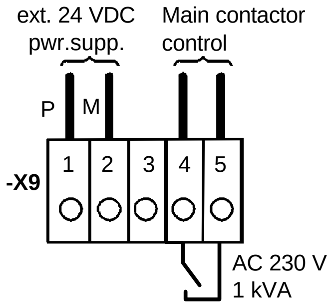


Fig. 3.2 Connecting an external auxiliary 24 V DC power supply and main contactor control

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

Table 3.3 Connector assignment for -X9

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

3.2.2 Drive converters for rated input voltages 380 V to 575 V AC

The auxiliary power supply and the main contactor are connected through the 9-pin connector X9. Connector X9 is supplied together with the connectors for the control terminal strip. Cables with cross-sections from 0.14 mm^2 to 1.5 mm^2 (AWG: 26 to 16) and 1 mm^2 (AWG: 18), finely-stranded with connector sleeves, can be connected at X9.

The auxiliary power supply is required, if the drive converter is fed via a main contactor, and the control function is to be maintained even with the main contactor opened.

The main contactor is controlled through floating contacts -X9.7 and -X9.9 (software pre-setting). More detailed information is provided in the Section „options“.

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

Table 3.4 Connector assignment for -X9

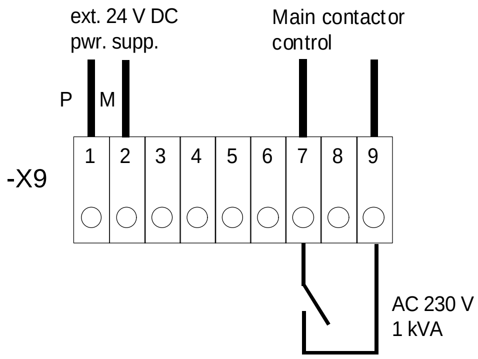


Fig. 3.3 Connecting an external auxiliary 24 V DC power supply and main contactor control

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

3.3 Instructions for EMC-correct installation

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

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

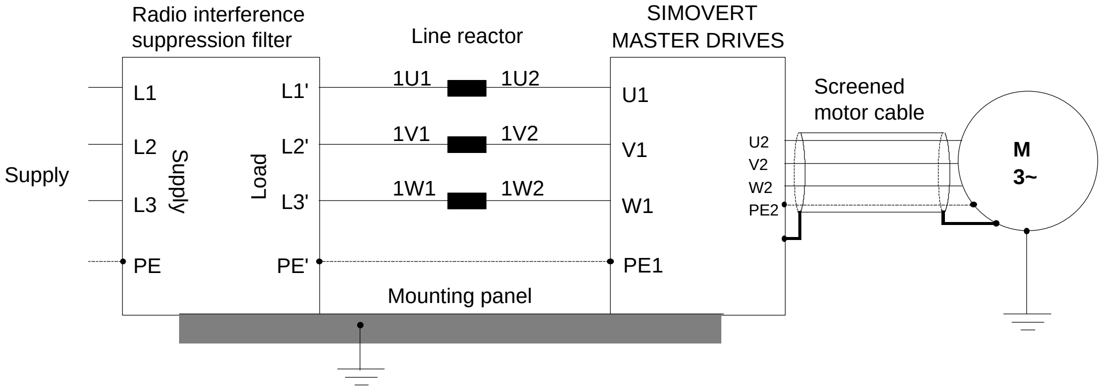


Fig. 3.4 Location of the components

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

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

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

Use screened control cables to increase the **noise immunity**. Connect the screens of the control cables to the mounting positions provided. Screen clamps are provided with every SIMOVERT MASTER DRIVES to connect the screens of the control cables (☞ Fig. 3.5.1). Otherwise, cable ties can be used to connect the screen (☞ Fig. 3.5.2).

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

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

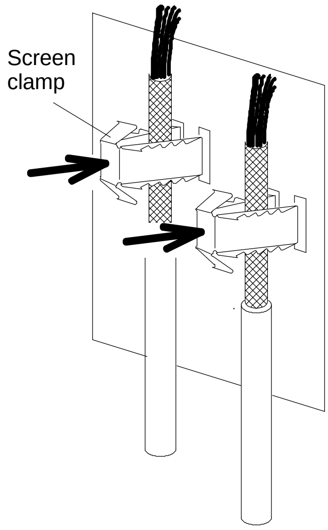


Fig. 3.5.1

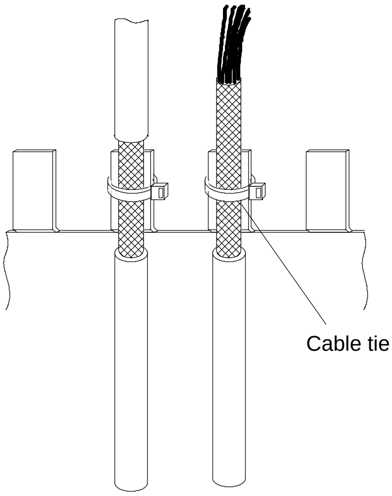


Fig. 3.5.2

Fig. 3.5 Connecting the screens of signal cables for SIMOVERT MASTER DRIVES

4 Operator control

The converter can be controlled via:

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

Operator control using the PMU is described in this section.

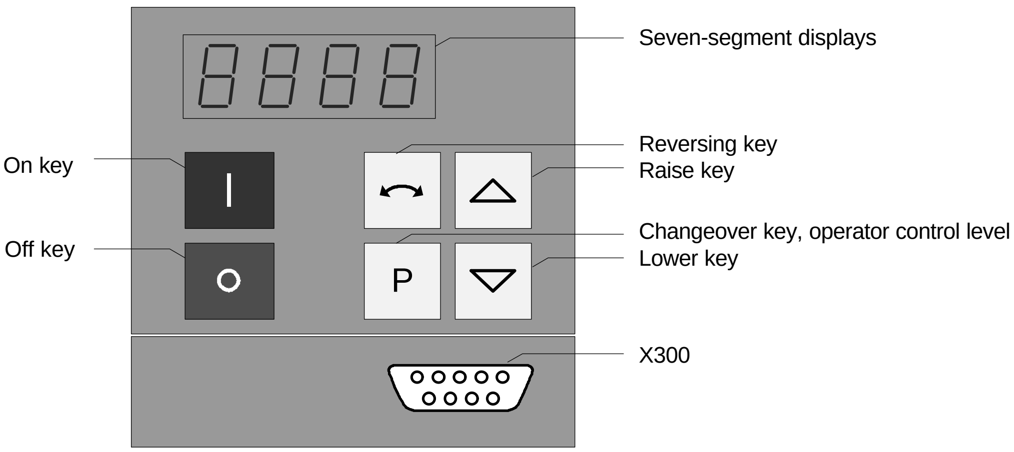


Fig. 4.1 Parameterization unit

4.1 Operator control elements

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

Table 4.1 Function of the operator control elements on the PMU

4.2 Displays 8.8.8.8.

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

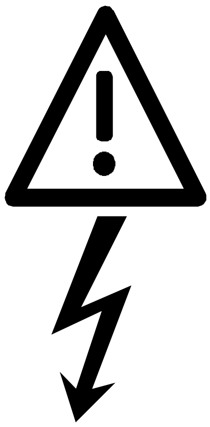
Table 4.2 Displaying visualization- and setting parameters on the PMU

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

Table 4.3 Status display on the PMU

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

5 Maintenance



WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VBG4 in Germany).

Maintenance and service work may only be executed by qualified personnel.

Only spare parts authorized by the manufacturer may be used.

The specified maintenance intervals and also the instructions for repair and replacement must be adhered to.

The drive units have hazardous voltage levels up to 5 min after the converter has been powered-down due to the DC link capacitors so that the unit must only be opened after an appropriate delay time.

The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.

If it is absolutely necessary that the drive converter must be worked on when powered-up:

- never touch any live components.
- only use the appropriate measuring and test equipment and protective clothing.
- always stand on an ungrounded, isolated and ESD-compatible pad.

If these warnings are not observed this can result in death, severe bodily injury or significant material damage.

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

5.1 Maintenance requirements

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

5.2 Replacing components

WARNING

The fan may only replaced by qualified personnel.

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

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

5.2.1 Replacing the fan

Housing sizes A to C

The fan is located under the converter

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

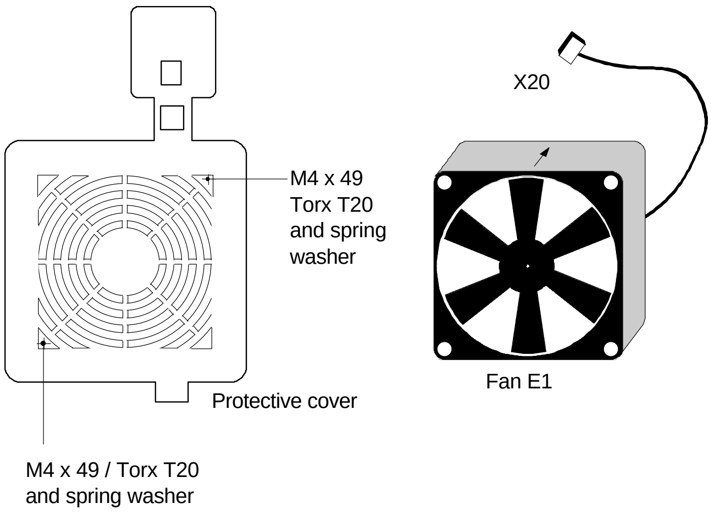


Fig. 5.1 Fan (24 V) and protective cover for housing sizes A to C

Size D

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

- ♦ Withdraw connector X20
- ♦ Remove both M5 x 16 Torx screws on the lower part of the converter

  (They are captive, and connected to the console)
- ♦ Withdraw the fan with bracket out of the unit from the bottom
- ♦ Release fan screws M4 (observe the cable routing!)
- ♦ Install the new fan in the inverse sequence (the fan is already mounted on the bracket).
- ♦ Before commissioning the drive, check that the fan can rotate freely.

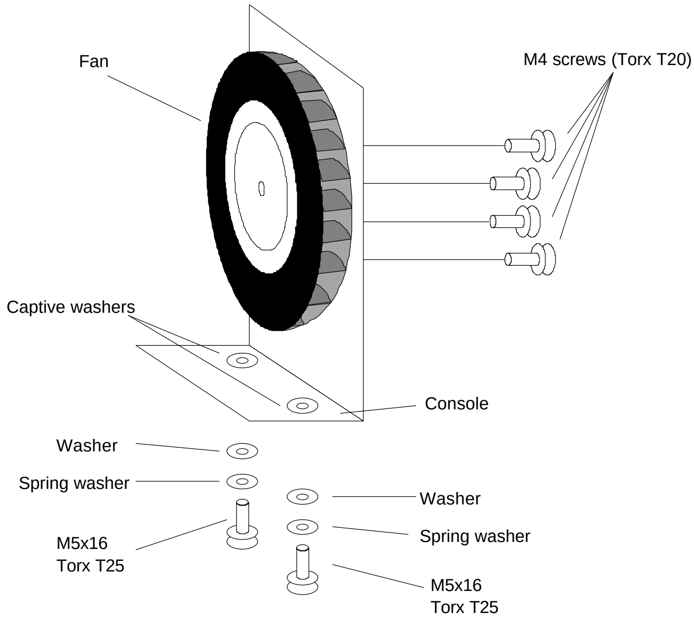


Fig. 5.2 Fan (230 V) with bracket for housing size D

5.2.2 Replacing the fuses (size D)

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

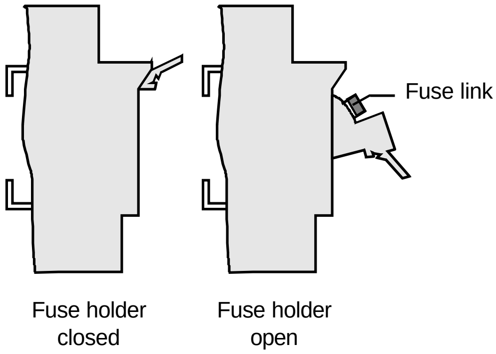
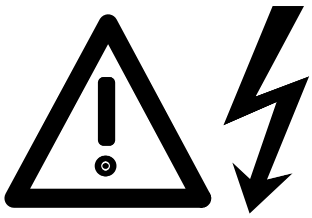


Fig. 5.3 Fuse holder (size D)

5.2.3 Replacing boards

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

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

5.2.3.1 Replacing boards in the electronics box

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

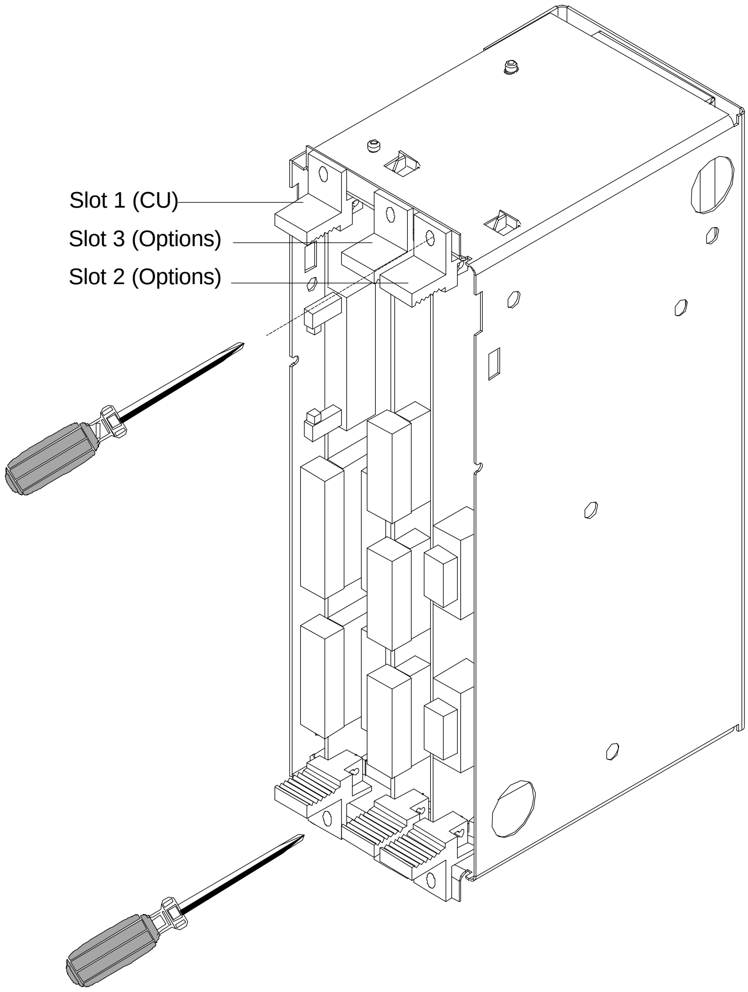


Fig. 5.4 Electronics box equipped with CU (slot 1) and options (slot 2 (right) and 3 (middle))

5.2.3.2 Replacing the PMU (Parameterization Unit)

- ♦ Release the snaps on the front cover
- ♦ Open-up the front cover
- ♦ Withdraw connector X108 on the CU (Control Unit)
- ♦ Remove the ribbon cable from the guide hooks
- ♦ Carefully depress the latch upwards on the inner side of the front cover using a screwdriver
- ♦ Remove the PMU board
- ♦ Install the new PMU board in the inverse sequence.

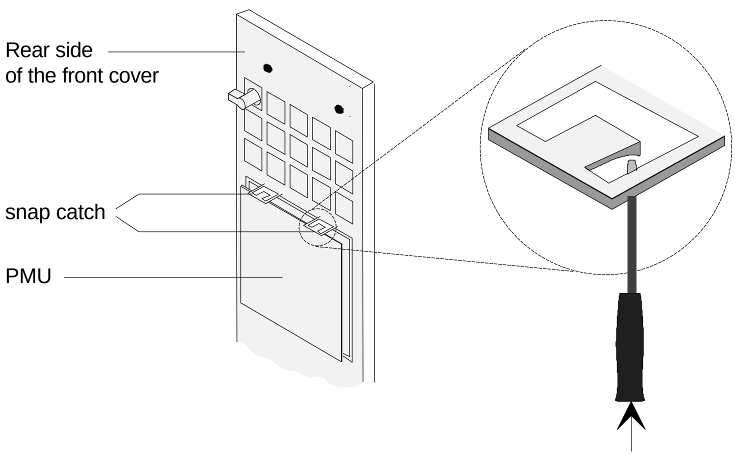


Fig. 5.5 Rear side of the front cover with PMU board

6 Options

6.1 Options which can be integrated into the electronics box

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

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

Install the LBA bus expansion:

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

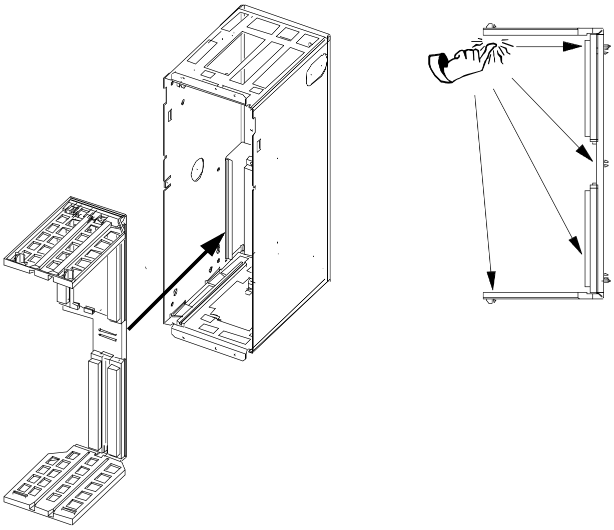


Fig. 6.1 Installing the Local Bus Adapter

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

NOTES

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

Table 6.1 Possible arrangements of boards in the electronics box

The options are supplied with the option description.

Desig-nation	Description	Order No.	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7087-6CX84-4HA0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7087-6CX84-0AH0
TSY	Synchronizing board	Board description	6SE7090-0XX84-0BA0 6SE7087-6CX84-0BA0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7087-6CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7087-6CX84-0BD0
	Use of the serial interface with USS protocol	Application description	6SE7087-6CX87-4KB0
CB1	Communications board with interface for SINEC- L2-DP, (Profibus)	Board description	6SE7090-0XX84-0AK0 6SE7087-6CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0

Table 6.2 Option boards and bus adapter

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

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

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

Table 6.3 Current drain of the option boards

6.2 Interface boards

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

Desig- nation	Description	Order No.	
SCI1	Serial I/O board (only in conjunction with SCB1). Analog and binary input and outputs for coupling to the SCB1 via fiber-optic cable	Board description	6SE7090-0XX84-3EA0 6SE7087-6CX84-0BC0
SCI2	Serial I/O board (only in conjunction with SCB1) Binary inputs and outputs for coupling to the SCB1 via fiber-optic cable.	Board description	6SE7090-0XX84-3EF0 6SE7087-6CX84-0BC0
DTI	Digital tachometer interface	Board description	6SE7090-0XX84-3DB0 6SE7087-6CX84-3DB0
ATI	Analog tachometer interface	Board description	6SE7090-0XX84-3DF0 6SE7087-6CX84-3DF0

Table 6.4 Interface boards

6.3 Power supplies

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

Table 6.5 Recommended power supply

6.4 Isolating amplifiers

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

Table 6.6 Overview of isolating amplifiers

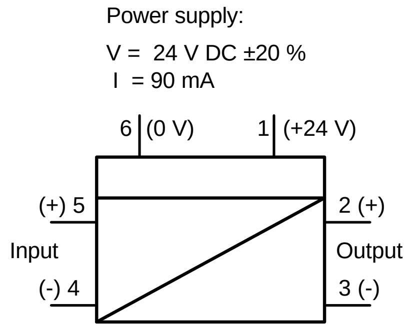


Fig. 6.2 Isolating amplifiers

6.5 Power section

Options	Description/function
Circuit-breaker	Power-up
Line fuses	Protects the motor feeder and limits the short-circuit current
Commutating reactor	Reduces harmonic feedback into the supply
Input filter, A1 and B2	Maintains the radio interference suppression level acc. to EN55011
Braking units	Converts regenerative power into heat
Braking resistors	Load resistor for the braking unit

Table 6.7 Power section options

6.5.1 Output reactor, dv/dt filter, sinusoidal filter

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

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

NOTE

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

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

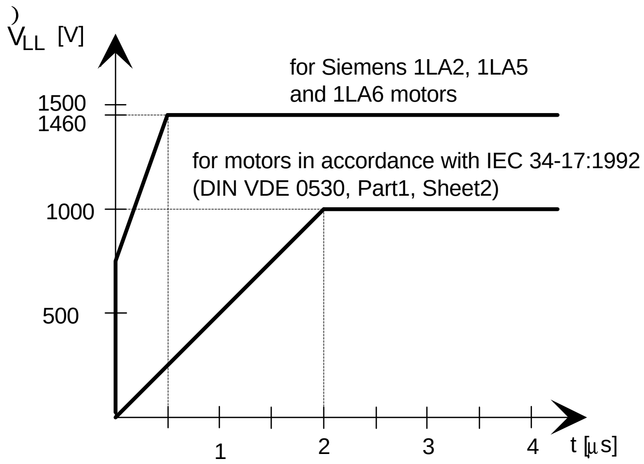


Fig. 6.3 Permissible limit values for the motor insulation

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

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

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

Table 6.8

6.5.1.1 Output reactor

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

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

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

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

	V/f = constant		**V = constant**	
	3-ph. 230 V to 460 V AC	**3-ph. 500 V to 575 V AC**	**3-ph. 230 V to 460 V AC**	**3-ph. 500 V to 575 V AC**
Standard reactor (iron) $f_P \leq 3$ kHz				
V/f / Vector control	$f_{mot\ N} \leq 87$ Hz	$f_{mot\ N} \leq 200$ Hz	$f_{max} \leq 200$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\ N} = f_{max} \leq 120$ Hz	not possible	not possible	not possible
Ferrite reactor $f_P \leq 6$ kHz				
V/f / Vector control	$f_{mot\ N} \leq 150$ Hz	$f_{mot\ N} \leq 150$ Hz	$f_{max} \leq 300$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\ N} = f_{max} \leq 600$ Hz	not possible	not possible	not possible

Table 6.9 Output reactor design

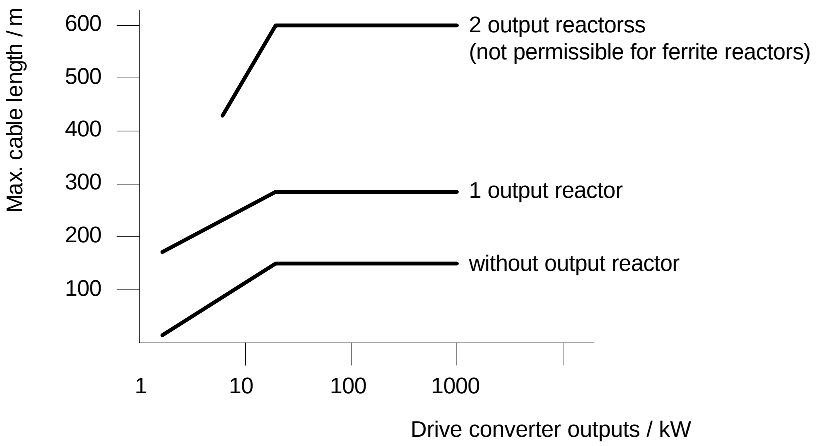


Fig. 6.4 Permissible cable lengths with and without output reactors

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

6.5.1.2 dv/dt filter

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

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

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

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

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

The dv/dt filter is suitable for use with

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

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

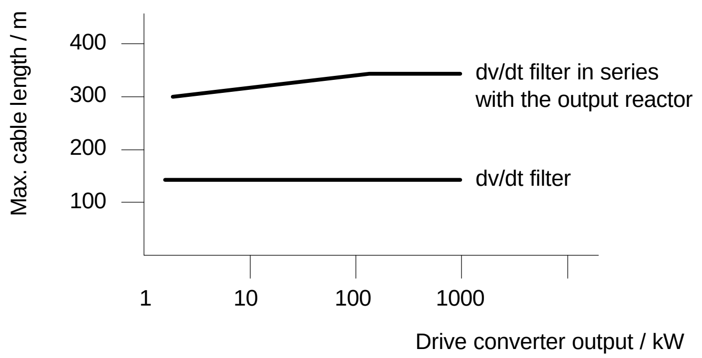


Fig. 6.5 Permissible cable lengths with dv/dt filter

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

6.5.1.3 Sinusoidal filter

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

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

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

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

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

The sinusoidal filter is suitable for use with

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

NOTE

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

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

P092 = 1 causes:	**Input voltage, drive converter/inverter**	
	3-ph. AC 380 V - 460 V	**3-ph. AC 500 V - 575 V**
Pulse frequency	P761 = 6 kHz	P761 = 3 kHz
Maximum frequency, RDF Maximum frequency, LDF	P452 ≤ + 400 Hz P453 ≥ – 400 Hz	P452 ≤ + 200 Hz P453 ≥ – 200 Hz
Pulse system enable	corresponding to P769 = 3 (no edge modulation systems)	
Firing angle limit	r180 < approx. 83 %	r180 < approx. 87 %

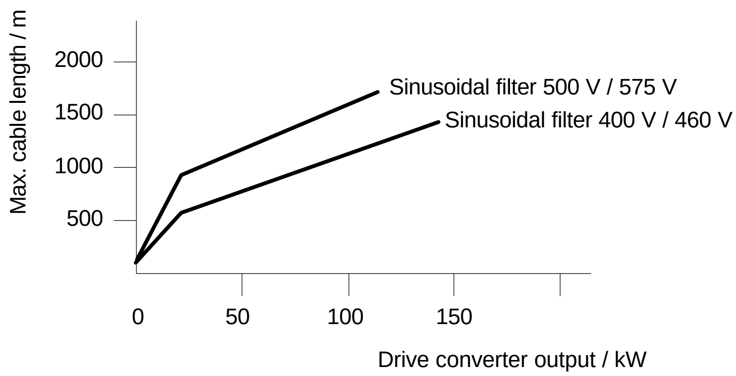


Fig. 6.6 Permissible cable lengths with sinusoidal filter

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

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

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

	Voltage range		
	208 V - 230 V (3-ph. AC)	**380 V - 500 V (3-ph. AC)**	**525 V - 575 V (3-ph. AC)**
Motors, acc. to IEC 34-17:1992 (DIN VDE 0530, Part 1, Sheet 2)	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.
Siemens motors 1LA2, 1LA5, 1LA6.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	dv/dt- filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.

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

6.5.2 Operation from non-grounded supply network (option L20)

Basic noise suppression, which is included as standard, is not permissible when the drive converter is fed from an IT network (non-grounded supply network). Option L20 is mandatory for this application.

6.6 Operator control

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

Table 6.11 Operator control options

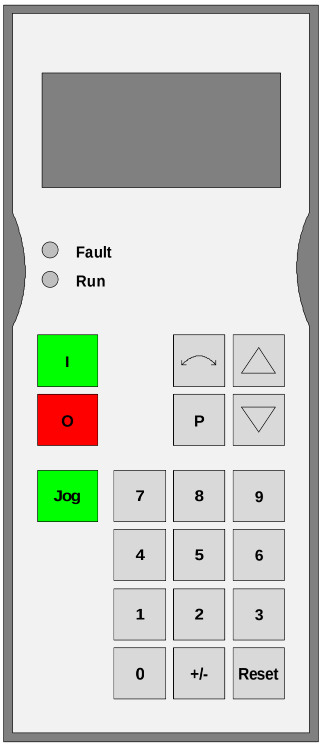


Fig. 6.7 OP1

6.7 Mechanical design

Option	Description
EMC screened housing	For screened cables

Table 6.12 Mechanical options

7 Spare Parts

Component code	**Designation**	**Order number**	**Used in**
-A10	CU1 (FC)	6SE7090-0XX84-0AA0	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	6SE70_ _-_ _A_0 6SE70_ _-_ _B_0
-A30	PMU	6SE7090-0XX84-2FB0	6SE70_ _-_ _C_0 6SE70_ _-_ _D_0
-E1	24 V DC fan	6SY7000-0AA50	6SE70_ _-_ _A_0
-E1	24 V DC fan	6SY7000-0AA48	6SE70_ _-_ _B_0 6SE70_ _-_ _C_0
-E1	230 V AC fan	6SY7000-0AA80	6SE70_ _-_ _D_0
-F101, -F102	2 A, fuse, 600 V	6SY7000-0AA24	6SE70_ _-_ _D_0

Table 7.1 Spare parts

8 Environmental friendliness

Environmental aspects during the development

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

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

Plastic parts used:	PC:	Front cover
	ABS:	Fan mesh PMU support board Logo
	PP:	Hinges Insulating board Handle Bus retrofit
	PA6:	Insulating foils Terminal housing Support

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

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

Environmental aspects during production

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

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

ASIC devices and SMD devices were used on the boards.

The product is emission-free.

Environmental aspects for disposal

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

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

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

9 Technical Data

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

Switching at the input	No./min	2
Cooling medium temperature		0 °C to +40 °C
Storage temperature		– 25 °C to +70 °C
Transport temperature		– 25 °C to +70 °C
Environmental class	3K3	DIN IEC 721-3-3 Moisture condensation not permissible
Pollution level	2	DIN VDE 0110 Pert 1
Overvoltage category	III	DIN VDE 0110 Part 2
Overvoltage property class	1	E DIN VDE 0160
Degree of protection		DIN VDE 0470 Section 1 ≙ EN 60529
– standard	IP20	

NOTE

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

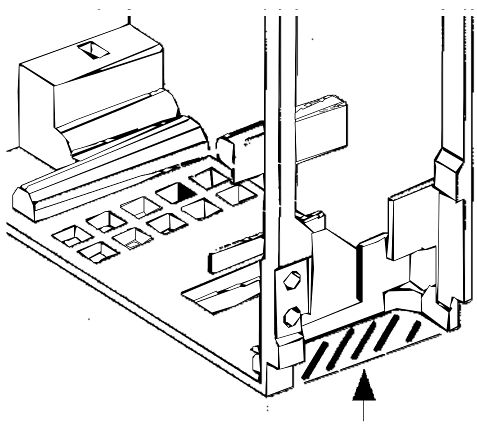


Fig. 9.1

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

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

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

Drive converter types							
FC	**6SE70...**	**21-1CA10**	**21-3CA10**	**21-8CB10**	**22-3CB10**	**23-2CB10**	**24-4CC10**
VC	**6SE70...**	**21-1CA20**	**21-3CA20**	**21-8CB20**	**22-3CB20**	**23-2CB20**	**24-4CC20**
SC	**6SE70...**	**21-1CA30**	**21-3CA30**	**21-8CB30**	**22-3CB30**	**23-2CB30**	**24-4CC30**
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 3 AC 208 ... 230 ±15 % 3 AC 0 ... Rated input voltage;**SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	 50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 10.6 10.6	 13.3 13.3	 17.7 17.7	 22.9 22.9	 32.2 32.2	 44.2 44.2
DC link voltage V_{dn}	V	280...310					
Rated output	kVA	3.8...4.2	4.8...5.3	6.4...7.1	8.3...9.1	11.6...12.8	15.4...17.6
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	9.6	12.1	16.1	20.8	29.3	40.2
Base load time	s	240					
Overcurrent	A	14.5	18.2	24.2	31.3	44.0	60.3
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	9.6	12.1	16.1	20.8	29.3	40.2
Base load time	s	270					
Overcurrent	A	17.0	21.3	28.3	36.6	51.5	70.7
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.96	 0.97 0.96	 0.97 0.96	 0.97 0.97	 0.97 0.97	 0.97 0.97
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.13 0.14	 0.16 0.17	 0.20 0.21	 0.25 0.27	 0.33 0.36	 0.41 0.44
Required cooling air flow	m^3/s	0.009	0.009	0.022	0.022	0.022	0.028
Pressure drop Δp	Pa	10	10	32	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		A	A	B	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	135 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8.5	8.5	12.5	12.5	12.5	21

Drive converter types							
FC	**6SE70...**	**25-4CD10**	**27-0CD10**	**28-1CD10**			
VC	**6SE70...**	**25-4CD20**	**27-0CD20**	**28-1CD20**			
SC	**6SE70...**	**25-4CD30**	**27-0CD30**	**28-1CD30**			
Rated voltage, rated frequency, rated current							
Rated voltage in V_n Input Output	V	 3 AC 208 ... 230 ± 15 % 3 AC 0 ... Rated input voltage; **SC**: × 0.86at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	 50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 54 54	 69 69	 81 81			
DC link voltage V_{dn}	V	280...310					
Rated output	kVA	19.5...21.5	24.9...27.5	29.2...32.3			
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	49.1	62.8	73.7			
Base load time	s	240					
Overcurrent	A	73.7	94.2	110.6			
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	49.1	62.8	73.7			
Base load time	s	270					
Overcurrent	A	86.4	110.4	129.6			
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.			
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.97	 0.97 0.97	 0.97 0.97			
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.59 0.64	 0.74 0.80	 0.81 0.88			
Required cooling air flow	m^3/s	0.054	0.054	0.054			
Pressure drop Δp	Pa	230	230	230			
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	65	65	65			
Type		D	D	D			
Width Height Depth	mm	270 600 350	270 600 350	270 600 350			
Weight	kg	32	32	32			

Drive converter types							
FC	6SE70...	16-1EA11	18-0EA11	21-0EA11	21-3EB11	21-8EB11	22-6EC11
VC	6SE70...	16-1EA21	18-0EA21	21-0EA21	21-3EB21	21-8EB21	22-6EC21
SC	6SE70...	16-1EA31	18-0EA31	21-0EA31	21-3EB31	21-8EB31	22-6EC31
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 3 AC 380 ... 460 ±15 % 3 AC 0 ... Rated input voltage; **SC**: × 0.86at f_p = 5 kHz					
Rated frequency f_n Input Output	Hz	 50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 6.1 6.1	 8.0 8.0	 10.2 10.2	 13.2 13.2	 17.5 17.5	 25.5 25.5
DC link voltage V_{dn}	V	510...620					
Rated output	kVA	4...4.9	5.3...6.4	6.7...8.1	8.7...10.5	11.5...13.9	16.8...20.3
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	5.6	7.3	9.3	12.0	15.9	23.2
Base load time	s	240					
Overcurrent	A	8.3	10.9	13.9	18.0	23.9	34.8
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	5.6	7.3	9.3	12.0	15.9	23.2
Base load time	s	270					
Overcurrent	A	9.8	12.8	16.3	21.1	28.0	40.8
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.97	 0.97 0.97	 0.97 0.97	 0.98 0.98	 0.98 0.98	 0.98 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.11 0.13	 0.12 0.13	 0.19 0.21	 0.16 0.18	 0.24 0.28	 0.36 0.41
Required cooling air flow	m^3/s	0.009	0.009	0.009	0.022	0.022	0.028
Pressure drop Δp	Pa	10	10	10	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		A	A	A	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	90 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8.5	8.5	8.5	12.5	12.5	21

Drive converter types							
FC	**6SE70...**	**23-4EC11**	**23-8ED11**	**24-7ED11**	**26-0ED11**	**27-2ED11**	
VC	**6SE70...**	**23-4EC21**	**23-8ED21**	**24-7ED21**	**26-0ED21**	**27-2ED21**	
SC	**6SE70...**	**23-4EC31**	**23-8ED31**	**24-7ED31**	**26-0ED31**	**27-2ED31**	
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	3 AC 380 ... 460 ±15 % 3 AC 0 ... Rated input voltage; **SC**: × 0.86at f_p = 5 kHz					
Rated frequency fn Input Output:	Hz	50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	34 34	37.5 37.5	47 47	59 59	72 72	
DC link voltage V_{dn}	V	510...620					
Rated output	kVA	22.4...27.1	24.7...29.9	30.9...37.4	38.8...47.0	47.4...57.4	
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	30.9	34.1	42.8	53.7	65.5	
Base load time	s	240					
Overcurrent	A	46.4	51.2	64.2	80.5	98.3	
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	30.9	34.1	42.8	53.7	65.5	
Base load time	s	270					
Overcurrent	A	54.4	60.0	75.2	94.4	115.2	
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		> 0.98 < 0.92 ind.	> 0.98 < 0.92 ind.	> 0.98 < 0.92 ind.	> 0.98 < 0.92 ind.	> 0.98 < 0.92 ind.	
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		0.98 0.98	0.97 0.97	0.98 0.97	0.98 0.97	0.98 0.98	
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	0.49 0.55	0.58 0.64	0.73 0.81	0.86 0.94	1.05 1.19	
Required cooling air flow	m^3/s	0.028	0.054	0.054	0.054	0.054	
Pressure drop Δp	Pa	30	230	230	230	230	
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	65	65	65	65	
Type		C	D	D	D	D	
Width Height Depth	mm	180 600 350	270 600 350	270 600 350	270 600 350	270 600 350	
Weight	kg	21	32	32	32	32	

Drive converter types							
FC	**6SE70...**	**14-5FB11**	**16-2FB11**	**17-8FB11**	**21-1FB11**	**21-5FB11**	**22-2FC11**
VC	**6SE70...**	**14-5FB21**	**16-2FB21**	**17-8FB11**	**21-1FB21**	**21-5FB11**	**22-2FC21**
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 3 AC 500 ... 575 ± 15 % 3 AC 0 ... Rated input voltage					
Rated frequency f_n Input Output:	Hz	 50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 4.5 4.5	 6.2 6.2	 7.8 7.8	 11 11	 15.1 15.1	 22 22
DC link voltage V_{dn}	V	675...780					
Rated output	kVA	3.9...4.5	5.4...6.2	6.7...7.7	9.5...10.9	13.1...15	19.1...21.9
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	4.1	5.6	7.1	10.0	13.7	20.0
Base load time	s	240					
Overcurrent	A	6.1	8.5	10.6	15.0	20.6	30.0
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	4.1	5.6	7.1	10.0	13.7	20.0
Base load time	s	270					
Overcurrent	A	7.2	9.9	12.5	17.6	24.2	35.2
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.97	 0.97 0.97	 0.98 0.98	 0.98 0.98	 0.98 0.98	 0.98 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.09 0.10	 0.14 0.16	 0.12 0.14	 0.15 0.18	 0.23 0.28	 0.33 0.39
Required cooling air flow	m^3/s	0.022	0.022	0.022	0.022	0.022	0.028
Pressure drop Δp	Pa	32	32	32	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		B	B	B	B	B	C
Width Height Depth	mm	135 425 350	135 425 350	135 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	12.5	12.5	12.5	12.5	12.5	21

Drive converter types							
FC	**6SE70...**	**23-0FD11**	**23-4FD11**	**24-7FD11**			
VC	**6SE70...**	**23-0FD21**	**23-4FD21**	**24-7FD21**			
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 3 AC 500 ... 575 ± 15 % 3 AC 0 ... Rated input voltage					
Rated frequency f_n Input Output:	Hz	 50/60 ± 6 % FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 29 29	 34 34	 46.5 46.5			
DC link voltage V_{dn}	V	675...780					
Rated output	kVA	25.1...28.9	29.4...33.9	40.3...46.3			
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	26.4	30.9	42.3			
Base load time	s	240					
Overcurrent	A	39.6	46.4	63.5			
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	26.4	30.9	42.3			
Base load time	s	270					
Overcurrent	A	46.4	54.4	74.4			
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.			
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.97	 0.98 0.98	 0.98 0.98			
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.62 0.73	 0.70 0.84	 0.87 1.04			
Required cooling air flow	m^3/s	0.054	0.054	0.054			
Pressure drop Δp	Pa	230	230	230			
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	65	65	65			
Type		D	D	D			
Width Height Depth	mm	270 600 350	270 600 350	270 600 350			
Weight	kg	32	32	32			

9.1 De-rating for an increased cooling medium temperature

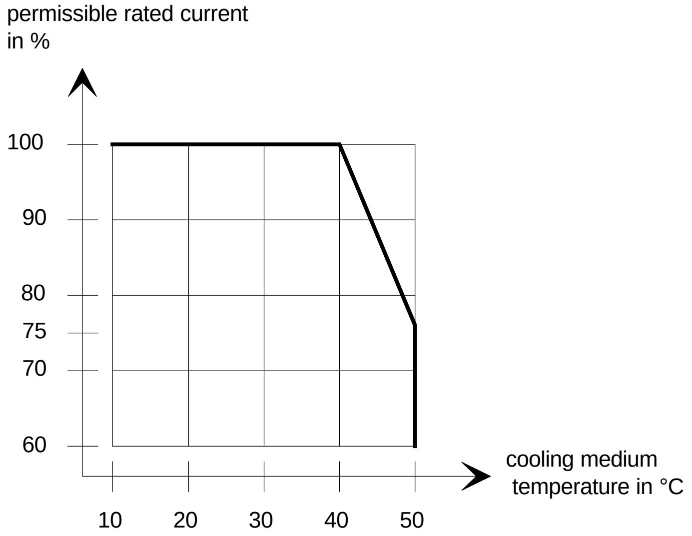


Fig. 9.2 Max. permissible rated current as a function of the cooling medium temperature

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

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

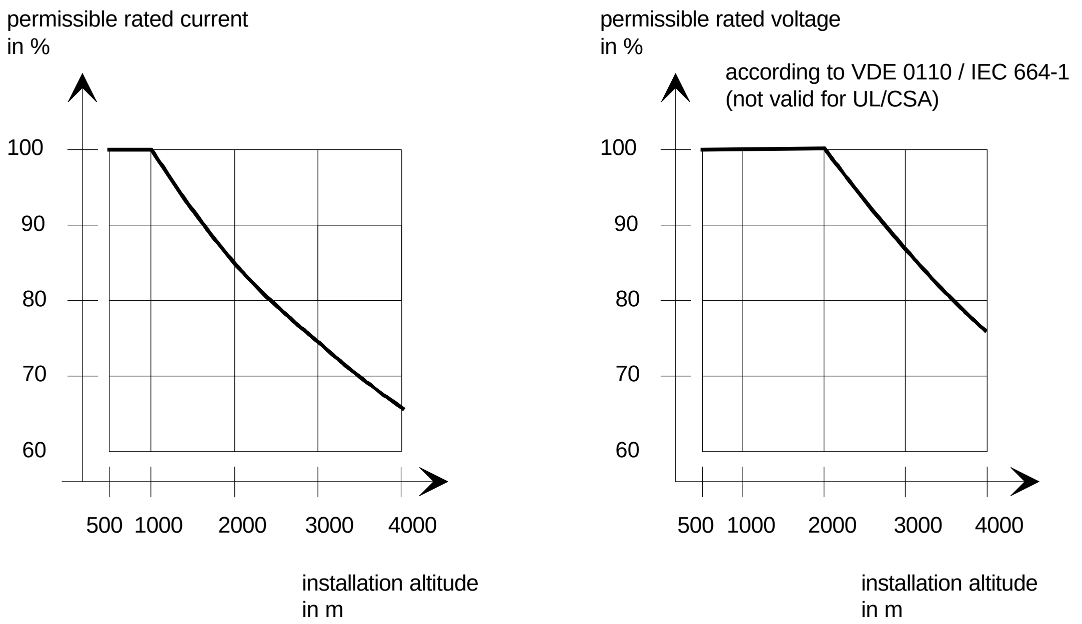


Fig. 9.3 Max. permissible rated current and rated voltage as a function of the installation altitude

9.3 De-rating as a function of the pulse frequency

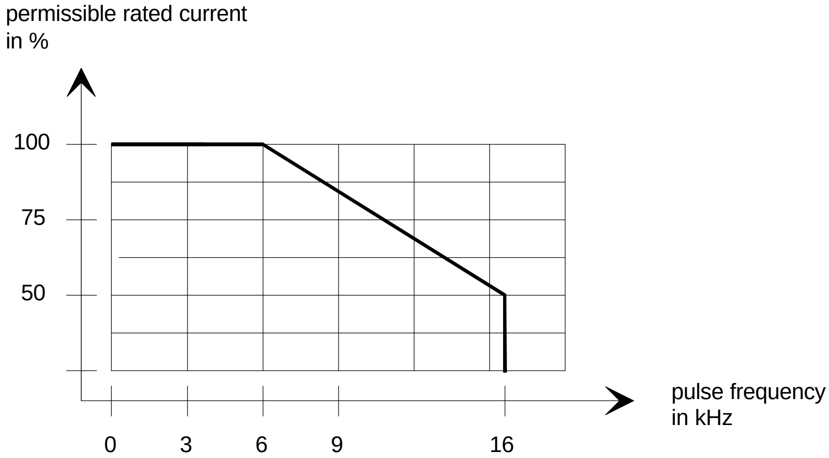


Fig. 9.4 Max. permissible rated current as a function of the pulse frequency

10 Appendix

10.1 Index

10.2 List of abbreviations

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

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

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

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12 Certificates

SIEMENS

Drive and Standard Products Group

Test certificate

Erlangen, 01.07.1995

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

The routine testing according to these test instructions

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

Tests performed:

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

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

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

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

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

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

ASI 1 PE D F

Schlögel

ASI 1
System-Based
Drive Technology

SIEMENS

Drive and Standard Products Group

Confirmation

Erlangen, 01.07.1995

This confirms that

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

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

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

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

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

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

ASI 1 PE D T

Dr. Link

ASI 1
System-Based
Drive Technology

SIEMENS

Factory certificate *

regarding electromagnetic compatability

4SE.475 000 0001.00 WB EEC

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

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

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

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

Note:

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

Erlangen, 20. 01. 1997

i. V.

H. Mickal
Head of the Drive System Production Unit

This declaration does not guarantee any features.

*) acc. to EN 10204 (DIN 50049)

ASI 1 D/U 4102x Page 1 of 1

The following versions have appeared so far:

Version	Internal Item number
AA	475 944.4000.76 J AA-76
AB	475 944.4000.76 J AB-76
AC	475 944.4000.76 J AC-76
AD	475 944.4000.76 J AD-76

Version AD consists of the following chapters

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

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Division: Variable-Speed Drive Systems
Postfach 3269, D-91050 Erlangen

Siemens Aktiengesellschaft

Subject to change

Order No.: 6SE7087-6AD70
Printed in the Federal Republic of Germany
01.2000

SIEMENS

SIMOVERT MASTER DRIVES

Operating Instructions
Part 1

Chassis units (Types E - H)
DC-AC

Edition: AB

Order No.: 6SE7087-6BH70

Overview of the MASTER DRIVES Operating Instructions:

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

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

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

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

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

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

Contents

0 Definitions

- QUALIFIED PERSONAL

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

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

- DANGER

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

- WARNING

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

- CAUTION

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

- NOTE

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

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

CAUTION

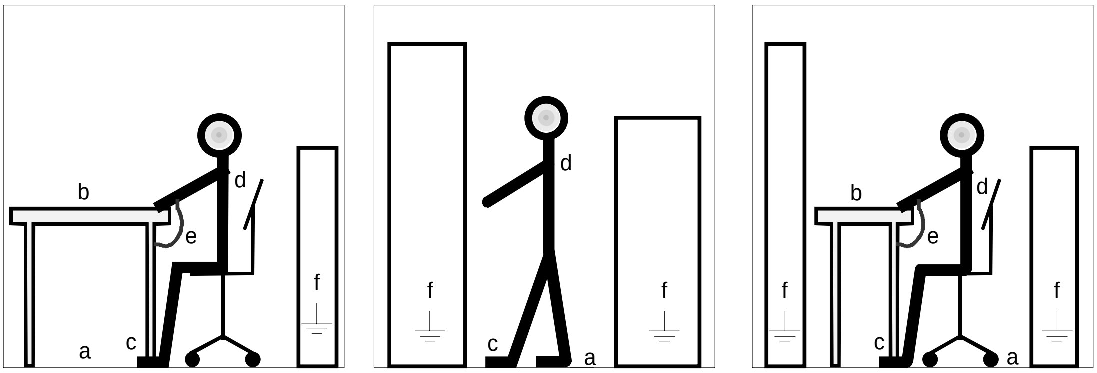
Components which can be destroyed by electrostatic discharge (ESD)

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

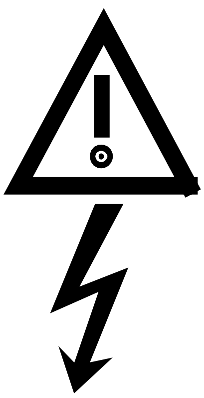
- ♦ Electronic boards should only be touched when absolutely necessary.
- ♦ The human body must be electrically discharged before touching an electronic board
- ♦ Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured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

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

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



Sitting **Standing** **Standing / Siting**



WARNING

Hazardous voltages are present in this electrical equipment during operation.

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

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

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

0.1 Safety and operating instructions for drive converters

Safety and operating instructions for drive converters

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

1. General

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

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

For further information, see documentation.

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

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

2. Intended use

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

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

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

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

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

3. Transport, storage

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

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

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

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

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

5. Electrical connection

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

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

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

6. Operation

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

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

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

7. Maintenance and servicing

The manufacturer’s documentation shall be followed.

Keep safety instructions in a safe place!

1 Description

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

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

There are three versions depending on the particular application

- Frequency control FC simple applications(e.g. pumps and fans)
- Vector control VC high demands regarding dynamic performance and accuracy
- Servo Control SC servo drives

1.1 Applications

Drive converter with DC current input

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

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

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

1.2 Mode of operation

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

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

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

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

SIMOVERT FC

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

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

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

Some of the applications are, for example:

- ♦ Pump drives
- ♦ Fan drives
- ♦ Textile machines

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

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

SIMOVERT VC

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

SIMOVERT VC is suitable for:

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

Some of the applications are, for example:

- Winder drives
- Rolling mill drives.

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

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

SIMOVERT SC

The inverter open-loop control uses a microprocessor with field-oriented vector control, with a very fast secondary closed-loop current control. High drive dynamic performance is achieved as a result of the field oriented vector control. When the unit is shipped, the pulse frequency is preset to 5 kHz. It can be set in the range from 5 kHz to 7.5 kHz.

SIMOVERT SC is suitable for:

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

Some of the applications are, for example

- Winder drives,
- Foil machines,
- Packaging machines

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

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

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

The following encoders can be used:

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

1.3 Operator control- and open-loop control possibilities

The unit can be controlled via

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

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

1.4 Block diagram

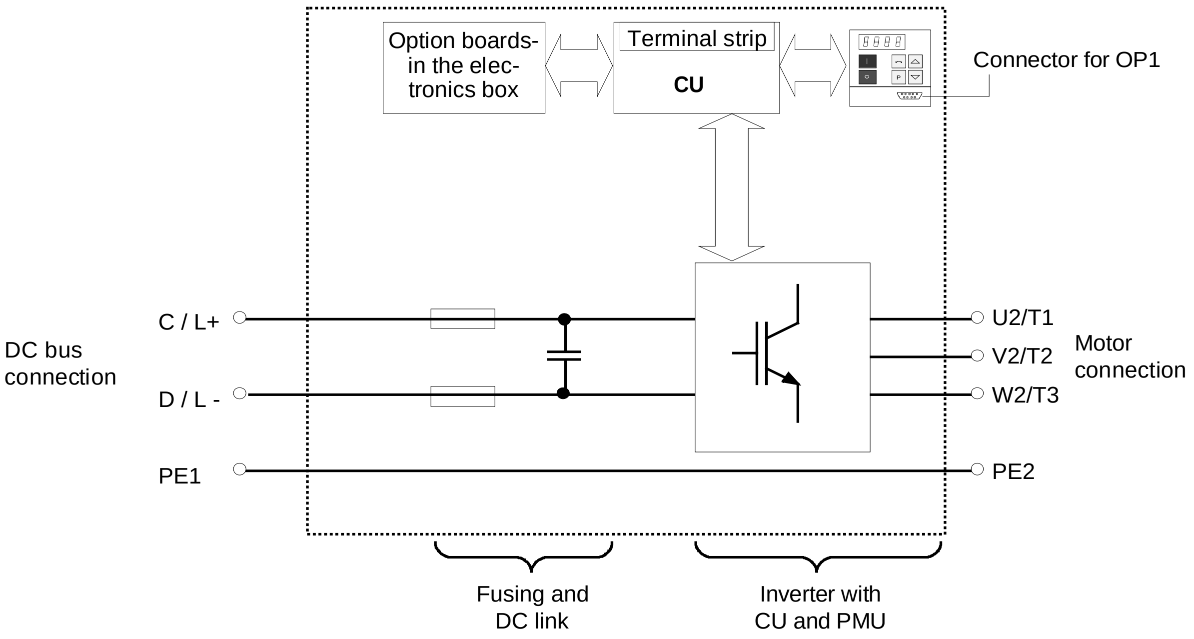


Fig. 1.1 Block diagram

2 Transport, Unpacking, Installation

2.1 Transport and unpacking

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

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

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

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

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

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

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

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

2.2 Storage

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

WARNING

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

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

2.3 Mounting

The following are required for mounting:

- M8 bolt(s)
- Dimension drawings: Fig. 2.2 for types of construction E, F, Fig. 2.3 for types of construction G and Fig. 2.4 for type of construction H.

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE) must be observed as well as the professional handling of tools and the use of personnal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

Chassis units do not provide any protection against direct contact. It is the users responsibility to ensure and provide the correct protection against contact according to the relevant accident prevention regulations VBG4, by appropriately designing the enclosure or enclosures around the chassis unit.

Remove shipping brace (marked).

Requirements at the point of installation:

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

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

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

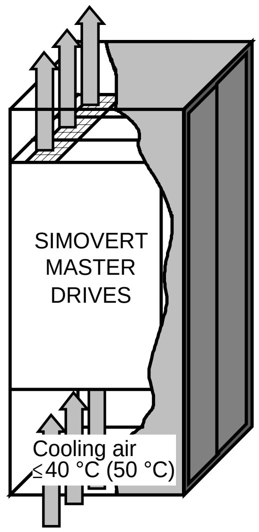


Fig. 2.1 Mounting the converters in cabinets

WARNING

When mounting in cabinets, a clearance of above and below must be provided so that the cooling air flow is not restricted (refer to dimension drawings, Section 2.4).

Dimension the cabinet cooling in line with the power loss! (☞ Section „Technical data“)

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

2.4 Dimension drawings

Chassis units DC-A
Types E and F
6SE70
IP00

	Height	Width	Depth
Type E	1050	270	350
Type F	1050	360	350

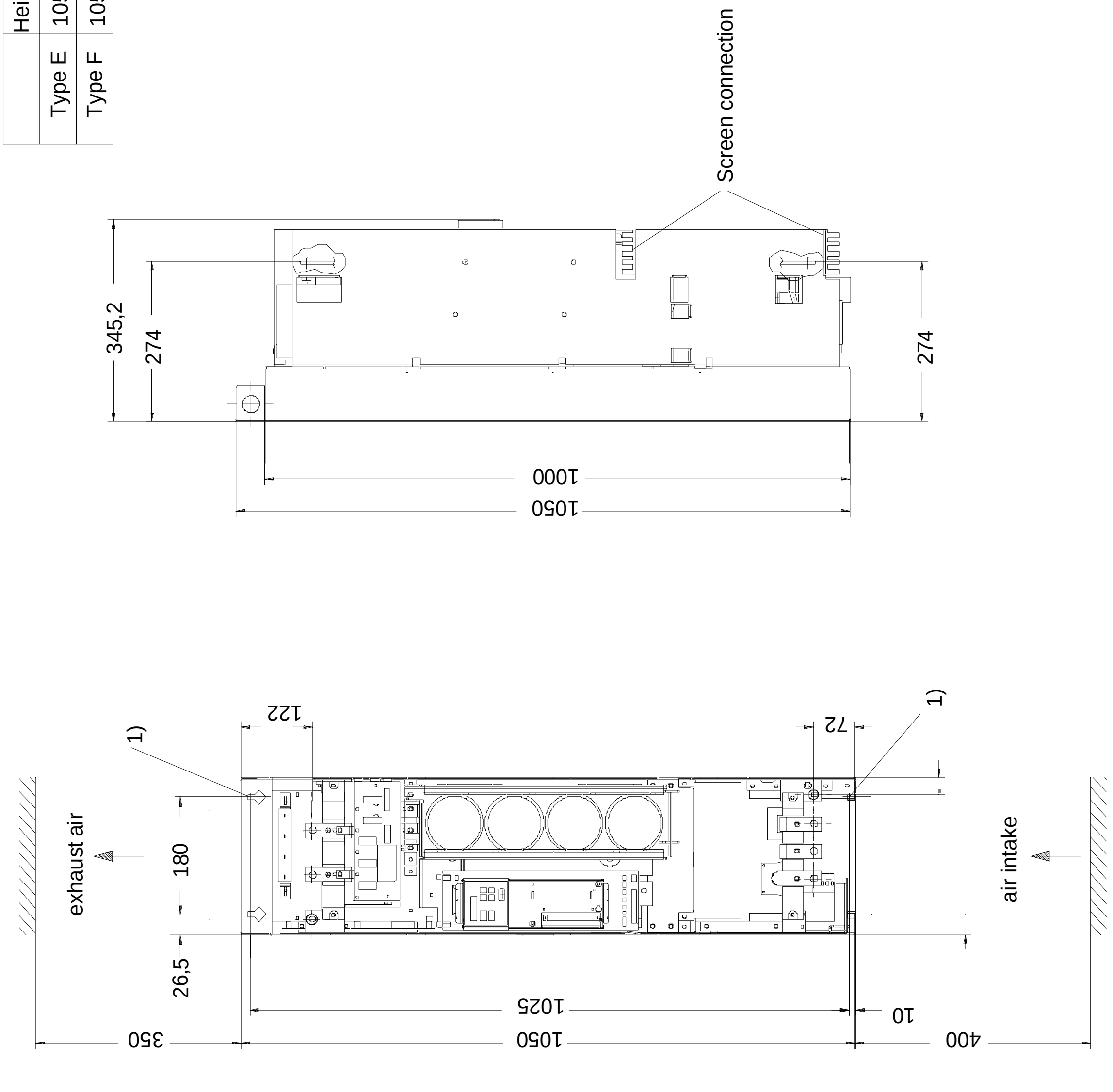
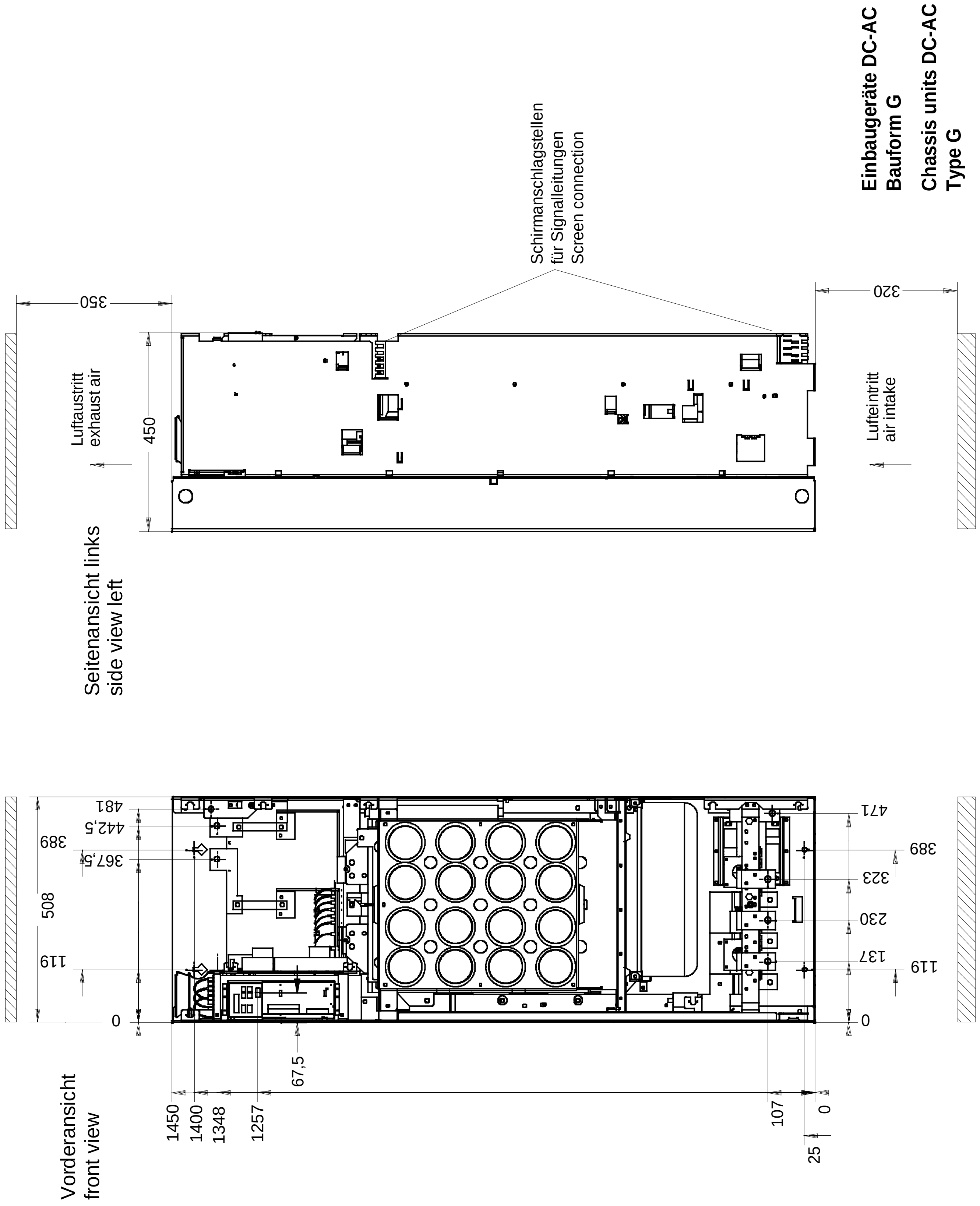


Fig. 2.2 Types E and F



Einbaugeräte DC-AC
Bauform G
Chassis units DC-AC
Type G
Schirmanschlagstellen
für Signalleitungen
Screen connection
350
320
450
Luftaustritt
exhaust air
Lufteintritt
air intake
Seitenansicht links
side view left
481
442,5
367,5
389
508
119
0
471
389
323
230
137
119
0
67,5
1450
1400
1348
1257
107
0
25
Vorderansicht
front view

Fig. 2.3 Type G

Einbaugeräte DC-AC Bauform H

Chassis units DC-AC Type H

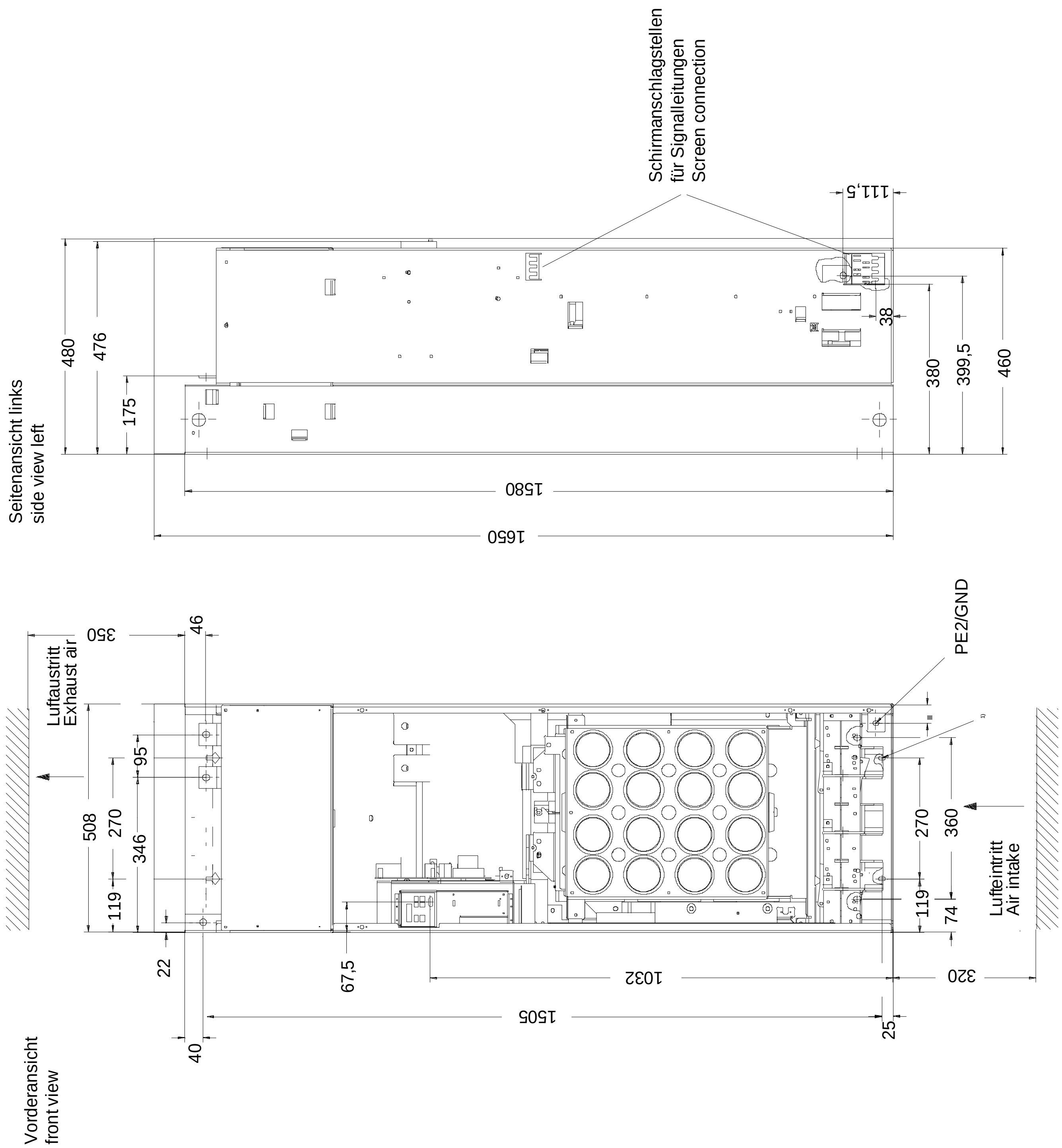


Fig. 2.4 Type H

3 Connecting-up

WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out!

Only professionally trained, qualified personnel must work on or with the unit.

Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.

Extreme caution should be taken when working-on the unit when it is open, as external power supplies may be connected. The power terminals and control terminals can still be at hazardous potentials even when the motor is stationary.

Hazardous voltages are still present in the unit up to 5 minutes after it has been powered-down due to the DC link capacitors. Thus, the appropriate delay time must be observed before opening-up the unit.

Forming the DC link capacitors:

The storage time should not exceed one year. The converter DC link capacitors must be formed at start-up if the unit has been stored for a longer period of time.

Forming is described in the Instruction Manual, Part 2.

When the DC link is supplied from a central unit, it must be ensured that the converter is reliably isolated from the DC link voltage!

The user is responsible, that the motor, converter and any other associated devices or units are installed and connected-up according to all of the recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be especially observed.

INFORMATION

♦ Supply rating:	The converter is suitable for connecting to supplies with a short-circuit rating (supply) $\leq 100 \times$ rated output (converter).
♦ Cabling/wiring:	Connecting cables should be dimensioned according to the local regulations and according to Table 3.1. The insulation should be suitable for 75°C.

3.1 Power connections

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

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

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

Connections must be established using cable lugs with bolts according to Table 3.2.

NOTE

Converters type of construction H: The busbars of the motor connection are rotated through 90 °.

The fan needs an external power supply of AC 230 V via terminal strip X18 1/5 on the PSU.

NOTE FC and VC

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

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

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

Order - No.	Supply side								Motor side			
	Rated DC Curr.	Cross-section		Recommended fuse					Rated output		Cross-section	
		VDE				North-America			Voltage	Curr.	VDE	
	(A)	(mm²)	AWG1)	(A)	Type	Type	(V)	(A)	(V)	(A)	(mm²)	AWG
6SE70					3NE3	170M						
	Rated DC Voltage 510 V to 620 V											
31-0TE	110	1x70	1x000	160	224	3716	660	250	0 to 620	92	1x35	1x0
31-2TF	148	2x35	2x0	250	227	3718	660	350	0 to 620	124	2x25	2x2
31-5TF	174	2x35	2x0	250	227	3718	660	350	0 to 620	146	2x25	2x2
31-8TF	221	2x50	2x00	315	230-0B	3720	660	450	0 to 620	186	2x35	2x00
32-1TG	250	2x70	2x000	450	233	6709	660	550	0 to 620	210	2x50	2x00
32-6TG	310	2x95	2x4/0	450	233	6709	660	550	0 to 620	260	2x70	2x000
33-2TG	375	2x120	2x300	500	334-0B	6710	660	630	0 to 620	315	2x95	2x4/0
33-7TH	440	2x120	2x300	630	336	6710	660	630	0 to 620	370	2x120	2x300
	Rated DC Voltage 675 V to 780 V											
26-1UE	73	1x50	1x00	125	222	3714	660	160	0 to 780	61	1x25	1x2
26-6UE	79	1x50	1x00	160	224	3714	660	160	0 to 780	66	1x25	1x2
28-0UF	94	1x50	1x00	160	224	3716	660	250	0 to 780	79	1x35	1x0
31-1UF	128	2x35	2x0	200	225	3718	660	350	0 to 780	108	2x16	2x4
31-3UG	152	2x35	2x0	200	225	3718	660	350	0 to 780	128	2x25	2x2
31-6UG	186	2x50	2x00	250	227	3718	660	350	0 to 780	156	2x35	2x0
32-0UH	228	2x50	2x00	400	232-0B	6707	660	450	0 to 780	192	2x35	2x0
32-3UH	267	2x70	2x000	400	232-0B	6707	660	450	0 to 780	225	2x50	2x00
	Rated DC Voltage 890 V to 930 V											
26-0WF	71	1x25	1x2	125	222				0 to 930	60	1x25	1x2
28-2WF	98	1x50	1x00	160	224				0 to 930	82	1x35	1x0
31-0WG	115	1x70	1x000	200	225				0 to 930	97	1x50	1x00
31-2WG	140	2x35	2x0	200	225				0 to 930	118	2x25	1x2
31-5WG	172	2x50	2x00	315	230-0B				0 to 930	145	2x25	2x2
31-7WG	204	2x50	2x00	315	230-0B				0 to 930	171	2x25	2x2
32-1WH	248	2x70	2x000	400	232-0B				0 to 930	208	2x50	2x00

INFORMATION AND EXPLANATIONS

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

1) American Wire Gauge

Table 3.1 Power connections acc. to DIN VDE

Type of construction	Order No.	Possible connection cross-section		Bolted joint
		(mm²) lt. VDE	AWG	
E	6SE70_._-._._E_0	2 x 70	2 x 00	M10
F	6SE70_._-._._F_0	2 x 70	2 x 00	M10
G	6SE70_._-._._G_0	2 x 150	2 x 300	M12
H	6SE70_._-._._H_0	2 x 240	2 x 500	M12

Table 3.2 Possible connection cross-sections and bolted joints

3.1.1 Protective conductor connection

The protective conductor should be connected-up on both the supply- and motor sides. It should be dimensioned according to the power connections.

3.2 Auxiliary power supply/main contactor or bypass contactor

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

Connector X9 is supplied together with the connectors for the control terminal strip. Cables from 0.2 mm² to 2.5 mm² (AWG: 24 to 14) can be connected to X9.

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

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

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

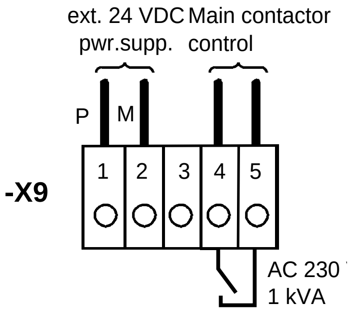


Fig. 3.1 Connecting an external auxiliary 24 V DC power supply and main contactor control

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

Table 3.3 Connector assignment for -X9

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

4 Operator control

The converter can be controlled via:

- the PMU (Parameterization Unit)
- the control terminal strip on the CU (☞ section "Control terminal strip")
- the OP1 operator control panel (☞ section "Options")
- the RS485 and RS232 serial interface on PMU-X300

Operator control using the PMU is described in this section.

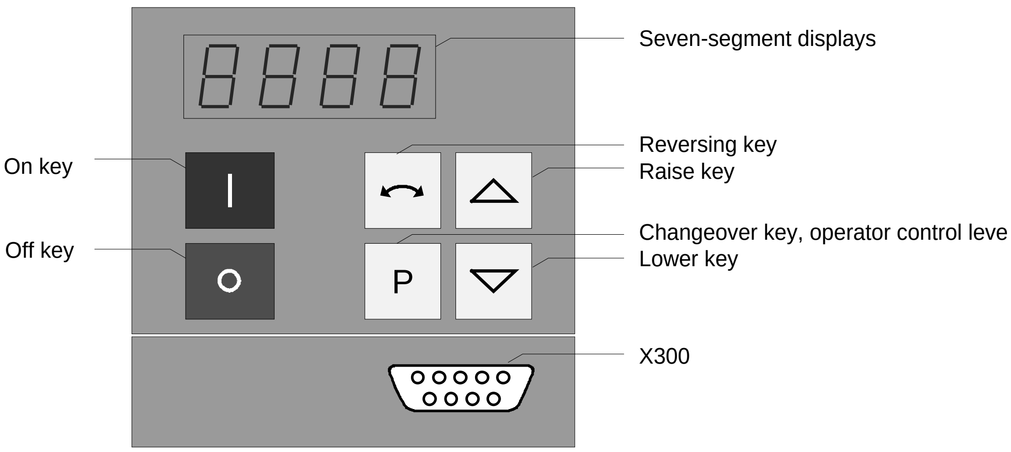


Fig. 4.1 Parameterization unit

4.1 Operator control elements

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

Table 4.1 Function of the operator control elements on the PMU

4.2 Displays 8.8.8.8.

		Parameter number Pos. actual value e.g	Neg. actual value e.g	Index e.g..	Parameter value e.g.
Visualization parameters	**Basic converter**	r000	r.000	---	°009
	Technology board	d000	d.000		
Setting parameters	**Basic converter**	P005	P.005	ı000	-2.08
	Technology board	H002	H.002		

Table 4.2 Displaying visualization- and setting parameters on the PMU

	Actual value	**Parameter value not possible**	**Alarm**	**Fault**
Display	-2.08	‾‾‾‾ / ____	A022	F006

Table 4.3 Status display on the PMU

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

5 Maintenance

WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VBG4 in Germany).

Maintenance and service work may only be executed by qualified personnel.

Only spare parts authorized by the manufacturer may be used.

The specified maintenance intervals and also the instructions for repair and replacement must be adhered to.

The drive units have hazardous voltage levels up to 5 min after the converter has been powered-down due to the DC link capacitors so that the unit must only be opened after an appropriate delay time.

The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.

If it is absolutely necessary that the drive converter must be worked on when powered-up:

- never touch any live components.
- only use the appropriate measuring and test equipment and protective clothing.
- always stand on an ungrounded, isolated and ESD-compatible pad.

If these warnings are not observed this can result in death, severe bodily injury or significant material damage.

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

5.1 Maintenance requirements

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

5.2 Replacing components

	WARNING
	The fan may only replaced by qualified personnel. The drive converters are still at hazardous voltage levels up to 5 min. after the unit has been powered-down as a result of the DC link capacitors. If these warnings are not observed, death, severe bodily injury or considerable material damage could occur.

5.2.1 Replacing the fan assembly

The fan assembly consists of:

- the fan housing
- a fan
- the starting capacitor, only for type of construction H

The fan is mounted for

♦ between the capacitors and the motor connection for **types of construction E to G**

♦ below the line supply- and DC link circuit connection for **type of construction H**.

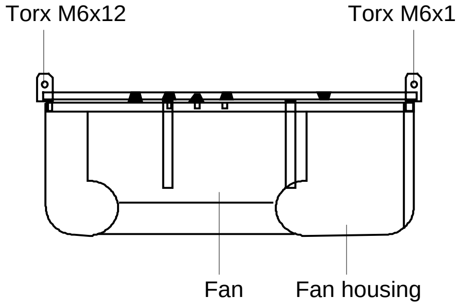


Fig. 5.1 Fan module for housing sizes E to G

- Remove connector X20
- Remove the cable ties
- Release the screw connections
- Remove the fan assembly towards the front
- Install the new fan assembly in the inverse sequence
- Before commissioning the drive check that the fan can run freely and check the airflow direction. The air must be blown upwards out of the unit.

5.2.2 Replacing the starting capacitor

The starting capacitor is mounted next to the fan connection.

- Remove the plug connections from the starting capacitor
- Unbolt the starting capacitor
- Install a new starting capacitor in the inverse sequence

5.2.3 Replacing the capacitor bank

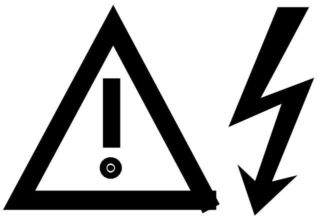
The board consists of the DC link capacitors, the capacitor mounting element and the DC link connection.

♦ **Types of construction E to F**
- Release the electrical connection to the inverter busbars
- Release the mechanical locking
- Swing-out the capacitor bank towards the front and remove from the top.

♦ **Types of construction G to H**
- Remove the connection for the symmetrical resistor (cable lug M6)
- Release the mechanical mounting
- Swing-out the capacitor bank to the front and lift out of the converter at a 45 ° angle.

- Install a new capacitor bank in the inverse sequence.

5.2.4 Replacing boards

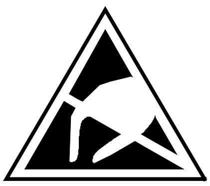


WARNING

The boards may only be replaced by qualified personnel.

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

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



CAUTION

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

5.2.4.1 Replacing the IVI

IVI Inverter-Value Interface

The IVI is bolted to the rear of the electronics box

♦ Remove connector X205; X206; X208; X31; X33 from the IVI

♦ **Types of construction E to F**
- Withdraw the fiber-optic cable connections
- Remove the capacitor bank

♦ **Types of construction G to H**
- Remove PSU with insulation

♦ **All types of construction**
- Remove all boards from the electronics box
- Remove both mounting bolts from the electronics box (Fig. 5.3)
- Release the electronics box and remove towards the front.
- Unbolt the IVI and remove
- Install the new IVI in the inverse sequence

5.2.4.2 Replacing the PSU

PSU Power-Supply Unit (Power Supply)

- Remove connector X18; X258 and X70.
- Remove the Torx bolt with ground connection from the side panel.
- Shift the PSU from the locking bolts and remove towards the front under the input bar.
- Install the new PSU in the invserse sequence.

5.2.4.3 Replacing the IGD

IGD IGBT-Gate Drive

♦ **Types of construction E to F**

The IGD is directly mounted onto the IGBT modules.

- Remove the capacitor bank
- For type of construction E: Remove the electronics box with IVI
- Label the output wiring U2/T1;V2/T2;W2/T3 and disconnect
- Remove the inverter busbars after releasing the 12 M6 bolts
- Label the auxiliary connections of the defective module and remove
- Withdraw connector X295
- Release the mounting bolts and remove the IGD.

♦ **Types of construction G to H**

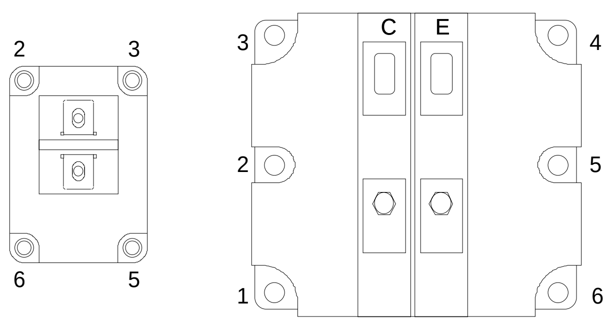
The IGD is located in the rear mounting plane on the heatsink betwen the inverter modules, i.e. behind the capacitor bank and the inverter busbars.

- Remove the capacitor bank
- Remove the SML- and SMU boards
- Remove the inverter busbars
- Remove the SIB board
- Remove the fiber-optic cable connections
- Remove connector X290
- Remove the mounting bolts and remove the IGD.

♦ Install the new IGD in the inverse sequence

5.2.4.4 Replacing the IGBT modules

- Replace as for IGD, but additionally
- Remove the mounting bolts of the defective IGBT modules and remove the IGBT.
- Install the new IGBT module. Observe the following:
  – Coat the module mounting surface with a **thin and uniform** coating of heat conducting paste.
  – Tighten-up the IGBT module mounting bolts with 3 Nm, observe the sequence (Fig. 5.2).



Tighten-up the IGBT modules
1. By hand (≈ 0,5 Nm), sequence: 2 - 5 - 3 - 6 - 1 - 4
2. tighten-up with 3 Nm, sequence: 2 - 5 - 3 - 6 - 1 - 4

Fig. 5.2 Tighten-up IGBT modules

5.2.4.5 Replacing boards in the electronics box

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

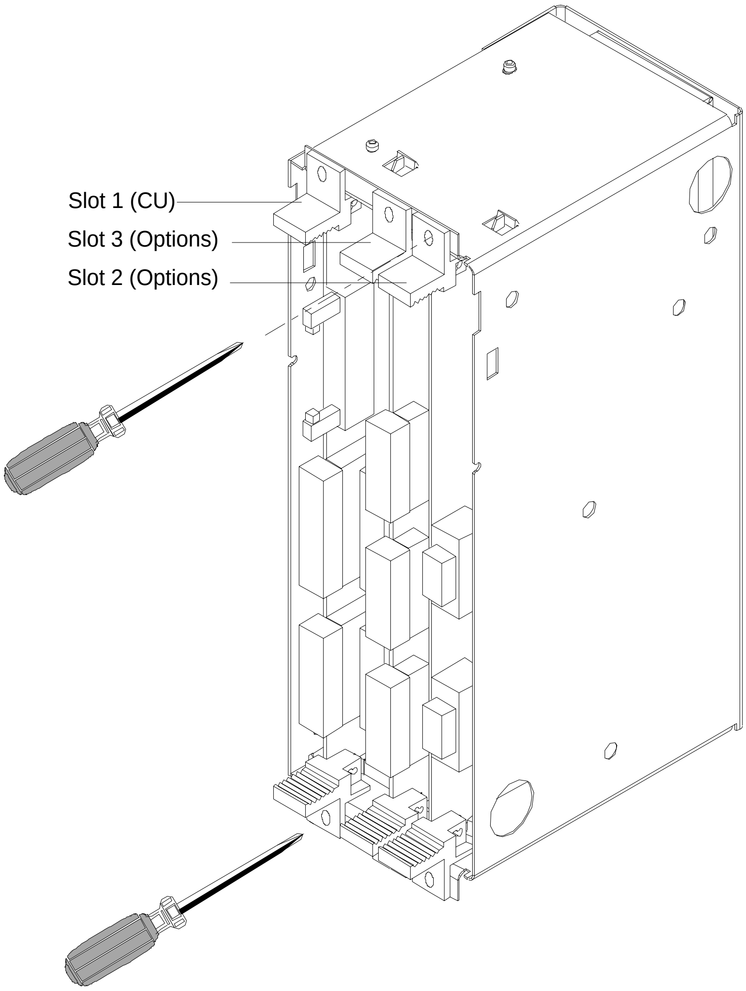


Fig. 5.3 Electronics box equipped with CU (slot 1) and options (slot 2 (right) and 3 (middle))

5.2.4.6 Replacing the PMU (Parameterization Unit)

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

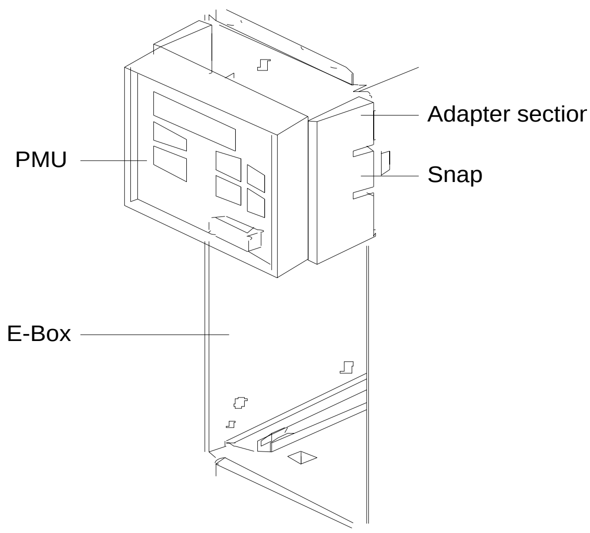


Fig. 5.4 PMU with adapter section on the E box

6 Options

6.1 Options which can be integrated into the electronics box

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

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

Install the LBA bus expansion:

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

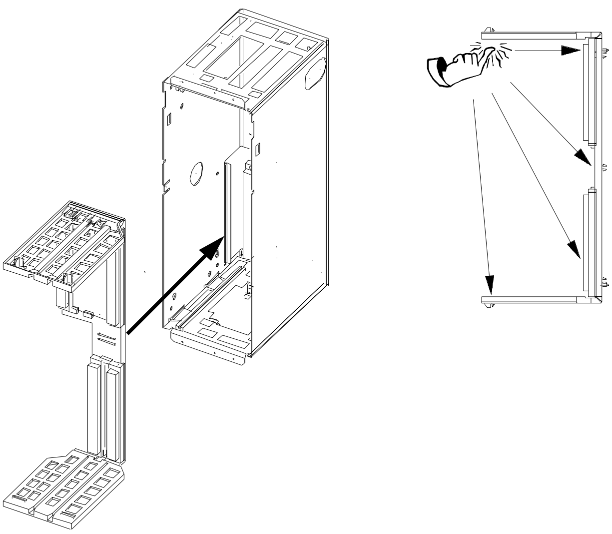


Fig. 6.1 Installing the Local Bus Adapter

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not for T300)
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE

Only one of each option board type may inserted in the electronics box.

TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.

If only one option board is used it must always be inserted at slot 2.

Table 6.1 Possible arrangements of boards in the electronics box

The options are supplied with the option description.

Desig-nation	Description	Order No.	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7087-6CX84-4HA0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7087-6CX84-0AH0
TSY	Synchronizing board	Board description	6SE7090-0XX84-0BA0 6SE7087-6CX84-0BA0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7087-6CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7087-6CX84-0BD0
	Use of the serial interface with USS protocol	Application description	6SE7087-6CX87-4KB0
CB1	Communications board with interface for SINEC- L2-DP, (Profibus)	Board description	6SE7090-0XX84-0AK0 6SE7087-6CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0

Table 6.2 Option boards and bus adapter

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

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

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

Table 6.3 Current drain of the option boards

6.2 Interface boards

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

Desig-nation	Description	Order No.	
SCI1	Serial I/O board (only in conjunction with SCB1). Analog and binary input and outputs for coupling to the SCB1 via fiber-optic cable	Board description	6SE7090-0XX84-3EA0 6SE7087-6CX84-0BC0
SCI2	Serial I/O board (only in conjunction with SCB1) Binary inputs and outputs for coupling to the SCB1 via fiber-optic cable.	Board description	6SE7090-0XX84-3EF0 6SE7087-6CX84-0BC0
DTI	Digital tachometer interface	Board description	6SE7090-0XX84-3DB0 6SE7087-6CX84-3DB0
ATI	Analog tachometer interface	Board description	6SE7090-0XX84-3DF0 6SE7087-6CX84-3DF0

Table 6.4 Interface boards

6.3 Power supplies

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

Table 6.5 Recommended power supply

6.4 Isolating amplifiers

Input	Output	Order number Option
Input isolating amplifiers for analog inputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–20 mA to +20 mA	–10 V to +10 V	6SX7010-0AC02
4 mA to +20 mA	4 mA to +20 mA	6SX7010-0AC01
Output isolating amplifiers for analog outputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–10 V to +10 V	–20 mA to +20 mA	6SX7010-0AC03
0 V to +10 V	4 mA to +20 mA	6SX7010-0AC04

Table 6.6 Overview of isolating amplifiers

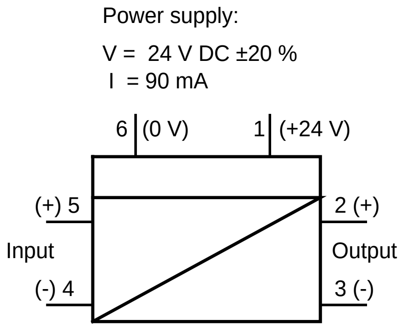


Fig. 6.2 Isolating amplifiers

6.5 Power section

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

Table 6.7 Power section options

6.5.1 Output reactor, dv/dt filter, sinusoidal filter

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

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

NOTE

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

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

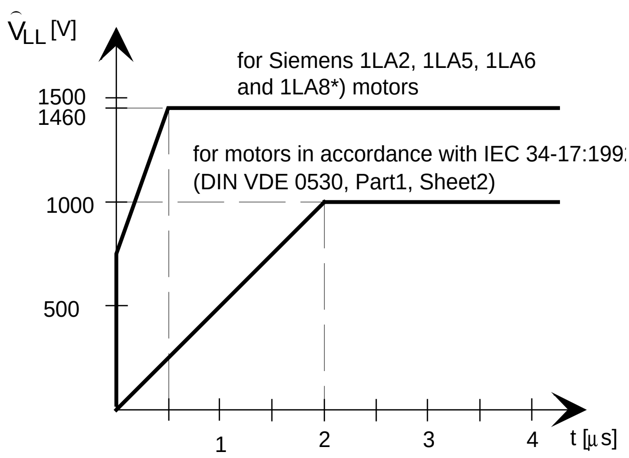


Fig. 6.3 Permissible limit values for the motor insulation

*) Standard 1LA8 motors;
1LA8 motors with improvedinsulation are available

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

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

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

Table 6.8

6.5.1.1 Output reactor

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

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

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

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

	V/f = constant		**V = constant**	
	510 V to 620 V DC	**675 V to 930 V DC**	**510 V to 620 V DC**	**675 V to 930 V DC**
Standard reactor (iron) $f_P \leq 3$ kHz				
V/f / Vector control	$f_{mot\ N} \leq 87$ Hz	$f_{mot\ N} \leq 200$ Hz	$f_{max} \leq 200$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\ N} = f_{max} \leq 120$ Hz	not possible	not possible	not possible
Ferrite reactor $f_P \leq 6$ kHz				
V/f / Vector control	$f_{mot\ N} \leq 150$ Hz	$f_{mot\ N} \leq 150$ Hz	$f_{max} \leq 300$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\ N} = f_{max} \leq 600$ Hz	not possible	not possible	not possible

Table 6.9 Output reactor design

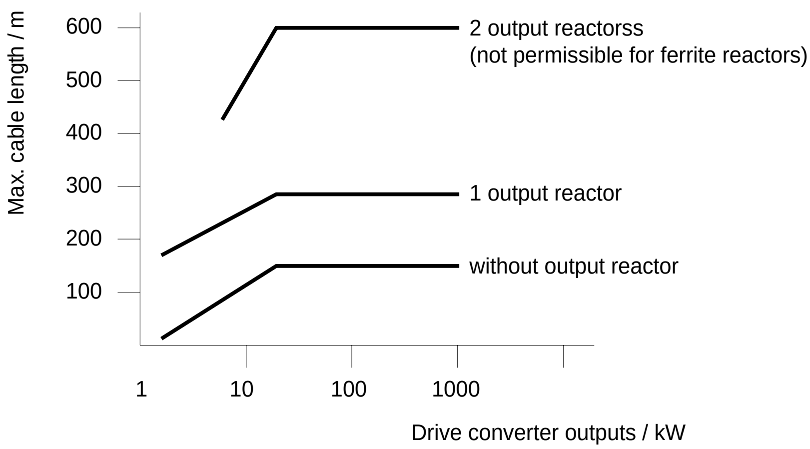


Fig. 6.4 Permissible cable lengths with and without output reactors

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

6.5.1.2 dv/dt filter

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

- ♦ Voltage gradient (rate of rise) dv/dt ≤ 500 V/µs
- ♦ Transient peak voltage at the motor terminals:

  $\hat{U}_{typ.}$ ≤ 800 V for 380 V ≤ U_N ≤ 460 V (3 ph. AC)

  $\hat{U}_{typ.}$ ≤ 1000 V for 500 V ≤ U_N ≤ 575 V (3 ph. AC)

  $\hat{U}_{typ.}$ ≤ 1250 V for 660 V ≤ U_N ≤ 690 V (3 ph. AC).

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

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

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

The dv/dt filter is suitable for use with

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

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

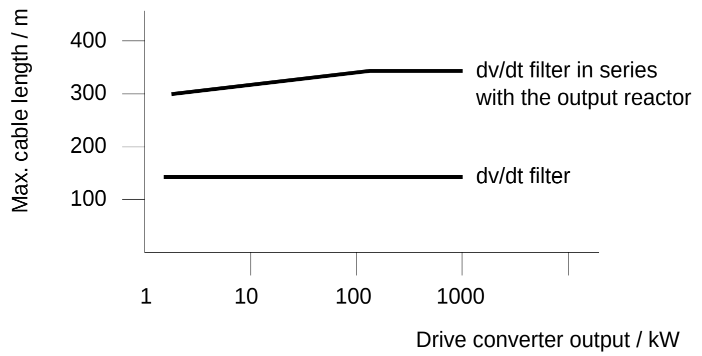


Fig. 6.5 Permissible cable lengths with dv/dt filter

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

6.5.1.3 Sinusoidal filter

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

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

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

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

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

The sinusoidal filter is suitable for use with

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

NOTE

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

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

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

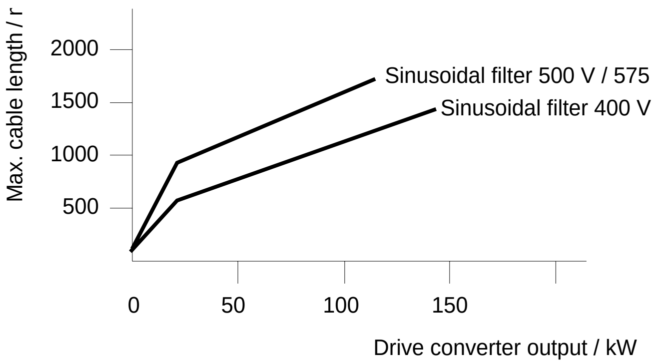


Fig. 6.6 Permissible cable lengths with sinusoidal filter

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

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

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

	Voltage range		
	510 V - 675 V (DC)	**710 V - 780 V (DC)**	**890 V - 930 V (DC)**
Motors, acc. to IEC 34-17:1992 (DIN VDE 0530, Part 1, Sheet 2)	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.
Siemens motors 1LA2, 1LA5, 1LA6, 1LA8 ***)**.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.
***)** Standard 1LA8 motors; 1LA8 motors are available with a better insulation.			

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

6.6 Bypass- and output contactor

6.6.1 Bypass contactor (electrical DC link coupling)

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

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

Binary output -X9:4,5 is provided to control the contactor.

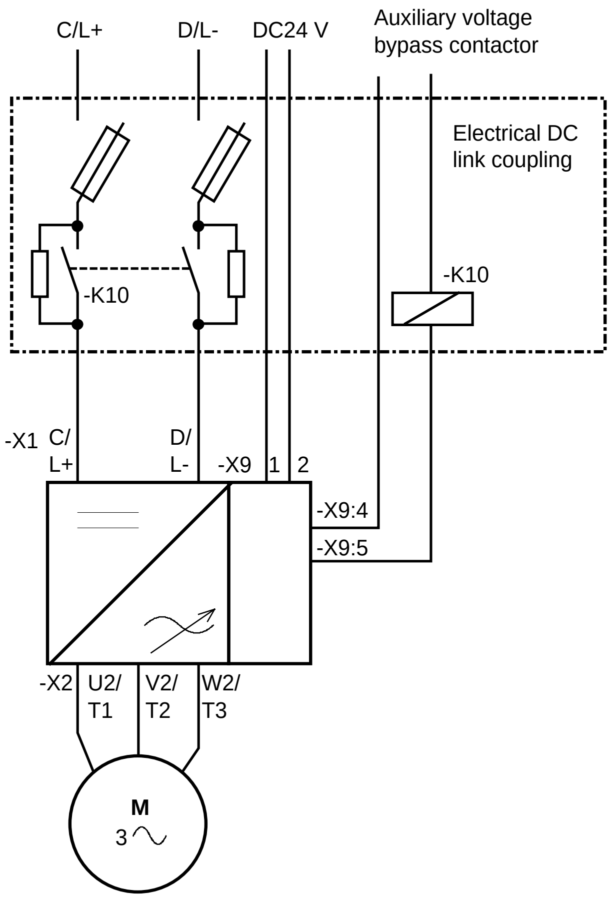


Fig. 6.7 Connecting-up example for the bypass contactor

6.6.1.1 Bypass contactor without I/R unit

Parameterization for operation with bypass contactor:

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

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

6.6.1.2 Bypass contactor with I/R unit

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

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

♦ Re-parameterization for the optimization run:

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

Table 6.12 Parameterization for the optimization run

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

♦ Re-parameterize for operation with the bypass contactor:

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

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

6.6.1.3 Connecting and disconnecting individual converters to the DC bus

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

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

6.6.2 Output contactor

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

If the converter is operated with output contactor, binary output-X9:4,5 is provided for contactor control (re-assignment).

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

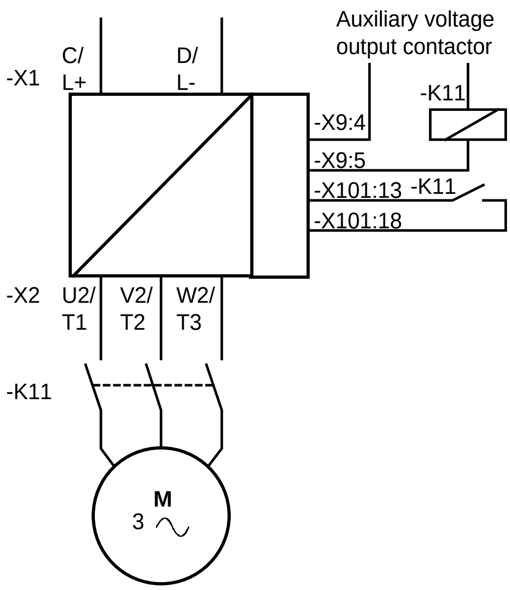


Fig. 6.8 Example for connecting-up a output contactor

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

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

6.7 Operator control

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

Table 6.15 Operator control options

Fig. 6.9 OP1

7 Spare Parts

7.1 Converter 510 V to 620 V DC

Component code	Designation	Order number	Qty.	Used in
-A10	CU1 (FC)	6SE7090-0XX84-0AA1	1	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	1	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	1	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	1	6SE70_ _-_ _ _ _ _
-E1	230 V AC fan	6SY7000-0AB28	1	6SE70_ _-_ TE_ _
-E1	230 V AC fan	6SY7000-0AB30	1	6SE70_ _-_ TF_ _
-E1	230 V AC fan	6SY7000-0AB66	1	6SE7032-1/6TG_ _
-E1	230 V AC fan	6SY7000-0AB67	1	6SE7033-2TG_ _
-E1	230 V AC fan	6SY7000-0AB68	1	6SE70_ _-_ TH_ _
-E1#	Fan nozzle	6SY7000-0AB65	1	6SE70_ _-_ _H_ _
-C110	Starting capacitor 2,0 µF	6SY7000-0AA36	1	6SE70_ _-_ TE_ _
-C110	Starting capacitor 2,5 µF	6SY7000-0AA52	1	6SE70_ _-_ TF_ _
-C110	Starting capacitor 4,0 µF	6SY7000-0AB10	1	6SE7032-1/6TG_ _
-C110	Starting capacitor 5,0 µF	6SY7000-0AB15	1	6SE7033-2TG_ _
-C110	Starting capacitor 10 µF	6SY7000-0AA52	1	6SE70_ _-_ _H_ _
-G25-F1 -G25-F2	Fuse 2 A / 600 V 5 A / 600 V	 6SY7000-0AA24 6SY7000-0AB62	 2 2	 6SE70_ _-_ _E/F_ _ 6SE70_ _-_ _G/H_ _
	Capacitor bank	6SY7000-0AB43	1	6SE7031-0TE_ _
		6SY7000-0AB44	1	6SE7031-2/5TF_ _
		6SY7000-0AB45	1	6SE7031-8TF_ _
		6SY7000-0AB46	1	6SE7032-1/6TG_ _
		6SY7000-0AB47	1	6SE7033-2TG_ _
		6SY7000-0AB48	1	6SE7033-7EH20
-G25	PSU1	6SE7031-7HG84-1JA0	1	6SE70_ _-_ E_ _ _
-A20	IVI	6SE7031-2HF84-1BG0	1	6SE70_ _-_ TE_ _ 6SE70_ _-_ TF_ _
-A20	IVI	6SE7038-6GL84-1BG0	1	6SE70_ _-_ TG_ _ 6SE70_ _-_ TH_ _
-A29	IGD1	6SE7031-5EF84-1JC0	1	6SE7031-0TE_ _ 6SE7031-2TF_ _ 6SE7031-2/5TF_ _
-A29		6SE7031-8EF84-1JC0	1	6SE7031-8TF_ _

Component code	Designation	Order number	Qty.	Used in
-A29	IGD5	6SE7031-6FG84-1JC0	1	6SE7032-1/6TG_ _
-A29	IGD6	6SE7033-2EG84-1JC0	1	6SE7033-2TG_ _
-A29		6SE7033-7EH84-1JC0	1	6SE7033-7TH20
-A100 to -A310	IGBT	6SY7000-0AA44	6	6SE7031-0TE_ _
-A100 to -A310		6SY7000-0AA43	6 12	6SE7031-2/5TF_ _ 6SE7032-1/6TG_ _
-A100 to -A310		6SY7000-0AA34	6	6SE7031-8TF_ _
-A100 to -A310		6SY7000-0AB70	6	6SE7033-2TG_ _
-A100 to -A310		6SY7000-0AA81	6	6SE7033-7TH20
-A26	ABO	6SE7031-0EE84-1BH0	1	6SE7031-0TE_ _
-A26		6SE7031-5EF84-1BH0	1	6SE7031-2/5TF_ _
-A26		6SE7031-8EF84-1BH0	1	6SE7031-8TF_ _
-A26		6SE7032-6EG84-1BH0	1	6SE7032-1/6TG_ _
-A26		6SE7033-2EG84-1BH0	1	6SE7033-2TG_ _
-A26		6SE7033-7EH84-1BH0	1	6SE7033-7TH20

Table 7.1 Spare parts

7.2 Converter 675 V to 780 V DC

Part code No.	Designation	Order number	No.	Used in
-A10	CU1 (FC)	6SE7090-0XX84-0AA1	1	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	1	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	1	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	1	6SE70_ _-_ _ _ _ _
-E1	230 V AC fan	6SY7000-0AB28	1	6SE70_ _-_ _E_ _
-E1	230 V AC fan	6SY7000-0AB30	1	6SE70_ _-_ _F_ _
-E1	230 V AC fan	6SY7000-0AB66	1	6SE7031-3/6UG_ _
-E1	230 V AC fan	6SY7000-0AB68	1	6SE70_ _-_ _H_ _
-E1#	Fan nozzle	6SY7000-0AB65	1	6SE70_ _-_ _H_ _
-C110	Starting capacitor 2,0 µF	6SY7000-0AA36	1	6SE70_ _-_ _E_ _
-C110	Starting capacitor 2,5 µF	6SY7000-0AA52	1	6SE70_ _-_ _F_ _
-C110	Starting capacitor 4,0 µF	6SY7000-0AB10	1	6SE7031-3/6UG_ _
-C110	Starting capacitor 10 µF	6SY7000-0AA52	1	6SE70_ _-_ _H_ _
-G25-F1 -G25-F2	Fuse 2 A / 600 V 5 A / 600 V	 6SY7000-0AA24 6SY7000-0AB62	 2 2	 6SE70_ _-_ _E/F_ _ 6SE70_ _-_ _G/H_ _

Part code No.	Designation	Order number	No.	Used in
	Capacitor bank	6SY7000-0AB50		6SE7026-1UE_ _ / 6SE7026-6UE_ _
		6SY7000-0AB51		6SE7028-0UF_ _ / 6SE7031-1UF_ _
		6SY7000-0AB52		6SE7031-3UG_ _
		6SY7000-0AB53		6SE7031-6UG_ _
		6SY7000-0AB54		6SE7032-0/3UH_ _
-G25	PSU1	6SE7032-8FH84-1JA0	1	6SE70_ _-_ U_ _ _
-A20	IVI	6SE7031-2HF84-1BG0		6SE7026-6UF_ _ / 6SE7028-0UF_ _ 6SE7031-1UF_ _
-A20	IVI	6SE7038-6GL84-1BG0		6SE7031-3UG_ _ / 6SE7031-3UH_ _
-A29	IGD1	6SE7028-0FF84-1JC0		6SE7026-1UE_ _ / 6SE7031-1UF_ _ 6SE7026-6UE_ _ / 6SE7028-0UF_ _
-A29	IGD5	6SE7031-3FG84-1JC0		6SE7031-3UG_ _
-A29	IGD5	6SE7032-6EG84-1JC0		6SE7031-6UG_ _
-A29	IGD6	6SE7032-3FH84-1JC0		6SE7032-0/3UH_ _
-A100 ...	IGBT	6SY7000-0AA66	6 12	6SE7026-1UE_ _ / 6SE7026-6UE_ _ 6SE7031-3UG_ _
-A100 ...		6SY7000-0AA65	6 12	6SE7028-0UF_ _ / 6SE7031-1UF_ _ 6SE7031-6UG_ _
-A100 ...		6SY7000-0AB71	6	6SE7032-0/3UH_ _
-A26	ABO	6SE7026-1FE84-1BH0	1	6SE7026-1UE_ _0
-A26		6SE7028-0FF84-1BH0	1	6SE7026-6UE_ _ / 6SE7028-0UF_ _
-A26		6SE7031-3FG84-1BH0	1	6SE7031-3UG_ _ / 6SE7031-1UF_ _
-A26		6SE7031-6FG84-1BH0	1	6SE7031-6UG_ _
-A26		6SE7032-3FH84-1BH0	1	6SE7032-0/3UH_ _

Table 7.2 Spare parts

7.3 Converter 890 V to 930 V DC

Part code No.	Designation	Order number	No.	Used in
-A10	CU1 (FC)	6SE7090-0XX84-0AA1	1	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	1	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	1	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	1	6SE70_ _-_ _ _ _ _
-E1	230 V AC fan	6SY7000-0AB28	1	6SE70_ _-_ _E_ _
-E1	230 V AC fan	6SY7000-0AB30	1	6SE70_ _-_ _F_ _
-E1	230 V AC fan	6SY7000-0AB66	1	6SE7031-0/2WG_ _
-E1	230 V AC fan	6SY7000-0AB67	1	6SE7031-5/7WG_ _
-E1	230 V AC fan	6SY7000-0AB68	1	6SE70_ _-_ _H_ _
-E1#	Fan nozzle	6SY7000-0AB65	1	6SE70_ _-_ _H_ _

Part code No.	Designation	Order number	No.	Used in
-C110	Starting capacitor 2,0 µF	6SY7000-0AA36	1	6SE70_ _-_ _E_ _
-C110	Starting capacitor 2,5 µF	6SY7000-0AA52	1	6SE70_ _-_ _F_ _
-C110	Starting capacitor 4,0 µF	6SY7000-0AB10	1	6SE7031-0/2WG_ _
-C110	Starting capacitor 5,0 µF	6SY7000-0AB15	1	6SE7031-5/7WG_ _
-C110	Starting capacitor 10 µF	6SY7000-0AA52	1	6SE70_ _-_ _H_ _
-G25-F1 -G25-F2	Fuse 6 A / 660 V	6SY7000-0AB63 6SY7000-0A???	2 2	6SE70_ _-_ _F_ _ 6SE70_ _-_ _G/H_ _
	Capacitor bank	6SY7000-0AB55		6SE7026-0WF_ _ 6SE7028-2WF_ _
		6SY7000-0AB56		6SE7031-0/2WG_ _
		6SY7000-0AB57		6SE7031-5/7WG_ _
		6SY7000-0AB58		6SE7032-1WH20
-G25	PSU1	6SE7031-7HG84-1JA0	1	6SE70_ _-_ W_ _ _
-A20	IVI	6SE7038-6GL84-1BG0		6SE70_ _-_ WF_ _ 6SE70_ _-_ WG_ _ 6SE70_ _-_ WH_ _
-A29	IGD2	6SE7026-0HF84-1JC0		6SE7026-0WF_ _ 6SE7028-2WF_ _
-A29	IGD5	6SE7031-2HG84-1JC0		6SE7031-0/2WG_ _
-A29		6SE7031-7HG84-1JC0		6SE7031-5/7WG_ _
-A29	IGD6	6SE7032-HH84-1JC0		6SE7032-1WH20
-A100 ...	IGBT	6SY7000-0AA66	12	6SE7026-0WF_ _ 6SE7031-0/2WG_ _
-A100 ...		6SY7000-0AA65	6 12	6SE7028-2WF_ _ 6SE7031-5/7WG_ _
-A100 ...		6SY7000-0AB71	6	6SE7032-1WH20
-A26	ABO	6SE7026-0HF84-1BH0	1	6SE7026-0WF_ _
-A26	ABO	6SE7028-2HF84-1BH0	1	6SE7028-2WF_ _
-A26	ABO	6SE7031-2HG84-1BH0	1	6SE7031-0/2WG_ _
-A26	ABO	6SE7031-7HG84-1BH0	1	6SE7031-5/7WG_ _
-A26	ABO	6SE7032-3HH84-1BH0	1	6SE7032-1WH20

Table 7.3 Spare parts

8 Environmental friendliness

Environmental aspects during the development

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

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

Plastic components:

ABS:	PMU support panel LOGO	PC:	Covers
LDPE:	Capacitor ring	PP:	Insulating boards bus retrofit
PA6.6:	Fuse holders, mounting rail, capacitor holder, cable retainer, connecting strips, terminal strip, supports, PMU adapter, covers	PS:	Fan housing
		UP:	Tensioning profile retaining bolts

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

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

Environmental aspects during production

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

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

ASIC devices and SMD devices were used on the boards.

The product is emission-free.

Environmental aspects for disposal

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

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

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

9 Technical Data

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

Switching at the input	No./min	2
Cooling medium temperature		0 °C to +40 °C
Storage temperature		– 25 °C to +70 °C
Transport temperature		– 25 °C to +70 °C
Environmental class	3K3	DIN IEC 721-3-3 Moisture condensation not permissible
Pollution level	2	DIN VDE 0110 Pert 1
Overvoltage category	III	DIN VDE 0110 Part 2
Overvoltage property class	1	E DIN VDE 0160
Degree of protection		DIN VDE 0470 Section 1 ≙ EN 60529
– standard	IP00	
– option	IP20	
Protection class	I	DIN VDE 0106 Section 1
Radio interference level		DIN VDE 0875 Section 11 ≙ EN 55011
– standard	without	
– option	A1	EN55011
Noise immunity		EN50082-2
Mechanical strength		DIN IEC 68-2-6 / 06.90

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

Inverter types							
FC	**6SE70...**	**31-0TE10**	**31-2TF10**	**31-5TF10**	**31-8TF10**	**32-1TG10**	**32-6TG10**
VC	**6SE70...**	**31-0TE20**	**31-2TF20**	**31-5TF20**	**31-8TF20**	**32-1TG20**	**32-6TG20**
VC	**6SE70...**	**31-0TE30**	**31-2TF30**		**31-8TF30**	**32-1TG30**	**32-6TG30**
Rated voltage, rated frequency, rated current							
Rated voltage in V_n Input Output	V	 DC 510 ... 620 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 110 92	 148 124	 174 146	 221 186	 250 210	 310 260
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	61...73	82...99	96...116	122...148	138...167	171...207
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	84	113	133	169	191	237
Base load time	s	240					
Overcurrent	A	126	169	199	254	287	355
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	84	113	133	169	191	237
Base load time	s	270					
Overcurrent	A	147	198	234	298	336	416
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		 < 0.92 ind.	 < 0.92 ind.	 < 0.92 ind.	 < 0.92 ind.	 < 0.92 ind.	 < 0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.98 0.97	 0.98 0.97	 0.98	 0.98	 0.98	 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 1.02 1.17	 1.41 1.62	 1.73	 1.74	 2.73	 3.38
Required cooling air flow	m^3/s	0.10	0.14	0.14	0.14	0.31	0.31
Pressure drop Δp	Pa	160	230	230	230	130	130
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	71	71	71	71	84	84
Type		E	F	F	F	G	G
Width Height Depth	mm	270 1050 350	360 1050 350	360 1050 350	360 1050 350	508 1450 460	508 1450 460
Weight – IP00 – IP20	kg	 55 70	 65 82	 65 82	 65 82	 150 181	 150 181

Inverter types								
FC	**6SE70...**	**33-2TG10**					
VC	**6SE70...**	**33-2TG20**	**33-7TG20**				
SC	**6SE70...**	**33-2TG30**	**33-7TG30**				
Rated voltage, rated frequency, rated current							
Rated voltage in V_n Input Output	V	 DC 510 ... 620 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 375 315	 440 370				
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	207...251	244...295				
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	287	337				
Base load time	s	240					
Overcurrent	A	430	503				
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	287	337				
Base load time	s	270					
Overcurrent	A	504	592				
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		< 0.92 ind.	< 0.92 ind.				
Efficiency η – Pulse frequency 3 kHz		0.98	0.98				
Power loss – Pulse frequency 3 kHz	kW	4.35	5.75				
Required cooling air flow	m^3/s	0.278	0.333				
Pressure drop Δp	Pa	145	256				
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	84	86				
Type		G	H				
Width Height Depth	mm	508 1450 460	508 1580 460				
Weight – IP00 – IP20	kg	 160 191	 215 235				

Inverter types							
FC	**6SE70...**	**26-1UE10**	**26-6UE10**	**28-0UF10**	**31-1UF10**	**31-3UG10**	**31-6UG10**
VC	**6SE70...**	**26-1UE20**	**26-6UE20**	**28-0UF20**	**31-1UF20**	**31-3UG20**	**31-6UG20**
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	DC 675...780 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	–––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	73 61	79 66	94 79	128 108	152 128	186 156
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	53...61	57...66	68...79	94...108	110...127	135...155
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	55	60	72	98	117	142
Base load time	s	240					
Overcurrent	A	83	90	108	147	174	213
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	55	60	72	98	117	142
Base load time	s	270					
Overcurrent	A	98	106	126	173	205	250
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		< 0.92 ind.	< 0.92 ind.	< 0.92 ind.	< 0.92 ind.	< 0.92 ind.	< 0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		0.98 0.97	0.98 0.97	0.98	0.98	0.98	0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	0.90 1.15	0.97 1.25	1.27	1.6	2.98	3.67
Required cooling air flow	m^3/s	0.10	0.10	0.14	0.14	0.31	0.31
Pressure drop Δp	Pa	160	160	230	230	130	130
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	71	71	71	71	84	84
Type		E	E	F	F	G	G
Width Height Depth	mm	270 1050 350	270 1050 350	360 1050 350	360 1050 350	508 1450 460	508 1450 460
Weight – IP00 – IP20	kg	55 70	55 70	65 82	65 82	150 181	150 181

Inverter types							
FC	**6SE70...**	**32-0UH10**	**32-3UH10**				
VC	**6SE70...**	**32-0UH20**	**32-3UH20**				
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	DC 675...780 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	–––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	228 192	267 225				
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	166...191	195...224				
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	174	205				
Base load time	s	240					
Overcurrent	A	262	307				
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	174	205				
Base load time	s	270					
Overcurrent	A	307	360				
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		< 0.92 ind.	< 0.92 ind.				
Efficiency η – Pulse frequency 3 kHz		0.97	0.97				
Power loss – Pulse frequency 3 kHz	kW	5.0	5.86				
Required cooling air flow	m^3/s	0.57	0.57				
Pressure drop Δp	Pa	250	250				
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	86	86				
Type		H	H				
Width Height Depth	mm	508 1580 460	508 1580 460				
Weight – IP00 – IP20	kg	215 235	215 235				

Inverter types							
FC	**6SE70...**	**26-0WF10**	**28-2WF10**	**31-0WG10**	**31-2WG10**	**31-5WG10**	**31-7WG10**
VC	**6SE70...**	**26-0WF20**	**28-2WF20**	**31-0WG20**	**31-2WG20**	**31-5WG20**	**31-7WG20**
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 DC 890...930 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 71 60	 98 82	 115 97	 140 118	 172 145	 204 171
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	69...72	94...98	111...116	138...141	166...173	171...179
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	55	75	88	107	132	156
Base load time	s	240					
Overcurrent	A	82	112	132	161	198	233
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		< 0.92 ind.	< 0.92 ind.	< 0.92 ind.	< 0.92 ind.	< 0.92 ind.	< 0.92 ind.
Efficiency η – Pulse frequency 3 kHz		0.98	0.98	0.98	0.98	0.98	0.98
Power loss – Pulse frequency 3 kHz	kW	1.11	1.76	2.54	2.75	3.40	3.98
Required cooling air flow	m^3/s	0.14	0.14	0.31	0.31	0.41	0.41
Pressure drop Δp	Pa	230	230	130	130	145	145
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	71	71	84	84	84	84
Type		F	F	G	G	G	G
Width Height Depth	mm	360 1050 350	360 1050 350	508 1450 460	508 1450 460	508 1450 460	508 1450 460
Weight – IP00 – IP20	kg	 65 82	 65 82	 150 181	 150 181	 150 181	 150 181

Inverter types							
FC	**6SE70...**						
VC	**6SE70...**	**32-1WH20**					
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 DC 890...930 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 248 208					
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	238...149					
Auxiliary power supply	V	DC 24 (20-30) (3 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	189					
Base load time	s	240					
Overcurrent	A	284					
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		 < 0.92 ind.					
Efficiency η – Pulse frequency 3 kHz		 0.98					
Power loss – Pulse frequency 3 kHz	kW	 5.88					
Required cooling air flow	m^3/s	0.57					
Pressure drop Δp	Pa	256					
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	86					
Type		H					
Width Height Depth	mm	508 1580 460					
Weight – IP00 – IP20	kg	 215 235					

9.1 De-rating for an increased cooling medium temperature

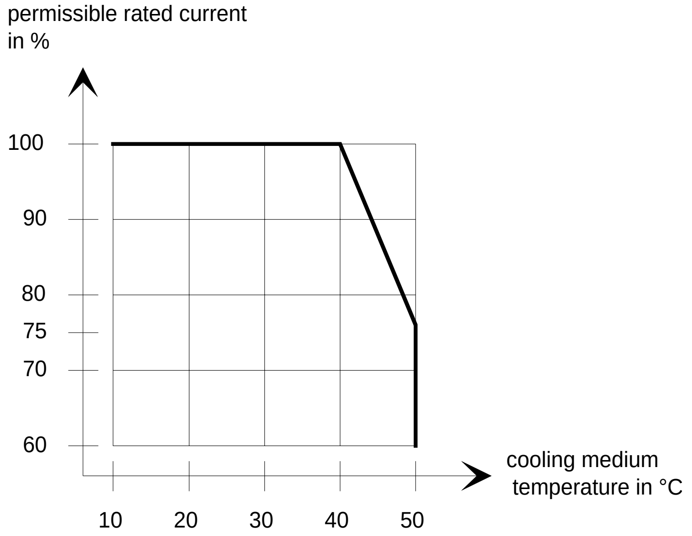
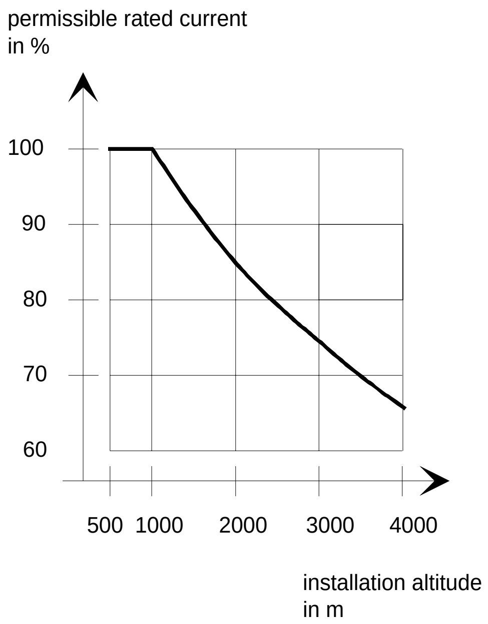


Fig. 9.1 Max. permissible rated current as a function of the cooling medium temperature

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

For installation altitudes > 1000 m above sea level, the rated current must be reduced. For installation altitudes > 2000 m above sea level, the rated voltage must be reduced (see Fig. 9.2). Installation altitudes > 4000 m above sea level are not permissible.



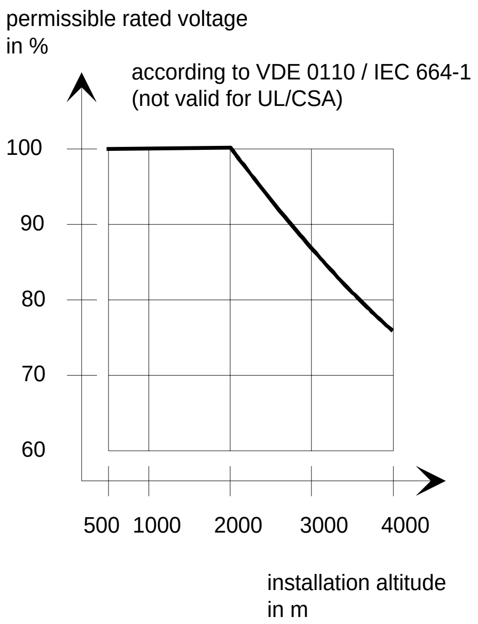


Fig. 9.2 Max. permissible rated current and rated voltage as a function of the installation altitude

9.3 De-rating as a function of the pulse frequency

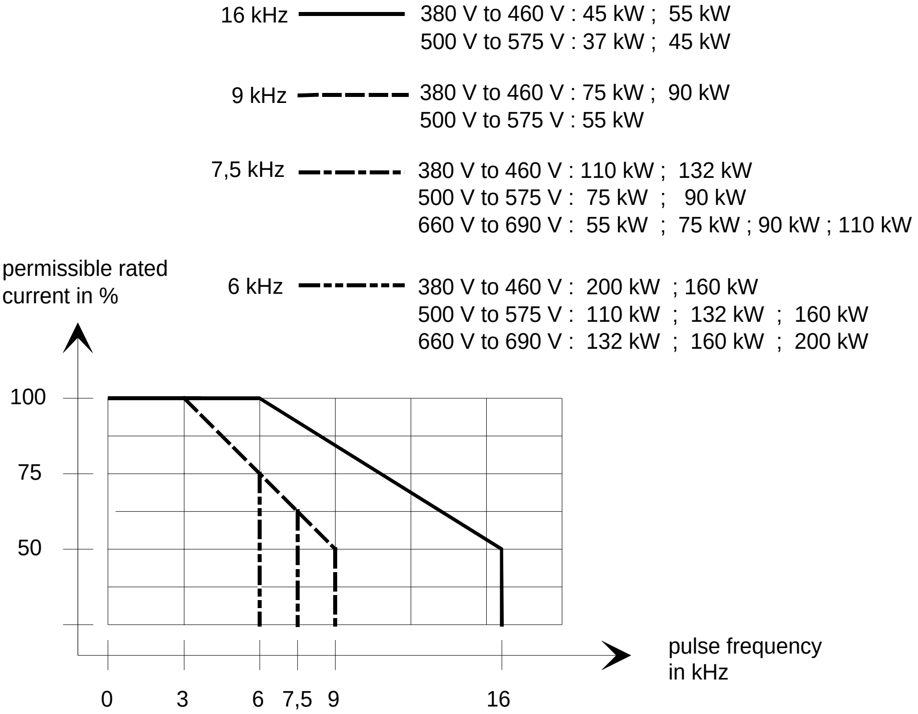


Fig. 9.3 Max. permissible rated current as a function of the pulse frequency

10 Appendix

10.1 Index

10.2 List of abbreviations

A	Alarm
AA	Analog output
AC	Alternating current
AE	Analog input
AFE	Active front end
AS	Sequence control
ASIC	Application specific integrated circuit
ASM	Asynchronous motor
ATI	Analog tacho-Interface
AWG	American wire gauge
BA	Binary output
BC	Bypass contactor
BE	Binary input
BF	Type of construction
CAN	Controller area network
CB	Communication board (option)
CU	Control unit
CUA	Control unit AFE (control unit of AFE)
DC	Direct current
DPR	Dual-port-RAM
DPRAM	Dual-port-RAM
EA	First run-up
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMF	Electromotive force
EPROM	Erasable programmable read-only memory
ESD	Electrostatic sensitive devices
F	Fault
FC	Frequency control (control version of SIMOVERT MASTER DRIVES)

FF	Fatal fault
FI	Fault current
FSW	Fixed setpoint
G/R	Basic/reserve
GSST(1/2)	Basic drive converter serial interface (1/2)
H	High (binary signal level)
HLG	Ramp-function generator
HTL	High-voltage transistor logic
HW	Hardware
I/O	Input/output
IGBT	Insulated gate bipolar transistor
IGD	IGBT gate drive
IVI	Inverter interface
KIP	Kinetic buffering
L	Low (binary signal level)
LBA	Local bus adapter (option)
LED	Light emitting diode
LSB	Least significant bit
MC	Main contactor
MDS	Motor data set
MLFB	Machine-readable product designation (machine-readable designation)
MSB	Most significant bit
NN	Sea level
OP(1)	Operation panel (1)
Par	Parameter
PC	Personal computer
PEU	Power electronic unit
PG	Programming unit (programmer)
PKW	Parameter ID value
PMU	Parameterization unit
PROFIBUS	Process field bus
PS	Power supply
PSU	Power supply unit
PWE	Parameter value
PZD	Process data
Q	Source
RC	Combination, resistor ® and capacitor (C)
RDS	Reserve data set

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

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12 Certificates

SIEMENS

Drive and Standard Products Group

Test certificate

Erlangen, 01.07.1995

Equipment	AC drive converter
• Type	SIMOVERT MASTER DRIVES
• Order No.:	6SE70... 1)

The routine testing according to these test instructions		475 100.9000.00 QP 476 100.9000.00 QP 476 200.9000.00 QP	for size A - D for size E - H for size J - M
Tests performed:	I. Product check	• checking of presence of all components acc. to parts list	
	II. Isolation test	• DIN VDE 0160 draft 04.91, par. 7.6.1 • CSA 22.2-14.M91, par. 6.8	
	III. Functional test acc. to DIN VDE 0558, part1	• power supply • customer terminals and interfaces • power conversion section • protective and monitoring functions	
	IV. RUN-IN	• Ambient temperature • Duration • Scampling	55 °C cycled 24 up to 72 hours 10 % to 100 %

The equipment complied with the test requirements.
Test results are documented within the production data file.

1) For complete type, serial number and technical data please see rating plate.

ASI 1 PE D F

Schlögel

ASI 1
System-Based
Drive Technology

SIEMENS

Drive and Standard Products Group

Confirmation

Erlangen, 01.07.1995

This confirms that

Equipment	AC drive converter
• Type	SIMOVERT MASTER DRIVES
• Order No.:	6SE70...

is manufactured in conformance with DIN VDE 0558 Part 2and DIN VDE 0113 Part 6.2.

This equipment fulfills the shock hazard protection requirements according to DIN VDE 0106 Part 100 when the following safety rules are observed:

- Service work in operation is only permissible at the electronics box
- The converter must be switched into a no-voltage condition and isolated from the supply when replacing any part/component
- All panels must be closed during operation.

Thus, this equipment conforms to the appropriate regulations in Germany according to VBG 4 §2 (2) (VBG is a German regulatory body for safety-related issues).

The local operating regulations (e.g. DIN VDE 0105) must be observed when operating the equipment.

ASI 1 PE D T

Dr. Link

ASI 1
System-Based
Drive Technology

SIEMENS

EEC Manufacturer's Declaration

(acc. to Article 4, Section 2 of the EEC Directive 89/392/EEC MSR)

4SE.476 000 0000.00 HE

Manufacturer:	Siemens Aktiengesellschaft
	Drives and Standard Products Group
	Business Division Drive systems
	Sub-Division Variable-speed drives
Address:	Postfach 3269
	D-91050 Erlangen
Product name:	SIMOVERT
	Type 6SE70 chassis units AC-AC and DC-AC

The designated product is exclusively designed for installation in another machine. Start-up is absolutely prohibited until it has been determined that the final product conforms with the Directive 89/392/EEC of the Council.

We confirm the conformance of the above designated product with the relevant Standards:

EN 60204-1 (DIN EN 60204 Part 1 / VDE 0113 Part 1)

VDE 0160

VDE 0558 Part 1

Erlangen, 10. 02. 1995

Siemens Aktiengesellschaft

i. V. ------------------------------------
H. Mickal

Head of the production unit
Variable-speed drives

i. V. ------------------------------------
G. Löw

Head of the commercial department
Variable-speed drives

This declaration does not guarantee specific equipment characteristics and features.

The safety instructions provided with the product documentation must be observed.

ASI 1 D /U 4100 4SE.476 000 0000.00 HE Page 1 of 1

SIEMENS

EC Declaration of Conformity

(acc. to Article 10 of the EEC Directive 73/23/EEC with all revisions NSR)

4SE.476 000 0000.00 KE NSR

Manufacturer:	Siemens Aktiengesellschaft Drives and Standard Products Group	
	Business Division	Variable-speed drives
	Sub-Division	Drive systems
Address:	Postfach 3269 D-91050 Erlangen	
Product name:	SIMOVERT Type 6SE70 chassis units AC-AC and DC-AC	

The designated product fulfills the regulations and rules of the following European Directives:

73/23/EEC Directive of the council for the harmonisation of the binding regulations of member states regarding electrical equipment for use within certain voltage limits, modified by RL 93/68/EEC of the Council.

We confirm the conformance of the above designated product with the relevant Standards:

EN 60204-1 Edition date 06/93

CE mark attached: 1996

Erlangen, 21.12.1995

Siemens Aktiengesellschaft

i. V.

H. Mickal
Head of the Drive System Production Unit

Dr. H. Preßl
Head of the commercial department

The LVD Appendix is part of this declaration.

This declaration does not guarantee specific equipment characteristics and features.

The information and instrucions in the product documentation must be observed.

ASI 1 D/U 4103 Page 1 of 1

SIEMENS

Factory certificate *

regarding electromagnetic compatability

4SE.476 000 0000.00 WB EMC

Manufacturer:	Siemens Aktiengesellschaft	
	Drives and Standard Products Group	
	Business Division	Variable-speed drives
	Sub-Division	Drive systems
Address:	Postfach 3269	
	D-91050 Erlangen	
Product name:	SIMOVERT	
	Type 6SE70 chassis units AC-AC and DC-AC	

When correctly used, the designated product fulfills all the requirements of Directive 89/336/EEC regarding electromagnetic compatibility.

We confirm the conformance of the above designated product with the relevant Standards:

EN 55011 (DIN VDE 0875 Part 11)

E DIN/IEC 22G /21/ CDV: 1995-10

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)

Note:

The instrucions relating to EMC-correct installation, correct operation, connecting-up conditions and associated instructions in the product documentation supplied must be observed.

Erlangen, 21. 12. 1995

i. V.

H. Mickal
Head of the Drive System Production Unit

This declaration does not guarantee specific equipment characteristics and features.

*) acc. to EN 10204 (DIN 50049)

ASI 1 D/U 4102x Page 1 of 1

The following versions have appeared so far:

Version	Internal Item number
AB	476 957.4100.76 J AB-76

Version AB consists of the following chapters

Chapters		Changes	Pages	Version date
0	General			12.96
1	Description	First Edition	4	08.96
2	Transport, Unpacking, Installation	First Edition	5	08.96
3	Connecting-up	First Edition	4	08.96
4	Operator control	First Edition	2	08.96
5	Maintenance	First Edition	5	08.96
6	Options	First Edition	13	08.96
7	Spare Parts	First Edition	4	08.96
8	Environmental friendliness	First Edition	1	08.96
9	Technical Data	First Edition	9	08.96
10	Appendix	First Edition	4	08.96
11	Adresses	First Edition	2	08.96
12	Certificates	Reviewed Edition	5	12.96

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Subject to change without notice

Order No.: 6SE7087-6BH70
Printed in the federal Republic of Germany
12.96

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SIMOVERT MASTERDRIVES

Operating Instructions
Part 1

Compact units (Types A - D) DC-AC

Edition: AD

Order No.: 6SE7087-6BD70

Overview of the MASTER DRIVES Operating Instructions:

Operating Instructions	consists of Part 1	Part 2
6SE708_-_AD10	6SE708_-_AD70	6SE708_-_XX10
6SE708_-_AD20	6SE708_-_AD70	6SE708_-_XX20
6SE708_-_AD30	6SE708_-_AD70	6SE708_-_XX30
6SE708_-_BD10	6SE708_-_BD70	6SE708_-_XX10
6SE708_-_BD20	6SE708_-_BD70	6SE708_-_XX20
6SE708_-_BD30	6SE708_-_BD70	6SE708_-_XX30
6SE708_-_AH10	6SE708_-_AH70	6SE708_-_XX10
6SE708_-_AH20	6SE708_-_AH70	6SE708_-_XX20
6SE708_-_AH30	6SE708_-_AH70	6SE708_-_XX30
6SE708_-_BH10	6SE708_-_BH70	6SE708_-_XX10
6SE708_-_BH20	6SE708_-_BH70	6SE708_-_XX20
6SE708_-_BH30	6SE708_-_BH70	6SE708_-_XX30
6SE708_-_BM20	6SE708_-_BM70	6SE708_-_XX20

You will receive Parts 1 and 2 of the Operating Instructions when you use this Order No. Parts 1 and 2 can be individually ordered by specifying the particular Order No.

_-_ stands for the language code, e.g. 0-0 for German Editions.

The following foreign language Editions of these Operating Instructions are available:

Language	German	French	Spanish	Italian
Language code	0-0	7-7	7-8	7-2

These Operating Instructions are valid for software release V1.3.

Contents

0 Definitions

- QUALIFIED PERSONAL

  For the purpose of these instructions and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

  1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
  2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
  3. Trained in rendering first aid.

- DANGER

  For the purpose of these instructions and product labels, "Danger" indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.

- WARNING

  For the purpose of these instructions and product labels, "Warning" indicates death, severe personal injury or property damage can result if proper precautions are not taken.

- CAUTION

  For the purpose of these instructions and product labels, "Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.

- NOTE

  For the purpose of these instructions, "Note" indicates information about the product or the respective part of the Instruction Manual which is essential to highlight.

NOTE
These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens sales office. The contents of this Instruction Manual shall not become part of or modify any prior or existing agreement, committment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

CAUTION

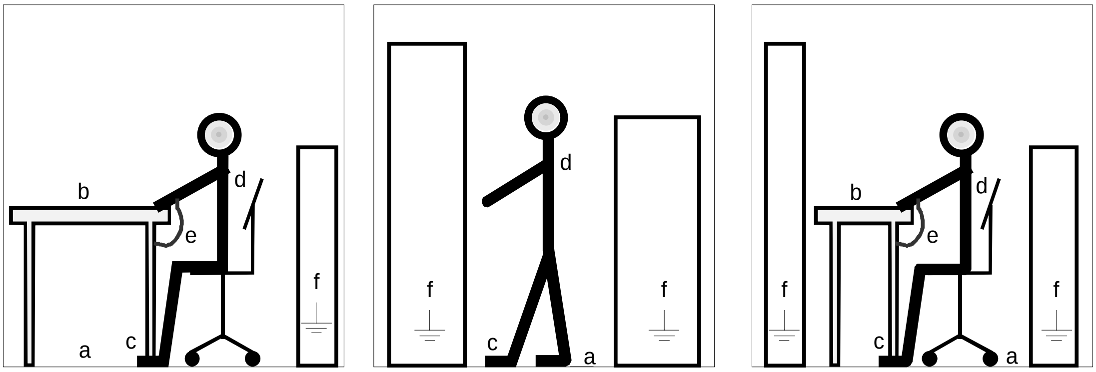
Components which can be destroyed by electrostatic discharge (ESD)

The converters contain components which can be destroyed by electrostatic discharge. These components can be easily destroyed if not carefully handled. If you have to handle electronic boards please observe the following:

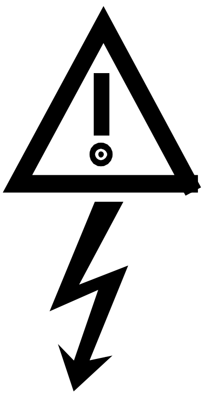
- Electronic boards should only be touched when absolutely necessary.
- The human body must be electrically discharged before touching an electronic board
- Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from man-made fibers
- Boards must only be placed on conductive surfaces
- When soldering, the soldering iron tip must be grounded
- Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes, metal containers)
- If the packing material is not conductive, the boards must be wrapped with a conductive packaging material, e.g. conductive foam rubber or household aluminum foil.

The necessary ECB protective measures are clearly shown in the following diagram:

a	=	Conductive floor surface	d	=	ESD overall
b	=	ESD table	e	=	ESD chain
c	=	ESD shoes	f	=	Cubicle ground connection



Sitting Standing Standing / Siting



WARNING

Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the safety instructions can result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

0.1 Safety and operating instructions for drive converters

Safety and operating instructions for drive converters

(in conformity with the low-voltage directive 73/23/EEC)

1. General

In operation, drive converters, depending on their degree of protection, may have live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces.

In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

For further information, see documentation.

All operations serving transport, installation and commissioning as well as maintenance are to be carried out **by skilled technical personnel** (Observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN/VDE 0110 and national accident prevention rules!).

For the purposes of these basic safety instructions, "skilled technical personnel" means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Intended use

Drive converters are components designed for inclusion in electrical installations or machinery.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 89/392/EEC (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the starting of normal opertion) is admissible only where conformity with the EMC directive (89/336/EEC) has been established.

The drive converters meet the requirements of the low-voltage directive 73/23/EEC. They are subject to the harmonized standards of the series prEN 50178/DIN VDE 0160 in conjunction with EN 60439-1/ VDE 0660, part 500, and EN 60146/ VDE 0558.

The technical data as well as information concerning the supply conditions shall be taken from the rating plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

The installation and cooling of the appliances shall be in accordance with the specifications in the pertinent documentation.

The drive converters shall be protected against excessive strains. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatic sensitive components which are liable to damage through improper use. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

When working on live drive converters, the applicable national accident prevention rules (e.g. VBG 4) must be complied with.

The electrical installation shall be carried out in accordance with the relevant requirements (e.g. cross-sectional areas of conductors, fusing, PE connection). For further information, see documentation.

Instructions for the installation in accordance with EMC requirements, like screening, earthing, location of filters and wiring, are contained in the drive converter documentation. They must always be complied with, also for drive converters bearing a CE marking. Observance of the limit values required by EMC law is the responsibility of the manufacturer of the installation or machine.

6. Operation

Installations which include drive converters shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. Act respecting technical equipment, accident prevention rules etc. Changes to the drive converters by means of the operating software are admissible.

After disconnection of the drive converter from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this respect, the corresponding signs and markings on the drive converter must be respected.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer’s documentation shall be followed.

Keep safety instructions in a safe place!

1 Description

SIMOVERT MASTER DRIVES are power electronic units. They are available as

♦	Compact units	with three-phase- or DC current input Output range:	 2.2 kW to 37 kW
♦	Chassis units	with three-phase- or DC current input Output range:	 45 kW to 200 kW
♦	Cabinet units	with three-phase- or DC current input Output range:	 250 kW to 1500 kW

There are three versions depending on the particular application

♦	Frequency control	FC	simple applications (e.g. pumps and fans)
♦	Vector control	VC	High demands on dynamic performance and accuracy
♦	Servo Control	SC	Servodrives

1.1 Applications

Drive converter with DC current input

DC drive converters generate a variable-frequency three-phase system at the motor side from a DC supply. This variable-frequency three-phase system is used to continuously control the speed of three-phase motors.:

SIMOVERT MASTER DRIVES can be used with a common DC link, as well as for single-motor and multi-motor drives.

Technological functions and expansions can be realized via defined interfaces in the open-loop control section.

1.2 Mode of operation

Converters with DC current input are suitable for coupling several converters to a common DC link bus. This permits energy transfer between drives in the motoring and generating modes which in turn means energy savings.

The DC converter must be connected to the DC bus through an E unit (rectifier unit) due to the pre-charging of the DC link capacitors. If an I/R unit (rectifier and regenerative feedback unit) is used instead of the E unit, power is fed back into the supply if the regenerative output for several drives is greater than the motor power required.

The converter is ready for operation after the DC link capacitors have been pre-charged.

The inverter, configured using IGBT modules, generates a three-phase system from the DC link voltage to feed the motor.

SIMOVERT FC

The inverter open-loop control uses a microprocessor with an adjustable V/f characteristic. The pulse frequency is preset to 3 kHz when the unit is shipped.

SIMOVERT FC is suitable for single-motor and multi-motor drives with:

- ♦ Induction motors
- ♦ Synchronous motors (SM)
- ♦ Reluctance motors

Some of the applications are, for example:

- ♦ Pump drives
- ♦ Fan drives
- ♦ Textile machines

The following can be set for the V/f characteristic:

- ♦ Max. frequency 300 Hz
- ♦ Operation with or without slip compensation
- ♦ Operation with or without higher-level speed controller

SIMOVERT VC

The inverter open-loop control uses a microprocessor and field-oriented vector control with an extremely fast closed-loop current control. The drive can be precisely adapted to the demanded load torque as a result of the field-oriented control, which in turn means that the drive has an extremely high dynamic performance.The pulse frequency is preset to 2.5 kHz when the unit is shipped.

SIMOVERT VC is suitable for:

- Induction motors in both single-motor or multi-motor drives.
  For multi-motor drives, the motors within the group must be the same.

Some of the applications are, for example:

- Winder drives
- Rolling mill drives.

When the drive is shipped, closed-loop V/f control is preset. Closed-loop frequency control with field-oriented vector control must be parameterized.

The converter can be set, as a result of the precise motor simulation up to a maximum frequency of 300 Hz, with and without stall protection and with and without tachometer feedback.

SIMOVERT SC

The inverter open-loop control uses a microprocessor with field-oriented vector control, with a very fast secondary closed-loop current control. High drive dynamic performance is achieved as a result of the field oriented vector control. When the unit is shipped, the pulse frequency is preset to 5 kHz.

It can be set in the range from 5 kHz to 7.5 kHz.

SIMOVERT SC is suitable for:

- Single-motor drives with permanent-field 1FT6 motors

Some of the applications are, for example

- Winder drives,
- Foil machines,
- Packaging machines

After power-up, only the motor must be selected and the drive can then be enabled. The drive can be matched to the load moment of inertia and optimized by changing a closed-loop control parameter.

The converter operates with motor identification (MOTID). The maximum stator frequency is 400 Hz.
The following operating modes can be selected:

- Closed-loop speed control
- Closed-loop torque control

The following encoders can be used:

- ERN 1387 encoders
- Encoders which are compatible to ERN 1387
- Resolvers

1.3 Operator control- and open-loop control possibilities

The unit can be controlled via

- the parameterization unit (PMU)
- an optional operator control panel (OP1)
- terminal strip
- a serial interface.

When networked with automation systems, the unit open-loop control is realized via optional interfaces and technology boards.

1.4 Block diagram

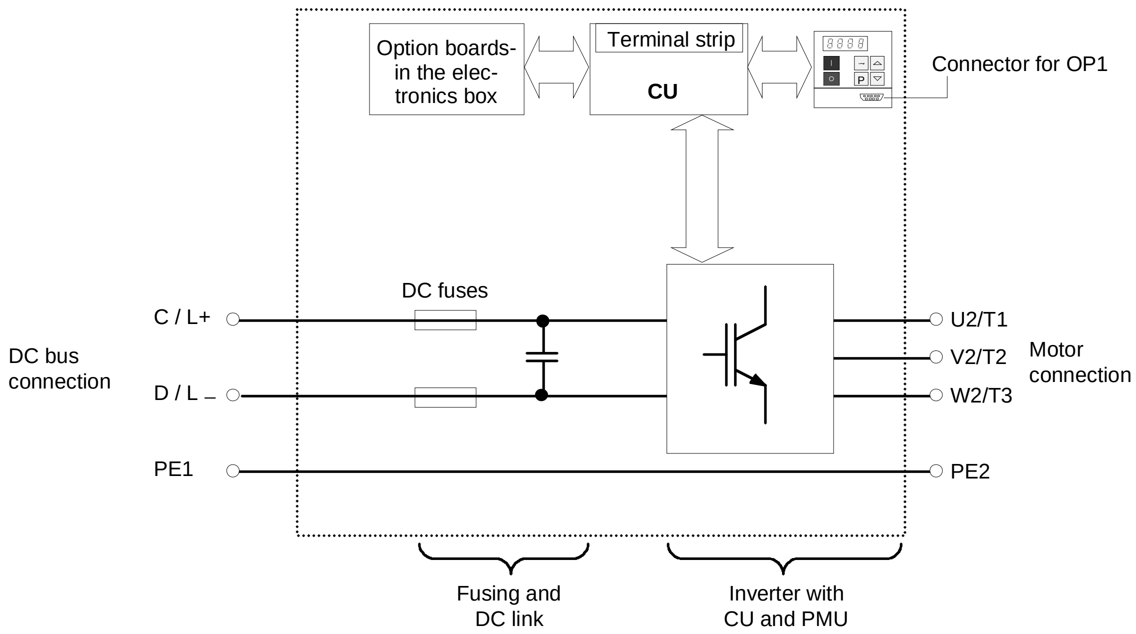


Fig. 1.1 Block diagram

2 Transport, Unpacking, Installation

2.1 Transport and unpacking

The units are packed in the manufacturing plant corresponding to that specified when ordered. A product packing label is located on the outside of the packing.

Please observe the instructions on the packaging for transport, storage and professional handling.

Vibration and jolts must be avoided during transport, e.g. when setting the unit down.

The converter can be installed after it has been unpacked and checked to ensure that everything is complete and that the converter is not damaged.

If the converter is damaged you must inform your shipping company immediately.

The packaging comprises board and corrugated paper. It can be disposed of corresponding to the appropriate local regulations for the disposal of board products.

2.2 Storage

The converters must be stored in clean dry rooms.Temperatures between – 25 °C (–13 °F) and + 70 °C (158 °F) are permissible. Temperature fluctuations > 20 K per hour are not permissible.

WARNING

The equipment should not be stored for longer than one year. If it is stored for longer periods of time, the converter DC link capacitors must be formed at start-up.

Capacitor forming is described in Part 2 of the Operating Instructions.

2.3 Mounting

The following are required for mounting:

- G busbar according to EN50035 with screws for mounting
- One M6 screw for types of construction A to C; two M6 screws for type of construction D
- Dimension drawing (Fig. 2.2 for types of construction A, B and C, Fig. 2.3 for type of construction D).

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE) must be observed as well as the professional handling of tools and the use of personnal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

The unit must be protected against the ingress of foreign bodies as otherwise the function as well as the operational safety cannot be guaranteed.

Requirements at the point of installation:

The local guidelines and regulations must be observed when mounting and installing the equipment.

The unit is mounted corresponding to the dimension drawings in Section 2.4.

Equipment rooms must be dry and dust-free.Ambient and cooling air must not contain any electrically conductive gases, vapors and dusts which could diminish the functionality. Dust-laden air must be filtered.

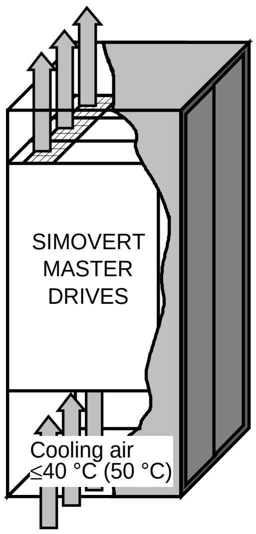


Fig. 2.1 Mounting the converters in cabinets

WARNING

When mounting in cabinets, a clearance of above and below must be provided so that the cooling air flow is not restricted (refer to dimension drawings, Section 2.4).

Dimension the cabinet cooling in line with the power loss!
(☞ Section „Technical data“)

The converter ambient climate in operating rooms may not exceed the values of code F according to DIN 40040. For temperatures > 40 °C (104 °F) and installation altitudes > 1000 m, de-rating is required (☞ Section „Technical data“).

2.4 Dimension drawings

	a	b	c	d	e
Bauform/Type A	425	48.5	45	90	38.5
Bauform/Type B	425	47	67.5	135	37
Bauform/Type C	600	70	90	180	70

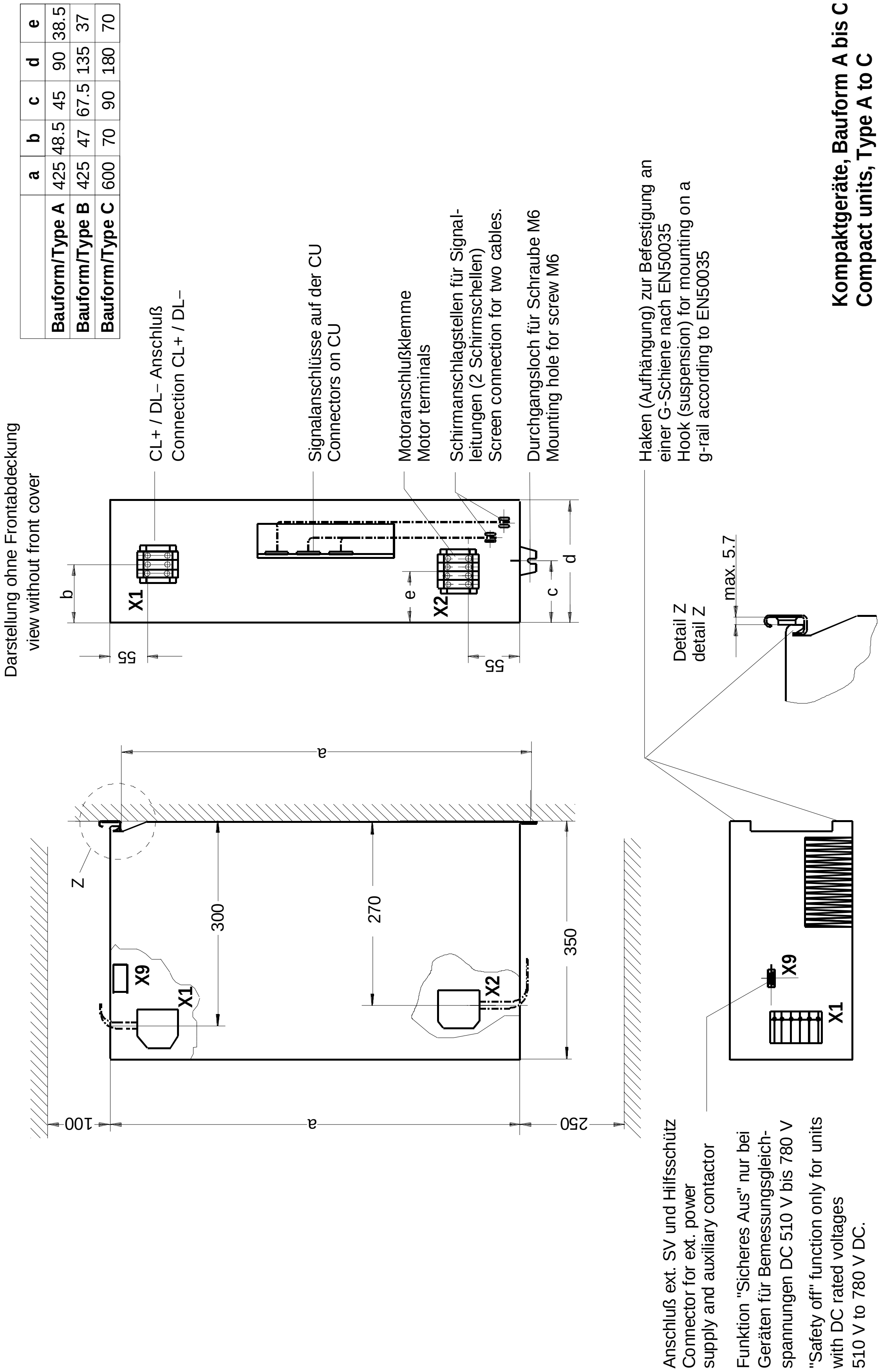
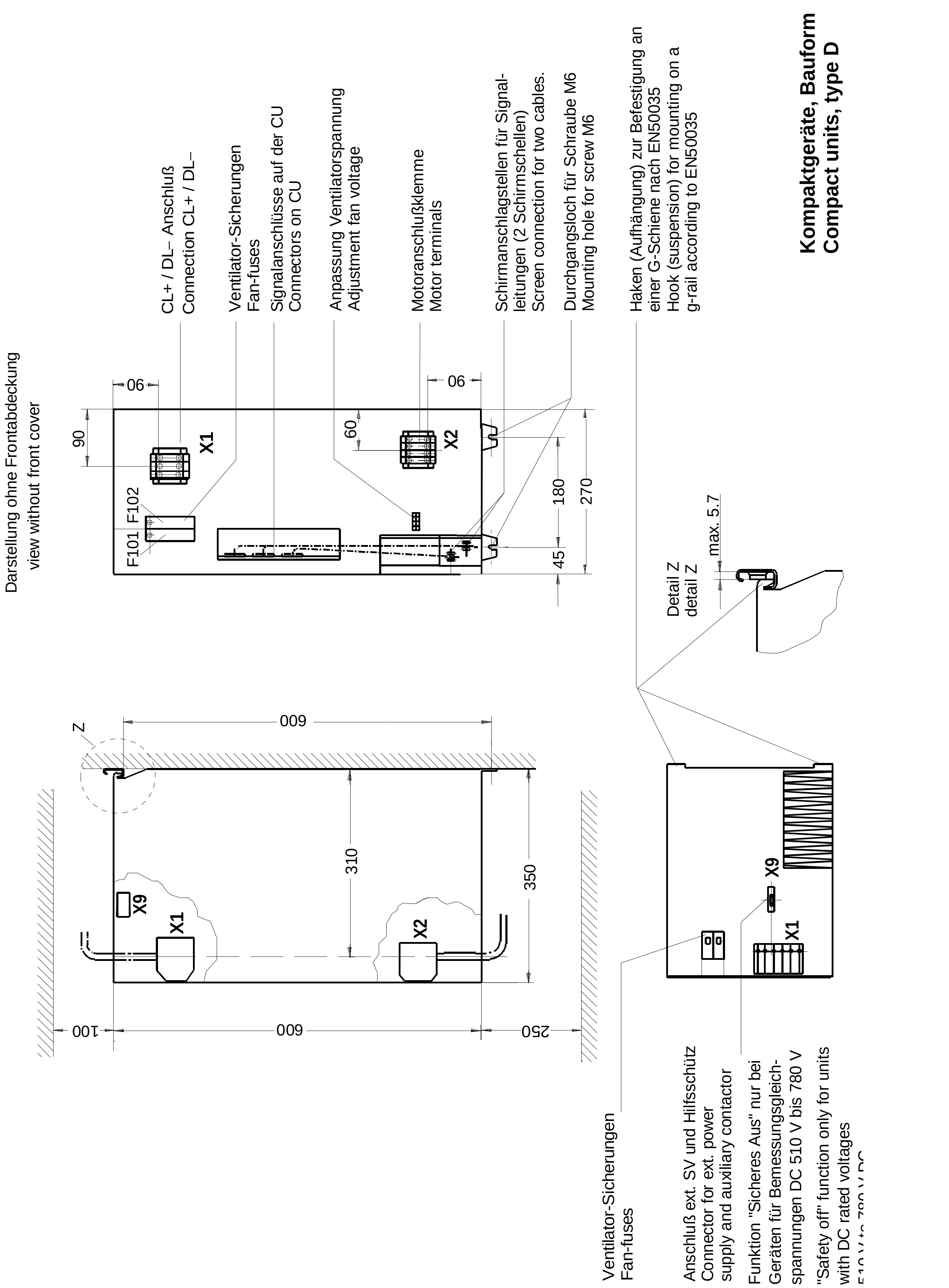


Fig. 2.2 Types A, B and C



Kompaktgeräte, Bauform
Compact units, type D
Darstellung ohne Frontabdeckung
view without front cover
CL+ / DL– Anschluß
Connection CL+ / DL–
Ventilator-Sicherungen
Fan-fuses
Signalanschlüsse auf der CU
Connectors on CU
Anpassung Ventilatorspannung
Adjustment fan voltage
Motoranschlußklemme
Motor terminals
Schirmanschlagstellen für Signal-
leitungen (2 Schirmschellen)
Screen connection for two cables.
Durchgangsloch für Schraube M6
Mounting hole for screw M6
Haken (Aufhängung) zur Befestigung an
einer G-Schiene nach EN50035
Hook (suspension) for mounting on a
g-rail according to EN50035
F101
F102
X1
X2
X9
90
90
90
60
180
270
45
max. 5.7
Detail Z
detail Z
Z
600
310
350
100
600
250
Ventilator-Sicherungen
Fan-fuses
Anschluß ext. SV und Hilfsschütz
Connector for ext. power
supply and auxiliary contactor
Funktion "Sicheres Aus" nur bei
Geräten für Bemessungsgleich-
spannungen DC 510 V bis 780 V
"Safety off" function only for units
with DC rated voltages

Fig. 2.3 Type D

3 Connecting-up

WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out!

Only professionally trained, qualified personnel must work on or with the unit.

Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.

Extreme caution should be taken when working-on the unit when it is open, as external power supplies may be connected. The power terminals and control terminals can still be at hazardous potentials even when the motor is stationary.

Hazardous voltages are still present in the unit up to 5 minutes after it has been powered-down due to the DC link capacitors. Thus, the appropriate delay time must be observed before opening-up the unit.

Forming the DC link capacitors:

The storage time should not exceed one year. The converter DC link capacitors must be formed at start-up if the unit has been stored for a longer period of time.

Forming is described in the Instruction Manual, Part 2.

When the DC link is supplied from a central unit, it must be ensured that the converter is reliably isolated from the DC link voltage!

The user is responsible, that the motor, converter and any other associated devices or units are installed and connected-up according to all of the recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be especially observed.

INFORMATION

- Cabling/wiring: Connecting cables should be dimensioned according to the local regulations and according to section „Power connections“. The insulation should be suitable for 75°C.

3.1 Power connections

	WARNING
	♦ By interchanging the input terminals, the converter or the rectifier will be destroyed! ♦ The drive converter or rectifier unit could be destroyed if the input terminals are interchanged! ♦ The coils of contacts and relays which are connected to the same supply as the converter or are located in the vicinity of the converter, must be provided with overvoltage limiters, e.g. RC elements.

The position of the connecting terminals can be seen in the dimension drawings (☞ Section 2.4).

DC connection:	C/L+	D/L–	
Motor connection:	U2/T1	V2/T2	W2/T3
Protective conductor connection:	PE1 ⏚	PE2 ⏚	

The cross-sections listed in Table 3.2 are defined by the terminal size.

NOTE
For type of construction D, an external 230 V AC auxiliary voltage must be connected at F101 and F102. This auxiliary voltage is required for the unit fan.

NOTE FC and VC
Depending on the motor insulation strength and the length of the motor feeder cable, it may be necessary to install one of the following options between the motor and the converter: ♦ Output reactor ♦ dv/dt-filter only for FC and VC, not permissible for SC ♦ Sinusoidal filter only for FC and VC, not permissible for SC Information regarding selection and dimensioning is provided in Section „Options“.

Order No.	Supply side					Internal DC fuse			Motor side			
	Rated DC Curr.	Cross-section		Recommended fuse					Rated output		Cross-section	
									Voltage	Curr.		
	(A)	VDE (mm^2)	AWG1)	(A)	Type	Type	(V)	(A)	(V)	(A)	VDE (mm^2)	AWG
6SE70					3NE	FWP						
	Rated DC Voltage 280 V to 310 V											
21-1RA_0	12,6	1,5	16	25	8 015	–			0 to 230	10,6	1,5	16
21-3RA_0	15,8	2,5	14	35	8 003	–			0 to 230	13,3	1,5	16
21-8RB_0	21,1	4	10	50	8 017	–			0 to 230	17,7	2,5	14
22-3RB_0	27,3	6	8	80	8 020	–			0 to 230	22,9	4	10
23-2RB_0	38,3	10	6	100	8 021	–			0 to 230	32,2	10	6
24-4RC_0	52,6	16	4	125	8 022	–			0 to 230	44,2	16	4
25-4RD_0	64,3	35	2	160	8 024	–			0 to 230	54,0	25	2
27-0RD_0	82,1	35	2	160	8 024	–			0 to 230	69	25	2
28-1RD_0	96,4	50	0	160	4 124	–			0 to 230	81	35	0
	Rated DC Voltage 510 V to 620 V											
16-1TA_1	7,3	1,5	16	25	8 015	25A14F	700	25	0 to 460	6,1	1,5	16
18-0TA_1	9,5	1,5	16	25	8 015	50A14F	700	50	0 to 460	8,0	1,5	16
21-0TA_1	12,1	1,5	16	25	8 015	50A14F	700	50	0 to 460	10,2	1,5	16
21-3TB_1	15,7	4	10	50	8 017	50A22F	700	50	0 to 460	13,2	2,5	14
21-8TB_1	20,8	4	10	50	8 017	50A22F	700	50	0 to 460	17,5	2,5	14
22-6TC_1	30,4	10	6	80	8 020	100A22F	700	100	0 to 460	25,5	6	8
23-4TC_1	40,5	10	6	80	8 020	100A22F	700	100	0 to 460	34	10	6
23-8TD_1	44,6	16	4	125	8 022	100A22F	700	100	0 to 460	37,5	16	4
24-7TD_1	55,9	25	2	125	8 022	100A22F	700	100	0 to 460	47	16	4
26-0TD_1	70,2	35	0	160	8 024	80A22F	700	2x80	0 to 460	59	25	2
27-2TD_1	85,7	35	0	160	8 024	80A22F	700	2x80	0 to 460	72	25	2
	Rated DC Voltage 675 V to 780 V (only for SC and VC)											
14-5UB_1	5,4	1,5	16	32	4 101	50A22F	700	50	0 to 575	4,5	1,5	16
16-2UB_1	7,4	1,5	16	32	4 101	50A22F	700	50	0 to 575	6,2	1,5	16
17-8UB_1	9,3	2,5	14	32	4 101	50A22F	700	50	0 to 575	7,8	1,5	16
21-1UB_1	13,0	4	10	32	4 101	50A22F	700	50	0 to 575	11	1,5	16
21-5UB_1	18,0	4	10	32	4 101	50A22F	700	50	0 to 575	15,1	1,5	16
22-2UC_1	26,2	6	8	50	4 117	50A22F	700	50	0 to 575	22	4	10
23-0UD_1	34,5	16	4	80	4 120	100A22F	700	100	0 to 575	29	10	6
23-4UD_1	40,5	16	4	80	4 120	100A22F	700	100	0 to 575	34	10	6
24-7UD_1	55,4	25	2	100	4 121	100A22F	700	100	0 to 575	46,5	16	4

INFORMATION AND EXPLANATIONS

The cross-sections are determined for copper cables at 40 °C (104 °F) ambient temperature (in accordance with DIN VDE 0298 Part 4 / 02.88 Group 5).

For rated DC voltages 510 V to 780 V DC, fuses on the incoming supply side are not required as the unit has integrated DC fuses; this assumes that the connecting cables to the DC bus are routed so that they are short-circuit proof and the cable cannot be overloaded by other loads.

1) American Wire Gauge

Table 3.1 Power connections acc. to DIN VDE

Type	Order No.	Possible connection cross-section for power terminals			
		Finely stranded		Multi-stranded/solid	
		(mm2)	AWG	(mm2)	AWG
A	6SE702_-_ _ A_ _	1.5 to 10	12 to 6	2.5 to 16	12 to 4
B	6SE702_-_ _ B_ _	1.5 to 10	12 to 6	2.5 to 16	12 to 4
C	6SE702_-_ _ C_ _	4 to 16	10 to 4	10 to 25	6 to 2
D	6SE702_-_ _ D_ _	10 to 35	6 to 2	10 to 50	6 to 0

Table 3.2 Possible connection cross-sections

3.1.1 Protective conductor connection

The protective conductor should be connected-up on both the supply- and motor sides. It should be dimensioned according to the power connections. Due to discharge currents from the noise suppression capacitors, according to VDE 0160, a minimum cross-section of 10 mm^2 is required, or a second protective conductor with the same cross-section must be routed in parallel (for cross-sections < 10 mm^2).

3.2 Auxiliary power supply / main contactor or bypass contactor / „Safety off“

3.2.1 Drive converters for rated DC voltages 280 V to 310 V DC

The auxiliary power supply and the main- or bypass contactor are connected through the 5-pin connector X9.

Connector X9 is supplied together with the connectors for the control terminal strip. Cables with cross-sections from 0.2 mm^2 to 2.5 mm^2 (AWG: 24 to 14) can be connected at X9.

The auxiliary power supply is required if the drive converter is fed through a main- and bypass contactor.

The main- or monitoring contactor is controlled through floating contacts -X9.4 and -X9.5 (software pre-setting).

More detailed information is provided in the Section „options“.

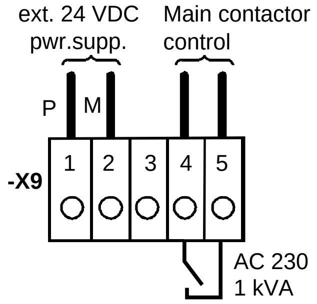


Fig. 3.1 Connecting an external auxiliary 24 V DC power supply and main contactor control

Term.	Function description
1	24 V DC external ≥ 2.1 A (max. 4 A dependent on the options)
2	Reference potential to DC
3	Unassigned
4	Main contactor control
5	Main contactor control

Table 3.3 Connector assignment for -X9

NOTE
The main contactor coil must be provided with overvoltage limiters, e.g. RC element.

3.2.2 Drive converters for rated DC voltages 510 V to 780 V DC

The auxiliary power supply and the main- and bypass contactor as well as the "safety off" function are connected via the nine-pin connector X9.

Connector X9 is supplied together with the connectors for the control terminal strip. Cables with cross-sections from 0.14 mm^2 to 1.5 mm^2 (AWG: 26 to 16) and 1 mm^2 (AWG: 18), finely-stranded with connector sleeves, can be connected at X9.

The auxiliary power supply is required if the drive converter is fed through a main- and bypass contactor.

The main- or monitoring contactor is controlled through floating contacts -X9.7 and -X9.9 (software pre-setting).

The "safety off" function guarantees that a rotating field cannot occur at the motor terminals, i.e. the motor cannot rotate. The "safety off" function is activated by opening the external contact S1 (Fig. 3.2). The drive converter is supplied with terminals X9.5 and X9.6 jumpered.

More detailed information is provided in the Section „options“.

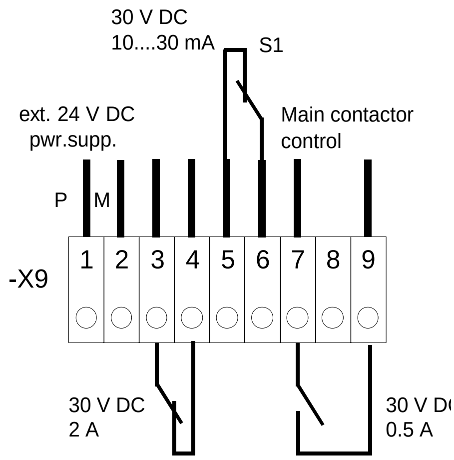


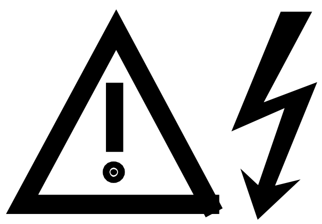
Fig. 3.2 Connecting an external auxiliary 24 V DC power supply, main contactor control and safety off

Term.	Function description
1	24 V DC external ≥ 2.1 A (max. 4 A dependent on the options)
2	Reference potential to DC
3 / 4	Checkback signal for "safety off"
5 / 6	"Safety off" active with switch S1 open
7	Main contactor control
8	Unassigned
9	Main contactor control

Table 3.4 Connector assignment for -X9

NOTE

The main contactor coil must be provided with overvoltage limiters, e.g. RC element.



WARNING

- The power terminals can still be live (under voltage), even if the "safety off" function is active!
- The relay on PEU -X9:7,9 is, for DC-AC units, only suitable for switching voltages up to 30 V!

3.3 Instructions for EMC-correct installation

EMC (**E**lectro**m**agnetic **C**ompatibility) involves the noise emission and noise immunity of electrical equipment.

Optional radio interference suppression filters are available to limit the **noise emission**.

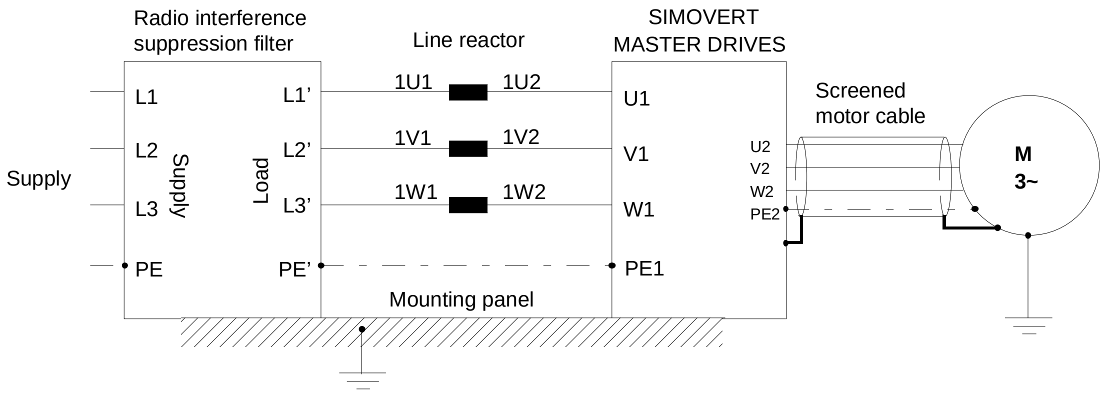


Fig. 3.3 Location of the components

The radio interference suppression filter and drive converter must be connected through a large surface area. The most favorable method is to mount all of the components on a bare metal mounting panel (e.g. galvanized steel). A line reactor must be connected between the radio interference suppression filter and the drive converter.

The cabling should be kept as short as possible. The line feeder cable to the radio interference suppression filter should be routed separately away from other cables.

The motor must be connected using a screened cable, e.g. Siemens PROTOFLEX-EMV-CY (cross-section up to 120 mm^2) or Siemens PROTODUR NYCW (cross-section > 120 mm^2). The screen must be connected to the motor- and drive converter housing through the largest possible surface area to keep inductances as low as possible.

Use screened control cables to increase the **noise immunity**. Connect the screens of the control cables to the mounting positions provided. Screen clamps are provided with every SIMOVERT MASTER DRIVES to connect the screens of the control cables (☞ Fig. 3.4.1). Otherwise, cable ties can be used to connect the screen (☞ Fig. 3.4.2).

- Do not interrupt the screens, e.g. when installing intermediate terminals.
- Control cables and power cables (= line feeder cable, motor cable) must be routed separately away from one another.

You will find more detailed information in the brochure (Installation instructions for EMC correct design of drives"
(Order No.: 6SE7087-6CX87-8CE0).

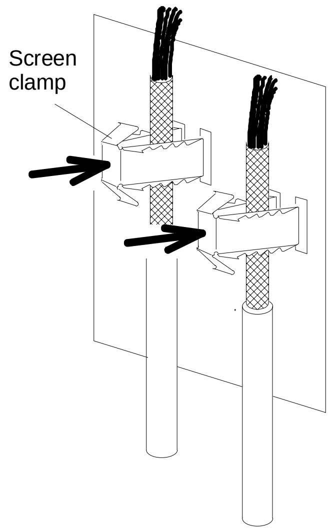


Fig. 3.4.1

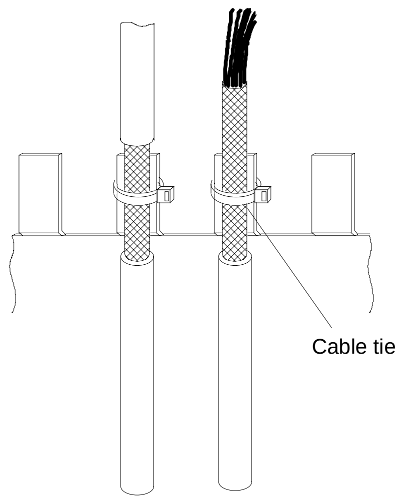


Fig. 3.4.2

Fig. 3.4 Connecting the screens of signal cables for SIMOVERT MASTER DRIVES

4 Operator control

The converter can be controlled via:

- the PMU (Parameterization Unit)
- the control terminal strip on the CU (☞ section “Control terminal strip“ in the Operating Instructions, Part 2)
- the OP1 operator control panel (☞ section “Options“)
- the RS485 and RS232 serial interface on PMU-X300

Operator control using the PMU is described in this section.

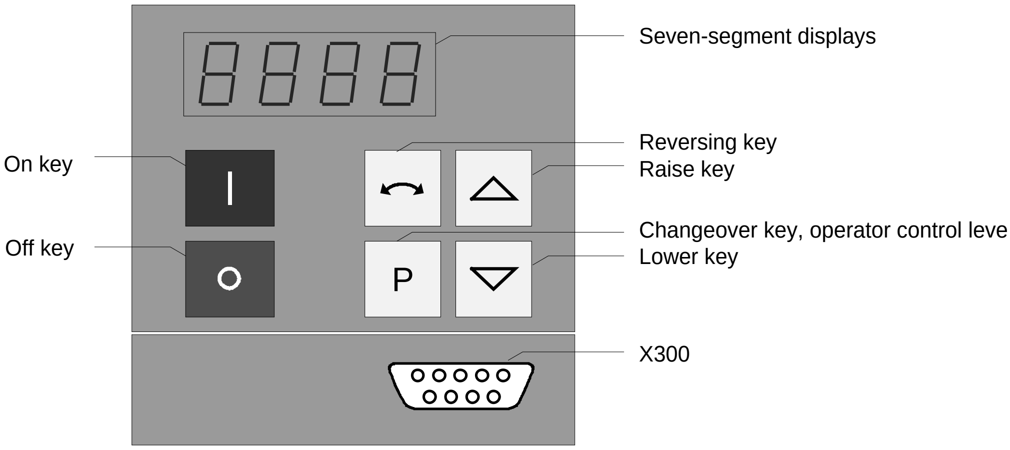


Fig. 4.1 Parameterization unit

4.1 Operator control elements

Operator control elements	Function
I	Converter switch on (standard). For faults: Return to the fault display. Command is effective when the key is released.
O	Converter shutdown depending on the parameterization of OFF 1, OFF 2 or OFF 3 (P554 to P560). Command becomes effective when the key is released.
↷	Field reversal / reversing for the appropriate parameterization. Command becomes effective when the key is released.
P	Changeover from parameter number to parameter value. In conjunction with other keys, additional functions (see Operating Instructions, Part 2). Command becomes effective when the key is released.
△, ▽	Values (raise, lower) change as long as the keys are depressed.
P + △ resp. P + ▽	Depress P and hold, then depress the second key. The command becomes effective when the key is released (e.g. fast changeover).

Table 4.1 Function of the operator control elements on the PMU

4.2 Displays 8.8.8.8.

		Parameter number		Index	Parameter value
		Pos. Actual value e.g	Neg. actual value e.g	e.g..	e.g.
Visualization parameters	Basic converter	r000	r.000	---	°009
	Technology board	d000	d.000		
Setting parameters	Basic converter	P005	P.005	i000	-2.08
	Technology board	H002	H.002		

Table 4.2 Displaying visualization- and setting parameters on the PMU

	Actual value	Parameter value not possible	Alarm	Fault
Display	-2.08	---- ----	A022	F006

Table 4.3 Status display on the PMU

NOTE
The parameter description is provided in the Operating Instructions, Part 2.

5 Maintenance

WARNING

SIMOVERT MASTER DRIVES are operated at high voltages.

All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VBG4 in Germany).

Maintenance and service work may only be executed by qualified personnel.

Only spare parts authorized by the manufacturer may be used.

The specified maintenance intervals and also the instructions for repair and replacement must be adhered to.

The drive units have hazardous voltage levels up to 5 min after the converter has been powered-down due to the DC link capacitors so that the unit must only be opened after an appropriate delay time.

The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.

If it is absolutely necessary that the drive converter must be worked on when powered-up:

- never touch any live components.
- only use the appropriate measuring and test equipment and protective clothing.
- always stand on an ungrounded, isolated and ESD-compatible pad.

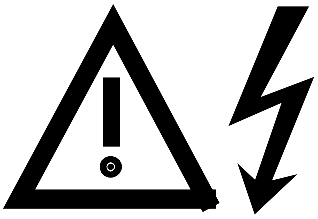
If these warnings are not observed this can result in death, severe bodily injury or significant material damage.

Always have your MASTER DRIVE converter Order No. and serial No. available when contacting the service department. These numbers and other important data are located on the drive converter rating plate.

5.1 Maintenance requirements

The fans are designed for a service life of 35000 hours at an ambient temperature of T_U = 40 °C. They must be replaced before their service life expires so that the drive converter availability is guaranteed.

5.2 Replacing components

	WARNING
	The fan may only replaced by qualified personnel. The drive converters are still at hazardous voltage levels up to 5 min. after the unit has been powered-down as a result of the DC link capacitors. If these warnings are not observed, death, severe bodily injury or considerable material damage could occur.

5.2.1 Replacing the fan

Housing sizes A to C

The fan is located under the converter

- Remove the M4 x 49 Torx screws
- Remove the fan towards the bottom and withdraw connector X20
- Install the new fan in the inverse sequence
- Before commissioning the drive check that the fan can run freely and the air flow direction (arrow towards the top). The air must be blown upwards out of the unit.

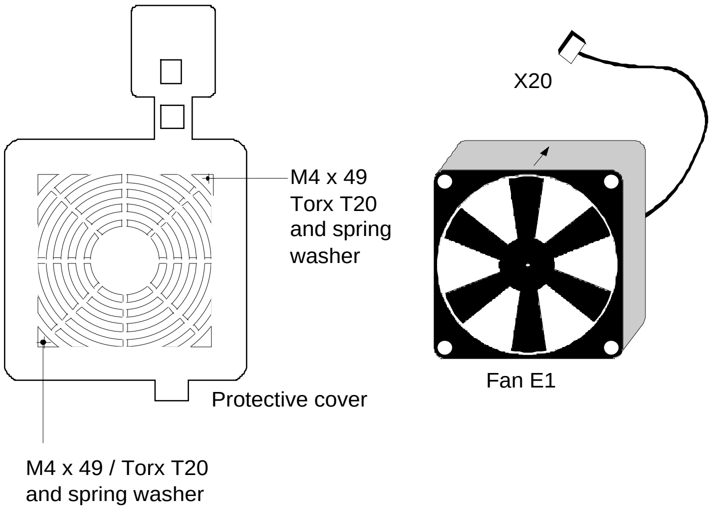


Fig. 5.1 Fan (24 V) and protective cover for housing sizes A to C

Size D

The fan is screwed to a bracket which is located in the lower section of the drive converter.

- Withdraw connector X20
- Remove both M5 x 16 Torx screws on the lower part of the converter
  (They are captive, and connected to the console)
- Withdraw the fan with bracket out of the unit from the bottom
- Release fan screws M4 (observe the cable routing!)
- Install the new fan in the inverse sequence (the fan is already mounted on the bracket).
- Before commissioning the drive, check that the fan can rotate freely.

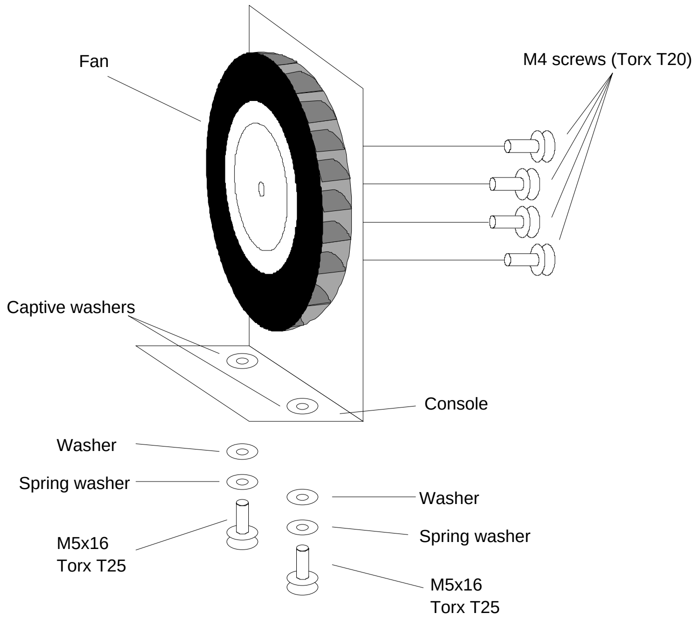


Fig. 5.2 Fan (230 V) with bracket for housing size D

5.2.2 Replacing the fuses (size D)

The fuses are located in the upper section of the converter in a fuse holder. The fuse holder must be opened to remove the fuses.

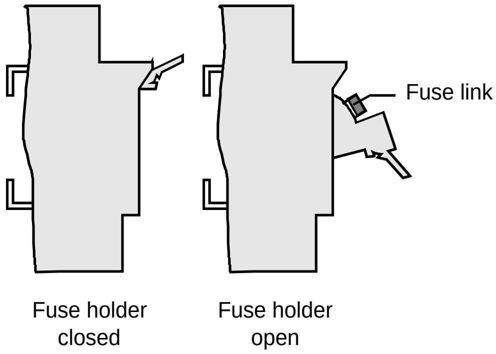
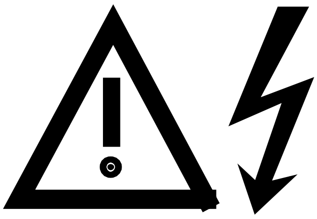


Fig. 5.3 Fuse holder (size D)

5.2.3 Replacing boards

	WARNING
	The boards may only be replaced by qualified personnel. It is not permissible that the boards are withdrawn or inserted under voltage. Death, severe bodily injury or significant materal damage might result if these instructions are not observed.

	CAUTION
	Boards contain components which could be damaged by electrostatic discharge. The human body must be discharged immediately before an electronics board is touched. This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cubicle components).

5.2.3.1 Replacing boards in the electronics box

- ♦ Loosen the board retaining screws above and below the handles for inserting/withdrawing the boards
- ♦ Carefully remove the board using these handles making sure that the board doesn't catch on anything
- ♦ Carefully locate the new board on the guide rails and insert it completely into the electronics box
- ♦ Tighten the retaining screws above and below the handles.

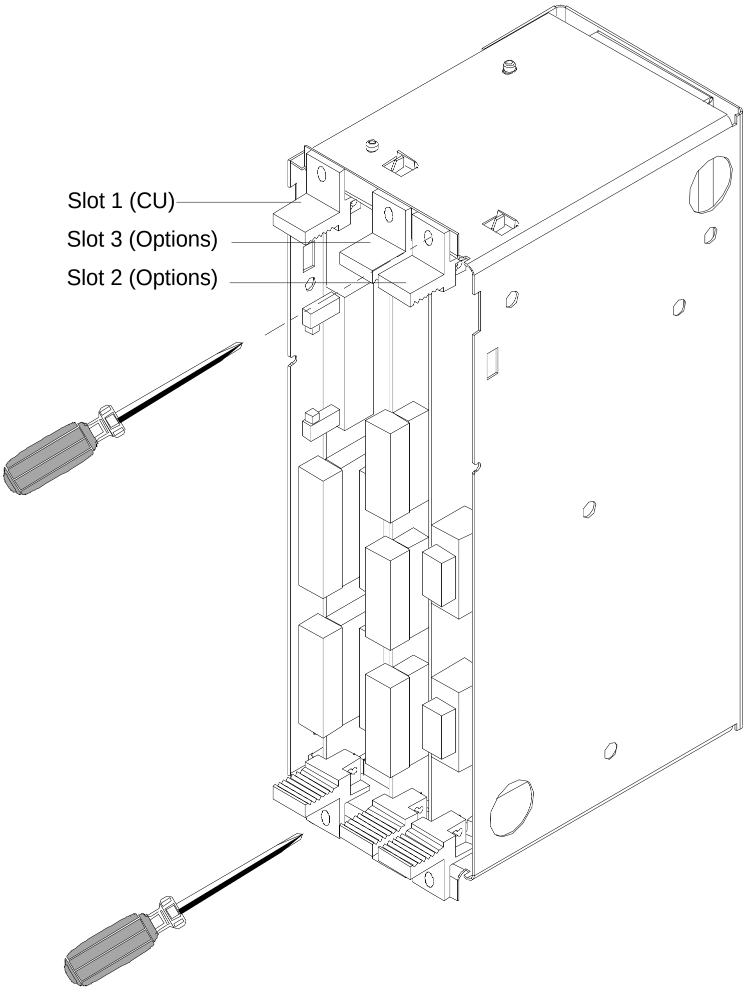


Fig. 5.4 Electronics box equipped with CU (slot 1) and options (slot 2 (right) and 3 (middle))

5.2.3.2 Replacing the PMU (Parameterization Unit)

- ♦ Release the snaps on the front cover
- ♦ Open-up the front cover
- ♦ Withdraw connector X108 on the CU (Control Unit)
- ♦ Remove the ribbon cable from the guide hooks
- ♦ Carefully depress the latch upwards on the inner side of the front cover using a screwdriver
- ♦ Remove the PMU board
- ♦ Install the new PMU board in the inverse sequence.

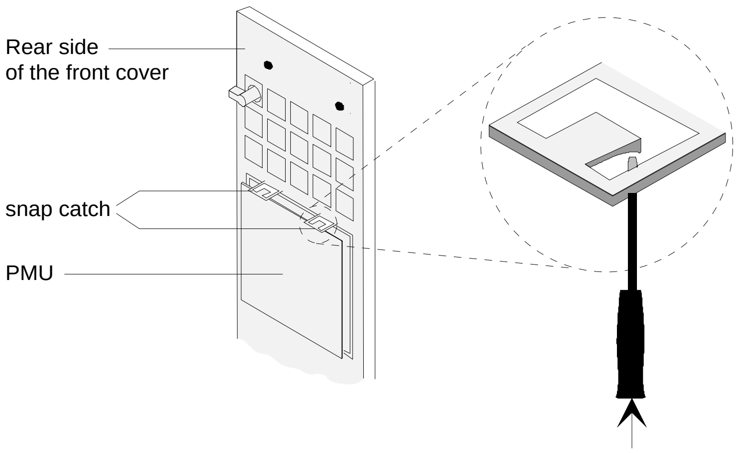


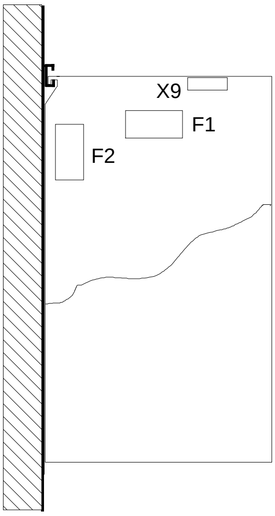
Fig. 5.5 Rear side of the front cover with PMU board

5.2.4 Replacing the DC fuses

Types A and B

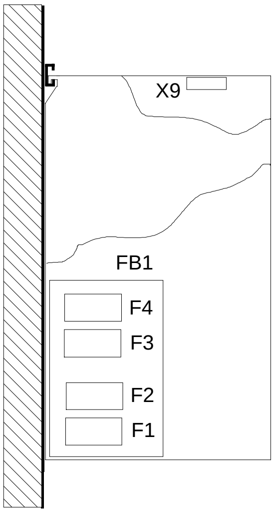
For types A and B, the DC fuses are not accessible. They may only be replaced by service personnel.

Type C



- Remove the side panel
- Replace fuses F1 and F2

Type D



- Remove the side panel
- Replace fuses F1 to F4 on FB1 (fuse board)

6 Options

6.1 Options which can be integrated into the electronics box

One or two option boards, listed in Table 6.1, can be inserted in the electronics box using the LBA option (local bus adapter).

Before installing option boards in the electronics box, the LBA (local Bus Adapter) has to be inserted.

Install the LBA bus expansion:

- Remove the CU (lefthand slot in the electronics box) using the handles after first removing the connecting cable to the PMU and both retaining screws.
- Insert the LBA bus expansion in the electronics box (position, refer to the diagram) so that it snaps into place.
- Re-insert the CU into the lefthand slot, screw the retaining screws on the handles tight, and insert the connecting cable to the PMU.
- Insert the option board in slot 2 (right) or slot 3 (center) of the electronics box, and screw into place. Each option board may only by inserted in the electronics box. If only one option is used, it must always be inserted at slot 2 (right).

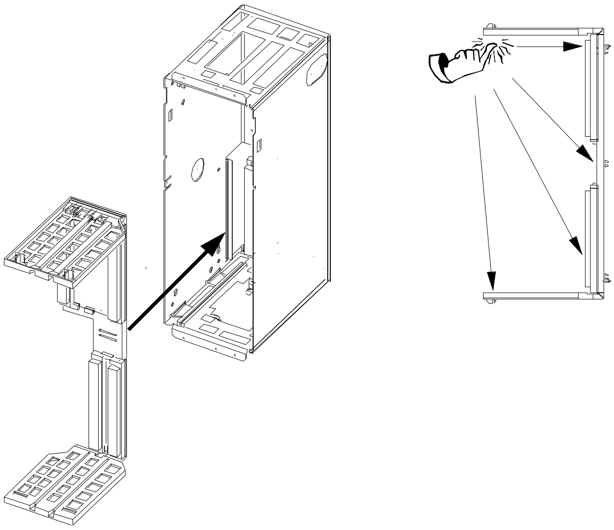


Fig. 6.1 Installing the Local Bus Adapter

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTES

- Only one of each option board type may inserted in the electronics box.
- TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.
- If only one option board is used it must always be inserted at slot 2.

Table 6.1 Possible arrangements of boards in the electronics box

The options are supplied with the option description.

Desig-nation	Description	Order No.	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7087-6CX84-4HA0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7087-6CX84-0AH0
TSY	Synchronizing board	Board description	6SE7090-0XX84-0BA0 6SE7087-6CX84-0BA0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7087-6CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7087-6CX84-0BD0
	Use of the serial interface with USS protocol	Application description	6SE7087-6CX87-4KB0
CB1	Communications board with interface for SINEC- L2-DP, (Profibus)	Board description	6SE7090-0XX84-0AK0 6SE7087-6CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0

Table 6.2 Option boards and bus adapter

If the converter is supplied through an external main contactor, the option board in the electronics box must be supplied from an external power supply, according to Table 6.3.

These values are required in addition to the current drawn by the basic converter (☞ section “Technical Data“).

Board	**Current drain** (mA)
CB1	190
SCB1	50
SCB2	150
TSY w/out tacho	150
T300 w/out tacho	620
Standard tacho Type: 1XP 8001-1	I_0 95 (190 at 6000 RPM)

Table 6.3 Current drain of the option boards

6.2 Interface boards

The boards, listed in the following table must be externally mounted and wired-up on the external system side.

Desig-nation	Description	Order No.	
SCI1	Serial I/O board (only in conjunction with SCB1). Analog and binary input and outputs for coupling to the SCB1 via fiber-optic cable	Board description	6SE7090-0XX84-3EA0 6SE7087-6CX84-0BC0
SCI2	Serial I/O board (only in conjunction with SCB1) Binary inputs and outputs for coupling to the SCB1 via fiber-optic cable.	Board description	6SE7090-0XX84-3EF0 6SE7087-6CX84-0BC0
DTI	Digital tachometer interface	Board description	6SE7090-0XX84-3DB0 6SE7087-6CX84-3DB0
ATI	Analog tachometer interface	Board description	6SE7090-0XX84-3DF0 6SE7087-6CX84-3DF0

Table 6.4 Interface boards

6.3 Power supplies

Designation	Description	Order number Option	Use with
Power supply, 0.3 A	115 V / 230 V AC - 24 V 0.3 A DC	6SX7010-0AC14	e.g.: DTI
Power supply 1 A	115 V / 230 V AC - 24 V 1 A DC	6SX7010-0AC15	e.g.: 1 x SCI
Power supply 5 A	115 V / 230 V AC - 24 V 5 A DC	6EP1333-1SL11	Basic conv

Table 6.5 Recommended power supply

6.4 Isolating amplifiers

Input	Output	Order number Option
Input isolating amplifiers for analog inputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–20 mA to +20 mA	–10 V to +10 V	6SX7010-0AC02
4 mA to +20 mA	0 V to +10 V	6SX7010-0AC16
Output isolating amplifiers for analog outputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–10 V to +10 V	–20 mA to +20 mA	6SX7010-0AC03
0 V to +10 V	4 mA to +20 mA	6SX7010-0AC04

Table 6.6 Overview of isolating amplifiers

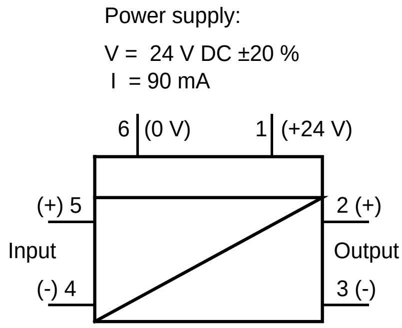


Fig. 6.2 Isolating amplifiers

6.5 Power section

Options	Description/function
Braking unit	For converting the regenerative energy into heat
Braking resistors	Load resistor for the braking unit
Electrical DC link coupling	Switching the DC-AC converter in and out under load
Mechanical DC link coupling	Switching the DC-AC converter in and out in a no-voltage condition
Input rectifier	Input rectifier for one or several DC-AC converters
Input rectifier with line-commutated feedback	Supply rectifier for one or several DC-AC converters for motor or generator operation

Table 6.7 Power section options

6.5.1 Output reactor, dv/dt filter, sinusoidal filter

When longer feeder cables are used between the converter and motor:

- the converter has to cope with additional current peaks due to re-charging the cable capacitances
- the motor insulation is additionally stressed as a result of transient voltage spikes caused by reflection.

NOTE

In order to prevent premature aging of the motor insulation and thus early failures, the following limit values may not be exceeded at the motor terminals:

- the permissible voltage gradient dv/dt and
- the permissible peak voltage between phase conductors $\hat{V}_{LL}$

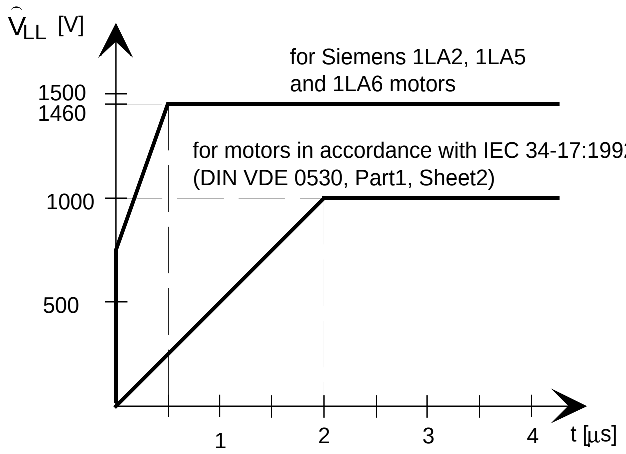


Fig. 6.3 Permissible limit values for the motor insulation

Depending on the application, the voltagerate-of-rise, voltage and current peaks can be reduced using the following options: Output reactor, dv/dt filter, or sinusoidal filter.

Characteristics of the output reactors, dv/dt filters and sinusoidal filter:

	Output reactor	**dv/dt filter**	**Sinusoidal filter**
Reduces the current peaks for long cables	yes	yes	yes
Reduces the voltage gradient (rate of rise) dv/dt at the motor terminals	slightly	yes	yes
Limits the amplitude of the transient voltage peaks at the motor terminals to the following typical values ≤ 800 V at 3-ph. AC 400 V to 460 V ≤ 1000 V at 3-ph. AC 500 V to 575 V	no	yes	yes
Generates sinusoidal motor voltages and currents	no	no	yes
Reduces the supplementary losses in the motor	no	no	yes
Reduces motor noise (corresponding to direct online operation)	no	no	yes

Table 6.8

6.5.1.1 Output reactor

The output reactor is especially used to limit additional current spikes caused by the cable capacitances when long cables are used, i.e. it

- reduces the charge current spikes for long cables
- reduces the voltage rate-of-change dv/dt at the motor terminals.

It does **not** reduce the magnitude of the transient voltage spikes at the motor terminals.

In order that the reactor temperature rise remains within the specified limits, the pulse frequency f_p of the drive converter, rated motor frequency $f_{mot\,N}$ and the maximum drive converter output frequency f_{max} must lie within the specified limits:

	V/f = constant		**V = constant**	
	280 V to 620 V DC	**675 V to 780 V DC**	**280 V to 620 V DC**	**675 V to 780 V DC**
Standard reactor (iron) $f_P \leq 3$ kHz				
V/f / Vector control	$f_{mot\,N} \leq 87$ Hz	$f_{mot\,N} \leq 200$ Hz	$f_{max} \leq 200$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\,N} = f_{max} \leq 120$ Hz	not possible	not possible	not possible
Ferrite reactor $f_P \leq 6$ kHz				
V/f / Vector control	$f_{mot\,N} \leq 150$ Hz	$f_{mot\,N} \leq 150$ Hz	$f_{max} \leq 300$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\,N} = f_{max} \leq 600$ Hz	not possible	not possible	not possible

Table 6.9 Output reactor design

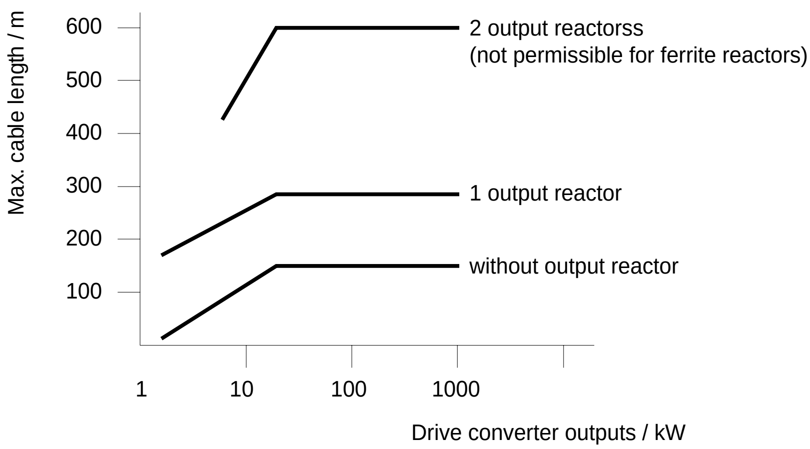


Fig. 6.4 Permissible cable lengths with and without output reactors

NOTE
The specified lengths are valid for unshielded cables; for shielded cables, these values must be reduced to 2/3. If several motors are connected to a drive converter, the sum of the cables lengths of all the motor feeder cables must be less than the permissible cable length.

6.5.1.2 dv/dt filter

The dv/dt filter protects the motor insulation by limiting the voltage gradient and the transient peak voltage at the motor winding to uncritical values in accordance with IEC 34-17:1992 (DIN VDE 0530, Part 1, Sheet 2):

- Voltage gradient (rate of rise) dv/dt ≤ 500 V/µs
- Transient peak voltage $\hat{U}_{typ.}$ ≤ 800 V for 400 V ≤ U_N (3 ph. AC) ≤ 460 V
  540 V ≤ U_N (DC) ≤ 620 V
  $\hat{U}_{typ.}$ ≤ 1000 V for 500 V ≤ U_N (3 ph. AC) ≤ 575 V
  675 V ≤ U_N (DC) ≤ 780 V

For long feeder cables, the dv/dt filter simultaneously reduces the current spikes, which additionally load the drive converter due to the re-charging of the cable capacitances.

The dv/dt filter can be used for the following control versions
- FC (Frequency Control) and
- VC (Vector Control)

The dv/dt filter is suitable for use with
- grounded supply networks (TN- and TT supply networks)
- ungrounded supplies (IT supplies)
  (exceptions: 6SE70_ _ - _ _ B _ _ -1FD0 and 6SE70 _ _ - _ _ C _ _ -1FD0 with version release A)

NOTE
The dv/dt filter is designed for a pulse frequency fp = 3 kHz and can be operated at pulse frequencies f_p ≤ 3 kHz. In this case, when the drive converter is being set (P052 = 5), parameter **P092 should be set to 2**. Thus, parameter P761 (pulse frequency) is automatically limited to values ≤ 3 kHz.

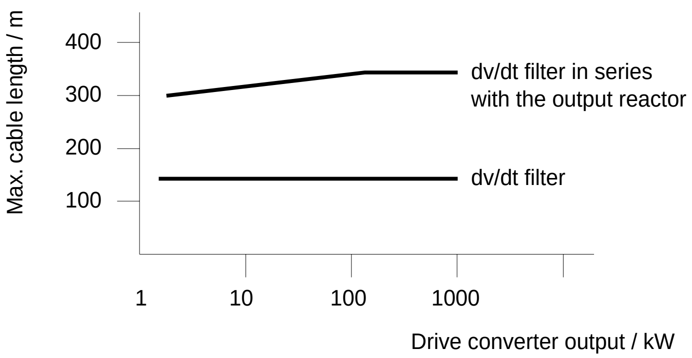


Fig. 6.5 Permissible cable lengths with dv/dt filter

NOTES
The specified cable lengths are valid for unshielded cables; for shielded cables, these values should be reduced to 2/3. If several motors are connected to a drive converter, the sum of the cable lengths of all of the motor feeder cables must be less than the permissible cable length.

6.5.1.3 Sinusoidal filter

Using the sinusoidal filter, square-wave voltage pulses at the converter output are almost sinusoidal, i.e.

- generates an almost sinusoidal motor voltage, and an absolute sinusoidal motor current,
- reduces the voltage gradient at the motor terminals to values dv/dt << 500 V/µs,
- prevents transient voltage spikes at the motor terminals
- reduces the supplementary motor losses
- reduces motor noise.

Simultaneously, the sinusoidal filter, for long motor feeder cables, reduces the current peaks, which additionally stress the drive converter as a result of the periodic re-charging of the cable capacitances.

The sinusoidal filter can be used with the following control versions.

- FC (Frequency Control) and
- VC (Vector Control)

The sinusoidal filter is suitable for use with

- grounded supplies (TN- and TT supply networks)
- ungrounded supply networks (IT supply networks)

NOTE

Operation with the sinusoidal filter requires a defined drive converter setting. For this purpose, when setting the drive converter (P052 = 5), parameter **P092 should be set to 1**.

Thus, **all** of the relevant parameters for operation with the sinusoidal filter are correctly set and limited:

P092 = 1 causes:	**Input voltage, drive converter/inverter**	
	DC 510 V - 620 V	**DC 675 V - 780 V**
Pulse frequency	P761 = 6 kHz	P761 = 3 kHz
Maximum frequency, RDF Maximum frequency, LDF	P452 ≤ + 400 Hz P453 ≥ – 400 Hz	P452 ≤ + 200 Hz P453 ≥ – 200 Hz
Pulse system enable	corresponding to P769 = 3 (no edge modulation systems)	
Firing angle limit	r180 < approx. 83 %	r180 < approx. 87 %

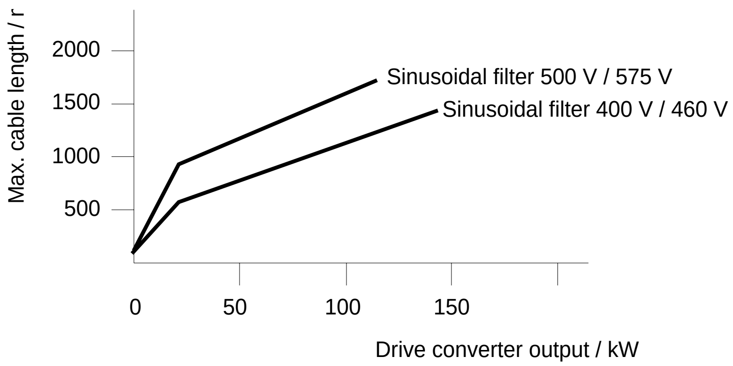


Fig. 6.6 Permissible cable lengths with sinusoidal filter

NOTE
The specified lengths are valid for unshielded cables; for shielded cables, the values must be reduced to 2/3. If several motors are connected to a drive converter, the sum of the cable lengths of all of the motor feeder cables must be less than the permissible cable lengths. When fully utilizing the permissible cable lengths, a line commutating reactor should be used and, if required, a higher starting current set.

6.5.1.4 Selection criteria for the output reactor, dv/d filter or sinusoidal filter

The following table indicates the selection criteria for the output reactor, dv/dt filter or sinusoidal filters

	Voltage range		
	280 V - 310 V (DC)	**510 V - 675 V (DC)**	**710 V - 780 V (DC)**
Motors, acc. to IEC 34-17:1992 (DIN VDE 0530, Part 1, Sheet 2)	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.
Siemens motors 1LA2, 1LA5, 1LA6.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	dv/dt- filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.

Table 6.10 Selection criteria for the following options: Output reactor, sinusoidal filter and dv/dt filter between the converter and motor

6.6 Bypass- and output contactor

6.6.1 Bypass contactor (electrical DC link coupling)

Using the electrical DC link coupling, it is possible, for a multi-motor group with common DC bus, to connect or disconnect a converter with DC supply input to the DC bus.

This option is used when an inverter section has to be replaced.

For drive converters with rated DC voltage 280 V to 310 V, binary output **-X9:4,5** is provided to control the contactor.

For drive converters with rated DC voltage 510 V to 780 V, binary output **-X9:7,9** is provided to control the contactor. For higher outputs, an additional auxiliary contactor must be provided due to the necessary 230 V AC (contactor coil).

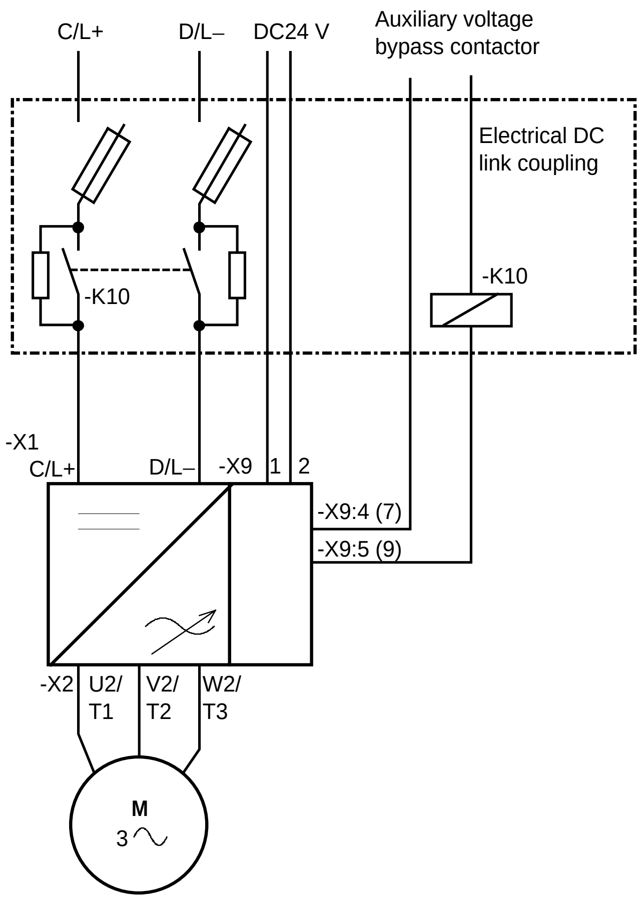


Fig. 6.7 Connecting- up example for the bypass contactor

6.6.1.1 Bypass contactor without I/R unit

Parameterization for operation with bypass contactor:

Parameter-			Terminal
No.	Name	Value	
P612, i001	ST.MC energized	0000	X9:4,5 (7,9) *)
P629, i001	ST.BC energized	1001	X9:4,5 (7,9) *)

Table 6.11 Parameterization for the bypass contactor (electrical DC link coupling)

*) Terminal assignment for drive converters for rated DC voltages 510 V to 780 V DC in brackets.

6.6.1.2 Bypass contactor with I/R unit

NOTE
If individual inverters have to be isolated when the DC busbar is supplied through an input/regenerative feedback unit, the the appropriate parameter sets of the infeed/regenerative feedback unit must be simultaneously switched-over using the binary input. An optimization run for each required constellation must be executed to determine the appropriate parameters. A maximum of four parameter sets can be selected.

If the DC busbar is to be fed from an infeed/regenerative feedback unit, the control parameter values must be determined for this infeed/regenerative feedback unit. During commissioning, the following steps are required:

♦ Re-parameterization for the optimization run:

Parameter-			**Terminal**	**Information**
No.	**Name**	**Value**		
P629, i001	ST.BC energized	0000	X9:4,5 (7,9) *)	
P612, i001	ST.BC energized	1001	X9:4,5 (7,9) *)	
P600, i001	ST. ready to switch-on	1001	X9:4,5 (7,9) *)	Bypass contactor closes

Table 6.12 Parameterization for the optimization run

♦ Execute the optimization run to determine the values for the closed-loop control parameters for the infeed/regenerative feedback unit (☞ Instruction Manual, infeed/regenerative feedback unit).

♦ Re-parameterize for operation with the bypass contactor:

Parameter-			**Terminal**	**Information**
No.	**Name**	**Value**		
P600, i001	ST.ready-to-switch-on	0000	X9:4,5 (7,9) *)	
P629, i001	ST.BC energiz.	1001	X9:4,5 (7,9) *)	
NOTE				
In this case, the converter must be externally supplied with 24 V DC (connector -X9: 1,2)				

Table 6.13 Parameterization for the bypass contactor (electrical DC link coupling)

*) Terminal assignment for drive converters for rated DC voltages 510 V to 780 V DC in brackets.

6.6.1.3 Connecting and disconnecting individual converters to the DC bus

Sequence control	
Switch the converter to the DC bus	**Isolate the converter from the DC bus**
Close the fuse disconnect switch	Output an off command
DC link is pre-charged through the pre-charging resistors	Bypass contactor drops out
Enter an on command	Open the fuse disconnect switch
Bypass contactor is closed	Converter is electrically isolated from the DC bus
	Wait until the DC link capacitors have completely discharged

Table 6.14 Sequence control for connecting/disconnecting individual converters to the bus

6.6.2 Output contactor

It is not necessary that the converter is operated with output contactor.

If the drive converter is operated using an output contactor, for drive converters with rated DC voltage 280 V to 310 V DC binary output -X9:4,5 is provided to control the contactor (pre-assignment).

For drive converters with rated DC voltage 510 V to 780 V DC, binary output -X9:7,9 is provided to control the contactor. Binary output X9:7,9 is only suitable for switching voltages up to 30 V DC.

The checkback signal can be connected to a binary input (e.g. binary input 3).

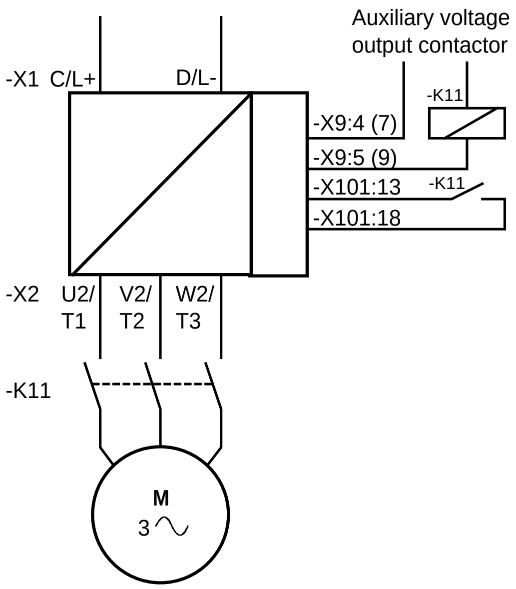


Fig. 6.8 Example for connecting-up a output contactor

Sequence control, on command-operation (effect on the bypass-or output contactor)

NOTES
For the special case, where a customer wishes to connect-up both an electrical DC link coupling as well as an output contactor, then one of the two must be energized through a binary output. For higher ratings, an additional auxiliary contactor must be provided due to the 230 V AC required (contactor coil).

6.7 Operator control

Option	Description
OP1	User-friendly operator control panel with plain text display
SIMOVIS	Floppy disk with program for operator control via PC

Table 6.15 Operator control options

Fig. 6.9 OP1

6.8 Mechanical design

Option	Description
EMC screened housing	For screened cables

Table 6.16 Mechanical options

7 Spare Parts

Component code	Designation	Order number	Used in
-A10	CU1 (FC)	6SE7090-0XX84-0AA0	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	6SE70_ _-_ _A_0 6SE70_ _-_ _B_0
-A30	PMU	6SE7090-0XX84-2FB0	6SE70_ _-_ _C_0 6SE70_ _-_ _D_0
-E1	24 V DC fan	6SY7000-0AA50	6SE70_ _-_ _A_0
-E1	24 V DC fan	6SY7000-0AA48	6SE70_ _-_ _B_0 6SE70_ _-_ _C_0
-E1	230 V AC fan	6SY7000-0AA80	6SE70_ _-_ _D_0
-F101, -F102	2 A, fuse, 600 V	6SY7000-0AA24	6SE70_ _-_ _D_0
-F1, -F2	50 A, fuse 700 V	6SY7000-0AC74	6SE7022-2UC_1
-F1, -F2, -F3, -F4	80 A, fuse 700 V	6SY7000-0AC73	6SE7026-0TD_1 6SE7027-2TD_1
-F1, -F2	100 A, fuse 700 V	6SY7000-0AC72	6SE7022-6TC_1 6SE7023-4TC_1
-F1, -F3	100 A, fuse 700 V	6SY7000-0AC72	6SE7023-8TD_1 6SE7024-7TD_1 6SE702_-_UD_1

Table 7.1 Spare parts

8 Environmental friendliness

Environmental aspects during the development

The number of components has been significantly reduced over earlier converter series by the use of highly integrated components and the modular design of the complete series. Thus, the energy requirement during production has been reduced.

Special significance was placed on the reduction of the volume, weight and variety of metal and plastic components.

Plastic parts used:	PC:	Front cover
	ABS:	Fan mesh PMU support board Logo
	PP:	Hinges Insulating board Handle Bus retrofit
	PA6:	Insulating foils Terminal housing Support

Halogen-containing flame retardants were, for all essential components, replaced by environmentally-friendly flame retardants.

Environmental compatibility was an important criterium when selecting the supplied components.

Environmental aspects during production

Purchased components are generally supplied in recyclable packaging materials (board).

Surface finishes and coatings were eliminated with the exception of the galvanized sheet steel side panels.

ASIC devices and SMD devices were used on the boards.

The product is emission-free.

Environmental aspects for disposal

The unit can be broken-down into recyclable mechanical components as a result of the easily releasable screw- and snap connections.

The plastic components and moulded housing are to DIN 54840 and have a recycling symbol.

Units can be disposed of through certified disposal companies. Addresses are available from your local Siemens partner.

9 Technical Data

The drive converters correspond to the listed conditions as well as the specified domestic and international standards.

Switching at the input	No./min	2
Cooling medium temperature		0 °C to +40 °C
Storage temperature		– 25 °C to +70 °C
Transport temperature		– 25 °C to +70 °C
Environmental class	3K3	DIN IEC 721-3-3 Moisture condensation not permissible
Pollution level	2	DIN VDE 0110 Pert 1
Overvoltage category	III	DIN VDE 0110 Part 2
Overvoltage property class	1	E DIN VDE 0160
Degree of protection		DIN VDE 0470 Section 1 ≙ EN 60529
– standard	IP20	

NOTE

Degree of protection IP20 is only guaranteed if the size of the opening for the control- and outgoing cables is reduced in accordance with DIN VDE 0470 Part 1 (☞ Fig. 9.1).

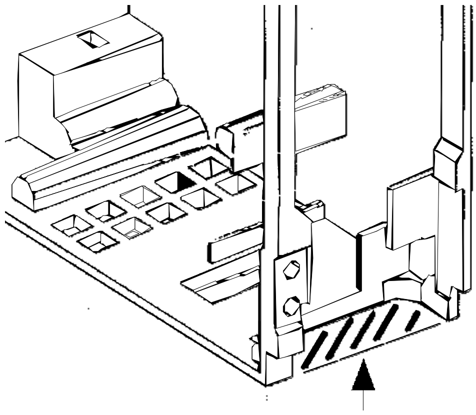


Fig. 9.1

Protection class	I	DIN VDE 0106 Section 1
Radio interference level		DIN VDE 0875 Section 11 ≙ EN 55011
– standard	without	
– option	B1	EN55011
Noise immunity		EN50082-2
Mechanical strength		
– Vibrations/oscillations		DIN IEC 68-2-6 / 06.90

	Frequency range	Constant amplitude of the	
		Deflection	Acceleration
	Hz	mm	m/s^2 (g)
– for stead-state operation, severity level 12	10 to 58	0.075	
	above 58 to 500		9.8 (1)
– for transport, severity level 22	5 to 9	3.5	
	above 9 to 500		10 (1)

– Shock
shock stressing — DIN IEC 68-2-27 / 08.89
30 g, 16 ms half-sinusoidal shock

– Falling over
falling over on a surface and on a corner — DIN IEC 68-2-31 / 04.84

Inverter types							
FC	**6SE70...**	**21-1RA10**	**21-3RA10**	**21-8RB10**	**22-3RB10**	**23-2RB10**	**24-4RC10**
VC	**6SE70...**	**21-1RA20**	**21-3RA20**	**21-8RB20**	**22-3RB20**	**23-2RB20**	**24-4RC20**
SC	**6SE70...**	**21-1RA30**	**21-3RA30**	**21-8RB30**	**22-3RB30**	**23-2RB30**	**24-4RC30**
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 DC 280 ... 310 ±15 % 3 AC 0 ... Rated voltage / 1.35; **SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 12.6 10.6	 15.8 13.3	 21.1 17.7	 27.3 22.9	 38.3 32.2	 52.6 44.2
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	3.8...4.2	4.8...5.3	6.4...7.1	8.3...9.1	11.6...12.8	15.8...17.6
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	9.6	12.1	16.1	20.8	29.3	40.2
Base load time	s	240					
Overcurrent	A	14.5	18.2	24.2	31.3	44.0	60.3
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	9.6	12.1	16.1	20.8	29.3	40.2
Base load time	s	270					
Overcurrent	A	17.0	21.3	28.3	36.6	51.5	70.7
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.97	 0.98 0.97	 0.97 0.97	 0.98 0.97	 0.98 0.98	 0.98 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.09 0.11	 0.11 0.13	 0.13 0.15	 0.17 0.18	 0.22 0.24	 0.29 0.31
Required cooling air flow	m^3/s	0.009	0.009	0.022	0.022	0.022	0.028
Pressure drop Δp	Pa	10	10	32	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		A	A	B	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	135 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8.5	8.5	12.5	12.5	12.5	21

Inverter types							
FC	**6SE70...**	**25-4RD10**	**27-0RD10**	**28-1RD10**			
VC	**6SE70...**	**25-4RD20**	**27-0RD20**	**28-1RD20**			
SC	**6SE70...**	**25-4RD30**	**27-0RD30**	**28-1RD30**			
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 DC 280 ... 310 ±15 % 3 AC 0 ... Rated voltage / 1.35; **SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 64.3 54.0	 82.1 69.0	 96.4 81.0			
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	19.5...21.5	24.9...27.5	29.2...32.3			
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	49.1	62.8	73.7			
Base load time	s	240					
Overcurrent	A	73.7	94.2	110.6			
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	49.1	62.8	73.7			
Base load time	s	270					
Overcurrent	A	86.4	110.4	129.6			
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		 <0.92 ind.	 <0.92 ind.	 <0.92 ind.			
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.98 0.98	 0.98 0.98	 0.98 0.98			
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.44 0.49	 0.54 0.61	 0.60 0.67			
Required cooling air flow	m^3/s	0.054	0.054	0.054			
Pressure drop Δp	Pa	230	230	230			
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	65	65	65			
Type		D	D	D			
Width Height Depth	mm	270 600 350	270 600 350	270 600 350			
Weight	kg	32	32	32			

Inverter types							
FC	**6SE70...**	**16-1TA11**	**18-0TA11**	**21-0TA11**	**21-3TB11**	**21-8TB11**	**22-6TC11**
VC	**6SE70...**	**16-1TA21**	**18-0TA21**	**21-0TA21**	**21-3TB21**	**21-8TB21**	**22-6TC21**
SC	**6SE70...**	**16-1TA31**	**18-0TA31**	**21-0TA31**	**21-3TB31**	**21-8TB31**	**22-6TC31**
Rated voltage, rated frequency, rated current							
Rated voltage in V_n Input Output	V	 DC 510 ... 620 ±15 % 3 AC 0 ... Rated voltage / 1.35; **SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 7.3 6.1	 9.5 8.0	 12.1 10.2	 15.7 13.2	 20.8 17.5	 30.4 25.5
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	4...4.9	5.3...6.4	6.7...8.1	8.7...10.5	11.5...13.9	16.8...20.3
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	5.6	7.3	9.3	12.0	15.9	23.2
Base load time	s	240					
Overcurrent	A	8.3	10.9	13.9	18.0	23.9	34.8
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	5.6	7.3	9.3	12.0	15.9	23.2
Base load time	s	270					
Overcurrent	A	9.8	12.8	16.3	21.1	28.0	40.8
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.97	 0.98 0.98	 0.98 0.98	 0.98 0.98	 0.98 0.98	 0.98 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.09 0.10	 0.10 0.11	 0.12 0.13	 0.13 0.15	 0.16 0.19	 0.27 0.31
Required cooling air flow	m^3/s	0.009	0.009	0.009	0.022	0.022	0.028
Pressure drop Δp	Pa	10	10	10	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		A	A	A	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	90 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8.5	8.5	8.5	12.5	12.5	21

Inverter types							
FC	**6SE70...**	**23-4TC11**	**23-8TD11**	**24-7TD11**	**26-0TD11**	**27-2TD11**	
VC	**6SE70...**	**23-4TC21**	**23-8TD21**	**24-7TD21**	**26-0TD21**	**27-2TD21**	
SC	**6SE70...**	**23-4TC31**	**23-8TD31**	**24-7TD31**	**26-0TD31**	**27-2TD31**	
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	DC 510 ... 620 ±15 % 3 AC 0 ... Rated voltage / 1.35; **SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	–––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	40.5 34.0	44.6 37.5	55.9 47.0	70.2 59	85.7 72.0	
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	22.4...27.1	24.7...29.9	30.9...37.4	38.8...47.7	47.4...57.4	
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V		AC 230 ±15% (0.4 A)				
Loading Class II acc. to EN 60146-1-1							
Rated current	A	30.9	34.1	42.8	53.7	65.5	
Base load time	s	240					
Overcurrent	A	46.4	51.2	64.2	80.5	98.3	
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	30.9	34.1	42.8	53.6	65.5	
Base load time	s	270					
Overcurrent	A	54.4	60.0	75.2	94.4	115.2	
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.	
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		0.98 0.98	0.98 0.98	0.98 0.98	0.98 0.98	0.98 0.98	
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	0.37 0.43	0.49 0.55	0.58 0.67	0.70 0.79	0.86 0.97	
Required cooling air flow	m^3/s	0.028	0.054	0.054	0.054	0.054	
Pressure drop Δp	Pa	30	230	230	230	230	
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	65	65	65	65	
Type		C	D	D	D	D	
Width Height Depth	mm	180 600 350	270 600 350	270 600 350	270 600 350	270 600 350	
Weight	kg	21	32	32	32	32	

Inverter types							
FC	**6SE70...**	**14-5UB11**	**16-2UB11**	**17-8UB11**	**21-1UB11**	**21-5UB11**	**22-2UC11**
VC	**6SE70...**	**14-5UB21**	**16-2UB21**	**17-8UB21**	**21-1UB21**	**21-5UB21**	**22-2UC21**
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 DC 675 ... 780 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 5.4 4.5	 7.4 6.2	 9.3 7.8	 13.0 11.0	 18.0 15.1	 26.2 22.0
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	3.9...4.5	5.4...6.2	6.7...7.7	9.5...10.9	13.1...15	19.1...21.9
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	4.1	5.6	7.1	10.0	13.7	20.0
Base load time	s	240					
Overcurrent	A	6.1	8.5	10.6	15.0	20.6	30.0
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	4.1	5.6	7.1	10.0	13.7	20.0
Base load time	s	270					
Overcurrent	A	7.2	9.9	12.5	17.6	24.2	35.2
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.99 0.98	 0.98 0.97	 0.99 0.98	 0.99 0.98	 0.99 0.98	 0.99 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.08 0.09	 0.09 0.11	 0.10 0.12	 0.13 0.16	 0.17 0.20	 0.27 0.32
Required cooling air flow	m^3/s	0.022	0.022	0.022	0.022	0.022	0.028
Pressure drop Δp	Pa	32	32	32	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		B	B	B	B	B	C
Width Height Depth	mm	135 425 350	135 425 350	135 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	12.5	12.5	12.5	12.5	12.5	21

Inverter types							
FC	**6SE70...**	**23-0UD11**	**23-4UD11**	**24-7UD11**			
VC	**6SE70...**	**23-0UD21**	**23-4UD21**	**24-7UD21**			
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 DC 675 ... 780 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	 –––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 34.5 29	 40.5 34.0	 55.4 46.5			
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	5.4...6.2	29.4...33.9	40.3...46.3			
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	26.4	30.9	42.3			
Base load time	s	240					
Overcurrent	A	39.6	46.4	63.5			
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		 <0.92 ind.	 <0.92 ind.	 <0.92 ind.			
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.98 0.97	 0.98 0.97	 0.98 0.97			
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.52 0.63	 0.59 0.73	 0.74 0.91			
Required cooling air flow	m^3/s	0.054	0.054	0.054			
Pressure drop Δp	Pa	230	230	230			
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	65	65	65			
Type		D	D	D			
Width Height Depth	mm	270 600 350	270 600 350	270 600 350			
Weight	kg	32	32	32			

9.1 De-rating for an increased cooling medium temperature

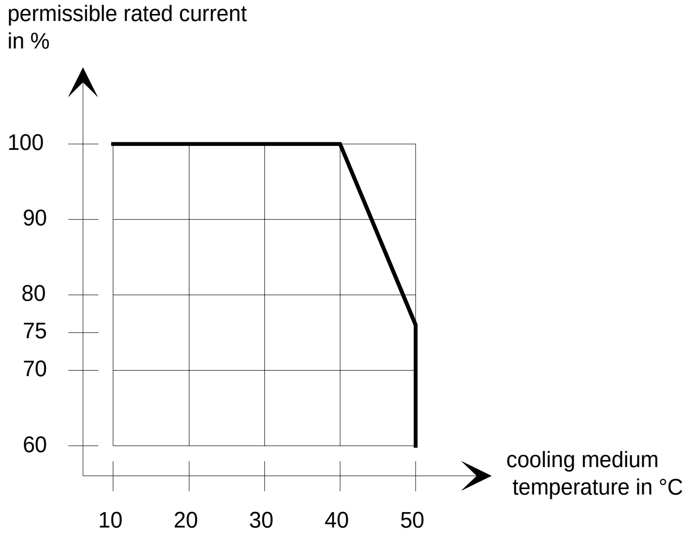
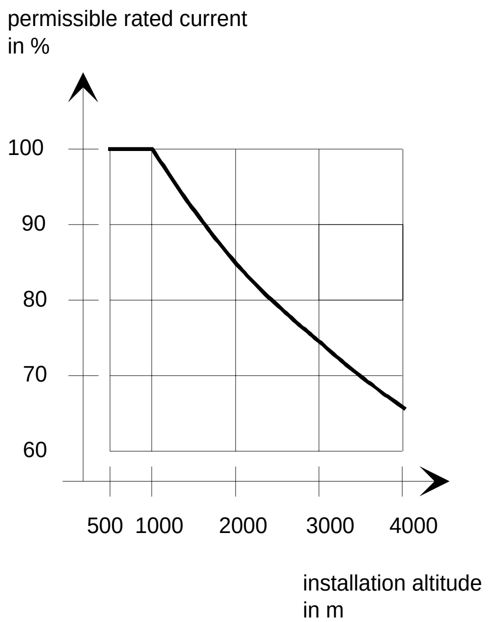


Fig. 9.2 Max. permissible rated current as a function of the cooling medium temperature

9.2 De-rating at installation altitudes > 1000 m above sea level

For installation altitudes > 1000 m above sea level, the rated current must be reduced. For installation altitudes > 2000 m above sea level, the rated voltage must be reduced (see Fig. 9.3). Installation altitudes > 4000 m above sea level are not permissible.



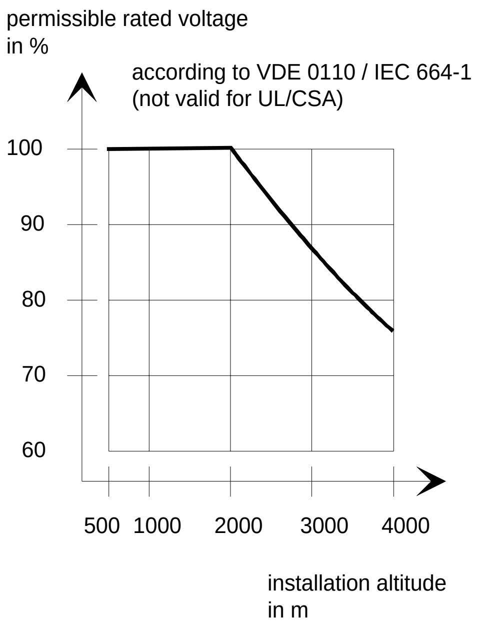


Fig. 9.3 Max. permissible rated current and rated voltage as a function of the installation altitude

9.3 De-rating as a function of the pulse frequency

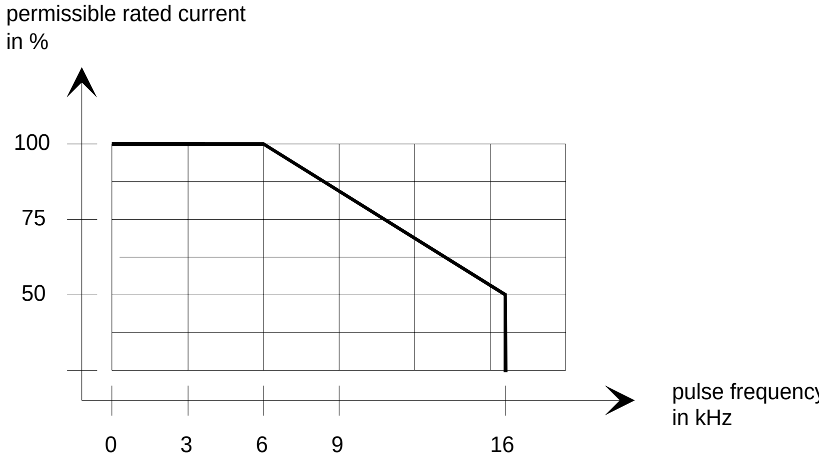


Fig. 9.4 Max. permissible rated current as a function of the pulse frequency

10 Appendix

10.1 Index

10.2 List of abbreviations

A	Alarm
AA	Analog output
AC	Alternating current
AE	Analog input
AFE	Active front end
AS	Sequence control
ASIC	Application specific integrated circuit
ASM	Asynchronous motor
ATI	Analog tacho-Interface
AWG	American wire gauge
BA	Binary output
BC	Bypass contactor
BE	Binary input
BF	Type of construction
CAN	Controller area network
CB	Communication board (option)
CU	Control unit
CUA	Control unit AFE (control unit of AFE)
DC	Direct current
DPR	Dual-port-RAM
DPRAM	Dual-port-RAM
EA	First run-up
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMF	Electromotive force
EPROM	Erasable programmable read-only memory
ESD	Electrostatic sensitive devices
F	Fault
FC	Frequency control (control version of SIMOVERT MASTER DRIVES)
FF	Fatal fault
FI	Fault current
FSW	Fixed setpoint
G/R	Basic/reserve
GSST(1/2)	Basic drive converter serial interface (1/2)
H	High (binary signal level)
HLG	Ramp-function generator
HTL	High-voltage transistor logic

HW	Hardware
I/O	Input/output
IGBT	Insulated gate bipolar transistor
IGD	IGBT gate drive
IVI	Inverter interface
KIP	Kinetic buffering
L	Low (binary signal level)
LBA	Local bus adapter (option)
LED	Light emitting diode
LSB	Least significant bit
MC	Main contactor
MDS	Motor data set
MLFB	Machine-readable product designation (machine-readable designation)
MSB	Most significant bit
NN	Sea level
OP(1)	Operation panel (1)
Par	Parameter
PC	Personal computer
PEU	Power electronic unit
PG	Programming unit (programmer)
PKW	Parameter ID value
PMU	Parameterization unit
PROFIBUS	Process field bus
PS	Power supply
PSU	Power supply unit
PWE	Parameter value
PZD	Process data
Q	Source
RC	Combination, resistor ® and capacitor (C)
RDS	Reserve data set
RFG	Ramp-function generator
SC	Servo control (control version of SIMOVERT MASTER DRIVES)
SCB(1/2)	Serial communication board (option)
SCI(1/2)	Serial communication Interface (1/2)
SDS	Setpoint data set
SL	Slave
SM	Synchronous motor
SMD	Surface mounted device

SML	Snubber module low
SMU	Snubber module up
SST1/2	Serial interface 1/2
SW	Software
TB	Technology board (option)
TLG	Telegram
TRC	Trace
TSY	Tacho and synchronization (option)
TTL	Transistor-Transistor-Logic
UCE	Voltage (V) collector->emitter (desaturation signal of the transistors)
UMR	Drive converter
USS	Universal serial interface
VC	Vector control (control version of SIMOVERT MASTER DRIVES)
VDU	Voltage-dividing-unit
VS	Precharging contactor
Vsa	Line supply voltage components in the a axis
Vsb	Line supply voltage components in the b axis
VSB	voltage sensing board (line supply voltage sensing board)
WEA	Automatic restart function
WR	Inverter
X9	Terminal strip on the PEU (types A to D), PSU1 (types E to H) and PSU2 (types J to M)
ZK	DC link

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12 Certificates

SIEMENS

Drive and Standard Products Group

Test certificate

Erlangen, 01.07.1995

Equipment

AC drive converter

- Type: SIMOVERT MASTER DRIVES
- Order No.: 6SE70... 1)

The routine testing according to these test instructions

475 100.9000.00 QP for size A - D
476 100.9000.00 QP for size E - H
476 200.9000.00 QP for size J - M

Tests performed:	I. Product check	• checking of presence of all components acc. to parts list
	II. Isolation test	• DIN VDE 0160 draft 04.91, par. 7.6.1 • CSA 22.2-14.M91, par. 6.8
	III. Functional test acc. to DIN VDE 0558, part1	• power supply • customer terminals and interfaces • power conversion section • protective and monitoring functions
	IV. RUN-IN	• Ambient temperature 55 °C cycled • Duration 24 up to 72 hours • Scampling 10 % to 100 %

The equipment complied with the test requirements.
Test results are documented within the production data file.

1) For complete type, serial number and technical data please see rating plate.

ASI 1 PE D F

Schlögel

ASI 1
System-Based
Drive Technology

SIEMENS

Drive and Standard Products Group

Confirmation

Erlangen, 01.07.1995

This confirms that

Equipment AC drive converter

- **Type** SIMOVERT MASTER DRIVES
- **Order No.:** 6SE70...

is manufactured in conformance with DIN VDE 0558 Part 2and DIN VDE 0113 Part 6.2.

This equipment fulfills the shock hazard protection requirements according to DIN VDE 0106 Part 100 when the following safety rules are observed:

- Service work in operation is only permissible at the electronics box
- The converter must be switched into a no-voltage condition and isolated from the supply when replacing any part/component
- All panels must be closed during operation.

Thus, this equipment conforms to the appropriate regulations in Germany according to VBG 4 §2 (2) (VBG is a German regulatory body for safety-related issues).

The local operating regulations (e.g. DIN VDE 0105) must be observed when operating the equipment.

ASI 1 PE D T

Dr. Link

ASI 1
System-Based
Drive Technology

SIEMENS

Factory certificate *

regarding electromagnetic compatability

4SE.475 000 0001.00 WB EEC

Manufacturer:	Siemens Aktiengesellschaft Drives and Standard Products Group Business Division Variable-speed drives Sub-Division Drive systems
Address:	Postfach 3269 D-91050 Erlangen
Product name:	SIMOVERT Type 6SE70 compact drive converters AC-AC and DC-AC

When correctly used, the designated product fulfills all the requirements of Directive 89/336/EEC regarding electromagnetic compatibility.

We confirm the conformance of the above designated product with the Standards:

EN 61800-3	**10-1996**
EN 61000-4-2	**(old IEC 801-2)**
EN 61000-4-4	**(old IEC 801-4)**
EN 61000-4-5	**(old IEC 801-5)**
IEC 1000-4-3	**(old IEC 801-3)**
EN 55011	**(DIN VDE 0875 Part 11)**

Note:

This instructions relating to EMC-correct installation, correct operation, connecting-up conditions and associated instructions in the product documentation supplied must be observed.

Erlangen, 20. 01. 1997

i. V.

H. Mickal

Head of the Drive System Production Unit

This declaration does not guarantee any features.

*) acc. to EN 10204 (DIN 50049)

ASI 1 D/U 4102x

Page 1 of 1

The following versions have appeared so far:

Version	Internal Item number
AA	475 944.4100.76 AA-76
AB	475 944.4100.76 AB-76
AC	475 944.4100.76 AC-76
AD	475 944.4100.76 AD-76

Version AD consists of the following chapters

Chapters		Changes	Pages	Version date
0	General	Reviewed Edition	8	09.97
1	Description	Reviewed Edition	4	09.97
2	Transport, Unpacking, Installation	Reviewed Edition	4	09.97
3	Connecting-up	Reviewed Edition	6	09.97
4	Operator control	Reviewed Edition	2	09.97
5	Maintenance	Reviewed Edition	5	09.97
6	Options	Reviewed Edition	13	09.97
7	Spare Parts	Reviewed Edition	1	01.2000
8	Environmental friendliness	First Edition	1	08.96
9	Technical Data	Reviewed Edition	9	09.97
10	Appendix	Reviewed Edition	4	09.97
11	Adresses	First Edition	2	08.96
12	Certificates	Reviewed Edition	3	09.97

Group: Automation and Drives (A&D)
Division: Variable-Speed Drive Systems
Postfach 3269, D-91050 Erlangen

Siemens Aktiengesellschaft

Subject to change

Order No.: 6SE7087-6BD70
Printed in the Federal Republic of Germany
01.2000

SIEMENS

SIMOVERT MASTER DRIVES

Frequency Control (FC)

Operating Instructions
Part 2

Edition: AA

Order-No.: 6SE7087-6XX10

Overview of the MASTER DRIVES Operating Instructions:

Operating Instructions	consists of Part 1	Part 2
6SE708_-_AD10	6SE708_-_AD70	6SE708_-_XX10
6SE708_-_AD20	6SE708_-_AD70	6SE708_-_XX20
6SE708_-_AD30	6SE708_-_AD70	6SE708_-_XX30
6SE708_-_BD10	6SE708_-_BD70	6SE708_-_XX10
6SE708_-_BD20	6SE708_-_BD70	6SE708_-_XX20
6SE708_-_BD30	6SE708_-_BD70	6SE708_-_XX30
6SE708_-_AH10	6SE708_-_AH70	6SE708_-_XX10
6SE708_-_AH20	6SE708_-_AH70	6SE708_-_XX20
6SE708_-_AH30	6SE708_-_AH70	6SE708_-_XX30
6SE708_-_BH10	6SE708_-_BH70	6SE708_-_XX10
6SE708_-_BH20	6SE708_-_BH70	6SE708_-_XX20
6SE708_-_BH30	6SE708_-_BH70	6SE708_-_XX30
6SE708_-_BM20	6SE708_-_BM70	6SE708_-_XX20

→ You will receive Parts 1 and 2 of the Operating Instructions when you use this Order No. Parts 1 and 2 can be individually ordered by specifying the particular Order No.

_-_ stands for the language code, e.g. 0-0 for German Editions.

The following foreign language Editions of these Operating Instructions are available:

Language	English	French	Spanish	Italian
Language code	7-6	7-7	7-8	7-2

These Operating Instructions are valid for software release V1.3.

We have checked the contents of this document to ensure that they coincide with the described hardware and software. However, differences cannot be completely excluded, so that we do not accept any guarantee for complete conformance. However, the information in this document is regularly checked and necessary corrections will included in subsequent editions. We are grateful for any recommendations for improvement.

SIMOVERT® Registered Trade Mark

Contents

Definitions

- QUALIFIED PERSONAL

  For the purpose of these instructions and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

  1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
  2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
  3. Trained in rendering first aid.

- DANGER

  For the purpose of these instructions and product labels, "Danger" indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.

- WARNING

  For the purpose of these instructions and product labels, "Warning" indicates death, severe personal injury or property damage can result if proper precautions are not taken.

- CAUTION

  For the purpose of these instructions and product labels, "Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.

- NOTE

  For the purpose of these instructions, "Note" indicates information about the product or the respective part of the Instruction Manual which is essential to highlight.

NOTE
These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser’s purposes, the matter should be referred to the local Siemens sales office. The contents of this Instruction Manual shall not become part of or modify any prior or existing agreement, committment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

CAUTION

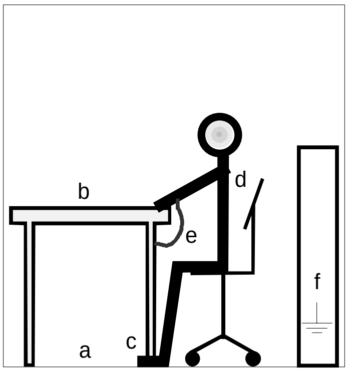
Components which can be destroyed by electrostatic discharge (ESD)

The converters contain components which can be destroyed by electrostatic discharge. These components can be easily destroyed if not carefully handled. If you have to handle electronic boards please observe the following:

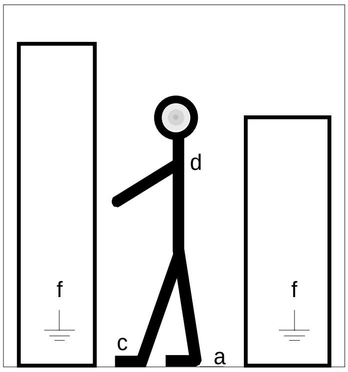
- Electronic boards should only be touched when absolutely necessary.
- The human body must be electrically discharged before touching an electronic board
- Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from man-made fibers
- Boards must only be placed on conductive surfaces
- When soldering, the soldering iron tip must be grounded
- Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes, metal containers)
- If the packing material is not conductive, the boards must be wrapped with a conductive packaging material, e.g. conductive foam rubber or household aluminum foil.

The necessary ECB protective measures are clearly shown in the following diagram:

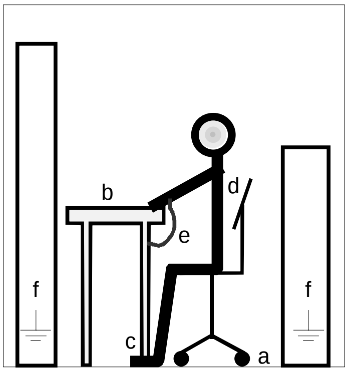
a	=	Conductive floor surface	d	=	ESD overall
b	=	ESD table	e	=	ESD chain
c	=	ESD shoes	f	=	Cubicle ground connection



Sitting



Standing



Standing / Siting

WARNING

Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the safety instructions can result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

Safety and operating instructions for drive converters

Safety and operating instructions for drive converters

(in conformity with the low-voltage directive 73/23/EEC)

1. General

In operation, drive converters, depending on their degree of protection, may have live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces.

In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

For further information, see documentation.

All operations serving transport, installation and commissioning as well as maintenance are to be carried out **by skilled technical personnel** (Observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN/VDE 0110 and national accident prevention rules!).

For the purposes of these basic safety instructions, "skilled technical personnel" means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Intended use

Drive converters are components designed for inclusion in electrical installations or machinery.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 89/392/EEC (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the starting of normal opertion) is admissible only where conformity with the EMC directive (89/336/EEC) has been established.

The drive converters meet the requirements of the low-voltage directive 73/23/EEC. They are subject to the harmonized standards of the series prEN 50178/DIN VDE 0160 in conjunction with EN 60439-1/ VDE 0660, part 500, and EN 60146/ VDE 0558.

The technical data as well as information concerning the supply conditions shall be taken from the rating plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

The installation and cooling of the appliances shall be in accordance with the specifications in the pertinent documentation.

The drive converters shall be protected against excessive strains. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatic sensitive components which are liable to damage through improper use. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

When working on live drive converters, the applicable national accident prevention rules (e.g. VBG 4) must be complied with.

The electrical installation shall be carried out in accordance with the relevant requirements (e.g. cross-sectional areas of conductors, fusing, PE connection). For further information, see documentation.

Instructions for the installation in accordance with EMC requirements, like screening, earthing, location of filters and wiring, are contained in the drive converter documentation. They must always be complied with, also for drive converters bearing a CE marking. Observance of the limit values required by EMC law is the responsibility of the manufacturer of the installation or machine.

6. Operation

Installations which include drive converters shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. Act respecting technical equipment, accident prevention rules etc. Changes to the drive converters by means of the operating software are admissible.

After disconnection of the drive converter from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this respect, the corresponding signs and markings on the drive converter must be respected.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer’s documentation shall be followed.

Keep safety instructions in a safe place!

1 Control terminal strip and serial interface

WARNING
The unit must be disconnected and locked-out before control cables are connected to the CU.

The unit can be controlled via the following interfaces:

- Control terminal strip -X101 and -X102 on the electronics board CU
- RS485 serial interface (SST1); control terminal strip -X100 on the electronics board CU
- OP operator control panel (Chapter "Options" in the Operating Instructions, Part 1)
- RS485 and RS232 serial interfaces (SST1) on the PMU -X300
- RS485 (SST2) serial interfaces; control terminal strip -X100 on the electronics board CU.

CAUTION
The CU board contains components which can be destroyed by electrostatic discharge. These components can be very easily destroyed if not handled with caution. Also refer to the ECB cautionary measures in the Section, General Information.

1.1 Connectors for the control terminal strip

The connectors for the control terminal strip are supplied (loose) with the unit. Cables with cross-sections from 0.14 mm^2 to 1.5 mm^2 (AWG: 26 to 16), or 1 mm^2 (AWG: 18) can be connected using stranded wire with lugs at the connector (recommended: 0.5 mm^2 (AWG: 20)). The connectors can be identified using the pin numbers (Table 1.1); the connector position on the board is illustrated in Fig. 1.1. Two screen clamps and four cable ties are required from the loose components supplied to connect the control cables.

The remaining connector X9, included loose with the equipment, is required to control a main contactor and for connecting an external power supply (Section „Auxiliary power supply/main contactor“ in the Operating Instructions, Part 1).

Connector		**Labeling**								
X100	eight-pin, coded	1	2	3	CU1	6	7	8		
X101	eight-pin, coded	13	14	15	CU1	18	19	20		
X102	ten-pin	25	26	27	28	CU1	31	32	33	34

Table 1.1 Connectors for the control terminal strip are supplied loose

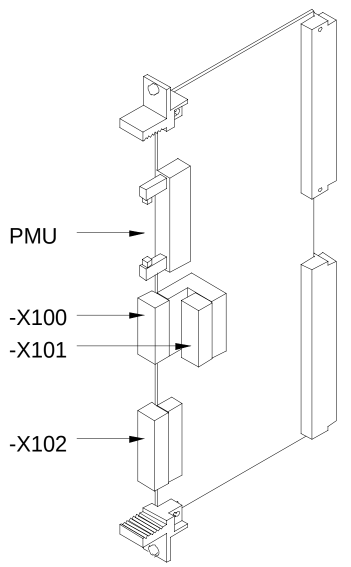


Fig. 1.1 Control terminals on CU

1.1.1 Connecting-up the control cables

NOTE
As a general rule, it is recommended that shielded control wiring be used for signals connected directly to the chassis, in order to achieve maximum noise immunity. The shield must be grounded at both ends. To avoid noise coupling, control wires which are directly connected to the chassis should be separated from power wiring by a minimum distance of 20 cm. For drives wired in approved factories, internal wiring practices which achieve acceptable noise immunity results may be used for drive connections. Control- and cables must cross each other at an angle of 90°.

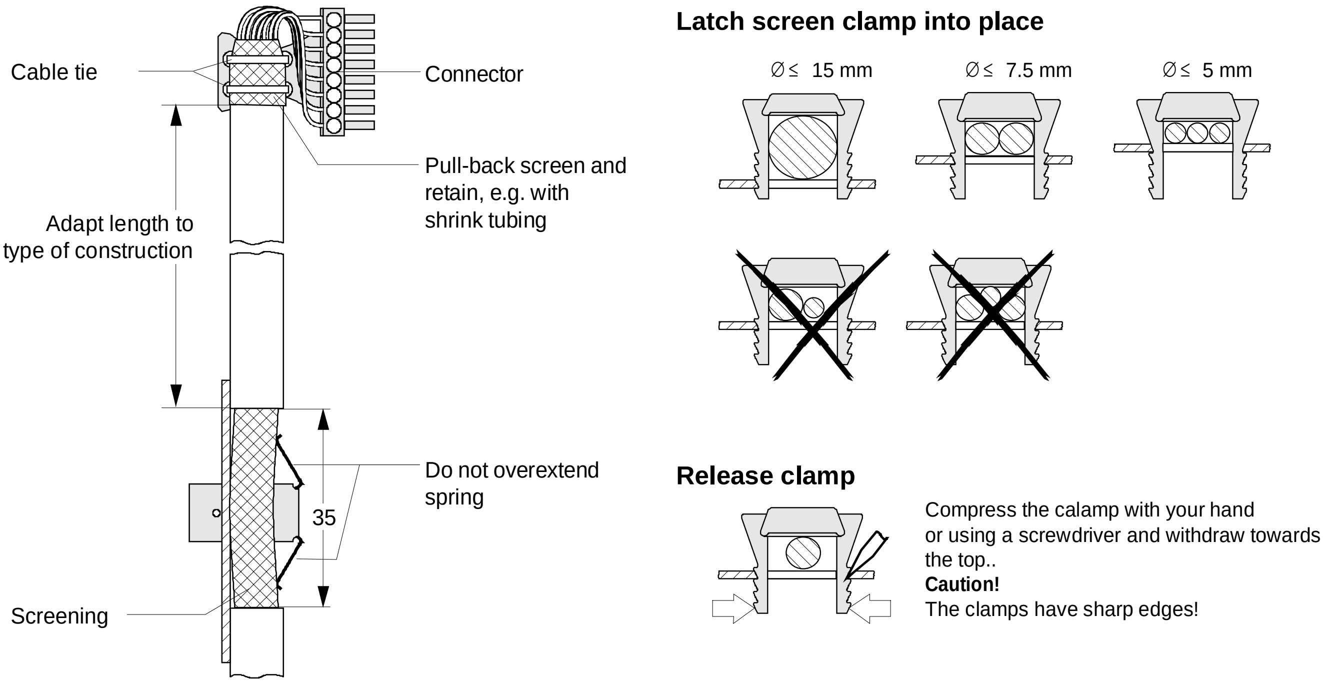


Fig. 1.2 Connecting-up the control cables and the technique for using the screen clamps

The "EMC screened housing" option should be used if so many control cables are required that two screen clamps are not sufficient.

Order No.:
- Type A 6SE7090-0XA87-3CA0
- Type B 6SE7090-0XB87-3CA0
- Type C 6SE7090-0XC87-3CA0
- Type D 6SE7090-0XD87-3CA0

1.2 Terminal connection

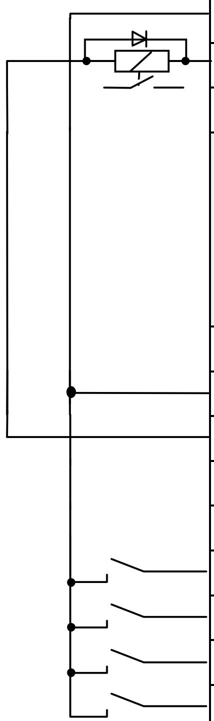
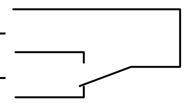
Connecting example	Term.	Function, notes
	-X100	
	1	Transmit- and receive line -RS485, differential input / -output, positive (RS485R/T+)
	2	Transmit- and receive line -RS485, differential input / -output, negative (RS485R/T–)
	3	Transmit output RS485 Standard, differential output, positive (RS485T+)
	4	Transmit output RS485 Standard, differential output, negative (RS485T–)
	5	Reference potential, RS485 interface
	NOTE	The interface at connector -X100 is available again in the -X300 parameterizing unit. Only one of the two interfaces may be used, ☞ Chapter 4 „Start-up“).
	NOTE	Binary output 1 is connected at -X9:4,5 main contactor control
	6	Binary output 2 (changeover contact) reference contact 
	7	Binary output 2 (changeover contact) NO contact
	8	Binary output 2 (changeover contact) NC contact
	NOTE	Load capability of the binary outputs: 60 V AC, 60 VA, cosφ = 1 60 V AC, 16 VA, cosφ = 0.4 60 V DC, 24 W Inductive loads, e.g. contactors, relays, for DC voltage loads, must be damped using a diode or varistor, and for AC loads, with a varistor or RC element.
	-X101	
	13	+24 V, 150 mA for binary inputs and outputs
	14	Ref. potential for 24 V (ground)
	15	Ref. potential for binary inputs 1 to 5 for ext. signal voltage
	16	Binary input 1
	17	Binary input 2
	18	Binary input 3
	19	Binary input 4
	20	Binary input 5
	NOTE	Signal sensitivity of the binary inputs: H = 24 V (13 V to 33 V) I_{max} = 15.7 mA L = 0 V (–0.6 V to 3 V)

Table 1.2 Connecting example for control terminal strips -X100 and -X101

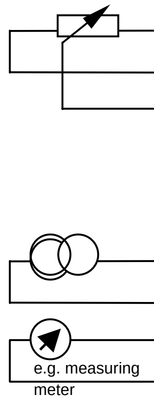
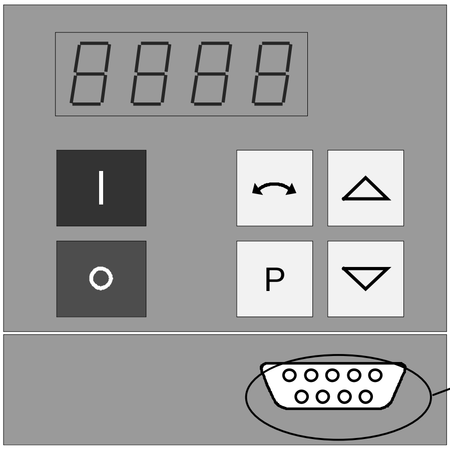
Connecting example	Term.	Function, notes
	-X102	
	25	+10 V / 5 mA, ±2 %, for setpoint pot., non-floating
	26	–10 V / 5 mA, ± 2%, for setpoint pot., non-floating
	27[1]	Analog input 1 (0 V to ±10 V)
	28	Ref. potential, analog input 1
	29[1]	Analog input 1 (0 mA to 20 mA or. 4 mA to 20 mA) int. load resistor 250 Ω
	30[2]	Analog input 2 (0 V to ±10 V)
	31	Ref. potential, analog input 2
	32[2]	Analog input 2 (0 mA to 20 mA or 4 mA to 20 mA) int. load resistor 250 Ω
	33	Ref. potential, analog output 1
	34	Analog output 1 (0 V to 10 V) permissible load ≤ 5 mA ≙ > 2 kΩ
	NOTE	Terminals 33 and 34: To increase the noise immunity of the signals, an isolating amplifier should be connected between the analog output and measuring unit for cables > 4 m.

Table 1.3 Connecting-up example for the control terminal strip -X102

1.2.1 Connecting-up the parameterizing unit (PMU)

A serial connection to automation unit or a PC can be realized via connector X300 on the PMU. Thus, the unit can be controlled and operated from the central control station or control room.

For degree of protection IP20 (option), there is no PMU. The OP1 operator control panel must be removed to connect a PC or an automation unit to X300 (to remove OP1, release the 2 mounting screws on the inside of the doors).



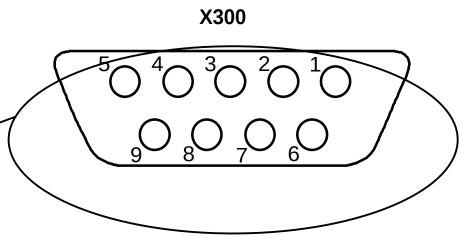


Fig. 1.3 Parameterizing unit (PMU)

PMU -X300	Description
1	Not assigned
2	Receive line, RS232 standard (V.24)
3	Transmit- and receive line, RS485, two-wire, positive differential input/output
4	RTS (request to send)
5	Ref. potential (ground)
6	5 V power supply for OP
7	Transmit line, RS232 standard (V.24)
8	Transmit- and receive line RS485, two-wire, negative differential input/output
9	Ref. potential for RS232- or RS485 interface (EMC suppressed).

Table 1.4 Connector assignment for interface -X300

1) Only one of the two terminals, 27 or 29, may be assigned
2) Only one of the two terminals, 30 or 32, may be assigned

1.3 Measures to maintain the radio interference suppression regulations

The drives must be installed and mounted according to the „Installation Instructions for EMC-correct installation and mounting of drives“ (Order No. 6SE7087-6CX87-8CE0).

The limit values for industrial environments can be maintained without radio interference suppression filter.
B1 radio interference suppression filters must be used for environments other than industrial environments.

The following points must be observed regarding radio interference suppression regulations:

♦ **Grounding**

Converters generate radio interference noise. This noise should be fed back to the source through the lowest possible ohmic connection (ground connection cross-section ≥ supply connection cross-section).

Use the best grounding possibility (e.g. mounting panel, grounding cable, grounding bar) when installing converters and optional radio interference suppression filters. Connect all connector housings together through the largest possible surface area.

For radio interference suppression, the cross-section (observe the safety regulations under fault conditions), is not so important, but the contact surface, as high-frequency noise currents do not flow through the complete cross-section, but essentially on the outside surface of a conductor (skin effect).

♦ **Screening**

In order to reduce noise and maintain the radio interference suppression level, the following should be maintained

- screened cables should be used between the converter output and motor
- screen control cables must be used.
- route control- and power cables separately; min. clearance, 20 cm.

The screen must be connected to ground potential at both ends.

♦ Control cables and power cables may only cross at an angle of 90 °.

♦ **Filter**

The radio interference suppression filter must be connected directly in front of the rectifier- or rectifier and regenerative feedback unit. The housings must be connected electrically with one another.

2 Operator control

The converter can be controlled via:

- the PMU (Parameterization Unit)
- the control terminal strip on the CU (Chapter 1 „Control terminal strip“)
- the OP1 operator control panel (Chapter „Options“ in the Operating Instructions, Part 1)
- the RS485 and RS232 serial interface on PMU -X300

When the equipment is shipped, the drive converter is controlled and parameterized by the parameterizing unit (PMU) on the front side of the unit.

For option M20 (degree of protection IP20), the unit is controlled and parameterized via the OP1.

Operator control using the PMU is described in this section.

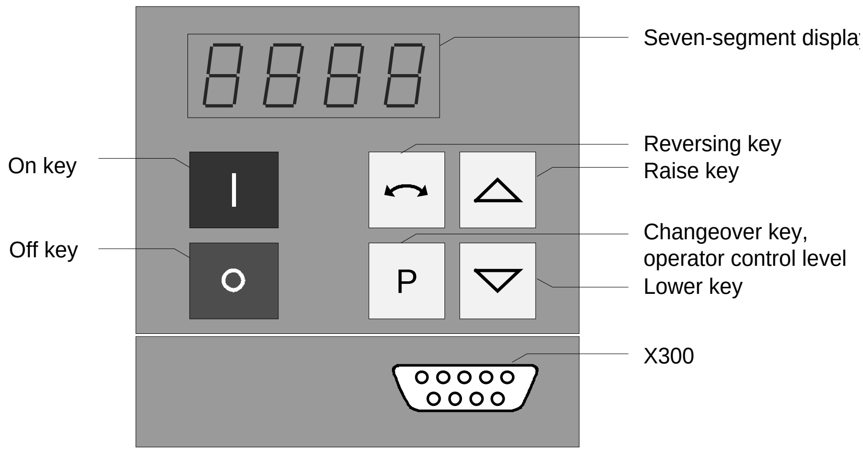


Fig. 2.1 Parameterization unit

2.1 Operator control elements

Operator control elements	Function
I	Converter switch on (standard). For faults: Return to the fault display. Command is effective when the key is released.
O	Converter shutdown depending on the parameterization of OFF1, OFF2 or OFF3 (P554 to P560). Command becomes effective when the key is released.
↷	Field reversal / reversing for the appropriate parameterization (P571 and P572). Command becomes effective when the key is released.
P	Changeover from parameter number to parameter value. In conjunction with other keys, additional functions (refer to Figs. 2.2 to 2.5). Command becomes effective when the key is released.
△ , ▽	Values (raise, lower) change as long as the keys are depressed.
P + △ resp. P + ▽	Depress P and hold, then depress the second key. The command becomes effective when the key is released (e.g. fast changeover).

Table 2.1 Function of the operator control elements on the PMU

2.2 Displays 8.8.8.8.

		Parameter number Pos. actual value e.g	 Neg. actual value e.g	Index e.g..	Parameter value e.g.
Visualization parameters	**Basic converter**	r000	r.000	---	°009
	Technology board	d000	d.000		
Setting parameters	**Basic converter**	P005	P.005	i000	-2.08
	Technology board	H002	H.002		

Table 2.2 Displaying visualization- and setting parameters on the PMU

	Actual value	Parameter value not possible	Alarm	Fault
Display	-2.08	----	A022	F006

Table 2.3 Status display on the PMU

NOTE
The parameter description is provided in Chapter 11 „Parameter list“.

2.3 Structure

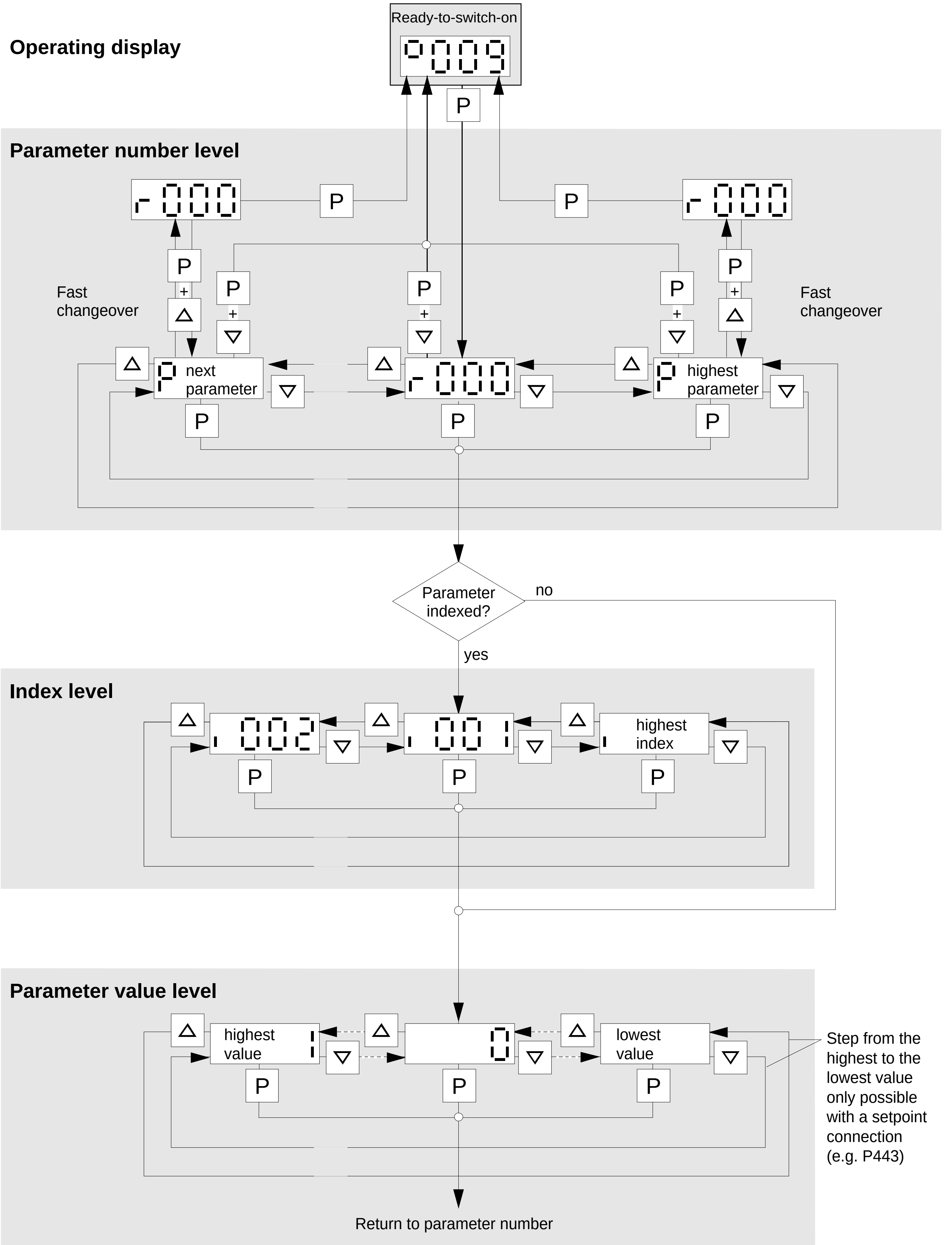
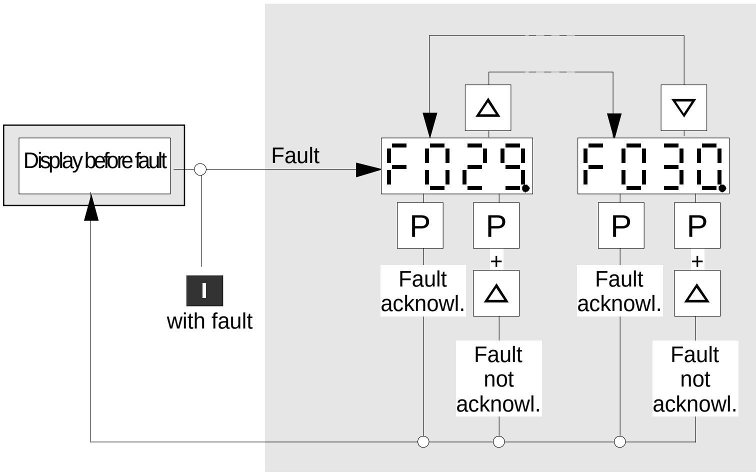


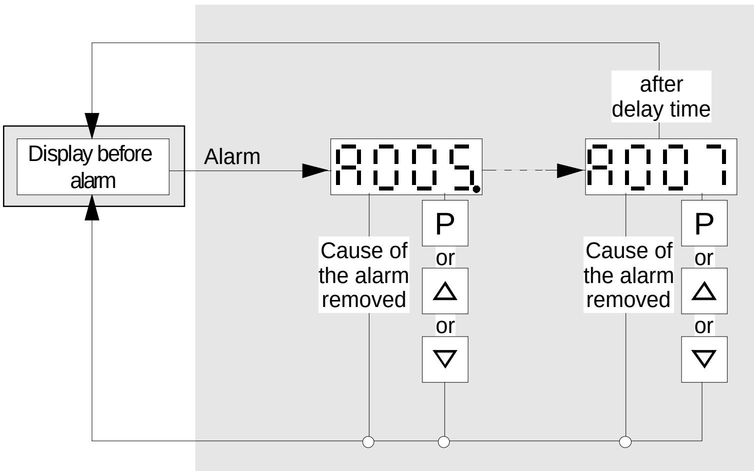
Fig. 2.2 Operator control structure using the PMU



If several fault exist, the particular fault can be selected using the △▽ keys.

P- + △ key: Jump into the parameterizing level, if, e.g., fault acknowledgement is not possible.

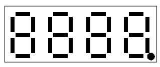
Fig. 2.3 Operator control structure of the PMU for faults

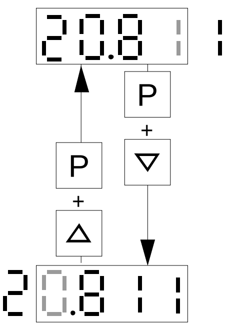


If several alarms are present, then display automatically switches to the higher alarm.

P- + △-
or ▽ key: Jump into the parameterizing level independent of the alarms which are present

Fig. 2.4 Operator control structure of the PMU for alarms

If several faults or alarms exist, a point appears at the right in the display .



The shift is only possible in the parameter value level.

Fig. 2.5 Shifting the PMU display for parameter values with more than 4 digits

3 General explanation of the terminology and functional scope of the unit

Abbreviations:

♦ Abbreviations used: ☞ Chapter 14 „Index and Abbreviations“

3.1 Converter open-loop/closed-loop control versions

♦ Open-loop control versions (also suitable for multi-motor drives):
- V/f characteristic:
  Open-loop frequency control with constant voltage/frequency ratio, or a voltage/frequency ratio entered via a characteristic
- V/f characteristic, for textile applications:
  as for the V/f characteristic, however certain functions where the frequency setpoint (☞ function diagrams) is inhibited for textile machine applications.

♦ Closed-loop control version:
- V/f + closed-loop speed control (V/f characteristic with higher-level closed-loop speed control):
  In addition to the specified V/f characterstic, in order to achieve an especially high speed accuracy, the motor speed, measured using a tachometer, is fed to a higher-level speed controller.

Tip: For digital tachos and for certain analog tachos, option boards are required!

3.2 Process data

The following is understood under process data:

♦ **Setpoints** and **control commands**, which „directly“ influence the drive operating status,

♦ **Actual values** and **status messages**, which are „directly“ output from the drive.

„Directly“ means: Each process data change is realized immediately and without any acknowledgement - or handshake mechanisms.
Only then can fast process responses be achieved

Contrary to the process data, a parameter value change is subject to a specified mechanism, and consists of task and checkback signal.

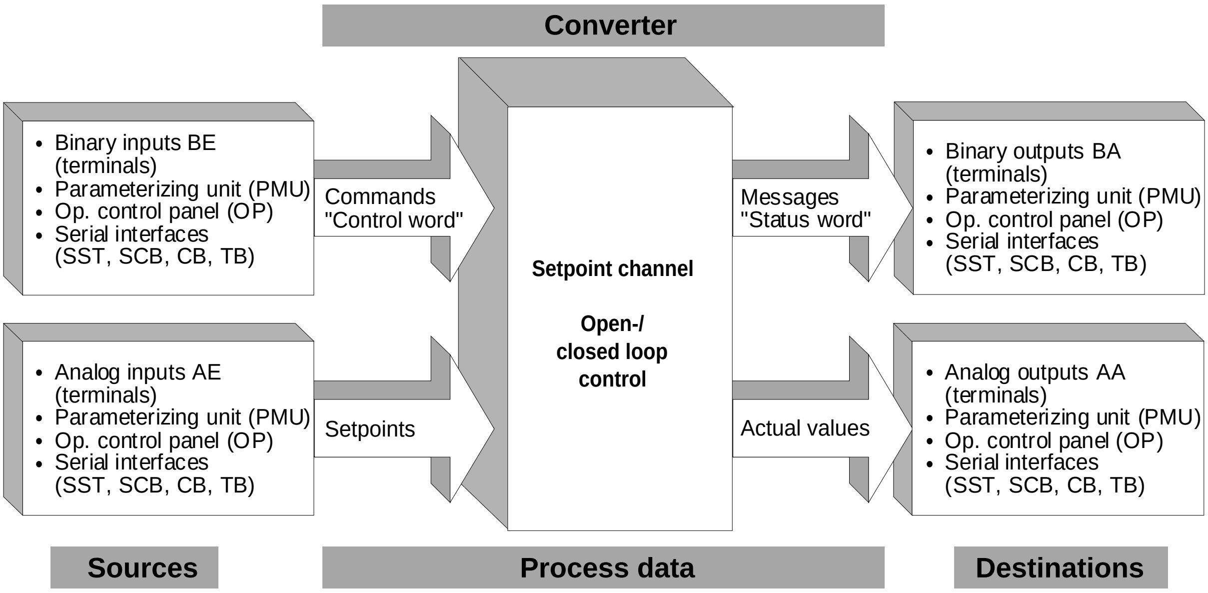


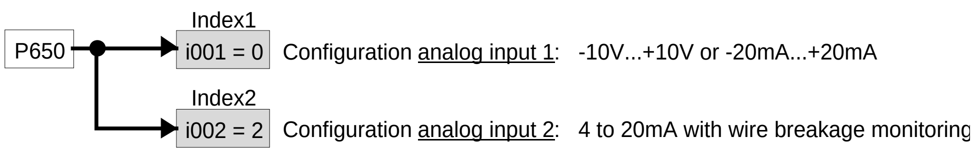
Fig. 3.1 Process data

3.3 Indexed parameters

Indexed parameters are sub-divided into various „indices“ (briefly: i001, i002, etc.), in which the particular parameter values can be entered.

The significance of the „indices“ of the particular parameter (parameter number) can be taken from the chapter 11 „Parameter list“.

Example:



3.4 Data sets

„Indexed“ parameters can be sub-divided according to data sets (indexed).

There are three kinds of data sets:

♦ SDS (setpoint channel data set) 1 and 2:

  2 setpoint channel data sets which can be changed over; e.g. for production-related different drive ramp-up and ramp-down times.

♦ Basic/reserve (basic- or reserve setting):

  e.g. for changing over between manual and automatic operation

♦ MDS (motor data set) 1 and 2:

  2 motor data sets which can be changed over; e.g. for operating different motor types from one converter.

The data sets are selected via the „control word“, and are read-out in r410, r012 and r152.

☞ Chapter 10 „Function diagrams“

4 Start-up

The drive converter must be ready. This means, that it must be installed and connected-up according to the information in the hardware description.

NOTE	
Forming:	If the drive converter was continuously shutdown for longer than a year, or not connected, then the DC link capacitors must be formed.

4.1 Capacitor forming

The DC link capacitors must be re-formed if the converter has been non-operational for more than one year. If the converter was started-up within one year after having been shipped (serial number on the rating plate), it is not necessary to re-form the DC link capacitors

For AC-AC, as well as for DC-AC drive converters, forming is realized by switching-in a rectifier and resistor, which are connected to the DC link (circuit configuration: refer to Figs. Fig. 4.2 and Fig. 4.3). The drive converter feed in this case must be shutdown (disconnected)!
A second possibility exists for DC-AC units. The DC busbar voltage is slowly increased up to the rated drive converter input voltage during the forming time.
The forming time is dependent on the time for which the drive converter stood. (refer to Fig. 4.1)

		Recommended components		
		A	**R**	**C**
3AC	208 V to 415 V	SKD 50 / 12	220 Ω / 100 W	22 nF / 1600 V
DC	280 V to 310 V			
3AC	510 V to 620 V	SKD 62 / 16	470 Ω / 100 W	22 nF / 1600 V
DC	380 V to 460 V			
3AC	675 V to 930 V	SKD 62 / 18	680 Ω / 100 W	22 nF / 1600 V
DC	500 V to 690 V			

Table 4.2 Recommended components for circuits acc. to Fig. 4.2 and Fig. 4.3

Position	Example	
1 and 2	A-	Manufacturing location
3	E F H	1994 1995 1996
4	1 to 9 O N D	January to September October November December
5 to 14		Not relevant for forming

Table 4.1 Serial number structure: A-E60147512345

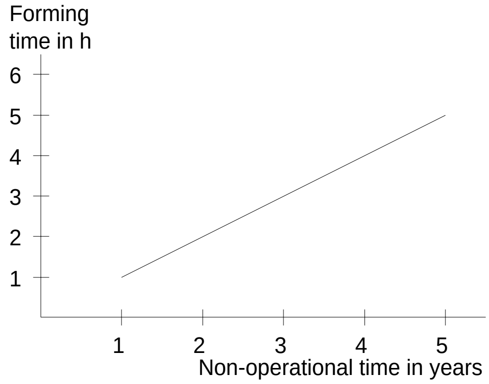


Fig. 4.1 Forming time as a function for the time which the converter was non-operational

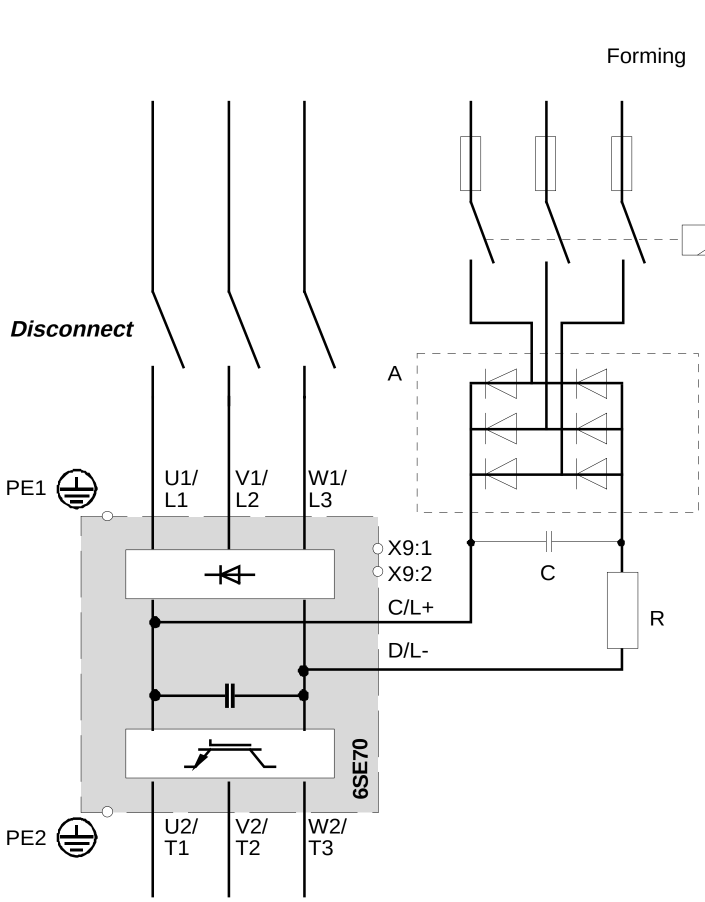


Fig. 4.2 Circuit to form AC-AC units

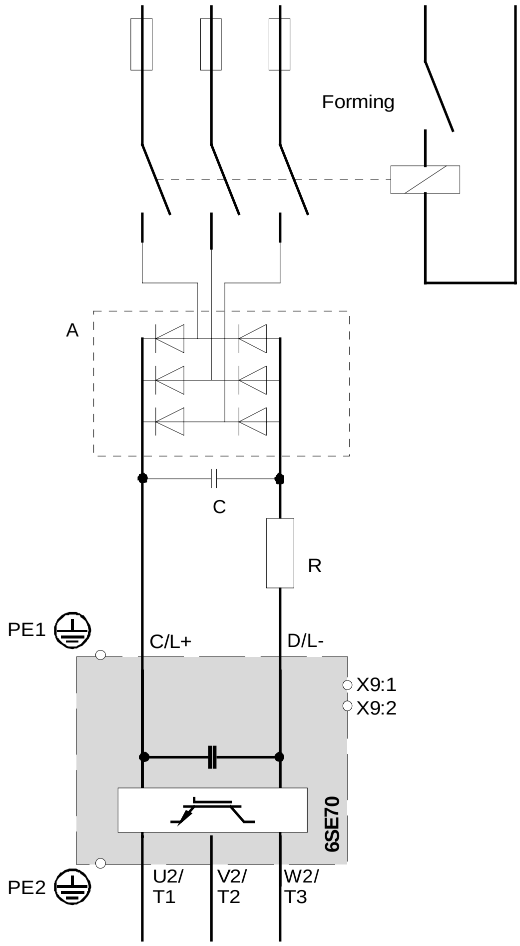


Fig. 4.3 Circuit to form DC-AC units

4.2 First start-up

The converter is supplied with the „Factory setting“ (☞ Chapter 11 „Parameter list“) and access stage 2 (standard mode). That means:

- ♦ The converter data correspond to the converter type, MLFB (Order No.) (converter initialized).
- ♦ A 50 Hz induction motor, adapted to the converter type, is parameterized, which is operated using the V/f control (open-loop).

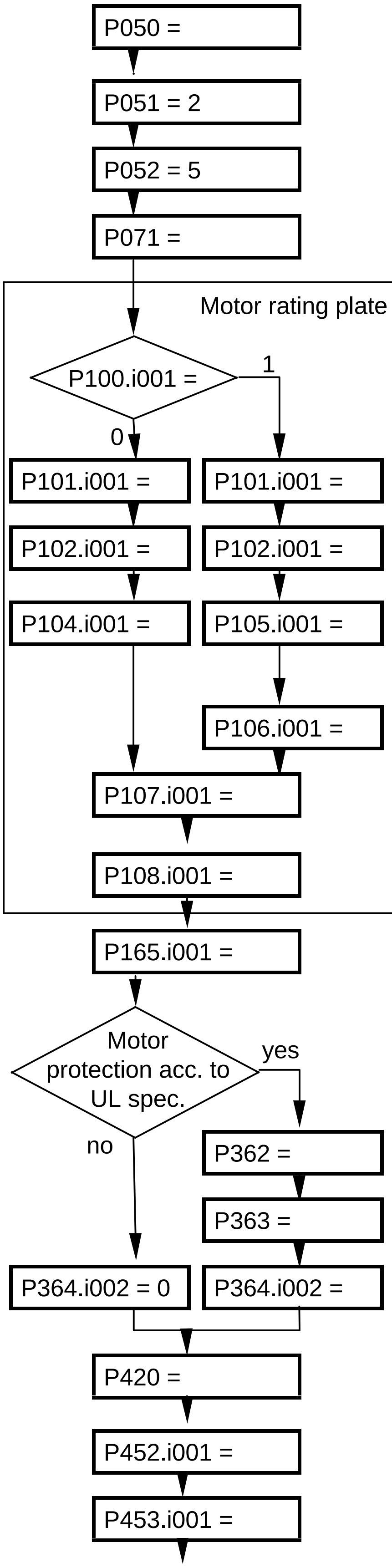
If the required converter functions are already realized with the factory setting, the converter can be immediately switched-on and operated. Further parameterization is not required.

Parameterization is realized according to the following sections:

4.2.1 As „**Standard application with V/f characteristic without hardware options**“ for simple applications.

or **4.2.2** As **„Expert application**“ for sophisticated applications (e.g.: Closed-loop control, data set changeover, interface operation, etc.) of if hardware options are available.

4.2.1 Parameterization „Standard application“



Language:
0 = German, 1 = English, 2 = Espanol, 3 = Francais, 4 = Italiano

Access „stage standard mode“

Function selection. „drive setting“

Converter supply voltage [V] : AC units: Line supply voltage
DC units: DC link voltage

Motor rating plate data observe config. (star/delta)!

Motor type: 0 = IEC-motor (international standard)
1 = NEMA-motor (US standard)

Rated motor voltage [V]

Rated motor current [A]
(multi-motor drives: sum of all the currents)

IEC motor:: Cos Phi (n)
NEMA motor: Rated output [Hp] (multi-motor drives: sum af all the outputs)

Efficiency [%]

Rated motor frequency [Hz] The maximum frequency is a function of P163 „Control mode“

Rated motor speed [RPM]

Characteristic: 0: linear characteristic (constant-torque drives)
1: parabolic characteristic (fans and pumps)

NOTE
The motor temperature is estimated using the motor current. The motor is reliably protected with the factory setting

Motor cooling: 0: naturally ventilated
1: force ventilated

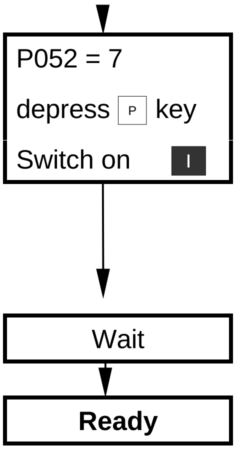
Motor thermal time constant

Motor load limit 1 ... 300 %

Rated system frequency [Hz]
Rated motor operating frequency in the system

Max. frequency, clockwise phase sequence [Hz]

Max. frequency, counter-clockwise phase sequence[Hz]



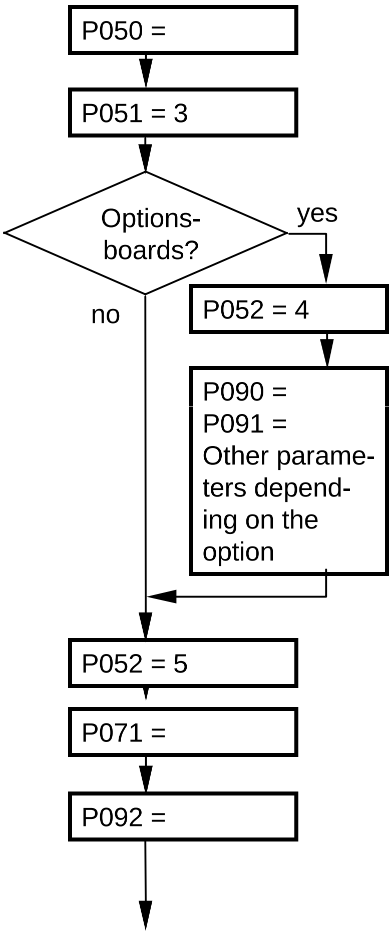
Function selection „motor identification at standstill“
(includes „ground fault test“ and „automatic parameterization“)

NOTE
Current flows in the motor and the rotor can align itself

Alarm „A078“ appears after the P key is depressed.The converter must be switched-on within 20 s.

Wait until the converter shuts down!
If fault Ffxx occurs, ☞ Chapter 12 „Fault and alarm messages“

4.2.2 Parameterization „Expert application“



Language:
0: Deutsch, 1: English, 2: Espanol, 3: Francais, 4: Italiano

Access stage „expert mode“

Possible option boards: SCB, TSY, CB, TB

Function selection „hardware configuration“

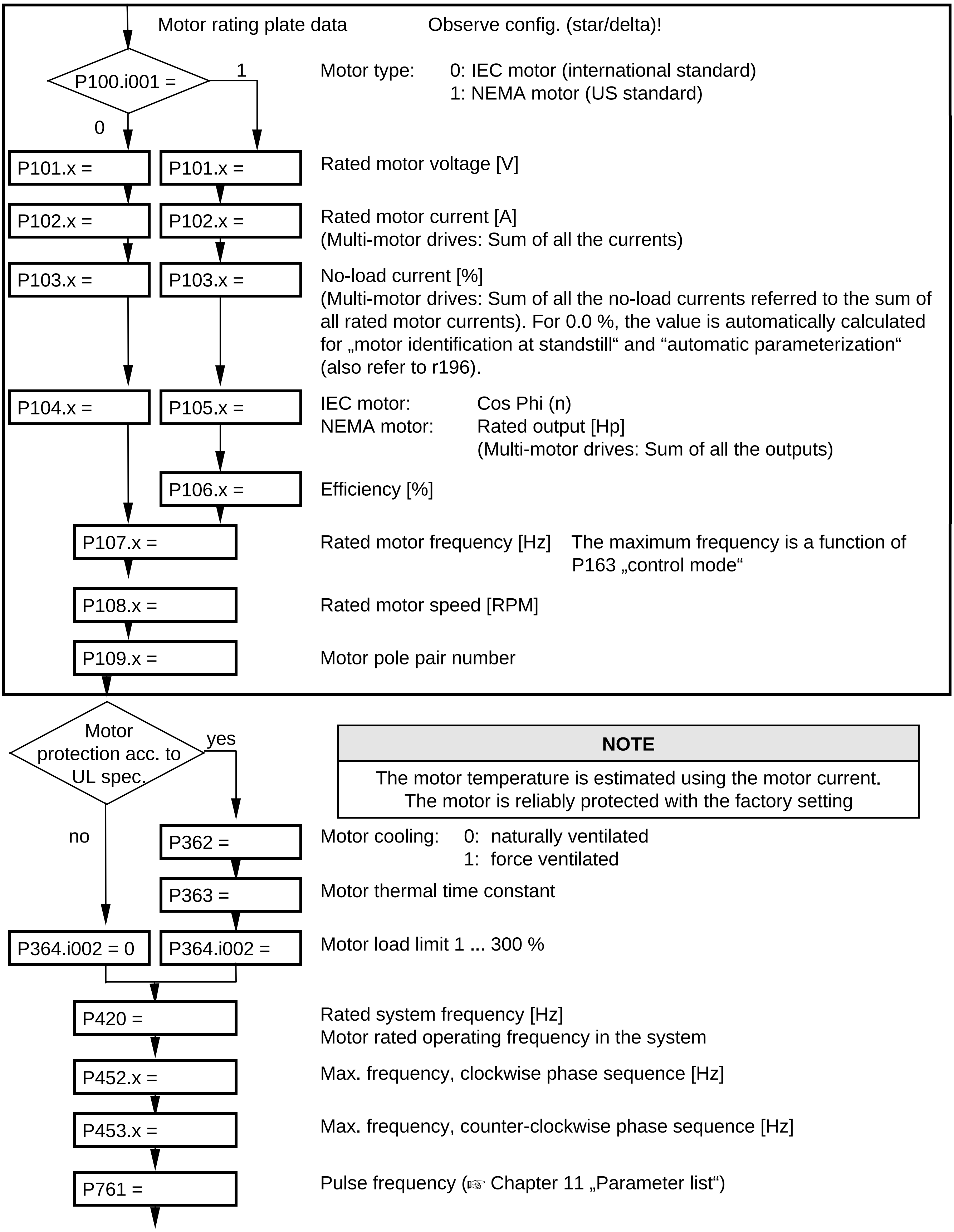
Define and parameterize the option boards:
☞ Instruction Manuals for the option boards

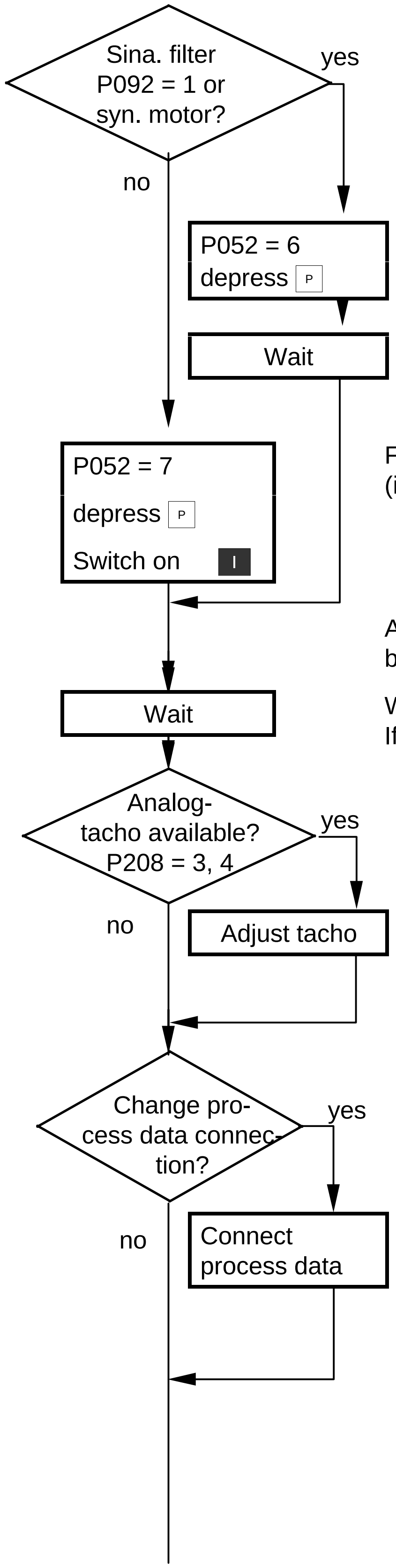
Option boards:
0: none
1: CB
2: TB
3: SCB
4: TSY

Function selection „drive setting“
If fault „Fxxx“, ☞ Chapter 12 „Fault and alarm messages“

Converter supply voltage [V] AC units: Line supply voltage
DC units: DC link voltage

Select output filter:
0: without sinusoidal filter
1: with sinusoidal filter
2: with dv/dt filter


Motor rating plate data
Observe config. (star/delta)!
P100.i001 =
1
0
Motor type: 0: IEC motor (international standard)
1: NEMA motor (US standard)
P101.x =
P101.x =
Rated motor voltage [V]
P102.x =
P102.x =
Rated motor current [A]
(Multi-motor drives: Sum of all the currents)
P103.x =
P103.x =
No-load current [%]
(Multi-motor drives: Sum of all the no-load currents referred to the sum of all rated motor currents). For 0.0 %, the value is automatically calculated for „motor identification at standstill“ and “automatic parameterization“ (also refer to r196).
P104.x =
P105.x =
IEC motor: Cos Phi (n)
NEMA motor: Rated output [Hp]
(Multi-motor drives: Sum of all the outputs)
P106.x =
Efficiency [%]
P107.x =
Rated motor frequency [Hz]
The maximum frequency is a function of P163 „control mode“
P108.x =
Rated motor speed [RPM]
P109.x =
Motor pole pair number
Motor protection acc. to UL spec.
yes
no
NOTE
The motor temperature is estimated using the motor current.
The motor is reliably protected with the factory setting
P362 =
Motor cooling: 0: naturally ventilated
1: force ventilated
P363 =
Motor thermal time constant
P364.i002 = 0
P364.i002 =
Motor load limit 1 ... 300 %
P420 =
Rated system frequency [Hz]
Motor rated operating frequency in the system
P452.x =
Max. frequency, clockwise phase sequence [Hz]
P453.x =
Max. frequency, counter-clockwise phase sequence [Hz]
P761 =
Pulse frequency (☞ Chapter 11 „Parameter list“)



Function selection „automatic parameterizationl“

Wait until the converter is ready to switch on! (PMU display: 009)
If fault „Fxxx“ occurs ☞ Chapter 12 „Fault and alarm messages“

Function selection „motor identification at standstill“
(includes „ground fault test“ and „automatic parameterization“)

NOTE
Current flows in the motor and the rotor can align itself!

Alarm „A078“ appears after the P key is depressed. The converter must be switched-on within 20s!

Wait until the converter shuts down!
If fault „Fxxx“ occurs ☞ Chapter 12 „Fault and alarm messages“

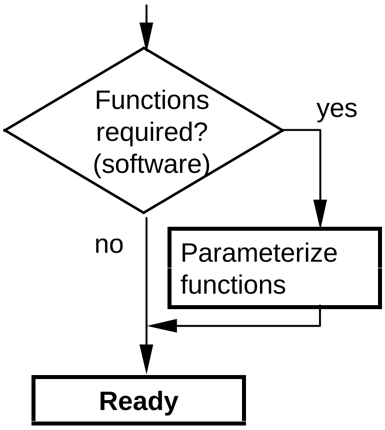
Adjust tacho:
- Tacho at ATI: refer to the ATI Instruction Manual
- Tacho at terminal strip CU:
  ☞ Section 6.3 „Analog inputs“

Change factory setting for:
Command- and setpoint sources,
Destinations for signals and actual values

Process data: (☞ Chapter 5 „Process data“)
- Control word (commands)/status word (messages)
- Setpoint/actual values

  Possible process data sources/destinations: (Sections 5.1 to 5.3)
  - Binary inputs, binary outputs
  - Analog inputs, analog outputs
  - Serial interface in the basic converter (SST1, SST2)
  - Option boards (SCB, TSY, CB, TB)

Simple applications: ☞ Section 4.6



Possible functions:
KIP, WEA, restart-on-the-fly, DC braking, selectivity, Vd-max. controller

Parameterize function:
Chapter 9 „Functions“
and Chapter 11 „Parameter list“

- ♦ detailed parameter description: ☞ Chapter 11 „Parameter list“
- ♦ detailed function diagrams: ☞ Chapter 10 „Function diagrams“

4.3 Drive start-up when the drive converter is controlled through an external main contactor

It is not absolutely necessary that the converter is operated with a main- or output contactor. If the converter control functions have to be maintained with the main contactor open, an external 24 V DC power is required.

Binary output 1 (-X9:4,5) is provided to control the contact (pre-assigned P612).

The checkback signal can be wired to a binary input (e.g. binary input 3).

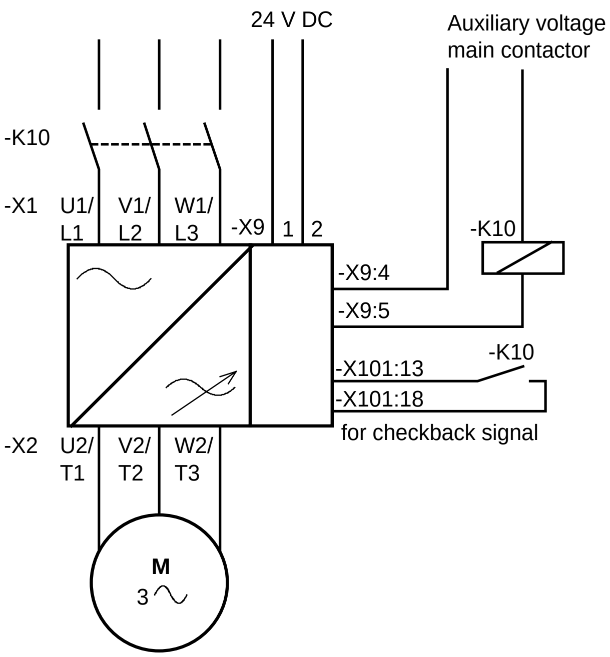


Fig. 4.4 Example for connecting an main- and input contactor

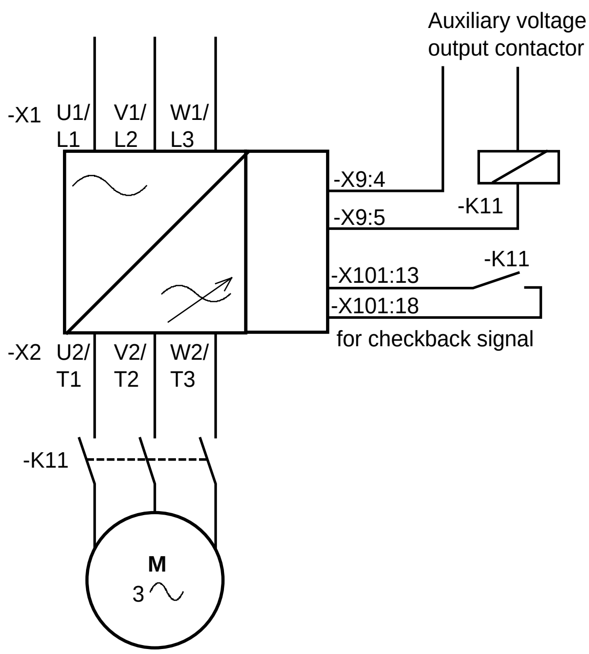


Fig. 4.5 Example for connecting an output contactor

Sequence control, on command-operation (effect on the main- or output contactor).

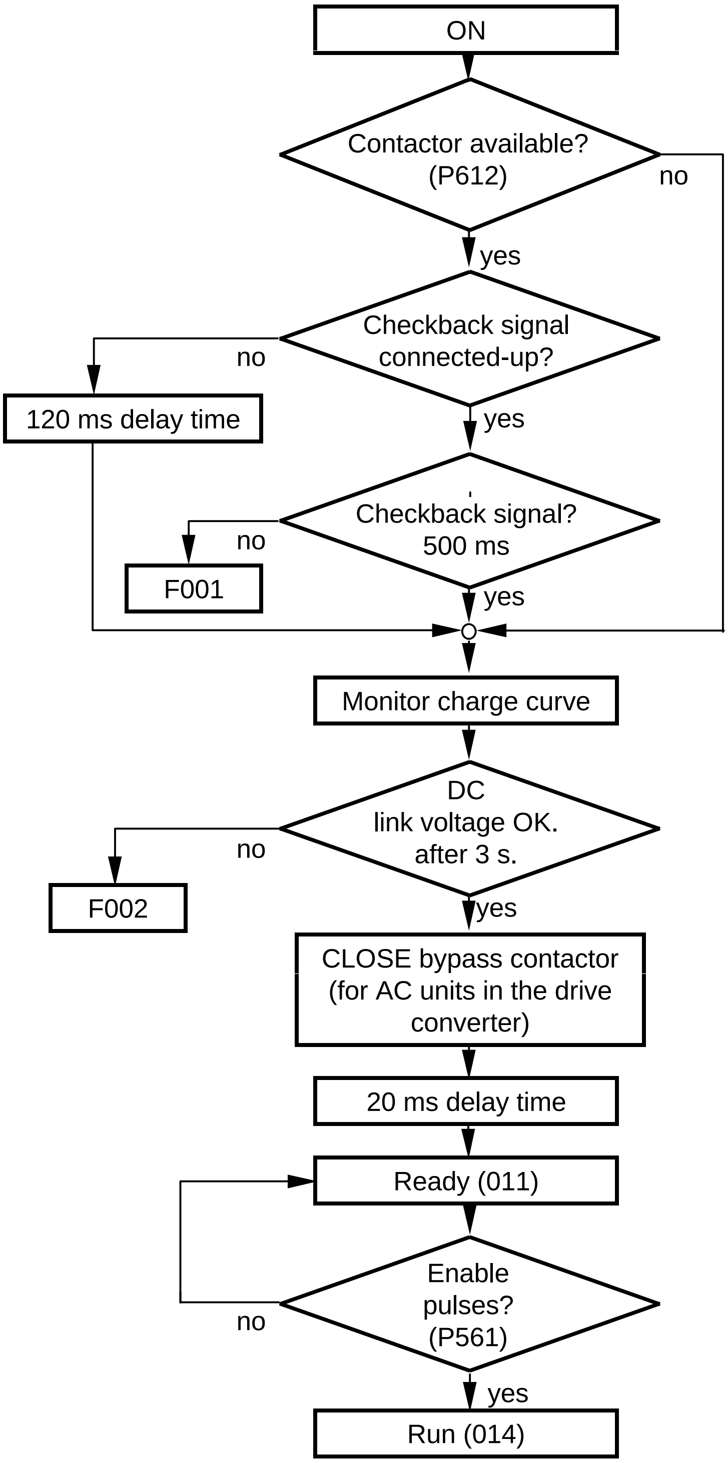


Fig. 4.6 Sequence control, on command- operation

Parameter- No.	Name	Index	Parameter-value	Terminal	With contactor(s)	Contactor(s) with checkback signals
P612	Dst.MC energized	i001	1001	X9: 4,5	X	X
P591	Src MC chckbck sig. binary input 3	-	1003	X101:18		X

Table 4.3 Recommended parameterization for the main- and output contactors

4.4 Drive start-up after enabling additional software functions or hardware options

If new software functions were enabled in the drive converter or hardware options installed, start-up must be repeated. This must be realized using the same steps as for first start-up:

- Standard application; ☞ refer to Section 4.2.1
- Expert application: ☞ refer to Section 4.2.2

NOTES
♦ Depending on the required change and taking into account the access stage (P051), and a possibly necessary function selection (P052), a jump can be made to the appropriate step.
♦ Due to background calculations, it is recommended that the following parameters and functions selections are checked/executed after the position jumped to!

For example:

Standard application (Section 4.2.1): Changing motor data

- ♦ P051 = 2 Access stage
- ♦ P052 = 5 Function selection, „drive setting“
- ♦ Change motor data
- ♦ Check subsequent parameters
- ♦ P052 = 0 Return from function selection
- ♦ P051 = 1 Access stage

Description of the „function selection“ (P052) and „motor identification at standstill“ (P052 = 7), ☞ Sections 8.1.4 and 8.1.6.

Subsequent enabling of „functions“: ☞ Chapter 9

Subsequent enabling of „hardware options“, Additional information regarding the appropriate options is provided in the Instruction Manuals.

4.5 Simple application examples for connecting process data with connection assignment

Connecting-up: ☞ Chapter 1 „Control terminal strip“

Multiple use of control word bits and source connections are permitted.

Caution: This excludes undesirable connections; e.g. factory setting basic/reserve changeover connected at binary input 5 (P590 = 1005)

4.5.1 Factory setting

Switch-on/off as well as setpoint input via the PMU, messages and actual values via the terminal strip.
Terminal strip only operational if binary input 5 (BE5) is energized (high signal level corresponds to „reserve“).
If BE5 is open (low signal level), then operator control is realized via the PMU.
The factory setting shown is not valid for cabinet units (compare P077)

Controlling via PMU Basic setting		**Switch-on/off, setpoint input**	**Controlling via terminal strip Reserve setting**	
CU1 -X101/13 P24 -X101/20 BE5			**CU1** -X101/13 P24 -X101/20 BE5	
	PMU			**CU1** -X101/13 P24
P554.1 = 1010	I / O	------------ON/OFF1 -------------	P554.2 = 1001	-X101/16 BE1
P555.1 = 1	no source	----- OFF2 (pulse inhibit)-------	P555.2 = 1002	-X101/17 BE2
P565.1 = 0	only PMU	---------- Aknowledge------------	P565.2 = 1003	-X101/18 BE3
P580.1 = 1	no source	------- Fixed setpoint 0/1 --------	P580.2 = 1004	-X101/19 BE4
P573.1 = 1010	△	---------Raise mot. pot.----------	P573.2 = 0	no source
P574.1 = 1010	▽	-------- Lower mot. pot. ---------	P574.2 = 0	no source

Fig. 4.7 Factory setting: Switsch-on/off as well as setpoint input

Examples of output connections:

Messages and setpoints	**Parameter values / terminals**		
		CU1	
Floating contact ----------------------------------	----------------------	-X100/06	BA2
Fault --	P603.1 = 1002	-X100/07	BA2
		-X101/13	P24
Basic/reserve --------------------------------------	P590 = 1005	-X101/20	BE5
Speed/frequency-act. value --------------------	P655.1 = 0218	-X102/33	AA1M
		-X102/34	AA1

Fig. 4.8 Factory setting: Messages and setpoints

4.5.2 Manual/automatic operation (Basic/reserve changeover)

Manual operation (BE5 low signal level): Setpoint- and command input via the terminal strip.

Automatic operation (BE5 high signal level): Setpoint-and command input from the automation unt via serial interface (SST1), OFF3 and the monitoring of external faults via a terminal strip also possible.

Recommended parameterization:

Manual operation, Controlling via terminal strip			**Setpoint- and command input**	**Automatic operation**		
	CU1			**CU1**		
	-X101/13	P24		-X101/13	P24	
	-X101/20	BE5		-X101/20	BE5	
	SST2					
	-X101/13	P24				
P554.1 = 1001	-X101/16	BE1	------------ ON/OFF1 -----------	P554.2 = 2001	SST2 control word	
P558.1 = 1002	-X101/17	BE2	--------OFF3 (fast stop)-------	P559.2 = 2001		
P565.1 = 1003	-X101/18	BE3	---------- Aknowledge---------	P565.2 = 2001		
P575.1 = 1004	-X101/19	BE4	-------- Fault external 1 -------			
			--------- cw phase seq. --------	P571.2 = 2001		
			-------- ccw phase seq. -------	P572.2 = 2001		
P443.1 = 1003	-X102/27	AE1	----------Main setpoint---------	P443.2 = 2002	SST2 word 2	
	-X102/28	AE1M				

Fig. 4.9 Manual / automatic: switsch-on/off as well as setpoint input

Examples of output connections:

Messages and setpoints	**Parameter values / terminals**		
		CU1	
Floating contact-----------------------------------	---------------------	-X100/06	BA2
Operation--	P602.1 = 1002	-X100/07	BA2
		-X101/13	P24
Basic/reserve--------------------------------------	P590 = 1005	-X101/20	BE5
Output current------------------------------------	P655.1 = 0004	-X102/33	AA1M
		-X102/34	AA1

Fig. 4.10 Manual / automatic: Messages and setpoints

Tip: If a terminal cannot be connected-up as source or destination, it should be checked as to whether it has already been used for other signals.

5 Process data

5.1 Control word (control word 1 and control word 2)

Introduction and application example

An individual source can be parameterized for every control command, from where the control command may be output (fixed values, binary inputs, PMU, PZD part of the telegram from the automation devices).

The selection parameters for the sources are, with the exception of P590 and P591 are indexed 2x as follows:

Index i001: Basic setting (GRD)
Index i002: Reserve setting (RES)

One parameter is available to „connect-up“ the source(s) for the control commands.

Example for connecting-up the sources:

The basic setting for the ON command (control word bit 0, control word 1), should be „connected-up“ to binary input 1 of the CU (terminal -X101:16):

- From control word 1 table, one can identify that the factory setting of parameter P554.1 is 1010 for the basic setting of the ON command source.
- In Table A for the possible sources of the ON-command, one can see that 1010 corresponds to the „PMU operator control panel“ source.
- The parameter value for the required source is searched for in Tables X and A. For binary input 1 (BE1) of the CU, the result is found in table X, it is 1001.
- This parameter value must now be entered into parameter P554.1.

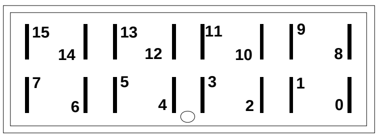
Command	Parameter	Possible sources	Parameter value	Required source connection
ON/OFF1 (GRD)	P554.1	Tab. X,A	1001	BE1 terminal -X101:16

A high signal at terminal -X101:16 powers-up the drive converter; a low signal powers-down the drive converter.

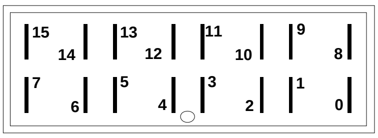
INFORMATION

- Multiple wiring is permitted!
- The control word commands „OFF2“ (bit 1), „OFF3“ (bit 2) and „acknowledge“ (bit 7) are always simultaneously effective from 3 sources (can be parameterized)!
- „Acknowledge“ (bit7) is additionally always effective from the PMU!
- If the „on“ command (bit 0) is connected to a serial interface (SST, CB/TB, SCB-SST), then the following must be observed for safety-related reasons:
  Additionally, an „OFF2“ or „OFF3“ command must be parameterized at the terminal strip/PMU, as otherwise the converter cannot be shutdown with a a defined command, when communications fail!

5.1.1 Control word display using the 7-segment display on the PMU



Control word 1



Control word 2

5.1.2 Control word 1 (Visualization parameter r550 or r967)

The factory setting is only valid for P077 = 0.

Designation / Bit No. (Significance)	Value High / Low (1 = High, 0 = Low)				Parameter No. BAS (RES)	Fact. setting. BAS (RES) (P077 = 0)	Source selection see 5.1.4
ON / OFF1 (Stop)	ON		OFF1				
0	1		0		P554.1 (2)	1010 (1001)	Tab. X,A
OFF2 (electrical)	ON		OFF2				
1	1		0		& P555.1 (2)	0001 (1002)	Tab. X,B
					& P556.1 (2)	0001 (0001)	Tab. X,B
					& P557.1 (2)	0001 (0001)	Tab. X,B
OFF3 (fast stop)	ON		OFF3				
2	1		0		& P558.1 (2)	0001 (0001)	Tab. X,B
					& P559.1 (2)	0001 (0001)	Tab. X,B
					& P560.1 (2)	0001 (0001)	Tab. X,B
Inverter enable	Inverter enable		Inhibit inverter				
3	1		0		P561.1 (2)	0001 (0001)	Tab. X,F
RFG enable	RFG enable		Inhibit RFG				
4	1		0		P562.1 (2)	0001 (0001)	Tab. X,F
Start RFG	Start RFG		RFG stop				
5	1		0		P563.1 (2)	0001 (0001)	Tab. X,F
Setpoint enable	Setpoint enable		Inhibit setpoint				
6	1		0		P564.1 (2)	0001 (0001)	Tab. X,F
Acknowledge	ON						
7	0 → 1 (rising edge)				P565.1 (2)	0000 (1003)	Tab. X,C
					P566.1 (2)	0000 (0000)	Tab. X,C
					P567.1 (2)	2001 (2001)	Tab. X,C
						1010 (fixed)	
Inching 1	Inching 1 ON		Inching 1 OFF				
8	1		0		P568.1 (2)	0000 (0000)	Tab. X,C
9	Reserve						
Control from the PLC	Control		no control				
10	1		0		≥1	SST1/2	
						CB / TB	
						SCB 2	
Enable ph. seq.	Both enab.	ccw ph seq	cw ph. seq	No ph seq			
11	1	0	1	0	P571.1 (2)	0001 (0001)	Tab. X,E
12	1	1	0	0	P572.1 (2)	0001 (0001)	Tab. X,E
Motor potentiometer	Stop	Raise	Lower	Stop			
13	0	1	0	1	P573.1 (2)	1010 (0000)	Tab. X,A
14	0	0	1	1	P574.1 (2)	1010 (0000)	Tab. X,A
Fault, external 1	no fault		Fault, external 1				
15	1		0		P575.1 (2)	0001 (0001)	Tab. X,D

5.1.3 Control word 2 (Visualization parameter r551)

The factory setting is only valid for P077 = 0

Designation / Bit No. (Significance)	Value High / Low (1 = High, 0 = Low)				Parameter No. BAS (RES)	Fact. setting. BAS (RES) (P077 = 0)	Source selection see 5.1.4
Setpoint data set	SDS 2		SDS 1				
16	1		0		P576.1 (2)	0000 (0000)	Tab. X,I
17	Reserve						
Motor data set	MDS 2		MDS 1				
18	1		0		P578.1 (2)	0000 (0000)	Tab. X,I
19	Reserve						
Fixed setpoint	FS 4	FS 3	FS 2	FS 1			
20	1	0	1	0	P580.1 (2)	0000 (1004)	Tab. X,I
21	1	1	0	0	P581.1 (2)	0000 (0000)	Tab. X,I
22	Reserve						
Restart-on-the-fly	Enable		Inhibit				
23	1		0		P583.1 (2)	0000 (0000)	Tab. X,I
Technology controller	Enable		Inhibit				
24	1		0		P584.1 (2)	0000 (0000)	Tab. X,I
25	Reserve						
Fault, external 2	No fault		Fault, external 2				
26	1		0		P586.1 (2)	0001 (0001)	Tab. X,G
27	Reserve						
Alarm, external 1	No alarm		Alarm, external 1				
28	1		0		P588.1 (2)	0001 (0001)	Tab. X,G
Alarm, external 2	No alarm		Alarm, external 2				
29	1		0		P589.1 (2)	0001 (0001)	Tab. X,G
Basic/reserve	Reserve setting		Basic setting				
30	1		0		P590	1005	Tab. X,I
HS checkback sig.	HS checkback sig.		No HS checkb. sig.				
31	1		0		P591	0001	Tab. X,H

5.1.4 Selecting the source for control words 1 and 2

Table X (external pins)

1001	BE1 Pin -X101:16
1002	BE2 Pin -X101:17
1003	BE3 Pin -X101:18
1004	BE4 Pin -X101:19
1005	BE5 Pin -X101:20
4101	SCI, Slave1, Pin 01
4102	SCI, Slave1, Pin 02
4103	SCI, Slave1, Pin 03
4104	SCI, Slave1, Pin 04
4105	SCI, Slave1, Pin 05
4106	SCI, Slave1, Pin 06
4107	SCI, Slave1, Pin 07
4108	SCI, Slave1, Pin 08
4109	SCI, Slave1, Pin 09
4110	SCI, Slave1, Pin 10
4111	SCI, Slave1, Pin 11
4112	SCI, Slave1, Pin 12
4113	SCI, Slave1, Pin 13
4114	SCI, Slave1, Pin 14
4115	SCI, Slave1, Pin 15
4116	SCI, Slave1, Pin 16
4201	SCI, Slave2, Pin 01
4202	SCI, Slave2, Pin 02
4203	SCI, Slave2, Pin 03
4204	SCI, Slave2, Pin 04
4205	SCI, Slave2, Pin 05
4206	SCI, Slave2, Pin 06
4207	SCI, Slave2, Pin 07
4208	SCI, Slave2, Pin 08
4209	SCI, Slave2, Pin 09
4210	SCI, Slave2, Pin 10
4211	SCI, Slave2, Pin 11
4212	SCI, Slave2, Pin 12
4213	SCI, Slave2, Pin 13
4214	SCI, Slave2, Pin 14
4215	SCI, Slave2, Pin 15
4216	SCI, Slave2, Pin 16
5001	TSY, Pin 1

Table A

0000	constant value 0
1010	PMU
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5

Table B

0001	constant value 1
1010	PMU
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5

Table C

0000	constant value 0
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5

Table D

0001	constant value 1
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5

Table E

0000	constant value 0
0001	constant value 1
1010	PMU
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5

Table F

0000	constant value 0
0001	constant value 1
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5

Table G

0001	constant value 1
2004	SST1 word 4
3004	CB/TB word 4
4501	SCB1/2 peer-to-peer, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, SCB2 USS, word 4
4505	SCB1/2 peer-to-peer, word 5

Table H

0001	No HS checkback sig.
4501	SCB1/2 peer-to-peer, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5

Table I

0000	constant value 0
0001	constant value 1
2004	SST1 word 4
3004	CB/TB word 4
4501	SCB1/2 peer-to-peer, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, SCB2 USS, word 4
4505	SCB1/2 peer-to-peer, word 5

5.1.5 Significance of control word- (1 and 2) commands

The operating statuses can be read in monitoring parameter r001: e.g. READY-TO-POWER-UP: r001=009.

The function sequences are described in the sequence in which they are realized.

Bit 0: ON / OFF1 command (↑ „ON“) / (L „OFF1“)

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON (009).

Folge:
- PRE-CHARGING (010)
  Main contactor/bypass contactor (option) are switched-in, if present
  Pre-charging is realized
- READY STATUS (011)
  If the unit was last powered don using „OFF2“, the drive converter only changes over into the next status after the de-energization time (P371) since the last shutdown instant.
- GROUND FAULT TEST (012), only for selected ground-fault test (P354).
- RESTART-ON-THE-FLY (013), if restart-on-the-fly (control word bit 23 via P583) is enabled**.**
- READY (014).

LOW-Signal

Result:
- OFF1 (015), if the unit is in a status with inverter enable.

  The setpoint is inhibited at the ramp-function generator input (setpoint=0), so that the drive is decelerated along the parameterized deceleration ramp (P464) down to the OFF shutdown frequency (P514).

  After the OFF delay time has expired (P516), the inverter pulses are inhibited, and the main contactor, if available, is opened. If the OFF1 command is again withdrawn during ramp-down (e.g. using an ON command), deceleration is interrupted, and the drive goes into the „RUN (014) status.
- The inverter pulses are inhibited, and the main contactor, if available, opened for PRECHARGING (010), READY (011), RESTART-ON-THE-FLY (013) or MOT-ID STANDSTILL (018).
- SWITCH-ON INHIBIT (008)
- SWITCH-ON INHIBIT (009), if „OFF2“ or „OFF3“ is not present.

Bit 1: OFF2 command (L „OFF2“) (electrical)

LOW signal

Result:
- The inverter pulses are inhibited, and the main contact, if available, opened.
- SWITCH-ON INHIBIT (008), until the command is withdrawn.

NOTE
The **OFF2** command is simultaneously effective from three sources (P555, P556 and P557)!

Bit 2: OFF3 command (L „OFF3“) (fast stop)

LOW signal

Result:
- ♦ This command has two possible effects:
  - DC braking is enabled (P372 = 1):
    DC braking (017)
    The drive decelerates along the parameterized down ramp for OFF3 (P466), until it reaches the start of DC braking frequency (P375).
    The inverter pulses are then inhibited for the duration of the de-energization time (P371).
    DC current braking is then realized with an adjustable braking current (P373) with a braking time which can be parameterized (P374).
    The inverter pulses are then inhibited, and the main contactor, if available, is opened.
  - DC braking is not enabled (P372 = 0):
    The setpoint is inhibited at the ramp-function generator input (setpoint = 0), so that the drive decelerates along the parameterized downramp for OFF3 (P466) to the OFF shutdown frequency (P514).
    After the OFF delay time (P516) has expired, the inverter pulses are inhibited, and the main/bypass contactor, if available, is opened.
    If the OFF 3 command is again withdrawn during deceleration, the drive still continues to decelerate.
    ☞ Section 6.6 „Ramp-function generator“
- ♦ The inverter pulses are inhibited, and the main/bypass contactor, if available, is opened for PRECHARGING (010), READY (011), RESTART-ON-THE-FLY (013) or MOT-ID STANDSTILL (018).
- ♦ If the drive operates as slave drive, then it automatically switches-over to master drive, for an OFF3 command.
- ♦ SWITCH-ON INHIBIT (008), until the command is withdrawn.

NOTE
♦ The **OFF 3** command is simultaneously effective from three sources (P558, P559 und P560)!
♦ Priority of the **OFF** commands: **OFF2** > **OFF3** > **OFF1**

Bit 3: Inverter enable command (H „inverter enable“) / (L „inverter inhibit“)

HIGH signal, READY (011) and expiration of the de-energization time (P371) since the last shutdown instant.

Result:
- ♦ RUN (014)
  The inverter pulses are enabled, and the setpoint is approached via the ramp-function generator.

LOW signal

Result:
- ♦ For RESTART-ON-THE-FLY (013), RUN (014) or KINETIC BUFFERING with pulse enable:
  Changeover into the READY (011) status, the inverter pulses are inhibited.
- ♦ For OFF1 (015 / stop), the inverter pulses are inhibited, the main contact, if available, opens, and the drive converter changes over into the SWITCH-ON INHIBIT status (008).
- ♦ For OFF3 (016 / fast stop), the inverter inhibit command is ignored, and fast stop is continued.

Bit 4: Ramp-function generator inhibit command (L „inhibit ramp-function generator“)

LOW signal in the RUN (014) status.

Result: ♦ The ramp-function generator output is set to setpoint = 0.

Bit 5: Ramp-function generator stop command (L „ramp-function generator stop“)

LOW signal in the RUN status (014).

Result: ♦ The actual setpoint is frozen at the ramp-function generator output.

Bit 6: Setpoint enable command (H „setpoint enable“)

HIGH signal and expiration of the de-energization time (P189).

Result: ♦ The setpoint at the ramp-function generator input is enabled.

Bit 7: Acknowledge command (↑ „Acknowledge“)

Positive edge change from (L → H) in the FAULT status (007).

Result:
- ♦ All of the actual faults are deleted after they have been previously transferred into the diagnostics memory.
- ♦ SWITCH-ON INHIBIT (008), if no actual faults exist.
- ♦ FAULT (007), if additional actual faults exist.

NOTE
The **acknowledge** command is simultaneously effective from three sources (P565, P566 und P567) and alwlays from the PMU!

Bit 8: Inching 1 ON command (↑ „Inching 1 ON“) / (L „Inching 1 OFF“)

Positive edge change from L to H (L → H) in the READY TO SWITCH-ON status (009).

Result: ♦ An ON command (refer to control word, bit 0) is issued, and the inching frequency 1 (P448) is enabled in the setpoint channel.
The ON/OFF1 command (bit 0) is ignored for active inching operation.

LOW signal

Result: ♦ An OFF1 command (refer to control word bit 0) is automatically issued.

Bit 9: Reserved

Bit 10: Control from the PLC command (H „control from the PLC“)

HIGH signal; Process data PZD (control word, setpoints) which were sent via the SST1 interface of CU, the CB/TB interface (option) and the SST/SCB interface (option), are only evaluated if the command was accepted.

Result:
- ♦ If several interfaces are operational, only the process data of the interfaces are evaluated, which transmit the H signal.
- ♦ For an L signal, the last values are retained in the appropriate dual port RAM of the interface.

NOTE
An H signal appears in the visualization parameter r550 „control word 1“, if **one** of the interfaces transmits an H signal!

Bit 11: Clockwise phase sequence command (H „clockwise phase sequence“)

HIGH signal

Result: ♦ The setpoint is influenced in conjunction with bit 12 „counter-clockwise rotating field“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 2)“*

Bit 12: Counter-clockwise phase sequence command (H „counter-clockwise phase sequence“)

HIGH signal

Result: ♦ The setpoint is influenced in conjunction with bit 11 „clockwise rotating field“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 2)“*

NOTE
The **counter-clockwise phase sequence**- and **clockwise phase sequence** commands have no influence on the supplementary setpoint, if this is added after the ramp-function generator via P432=0 (factory setting 1)!

Bit 13: Motorized potentiomenter, raise command (H „raise motorized potentiometer“)

HIGH signal

Result: ♦ The motorized potentiometer in the setpoint channel is energized in conjunction with bit 14 „motorized potentiometer, lower“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 1)“*

Bit 14: Motorized potentiometer, lower command (H „motorized potentiometer, lower)

HIGH signal

Result: ♦ The motorized potentiometer in the setpoint channel is energized in conjunction with bit 13 „motorized potentiometer, raise“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 1)“*

Bit 15: Fault, external 1 command (L „fault, external 1“)

LOW signal

Result: ♦ FAULT (007) and fault message (F035).
The inverter pulses are inhibited and the main contactor, if available, is opened.

☞ *Chapter 12 „Fault and alarm messages“*

Bit 16: Setpoint channel data set SDS bit 0 command (H „SDS2“) / (L „SDS1“)

HIGH signal activates SDS2, LOW signal, SDS1.

Result: ♦ The parameter settings of the appropriate data set are activated in the setpoint channel.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Part 1) / data sets“*

Bit 17: Reserved

Bit 18: Motor data set MDS bit 0 command (H „MDS2“) / (L „MDS1“)

READY-TO-SWITCH-ON (009), PRECHARGING (010) or READY (011)

HIGH signal activates MDS2, LOW signal, MDS1.

Result: ♦ The parameter settings of the appropriate motor data set in the setpoint channel and in the open-loop/closed-loop control are activated.

☞ *Chapter 10 „Function diagram, data sets“*

Bit 19: Reserved

Bit 20: Fixed setpoint FSW bit 0 (LSB command)

Result: ♦ One of the four possible fixed setpoints is controlled in conjunction with bit 21 „FSW BIT 1“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 1) / data sets“*

Bit 21: Fixed setpoint FSW bit 1 (MSB) command

Result: ♦ One of the four possible fixed setpoints is controlled in conjunction with bit 20 „FSW BIT 0“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 1) / data sets“*

Bit 22: Reserved

Bit 23: Restart-on-the-fly enable command (H „enable restart-on-the-fly“)

HIGH-Signal

Folge: ♦ This command enables the restart-on-the-fly function.

☞ *Chapter 9 „Functions (software)"*

Bit 24: Technology controller enable command (H „technology controller enable")

HIGH-Signal

Folge: ♦ The command activates the technology controller if the inverter pulses are enabled and the excitation time has expired. The technology controller can be parameterized using parameters P525 to P545.

☞ *Chapter 10 „Function diagrams, closed-loop control" and Chapter 11 „Parameter list"*

Bit 25: Reserved

Bit 26: Fault, external 2 command (L „fault, external 2")

LOW signal; only activated from the READY status (011) with an additional time delay of 200 ms.

Result: ♦ FAULT (007) and fault message (F036).
The inverter pulses are inhibited, the main contactor, if available, is opened.

☞ *Chapter 12 „Fault and alarm messages"*

Bit 27: Reserved

Bit 28: Alarm, external 1 command (L „alarm, external 1")

LOW signal

Result: ♦ The operating status is retained. An alarm message (A015) is output.

☞ *Chapter 12 „Fault and alarm messages"*

Bit 29: Alarm, external 2 command (L „alarm, external 2")

LOW-Signal

Result: ♦ The operating status is retained. An alarm message (A016) is output.

☞ *Chapter 12 „Fault and alarm messages"*

Bit 30: Selection, reserve/basic setting command (H „reserve setting") / (L „basic setting")

HIGH signal

Folge: ♦ The parameter settings of the reserve setting for the control word itself, the setpoint channel, and the closed-loop control are activated.

LOW signal

Result: ♦ The parameter settings of the basic setting for the control word itself, the setpoint channel, and the closed-loop control are activated.

☞ *Chapter 10 „Function diagrams, data sets"*

Bit 31: HS checkback signal command (H „HS checkback signal")

HIGH signal, corresponding to the configuration (wiring) and parameterization of the main contactor (option).

Result: ♦ Checkback signal, „main contactor energized".

☞ *Chapter „Options" in Operating Instructions, Part 1*

5.2 Status word

Introduction and application example

Status words are process data in the sense of the explanation in Section 3.2.

A „destination“ can be parameterized for every bit of a status word, which can be identified by the bit status (binary outputs of the CU, SCI 1/2 terminals, TSY terminals).

A parameter is available to „connect-up“ the destination for each status bit.

The selection parameters are indexed three times as follows:

Index i001 Selecting a terminal on the CU / PEU board (basic drive converter)
Index i002 Selecting a terminal on the SCI 1/2 board (option)
Index i003 Selecting a terminal on the TSY board (option)

Example for connecting-up the destination:

The „ramp-function generator active“ signal (status word 1, bit 13), is to be connected-up as high-active signal at binary output 2 (BA2) of CU (terminal -X100:6/7) :

- The status bit „connection“ to binary output of the CU is parameterized via index i001.
- From the status word 1 table, it can be identified that the „ramp-function generator active“ signal is assigned to parameter P613.
- The parameter value for the required destination is searched for in the same table. The result is 1002 for binary output 2 of the CU.
- This parameter value must now be entered into parameter P613.1.

Bit #	Significance	Parameter	Parameter value	Required destination connection
Bit 13	Ramp-function generator active	P613.1	1002	BA2 terminal -X100:6/7

For a high signal at terminal -X100:6/7, the ramp-function generator is active; it is inactive for a low signal.

If a value, which is assigned a terminal (binary output BA), is assigned once in a select parameter for a destination, then it is no longer available in the same index of another select parameter, as a terminal is only suitable to output one status bit.

INFORMATION

Faults, alarms and **power-on inhibit (HIGH active),** are displayed via the terminal strip (binary outputs) as **LOW active**.

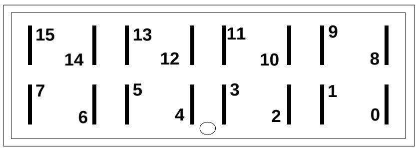
This is also valid for possible option boards!

☞ Section 6.2 „Binary outputs“

5.2.1 Status word 1 (visualization parameter r552 or r968)

PMU display

„Status word 1“



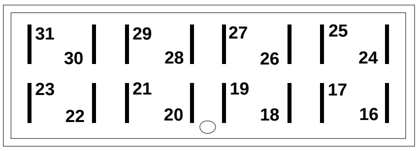
Bit #	Value	1 = High 0 = Low	Select dest.
Bit 0	1	Ready-to-switch-on	P600.x
	0	Not ready to switch on	
Bit 1	1	Ready	P601.x
	0	Not ready	
Bit 2	1	Run	P602.x
	0	Inverter pulses inhibited	
Bit 3	1	Fault	P603.x
	0	No fault	
Bit 4	1	No OFF 2	P604.x
	0	OFF2	
Bit 5	1	No OFF 3	P605.x
	0	OFF3	
Bit 6	1	Switch-on inhibit	P606.x
	0	No switch-on inhibit	
Bit 7	1	Alarm	P607.x
	0	No alarm	
Bit 8	1	No setpt. act. val. deviation	P608.x
	0	Setpt. act. value deviation	
Bit 9	1	PZD control requested	always 1
	0	(not permissible)	
Bit 10	1	Comparison freq. reached	P610.x
	0	Actual val. < comparitive freq.	
Bit 11	1	Fault, undervoltage	P611.x
	0	No undervoltage fault	
Bit 12	1	Main contactor energized	P612.x
	0	Main contactor not energized	
Bit 13	1	HLG active	P613.x
	0	HLG not active	
Bit 14	1	Clockwise phase sequence	P614.x
	0	Counter-clockwise phase seq.	
Bit 15		KIP/FLN active	P615.x
	0	KIP/FLN not active	

	Value	Destination
x = 1	0000	No destination
	1001	BA1, -X9:4/5
	1002	BA2, -X100:6/7/8
x = 2	0000	No destination
	4101	SCI 1/2, slave 1, BA1
	4102	SCI 1/2, slave 1, BA2
	4103	SCI 1/2, slave 1, BA3
	4104	SCI 1/2, slave 1, BA4
	4105	SCI 1/2, slave 1, BA5
	4106	SCI 1/2, slave 1, BA6
	4107	SCI 1/2, slave 1, BA7
	4108	SCI 1/2, slave 1, BA8
	4109	only SCI 2, slave 1, BA9
	4110	only SCI 2, slave 1, BA10
	4111	only SCI 2, slave 1, BA11
	4112	only SCI 2, slave 1, BA12
	4201	SCI 1/2, slave 2, BA1
	4202	SCI 1/2, slave 2, BA2
	4203	SCI 1/2, slave 2, BA3
	4204	SCI 1/2, slave 2, BA4
	4205	SCI 1/2, slave 2, BA5
	4206	SCI 1/2, slave 2, BA6
	4207	SCI 1/2, slave 2, BA7
	4208	SCI 1/2, slave 2, BA8
	4209	only SCI 2, slave 2, BA9
	4210	only SCI 2, slave 2, BA10
	4211	only SCI 2, slave 2, BA11
	4212	only SCI 2, slave 2, BA12
x = 3	0000	No destination
	5001	TSY, BA1
	5002	TSY, BA2

5.2.2 Status word 2 (visualization parameter r553)

PMU display

„Status word 2“



Bit #	Value	1 = High 0 = Low	Select dest.
Bit 16	1	Restart on the fly active	P616.x
	0	Restart-on-the-fly not active	
Bit 17		Reserved	
Bit 18	1	No overspeed	P618.x
	0	Overspeed	
Bit 19	1	Fault, external 1	P619.x
	0	No fault, external 1	
Bit 20	1	Fault, external 2	P620.x
	0	No fault, external 2	
Bit 21	1	Alarm, external	P621.x
	0	No alarm, external	
Bit 22	1	Alarm i2t converter	P622.x
	0	No alarm, i2t converter	
Bit 23	1	Fault, overtemp., converter	P623.x
	0	No fault, overtemp. conv.	
Bit 24	1	Alarm, overtemp., conv.	P624.x
	0	No alarm, overtemp., conv.	
Bit 25	1	Alarm, motor overtemp.	P625.x
	0	No alarm, overtemp. mot.	
Bit 26	1	Fault, motor overtemp.	P626.x
	0	No fault, overtemp. mot.	
Bit 27	1	T. contr. act. val.>T. contr. setp.	P627.x
	0	T. contr. act. val.<T. contr. setp.	
Bit 28	1	Fault, motor stall/lock	P628.x
	0	No fault motor stall/lock	
Bit 29	1	Bypass contactor energized	P629.x
	0	Bypass contactor not energized	
Bit 30		Reserved	
Bit 31	1	Pre-charging active	P631.x
	0	Pre-charging not active	

	Value	Destination
x = 1	0000	No destination
	1001	BA1, -X9:4/5
	1002	BA2, -X100:6/7/8
x = 2	0000	No destination
	4101	SCI 1/2, slave 1, BA1
	4102	SCI 1/2, slave 1, BA2
	4103	SCI 1/2, slave 1, BA3
	4104	SCI 1/2, slave 1, BA4
	4105	SCI 1/2, slave 1, BA5
	4106	SCI 1/2, slave 1, BA6
	4107	SCI 1/2, slave 1, BA7
	4108	SCI 1/2, slave 1, BA8
	4109	only SCI 2, slave 1, BA9
	4110	only SCI 2, slave 1, BA10
	4111	only SCI 2, slave 1, BA11
	4112	only SCI 2, slave 1, BA12
	4201	SCI 1/2, slave 2, BA1
	4202	SCI 1/2, slave 2, BA2
	4203	SCI 1/2, slave 2, BA3
	4204	SCI 1/2, slave 2, BA4
	4205	SCI 1/2, slave 2, BA5
	4206	SCI 1/2, slave 2, BA6
	4207	SCI 1/2, slave 2, BA7
	4208	SCI 1/2, slave 2, BA8
	4209	only SCI 2, slave 2, BA9
	4210	only SCI 2, slave 2, BA10
	4211	only SCI 2, slave 2, BA11
	4212	only SCI 2, slave 2, BA12
x = 3	0000	No destination
	5001	TSY, BA1
	5002	TSY, BA2

5.2.3 Significance of the status word messages

Bit 0: Signal, „Ready to switch-on“ (H)

HIGH signal: SWITCH-ON INHIBIT (008) or READY-TO-SWITCH-ON (009) status

Significance
- ♦ The power supply, the open-loop and closed-loop control are operational.
- ♦ The inverter impulses are inhibited.
- ♦ If an external power supply and a main contactor (option) are available, it is possible that the DC link can be brought into a no-voltage condition in this converter status!

Bit 1: Signal, „ready“ (H)

HIGH signal: PRE-CHARGING (010) or READY (011) status

Significance
- ♦ The power supply, the open-loop and closed-loop control are operational.
- ♦ The converter is switched-on.
- ♦ Pre-charging is executed (has been completed).
- ♦ The DC link is ramped-up to the full voltage (has attained full voltage).
- ♦ The inverter pulses are still inhibited.

Bit 2: Signal, „run“ (H)

HIGH signal: RESTART-ON-THE-FLY (013), RUN (014), OFF1 (015) or OFF3 (016) status

Significance
- ♦ The converter is functioning.
- ♦ The inverter pulses are enabled.
- ♦ The output terminals are live.

Bit 3: Signal, „Fault“ (H)

HIGH signal: FAULT (007) status

Significance ♦ A fault has occured.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 4: Signal, „OFF2“ (L)

LOW signal: OFF2 command present

Significance ♦ The OFF2 command (control word bit 1) was output.

Bit 5: Signal, „OFF3“ (L)

LOW signal : OFF3 (016) status, and/or OFF3 command available

Significance ♦ The OFF3 command (control word bit 2) was output.

Bit 6: Signal, „switch-on inhibit“ (H)

HIGH signal: SWITCH-ON INHIBIT (008) status

Significance
- The power supply, open- and closed-loop control are operational.
- If an external power supply and a main contactor (option) are available, it is possible that the DC link is in a no-voltage condition in this converter status!
- The message is continuously available as long as an OFF2 command is present via the control word bit1; or/and an OFF3 command is available via the control word bit 2 after the setpoint has been reduced; or/and an ON command is still available via the control word bit 0 (edge evaluation).

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 7: Signal, „alarm“ (H)

HIGH signal: Alarm (Axxx)

Significance
- An alarm has occured.
- The signal remains until the cause has been removed.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 8: Signal, „setpoint-actual value deviation“ (L)

LOW signal: Alarm „setpoint-actual value deviation“ (A034)

Significance
- The frequency actual value - frequency setpoint deviation is greater than P517 (Deviation Freq.) and remains for longer than the time parameterized in P518 (Deviation Time).
- The bit is again set to an H signal if the deviation is less than the parameter value P517.

Bit 9: Signal, „PZD control requested“ (H)

HIGH signal: It is always present.

Bit 10: Signal, „comparison frequency reached“ (H)

HIGH signal: The parameterized comparison frequency has been reached.

Significance
- The absolute frequency actual value is greater than or the same as the parameterized comparison frequency (P512).
- The bit is again set to L, as soon as the actual absolute frequency value falls below the comparison frequency (P512), minus the parameterized comparison frequency hysteresis (P513 in % referred to the comparison frequency (P512)).

Bit 11: Signal, „fault, undervoltage“ (H)

HIGH signal: Fault „undervoltage in the DC link“ (F008)

Significance
- The DC link voltage has fallen below the permissible limit value.

☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 12: Signal, „main contactor energized“ (H)

HIGH signal: The main contactor is energized.

Significance ♦ A main contactor (option) can be controlled with the appropriate „wiring“ and parameterization.
☞ Chapter „Options“ in the Operating Instructions, Part 1

Bit 13: Signal, „RFG active“ (H)

HIGH signal: Ramp-function generator active

Significance ♦ The ramp-function generator output value (r480) is not equal to the ramp-function input value (r460).
A hysteresis, which can be parameterized, (P476 in %, referred to the rated system frequency P420) can only be taken into account for an analog setpoint input.

Bit 14: Signal, „clockwise phase sequence“ (H)/“ counter-clockwise phase sequence“ (L)

HIGH signal: Clockwise phase sequence

Significance ♦ The frequency setpoint for the closed-loop control (n/f setpoint, r482), is greater than or equal to 0).

LOW signal: Counter-clockwise phase sequence

Significance ♦ The frequency setpoint for the closed-loop control (n/f setpoint, r482) is less than 0.

Bit 15: Signal, „KIP/FLN active“ (H)

HIGH signal: The kinetic buffering (KIP) function or the flexible response (FLN) function is active.

Significance
- ♦ KIP: A brief supply failure is buffered using the kinetic energy of the machine.
- ♦ FLN: The drive converter can be operated down to a minimum DC link voltage of 50% of the rated value.

☞ Chapter „Functions“

Bit 16: Signal, „restart-on-the-fly active“ (H)

HIGH signal: The restart-on-the-fly function is active or the excitation time (P189) is running.

Significance
- ♦ The drive converter has been switched to a motor which is still rotating.
- ♦ An overcurrent condition is prevented using the restart-on-the-fly function.
  ☞ Chapter 9 „Functions“
- ♦ The energization time is active.

Bit 17: Reserved

Bit 18: Signal, „overspeed“ (L)

LOW signal: Alarm „overspeed“ (A033)

Significance ♦ The frequency actual value is either:
- greater than the maximum frequency for a clockwise phase sequence (P452), plus a hysteresis (P519 in %, referred to P452) or
- is less than the maximum frequency for the counter-clockwise phase sequence (P453) plus a hysteresis (P519 in %, referred to P453).

♦ The bit is again set to an H, as soon as the absolute frequency actual value is less than or equal to the absolute value of the appropriate maximum frequency.

Bit 19: Signal, „fault, external 1“ (H)

HIGH signal: „Fault, external 1“

Significance ♦ A „fault, external 1“ is present in control word bit 15.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 20: Signal, „fault, external 2“ (H)

HIGH signal: „Fault, external 2“

Significance ♦ A „fault, external 2“ is present in control word bit 26.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 21: Signal, „external alarm“ (H)

HIGH signal: „External alarm“

Significance ♦ An „external alarm 1“ is present in control word bit 28, or an „external alarm 2“ in control word bit 29.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 22: Signal, „alarm i^2t inv.“ (H)

HIGH signal: Alarm „i^2t-Inv.“ (A025)

Significance ♦ If the instantaneous load status remains the same, then the drive converter will be thermally overloaded.
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 23: Signal, „Overtemperature fault signal UMR“ (H)

HIGH signal: „Inverter temperature too high“ fault (F023)

Significance ♦ The inverter temperature limit value was exceeded.
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 24: Signal, „motor overtemperature alarm“ (H)

HIGH signal: Alarm „inverter temperature too high“ (A022)

Significance ♦ Alarm temperature threshold of the inverter was exceeded.
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 25: Signal, „motor overtemperature alarm“ (H)

HIGH signal: „Motor overtemperature“ alarm

Significance
- It involves „motor I^2t alarm“ (A029).
- The prerequisite for the alarm is fulfilled by calculating the motor load (r008).
- Parameters used in the calculation: P362 (Motor cooling), P363 (Mot.ThermT-Const), P364 (Mot. Load Limits).
  ☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 26: Signal, „motor overtemperature fault“ (H)

HIGH signal: High signal: „motor overtemperature“ fault

Significance
- It involves a „motor I^2t fault“ (F021).
  ☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 27: Signal, „technology controller actual value greater than technology controller setpoint“ (H)

HIGH signal: The technology controller actual value (r534) is greater than the technology controller setpoint (r529).

Significance
- The signal is set when the technology controller setpoint is exceeded.
- If the technology controller actual value becomes less than the technology controller setpoint, a hysteresis (P535) is also taken into account.

Bit 28: Signal, „motor stall“ (H)

HIGH signal: „Motor stalled or locked rotor“ fault (F015)

Significance
- The drive has either stalled or the rotor is locked.
  ☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 29: Signal, „bypass contactor energized“ (H)

HIGH signal: The bypass (pre-charging) contactor is energized (closed).

Significance
- A bypass contactor (option) can be energized (closed) with the appropriate wiring and parameterization.
  ☞ Chapter „Options“ in the Operating Instructions, Part 1

Bit 30: Reserved

Bit 31: „Pre-charging active“ signal (H)

HIGH signal: PRE-CHARGING (010) status

Significance
- Pre-charging is executed after an ON command.

5.3 Setpoints

Introduction and application example

The setpoints are process data in the sense of the explanation in Section 3.2.

An individual source can be parameterized for every setpoint, from which the setpoint may be entered (fixed values, analog inputs, PMU, PZD part of the telegram from automation units).

The select parameters for the sources are indexed twice:

Index i001: Basic setting (BASE)
Index i002: Reserve setting (RES)

One parameter is available for the setpoints to „connect“ the source(s).

Example for connecting-up the sources:

The main setpoint should be „connected“ to analog input 1 of the CU (terminal -X102:27,28) as voltage input in the basic setting:

- From the setpoint table, it is possible to identify that the factory setting of parameter P443.1 of the main setpoint value is 1002
- In table B for the possible sources of the main setpoint, it can be seen that 1002 corresponds to the „motorized potentiometer“ source.
- In the setpoint table, it can be seen that the possible sources for the main setpoint are written into tables X, Y and B.
- The parameter value for the required source is searched for in tables X, Y and B. For analog input 1 of the CU, the value is found in Table X. The result is 1003.
- This parameter value must now be entered into parameter P443.1.

Designation	Parameter	Possible sources	Parameter value	Required source wiring
Main setpoint (GRD)	P443.1	Tab.X,Y,B	1003	AE1 terminal -X102:27,28,29

An amplification factor (P444.1) is available for parameter P443.1, which can be set as required.

		Gain	Normalization	Visualization
Supplementary setpoint	P428	P429	4000Hex = P420	r431
Main setpoint	P443	P444	4000Hex = P420	r447
Technology controller setpoint	P526	P527	4000Hex = 100 %	r529
Technology controller actual value	P531	P532	4000Hex = 100 %	r534

Table 5.1 Interdependecies of the parameters for gain, normalization and visualization

5.3.1 Overview of the setpoints

Designation	Param. No. BAS (RES)	Fac. setting BAS (RES)	Possible sources	Gain BAS (RES)	Fac. set. BAS+RES
Supplementary setpoint 1	P428.1 (2)	0 (0)	Tab.X, A	P429.1 (2)	100.00
Main setpoint	P443.1 (2)	1002 (1001)	Tab.X, B	P444.1 (2)	100.00
Technology controller setpoint	P526.1 (2)	0 (0)	Tab.X, A	P527.1 (2)	100.00
Technology controller actual value	P531.1 (2)	0 (0)	Tab.X, C	P532.1 (2)	100.00

Table 5.2 Setpoints

5.3.2 Selecting the possible setpoint sources

Table X

CU BOARD	
Value	**Source**
0000	Constant setpoint 0
1003	Analog input 1
1004	Analog input 2
2002	SST1 word 2
2003	SST1 word 3
2004	SST1 word 4 1)
…	Consecutively to
2016	SST1 word 16
OPTIONS	
Value	**Source**
3002	PT/CB word 2
3003	PT/CB word 3
3004	PT/CB word 4 3)
…	Consecutively to
3016	PT/CB word 16
4101	SCI1, slave1, AE1
4102	SCI1, slave1, AE2
4103	SCI1, slave1, AE3
4201	SCI1, slave2, AE1
4202	SCI1, slave2, AE2
4203	SCI1, slave2, AE3
4501	SCB1/2 (peer to peer) word 1 4)
4502	SCB1/2 (peer to peer, USS) word 2
4503	SCB1/2 (peer to peer, USS) word 3
4504	SCB1/2 (peer to peer, USS) word 4 5)
…	Consecutively to
4505	SCB1/2 (peer to peer, USS) word 5
4506	SCB2 (USS) word 6
…	Consecutively to
4516	SCB2 (USS) word 16

Table A

Value	Source
1001	Fixed setpoint – for source P428: P421 to P424 – for source P526: P525
1020	Technology controller output

Table B

Value	Source
1001	Fixed setpoint (P421 to P424)
1002	Motorized potentiometer
1020	Technology controller output

Table C

Value	Source
1100	Technology controller actual value 1: P530.1
1200	Technology controller actual value 2: P530.2

1) only when word4 is not assigned for „control word2“ with 2004 (Section 5.1)
2) only if word4 is not assigned for „control word2“ with 6004 (Section 5.1)
3) only if word4 is not assigned for „control word2“ with 3004 (Section 5.1)
4) only if word1 is not assigned for „control word2“ with 4501 (Section 5.1)
5) only if word4 is not assigned for „control word2“ with 4504 (Section 5.1)

5.4 Actual values

Actual values are process data in the sense of the explanation in Section 3.2.

Three destinations are available in the basic version to output actual values.
Three additional output devices can be parameterized via option boards.

The contents of all available parameters of the basic drive converter can be selected as output values.

In order to connect a parameter to a destination, its parameter number must be entered in the selected destination parameter.

NOTES
♦ When selecting an indexed parameter, the value of the first index is always output!
♦ When entering a „0“ instead of a parameter number, an output is not made to the appropriate destination!

Destinations:

P530 „ActVal’s ProcReg“
Output at the technology controller actual value input
Indices: i001 Value 1 for the technology controller actual value input (P531 = 1100)
i002 Value 2 for the technology controller actual value input (P531 = 1200)
☞ Chapter 10 „Function diagrams, closed-loop control“

P655 „CU-AA actual values“
Output via the CU control terminal strip (Chapter 1)
Analog output (-X102:34 / reference potential -X102:33)
☞ Section 6.4 „Analog output“

P680 „SCom1 Act Value“
Output via the basic converter interface SST1
Indices: i001 Word 01 of the telegram (PZD)
⇓ ⇓
i016 Word 16 of the telegram (PZD)
☞ Section 6.5 „Basic converter interface SST1“

Destination, options:

P664 „SCI-AA actual values“
Output via the SCB1 interface with SCI1
☞ Instruction Manual for the option boards

Indexes	i001	Destination: Analog output 1 from slave 1
	i002	Destination: Analog output 2 from slave 1
	i003	Destination: Analog output 3 from slave 1
	i004	Destination: Analog output 1 from slave 2
	i005	Destination: Analog output 2 from slave 2
	i006	Destination: Analog output 3 from slave 2

P690 „SCB actual values“
Output via the SCB1 interface with peer-to-peer protocol or SCB2
☞ Instruction Manual for the option boards

Indexes:	i001	Destination: Word 01 of the telegram (PZD)
	⇓	⇓
	i016	Destination: Word 16 of the telegram (PZD)

P694 „CB/TB actual values“
Output via the CB or TB interface
☞ Instruction Manual for the option boards and Sections 6.5.2 „DPR“

Indices:	i001	Destination: Word 01 of the telegram (PZD)
	⇓	⇓
	i016	Destination: Word 16 of the telegram (PZD)

NOTE
For telegram data transfer (P680, P690, P694), it is generally necessary/practical to assign „word 01 of the telegram (PZD)“ with status word 1 (r968 or r552)!

Normalization:

The values of the parameters to be output are weighted with the normalization relationship specified in the parameter list.
For example, r004 (output current) is referred to 4 x P102 (Mot.curr(n)), i.e. 100 % corresponds to 400 % rated motor current.

Examples:

1) Technology controller

The output power (r005) of the control should be fed to the technology controller as second actual value.

P530.02 = 005

P531.01 = 1200 (basic setting)

6 Interfaces

6.1 Binary inputs

Five binary inputs (24 V) **which can be parameterized** are available at the control terminal strip of board CU (-X101). These inputs can be used to input commands, external faults/alarms as well as checkback signal at the control word of the drive converter.

Connecting-up: ☞ Chapter 1 „Control terminal strip“.

Parameterization: ☞ Section 5.1 „Control word“.

Factory setting (valid for standby operation)**:**

Binary input	Command HIGH	Command LOW	Control word bit	Parameter
1	ON	OFF1	0	P554.2 = 1001 (reserve)
2	ON	OFF2 (electrical)	1	P555.2 = 1002 (reserve)
3	Acknowledge		7	P565.2 = 1003 (reserve)
4	FSW-Bit 0 = 1	FSW-Bit 0 = 0	20	P580.2 = 1004 (reserve)
5	Reserve setting	Basic setting	30	P590 = 1005

Table 6.1 Binary inputs

6.2 Binary outputs

There are **two binary outputs which can be parameterized**.
These outputs can be used to output signals and external commands of the drive converter status word.

Connecting-up: Binary output 1 at the basic drive converter (connector -X9):
☞ Section „Auxilary power supply / main contactor“ in Operating Instructions, Part 1

Binary output 2 on the control terminal strip of board CU (connector -X100):
☞ Chapter 1 „Control terminal strip“

Parameterization: ☞ Section 5.2 „Status word“.

Factory setting (not valid for cabinet units)**:**

Binary output	Connector, location	Signal HIGH	Signal LOW	Status-word bit	Parameter
1	-X9	Main contactor energized	Main contactor not energized	12	P612.1 = 1001
2	-X100 on the CU	Fault	No fault	3	P603.1 = 1002

Table 6.2 Binary outputs

NOTE
Faults, alarms and power-on inhibit (HIGH active) are displayed as **LOW active via the terminal strip (binary outputs)** ☞ Section 5.2 „Status word“.

6.3 Analog inputs

Control board CU has 2 analog inputs (AI), which can be used to input setpoints via voltage- or current signals or as speed actual value input (Connection ☞ Chapter 1).

Technical data:

Setpoint input via voltage	Setpoint via current	Speed actual value input
♦ Input voltage range: • –10 V to +10 V • 0 V to +10 V • + 2 V to +10 V ♦ Resolution 20 mV (9 bit + sign) ♦ Accuracy ± 0,6 % ♦ Stability at ΔT = 10 K: 0,2% ♦ Smoothing 3.5 ms	♦ Input current range: • –20 mA to +20 mA • 0 mA to 20 mA • 4 mA to 20 mA ♦ Resolution 0,04 mA (9 bit + sign) ♦ Accuracy ± 0,7 % ♦ Stability at ΔT = 10 K: 0,2% ♦ Smoothing 3.5 ms	♦ Input voltage range: ♦ –10 V to +10 V (use the ATI board for higher tachometer voltages!) ♦ Use a shielded cable and connect at one end to the drive converter.

Table 6.3 Technical data of the analog inputs

Using P208.x, it can be defined as to whether the analog input should be used as tachometer input (refer to Section 6.3.2).

P208.x	Analog input AE1	Analog input AE2
3	Analog tach. input	
4		Analog tach. input

Table 6.4 Speed feedback

6.3.1 Analog input as setpoint input

Signal flow for any setpoint; the overview of the possible setpoints is located in Section 5.3.1. (☞ Function diagrams „Analog inputs“, Chapter 10):

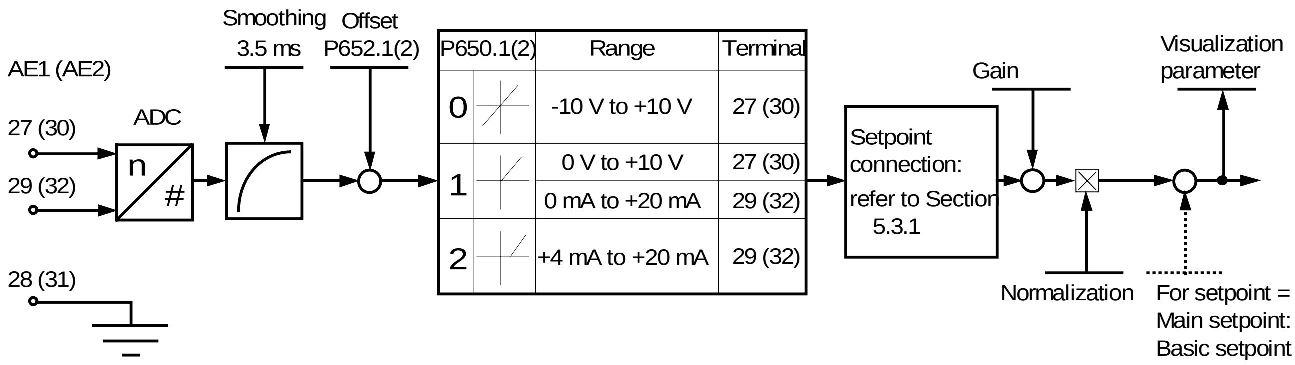


Fig. 6.1 Analog input as setpoint input

Parameters for gain, normalization and visualization belonging to a specific setpoint connection:

		Gain	Normalization	Visualization
Supplementary setpoint	P428	P429	10 V = P420	r431
Main setpoint	P443	P444	10 V = P420	r447
Technology controller setpoint	P526	P527	10 V = 100 %	r529
Technology controller actual value	P531	P532	10 V = 100 %	r534

Table 6.5 Inter-relationships between parameters for gain, normalization and visualization

Parameterization:

- ♦ Connect the setpoint to the required analog input
(e.g.: P443.1 = 1003: The main setpoint is connected to analog input 1 (basic setting)).
- ♦ P650.1(2) = Defines the input signal for analog input 1(2)
(± 10 V, 0 to 10 V / 0 to 20 mA, 4 to 20 mA).

NOTE
For P650 = 2 (4 to 20 mA), setpoints < 2 mA result in a fault trip (wire breakage monitoring function)

- ♦ When required, adjust the zero point (offset adjustment) for setpoint input ‘0’.
In this case, P652.1(2) is changed until the setpoint visualization parameter (corresponding to Table 6.5) is ‘0’, e.g. r447.
- ♦ When required, set the gain (parameter according to Table 6.5) e.g. P444.

Calculating the gain using as an example, the main setpoint (including the basic setpoint):

Values X_1 to X_2 at the analog input should be represented at setpoints Y_1 to Y_2.

- ♦ ±10 V and 0 to 10 V:

$$P444.x = \frac{10\ V}{X_2 - X_1} \times \frac{Y_2 - Y_1}{P420} \times 100\%$$

$$P445.x = \frac{X_2 Y_1 - X_1 Y_2}{X_2 - X_1} \times \frac{1}{P420} \times 100\%$$

- ♦ 4 mA to 20 mA:

$$P444.x = \frac{16\ mA}{X_2 - X_1} \times \frac{Y_2 - Y_1}{P420} \times 100\%$$

$$P445.x = \frac{(X_2 - 4\ mA) \times Y_1 - (X_1 - 4\ mA) \times Y_2}{X_2 - X_1} \times \frac{1}{P420} \times 100\%$$

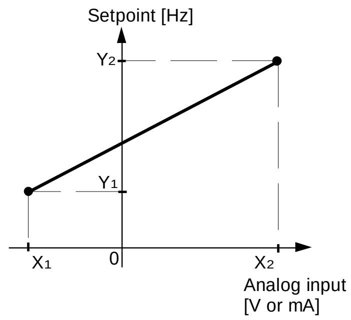


Fig. 6.2 Gain

Example of setpoint input via analog input:

In the basic setting, the main setpoint for motor data set 1 should be entered via analog input 1.

Setting range: 0 to 10 V should correspond to + 15 Hz to + 50 Hz.

Rated system frequency P420 = 50 Hz.

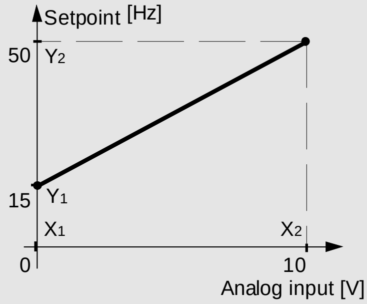


Fig. 6.3 Setpoint input via analog input

Parameterization:

- P443.1 = 1003 The basic setting for the main setpoint is connected to analog input 1.
- P650.1 = 1 The input voltage range for AE1 is set to 0 to 10 V
- P651.1 = 4 The smoothing time constant of AE1 is 4 ms (if required, change).
- P652.1 = 0.000 AE 1 does not have a zero point deviation. When required, change P652.1 until the main setpoint, r447=0, for setpoint input ‘0’.
- Set gain P444.1 and basic setpoint P445.1:

$$P444.1 = \frac{10\,V}{10\,V - 0\,V} \times \frac{50\,Hz - 15\,Hz}{50\,Hz} \times 100\,\% = 70\,\%$$

$$P445.1 = \frac{10\,V \times 15\,Hz - 0\,V \times 50\,Hz}{10\,V - 0\,V} \times \frac{1}{50\,Hz} \times 100\,\% = 30\,\%$$

Example without offset (P420 = 50 Hz):

- P445 = 0
- Setting range $\pm$ 10 V ≙ $\pm$ 50 Hz : P444 = 100 %
  $\pm$ 10 V ≙ $\pm$ 100 Hz : P444 = 200 %

6.3.2 Analog input as speed actual value input

For drive converter output frequencies up to 100 Hz, an analog tachometer can be used for speed sensing. Generally, the ATI option is used as interface between the tachometer and board CU.

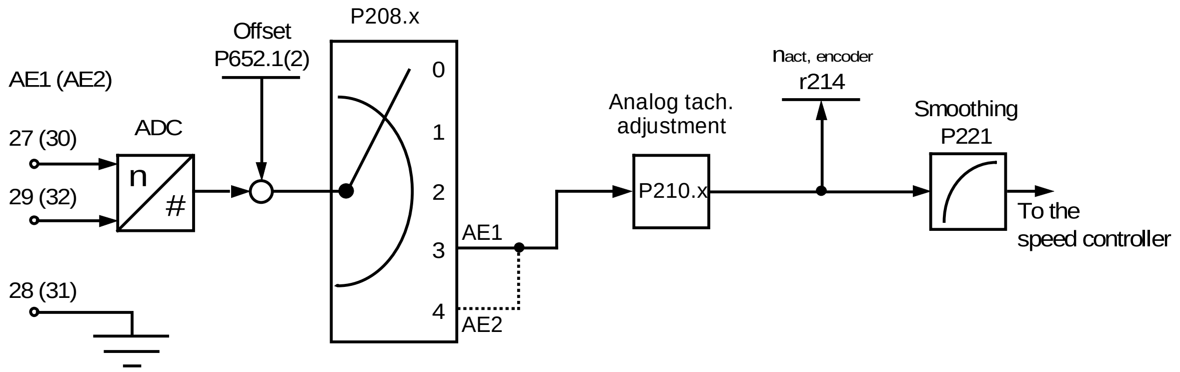


Fig. 6.4 Analog input as speed actual value input

Parameterization:

- ♦ P052 = 5 „Drive setting“ function
- ♦ P053 = 3 „Expert mode“ access stage
- ♦ P208.x = 3 The speed actual value is received via analog input 1,
  or 4 speed actual value is received via analog input 2.
- ♦ P210.x = Enter the maximum occuring speed (in RPM) (it is absolutely necessary that the speed overshoot is taken into account - typical value: 10 %!).
  An input signal of 10 V at the analog input corresponds to the speed set here.
- ♦ P163.x = 1 control with V/Hz characteristic
- ♦ P052 = 0 Return from the „drive setting“ function
- ♦ With the motor stationary, select r214 (n(act, encoder)), and if required, adjust the zero point using P652.1(2).
- ♦ If possible, de-couple the motor from the load.
- ♦ Power-up the unit and operate the drive at various speeds. Measure the speed, for example, using a hand-held tachometer, and adjust the potentiometer on the ATI board so that the measured value coincdies with the display in r214.
- ♦ If the motor is operated under no load (no-load operation), it is adjusted, if the setpoint and actual value speeds are the same (r482 = r214).
- ♦ P651.1(2) smoothing time constant ineffective, use P221 for smoothing.
- ♦ P052 = 5 „Drive setting“ function
- ♦ P163.x = 0 V/Hz+speed control
- ♦ P052 = 0 Return from „drive setting“
- ♦ When required, the speed actual value can be smoothed via P221, and a maximum value for the permissible speed change entered using P215 (☞ the function diagrams in Chapter 10).

Special case: The tachometer voltage at the maximum occuring speed is < 10 V.

- ♦ Connect the tachometer voltage directly at the analog input.
- ♦ Set P210.x to that speed, where the tachometer voltage is 10 V (the value can exceed the maximum occuring speed).

Example for using the analog input as speed actual value input:

The speed actual value is to be fed in via analog input 2.

Tachometer and system data: Analog tachometer with 30 V / 1000 RPM
Speed at the maximum setpoint: 1700 RPM

Parameterization:

- Ground the tachometer cable shield at 1 end, at the drive converter.
  If noise is coupled-in, connect a 100 nF capacitor to the motor housing.
- P052 = 5 „Drive setting“ function
- P053 = 3 „Expert mode“ access stage
- P208.1 = 4 Connect the speed actual value to analog input 2.
- P210.x = Enter the maximum occuring speed (in RPM):
  1700 RPM + e.g. 8 % for overshoot → 1836 RPM.
- Tachometer voltage at the maximum speed: 55 V -> the ATI board is required.
- P163.1 = 1 Control with V/Hz characteristic
- P052 = 0 return from the „drive setting“
- With the motor stationary, select r214, and if required, adjust the zero point using P652.2.
- Power-up the unit and operate the drive at various speeds (e.g. 500, 1000 and 1500 RPM). Measure the speed, for example, using a handheld tachometer, and adjust the potentiometer on the ATI board so that the measured value coincides with the display in r214 (the display is realized in Hz).
- Specify additional steps as above.

6.4 Analog output

The CU control board has 1 analog output (AO) to output actual values and other internal quantities of the drive converter (Connection ☞ Chapter 1).

Technical data:

- Output voltage range –10 V to +10 V
- 40 mV resolution (8 bits + sign)
- Accuracy ± 2 %
- Output current, max. ± 5 mA
- Short-circuit proof
- Not floating

Additional details, ☞ Function diagram „Analog output“, Chapter 10.

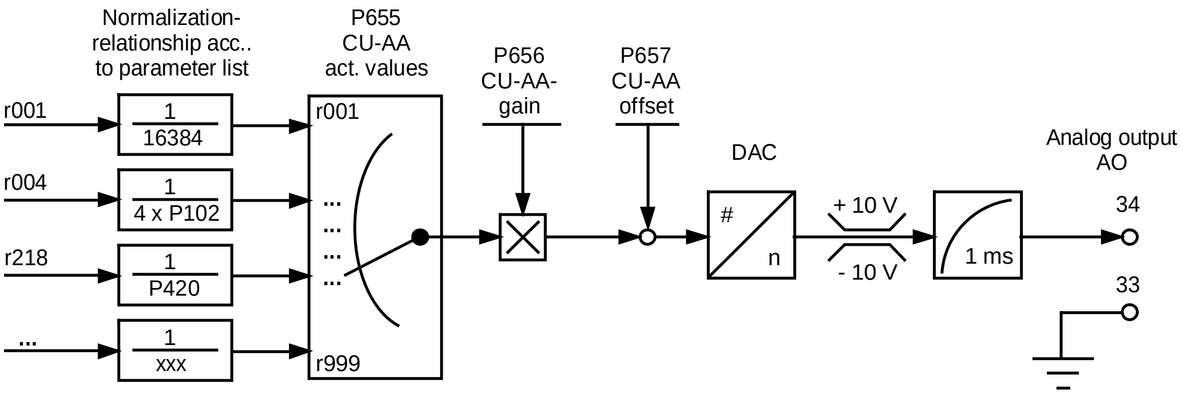


Fig. 6.5 Analog output

Normalization:

The values of the parameters to be output are weighted with the normalization relationships specified in the parameter list (e.g. r004 (output current) referred to 4 x p102 (rated motor current).

Example:

P656 = 10 V
Analog output = 10 V, if r004 = 4 x P102

P656 = 40 V
Analog output = 10 V, if r004 = P102

Parameterization:

- The number of the parameter, whose value is to be output at the analog output, is entered in P655 (CU-AA actual values).
  - Corresponding to points X_2,Y_2 and X_1,Y_1, the required analog output characteristics are defined, set gain P656 and offset P657:

$$P656 = \frac{Y_2 - Y_1}{(X_2 - X_1) \ / \ \text{ref. quantity}}$$

$$P657 = \frac{(Y_1 X_2) - (Y_2 X_1)}{X_2 - X_1}$$

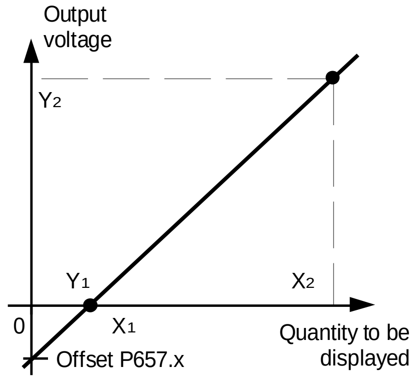


Fig. 6.6 Analog output

1. The output current (r004) should be represented as 0 V to +10 V at the analog output, in the range 32 A to 160 A.
   The rated motor current (P102) is 40.0 A.

Parameterization:

- P655 = 004 The output current is connected to the analog output.
- The reference quantity for r004 is taken from the parameter list. It is 4 x P102.

Set the gain and offset:

- $$P656 = \frac{10\text{ V} - 0\text{ V}}{(160\text{ A} - 32\text{ A}) \ / \ (4 \times 40\text{ A})} = 12.5\text{ V}$$

$$P657 = \frac{(0\text{ V} \times 160\text{ A}) - (10\text{ V} \times 32\text{ A})}{160\text{ A} - 32\text{ A}} = -2.50\text{ V}$$

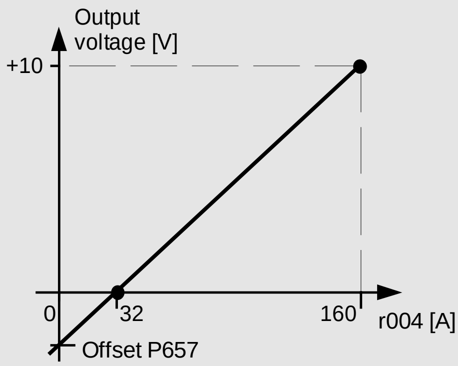


Fig. 6.7 Example, output current at the analog output

2. The frequency actual value (r218) is to be represented from -10 V to +10 V at the analog output from –2 Hz to + 5 Hz.

The rated system frequency (P420) is 100 Hz.

Parameterization:

- P655 = 218 The frequency actual value is connected to the analog output.
- Take the reference quantity for r218 from the parameter list. It is P420.
- Set the gain and offset:

$$P656 = \frac{10\text{ V} + 10\text{ V}}{(5\text{ Hz} + 2\text{ Hz}) \ / \ 100\text{ Hz}} = 285.71\text{ V}$$

$$P657 = \frac{(-10\text{ V} \times 5\text{ Hz}) - (10\text{ V} \times (-2\text{ Hz}))}{5\text{ Hz} + 2\text{ Hz}} = -4.29\text{ V}$$

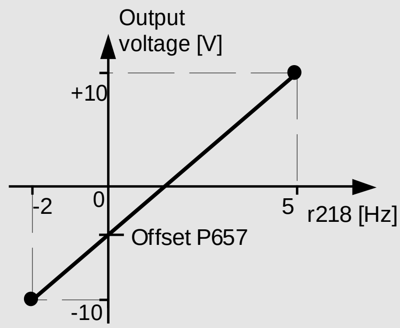


Fig. 6.8 Example, frequency actual value at the analog output

6.5 Serial interfaces

6.5.1 Basic converter interface SST1

The USS protocol (universal serial interface) is implemented at the basic converter interface SST1.

The following documentation is available depending on the particular application of the SST1 basic converter interface:

♦ Connecting a PC / PG with SIMOVIS software for start-up / service operator control:
The documentation is provided on SIMOVIS floppy disks in files BEDANLTG.TXT (ASCII format) and BEDANLTG.WRI (WRITE format).

♦ Connecting higher-level PLCs with the USS protocol:
SIMOVERT MASTER DRIVES
Using the serial interfaces with USS protocol
Order No.: 6SE7087-6CX87-4KB0

Additional general comments regarding connecting-up and parameterization:

♦ **Connecting-up:** ☞ Chapter 1 „Control terminal strip“

NOTE
Communications can either be realized via the terminal strip of CU -X100 (RS485 standard) **or** the interface connector on PMU -X300 (9-pin SUB D connector / RS485 or RS232 (V24)). **Only one of the two possible connections may be used!**

When connecting SST2 via the terminal strip (-X100), of the CU, a four-wire connection can be implemented. The changeover between two- and four-wire connection is realized automatically.

NOTE
The bus terminating resistors (total 150 Ω) must be switched-in at the last bus node (slave). ☞ Fig. 6.9 for the position of the jumpers S1. • SST1: Close jumpers S1.1 and S1.2 of DIP-FIX S1 on the CU

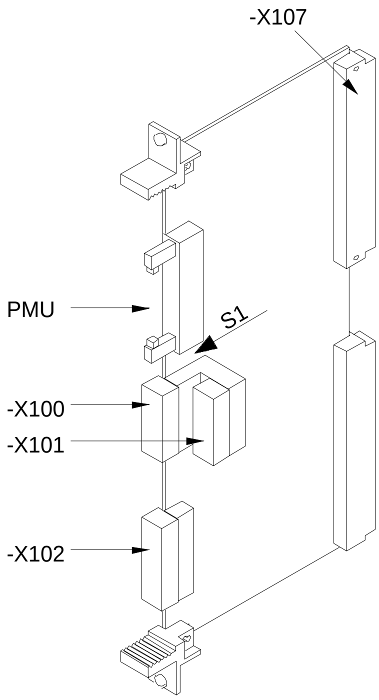


Fig. 6.9 CU

Parameterization:

- Define the process data: **P683 bis P687**
- Connect process data (control word, status word, setpoints, actual values) to the interfaces
  ☞ Chapter 5 „Process data“
- Enabling parameterization: **P053 oder P927**

6.5.2 Dual port RAM (DPR for SCB, TSY, CB, TB)

The dual port RAM is the internal interface on the CU (-X107) to connect possible option boards via the LBA (Local Bus Adapter, option) of the electronics box.

Possible option boards:

- TSY (tachometer- and synchronization board),
- TB (Technology board),
- SCB (serial communications board),
- CB (Communications board).

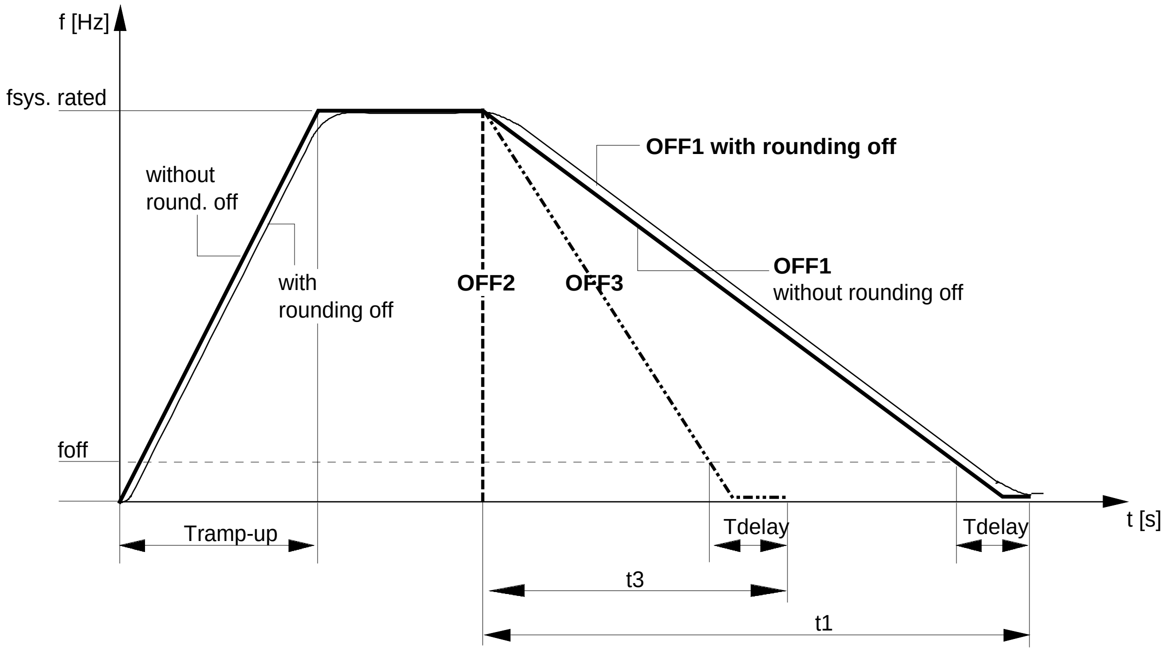
To connect possible option boards and parameterize the interface, ☞ Chapter „Options“ in the Operating Instructions, Part 1 as well as the Operating Instructions of the option boards.

Additional information, ☞ Chapter 5 „Process data“.

6.6 Ramp-function generator (RFG) and limiting stage in front of the ramp-function generator

A detailed description as supplement to the „Function diagrams, setpoint channel CU“, Chapter 10

6.6.1 Ramp-function generator, RFG



Ramp down time for an OFF1 command: $$t_1 = T_{OFF1\text{-ramp down}} \times \frac{f_{set} - f_{off}}{f_{Anl\text{-rated}}} + T_{delay}$$

Ramp down time for an OFF3 command: $$t_3 = T_{OFF3\text{-ramp down}} \times \frac{f_{set} - f_{off}}{f_{Anl\text{-rated}}} + T_{delay}$$

Fig. 6.10 Ramp-function generator

For a detailed description of the OFF1-, OFF2- and OFF3 commands, refer to Section 5.1.2 „Control word 1“

Parameters for setting the acceleration time

P420	Rated system frequency ($f_{rated\ system}$)	1.00 Hz to 300.00 Hz

P462	Acceleration time ($T_{ramp\text{-}up}$)	i001 SDS1 i002 SDS2	0.1 s to 999.9 s
Acceleration time from standstill up to rated system frequency (P420)			

P464	Deceleration time ($T_{deceleration}$)	i001 SDS1 i002 SDS2	0.1 s to 999.9 s
Deceleration time in s from the rated system frequency (P420) down to standstill			

P466	OFF3 deceleration time ($T_{off\ 3\ deceleration}$)	0.1 s to 999.9 s

Deceleration time for the OFF3 command (if DC braking, P372 is not selected) in s from the rated system frequency (P420) down to standstill.
Rounding-off (P468) is de-activated.

P467	Protective ramp-up Kp	i001 SDS1 i002 SDS2	1.0 to 100.0

Factor from 1.0 to 100.0 referred to the acceleration time, P462 to enter a protective ramp-up time.

Using the protective ramp-up, the acceleration time up to 15% of the rated motor frequency (P107) can be extended (☞ Fig. 6.11 „Protective ramp-up").

Protective ramp-up is not activated for 1.0.

The total run-up (acceleration time) can be calculated according to

$$\text{total run-up} = P462 + P462 \text{ x } \frac{15}{100} \text{ x } \frac{P107}{P420} \text{ x } (P462 - 1)$$

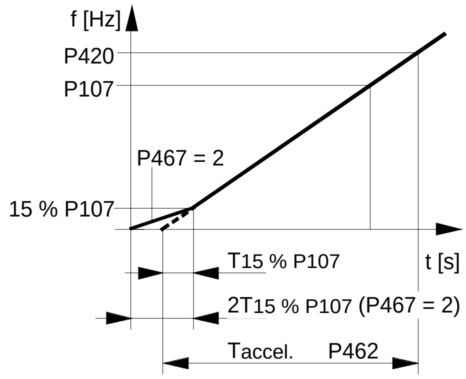


Fig. 6.11 Protective ramp-up

P468	Rounding-off	i001 SDS1 i002 SDS2	0 % to 50 %

Rounding-off in % referred to the acceleration time, P462 when accelerating or the deceleration time, P464, when decelerating.

- Example: Acceleration time P462, = 10 s rounding-off = 10 %. Thus, a rounding-off time of 1s is obtained. The same is valid for the deceleration time.
- If the motorized potentiometer is active (control word bits 13 and 14 set, ☞ Section 5.1), rounding-off is not realized.

P514	OFF shutdown frequency (f_{off})	0.00 Hz to 300.0 Hz

As soon as the „speed/frequency actual value" r218 reaches the OFF shutdown frequency, P14 when the drive decelerates (OFF1 or OFF3 without DC braking, P372), then the OFF delay time P516, starts to run. After this, the inverter pulses are inhibited.

P516	OFF delay time (T_{delay})	i001 SDS1 i002 SDS2	0.0 s to 60.0 s

Delay time for OFF1 and OFF3 (if no DC braking, P372 is selected for OFF3) in s.

As soon as the „speed/frequency actual value" (r218) reaches the OFF shutdown frequency (P514) when the drive decelerates, the OFF delay time starts to run. The inverter pulses are then inhibited.

Further, it is still possible to inhibit or hold the ramp-function generator via the „Control word" (Section 5.1).

6.6.2 Limit value stage in front of the ramp-function generator

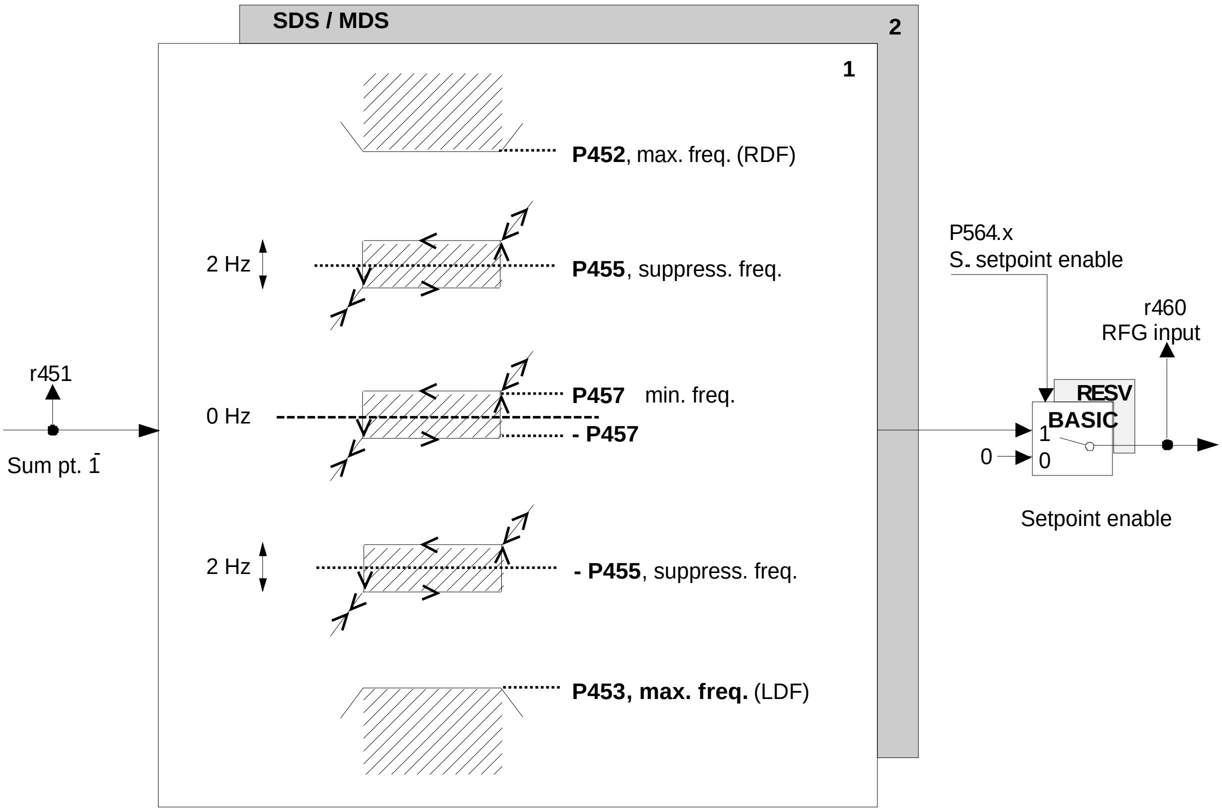


Fig. 6.12 Limit value stage before the ramp-function generator

P452	Max. frequency (RDF) Clockwise phase sequence	i001 MDS1 i002 MDS2	0.0 Hz to 300.0 Hz
Max. setpoint frequency for a clockwise phase sequence			

P453	Max. frequency (LDF) Counter-clockwise phase sequence	i001 MDS1 i002 MDS2	– 300.0 Hz to 0.0 Hz
Max. setpoint frequency for a counter-clockwise phase sequence			

P455	Suppression frequency	i001 SDS1 i002 SDS2	0.0 Hz to 300.0 Hz
Frequency suppression of ± 1 Hz on each side of the parameterized suppression frequency (is valid for positive and negative setpoints), in order to prevent steady-state drive operation at possible resonant frequencies. ♦ Steady-state operation in a parameterized 2 Hz suppression bandwidth is therefore not possible; the range can only be run-through. ♦ For a setpoint at summation point 1 in front of the ramp-function generator, r451, which lies within the suppression bandwidth, the setpoint, increasing from below is held at the lower limit, and the setpoint decreasing from above, is held at the upper limit. ♦ The suppression bandwidth is **not** activated when a suppression frequency of 0.0 to 1.0 Hz is entered.			

P457	Min. frequency	i001 SDS1 i002 SDS2	–300.0 Hz to 300.0 Hz ≤ Max. frequency LDF/RDF

It is possible to realize a 0 Hz frequency suppression using the minimum frequency.

- Steady-state operation in the range 0 Hz ± minimum frequency is therefore not possible; the range can only be run-through.
- After the drive has been switched-on, and for a setpoint at summation point 1 in front of the ramp-function generator, r451, in the range from 0 Hz up to the positive minimum frequency, the positive minimum frequency is approached, and in the range 0 Hz to the negative minimum frequency, the negative minimum frequency.
- In operation, and for a setpoint at summation point 1 in front of the ramp-function generator, r451, in the suppression bandwidth (0 Hz ± minimum frequency), the setpoint, increasing from below is held at the lower limit, and the setpoint decreasing from above, is held at the upper limit.
- The drive can be reversed by entering a setpoint (reference) frequency at summation point 1, which lies outside the suppression bandwidth.

7 Open-loop and closed-loop control types

7.1 V/f characteristic

A detailed description as supplement to the „Function diagrams, V/f characteristic“, Section 4.4

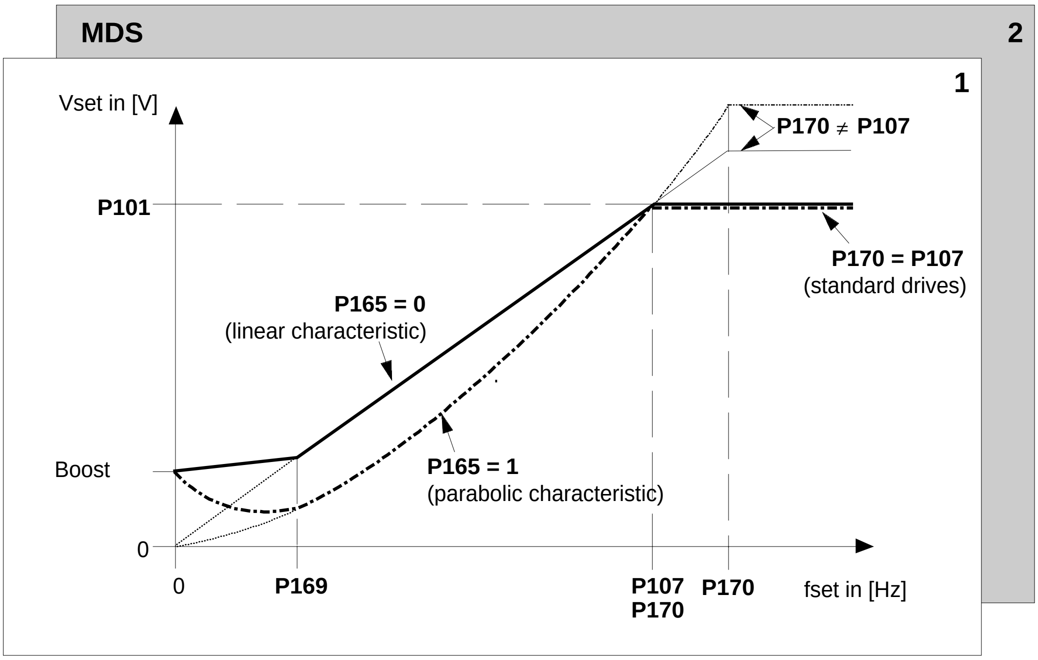


Fig. 7.1 V/f characteristic

Boost:
- ♦ P166 = 0: current reference: P167 (taking into account P272)
- ♦ P166 = 1: voltage reference: P168
- ♦ P171: Acceleration current

P101	Motor voltage (n)	i001: MDS1 i002: MDS2	115.0 V to 1600.0 V
Rating plate value of the rated motor voltage (observe whether the motor is connected in star or delta!) For SIMOSYN motors: Voltage at the rated drive frequency			

P107	Motor frequency (n)	i001: MDS1 i002: MDS2	8.0 Hz to 300.0 Hz
Rating plate value of the rated motor frequency			

P165	Characterisic	i001: MDS1 i002: MDS2	0 and 1
V/f characteristic type: 0: Linear characteristic (constant-torque drives) 1: Parabolic characteristic (fans and pumps)			

P166	Boost	i001: MDS1 i002: MDS2	0 and 1

Select the boost reference type (for high-inertia starting and compensating the ohmic voltage drops across the motor feeder/stator winding of the drives at low frequencies):

0: Current reference via P167
Voltage for f = 0 Hz for the starting current (conversion using P272 (R (stator + feeder cable))

1: Voltage reference via P168
Voltage for f = 0 Hz

P167	Boost current	i001: MDS1 i002: MDS2	10.0 % to 400.0 %

Only valid for current reference: (P166 = 0)

Boost current for f=0 Hz as a % referred to the rated motor current (P102)

- ♦ The boost current is reduced to 0 when the boost end frequency (P169) is reached.
- ♦ The boost current is converted into a voltage boost taking into account (P272 (R (stator + feeder cable)).

NOTE

P272 (R(stator + feeder cable)) should be calculated or measured using „Automatic parameterization“ or even better, using „motor identification“ (function selection P052, ☞ Section 8.1)!

P168	Boost voltage	i001: MDS1 i002: MDS2	10.00 % to 25.00 %

Only valid for voltage reference: (P166 = 1)

Boost voltage at f = 0 Hz as a % referred to the rated motor voltage (P101)

- ♦ The boost voltage is reduced to 0 when the „boost end frequency“ (P169) is reached.
- ♦ P168 is calculated during „automatic parameterization“ or „motor identification“ (function selection P052, ☞ Section 8.1).

P169	Boost end frequency	i001: MDS1 i002: MDS2	0.0 Hz to 300.0 Hz

In the range from 0 Hz up to the boost end frequency, the voltage boost value (P167 or P168) is reduced to 0

- ♦ Special case:
  For P169 = 0.0 Hz and specified voltage boost (P167 ≠ 0 % or P168 ≠ 0 %), the voltage from 0 Hz up to the intersection point of the non-boosted V/f characteristic is kept constant to the value corresponding to the reference entered using P167 or P168 (horizontal boost).
- ♦ P169 is set to 20% of the rated motor frequency (P107) using the „automatic parameterization“ (function selection P052, ☞ Section 8.1).

P170	Field weakening frequency	i001: MDS1 i002: MDS2	8.0 Hz to 300.0 Hz

Frequency at the start of field weakening

- ♦ The voltage is kept constant above this frequency limit. When the conveter voltage limit (r181) is reached before this frequency, field weakening is started appropriately earlier. The actual field-weakening frequency can be read from parameter r182 (field weakfrq(act)).
- ♦ P170 is set to the rated motor frequency (P107) (standard drives) during „automatic parameterization“ (function selection P052, ☞ Section 8.1).

P171	Acceleration current	i001: MDS1 i002: MDS2	0.0 % to 799.9 %

Acceleration current (supplementary boost current) for active acceleration for high-inertia starting as a [%] referred to the rated motor current (P102)

- The acceleration current is only switched-in up to the „boost end frequency“ (P169).
- The acceleration current is converted into a voltage boost taking into account P272 (R(stator total)).

NOTE

P272 „R(stator, total)“ should be calculated or measured using „automatic parameterization“ or even better using „motor identification“ (function selection P052, ☞ Section 8.1!

Further, it is possible,

- to set load-dependent voltage injection to compensate for voltage drops across the motor feede cables using P172 „IxR compensation Kp“.
- to set soft starting P190 (to ramp-up the characteristic voltage when powering-up within the excitation time P189).

8 Start-up functions

8.1 Function selection (P052)

Function selection is activated via parameter **P052** and permits various special functions during the start-up phase.

Condition: Access stage 2 (**P051 = 2**) must be enabled and the converter may only be in the „Run“ (R) status.

The following functions are available:

- Return from function selection (P052 = 0)
- Factory setting (P052 = 1)
- Initialization (P052 = 2)
- Download (P052 = 3)
- Hardware configuration (P052 = 4)
- Drive setting (P052 = 5)
- Automatic parameterization (P052 = 6)
- Motor identification at standstill (P052 = 7)

The „factory setting“, „automatic parameterization“, and „motor identification at standstill“ functions are automatically reset after completion, i.e. P052=0 („return“).

The other functions must be manually reset!

P052 = 5 can be exited using P052 = 0, 6, 7, 8, 11.

P052 = 6 can only be selected from the "drive setting" (P052 = 5).

8.1.1 Factory setting (P052 = 1)

Function: This function is used to establish the factory setting (the same as when the unit was shipped) for all of the parameters (☞ Chapter 11 „Parameter list“). Observe the pre-setting of P077!

Condition: The „factory setting“ can be realized in the status DRIVE SETTING (005), FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009).

Result: In this case, several drive converter- and motor data as well as several open-loop/closed-loop control parameters („automatic parameterization“) are set according to the drive converter type (MLFB dependent / P070).

Procedure:

⇓ P052 = 1 Function selection „Factory setting“

⇓ P key The numbers of the newly-assigned parameters are consecutively displayed:

- Factory setting of **all** parameters according to the parameter list (Chapter 11) (also the board configuration P090/P091)
- Drive converter data (determined from the MLFB of the drive converter (P070)
  P071 Drive converter supply voltage
  P072 Drive converter current (n)
  P073 Drive converter output (n)
- Motor data (determined from the MLFB of the drive converter (P070))
  P101 Motor voltage (n)
  P102 Motor current (n)
  P104 Motor cos phi (n)
  P105 Motor output (n)
  P106 Motor efficiency (n)
  P109 Motor pole pair number
  P173 Imax (max. current)
- Open-loop/closed-loop control parameter
  „Automatic parameterization“ is executed (☞ Section 8.1.5). **All** motor data sets are re-assigned.

⇓ After the factory setting has been completed, SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) are displayed

8.1.2 Initialization (MLFB input) (P052 = 2)

Function: This function is used to change the model No. (unit type).

Condition: „Initialization“ can be realized in the DRIVE SETTING (005), FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009).

Result: When the Model No. **is changed** the factory setting is only **partially** established (as when the unit is shipped), depending on the new model No. The process data connection retained.

Procedure:

⇓ P051 = 3 access stage „Expert mode“ (in order to change P070)

⇓ P052 = 2 function selection „Initialization“

⇓ P070 = MLFB (specifies the MLFB (machine-readable product designation = model No.) of the drive converter (☞ type plate).
When changing the CU, the MLFB corresponding to the drive converter must be input.
When parameterizing via the PMU, the appropriate identification number (PWE) must be specfied in accordance with the following table:

Table of SIMOVERT MASTER-DRIVES

minimum pulse frequency = 1.5 kHz
rated pulse frequency = 3.0 kHz

Brief description of the table columns:

PWE parameter value (enter for initialization / PMU / P070)

I(n) rated drive converter current in A (P072)

V cl. voltage class, voltage range

PWE	Model No.	I(n)	U-Kl.
1	6SE7014-5FB10	4,5	3AC 500-575
2	6SE7014-5UB10	4,5	DC 675-780
3	6SE7016-1EA10	6,1	3AC 380-460
4	6SE7016-1TA10	6,1	DC 510-620
5	6SE7016-2FB10	6,2	3AC 500-575
6	6SE7016-2UB10	6,2	DC 675-780
7	6SE7017-8FB10	7,8	3AC 500-575
8	6SE7017-8UB10	7,8	DC 675-780
9	6SE7018-0EA10	8,0	3AC 380-460
10	6SE7018-0TA10	8,0	DC 510-620
11	6SE7021-0EA10	10,2	3AC 380-460
12	6SE7021-0TA10	10,2	DC 510-620
14	6SE7021-1CA10	10,6	3AC 208-230
15	6SE7021-1RA10	10,6	DC 280-310
16	6SE7021-1FB10	11,0	3AC 500-575
17	6SE7021-1UB10	11,0	DC 675-780
18	6SE7021-3EB10	13,2	3AC 380-460
19	6SE7021-3TB10	13,2	DC 510-620
21	6SE7021-3CA10	13,3	3AC 208-230
22	6SE7021-3RA10	13,3	DC 280-310
23	6SE7021-5FB10	15,1	3AC 500-575
24	6SE7021-5UB10	15,1	DC 675-780
25	6SE7021-8EB10	17,5	3AC 380-460
26	6SE7021-8TB10	17,5	DC 510-620
27	6SE7021-8CB10	17,7	3AC 208-230
28	6SE7021-8RB10	17,7	DC 280-310
30	6SE7022-2FC10	22,0	3AC 500-575
31	6SE7022-2UC10	22,0	DC 675-780
32	6SE7022-3CB10	22,9	3AC 208-230
33	6SE7022-3RB10	22,9	DC 280-310
35	6SE7022-6EC10	25,5	3AC 380-460
36	6SE7022-6TC10	25,5	DC 510-620
37	6SE7023-0FD10	29,0	3AC 500-575
38	6SE7023-0UD10	29,0	DC 675-780
39	6SE7023-2CB10	32,2	3AC 208-230
40	6SE7023-2RB10	32,2	DC 280-310
42	6SE7023-4EC10	34,0	3AC 380-460
43	6SE7023-4TC10	34,0	DC 510-620
44	6SE7023-4FD10	34,0	3AC 500-575
45	6SE7023-4UD10	34,0	DC 675-780
46	6SE7023-8ED10	37,5	3AC 380-460
47	6SE7023-8TD10	37,5	DC 510-620
48	6SE7024-4CC10	44,2	3AC 208-230
49	6SE7024-4RC10	44,2	DC 280-310
50	6SE7024-7FD10	46,5	3AC 500-575
51	6SE7024-7UD10	46,5	DC 675-780

PWE	Model No.	I(n)	U-Kl.
52	6SE7024-7ED10	47,0	3AC 380-460
53	6SE7024-7TD10	47,0	DC 510-620
54	6SE7025-4CD10	54,0	3AC 208-230
55	6SE7025-4RD10	54,0	DC 280-310
56	6SE7026-0ED10	59,0	3AC 380-460
57	6SE7026-0TD10	59,0	DC 510-620
58	6SE7026-0HF10	60	3AC 660-690
59	6SE7026-0WF10	60	DC 890-930
60	6SE7026-1FE10	61	3AC 500-575
61	6SE7026-1UE10	61	DC 675-780
62	6SE7026-6FF10	66	3AC 500-575
63	6SE7026-6UF10	66	DC 675-780
64	6SE7027-0CD10	69,0	3AC 208-230
65	6SE7027-0RD10	69,0	DC 280-310
66	6SE7027-2ED10	72,0	3AC 380-460
67	6SE7027-2TD10	72,0	DC 510-620
68	6SE7028-0FF10	79,0	3AC 500-575
69	6SE7028-0UF10	79,0	DC 675-780
70	6SE7028-1CD10	81,0	3AC 208-230
71	6SE7028-1RD10	81,0	DC 280-310
72	6SE7028-2HF10	82,0	3AC 660-690
73	6SE7028-2WF10	82,0	DC 890-930
74	6SE7031-0EE10	92,0	3AC 380-460
75	6SE7031-0TE10	92,0	DC 510-620
76	6SE7031-0HG10	97,0	3AC 660-690
77	6SE7031-0WG10	97,0	DC 890-930
78	6SE7031-1FG10	108,0	3AC 500-575
79	6SE7031-1UG10	108,0	DC 675-780
80	6SE7031-2HG10	118,0	3AC 660-690
81	6SE7031-2WG10	118,0	DC 890-930
82	6SE7031-2EF10	124,0	3AC 380-460
83	6SE7031-2TF10	124,0	DC 510-620
84	6SE7031-3FG10	128,0	3AC 500-575
85	6SE7031-3UG-10	128,0	DC 675-780
88	6SE7031-5HG10	145,0	3AC 660-690
89	6SE7031-5WG10	145,0	DC 890-930
90	6SE7031-5EF10	146,0	3AC 380-460
91	6SE7031-5TF10	146,0	DC 510-620
94	6SE7031-6FG10	156,0	3AC 500-575
95	6SE7031-6UG10	156,0	DC 675-780
96	6SE7031-7HG10	171,0	3AC 660-690
97	6SE7031-7WG10	171,0	DC 890-930
98	6SE7031-8EF10	186,0	3AC 380-460
99	6SE7031-8TF10	186,0	DC 510-620
100	6SE7032-0FH10	192,0	3AC 500-575
101	6SE7032-0UH10	192,0	DC 675-780

PWE	Model No.	I(n)	U-Kl.
102	6SE7032-1EG10	210,0	3AC 380-460
103	6SE7032-1TG10	210,0	DC 510-620
104	6SE7032-3FH10	225,0	3AC 500-575
105	6SE7032-3UH10	225,0	DC 675-780
108	6SE7032-6EG10	260,0	3AC 380-460

PWE	Model No.	I(n)	U-Kl.
109	6SE7032-6TG10	260,0	DC 510-620
112	6SE7033-2EG10	315,0	3AC 380-460
113	6SE7033-2TG10	315,0	DC 510-620
117	6SE7033-7TH10	370,0	DC 510-620

⇓ P052 = 0 Function selection „return“

⇓ P key The operating display appears, and when the MLFB has been changed, the following parameters are re-assigned:

- ♦ Equipment data and motor data (from the MLFB of the equipment (P070) determine), as well open-loop/closed-loop control parameters („automatic parameterization“ over **all** data sets as for function selection „factory setting“ (☞ Section 8.1.1)).
  The process data connections (e.g. analog inputs/outputs are retaineid).

⇓ SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) are displayed after initialization has been completed.

8.1.2.1 Download (P052 = 3)

Function: It is used to read and change all parameters using a PC at the basic drive converter interface SST1.

Condition: „Download“ is possible in the FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) statuses.

Procedure:

⇓ P052 = 3 Function selection „Download“

⇓ P key Operating display (021).

- ♦ All of the parameters can now be read and changed, independently of the selected control type etc. using a PC connected at the basic drive converter interface SST1.

⇓ P052 = 0 Function selection „Return“

⇓ P key

⇓ After return, the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) is displayed.

8.1.3 Hardware configuration (P052 = 4)

Function: It is used to define option boards (SCB, TSY, CB, TB) in the electronics box of the drive converter.

Condition: The „hardware configuration“ is possible in the FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) status.
Further, the bus coupling LBA (Local Bus Adapter) is required for the electronics box!
☞ Chapter „Options“ in the Operating Instructions, Part 1

Result: All parameters, which can be written into the „hardware configuration“ status („H“, ☞ righthand column in the „parameter list“, Chapter 11), can be changed.

Procedure:

⇓ P052 = 4 Function selection „Hardware-configuration“

⇓ P051 = 3 Access stage Expert mode (to change the following parameters)

⇓ P090 = Board, slot 2 (To the **RIGHT** in the electronics box!!)
P091 = Board, slot 3 (To the **CENTER** in the electronics box!!)

Parameter values for P090/P091:
0: No option board
1: CB Communications board
2: TB Technology board (only P090)
3: SCB Serial communications board
4: TSY Digital tachometer and synchronization board

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not for TB)
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE

- Only one of each option board type may inserted in the electronics box.
- Technology boards (e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.
- If only one option board is used it must always be inserted at slot 2.
- Order numbers for option boards and their descriptions, are provided in the Chapter „Options“ in the Operating Instructions, Part 1.

⇓ Additional parameters, depending on the option boards
(☞ associated Operating Instructions and parameter list, Chapter 11)

⇓ Select one of the following:

⇓ P052 = 5 Function selection „drive setting“ (☞ Section 8.1.4)
or ⇓ P052 = 0 return

⇓ P key
- The operational display (r000) appears during which parameters and internal quantities are re-assigned depending on the function selection.
- The hardware is initialized.
If a fault message F050/F070/F080 appears, ☞ Chapter 12 „Fault and alarm messages“.

⇓ After the selected function has been completed, the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) display appears.

8.1.4 Drive setting (P052 = 5)

Function: It is used to change the drive setting (drive converter/motor data, system data).

Condition: The „drive setting“ is possible in the FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) status.

Result:
- ♦ All parameters, which can be written in the „drive setting“ status („A“, ☞ righthand column in the parameter list, Chapter 11) can be changed.
- ♦ After the drive setting has been completed, it can be decided as to whether the „automatic parameterization“ (P052 = 6) or „motor identification at standstill“ (P052 = 7) functions should be executed, or if the status (P052 = 0) is just reset with a calculation of the internal quantities.
- ♦ If fault F061 occurs when exiting the drive setting, the parameter number, which caused the fault, can be read in fault value r949.

Procedure:

⇓ P052 = 5 Function selection „drive setting“

⇓ P051 = 3 Access stage „expert mode“ (if parameters are to be changed, which require the expert mode)

⇓ Change the selected parameters, which can be written into the drive setting status.

⇓ Make a selection between the following:

either ⇓ P052 = 6 Function selection „automatic parameterization“ (☞ Section 8.1.5)
or ⇓ P052 = 7 Function selection „motor identification at standstill“ (☞ Section 8.1.6)
oder ⇓ P052 = 0 Function selection „return“

⇓ P key The operating display (r000) appears while parameters and internal quantities are re-assigned depending on the particular function selection.

⇓ After the selected function has been completed, the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) function is displayed.

8.1.5 Automatic parameterization (P052 = 6)

Function: It is used to pre-assign open-loop/closed-loop control parameters, dependent on the selected drive setting (drive converter- and motor data) and open-loop/closed-loop control type (P163).

Condition: „Automatic parameterization“ can only be selected from the „drive setting“ status (P052=5).

Result: Only the parameters of the **currently** selected motor data set MDS can be pre-assigned!

Procedure:

⇓ P052 = 5 Function selection „drive setting“

⇓ P051 = 3 Access stage „expert mode“ (if parameters are to be changed, which require the expert mode)

⇓ P052 = 6 Function selection „automatic parameterization“

⇓P key The operating display appears, while the following parameters are re-assigned:

If parameter P103 (no-load motor current) has the value 0.0%, the rated magnetizing current is calculated, and can be subsequently read via r196. Otherwise, the value is retained.

P169	Boost end frequency
P170	Field weakening frequency
P172	IxR compensation Kp
P173	Imax (max. current value)
P189	Energization time
P215	Delta n(act, permissible)
P221	Smothing n/f (act)
P225	n/f controller Kp
P229	n/f controllerTn
P261	Smoothing Isq
P272	R(stator + cable)
P294	Slip compensation Kp
P299	Resonant damping Kp
P369	Restart-on-the-fly, search current
P371	De-energization time

⇓ After „automatic parameterization“ has been completed, the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) operating display appears.

8.1.6 Motor identification at standstill (P052 = 7)

Function: This function executes a ground-fault test, and then activates „automatic parameterization“ (☞ Section 8.1.5), and then carries-out a resistance measurement to improve the control characteristics.
In so doing, certain control parameters are re-assigned.

Condition: The „motor identification at standstill“ can be selected from the „drive setting“ (P052 = 5) or READY TO SWITCH-ON (009).

Result:

- Only the parameters of the **currently** selected motor data set MDS are pre-assigned!
- The „motor identification at standstill“ can be interrupted at any time using an OFF command. In this case, fault message F114 „measurement aborted“ is output.
- To display the actual measuring segment of the „motor identification at standstill“ the visualization parameter (display parameter) r333 „measurement section“ is available.
- If a fault/error occurs during measurement, the test is terminated with a fault message.
  The fault message (r947) is stored together with the fault value (r949) in the fault memory. The fault cause is described in detail in the fault value. The fault messages, fault values and alarm messages are described in Chapter 12 „Fault- and alarm messages“.

NOTE
The "motor identification at standstill" is not possible when operating the drive converter with an input voltage range of 500 V to 575 V with sinusoidal filter (option)!

Procedure:

⇓ P052 = 7 Function selection, „motor identification at standstill“

⇓ P key The operating display appears:

The alarm message A078 „standstill measurement follows“ is output, and the drive converter must be powered-up within 20 s. Otherwise, F114 fault trip „measurement aborted“ is output.

⇓ Power-up the drive converter
Alarm message A078 „standstill measurement follows“ is reset.

NOTE
The inverter is enabled, current flows through the motor and the rotor can align itself!

⇓ The operational display appears, while the following steps are automatically executed:

- „Automatic parameterization“ is called-up (☞ Section 8.1.5).
- Ground-fault test:

  When the drive converter is operated from a grounded line network, a ground fault in the connected motor (including feeder cables) is identified, if the ground fault current > 5 % $\hat{I}_{\text{rated (drive converter)}}$.

  Further, defective transistors, which are still conductive, are identified in the inverter.

  The tests consists of 7 steps. No transistor is fired in the 1st step, and in additional steps, precisely one transistor is fired.

  In each step, the actual values of the output currents, phases U and W, the UCE checkback signals of the 3 phases, the overcurrent comparator, and the overvoltage comparator monitored.

  The visualization parameter r358 (ground fault test result) is available, from which the measurement result which caused the fault, can be read-out.

  Comment: The ground fault test can also be separately called-up using parameter 354 (ground-fault test).

- Resistance measurement and the resulting parameter change:
  The resistance measurement defines the total resistance P272 (consisting of the motor stator resistance and the feeder resistance), as well as the setting of the „deadtime compensation“.
  The measurement consists of 5 measuring segments.
  The deadtime compensation is determined in measuring segments 1 and 2.
  Measurements in measurement segments 3 to 5 is realized using a constant DC current with a magnitude of the peak value of the rated motor current (≤ rated drive converter output current) at different pulse frequencies.
  Two resistance values are calculated in each of the three measuring segments. An average value, which is limited to max. 49.9 % is generated from these 6 individual results.

  Measured/calculated parameter values:
  P272R (stator + cable)
  “deadtime compensation“

⇓ The READY TO SWITCH-ON (009) operating display appears after the selected function has been completed.

9 Functions (software)

9.1 WEA (automatic restart)

Description:

The automatic restart function can be used for automatic fault acknowledgement and automatic power-up after a power failure (F008 „DC link undervoltage“) as well as to permanently activate the restart-on-the-fly function without operating personnel having to intervene.

For fault message F008 „DC link undervoltage“ (power failure): ☞ Section 12 „Fault and Alarm Messages“

Parameter to set the automatic restart function:

P366	WEA selection	i001: MDS1 i002: MDS2	0 to 3

P366 = 0 (inhibited):

WEA is inhibited.

P366 = 1 (power failure acknowlegement after the power returns):

Fault message F008 „DC link undervoltage“(power failure) is acknowledged, if this did not occur for an OFF- or INCHING command for motor identification MOTID.

The converter is **not** automatically switched-in by the WEA.

P366 = 2 (Drive restart after the power returns):

Fault message F008 „DC link undervoltage“ (power failure), is acknowledged, if this did not occur for an OFF or inching command or for motor identification MOTID.

If it has been acknowledged, a delay time P367 in (s), which can be parameterized has to expire in the status SWITCH-ON INHIBIT (008), until the drive is automatically restarted by WEA.

If the restart-on-the-fly function is activated via control word bit 23 (Section 5.1), delay time P367 is ignored.

The unit is only switched-in again if the ON command (control word bit 0) is still present after the power returns.
Thus, the WEA function is not possible with a parameterized ON command (control word bit 0) via PMU or OP1!

P366 = 3 (drive is always powered-up with automatic restart-on-the-fly circuit):

As for P366 = 2, however, the restart-on-the-fly function is always activated, independent of control word bit 23 (Section 5.1).

Delay time (P367) is ignored.

The restart-on-the fly function is activated each time the drive is powered-up, even if the power had not previously failed!
A description of the additionally necessary settings for the restart-on-the-fly function is provided in Section „Restart-on-the-fly“.

P367	WEA delay time	i001: MDS1 i002: MDS2	0 s to 650 s

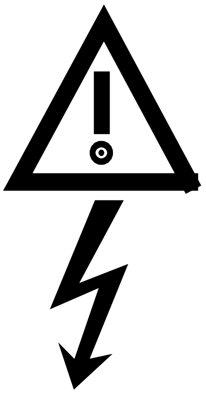
Delay time between the supply return and when the drive converter is restarted with the WEA function activated.
The delay time is not effective for P366 = 3 or when control word bit 23 is set.

Alarm A065 (Automatic restart function active):

- The alarm is set by WEA after switch-on, and is reset after precharging has been completed.
- When the drive is started by he WEA, the pre-charging time is not monitored, so that fault F002 „DC link precharging fault“ can not occur.
- The converter can be manually shutdown with an OFF command during this switch-on phase.
  ☞ Chapter 12 „Fault and Alarm Messages“.

Special cases:

- ♦ If the conveter has an external auxiliary supply, a fault is acknowledged and the drive re-started although the supply is still faulted, dependent on parameter P366!
  Alarm A065 „automatic restart active“ is continuously present until the supply returns!
- ♦ If additional faults/errors have simultaneously occurred in addition to fault message F008 „DC link undervoltage“ (power failure), these are also acknowledged, dependent on parameter P366 !
- ♦ If the kinetic buffering function is also activated, when the power fails, this is first executed, before fault trip F008 occurs and the WEA intervenes.



WARNING

During power failures and activated WEA (P366 = 2, 3), the converter can automatically restart when the supply returns and after delay time P367 has expired (not valid when the restart-on-the-fly function is activated).

Thus, the drive could be at a standstill for a longer period of time which could be accidentally mistaken for being switched-off.

If the drive area is approached when in this status, severe bodily injury or material damage could occur.

NOTE

If the restart-on-the-fly function is not activated, and **P366 = 2,** overcurrent trip F011 could occur or the motor could be suddenly braked, when the converter is restarted and the motor is still rotating !
Thus, delay time **P367** must be selected high enough, so that it is guaranteed that the motor comes to a standstill before the switch-on command!

9.2 KIP (Kinetic buffering)

Description:

The KIP function allows brief power supply failures to be buffered by utilizing the kinetic energy, i.e. inertia of the connected load.

In this case, the frequency is controlled (closed-loop), so that the system losses are covered by the over-synchronous motor operation.

As the losses remain during the power failure, the converter output frequency has to be lower. The thus reduced speed reduction must be taken into account.

When the supply returns, power is fed in from the supply, and the converter output frequency returns to the selected reference frequency via a ramp-function generator function (RFG).

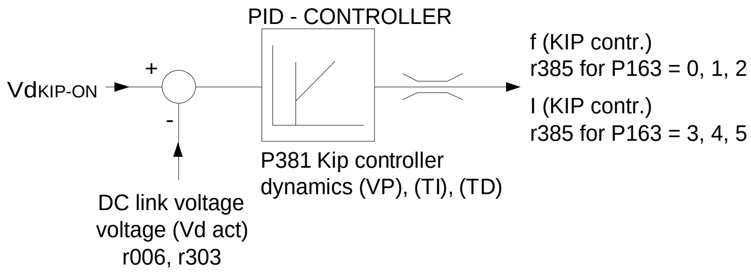


Fig. 9.1 Kinetic buffering

As long as the KIP function is switched-in, the „**KIP active**“ signal is set via **status word bit 15** (☞ Section 5.2).

Parameter to set the kinetic buffering function:

P379	KIP on/off	i001: MDS1 i002: MDS2	0 to 3
0: Kinetic buffering is not enabled. 1: Kinetic buffering is enabled. 2: Flexible response is enabled with V/f = const. 3: Flexible response is enabled with f = const			

P380	KIP initiation point	i001: MDS1 i002: MDS2	65 % to 115 %
The kinetic buffering threshold can be set between 65 % and 115 % using this parameter. The switch-off threshold is 5 % above the switch-on threshold (☞ Chapter 10 „Function diagrams“).			
NOTE			
For kinetic buffering, values for P380 > 90 % are only practical, if an active front end (AFE) is used as rectifier/regenerative feedback unit.			

P381	KIP controller dynamic	i001: MDS1 i002: MDS2	0 % to 200 %
The characteristics of the PIB controller can be influenced using this parameter. The factory setting is 50 %. At 0 %, the kinetic buffering function is disabled. The controller output can be visualized via parameter **r385**.			

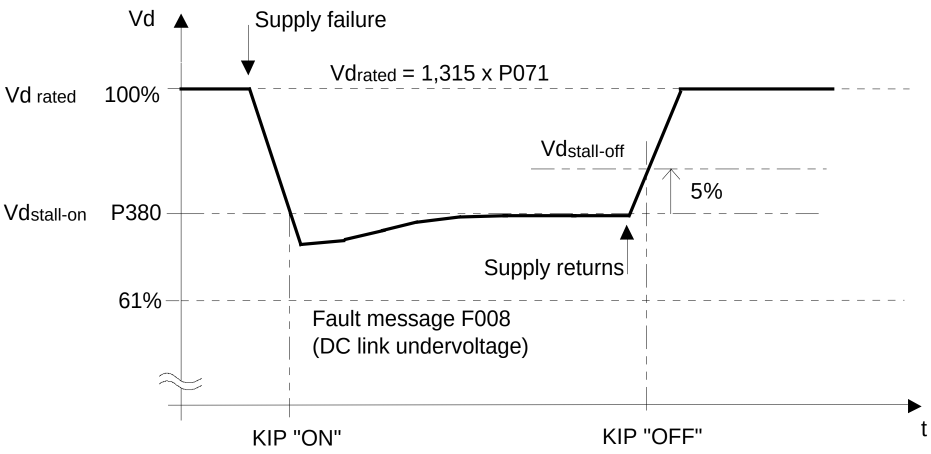


Fig. 9.2 Switch-on/switch-off threshold

$V_{d\ KIP\ ON} = \ P380 \ \times \ V_{d\ rated}$ Pre-assign: P380 = 76 %

$V_{d\ KIP\text{-}OFF} = \ (P380 \ + \ 5\ \%) \ \times \ V_{d\ rated}$ Pre-assign: bei P380 = 76 % ⇒ 81 %

$V_{d\ rated} = \ 1{,}315 \ \times \ P071$

9.3 Flexible response

Description:

The „flexible response“ function allows the converter to still operate during supply dips up to a minimum DC link voltage of 50% of the rated value. The maximum converter output is decreased corresponding to the actual line supply voltage. If the „flexible response“ function is enabled, the firing level is limited to the range of the asynchronous vector modulation (reduction of the max. output voltage).

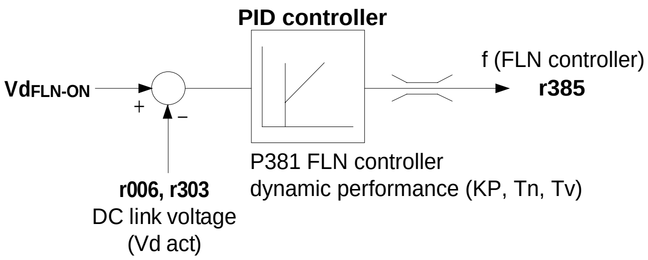


Fig. 9.3 Flexible response

NOTE
The maximum firing level can be taken from parameter r180. The maximum output voltage at the particular operating point can be read-out at parameter r181.

The „FLR active“ signal is set via the **status word bit 15**, (☞ Section 5.2) as long as the „**flexible response**“ function is active.

Conditions:

- ♦ A line commutating reactor von 4 % must be provided.
- ♦ The electronics power supply must be realized using an external 24 V supply at connector X9 (☞ Chapter "Connecting-up" in the Operating Instructions, Part 1).
- ♦ It must be ensured, that if there is an external main contactor, this does not drop-out during the supply dip.
- ♦ When the line voltage supply returns, it is not permissible that the voltage increases 50% to 100% in less than 5 ms.
- ♦ A maximum of 10 dips/hour are permissible with a minimum 10 s time between them.

WARNING

If these conditions/instructions are not observed, this can result in erronous function or the drive converter being destroyed.

During a supply dip, the available induction motor output is reduced over-proportionally for operation with one of the V/f operating modes (P163 = 0,1,2)

Parameter to set the flexible response function:

P379	FLR on/off	i001: MDS1 i002: MDS2	0 to 3

0: Flexible response is not enabled.
1: Kinetic buffering is enabled.
2: Flexible response is enabled with V/f = const.
3: Flexible response is enabled with f = const. (only for v/f operation P163 = 0, 1, 2).

P380	FLR initiation point	i001: MDS1 i002: MDS2	65 % to 115 %

The FLN threshold can be set to between 65% and 115% using this parameter.
The switch-off threshold is 5% above the switch-on threshold (☞ Section 10 „Function diagrams“).

NOTE

For flexible response, values of P380 > 90 % are not practical, as otherwise the function may not be able to be switched-out. When using an active front end (AFE) as rectifier/regenerative feedback unit, the FLN function is automatically included in the AFE.

P381	FLN controller dynamic performance	i001: MDS1 i002: MDS2	0 % to 200 %

The characteristics of the PID controller can be changed using this parameter.

The FLN controller is only enabled for P379 = 2.

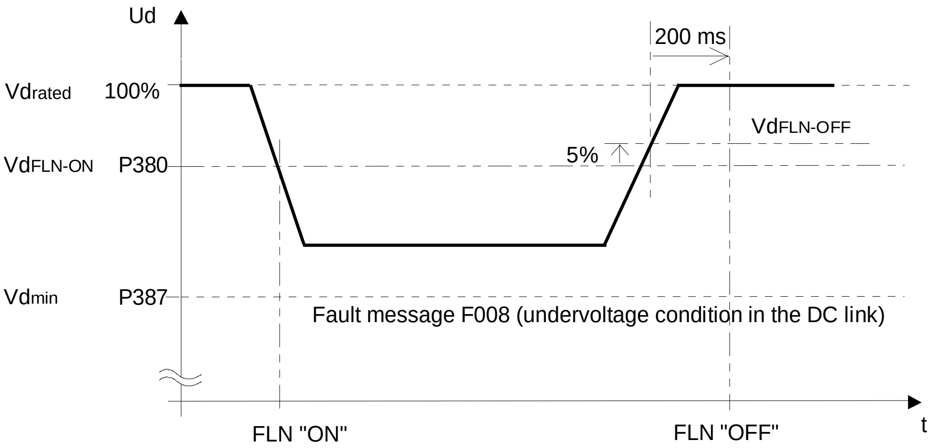
The controller ensures that the v/f ratio remains constant. For supply dips/interruptions (power outages), the drive converter output frequency and therefore the motor speed can decrease.

The factory setting is 50 %.

The controller output can be visualized via parameter **r385**.

P387	FLN Vdmin	i001: MDS1 i002: MDS2	50 % to 76 %
Using this parameter, the voltage threshold of the fault message F008 (DC link undervoltage) can be reduced from 76 % (factory setting!) to 50 % (☞ Section 10 „Function diagrams“).			

P189	Energization time	i001: MDS1 i002: MDS2	0.01 s to 10.00 s
If field weakening is reached during voltage dips, then, for V/Hz open-loop control types (P163 = 0, 1, 2), when the voltage returns, the output voltage is ramped-up which corresponds to twice the excitation time. The excitation time is calculated during automatic parameterization (P052 = 6) and motor identification (P052 = 7, 8).			



$V_{d\ FLN\ ON} = P380 \times V_{d\ rated}$ Pre-assigned: P380 = 76 %

$V_{d\ FLN\ OFF} = (P380 + 5\ \%) \times V_{d\ rated}$ Pre-assigned: for P380 = 76 % ⇒ 81 %

$V_{d\ min} = P387 \times V_{d\ rated}$

$V_{d\ rated} = 1.315 \times P071$

Fig. 9.4 Flexible response

9.4 Vdmax closed-loop control

Description:

The Vdmax closed-loop control function allows briefly occurring regenerative loading to be handled without the unit shutting down with fault F006 (DC link overvoltage). In this case, the frequency is controled (closed-loop), so that the motor does not excessively enter over-synchronous operation.

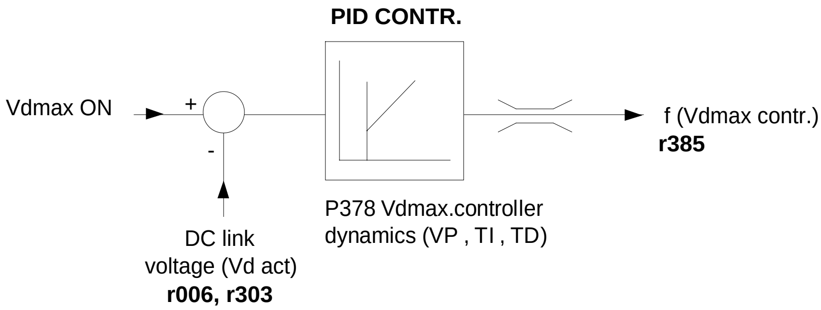


Fig. 9.5 Vdmax closed-loop control

For a steady-state load, the converter output frequency must increase. If a regenerative load excists for too long, the unit is shutdown with F006 when the maximum frequency is reached (P452, P453). If regenerative loading occurs when the machine is decelerating too quickly (P464), then this is automatically reduced, so that the converter is operated at the voltage limit.

The Vdmax control is also optimally suited for regenerative operation, which can occur when the speed stabilizes at the end of ramp-up.

Parameters to set the Vdmax closed-loop control:

P377	Vdmax controller on/off	i001: MDS1 i002: MDS2	0 to 1
0: The Vdmax controller is inhibited. 1: The Vdmax controller is enabled.			

P378	Dynamic performance of the Vdmax controller	i001: MDS1 i002: MDS2	0 % to 200 %
The characteristics of the PID controller can be influenced using this parameter. For 0 %, the Vdmax controller is disabled. The factory setting is 50 %. The controller output can be visualized via parameter r385.			

Alarm A041 „Vdmax controller inhibited“:

The line supply voltage is too high or the drive converter supply voltage (P071) is incorrectly parameterized. The Vdmax controller is inhibited in spite of the fact that the parameter is enabled (P377 = 1), as otherwise, the motor would immediately accelerate to the maximum frequency in operation.

The response threshold when inhibiting the Vdmax controller is calculated as follows:

$$V_{d\,max-ON} = 119\,\% \times \sqrt{2} \times V_{supply,\ rated} = 168\,\%\ V_{supply,\ rated}$$

$$V_{supply,\ rated} = \text{P071 for AC-AC drive converters and}$$

$$V_{supply,\ rated} = \frac{\text{P071}}{1.315} \text{ for DC-AC drive converters}$$

9.5 DC current brake

Description:

The DC brake function allows the drive to be brought to a standstill in the shortest possible time. To realize this, a DC current is impressed in the motor windings, which, for an induction motor, results in a very high braking torque.

NOTE
The „DC current braking“ function is only practical for induction motors!
With the „DC current braking“ function, the kinetic energy of the motor is converted into heat **in the motor**. The drive could overheat if it remains in this status for an excessive period of time!

Parameters to adjust the DC current brake:

P371	Motor de-energization time	i001: MDS1 i002: MDS2	0,01 s to 10,00 s
The minimum delay time between pulse inhibit and pulse enable is set using the parameter. Thus, it should be ensured that the motor is at least de-magnetized to 90% when the pulses are enabled. The parameter is pre-assigned during automatic parameterization and motor identification.			

P372	DC brake on/off	i001: MDS1 i002: MDS2	0 to 1
0: DC brake on/off. 1: The DC brake is not activated for an OFF3 command (fast stop), the unit is DC current braked.			

P373	DC braking current	i001: MDS1 i002: MDS2	20 % to 400 %
The current setpoint (as a %, referred to the rated motor current) is set using this parameter, which is impressed for DC current braking			

P374	DC braking duration	i001: MDS1 i002: MDS2	0.1 s to 99.9 s
The DC current braking duration is selected using this parameter.			

P375	Frequency at the start of DC braking	i001: MDS1 i002: MDS2	0.1 Hz to 300.0 Hz
For an OFF3 command, DC current braking is realized from this frequency.			

Procedure:

- The DC brake is activated using the OFF3 command.
- The drive converter decelerates along the parameterized OFF3 ramp (P466) down to the frequency for the start of DC braking (P375). Thus, the motor kinetic energy can be reduced without endangering the drive. However, if the OFF3 ramp-down time (P466) is selected to be too low, there is a potential danger that a fault could occur due to DC link overvoltage (F006).
- The inverter pulses are inhibited for the duration of the de-energization time (P371).
- The required current (P373) is then impressed for the selected braking duration (P374).
- The drive converter changes into the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) status.

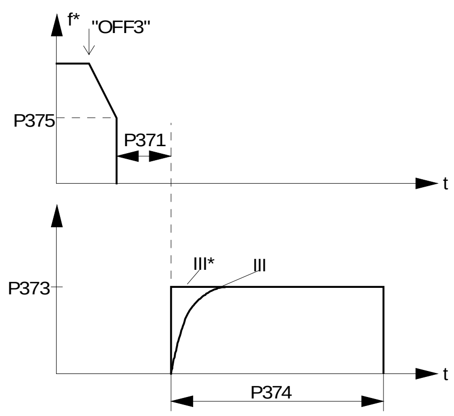


Fig. 9.6 DC current braking

9.6 Restart-on-the-fly

Description:

The restart-on-the-fly function allows the converter to be connected to a motor which is still rotating. If the converter was to be switched-on without the restart-on-the-fly function, an overcurrent condition would occur, as the flux in the motor has to first be built-up, and the open-loop/closed-loop control must be appropriately set.

NOTE
It is not possible to implement a restart-on-the-fly function for multi-motor drives, as the motors have different run-down characteristics!

The following is executed, depending on whether a tachometer is enabled:

Restart-on-the-fly without tachometer (with search) (P208 = 0):

NOTE
„Restart-on-the-fly without tachometer“ (searching) is only practical for induction motors! For „restart-on-the-fly without tachometer“, the „Standstill test“ generates a braking torque which can cause drives with low moments of inertia to be braked to a standstill.

- A standstill test (a DC current is briefly impressed) is executed after the de-energization time (P371) has expired after the supply returns, with WEA (☞ Section 9.1) active, or since the last shutdown time with „OFF 2“ command (inverter inhibit).
- If it is identified that the motor is at standstill, energization and acceleration are started as for a standard start
- If motor standstill has not been identified, searching is started with the maximum frequency, clockwise phase sequence (P452); if only a COUNTER-CLOCKWISE phase sequence is selected (☞ Section 5.1 „Control word“), searching starts with the maximum frequency, clockwise rotating phase sequence (P453).
- The search frequency is linearly reduced down to 0 Hz, and more specifically by the search speed which can be parameterized **P370** (in Hz, referred to 1 second). In this case the search current **P369**, which can be parameterized, is impressed.
  The setpoint output voltage of the drive converter, required for the search current, is compared with the voltage value of the V/f characteristic corresponding to the search frequency. If the motor frequency is found using this evaluation, the search frequency is kept constant and the output voltage is changed to the voltage value of the V/f characteristic with the energization time constant (dependent on the energization time (P189)).
  The ramp-function generator is then set to the search frequency.
  If it is not possible to set the ramp-function generator, as the supplementary setpoint is too high, then the unit is shutdown with **Fault F018** „ramp-function generator could not be set at restart on the fly“. Otherwise the RESTART-ON-THE-FLY status (013) is exited and the motor (via the ramp-function generator) is ramped up to the actual setpoint frequency.
- If the motor was not found, at 0 Hz search frequency, a standstill test is again executed and a search run made in the appropriate direction of rotation when the phase sequence in the other direction of rotation is enabled. The motor is switched-in at 0 Hz even if the search was not successful.

Example: Restart-on-the-fly without tachometer (search)

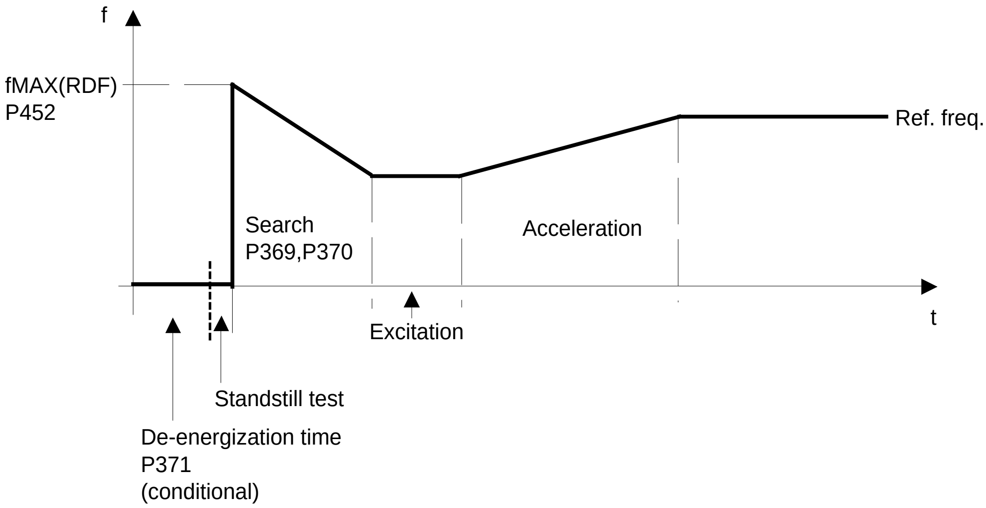


Fig. 9.7 Restart-on-the-fly

Restart-on-the-fly with tachometer (P208 ≠ 0):

- After the de-energization time (P371) expires after the supply returns with activated WEA (Section 4.3.10.1), or since the last shutdown with „OFF2“ command (inverter inhibit), the converter output voltage is linearly increased from 0 to the V/f characteristic value (detemined from the measured, smooth speed actual value), within the excitation time P189).
- After the energization time (P189 has expired, the ramp-function generator is set to the smoothed speed actual value.
  If it is not possible to set the ramp-function generator, because the supplementary setpoint is too high, then the unit is shutdown with **Fault F018** „ramp-function generator was not able to be set for restart-on-the-fly“.
- Otherwise, RESTART-ON-THE-FLY status (013) is exited, and the motor is ramp-up to the actual setpoint frequency (via the ramp-function generator.
- For closed-loop torque control (P163 = 5) or a slave drive (refer to P587), the drive continues with the actual torque setpoint

Parameter to select the restart-on-the-fly function:

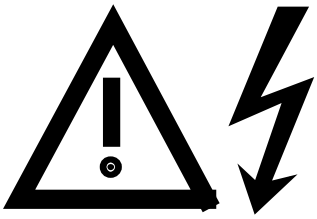
P583 Control word bit 23	Restart-on-the-fly enable	i001: BASIC i002: RES	0 to 1
0: Restart-on-the-fly is not enabled. 1: Restart-on-the-fly is enabled at each on command. Source selection parameter for control word bit: P583 ☞ Section 5.1 „Control word“. **Exception: P366 = 3** The **automatic restart** (☞ Section 9.1) **and restart-on-the-fly** (without taking into account the control word command „restart-on-the-fly enable“ (bit 23)) functions are always activated.			

Only for restart-on-the-fly without tachometer (with search) (P208 = 0):

P369	Restart-on-the-fly search current	i001: MDS1 i002: MDS2	10 % to 400 %
Setpoint of the impressed current when searching for the motor (as a %, referred to the rated motor current (P102)) Presetting during „automatic parameterization“ to „no-load motor current“ (r196)			

P370	Restart-on-the-fly search speed	i001: MDS1 i002: MDS2	0.1 Hz to 100.0 Hz
Ramp gradient with which the search frequency can be changed (in Hz, referred to 1 second).			

As long as the restart-on-the-fly function is active, the **„restart-on-the-fly active" message** is set via the **status word bit 16** (☞ Section 5.2).

	WARNING
	With the „restart-on-the-fly without tachometer" activated (P366 = 3 with WEA or control word bit 23), the drive may suddenly accelerate as a result of the search current in spite of the fact that the drive is at a standstill and a 0 Hz setpoint ! Death, severe bodily injury or material damage can occur if the drive area is entered!

9.7 Technology controller

Description:

The technology controller function can be used for simple, higher-level closed-loop control functions without requiring an additional technology board (TB)

A freely connectable setpoint is compared with a freely connectable actual value, and the output is tracked via a parameterizable controller characteristic.

The technology controller sampling time is 8×P308 (pre-setting, 16 ms).

The technology controller computes in the PZD notation, i.e. 100 % corresponds to 4000H.

The function diagram of the technology controller is provided is Section 10.

Parameters to set the technology controller:

- **Enable:**

P584 Control word bit 24	Source, technology controller enable	i001: BASIC i002: RES	0 to 4505
Value 0: Technology controller is not enabled Value 1: Technology controller is enabled, if P526 or P531 ≠ 0 additional possible settings, ☞ Section 5.1			

- **Technological setpoint:**

P525	Fixed technological setpoint	i001: BASIC i002: RES	–200 % to 200 %
This value is active for P526 = 1001			

P526	Technological setpoint source	i001: GRD i002: RES	0 to 4545
Source of the technological setpoint (possible settings, refer to Section 5.3)			

P527	Technological setpoint gain	i001: BASIC i002: RES	–300 % to 300 %
Is not valid for technological controller setpoint input via a fixed setpoint (P526 = 1001)			

P528	Setpoint smoothing	0.00 s to 600.00 s
Smoothing time constant of the setpoint (to prevent setpoint steps)		

r529	Actual technological setpoint
Visualization parameter for the actual technological setpoint in %.	

- **Technological actual value:**

P530	Technological actual value	i001: Value 1 i002: Value 2	0 to 999
Internal sources for the technological actual values. The parameter number of the internal drive converter quantity is specified here, which is to be used as technological actual value.			

P531	Source, technological actual value	i001: BASIC i002: RES	0 to 4545
P531 = 1100: Internal technological actual value 1 (= contents of P530.1) P531 = 1200: Internal technlogical actual value 2 (= contents of P530.2) Additional possible settings, refer to Section 5.3			

P532	Gain, technological actual value	i001: BASIC i002: RES	-300 % to 300 %
Gain of the technology controller actual value			

r534	Actual technological actual value
Visualization parameter for the actual technological actual value in %.	

- **Setpoint/actual value comparison:**

A binary status bit is generated from the comparison between the technological setpoint and the technological actual value; this can be visualized in status word 2, bit 27.
The status „connection“ is realized via parameter P627.

	Technological setpoint, positive	Technological setpoint, negative
HIGH	Techn. actual value > technological setpoint	Techn. actual value < technological setpoint
LOW	Techn actual value < techn. setpoint – hysteresis (P535)	Techn. actual value > techn. setpoint + hysteresis (P535)

P535	Hysteresis of the comparison	0.0 % to 100.0 %
Hysteresis for the „technological setpoint reached“ message. The hysteresis is only effective if the message is withdrawn.		

r536	Technological controller error signal
Control error signal at the input of the technological controller in %.	

♦ **PI controller:**
Depending on the particular application, the controller can be operated as a pure PC controller or as PI controller.
The controller is active, if the inverter pulses are enabled, the energization time (P189) has expired, and the technological controller has been enabled (control word bit 24=1, „connection“ via P584).

P537	Technological controller gain (P component)	0.00 to 250.00

P538	Technological controller integral action time (I component)	0.00 s to 600.00 s
The I component can be disabled using the value „0“.		

r540	Technological controller output signal
Output signal of the technological controller before the limit value stage in %.	

P541	Technological controller limit 1	-200.000 % to 200.000 %
Upper limit of the controller output signals.		

P542	Technological controller limit 2	-200.000 % to 200.000 %
Lower limit of the controller output signal.		

r545	Limited technological controller output signal
Output signal of the technological controller after the limit value stage in %. If limiting is active, the I component of the PI controller is held, in order to permit that the controller quickly leaves the limit.	

The technology controller output can then be connected with value 1020 to parameters **P428 (S.suppl.setpoint)** and **P443 (S.main setpoint)**.

Additional applications of the technology controller:

1. Using parameters P526 and r529 as well as P531 and r534, process data can be transferred from analog inputs or serial interfaces to supplementary boards.

   Example:

   Setpoints for a technological board are to entered in word 05 and word 06 via SST1. In order to permit this, the parameterization must be as follows:

   P526.1 = 2005 (word 05 from SST1)

   P527.1 = 100.00 % (no gain)

   P528 = 0.0 s (no smoothing)

   P531.1 = 2006 (word 06 from SST1)

   P532.1 = 100.00 % (no gain)

   P694.2 = 529 (the actual value W02 for TB is thus word 05 from SST1)

   P694.3 = 534 (actual value W03 for TB is thus word 06 from SST1)

   The technological controller must not be activated for this function (P584 = 0).

2. Status bit 27 can be used as any comparitor, by entering a comparison value via parameters P525 and P526, and a comparison quantitiy via P530 and P531.

   The technological controller does not have to be activated for this function (P584 = 0).

10 Function diagrams

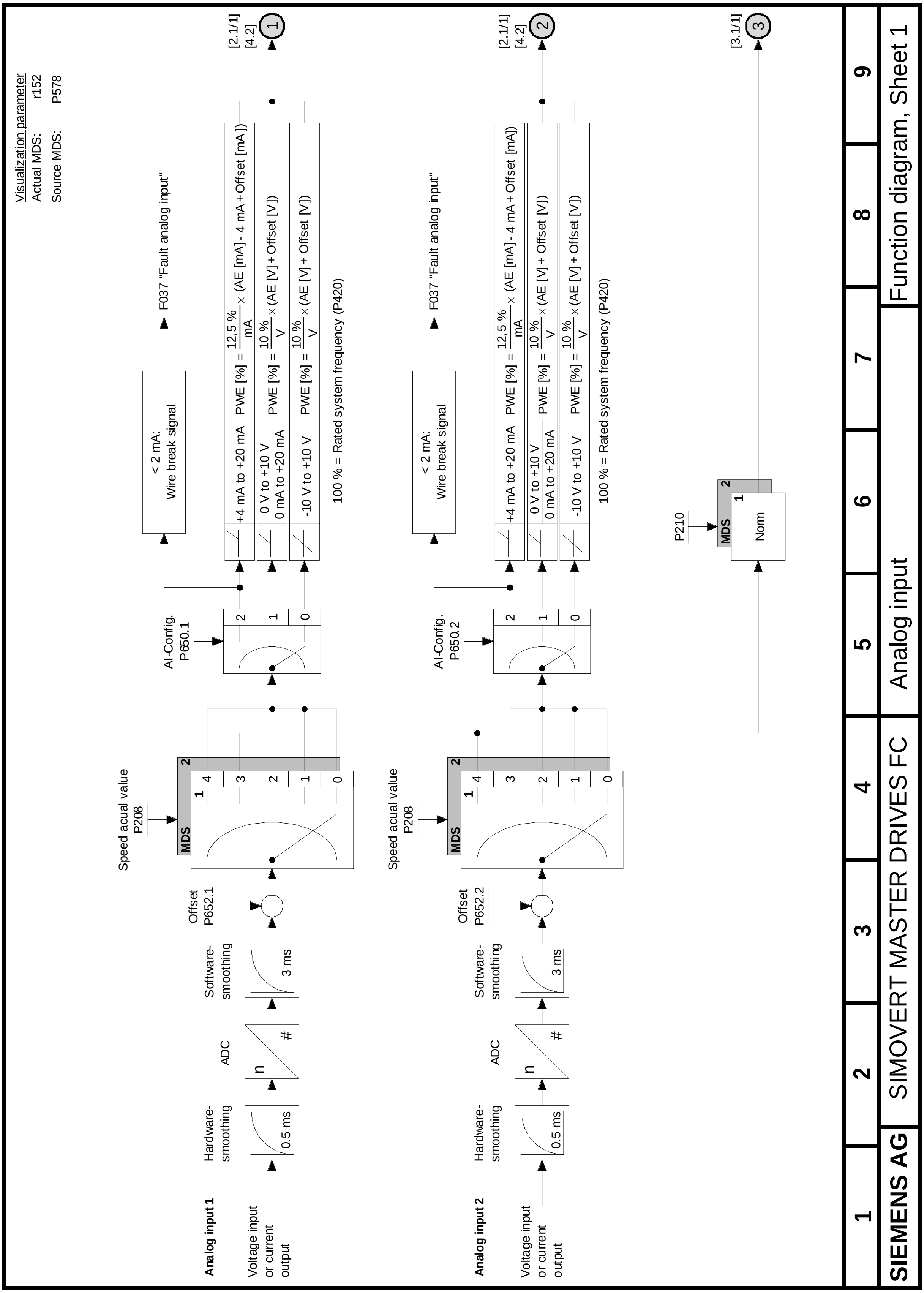


Fig. 10.1 Analog input

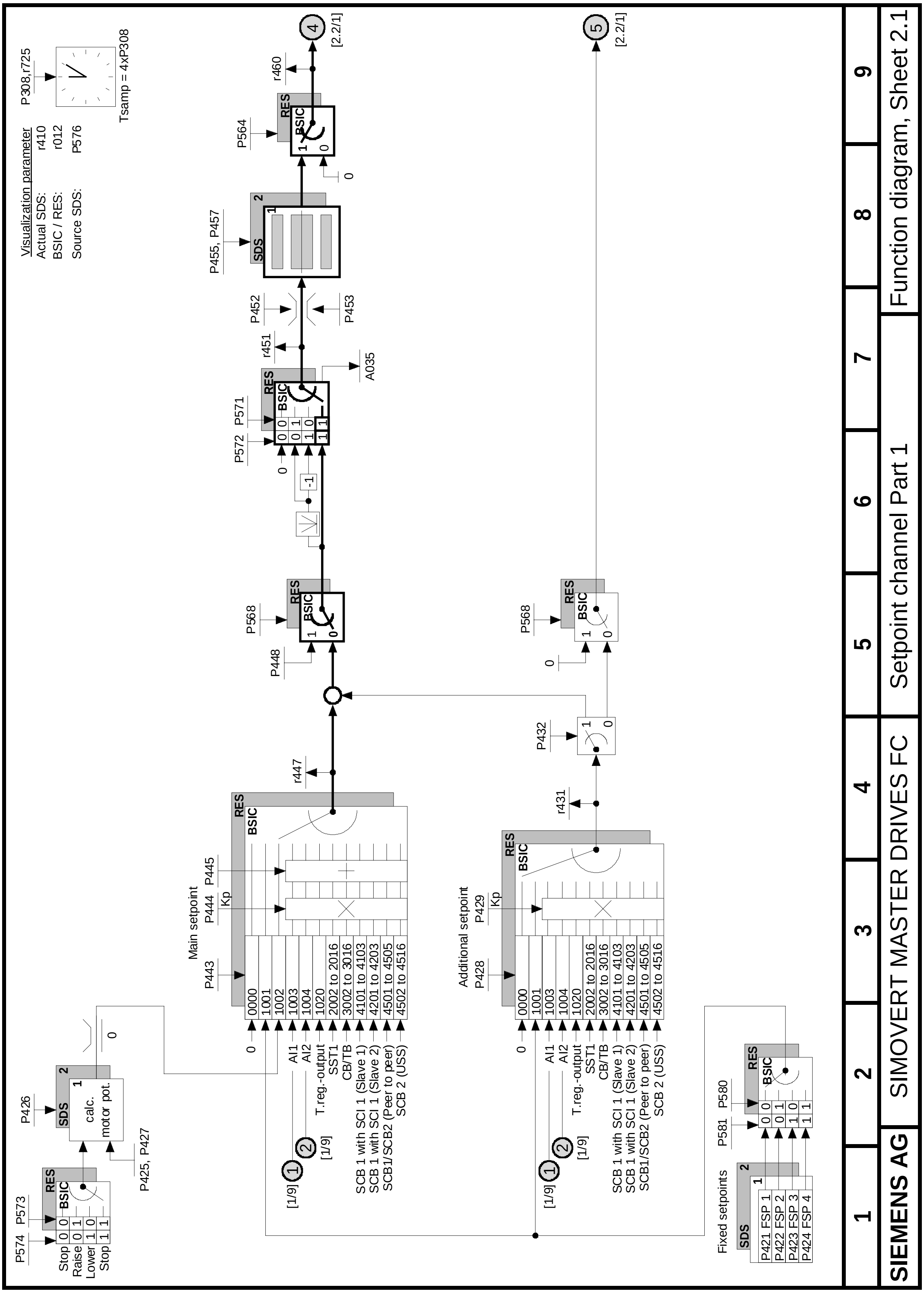


Fig. 10.2 Setpoint channel, Part 1

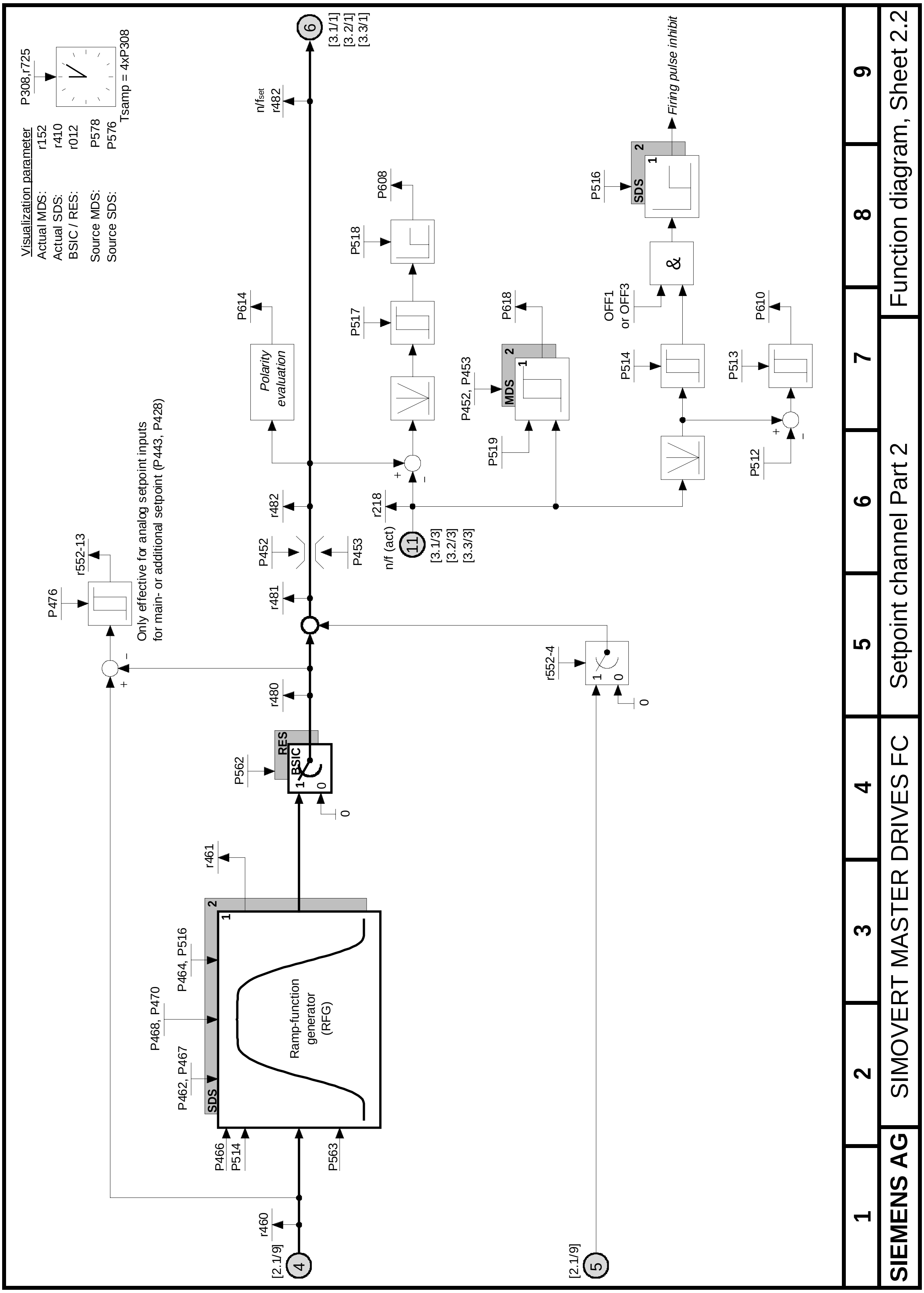


Fig. 10.3 Setpoint channel, Part 2

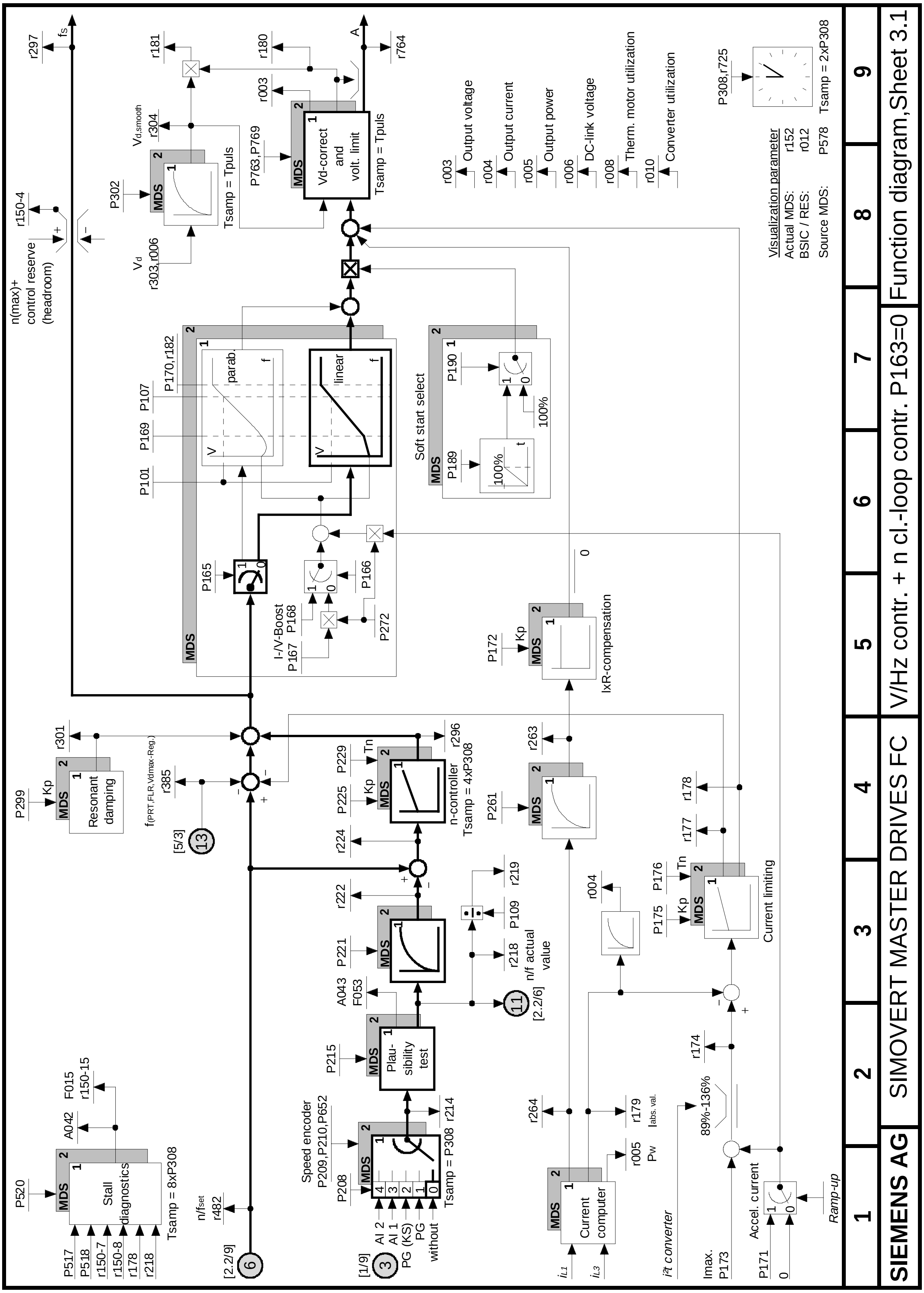


Fig. 10.4 V/Hz control + n closed loop control (P163 = 0)

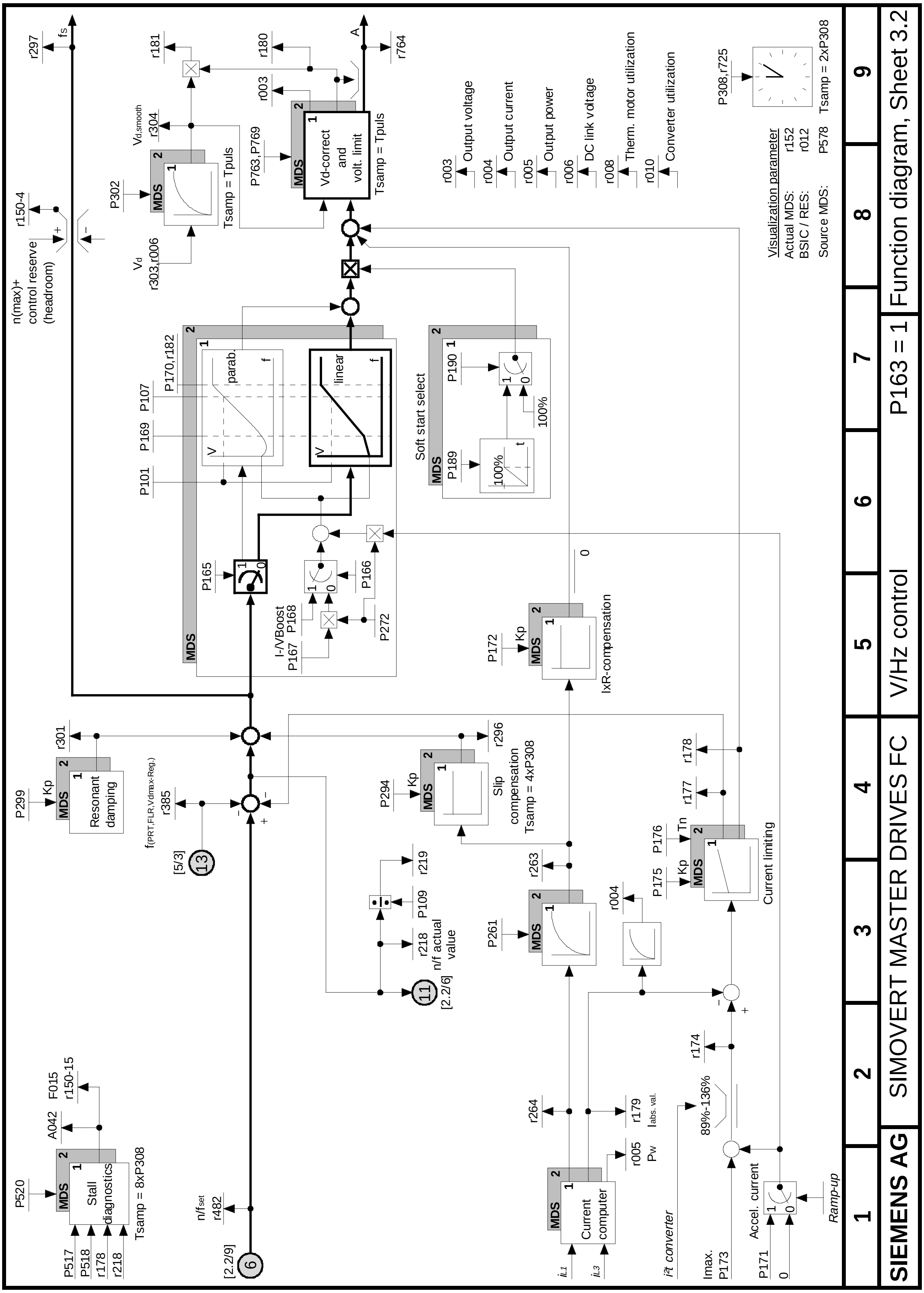


Fig. 10.5 V/Hz control (P163 = 1)

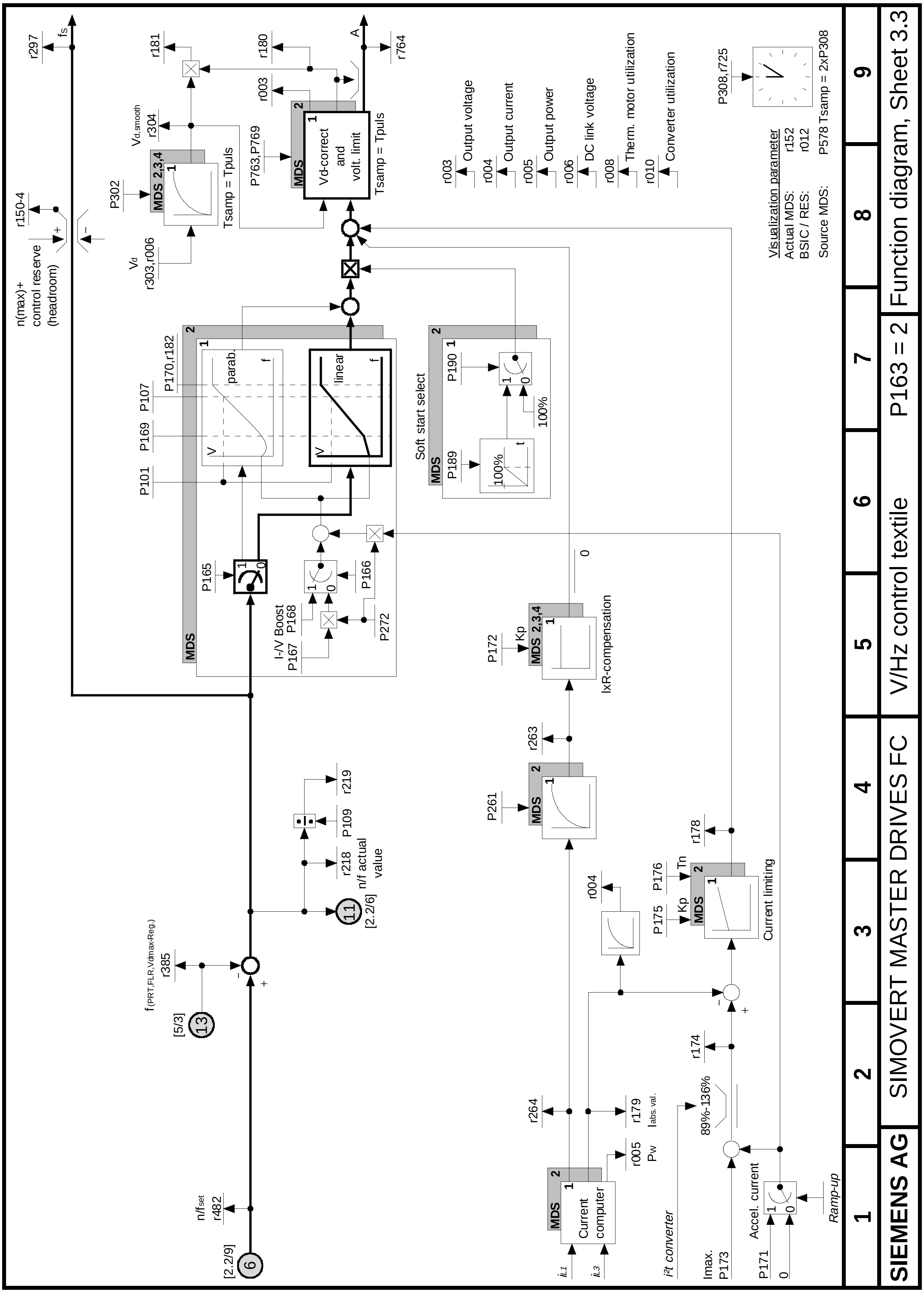


Fig. 10.6 V/Hz control textile (P163 = 2)

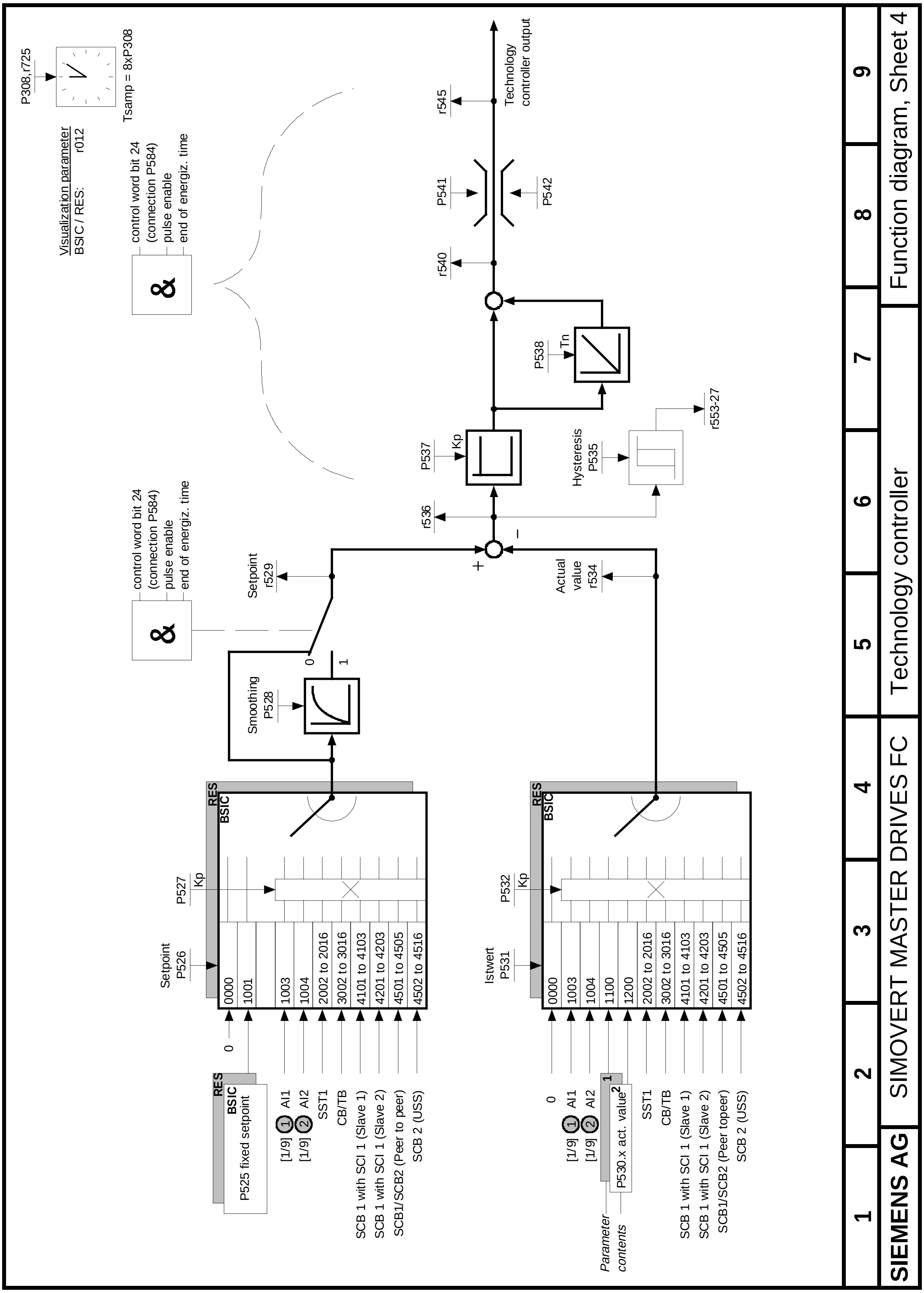


Fig. 10.7 Technology controller

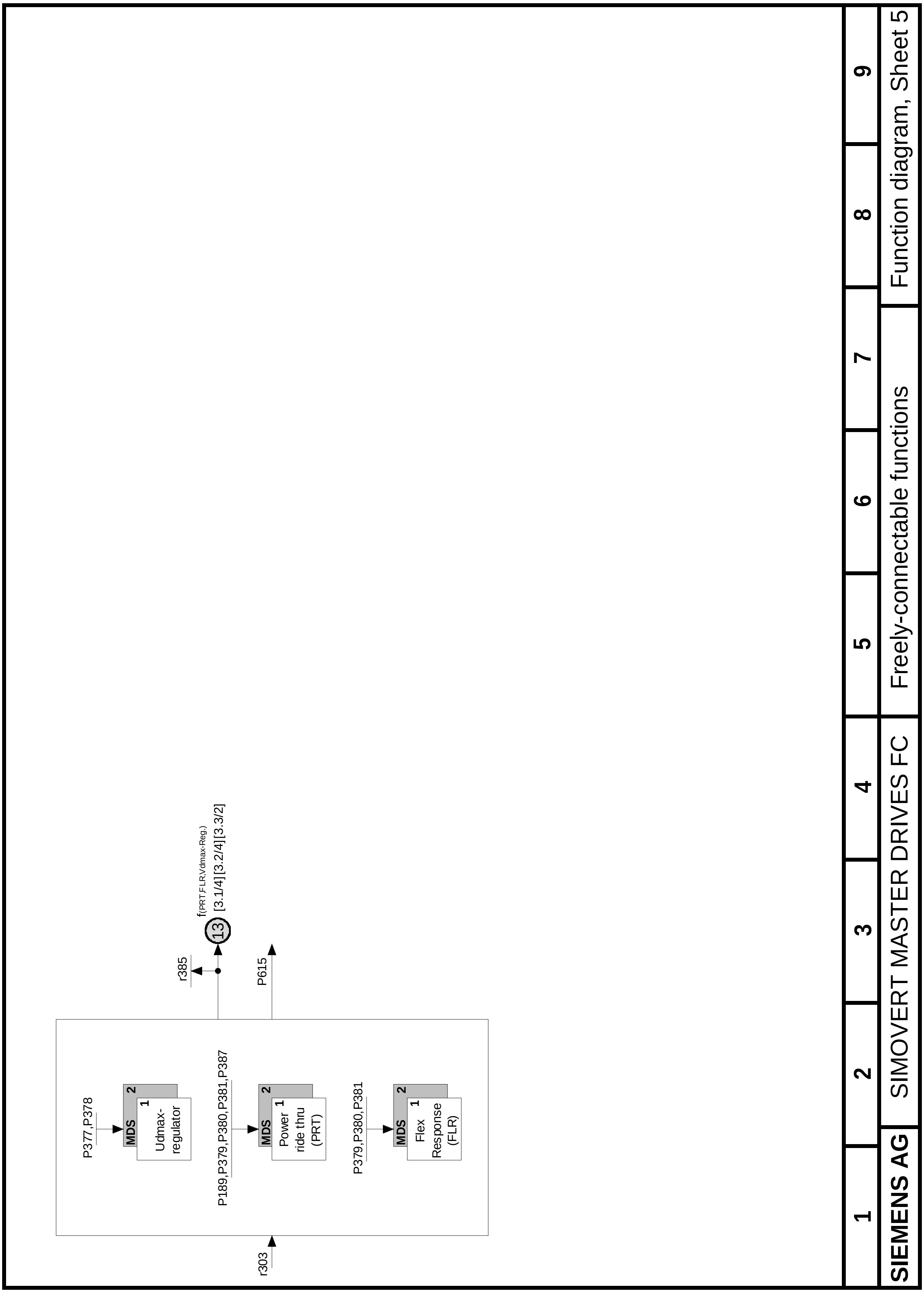


Fig. 10.8 Freely-connectable functions

11 Parameter list

Explanations on the Parameter List

Example:

PNU ***:conf-P**	**Parameter Name in OP1** **Description**	**Range** **[Unit]** **Value texts**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
P999 ***1)** 3E7Hex	**Parameter Name in OP1** Description SDS(2)-Parameter**6)** Type=I2; **2)** PKW: 1Hex=0.01Hz; Process Data Group.: 0**3)**	-300.00 to 300.00 [Hz]	2 i001=50.00 i002=50.00 or: ←**7)**	2**5)**/ BR**4)** 2**5)**/ BR**4)**

1) Confirmation Parameter: not active before pressing the P-key

2) Parameter Type
O2 16 Bit Value without sign
I2 16 Bit Value with sign
L2 Nibble coded Quantity
V2 Bit coded Quantity

3) Normalization Group for Process Data (PcD)

Process Data Group	Process Data Normalization
0	as Parameter Value Normalization
1	4000Hex = P420 Rated System Frequency
2	1000Hex = P102 Rated Motor Amps
3	1000Hex = P101 Rated Motor Volts
4	1000Hex = r307 Line Volts (AC)

4) Drive status:
U MLFB Input
H Hardware Configuration
A Hardware Setting
B Ready (Including Fault)
R (Run) Operation (including Fly Restart, Power Ride Thru)

5) Access Level which is minimum needed to display or change a Parameter
1 Operation
2 Standard Mode
3 Expert Mode

6) Abbreviations for Index Parameters
SDS(2) Setpoint Channel Data Set Parameter with 2 Indices, to be changed via Control Word 2, Bit 16
MDS(2) Motor Data Set Parameter with 2 Indices, to be changed via Control Word 2, Bit 18
B/R Parameter which can be changed between Base and Reserve setting via Control Word 2, Bit 30

7) Parameter value is pre-assigned after initialization dependent on the MLFB drive converter.

11.1 General Observation Parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r000	**Operation Display** Displays Drive Status, Fault Messages and Warnings; Description, refer to Section 6 operator control „Operator control“ in the Operating Instructions, Part 2.		-	1 /UHABR
r001 1Hex	**Drive Status** Displays the actual drive status Parameter Values: 0 = Drive MLFB input 1 = Drive initialization 2 = Hardware initialization 3 = Drive system initialization 4 = Hardware settings 5 = Drive system settings 6 = Selection on several drive test functions 7 = Fault 8 = Restart inhibition 9 = Ready for turn-ON 10 = Pre-charging of the DC link bus 11 = Ready for operation 12 = Ground fault test 13 = Flying Restart is active 14 = Drive is operating 15 = Ramp generator decelerating (OFF1) 16 = Quick Stop (OFF3) 17 = DC braking 18 = Motor data identification (standstill test) 19 = Speed controller optimization 20 = Synchronization active 21 = Download of parameter settings Analog Output: 100% Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 MLFB Input Drive Init H/W Init System Init H/W Setting System Set. Test Fault ON locked Rdy ON Precharging Rdy Operat. Grd Flt TST Fly Restart Operation OFF 1 OFF 2 DC Brake Mot ID Stop n Reg Opt. Synchronize Download	-	2 /UHABR
r003 3Hex	**Output Volts** Drive output voltage (Fundamental rms) Analog Output: 100% @ Parameter Value=4*P101 Type=O2; PKW: 1HEX=0.1V PcD Gr.: 3	[V]	-	2 / BR
r004 4Hex	**Output Amps** Drive output current (Fundamental rms) Analog Output: 100% @ Parameter Value=4*P102 Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	[A]	-	2 / BR
r005 5Hex	**Output Power** Output active power (calculated value) in % of rated motor power Analog Output: 100% @ Parameter Value=400.0% Type=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	[%]	-	2 / BR
r006 6Hex	**DC Bus Volts** DC Bus voltage (actual value to be displayed on PMU and OP) Analog Output: 100% @ Parameter Value=4*r307 Type=I2; PKW: 1HEX=1.0V PcD Gr.: 4	[V]	-	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r008 8Hex	**Motor Utilizat.** Thermal motor utilization (calculated value) ATTENTION: for an overload protection of the motor which is derived from this parameter sufficient cooling of the motor must be guaranteed. Condition: P363 >= 100 s Analog Output: 100% @ Parameter Value=16384% Type=O2; PKW: 1HEX=1.0% PcD Gr.: 0	 [%]	-	2 / BR
r010 AHex	**Drive Utilizat.** Drive utilization Thermal drive utilization as a result of an i^2t calculation of the output current. Maximum load of the drive will have the following reaction: • after 30 sec. a warning message (P622) and • after 60 sec. a reduction of the output current to 91% of the rated drive current. Analog Output: 100% @ Parameter Value=16384% Type=O2; PKW: 1HEX=1.0% PcD Gr.: 0	 [%]	-	2 / BR
r012 CHex	**Base / Reserve** Base / reserve settings of the process data wiring for setpoint signals and for control word bits Parameter values: 0: Base setting 1: Reserve setting Analog Output: 100% @ Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 Base Reserve	0 to 1	2 / BR
r013 DHex	**Operat. Hours** Operation hours with released inverter pulses (drive status ’operation’). Indices: i001 = Days: days (0...9999) i002 = Hour: hours (0...24) i003 = Sec: seconds (0...3600) Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	2 / BR

11.2 General Parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P050 * 32Hex	**Language** Display language on the optional operation panel OP and in the PC software SIMOVIS Parameter values: 0: Deutsch 1: English 2: Espanol 3: Francais 4: Italiano Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 Deutsch English Espanol Francais Italiano	- 0	2 /UHABR 2 /UHABR
P051 * 33Hex	**Access Level** Setting of access levels; with higher access levels more parameters can be read and/or written. Parameter values: 1: Operating via PMU or OP with motor operated potentiometer function 2: Standard mode 3: Expert mode Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 3 Operation Standard Expert	- 2	1 /UHABR 1 /UHABR
P052 * 34Hex	**Function Select** Selection of several commissioning steps and special functions. Parameter values: 0 = Return into the former drive status from one of the further described functions. 1 = Parameter-Reset: all parameters are reset to their original settings (factory settings). According to the Profibus profile for variable speed drives this function is also accessible via parameter P970. After finishing this function the parameter is automatically reset to 0. 2 = Release for MLFB setting (changing into the drive status 'Drive MLFB input'). To exit this function the parameter must be reset to 0. 3 = Download/Upread (Changing into the drive status 'Download'). To exit this function the parameter must be reset to 0. 4 = Hardware configuration (Changing into the drive status 'Hardware settings'). To exit this function the parameter must be reset to 0. 5 = Drive system settings (Changing into the drive status 'Drive system settings' to parameterize the motor data). To exit this function without internal parameter adaptions, P052 must again be set to 0 (reset). If the motor data or pulse frequency were changed, the function should be exited with P052 = 6, 7 or 8. 6 = Automatic parameterization: sets the control system parameters based on the motor name plate data and the gating unit configuration (e.g. P761, pulse frequency). Automatic parameter setting (parameterization) can only be called-up from the drive setting (P052 = 5). 7 = Motor data identification at standstill: sets the control system parameters (except speed controller) based on measured motor data; this function contains ground fault test and function #6. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 7 Return Par. Reset Set MLFB Download H/W Setting System Set. Auto Param. Mot ID Stop	- 0	2 /UHABR 2 /UHAB

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P053 * 35Hex	**Parameter Access** Release of interfaces for parameterization. At any time all interfaces have write access to this parameter. Parameter values: 0: none 1: COM BOARD (CB) 2: BASE KEYPAD (PMU) 4: BASE SERIAL (SST1) (SST1) 8: Serial I/O (SCB with USS) (SCB) 16: TECH BOARD (TB) Description for Setting: • Every interface is coded by a number. • Input of the number or the total of several numbers which are related to interfaces, gives parameterization access to these interfaces. Example: The factory setting ’6’ means, that BASE KEYPAD (PMU) and BASE SERIAL (SST1) have parameterization access. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 31	- 6	1 /UHABR 1 /UHABR
P054 36Hex	**OP Backlight** Backlight for the optional operation panel OP Parameter values: 0 = Backlight always ON 1 = Backlight only ON during operation Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 always ON dur.operat.	- 0	3 / BR 3 / BR

11.3 Drive Data

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P070 * 46Hex	**MLFB (6SE70..)** MLFB (model number) of the base drive Parameter values: see section „Initialization“ in the Operating Insructions, Part 2 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 117	- 0	3 /U BR 3 /U
P071 47Hex	**Line Volts** Line voltage of the drive Rated voltage of the feeding AC or DC mains; this parameter is used to calculate the rated DC bus voltage as a basis for the voltage limits of the Vd(max) and the Vd(min) [Power ride thru] controller (e. g. undervoltage failure limit). Type=O2; PKW: 1HEX=0.1V PcD Gr.: 0	90.0 to 1320.0 [V]	- ←	2 / ABR 2 / A
P072 48Hex	**Rtd Drive Amps** Rated drive output current Type=O2; PKW: 1HEX=0.1A PcD Gr.: 0	4.5 to 6540.0 [A]	- ←	2 /U ABR 4 /U
P073 49Hex	**Rtd Drive Power** Rated drive output power Type=O2; PKW: 1HEX=0.1kW PcD Gr.: 0	2.2 to 1800.0 [kW]	- ←	3 /U BR 4 /U
P077 * 4DHex	**FactSettingType** Selective factory setting. The parameter can be changed in the status „MLFB input“ (P052 = 2). If an MLFB still hasn’t been entered, after the MLFB number has been entered and the „MLFB input“ has been left (P052 = 0) then the selected factory setting-type is immediately valid. A selective factory setting can be executed via „Par. reset“ (P052 = 1 or P970 = 0). This parameter value is not changed. Parameter values: 0: Factory setting as before. 1: With this setting, with respect to 0, the following parameters are initialized differently: P554, P568, P571, P572, P573, P574 2: With this setting, with respect to 0, the following parameters are initialized differently: P554, P568, P571, P572, P573, P574, P575, P588 3: With this setting, with respect to 0, the following parameters are initialized differently: P554, P565, P575, P588 Type:O2; PKW: 1 HEX=1.0 PcD Gr.: -	0 to 3 – Normal OP1 OP1 cabinet unit Cabinet terminal	– 0	3 /U BR 3 /U
r089 59Hex	**Board Position 1** PCB in position #1 (left) of the electronic box Parameter Values: 0 = none 1 = SIMOVERT FC CU Board 2 = SIMOVERT VC CU Board 3 = SIMOVERT SC CU Board Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 3 none FC VC SC		3 / B

11.4 Hardware Configuration

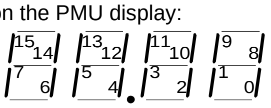
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P090 * 5AHex	**Board Position 2** PCB in position #2 (right) of the electronic box Parameter values: 0 = no optional PCBs 1 = CB Communication Board 2 = TB Technology Board 3 = SCB Serial Communication Board 4 = TSY Digital-Tacho and Synchronization Board Description for Setting: Only the following combinations of PCBs and positions are admitted: Position #3 (P091) / Position #2 (P090) - / CB - / TB - / SCB - / TSY SCB / CB CB / TB SCB / TB CB / SCB CB / TSY TSY / CB SCB / TSY TSY / SCB Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 none CB TB SCB TSY	- 0	3 / H BR 3 / H
P091 * 5BHex	**Board Position 3** PCB in position #3 (center) of the electronic box Description see P090 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4	- 0	3 / H BR 3 / H
P092 5CHex	**Output Filter** Defines connected Output Filter Parameter values: 0 = no output filter 1 = sine wave output filter 2 = dV/dt filter Value '1' limits the depth of modulation to the range of space vector modulation (see also P763, maximum depth of modulation). After leaving drive settings (see P052 = 5) the pulse frequency (P761) is adapted to the sine wave filter requirements. Notes: • For closed-loop speed/frequency/torque control, the sinusoidal filter for the drive converter is taken into account. • Parameter value 2 limits the adjustable pulse frequency P761 to 3 kHz. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 none sine wave dV/dt	- 0	3 / ABR 3 / A

11.5 Motor Data

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P100 64Hex	**Type of Motor** Changes between international (IEC) and US (NEMA) motor data parameterization modes. Input data are for IEC motors: power factor cos(PHI) for NEMA motors: efficiency and rated motor power Parameter values: 0: IEC 1: NEMA MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 IEC NEMA	2 i001=0 i002=0	2 / ABR 2 / A
P101 * 65Hex	**Motor Rtd Volts** Rated motor voltage Name plate value of the rated motor voltage; the valid kind of connection (star / delta) must be regarded. Input for Siemosyn motors is the rated voltage at rated motor frequency. MDS(2) Parameter Type=O2; PKW: 1HEX=0.1V PcD Gr.: -	115.0 to 1600.0 [V]	2 ←	2 / ABR 2 / A
P102 66Hex	**Motor Rtd Amps** Rated motor current; name plate value for the valid kind of connection (star / delta. MDS(2) Parameter Type=O2; PKW: 1HEX=0.1A PcD Gr.:0	0.6 to 3000.0 [A]	2 ←	2 / ABR 2 / A
P103 * 67Hex	**Mot No Load Amps** Motor no load current (rated magnetizing current, data sheet value) in % of rated motor Amps. A correct input improves the calculation of motor data and results in a more accurate active current calculation. Pre-set during automatic parameterization (P052 = 7) Note: for 0 % < P103 < 10 % the value of P196 is set to 10 %. MDS(2) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 95.0 [%]	2 i001=0.0 i002=0.0	3 / ABR 3 / A
P104 * 68Hex	**MotPwrFactor** Power factor cos(PHI) of the motor (name plate value) Condition: P100 = 0 (IEC-Motor) MDS(2) Parameter Type=O2; PKW: 1HEX=0.001 PcD: 4000HEX=0.25	0.500 to 0.999	2 ←	2 / ABR 2 / A
P105 * 69Hex	**Motor Rtd Power** Rated motor power (name plate value) Condition: P100 = 1 (NEMA-Motor) MDS(2) Parameter Type=O2; PKW: 1HEX=0.1hp PcD Gr.: 0	0.1 to 2000.0 [hp]	2 ←	2 / ABR 2 / A
P106 * 6AHex	**Motor Rtd Effic.** Rated motor efficiency (name plate value) Condition: P100 = 1 (NEMA-Motor) MDS(2) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=25%	50.0 to 99.9 [%]	2 ←	2 / ABR 2 / A

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P107 6BHex	**Motor Rtd Freq** Rated motor frequency Name plate value of the rated synchronous frequency of the motor. ATTENTION: Changing this parameter may also change the pulse frequency (P761). Notes: • For P163 = 0, 1 (V/Hz control and V/Hz control with speed control): maximum value is 200 Hz • For P163 = 2 (Textile applications): maximum value is 300Hz The pole pair number (P109) is calculated when parameters are changed For induction motors, a slip (r295) must exist to P108 * P109/60, if the slip compensation function is to operate correctly. MDS(2) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	8.0 to 300.0 [Hz]	2 i001=50.0 i002=50.0	2 / ABR 2 / A
P108 * 6CHex	**Motor Rtd Speed** Rated motor speed (name plate value) Note: P163 = 0 (V/Hz control with speed control) is only available with this information The pole pair number (P109) is calculated when parameters are changed For induction motors, a slip (r295) must exist to P107/ P109*60, if the slip compensation function is to operate correctly. MDS(2) Parameter Type=O2; PKW: 1HEX=1.0min-1 PcD Gr.: 0	0 to 18000 [min-1]	2 i001=0 i002=0	2 / ABR 2 / A
P109 * 6DHex	**Motor #PolePairs** Number of motor pole pairs (calculated from rated frequency (P107) and rated motor speed (P108)); may be checked and - if needed - corrected. ATTENTION: As the pole pair number is automatically calculated when entering the rated motor frequency and speed (P107, P108), it is always necessary to check P109. P109 must be written into when downloading (P052 = 3) For motors with rated data for regenerative operation, the automatically calculated pole pair number must be increased by 1. MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 10	2 ←	3 / ABR 3 / A

11.6 Control

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r150 96Hex	**Control Status** Status word of the control circuit Parameter values: Bit00 = 1: Ramp generator set command is active Bit01 = 1: Drive is operated in field weakening mode Bit02 = 1: Ud(min) controller is active (power ride thru) Bit03 = 1: Ud(max) controller is active Bit04 = 1: Frequency limitation is active Bit05 = 0: Ramp generator: acceleration lock is active Bit06 = 0: Ramp generator: deceleration lock is active Bit07 = 1: Speed controller output at upper limit Bit08 = 1: Speed controller output at lower limit Bit09 = 1: Ramp generator in protective mode Bit10 = 1: i(max) controller active Bit11 = 1: Initialization of the control circuit is finished Bit12 = 1: Speed controller: Output set command is active Bit13 = not used Bit14 = not used Bit15 = 1: Motor pulled out or blocked Coding of bits on the PMU display:  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r152 98Hex	**act. MotDataSet** Displays the active motor data set Parameter values: 0: motor data set 1 1: motor data set 2 Type=O2; PKW: 1HEX=1.0 PcD-Gr.: 0	 MotDataSet1 MotDataSet2	–	3 / ABR
P163 A3Hex	**Control Mode** Parameter values: 0: V/Hz control with superposed speed control 1: V/Hz control 2: V/Hz control for textile applications; allows no frequency corrections e. g. by the current limitation controller MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 V/Hz+ nReg V/Hz V/Hz Textil	2 i001=1 i002=1	3 / ABR 3 / A
P165 A5Hex	**V/Hz Mode** V/Hz mode Parameter values: 0: linear characteristic (for constant torque drives) 1: parabolic characteristic (for pumps, fans, etc.) See section „V/Hz mode“ in the Operating Instructions, Part 2 MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 linear parabolic	2 i001=0 i002=0	2 / ABR 2 / A
P166 A6Hex	**Boost Mode** Boost mode at f = 0 Hz Parameter values: 0: Current boost: a voltage boost is calculated by means of a starting current (P167) allowing for the measured stator resistance. 1: Voltage boost: the voltage boost of the V/Hz curve is directly entered via P168. See section „V/Hz mode“ in the Operating Instructions, Part 2 MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 Curr.Boost Volt.Boost	2 i001=1 i002=1	2 / BR 2 / B

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P167 A7Hex	**Boost Amps** Current boost in % of rated motor current is the basis for the voltage boost at f = 0 Hz, allowing for the measured stator resistance. See section „V/Hz mode“ in the Operating Instructions, Part 2 Condition: P166 = 0 (Current boost) MDS(2) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	10.0 to 400.0 [%]	2 i001=100.0 i002=100.0	2 / BR 2 / BR
P168 A8Hex	**Boost Volts** Voltage boost at f = 0 in % of rated motor voltage (P101) The value is pre-assigned for automatic parameter setting (P052 = 6, 7) See section „V/Hz mode“ in the Operating Instructions, Part 2 Condition: P166 = 1 (Voltage boost) MDS(2) Parameter Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=400%	0.00 to 25.00 [%]	2 i001=2.00 i002=2.00	2 / BR 2 / BR
P169 A9Hex	**Boost End Freq** End frequency of voltage boost In the range from 0 Hz to the end frequency the voltage boost is reduced to 0. Special case: A value of 0 Hz causes the output voltage to stay constant until crossing the normal V/Hz curve ('horizontal boost'). The value is pre-set during automatic parameterization (P052 = 6, 7). See section „V/Hz mode“ in the Operating Instructions, Part 2 MDS(2) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 300.0 [Hz]	2 i001=10.0 i002=10.0	2 / BR 2 / BR
P170 AAHex	**Field Weak Freq** Start frequency for field weakening At higher frequencies the output voltage is kept constant. If the voltage limit is reached below this value, field weakening starts at a lower frequency. See section „V/Hz mode“ in the Operating Instructions, Part 2 Note: r182 (real frequency at start of field weakening) The maximum value is limited to 2 * P107 (rated motor frequency). MDS(2) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	8.0 to 300.0 [Hz]	2 i001=50.0 i002=50.0	2 / BR 2 / B
P171 ABHex	**Accel Amps** Additional acceleration current in % of rated motor current Additional current setpoint signal for high acceleration torque at low speed. The acceleration current is only active during acceleration and up to the end frequency (P169) of the voltage boost. It may be used to generate a break off torque. See section „V/Hz mode“ in the Operating Instructions, Part 2 MDS(2) Parameter yp=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 799.9 [%]	2 i001=0.0 i002=0.0	3 / BR 3 / BR
P172 ACHex	**IxR Compens Gain** Compensation of voltage drops on long motor cables in % of the rated motor impedance. Depending on the actual torque generating current component the output voltage is increased . See section „V/Hz mode“ in the Operating Instructions, Part 2 MDS(2) Parameter Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	0.00 to 40.00 [%]	2 i001=0.00 i002=0.00	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P173 ADHex	**Imax** Maximum current (Fundamental rms) Setpoint signal for the current limit (Imax controller) to protect the motor and the drive, respectively. Setting range: 0.125 to 4.00*rated motor current (P102), but maximum 1,36* rated drive current (P072). After the automatic parameterization (P052 = 6, 7) the parameter is pre-set to 1,5 * rated motor current (P102). Reaction (derating) may result from the pulse frequency parameter (P761). Related display parameter: r174: realized maximum current setpoint signal; allows for other influences MDS(2) Parameter Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	0.1 to 3000.0 [A]	2 ←	2 / BR 2 / BR
r174 AEHex	**Imax(set)** Maximum current (realized setpoint signal) for the Imax controller allows for the influences of the I^2t calculation and the acceleration current (P171) Dependent Parameter: P173 (maximum current, parameterized value) MDS(2) Parameter Analog Output: 100% @ Parameter Value=4*P102 Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
P175 AFHex	**Imax Reg. Gain** Gain of the current limiting PI controller (Imax controller). The parameter is pre-set during automatic parameterization (P052 = 6). MDS(2) Parameter Type=O2; PKW: 1HEX=0.01 PcD: 4000HEX=0.25	0.01 to 0.49	2 i001=0.05 i002=0.05	3 / BR 3 / BR
P176 B0Hex	**Imax Reg. Time** Integral time constant of the current limiting PI controller (Imax controller). MDS(2) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	4 to 32001 [ms]	2 i001=100 i002=100	3 / BR 3 / BR
r177 B1Hex	**f(Imax-Reg.)** Frequency output of the Imax controller. The sign depends of the sign of the torque generating current component. Note: P163 = 0, 1 (V/Hz modes except textile applications) Analog Output: 100 % @ Parameter Value=163.84Hz Type=I2; PKW: 1HEX=0.1Hz PcD Gr.: 1	 [Hz]	-	3 / BR
r178 B2Hex	**V(Imax-Reg.)** Output voltage of the Imax controller to reduce the drive setpoint voltage. Notes: P163 = 0, 1 (V/Hz modes except textile applications): Only active, when the stator frequency setpoint signal is less than the rated slip frequency (r295). P163 = 2 (Textile applications): Active in the complete frequency range but no frequency correction (r177). Analog Output: 100% @ Parameter Value=4*P101 Type=I2; PKW: 1HEX=0.1V PcD Gr.: 3	 [V]	-	3 / BR
r179 B3Hex	**Output Amps(rms)** Output current (fundamental rms); fast actual value for automation purposes. Analog Output: 100% @ Parameter Value=4*P102 Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r180 B4Hex	**Mod Depth Limit** The modulation depth limit is mainly influenced by the modulator, it is always equal or less than the value of P763 (e. g. when a sine wave filter is present (P091 = 1) or when edge modulation is off (P769 > 0)) Note: The maximum possible control limit (approx. 93 %) of the gating unit at frequencies less than 28 Hz, is only taken into account in r181. Analog Output: 100% @ Parameter Value=400% Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	 [%]	-	3 / BR
r181 B5Hex	**Max Output Volts** Maximum possible output voltage; calculated of the maximum depth of modulation (r180) and the actual value of the DC bus voltage (r304). Analog Output: 100% @ Parameter Value=4*P101 Type=O2; PKW: 1HEX=0.1V PcD Gr.: 3	 [V]	-	3 / BR
r182 B6Hex	**FieldWeakFrq-act** Frequency at start of field weakening; compared to P170 the available voltage headroom is allowed for. In combination with the actual value of the frequency (r297) this parameter is used to calculate a field weakening curve for the adaptation of the slip in the field weakening range. Analog Output: 100% @ Parameter Value=163.84Hz Type=O2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P189 BDHex	**Excitation Time** Motor excitation time Wait time between pulse release and ramp generator release. Within this period the magnetization of the induction motor is built up. The value is pre-set during automatic parameterization (P052 = 6, 7). Notes: • The magnetization is built up at a frequency of 0 Hz with the selected V/Hz curve voltage (see P167 and P168, respectively) • If smooth start mode (P190 = 1) is selected, the voltage is built up ramp-like instead of step-like. • The „restart-on-the-fly active“ status bit (refer to P616) is set during the motor excitation time. MDS(2) Parameter Type=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.01 to 10.00 [s]	2 i001=1.00 i002=1.00	3 / BR 3 / BR
P190 BEHex	**Smooth Accel** For smooth starting, the flux in the motor is established with some delay. This is to ensure, that even with residual magnetization, the motor only rotates in the required direction of rotation. If smooth acceleration mode is selected, at turn on the output voltage increases ramp like to the V/Hz curve voltage within the excitation time (P189). Parameter values: 0 = off 1 = on Condition: P100 = 0, 1 (motor type = IEC, NEMA) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 0: off 1: on	2 i001=0 i002=0	3 / BR 3 / BR
r196 C4Hex	**No Load Amps** Rated magnetizing current (see P103, motor no load current) if P103 = 0.0%: r196 is automatically calculated if 0.0% < P103 < 10.0%: r196 = 0.1 * P102 (rated motor current) if P103 >= 10%: r196 = P103 * P102 Analog Output: 100% @ Parameter Value=4*P102 Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r200 C8Hex	**Rotor Time Const** Rotor time constant of the motor (calculated) Analog Output: 100% @ Parameter Value=16384ms Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	 [ms]	-	3 / BR
P208 * D0Hex	**Src RotSpeed act** Type of tachometer and type of its connection (for speed control (P163=0) a tachometer must be reported). Parameter values: 0 = no tachometer 1 = Encoder 2 = Encoder with control track 3 = Analog tachometer via analog input #1 4 = Analog tachometer via analog input #2 Notes P208 = 1, 2 (Encoder): • The encoder evaluation requires the TSY board in position 2 or 3 (P090, P091) of the electronic box. • Only encoders with a phase shift of 90° between the 2 tracks can be used. • For settings '2' or a low level signal or disconnecting of the control track terminal of the TSY board will cause the fault message F052 in order to report a broken wire. • Set P209 to the number of pulses of the encoder. Please refer to the manual of your encoder or to the TSY manual for details. P208 = 3, 4 (Analog tachometer): • Scale the analog tachometer input via P210 • If the output voltage of the analog tachometer is > 10 V, the analog tachometer interface (ATI) must be used. Related display parameter: r214 (Actual speed measured by the tachometer) Conditions: P163 = 0 (V/Hz modes with speed control) with encoder: P090, P091, TSY board with analog tachometer: ATI board if needed MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 none Encoder Enc+CtTrack AnalogTach1 AnalogTach2	2 i001=0 i002=0	3 / ABR 3 / A
P209 D1Hex	**Encoder Pulse #** Number of pulses of the encoder Description for setting: Parameter is only needed if an encoder is reported (P208 = 1 or 2). Related display parameter: r214 (Actual speed measured by the tachometer) Condition: 208 = 1, 2, 5, 6 (pulse encoder) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	60 to 5000	2 i001=1024 i002=1024	3 / ABR 3 / A

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P210 D2Hex	**AnalogTachScale** Analog tachometer scaling Speed which causes 10 V input signal at the analog input (see P208). The gain setting board ATI is required to connect the analog tachometer to the drive if the tachometer voltage may exceed 10 V. ATTENTION: The parameter value is at same time the limit of the speed measurement range. Speed overshoots must be allowed for. Analog tachometers can be used up to drive output frequencies of max. 100 Hz. Description for Setting: Example: Maximum speed is 3000 rpm plus a 10 % overshot, an ATI board is used 1 P210 must be set to 3300 rpm (3000 rpm + 10 %), 2 in V/Hz mode (P163 = 1) the motor must be operated at 3300 rpm (e. g. to be measured with an external rpm meter) ATTENTION: The analog input where the ATI board is connected to must not be parameterized to be a setpoint input! 3. the output voltage of the ATI board, connected to the selected analog input terminal (P208) must be adjusted to 10.00 V. Dependent parameter: The offset of the analog input must be adjusted (P652). Condition: P208 = 3, 4 (analog tachometer) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0min-1 PcD Gr.: 0	500 to 6000 [min-1]	2 i001=3000 i002=3000	3 / ABR 3 / ABR
r214 D6Hex	**Meas'd Rot.Speed** Actual speed value, measured via a tachometer (P208). Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P215 D7Hex	**max. dn/dt** Maximum allowed change of the measured speed actual value in % of rated motor speed (P108) during one sampling period of the control system (P308). The function may identify noise or interrupted speed signals e. g. caused by defective cable shielding or tachometer coupling. ATTENTION: This function limits the rate of change in speed of the drive. If a warning message is reported during acceleration or at load changes it may be needed to increase the parameter value. Pre-set during automatic parameterization (P052 = 6, 7) . Related display parameter: r218 (Actual speed value) Condition: P208 <> 0 (Source of actual speed value) MDS(2) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.1 to 199.9 [%]	2 i001=10.0 i002=10.0	3 / BR 3 / BR
r218 DAHex	**n/f(act)** Actual value of speed / frequency P163 = 0 (V/Hz modes with speed control): actual speed multiplied with the number of pole pairs of the motor (P109) P163 = 1, 2 (V/Hz mode, V/Hz mode for textile applications) @ slip compensation P294 = 0 %: stator frequency P163 = 1 (V/Hz mode) and slip compensation (P294) active: actual speed multiplied with the number of pole pairs of the motor (P109) Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r219 DBHex	**n(act)** Actual speed P163 = 0 (V/Hz modes with speed control): actual speed of the motor P163 = 1, 2 (V/Hz mode, V/Hz mode for textile applications) @ slip compensation P294 = 0 %: stator frequency divided by the number of pole pairs of the motor (P109) P163 = 1 (V/Hz mode) and slip compensation (P294) active: actual speed Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	2 / BR
P221 DDHex	**Smooth n/f(act)** Smoothing time constant of the actual n/f value for the speed controller (e. g. for gear box looseness. Related display parameter: r222 (smoothed n/f actual value) Condition: P163 = 0 (V/Hz mode with speed control) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	0 to 2000 [ms]	2 i001=0 i002=0	2 / BR 2 / BR
r222 DEHex	**n/f(act,smo'd)** Smoothed n/f actual value at the input of the speed controller Dependent parameter: P221 (Smoothing of the n/f actual value) Condition: P163 = 0 (V/Hz mode with speed control) Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	2 / BR
r224 E0Hex	**n/f Deviation** Control deviation at the input of the speed controller. Condition: P163 = 0 (V/Hz mode with speed control) Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P225 E1Hex	**n/f Reg. Gain** Proportional gain of the n/f controller. Pre-set during automatic parameterization (P052 = 6). Condition: P163 = 0 (V/Hz mode with speed control) MDS(2) Parameter Type=O2; PKW: 1HEX=0.01 PcD: 4000HEX=64	0.00 to 250.00	2 i001=3.00 i002=3.00	2 / BR 2 / BR
P229 E5Hex	**n/f Reg Time** Integral time constant of the speed controller pre-set during automatic parameterization (P052 = 6, 7). Description for setting: With a value of 32001 ms the integral part of the controller is turned off, the controller operates as a P controller. Related display parameter: r237 (integral part of the n/f controller) Condition: P163 = 0 (V/Hz mode with speed control) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	25 to 32001 [ms]	2 i001=400 i002=400	2 / BR 2 / BR
P261 105Hex	**Smooth Isq** Time constant for smoothing the torque generating current component (r264). Pre-set during automatic parameterization (P052 = 6, 7). Related display parameter: r263 (Isq(set, smo'd)) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	0 to 3200 [ms]	2 i001=2000 i002=2000	3 / BR 3 / BR

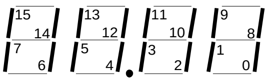
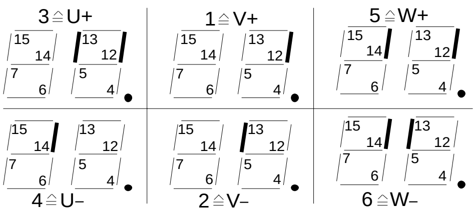
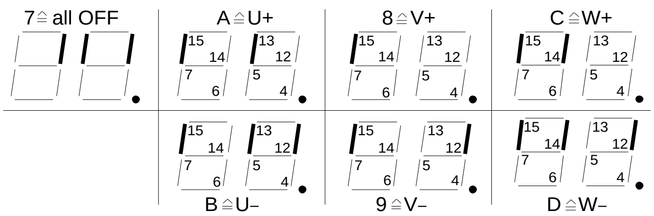
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r263 107Hex	**Isq(set,smo'd)** Smoothed actual value of the torque generating current component; is used for the slip compensation. Dependent parameter: P261 (Smoothing of Isq) Condition: P163 = 1 (V/Hz mode) Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
r264 108Hex	**Isq(act)** Actual value of the torque generating current component Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
P272 110Hex	**ResistStator+Cab** Total of the stator resistance of the motor and the cable resistance in % of rated motor impedance. Pre-set during automatic parameterization (P052 = 6) and during motor data identification(P052 = 7). MDS(2) Parameter Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	0.00 to 49.99 [%]	2 i001=3.00 i002=3.00	2 / BR 2 / BR
P294 126Hex	**Slip Comp Gain** Proportional gain of the slip compensation (also allowing for the rotor temperature) Description for Setting: 0.0%: Slip compensation off 50 - 70%: Full slip compensation at cool motor (partial load) 100%: Full slip compensation at warm motor (full load) ATTENTION: Name plate data for rated motor current (P102), speed (P108) and frequency (P107) must be entered correctly and completely. Condition: P163 = 1 (V/Hz mode) MDS(2) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 400.0 [%]	2 i001=0.0 i002=0.0	2 / BR 2 / BR
r295 127Hex	**Motor Rtd Slip** Rated motor slip in % of rated motor frequency (P108). Analog Output: 100% @ Parameter Value=25.0% Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	 [%]	-	3 / BR
r296 128Hex	**Slip Frequency** Actual slip frequency of the motor P163 = 0 (V/Hz mode with speed control): Output signal of the speed controller. P163 = 1 (V/Hz mode): Output signal of the slip compensation. Dependent parameters: P294 (Kp of the slip compensation) for P163 = 0 V/f class Analog Output: 100% @ Parameter Value=25.0% Type=I2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	 [%]	-	3 / BR
r297 129Hex	**f(set,stator)** Stator frequency setpoint signal Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P299 12BHex	**Reson Damp Gain** Proportional gain of the resonance damping circuit The resonant damping circuit is effective in a range from about 5 % to 70 % of rated motor frequency. Description for setting: Too high parameter values cause instability (forward control effect). Note: The resonance damping circuit damps oscillations of the active current. These oscillationa mainly happen during no load operation. The parameter can not be used to optimize the response behavior of V/Hz mode with speed control (P163 = 0). Related display parameters: r264 (Isq(act)) r301 (f (Resonance damping)). Condition: P163 = 0, 1 (V/Hz modes except textile applications) MDS(2) Parameter Type=O2; PKW: 1HEX=0.01 PcD Gr.: 0	0.00 to 0.99	2 i001=0.00 i002=0.00	3 / BR 3 / BR
r301 12DHex	**f(Reson Damp)** Output frequency of the resonance damping circuit Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.1Hz PcD Gr.: 1	[Hz]	-	3 / BR
P302 12EHex	**SmoothDCBusVolts** Time constant for smoothing the DC link bus voltage (r304) for use in the Vd correction circuit. The smoothing is exponentially related to the parameter value. $T_{smooth} \sim 2^{\text{Parameter value}}$ Related display parameter: r304 (Vd(act,smooth)) Note: if P302 = 16, P304 displays the DC bus voltage calculated from P071 (Line Voltage) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 16	2 i001=9 i002=9	3 / BR 3 / BR
r303 12FHex	**DC BusVolts(act)** unfiltered actual value of the DC link bus voltage Analog Output: 100% @ Parameter Value=4*r307 Type=I2; PKW: 1HEX=1.0V PcD Gr.: 4	[V]	-	3 / BR
r304 130Hex	**DCBusVolt(smo'd)** Smoothed actual value of the DC bus voltage; smoothing see P302 Analog Output: 100% @ Parameter Value=4*r307 Type=O2; PKW: 1HEX=0.1V PcD Gr.: 4	[V]	-	3 / BR
r307 133Hex	**Line Volts (AC)** Rated line voltage For AC drives: Rated drive input voltage (P071). For DC inverters: fictive AC input voltage which would cause the DC voltage ($\frac{P071}{1,35}$). Analog Output: 100% @ Parameter Value=1638.4V Type=O2; PKW: 1HEX=0.1V PcD Gr.: 0	[V]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P308 134Hex	**Sampling Time** Base sampling time T0 of the V/Hz control. Description for Setting: • Before reducing the sampling time the calculation time headroom should be checked (r725). A minimum headroom of 5 % should always be guaranteed to prevent the operation program from a slow reaction. • If fault message #42 'Calculation time' occurs, the sampling time must be increased. • The calculation time loading also depends on the pulse frequency (P761). Type=O2; PKW: 1HEX=0.1ms PcD Gr.: 0	0.8 to 4.0 [ms]	- 2.0	3 / ABR 3 / A

11.7 Functions

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r333 14DHex	**Mot ID Status** Displays the actual measuring step of the motor data identification; see also section „Function selection“ in the Operating Instructions, Part 2 The '100' digit displays the type of measurement: 0xx: not active 1xx: ground fault test 4xx: DC measurement The '10' digit separates the measurement into several steps; the detailed meaning depends of the '100' digit: 10x: ground fault test selected 11x: no transistor ON 12x: transistor V+ ON 13x: transistor V- ON 14x: transistor U+ ON 15x: transistor U- ON 16x: transistor W+ ON 17x: transistor W- ON The '1' digit displays more details of the steps: 4x0: DC current measurement selected 4x1: Measurement in phase direction U 4x2: Measurement in phase direction V 4x3: Measurement in phase direction W 4x4: Parameter written into Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
P354 162Hex	**Ground Flt Test** Ground fault test; this is not a protective function according to any standard. Parameter values: 0 = no ground fault test to be performed except during parameter identification 1 = ground fault test will be performed after the next ON command; afterwards the parameter is reset to '0' 2 = ground fault test to be performed after every ON command 3 = ground fault test is always OFF, even during parameter identification Note: During motor data identification (P052 = 7) a ground fault test is performed if P354 = 0, 1, or 2. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 not active next ON every ON OFF	- 1	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r358 166Hex	**GrdFltTestResult** Results of the ground fault test Bit-coded display of the reason which has caused the break of the test.  Parameter values: Bit 0 =1: VCE phase W Bit 1 =1: VCE phase V Bit 2 =1: VCE phase U Bit 3 =1: overcurrent Bit 8 =1: negative IW Bit 9 =1: positive IW Bit 10 =1: negative IU Bit 11 =1: positive IU ATTENTION! The semiconductor which was triggered or where the fault occurred is coded using Bits 12 to 14 or the highest value nibble on the OP1. Individual converter or Inverter 1 in the parallel circuit:  Bits 12 to 14 all OFF: no semiconductor was in ON-state. Inverter 2 in the parallel circuit:  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		–	3 / BR
P362 * 16AHex	**Motor Cooling** Motor cooling The kind of cooling of the motor influences the calculation of the allowed duty cycle. Because the cooling of self cooled motors depends on the speed, the admissible load decreases with lower speed. Motors with forced cooling don't have these restrictions. Parameter values: 0: self cooled 1: forced cooling MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 self cooled forced vent	2 i001=0 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P363 16BHex	**Mot ThermT-Const** Thermal time constant of the motor Description for Setting: The i^2t calculation is activated by a parameter value >= 100 sec Example: For a 2-pole 1LA5063 motor, the value should be set to: 8 min (from the table)*60 s/min = 480 s Typical thermal time constants for Siemens motors (in min.):	0 to 16000 [s]	2 i001=100 i002=100	2 / BR 2 / BR

Type	2-pole	4-pole	6-pole	8-pole	10-pole	12-pole
1LA5063	8	13	-	-	-	-
1LA5070	8	10	12	-	-	-
1LA5073	8	10	12	-	-	-
1LA5080	8	10	12	-	-	-
1LA5083	10	10	12	-	-	-
1LA5090	5	9	12	12	-	-
1LA5096	6	11	12	14	-	-
1LA5106	8	12	12	16	-	-
1LA5107	-	12	-	16	-	-
1LA5113	14	11	13	12	-	-
1LA5130	11	10	13	10	-	-
1LA5131	11	10	-	-	-	-
1LA5133	-	10	14	10	-	-
1LA5134	-	-	16	-	-	-
1LA5163	15	19	20	12	-	-
1LA5164	15	-	-	-	-	-
1LA5166	15	19	20	14	-	-
1LA5183	25	30	-	-	-	-
1LA5186	-	30	40	45	-	-
1LA5206	30	-	45	-	-	-
1LA5207	30	35	45	50	-	-
1LA6220	-	40	-	55	-	-
1LA6223	35	40	50	55	-	-
1LA6253	40	45	50	60	-	-
1LA6280	40	50	55	65	-	-
1LA6283	40	50	55	65	-	-
1LA6310	45	55	60	75	-	-
1LA6313	-	55	60	75	-	-
1LA831.	35	40	45	45	50	50
1LA835.	40	45	50	50	55	55
1LA840.	45	50	55	55	60	60
1LA845.	55	55	60	60	70	70
1LL831.	25	25	30	30	35	35
1LL835.	30	30	35	35	40	40
1LL840.	35	35	35	35	40	40
1LL845.	40	35	40	40	45	45
1LA135.	30	35	40	-	-	-
1LA140.	35	40	45	45	-	-
1LA145.	40	45	50	50	55	55
1LA150.	50	50	55	55	65	65
1LA156.	60	55	60	60	70	70
1LL135.	20	20	25	-	-	-
1LL140.	25	25	30	30	-	-
1LL145.	30	30	30	30	35	35
1LL150.	35	30	35	35	40	40
1LL156.	40	35	35	35	40	40

Type n_n=	3000	2000	1500	1000	500	1/min
1PH610.	25	25	25	20	-	
1PH613.	30	30	30	30	-	
1PH616.	-	35	35	35	-	
1PH618.	40	40	40	40	40	
1PH620.	40	40	40	40	40	
1PH622.	40	40	40	40	40	

MDS(2) Parameter

Type=O2; PKW: 1HEX=1.0s PcD Gr.: 0

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P364 * 16CHex	**Mot Load Limits** Messages of the duty cycle monitor for the motor (in % of rated motor power) The parameter is valid for all motor data sets. Index i001 = WARN: When the entered load value is reached a warning message is edited via P625. Index i002 = FLT: When the entered load value is reached a fault message is edited via P626. Description for Setting: 0: no evaluation Related display parameter: r008 (Motor loading) Type=O2; PKW: 1HEX=1.0% PcD Gr.: 0	0 to 300 [%]	2 i001=100 i002=100	2 / BR 2 / BR
P366 16EHex	**Auto Restart** Auto restart after power outage Parameter values: 0 = blocked 1 = only power outage fault reset after power return (-> status Ready for turn-ON) 2 = When power returns the drive turns on again after the wait time (P367) 3 = Immediately after power return the drive turns on and performs the function 'Flying Restart'. Note: independently of the status of the bit 'release of Flying Restart' of the control word the 'Flying Restart' function is active at every turn ON if P366 = 3. ATTENTION: it must be guaranteed by external safety means that the drive can not start without intention at parameter settings P366 = 2, 3 MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 none Flt Reset Auto Start Fly Auto St	2 i001=0 i002=0	2 / BR 2 / BR
P367 16FHex	**AutoRestart Wait** Wait time between return of power and automatic drive restart if auto restart is on (P366=2). Note: The wait time is not valid if the Flying Restart function is active: (P366 = 3 (auto restart with flying restart), P583 (source for release of flying restart) or if bit 'Flying Restart' of the control word is set). Description for setting: the wait time should be in the range of the coasting time of the drive system. MDS(2) Parameter Type=O2; PKW: 1HEX=1.0s PcD Gr.: 0	0 to 650 [s]	2 i001=0 i002=0	2 / BR 2 / BR
P369 171Hex	**Fly Search Amps** Search current used for flying restart if no tachometer is used in % of rated motor current (P102) Conditions: P163 = 1 (V/Hz mode) Flying restart function must be released by the control bit (source see P583) or flying restart function must be released via P366 = 3 (auto restart) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0% PcD: 4000HEX=400%	10 to 400 [%]	2 i001=50 i002=50	2 / BR 2 / BR
P370 172Hex	**Fly Search Speed** Search speed Frequency range which is to be passed during flying restart within 1 sec. Note: Conditions as for P369 MDS(2) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.1 to 100.0 [Hz]	2 i001=1.0 i002=1.0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P371 173Hex	**De-magnetizeTime** De-excitation time of the motor Minimum wait time between pulse blocking and pulse release. The induction motor de-magnetizes during this period. Pre-set during automatic parameterization (P052 = 6, 7). Description for setting: About 2.3*rotor time constant (r200), but not more than 3.0 s. This setting guarantees that the motor is de-magnetized for at least 90 % when pulses are released. ATTENTION: After OFF1, OFF3 and JOG commands the de-excitation time is not active MDS(2) Parameter Type=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.01 to 10.00 [s]	2 i001=1.00 i002=1.00	2 / BR 2 / BR
P372 174Hex	**DC Braking** DC injection braking of the motor to brake a motor without optional braking equipment (chopper, regenerative front end) ATTENTION: All loss energy concentrates in the motor, the danger of a local overheating in the motor exists! Note: Only for induction motors Overcurrent interventions (alarm A02) can occur for over-dimensioned motors (P102 > P072) when starting the DC brake. In this case, the de-energization time (P371) must be increased. Parameter values: 0: DC injection braking OFF 1: DC injection braking active with OFF3 command ('quick stop'). MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 off on	2 i001=0 i002=0	2 / BR 2 / BR
P373 175Hex	**DC Braking Amps** Setpoint for the DC injection braking current in % of rated motor current Condition: P372 = 1 (DC injection braking) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0% PcD: 4000HEX=400%	20 to 400 [%]	2 i001=100 i002=100	2 / BR 2 / BR
P374 176Hex	**DC Braking Time** DC injection braking time Condition: P372 = 1 (DC injection braking) MDS(2) Parameter Type=O2; PKW: 1HEX=0.1s PcD: 4000HEX=163.84s	0.1 to 99.9 [s]	2 i001=5.0 i002=5.0	2 / BR 2 / BR
P375 177Hex	**DC Braking Freq** Start frequency for DC injection braking; if OFF3 command is active DC injection braking is performed below this frequency Condition: P372 = 1 (DC injection braking) MDS(2) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.1 to 300.0 [Hz]	2 i001=300.0 i002=300.0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P377 179Hex	**DC Bus Volts Reg** Limitation controller for the DC link bus voltage; limits the DC link bus voltage during regenerative operation (e. g. fast deceleration) to the maximum allowed value. Note: • This function can not replace braking or regenerating equipment when the load actively regenerates energy! • The Vdmax controller should be blocked when braking or regenerating equipment is connected . Parameter values: 0: blocked 1: Vdmax controller released Dependent parameter: P378 (Vdmax controller dynamic behavior): the Vdmax controller is OFF at a controller dynamics setting of 0 %. Related display parameter: r385 (Output signal of the Vdmax controller) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 off on	2 i001=0 i002=0	3 / BR 3 / B
P378 17AHex	**DC Bus Volts Dyn** Vdmax controller dynamic behavior Description for setting: Vdmax controller is OFF at a 0 % setting. Condition: P377 = 1 (Vdmax controller) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 200 [%]	2 i001=50 i002=50	3 / BR 3 / BR
P379 17BHex	**PRT/FLR** Power ride thru (PRT) / Flexible response (FLR) Power ride thru: Operation may be continued during short power outages by regenerating energy from the load / motor to the drive. Loads with high inertia and high speed allow longer sustaining periods. Dependency: P381 (PRT/FLR controller speed) Related display parameter: r385 (PRT controller output) Flexible response: The flexible response function allows converter operation for short power outages. The available output power is reduced according to the actual supply voltage and the rated converter current (P072). The firing angle which can be realized when the function is released (P379 = 2, 3) is limited to the vector modulation range. Note: For the flexible response function, the electronics power supply must be buffered using an external auxiliary power supply. Dependent parameters: P380 (PRT/FLR LowVolts) P381 (PRT/FLR controller speed) P387 (FLR Vdmin) Visualization parameter: r385 (FLR controller output) Parameter values: 0: PRT and FLR blocked 1: PRT released 2: FLR released with V/f = const. 3: FLN released with f = const. MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 OFF PwrRideThru FLR V/f = const. FLR f = const.	2 i001=0 i002=0	3 / BR 3 / B
P380 17CHex	**PRT/FLR LowVolts** Point at which the PRT control or the FLR is activated. DC link voltage which when fallen below, the PRT or FLR is activated (reference quantity: rated DC link voltage; for AC drive converters P071*1.32, for DC converters, P071). Condition: P379 = 1 (select PRT) or P379 = 2, 3 (select FLR) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	70 to 115 [%]	2 i001=76 i002=76	3 / BR 3 / BR

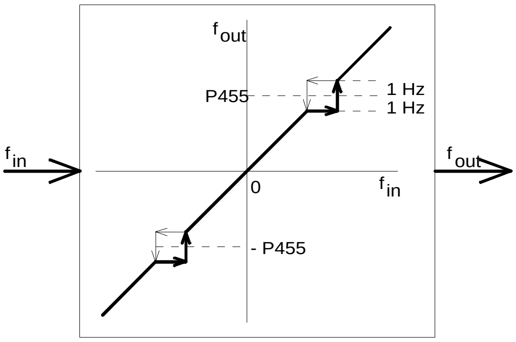
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P381 17DHex	**PRT/FLR Reg Dyn** Controller dynamic behavior for kinetic buffering (P379 = 1) for all control types and flexible response (P379 = 2, V/f = const.) A parameter value of 0% turns OFF the function. Condition: P379 = 1 (select PRT) or P379 = 2 (select FLR, V/f = const.) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 200 [%]	2 i001=50 i002=50	3 / BR 3 / BR
r385 181Hex	**f(PRT/VdmaxReg)** Output signal of the Vdmax / PRT controller; this frequency is added to the frequency setpoint (r482). Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P387 183Hex	**FLR Vd min** Minimum DC link bus voltage in % of the rated DC link bus voltage (for AC drives: P071 * 1.32, for DC inverters: P071); lower voltages trip the inverter and an DC link bus undervoltage fault. Condition: P379 = 2, 3 (FLR released) MDS(2) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	50 to 76 [%]	2 i001=76 i002=76	3 / BR 3 / B
P395 18BHex	**Selectivity** In configurations, where one drive is feeding a number of paralleled motors in the case of a failure (short circuit, ground fault, motor blocked) one of these motors may be disconnected from the drive by blowing its fuses. ATTENTION: If the selectivity function is selected, there is no protection available against a terminal short circuit; the overcurrent protection is still active. Parameter values: 0: Selectivity OFF 1: Selectivity ON Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 OFF ON	- 0	3 / BR 3 / B

11.8 Setpoint Channel

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r410 19AHex	**act. SetpDataSet** Active setpoint channel data set Parameter values: 0 = setpoint data set 1 1 = setpoint data set 2 Analog Output: 100% @ Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 SDS 1 SDS 2	-	3 / BR
P420 1A4Hex	**System Rtd Freq** Rated system frequency / speed Reference quantity for acceleration time (P462), deceleration time (P464), hysteresis for 'ramp generator active' message (P476), base setpoint (P445) and for speed / frequency setpoint and actual values which are transfered via analog inputs and outputs or serial communications. Type=O2; PKW: 1HEX=0.01Hz PcD Gr.: 1	1.00 to 300.00 [Hz]	- 50.00	2 / ABR 2 / AB
P421 1A5Hex	**Fixed Freq1(set)** By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. SDS(2) Parameter Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	-300.00 to 300.00 [Hz]	2 i001=50.00 i002=50.00	2 / BR 2 / BR
P422 1A6Hex	**Fixed Freq2(set)** By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. SDS(2) Parameter Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	-300.00 to 300.00 [Hz]	2 i001=-50.00 i002=-50.00	2 / BR 2 / BR
P423 1A7Hex	**Fixed Freq3(set)** By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. SDS(2) Parameter Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	-300.00 to 300.00 [Hz]	2 i001=20.00 i002=20.00	2 / BR 2 / BR
P424 1A8Hex	**Fixed Freq4(set)** By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. SDS(2) Parameter Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	-300.00 to 300.00 [Hz]	2 i001=5.00 i002=5.00	2 / BR 2 / BR
P425 1A9Hex	**MOP saving** Saving of the setpoint which has come from the motor operated potentiometer (MOP) at turn OFF / power outage The saved setpoint signal is active again after a new ON command (P443 = 1002, main setpoint from MOP). If saving of the MOP setpoint is not active (P425 = 0, 2), the MOP start frequency (P426) is cleared after an OFF command or a power outage. The „internal motorized potentiometer rounding-off" (necessary to precisely set a frequency) can be cancelled if the motorized potentiometer (MOP) is to ramp-up extremely quickly. Parameter values: 0: without save with 'internal MOP rounding-off' 1 : with save with 'internal MOP rounding-off' 2: without save without 'internal MOP rounding-off' 3: with save without 'internal MOP rounding-off' Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 OFF ON OFF ON	- 0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P426 1AAHex	**MOP start frequ** Start frequency of the motor operated potentiometer (MOP) The motorized potentiometer setpoint is set to this start frequency if storage is not active (P425 = 0, 2), in the drive converter statuses, switch-on inhibit (r001 = °008), and ready to power-up (r001 =°009). As the motorized potentiometer setpoint can only have positive values, the sign must be specified via the direction of rotation bits (P571, P572). SDS(2) parameter Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	-300.00 to 300.00 [Hz]	2 i001=0.00 i002=0.00	3 / BR 3 / BR
P427 1ABHex	**Set MOP** The motorized potentiometer is set to the absolute value of the main setpoint. The motorized potentiometer setpoint is set to the absolute value of the main setpoint (r447) when changing-over the main setpoint source to a motorized potentiometer (P443 = 1002; e.g. for basic/reserved changeover). Thus, a continuous transition can be achieved when changing-over from automatic- to manual operation. As the motorized potentiometer setpoint can only be positive, the sign must be specified via the direction of rotation bits (P571, P572). Parameter values: 0: no storage 1: with storage Type=I2; PKW: 1HEX = 0.01 Hz PcD Gr.:1	0 to 1 OFF ON	- 0	2 / BR 2 / BR
P428 * 1ACHex	**Src Add Setpoint** Source of the additional setpoint signal. Depending on P432 the additional setpoint is added in front or behind the ramp generator Parameter values: 1001: Fixed setpoints (P421 to P424) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 4545	2 i001=0 i002=0	3 / BR 3 / BR
P429 1ADHex	**AddSetpoint Gain** Proportional gain of the additional setpoint Not effective if the additional setpoint is a fixed setpoint (P428 = 1001). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
r431 1AFHex	**AddSetpoint(act)** Actual additional setpoint signal Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	[Hz]	-	3 / BR
P432 1B0Hex	**AddSetpoint Dest** Access location of the additional setpoint signal Parameter values: 0 = behind of ramp generator 1 = in front of ramp generator Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 Bef RampGen Aft RampGen	- 1	3 / BR 3 / BR
P443 * 1BBHex	**Src MainSetpoint** Source of the (frequency / speed) main setpoint signal. Parameter values: 1002: Motor operated potentiometer (MOP) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 4545	2 i001=1002 i002=1001	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P444 1BCHex	**GainMainSetpoint** Proportional gain of the main setpoint signal Not effective if the setpoint is a fixed setpoint or comes from the MOP (P443 = 1001, 1002). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	2 / BR 2 / BR
P445 1BDHex	**Base Setpoint** Base setpoint of the main setpoint channel in % of rated system frequency (P420); is added to the main setpoint signal. Not effective if the setpoint is a fixed setpoint or comes from the MOP (P443 =1001, 1002). B/R Parameter Type=I2; PKW: 1HEX=0.1% PcD Gr.: 0	-100.0 to 100.0 [%]	2 i001=0.0 i002=0.0	3 / BR 3 / BR
r447 1BFHex	**Main Setp.(act)** Actual main setpoint Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	2 / BR
P448 1C0Hex	**Jog Frequency** Jog frequency Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	-300.00 to 300.00 [Hz]	- 5.00	2 / BR 2 / BR
r451 1C3Hex	**n/f(set,total1)** Frequency setpoint signal at the addition point in front of the ramp generator Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P452 1C4Hex	**Max Freq FWD** Maximum frequency at forward speed Limited by: • double rated motor frequency (P107) • pulse frequency (P761) MDS(2) Parameter Type=I2; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 300.0 [Hz]	2 i001=55.0 i002=55.0	2 / ABR 2 / AB
P453 1C5Hex	**Max Freq REV** Maximum frequency at reverse speed Limited by: • double rated motor frequency (P107) • pulse frequency (P761) MDS(2) Parameter Type=I2; PKW: 1HEX=0.1Hz PcD Gr.: 1	-300.0 to 0.0 [Hz]	2 i001=-55.0 i002=-55.0	2 / ABR 2 / AB

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P455 1C7Hex	**Skip Frequency** Skip frequency for the frequency setpoint in front of the ramp generator. Steady state operation is not possible in the range of the positive and the negative value of the skip frequency.  Note: Frequency skipping is OFF at parameter values between 0.0 and 1.0 Hz SDS(2) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 300.0 [Hz]	2 i001=0.0 i002=0.0	2 / BR 2 / BR
P457 1C9Hex	**Min Frequency** Minimum frequency f_{min} (amount) of the drive; same as frequency skipping around 0 Hz with a bandwidth of 2 * f_{min}, effective for the setpoint signal in front of the ramp generator Given setpoint f_{set}: realized setpoint • $-f_{min} < f_{set}$ (coming from lower values) $< f_{min}$ — $-f_{min}$ • $-f_{min} < f_{set}$ (coming from higher values) $< f_{min}$ — $+f_{min}$ • $0 <= f_{set}$ (after turn ON) $< f_{min}$ — $+f_{min}$ • $-f_{min} < f_{set}$ (after turn ON) < 0 — $-f_{min}$ • $f_{set} > f_{min}$ — f_{set} • $f_{set} < -f_{min}$ — f_{set} Note: The bits for forward / reverse operation (see P571, P572) are allowed for. SDS(2) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 300.0 [Hz]	2 i001=0.0 i002=0.0	2 / BR 2 / BR
r460 1CCHex	**n/f(set,Ramp IN)** Frequency setpoint signal at ramp generator input Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
r461 1CDHex	**Ramp Gen Status** Status of the ramp generator Parameter values: 0: ramp generator blocked 1: ramp generator released 2: ramp generator stopped 4: ramp generator set Analog Output: 100% @ Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 Locked Released STOP Set	-	3 / BR
P462 1CEHex	**Accel. Time** Ramp generator acceleration time for acceleration from 0 to rated system frequency (P420). SDS(2) Parameter Type=O2; PKW: 1HEX=0.1s PcD Gr.: 0	0.1 to 999.9 [s]	2 i001=10.0 i002=10.0	2 / ABR 2 / ABR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P464 1D0Hex	**Decel. Time** Ramp generator deceleration time for deceleration from rated system frequency (P420) to standstill SDS(2) Parameter Type=O2; PKW: 1HEX=0.1s PcD Gr.: 0	0.1 to 999.9 [s]	2 i001=20.0 i002=20.0	2 / ABR 2 / ABR
P466 1D2Hex	**Decel. Time OFF3** OFF3 deceleration time (quick stop) for deceleration from rated system frequency (P420) to standstill Note: Rounding (P468) is not active during OFF3. Description for setting: The parameter value must be high enough to prevent an overvoltage fault. Type=O2; PKW: 1HEX=0.1s PcD Gr.: 0	0.1 to 999.9 [s]	- 2.0	2 / BR 2 / BR
P467 1D3Hex	**ProtRampGen Gain** Protective ramp generator: factor, which extends the acceleration time (P462). The protective ramp generator is active up to 15 % of rated motor frequency (P107); see section „Ramp-function generator RFG“ in the Operating Instructions, Part 2 Description for setting: Parameter value 1,0 turns OFF the protective ramp generator. SDS(2) Parameter Type=O2; PKW: 1HEX=0.1 PcD Gr.: 0	1.0 to 100.0	2 i001=1.0 i002=1.0	3 / BR 3 / BR
P468 1D4Hex	**Ramp Smoothing** Rounding of the ramp generator in % of the acceleration (P462) and deceleration times (P464). At accelerating from 0 to rated system frequency (P420) the real acceleration time will increase to $P462 \cdot \left(1 + \frac{P468}{100\ \%}\right)$. Description for Setting: The parameter value is symmetrically shared to start and end roundings. SDS(2) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 50 [%]	2 i001=20 i002=20	2 / BR 2 / BR
P476 1DCHex	**RampGen Act Hyst** Hysteresis for the message 'ramp generator active' The message 'ramp generator active' is issued, if |ramp generator input - ramp generator output| >= P476 * P420 . Condition: analog frequency setpoint in front of the ramp generator (see P428 and P443) Type=O2; PKW: 1HEX=0.1% PcD Gr.: -	0.0 to 20.0 [%]	- 1.0	3 / BR 3 / BR
r480 1E0Hex	**n/f(set,rampOUT)** Frequency setpoint at the output of the ramp generator Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	[Hz]	-	3 / BR
r481 1E1Hex	**n/f(set,total2)** Frequency setpoint at the addition point behind the ramp generator Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	[Hz]	-	3 / BR
r482 1E2Hex	**n/f(set)** Frequency setpoint at the input of the V/Hz control circuit Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	[Hz]	-	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P512 200Hex	**Compare Freq** Compare frequency for the message 'Compare frequency reached' (status word 1, bit 10 (r552)); see also P513 (Hysteresis) Type=O2; PKW: 1HEX=0.01Hz PcD Gr.: 1	0.00 to 320.00 [Hz]	- 50.00	3 / BR 3 / BR
P513 201Hex	**Comp Freq. Hyst** Hysteresis for the message 'Compare frequency reached' in % of the compare frequency (P512) Type=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 100.0 [%]	- 3.0	3 / BR 3 / BR
P514 202Hex	**OFF Frequency** Pulse block frequency at turn OFF If after an OFF command (OFF1, OFF3) the actual value of the frequency (r218) comes below this value, the pulses are blocked after the OFF wait time (P516). Type=O2; PKW: 1HEX=0.01Hz PcD Gr.: 1	0.00 to 300.00 [Hz]	- 0.10	3 / BR 3 / BR
P516 204Hex	**OFF Wait Time** Wait time between reaching of the pulse block frequency (P514) and pulse blocking; only for turn OFF via OFF1 or OFF3. SDS(2) Parameter Type=O2; PKW: 1HEX=0.1s PcD Gr.: 0	0.0 to 60.0 [s]	2 i001=0.0 i002=0.0	3 / BR 3 / BR
P517 205Hex	**Deviation Freq** Deviation frequency for the message 'Set/Actual deviation' (status word 1, bit 8 (r552)); the message is issued if the deviation is higher than the parameter value; see also P518 (deviation time) Depending items: P520 (pull out / blocking wait time) Type=O2; PKW: 1HEX=0.01Hz PcD Gr.: 1	0.00 to 300.00 [Hz]	- 3.00	3 / BR 3 / BR
P518 206Hex	**Deviation Time** Minimum time of the Set/Actual deviation; after this minimum time a Set/Actual deviation (P517) issues the message 'Set/Actual deviation' (status word 1, bit 8 (r552)) Depending items: P520 (pull out / blocking wait time) Type=O2; PKW: 1HEX=0.1s PcD Gr.: -	0.0 to 10.0 [s]	- 3.0	3 / BR 3 / BR
P520 208Hex	**PullOut/BlckTime** Wait time between the message 'motor puled out/blocked' and issuing a fault message Dependent parameters: P517 (speed of the set/actual deviation), P518 (set/actual deviation time) MDS(2) Parameter Type=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.00 to 100.00 [s]	2 i001=50.00 i002=50.00	3 / BR 3 / BR
P525 20DHex	**Fix Setp ProcReg** Fixed setpoints for the technology controller B/R parameter Type=I2; PKW: 1HEX=0.01 % PcD: 4000HEX=100.00 %	–200.00 to 200.00 [%]	2 i001=0.00 i002=0.00	3 / BR 3 / BR
P526 * 20EHex	**Src ProcReg Setp** Source for the technology controller setpoint. Parameter values: 1001: Technology setpoint (P525) 1002: Not permissible Additional value: According to PcD wiring of the setpoint channel B/R parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 4545	2 i001=0 i002=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P527 20FHex	**SetpGain ProcReg** Technology controller setpoint gain. Not effective for technology setpoint input via fixed setpoint (P526 = 1001). B/R parameter Type=O2; PKW:1HEX=0.01 % PcD Gr.: 0	–300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
P528 * 210Hex	**SmoothProcRegSet** Technology controller setpoint smoothing time constant. The smoothing first becomes active when the technology controller is activated (control word 2 bit 24 = 1 and RUN status). Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 600.00 [s]	- 0.00	3 / BR 3 / BR
r529 211Hex	**Setpoint ProcReg** Actual technological setpoint Analog output: 100 % for PWE=100.00 % Type=I4; PKW: 1HEX=0.01 % PcD: 4000HEX=100.00 %	[%]	–	3 / BR
P530 * 212Hex	**ActVal's ProcReg** Actual values for the technology controller actual value input. Defines which parameter are used as actual values for the technology controller. Indices: i001 = W01: Value1 for technology controller i002 = W02: Value2 for technology controller Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	2 i001=0.0 i002=0.0	3 / BR 3 / BR
P531 * 213Hex	**SRC ProcReg ActV** Source of the technology controller actual value. Parameter values: 1001: Illegal 1002: Illegal 1020: Illegal 1100: Internal technology controller actual value 1 (= contents of P530 index i001) 1200: Internal technology controller actual value 2 (= contents of P530 index i002) Additional values: According to the PcD wiring of the setpoint channel B/R parameter Type=L2; PKW: PKW format(HEX)=Par Value PcD Gr.: 0	0 to 4545	2 i001=0 i002=0	3 / BR 3 / BR
P532 * 214Hex	**Gain ProcRegActV** Technology controller actual value gain. B/R parameter Type=I2; PKW: 1HEX=0.01 % PcD Gr.: 0	–300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
r534 216Hex	**ActValueProcReg** Technological actual value Analog output: 100 % at PWE=100.00 % Type=I2; PKW: 1HEX=0.01 % PcD: 4000HEX=100.000 %	[%]	–	3 / BR
P535 * 217Hex	**R,g. T:Hyst.** Hysteresis for the signal - technological setpoint reached. This signal is output, if the technological actual value (r534) is greater than the technological setpoint (r529). The hysteresis is only effective when this signal is withdrawn Type=O2; PKW:1HEX=0.1 % PcD: 4000HEX=100.0 %	0.0 to 100.0 [%]	– 3.0	3 / BR 3 / BR
r536 218Hex	**DeviationProcReg** Control deviation at the input of the technology controller. Analog output: 100 % at PWE=100.00 % Type=I4; PKW: 1HEX=0.01 % PcD: 4000HEX=100.00 %	[%]	–	3 / BR

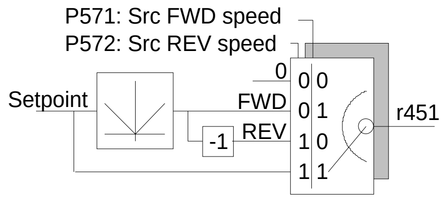
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P537 219Hex	**Gain ProcReg** Technology controller gain. Type=O2; PKW:1HEX=0.01 PcD: 4000HEX=64.00	0.00 to 250.00	– 1.00	3 / BR 3 / BR
P538 21AHex	**IntTConstProcReg** Technology controller integral action time (I component). Setting information: The technology controller I component is disabled with the value 0.00. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 600.00 [s]	– 0.00	3 / BR 3 / BR
r540 21CHex	**ProcReg Output** Technology controller output before the limit value stage (P541, P542). Analog output: 100 % at PWE=100.00 % Type=I2; PKW: 1HEX=0.01 % PcD: 4000HEX=100.00 %	 [%]	–	3 / BR
P541 21DHex	**ProcReg Up1Limit** Upper limit of the technology controller output. Type=I2; PKW:1HEX=0.01 % PcD: 4000HEX=100.00 %	–200.00 to 200.00 [%]	– 200.00	3 / BR 3 / BR
P542 21EHex	**ProcReg Up2Limit** Lower limit of the technology controller output. Type=I2; PKW:1HEX=0.01 % PcD: 4000HEX=100.00 %	–200.00 to 200.00 [%]	– 200.00	3 / BR 3 / BR
r545 221Hex	**ProcReg Out(Lim)** Limited technology controller output (after the limit value stage). Analog output: 100 % at PWE=100.00 % Type=I2; PKW: 1HEX=0.01 % PcD: 4000HEX=100.00 %	 [%]	–	3 / BR

11.9 Control and Status Word

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r550 226Hex	**Control Word 1** Display of the control word 1 (bits 0 to 15); see section „Control word“ in the Operating Instructions, Part 2 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r551 227Hex	**Control Word 2** Display of the control word 2 (bits 16 to 31); see section „Control word“ in the Operating Instructions, Part 2. 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r552 228Hex	**Status Word 1** Display of the status word 1 (bits 0 to 15); see section „Control word“ in the Operating Instructions, Part 2. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r553 229Hex	**Status Word 2** Display of the status word 2 (bits 16 to 31); see section „Control word“ in the Operating Instructions, Part 2. 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
P554 * 22AHex	**Src ON/OFF1** Source of the 'ON/OFF1' command (Control word 1, bit 0) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: OFF1 1: not allowed 1001 CU binary input 1 1003: CU binary input 3 1010: PMU ON/OFF keys 2001: SST1, Word 1,Bit 0 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Note: When using the inputs of the serial IO system, values 4101 or 4201 are recommended. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 P077=0 i001=1010 i002=1001 P077=1,2 i001=2001 i002=1001 P077=3 i001=1003 i002=1001	2 / BR 2 / BR
P555 * 22BHex	**Src1 OFF2(coast)** Source 1 of the 'OFF2' command (Coasting; control word 1, bit 1) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: not allowed 1: condition for operation 1002: CU binary input 2 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 i001=1 i002=1002	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P556 * 22CHex	**Src2 OFF2(coast)** Source 2 of the 'OFF2' command (Coasting; control word 1, bit 1) Description see P555 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P557 * 22DHex	**Src3 OFF2(coast)** Source 3 of the 'OFF2' command (Coasting; control word 1, bit 1) Description see P555 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P558 * 22EHex	**Src1 OFF3(QStop)** Source 1 of the 'OFF3' command (quick stop; control word 1, bit 2) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: not allowed 1: condition for operation 1002 binary input 2 of CU board 1010: PMU OFF key other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P559 * 22FHex	**Src2 OFF3(QStop)** Source 2 of the 'OFF3' command (quick stop; control word 1, bit 2) Description see P558 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P560 * 230Hex	**Src3 OFF3(QStop)** Source 3 of the 'OFF3' command (quick stop; control word 1, bit 2) Description see P558 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P561 * 231Hex	**Src InvRelease** Source of the 'inverter release' command (control word 1, bit 3) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: Inverter blocked 1: automatic release after wait times other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=1 i002=1	3 / BR 3 / BR
P562 * 232Hex	**Src RampGen Rel** Source of the 'ramp generator release' command (control word 1, bit 4) Details see section„Control word“ in the Operating Instructions, Part 2 Parameter values: 0: Ramp generator blocked 1: automatic release after wait times other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=1 i002=1	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P563 * 233Hex	**Src RampGen Stop** Source of the 'ramp generator stop' command (control word 1, bit 5) Details see section „Control word" in the Operating Instructions, Part 2 Parameter values: 0: ramp generator stopped 1: ramp generator released other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=1 i002=1	3 / BR 3 / BR
P564 * 234Hex	**Src Setp Release** Source of the 'setpoint release' command (control word 1, bit 6) Details see section „Control word" in the Operating Instructions, Part 2 Parameter values: 0: Ramp generator input is set to '0' 1: Setpoint at ramp generator input other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=1 i002=1	3 / BR 3 / BR
P565 * 235Hex	**Src1 Fault Reset** Source 1 of the 'reset' command (control word 1, bit 7) Details see section „Control word" in the Operating Instructions, Part 2 Parameter values: 0: no source selected for reset 1: not allowed 1003 Binary input 3 of the CU board 1004: Binary input 4 of the CU board other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) Note: The control command 'acknowledge' is edge triggered. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 P077=0,1,2 i001=0 i002=1003 P077=3 i001=1004 i002=1003	2 / BR 2 / BR
P566 * 236Hex	**Src2 Fault Reset** Source 2 of the 'reset' command (control word 1, bit 7) Description see P565 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=0 i002=0	2 / BR 2 / BR
P567 * 237Hex	**Src3 Fault Reset** Source 3 of the 'reset' command (control word 1, bit 7) Description see P565 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=2001 i002=2001	2 / BR 2 / BR
P568 * 238Hex	**Src Jog1 ON** Source of the 'Jog 1' command (control word 1, bit 8) Details see section „Control word" in the Operating Instructions, Part 2 Parameter values: 0: no Jog operation 1: not allowed 2001: SST1, Word 1, Bit 8 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 P077=0,3 i001=0 i002=0 P077=1,2 i001=2001 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P571 * 23BHex	**Src FWD speed** Source of the 'forward speed' command (control word 1, bit 11) Parameter values: 0: forward speed blocked 1: forward speed released 1010: PMU forward/reverse key 2001: SST1, Word 1, Bit 11 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) Note: Both parameters P571 and P572 or the sources defined by them define which of the directions are really released:  B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 P077=0,3 i001=1 i002=1 P077=1,2 i001=2001 i002=1	2 / BR 2 / BR
P572 * 23CHex	**Src REV speed** Source of the 'reverse speed' command (control word 1, bit 12) Parameter values: 0: reverse speed blocked 1: reverse speed released 1010: PMU forward/reverse key 2001: SST1, Word 1, Bit 12 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) Note: The two parameters P571 and P572 or the values which are supplied from the sources defined for these parameters, defines which direction of rotation is actually enabled; refer to P571. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 P077=0,3 i001=1 i002=1 P077=1,2 i001=2001 i002=1	2 / BR 2 / BR
P573 * 23DHex	**Src MOP UP** Source of the command 'motor operated potentiometer (MOP) UP' (control word 1, bit 13) Parameter values: 0: not active 1: not allowed 1010: PMU UP key 2001: SST1, Word 1, Bit 13 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 P077=0,3 i001=1010 i002=0 P077=1,2 i001=2001 i002=0	2 / BR 2 / BR
P574 * 23EHex	**Src MOP DOWN** Source of the command 'motor operated potentiometer (MOP) DOWN' (control word 1, bit 14) Parameter values: 0: not active 1: not allowed 1010: PMU DOWN key 2001: SST1, Word 1, Bit 14 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 P077=0,3 i001=1010 i002=0 P077=1,2 i001=2001 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P575 * 23FHex	**Src No ExtFault1** Source of the message 'external fault 1' (control word 2, bit 27); L-level causes fault trip of the drive Parameter values: 0: not allowed 1: no external fault 1 1001: Binary input 1 of CU board other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 P077=0,1 i001=1 i002=1 P077=2,3 i001=1001 i002=1	2 / BR 2 / BR
P576 * 240Hex	**Src SetpDSetBit0** Source of bit 0 for the selection of the setpoint channel data set (SDS; control word 2, bit 16) Parameter values: 0: SDS bit 0 has value of 0 1: SDS bit 0 has value of 1 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=0 i002=0	3 / BR 3 / BR
P578 * 242Hex	**Src MotDSet Bit0** Source of bit 0 for the selection of motor data set (MDS; control word 2, bit 18) Parameter values: 0: MDS bit 0 has value of 0 1: MDS bit 0 has value of 1 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) Note: The motor data set can not be changed during operation; a change of this bit will only become effective in the ready state. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=0 i002=0	3 / BR 3 / BR
P580 * 244Hex	**Src FixSetp Bit0** Source of bit 0 to select a fixed setpoint FS (control word 2, bit 20) Parameter values: 0: FS bit 0 has value of 0 1: FS bit 0 has value of 1 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=0 i002=1004	2 / BR 2 / BR
P581 * 245Hex	**Src FixSetp Bit1** Source of bit 1 to select a fixed setpoint FS (control word 2, bit 21) Parameter values: 0: FS bit 1 has value of 0 1: FS bit 1 has value of 1 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=0 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P583 * 247Hex	**Src Fly Release** Source of the command 'release of flying restart' (control word 2, bit 23) Parameter values: 0: Flying restart not released 1: Flying restart released with every ON command other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) Dependent parameter: Special behavior in combination with the auto restart function see P366 (auto restart). B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=0 i002=0	2 / BR 2 / BR
P584 * 248Hex	**Src.TReg.Enable** Source for the control command, technolgoy controller enable (control word2, bit24) Parameter values: 0: Technology controller not enabled 1: Technology controller enabled other values refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	2 i001=0 i002=0	3 / BR 3 / BR
P586 * 24AHex	**Src No ExtFault2** Source of the message 'external fault 2' (control word 2, bit 26) L signal fault trips the unit if • precharging has been completed (drive converter status > 10) • and the 200 ms delay time after precharging has expired Parameter values: 0: not allowed 1: no external fault 2 1004: CU binary input 4 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P588 * 24CHex	**Src No Ext Warn1** Source of the message 'external warning 1' (control word 2, bit 28) Parameter values: 0: not allowed 1: no external warning 1 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 P077=0,1 i001=1 i002=1 P077=2,3 i001=1002 i002=1	3 / BR 3 / BR
P589 * 24DHex	**Src No Ext Warn2** Source of the message 'external warning 2' (control word 2, bit 29) Parameter values: 0: not allowed 1: no external warning 1 1002: CU binary input 2 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	2 i001=1 i002=1	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P590 * 24EHex	**Src Base/Reserve** Source of the switching command 'base / reserve settings' (control word 2, bit 30) Parameter values: 0: base setting 1: reserve setting 1005: Binary input 5 of the CU board other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	- 1005	3 / BR 3 / BR
P591 * 24FHex	**Src ContactorMsg** Source of the message 'main contactor energized' (control word 2, bit 31) Parameter values: 0: not allowed 1: no message; main contactor must be energized within 120 msec after the related command 1001 to 1005: CU terminals 4101 to 4116: SCB-SCI1 terminals (serial I/O) 4201 to 4216: SCB-SCI2 terminals (serial I/O) 5001: TSY terminal 1 Notes: If the function is active, pulses are released as soon as the message is available. No base / reserve settings possible Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	- 1	3 / BR 3 / BR
P600 * 258Hex	**Dst Ready for ON** Destination of the status bit 'ready for turn ON' (status word 1, bit 0) Power is ON, the drive may be turned on. Parameter values: Depending on the selected index all settings according to section „Status word“ in the Operating Instructions, Part 2 (PcD connection of the status word) may be selected. Indices: i001: BD: selection of a base drive terminal i002: SCI : selection of a SCI1/2 terminal i003: TSY : selection of a TSY terminal Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P601 * 259Hex	**Dst Rdy for Oper** Destination of the status bit 'ready for operation' (status word 1, bit 1) The DC bus is charged, pulses may be released. Parameter values, indices: as P600. Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P602 * 25AHex	**Dst Operation** Destination of the status bit 'operation' (status word 1, bit 2) The drive is in operation. Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1003 i002=0 i003=0	2 / BR 2 / BR
P603 * 25BHex	**Dst Fault** Destination of the status bit 'fault' (status word 1, Bit 3) Note: for issuing the fault message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1002 i002=0 i003=0	2 / BR 2 / BR
P604 * 25CHex	**Dst NO OFF2** Destination of the status bit 'no OFF2 command' (status word 1, bit 4) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P605 * 25DHex	**Dst NO OFF3** Destination of the status bit 'no OFF3 command' (status word 1, bit 5) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P606 * 25EHex	**Dst ON blocked** Destination of the status bit 'turn-ON locked' (status word 1, bit 6) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P607 * 25FHex	**Dst Warning** Destination of the status bit 'warning' (status word 1, bit 7) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P608 * 260Hex	**Dst Deviation** Destination of the status bit 'set frequency = act. frequency' (status word 1, bit 8) - see P517; for details see section „Status word“ in Operating Instructions, Part 2 Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P610 * 262Hex	**Dst CompareFreq** Destination of the status bit 'compare frequency reached' (status word 1, bit 10) - see P512; for details see section „Status word“ in Operating Instructions, Part 2 Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P611 * 263Hex	**Dst Low Voltage** Destination of the status bit 'undervoltage' (status word 1, bit 11) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P612 * 264Hex	**Dst Contactor** Destination of the bit 'energize main contactor' (status word 1, bit 12) H-level: energize contactor! Note: If the message 'main contactor energized' is not selected (P591 = 1), the main contactor must be energized within 120 ms after the bit 'energize main contactor' is set. ATTENTION: For switching voltages between 50 and 230 V AC only the following relays may be used: - relay on the PEU or the PSU board (driven via binary output 1) or - the relays of the optional SCI boards, which are specified for 230 V AC (see section „Bypass- and output contactor“ in the Operating Instructions, Part 1) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1001 i002=0 i003=0	3 / BR 3 / BR
P613 * 265Hex	**Dst RampGen act** Destination of the status bit 'ramp generator active' (status word 1, bit 13) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P614 * 266Hex	**Dst FWD speed** Destination of the status bit 'speed direction' (status word 1, bit 14) Meanings: H-level: forward L-level: reverse Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P615 * 267Hex	**PRT active** Destination of the status bit 'power ride thru (PRT) active' (status word 1, bit 15) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P616 * 268Hex	**Dst Fly Restart** Destination of the status bit 'flying restart active' and 'energization time running' (status word 2, bit 16) (refer to P189) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P618 * 26AHex	**Dst No Overspeed** Destination of the status bit 'no overspeed' (status word 2, bit 18) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P619 * 26BHex	**Dst Ext Fault 1** Destination of the status bit 'external fault 1' (status word 2, bit 19) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P620 * 26CHex	**Dst Ext Fault 2** Destination of the status bit 'external fault 2' (status word 2, bit 20) Note: • for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). • If an ON command is active, L-level causes fault trip after 200 msec. Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P621 * 26DHex	**Dst Ext Warning** Destination of the status bit 'external warning' (status word 2, bit 21) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P622 * 26EHex	**Dst i2t Drive** Destination of the status bit 'warning drive overload' (status word 2, bit 22); see r010 (drive utilization) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P623 * 26FHex	**Dst TmpFlt Drive** Destination of the status bit 'fault drive overtemperature' (status word 2, bit 23) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P624 * 270Hex	**Dst TmpWarnDrive** Destination of the status bit 'warning drive overtemperature' (status word 2, bit 24) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P625 * 271Hex	**Dst TmpWarnMotor** Destination of the status bit 'warning motor overtemperature' (status word 2, bit 25) Reason: The condition for the warning is met via the motor utilization calculation (see r008 (motor utilization), P362 (motor cooling), P363 (thermal time constant of the motor), P364 (duty cycle monitoring)). Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P626 * 272Hex	**Dst TmpFlt Motor** Destination of the status bit 'fault motor overtemperature' (status word 2, bit 26) Reason: The condition for the fault is met via the motor utilization calculation (see r008 (motor utilization), P362 (motor cooling), P363 (thermal time constant of the motor), P364 (duty cycle monitoring)). Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P627 * 273Hex	**Dst ProcReg A=S** Destination connection of the status bit „technological setpoint reached“ (status word 2, bit27) Parameter values, indices: As for P600 Type=L2; PKW: PKW format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P628 * 274Hex	**Dst PullOut/Blck** Destination of the status bit 'fault motor pulled out / blocked' (status word 2, bit 28) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P629 * 275Hex	**Dst ChrgRelay ON** Destination of the status bit 'charging relay energized' (status word 2, bit 29) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P631 * 277Hex	**Dst Pre-Charging** Destination of the status bit 'charging active' (status word 2, bit 31) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

11.10 Analog Input/Output

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P650 * 28AHex	**CU AnalogInConf** Configuration of the CU analog inputs; defines the kind of the analog input signals Parameter values — Terminals 27 and 30 — Terminals 29 and 32 0: -10 V ... + 10 V — - 20 mA ... + 1: 0 V ... + 10 V — 0 mA ... + 2: — + 4 mA ... + 20 mA Notes: • Only one signal can be wired per input; alternatively voltage or current signals can be evaluated. • Voltage and current signals must be connected to different terminals. • Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar. • At setting 2 an input current < 2 mA causes a fault trip (broken wire proof) • The offset scaling of the analog inputs is done via P652. Indices: i001: CU-1: configuration of analog terminal 1 i002: CU-2: configuration of analog terminal 2 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 -10V...+10V 0V...+10V 4mA...20mA	2 i001=0 i002=0	2 / BR 2 / BR
P652 28CHex	**CU AnalogIn Offs** Offset scaling of the CU analog inputs Description for setting see section „Analog inputs“ in the Operating Instructions, Part 2 Indices: i001: CU-1: offset of analog input 1 i002: CU-2 offset of analog input 2 Type=I2; PKW: 1HEX=0.001V PcD Gr.: 0	-20.000 to 20.000 [V]	2 i001=0.000 i002=0.000	2 / BR 2 / BR
P655 * 28FHex	**CU AnaOut ActVal** Actual value output via the CU analog output Description for setting: enter the parameter number of the quantity, which is to be issued. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	- 218	2 / BR 2 / BR
P656 290Hex	**CU AnalogOutGain** Proportional gain of the CU analog output, see section „Analog inputs“ in the Operating Instructions, Part 2 Parameter values: P656= calculated output voltage at when the displayed parameter has a value of 100% The output voltage V(out) is calculated according to: $V(out) = \frac{\text{value of displayed parameter}}{100\ \%} * P656 + P657$ Note: Maximum value of the output voltage: +/- 10 V Type=I2; PKW: 1HEX=0.01V PcD Gr.: 0	-320.00 to 320.00 [V]	- 10.00	2 / BR 2 / BR
P657 291Hex	**CU AnalogOutOffs** Offset of the CU analog output; see P656 Type=I2; PKW: 1HEX=0.01V PcD Gr.: 0	-100.00 to 100.00 [V]	- 0.00	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P660 294Hex	**SCI AnalogInConf** Configuration of the SCI analog inputs; defines the kind of the input signals Parameter values / Terminals X428 / 3, 6, 9 / Terminals X428 / 5, 8, 11 0: -10 V ... + 10 V / - 20 mA ... + 1: 0 V ... + 10 V / 0 mA ... + 2: / 4 mA ... + 20 mA Notes: • Only one signal can be wired per input; alternatively voltage or current signals can be evaluated. • Voltage and current signals must be connected to different terminals. • Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar. • At setting 2 an input current < 2 mA causes a fault trip (broken wire proof) • The offset scaling of the analog inputs is done via P662. Indices: i001: Sl11 Slave 1, analog input 1 i002: Sl12 Slave 1, analog input 2 i003: Sl13 Slave 1, analog input 3 i004: Sl21 Slave 2, analog input 1 i005: Sl22 Slave 2, analog input 2 i006: Sl23 Slave 2, analog input 3 Condition: the related SCB board must be reported via P090 and P091, respectively Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 -10V...+10V 0V...+10V 4mA...20mA	6 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	3 / BR 3 / BR
P661 295Hex	**SCI AnaInSmooth** Filter time constant of the SCI analog inputs; Formula: $T = 2\text{ ms} * 2^{P661}$ Indices: see P660 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 15	6 i001=2 i002=2 i003=2 i004=2 i005=2 i006=2	3 / BR 3 / BR
P662 296Hex	**SCI AnalogInOffs** Offset scaling of the SCI analog inputs Description for setting see SCI manual Indices: see P660 Type=I2; PKW: 1HEX=0.01V PcD: 4000HEX=160V	-20.00 to 20.00 [V]	6 i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	3 / BR 3 / BR
P664 * 298Hex	**SCI AnaOutActVal** Actual value output via SCI analog outputs Description for setting: Enter the parameter number of the quantities, which are to be issued; for details see SCI manual. Indices: i001: Sl11 Slave 1, analog output 1 i002: Sl12 Slave 1, analog output 2 i003: Sl13 Slave 1, analog output 3 i004: Sl21 Slave 2, analog output 1 i005: Sl22 Slave 2, analog output 2 i006: Sl23 Slave 2, analog output 3 Condition: the related SCB board must be reported via P090 and P091, respectively Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 1999	6 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	3 / BR 3 / BR
P665 299Hex	**SCI AnaOut Gain** Proportional gain of the SCI analog outputs Description for setting: see SCI manual Indices: see P664 Type=I2; PKW: 1HEX=0.01 PcD: 4000HEX=160V	-320.00 to 320.00	6 i001=10.00 i002=10.00 i003=10.00 i004=10.00 i005=10.00 i006=10.00	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P666 29AHex	**SCI AnaOut Offs** Offset of the SCI analog outputs Indices: see P664 Type=I2; PKW: 1HEX=0.01V PcD: 4000HEX=160V	-100.00 to 100.00 [V]	6 i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	3 / BR 3 / BR

11.11 Communications

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P680 * 2A8Hex	**SCom1 Act Value** Actual value output via serial communication SST1 Defines, which parameter is to be transferred at which telegram address. Notes: • Word 1 should be set for status word 1 (r968) • The length (number of words) of the process data part of the telegram is set by P685, i001 Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P682 2AAHex	**SCB Protocol** SCB can be operated as • master for the SCI boards or as • serial communications board (see SCB manual). Parameter values: 0 = Master for SCI boards 1 = 4 wire USS 2 = 2 wire USS 3 = Peer to Peer 4 = not used 5 = not used Condition: SCB board must be reported via P090 and 0P91, respectively Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 SCI Module 4 wire USS 2 wire USS Peer 2 Peer Option 1 Option 2	- 0	3 / H BR 3 / H
P683 * 2ABHex	**SCom/SCB BusAddr** Bus address of the serial communication interfaces (see section „Serial interfaces“ in the Operating Instructions, Part 2) Indices: i001 = SCo1: bus address of serial comm. interface 1 (CU) i002 = SCB: SCB bus address, if P682 = 1, 2 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 31	2 i001=0 i002=0	3 / BR 3 / BR
P684 * 2ACHex	**SCom/SCB Baud** Serial interfaces baud rate Parameter values: 1: 300 Baud 8: 38400 Baud 2: 600 Baud 9: 57600 Baud 3: 1200 Baud 10: 76800 Baud 4: 2400 Baud 11: 93750 Baud 5: 4800 Baud 12: 115200 Baud 6: 9600 Baud 13: 187500 Baud 7: 19200 Baud Note: Maximum baud rate for SST1 (i001): 38400 for SCB: dependent on the version and selected protocol, refer to the SCB operating instructions) Indices: i001 = SCo1: baud rate of serial comm. interface 1 (CU) i002 = SCB: SCB baud rate, if P682 = 1, 2, 3 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 13	2 i001=6 i002=6	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P685 * 2ADHex	**SCom/SCB PCV** Number of words (16 bit) of the parameter data part in the net data block of the telegram. (see section „Serial interfaces“ in the Operating Instructions, Part 2) Parameter values: 0: no parameter data part in the telegram 3, 4 parameter data part is 3 (parameter identifier, Ind, parameter value), 4 words long 127 variable parameter data length for the transfer of parameter description and texts. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682 = 1, 2, 3 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 127	2 i001=127 i002=3	3 / BR 3 / BR
P686 * 2AEHex	**SCom/SCB # PrDat** Number of words (16 bit) of the process data part in the net data block of the telegram. (see section „Serial interfaces“ in the Operating Instructions, Part 2) Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682 = 1, 2, 3 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 16	2 i001=2 i002=2	3 / BR 3 / BR
P687 * 2AFHex	**SCom/SCB TlgOFF** Telegram OFF time of CU and SCB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: • Value 0: no monitoring, no fault trip; must be parameterized for sporadic (a-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. • If a TB is inserted in slot 2, and an SCB in slot 3, then the value in i002 is ineffective Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682 = 1, 2, 3 Type=O2; PKW: 1HEX=1.0ms PcD: 4000HEX=1638.4ms	0 to 6500 [ms]	2 i001=0 i002=0	3 / BR 3 / BR
P689 2B1Hex	**SCB Peer2PeerExt** Immediate transfer on of data received via the peer to peer protocol of SCB. Mark of these words of the received peer to peer telegram which are to be transferred on immediately. Parameter values: 0: no immediate transfer (only to CU) 1: immediate transfer (and passing to CU) Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram Condition: P688 = 3 (peer to peer protocol) Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 CU only Transfer	5 i001=0 i002=0 i003=0 i004=0 i005=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P690 * 2B2Hex	**SCB Act Values** Actual value output via the serial communications interface of the SCB board; defines, which parameter is to be transferred at which telegram address. Notes: • Word 1 should be set for status word 1 (r968) • The length (number of words) of the process data part of the telegram is set by P685, index i002 Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram ATTENTION: if P682 = 3 (peer to peer protocol) a maximum of 5 words (i001 to i005) can be transferred Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P692 * 2B4Hex	**ResPonseTLGfail** Defines how the unit responds when a telegram fails. Parameter values: 0: Immediate fault trip 1: OFF3 (fast stop) and subsequent fault trip Note: This parameter is valid for all interfaces, where a telegram monitoring time is defined (SST1, CB/TB, SCB, SST2) Condition: The particular program monitoring time must be active. (P687 or P695 > 0) Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 1 Fault OFF3(fast stop)	- -	3 / BR 3 / BR
P694 * 2B6Hex	**CB/TB Act Values** Output of analog values via CB or TB defines, which parameter is to be transferred at which telegram address. Notes: • Word 1 should be set for status word 1 (r968) Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P695 * 2B7Hex	**CB/TB TlgOFFTime** Telegram lag time of CB and TB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: Value 0: no monitoring, no fault trip; must be parameterized for sporadic (non-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. Type=O2; PKW: 1HEX=1.0ms PcD: 4000HEX=1638.4ms	0 to 6500 [ms]	- 10	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P696 2B8Hex	**CB Parameter 1** Communication Board parameter 1; see manual of the used communication board Description for setting: • Parameter is only needed if a communication board is reported (P090 or P091 = 1) • The communication board checks, if the set value is valid. • If the value is not accepted, the fault message 80 is issued with fault value 5 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P697 2B9Hex	**CB Parameter 2** Communication Board parameter 2; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P698 2BAHex	**CB Parameter 3** Communication Board parameter 3; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P699 2BBHex	**CB Parameter 4** Communication Board parameter 4; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P700 2BCHex	**CB Parameter 5** Communication Board parameter 5; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P701 2BDHex	**CB Parameter 6** Communication Board parameter 6; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P702 2BEHex	**CB Parameter 7** Communication Board parameter 7; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P703 2BFHex	**CB Parameter 8** Communication Board parameter 8; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P704 2C0Hex	**CB Parameter 9** Communication Board parameter 9; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P705 2C1Hex	**CB Parameter 10** Communication Board parameter 10; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P706 2C3Hex	**CB Parameter 11** Communication Board parameter 11 Indices: i001 - i005 Refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	5 i001=0 i002=0 i003=0 i004=0 i005=0	3 / H BR 3 / H

11.12 Diagnosis

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r720 2D0Hex	**SW Version** Software version of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: Software version of the PCB in position 1 (left) i002: Pos2: Software version of the PCB in position 2 (right) i003: Pos3: Software version of the PCB in position 3 (center) i004: Text: Software version of the text EPROM in position 1 Note: The TSY board has no software code; the reported code is always ’0.0’ Type=O2; PKW: 1HEX=0.1 PcD Gr.: 0		4	3 /U BR
r721 2D1Hex	**SW Generat.Date** Software generation date of the CU board. Indices: i001= Year: Year i002= Mon.: Month i003= Day: Day Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	3 /U BR
r722 2D2Hex	**SW ID** Expanded software version code of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: Software code of the PCB in position 1 (left) i002: Pos2: Software code of the PCB in position 2 (right) i003: Pos3: Software code of the PCB in position 3 (center) i004: Text: Software code of the text EPROM in position 1 Note: The TSY board has no software code; the reported code is always ’0.0’ Type=O2; PKW: 1HEX=0.1 PcD Gr.: 0		4	3 /U BR
r723 2D3Hex	**PCB Code** Identification code of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: PCB code of the PCB in position 1 (left) i002: Pos2: PCB code of the PCB in position 2 (right) i003: Pos3: PCB code of the PCB in position 3 (center) PCB codes: CU: 100 - 109 CB: 140 - 149 TB: 130 - 139 SCB: 120 - 129 TSY: 110 - 119 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	3 /U BR
r725 2D5Hex	**CalcTimeHeadroom** Calculation time headroom of the CU board CPU in % of the computing power; influenced by sampling time (P308) and pulse frequency (P761) (not vor VC), as well as the number activated unit functions. Analog Output: 100% @ Parameter Value=16384% Type=O2; PKW: 1HEX=1.0% PcD Gr.: 0	[%]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r730 2DAHex	**SCB Diagnosis** SCB diagnosis (all values in HEX display). Displayed numbers have an overflow at FF. The meaning of several Indices depends of the selected SCB protocol (P682). Indices: i001: fITC Number of error-free telegrams i002: Terr Number of error telegrams i003: Voff USS: Number of Byte-Frame-errors SCI boards: number of slave power outages i004: Toff USS: Number of Overrun-errors SCI boards: number of fiber optic link interrupts i005: PnoS USS: Parity error SCI boards: number of missing answer telegrams i006: STxL USS: STX-error SCI boards: number of search telegrams to accept a slave i007: ETX ETX-error i008: BcCC USS: Block-Check-error SCI boards: number of configuration telegrams i009: L/Te USS/Peer to Peer: incorrect telegram length SCI modules: required maximum number of terminals according to process data wiring (P554 to P631) . i010: T/An USS: Timeout SCI modules: required analog inputs / outputs according to process data wiring of the setpoint channel and actual value output via SCI (P664) . i011: Res1 Reserve i012: Res2 Reserve i013: Warn SCB/DPR warning word i014: Sl1? Information, if slave 1 needed and if yes, which type 0: no slave 1 needed 1: SCI1 2: SCI2 i015: Sl2? Information, if slave 2 needed and if yes, which type 0: no slave 2 needed 1: SCI1 2: SCI2 i016: IniF: with 'SCI modules': initialization fault Type=L2; PKW: 1HEX=1.0 PcD Gr.: 0		16	3 / H BR
r731 2DBHex	**CB/TB Diagnosis** For detailed information see manuals of the used communication or technology boards. Type=L2; PKW: 1HEX=1.0 PcD Gr.: 0		32	3 / H BR
P733 * 2DDHex	**Simulated OPerat** Simulated operation, allows test operation of the drive with de-energized DC bus. Parameter values: 0: no simulated operation 1: simulated operation Conditions: • 24 V auxiliary power supply must be provided • Drive must be connected to the mains via a main contactor, which is driven by the drive (see P612) Note: Simulated operation can only be selected, when the DC bus voltage (r006) is less than 5% of the rated DC bus voltage Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 off on	- 0	3 / BR 3 / B
r743 2E7Hex	**Fault n/f(act)** Frequency / speed actual value (r218) at time of tripping Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	[Hz]	-	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r744 2E8Hex	**Fault dn/dt** Change of frequency / speed per sec at time of tripping Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	[Hz]	-	2 / BR
r745 2E9Hex	**Fault Isq(act)** Actual value of the torque generating current component (r264) at time of tripping Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	[A]	-	2 / BR
r746 2EAHex	**Fault Out Volts** Actual value of the drive output voltage (r003) at time of tripping Type=O2; PKW: 1HEX=0.1V PcD Gr.: 3	[V]	-	2 / BR
r747 2EBHex	**Fault CtrlStatus** Status of the control circuit (r150) at time of tripping Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r748 2ECHex	**TriP Time** Trip times (operating hour meter values, r013) Indices: Day Hours Seconds latest trip (1) i001=T1-d i002=T1-h i003=T1-s last reset trip(2) i004=T2-d i005=T2-h i006=T2-s (last+1) reset trip (3) i007=T3-d i008=T3-h i009=T3-s ... oldest saved trip (8) i022=T8-d i023=T8-h i024=T8-s Trip description by: r947 Fault number r949 Fault value r951 list of fault numbers P952 number of faults Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		24	2 / BR

11.13 Modulator

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P761 2F9Hex	**Pulse Frequency** Pulse frequency at asynchronous space vector modulation Description for setting: The setting range of the pulse frequency depends of the type of the drive ATTTENTION: if the pulse frequency is increased, the maximum current (P173) may be reduced. If afterwards the pulse frequency is reduced again, the value of P173 will not be changed back. Note: the setting range of this parameter is also influenced by P092 (output filter). For active noise damping (P762 > 0), the pulse frequency is limited to min. 45*rated motor frequency (P107), otherwise to 30*P107. MDS(2) Parameter Type=O2; PKW: 1HEX=0.1kHz PcD: 4000HEX=16.384kHz	1.5 to 16.0 [kHz]	2 i001=3.0 i002=3.0	3 / ABR 3 / A
P762 2FAHex	**SIMO Sound** changes the noise characteristics of the motor; at low pulse frequencies this may result in a noise reduction As a result of increased harmonics, when this function is activated, a minimum pulse frequency P761 must be set to 45*rated motor frequency. Only then can SIMO-Sound be enabled. Description for setting: the motor noise is significantly influenced by mechanical oscillations of the drive system; for that reason several settings must be tested. Parameter values: 0: not active 1: sound steps 1 2: sound steps 2 3: sound steps 3 4: sound steps 4 MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 OFF Sound 1 Sound 2 Sound 3 Sound 4	2 i001=0 i002=0	3 / BR 3 / BR
P763 2FBHex	**Max ModulatDePth** Maximum depth of modulation of the modulator; defines the maximum possible output voltage Description for Setting: • High output voltages can be reached by using the edge modulation mode at a high depth of modulation. Low parameter values prevent the change from space vector to edge modulation mode, the reachable output voltage is lower. • The depth of modulation at the change from space vector to edge modulation mode depends of the type of the drive. • Typical values @ 3 kHz are: for a rated drive current <= 186 A: about 87% for a rated drive current > 186 A: about 84%. • The change to edge modulation can be prevented via P769. Note: if a sine wave output filter is used (P092 = 1) the maximum depth of modulation is so far reduced, that the modulator only operates in space vector modulation mode. The effective modulation depth limit is displayed in P180. MDS(2) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	20.0 to 96.0 [%]	2 i001=96.0 i002=96.0	3 / BR 3 / BR
r764 2FCHex	**Modulation DePth** Depth of modulation of the modulator Analog Output: 100% @ Parameter Value=1638.4% Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	[%]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P769 301Hex	**ModSystemRelease** Releases edge modulation systems. Parameter values: 0: all systems 1: edge modulation systems above 60 Hz 2: adge modulation systems above 100 Hz 3: no edge modulation systems Note: If needed the modulation depth limit (P763) is automatically reduced if edge modulation is de-selected. MDS(2) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 all syst. FLM from 60 Hz FLM from 100 Hz no FLM	2 i001=0 i002=0	3 / ABR 3 / A
P770 302Hex	**Deadtime comp.** Selects the deadtime compensation in the gating unit. The deadtime compensation eliminates voltage errors, which are obtained by the interlock times in the gating unit. Compensation is enabled/disabled during automatic parameter setting (P052 = 6) and during automatic motor identification (P052 = 7, 8). Parameter values: 0: No deadtime compensation in the gating unit 1: Deadtime compensation enabled in the gating unit Setting instructions: • For high pulse frequencies, for motors with low stator time constant (r274, positioning drives) and for long feeder cables, it may be practical to disable the compensation in order to improve the smooth running characteristics at low speeds. • In order to compensate the steady-state error in the stator resistance, for vector control types (P163 = 3, 4, 5), an addition transistor voltage is automatically internally added. The current controller dynamic performance is simultaneously increased. For frequency control (P163 = 3), the resonant damping P300 could also be additionally reduced. Type=O2; PKW: 1HEX: = 0.01 µs PcD Gr.: 0	0 to 1 off on	- 1	3 / BR 3 / BR

11.14 Factory Parameters

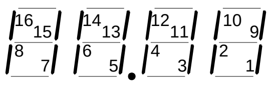
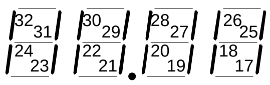
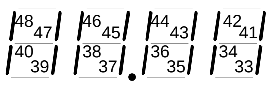
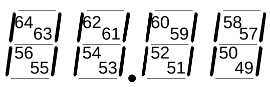
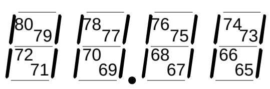
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P789 315Hex	**RAM Access Value** Value of the memory cell of the CU Type=L2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / BR 4 / BR
P799 * 31FHex	**SPecial Access** Parameter for special access Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / BR 3 / BR

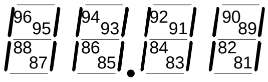
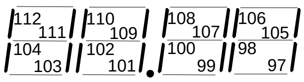
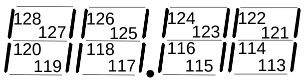
11.15 Special Parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P899 383Hex	**OP setting** Is used to set the drive converter address when several drive converters are controlled from one OP. Note: The parameter can only be displayed at the OP.		–	1 /UHABR 1 /UHABR

11.16 Profile Parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P918 396Hex	**CB Bus Address** Protocol depending bus address for communication boards; see manual of these boards Note: The communication board checks, if the set value is valid. If the value is not accepted, the fault message 80 is issued with fault value 5 Condition: P090 = 1 or P091 = 1 (communication board installed) Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 126	- 3	3 / H BR 3 / H
P927 * 39FHex	**Parameter Access** Release of interfaces for the parameterization; description see P053. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 31	- 6	3 / BR 3 / BR
P928 * 3A0Hex	**Src Base/Reserve** Source of the switching command 'base / reserve settings' (control word 2, bit 30); parameter is identical with P590 - description there Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5001	- 1005	3 / BR 3 / BR
r947 3B3Hex	**Fault Memory** Display of the faults which have occurred at the last 8 trips (r748); at every trip up to 8 faults can be saved, related to each of them a fault number (see list of faults, chapter 7) is related. For text display of the faults see r951. Indices: Fault 1 / Fault 2 / ... / Fault 8 latest trip (1): i001=F1-1, i002=F1-2, ..., i008=F1-8 last reset trip (2): i009=F2-1, i010=F2-2, ..., i016=F2-8 (last+1) reset trip (3): i017=F3-1, i018=F3-2, ..., i024=F3-8 ... oldest saved trip (8): i057=F8-1, i058=F8-2, ..., i064=F8-8 Notes: A value of '0' means 'no fault' During a power outage only the actual and the last reset trips are saved. Indices 17 to 64 are reset to '0'. Number of saved trips: see P952. Example of a trip: last reset trip (2) Index / r947 / r949: 9 / 35 / 0; 10 / 37 / 2; 11 / 0 / 0; 12; 13; 14; 15; 16 Index / r748: 4 / 62; 5 / 1; 6 / 7 Trip time (r748): after 62 days, 1 hour, 7 sec of operation Faults (r947): Fault value (r949): 35 not defined 37 2 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		64	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r949 3B5Hex	**Fault Value** Fault values of the faults; allows a more detailed diagnosis at several faults. The fault values are saved in the same indices as the related fault numbers (r947) - see example at P947. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		64	3 / BR
r951 3B7Hex	**Fault Texts** List of fault texts; every fault text is saved in the index equivalent to its fault number. Example (see P947): Value of P947, i09 is '*35*'. The related fault was (P951, i*35*): 'Ext. Fault1'. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	2 / BR
P952 * 3B8Hex	**# of Faults** Number of saved trips (max. 8). If the parameter is set to '0', the diagnosis memory (r748 - trip times, r947 - fault number, r949 fault value) is cleared. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 8	- 0	2 / BR 2 / BR
r953 3B9Hex	**Warning Param1** If a warning (numbers 1 to 16) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r954 3BAHex	**Warning Param2** If a warning (numbers 17 to 32) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r955 3BBHex	**Warning Param3** If a warning (numbers 33 to 48) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r956 3BCHex	**Warning Param4** If a warning (numbers 49 to 64) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r957 3BDHex	**Warning Param5** If a warning (numbers 65 to 80) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r958 3BEHex	**Warning Param6** If a warning (numbers 81 to 96) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r959 3BFHex	**Warning Param7** If a warning (numbers 97 to 112 is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r960 3C0Hex	**Warning Param8** If a warning (numbers 113 to 128) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r964 3C4Hex	**Drive ID** Drive ID Text string; contains information about the ID# (first 2 bytes of the string, used to identify the drive by Profibus) and about the drive type name (last 24 bytes of the string, used for display in visualization systems). A further 24 characters contain the software release and the date the software was generated Parameter values: 2 Bytes: ID#: 8022Hex 24 Byte: model name according to the drive type: MASTER DRIVES FC 24 Byte: Software release and date that the software was generated V1.3 day.month.year Note: The parameter cannot be selected at the PMU; for OP, the value cannot be displayed. Type=VS; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r965 3C5Hex	**Profile #** PROFIBUS specific parameter Note: The parameter cannot be selected at the PMU; for OP, the value cannot be displayed. Type=OS; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r967 3C7Hex	**Control Word 1** Display parameter of control word 1 (bit 0-15) Identical with r550 (control word 1) Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r968 3C8Hex	**Status Word 1** Display parameter of status word 1 (bit 0 - 15) Identical with r552 (status word 1) Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P970 * 3CAHex	**Factory Settings** Parameter reset to factory settings Parameter values: 0: Parameter reset: all parameters are reset to their original values (factory settings); after this the parameter is reset to '1'. 1: no parameter reset Note: This function can also be selected via P052=1. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 FactSetting Return	- 1	3 / B 3 / B
P971 * 3CBHex	**EEPROM Saving** Saves parameter values in the EEPROM with a transition of the parameter value from 0 to 1. The parameter must be manually reset to '0'. Parameter values: 0: no saving of parameter values 1: a transition from 0 to 1 saves the RAM values to the EEPROM Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1	- 0	3 / BR 3 / BR
r980 3D4Hex	**Par # List Pt1** List of the available parameter numbers; part 1 The parameter numbers are listed in a positive sequence. The first existing '0' shows, that no more parameter numbers are available. Index range: 1 to 116. As special function the value of i116 is the number of the parameter which contains the next following part of the list. If i116 has a value of '0' then there are no more parts of the list. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r981 3D5Hex	**Par # List Pt2** List of the available parameter numbers; part 2; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r982 3D6Hex	**Par # List Pt3** List of the available parameter numbers; part 3; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r983 3D7Hex	**Par # List Pt4** List of the available parameter numbers; part 4; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r984 3D8Hex	**Par # List Pt5** List of the available parameter numbers; part 5; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r985 3D9Hex	**Par # List Pt6** List of the available parameter numbers; part 6; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r986 3DAHex	**Par # List Pt7** List of the available parameter numbers; part 7; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r987 3DBHex	**Par # List Pt8** List of the available parameter numbers; part 8; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r988 3DCHex	**Par # List Pt9** List of the available parameter numbers; part 9; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r989 3DDHex	**Par # List Pt10** List of the available parameter numbers; part 10; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r990 3DEHex	**Par # List chg1** List of the changed parameters; part 1 The parameter numbers are listed in a positive sequence. The first existing '0' shows, that no more parameter numbers are available. Index range: 1 to 116. As special function the value of i116 is the number of the parameter which contains the next following part of the list. If i116 has a value of '0' then there are no more parts of the list. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r991 3DFHex	**Par # List chg2** List of the changed parameters; part 2; see r990. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r992 3E0Hex	**Par # List chg3** List of the changed parameters; part 3; see r990. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	116	116	3 / BR

12 Fault and alarm messages

12.1 Fault messages

For each fault the following information is available:

Parameter	r947	Fault number
	r949	Fault value
	r951	Fault list
	P952	Number of faults
	r748	Fault time

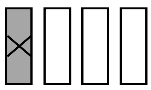
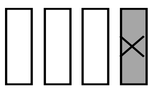
If a fault code is not reset before the electronic supply is switched off, then the fault code will be present again, when the electronic supply is switched on again. The unit cannot be operated without resetting the fault message. (Exeption: Automatic restart has been selected, see P366).

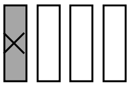
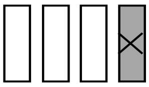
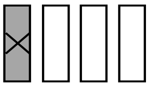
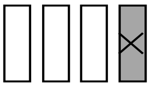
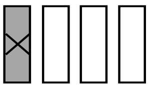
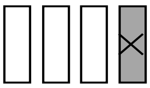
Fault messages		
No.	**Fault description**	**Counter measures**
F001	**Contact. chckbck.** If a main contactor checkback signal is configured, a checkback signal was not received within 500 ms after the power-up command.	**P591 S.MC chckbck. sign.**, The parameter value must match the main contactor checkback signal connection. Check the main contactor checkback signal circuit. ☞ Section "Connecting-up" in the Operating Instructions, Part 1.
F002	**Pre-charging** When pre-charging, the minimum DC link voltage (**P071 Conv. supply voltage** ∗ 1.34) of 80 % was not reached. The maximum pre-charging time of 3 s was exceeded.	Check the supply voltage, Compare with **P071 Conv. supply volt.**.
F006	**DC link overvoltage** The unit was shutdown due to an excessive DC link voltage. Supply voltage - I DC voltage range I Shutdown threshold 208 V - 230 V I 280 V - 310 V I 412 V 380 V - 460 V I 510 V - 620 V I 819 V 500 V - 575 V I 675 V - 780 V I 1022 V 660 V - 690 V I 890 V - 930 V I 1220 V	Check the supply voltage or the input DC voltage The converter operates in the regenerative mode without regenerative possibility. If the converter supply voltage is at the upper tolerance limit and it is operating under full load conditions, F006 can also be initiated when a line phase fails. Possibly; • **P464** increase decelaration time**,** • **P377** activate the V(d,max)-Controller (first check P071) • **P370** decrease the speed catch speed.
F008	**DC link uvolt.** The lower limit of 76 % of the DC link voltage (**P071 Line Volts** ∗ 1.34) was fallen below. For enabled kinetic buffering, 61 %. DC link undervoltage in ‘standard’ operation (i.e. no SIMULATION). DC link undervoltage with active kinetic buffering and speed less than 10 % of the rated motor speed. It was a ‘brief supply failure’ which was only detected after the supply returned (WEA-flag).	Check • the supply voltage **P071 Line Volts** • of the input rectifier • of the DC link
F011	**Overcurrent** The unit was shutdown due to an overcurrent condition. The shutdown threshold was exceeded,	Check • the converter-output for short-circuit or ground fault • the load for an overload condition • whether the motor and converter are correctly matched • whether the dynamic requirements are too high.

No.	Fault messages Fault description	Counter measures
F015	**Motor stall.** Motor has stalled or is locked: as a result of excessive ramp- or ramp-down times, a load change which was too fast and too high, or an excessive steady-state load. The fault is only generated after a time, entered in P520. The identification as to whether the drive has been locked or stalled, is dependent on P517 (setpoint-actual value deviation) and P518. For V/f control, the I(max) regulator must be activated (P175). For closed-loop speed regulation, a condition is that the speed controller limit has been reached (r150 bit7, bit8) before this fault is initiated.	reduce the load release the brake increase the current limit increase P520 stall time Increase P517 response threshold for the setpoint-actual value deviation ♦ only for V/f control with speed regulator: (P163 = 0) • check for interrupted tachometer cable • check the pulse encoder pulse number • check the analog tachometer normalization
F017	**Motor not found** Motor was not found (for restart on the fly with tachometer).	Power-up - after coast down. If required, increase **P369, Restart search current**
F018	**F set restart** The found set-frequency was not able to be implemented, as the supplementary setpoint is too high.	Check the supplementary setpoint. Power-up after the motor has coasted to a stop.
F021	**Motor I2t** Parameterized limit value of the I^2t-monitoring for the motor was exceeded.	Check: **P363 Mot. temp.T1**
F023	**Inverter temp.** The temperature limit of the inverter has been exceeded. **r949 = 1** The temperature limit of the inverter has been exceeded. **r949 = 2** Sensor 1: Wire break in the sensor wire or sensor is defect **r949 = 18** Sensor 2: Wire break in the sensor wire or sensor is defect **r949 = 34** Sensor 3: Wire break in the sensor wire or sensor is defect **r949 = 50** Sensor 4: Wire break in the sensor wire or sensor is defect	Measure the air intake and ambient temperature. Please observe the derating curves“ for ϑ >40 ºC. ☞ Section "Technical data" in the Operating Instructions, Part 1 Check; • whether fan -E1 is connected and is rotating in the correct direction. • that the air entry and discharge openings are not restricted. • temperature sensor at -X30
F025	**UCE ph. L1** There was an UCE shutdown in phase L1.	Check; • phase L1 for short-circuit or ground fault (-X2:U2 including motor). • that the **CU** is correctly inserted.
F026	**UCE ph. L2** There was an UCE shutdown in phase L2.	Check; • phase L2 for short-circuit or ground fault (-X2:V2 including motor). • that the **CU** is correctly inserted.
F027	**UCE ph. L3** There was an UCE-shutdown in phase L3.	Check; • phase L3 for short circuit or ground fault. (-X2:W2 -including motor). • that the **CU** is correctly inserted.
F028	**Supply phase** The frequency and amplitude of the DC link ripple indicates a single phase supply failure.	Check the supply voltage

Fault messages		
No.	**Fault description**	**Counter measures**
F029	**Meas. val. sens.** The measured value sensing system has developed a fault. • **(r949 = 1)** Offset adjustment not possible in phase L1. • **(r949 = 2)** Offset adjustment not possible in phase L3. • **(r949 = 3)** Offset adjustment not possible in phases L1and L3.	Defective measured value sensing Defective power section(valve cannot block)
F035	**Ext. fault1** External fault 1 input, which can be parameterized, was activated.	Check; • if there is an external fault • if the cable to the appropriate binary input is interrupted • **P575 S k fault ext.1** ☞ Section "Binary inputs" in the Operating Instructions, Part 2
F036	**Ext. fault2** External fault 2 input, which can be parameterized, was activated.	Check; • if there is an external fault • if the cable to the appropriate binary input is interrupted • **P586 S.k. fault ext. 1** ☞ Section „Binary inputs“ in the Operating Instructions, Part 2
F037	**Analog input.**	Check the connection to • analog input -X102:27, 28, 29. • analog input 2 -X102:30 ,31, 32. check parameters • **P650 CU-AE configuration** • **P651 CU-AE smoothing** • **P652 CU-AE offset** ☞ Section "Control terminal strip and serial interface" in the Operating Instructions, Part 2
F040	**AS internal** Incorrect operating status.	Replace the CU board (-A10)
F041	**EEprom fault** A fault occured when storing the values in the EEPROM.	Replace the CU board (-A10)
F042	**Comp. time** Computation time problems	Reduce computation time load, increase **sampling time P308** observe **r725 , free comp time**
F043	**Coupling, int.** Internal coupling error. One of the two coupling partners does not respond	Replace the CU board (-A10)
F045	**Opt.brd HW** A hardware fault occurred when accessing the option board	Replace CU Check the connection between the subrack and option boards
F046	**Par. con.**	Power the converter off and up again. Replace CU board (-A10).
F047	**Int. comp. time**	Replace CU board (-A10).
F048	**Int. pulse fr.**	Change **P761 pulse frequency**.
F049	**SW release** The EPROMs on the CU have different software releases. In this case, the language EPROM is compared with the CU software.	• Replace language PROM

Fault messages		
No.	**Fault description**	**Counter measures**
F050	**TSY init.** Error when initializing the TSY board	Check; • is the TSY board correctly inserted • does the parameter setting coincide with the boards used **P090 board, slot 2 - P091 board, slot 3** **r723 board code - 724 board ID**
F053	**Tacho dn/dt** The permissible change value of the speed encoder signal **P215 dn(actual, permissible)** was exceeded.	Check the tacho feeder cables to ensure that they are intact. Check the tachometer screen ground. If required, change **P215**
F060	**MLFB missing** This is set, if the MLFB = 0 when INITIALIZATION is exitted (0.0 kW). MLFB = Order No.	After acknowledgement, in INITIALIZATION enter the correct MLFB in parameter **P070 MLFB (6SE70..)**. (Only possible with the appropriate access stages to both access parameters).
F061	**Incorr param.** A parameter entered when setting the drive is not in the admissible range (e.g. P107 mot. frequency (ies), P108 mot. speed (s)), P761 pulse frequency) (dependent on the control type).	Acknowledge the fault, and change the appropriate parameter value. The erroneous parameter is specified in r949 as fault value.
F065	**INT1 telegram** A telegram was not received at interface 1 (SST1/USS protocol) during the telegram failure time	• Check the connection CU -X100:1 to 5. and check the connection PMU -X300. • Check **P687.01“SST/SCB TLG-fail“** • Replace CU (-A10).
F070	**SCB init.** Error when initializing the SCB board	**r 949 =1 or 2** • Check the SCB board to ensure that it is correctly inserted and that the slot coincides with assignment • **r723 board code ,** – **r724 board ID and** • **P090 board slot 2,** – **P091 board slot 3** **r 949 =5** error, initialization data • Check parameters **P682 and P684** **r 949=6** time-out when initializing and **r949=10** error, configuration channel • Check parameters **P090, P091, P682 and P684**
F072	**SCB heartb.** SCB no longer processes the monitoring counter (heartbeat counter)	Replace SCB Check the connection between the subrack and option board
F073	**Aninput1 SL1** 4 mA at analog input 1, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 1) -X428:4, 5.
F074	**Aninput2 SL1** 4 mA at analog input 2, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 2) -X428:7, 8.
F075	**Aninput3 SL1** 4 mA at analog input 3, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 3) -X428:10, 11.
F076	**Aninput1 SL2** 4 mA at analog input 1, slave 2 fallen below	Check the connection, signal source to the SCI1 (slave1) -X428:4, 5.
F077	**Aninput2 SL2** 4 mA at analog input 2, slave 2 fallen below	Check the connection, signal source to the SCI 1 board (slave 2) -X428:7,8.
F078	**Aninput3 SL2** 4 mA at analog input 3, slave 2 fallen below	Check the connection, signal source to the SCI 1 board (slave 3) -X428:10, 11.
F079	**SCB telegram** A telegram was not received from the SCB (USS, peer-to-peer, SCI) during the telegram failure time.	• Check the connections of SCB1(2). • Check **P687.01“SST/SCB TLG-fail“.** • Replace SCB1(2). • Replace CU (-A10).

Fault messages		
No.	**Fault description**	**Counter measures**
F080	**TB/CB init.** Error when initializing the board at the DPR interface	**r949 = 1** PT/CB not inserted or PT/CB board code incorrect **r949 = 2** PT not compatible **r949 = 3** CB not compatible **r949 = 4** error, initialization data Check the T300/CB board to ensure that is correctly inserted and that the slot and assignment coincide; • **P090 board slot 2, • P091 board slot 3** • **r723 board code, •r724 board ID** **r949 = 5** time-out at initialization **r949 = 10** error, configuration channel Checking the CB initialization parameters; • **P918 CB bus address,** • **696 to P705 CB parameters 1 to 10**
F081	**TB/CB heartb** TB or CB no longer processes the heartbeat counter	Replace TB or CB Check the connection between the subrack and option boards
F082	**TB/CB Tlgr.** No new process data were received from TB or CB during the telegram failure. .	• Check the connections of the CB/TB. • Check **P695 “CB/TB TLG-fail“.** • Replace CB. • Replace TB.
F100	**GRND init** During the ground fault test, a current not equal to 0 was measured, or a UCE or the overcurrent monitoring responded, although none of the valves were triggered.	The fault cause can be read-out of r358 "ground fault test result". Check the converter output for short-circuit or ground fault (-X2:U2, V2, W2 - including motor). Check that the CU board is correctly inserted. Frame sizes 1 and 2: Check the transistor modules on the PEU board -A23 for short-circuit. Frame sizes 3 and 4: Check the transistor modules -A100, -A200, -A300 for a short-circuit condition.
F101	**GRND UCE** During the ground fault test a UCE monitoring function responded in a phase in which no valve was triggered	Check the power section valves for a short-circuit, and for converters with fiber-optic gating, the gating unit wiring and the UCE checkback signals, for the correct assignment. **r358** can be interrogated to indicate which UCE monitoring has responded.
F102	**GRND phase** During the ground fault test, current flowed in one phase where none of the valves were triggered, or the UCE monitoring in the phase responded in which the valve was triggered.	Read-out the fault value from R949. The digit of the xth position indicates the valve, where the fault occured at power-up.  Digit x = 1 = L2+ x = 2 = L2– x = 3 = L1+ x = 4 = L1– x = 5 = L3+ x = 6 = L3– The digit of the xth position defines the phase, in which I *f* is 0, and thus a valve is defective (always conductive)  Digit x = 1 = Phase 1 Digit x = 3 = Phase 3 Digit x = 4 = Phase 1 and 3 Check the phase assembly for defective valves (always conductive)

Fault messages		
No.	**Fault description**	**Counter measures**
F103	**Ground fault** An earth fault or a fault in the power section is present. During the ground fault test, a current flows from the phase in which a valve was triggered, the overcurrent comparitor responded, or a UCE monitoring in a phase has responded in which a valve was triggered.	Read-out the fault value from r949. The digit of the xth position specifies the valve, which, when triggered, manifested the fault.  x = 1 = V+ x = 2 = V- x = 3 = U+ x = 4 = U- x = 5 = W+ x = 6 =W- Check the motor including feeder cable for ground faults. If there is no ground fault, check the power section for defective valves which remain conductive. The digit of the xth position defines the phase in which I *f* is 0, and therefore a valve must be defective (always conductive).  1 = Current in phase 1 (2 = UCE in phase 2 (V) 3 = Current in phase 3 (4 = Only overcurrent The motor speed should be less than 10 % of the rated speed during the ground fault test! 1) A ground fault is present in phase V, or there is a defective valve (always conductive).
F104	**Mess. I pol.** For the resistance measurement, the average current value in a phase has the incorrect polarity.	Read-out the fault value from r949. The digit of the xth position specifies the valve, which, when triggered, manifested the fault.  x = 1 = 100 x = 2 =010 x = 3 = 001 Specifies the phase current with the incorrect polarity.  x = 1 = Phase 1 (U) x = 3 = Phase 3 (W) x = 4 = Phase 1 (U) and 3 Check that the output current is flowing through the CT in the correct direction, and whether the CT signal cables are connected with the correct polarity to the electronics. The CT could be defective.
F105	**Mess. I too large** Phase current deviates by more than 15 % from the setpoint.	Read-out the fault value from r949. The digit of the xth position specifies the voltage direction when the fault occurred.  x = 1 = 100 x = 2 =010 x = 3 = 001 The digit of the xth position specifies the phase current, which is higher than can be expected for this particular current setpoint.  x = 1 = Phase 1 (U) x = 3 = Phase 3 (W) x = 4 = Phase 1 (U) and 3 Check whether the motor-converter feeder cable or the motor winding in phase 2 are interrupted, and that <u>both</u> CTs represent the actual value with the correct gain.
F106	**Mess. I dev.** Phase current deviates by more than 15 % from the setpoint.	Check whether the motor-converter feeder cable or the motor winding in phase 2 are interrupted, and that <u>both</u> CTs represent the actual value with the correct gain. The referred stator- and feeder resistances are possibly >50 %. For the resistance measurement, the measured phase current was more than 15 % of the value for this particular setpoint

No.	Fault description	Counter measures
	Fault messages	
F107	**Mess. I = 0** During the resistance measurement, current was not measured in one phase, although the inverter was enabled.	Read-out the fault value from r949. The digit of the xth position specifies the voltage direction at which the fault occurred. x = 1 = 100 x = 2 =010 x = 3 = 001 The digit of the xth position indicates the phase, in which no current was measured. x = 1 = Phase 1 (U) x = 2 = Phase 2 (V) x = 3 = Phase 3 (W) x = 4 = Phase 1 (U) and 3 (W) Check that all three motor feeder cables and motor windings are not interrupted. Check the connections between the CT and electronics. Check that the correct rating plate data have been entered for the motor data set valid during the measurement.
F108	**Mess. unsym** At least one of the six individual values from Rg deviate by more than 10 % from the average value. The motor winding is significantly non-symmetrical.	Check the motor feeder cables and motor winding.
F114	**Mess. OFF** The converter automatically aborted the automatic measurement as the time limit was exceeded up to converter power-up, or due to an OFF command during the measurement; the selection in **P052 function selection** is reset.	For **P052, function selection = 7,** restart **motor identification at standstill.** The on command must be provided within 20 s after the warning message **A078 standstill measurement appears.** Withdraw the off command and re-start the measurement.
F115	**KF internal**	Power-down the converter and electronics and power-up again.
F255	Fault in the NOVRAM	Power-down the converter and electronics and power-up again. If the fault occurs again, change the CU.

Fatal errors (FF):

Fatal errors are those hardware or software errors which no longer permit normal converter operation. They only appear on the PMU in the form "FF<Nr>". The software is re-booted by actuating any PMU key.

FFxx	Error message	Power-down the converter and power-up again. Call the responsible service department if a fatal error message is re-displayed.
FF01	**Time sector overflow** A non-removable time sector overflow was identified in the higher priority time sectors.	• Increase the sampling time **(P308)** or reduce the pulse frequency **(P761)** • replace CU
FF03	**Access error, option board** A fatal error occured when accessing the external option boards (CB, TB, SCB, TSY ..)	• replace CU • replace LBA • replace option board
FF06	**Stack-Overflow** Stack overflow.	• Increase the sampling time **(P308)** or reduce the pulse frequency **(P761)** • replace CU
FFxx	**Other fatal errors.**	• replace CU

12.2 Alarm messages

The alarm message is periodically displayed on the PMU by A=alarm and a 3-digit number. An alarm cannot be acknowledged. It is automatically deleted once the cause has been removed. Several alarms can be present. The alarms are then displayed one after another.

When the converter is operated with the OP1 operator control panel, the alarm is indicated in the lowest operating display line. The red LED additionally flashes (refer to the OP1 Instruction Manual).

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A001	**P953** —— 0	**Comp. time** CU board comp. time utilization too high	observe **r725 free computation time** increase **P308, sampling time** or
A014	**P953** —— 13	**Simulation** The DC link voltage is not equal to zero when the simulation mode is selected (P733 = 1).	• set P733 to zero • drop the DC link voltage (remove the inverter from the mains)
A015	**P953** —— 14	**Ext. alarm 1** External alarm input 1, which can be parameterized, was activated	External alarm! check whether the cable to the appropriate binary input is interrupted. Check **parameter P588 S alarm ext. 1.** ☞ Section "Binary inputs" in the Operating Instructions, Part 2
A016	**P953** —— 15	**Ext. alarm 2** External alarm input 2, which can be parameterized, was activated	External alarm! check whether the cable to the appropriate binary input is interrupted. Check **parameter P589 S alarm ext. 2.** ☞ Section "Binary inputs" in the Operating Instructions, Part 2
A020	**P954** —— 3	**Overcurrent** An overcurrent condition has occurred.	Check the driven load for an overload condition. - are the motor and converter matched - are the dynamic performance requirements exceeded.
A021	**P954** —— 4	**Overvoltage** A DC link overvoltage condition has occurred.	Check the supply voltage. Converter regenerates without regeneration possibility.
A022	**P954** —— 5	**Inv. temp.** The threshold for initiating an alarm, which can be parameterized, was fallen below.	Observe **r011 conv. temp.** Measure the air intake or ambient temperature. Observe the de-rating curves for ϑ >40 ºC ☞ Section "Technical data" in the Operating Instructions, Part 1 Check: - whether fan -E1 is connected and is rotating in the correct direction. - the air intake and discharge openings for blockage. - the temperature sensor at -X30.
A023	**P954** —— 6	**Mot temp** The threshold to initialize an alarm, which can be parameterized, was exceeded.	Check the motor (load, ventilation etc.). Read-out the actual temperature in **r009 mot.temp.** Check the KTY84 input at connector -X104:25,26 for a short-circuit condition.
A025	**P954** —— 8	**I2t- inv.** If the instantaneous load condition is maintained, then the inverter will be thermally overloaded.	Check whether the rated output current or the peak current (operating class II) is (was) too high. View **r010 conv. load**
A029	**P954** —— 12	**I2t motor** The parameterized limit value for the motor I2t monitoring was exceeded.	Motor duty cycle is exceeded! Check parameters: **P362 motor cooling** **P363 mot. temp. T1** **P364 mot. load limits**

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A033	**P955** —— 0	**Overspeed** Bit in **r553 status word 2** of the setpoint channel. The speed actual value has exceeded the maximum speed plus the selected hysteresis.	**P519 overspeed hys.** plus **P452 max. frequency (RDF)/ max. speed (RDF)** or **P453 max. frequency (LDF)/ max.speed (LDF)** was exceeded. Increase the parameter for the maximum frequencies, or reduce the regenerative load.
A034	**P955** —— 1	**Setpoint- act. val. diff.** Bit in the **r552 status word 2** of the setpoint channel. The absolute difference between the frequency setpoint and actual value is greater than the parameterized value and the control monitoring time has expired.	Check; - whether an excessive torque requirement is available. - whether the motor was dimensioned too small. increase **P517 setpoint-act. val. diff. frq./setp. act. diff. speed** or **P518 setp.-act. val. diff. time,**
A035	**P955** —— 2	**Wire breakage** Clockwise and/or counter-clockwise rotating field is not enabled, or a wire is interrupted (both control word bits are zero)	Check, whether the cable(s) to the appropriate binary input(s), **P572 S. clockwise phase sequence/P571 S. counter-clockwise phase sequence** is (are) interrupted or withdrawn. ☞ Section "Binary inputs" in the Operating Instructions, Part 2
A041	**P955** —— 8	**DC link overv.** The supply voltage is too high or the converter supply voltage (P071) is incorrectly parameterized. The Vd_max. controller is inhibited, as otherwise the motor would immediataly accelerate in operation up to the maximum frequency.	Check: - the supply voltage. **- P071 conv. supply volt**.
A042	**P955** —— 9	**Mot. stall/lock** Motor has stalled or is locked.	Reduce load. Check: - whether the drive is locked. - whether the drive has stalled.
A043	**P955** —— 10	**n-act. jump** The permissible rate of change of the speed encoder signal (P215) was exceeded..	Only for configured speed encoder **P208 S. speed act. val.** Check! Tacho cable for interruption. Tacho screen grounding.
A049	**P956** —— **0**	**No slave** For serial I/O (SCB1 with SCI1/2), no slave is connected, opto-cable interrupted or slaves have no power.	**P660 SCI AE config.** • Check slave • Check cable
A050	**P956** —— **1**	**Slave incorrect** For serial I/O, the slaves required according to the parameterized configuration are not present (slave number or slave type).	Check **P660 SCI AE config.**
A051	**P956** —— 2	**Peer bdrate** The peer-to-peer connection is too high or different baud rates have been selected.	Adapt the baud rate in conjunction with the SCB boards, **P684 SST/SCB baud rate**
A052	**P956** —— 3	**Peer PZD-L** for peer-to-peer connection, PZD length selected too high (>5).	Reduce the number of words **P686 SST/SCB PZD No.**
A053	**P956** —— 4	**Peer lng f.** For peer-to-peer connection, the PZD length of sender and receiver do not match.	Adapt the word length for sender and receiver **P686 SST/SCB PZD No.**

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A057	**P956** —— 8	**TB-Param** Technology Board Parameter occurs when a technology board is present, but parameterisation commands from the PMU, SST1 or SST2 are not answered by the technology board within 6 seconds	Change TB software
A065	**P957** —— 0	**WEA active** The WEA option **(P366)** always restarts the drive. A possibly parameterized power-up delay time **(P367)** expires, if restart-on-the-fly is not selected. For DC link pre-charging, there is **no** time monitoring, i.e. with an external electronics power supply, it is also switched-in again.	**CAUTION** Personnel could be endangered when the drive automatically restarts. Please check as to whether WEA (automatic restart) is reeally required. If required, change **P366 WEA**.
A070	**P957** —— 5	**Sync. error** This alarm is output, if the phase difference goes outside the synchronizing window **(P 391)** after synchronization.	The alarm can only be deleted after synchronization has been exited
A076	**P957** —— 11	**t-comp lim.** The determined compensation time was limited to 0.5µs - 1.5µs.	Converter and motor outputs are too different. Check motor data entries **P100 to P109**.
A077	**P957** —— 12	**r-g limit** The measured resistance is limited to the max. value of 49%.	Converter and motor outputs are too different. Check motor data entries **P100 to P109**.
A078	**P957** —— 13	**Stands.meas** The standstill measurement is executed when the converter is powered-up. With this measurement, the motor can align itself several times in any direction of rotation.	If the standstill measurement can be executed without any danger: Power-up the converter.
A081.. **A096**	**r958** —— 0...15	**CB alarm** Refer to the User Manual, CB board	
A097.. **A112**	**r959** —— 0...15	**TB alarm 1** Refer to the User Manual, TB board	
A113.. **A128**	**r960** —— 0...15	**TB alarm 2** Refer to the User Manual, TB board	

13 Logbook

The logbook must be kept up-to-date by the operating personnel

All service- and maintenance work carried-out on the converter should be briefly entered into the logbook.

Continuous entries are important for maintenance and could be significant when it comes to warranty claims.

The logbook is available as file on the SIMOVIS floppy disk supplied, and it can be printed-out at any time.

Format	**File name**
WINWORD 6.0	LOG_FC.DOC
WRITE	LOG_FC.WRI

<table>
<tr><td colspan="3">Location: ....</td><td colspan="2">Unit Order No.:
Serial No.:</td></tr>
<tr><td></td><td>Date</td><td>Name</td><td>Department</td><td>Signature</td></tr>
<tr><td>Start-up settings</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Start-up settings change</td><td></td><td></td><td></td><td></td></tr>
</table>

No.	Date/time	Name/department	Fault- and diagnostic messages	Measures

14 Index and Abbreviations

14.1 Index

14.2 List of abbreviations

A	Alarm
AA	Analog output
AC	Alternating current
AE	Analog input
AFE	Active front end
AS	Sequence control
ASIC	Application specific integrated circuit
ASM	Asynchronous motor
ATI	Beliebig sinnvoll/sinnloser Kommentar
AWG	American wire gauge
BA	Binary output
BC	Bypass contactor
BE	Binary input
BF	Type of construction
CAN	Controller area network
CB	Communication board (option)
CU	Control unit
CUA	Control unit AFE (control unit of AFE)
DC	Direct current
DPR	Dual-port-RAM
DPRAM	Dual-port-RAM
EA	First run-up
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMF	Electromotive force
EPROM	Erasable programmable read-only memory
ESD	Electrostatic sensitive devices
F	Fault
FC	Frequency control (control version of SIMOVERT MASTER DRIVES)
FF	Fatal fault
FI	Fault current
FSW	Fixed setpoint
G/R	Basic/reserve
GSST(1/2)	Basic drive converter serial interface (1/2)
H	High (binary signal level)
HLG	Ramp-function generator
HTL	High-voltage transistor logic

HW	Hardware
I/O	Input/output
IGBT	Insulated gate bipolar transistor
IGD	IGBT gate drive
IVI	Inverter interface
KIP	Kinetic buffering
L	Low (binary signal level)
LBA	Local bus adapter (option)
LED	Light emitting diode
LSB	Least significant bit
MC	Main contactor
MDS	Motor data set
MLFB	Machine-readable product designation (machine-readable designation)
MSB	Most significant bit
NN	Sea level
OP(1)	Operation panel (1)
Par	Parameter
PC	Personal computer
PEU	Power electronic unit
PG	Programming unit (programmer)
PKW	Parameter ID value
PMU	Parameterization unit
PROFIBUS	Process field bus
PS	Power supply
PSU	Power supply unit
PWE	Parameter value
PZD	Process data
Q	Source
RC	Combination, resistor ® and capacitor (C)
RDS	Reserve data set
RFG	Ramp-function generator
SC	Servo control (control version of SIMOVERT MASTER DRIVES)
SCB(1/2)	Serial communication board (option)
SCI(1/2)	Serial communication Interface (1/2)
SDS	Setpoint data set
SL	Slave
SM	Synchronous motor
SMD	Surface mounted device

SML	Snubber module low
SMU	Snubber module up
SST1/2	Serial interface 1/2
SW	Software
TB	Technology board (option)
TLG	Telegram
TRC	Trace
TSY	Tacho and synchronization (option)
TTL	Transistor-Transistor-Logic
UCE	Voltage (V) collector->emitter (desaturation signal of the transistors)
UMR	Drive converter
USS	Universal serial interface
VC	Vector control (control version of SIMOVERT MASTER DRIVES)
VDU	Voltage-dividing-unit
VS	Precharging contactor
Vsa	Line supply voltage components in the a axis
Vsb	Line supply voltage components in the b axis
VSB	voltage sensing board (line supply voltage sensing board)
WEA	Automatic restart function
WR	Inverter
X9	Terminal strip on the PEU (types A to D), PSU1 (types E to H) and PSU2 (types J to M)
ZK	DC link

The following editions have been published so far:

Edition	Internal Item Number
AA	475 100.4000.76 J AA-76

Version AA consists of the following chapters:

Chapter		Changes	Pages	Version date
0	General	First edition	10	08.96
1	Control terminal strip and serial interface	First edition	5	08.96
2	Operator control	First edition	4	08.96
3	General explanation of the terminology and functional scope of the unit	First edition	2	08.96
4	Start-up	First edition	11	08.96
5	Process data	First edition	23	08.96
6	Interfaces	First edition	14	08.96
7	Open-loop and closed-loop control types	First edition	3	08.96
8	Start-up functions	First edition	8	08.96
9	Functions (software)	First edition	13	08.96
10	Function diagrams	First edition	8	08.96
11	Parameter list	First edition	59	08.96
12	Fault and alarm messages	First edition	10	08.96
13	Logbook	First edition	1	08.96
14	Index and abbreviations	First edition	5	08.96

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SIEMENS

SIMOVERT Master Drives
Servo Control (SC)
Types A to D
AC-AC

Operating Instructions

Edition: **B**

Order-No.:6SE7087-6AD30

These Operating Instructions are available in the following languages:

Language	German	French	Spanish	Italian
Order-No.	6SE7080-0AD30	6SE7087-7AD30	6SE7087-8AD30	6SE7087-2AD30

Contents

0 Definitions

- QUALIFIED PERSONAL

  For the purpose of these instructions and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

  1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
  2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
  3. Trained in rendering first aid.

- DANGER

  For the purpose of these instructions and product labels, "Danger" indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.

- WARNING

  For the purpose of these instructions and product labels, "Warning" indicates death, severe personal injury or property damage can result if proper precautions are not taken.

- CAUTION

  For the purpose of these instructions and product labels, "Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.

- NOTE

  For the purpose of these instructions, "Note" indicates information about the product or the respective part of the Instruction Manual which is essential to highlight.

NOTE
These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens sales office. The contents of this Instruction Manual shall not become part of or modify any prior or existing agreement, committment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

CAUTION

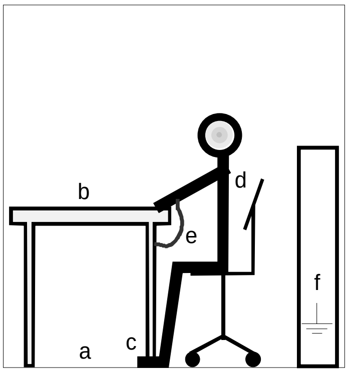
Components which can be destroyed by electrostatic discharge (ESD)

The converters contain components which can be destroyed by electrostatic discharge. These components can be easily destroyed if not carefully handled. If you have to handle electronic boards please observe the following:

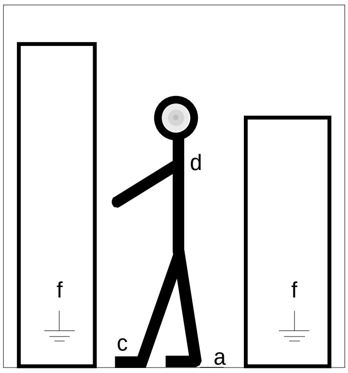
- Electronic boards should only be touched when absolutely necessary.
- The human body must be electrically discharged before touching an electronic board
- Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from man-made fibers
- Boards must only be placed on conductive surfaces
- When soldering, the soldering iron tip must be grounded
- Boards and components should only be stored and transported in conductive packaging (e.g. metalizedplastic boxes, metal containers)
- If the packing material is not conductive, the boards must be wrapped with a conductive packaging material, e.g. conductive foam rubber or household aluminum foil.

The necessary ECB protective measures are clearly shown in the following diagram:

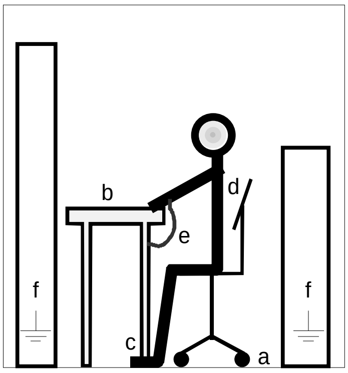
a	=	Conductive floor surface	d	=	ESD overall
b	=	ESD table	e	=	ESD chain
c	=	ESD shoes	f	=	Cubicle ground connection



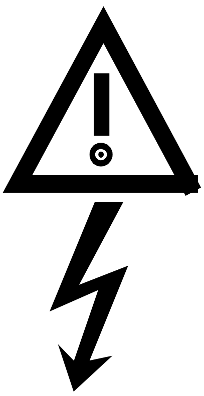
Sitting



Standing



Standing / Siting



WARNING

Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the safety instructions can result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

1 Description

1.1 Applications

SIMOVERT Master Drive are power electronic units. The converters, described in this Instruction Manual generate a variable-frequency three-phase system from a three-phase supply network with fixed frequency (50/60 Hz). This allows AC motors to be continuously speed controlled. There are three different versions depending on the particular application:

- ♦ Frequency control FC simple applications (e.g. pumps and fans)
- ♦ Vector control VC high demands regarding dynamic performance and accuracy
- ♦ Servo control SC servo drives

In the basic design, SIMOVERT Master Drives can be used for two-quadrant operation. Four-quadrant operation is possible using the braking unit option. SIMOVERT Master Drives are suitable for single-motor- and multi-motor drives.

Expanded functions for certain technological requirements are possible via defined power section interfaces.

1.2 Mode of operation

The three-phase AC voltage, fed to the SIMOVERT Master Drives through the input terminals, is rectified in a B6 bridge rectifier and fed to the DC link through series resistors. The DC link is charged through two resistors, so that complete ground-fault proof operation is provided on the load side.

The converter is then ready for operation.

The inverter, configured using IGBT modules, generates a three-phase system from the DC link voltage to feed the motor

The inverter open-loop control uses a microprocessor with field-oriented vector control, with a very fast secondary closed-loop current control. High drive dynamic performance is achieved as a result of the field oriented vector control. When the unit is shipped, the pulse frequency is preset to 5 kHz. It can be set in the range from 5 kHz to 7.5 kHz.

SIMOVERT SC is suitable for:

- ♦ Single-motor drives with permanent-field 1FT6 motors

Some of the applications are, for example

- ♦ Winder drives,
- ♦ Foil machines,
- ♦ Packaging machines

After power-up, only the motor must be selected and the drive can then be enabled. The drive can be matched to the load moment of inertia and optimized by changing a closed-loop control parameter.

The converter operates with motor identification (MOTID). The maximum stator frequency is 400 Hz.

The following operating modes can be selected:

- ♦ Closed-loop speed control
- ♦ Closed-loop torque control

The following encoders can be used:

- ERN 1387 encoders
- Encoders which are compatible to ERN 1387
- Resolvers

The converter can be controlled via

- the parameterization unit (PMU)
- an optional operator control panel (OP1)
- terminal strip
- a serial interface.

When networked with automation systems, the converter open-loop control is realized via optional interfaces and technology boards.

2 Transport, Unpacking, Installation

2.1 Transport and unpacking

SIMOVERT Master Drives are packed in the manufacturing plant corresponding to that specified when ordered. A product packing label is provided on the carton.

Vibration and jolts must be avoided during transport, e.g. when setting the unit down.

Please observe the instructions on the packaging for transport, storage and professional handling.

The converter can be installed after it has been unpacked and checked to ensure that everything is complete and that the converter is not damaged.

If the converter is damaged you must inform your shipping company immediately.

The packaging comprises board and corrugated paper. It can be disposed of corresponding to the appropriate local regulations for the disposal of board products.

2.2 Storage

The converters must be stored in clean dry rooms.Temperatures between – 25 °C (–13 °F) and + 70 °C (158 °F) are permissible. Temperature fluctuations > 20 K per hour are not permissible.

WARNING

The equipment should not be stored for longer than one year. If it is stored for longer periods of time, the converter DC link capacitors must be formed at start-up.

Forming is described in Section 4.3.12.

2.3 Mounting

The following are required for mounting:

- G busbar according to EN50035 with screws for mounting
- One M6 screw for types of construction A to C; two M6 screws for type of construction D
- Dimension drawing (Fig. 2.2 for types of construction A, B and C, Fig. 2.3 for type of construction D).

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE) must be observed as well as the professional handling of tools and the use of personnal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

The unit must be protected against the ingress of foreign bodies as otherwise the function as well as the operational safety cannot be guaranteed.

Requirements at the point of installation:

The local guidelines and regulations must be observed when mounting and installing the equipment. Equipment rooms must be dry and dust-free. Ambient and cooling air must not contain any electrically conductive gases, vapors and dusts which could diminish the functionality. Dust-laden air must be filtered.

WARNING

When mounting in cabinets, a clearance of above and below must be provided so that the cooling air flow is not restricted (refer to dimension drawings, Section 2.4).

Dimension the cabinet cooling in line with the power loss! (technical data, Section 13)

The converter ambient climate in operating rooms may not exceed the values of code F according to DIN 40040. The drive converter must be de-rated, corresponding to Sections 13.1 and 13.2, for temperatures > 40 °C (104 °F) and installation altitudes > 1000 m.

The unit is mounted corresponding to the dimension drawings in Section 2.4.

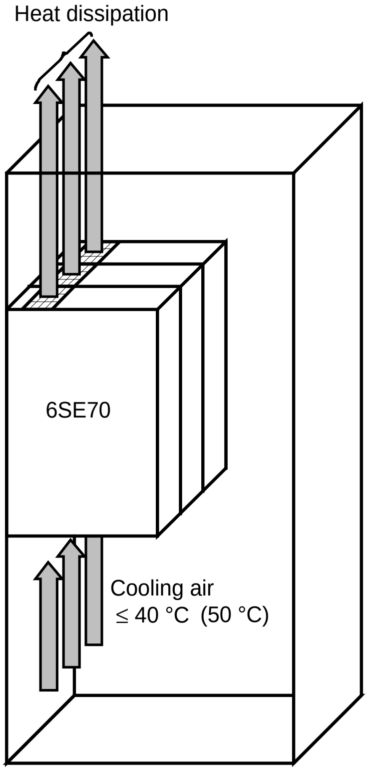


Fig. 2.1 Mounting the converters in cabinets

2.4 Dimension drawings

	a	b	c	d	e
Bauform/Type A	425	48.5	45	90	38.5
Bauform/Type B	425	47	67.5	135	37
Bauform/Type C	600	70	90	180	70

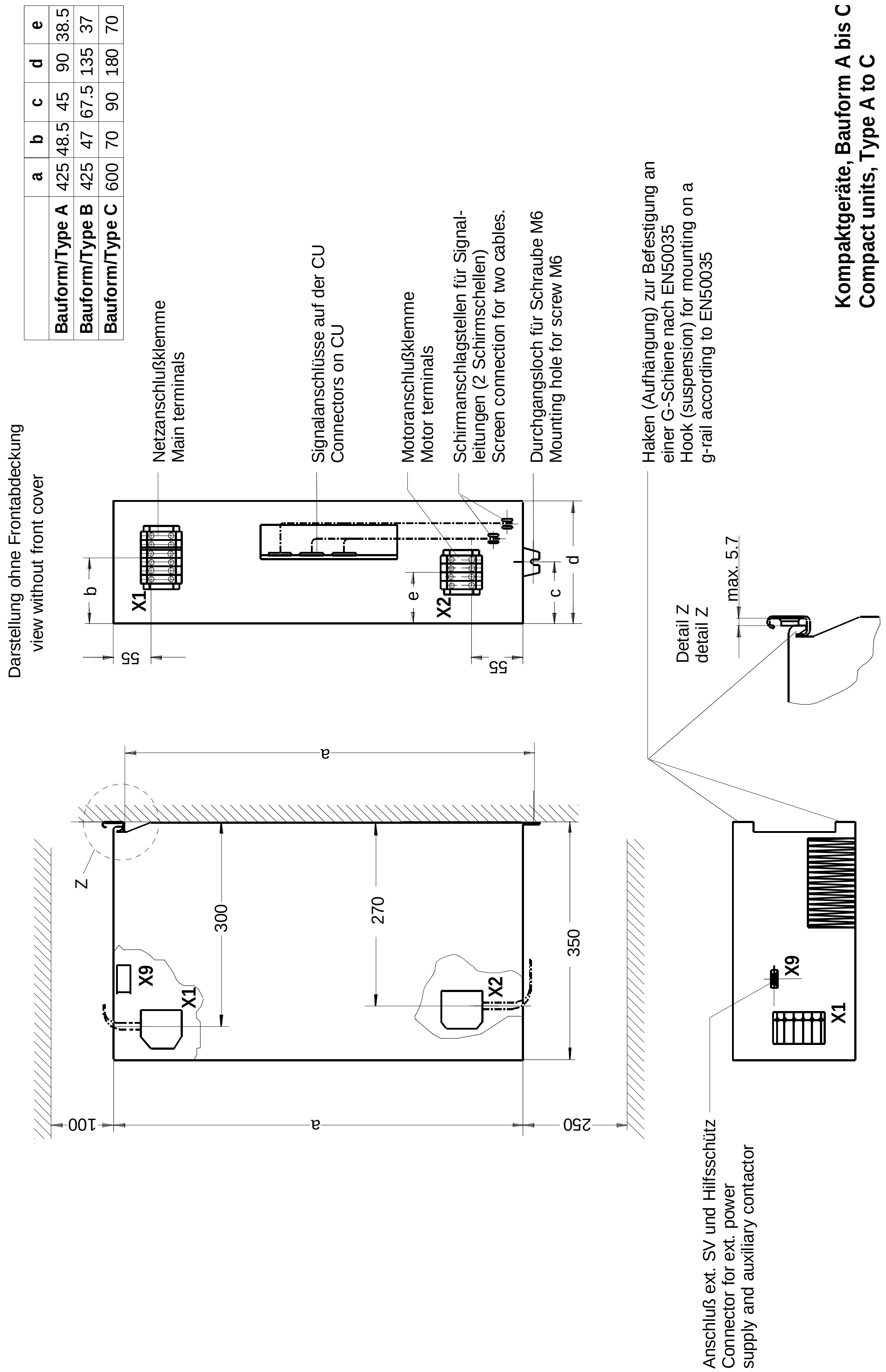


Fig. 2.2 Types A, B and C

Kompaktgeräte, Bauform
Compact units, type D

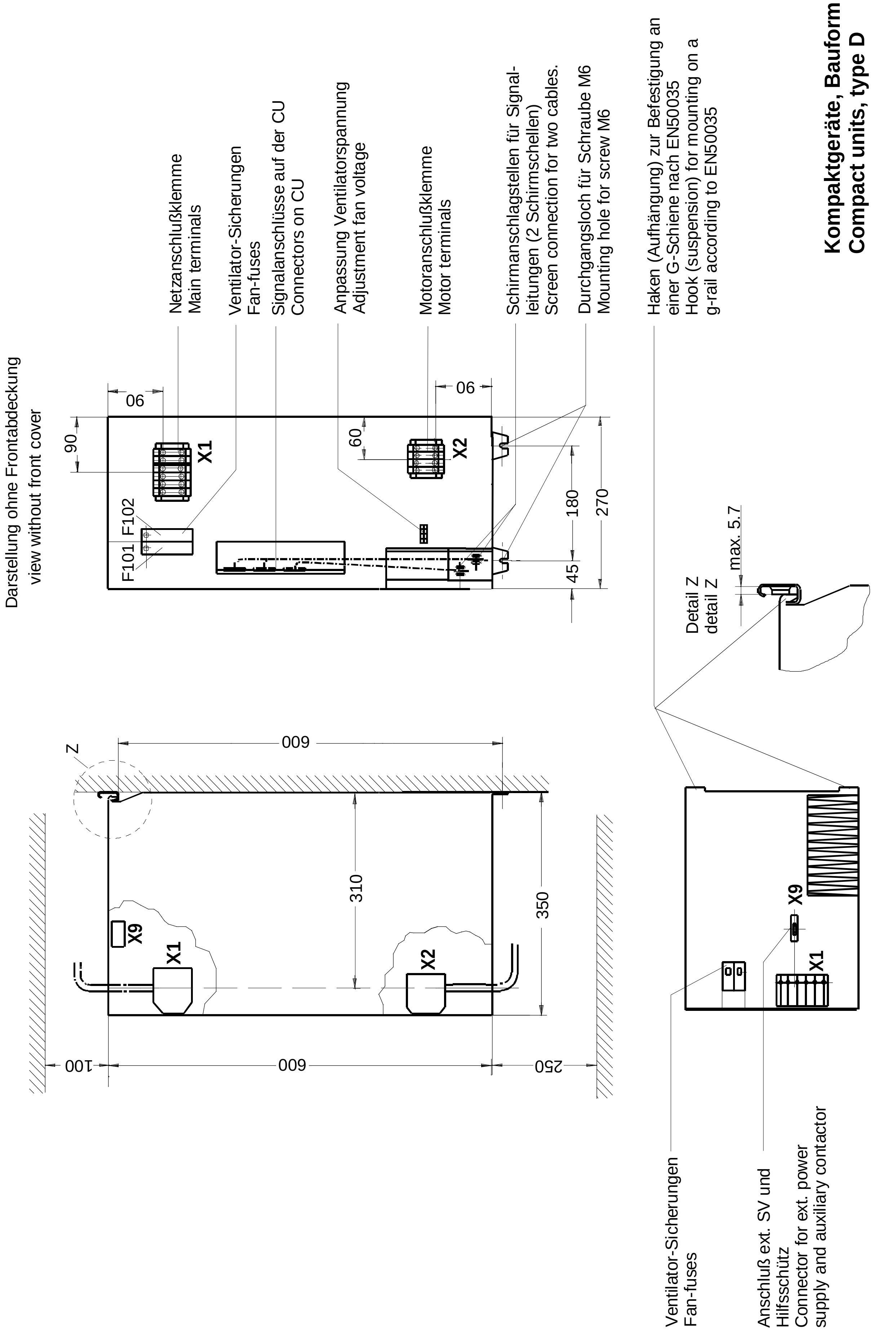
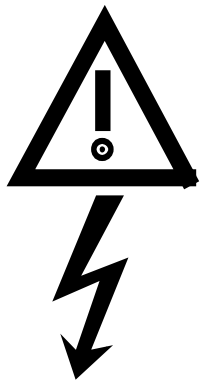


Fig. 2.3 Type D

3 Connecting-up



WARNING
SIMOVERT Master Drives are operated at high voltages. The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out! Only professionally trained, qualified personnel must work on or with the unit. Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.
Hazardous voltages are still present in the unit up to 5 minutes after it has been powered-down due to the DC link capacitors. Thus, the appropriate delay time must be observed before opening-up the unit.
The power terminals and control terminals can still be live even though the motor is stationary.
Forming the DC link capacitors: The storage time should not exceed one year. The converter DC link capacitors must be formed at start-up if the unit has been stored for a longer period of time. Forming is described in Section 4.3.12.
When working on an opened unit, it should be observed that live components (at hazardous voltage levels) can be touched (shock hazard)
The user is responsible, that the motor, converter and any other associated devices or units are installed and connected-up according to all of the recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be especially observed.

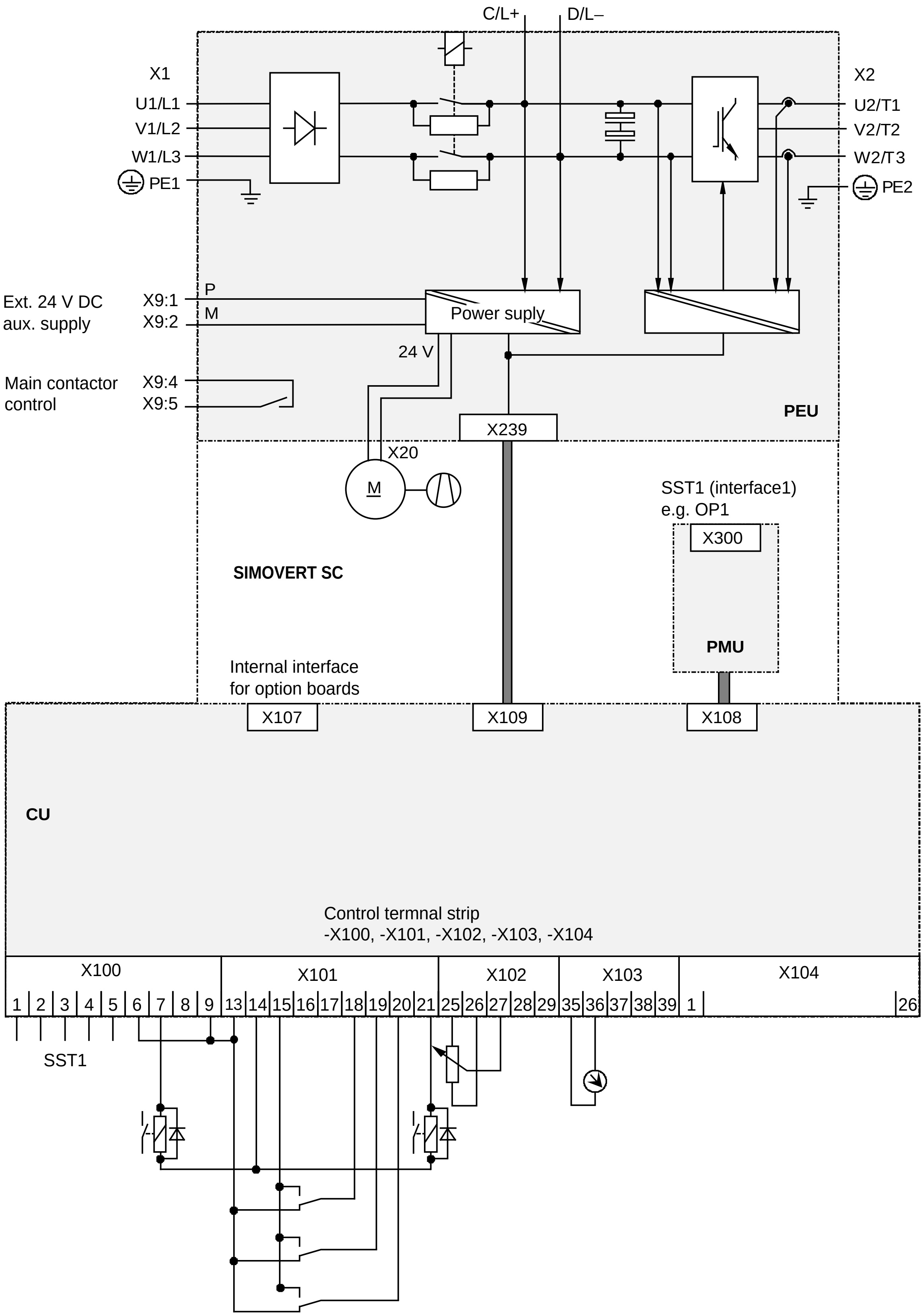


Fig. 3.1 Block diagram, types A, B, and C (24 V DC fan)

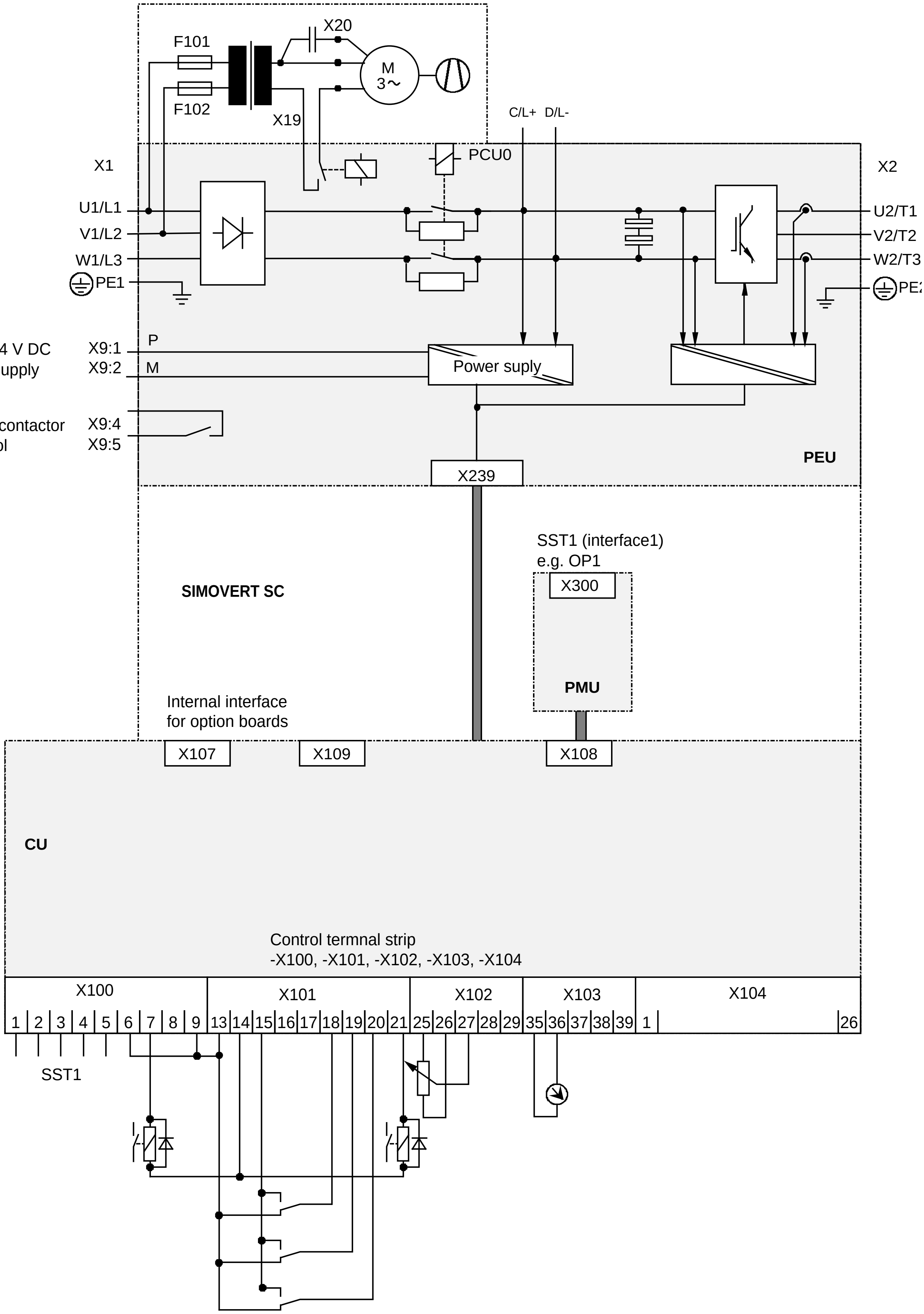


Fig. 3.2 Block diagram, types D (230 V AC fan)

3.1 Power connections

	WARNING
	♦ The unit will be destroyed if the input- and output terminals are interchanged! ♦ The converter will be destroyed if the DC link terminals are interchanged or short-circuited! ♦ The coils of contacts and relays which are connected to the same supply as the converter or are located in the vicinity of the converter, must be provided with overvoltage limiters, e.g. RC elements. ♦ It is not permisible that the converter is connected-up through an e.l.c.b. (ground fault circuit interrupter) (DIN VDE 0160).

The converters should be fused on the line side with fuses according to Table 3.1. In order to reduce noise and to limit the harmonics fed back into the supply a 2 % commutating reactor should be used to connect the converter to the supply. Refer to Table 3.1 for the Order Nos. for the fuses and the line commutating reactors.

Refer to Section 3.4 regarding the radio interference suppression regulations.

The connecting cable cross-sections, specified in Table 3.1 are determined for copper cable at a 40 ° C (104 ° F) ambient temperature (acc. to DIN VDE 0298 Part 4/02.88 Group 5) and the recommended cable protection according to DIN VDE 0100, Part 430.

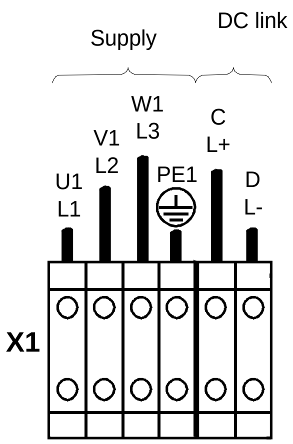


Fig. 3.3 Supply connection

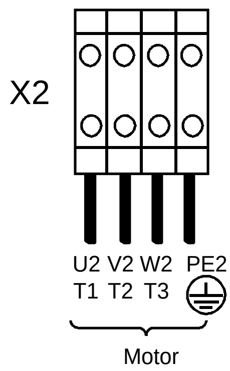


Fig.3.4 Motor connection

The cross sections, specified in Table 3.2 are the connection cross-sections which are possible with the particular terminal size.

NOTE
Depending on the motor insulation strength and the length of the motor feeder cable, it may be necessary to install one of the following options between the motor and the converter: ♦ Output reactor ♦ dv/dt-filter ♦ Sinusoidal filter Information regarding selection and dimensioning is provided in Section 9, "Options".

NOTE
A transformer is integrated into converters, type of construction D, due to the 230 V fan. The terminals on the primary side must be connected corresponding to the rated input voltage.

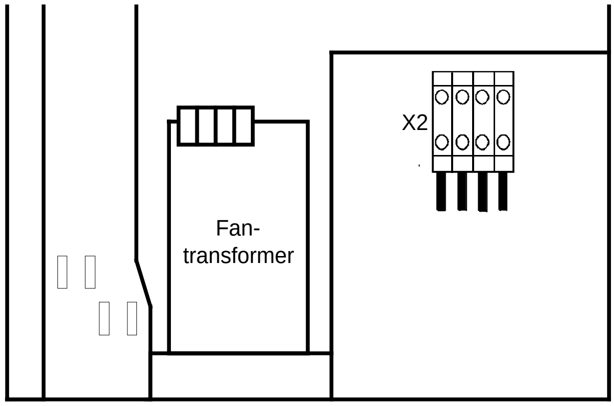


Fig. 3.5 Transformer location (only for converters, type of construction D)

3.1.1 Protective conductor connection

The protective conductor should be connected-up on both the supply- and motor sides. It should be dimensioned according to the power connections. A minimum 10 mm^2 cross-section is required due to the discharge currents through the noise suppression capacitors.

3.1.2 DC link connection

The– "braking unit" and "dv/dt filter" options can be connected at the DC link terminals X1 C/L+ and X1 D/L.

Order No.	Rated input		Supply connection							Motor connection	
	Voltage	Curr.	Cross-section		Recommended fuse				Line reactor	Cross-section	
			VDE		gR (SITOR)		gL NH			VDE	
	(V)	(A)	(mm^2)	AWG[1)]	(A)		(A)			(mm^2)	AWG
6SE70						3NE		3NA	4EP		
21-1CA30	208 to 230	10,6	2,5	14	– – –	– – –	16	3805	3400-1UK	1,5	16
21-3CA30	208 to 230	13,3	4	10	– – –	– – –	20	3807	3500-0UK	1,5	16
21-8CB30	208 to 230	17,7	6	8	25	1815-0	25	3810	3600-4UK	2,5	14
22-3CB30	208 to 230	22,9	10	6	35	1803-0	35	3814	3600-5UK	4	10
23-2CB30	208 to 230	32,2	16	4	– – –	– – –	50	3820	3700-2UK	10	6
24-4CC30	208 to 230	44,2	25	2	50	1817-0	63	3822	3800-2UK	16	4
25-4CD30	208 to 230	54	25	2	80	1820-0	80	3824	3900-2UK	25	2
27-0CD30	208 to 230	69	35	0	80	1820-0	80	3824	3900-2UK	25	2
28-1CD30	208 to 230	81	50	00	100	1021-0	100	3830	3900-2UK	35	0
16-1EA30	380 to 460	6,1	1,5	16	– – –	– – –	10	3803	3200-1UK	1,5	16
18-0EA30	380 to 460	8,0	1,5	16	– – –	– – –	16	3805	3400-2UK	1,5	16
21-0EA30	380 to 460	10,2	2,5	14	– – –	– – –	16	3805	3400-1UK	1,5	16
21-3EB30	380 to 460	13,2	2,5	14	25	1815-0	25	3810	3500-0UK	2,5	14
21-8EB30	380 to 460	17,5	4	10	25	1815-0	25	3810	3600-4UK	2,5	14
22-6EC30	380 to 460	25,5	10	6	35	1803-0	35	3814	3600-5UK	10	6
23-4EC30	380 to 460	34	16	4	– – –	– – –	50	3820	3600-5UK	10	6
23-8ED30	380 to 460	37,5	16	4	63	1818-0	63	3822	3700-5UK	16	4

Order No.	Rated input		Supply connection							Motor connection	
	Voltage	Curr.	Cross-section		Recommended fuse				Line reactor	Cross-section	
			VDE		gR (SITOR)		gL NH			VDE	
	(V)	(A)	(mm²)	AWG[1]	(A)		(A)			(mm²)	AWG
6SE70						3NE		3NA	4EP		
24-7ED30	380 to 460	47	25	2	63	1818-0	63	3822	3800-2UK	16	4
26-0ED30	380 to 460	59	25	2	80	1820-0	100	3830	3800-2UK	16	4
27-2ED30	380 to 460	72	50	00	80	1820-0	100	3830	3900-2UK	25	2

INFORMATION AND EXPLANATIONS

The cables and semiconductors are protected using fuses with gR characteristics. Only the cables, but not the semiconductors, are protected using gL fuses.

1) American Wire Gauge

2) The specified fuses are valid for converters with a 3-ph AC 500 V input voltage. For converters with higher input voltage, fuses up to 660 V must be used. The Order Nos. of these fuses are obtained by attaching the suffix "-6" to the appropriate 500 V fuse Order No. e.g.: 3NA3803 ≙ 500 V
3NA3803-6 ≙ 660 V

Table 3.1 Power connections acc. to DIN VDE and recommended line fuses

Type	Order No.	Possible connection cross-section			
		Finely stranded		Multi-stranded/solid	
		(mm²)	AWG	(mm²)	AWG
A	6SE702_-_ _ _30	2,5 to 10	12 to 6	2,5 to 16	12 to 4
B	6SE702_-_ _ _30	2,5 to 10	12 to 6	2,5 to 16	12 to 4
C	6SE702_-_ _ _30	1 to 16	16 to 4	10 to 25	6 to 2
D	6SE702_-_ _ _30	2,5 to 35	12 to 2	10 to 50	6 to 0

Table 3.2 Possible connection cross-sections

3.2 Auxiliary power supply/main contactor

The auxiliary power supply and the main contactor are connected through the 5-pin connector X9.

Connector X9 with the plugs for the control terminal strip are supplied together (loose) with the equipment. 0.2 mm^2 to 2.5 mm^2 (AWG: 24 to 14) can be connected to X9.

The auxiliary power supply is required if the converter is fed through a main contactor and the open-loop control functions must be maintained even if the main contactor is open.

The main contactor is controlled through floating contacts -X9.4 and -X9.5 (software pre-setting). Detailed information is provided in Section 9, options.

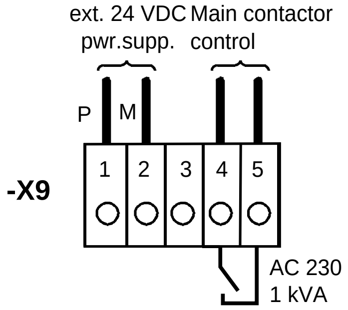


Fig. 3.6 Connecting an external auxiliary 24 V DC power supply and main contactor control

Term.	Function description
1	24 V DC external ≥ 2,1 A (dependent on the options)
2	Reference potential to DC
3	Unassigned
4	Main contactor control
5	Main contactor control

Table 3.3 Connector assignment for -X9, auxiliary power supply and main contactor connection

NOTE
The main contactor coil must be provided with overvoltage limiters, e.g. RC element (Section 9).

3.3 Control terminal strip and serial interface

WARNING
The converter must be disconnected and locked-out before control cables are connected to the CU.

The converter can be controlled via the following interfaces:

- Control terminal strip -X101 to -X104 on the electronics board CU
- RS 485 serial interface; control terminal strip -X100 on the electronics board CU
- OP operator control panel (refer to Section 9, Options)
- RS485 and RS232 serial interfaces on the PMU -X300

CAUTION
The CU board contains components which can be destroyed by electrostatic discharge. These components can be very easily destroyed if not handled with caution. Also refer to the ECB cautionary measures in the Section, General Information.

3.3.1 Connectors for the control terminal strip

The connectors for the control terminal strip are supplied (loose) with the unit. Cables with cross-sections from 0.14 mm^2 to 1.5 mm^2 (AWG: 26 to 16), or 1 mm^2 (AWG: 18) can be connected, using finely stranded wire with lugs at the connector (recommended: 0.5 mm^2 (AWG: 20)). The connectors can be identified using pin numbers (Table 3.4); the connector position on the board is illustrated in Fig. 3.8.

Connector		**Labeling**							
X100	9-pin, coded	1	2	3	CU3	6	7	8	9
X101	9-pin, coded	13	14	15	CU3	18	19	20	21
X102	5-pin	25	26	27	28	29			
X103	5-pin	35	36	37	38	39			
X104	26-pin	1							26

Table 3.4 Connectors for the control terminal strip are supplied loose

Two screen clamps and four cable ties are required from the loose components supplied to connect the control cables.

The remaining connector X9, included loose with the equipment, is required to control a main contactor and for connecting an external power supply (refer to Section 3.2 „Auxiliary power supply/main contactor“).

3.3.2 Connecting-up the control cables

NOTE
The control cables must be screened and should be routed away from the power cables with a minimum clearance of 20 cm. The screen should be connected at both ends. The screen is connected to the converter housing using screen clamps - as illustrated in Fig. 3.7. Control- and cables must cross each other at an angle of 90 °.

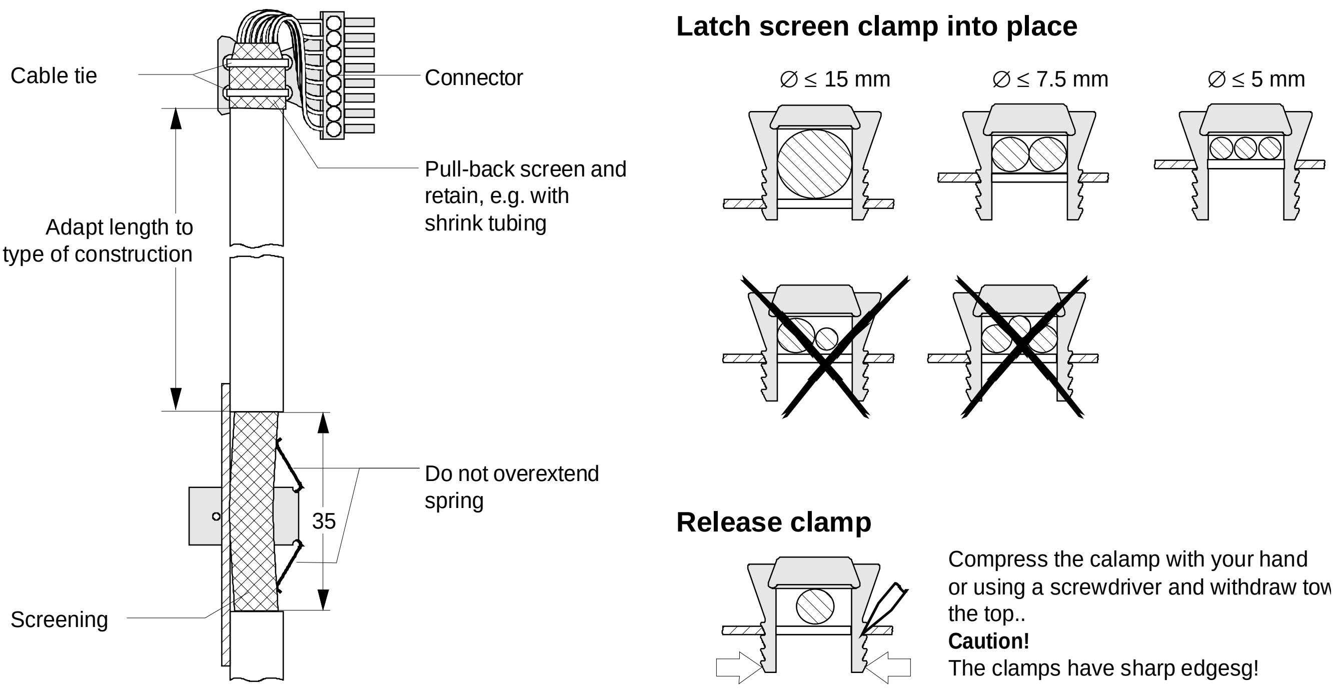


Fig. 3.7 Connecting-up the control cables and the technique for using the screen clamps

The "EMC screened housing" option should be used if so many control cables are required that two screen clamps are not sufficient.

Order No.:

- ♦ Type A 6SE7090-0XA87-3CA0
- ♦ Type B 6SE7090-0XB87-3CA0
- ♦ Type C 6SE7090-0XC87-3CA0
- ♦ Type D 6SE7090-0XD87-3CA0

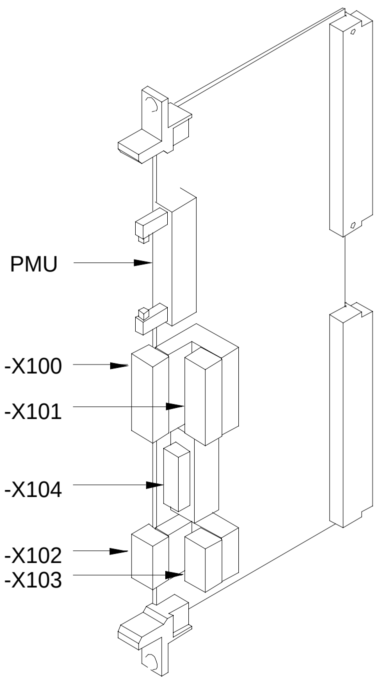


Fig. 3.8 Control terminals on CU

3.3.3 Terminal connection

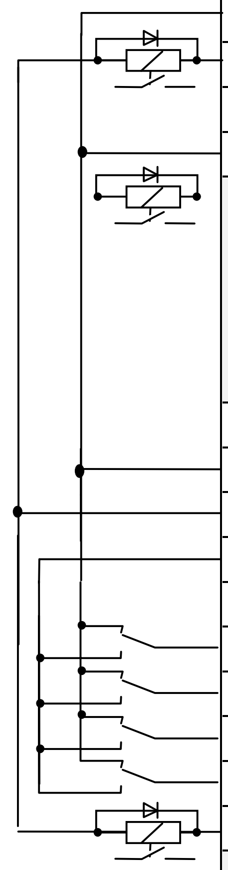
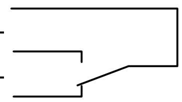
Connecting example	Term.	Function, notes
	-X100	
	1	Transmit- and receive line -RS485, differential input / -output, positive (RS485R/T+)
	2	Transmit- and receive line -RS485, differential input / -output, negative (RS485R/T–)
	3	Transmit output RS485 Standard, differential output, positive (RS485T+)
	4	Transmit output RS485 Standard, differential output, negative (RS485T–)
	5	Reference potential, RS485 interface
	NOTE	In addition to the GSST_2 interface on -X100, a GSST_1 interface -X300 is available on the parameterization unit; refer Section 4 "Start-up".
	6	Binary output, relay 1 (changeover contact) reference contact 
	7	Binary output, relay 1 (changeover contact) NO contact
	8	Binary output, relay 1 (changeover contact) NC contact
	9	Binary output, relay 2 (NO contact) reference contact
	NOTES	Load capability of the binary outputs: 60 V AC, 60 VA, cosφ = 1 60 V AC, 16 VA, cosφ = 0.4 60 V DC, 24 W Inductive loads, e.g. contactors, relays, for DC voltage loads, must be damped using a diode or varistor, and for AC loads, with a varistor or RC element.
	-X101	
	13	+24 V, 150 mA for binary inputs and outputs
	14	Ref. potential for 24 V (ground)
	15	Ref. potential for binary inputs 1 to 7 for ext. signal voltage
	16	Binary input 1
	17	Binary input 2
	18	Binary input 3
	19	Binary input 4
	20	Binary input 5
	21	Binary output, relay 2 (NO contact) NO contact
	NOTE	Signal sensitivity of the binary inputs: H = 24 V (13 V to 33 V) L = 0 V (–0,6 V to 3 V) I_{max} = 15.7 mA

Table 3.5 Connecting example for control terminal strips -X100 and -X101

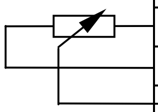
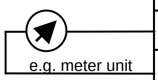
Connecting example	Term.	Function, notes
	-X102	
	25	+10 V / 5 mA, ±2 %, for setpoint pot., non-floating
	26	–10 V / 5 mA, ± 2%, for setpoint pot., non-floating
	27[1)]	Analog input 1 (0 V to ±10 V)
	28	Ref. potential, analog input 1
	29[1)]	Analog input 1 (0 mA to 20 mA or. 4 mA to 20 mA) int. load resistor 250 Ω
	NOTE	Terminals 33 and 34: To increase the noise immunity of the signals, an isolating amplifier should be connected between the analog output and measuring unit for cables > 4 m.
	-X103	
	35	Analog output 1 ≤ 5 mA
	36	Ref. potential, analog output 1
	NOTE	Terminals 35 and 36: To increase the noise immunity of the signals, an isolating amplifier should be connected between the analog output and the measuring unit for cables > 4m.
	37	Output, track A in the HTL level
	38	Output, track B in the HTL level
	39	Output, zero pulse in the HTL level

Table 3.6 Connecting-up example for control terminal strips -X102 and -X103

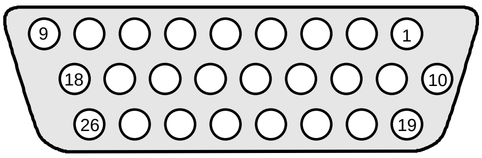


Fig. 3.9 Connecting-up example for control terminal strip -X104

Term.	Function, notes
X104	
1	Resolver field voltage R1
2	Resolver field voltage R2
3	Track C, Sincos encoders
4	Track C\, Sincos encoders
5	Track D, Sincos encoders
6	Track D\, Sincos encoders
7	0 V sensing line for 5 V encoder
8	Ref. potential for encoder or digital tacho
9	+5 V encoder power supply
10	Output voltage V_{S1-S3}, connection S1
11	Output voltage V_{S1-S3} connection S3
12	Track A, Sincos encoders
13	Track A\, Sincos encoders
14	Track B, Sincos encoders
15	Track B\, Sincos encoders

1) Only one of the two terminals, 27 or 29, may be assigned

Term.	Function, notes
16	Zero pulse, Sincos encoders
17	Zero pulse\, Sincos encoders
18	+ 5 V sense line for 5 V encoders
19	Output voltage V_{S2-S4}, connection S2
20	Output voltage V_{S2-S4}, connection S4
21	Connection for inner screen
22	Connection for inner screen
23	Connection for inner screen
24	Connection for inner screen
25	Motor temperature input (KTY84)
26	Ref. potential for motortemperature
NOTE	Protective separation for terminals 25 and 26 must be externally guaranteed.

Table 3.7 Connecting-up example for control terminal strip -X104

3.3.4 Connecting-up the parameterizing unit (PMU)

A serial connection to automation unit or a PC can be realized via connector X300 on the PMU. Thus, the converter can be controlled and operated from the central control station or control room.

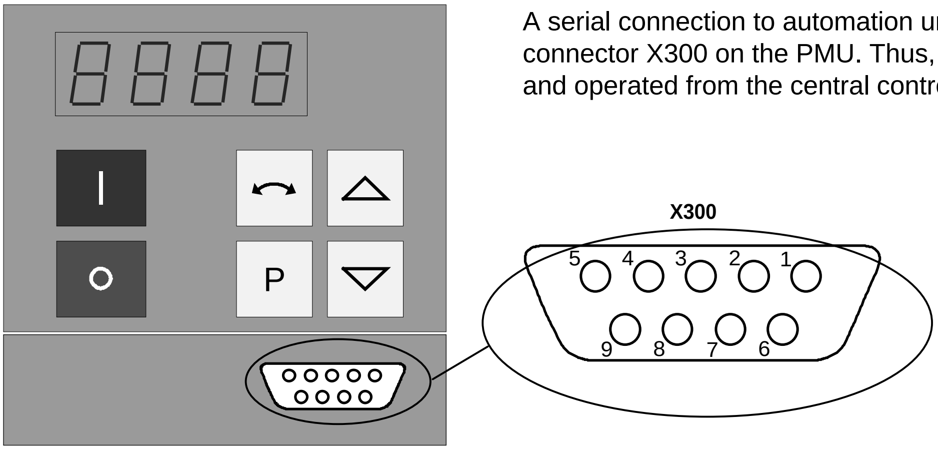


Fig. 3.10 Parameterizing unit (PMU)

PMU -X300	Description
1	Housing ground
2	Receive line, RS232 standard (V.24)
3	Transmit- and receive line, RS485, two-wire, positive differential input/output
4	RTS (request to send)
5	Ref. potential (ground)
6	5 V power supply for OP
7	Transmit line, RS232 standard (V.24)
8	Transmit- and receive line RS485, two-wire, negative differential input/output
9	Ref. potential for RS232- or RS485 interface (EMC suppressed).

Table 3.8 Connector assignment for interface -X300

3.4 Measures to maintain the radio interference suppression regulations

The following points must be observed regarding radio interference suppression regulations

♦ **Grounding**

Converters generate radio interference noise. This noise should be fed back to the source through the lowest possible ohmic connection (ground connection cross-section ≥ supply connection cross-section, also refer to Section 3.1.2)

Use the best grounding possibility (e.g. mounting panel, grounding cable, grounding bar) when installing converters and optional radio interference suppression filters. Connect all connector housings together through the largest possible surface area.

For radio interference suppression, the cross-section (observe the safety regulations under fault conditions), is not so important, but the contact surface, as high-frequency noise currents do not flow through the complete cross-section, but essentially on the outside surface of a conductor (skin effect).

♦ **Screening**

In order to reduce noise and maintain the radio interference suppression level, the following should be maintained

- screened cables should be used between the converter output and motor
- screen control cables must be used.

The screen must be connected to ground potential at both ends.

♦ **Filter**

The radio interference suppression filter and the converter must be mounted directly next to one another on a metal panel.

To maintain the radio interference suppression regulations, radio interference filter B1 should be used.

3.5 Recommended circuit

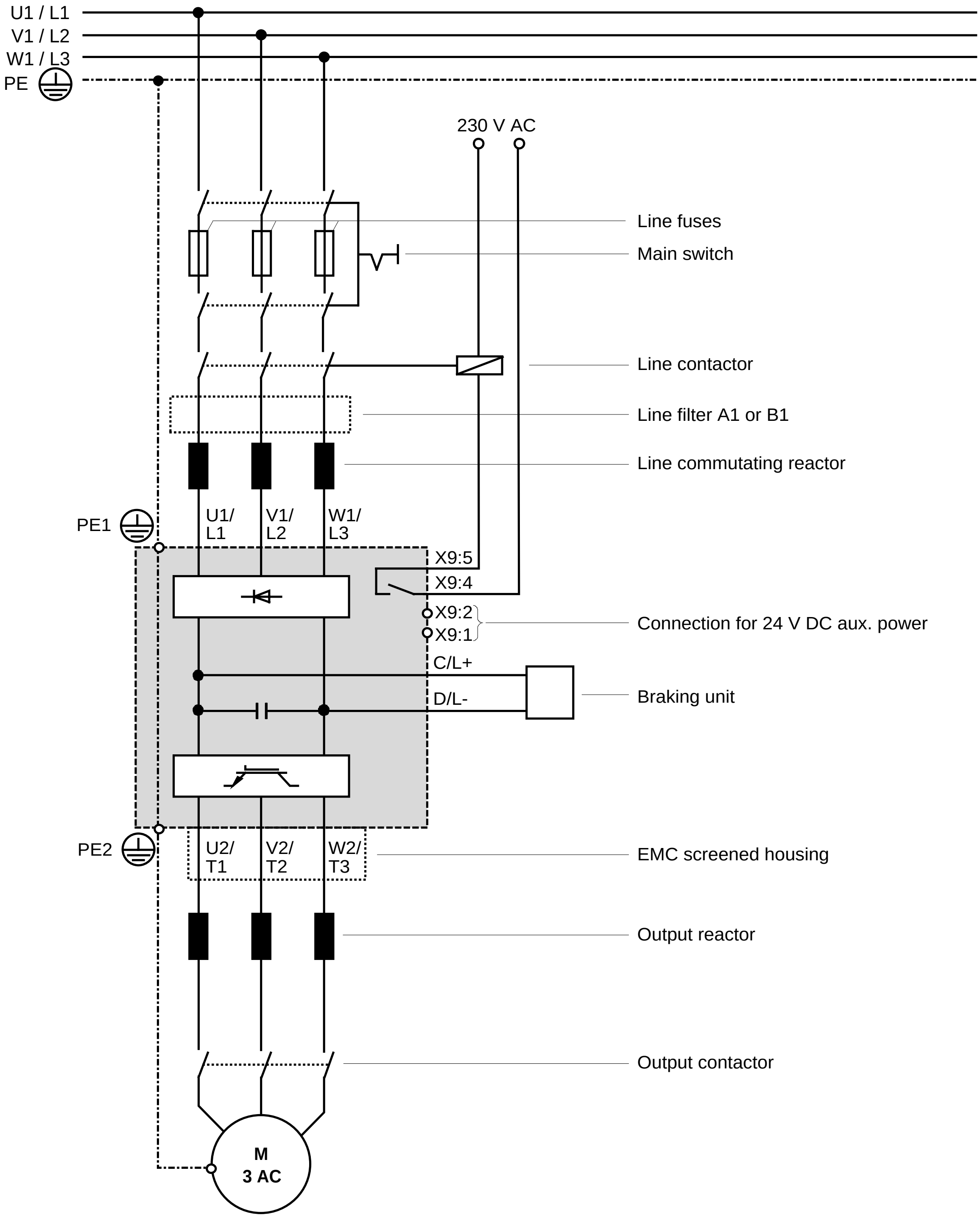


Fig. 3.11 Recommended circuit

NOTE
If the main contactor is externally controlled, the converter requires an external 24 V DC power supply.

4 Start-up

4.1 Introduction and handling start-up

4.1.1 Handling the start-up instructions

NOTE
♦ Section 4.2 First start-up: First start-up of the converter ♦ Section 4.3 Start-up aids: Index-type reference for start-up and use of the converter, which must only be used when actually required! ♦ Section 4.4 Function diagrams: Graphical overview of the setpoint channel, open-loop/closed-loop control, analog inputs/outputs, and the converter data sets

4.1.2 General explanation of the terminology and functional scope of the converter

Abbreviations:

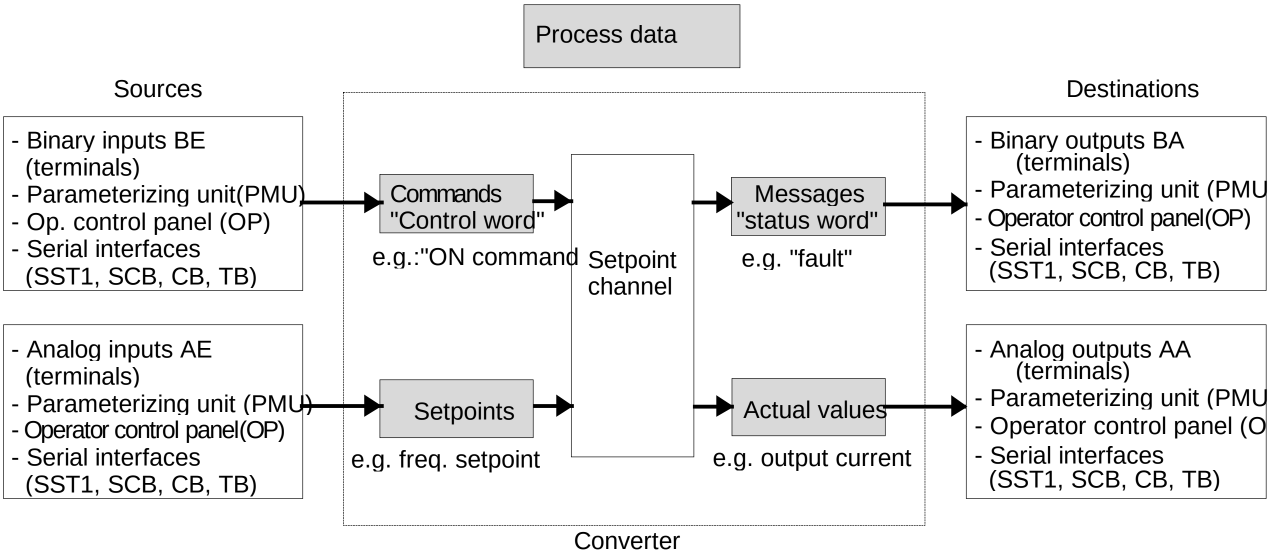
- Abbreviations used: Refer to Section 15 "Information, notes"

Converter closed-loop control

- Simplified block diagrams in Section 4.2.4
(Detailed "function diagrams, open-loop/closed-loop control": refer to Section 4.4)
- Common data: Speed resolution: 0.3 RPM
Max. frequency: 400 Hz
- Applications: Permanent-magnet synchronous-motor drives, e.g. for actuator drives, winders, etc.
- Control versions:
  - Closed-loop speed control
  - Closed-loop torque control (entering the torque-generating current).

" Process data ":

♦ "Process data" are commands and setpoints from "outside" fed into the converter as well as signals and actual values which are output from the converter.

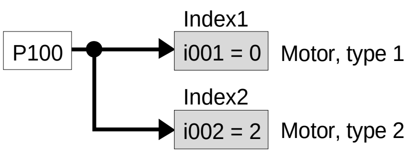


" Indexed" parameters:

i.e. the parameter number is sub-divided into various "indices" (briefly: i001, i002, etc.), in which the particular parameter value can be entered.

The significance of the "indices" of the particular parameter (parameter number) can be taken from the parameter list, in Section 5.

Example:



" Data sets ":

"Indexed" parameters can be sub-divided according to data sets (indexed).

The appropriate data set is selected using a command, via the "control word".

Refer to "function diagram, data set" in Section 4.4.

♦ SDS (setpoint channel data set) 1 to 4:

  4 setpoint channel data sets which can be changed over; e.g. for production-related different drive ramp-up and ramp-down times.

♦ Basic/reserve (basic- or reserve setting):

  e.g. for changing over between manual and automatic operation

♦ MDS (motor data set) 1 or 2:

  2 motor data sets which can be changed over; e.g. for operating different motor types from one converter.

4.2 First start-up

4.2.1 Preparatory measures

♦ Transporting, unpacking, assembling: refer to Section 2

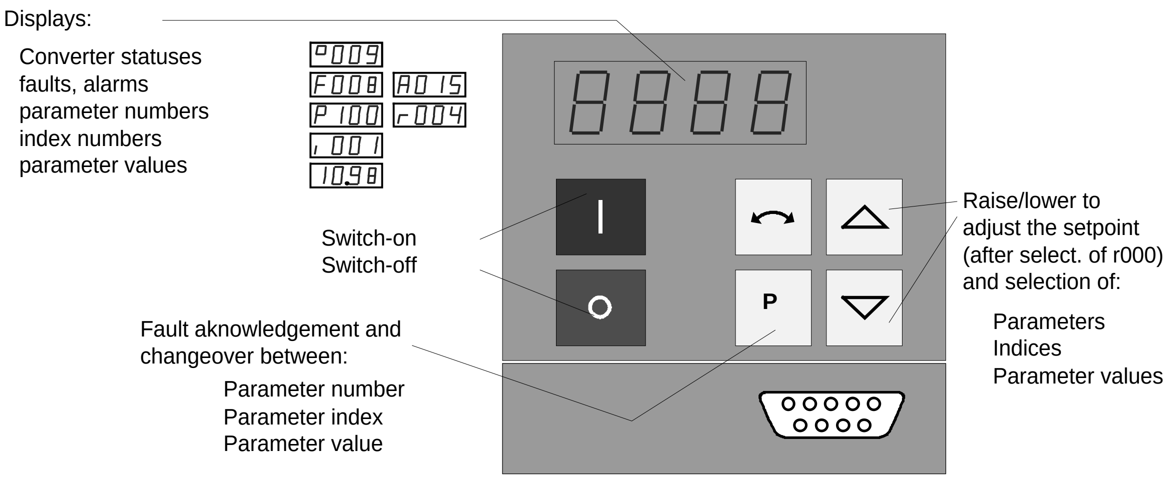
♦ Connecting-up: Refer to Section 3

♦ Read "Introduction and handling the start-up instructions ": Section 4.1

♦ Forming the capacitors: If the converter has been continuously shutdown for longer than one year, or was not connected, then the DC link capacitors must be formed. Also refer to Section 4.3.12

♦ Connect-up the supply and electronics power supply of the converter with the front panel closed.

When supplied, the converter is controlled and parameterized by the parameterizing unit (PMU) located on the front side of the converter.



A detailed description of the displays as well as the parameterizing and operator control possibilities of the converter via the PMU, is provided in Section 6 "operator control".

The converter is supplied with the “factory setting“ (refer to Section 5 “Parameter list“) and access stage 2 (standard mode). After the drive converter has been owered-up for the first time, it goes into status 005 “drive settings“ (P052 = 005). This status can be exited after entering valid motor data (refer to Sections 4.2.2 and 4.2.3) (P052 = 000) and the drive can then be powered-up

Parameterization is realize according to Section

4.2.2 as “**Standard application with V/f characteristic without hardware options“** for simple applications with1 FT6 motors.

or **4.2.3** as **„Expert application“** when using motors from other manufacturers, sophisticated applications (e.g.: Close-loop control, data set changeover, interface operation, etc.) or if hardware options are available.

4.2.1.1 Motor list

Settings for motor type P100. The tabulated data for torque, current and output, are nominal values and are valid for a 3-ph. 380 V AC to 460 V AC converter supply voltage. Other motor data (e.g. also data for 3-ph. 208 V to 230 V AC supplies) are provided in the Engineering Manual „1FT6 three-phase servomotors“, Section 2.3.3 (motor overview).

PWE	Motor MLFB	Speed n_n [RPM]	Torque M_n [Nm]	Current I_n [A]	Output P_n [kW]	Cooling
1	1FT6031-4AK7_	6000	0.8	1.2	0.47	Self
2	1FT6034-4AK7_	6000	1.4	2.1	0.88	Self
3	1FT6041-4AF7_	3000	2.2	1.7	0.68	Self
4	1FT6041-4AK7_	6000	1.7	2.4	1.1	Self
5	1FT6044-4AF7_	3000	4.3	2.9	1.3	Self
6	1FT6044-4AK7_	6000	3.0	4.1	1.9	Self
7	1FT6061-6AC7_	2000	3.7	1.9	0.77	Self
8	1FT6061-6AF7_	3000	3.5	2.6	1.1	Self
9	1FT6061-6AH7_	4500	2.9	3.4	1.4	Self
10	1FT6061-6AK7_	6000	2.1	3.1	1.3	Self
11	1FT6062-6AC7_	2000	5.2	2.6	1.1	Self
12	1FT6062-6AF7_	3000	4.6	3.4	1.4	Self
13	1FT6062-6AH7_	4500	3.6	3.9	1.7	Self
14	1FT6062-6AK7_	6000	2.1	3.2	1.3	Self
15	1FT6064-6AC7_	2000	9.0	3.8	1.7	Self
16	1FT6064-6AF7_	3000	7.0	4.9	2.2	Self
17	1FT6064-6AH7_	4500	4.8	5.5	2.3	Self
18	1FT6064-6AK7_	6000	2.1	3.5	1.3	Self
19	1FT6081-8AC7_	2000	7.5	4.1	1.6	Self
20	1FT6081-8AF7_	3000	6.9	5.6	2.2	Self
21	1FT6081-8AH7_	4500	5.8	7.3	2.7	Self
22	1FT6081-8AK7_	6000	4.6	7.7	2.9	Self
23	1FT6082-8AC7_	2000	11.4	6.6	2.4	Self
24	1FT6082-8AF7_	3000	10.3	8.7	3.2	Self
25	1FT6082-8AH7_	4500	8.5	11	4.0	Self
26	1FT6082-8AK7_	6000	5.5	9.1	3.5	Self
27	1FT6084-8AC7_	2000	16.9	8.3	3.5	Self
28	1FT6084-8AF7_	3000	14.7	11	4.6	Self
29	1FT6084-8AH7_	4500	10.1	12	4.8	Self
30	1FT6084-8AK7_	6000	4.0	5.8	2.5	Self
31	1FT6084-8SC7_	2000	23.5	12.5	4.9	External
32	1FT6084-8SF7_	3000	22	17	6.9	External
33	1FT6084-8SH7_	4500	20	24.5	9.4	External
34	1FT6084-8SK7_	6000	17	25.5	10.7	External
35	1FT6086-8AC7_	2000	23	10.9	4.8	Self
36	1FT6086-8AF7_	3000	18.5	13	5.8	Self
37	1FT6086-8AH7_	4500	12.0	12.6	5.6	Self
38	1FT6086-8SC7_	2000	33	17.5	6.9	External
39	1FT6086-8SF7_	3000	31	24.5	9.7	External
40	1FT6086-8SH7_	4500	27	31.5	12.7	External
41	1FT6086-8SK7_	6000	22	29	13.8	External
42	1FT6102-8AB7_	1500	24.5	8.4	3.9	Self
43	1FT6102-8AC7_	2000	23	11.0	4.8	Self

PWE	Motor MLFB	Speed n_n [RPM]	Torque M_n [Nm]	Current I_n [A]	Output P_n [kW]	Cooling
44	1FT6102-8AF7_	3000	19.5	13.2	6.1	Self
45	1FT6102-8AH7_	4500	12.0	12	5.6	Self
46	1FT6105-8AB7_	1500	42	14.5	6.6	Self
47	1FT6105-8AC7_	2000	38	17.6	7.9	Self
48	1FT6105-8AF7_	3000	31	22.5	9.7	Self
49	1FT6105-8SB7_	1500	57	21.5	9	External
50	1FT6105-8SC7_	2000	55	28	11.5	External
51	1FT6105-8SF7_	3000	49	35	15.4	External
52	1FT6108-8AB7_	1500	61	20.5	9.6	Self
53	1FT6108-8AC7_	2000	55	24.5	11.5	Self
54	1FT6108-8SB7_	1500	83	31	13	External
55	1FT6108-8SC7_	2000	80	39	16.7	External
56	1FT6132-6AB7_	1500	62	19	9.7	Self
57	1FT6132-6AC7_	2000	55	23	11.5	Self
58	1FT6132-6AF7_	3000	36	23	11.3	Self
59	1FT6132-6SB7_	1500	100	36	15.2	External
60	1FT6132-6SC7_	2000	98	46	20.5	Self
61	1FT6132-6SF7_	3000	90	62	28.3	External
62	1FT6134-6AB7_	1500	75	24	11.8	Self
63	1FT6134-6AC7_	2000	65	27	13.6	Self
64	1FT6134-6SB7_	1500	130	45	20.4	External
65	1FT6134-6SC7_	2000	125	57	26.2	External
66	1FT6134-6SF7_	3000	110	72	34.5	External
67	1FT6136-6AB7_	1500	88	27	13.8	Self
68	1FT6136-6AC7_	2000	74	30	15.5	Self
69	1FT6136-6SB7_	1500	160	55	25	External
70	1FT6136-6SC7_	2000	150	72	31.4	External
71	1FT6034-1AK71-3A.0	6000	1.4	2.1	0.88	Self
72	1FT6044-1AF71-3A.0	3000	4.3	2.9	1.3	Self
73	1FT6061-1AF71-3A.0	3000	3.5	2.6	1.1	Self
74	1FT6062-1AF71-3A.0	3000	4.6	3.4	1.4	Self
75	1FT6064-1AF71-3A.0	3000	7.0	4.9	2.2	Self
76	1FT6082-1AF71-1A.0	3000	10.3	8.7	3.2	Self
77	1FT6084-1AF71-1A.0	3000	14.7	11	4.6	Self
78	1FT6086-1AF71-1A.0	3000	18.5	13	5.8	Self
79	1FT6102-1AC71-1A.0	2000	23	11.0	4.8	Self
80	1FT6105-1AC71-1A.0	2000	38	17.6	7.9	Self

Table 4.1 Motor list

NOTE

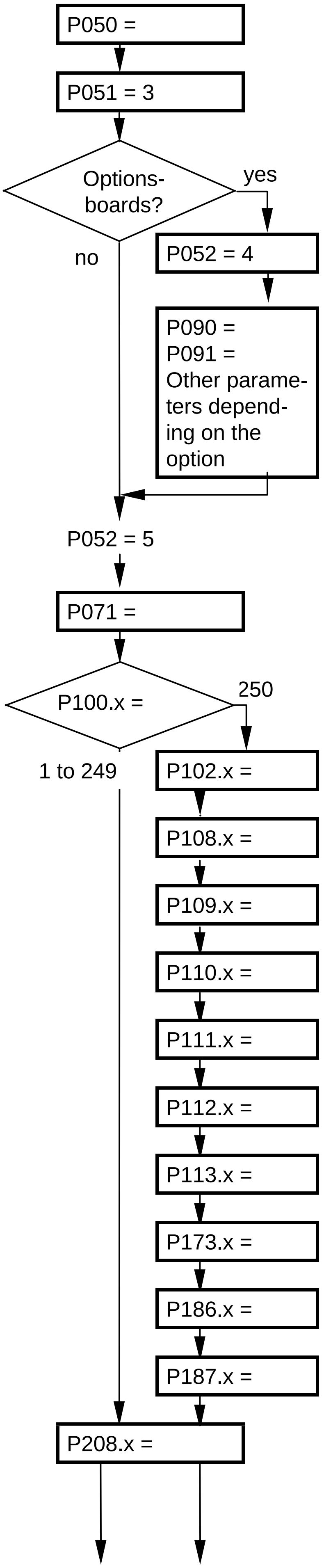
It is possible to jump into the appropriate sequence step if incorrect entries have been made, taking into account the access stage (P051) and a function selection (P052) which may be required.

It is recommended that the following parameters and function steps after the jump-in position are re-checked and executed due to the background calculations !

4.2.2 Parameterization "Standard application with V/f characteristic without hardware options"

P050 =	Language: 0 = German, 1 = English, 2 = Espanol, 3 = Francais, 4 = Italiano
P051 = 2	Access “stage standard mode“
P052 = 5	Function selection "drive setting"
P071 =	Converter supply voltage [V]
P100.i001 =	Selecting a 1FT6 Siemens motor from the motor list, refer to Section 4.2.1.1
P208.x =	Define the encoder (refer to Section 5, Parameter list): 0: No encoder (not permissible) 1: ERN1387 encoder or compatible 2: Resolver with the motor pole pair number 3: Resolver with pole pair number 1
P420 =	Rated system speed [RPM] Rated motor speed in the Appendix
P452.i001 =	Maximum speed, clockwise phase sequence [RPM]
P453.i001 =	Maximum speed, counter-clockwise phase sequence [RPM]
P462.i001 =	Ramp-up time [s] from standstill up to the rated system freq. (P420)
P464.i001 =	Ramp-down. time [s] from the rated system freq. (P420) down to standstill
P052 = 0 depress P	If fault Ffxx occurs, refer to Section 7 „Fault finding“
Ready	The converter executes a motor identification run after the first power-up (refer to P330.x).

4.2.3 Parameterization "expert application"



Language:
0: Deutsch, 1: English, 2: Espanol, 3: Francais, 4: Italiano

Access stage "expert mode"

Possible option boards: SCB, CB, TB

Function selection "hardware configuration“

Define and parameterize the option boards:
refer to the Instruction Manuals for the option boards

Option boards: 0: none
1: CB
2: TB
3: SCB

Function selection "drive setting"
If fault "Fxxx", refer to Section 7 " Troubleshooting "

Converter supply voltage [V]

Motor type: 0: No motor
1 to 249: 1FT6 Siemens motor according to the motor list
250: Motor from another manufacturer

Rated motor current [A]

Rated motor speed [RPM]

Motor pole pair number

Motor torque constant k_T [Nm/A]

Maximum permissible deviation of torque constant k_T from the set value (P110.x) [Nm/A]

Speed limit, from where the torque constant is adapted [%]

Rated motor torque [Nm]

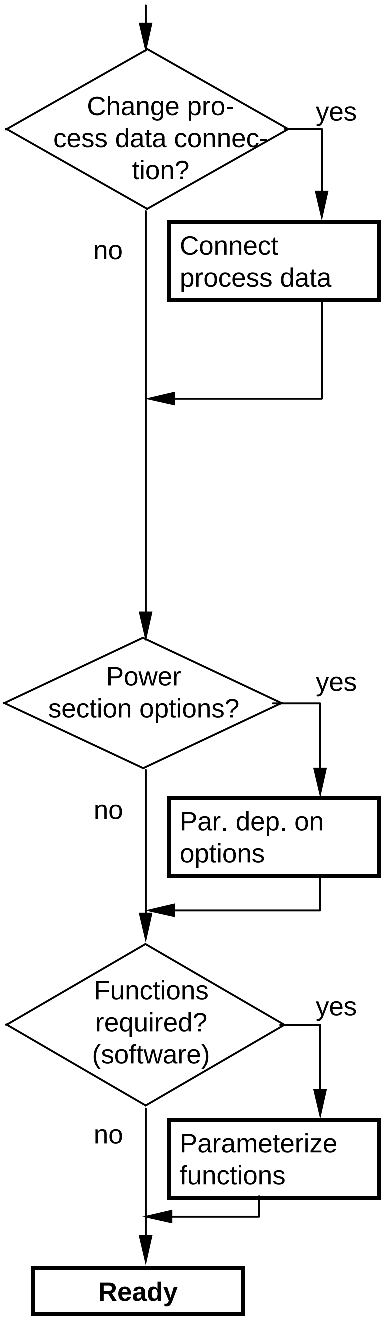
Maximum motor current [A]

Speed-dependent torque constant [%]

Temperature-dependent torque constant [%]

Define encoder (refer to Section 5, parameter list):
0: No encoder (not permissible)
1: ERN1387 encoder or compatible
2: Resolver with the motor pole pair number
3: Resolver with pole pair number 1

P209.x =	Only for P208.x =1: encoder pulse number (only powers of 2 permissible)
P211.x =	Only for P208.x = 2.3: Resolver field: 0: Automatic adaption 1 to 7: Manual adaption
P213.x =	Only for P208.x =2.3: Resolver offset source: 0: Measured values 1: Value corresponding to the entry in P212.x 2: Transfer the measured value into P212.x
P242.x =	Starting time [s]: Accelerating time from standstill up to the rated speed with the rated motor torque (P113.x)
P272.x =	Motor stator resistance [W]
P330 =	Select motor identification: 0: Only after entering new motor data 1: After every ON command
P331.x =	Voltage amplitude for motor identification [V]
P332.x =	Number of measuring cycles for motor identification
P354 =	Select ground-fault test: 0: No ground-fault test 1: Only after the next ON command 2: After each ON command
P355 =	Test duration for the ground-fault test in phases U and W [ms]
P356 =	Test duration for the ground-fault test in phase V [ms]
P357 =	Current limit for the ground-fault test [A]
P420 =	Rated system speed [RPM] Rated motor speed in the system
P452.x =	Maximum speed, clockwise phase sequence [RPM]
P453.x =	Maximum speed, counter-clockwise phase sequence [RPM]
P462.x =	Accelerating time [s] from standstill up to the rated system speed (P420)
P464.x =	Deceleration time [s] from the rated system speed (P420) down to standstill
P485.x =	Rated system torque referred to the rated motor torque (P113.x) [%]
P761.x =	Pulse frequency [kHz]
P052 = 0 depress P key	If fault "Fxxx", refer to Section 7 „Troubleshooting“. The converter executes a motor identification run after the first power-up (refer to P330.x).



Change factory setting for:
Command- and setpoint sources,
Destinations for signals and actual values

Process data: refer to Section 4.3.1

- Control word (commands)/status word (messages)
- Setpoint/actual values

  Possible process data sources/destinations: (refer to Sections 4.3.2 to 4.3.6)

  - Binary inputs, binary outputs
  - Analog inputs, analog outputs
  - Serial interface in the basic converter (SST1)
  - Option boards (SCB, TSY, CB, TB)

Simple applications: Refer to Section 4.2.6

Possible options, power section:

- Main contactor,
- Output contactor,
- Braking unit

Define and parameterize power section options:

- Main contactor, output contactor (refer to Section 9 „options")
- Braking unit (refer to the Instruction Manual for the option)

Possible functions:

- Motor identification, first run,
- Restart-on-the-fly,
- Ground-fault test

Parameterize function:
Section 4.3.10 "Functions"
and Section 5 „Parameter list"

4.2.4 Simplified block diagrams for setpoint channel and closed-loop control

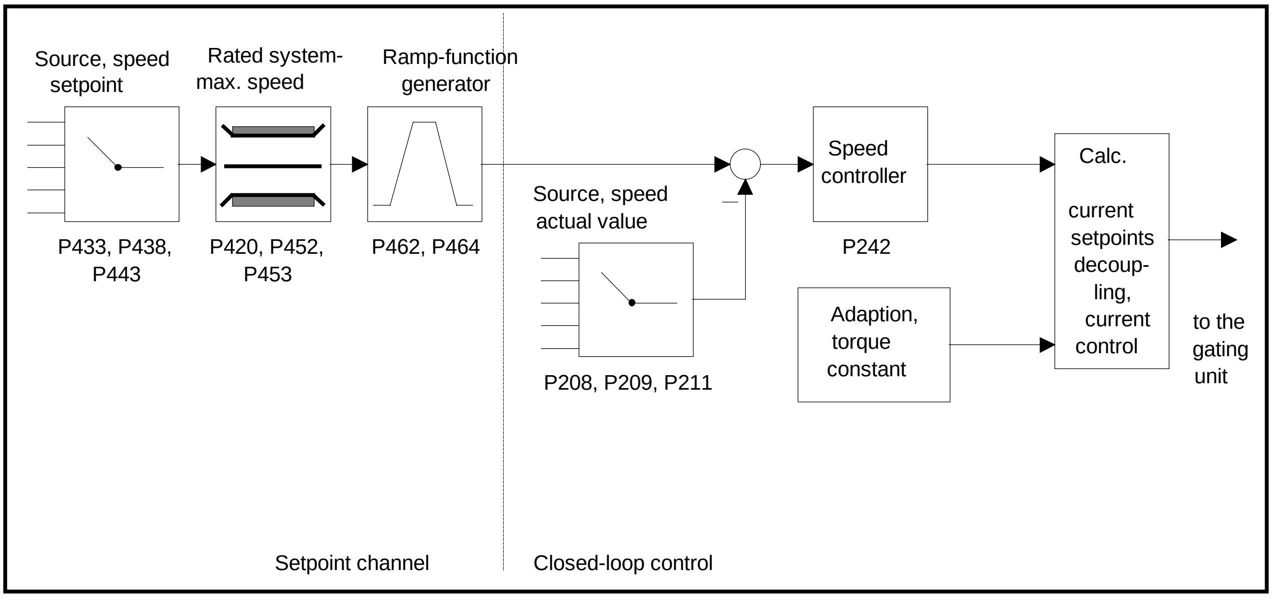


Fig. 4.1 Closed-loop speed control P163 = 4

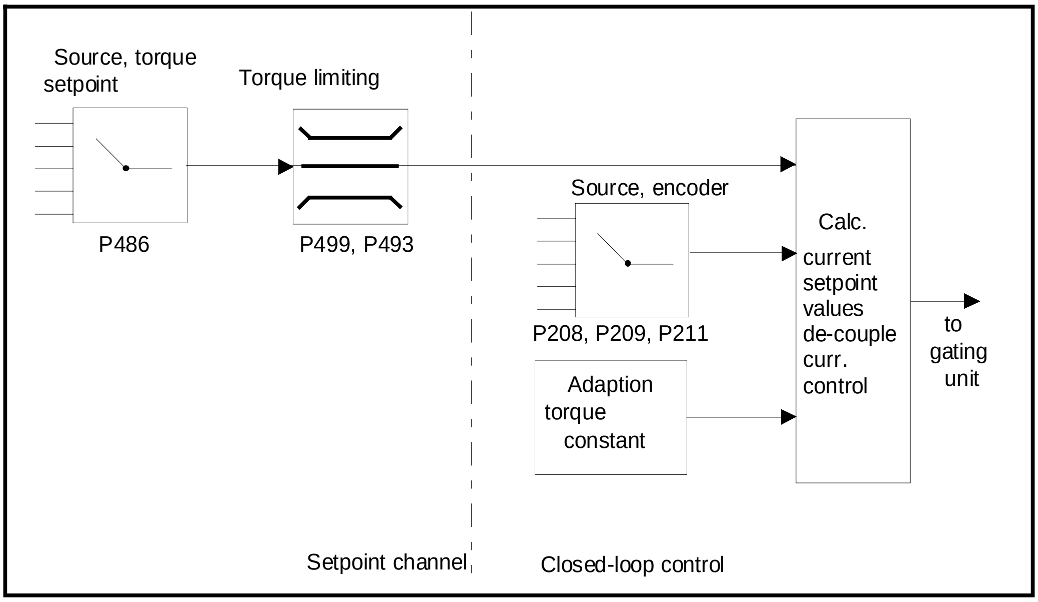


Fig. 4.2 Closed-loop torque control P163 = 5

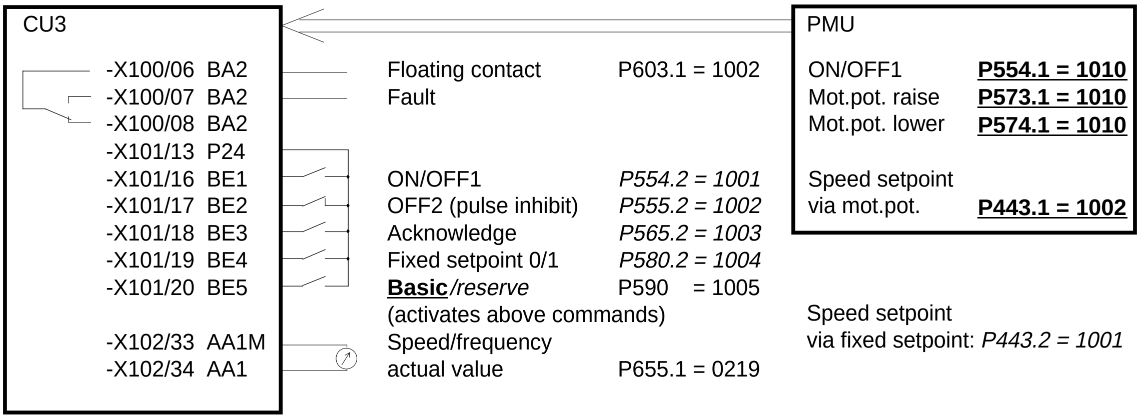
- detailed parameter description: refer to section 5 “Parameter list“
- detailed function diagrams: refer to section 4.9 “Function Diagrams“

4.2.5 Simple application examples for connecting process data with connection assignment

Connecting-up: Refer to Section 3.3 "Control terminal strip"

Factory setting:

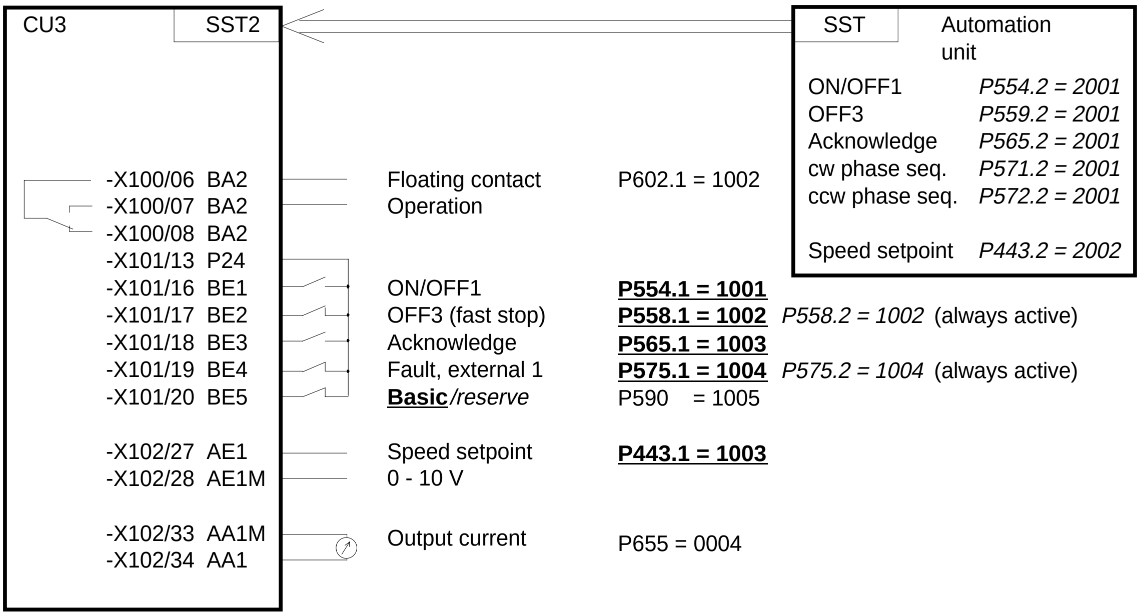
Switch-on/off as well as setpoint input via the PMU, messages and actual values via the terminal strip.
Terminal strip only operational if binary input 5 (BE5) is energized (high signal level corresponds to "reserve").



Manual/automatic operation:

Automatic operation (BE5 high level): Setpoint and command input from the automation unit via serial interface (SST1), OFF3 and monitoring external faults, also possible via terminal strip.

Manual operation (BE5 low level): Setpoint- and command input via terminal strip.



Tip: If a terminal cannot be connected-up as source or destination, it should be checked as to whether it has already been used for other signals.

4.3 Start-up aids

4.3.1 Process data

Process data are commands and setpoints which are entered into the converter from "outside" as well as signals and actual values which the converter outputs.

4.3.1.1 Control word (control word 1 and control word 2)

4.3.1.1.1 Introduction and application example

The two control words 1 (bits 0 to 15) and 2 (bits 16 to 31) output commands and external signals (messages) to the converter. Their status can be read-out via parameter r550 or r967 (control 1) and r551 (control word 2).

An overview is provided in Section 4.3.1.1.2 "Overview of the control word".

The significance of the possible commands and signals, entered externally, is described in Section 4.3.1.1.4 "Significance of the control word commands".

Every control word bit is assigned a selection parameter, which defines from which source(s) this bit can be changed (refer to Section 4.3.1.1.2, righthand column).

The selection parameters for the sources are, with the exception of P590 (source selection for control word bit 30 "basic/reserve setting") and P591 (source selection for control word bit 31 "HS checkback signal") are indexed 2x as follows:

Index	i001	Basic setting
	i002	Reserve setting

An overview of the possible sources, which are assigned fixed values (0-6004 non-consecutive), is provided in Section 4.3.1.1.3 "Selecting the control word source".

Values 0 and 1 are an exception in this overview; here, no sources are selected, but the bits are permanently set to 0 (LOW) or 1 (HIGH) (also refer to select parameters P554 to P591 in Section 5 "Parameter list").

If a value, which is assigned a terminal (binary input BI) (1001 to 1007, 4101 to 4116, 4201 to 4216, 5001), is assigned once in a select parameter for the source, then it is no longer available in the same index of another select parameter, as a terminal is only suitable for entering a control word bit.

NOTES

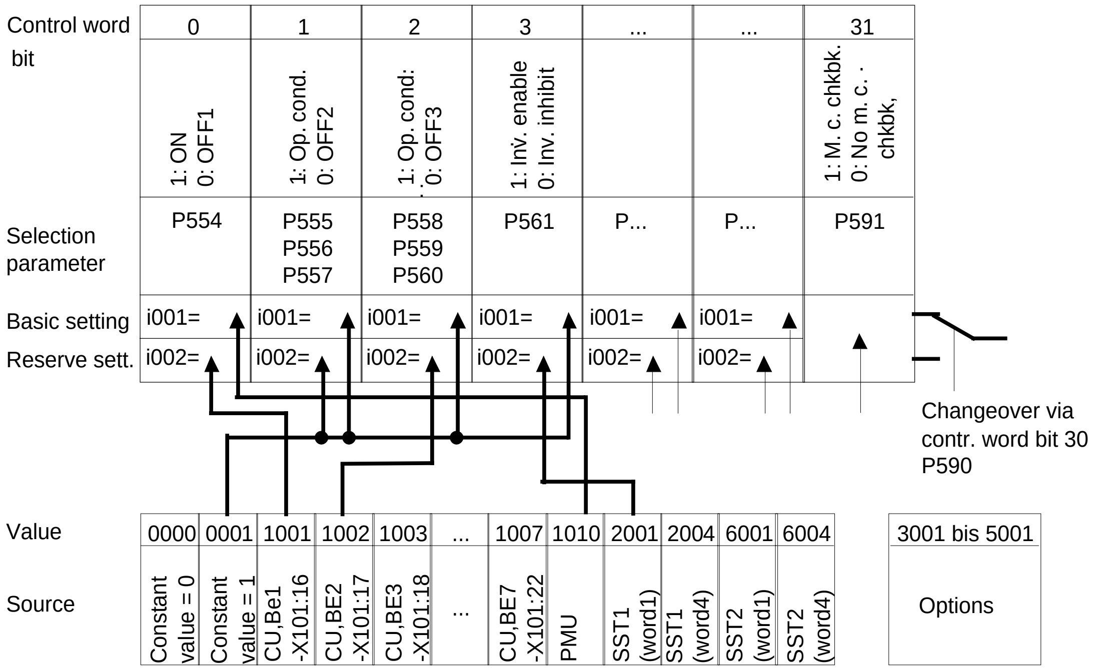
The control word commands "OFF2" (bit1), "OFF3" (bit2) and "acknowledge" (bit7) are always simultaneously effective from 3 sources (can be parameterized) !

"Acknowledge" (bit7) is also always effective from the PMU !

If the "on" command (bit 0) is connected to a serial interface (SST1, CB/TB, SCB-SST), then the following must be observed for safety-related reasons:

Additionally, an "OFF2" or "OFF3" command must be parameterized at the terminal strip/PMU, as otherwise the converter cannot be shutdown with a a defined command, <u>when communications fail</u>!

Application example:

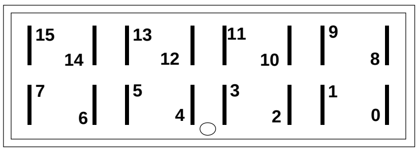


ON/OFF1:	Basic set.:	via PMU (keys I/0)	Reserve set.:	via bin. input 1 of CU
Op. cond/OFF2:	Basic set.:	Constant value= 1 = always op. cond.	Reserve set.:	Constant value = 1 = always op. cond.
Op. cond./OFF3:	Basic set.:	Constant value= 1 = always op. cond.	Reserve set.:	via bi. input 2 of CU

NOTE
For OFF2 and OFF3, 3 selection parameters can be assigned differently in the same index!

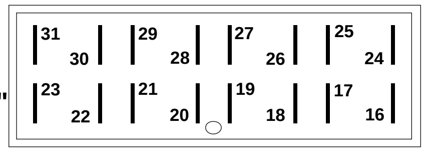
Inv. enable/inhibit:	Basic set.:	Constant value = 1 = always inv. enable.	Reserve set.:	via serial interface SST1 of the CU

4.3.1.1.2 Overview of the control word (control word 1 and control word 2)



PMU-Display

„Control word 1" **„Control word 2"**



„Control word 1" (visualization parameter r550 oder r967)				**Source selection**
Bit	**High**	**Low**	**Comments**	
0	ON	OFF1 (stop)	(Priority OFF 2/3/1)	P554
1	Operating condition	OFF2 (electrical)	3 sources simultaneously effective; (Priority OFF 2/3/1)	P555 P556 P557
2	Operating condition	OFF3 (fast stop)	3 sources simultaneously effective; (Priority OFF 2/3/1)	P558 P559 P560
3	Inverter enable	Inhibit inverter	Inverter enable	P561
4	RFG enable	HInhibit RFG	Ramp-function gen. enable	P562
5	Start RFG	RFG stop	Hold ramp-function generator	P563
6	Setpoint enable	Inhibit setpoint		P564
7	Acknowledge		Simultaneously effective from 3 sources and PMU; Positive edge evaluation	P565 P566 P567
8	Inching 1 ON	Inching 1 OFF		P568
9	Inching 2 ON	Inching 2 OFF		P569
10	Control from the PLC	No control	Only effective via CB, TB, SST1, SST/SCB	
11	Clockwise phase sequence		Logic op. with bit 12	P571
12	Counter-clockwise phase sequence		Logic op. with bit 11	P572
13	Mot. potentiometer, raise		Logic op. with bit 14	P573
14	Mot. potentiometer, lower		Logic op. with bit 13	P574
15	No fault, external 1	Fault, external 1		P575
„Control word 2" (visualization parameter r551)				
16	SDS bit 0 (LSB)		Setpoint channel data set	P576
17	SDS bit 1 (MSB)		Logic op. with bit 16	P577
18	MDS bit 0 (LSB)		Motor data set	P578
19			Reserved	
20	FSW bit 0 (LSB)		Logic operation with bit 21	P580
21	FSW bit 1 (MSB)		Logic operation with bit 20	P581
22			Reserved	
23	Enable restart-on-the-fly	Restart-on-the-fly inhibited		P583
24			Reserved	
25	Controller enable	Controller inhibited		P585
26	No fault, external 2	Fault, external 2		P586
27	slave drive	master drive		P587
28	No alarm, external 1	Alarm, external 1		P588
29	No alarm, external 2	Alarm, external 2		P589
30	Reserve setting for setpoints and control word	Basic setting for setpoints and control word		P590
31	HS checkback signal	No HS checkback signal	Can only connected at the converter term.strip or SCB	P591

4.3.1.1.3 Selecting the source for control word 1 (bits 0-7)

	Bit	0	1	2	3	4	5	6	7
	Selection P. basic setting	554.1	555 to 557.1	558 to 560.1	561.1	562.1	563.1	564.1	565 to 567.1
	Selection P. reserve setting	554.2	555 to 557.2	558 to 560.2	561.2	562.2	563.2	564.2	565 to 567.2
Value	**Source**								
0000	Constant value = 0	x			x	x	x	x	**xG/R**
0001	Constant value = 1		**xG/R**	**xG/R**	**xG/R**	**xG/R**	**xG/R**	**xG/R**	
1001	CU, BE1, -X101:16	**xR**	x	x	x	x	x	x	x
1002	CU, BE2, -X101:17	x	**xR for 555**	x	x	x	x	x	x
1003	CU, BE3, -X101:18	x	x	x	x	x	x	x	**xR for 565**
1004	CU, BE4, -X101:19	x	x	x	x	x	x	x	x
1005	CU, BE5, -X101:20	x	x	x	x	x	x	x	x
1006	CU, BE6, -X101:21	x	x	x	x	x	x	x	x
1007	CU, BE7, -X101:22	x	x	x	x	x	x	x	x
1010	PMU	**xG**	x	x					always
2001	SST1,PMU -X300 (word1)	x	x	x	x	x	x	x	x
2004	SST1,PMU -X300 (word4)								
6001	SST2,-X100:1...5 (word1)	x	x	x	x	x	x	x	x
6004	SST2,-X100:1...5 (word4)								
OPTIONS									
3001	CB/TB (word1)	x	x	x	x	x	x	x	x
3004	CB/TB (word4)							x	
4101	SCI 1and2,slave1,BE1	x	x	x	x	x	x	x	x
4102	BE2	x	x	x	x	x	x	x	x
...	Consecutively to	x	x	x	x	x	x	x	x
4110	BE10	x	x	x	x	x	x	x	x
4111	only SCI 2,slave 1,BE11	x	x	x	x	x	x	x	x
4112	BE12	x	x	x	x	x	x	x	x
...	Consecutively to	x	x	x	x	x	x	x	x
4116	BE16	x	x	x	x	x	x	x	x
4201	SCI 1and2,slave2,BE1	x	x	x	x	x	x	x	x
4202	BE2	x	x	x	x	x	x	x	x
...	Consecutively to	x	x	x	x	x	x	x	x
4210	BE10	x	x	x	x	x	x	x	x
4211	only SCI 2,slave 2,BE11	x	x	x	x	x	x	x	x
4212	BE12	x	x	x	x	x	x	x	x
...	Consecutively to	x	x	x	x	x	x	x	x
4216	BE16	x	x	x	x	x	x	x	x
4501	SCB-SST (USS /peer-t-peer) (word1)	x	x	x	x	x	x	x	x
4504	SCB-SST (USS /peer-t-peer) (word4)								
5001	TSY,BE	x	x	x	x	x	x	x	x

x: Value can be assigned for the selection parameters (BE can only be assigned once in the same index of all selection parameters!)

Factory setting: **xG:** for basic setting
xR: for reserve setting

4.3.1.1.4 Selecting the source for control word 1 (bits 8-15)

	Bit	8	9	10	11	12	13	14	15
	Selection P. basic setting	568.1	569.1		571.1	572.1	573.1	574.1	575.1
	Selection P. reserve setting	568.2	569.2		571.2	572.2	573.2	574.2	575.2
Value	**Source**								
0000	Constant value = 0	**xG/R**	**xG/R**		x	x	**xR**	**xR**	**xG/R**
0001	Constant value = 1				**xG/R**	**xG/R**			x
1001	CU, BE1, -X101:16	x	x		x	x	x	x	x
1002	CU, BE2, -X101:17	x	x		x	x	x	x	x
1003	CU, BE3, -X101:18	x	x		x	x	x	x	x
1004	CU, BE4, -X101:19	x	x		x	x	x	x	x
1005	CU, BE5, -X101:20	x	x		x	x	x	x	x
1006	CU, BE6, -X101:21	x	x		x	x	x	x	x
1007	CU, BE7, -X101:22	x	x		x	x	x	x	x
1010	PMU				x	x	**xG**	**xG**	
2001	SST1,PMU -X300 (word1)	x	x		x	x	x	x	x
2004	SST1,PMU -X300 (word4)								
6001	SST2,-X100:1...5 (word1)	x	x		x	x	x	x	x
6004	SST2,-X100:1...5 (word4)								
OPTIONS									
3001	CB/TB (word1)	x	x		x	x	x	x	x
3004	CB/TB (word4)								
4101	SCI 1and2,slave1,BE1	x	x		x	x	x	x	x
4102	BE2	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4110	BE10	x	x		x	x	x	x	x
4111	only SCI 2,slave 1,BE11	x	x		x	x	x	x	x
4112	BE12	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4116	BE16	x	x		x	x	x	x	x
4201	SCI 1and2,slave2,BE1	x	x		x	x	x	x	x
4202	BE2	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4210	BE10	x	x		x	x	x	x	x
4211	only SCI 2,slave 2,BE11	x	x		x	x	x	x	x
4212	BE12	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4216	BE16	x	x		x	x	x	x	x
4501	SCB-SST (USS /peer-t-peer) (word1)	x	x		x	x	x	x	x
4504	SCB-SST (USS /peer-t-peer) (word4)								
5001	TSY,BE	x	x		x	x	x	x	x

x: Value can be assigned for the selection parameters (BE can only be assigned once in the same index of all selection parameters!)

Factory setting: **xG:** for basic setting
xR: for reserve setting

4.3.1.1.5 Selecting the source for control word 2 (Bit 16-23)

	Bit	16	17	18	19	20	21	22	23
	Selection P. basic setting	576.1	577.1	578.1		580.1	581.1		583.1
	Selection P. reserve setting	576.2	577.2	578.2		580.2	581.2		583.2
Value	**Source**								
0000	Constant value = 0	**xG/R**	**xG/R**	**xG/R**		**xG**	**xG/R**		**xG/R**
0001	Constant value = 1	x	x	x		x	x		x
1001	CU, BE1, -X101:16	x	x	x		x	x		x
1002	CU, BE2, -X101:17	x	x	x		x	x		x
1003	CU, BE3, -X101:18	x	x	x		x	x		x
1004	CU, BE4, -X101:19	x	x	x		**xR**	x		x
1005	CU, BE5, -X101:20	x	x	x		x	x		x
1006	CU, BE6, -X101:21	x	x	x		x	x		x
1007	CU, BE7, -X101:22	x	x	x		x	x		x
1010	PMU								
2001	SST1,PMU -X300 (word1)								
2004	SST1,PMU -X300 (word4)	x	x	x		x	x		x
6001	SST2,-X100:1...5 (word1)								
6004	SST2,-X100:1...5 (word4)	x	x	x		x	x		x
	OPTIONS								
3001	CB/TB (word1)								
3004	CB/TB (word4)	x	x	x		x	x		x
4101	SCI 1and2,slave1,BE1	x	x	x		x	x		x
4102	BE2	x	x	x		x	x		x
...	Consecutively to	x	x	x		x	x		x
4110	BE10	x	x	x		x	x		x
4111	only SCI 2,slave 1,BE11	x	x	x		x	x		x
4112	BE12	x	x	x		x	x		x
...	Consecutively to	x	x	x		x	x		x
4116	BE16	x	x	x		x	x		x
4201	SCI 1and2,slave2,BE1	x	x	x		x	x		x
4202	BE2	x	x	x		x	x		x
...	Consecutively to	x	x	x		x	x		x
4210	BE10	x	x	x		x	x		x
4211	only SCI 2,slave 2,BE11	x	x	x		x	x		x
4212	BE12	x	x	x		x	x		x
...	Consecutively to	x	x	x		x	x		x
4216	BE16	x	x	x		x	x		x
4501	SCB-SST (USS /peer-t-peer) (word1)								
4504	SCB-SST (USS /peer-t-peer) (word4)	x	x	x		x	x		x
5001	TSY,BE	x	x	x		x	x		x

x: Value can be assigned for the selection parameters (BE can only be assigned once in the same index of all selection parameters!)

Factory setting: **xG:** for basic setting
xR: for reserve setting

4.3.1.1.6 Selecting the source for control word 2 (bits 24-31)

	Bit	24	25	26	27	28	29	30	31
	Selection P. basic setting		585.1	586.1	587.1	588.1	589.1	590	591
	Selection P. reserve setting		585.2	586.2	587.2	588.2	589.2	590	591
Value	**Source**								
0000	Constant value = 0		x		**xG/R**			x	
0001	Constant value = 1		**xG/R**	**xG/R**	x	**xG/R**	**xG/R**	x	**x**
1001	CU, BE1, -X101:16		x	x	x	x	x	x	x
1002	CU, BE2, -X101:17		x	x	x	x	x	x	x
1003	CU, BE3, -X101:18		x	x	x	x	x	x	x
1004	CU, BE4, -X101:19		x	x	x	x	x	x	x
1005	CU, BE5, -X101:20		x	x	x	x	x	**x**	x
1006	CU, BE6, -X101:21		x	x	x	x	x	x	x
1007	CU, BE7, -X101:22		x	x	x	x	x	x	x
1010	PMU								
2001	SST1,PMU -X300 (word1)								
2004	SST1,PMU -X300 (word4)		x	x	x	x	x	x	
6001	SST2,-X100:1...5 (word1)								
6004	SST2,-X100:1...5 (word4)		x	x	x	x	x	x	
OPTIONS									
3001	CB/TB (word1)								
3004	CB/TB (word4)		x	x	x	x	x	x	
4101	SCI 1and2,slave1,BE1		x	x	x	x	x	x	x
4102	BE2		x	x	x	x	x	x	x
...	Consecutively to		x	x	x	x	x	x	x
4110	BE10		x	x	x	x	x	x	x
4111	only SCI 2,slave 1,BE11		x	x	x	x	x	x	x
4112	BE12		x	x	x	x	x	x	x
...	Consecutively to		x	x	x	x	x	x	x
4116	BE16		x	x	x	x	x	x	x
4201	SCI 1and2,slave2,BE1		x	x	x	x	x	x	x
4202	BE2		x	x	x	x	x	x	x
...	Consecutively to		x	x	x	x	x	x	x
4210	BE10		x	x	x	x	x	x	x
4211	only SCI 2,slave 2,BE11		x	x	x	x	x	x	x
4212	BE12		x	x	x	x	x	x	x
...	Consecutively to		x	x	x	x	x	x	x
4216	BE16		x	x	x	x	x	x	x
4501	SCB-SST (USS /peer-t-peer) (word1)								
4504	SCB-SST (USS /peer-t-peer) (word4)		x	x	x	x	x	x	
5001	TSY,BE		x	x	x	x	x	x	x

x: Value can be assigned for the selection parameters (BE can only be assigned once in the same index of all selection parameters)

Factory setting: **x:** for P590 / P591
xG: for the basic setting
xR: for the reserve setting

4.3.1.1.7 Significance of control word- (1 and 2) commands

The converters statuses can be read in the operating display r000: e.g. READY-TO-SWITCH-ON r000=009

The function sequences are described in the sequence in which they are realized.

Bit 0: ON command (↑ "ON")

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON (009).

After the command has been accepted:

- ♦ Changeover into the status PRE-CHARGING (010)
  Main contactor/bypass contactor (option) are switched-in, if present
  Pre-charging is realized
- ♦ Changevoer into the RUN status (011)
- ♦ Changeover into the RUN status (014)

Bit 0: OFF1 command (L "OFF1")

The OFF1 command (stop) is executed with an L signal.

After the command has been accepted.

- ♦ Changeover into the status OFF 1 (015), if the inverter is in an enabled status.
  The setpoint is inhibited at the ramp-function generator input (setpoint=0), so that the drive is decelerated along the parameterized deceleration ramp (P464) down to the OFF shutdown frequency (P514).
  After the OFF shutdown frequency has been reached, and the OFF delay time has expired (P516), the inverter pulses are inhibited and the main contactor, if available, is opened (also refer to "ramp-function generator" Section 4.3.7).
  If the OFF 1 command is again removed during ramp-down (ON command), ramp-down is terminated and the drive again goes into the RUN status (014).
- ♦ If one of the statuses PRE-CHARGING (010),
  READY (011),
  is present, the inverter pulses are inhibited and the main contactor, if available, is opened.
- ♦ Changeover into the status SWITCH-ON INHIBIT (008)
- ♦ If neither an OFF2 nor OFF3 command is present:
  Then the READY-TO-SWITCH-ON status is entered (009)
- ♦ For the slave drive, the drive remains active, until a speed is reached, below the OFF shutdown speed P514, as a result of a lower torque reference from the master drive.

Bit 1: OFF2 command (L "OFF2")

The OFF2 command (electrical) is realized with an L signal.

After the command has been accepted:

- ♦ The inverter pulses are inhibited, and the main contactor/bypass contactor (option) is opened
- ♦ Changeover into the SWITCH-ON INHIBIT status (008)

NOTE
The OFF2 command is simultaneously effective from three sources (P555, P556 and P557)!

Bit 2: OFF3 command (L "OFF3")

The OFF3 command (fast stop) is executed with the L signal.

After the command has been accepted:

- ♦ Changeover into the status OFF3 (016), if the drive is in a status with the inverter enabled
  - The setpoint at the RFG input is inhibited (setpoint = 0), so that the drive decelerates along the torque limit down to the OFF shutdown speed (P514).
After the off shutdown speed has been reached and after the OFF delay time (P516) has expired, the inverter pulses are inhibited, and the main/bypass contactor, if available, is opened. Deceleration is still continued if the OFF3 command is withdrawn while the drive is decelerating.
(also refer to „ramp-function generator“, Section 4.3.7)
- ♦ If one of the statuses PRECHARGING (010), READY (011),
is present:
The inverter pulses are inhibited, and the main contactor/bypass contactor, if available, is opened.
- ♦ Changeover into the SWITCH-ON INHIBIT status (008)

NOTE
The OFF 3 command is simultaneously effective from three sources (P558, P559 and P560)!
Priority of the OFF commands OFF**2** > OFF**3** > OFF**1**

Bit 3: Inverter enable command (H "inverter enable")

The INVERTER ENABLE command (inverter enable) is executed with an H signal.

After the command has been accepted:

- ♦ If the drive is in the READY status (011), the system changes into the RUN status (014), and the inverter pulses are enabled.

Bit 3: INVERTER inhibit command (L "inverter inhibit").

The INVERTER INHIBIT command (inverter inhibit) is executed with an (L signal)

After the command has been accepted:

- ♦ If the status RUN (014)
is available:

  The drive goes into the RUN STATUS (011) and the inverter pulses are inhibited.
- ♦ If the drive is in the OFF1 status (015/stop):
The inverter pulses are inhibited, the main contactor, if available, is opened, and the drive goes into the SWITCH-ON inhibit status (008).
- ♦ If the status OFF3 (016 / fast stop) is available,
the command, inverter inhibit is ignored, and fast stop continues.

Bit 4: Ramp-function generator inhibit command (L "inhibit ramp-function generator")

The RAMP-FUNCTION GENERATOR INHIBIT command (inhibit ramp-function generator) is executed for the setpoint with an L signal, only in the RUN status (014).

After the command has been accepted:

- The ramp-function generator output is set to setpoint = 0.

Bit 5: Ramp-function generator stop command (L "ramp-function generator stop")

The **ramp-function generator stop** command (hold ramp-function generator), is executed for the setpoint, with an L signal, only in the RUN status (014).

After the command has been accepted:

- The actual setpoint is frozen at the ramp-function generator output.

Bit 6: Setpoint enable command (H "setpoint enable")

The command is executed with an H signal.

After the command has been accepted:

- The setpoint at the ramp-function generator input is enabled.

Bit 7: Acknowledge command (↑ "Acknowledge")

The command is executed with a positive edge change from L to H (L → H) only in the FAULT status (007).

After the command has been accepted:

- All actual faults are deleted after having been previously transferred into the diagnostics memory
- If no faults are present:
  The drive changes into the status SWITCH-ON INHIBIT (008)
- If actual faults are present:
  The drive remains in the FAULT status (007).

NOTE
The acknowledge command is simultaneously effective from three sources (P565, P566 and P567) and alwlays from the PMU!

Bit 8: Inching 1 ON command (↑ "Inching 1 ON")

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON status (009).

After the command has been accepted

- an ON command is automatically executed (description, refer to control word bit 0) and inching frequency 1 P448 is enabled in the setpoint channel.
  The ON/OFF1 command (bit 0) is ignored for active inching operation.

Bit 8: Inching 1 OFF command (L "inching 1 OFF")

The command is executed with an L signal.

After the command has been accepted:

- An OFF 1 command is automaticaly executed (description, refer to control word bit 0).

Bit 9: Inching 2 ON command (↑ "inching 2 ON")

The command is executed with a positive edge change from L to H (L → H) only in the status READY-TO-SWITCH-ON (009).

After the command has been accepted

- an ON command (description, refer to control word bit 0) is automatically executed, and inching frequency 2 P449 is enabled in the setpoint channel.
  The ON/OFF1 command (bit 0) is ignored for active inching.

Bit 9: Inching 2 OFF command (L "inching 2 OFF")

The command is executed with the L signal.

After the command has been accepted:

- an OFF1 command (description, refer to control word bit 0) is automatically executed.

Bit 10: Control from the PLC command (H "control from the PLC)

The command is executed with an H signal.

Process data PZD (control word, setpoints) which were sent via the SST1 interface of CU, the CB/TB interface (option) and the SST/SCB interface (option), are only evaluated if the command was accepted.

- If several interfaces are operational, only the process data of the interfaces are evaluated, which transmit the H signal.
- For an L signal, the last values are retained in the appropriate dual port RAM of the interface.

An H signal appears in the visualization parameter r550 "control word 1", if <u>one</u> of the interfaces transmits an H signal!

Bit 11: Clockwise phase sequence command (H "clockwise phase sequence")

The command is executed with an H signal.

After the command has been accepted, the setpoint is influenced depending on the assignment of bit 12 "counter-clockwise phase sequence".

Refer to Section 4.4 "Function diagram, setpoint channel CU (Section 2)"!

Bit 12: Counter-clockwise phase sequence command (H "counter-clockwise phase sequence")

The command is executed with an H signal.

After the command has been accepted, the setpoint is influenced depending on the assignment of bit 11 "clockwise phase sequence".

Refer to Section 4.4 "Function diagram, setpoint channel CU (Section 2)"!

NOTE
The **counter-clockwise phases sequence-** and **clockwise phase sequence** commands have no influence on supplementary setpoint 2, which is added after the ramp-function generator!

Bit 13: Motorized potentiomenter, raise command (H "raise motorized potentiometer")

The command is executed with an H signal.

The motorized potentiometer in the setpoint channel is increased after the command has been accepted.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Part 1)"!

Bit 14: Motorized potentiometer, lower command (H "motorized potentiometer, lower")

The command is executed with an H signal.

After the command has been accepted, the motorized potentiometer is lowered in the setpoint channel.

Refer to section 4.4 „Function diagram, setpoint channel CU (Section 1)"!

Bit 15: Fault, external 1 command (L "fault, external 1")

The command is executed with an L signal.

After the command has been accepted:

The drive goes into the FAULT status (007) (fault F035)
The inverter pulses are inhibited and the main contactor, if available, is opened (also refer to Section 7 "Troubleshooting")

Bit 16: Setpoint channel data set SDS bit 0 command

In conjunction with bit 17 "SDS BIT 1" the command allows toggling between four possible setpoint channel data sets.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Part 1) / data sets“!

Bit 17: Setpoint channel data set SDS bit 1 command

In conjunction with bit 16 "SDS BIT 0" this command allows toggling between four possible setpoint channel data sets.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Part 1) / data sets"!

Bit 18: Motor data set MDS bit 0 command

The commands permits toggling between two motor data sets, and is only in the statuses

READY-TO-SWITCH-ON	(009)
PRE-CHARGING	(010)
READY	(011).

Refer to Section 4.4 "Function diagram, data sets"!

Bit 20: Fixed setpoint FSW bit 0 (LSB command):

The command, in conjunction with bit 21 "FSW BIT 1" permits one of the four possible fixed setpoints to be selected.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Section 1) / data sets"!

Bit 21: Fixed setpoint FSW bit 1 (MSB) command:

The command, in conjunction with bit 20 "FSW BIT 0" permits one of the four possible fixed setpoints to be selected.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Section 1) / data sets"!

Bit 23: Restart-on-the-fly enable command (H "enable restart-on-the-fly")

This command enables the restart-on-the-fly function.

Bit 25: Controller enable command (H „controller enable")

The command enables the speed controller if the converter inverter pulses are enabled.
Refer to „control function diagrams“, Section 4.4 .

Bit 26: Fault, external 2 command (L "fault, external 2")

The command is identified with an L signal, and is only active after pre-charging has been completed from READY status (011) onwards and an additional 200 ms delay.

After the command has been accepted

- ♦ The drive goes into the FAULT status (007) (fault F036)
  The inverter pulses are inhibited, the main contactor, if available, is opened (also refer to Section 7 "Troubleshooting").

Bit 27: Master/slave drive command (H "slave drive"/L "master drive")

The commands switches between speed control (master drive) and torque control (slave drive). For speed controls, the speed setpoint is injected into the control via the setpoint channel as well as the supplementary torque setpoint For torque control, the main torque setpoint is used as input quantity.

Bit 28: Alarm, external 1 command (L "alarm, external 1")

The command is executed with an L signal.

After the command has been accepted

- The operating status is retained. An alarm message (A015) is output (also refer to Section 7 "Troubleshooting")

Bit 29: Alarm, external 2 command (L "alarm, external 2")

The command is executed with an L signal.

After the command has been accepted:

- The operating status is retained.
  An alarm message (A016)is output (also refer to Section 7 "Troubleshooting").

Bit 30: Selection, basic/reserve setting command (L "basic setting / H "reserve setting")

The command activates the BASIC SETTING with an L signal and the RESERVE SETTING with an H signal.

After the command has been accepted:

- The parameter settings of the basic- or reserve setting for the control word itself, the setpoint channel, and the closed-loop control are activated (refer to Section 4.4 "Function diagrams, data sets").

Bit 31: HS checkback signal command (H "HS checkback signal")

The command is only processed when the appropriate connections have been made and the main contactor has been parameterized (option) (refer to "Options" in Section 9).

4.3.1.2 Status word (status word 1 and status word 2)

4.3.1.2.1 Introduction and application example

Status words 1 (bits 0 to 15) and 2 (bits 16 to 31) issue messages and commands from the converter to external destinations.

Their particular status can be read-out via parameters r552 or r968 (status word 1) and r553 (status word 2).

An overview is provided in Section 4.3.1.2.2 "Overview of the status word".
The significance of the possible messages and commands to the outside is described in Section 4.3.1.2.4 "Significance of the status word messages".

Each status word bit is assigned a selection parameter, which defines, to which destination this bit is sent (refer to Section 4.3.1.2.2, righthand column).
The selection parameters for the destinations are indexed 3 times as follows:

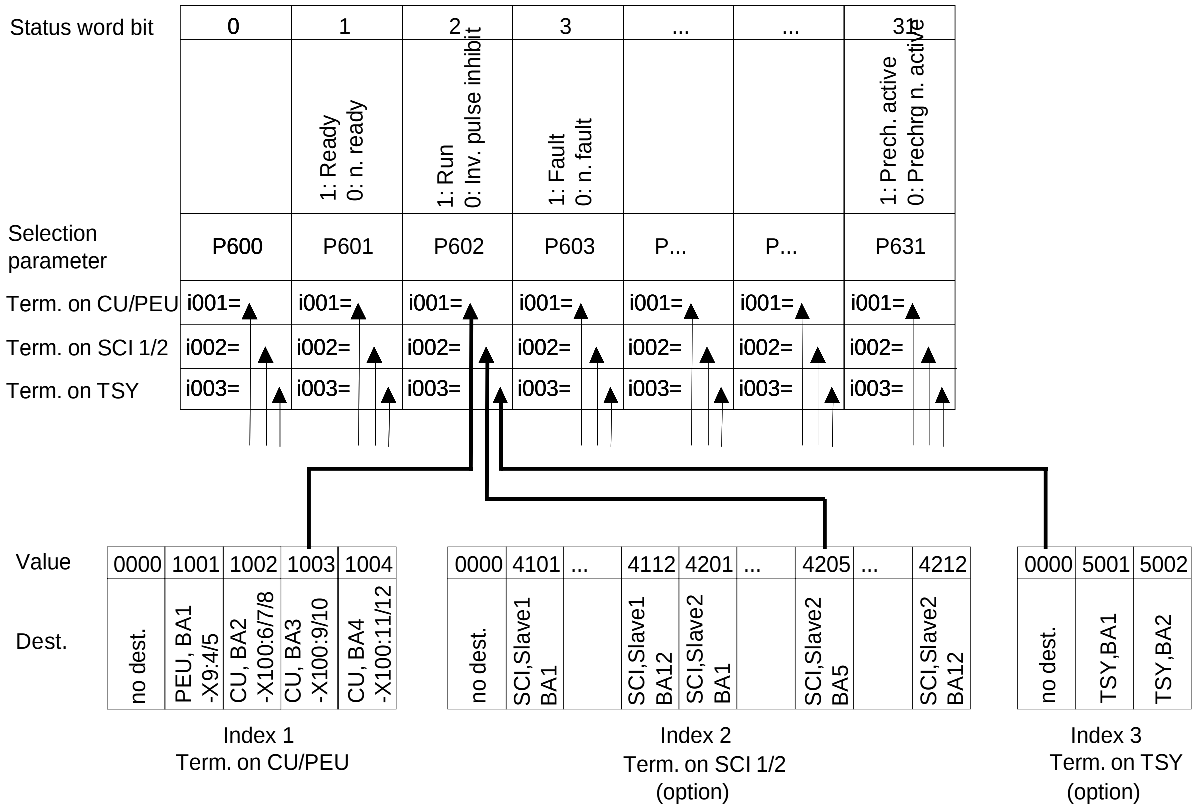
Index:	i001	Selecting a terminal on the CU / PEU board	(basic converter)
	i002	Selecting a terminal on the SCI 1/2 board	(option)
	i003	Selecting a terminal on the TSY board	(option)

An overview of the possible destinations, which are assigned fixed values, is provided in Section 4.3.1.2.3 "Selecting the destinations for the status word".

If a value, which is assigned a terminal (binary output BA), is assigned once to a selection parameter for the destination, then it is no longer available for another selection parameter as a terminal is only suitable for the output of a status bit.

NOTE
For the output of faults, alarms and switch-on inhibit of the status word (**HIGH active**) via the terminal strip, then these are LOW active at the terminals (binary outputs) (i.e.: the relay drops out)! This is also true for possible option boards! Also refer to Section 4.3.3 "Binary outputs"

EXAMPLE:



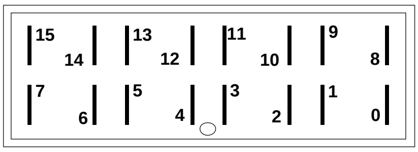
"Run" signal:

-at terminal -X100:9/10 of the CU

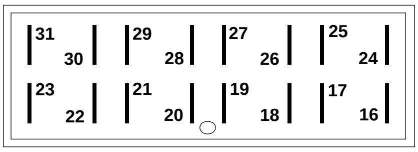
-at the terminal of binary output 5 of the SCI (option), which is coded as slave 2

- no signal at the TSY terminal (option)

4.3.1.2.2 Overview of the status word (status word 1 and status word 2)



PMU-Display
„Status word 1" **„Status word 2"**



Bit	High	Low	Comments	Dest. selection
"Status word 1"	**(visualization parameter r552 or r968)**			
0	Ready-to-switch-on	Not ready to switch on		P600
1	Ready	Not ready		P601
2	Run	Inverter pulses inhibited		P602
3	Fault	No fault	Inverted for terminal strips!	P603
4	No OFF 2	OFF2		P604
5	No OFF 3	OFF3		P605
6	Switch-on inhibit	No switch-on inhibit	Inverted for terminal strips!	P606
7	Alarm	No alarm	Inverted for terminal strips!	P607
8	No setpt. act. val. deviation	Setpt. act. value deviation	Can be parameterized	P608
9	PZD control requested		Always "High" (for CB,TB,SST1,SST/SCB)	
10	Comparison speed reached	Actual value < comparitive speed	Can be parameterized	P610
11	Fault, undervoltage	No undervoltage fault	Inverted for terminal strips!	P611
12	Main contactor energized	Main contactor not energized	Can only be connector for terminals CU1 or SCI!	P612
13	HLG active	Ramp-function generator not active		P613
14	Clockwise phase sequence	Counter-clockwise phase sequence		P614
15			Reserved	
"Status word 2"	**(visualization parameter r553)**			
16			Reserved	
17			Reserved	
18	No overspeed	Overspeed		P618
19	Fault, external 1	No fault, external 1	Inverted for terminal strips!	P619
20	Fault, external 2	No fault, external 2	Inverted for terminal strips!	P620
21	Alarm, external	No alarm, external	Inverted for terminal strips!	P621
22			Reserved	
23	Fault, overtemp., converter	No fault, overtemp. conv.	Inverted for terminal strips!	P623
24	Alarm, overtemp., conv.	No alarm, overtemp., conv.	Inverted for terminal strips!	P624
25	Alarm, motor overtemp.	No alarm, overtemp. mot.	Inverted for terminal strips!	P625
26	Fault, motor overtemp.	No fault, overtemp. mot.	Inverted for terminal strips!	P626
27			Reserved	
28			Reserved	
29	Bypass contactor energized	Bypass contactor not energized	Bypass contactor	P629
30			Reserved	
31	Pre-charging active	Pre-charging not active		P631

4.3.1.2.3 Selecting the destinations for the status word (bits 0 - 31)

For the selection parameters **P600 to P631**, in which the destination of the appropriate bit can be specified, then the indices are uniformly assigned as follows:

Index i001 Selecting a terminal on the CU / PEU board (basic converter)
i002 Selecting a terminal on the SCI 1/2 board (option)
i003 Selecting a terminal on the TSY board (option)

Index i001 Selecting a terminal on the CU / PEU board (basic converter)

Value	Destination		
0000	No destination		**Factory setting, except P602,P603 and P612**
1001	PEU,	BA1, -X9:4/5,	**Factory setting for P612**
1002	CU,	BA2, -X100:6/7/8	**Factory setting for P603**
1003	CU,	BA3, -X100:9/10	**Factory setting for P602**
1004	CU,	BA4, -X100:11/12	

Index i002 Selecting a terminal on the SCI 1/2 board (option)

Value	Destination		
0000	No destination		**Factory setting**
4101	SCI 1 and 2,slave 1,	BA1	
4102		BA2	
4103		BA3	
4104		BA4	
4105		BA5	
4106		BA6	
4107		BA7	
4108		BA8	
4109	Only SCI 2,slave 1,	BA9	
4110		BA10	
4111		BA11	
4112		BA12	
4201	SCI 1 and 2,slave 2,	BA1	
4202		BA2	
4203		BA3	
4204		BA4	
4205		BA5	
4206		BA6	
4207		BA7	
4208		BA8	
4209	Only SCI 2,slave 2,	BA9	
4210		BA10	
4211		BA11	
4212		BA12	

Index i003 Selecting a terminal on the TSY board (option)

Value	Destination		
0000	No destination		**Factory setting P617 and P630**
5001	TSY,	BA1	**Factory setting P617**
5002	TSY,	BA2	**Factory setting P630**

4.3.1.2.4 Significance of the status word messages

NOTE
When faults, alarms and switch-on inhibit of the status word are output (**HIGH active**) via the terminal strip, then these are LOW active at the terminal strips (binary outputs) (i.e.: relay drops out)! This is also valid for possible option boards! Also refer to Section 4.3.3 "Binary outputs"

Bit 0: Signal, "Ready to switch-on" (H)

An H signal indicates that the operating status SWITCH-ON INHIBIT (008) or READY-TO-SWITCH-ON (009) is available. The power supply, the open-loop and closed-loop control are operational, the inverter impulses are inhibited. If an external power supply and a main contactor (option) are available, it is possible that the DC link can be brought into a no-voltage condition in this converter status!

Bit 1: Signal, "ready" (H)

An H signal, indicates that the operating status READY (011) or PRE-CHARGING (010) is available. The power supply, and the open-loop and closed-loop control are operational. The converter is switched-on, pre-charging has been completed (is executed), and the DC link (is being) run-up to full voltage. The inverter pulses are still inhibited.

Bit 2: Signal, "run" (H)

An H signal indicates that the operating status RUN (014), RESTART-ON-THE-FLY (013), OFF1 (015) or OFF3 (016) is available. The converter is functioning, i.e. the inverter pulses are enabled and voltage is available at the output terminals.

Bit 3: Signal, "Fault" (H)

An H signal indicates that the operating status FAULT (007) is available. If the fault is output at a terminal strip (PEU, CU1, TSY, SCI1/2) an L signal appears there for this fault message.

Bit 4: Signal, "OFF2" (L)

An L signal indicates that an OFF2 command is present via the control word (bit 1).

Bit 5: Signal, "OFF3" (L)

An L signal indicates that an OFF 3 command is available, or/and the operating status OFF3 (016) is(are) available via the control word (bit 2).

Bit 6: Signal, "switch-on inhibit (H)

An H signal indicates that the operating status SWITCH-ON INHIBIT (008) is present. The power supply, open- and closed-loop control are operational. If an external power supply and a main contactor (option) are available, it is possible that the DC link is in a no-voltage condition in this converter status! The message is continuously available as long as an OFF2 command is present via the control word (bit1); or/and an OFF3 command is available via the control word (bit 2) after the setpoint has been reduced; or/and an ON command is still available via the control word (bit 0) (edge evaluation).

If the message is output at a terminal strip (PEU, CU1, SCB1) an L signal appears there for this message.

Bit 7: Signal "alarm" (H)

An H signal indicates that an alarm (Axxx) is present. If the alarm is output at the terminal strip (PEU, CU1, SCB1), an L signal appears there for this alarm.

Bit 8: Signal, setpoint- actual value deviation" (L)

An L signal indicates, that the setpoint-actual value deviation“ alarm is present (A034). This occurs as soon as the absolute value of the difference between the speed setpoint and speed actual value is greater than or equal to a deviation which can be parameterized (P517 „setpoint- actual value deviation, speed) for a time longer than the „setpoint-actual value deviation time“ (P518) The bit is again set to an H as soon as the absolute value of the difference between the speed setpoint and the speed actual value is less than the deviation (P517).

Bit 9: Signal, "PZD control requested" (H)

An H signal is always present.

Bit 10: Signal „comparison speed reached" (H)

An H signal indicates that the absolute value of the speed actual value is greater than or equal to the parameterized comparison speed (P512). The bit is again set to L, as soon as the actual absolute speed value falls below the comparison speed (P512), minus the parameterized comparison speed hysteresis (P513 in % referred to the comparison speed (P512)).

Bit 11: Signal, "fault, undervoltage" (H)

An H signal indicates that the "undervoltage in the DC link" fault is present (F008). Also refer to Section 7 "troubleshooting". If the fault is output at a terminal strip (PEU, CU1, TSY, SCI1/2) an L signal appears there for this fault signal.

Bit 12: Signal, "main contactor energized" (H)

A main contactor (option) can be energized with an H signal when the appropriate connections have been made and the appropriate parameterization. Also refer to Section 9 "Option".

Bit 13: Signal, "RFG active" (H)

An H signal indicates the difference between the RFG input (r460) and the RFG output (r480) exceeds the hysteresis which has been parameterized (P476 as a % of the rated system speed P420).

Bit 14: Signal, "clockwise phase sequence" (H)

An H signal indicates that the speed setpoint for the closed-loop control (n -setpoint, r482) is greater than or equal to 0.

Signal, "counter-clockwise phase sequence" (L)

An L signal indicates that the frequency setpoint for the closed-loop control (n/f setpoint, r482) is less than 0.

Bit 18: Signal, "overspeed" (L)

An L signal indicates that the „overspeed“ alarm (A033) is present. This is realized as soon as the absolute speed actual value exceeds the absolute value of the parameterized maximum speed (P452 for a clockwise phase sequence or P453 for a counter-clockwise phase sequence) in addition to the absolute value of the parameterized hysteresis (P519 in % referred to the appropriate maximum speed). The bit is again set to an H signal as soon as the absolute speed actual value is less than or equal to the absolute value of the corresponding maximum speed.

Bit 19: Signal, "fault, external 1" (H)

An H signal indicates that a "fault, external 1" is present in control word bit 15. If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 20: Signal, "fault, external 2" (H)

An H signal indicates that a "fault, external 2" is present in control word bit 26. If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 21: Signal, "external alarm" (H)

An H signal indicates that an "alarm, external 1" is present in control word bit 28, or an "alarm, external 2" in control word, bit 29.
If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 23: Signal "Overtemperature fault signal UMR- (H)"

An H signal indicates that an "inverter temperature too high" fault (F023) is present. Also refer to Section 7 "Troubleshooting".

If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 24: Signal "overtemperature alarm UMR" (H)

An H signal indicates that the "inverter temperature too high" alarm (A022) is present. Also refer to Section 7 "Troubleshooting". If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 25: Signal, "motor overtemperature alarm" (H)

An H signal: Parameterized alarm threshold (P360) was exceeded (also refer to Section 7 „Troubleshooting“).
When output at a terminal strip (PEU, CU, SCB1), an L signal appears there.

Bit 26: Signal " motor overtemperature fault" (H)

H signal: Parameterized fault threshold (P361) was exceeded, "motor thermal overload" fault (F021) present (also refer to Section 7 „troubleshooting“).

When output at a terminal strip (PEU, CU, SCB1) an L signal appears there.

Bit 29: Signal "bypass contactor energized" (H)

With an H signal, with the appropriate wiring and parameterization, a bypass contactor (option) can be energized. Also refer to Section 9 "Options".

Bit 31: Signal "precharging active" (H)

An H signal indicates that the drive is in the PRECHARGING (010) status after an ON command.

4.3.1.3 Setpoints

The setpoint parameters, in which values or sources can be specified, can be taken from the “function diagrams, setpoint channel and closed-loop control“ Section 4.4.
(Additional resources: Section 5 "Parameter list").

Dependent on the setpoint parameter, it is possible to changeover the control word commands:
"Basic- and reserve setting", "setpoint channel data set", "motor data set" and "fixed setpoints".

Refer to Section 4.4 "Function diagrams, data sets"

Special feature: P433 "source, supplementary setpoint 1", P438 "source, supplementary setpoint 2", P443 "source, main setpoint", P486 “source, torque setpoint“, P493 “source, torque limit 1“, P499 “source, torque limit 2“, P506 “source, supplementary torque setpoint.“:
In the parameters, setpoint sources are defined using values:

Value entry in	**Index1**	**i001**	**active when "basic setting" selected"**	(control word)
	Index2	**i002**	**active when "reserve setting" selected**	(control word)

Value assignment for P433, P438, P443, P486, P493, P499 and P506:

Value	Source	
0000	Constant setpoint = 0	**Factory setting: P433, P438, P486, P506 i001 and i002**
1001	Fixed setpoint - for source P433, P438 and P443: P421 to P424 - for source P493: P492 - for source P499: P498 - for source P506: P505	⇐ **cannot be selected for torque setpoint P486** **Factory setting: P493,P499 i001 and i002 P443 i002**
1002	Motorized potentiometer	⇐ only for main setpoint P443 **Factory setting: P443 i001**
1003	CU1, Analog input AE1, -X102	
2002	SST1(PMU -X300) (word2)	
2003	(word 3)	
2004	(word4)	⇐ only if word 4 is not assigned for "control word 1 with 2004 (Section 4.3.1.1)
...	Consecutively to	
2016	(word16)	
6002	SST2(-X100:1...5) (word2)	
6003	(word3)	
6004	(word4)	⇐ only if word4 is <u>not</u> assigned for "control word2" with 6004 (Section 4.3.1.1)
...	Consecutively to	
6016	(word16)	
OPTIONS		
3002	CB/TB (word 2)	
3003	(word 3)	
3004	(word 4)	⇐ only if word 4 is not assigned for "control word 1 with 3004 (Section 4.3.1.1)
...	Consecutively to	
3016	(word 16)	
4101	SCB1 with SCI 1,slave1,analog input AE1	
4102	AE2	
4103	AE3	
4201	SCB1 with SCI 1,slave2,analog input AE1	
4202	AE2	

4203	AE3
4501	SCB-SST (peer to peer) (word 1)
4502	SCB-SST (USS /peer to peer) (word 2)
4503	(word 3)
4504	(word 4)
...	Consecutively to
4516	(word 16)

⇐ only if word 1 is not assigned for "control word 1 with 4501 (Section 4.3.1.1)

⇐ only if word 4 is not assigned for "control word 1 with 4504 (Section 4.3.1.1)

4.3.1.4 Actual values

All available parameter numbers (0 to 999) can be entered into the actual value parameters, sorted according to destinations (refer to the following).
The parameter value of the entered parameter number is output at the selected destination.

Note:
- When specifying parameter numbers, which are indexed, the value of the first index (.i001) is always output!
- When specifying "0", no output is made to the appropriate destination!

Destinations:

P655 "CU AnaOut Act Val"
Output via the CU control terminal strip (Section 3.3)
Analog output (-X102:34 / reference potential -X102:33)
(refer to Section 4.3.5 "analog outputs")

P680 "SCom1 Act Value"

P681 "SCom2 Act Value"
Output via the basic converter interfaces SST1 and/or SST2
Indices: i001 word 01 of the telegram (PZD)
⇓ ⇓
i016 word 16 of the telegram (PZD)
(refer to Section 4.3.6.1 "basic converter interfaces SST1 and SST2")

Destination, options:

P664 "SCI-AA actual values"
Output via the SCB1 interface with SCI1
(also refer to the Instruction Manual for the option boards)
Indexes i001 Destination: Analog output 1 from slave 1
i002 Destination: Analog output 2 from slave 1
i003 Destination: Analog output 3 from slave 1
i004 Destination: Analog output 1 from slave 2
i005 Destination: Analog output 2 from slave 2
i006 Destination: Analog output 3 from slave 2

P690 "SCB actual values"
Output via the SCB1 interface with peer-to-peer protocol or SCB2
(also refer to the Instruction Manual for the option boards)
Indexes: i001 Destination: Word 01 of the telegram (PZD)
⇓ ⇓
i016 Destination: Word 16 of the telegram (PZD)

P694 "CB/TB actual values"
Output via the CB or TB interface
(also refer to the Instruction Manual for the option boards and Sections 4.3.6.2 "DPR")
Indices: i001 Destination: Word 01 of the telegram (PZD)
⇓ ⇓
i016 Destination: Word 16 of the telegram (PZD)

NOTE
For telegram transfer (P680,P681,P690,P694): ♦ Generally, it is necessary/practical to assign “word 01 of the telegram (PZD)" with the status word 1 (r968 or r552)! ♦ If double-word parameters (type I4) are to be transferred as actual values, the associated parameter number must be entered in 2 consecutive words (indices), as otherwise only the most significant word will be transferred!

4.3.2 Binary inputs

5 binary inputs (24V) which can be parameterized at the control terminal strip (board CU, -X101) to enter commands, external faults/alarms as well as a checkback signal to the converter control word.

Connecting-up: Refer to Section 3.3 "Control terminal strip"

Parameterization: Refer to Section 4.3.1.1 "Control word" .

Factory setting: „pulse inhibit" OFF 2 command

Binary input 1	Basic setting: Reserve setting	not assigned ÔN/OFF1
Binary input 2	Basic setting: Reserve setting:	not assigned OFF2 command „pulse inhibit"
Binary input 3	Basic setting: Reserve setting:	not assigned Acknowledge (control word bit 7)
Binary input 4	Basic setting: Reserve setting:	not assigned Fixed setpoint, bit 0 (control word bit 20)
Binary input 5	Basic setting: Reserve setting:	(control word bit 30) (control word bit 30)

4.3.3 Binary outputs

2 binary outputs, which can be parameterized, for the output of signals and external commands of the converter status word

Connecting-up: Binary output 1 on the PEU (connector - X9):
Refer to Section 3.1.1 "Auxilary power supply / main contactor"
Binary output 2 on the CU control terminal strip (connector X100 / changeover contact):
Refer to Section 3.3 "Control terminal strip"

Parameterization: Refer to Section 4.3.1.2 "Status word"

Factory setting:

Binary output 1 -X9 on the PEU	Main contactor energized (status word bit 12)
Binary output 2 -X100 on the CU	Fault (status word bit 3)

NOTE

When faults, alarms and switch-on inhibit of the status word (HIGH active) are output via the terminal strip, these are LOW active at the terminal strip (binary outputs) (i.e. relay drops out)!
Also refer to Section 4.3.1.2 "Status word"

4.3.4 Analog input

An analog input, which can be parameterized, at the control terminal strip (CU, -X102 / Section 3.3) as voltage- or current input for setpoint input.

- Voltage inputs:
  - ± 10 V or 0...+1 0V or +2...+10 V (can be parameterized
  - Resolution: < 10 mV (10 bit + sign)
  - Accuracy: < ± 2 %
  - Smoothing: can be parameterized (P651)
  - Offset can be parameterized (P652)
- Current inputs:
  - ± 20 mA or 0 mA...+ 20 mA or + 4 mA...+20 mA (can be parameterized)
  - Resolution: < 0,04 mA (10 bit + sign)
  - Accuracy: < ± 2 %
  - Smoothing: can be parameterized (P651)
  - Offset can be parameterized(P652)

Connecting-up: Refer to "Control terminal strip", Section 3.3

Parameterization: Also refer to the "Function diagrams, analog inputs CU", Section 4.4!

1. Parameterization as setpoint input:

- Connect-up AE as setpoint input in **P443** "main setpoint source" or **P428** "supplementary setpoint source 1" (refer to "Function diagrams, setpoint channel CU (Section 1)" Section 4.4 / "Setpoints", Section 4.3.1.3):

  Enter the value to identify the analog input:

  1003 > analog input 1 (AE1)

- Specify the required voltage- and current range in **P650** "CU-AE configuration":

P650	**i001 (AE1)**	= 0	±10 V , ±20 mA (factory setting)	
	i002 (AE2)	or	= 1	0...+10 V, 0...+20 mA
		or	= 2	+2...+10 V, +4...+20 mA (with wire breakage monitoring)

- The smoothing time constant should be set in **P651** "CU-AE smoothing".
  (Setting range: 0ms to 1000 ms / factory setting: 4 ms)

  P652 **i001 (AE1)**

- Set the smoothing time constant in Set the offset (zero point calibration) in P652 "CU-AE offset".
  (Setting range: -20,000 V to +20,000 V / factory setting: +0.000 V ⇔ no offset)

  P652 **i001 (AE1)**

- The input signals of the setpoint channel can be influenced as follows:

Supplementary setpoint 1	P436	(invert)
Supplementary setpoint 2	P441	(invert)
Main setpoint	P446	(invert)
Suppl. torque setpoint	P506	(invert, gain)
Main torque setpoint	P486	(invert)
Limit 1	P493	(not)
Limit 2	P499	(not)

Refer to „function diagrams, setpoint channel CU3 (Part 1)" Section 4.4

For the calculation:

Main setpoint (P443) and supplementary setpoint (P428) are entered as percentage quantities

The following is valid:
- 100% = rated system speed in [RPM] (P420).
- Max. range: -200% to +199.99%

P650 = 0 ±10V , ±20mA ⇔ ±100%

$$\Rightarrow \quad \text{PWE in [\%]} = \frac{10\,\%}{\text{V}} \times \left(\text{AE in [V]} + \text{Offset in [V]}\right)$$

P650 = 1 0...+10V , 0...+20mA ⇔ 0% to +100%

$$\Rightarrow \quad \text{PWE in [\%]} = \frac{10\,\%}{\text{V}} \times \left(\text{AE in [V]} + \text{Offset in [V]}\right)$$

P650 = 2 +2V...+10V , +4...+20mA ⇔ 0% to +100%
< 2mA (1V) wire breakage signal

$$\Rightarrow \quad \text{PWE in [\%]} = \frac{12.5\,\%}{\text{V}} \times \left(\text{AE in [V] - 2 V} + \text{Offset in [V]}\right)$$

Configuring example - using an analog input as setpoint input:

1st example:

Available:
- Rated system speed P420 = 3000 [RPM]

Required:
- Voltage input: ± 10 V (or current input ± 20 mA) via analog input 1 for the main setpoint
- Control range: –10 V to +10 V corresponds to -3000 RPM to +3000 RPM in the setpoint channel

- Analog input 1 connected-up as main setpoint:
  Enter 1003 in P443 "main setpoint source":P443 (i001: basic setting./i002: reserve setting.) = 1003
- Parameterize analog input 1 as voltage input ± 10 V (or current input ± 20 mA):
  P650 i001 = 0 ± 10 V für AE1)
- Set offset (zero point offset) for analog input 1:
  The following is valid for the selected voltage input (P650 i001 = 0): 0 V ⇔ 0 RPM
  Monitoring parameter: r447 "main setpoint"
  e.g.: P652 i001 = 0V offset (ideal case: No zero point drift)
- The main setpoint control range in the setpoint channel can be influenced:
  Inversion for supplementary torque setpoint:
  Additional gain:
  Refer to „function diagrams, setpoint channel CU (Part 1)" Section 4.4

2nd example:

Available: ♦ Rated system speed P420 = 3000 [RPM]

Required: ♦ Current input + 4...20 mA (or voltage input + 2...10 V) via the analog input for the supplementary setpoint

♦ Control range: + 4...20 mA corresponding to 0 to +3000 RPM to the setpoint channel

- Connect-up the analog input at supplementary setpoint 1:
  Enter the value to identify the analog input in P428 "supplementary setpoint source" P428 (i001: basic setting./i002: reserve setting.) = 1003
- Parameterize the analog input as current input + 4...20 mA (or voltage input + 2...10 V):
  P650 i002 = 2 (+ 4...20 mA for analog input with wire breakage signal at < 2 mA)
- Set the offset (zero point offset) for the analog input:
  The following is valid for the selected current input P650: 4 mA ⇔ 0 RPM
  Monitoring parameter: r431 "supplementary setpoint"
  e.g.: P652 i002 = 0 V offset (ideal case: no zero point trip)
- The supplementary setpoint can be inverted within the setpoint channel via parameter P46=1:
  Refer to „function diagrams, setpoint channel CU (Section 1)" Section 4.4

4.3.5 Analog output

1 analog output, which can be parameterized, at the control terminal strip (board CU, -X102 / Section 3.3) to output actual values and other internal converter quantities.

Analog output:

- Voltage range: ± 10 V
- Resolution: 4.9 mV (11 bits + sign)
- Accuracy: ± 1 %
- Smoothing 20 µs
- Output current: max. ± 5 mA
- Short-circuit proof and non-floating

Connecting-up: Refer to "Control terminal strip", Section 3.3

Parameterization: Also observe "Function diagram, analog output CU", Section 4.4!

- Enter the parameter number (0 to 999) whose value is to output, in P655 "CU-AA actual values".
- Set the analog output gain factor in P656 "CU-AA gain".
  (setting range: -320.00 V to +320.00 V / pre-setting: +10.00 V ⇔ gain of 1)
- Set the offset in P657 "CU-AA offset".
  (setting range: -100.00 V to +100.00 V / pre-setting: +0.00 V ⇔ no offset)

  The following is obtained for the calculation from the "function diagram, analog output CU":

$$U_{off} = \left(\frac{\text{Parameter value in [\%]}}{100\,[\%]} \times \text{Gain in [V]} \right) + \text{Offset in [V]}$$

Pre-assignment (gain of 1 and no offset): 100 % = 10 V

The parameter value in [%] for the appropriate parameter number can be taken from the parameter list, Section 5!

Configuring examples:

Example 1:
- Available: P102 (rated motor current = 40.0 A
- Required: Output current r004 is to represented in the range from 32 A to 160 A as 0.00 V to+10.00 V at the analog output

♦ Connect-up parameter R004 at the analog output

P655 "CU-AA actual values" **= 004**

♦ Converter the required output range in [%]:

r004 should be taken from the parameter list, Section 5:
Analog output: 100% = 4xP102 (in this case: 4x40.0A = 160A)

Thus, the following is obtained for the range to be represented:

32A → 20% (parameter value PWE1) to beented repres as V_{off1} = 0.00 V

160A → 100% (parameter value PWE2) to be represented as V_{off2} = +10.00 V

♦ Define gain factor **P656** and offset **P657** for analog output

The following is obtained from the formula shown above:

$$\text{Gain factor [V]} = \frac{(U_{off1}[V] - U_{off2}[V]) \times 100\,\%}{PWE_1[\%] - PWE_2[\%]} = \frac{(0.00\text{ V} - 10.00\text{ V}) \times 100\,\%}{20\,\% - 100\,\%}$$

$$= \frac{-10.00\text{ V} \times 100\,\%}{-80\,\%} = 12.5\text{ V}$$

$$\text{Offset [V]} = U_{off1}[V] - \left(\frac{\text{Gain factor [V]} \times PWE_1[\%]}{100\,\%}\right) = 0\text{ V} - \left(\frac{12.5\text{ V} \times 20.00\,\%}{100\,\%}\right)$$

$$= 0\text{ V} - \left(\frac{12.5\text{ V} \times 20.00\,\%}{100\,\%}\right) = -2.5\text{ V}$$

To be adjusted: Gain: **P656 = +12.50V**
Offset: **P657 = −2.50V**

Example 2:

- Available: P420 (rated system speed) = 3000 RPM
- Required: Speed/frequency actual value r219 in the range from –10.00 V to + 10.00 V, simulated at the analog output

♦ Connect parameter r218 to the analog output:
P655 "CU-AA actual values" **= 218**

♦ Convert the required output range in [%]:
r218 should be taken from the parameter list, Section 5:
Analog output: 100 % = P420 (in this case: = 3000 RPM)
Thus, following is obtained for the range to be represented:
–3000 RPM → –100 % (parameter value PWE1) referred to V_{Off1} = –10.00 V
+4800 RPM → 160 % (parameter value PWE2) referred to V_{Off2} = +10.00 V

♦ Define gain factor P656 and offset P657:
The following is obtained from the formula shown above:

$$\text{Gain factor [V]} = \frac{(U_{off1}[V] - U_{off2}[V]) \times 100\,\%}{PWE_1[\%] - PWE_2[\%]} = \frac{(-10.00\text{ V} - 10.00\text{ V}) \times 100\,\%}{-100\,\% - 160\,\%}$$

$$= \frac{-20.00\text{ V} \times 100\,\%}{-260\,\%} = 7.69\text{ V}$$

$$\text{Offset [V]} = U_{off1}[V] - \left(\frac{\text{Gain factor [V]} \times PWE_1[\%]}{100\,\%}\right) = -10\text{ V} - \left(\frac{7.69\text{ V} \times (-100.00\,\%)}{100\,\%}\right)$$

$$= -10\text{ V} + 7.69\text{ V} = -2.31\text{ V}$$

To be adjusted: Gain **P656 = +7.69 V**
Offset **P657 = -2.31 V**

4.3.6 Serial interfaces

4.3.6.1 Basic converter interfaces SST1 and SST2

The USS protocol (universal serial interface) is implemented at the basic converter interfaces SST1 and SST2.

The following documentation is available depending on the particular application of the SST1 basic converter interface:

♦ Connecting a PC / PG with SIMOVIS software for start-up / service operator control:

  SIMOVERT Master Drives
  SIMOVIS Instruction Manual
  Order No.: 6SE7087-6CX87-4KA0

♦ Connecting higher-level PLCs with the USS protocol:

  SIMOVERT Master Drives
  Using the serial interfaces with USS protocol
  Order No.: 6SE7087-6CX87-4KB0

♦ Additional general comments regarding connecting-up and parameterization:

♦ Connecting-up: Also refer to "control terminal strip" Section 3.3

  SST1: 9-pin SUB D connector -X300 on the PMU parameterizing unit
  SST2: Connector -X100 on the CU control terminal strip

When connecting SST2 via the terminal strip (-X100), of the CU, a four-wire connection can be implemented. The changeover between two- and four-wire connection is realized automatically.

NOTE
The bus terminating resistors (total 150 Ω) must be switched-in at the last bus node (slave). • SST1: Close jumpers S1.1 and S1.2 of DIP-FIX S1 on the CU • SST2: Close jumpers S2.1 and S2.2 of DIP-FIX S2 on the CU

♦ Parameterization:

- Parameterization: **P683 to P687**
- Define the process data (control word, status word, setpoints, actual values) for the interface:
  Refer to "Process data" Section 4.3.1
- Enabling parameterization: **P053 or P927**

NOTE
The factory setting (refer to "parameter list" Section 5) can be used if the SST1 and/or SST2 basic converter interfaces are not used!

4.3.6.2 Dual port RAM (DPR for SCB, TSY, CB, TB)

The dual port RAM is the internal interface on the CU (-X107) to connect possible option boards via the LBA (Local Bus Adapter, option) of the electronics box.

Possible option boards: TSY (tachometer- and synchronization board); TB (Technology board); SCB (serial communications board); CB (Communications board).

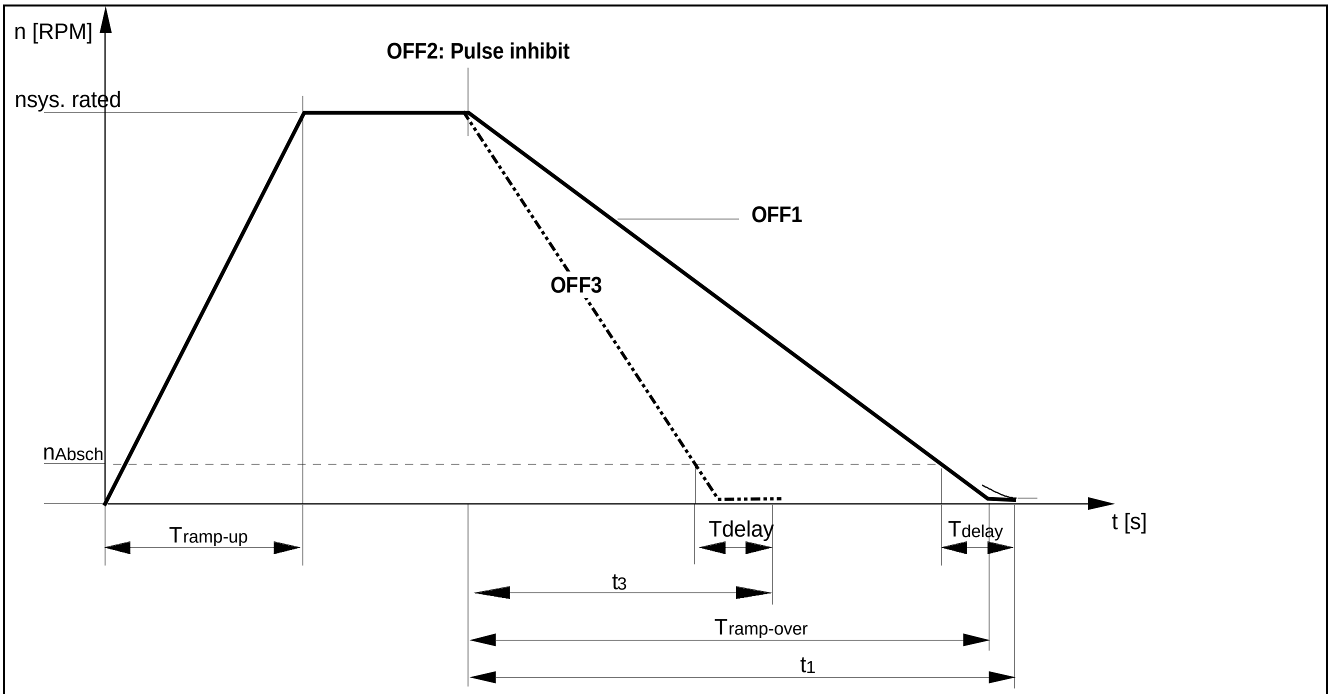
To connect possible option boards and parameterize the interface, also refer to the Section 3.5 "Recommended circuits" as well as in the appropriate Instruction Manuals to the various option boards.

Additional information can be taken from Sections 4.3.1.1 to 4.3.1.4 "Control word, status word, setpoints, actual values".

4.3.7 Ramp-function generator (RFG) and limiting stage in front of the ramp-function generator

A detailed description as supplement to the "Function diagrams", setpoint channel CU1 (Sections 1 to 3)", Section 4.4

4.3.7.1 Ramp-function generator, RFG



Ramp down time for an OFF1 command: $t1 = T_{decel.} \times \frac{n_{set} - n_{off}}{n_{Anl\text{-}start}} + T_{delay}$

OFF3: 0 setpoint is input, ramp-down along the torque limit

Fig. 4.3 Ramp-function generator

For a detailed description of the OFF1-, OFF2- and OFF3 commands, refer to Section 4.3.1.1 "Control word"

Parameters for setting the acceleration time

P420	Rated system speed	1 RPM to 9000 RPM

P462	Acceleration time ($T_{ramp-up}$)	i001: SDS1 to i004: SDS4	0,00 to 99,99 s
Acceleration time in s from standstill up to the rated system frequency, P420			

P464	Deceleration time ($T_{decelerate}$)	i001: SDS1 to i004: SDS4	0,00 bis 99,99 s
Deceleration time in s from the rated system frequency (P420) down to standstill			

P514	OFF shutdown speed (n_{off})	i001: SDS1 to i004: SDS4	0.00 to 9000.0 [RPM]
The OFF delay time P516 starts to run as soon as the „speed actual value“, r219 reaches the OFF shutdown speed, P514, when the drive is decelerating (OFF1 or OFF3).			

P516	OFF delay time (T_{delay})	i001: SDS1 to i004: SDS4	0.0 s to 60.0 s
Delay time for OFF1 and OFF3 in s. ♦ The OFF delay time starts to run, as soon as the „speed actual value“, r219 reaches the OFF shutdown speed, P514 when the drive decelerates. The inverter pulses are then inhibited.			

Further, it is still possible to inhibit or hold the ramp-function generator via the "control word" (Section 4.3.1.1).

4.3.7.2 Limit value stage in front of the ramp-function generator

P452	Max. speed (RDF) Clockwise phase sequence	i001 MDS1 i002 MDS2	-9000.0 [RPM] to +9000.0 [RPM]
Max. setpoint frequency for a clockwise phase sequence			

P453	Maxi. speed (LDF) Counter-clockwise phase sequence	i001 MDS1 i002 MDS2	-9000.0 [RPM] to +9000.0 [RPM]
Max. setpoint speed for counter-clockwise phase sequence			

When changing-over from the IBS converter status drive 005 to ready-to-switch-on 009, it is checked as to whether the maximum speed LDF is less than the maximum speed RDF.

4.3.8 Function selection (P052)

Function selection is activated via parameter P052 and permits various special functions during the start-up phase.

Access stage 2 (**P051 = 2**) must be enabled and the converter may only be in the "run" (R) status.

The following functions are available:

- ♦ Return from function selection (P052 = 0)
- ♦ Factory setting (P052 = 1)
- ♦ Initialization (P052 = 2)
- ♦ Download (P052 = 3)
- ♦ Hardware configuration (P052 = 4)
- ♦ Drive setting (P052 = 5)

The „factory setting“ function is automatically reset after completion, i.e. P052 = 0 ("return").
The remaining functions must be manually reset!

4.3.8.1 Factory setting (P052 = 1)

This function is used to establish the factory setting for all of the parameters according to the "parameter list" (Section 5).

In this case, some converter data are set, as a function of the converter type (MLFB-dependent/P070)).

"Factory setting" can be selected in the following statuses: "switch-on inhibit" (008), "ready-to-switch-on" (009) or "fault" (007).

Procedure:

⇓ P052 = 1 Function selection, "factory setting"

⇓ P key The operating display appears (001), and the following parameters can be re-assigned:

- ♦ Factory setting for all parameters according to the parameter list (Section 5)
(also the board configuration P090/P091)
- ♦ Converter data (taken from the converter MLFB (P070))
P071 Converter supply voltage
P072 Converter current (n)

⇓ The operating display "switch-on inhibit" (008) or "ready-to-switch-on" (009) appears after the factory setting has been completed (initialization).

4.3.8.2 Initialization (P052 = 2)

This function is used to change the converter MLFB (converter type) and the factory setting is only partially established when changing the MLFB (status when the converter is supplied), dependent on the new MLFB.

"Initialization" can be selected in the following statuses: "Switch-on inhibit" (008), "ready-to-switch-on" (009) or "fault" (007).

Procedure:

⇓	P051 = 3	Access stage	Expert mode (used to change P070)
⇓	P052 = 2	Function selection	Initialization
⇓	P070	MLFB	Specifies the converter MLFB (Rating plate data on the unit or after an upgrade (retrofit), the new MLFB assigned by the factory) When parameterizing via the PMU, corresponding to the code number (PWE): Refer to the following table:

Table of the SIMOVERT Master-Drives

Brief description of the table columns:

PWE	Parameter value (to be entered at initialization / PMU / P070)
I(n)	Rated converter current in A (P072)
U-Kl.	Voltage class, voltage range
P(n)	Rated converter active output in kW (P073)
f_{Der} 1	De-rating frequency 1 in kHz: De-rating not required up to this pulse frequency (de-rating, refer to Section 14.3)
BF	Type

PWE	Order No.	I(n)	U-Kl.	P(n)	fDer1	BF
3	6SE7016-1EA30	6,1	3AC 380-460V	2,2	6	A
9	6SE7018-0EA30	8,0	3AC 380-460V	3	6	A
11	6SE7021-0EA30	10,2	3AC 380-460V	4	6	A
14	6SE7021-1CA30	10,6	3AC 208-230V	2,2	6	A
18	6SE7021-3EB30	13,2	3AC 380-460V	5,5	6	B
21	6SE7021-3CA30	13,3	3AC 208-230V	3	6	A
25	6SE7021-8EB30	17,5	3AC 380-460V	7,5	6	B
27	6SE7021-8CB30	17,7	3AC 208-230V	4	6	B
32	6SE7022-3CB30	22,9	3AC 208-230V	5,5	6	B
35	6SE7022-6EC30	25,5	3AC 380-460V	11	6	C
39	6SE7023-2CB30	32,2	3AC 208-230V	7,5	6	B
42	6SE7023-4EC30	34,0	3AC 380-460V	15	6	C
46	6SE7023-8ED30	37,5	3AC 380-460V	18,5	6	D
48	6SE7024-4CC30	44,2	3AC 208-230V	11	6	C
52	6SE7024-7ED30	47,0	3AC 380-460V	22	6	D
54	6SE7025-4CD30	54,0	3AC 208-230V	15	6	D
56	6SE7026-0ED30	59,0	3AC 380-460V	30	6	D
64	6SE7027-0CD30	69,0	3AC 208-230V	18,5	6	D
66	6SE7027-2ED30	72,0	3AC 380-460V	37	6	D
70	6SE7028-1CD30	81,0	3AC 208-230V	22	6	D

⇓ P052 = 0 Function selection Return

⇓ P key The operating display appears, and the following parameters are re-assigned once the MLFB has been changed:

- ♦ Converter data (determined from the converter MLFB (P070)). Data sets as for function selection „factory setting“(refer to Section 4.3.9.1); not all of the parameters are reset to the factor settings according to the parameter list!

⇓ The operating display „drive start-up“ is displayed after initialization has been completed (005)

4.3.8.3 Download (P052 = 3)

This function is used to read and change all parameters using a PC at the basic converter interfaces SST1 or SST2.

"Download" can be selected in the following statuses: "Switch-on inhibit" (008), "ready-to-switch-on" (009) or "fault" (007).

Procedure:

⇓ P052 = 3 Function selection Download

⇓ P key The operating display appears (021)

- ♦ Using a PC at the basic converter interface SST1 or SST2 and an appropriate application program (e.g.: SIMOVIS), all parameters can now be read and changed independently of the access stage (P051) and function selection (P052)

⇓ P052 = 0 Function selection Return

⇓ P key

⇓ After return, the operating display appears, "switch-on inhibit" (008) or "ready-to-switch-on" (009)

4.3.8.4 Hardware configuration (P052 = 4)

This function is used to define option boards (SCB, TSY, CB, TB) in the converter electronics box.

Further, the LBA bus coupling (Local Bus Adapter) is required for the electronics box!

All parameters, which can be written into the "hardware configuration" status ("H", refer to the righthand column in the "parameter list", Section 5), can be changed.

The "hardware configuration" selection can be realized in the "switch-on inhibit", "ready-to-switch" or "fault" status.

Procedure:

⇓ P052 = 4 Function selection Hardware configuration

⇓ P051 = 3 Access stage Expert mode (to change the following parameters)

⇓ P090 = Board, slot 2 (To the RIGHT in the electronics box!)
P091 = Board, slot 3 (In the CENTER in the electronics box!)

Parameter values for P090/P091:
0: No option board
1: CB Communications board
2: TB Technology board (only P090)
3: SCB Serial communications board
4: TSY Digital tachometer and synchronization board

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not for T300)
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE

Only one of each option board type may inserted in the electronics box.

TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.

If only one option board is used it must always be inserted at slot 2.

Option board Order Nos. and their descriptions are found in Section 9 "Options".

⇓ Additional parameters, depending on the option boards (refer to the associated Instruction Manuals or parameter list / Section 5)

⇓ Make a selection:

⇓ P052 = 5 Function selection, "drive setting" (refer to Section 4.3.9.5)

or ⇓ P052 = 0 Return

⇓ P key The operating display (r000) appears, while, depending on the function selection, parameters and internal quantities can be re-assigned

- The hardware is initialized
  If fault message F050/F070/F080 appears: Refer to Section 7 "Troubleshooting"

⇓ After the selected function selection has been completed, the "switch-on inhibit" (008) or "ready-to-switch-on" (009) operating display appears.

4.3.8.5 Drive setting (P052 = 5)

This function is used to change the drive setting (converter/motor data, system data).

This includes all parameters, which can be written into the "drive setting" status ("A" refer to the righthand column in the "parameter list" Section 5.

Procedure:

⇓

- 1FT6 motor: Enter the motor number in P100
- Other motors Enter „250“ in P100 and the motor parameter values.

⇓ P208 encoder type,
possibly rated system speed and system torque

⇓ P052 = 0 Switch-on inhibit (008) or ready-to-switch-on (009)

Precise procedure, refer to Section 4.2.2.

4.3.9 Functions (software)

4.3.9.1 Motor identification

P330 Motid	= 0:	Motor identification is automatic, if there is no motor data available for start-up drive parameters were changed.
	= 1:	Motor identification after each ON command.

♦ Ground-fault test:

P354	= 0:	No ground fault test.
	= 1:	Ground fault test only with the next ON command; parameter is then reset to 0.
	= 2:	Ground fault test after every ON command.

4.3.9.2 Restart-on-the-fly

Restart-on-the-fly“ is set via the following parameters:

Control word bit 23 "restart-on-the-fly enable"
The control word bit must be set to enable the restart-on-the-fly function
Source selection parameter for control word bit: P583
Refer to Section 4.3.1.1 "control word"

Restart-on-the-fly inactive (control word bit):
The drive waits until the motor has come to a standstill before it goes into run.

Restart-on-the-fly active:
Synchronization to a running motor.

4.3.9.3 Pulse encoder simulation

A pulse encoder interface is also available on the CU for a higher-level technology board control (e.g. T300). If an encoder is connected (P208 = 1), then the track signals of the encoder are output at this interface. For the recommended ERN1387, this is 2048 pulses in two tracks, displaced through 90°, as well as a zero pulse at each revolution. If a resolver is connected (P208 = 2,3) then, independent of the resolver type, there is always a simulation with 2048 pulses per mechanical revolution as well as a zero pulse.

The pulse encoder simulation can be accessed:

⇒ as TTL signal at connector X107 (for DORAM interface T300)

⇒ as HTL signal at customer terminals X102:

Zero pulse	terminal 39
Track A	terminal 37
Track B	terminal 38

4.3.10 Start-up after first start-up including subsequent enabling of software functions and hardware options

When starting-up the drive after a first start-up, the procedure (sequence) of the first start-up should be taken into account:

- Standard application; refer to Section 4.2.2
- Expert application: refer to Section 4.2.3

♦ Depending on the required change and taking into account the access stage (P051), and a possibly necessary function selection (P052), a jump can be made to the appropriate step.

♦ Due to background calculations, it is recommended that the following parameters and functions selections are checked/executed after the position jumped to!

For example: Standard application (Section 4.2.2): Changing motor data

♦ P051 = 2 Access stage

♦ P052 = 5 Function selection, "drive setting"

♦ Change motor data

♦ Check subsequent parameters

♦ P052 = 7 Function selection "motor identification at standstill" (background calculations using new motor data)

♦ P051 = 1 Access stage

Description of the "function selection" (P052): Additional information in Section 4.3.9

Subsequent enabling of "functions": Additional information in Section 4.3.10

Subsequent enabling of "hardware options":
Additional information regarding the appropriate options is provided in the Instruction Manuals.

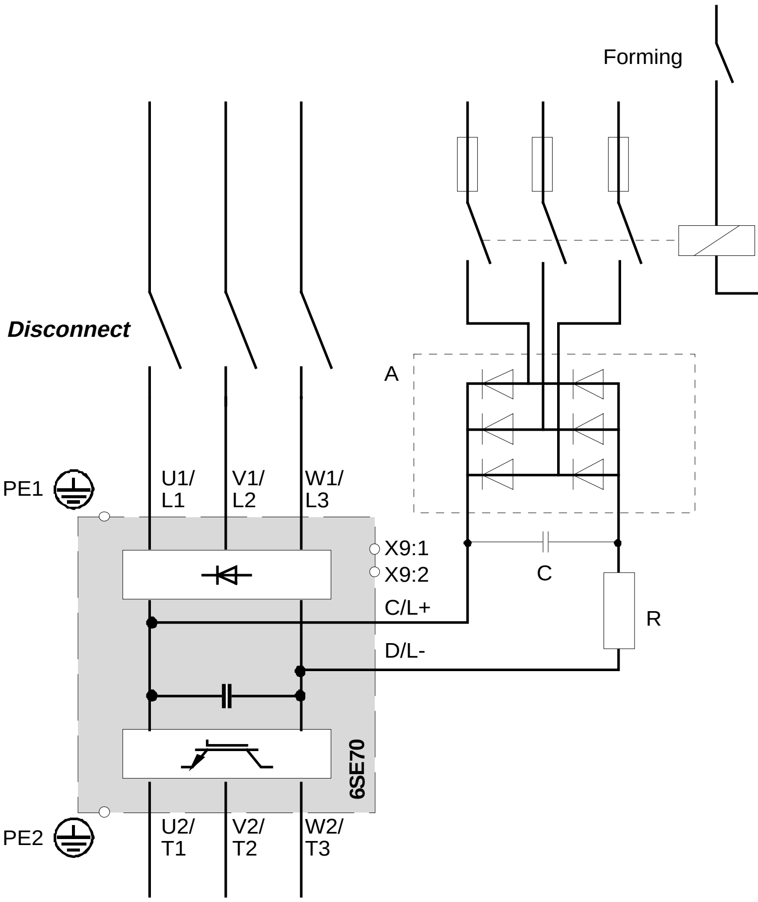
4.3.11 Capacitor forming

The DC link capacitors must be re-formed if the converter has been non-operational for more than one year. If the converter was started-up within one year after having been shipped (serial number on the rating plate), it is not necessary to re-form the DC link capacitors.

Forming is realized by switching-in a rectifier and resistor, which is connected to the DC link. The converter supply must be disconnected (Circuit: Refer to Fig. 4.6). The forming time is dependent on the time where the converter was not operational (refer to Fig. 4.5).

Position	Example	
1 and 2	A-	Manufacturing location
3	E F G	1994 1995 1996
4	1 to 9 O N D	January to September October November December
5 to 14		Not relevant for forming

Table 4.2 Serial number structure: A-E60147512345



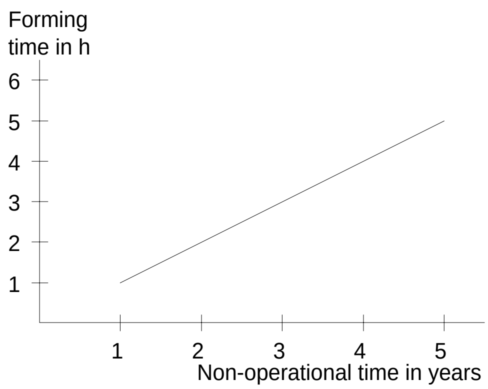


Fig. 4.5 Forming time as a function for the time which the converter was non-operational

	Recommended components		
	A	R	C
208 V < Un < 415 V	SKD 50 / 12	220 Ω / 700 W	22 nF / 1600 V
380 V < Un < 460 V	SKD 62 / 16	470 Ω / 1200 W	22 nF / 1600 V
500 V < Un < 690 V	SKD 62 / 18	680 Ω / 1700 W	22 nF / 1600 V

Fig. 4.6 Circuit for forming

4.4 Function Diagrams

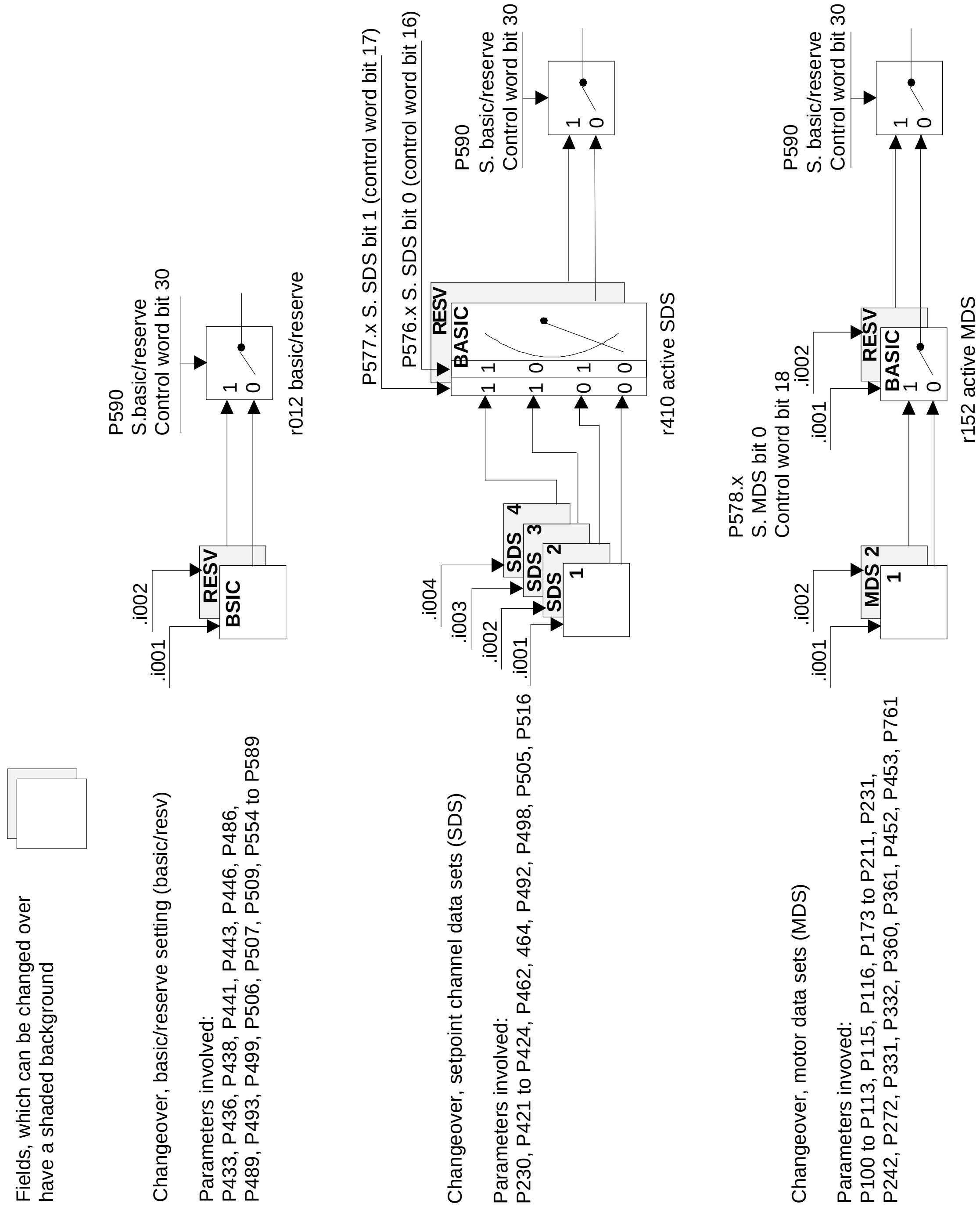


Fig. 4.7 Changeover

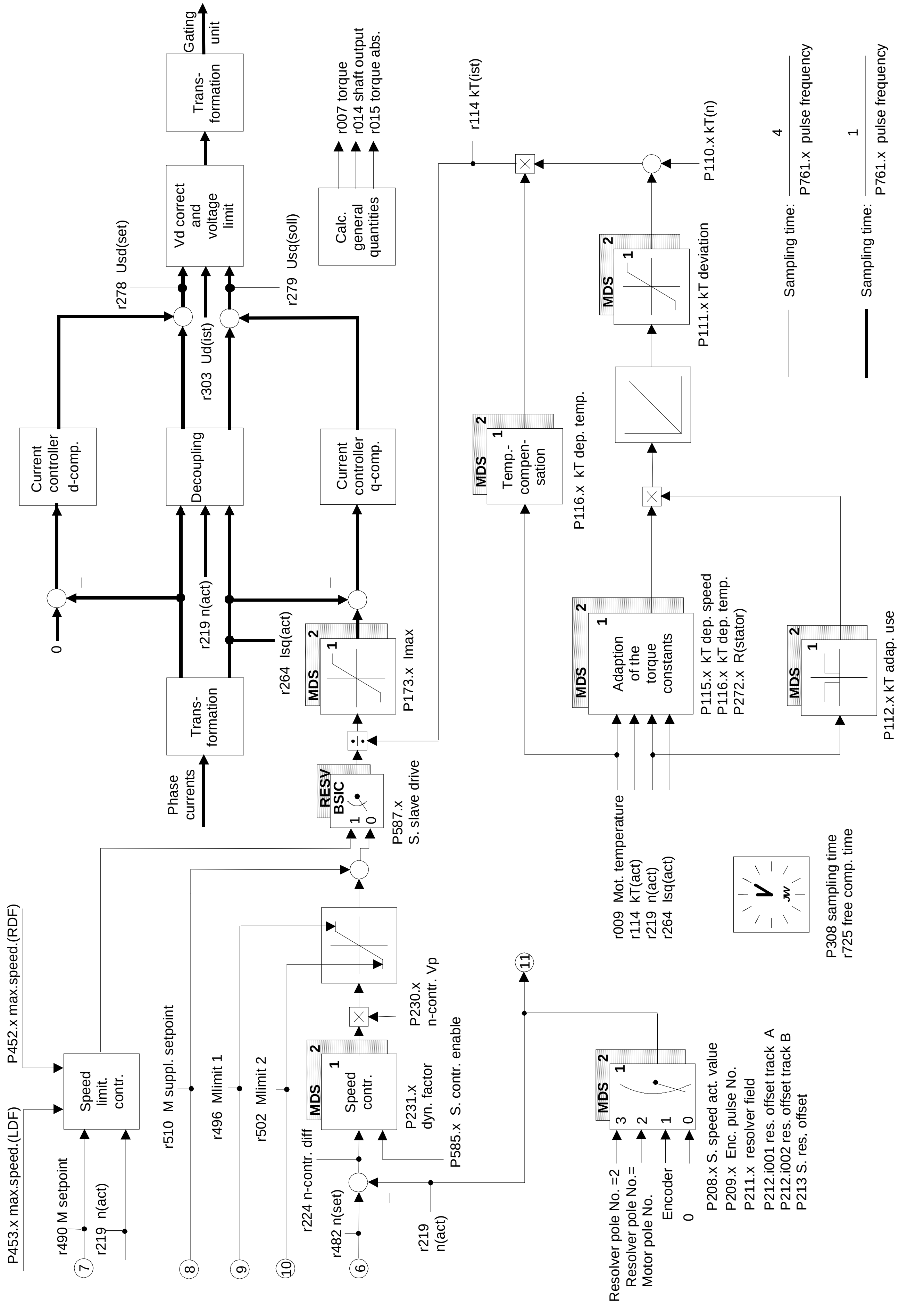


Fig. 4.8 Closed loop control

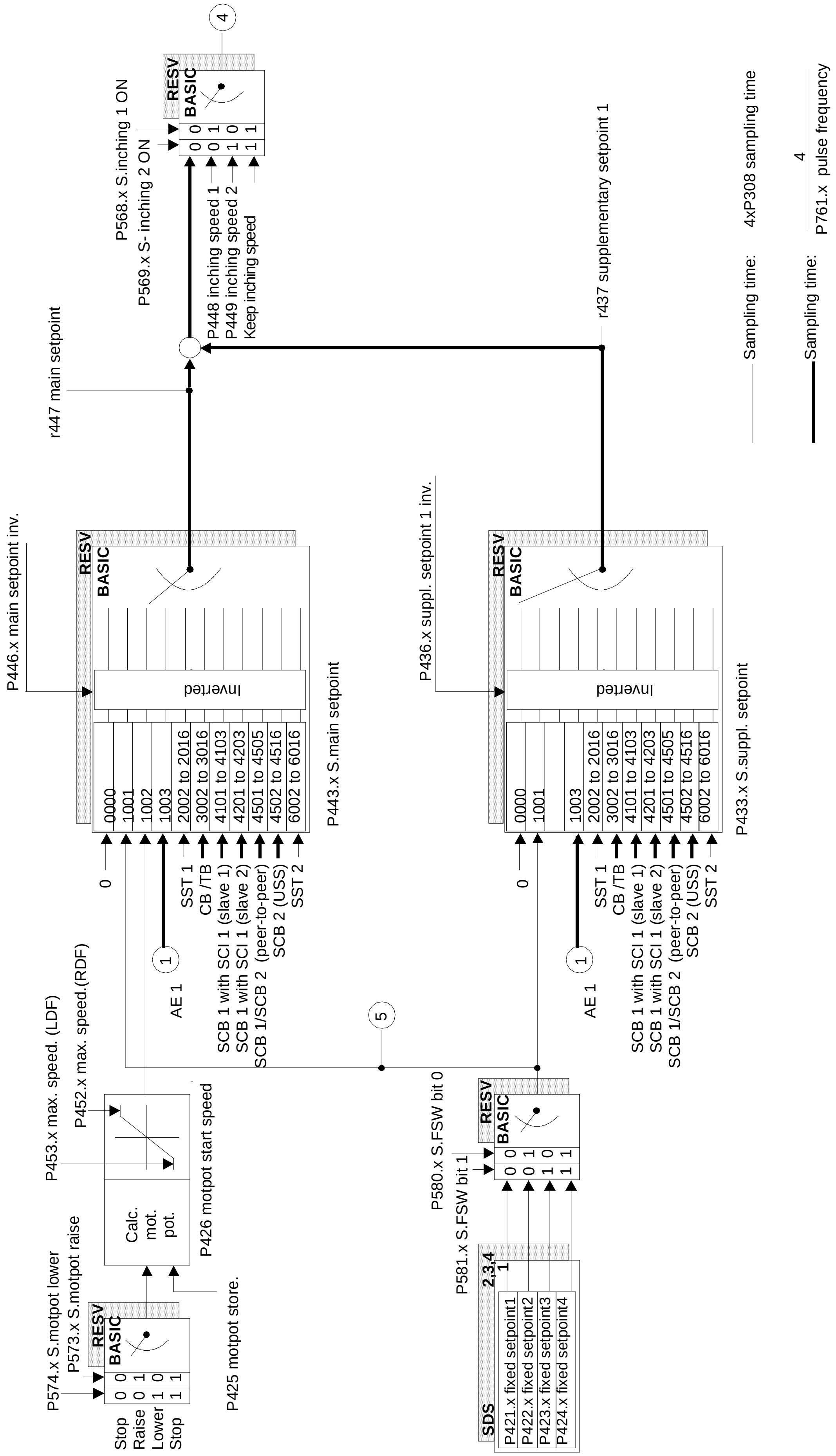


Fig. 4.9 Setpoint channel (Section 1)

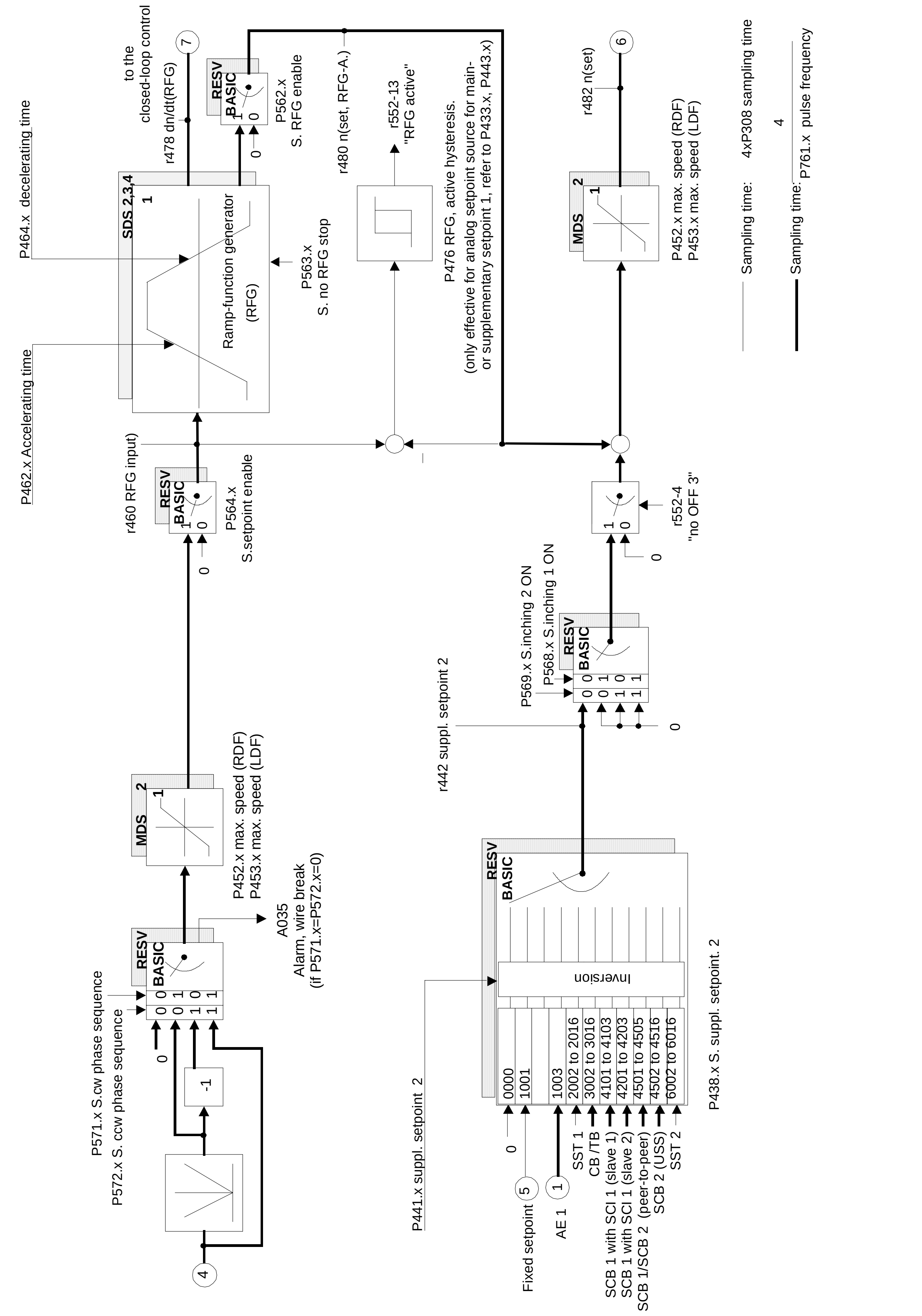


Fig. 4.10 Setpoint channel (Section 2)

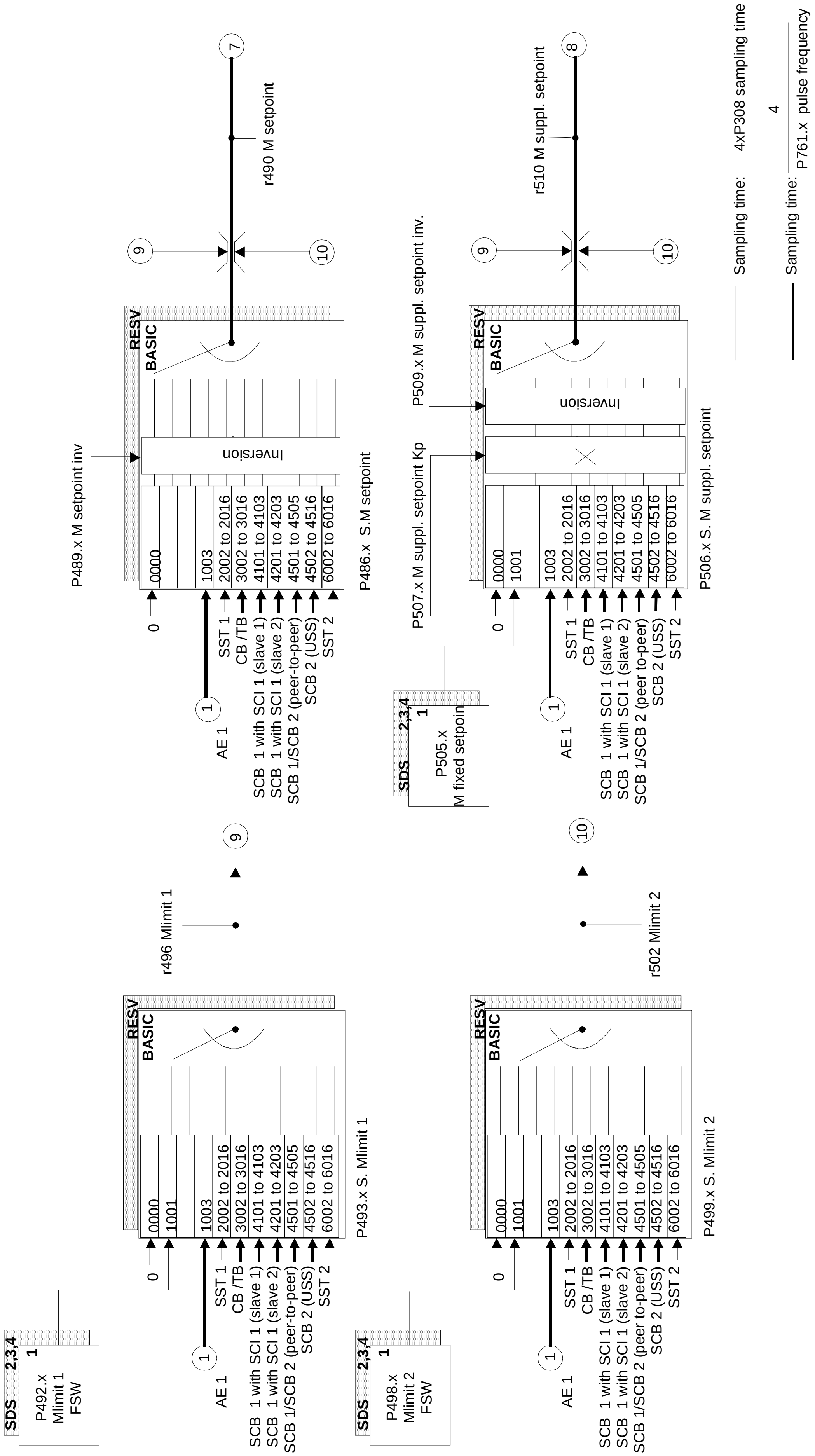


Fig. 4.11 Setpoint channel (Section 3)

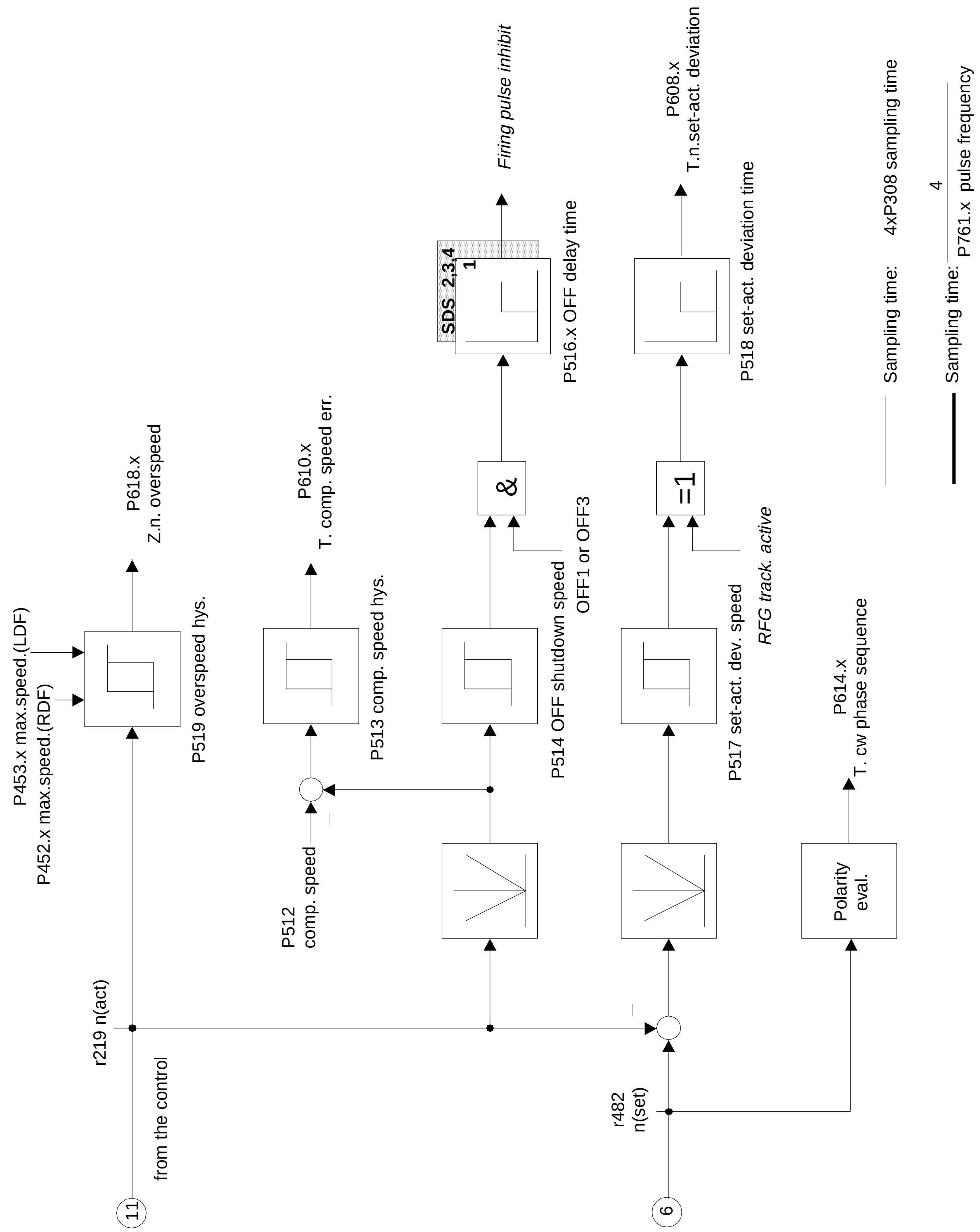


Fig. 4.12 Setpoint channel (Section 4)

5 Parameter List

General Observation Parameters	to r013	Contol and Status Word	from r550
General Parameters	from P050	Analog Input/Output	from P650
Drive Data	from P070	Communications	from P680
Hardware Configuration	from r089	Diagnosis	from r720
Motor Data	from P100	Modulator	from P761
Control	from r150	Factory Parameters	from P789
Functions	from r333	Profile Parameters	from P918
Setpoint Channel	from r410		

Explanations on the Parameter List

Example:

PNU ***:conf-P**	**Parameter name in OP1** Description	**Range** **[Unit]**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
P999 *1) 3E7Hex	**Parameter name in OP1** Description Typ=I2; 2) PKW: 1Hex=0.01Hz; Process Data Group.: 0 3)	-300.00 to 300.00 [Hz]	2 i001=50.00 i002=50.00	2 5)/ BR 4) 2 5)/ BR 4)

1) Confirmation Parameter: not active before pressing the P-key

2) Parameter Type
O2 16 Bit Value without sign
I2 16 Bit Value with sign
I4 32 Bit Value with sign
V2 Bit coded Quantity

3) Normalization Group for Process Data (PcD)

Process Data Group	Process Data Normalization
0	as Parameter Value Normalization
1	4000Hex = P420 Rated System Frequency
2	1000Hex = P102 Rated Motor Amps
3	1000Hex = P101 Rated Motor Volts
4	1000Hex = r307 Line Volts (AC)
5	4000Hex = P485 Rated system Torque

4) Drive status:
U MLFB Input
H Hardware-Konfiguration
A Hardware Setting
B Ready (Including Fault)
R (Run) Operation (including Fly Restart, Power Ride Thru, Flexible Response)

5) Access Level which is minimum needed to display or change a Parameter
1 Operation
2 Standard Mode
3 Expert Mode

6) Abbreviations for Index Parameters
SDS(2) Setpoint Channel Data Set Parameter with 2 or 4 Indices, to be changed via Control Word 2, Bits 16 and 17
MDS(2) Motor Data Set Parameter with 2 or 4 Indices, to be changed via Control Word 2, Bits 18 und 19
B/R Parameter which can be changed between Base and Reserve setting via Control Word 2, Bit 30

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r000	**Operation Display** Displays Drive Status, Fault Messages and Warnings; see section 6		-	1 /UHABR

5.1 General Observation Parameters

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r001 1Hex	**Drive Status** Displays the actual drive status Parameter Values: 0 = Drive MLFB input 1 = Drive initialization 2 = Hardware initialization 3 = Drive system initialization 4 = Hardware settings 5 = Drive system settings 6 = Selection on several drive test functions 7 = Fault 8 = Restart inhibition 9 = Ready for turn-ON 10 = Pre-charging of the DC link bus 11 = Ready for operation 12 = Ground fault test 13 = Flying Restart is active 14 = Drive is operating 15 = Ramp generator decelerating (OFF1) 16 = Quick Stop (OFF3) 17 = DC braking 18 = Motor data identification (standstill test) 19 = Speed regulator optimization 20 = Synchronization active 21 = Download of parameter settings Analog Output: 100% Parameter Value=16384 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 MLFB Input Drive Init H/W Init System Init H/W Setting System Set. Test Fault ON locked Rdy ON Precharging Rdy Operat. Grd Flt TST Fly Restart Operation OFF 1 OFF 2 DC Brake Mot ID Stop n Reg Opt. Synchronize Download	-	2 /UHABR
r002 2Hex	**Rot Speed** Rotational Speed of the motor Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	2 / BR
r003 3Hex	**Output Volts** Drive output voltage (Fundamental rms) Analog Output: 100% @ Parameter Value=4*P101 Typ=O2; PKW: 1HEX=0.1V PcD Gr.: 0	 [V]	-	2 / BR
r004 4Hex	**Output Amps** Drive output current (Fundamental rms) Analog Output: 100% @ Parameter Value=1638.4A Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	 [A]	-	2 / BR
r006 6Hex	**DC Bus Volts** DC Bus voltage (actual value to be displayed on PMU and OP) Analog Output: 100% @ Parameter Value=16384V Typ=I2; PKW: 1HEX=1.0V PcD Gr.: 0	 [V]	-	2 / BR
r007 7Hex	**Motor Torque** Calculated torque in % of rated motor torque P113 Analog Output: 100% @ Parameter Value=400.0% Typ=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	 [%]	-	2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r009 9Hex	**Motor Temperat.** The motor temperature is measured via a temperature sensor inside the motor (KTY84). Analog Output: 100% @ Parameter Value=16384°C Typ=I2; PKW: 1HEX=1.0°C PcD Gr.: 0	[°C]	-	2 / BR
r012 CHex	**Base/Reserve** Base / reserve settings of the process data wiring for setpoint signals and for control word bits Parameter values: 0: Base setting 1: Reserve setting Analog Output: 100% @ Parameter Value=16384 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 Base Reserve	-	2 / BR
r013 DHex	**Operat. Hours** Operation hours with released inverter pulses (drive status 'operation'). Indices: i001 = Days: days (0..9999) i002 = Hour: hours (0..24) i003 = Sec: seconds (0..3600) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	2 / BR
r014 EHex	**Shaft Power** Shaft Power of the Motor Analog Output: 100% @ Parameter Value=1638.4kW Typ=I2; PKW: 1HEX=0.1kW PcD Gr.: 0	[kW]	-	2 / BR
r015 FHex	**Motor Torque Nm** Calculated Torque Analog Output: 100% @ Parameter Value=1638.4Nm Typ=I2; PKW: 1HEX=0.1Nm PcD Gr.: 0	[Nm]	-	2 / BR

5.2 General Parameters

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P050 * 32Hex	**Language** Display language on the optional operation panel OP and in the PC software SIMOVIS Parameter values: 0: Deutsch 1: English 2: Espanol 3: Francais 4: Italiano Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 Deutsch English Espanol Francais Italiano	- 0	2 /UHABR 2 /UHABR
P051 * 33Hex	**Access Level** Setting of access levels; with higher access levels more parameters can be read and/or written. Parameter values: 1: Operating via PMU or OP with motor operated potentiometer function 2: Standard mode 3: Expert mode Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 3 Operation Standard Expert	- 2	1 /UHABR 1 /UHABR
P052 * 34Hex	**Function Select** Selection of several commissioning steps and special functions. Parameter values: 0 = Return into the former drive status from one of the further described functions 1 = Parameter-Reset: all parameters are reset to their original settings (factory settings). According to the Profibus profile for variable speed drives this function is also accessible via parameter P970. After finishing this function the parameter is automatically reset to 0. 2 = Release for MLFB setting (changing into the drive status ’Drive MLFB input’). To exit this function the parameter must be reset to 0. 3 = Download/Upread (Changing into the drive status ’Download’). To exit this function the parameter must be reset to 0. 4 = Hardware configuration (Changing into the drive status ’Hardware settings’). To exit this function the parameter must be reset to 0. 5 = Drive system settings (Changing into the drive status ’Drive system settings’ to parameterize the motor data). To exit this function the parameter must be reset to 0. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 Return Par. Reset Set MLFB Download H/W Setting System Set.	- 0	2 /UHABR 2 /UHAB

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P053 * 35Hex	**Parameter Access** Release of interfaces for the parameterization. At any time all interfaces have write access to this parameter. Parameter values: 0: none 1: COM BOARD (CB) 2: BASE KEYPAD (PMU) 4: BASE SERIAL (SST1) (SST1) 8: Serial I/O (SCB with USS)) (SCB) 16: TECH BOARD (TB) 32: BASE SERIAL2 (SST2) (SST2) Description for Setting: Every interface is coded by a number. Input of the number or the total of several numbers which are related to interfaces, gives parameterization access to these interfaces. Example: The factory setting ’6’ means, that BASE KEYPAD (PMU) and BASE SERIAL (SST1) have parameterization access. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 63	- 6	1 /UHABR 1 /UHABR
P054 36Hex	**OP Backlight** Backlight for the optional operation panel OP Parameter values: 0 = Backlight always ON 1 = Backlight only ON during operation Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 always ON dur.operat.	- 0	3 / BR 3 / BR

5.3 Drive Data

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P070 * 46Hex	**MLFB (6SE70..)** MLFB (order number) of the base drive Parameter values: see section 4.3.9.2 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 113	- 0	3 /U BR 3 /U
P071 47Hex	**Line Volts** Line voltage of the drive Rated voltage of the feeding AC or DC mains; this parameter is used to calculate the rated DC bus voltage as a basis for the voltage limits of the Vd(max) and the Vd(min) [Power ride thru] regulator (e. g. undervoltage failure limit). Typ=O2; PKW: 1HEX=0.1V PcD Gr.: 0	90.0 to 1320.0 [V]	- ←	2 / ABR 2 / A
P072 48Hex	**Rtd Drive Amps** Rated drive output current Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	5.0 to 200.0 [A]	- ←	2 /U BR 4 /U

5.4 Hardware Configuration

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r089 59Hex	**Board Position 1** PCB in position #1 (left) of the electronic box Parameter Values: 0 = none 1 = SIMOVERT FC CU Board 2 = SIMOVERT VC CU Board 3 = SIMOVERT SC CU Board Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 3 none FC VC SC		3 / B
P090 * 5AHex	**Board Position 2** PCB in position #2 (right) of the electronic box Parameter values: 0 = no optional PCBs 1 = CB Communication Board 2 = TB Technology Board 3 = SCB Serial Communication Board 4 = TSY Digital-Tacho and Synchronization Board Description for Setting: Only the following combinations of PCBs and positions are admitted: Position #3(P091) — Position #2(P090) - — CB - — TB - — SCB - — TSY SCB — CB CB — TB SCB — TB CB — SCB CB — TSY TSY — CB SCB — TSY TSY — SCB Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 none CB TB SCB TSY	- 0	3 / H BR 3 / H
P091 * 5BHex	**Board Position 3** PCB in position #3 (center) of the electronic box Description see P090 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4	- 0	3 / H BR 3 / H

5.5 Motor Data

PNU ***:conf-P**	**Parameter name in OP1** **Description**	**Range** **[Unit]**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
P100 * 64Hex	**Type of Motor** Automatic parameterization of the drive for a Siemens 1FT6 type motor. The number provided with the motor must be entered. If other motors are used the parameter must be set to 250 (P051=3). In this case the motor dependent parameters must be set manually (see 4.2.1) MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 250	2 i001=0 i002=0	2 / ABR 2 / A
P102 66Hex	**Motor Rtd Amps** Rated motor current, if P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	0.0 to 200.0 [A]	2 i001=0.0 i002=0.0	3 / ABR 3 / A
P108 6CHex	**Motor Rtd Speed** Rated motor speed; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0min-1 PcD Gr.: 0	0 to 9000 [min-1]	2 i001=0 i002=0	3 / ABR 3 / A
P109 6DHex	**Motor #PolePairs** Number of pole pairs; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 10	2 i001=0 i002=0	3 / ABR 3 / A
P110 6EHex	**Rtd kT** Torque / current ratio constant; if P100 <> 250 the correct value is automatically taken from the motor data list MDS (2) Parameter Typ=O2; PKW: 1HEX=0.01Nm/A PcD Gr.: 0	0.00 to 4.99 [Nm/A]	2 i001=0.00 i002=0.00	3 / ABR 3 / A
P111 6FHex	**kT Deviation** Maximum possible deviation between the adapted torque constant and the value of P110; if P100 <> 250 the correct value is automatically taken from the motor data list MDS (2) Parameter Typ=O2; PKW: 1HEX=0.01Nm/A PcD Gr.: 0	0.00 to 1.00 [Nm/A]	2 i001=0.00 i002=0.00	3 / ABR 3 / A
P112 70Hex	**kT Adap.Start** Speed limit above which the torque constant is adapted in % of rated motor speed; below this speed the torque constant is open loop controlled; if P100 <> 250 the correct value is automatically taken from the motor data list MDS (2) Parameter Typ=O2; PKW: 1HEX=1.0% PcD Gr.: 0	0 to 100 [%]	2 i001=0 i002=0	3 / ABR 3 / A
P113 71Hex	**Motor Rtd Torque** Rated motor torque, if P100 <> 250 the correct value is automatically taken from the motor data list MDS (2) Parameter Typ=O2; PKW: 1HEX=0.1Nm PcD Gr.: 0	0.0 to 1000.0 [Nm]	2 i001=0.0 i002=0.0	3 / ABR 3 / A
r114 72Hex	**kT(act)** Actual value of the adapted torque constant Analog Output: 100% @ Parameter Value=163.84Nm/A Typ=O2; PKW: 1HEX=0.01Nm/A PcD Gr.: 0	[Nm/A]	-	2 R

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P115 73Hex	**kT-Depend. Speed** Proportional factor between kT and the speed. If P100 <> 250 the correct value is automatically taken from the motor data list. The torque constant depends on speed and temperature: $kT = P110 * [(1 - \frac{P115 * n}{6000\ min^{-1}})^{3/2} * (1 - \frac{P116 * T}{100\ K})]$ MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 25.0 [%]	2 i001=0.0 i002=0.0	3 / ABR 3 / A
P116 74Hex	**kT-Depend. Temp.** Proportional factor between kT and the motor temperature. If P100 <> 250 the correct value is automatically taken from the motor data list. For details see also P115. MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 25.0 [%]	2 i001=0.0 i002=0.0	3 / ABR 3 / A

5.6 Control

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r152 98Hex	**act. MotDataSet** Displays the active motor data set; Parameter values: 0: motor data set 1 1: motor data set 2 2: motor data set 3 3: motor data set 4 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 MotDataSet1 MotDataSet2 MotDataSet3 MotDataSet4	-	3 / ABR
P163 A3Hex	**Control Mode** Parameter values: 4: Speed regulation 5: Torque regulation Control word 2 Bit 27 (master / slave) switches between these values. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	4 to 5 n Regulat. T Regulat.	4	3 / ABR 3 /
P173 ADHex	**Imax** Maximum current (Fundamental rms) Setpoint signal for the current limit to protect the motor and the drive, respectively. If P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	0.0 to 2000.0 [A]	2 i001=0.0 i002=0.0	3 / ABR 3 / AB
P208 D0Hex	**Src RotSpeed act** Type of tachometer Parameter values: 0: not allowed 1: Encoder ERN 1387 or compatible encoder 2: Resolver with same # of pole pairs as the motor 3: Resolver with # of pole pairs '1' MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 none Encoder Resol#p mot Resolv #p=1	2 i001=0 i002=0	2 / ABR 2 / A

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P209 D1Hex	**Encoder Pulse #** Number of pulses of the encoder (only for P208=1); the parameter value must be a power of 2; if P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 8192	2 i001=0 i002=0	3 / ABR 3 / A
P211 D3Hex	**Resolver Excitat** For the adaptation to different types of resolvers or different cable lengths the amplitude of the excitation of the resolver can be adjusted in 7 steps Parameter values: 0: automatic adjustment 1 ... 7: manual adjustment of the amplitude (amplitude is P211 * 3.4 V) If P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 7	2 i001=0 i002=0	3 / ABR 3 / A
P212 D4Hex	**Resolver Offset** Offset of the resolver evaluating circuit on the CU board. The offset is automatically measured during motor data identification; see also P213. When P211=0 (automatic excitation adjustment) a value of '1' equates approximately 0.05% of the amplitude. Indices: i001 = Tr A: Offset of resolver track A i002 = Tr B: Offset of resolver track B Typ=I2; PKW: 1HEX=1.0 PcD Gr.: 0	-2048 to 2048	2 i001=0 i002=0	3 / BR 3 / BR
P213 * D5Hex	**Src.Res.Offset** Selects, if the resolver offset is taken from the motor data identification program or if the offset is manually changed. Parameter values: 0: The measured offset values are to be used 1: Offset values saved in P212 are to be used 2: The measured values will be saved in P212 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 2 Measure Parameter Save	- 0	3 / ABR 3 / ABR
r219 DBHex	**n(act)** Actual speed (non-smoothed mechanical speed of the motor shaft) Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	2 / BR
r224 E0Hex	**n Deviation** Control deviation at the input of the speed regulator. Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR
P230 E6Hex	**n-Reg-Gain** Speed regulator gain. SDS(4) Parameter Typ=O2; PKW: 1HEX=0.001 PcD Gr.: 0	0.001 to 16.000	4 i001=1.000 i002=1.000 i003=1.000 i004=1.000	3 / BR 3 / BR
P231 E7Hex	**Dynamics** Sets the speed regulator response time between fast (7) and slow (0); resulting settling times: 0 -> approx. 40 ms 1 -> approx. 29 ms 2 -> approx. 21 ms 3 -> approx. 15 ms 4 -> approx. 11 ms 5 -> approx. 8 ms 6 -> approx. 6 ms 7 -> approx. 4 ms MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 7	2 i001=4 i002=4	2 / BR 2 / B

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P242 F2Hex	**Start-up Time** Start-up time of the drive system from standstill to rated system speed at acceleration with rated motor torque (motor without load). The parameter value is allowed for the calculation of the n/f regulator parameters. If P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=0.001s PcD Gr.: 0	0.000 to 10.000 [s]	2 i001=0.000 i002=0.000	3 / ABR 3 / A
r264 108Hex	**Isq(act)** Actual value of the torque generating current component Analog Output: 100% @ Parameter Value=4*P102 Typ=I2; PKW: 1HEX=0.1A PcD Gr.: 0	 [A]	-	3 / BR
P272 110Hex	**ResistStator+Cab** Stator resistance of the motor; if P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=0.001Ohm PcD Gr.: 0	0.000 to 60.000 [Ohm]	2 i001=0.000 i002=0.000	3 / ABR 3 / AB
r278 116Hex	**Usd(Set)** Flux generating voltage component (total of current regulator output signal and discoupling circuit output). Analog Output: 100% @ Parameter Value=1638.4V Typ=I2; PKW: 1HEX=0.1V PcD Gr.: 0	 [V]	-	3 R
r279 117Hex	**Usq(set)** Torque generating voltage component (total of current regulator output signal and discoupling circuit output). Analog Output: 100% @ Parameter Value=1638.4V Typ=I2; PKW: 1HEX=0.1V PcD Gr.: 0	 [V]	-	3 R
r303 12FHex	**DC BusVolt (act)** unfiltered actual value of the DC link bus voltage Analog Output: 100% @ Parameter Value=1638.4V Typ=I2; PKW: 1HEX=0.1V PcD Gr.: 0	 [V]	-	3 / BR
r307 133Hex	**Line Volts (AC)** Rated line voltage For AC drives: Rated drive input voltage (P071). For DC inverters: fictive AC input voltage which would cause the DC voltage entered in P071 $(\frac{P071}{1,35})$. Analog Output: 100% @ Parameter Value=1638.4V Typ=O2; PKW: 1HEX=0.1V PcD Gr.: 0	 [V]	-	3 / BR
P308 134Hex	**Sampling Time** Shortest sampling time of the operation system Description for Setting: Before reducing the sampling time the calculation time headroom should be checked (r725). A minimum headroom of 5% should always be guaranteed to prevent the operation program from a slow reaction. If fault message #42 'Calculation time' occurs, the sampling time must be increased. The calculation time loading also depends on the pulse frequency (P761). Typ=O2; PKW: 1HEX=0.1ms PcD Gr.: 0	0.3 to 4.0 [ms]	- 1.0	3 / ABR 3 / A

5.7 Functions

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P330 14AHex	**Mot ID** Selection of the motor data identification program Parameter values: 0: Motor data identification only to be performed after a new motor has been selected (new index value in P100) 1. Motor data identification after every ON command Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 First ON every ON	- 0	3 / ABR 3 / A
P331 14BHex	**Mot ID Amplitude** Voltage amplitude for the motor data identification; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1V PcD Gr.: 0	0.0 to 100.0 [V]	2 i001=0.0 i002=0.0	3 / ABR 3 / A
P332 14CHex	**Mot ID #ofCycles** Number of measurement cycles in the motor data identification program; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 10000	2 i001=0 i002=0	3 / ABR 3 / A
P354 * 162Hex	**Ground Flt Test** Ground fault test; this is not a protective function according to any standard. Parameter values: 0 = no ground fault test to be performed 1 = ground fault test will be performed after the next ON command; afterwards the parameter is reset to '0' 2 = ground fault test to be performed after every ON command Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 not active next ON every ON	- 0	3 / ABR 3 / ABR
P355 163Hex	**GrdFltTest Time1** Ground fault test time 1 for phases U and W Typ=O2; PKW: 1HEX=0.1ms PcD Gr.: 0	0.0 to 1000.0 [ms]	- 20.0	3 / ABR 3 / AB
P356 164Hex	**GrdFltTest Time2** Ground fault test time 2 for phase V Typ=O2; PKW: 1HEX=0.1ms PcD Gr.: 0	0.0 to 1000.0 [ms]	- 10.0	3 / ABR 3 / AB
P357 165Hex	**GrdFltTest Limit** Current limit for recognizing a ground fault within the times defined in P355 and P356. Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	0.0 to 5.0 [A]	- 1.0	3 / ABR 3 / AB
P360 168Hex	**Mot Tmp Warning** Limit for the warning message 'Motor overtemperature' (P625). Example: for isolation class B: <=110^{o}C; EXd<=100^{o}C for isolation class F: <=145^{o}C; EXd<=145^{o}C Description for setting: a parameter value > 0 activates this function. MDS(2) Parameter Typ=I2; PKW: 1HEX=1.0°C PcD Gr.: -	0 to 160 [°C]	2 i001=80 i002=80	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P361 169Hex	**Mot Tmp Fault** Limit for the fault message 'Motor overtemperature' (P626). Example: for isolation class B: <=110^{o}C; EXd<=100^{o}C for isolation class F: <=145^{o}C; EXd<=145^{o}C Description for setting: a parameter value > 0 activates this function. MDS(2) Parameter Typ=I2; PKW: 1HEX=1.0°C PcD Gr.: 0	0 to 300 [°C]	2 i001=110 i002=110	2 / BR 2 / BR

5.8 Setpoint Channel

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r410 19AHex	**act. SetpDataSet** Active setpoint channel data set Parameter values: 0: setpoint data set 1 1: setpoint data set 2 2: setpoint data set 3 3: setpoint data set 4 Analog Output: 100% @ Parameter Value=16384 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 SDS 1 SDS 2 SDS 3 SDS 4	-	3 / BR
P420 1A4Hex	**System Rtd Speed** Rated system speed Reference quantity for acceleration time (P462), deceleration time (P464), hysteresis for 'ramp generator active' message (P476), base setpoint (P445) and for speed / frequency actual values which are issued via analog outputs or serial communications. Via an anlog output actual values up to rated system speed can be issued, via automation system up to double rated system speed. Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	1.0 to 9000.0 [min-1]	- 3000.0	2 / ABR 2 / AB
P421 1A5Hex	**Fixed Freq1(set)** Note: By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. Maximum value: double rated system speed. SDS(4) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	4 i001=3000.0 i002=3000.0 i003=3000.0 i004=3000.0	2 / BR 2 / BR
P422 1A6Hex	**Fixed Freq2(set)** Note: By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. Maximum value: double rated system speed. SDS(4) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	4 i001=-3000.0 i002=-3000.0 i003=-3000.0 i004=-3000.0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P423 1A7Hex	**Fixed Freq3(set)** Note: By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. Maximum value: double rated system speed. SDS(4) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	4 i001=1000.0 i002=1000.0 i003=1000.0 i004=1000.0	2 / BR 2 / BR
P424 1A8Hex	**Fixed Freq4(set)** Note: By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. Maximum value: double rated system speed. SDS(4) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	4 i001=250.0 i002=250.0 i003=250.0 i004=250.0	2 / BR 2 / BR
P425 1A9Hex	**MotPot Storing** Saving of the setpoint which has come from the motor operated potentiometer (MOP) at turn OFF / power outage The saved setpoint signal is active again after a new ON command (P443=1002, main setpoint from MOP). If saving of the MOP setpoint is not active, the MOP start frequency is cleared after an OFF command or a power outage. Parameter values: 0: MOP setpoint is not saved 1 : MOP setpoint is saved Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 OFF ON	- 0	2 / BR 2 / BR
P426 1AAHex	**MOP start speed** Start speed of the motor operated potentiometer (MOP) Description for Setting: This value may also be changed via bits of the control word (P573 (MOP up), P574 (MOP down)). Depending on P425 the actual parameter value is saved or cleared after turn OFF or a power outage. Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	- 0.0	3 / BR 3 / BR
P433 * 1B1Hex	**Src AddSetpoint1** Source of the additional setpoint signal 1 (in front of the ramp generator) Parameter values: 1001: Fixed setpoints (P421 to P424) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P436 1B4Hex	**Invert Add Setp1** Inverting of the additional setpoint signal 1 Parameter values: 0: additional setpoint 1 not inverted 1: additional setpoint 1 inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 not invert. inverted	2 i001=0 i002=0	3 / BR 3 / BR
r437 1B5Hex	**n Add Setpoint 1** Actual additional speed setpoint 1 (in front of the ramp generator) Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P438 * 1B6Hex	**Src AddSetpoint2** Source of the additional setpoint signal 2 (behind the ramp generator) Parameter values: 1001: Fixed setpoints (P421 to P424) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P441 1B9Hex	**Invert Add Setp2** Inverting of the additional setpoint signal 2 Parameter values: 0: Additional setpoint 2 not inverted 1: Additional setpoint 2 inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 1 not invert. inverted	2 i001=0 i002=0	3 / BR 3 / BR
r442 1BAHex	**n Add Setpoint 2** Actual additional setpoint 2 (behind the ramp generator) Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR
P443 * 1BBHex	**Src MainSetpoint** Source of the speed main setpoint signal. Parameter values: 1002: Motor operated potentiometer (MOP) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1002 i002=1001	2 / BR 2 / BR
P446 1BEHex	**Invert Main Setp** Inverting of the main setpoint signal Parameter values: 0: Main setpoint not inverted 1: Main setpoint inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 not invert. inverted	2 i001=0 i002=0	2 / BR 2 / BR
r447 1BFHex	**n Main Setpoint** Actual speed main setpoint Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	2 / BR
P448 1C0Hex	**Jog Speed 1** Jog speed 1 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	- 200.0	2 / BR 2 / BR
P449 1C1Hex	**Jog Speed 2** Jog speed 2 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	- 1000.0	2 / BR 2 / BR
P452 1C4Hex	**Max Speed FWD** Maximum forward speed; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	2 i001=0.0 i002=0.0	2 / ABR 2 / AB

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P453 1C5Hex	**Max Speed REV** Maximum reverse speed; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	2 i001=0.0 i002=0.0	2 / ABR 2 / AB
r460 1CCHex	**n (set,Ramp IN)** Speed setpoint signal at ramp generator input Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR
P462 1CEHex	**Accel. Time** Ramp generator acceleration time for acceleration from 0 to rated system speed (P420). SDS(4) Parameter Typ=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.00 to 99.99 [s]	4 i001=10.00 i002=10.00 i003=0.01 i004=0.01	2 / ABR 2 / ABR
P464 1D0Hex	**Decel. Time** Ramp generator deceleration time for deceleration from rated system speed (P420) to standstill SDS(4) Parameter Typ=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.00 to 99.99 [s]	4 i001=20.00 i002=20.00 i003=0.01 i004=0.01	2 / ABR 2 / ABR
P476 1DCHex	**RampGen Act Hyst** Hysteresis for the message ’ramp generator active’ The message ’ramp generator active’ is issued, if |ramp generator input - ramp generator output| >= P476 * P420 . Condition: analog frequency setpoint in front of the ramp generator (see P428 and P443) Typ=O2; PKW: 1HEX=0.1% PcD Gr.: -	0.0 to 20.0 [%]	- 1.0	3 / BR 3 / BR
r478 1DEHex	**dn/dt(ramp gen)** Change of speed of the ramp generator per sampling period (4 * base sampling period (P308)) in min^{-1} / sec. Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1 PcD Gr.: 1		-	3 / BR
r480 1E0Hex	**n/f(set,rampOUT)** Speed setpoint at the output of the ramp generator Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR
r482 1E2Hex	**n (set)** Speed setpoint at the input of the control circuit Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	2 / BR
P485 1E5Hex	**System RtdTorque** Rated system torque in % of rated motor torque Scaling reference for torque setpoint signals which are entered via the admitted sources of the setpoint wiring (see process data wiring of the setpoint channel) This scaling is also valid for torque actual values which are issued via output channels (analog outputs, serial communications). Actual values up to P485 * rated motor torque can be issued via analog outputs, up to 2 * P485 * rated motor torque via automation interfaces. Typ=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.1 to 800.0 [%]	- 100.0	3 / ABR 3 / AB

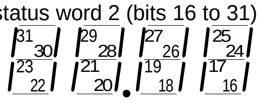
PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P486 * 1E6Hex	**Src Torque Setp** Source of the torque setpoint signal Parameter values: 1001: not allowed 1002: not allowed other values: see process data wiring of the setpoint channel. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P489 1E9Hex	**Torq setp.Invert** Inverts of the torque setpoint Parameter values: 0: Torque setpoint not inverted 1: Torque setpoint inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 not invert. inverted	2 i001=0 i002=0	3 / BR 3 / BR
r490 1EAHex	**Torque MainSetp** Actual torque setpoint in % of rated motor torque (P113) Analog Output: 100% @ Parameter Value=P485 Typ=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P492 1ECHex	**FixTorque 1 Set** Fixed upper limit of the torque setpoint in % of the rated motor torque. Note: P492 is also the upper torque limit during an external setpoint (P493 <> 1001) SDS(4) Parameter Typ=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-400.0 to 400.0 [%]	4 i001=100.0 i002=100.0 i003=100.0 i004=100.0	3 / BR 3 / BR
P493 * 1EDHex	**Src FixTorque 1** Source of the upper torque limit. Parameter values: 1001: internal upper fixed torque limit (P492) 1002: not allowed other values: see process data wiring of the setpoint channel. Note: The torque limit can only be changed within the range specified by the upper limit for the torque setpoint (P492). B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1001 i002=1001	3 / BR 3 / BR
r496 1F0Hex	**Fix Torque 1** Maximum value of the upper torque limit in % of rated motor torque Display parameter of the output of the upper torque limit (P493) Analog Output: 100% @ Parameter Value=P485 Typ=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P498 1F2Hex	**FixTorq 2 Set** Fixed lower torque limit in % of the rated motor torque. Note: P498 is also the lower torque limit during an external setpoint (P499 <> 1001) SDS(4) Parameter Typ=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-400.0 to 400.0 [%]	4 i001=-100.0 i002=-100.0 i003=-100.0 i004=-100.0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P499 * 1F3Hex	**Src FixTorq 2** Source of the lower torque limit. Parameter values: 1001: upper limit for the torque setpoint (P498) 1002: not allowed other values: see process data wiring of the setpoint channel. Note: The lower torque limit can only be changed within the range specified by the limit for the regenerative operation torque setpoint (P498). B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1001 i002=1001	3 / BR 3 / BR
r502 1F6Hex	**Fix Torque 2** Maximum value of the lower torque limit in % of rated motor torque. Display parameter of the output of the source of the lower torque limit (P499) Analog Output: 100% @ Parameter Value=P485 Typ=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P505 1F9Hex	**Torque Fix Set** Fixed setpoint for the additional torque % of the rated motor torque (P113).. SDS(4) Parameter Typ=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-150.0 to 150.0 [%]	4 i001=5.0 i002=5.0 i003=5.0 i004=5.0	3 / BR 3 / BR
P506 * 1FAHex	**Src T FixAdd Set** Source of the additional torque setpoint. Parameter values: 1001: Fixed torque setpoint (P505) 1002: not allowed other values: see process data wiring of the setpoint channel. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P507 1FBHex	**T FixAddSet Gain** Proportional gain of the additional torque setpoint B/R Parameter Typ=I2; PKW: 1HEX=0.01 PcD Gr.: 0	0.00 to 128.00	2 i001=1.00 i002=1.00	3 / BR 3 / BR
P509 1FDHex	**InvertFixAddTorq** Inverts of the additional torque setpoint Parameter values: 0: not inverted 1: inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 not invert. inverted	2 i001=0 i002=0	3 / BR 3 / BR
r510 1FEHex	**Torque AddSetp** Additional torque setpoint in % of rated motor torque; display parameter of the output of the source for the additional torque setpoint (P506) Analog Output: 100% @ Parameter Value=P485 Typ=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P512 200Hex	**Compare Speed** Compare speed for the message 'Compare speed reached' (status word 1, bit 10 (r552); see also P513 (Hysteresis) Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	0.0 to 9000.0 [min-1]	- 3000.0	3 / BR 3 / BR

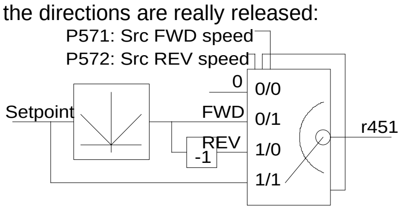
PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P513 201Hex	**Comp Speed Hyst** Hysteresis for the message 'Compare speed reached' in % of the compare speed (P512) Typ=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 100.0 [%]	- 3.0	3 / BR 3 / BR
P514 202Hex	**OFF Speed** Pulse block speed at turn OFF If after an OFF command (OFF1, OFF3) the actual value of the speed (r219) comes below this value, the pulses are blocked after the OFF wait time (P516). Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	0.0 to 9000.0 [min-1]	- 100.0	3 / BR 3 / BR
P516 204Hex	**OFF Wait Time** Wait time between reaching of the pulse block speed / frequency (P514) and pulse blocking; only for turn OFF via OFF1 or OFF3. SDS(4) Parameter Typ=O2; PKW: 1HEX=0.1s PcD Gr.: 0	0.0 to 60.0 [s]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / BR 3 / BR
P517 205Hex	**Deviation Speed** Deviation speed for the message 'Set/Actual deviation' (status word 1, bit 8 (r552)); the message is issued if the deviation is higher than the parameter value; see also P518 (deviation time) Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	0.0 to 9000.0 [min-1]	- 300.0	3 / BR 3 / BR
P518 206Hex	**Deviation Time** Minimum time of the Set/Actual deviation; after this minimum time a Set/Actual deviation (P517) issues the message 'Set/Actual deviation' (status word 1, bit 8 (r552)) Typ=O2; PKW: 1HEX=0.1s PcD Gr.: -	0.0 to 10.0 [s]	- 3.0	3 / BR 3 / BR
P519 207Hex	**Overspeed Hyst** Hysteresis of the message 'overspeed' (status word 2, bit 18 (r553)) Scaling quantity: reference values of P452 (Maximum forward frequency) and P453 (Maximum reverse frequency) Typ=O2; PKW: 1HEX=0.1% PcD Gr.: -	0.0 to 20.0 [%]	- 10.0	2 / BR 2 / BR

5.9 Control and Status Word

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r550 226Hex	**Control Word 1** Display of the control word 1 (bits 0 to 15); see section 4.3.1.1. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r551 227Hex	**Control Word 2** Display of the control word 2 (bits 16 to 31); see section 4.3.1.1. 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r552 228Hex	**Status Word 1** Display of the status word 1 (bits 0 to 15); see section 4.3.1.1. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r553 229Hex	**Status Word 2** Display of the status word 2 (bits 16 to 31); see section 4.3.1.1.  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
P554 * 22AHex	**Src ON/OFF1** Source of the 'ON/OFF1' command (Control word 1, bit 0) Details see section 4.3.1.1 Parameter values: 0: OFF1 1: not allowed 1001 CU binary input 1 1010: PMU ON/OFF keys other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1010 i002=1001	2 / BR 2 / BR
P555 * 22BHex	**Src1 OFF2(coast)** Source 1 of the 'OFF2' command (Coasting; control word 1, bit 1) Details see section 4.3.1.1 Parameter values: 0: not allowed 1: condition for operation 1001: Binary input 1 of the CU board 1010: PMU OFF key other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1002	2 / BR 2 / BR
P556 * 22CHex	**Src2 OFF2(coast)** Source 2 of the 'OFF2' command (Coasting; control word 1, bit 1) Description see P555 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P557 * 22DHex	**Src3 OFF2(coast)** Source 3 of the 'OFF2' command (Coasting; control word 1, bit 1) Description see P555 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P558 * 22EHex	**Src1 OFF3(QStop)** Source 1 of the 'OFF3' command (quick stop; control word 1, bit 2); Details see section 4.3.1.1 Parameter values: 0: not allowed 1: condition for operation 1002 binary input 2 of CU board 1010: PMU OFF key other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P559 * 22FHex	**Src2 OFF3(QStop)** Source 2 of the 'OFF3' command (quick stop; control word 1, bit 2); Description see P558 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P560 * 230Hex	**Src3 OFF3(QStop)** Source 3 of the 'OFF3' command (quick stop; control word 1, bit 2); Description see P558 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P561 * 231Hex	**Src InvRelease** Source of the 'inverter release' command (control word 1, bit 3) Details see section 4.3.1.1 Parameter values: 0: Inverter blocked 1: automatic release after wait times other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P562 * 232Hex	**Src RampGen Rel** Source of the 'ramp generator release' command (control word 1, bit 4) Details see section 4.3.1.1 Parameter values: 0: Ramp generator blocked 1: automatic release after wait times other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P563 * 233Hex	**Src RampGen Stop** Source of the 'ramp generator stop' command (control word 1, bit 5) Details see section 4.3.1.1 Parameter values: 0: ramp generator stopped 1: ramp generator released other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P564 * 234Hex	**Src Setp Release** Source of the 'setpoint release' command (control word 1, bit 6) Details see section 4.3.1.1 Parameter values: 0: Ramp generator input is set to '0' 1: Setpoint at ramp generator input other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P565 * 235Hex	**Src1 Fault Reset** Source 1 of the 'reset' command (control word 1, bit 7) Details see section 4.3.1.1 Parameter values: 0: no source selected for reset 1: not allowed 1003 Binary input 3 of the CU board other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=0 i002=1003	2 / BR 2 / BR
P566 * 236Hex	**Src2 Fault Reset** Source 2 of the 'reset' command (control word 1, bit 7) Description see P565 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=0 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P567 * 237Hex	**Src3 Fault Reset** Source 3 of the ’reset’ command (control word 1, bit 7) Description see P565 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=2001 i002=2001	2 / BR 2 / BR
P568 * 238Hex	**Src Jog1 ON** Source of the ’Jog 1’ command (control word 1, bit 8) Details see section 4.3.1.1 Parameter values: 0: no Jog operation 1: not allowed other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=0 i002=0	2 / BR 2 / BR
P569 * 239Hex	**Src Jog2 ON** Source of the ’Jog 2’ command (control word 1, bit 9) Description see P568 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=0 i002=0	2 / BR 2 / BR
P571 * 23BHex	**Src FWD speed** Source of the ’forward speed’ command (control word 1, bit 11) Parameter values: 0: forward speed blocked 1: forward speed released 1010: PMU forward/reverse key other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Note: *Both* parameters P571 and P572 or the sources defined by them define which of the directions are really released:  B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P572 * 23CHex	**Src REV speed** Source of the ’reverse speed’ command (control word 1, bit 12) Parameter values: 0: reverse speed blocked 1: reverse speed released 1010: PMU forward/reverse key other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Note: *Both* parameters P571 and P572 or the sources defined by them define which of the directions are really released; see figure at P571 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P573 * 23DHex	**Src MOP UP** Source of the command ’motor operated potentiometer (MOP) UP’ (control word 1, bit 13) Parameter values: 0: not active 1: not allowed 1010: PMU UP key other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1010 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P574 * 23EHex	**Src MOP DOWN** Source of the command 'motor operated potentiometer (MOP) DOWN' (control word 1, bit 14) Parameter values: 0: not active 1: not allowed 1010: PMU DOWN key other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1010 i002=0	2 / BR 2 / BR
P575 * 23FHex	**Src No Ext Fault1** Source of the message 'external fault 1' (control word 2, bit 27); L-level causes fault trip of the drive Parameter values: 0: not allowed 1: no external fault 1 1003: Binary input 3 of CU board other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P576 * 240Hex	**Src SetpDSetBit0** Source of bit 0 for the selection of the setpoint channel data set (SDS; control word 2, bit 16) Parameter values: 0: SDS bit 0 has value of 0 1: SDS bit 0 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P577 * 241Hex	**Src SetpDSetBit1** Source of bit 1 for the selection of the setpoint channel data set (SDS; control word 2, bit 17) Parameter values: 0: SDS bit 1 has value of 0 1: SDS bit 1 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P578 * 242Hex	**Src MotDSet Bit0** Source of bit 0 for the selection of motor data set (MDS; control word 2, bit 18) Parameter values: 0: MDS bit 0 has value of 0 1: MDS bit 0 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Note: The motor data set can not be changed during operation; a change of this bit will only become effective in the ready state. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P580 * 244Hex	**Src FixSetp Bit0** Source of bit 0 to select a fixed setpoint FS (control word 2, bit 20) Parameter values: 0: FS bit 0 has value of 0 1: FS bit 0 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=1004	2 / BR 2 / BR
P581 * 245Hex	**Src FixSetp Bit1** Source of bit 1 to select a fixed setpoint FS (control word 2, bit 21) Parameter values: 0: FS bit 1 has value of 0 1: FS bit 1 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	2 / BR 2 / BR
P583 * 247Hex	**Src Fly Release** Source of the command 'release of flying restart' (control word 2, bit 23) Parameter values: 0: Flying restart not released 1: Flying restart released with every ON command other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	2 / BR 2 / BR
P585 * 249Hex	**Src Reg Release** Source of the command 'release of the n/f regulator' (control word 2, bit 25) Parameter values: 0: regulator blocked 1: regulator is released with pulse release other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=1 i002=1	3 / BR 3 / BR
P586 * 24AHex	**Src No ExtFault2** Source of the message 'external fault 2' (control word 2, bit 26) If an ON command is active, L-level causes fault trip after 200 msec Parameter values: 0: not allowed 1: no external fault 2 1004: CU binary input 4 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 i001=1 i002=1	2 / BR 2 / BR
P587 * 24BHex	**Src Master/Slave** Source of the switching command 'master / slave drive' (control word 2, bit 15) Parameter values: 0: Master drive: the control circuit operates with internal speed / frequency setpoints (n/f regulation) 1: Slave drive: the control circuit operates with torque setpoints (T regulation, see P486) other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P588 * 24CHex	**Src No Ext Warn1** Source of the message 'external warning 1' (control word 2, bit 28) Parameter values: 0: not allowed 1: no external warning 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 i001=1 i002=1	3 / BR 3 / BR
P589 * 24DHex	**Src No Ext Warn2** Source of the message 'external warning 2' (control word 2, bit 29) Parameter values: 0: not allowed 1: no external warning 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 i001=1 i002=1	3 / BR 3 / BR
P590 * 24EHex	**Src Base/Reserve** Source of the switching command 'base / reserve settings' (control word 2, bit 30) Parameter values: 0: base setting 1: reserve setting 1005: Binary input 5 of the CU board other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	- 1005	3 / BR 3 / BR
P591 * 24FHex	**Src ContactorMsg** Source of the message 'main contactor energized' (control word 2, bit 31) Parameter values: 0: not allowed 1: no message; main contactor must be energized within 120 msec after the related command 1001 to 1005: CU terminals 4101 to 4116: SCB-SCI1 terminals (serial I/O) 4201 to 4216: SCB-SCI2 terminals (serial I/O) 5001: TSY terminal 1 Notes: If the function is active, pulses are released as soon as the message is available. No base / reserve settings possible Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	- 1	3 / BR 3 / BR
P600 * 258Hex	**Dst Ready for ON** Destination of the status bit 'ready for turn ON' (status word 1, bit 0) Power is ON, the drive may be turned on. Parameter values: Depending on the selected index all settings according to section 4.3.1.2 (process data wiring of the status word) may be selected. Indices: i001: BD: selection of a base drive terminal i002: SCI : selection of a SCI1/2 terminal i003: TSY : selection of a TSY terminal Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P601 * 259Hex	**Dst Rdy for Oper** Destination of the status bit 'ready for operation' (status word 1, bit 1) The DC bus is charged, pulses may be released. Parameter values, indices: as P600. Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P602 * 25AHex	**Dst Operation** Destination of the status bit 'operation' (status word 1, bit 2) The drive is in operation. Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P603 * 25BHex	**Dst Fault** Destination of the status bit 'fault' (status word 1, Bit 3) Note: for issuing the fault message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1002 i002=0 i003=0	2 / BR 2 / BR
P604 * 25CHex	**Dst NO OFF2** Destination of the status bit 'no OFF2 command' (status word 1, bit 4) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P605 * 25DHex	**Dst NO OFF3** Destination of the status bit 'no OFF3 command' (status word 1, bit 5) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P606 * 25EHex	**Dst ON blocked** Destination of the status bit 'turn-ON locked' (status word 1, bit 6) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P607 * 25FHex	**Dst Warning** Destination of the status bit 'warning' (status word 1, bit 7) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P608 * 260Hex	**Trg Bit Deviat.** Destination of the status bit 'set frequency = act. frequency' (status word 1, bit 8) - see P517; for details see section 4.3.1.2 Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P610 * 262Hex	**Dst CompareSpeed** Destination of the status bit 'compare speed reached' (status word 1, bit 10) - see P512; for details see section 4.3.1.2 Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P611 * 263Hex	**Dst Low Voltage** Destination of the status bit 'undervoltage' (status word 1, bit 11) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P612 * 264Hex	**Dst Contactor** Destination of the bit 'energize main contactor' (status word 1, bit 12); H-level: energize contactor! Note: If the message 'main contactor energized' is not selected (P591=1), the main contactor must be energized within 120 ms after the bit 'energize main contactor' is set. Attention: For switching voltages between 50 and 230 V AC only the following relays may be used: - relay on the PEU or the PSU board (driven via binary output 1) or - the relays of the optional SCI boards, which are specified for 230 V AC (see section 9.6) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1001 i002=0 i003=0	3 / BR 3 / BR
P613 * 265Hex	**Dst RampGen act** Destination of the status bit 'ramp generator active' (status word 1, bit 13) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P614 * 266Hex	**Dst FWD speed** Destination of the status bit 'speed direction' (status word 1, bit 14) Meanings: H-level: forward L-level: reverse Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P615 * 267Hex	**Z.KIP aktiv** Destination of the status bit 'power ride thru (PRT) active' (status word 1, bit 15) --- is not activated at SIMOVERT SC --- Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P616 * 268Hex	**Dst Fly Restart** Destination of the status bit 'flying restart active' (status word 2, bit 16) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P618 * 26AHex	**Dst No Overspeed** Destination of the status bit 'no overspeed' (status word 2, bit 18) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P619 * 26BHex	**Dst Ext Fault 1** Destination of the status bit 'external fault 1' (status word 2, bit 19) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P620 * 26CHex	**Dst Ext Fault 2** Destination of the status bit 'external fault 2' (status word 2, bit 20) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). If an ON command is active, L-level causes fault trip after 200 msec. Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P621 * 26DHex	**Dst Ext Warning** Destination of the status bit 'external warning' (status word 2, bit 21) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P622 * 26EHex	**Dst i2t Drive** Destination of the status bit 'warning drive overload' (status word 2, bit 22); see r010 (drive utilization) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P623 * 26FHex	**Dst TmpFlt Drive** Destination of the status bit 'fault drive overtemperature' (status word 2, bit 23); see r011 (drive temperature) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P624 * 270Hex	**Dst TmpWarnDrive** Destination of the status bit 'warning drive overtemperature' (status word 2, bit 24); see r011 (drive temperature) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P625 * 271Hex	**Trg BitWarTmpMot** Destination of the status bit 'warning motor overtemperature' (status word 2, bit 25); Reason: The condition for the warning is met KTY84 sensor monitoring (see r009 (motor temperature), P360 (motor temperature warning)). Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P626 * 272Hex	**Trg BitFltTmpMot** Destination of the status bit 'fault motor overtemperature' (status word 2, bit 26); Reason: The condition for the fault is met KTY84 sensor monitoring (see r009 (motor temperature), P360 (motor temperature warning)). Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P628 * 274Hex	**Dst PullOut/Blck** Destination of the status bit 'fault motor pulled out / blocked' (status word 2, bit 28) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). --- is not activated at SIMOVERT SC --- Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P629 * 275Hex	**Dst ChrgRelay ON** Destination of the status bit 'charging relay energized' (status word 2, bit 29) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P631 * 277Hex	**Dst Pre-Charging** Destination of the status bit 'charging active' (status word 2, bit 31) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

5.10 Analog Input/Output

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P650 * 28AHex	**CU AnalogInConf** Configuration of the CU analog inputs; defines the kind of the analog input signals Parameter values Terminal 27 Terminal 29 0: -10 V ... + 10 V - 20 mA ... + 1: 0 V ... + 10 V 0 mA ... + 2: + 4 mA ... + 20 mA Notes: Only one signal can be wired per input; alternatively voltage or current signals can be evaluated. Voltage and current signals must be connected to different terminals. Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar. At setting 2 an input current < 2 mA causes a fault trip (broken wire proof) The offset scaling of the analog inputs is done via P652. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 -10V...+10V 0V...+10V 4mA...20mA	- 0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P651 * 28BHex	**CU AnaInSmooth** Filter time constant of the CU analog inputs. Typ=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	0 to 1000 [ms]	- 4	2 / BR 2 / BR
P652 28CHex	**CU AnalogIn Offs** Offset scaling of the CU analog inputs Description for setting see section 4.3.4 Typ=I2; PKW: 1HEX=0.001V PcD Gr.: 0	-20.000 to 20.000 [V]	- 0.000	2 / BR 2 / BR
P655 * 28FHex	**CU AnaOut ActVal** Actual value output via the CU analog output Description for setting: enter the parameter number of the quantity, which is to be issued. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	- 219	2 / BR 2 / BR
P656 290Hex	**CU AnalogOutGain** Proportional gain of the CU analog output, see section 4.3.5 Parameter values: P656= calculated output voltage at when the displayed parameter has a value of 100% The output voltage V(out) is calculated according to: $V(out) = \frac{\text{value of displayed parameter}}{100\ \%} * P656 + P657$ Note: Maximum value of the output voltage: +/- 10 V Typ=I2; PKW: 1HEX=0.01V PcD Gr.: 0	-320.00 to 320.00 [V]	- 10.00	2 / BR 2 / BR
P657 291Hex	**CU AnalogOutOffs** Offset of the CU analog output; see P656 Typ=I2; PKW: 1HEX=0.01V PcD Gr.: 0	-100.00 to 100.00 [V]	- 0.00	2 / BR 2 / BR
P660 294Hex	**SCI AnalogInConf** Configuration of the SCI analog inputs; defines the kind of the input signals Parameter values — Terminals X428 / 3, 6, 9 — Terminals X428 / 5, 8, 11 0: -10 V ... + 10 V — - 20 mA ... + -10V...+10V 1: 0 V ... + 10 V — 0 mA ... + 0V...+10V 2: — 4 mA ... + 20 mA 4mA...20mA Notes: Only one signal can be wired per input; alternatively voltage or current signals can be evaluated. Voltage and current signals must be connected to different terminals. Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar. At setting 2 an input current < 2 mA causes a fault trip (broken wire proof) The offset scaling of the analog inputs is done via P662. Indices: i001: SI11 Slave 1, analog input 1 i002: SI12 Slave 1, analog input 2 i003: SI13 Slave 1, analog input 3 i004: SI21 Slave 2, analog input 1 i005: SI22 Slave 2, analog input 2 i006: SI23 Slave 2, analog input 3 Condition: the related SCB board must be reported via P090 and P091, respectively Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2	6 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	3 / BR 3 / BR
P661 295Hex	**SCI AnaInSmooth** Filter time constant of the SCI analog inputs; Formula: $T = 2\ ms * 2^{P661}$ Indices: see P660 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 15	6 i001=2 i002=2 i003=2 i004=2 i005=2 i006=2	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P662 296Hex	**SCI AnalogInOffs** Offset scaling of the SCI analog inputs Description for setting see SCI manual Indices: see P660 Typ=I2; PKW: 1HEX=0.01V PcD: 4000HEX=160V	-20.00 to 20.00 [V]	6 i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	3 / BR 3 / BR
P664 * 298Hex	**SCI AnaOutActVal** Actual value output via SCI analog outputs Description for setting: enter the parameter number of the quantities, which are to be issued; for details see SCI manual. Indices: i001: Sl11 Slave 1, analog output 1 i002: Sl12 Slave 1, analog output 2 i003: Sl13 Slave 1, analog output 3 i004: Sl21 Slave 2, analog output 1 i005: Sl22 Slave 2, analog output 2 i006: Sl23 Slave 2, analog output 3 Condition: the related SCB board must be reported via P090 and P091, respectively Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 1999	6 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	3 / BR 3 / BR
P665 299Hex	**SCI AnaOut Gain** Proportional gain of the SCI analog outputs Description for setting: see SCI manual Indices: see P664 Typ=I2; PKW: 1HEX=0.01 PcD: 4000HEX=160V	-320.00 to 320.00	6 i001=10.00 i002=10.00 i003=10.00 i004=10.00 i005=10.00 i006=10.00	3 / BR 3 / BR
P666 29AHex	**SCI AnaOut Offs** Offset of the SCI analog outputs Indices: see P664 Typ=I2; PKW: 1HEX=0.01V PcD: 4000HEX=160V	-100.00 to 100.00 [V]	6 i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	3 / BR 3 / BR

5.11 Communications

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P680 * 2A8Hex	**SCom1 Act Value** Actual value output via serial communication SST1 Defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r968) For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred The length (number of words) of the process data part of the telegram is set by P685, i001 Indices: i001=WD01: Word 01 of the (process data part of the) telegram i002=WD02: Word 02 of the (process data part of the) telegram ... i016=WD16: Word 16 of the (process data part of the) telegram Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P681 * 2A9Hex	**SCom2 Act Value** Actual value output via serial communication SST1 Defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r968) For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred The length (number of words) of the process data part of the telegram is set by P685, i001 Indices: i001=WD01: Word 01 of the (process data part of the) telegram i002=WD02: Word 02 of the (process data part of the) telegram ... i016=WD16: Word 16 of the (process data part of the) telegram Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P682 2AAHex	**SCB Protocol** SCB can be operated as - master for the SCI boards or as - serial communications board (see SCB manual). Parameter values: 0 = Master for SCI boards 1 = 4 wire USS 2 = 2 wire USS 3 = Peer to Peer 4 = not used 5 = not used Condition: SCB board must be reported via P090 and 0P91, respectively Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 SCI Module 4 wire USS 2 wire USS Peer 2 Peer Option 1 Option 2	- 0	3 / H BR 3 / H
P683 * 2ABHex	**SCom/SCB BusAddr** Bus address of the serial communication interfaces (see section 4.3.6.1) Indices: i001 = SCo1: bus address of serial comm. interface 1 (CU) i002 = SCB: SCB bus address, if P682=1, 2 i003=SCo2: bus address of serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 31	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P684 * 2ACHex	**SCom/SCB Baud** Serial interfaces baud rate Parameter values: 1: 300 Baud 5: 4800 Baud 2: 600 Baud 6: 9600 Baud 3: 1200 Baud 7: 19200 Baud 4: 2400 Baud 8: 38400 Baud Indices: i001 = SCo1: baud rate of serial comm. interface 1 (CU) i002 = SCB: SCB baud rate, if P682=1, 2, 3 i003=SCo2: baud rate of serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 8	3 i001=6 i002=6 i003=6	3 / BR 3 / BR
P685 * 2ADHex	**SCom/SCB PCV** Number of words (16 bit) of the parameter data part in the net data block of the telegram. Parameter values: 0: no parameter data part in the telegram 3, 4 parameter data part is 3 (parameter identifier, Ind, parameter value) ,4 words long 127 variable parameter data length for the transfer of parameter description and texts. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682=1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 127	3 i001=127 i002=3 i003=3	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P686 * 2AEHex	**SCom/SCB # PrDat** Number of words (16 bit) of the process data part in the net data block of the telegram. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682=1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 16	3 i001=2 i002=2 i003=2	3 / BR 3 / BR
P687 * 2AFHex	**SCom/SCB TlgOFF** Telegram OFF time of CU and SCB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: Value 0: no monitoring, no fault trip; must be parameterized for sporadic (a-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682=1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0ms PcD: 4000HEX=1638.4ms	0 to 6500 [ms]	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P689 2B1Hex	**SCB Peer2PeerExt** Immediate transfer on of data received via the peer to peer protocol of SCB. Mark of these words of the received peer to peer telegram which are to be transferred on immediately. Parameter values: 0: no immediate transfer (only to CU) 1: immediate transfer (and passing to CU) Indices: i001 = WD01: Word 01 of the (process data part of the) telegram i002 = WD02: Word 02 of the (process data part of the) telegram ... i016 = WD16: Word 16 of the (process data part of the) telegram Condition: P688 = 3 (peer to peer protocol) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 CU only Transfer	5 i001=0 i002=0 i003=0 i004=0 i005=0	3 / BR 3 / BR
P690 * 2B2Hex	**SCB Act Values** Actual value output via the serial communications interface of the SCB board; defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r968) For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred The length (number of words) of the process data part of the telegram is set by P685, i002 Indices: i001=WD01: Word 01 of the (process data part of the) telegram i002=WD02: Word 02 of the (process data part of the) telegram ... i016=WD16: Word 16 of the (process data part of the) telegram ATTENTION: if P682 = 3 (peer to peer protocol) a maximum of 5 words (i001 to i005) can be transferred Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P694 * 2B6Hex	**CB/TB Act Values** Output of analog values via CB or TB; defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r968) For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred Indices: i001=WD01: Word 01 of the (process data part of the) telegram i002=WD02: Word 02 of the (process data part of the) telegram ... i016=WD16: Word 16 of the (process data part of the) telegram Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P695 * 2B7Hex	**CB/TB TlgOFFTime** Telegram lag time of CB and TB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: Value 0: no monitoring, no fault trip; must be parameterized for sporadic (non-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. Typ=O2; PKW: 1HEX=1.0ms PcD: 4000HEX=1638.4ms	0 to 6500 [ms]	- 10	3 / BR 3 / BR
P696 2B8Hex	**CB Parameter 1** Communication Board parameter 1; see manual of the used communication board Description for setting: Parameter is only needed if a communication board is reported (P090 or P091 = 1) The communication board checks, if the set value is valid. If the value is not accepted, the fault message 80 is issued with fault value 5 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P697 2B9Hex	**CB Parameter 2** Communication Board parameter 2; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P698 2BAHex	**CB Parameter 3** Communication Board parameter 3; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P699 2BBHex	**CB Parameter 4** Communication Board parameter 4; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P700 2BCHex	**CB Parameter 5** Communication Board parameter 5; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P701 2BDHex	**CB Parameter 6** Communication Board parameter 6; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P702 2BEHex	**CB Parameter 7** Communication Board parameter 7; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P703 2BFHex	**CB Parameter 8** Communication Board parameter 8; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P704 2C0Hex	**CB Parameter 9** Communication Board parameter 9; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P705 2C1Hex	**CB Parameter 10** Communication Board parameter 10; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H

5.12 Diagnosis

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r720 2D0Hex	**SW Version** Software version of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: Software version of the PCB in position 1 (left) i002: Pos2: Software version of the PCB in position 2 (right) i003: Pos3: Software version of the PCB in position 3 (center) i004: Text: Software version of the text EPROM in position 1 Typ=O2; PKW: 1HEX=0.1 PcD Gr.: 0		4	3 /U BR
r721 2D1Hex	**SW Generat.Date** Software generation date of the CU board. Indices: i001= Year: Year i002= Mon.: Month i003= Day: Day Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	3 /U BR
r722 2D2Hex	**SW ID** Expanded software version code of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: Software code of the PCB in position 1 (left) i002: Pos2: Software code of the PCB in position 1 (right) i003: Pos3: Software code of the PCB in position 1 (center) i004: Text: Software code of the text EPROM in position 1 Note: The TSY board has no software code; the reported code is always '0.0' Typ=O2; PKW: 1HEX=0.1 PcD Gr.: 0		4	3 /U BR
r723 2D3Hex	**PCB Code** Identification code of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: PCB code of the PCB in position 1 (left) i002: Pos2: PCB code of the PCB in position 2 (right) i003: Pos3: PCB code of the PCB in position 3 (center) PCB codes: CU: 100 - 109 CB: 140 - 149 TB: 130 - 139 SCB: 120 - 129 TSY: 110 - 119 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	3 /U BR
r725 2D5Hex	**CalcTimeHeadroom** Calculation time headroom of the CU board CPU in % of the computing power; influenced by pulse frequency (P761) and sampling time (P308). Analog Output: 100% @ Parameter Value=16384% Typ=O2; PKW: 1HEX=1.0% PcD Gr.: 0	 [%]	-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r730 2DAHex	**SCB Diagnosis** SCB diagnosis (all values in HEX display). Displayed numbers have an overflow at FF. The meaning of several Indices depends of the selected SCB protocol (P682). Indices: i001: fITC Number of error-free telegrams i002: Terr Number of error telegrams i003: Voff USS: Number of Byte-Frame-errors SCI boards: number of slave power outages i004: Toff USS: Number of Overrun-errors SCI boards: number of fiber optic link interrupts i005: PnoS USS: Parity error SCI boards: number of missing answer telegrams i006: STxL USS: STX-error SCI boards: number of search telegrams to accept a slave i007: ETX ETX-error i008: BcCC USS: Block-Check-error SCI boards: number of configuration telegrams i009: L/Te USS/Peer to Peer: incorrect telegram length SCI modules: required maximum number of terminals according to process data wiring (P554 to P631) . i010: T/An USS: Timeout SCI modules: required analog inputs / outputs according to process data wiring of the setpoint channel and actual value output via SCI (P664) . i011: Res1 Reserve i012: Res2 Reserve i013: Warn SCB/DPR warning word i014: Sl1? Information, if slave 1 needed and if yes, which type 0: no slave 1 needed 1: SCI1 2: SCI2 i015: Sl2? Information, if slave 2 needed and if yes, which type 0: no slave 2 needed 1: SCI1 2: SCI2 i016: IniF: with 'SCI modules': initialization fault Typ=L2; PKW: 1HEX=1.0 PcD Gr.: 0		16	3 / H BR
r731 2DBHex	**CB/TB Diagnosis** For detailed information see manuals of the used communication or technology boards. Typ=L2; PKW: 1HEX=1.0 PcD Gr.: 0		32	3 / H BR
P733 * 2DDHex	**Simulated Operat** Simulated operation, allows test operation of the drive with de-energized DC bus. Parameter values: 0: no simulated operation 1: simulated operation Conditions: - 24 V auxiliary power supply must be provided - Drive must be connected to the mains via a main contactor, which is driven by the drive (see P612) Note: Simulated operation can only be selected, when the DC bus voltage (r006) is less than 5% of the rated DC bus voltage Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 off on	- 0	3 / BR 3 / B

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P735 * 2DFHex	**Trace TriggerPar** Parameter number of the signal which is to trigger the trace function; this function is realized with 8 channels. The tracer (TRC) can record internal quantities of the drive starting or ending with a certain condition. Related parameters: P735 to P737: trigger condition P738 to P739: trace quantity Indices: i001=Cha1: parameter number of the trigger signal, channel 1 i002=Cha2: parameter number of the trigger signal, channel 2 i003=Cha3: parameter number of the trigger signal, channel 3 i004=Cha4: parameter number of the trigger signal, channel 4 i005=Cha5: parameter number of the trigger signal, channel 5 i006=Cha6: parameter number of the trigger signal, channel 6 i007=Cha7: parameter number of the trigger signal, channel 7 i008=Cha8: parameter number of the trigger signal, channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P736 * 2E0Hex	**Trace Trig.Value** Parameter value for the trigger condition. Parameter value of the trigger signal which will start or stop the trace function Indices: i001=Cha1: parameter value of the trigger signal, channel 1 i002=Cha2: parameter value of the trigger signal, channel 2 i003=Cha3: parameter value of the trigger signal, channel 3 i004=Cha4: parameter value of the trigger signal, channel 4 i005=Cha5: parameter value of the trigger signal, channel 5 i006=Cha6: parameter value of the trigger signal, channel 6 i007=Cha7: parameter value of the trigger signal, channel 7 i008=Cha8: parameter value of the trigger signal, channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P737 * 2E1Hex	**Trace Trig.Cond.** Trigger condition for the trace function. Parameter values: 0: Trigger, when the value of the trigger parameter is < 736.x 1: Trigger, when the value of the trigger parameter is = 736.x 2: Trigger, when the value of the trigger parameter is > 736.x 3: Trigger with a fault trip 4: Trigger, when the value of the trigger parameter is <> 736.x Indices: i001=Cha1: trigger condition for channel 1 i002=Cha2: trigger condition for channel 2 i003=Cha3: trigger condition for channel 3 i004=Cha4: trigger condition for channel 4 i005=Cha5: trigger condition for channel 5 i006=Cha6: trigger condition for channel 6 i007=Cha7: trigger condition for channel 7 i008=Cha8: trigger condition for channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 TRC off TRC Start== TRC Stop== TRC Start>= TRC Stop>= TRC Start<= TRC Stop<=	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P738 * 2E2Hex	**Trace Act.Values** Parameter number of the signal, which is to be recorded by the trace function Indices: i001=Cha1: trace parameter channel 1 i002=Cha2: trace parameter channel 2 i003=Cha3: trace parameter channel 3 i004=Cha4: trace parameter channel 4 i005=Cha5: trace parameter channel 5 i006=Cha6: trace parameter channel 6 i007=Cha7: trace parameter channel 7 i008=Cha8: trace parameter channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P739 * 2E3Hex	**Trace Sampl.Time** Sampling time for recording the trace values in multiples of the base sampling time (P308); this function is realized with 4 channels. Description for Setting: the sampling time is P739 * P308 Indices: i001=Cha1: sampling time channel 1 i002=Cha2: sampling time channel 2 i003=Cha3: sampling time channel 3 i004=Cha4: sampling time channel 4 i005=Cha5: sampling time channel 5 i006=Cha6: sampling time channel 6 i007=Cha7: sampling time channel 7 i008=Cha8: sampling time channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 200	8 i001=1 i002=1 i003=1 i004=1 i005=1 i006=1 i007=1 i008=1	3 / BR 3 / BR
P740 * 2E4Hex	**Trace Pretrigger** Defines the number of data recorderd before and after the trigger condition. Example: a value of 40% means, that 40% of the data have been recorded before and 60% after the trigger condition. Indices: i001=Cha1: sampling time channel 1 Indices: i002=Cha2: sampling time channel 2 Indices: i003=Cha3: sampling time channel 3 Indices: i004=Cha4: sampling time channel 4 Indices: i005=Cha5: sampling time channel 5 Indices: i006=Cha6: sampling time channel 6 Indices: i007=Cha7: sampling time channel 7 Indices: i008=Cha8: sampling time channel 8 Typ=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 100 [%]	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P741 * 2E5Hex	**TRC Start** Start command for trace function. A trace channel can only be started after completion of setting of ots parameters (P735 to P740 must have valid values). After the trace recording has been finished, the parameter is automatically reset. Parameter values: 0: trace channel stopped 1: trace channel has started Indices: i001=Cha1: start channel 1 Indices: i002=Cha2: start channel 2 Indices: i003=Cha3: start channel 3 Indices: i004=Cha4: start channel 4 Indices: i005=Cha5: start channel 5 Indices: i006=Cha6: start channel 6 Indices: i007=Cha7: start channel 7 Indices: i008=Cha8: start channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
r748 2ECHex	**Trip Time** Trip times (operating hour meter values, r013) Indices: Day / Hours / Seconds latest trip (1): i001=T1-d, i002=T1-h, i003=T1-s last reset trip(2): i004=T2-d, i005=T2-h, i006=T2-s (last+1) reset trip (3): i007=T3-d, i008=T3-h, i009=T3-s ... oldest saved trip (8): i022=T8-d, i023=T8-h, i024=T8-s Trip description by: r947 Fault number r949 Fault value r951 list of fault numbers P952 number of faults Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		24	2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P750 * 2EEHex	**TRC Read Index** Number of the trace data block for each trace channel, whcih can be read via r751 to r758. Indices: i001=Cha1: data block number channel 1 i002=Cha2: data block number channel 2 i003=Cha3: data block number channel 3 i004=Cha4: data block number channel 4 i005=Cha5: data block number channel 5 i006=Cha6: data block number channel 6 i007=Cha7: data block number channel 7 i008=Cha8: data block number channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 255	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
r751 2EFHex	**TRC Data Ch 1** Displays teh trace data of channel 1. The blcok number of the trace data is set in P750. If all data of an array are requested via an automation interface in one order, P750.1 is automatically increased by 1 during the output. This allows an optimized reading of trace data. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r752 2F0Hex	**TRC Data Ch 2** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r753 2F1Hex	**TRC Data Ch 3** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r754 2F2Hex	**TRC Data Ch 4** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r755 2F3ex	**TRC Data Ch 5** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r756 2F4Hex	**TRC Data Ch 6** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r757 2F5ex	**TRC Data Ch 7** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r758 2F6Hex	**TRC Data Ch 8** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR

5.13 Modulator

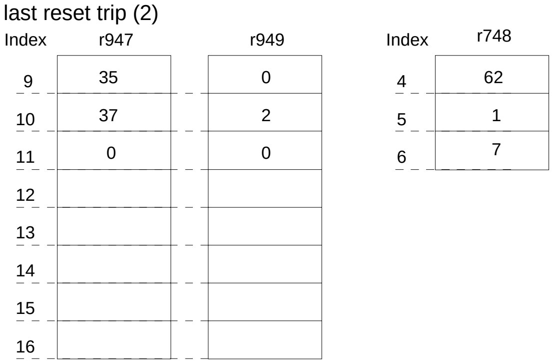
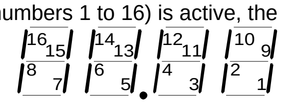
PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P761 2F9Hex	**Pulse Frequency** Pulse frequency at asynchronous space vector modulation; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1kHz PcD Gr.: 0	5.0 to 7.5 [kHz]	2 i001=5.0 i002=5.0	3 / ABR 3 / A

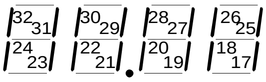
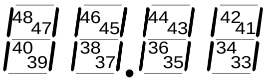
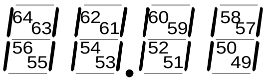
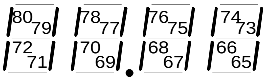
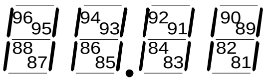
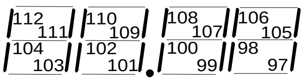
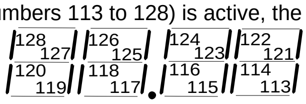
5.14 Factory Parameters

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P789 315Hex	**RAM Access Value** Value of the memory cell (RAM) which has been addressed by P788 Typ=L2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / BR 4 / BR
P799 * 31FHex	**Special Access** Parameter for special access Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 /U BR 3 /U BR
P917 * 395Hex	**Change reports** Defines the interfaces, where active parameters are reported if they are changed. Parameter values: 0: none 1: output via dual port RAM (TB, CB) 2: output via serial comm. interface 1 (SCom1) 4: output via SCB with USS protocol 8: Output via serial comm. interface 2 (SCom2) Description for setting: enter the total of the figures which are related to the interfaces, which are to issue the message. Typ=V2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 15	- 0	3 / B 3 / B

5.15 Profile Parameters

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P918 396Hex	**CB Bus Address** Protocol depending bus address for communication boards; see manual of these boards Note: The communication board checks, if the set value is valid. If the value is not accepted, the fault message 80 is issued with fault value 5 Condition: P090=1 or P091=1 (communication board installed) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 126	- 3	3 / H BR 3 / H
P927 * 39FHex	**Parameter Access** Release of interfaces for the parameterization; description see P053. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 63	- 6	3 / BR 3 / BR
P928 * 3A0Hex	**Src Base/Reserve** Source of the switching command ’base / reserve settings’ (control word 2, bit 30); parameter is identical with P590 - description there Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	- 1005	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r947 3B3Hex	**Fault Memory** Display of the faults which have occurred at the last 8 trips (r748); at every trip up to 8 faults can be saved, related to each of them a fault number (see list of faults, chapter 7) is related. For text display of the faults see r951. Indices: Fault 1 / Fault 2 / ... / Fault 8 latest trip (1): i001=F1-1, i002=F1-2, ..., i008=F1-8 last reset trip (2): i009=F2-1, i010=F2-2, ..., i016=F2-8 (last+1) reset trip (3): i017=F3-1, i018=F3-2, ..., i024=F3-8 ... oldest saved trip (8): i057=F8-1, i058=F8-2, ..., i064=F8-8 Notes: A value of '0' means 'no fault' Number of saved trips: see P952. Example of a trip: last reset trip (2)  Trip time (r748): after 62 days, 1 hour, 7 sec of operation Faults (r947): Fault value (r949): 35 not defined 37 2 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		64	2 / BR
r949 3B5Hex	**Fault Value** Fault values of the faults; allows a more detailed diagnosis at several faults. The fault values are saved in the same indices as the related fault numbers (r947) - see example at P947. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		64	3 / BR
r951 3B7Hex	**Fault Texts** List of fault texts; every fault text is saved in the index equivalent to its fault number. Example (see P947): Value of P947, i09 is '*35*'. The related fault was (P951, i*35*): 'Ext. Fault1'. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	2 / BR
P952 * 3B8Hex	**# of Faults** Number of saved trips (max. 8). If the parameter is set to '0', the diagnosis memory (r748 - trip times, r947 - fault number, r949 fault value) is cleared. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 8	- 0	2 / BR 2 / BR
r953 3B9Hex	**Warning Param1** If a warning (numbers 1 to 16) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r954 3BAHex	**Warning Param2** If a warning (numbers 17 to 32) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r955 3BBHex	**Warning Param3** If a warning (numbers 33 to 48) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r956 3BCHex	**Warning Param4** If a warning (numbers 49 to 64) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r957 3BDHex	**Warning Param5** If a warning (numbers 65 to 80) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r958 3BEHex	**Warning Param6** If a warning (numbers 81 to 96) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r959 3BFHex	**Warning Param7** If a warning (numbers 97 to 112 is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r960 3C0Hex	**Warning Param8** If a warning (numbers 113 to 128) is active, the related bar in the display is  ON Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r964 3C4Hex	**Drive ID** Drive ID Text string; contains information about the ID# (first 2 bytes of the string, used to identify the drive by Profibus) and about the drive type name (last 24 bytes of the string, used for display in visualization systems). Parameter values: 2 Bytes: ID#: 8022Hex 24 Byte: model name according to the drive type: SIMOVERT SC Note: the parameter is not accessible via PMU or OP. Typ=VS; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r965 3C5Hex	**Profile #** PROFIBUS specific parameter Note: the parameter is not accessible via PMU or OP. Typ=OS; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r967 3C7Hex	**Control Word 1** Display parameter of control word 1 (bit 0-15) Identical with r550 (control word 1) Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r968 3C8Hex	**Status Word 1** Display parameter of status word 1 (bit 0 - 15) Identical with r552 (status word 1) Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
P970 * 3CAHex	**Factory Settings** Parameter reset to factory settings Parameter values: 0: Parameter reset: all parameters are reset to their original values (factory settings); after this the parameter is reset to '1'. 1: no parameter reset Note: This function can also be selected via P052=1. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 FactSetting Return	- 1	3 / B 3 / B
P971 * 3CBHex	**EEPROM Saving** Saves parameter values in the EEPROM with a transition of the parameter value from 0 to 1. Parameter values: 0: no saving of parameter values 1: a transition from 0 to 1 saves the RAM values to the EEPROM Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1	- 0	3 / BR 3 / BR
r980 3D4Hex	**Par # List pt1** List of the available parameter numbers; part 1 The parameter numbers are listed in a positive sequence. The first existing '0' shows, that no more parameter numbers are available. Index range: 1 to 116. As special function the value of i116 is the number of the parameter which contains the next following part of the list. If i116 has a value of '0' then there are no more parts of the list. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r981 3D5Hex	**Par # List pt2** List of the available parameter numbers; part 2; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r982 3D6Hex	**Par # List pt3** List of the available parameter numbers; part 3; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r983 3D7Hex	**Par # List pt4** List of the available parameter numbers; part 4; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r984 3D8Hex	**Par # List pt5** List of the available parameter numbers; part 5; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r985 3D9Hex	**Par # List pt6** List of the available parameter numbers; part 6; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r986 3DAHex	**Par # List pt7** List of the available parameter numbers; part 7; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r987 3DBHex	**Par # List pt8** List of the available parameter numbers; part 8; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r988 3DCHex	**Par # List pt9** List of the available parameter numbers; part 9; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r989 3DDHex	**Par # List pt10** List of the available parameter numbers; part 10; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r990 3DEHex	**Par # List chg1** List of the changed parameters; part 1 The parameter numbers are listed in a positive sequence. The first existing '0' shows, that no more parameter numbers are available. Index range: 1 to 116. As special function the value of i116 is the number of the parameter which contains the next following part of the list. If i116 has a value of '0' then there are no more parts of the list. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r991 3DFHex	**Par # List chg2** List of the changed parameters; part 2; see r990. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r992 3E0Hex	**Par # List chg3** List of the changed parameters; part 3; see r990. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	116	116	3 / BR

6 Operator control

The converter can be controlled via:

- the PMU (Parameterization Unit)
- the control terminal strip on the CU (section 3.3 “Control terminal strip“)
- the OP1 operator control panel (section 9 “Options“)
- the RS485 and RS232 serial interface on PMU-X300

Operator control using the PMU is described in this section.

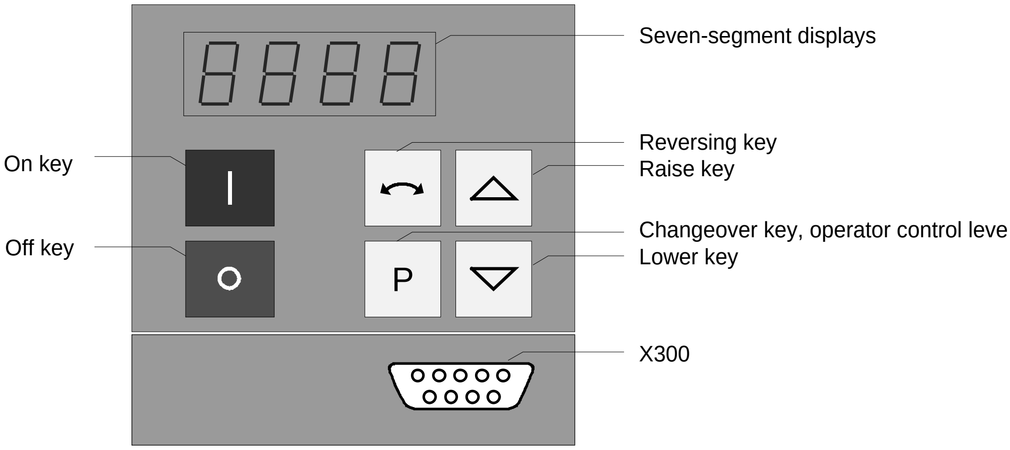


Fig. 6.1 Parameterization unit

6.1 Operator control elements

Operator control elements	Function
I	Converter switch on (standard). For faults: Return to the fault display. Command is effective when the key is released.
O	Converter shutdown depending on the parameterization of OFF1, Off2 or Off3 (P554 to P560). Command becomes effective when the key is released.
↶	Field reversal / reversing for the appropriate parameterization. Command becomes effective when the key is released.
P	Changeover from parameter number to parameter value. In conjunction with other keys, additional functions (refer to Figs. 6.2 to 6.4). Command becomes effective when the key is released.
△ , ▽	Values (raise, lower) change as long as the keys are depressed.
P + △ resp. P + ▽	Depress P and hold, then depress the second key. The command becomes effective when the key is released (e.g. fast changeover).

Table 6.1 Function of the operator control elements on the PMU

6.2 Displays 8.8.8.8.

		Parameter number		Index	Parameter value
		Pos. actual value e.g	Neg. actual value e.g	e.g..	e.g.
Visualization parameters	Basic converter	r000	r.000	---	°009
	Technology board	d000	d.000		
Setting parameters	Basic converter	P005	P.005	1 000	-2.08
	Technology board	H002	H.002		

Table 6.2 Displaying visualization- and setting parameters on the PMU

	Actual value	Parameter value not possible	Alarm	Fault
Display	-2.08	---- ----	A022	F006

Table 6.3 Status display on the PMU

Note
The parameter description is provided in section 5 “Parameter list“.

6.3 Structure

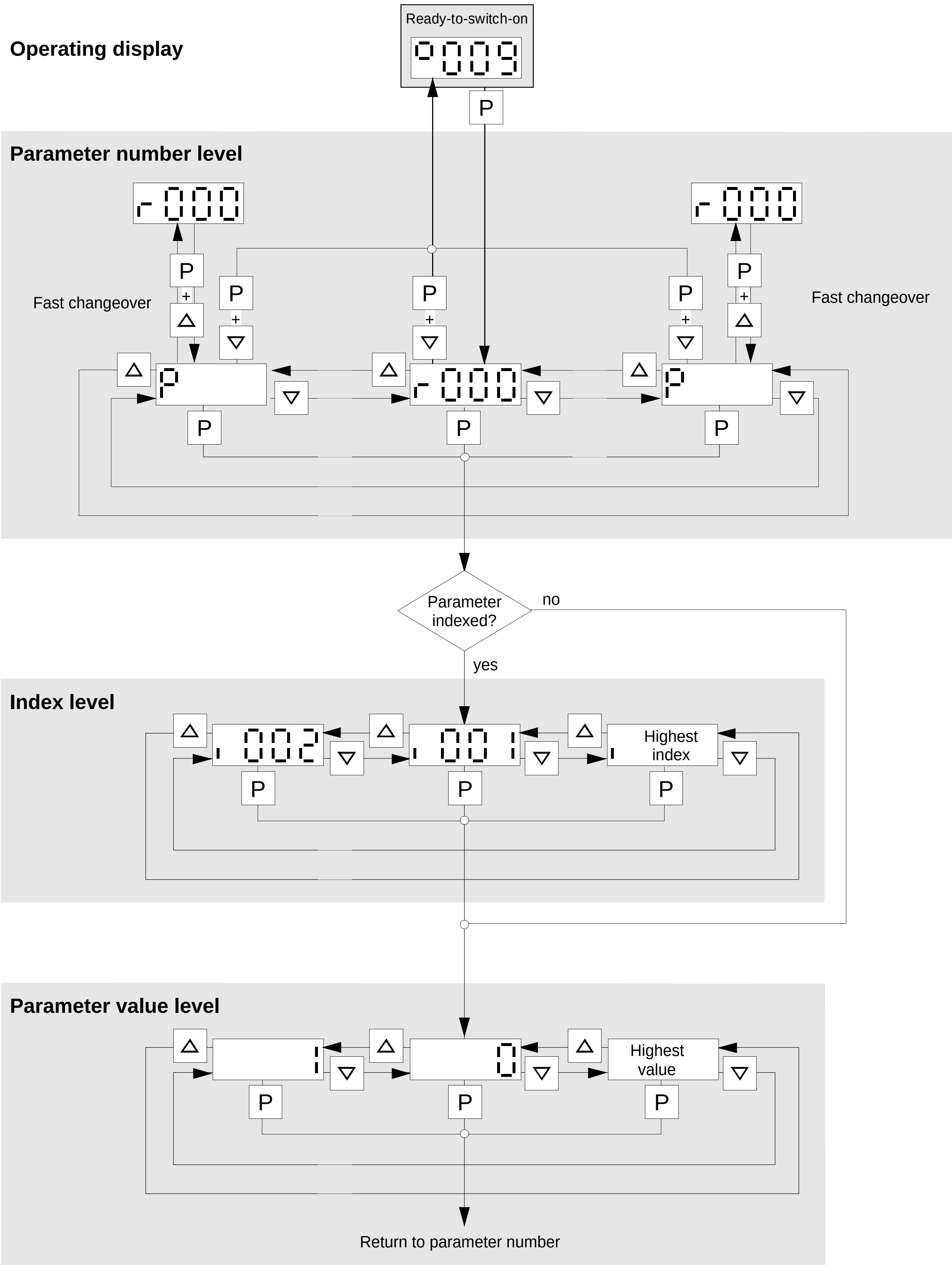
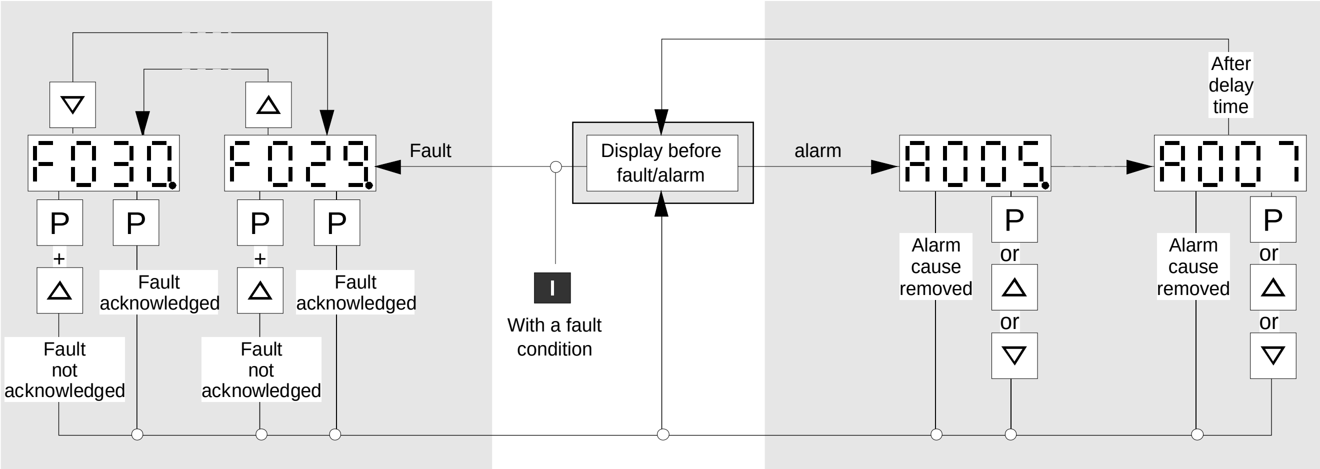


Fig. 6.2 Operator control structure using the PMU



The point for fault- or alarm messages is omitted if there is only one alarm or fault.

Fig. 6.3 Operator control structure of the PMU for alarms and faults

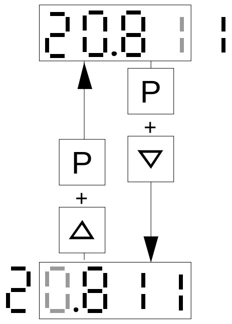


Fig. 6.4 Shifting the PMU display for parameters values with more than 4 digits

7 Fault and Alarm Messages

7.1 Fault messages

Fault messages		
No.	**Fault description**	**Counter measures**
F001	**Contact. chckbck.** If a main contactor checkback signal is configured, a checkback signal was not received within 500 ms after the power-up command.	**P591 S.MC chckbck. sign.**, The parameter value must match the main contactor checkback signal connection. Check the main contactor checkback signal circuit. Also refer to section 9.6.
F002	**Pre-charging** When pre-charging, the minimum DC link voltage (**P071 Conv. supply voltage** ∗ 1.34) of 80 % was not reached. The maximum pre-charging time of 3 s was exceeded.	Check the supply voltage, Compare with **P071 Conv. supply volt.**.
F006	**DC link overvoltage** The unit was shutdown due to an excessive DC link voltage. Supply voltage range | Shutdown threshold 208 V to 230 V | 412 V 380 V to 460 V | 819 V 500 V to 575 V | 1022 V 660 V to 690 V | 1220 V	Check the supply voltage, **P071 Conv. supply voltage,** The converter operates in the regenerative mode without regenerative possibility. reduce **P464 ramp-down time**, increase **P370 restart on the fly search speed**.
F008	**DC link uvolt.** The lower limit of 76 % of the DC link voltage (**P071 conv. supply voltage** ∗ 1.34) was fallen below. For enabled kinetic buffering, 61 %. DC link undervoltage in 'standard' operation (i.e. no SIMULATION). DC link undervoltage with active kinetic buffering and speed less than 10 % of the rated motor speed. It was a 'brief supply failure' which was only detected after the supply returned (WEA-flag).	Check • the supply voltage **P071 Conv. supply volt.** • of the input rectifier • of the DC link
F011	**Overcurrent** The unit was shutdown due to an overcurrent condition. The shutdown threshold was exceeded,	Check • the converter-output for short-circuit or ground fault • the load for an overload condition • whether the motor and converter are correctly matched • whether the dynamic requirements are too high.
F020	**Motor temp.** The motor limiting temperature has been exceeded.	Check the motor (load, ventilation, etc.). The actual motor temperature can be read in **r009 Motor_temp.** Check the KTY84-input at connector -X104:25,26 for a short-circuit.
F023	**Inverter temp.** The inverter limiting temperature has been exceeded.	Measure the air intake and ambient temperature. Please observe the derating curves" for ϑ >40 ºC. Refer to section 14.1. Check; • whether fan -E1 is connected and is rotating in the correct direction. • that the air entry and discharge openings are not restricted. • temperature sensor at -X30
F025	**UCE ph. L1** There was an UCE shutdown in phase L1.	Check; • phase L1 for short-circuit or ground fault (-X2:U2 including motor). • that the **CU** is correctly inserted.
F026	**UCE ph. L2** There was an UCE shutdown in phase L2.	Check; • phase L2 for short-circuit or ground fault (-X2:U2 including motor). • that the **CU** is correctly inserted.

Fault messages		
No.	**Fault description**	**Counter measures**
F027	**UCE ph. L3** There was an UCE-shutdown in phase L3.	Check; • phase L3 for short circuit or ground fault. (-X2:W2 -including motor). • that the **CU** is correctly inserted.
F035	**Ext. fault1** External fault 1 input, which can be parameterized, was activated.	Check; • if there is an external fault • if the cable to the appropriate binary input is interrupted • **P575 S k fault ext.1** also refer to section 4.3.2.
F036	**Ext. fault2** External fault 2 input, which can be parameterized, was activated.	Check; • if there is an external fault • if the cable to the appropriate binary input is interrupted • **P586 S.k. fault ext. 1** also refer to section 4.3.2.
F037	**Analog input.**	Check the connection to • analog input -X102:27, 28, 29. check parameters • **P650 CU-AE configuration** • **P651 CU-AE smoothing** • **P652 CU-AE offset** also refer to section 3.3.
F040	**AS internal** Incorrect operating status.	Replace the CU board (-A10)
F041	**EEprom fault** A fault occured when storing the values in the EEPROM.	Replace the CU board (-A10)
F042	**Comp. time** Computation time problems	Reduce computation time load, increase **sampling time P308** observe **r725 , free comp time**
F043	**VeCon-FR** VeCon-error at first run-up. When starting the VeCon in the INIT status for measured value sensing, the VeCon processor could not be stopped.	Replace CU3 board (-A10)
F044	**VeCon-SR** Internal coupling error, operating system to VeCon during second run-up	Replace CU3 board (-A10).
F045	**Opt.brd HW** A hardware fault occurred when accessing the option board	Replace CU Check the connection between the subrack and option boards
F046	**Par. con.**	Power the converter off and up again. Replace CU board (-A10).
F047	**VeCon fatal**	Replace CU board (-A10).
F048	**VeCon-int**.	
F049	**SW release** The EPROMs on the CU have different software releases. In this case, the language EPROM is compared with the CU software.	• Replace language PROM
F060	**MLFB missing** This is set, if the MLFB = 0 when INITIALIZATION is exitted (0.0 kW). MLFB = Order No.	After acknowledgement, in INITIALIZATION enter the correct MLFB in parameter **P070 MLFB (6SE70..)**. (Only possible with the appropriate access stages to both access parameters).
F061	**Incorr param.** A parameter entered when setting the drive is not in the admissible range (e.g. P107 mot. frequency (ies), P108 mot. speed (s)), P761 pulse frequency) (dependent on the control type).	Acknowledge the fault, and change the appropriate parameter value. The erroneous parameter is specified in r949 as fault value.
F065	**SST1 telegr** (USS protocol)	Check the connection CU board -X100:1 to 5. Check the connection PMU board -X300. Replace the CU board (-A10).
F066	**SST2 telegr** (USS protocol)	Check the connection CU board -X100:1 to 5. Replace the CU board (-A10).

Fault messages		
No.	**Fault description**	**Counter measures**
F070	**SCB init.** Error when initializing the SCB board	**r 949 =1 or 2** • Check the SCB board to ensure that it is correctly inserted and that the slot coincides with assignment • **r723 board code ,** – **r724 board ID and** • **P090 board slot 2,** – **P091 board slot 3** **r 949 =5** error, initialization data • Check parameters **P682 and P684** **r 949=6** time-out when initializing and **r949=10** error, configuration channel • Check parameters **P090, P091, P682 and P684**
F072	**SCB heartb.** SCB no longer processes the monitoring counter (heartbeat counter)	Replace SCB Check the connection between the subrack and option board
F073	**Aninput1 SL1** 4 mA at analog input 1, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 1) -X428:4, 5.
F074	**Aninput2 SL1** 4 mA at analog input 2, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 2) -X428:7, 8.
F075	**Aninput3 SL1** 4 mA at analog input 3, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 3) -X428:10, 11.
F076	**Aninput1 SL2** 4 mA at analog input 1, slave 2 fallen below	Check the connection, signal source to the SCI1 (slave1) -X428:4, 5.
F077	**Aninput2 SL2** 4 mA at analog input 2, slave 2 fallen below	Check the connection, signal source to the SCI 1 board (slave 2) -X428:7,8.
F078	**Aninput3 SL2** 4 mA at analog input 3, slave 2 fallen below	Check the connection, signal source to the SCI 1 board (slave 3) -X428:10, 11.
F079	**SCB telegram** (USS, peer-to-peer, CAN)	Check the connections of the SCB1(2) boards Replace SCB1(2) board. Replace the CU2 board (-A10).
F080	**TB/CB init.** Error when initializing the board at the DPR interface	**r949 = 1** PT/CB not inserted or PT/CB board code incorrect **r949 = 2** PT not compatible **r949 = 3** CB not compatible **r949 = 4** error, initialization data Check the T300/CB board to ensure that is correctly inserted and that the slot and assignment coincide; • **P090 board slot 2, • P091 board slot 3** • **r723 board code, •r724 board ID** **r949 = 5** time-out at initialization **r949 = 10** error, configuration channel Checking the CB initialization parameters; • **P918 CB bus address,** • **696 to P705 CB parameters 1 to 10**
F081	**TB/CB heartb** TB or CB no longer processes the heartbeat counter	Replace TB or CB Check the connection between the subrack and option boards
F082	**DPR telegram fail.**	Check the connections of the CB/TB boards. Replace the CB board. Replace the TB board.
F090	**Par start init** Incorrect parameter at first start-up, initialization program	Check the values of the following parameters: • **P071 Converter voltage** • **P102 Rated motor current** • **P108 Rated speed** • **P109 Pole pair number** • **P110 Torque constant** • **P111 Torque deviation** • **P112 Torque const** • **P113 Rated torque** • **P173 Imax** • **P186 Speed-dep flux** • **P187 Temp. dep. flux** • **P242 Start. time** • **P260 Vsdmax** • **P761 Pulse frequency** • **P267 Vsqmax**

Fault messages		
No.	**Fault description**	**Counter measures**
F091	**Par FR motK** An error occurred in the motor initialization at the first run-up of the VeCon processor after ready to power-up.	Check the parameter settings as under fault message F090
F092	**Par FR motP** An error occurred in the motor initialization at the first run-up of the VeCon processor after ready to power-up.	Check the parameter settings as under fault message F090
F093	**Par SR init** A parameter error occurred in the initialization at the second run-up of the VeCon processor after ready to power-up.	Check the parameter settings as under fault message F090
F094	**Par SR motK** An error occurred in the motor initialization at the second run-up of the VeCon processor after ready to power-up.	Check the parameter settings as under fault message F090
F095	**Par SR motP** An error occured in the motor initialization at the second run-up of the VeCon processor after ready to power-up.	Check the parameter settings as under fault message F090
F096	**InitD MDS1** A parameter error occurred for the converter status init drive.	Check motor data set
F097	**InitD MDS2** A parameter error occurred for the converter status init drive	The erroneous parameter is specified in r949 as fault value. Fault value 1005 in r949: At motor running up motor data set 1 was declared invalid.
F098	**Motdat can.** Motor data set error. Deletion setting was no able to be found in the motor table	
F099	**EEPROM org** EEPROM error	Power-down and -up again. Replace the CU board if the error re-occurs.
F100	**GRND init** During the ground fault test, a current not equal to 0 was measured, or a UCE or the overcurrent monitoring responded, although none of the valves were triggered.	The fault cause can be read-out of r358 "ground fault test result". Check the converter output for short-circuit or ground fault (-X2:U2, V2, W2 - including motor). Check that the CU board is correctly inserted. Frame sizes 1 and 2: Check the transistor modules on the PEU board -A23 for short-circuit. Frame sizes 3 and 4: Check the transistor modules -A100, -A200, -A300 for a short-circuit condition.
F101	**GRND second run mot** Ground fault test error during the second run-up before motor identification	Check the power section valves for a short-circuit, and for converters with fiber-optic gating, the gating unit wiring and the UCE checkback signals, for the correct assignment.
F102	**GRND control** Error during the ground fault test before the closed-loop control program	Check converter modules
F114	**Mess. OFF** The converter automatically aborted the automatic measurement as the time limit was exceeded up to converter power-up, or due to an OFF command during the measurement; the selection in **P052 function selection** is reset.	For **P052, function selection = 7,** restart **motor identification at standstill.** The on command must be provided within 20 s after the warning message **A078 standstill measurement appears.** Withdraw the off command and re-start the measurement.

Fatal errors (FF):

Fatal errors are those hardware or software errors which no longer permit normal converter operation. They only appear on the PMU in the form "FF<Nr>". The software is re-booted by actuating any PMU key.

FFxx	Error message	Power-down the converter and power-up again. Call the responsible service department if a fatal error message is re-displayed.
FF01	**Time sector overflow** A fatal time sector overflow was identified in the high-priority time sectors.	• Replace CU • Increase sampling time or reduce pulse frequency
FF02	**Watchdog error** The software monitoring has responded.	• Replace CU
FF03	**NMI error** Several NMIs have occurred one after another due to external option board accesses (busy monitoring).	• Replace CU • Replace BPL • Replace option board
FF04	**RAM error** An error was identified during the RAM memory test.	• Replace CU
FF05	**EPROM error** An error was identified during the EPROM memory test.	• Replace CU • Replace EPROMs
FF06	**Stack overflow** Stack overflow.	• Replace CU • Replace software • Increase sampling time or reduce the pulse frequency
FF07	**Stack underflow** Stack underflow	• Replace CU • Replace software
FF08	**Undefined opcode** An attempt was made to execute an invalid processor command	• Replace CU • Replace software
FF09	**Protection fault** Illegal format for a protected processor command	• Replace CU • Replace software • Replace EPROMs
FF10	**Illegal Word Operand Access** Word access to an uneven address	• Replace CU • Replace software • Replace EPROMs
FF11	**Illegal Instruction Access** Jump command to an uneven address	• Replace CU • Replace software • Replace EPROMs
FF12	**Illegal External Bus Access** Access to an unavailable external bus	• Replace CU • Replace software • Replace EPROMs
FF13	**SW error interrupt proc.** An error has occurred during interrupt processing	• Replace CU • Replace software • Replace EPROMs

7.2 Alarm messages

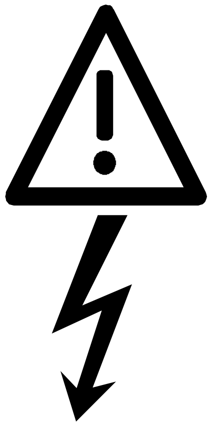
The alarm message is periodically displayed on the PMU by A=alarm and a 3-digit number. An alarm cannot be acknowledged. It is automatically deleted once the cause has been removed. Several alarms can be present. The alarms are then displayed one after another.

When the converter is operated with the OP1 operator control panel, the alarm is indicated in the lowest operating display line. The red LED additionally flashes (refer to the OP1 Instruction Manual).

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A001	**P953** —— 0	**Comp. time** CU board comp. time utilization too high	observe **r725 free computation time** increase **P308, sampling time** or reduce **P761 pulse frequency**.
A015	**P953** —— 14	**Ext. alarm 1** External alarm input 1, which can be parameterized, was activated	External alarm! check whether the cable to the appropriate binary input is interrupted. Check **parameter P588 S alarm ext. 1.** Also refer to Section 4.3.2.
A016	**P953** —— 15	**Ext. alarm 2** External alarm input 2, which can be parameterized, was activated	External alarm! check whether the cable to the appropriate binary input is interrupted. Check **parameter P589 S alarm ext. 2.** Also refer to Section 4.3.2.
A018	**P954** —— 1	**Match. meas. sys.** Resolver or encoder matching was erroneous at first run-up.	Check measuring system!
A019	**P954** —— 2	**Match. meas. sys.** Resolver or encoder matching was erroneous at second run-up.	Check measuring system!
A022	**P954** —— 5	**Inv. temp.** The threshold for initiating an alarm, which can be parameterized, was fallen below.	Observe **r011 conv. temp.** Measure the air intake or ambient temperature. Observe the de-rating curves for ϑ >40 ºC Refer to Section 14.1. Check: - whether fan -E1 is connected and is rotating in the correct direction. - the air intake and discharge openings for blockage. - the temperature sensor at -X30.
A023	**P954** —— 6	**Mot temp** The threshold to initialize an alarm, which can be parameterized, was exceeded.	Check the motor (load, ventilation etc.). Read-out the actual temperature in **r009 mot.temp.** Check the KTY84 input at connector -X104:25,26 for a short-circuit condition.
A024	**P954** —— 7	**Mot. move EA** The motor moved for the motor identification in the first run-up.	Lock the motor rotor
A025	**P954** —— 8	**Mot move. FR** The motor moved during motor identification at the second run-up.	Lock motor rotor
A033	**P955** —— 0	**Overspeed** Bit in **r553 status word 2** of the setpoint channel. The speed actual value has exceeded the maximum speed plus the selected hysteresis.	**P519 overspeed hys.** plus **P452 max. frequency (RDF)/ max. speed (RDF)** or **P453 max. frequency (LDF)/ max.speed (LDF)** was exceeded. Increase the parameter for the maximum frequencies, or reduce the regenerative load.
A034	**P955** —— 1	**Setpoint- act. val. diff.** Bit in the **r552 status word 2** of the setpoint channel. The absolute difference between the frequency setpoint and actual value is greater than the parameterized value and the control monitoring time has expired.	Check; - whether an excessive torque requirement is available. - whether the motor was dimensioned too small. increase **P517 setpoint-act. val. diff. frq./setp. act. diff. speed** or **P518 setp.-act. val. diff. time,**

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A035	**P955** —— 2	**Wire breakage** Clockwise and/or counter-clockwise rotating field is not enabled, or a wire is interrupted (both control word bits are zero)	Check, whether the cable(s) to the appropriate binary input(s), **P572 S. clockwise phase sequence/P571 S. counter-clockwise phase sequence** is (are) interrupted or withdrawn. Also refer to Section 4.3.2.
A043	**P955** —— 10	**n-act. jump** The permissible rate of change of the speed encoder signal (P215) was exceeded..	Only for configured speed encoder **P208 S. speed act. val.** Check! Tacho cable for interruption. Tacho screen grounding.
A050	**P956** —— **1**	**Slave incorrect** For serial I/O, the slaves required according to the parameterized configuration are not present (slave number or slave type).	Check **P660 SCI AE config.**
A051	**P956** —— 2	**Peer bdrate** The peer-to-peer connection is too high or different baud rates have been selected.	Adapt the baud rate in conjunction with the SCB boards, **P684 SST/SCB baud rate**
A052	**P956** —— 3	**Peer PZD-L** for peer-to-peer connection, PZD length selected too high (>5).	Reduce the number of words **P686 SST/SCB PZD No.**
A053	**P956** —— 4	**Peer lng f.** For peer-to-peer connection, the PZD length of sender and receiver do not match.	Adapt the word length for sender and receiver **P686 SST/SCB PZD No.**
A081.. **A096**	**r958** —— 0...15	**CB alarm** Refer to the User Manual, CB board	
A097.. **A112**	**r959** —— 0...15	**TB alarm 1** Refer to the User Manual, TB board	
A113.. **A128**	**r960** —— 0...15	**TB alarm 2** Refer to the User Manual, TB board	

8 Maintenance



WARNING

SIMOVERT Master Drives are operated at high voltages.

All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VBG4 in Germany).

Maintenance and service work may only be executed by qualified personnel.

Only spare parts authorized by the manufacturer may be used.

The specified maintenance intervals and also the instructions for repair and replacement must be adhered to.

The drive units have hazardous voltage levels up to 5 min after the converter has been powered-down due to the DC link capacitors so that the unit must only be opened after an appropriate delay time.

The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.

If it is absolutely necessary that the drive converter must be worked on when powered-up:

- ♦ never touch any live components.
- ♦ only use the appropriate measuring and test equipment and protective clothing.
- ♦ always stand on an ungrounded, isolated and ESD-compatible pad.

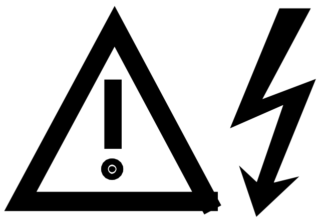
If these warnings are not observed this can result in death, severe bodily injury or significant material damage.

Always have your Master Drive converter Order No. and serial No. available when contacting the service department. These numbers and other important data are located on the drive converter rating plate.

8.1 Maintenance requirements

The fans are designed for a service life of 35000 hours at an ambient temperature of TU = 400C. They must be replaced before their service life expires so that the drive converter availability is guaranteed.

8.2 Replacing components



WARNING

The fan may only replaced by qualified personnel.

The drive converters are still at hazardous voltage levels up to 5 min. after the unit has been powered-down as a result of the DC link capacitors.

If these warnings are not observed, death, severe bodily injury or considerable material damage could occur.

8.2.1 Relacing the fan

Housing sizes A to C

The fan is located under the converter

- ♦ Remove the M4 x 49 Torx screws
- ♦ Remove the protective cover
- ♦ Remove the fan towards the bottom and withdraw connector X20
- ♦ Install the new fan in the inverse sequence
- ♦ Before commissioning the drive check that the fan can run freely and the air flow direction (arrow towards the top). The air must be blown upwards out of the unit.

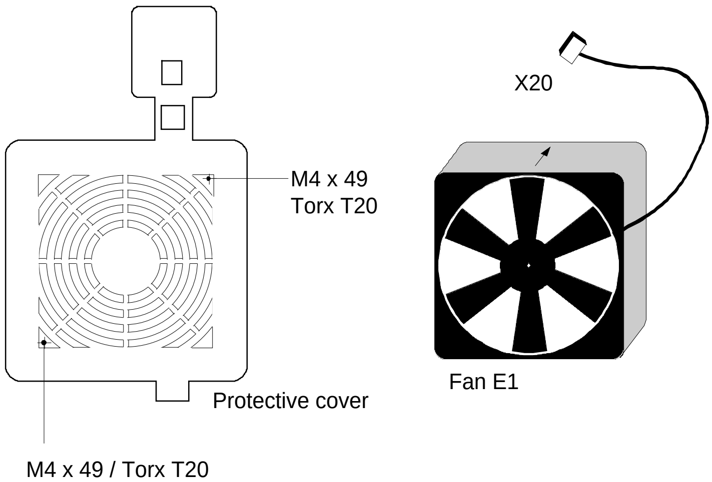


Fig. 8.1 Fan (24 V) and protective cover for housing sizes 1 to 3

Size D

The fan is screwed to a bracket which is located in the lower section of the drive converter.

- ♦ Withdraw connector X20
- ♦ Remove both M5 x 16 Torx screws on the lower part of the converter
- ♦ Withdraw the fan with bracket out of the unit from the bottom
- ♦ Install the new fan in the inverse sequence (the fan is already mounted on the bracket).
- ♦ Before commissioning the drive, check that the fan can rotate freely.

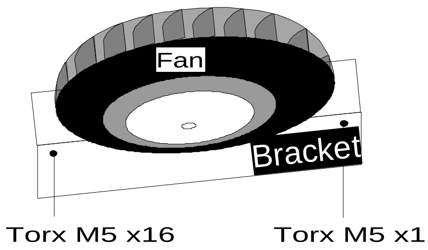
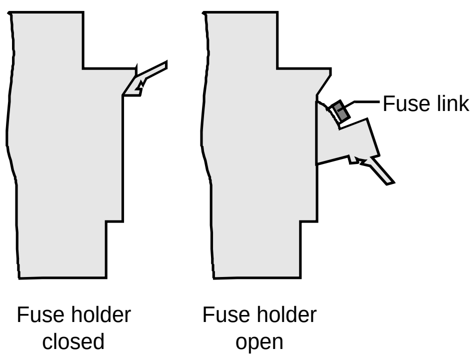


Fig. 8.2 Fan (230 V) with bracket

8.2.2 Replacing the fuses (size D)

The fuses are located in the upper section of the converter in a fuse holder. The fuse holder must be opened to remove the fuses.

Fig. 8.3 Fuse holder (size D)



8.2.3 Replacing boards

WARNING

The boards may only be replaced by qualified personnel.

It is not permissible that the boards are withdrawn or inserted under voltage.

Death, severe bodily injury or significant materal damage might result if these instructions are not observed.

CAUTION

Boards contain components which could be damaged by electrostatic discharge. The human body must be discharged immediately before an electronics board is touched.
This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cubicle components).

8.2.3.1 Replacing boards in the electronics box

- Loosen the board retaining screws above and below the handles for inserting/withdrawing the boards
- Carefully remove the board using these handles making sure that the board doesn't catch on anything
- Carefully locate the new board on the guide rails and insert it completely into the electronics box
- Tighten the retaining screws above and below the handles.

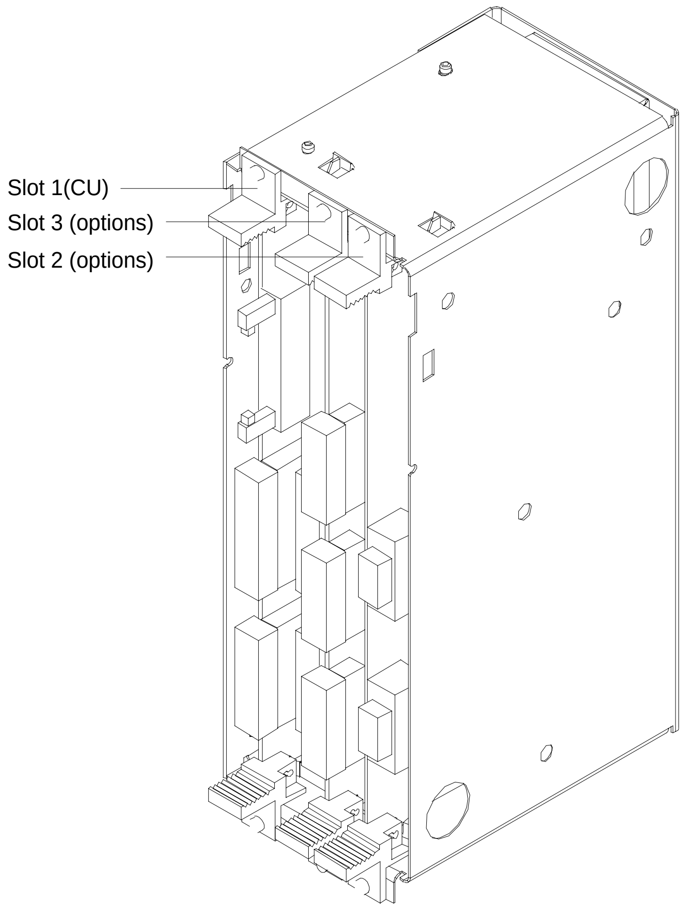


Fig. 8.4 Electronics box equipped with CU (slot 1) and options (slot 2 (left) and 3 (right))

Replacing the PMU

- ♦ Release the snaps on the front cover
- ♦ Open-up the front cover
- ♦ Withdraw connector X108 on the CU
- ♦ Carefully depress the latch upwards on the inner side of the front cover using a screwdriver
- ♦ Remove the PMU board
- ♦ Install the new PMU board in the inverse sequence.

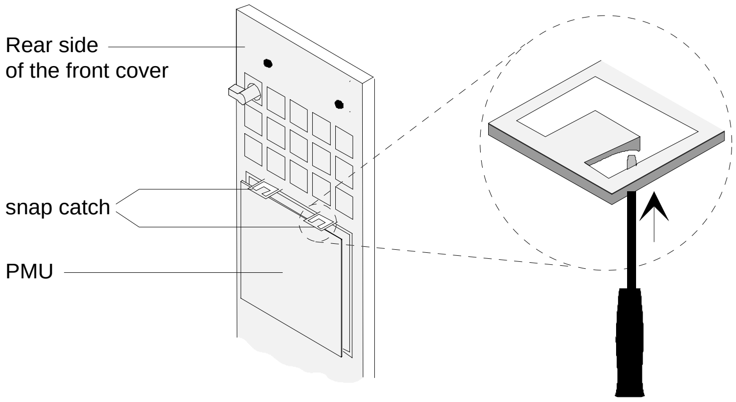


Fig. 8.5 Rear side of the front cover with PMU board

9 Options

9.1 Options which can be integrated into the electronics box

One or two option boards, listed in Table 9.1, can be inserted in the electronics box using the LBA option (local bus adapter).

The options are supplied with the option description.

Desig-nation	Description	Order No.	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7080-0CX84-4HA0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7080-0CX84-0AH0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7080-0CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7080-0CX84-0BD0
	Use of the serial interface with USS protocol	Application description	6SE7087-6CX87-4KB0
CB1	Communications board with interface for SINEC- L2-DP, (Profibus)	Board description	6SE7090-0XX84-0AK0 6SE7087-0CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0

Table 9.1 Option boards and bus adapter

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not for T300)
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE

Only one of each option board type may inserted in the electronics box.

TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.

If only one option board is used it must always be inserted at slot 2.

Table 9.2 Slots in the electronics box

If the converter is supplied through an external main contactor, the option board in the electronics box must be supplied from an external power supply, according to Table 9.3.

These values are required in addition to the current drawn by the basic converter (refer to section 13 “Technical Data“).

Board	**Current drain** (mA)
CB1	190
SCB1	50
SCB2	150
TSY w/out tacho	150
T300 w/out tacho	620
Standard tacho Type: 1PX 8001-1	I_0 95 (190 at 6000 RPM)

Table 9.3 Current drain of the option boards

9.2 Interface boards

The boards, listed in the following table must be externally mounted and wired-up on the external system side.

Desig-nation	**Description**	**Order No.**	
SCI1	Serial I/O board (only in conjunction with SCB1). Analog and binary input and outputs for coupling to the SCB1 via fiber-optic cable	Board description	6SE7090-0XX84-3EA0 6SE7080-0CX84-0BC0
SCI2	Serial I/O board (only in conjunction with SCB1) Binary inputs and outputs for coupling to the SCB1 via fiber-optic cable.	Board description	6SE7090-0XX84-3EF0 6SE7080-0CX84-0BC0

Table 9.4 Interface boards

9.3 Power supplies

Designation	**Description**	**Order number** **Option**	**Use with**
Power supply 1 A	115 V / 230 V AC - 24 V 1 A DC	6SX7010-0AC15	e.g.: 1 x SCI
Power supply 3,5 A	115 V / 230 V AC - 24 V 3,5 A DC	4AV2302-2AB	Basic conv
Power supply 5 A	115 V / 230 V AC - 24 V 5 A DC	6EP1333-1SL11	Basic conv. + options

Table 9.5 Recommended power supply

NOTE
The external auxiliary power supply must have protective separation according to DIN VDE 0160, otherwise protective separation for the converter control voltage is no longer provided.

9.4 Isolating amplifiers

Input	Output	Order number Option
Input isolating amplifiers for analog inputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–20 mA to +20 mA	–10 V to +10 V	6SX7010-0AC02
4 mA to +20 mA	4 mA to +20 mA	6SX7010-0AC01
Output isolating amplifiers for analog outputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC01
–10 V to +10 V	–20 mA to +20 mA	6SX7010-0AC03
0 V to +10 V	4 mA to +20 mA	6SX7010-0AC04

Table 9.6 Overview of isolating amplifiers

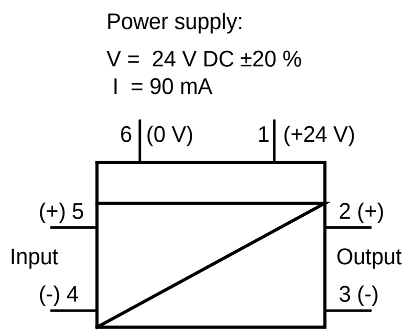


Fig. 9.1 Isolating amplifiers

9.5 Power section

Options	Description/function
Circuit-breaker	Power-up
Line fuses	Protects the motor feeder and limits the short-circuit current
Commutating reactor	Reduces harmonic feedback into the supply
Input filter, A1 or B1	Maintains the radio interference suppression level acc. to EN55011
Braking units	Converts regenerative power into heat
Braking resistors	Load resistor for the braking unit

Table 9.7 Power section options

9.5.1 Output reactor, dv/dt filter, sinusoidal filter

being prepared

9.6 Main-, output contactor

It is not absolutely necessary that the converter is operated with a main- or output contactor. If the converter control functions have to be maintained with the main contactor open, an external 24 V DC power is required.

Binary output -X9:4,5 is provided to control the contact (pre-assigned).

The checkback signal can be wired to a binary input (e.g. binary input 3).

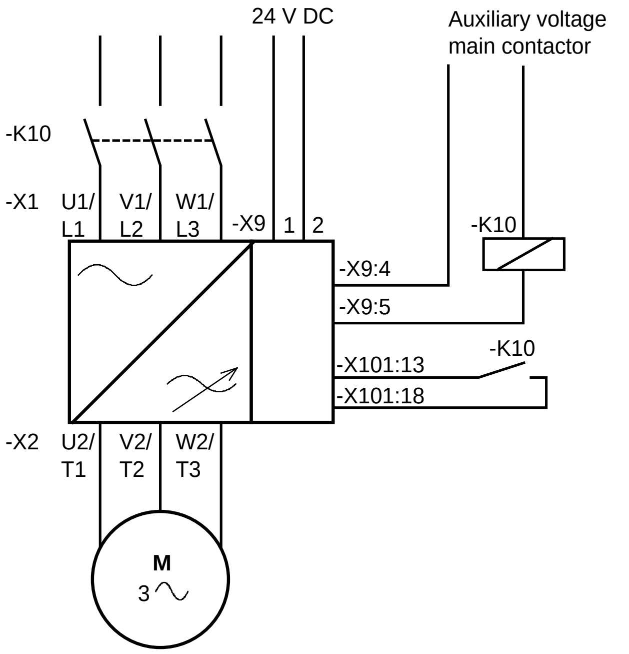


Fig. 9.2 Example for connecting an main- and input contactor

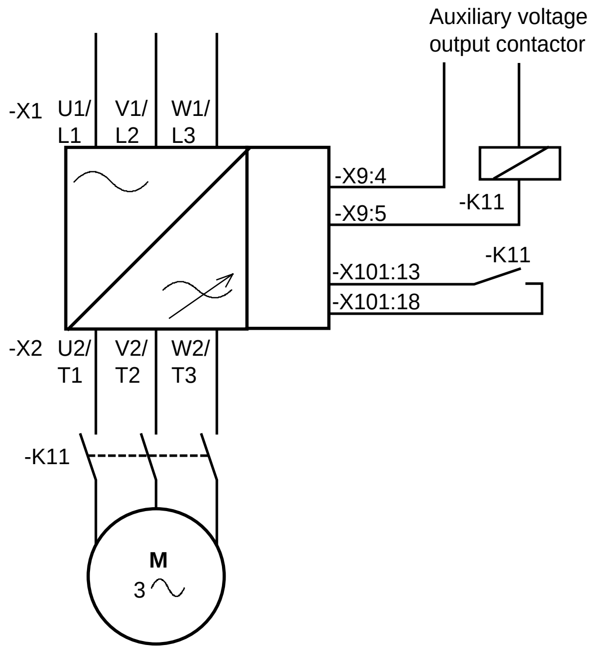


Fig. 9.3 Example for connecting an output contactor

Sequence control, on command-operation (effect on the main- or output contactor).

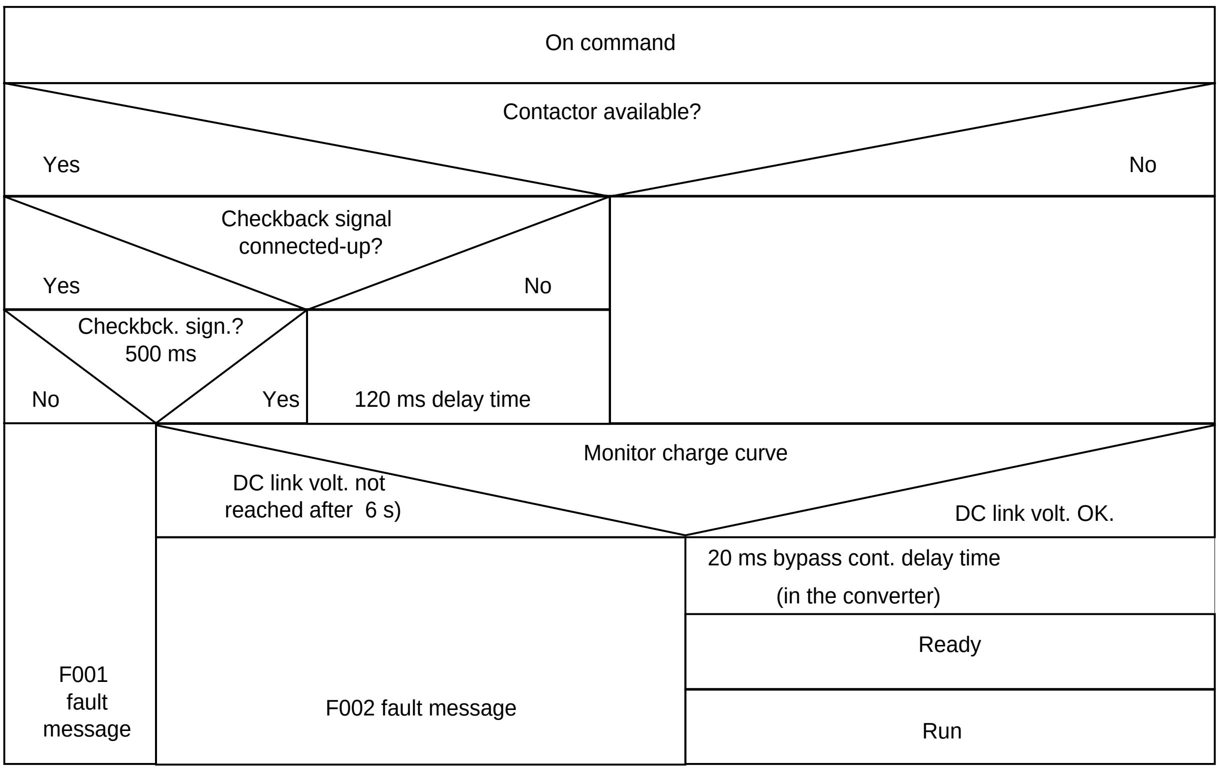


Fig. 9.4 Sequence control, on command- operation

Parameter- No.	Name	Index	Parameter- value	Terminal	With contactor(s)	Contactor(s) with checkback signals
P612	ST.MC energized	i001	1001	X9: 4,5	X	X
P591	ST MC chckbck sig. binary input 3	-	1003	X101:18		X

Table 9.8 Recommended parameterization for the main- and output contactors

9.7 Operator control

Option	Description
OP1	User-friendly operator control panel with plain text display
SIMOVIS	Floppy disk with program for operator control via PC

Table 9.9 Operator control options

Fig. 9.5 OP1

9.8 Mechanical design

Option	Description
EMC screened housing	For screened cables

Table 9.10 Mechanical options

9.9 Additional equipment series

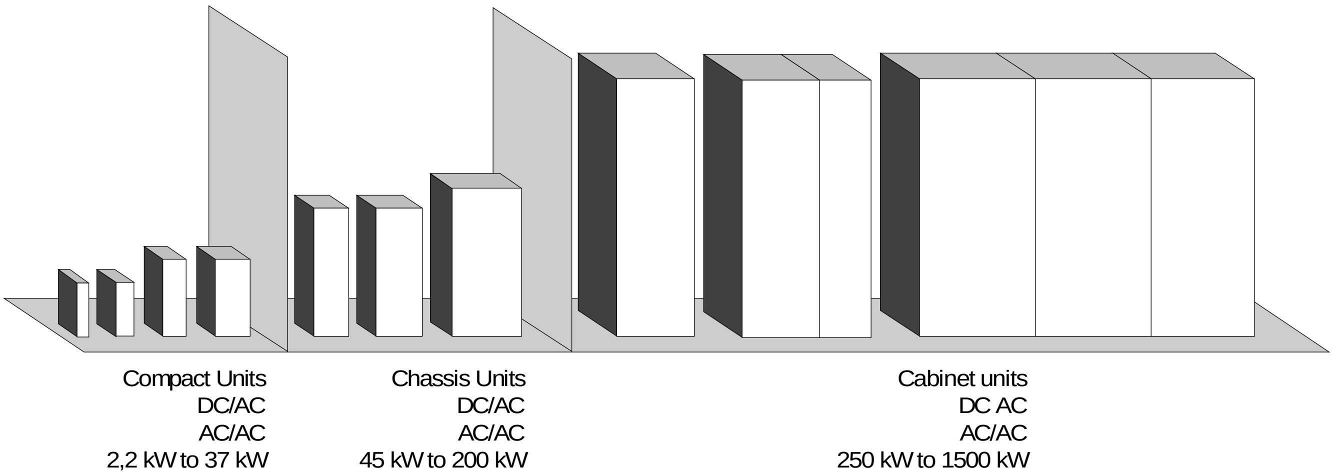


Fig. 9.6 Cabinet- and chassis units

- ♦ AC-AC converters FC, VC and SC
- ♦ DC-AC converters FC, VC and SC
  - with associated input rectifier
  - with associated input rectifier and line-commutated regenerative feedback

10 Spare Parts

Component code	Designation	Order number	Used in
-A10	CU3	6SE7090-0XX84-0AG0	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	6SE70_ _-_ _A30 6SE70_ _-_ _B30
-A30	PMU	6SE7090-0XX84-2FB0	6SE70_ _-_ _C30 6SE70_ _-_ _D30
-E1	24 V DC fan	6SY7000-0AA48	6SE70_ _-_ _A30
-E1	24 V DC fan	6SY7000-0AA50	6SE70_ _-_ _B30 6SE70_ _-_ _C30
-E1	230 V AC fan	6SY7000-0AA80	6SE70_ _-_ _D30
-F101, -F102	2 A, fuse, 600 V	6SY7000-0AA24	6SE70_ _-_ _D30

Table 10.1 Spare parts

11 Logbook

The logbook must be kept up-to-date by the operating personnel

All service- and maintenance work carried-out on the converter should be briefly entered into the logbook.

Continuous entries are important for maintenance and could be significant when it comes to warranty claims.

Location:			Unit Order No.: Serial No.:	
	Date	Name	Department	Signature
Start-up settings				
Start-up settings change				

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P050	Language	0		
P051	Access stge	2		
P052	Function select.	0		
P053	Param. enable	6		
P054	OP bckgrnd lit	0		
P070	MLFB(6SE70..)	0		
P071	Conv. supp. volt.	400.0		
P072	Conv. current(s)	6.1		
P090	Subrack slot 2	0		
P091	Subrack slot 3	0		
P100	Motor type	i001=0 i002=0	i001= i002=	i001= i002=
P102	Motor type(s)	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P108	Mot. current(s)	i001=0 i002=0	i001= i002=	i001= i002=
P109	Mot. popair no.	i001=0 i002=0	i001= i002=	i001= i002=
P110	kT(n)	i001=0.00 i002=0.00	i001= i002=	i001= i002=
P111	kT deviation	i001=0.00 i002=0.00	i001= i002=	i001= i002=
P112	kT adap.start	i001=0 i002=0	i001= i002=	i001= i002=
P113	Torque(s)	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P163	Op/cl loop c type	4		

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P173	Imax	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P186	Speed-dep flx	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P187	Tmp.-dep flx	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P208	S.speed actval.	i001=0 i002=0	i001= i002=	i001= i002=
P209	Pencodpulse no	i001=0 i002=0	i001= i002=	i001= i002=
P211	Resolver exic	i001=0 i002=0	i001= i002=	i001= i002=
P212	Resolver offset	i001=0 i002=0	i001= i002=	i001= i002=
P213	S. res. offset	0		
P230	n cont. vp	i001=1.000 i002=1.000 i003=1.000 i004=1.000	i001= i002= i003= i004=	i001= i002= i003= i004=
P242	Start time	i001=0.000 i002=0.000	i001= i002=	i001= i002=
P272	R(stator)	i001=0.000 i002=0.000	i001= i002=	i001= i002=
P330	MotId	0		
P331	MotId amplitude	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P332	MotId cycles	i001=0 i002=0	i001= i002=	i001= i002=
P346	Dynamic factor	i001=4 i002=4	i001= i002=	i001= i002=
P354	Ground fault test	0		
P355	Grnd test, time 1	20.0		
P356	Grnd test, time 2	10.0		
P357	Grnd test limit	1.0		
P360	Mot.tmp.alarm	i001=80 i002=80	i001= i002=	i001= i002=
P361	Mot.tmp.fault	i001=110 i002=110	i001= i002=	i001= i002=
P420	Sys. rat. freq.	3000.0		
P421	Fixed setpoint 1	i001=3000.0 i002=3000.0 i003=3000.0 i004=3000.0	i001= i002= i003= i004=	i001= i002= i003= i004=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P422	Fixed setpoint 2	i001=-3000.0 i002=-3000.0 i003=-3000.0 i004=-3000.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P423	Fixed setpoint 3	i001=1000.0 i002=1000.0 i003=1000.0 i004=1000.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P424	Fixed setpoint 4	i001=250.0 i002=250.0 i003=250.0 i004=250.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P425	Motpot. stor.	0		
P426	Motpot. strt. sp.	0.0		
P433	S. suppl. setp. 1	i001=0 i002=0	i001= i002=	i001= i002=
P436	Suppl.setp 1 inv.	i001=0 i002=0	i001= i002=	i001= i002=
P438	S. suppl. setp. 2	i001=0 i002=0	i001= i002=	i001= i002=
P441	Suppl. setp. 2 inv.	i001=0 i002=0	i001= i002=	i001= i002=
P443	S. main setp.	i001=1002 i002=1001	i001= i002=	i001= i002=
P446	Main setp. inv.	i001=0 i002=0	i001= i002=	i001= i002=
P448	Inch speed 1	200.0		
P449	Inch speed 2	1000.0		
P452	Max. speed (RDF)	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P453	Max. speed (LDF)	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P462	Ramp-up time	i001=10.00 i002=10.00 i003=0.01 i004=0.01	i001= i002= i003= i004=	i001= i002= i003= i004=
P464	Ramp-down time	i001=20.00 i002=20.00 i003=0.01 i004=0.01	i001= i002= i003= i004=	i001= i002= i003= i004=
P476	RFG active hys.	1.0		
P485	Rated system M	100.0		

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P486	S. torque sepoint	i001=0 i002=0	i001= i002=	i001= i002=
P489	Torque setpoint inv.	i001=0 i002=0	i001= i002=	i001= i002=
P492	M limit (mot) FSW	i001=100.0 i002=100.0 i003=100.0 i004=100.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P493	S. M lim. (mot)	i001=1001 i002=1001	i001= i002=	i001= i002=
P498	M lim. (gen) FSW	i001=-100.0 i002=-100.0 i003=-100.0 i004=-100.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P499	S. M lim (gen)	i001=1001 i002=1001	i001= i002=	i001= i002=
P505	M fixed setpoint	i001=5.0 i002=5.0 i003=5.0 i004=5.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P506	S. suppl. torque setp.	i001=0 i002=0	i001= i002=	i001= i002=
P507	M suppl. setp. Kp	i001=1.00 i002=1.00	i001= i002=	i001= i002=
P509	M suppl. setp. inv.	i001=0 i002=0	i001= i002=	i001= i002=
P512	Comp. speed	3000.0		
P513	Comp. speed hys.	3.0		
P514	OFF shutdown speed	100.0		
P516	OFF delay time	i001=0.0 i002=0.0 i003=0.0 i004=0.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P517	Sp.-act. dev. frq.	300.0		
P518	Sp. act. dev. time	3.0		
P519	Overspeed hys.	10.0		
P554	S. ON/OFF1	i001=1010 i002=1001	i001= i002=	i001= i002=
P555	S. 1OFF2 (elec.)	i001=1 i002=1002	i001= i002=	i001= i002=
P556	S.2 OFF2(elec.)	i001=1 i002=1	i001= i002=	i001= i002=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P557	S.3 OFF2 (elec.)	i001=1 i002=1	i001= i002=	i001= i002=
P558	S.1 OFF3 (fst stp)	i001=1 i002=1	i001= i002=	i001= i002=
P559	S.2 OFF3 (fst stp)	i001=1 i002=1	i001= i002=	i001= i002=
P560	S.3 OFF3 (fst stp)	i001=1 i002=1	i001= i002=	i001= i002=
P561	S. inv. enable	i001=1 i002=1	i001= i002=	i001= i002=
P562	S. RFG enable	i001=1 i002=1	i001= i002=	i001= i002=
P563	S. no RFG stop	i001=1 i002=1	i001= i002=	i001= i002=
P564	S.setp. enable	i001=1 i002=1	i001= i002=	i001= i002=
P565	S.1 acknow.	i001=0 i002=1003	i001= i002=	i001= i002=
P566	S.2 acknow.	i001=0 i002=0	i001= i002=	i001= i002=
P567	S.3 acknow.	i001=2001 i002=2001	i001= i002=	i001= i002=
P568	S.inch1 ON	i001=0 i002=0	i001= i002=	i001= i002=
P569	S.inch2 ON	i001=0 i002=0	i001= i002=	i001= i002=
P571	S.CWphseseq	i001=1 i002=1	i001= i002=	i001= i002=
P572	S.CCWphseseq	i001=1 i002=1	i001= i002=	i001= i002=
P573	S.motpot. raise	i001=1010 i002=0	i001= i002=	i001= i002=
P574	S.motpot. low	i001=1010 i002=0	i001= i002=	i001= i002=
P575	S.no fault ext.1	i001=1 i002=1	i001= i002=	i001= i002=
P576	S.SDS bit 0	i001=0 i002=0	i001= i002=	i001= i002=
P577	S.SDS bit 1	i001=0 i002=0	i001= i002=	i001= i002=
P578	S.MDS bit 0	i001=0 i002=0	i001= i002=	i001= i002=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P580	S.FSW bit 0	i001=0 i002=1004	i001= i002=	i001= i002=
P581	S.FSW bit 1	i001=0 i002=0	i001= i002=	i001= i002=
P583	S.restart enable	i001=0 i002=0	i001= i002=	i001= i002=
P585	S. con enable	i001=1 i002=1	i001= i002=	i001= i002=
P586	S. n flt ext 2	i001=1 i002=1	i001= i002=	i001= i002=
P587	S. slave drive	i001=0 i002=0	i001= i002=	i001= i002=
P588	S. no alrm ext. 1	i001=1 i002=1	i001= i002=	i001= i002=
P589	S. no alrm ext. 2	i001=1 i002=1	i001= i002=	i001= i002=
P590	S.base/res	1005		
P591	S.MCchckbcksig	1		
P600	ST. rdytswitch-on	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P601	ST. ready	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P602	ST. run	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P603	ST. fault	i001=1002 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P604	ST. no off 2	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P605	ST. no off 3	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P606	ST. swtch-on inhib.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P607	ST. alarm	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P608	ST. n sp.-act dev.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P610	ST. comp frq. err.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P611	ST. undervolt.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P612	ST. MC energized	i001=1001 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P613	ST. RFG active	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P614	ST. CW phseseq.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P615	ST. KIP active	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P616	ST. restrt active	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P618	ST. no oversp.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P619	ST. fault, ext. 1	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P620	ST. fault, ext. 2	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P621	ST. alarm ext.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P622	ST. alarm i2t conv.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P623	ST. flt. otmp cv.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P624	ST. alrm ot. cv.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P625	ST. alrm. ot. mt.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P626	ST. flt ot. mt.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P628	ST. mot. stll/lck	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P629	ST. BC energize	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P631	ST. pre-chrg act.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P650	CU-AE config.	0		
P651	CU-AE smooth.	4		
P652	CU-AE offset	0.000		
P655	CU-AA actual values	219		
P656	CU-AA gain	10.00		
P657	CU-AA offset	0.00		
P660	SCI-AE config.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P661	SCI-AE smooth.	i001=2 i002=2 i003=2 i004=2 i005=2 i006=2	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P662	SCI-AE offset	i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P664	SCI-AA actual values	i001=0	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
		i004=0	i004=	i004=
		i005=0	i005=	i005=
		i006=0	i006=	i006=
P665	SCI-AA gain	i001=10.00	i001=	i001=
		i002=10.00	i002=	i002=
		i003=10.00	i003=	i003=
		i004=10.00	i004=	i004=
		i005=10.00	i005=	i005=
		i006=10.00	i006=	i006=
P666	SCI-AA offset	i001=0.00	i001=	i001=
		i002=0.00	i002=	i002=
		i003=0.00	i003=	i003=
		i004=0.00	i004=	i004=
		i005=0.00	i005=	i005=
		i006=0.00	i006=	i006=
P680	SST1 act. vals	i001=968	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
		i004=0	i004=	i004=
		i005=0	i005=	i005=
		i006=0	i006=	i006=
		i007=0	i007=	i007=
		i008=0	i008=	i008=
		i009=0	i009=	i009=
		i010=0	i010=	i010=
		i011=0	i011=	i011=
		i012=0	i012=	i012=
		i013=0	i013=	i013=
		i014=0	i014=	i014=
		i015=0	i015=	i015=
		i016=0	i016=	i016=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P681	SST2 act. vals	i001=968	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
		i004=0	i004=	i004=
		i005=0	i005=	i005=
		i006=0	i006=	i006=
		i007=0	i007=	i007=
		i008=0	i008=	i008=
		i009=0	i009=	i009=
		i010=0	i010=	i010=
		i011=0	i011=	i011=
		i012=0	i012=	i012=
		i013=0	i013=	i013=
		i014=0	i014=	i014=
		i015=0	i015=	i015=
		i016=0	i016=	i016=
P682	SCB protocol	0		
P683	SST/SCB bus addr.	i001=0	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
P684	SST/SCB bd rts	i001=6	i001=	i001=
		i002=6	i002=	i002=
		i003=6	i003=	i003=
P685	SST/SCB PKW No.	i001=127	i001=	i001=
		i002=3	i002=	i002=
		i003=3	i003=	i003=
P686	SST/SCB PZD No.	i001=2	i001=	i001=
		i002=2	i002=	i002=
		i003=2	i003=	i003=
P687	SST/SCB TLG rec.	i001=0	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
P689	SCB peer exp.	i001=0	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
		i004=0	i004=	i004=
		i005=0	i005=	i005=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P690	SCB act. values	i001=0	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
		i004=0	i004=	i004=
		i005=0	i005=	i005=
		i006=0	i006=	i006=
		i007=0	i007=	i007=
		i008=0	i008=	i008=
		i009=0	i009=	i009=
		i010=0	i010=	i010=
		i011=0	i011=	i011=
		i012=0	i012=	i012=
		i013=0	i013=	i013=
		i014=0	i014=	i014=
		i015=0	i015=	i015=
		i016=0	i016=	i016=
P694	CB/TB act. values	i001=968	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
		i004=0	i004=	i004=
		i005=0	i005=	i005=
		i006=0	i006=	i006=
		i007=0	i007=	i007=
		i008=0	i008=	i008=
		i009=0	i009=	i009=
		i010=0	i010=	i010=
		i011=0	i011=	i011=
		i012=0	i012=	i012=
		i013=0	i013=	i013=
		i014=0	i014=	i014=
		i015=0	i015=	i015=
		i016=0	i016=	i016=
P695	CB/TB TLG rec.	1000		
P696	CB parameter 1	0		
P697	CB parameter 2	0		
P698	CB parameter 3	0		
P699	CB parameter 4	0		
P700	CB parameter 5	0		
P701	CB parameter 6	0		
P702	CB parameter 7	0		
P703	CB parameter 8	0		
P704	CB parameter 9	0		
P705	CB parameter 10	0		
P733	Simulations op.	0		

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P735	TRC trigger par.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P736	TRC trigger val.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P737	TRC trigger cond.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P738	TRC act. values	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P739	TRC sample time	i001=1 i002=1 i003=1 i004=1 i005=1 i006=1 i007=1 i008=1	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P740	TRC pre-trig.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P741	TRC start	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P750	TRC read index	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P761	Pulse freq.	i001=5.000 i002=5.000	i001= i002=	i001= i002=
P789	RAM accss val	0		
P799	SF	0		
P917	Par. chnge rep.	0		
P918	CB bus addr.	3		
P927	Param. enable	6		
P928	S.base/res.	1005		
P952	No. of faults	0		
P970	Factory setting	1		
P971	EEPROM transfer	0		

No.	Date/time	Name/department	Fault- and diagnostic messages	Measures

No.	Date/time	Name/department	Fault- and diagnostic messages	Measures

12 Environmental friendliness

Environmental aspects during the develpment

The number of components has been significantly reduced over earlier converter series by the use of highly integrated components and the modular design of the complete series. Thus, the energy requirement during production has been reduced.

Special significance was placed on the reduction of the volume, weight and variety of metal and plastic components.

Plastic components:	ABS:	Front cover Fan cover PMU support panel
	PP:	Hinges Insulating panel Grip recess Bus retrofit
	PA6:	Insulating foils Terminal housing

Halogen-containing flame retardants were, for all essential components, replaced by environmentally-friendly flame retardants.

Environmental compatibility was an important criterium when selecting the supplied components.

Environmental aspects during production

Purchased components are generally supplied in recyclable packaging materials (board).

Surface finishes and coatings were eliminated with the exception of the galvanized sheet steel side panels.

ASIC devices and SMD devices were used on the boards.

The product is emission-free.

Environmental aspects for disposal

The unit can be broken-down into recyclable mechanical components as a result of the easily releasable screw- and snap connections.

PC boards can be disposed off by incinerating. The proportion of components containing dangerous substances is extremely low

The plastic components and moulded housing are to DIN 54840 and have a recycling symbol.

Units can be disposed of through certified disposal companies. Addresses are available from your local Siemens partner.

13 Technical Data

If you have other application conditions other than those listed in this section, please contact your local Siemens office.

It is only permissible to switch off and on agiain twice in a minute.

Cooling medium temperature		0 °C to +40 °C
Storage temperature		– 25 °C to +70 °C
Transport temperature		– 25 °C to +70 °C
Environmental class	3K3	DIN IEC 721-3-3 Moisture condensation not permissible
Pollution level	2	DIN VDE 0110 Pert 1
Overvoltage category	III	DIN VDE 0110 Part 2
Overvoltage property class	1	E DIN VDE 0160
Degree of protection – Standard	IP20	DIN VDE 0470 Section 1 ≙ EN 60529
Protection class	I	DIN VDE 0106 Section 1
Radio interference level		DIN VDE 0875 Section 11 ≙ EN 55011
– standard	without	
– option	B1	EN55011
Noise immunity		EN50082-1
Mechanical strength		DIN IEC 68-2-6 / 06.90

	Frequency range	Constant amplitude of the	
		deflection	acceleration
	Hz	mm	m/s^2 (g)
– when stationary (in op.)	10 to 58	0.075	
	above 58 to 500		9.8 (1)
– during transport	5 to 9	3.5	
	above 9 to 500		9.8 (1)

The converters can also be operated in load class II. The permissible values must be taken from the following tables.

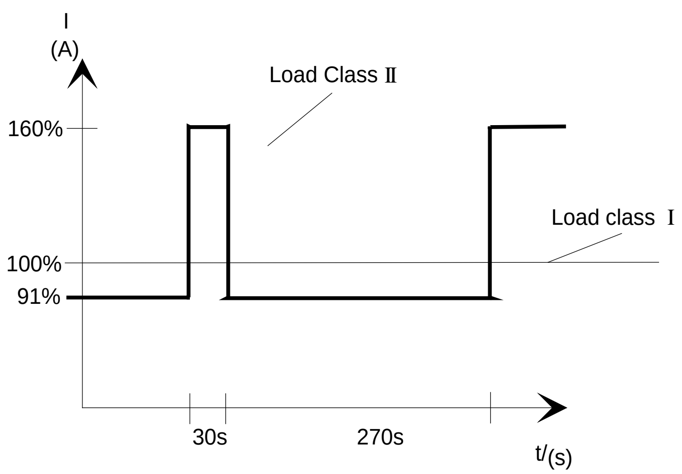


Fig. 13.1 Output according to load class II

AC → AC converters	6SE70...	21-1CA30	21-3CA30	21-8CB30	22-3CB30	23-2CB30	24-4CC30
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in Vn Input Output	V	 3 AC 208 ... 230 ±15 % 3 AC 0 ... Rated input voltage					
Rated frequency fn Input Output: U/f = const U = const	Hz	 50...60 ±6 % 0 ... 100 28 ... 400					
Rated current In Input Output	A	 10,6 10,6	 13,3 13,3	 17,7 17,7	 22,9 22,9	 32,2 32,2	 44,2 44,2
DC link voltage Vdn	V	280...310					
Rated output	kVA	3,8...4,2	4,8...5,3	6,4...7,1	8,3...9,1	11,6...12,8	15,4...17,6
Auxiliary power supply	V	DC 24 (20-30) (2,0 A without Options, with Options refer to Section 9.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	9,6	12,1	16,1	20,8	29,3	40,2
Base load time	s	240					
Overcurrent	A	14,4	18,1	24,1	31,1	43,8	60,1
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.	 > 0,98 < 0,92 ind.
Efficiency η – Pulse frequency 3kHz – Pulse frequency 6kHz		 0,97 0,96	 0,97 0,97	 0,97 0,96	 0,97 0,97	 0,97 0,97	 0,97 0,97
Power loss – Pulse frequency 3kHz – Pulse frequency 6kHz	kW	 0,13 0,14	 0,16 0,17	 0,20 0,21	 0,25 0,26	 0,33 0,36	 0,41 0,44
Required cooling air flow	m^3/s	0,009	0,009	0,022	0,022	0,022	0,028
Pressure drop Dp	Pa	10	10	32	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		A	A	B	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	135 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8	8	12	12	12	24

AC → AC converters	6SE70...	25-4CD30	27-0CD30	28-1CD30			
Bemessungsspannung, Bemessungsfrequenz, Rated current							
Rated voltage in Vn Input Output	V	 3 AC 208 ... 230 ± 15 % 3 AC 0 ... Rated input voltage					
Rated frequency fn Input Output: U/f = const U = const	Hz	 50...60 ±6 % 0 ... 100 28 ... 400					
Rated current In Input Output	A	 54 54	 69 69	 81 81			
DC link voltage Vdn	V	280...310					
Rated output	kVA	19,5...21,5	24.9...27.5	29.2...32.3			
Auxiliary power supply	V	DC 24 (20-30) (2,0 A without Options, with Options refer to Section 9.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	49.1	62.8	73.7			
Base load time	s	240					
Overcurrent	A	73.4	93.8	110			
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.			
Efficiency η – Pulse frequency 3kHz – Pulse frequency 6kHz		 0.97 0.97	 0.97 0.97	 0.97 0.97			
Power loss – Pulse frequency 3kHz – Pulse frequency 6kHz	kW	 0,59 0.64	 0.74 0.80	 0.81 0.88			
Required cooling air flow	m^3/s	0.054	0.054	0.054			
Pressure drop Dp	Pa	230	230	230			
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	65	65	65			
Type		D	D	D			
Width Height Depth	mm	270 600 350	270 600 350	270 600 350			
Weight	kg	35	35	35			

AC → AC converters	6SE70...	16-1EA30	18-0EA30	21-0EA30	21-3EB30	21-8EB30	22-6EC30
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in Vn Input Output	V	 3 AC 380 ... 460 ±15 % 3 AC 0 ... Rated input voltage					
Rated frequency fn Input Output: U/f = const U = const	Hz	 50...60 ±6 % 0 ... 100 28 ... 400					
Rated current In Input Output	A	 6.1 6.1	 8.0 8.0	 10.2 10.2	 13.2 13.2	 17.5 17.5	 25.5 25.5
DC link voltage Vdn	V	510...620					
Rated output	kVA	4...4.9	5,3...6,4	6.7...8.1	8,7...10,5	11.5...13.9	16.8...20.3
Auxiliary power supply	V	DC 24 (20-30) (2,0 A without Options, with Options refer to Section 9.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	5.6	7.3	9.3	12.0	15.9	23.2
Base load time	s	240					
Overcurrent	A	8.3	10.9	13.9	17.9	23.8	35
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.
Efficiency η – Pulse frequency 3kHz – Pulse frequency 6kHz		 0.97 0.96	 0.97 0.97	 0.97 0.97	 0.98 0.98	 0.98 0.98	 0.98 0.98
Power loss – Pulse frequency 3kHz – Pulse frequency 6kHz	kW	 0.11 0.13	 0,12 0,13	 0.19 0.21	 0,16 0,18	 0.24 0.28	 0.36 0.41
Required cooling air flow	m^3/s	0.009	0.009	0.009	0.022	0.022	0.028
Pressure drop Dp	Pa	10	10	10	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		A	A	A	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	90 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8	8	8	12	12	24

AC → AC converters 6SE70...		23-4EC30	23-8ED30	24-7ED30	26-0ED30	27-2ED30	
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in Vn Input Output	V	 3 AC 380 ... 460 ±15 % 3 AC 0 ... Rated input voltage					
Rated frequency fn Input Output: U/f = const U = const	Hz	 50...60 ±6 % 0 ... 100 28 ... 400					
Rated current In Input Output	A	 34 34	 37.5 37.5	 47 47	 59 59	 72 72	
DC link voltage Vdn	V	510...620					
Rated output	kVA	22.4...27.1	24,7...29,9	30.9...37.4	38,8...47,0	47.4...57.4	
Auxiliary power supply	V	DC 24 (20-30) (2,0 A without Options, with Options refer to Section 9.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	31	34.1	42.8	53.7	65.5	
Base load time	s	240					
Overcurrent	A	46	51.0	63.5	80.2	97.2	
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Supply $\cos\varphi_{1N}$ Converter $\cos\varphi_U$		 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	 > 0.98 < 0.92 ind.	
Efficiency η – Pulse frequency 3kHz – Pulse frequency 6kHz		 0.98 0.98	 0.97 0.97	 0.98 0.97	 0.98 0.97	 0.98 0.98	
Power loss – Pulse frequency 3kHz – Pulse frequency 6kHz	kW	 0.49 0.55	 0,58 0,64	 0.73 0.81	 0,86 0,97	 1.05 1.19	
Required cooling air flow	m^3/s	0.028	0.054	0.054	0.054	0.054	
Pressure drop Dp	Pa	30	230	230	230	230	
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	65	65	65	65	
Type		C	D	D	D	D	
Width Height Depth	mm	180 600 350	270 600 350	270 600 350	270 600 350	270 600 350	
Weight	kg	24	35	35	35	35	

13.1 De-rating for an increased cooling medium temperature

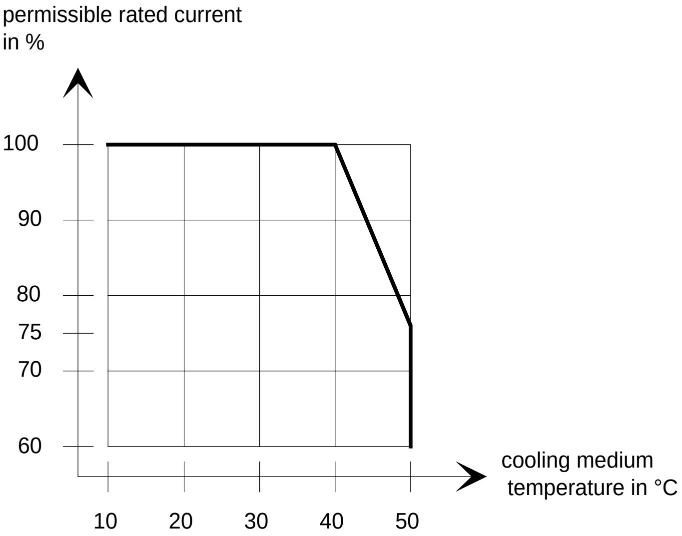


Fig. 13.2 Max. permissible rated current as a function of the cooling medium temperature

13.2 De-rating at installation altitudes > 1000 m above sea level

For installation altitudes > 1000 m above sea level, the rated current must be reduced. For installation altitudes > 2000 m above sea level, the rated voltage must be reduced (see Fig. 13.3). Installation altitudes > 4000 m above sea level are not permissible.

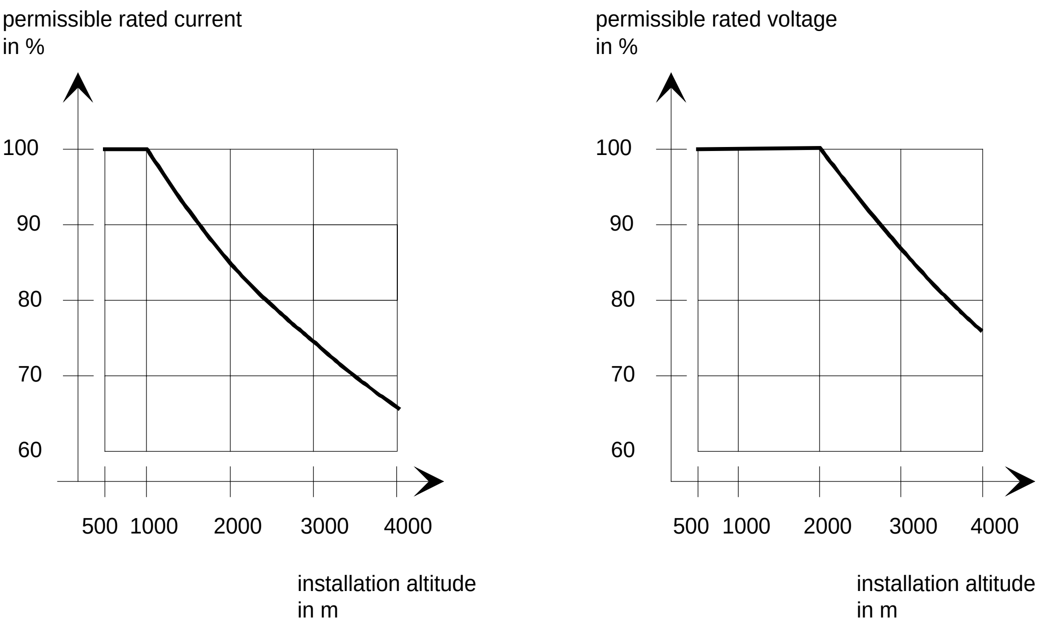


Fig. 13.3 Max. permissible rated current and rated voltage as a function of the installation altitude

13.3 De-rating as a function of the pulse frequency

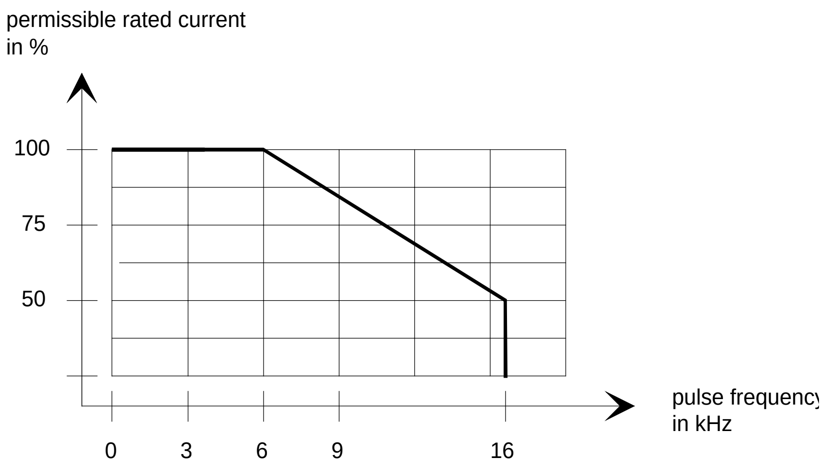


Fig. 13.4 Max. permissible rated current as a function of the pulse frequency

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15 Adressess

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B	475 344.4000.76 Jb-76

Version **B** consists of the following chapters

Chapters		Changes	Pages	Version date
0	General			01.95
1	Description	First Edition	2	01.95
2	Transport, Unpacking, Installation	First Edition	2	01.95
3	Connecting-up	First Edition	13	01.95
4	Start-up	First Edition	54	01.95
5	Parameter List	First Edition	43	01.95
6	Operator control	First Edition	4	01.95
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SIEMENS

SIMOVERT MASTER DRIVES
Servo Control (SC)
Types A to D
DC-AC

Operating Instructions

Edition: **AC**

Order-No.:6SE7087-6BD30

These Operating Instructions are available in the following languages:

Language	German	French	Spanish	Italian
Order-No.	6SE7080-0BD30	6SE7087-7BD30	6SE7087-8BD30	6SE7087-2BD30

Contents

0 Definitions

- QUALIFIED PERSONAL

  For the purpose of these instructions and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

  1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
  2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
  3. Trained in rendering first aid.

- DANGER

  For the purpose of these instructions and product labels, "Danger" indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.

- WARNING

  For the purpose of these instructions and product labels, "Warning" indicates death, severe personal injury or property damage can result if proper precautions are not taken.

- CAUTION

  For the purpose of these instructions and product labels, "Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.

- NOTE

  For the purpose of these instructions, "Note" indicates information about the product or the respective part of the Instruction Manual which is essential to highlight.

NOTE
These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser’s purposes, the matter should be referred to the local Siemens sales office. The contents of this Instruction Manual shall not become part of or modify any prior or existing agreement, committment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

CAUTION

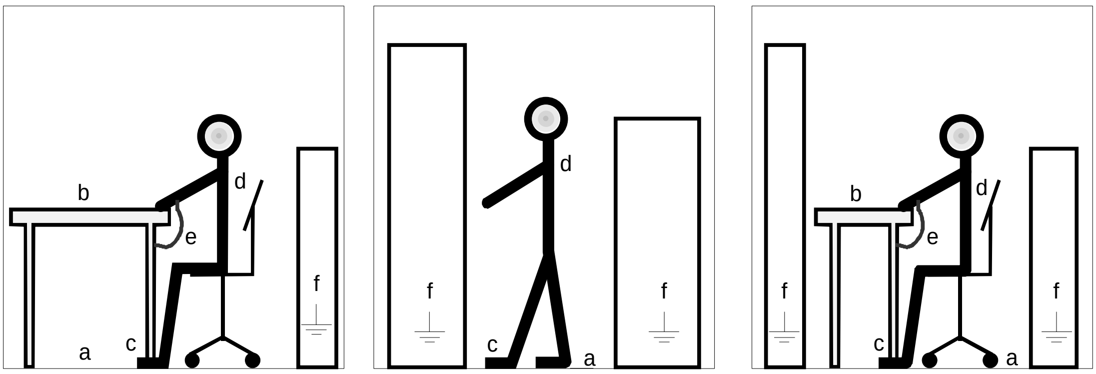
Components which can be destroyed by electrostatic discharge (ESD)

The converters contain components which can be destroyed by electrostatic discharge. These components can be easily destroyed if not carefully handled. If you have to handle electronic boards please observe the following:

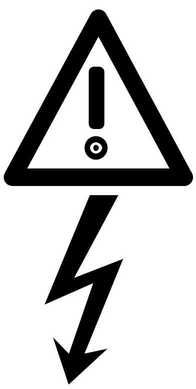
- ♦ Electronic boards should only be touched when absolutely necessary.
- ♦ The human body must be electrically discharged before touching an electronic board
- ♦ Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from man-made fibers
- ♦ Boards must only be placed on conductive surfaces
- ♦ When soldering, the soldering iron tip must be grounded
- ♦ Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes, metal containers)
- ♦ If the packing material is not conductive, the boards must be wrapped with a conductive packaging material, e.g. conductive foam rubber or household aluminum foil.

The necessary ECB protective measures are clearly shown in the following diagram:

a	=	Conductive floor surface	d	=	ESD overall
b	=	ESD table	e	=	ESD chain
c	=	ESD shoes	f	=	Cubicle ground connection



Sitting **Standing** **Standing / Siting**



WARNING

Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the safety instructions can result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

1 Description

1.1 Applications

SIMOVERT 6SE70 converters are power electronic units. The converters, described in this Instruction Manual generate a variable-frequency three-phase system for the motor from a DC supply. This allows AC motors to be continuously speed controlled. There are three different versions depending on the particular application:

♦ Frequency control	FC	simple applications (e.g. pumps and fans)
♦ Vector control	VC	high demands regarding dynamic performance and accuracy
♦ Servo control	SC	servo drives

SIMOVERT Master Drives can be used with a common DC link, as well as for single-motor and multi-motor drives.

Expanded functions for certain technological requirements are possible via defined power section interfaces.

1.2 Mode of operation

Converters with DC current input are suitable for coupling several converters to a common DC link bus. This permits energy transfer between drives in the motoring and generating modes which in turn means energy savings.

The DC converter must be connected to the DC bus through an E unit (rectifier unit) due to the pre-charging of the DC link capacitors. If an I/R unit (rectifier and regenerative feedback unit) is used instead of the E unit, power is fed back into the supply if the regenerative output for several drives is greater than the motor power required.

The converter is ready for operation after the DC link capacitors have been pre-charged

The inverter, configured using IGBT modules, generates a three-phase system from the DC link voltage to feed the motor

The inverter open-loop control uses a microprocessor with field-oriented vector control, with a very fast secondary closed-loop current control. High drive dynamic performance is achieved as a result of the field oriented vector control. When the unit is shipped, the pulse frequency is preset to 5 kHz. It can be set in the range from 5 kHz to 7.5 kHz.

SIMOVERT SC is suitable for:

- ♦ Single-motor drives with permanent-field 1FT6 motors

Some of the applications are, for example

- ♦ Winder drives,
- ♦ Foil machines,
- ♦ Packaging machines

After power-up, only the motor must be selected and the drive can then be enabled. The drive can be matched to the load moment of inertia and optimized by changing a closed-loop control parameter.

The converter operates with motor identification (MOTID). The maximum stator frequency is 400 Hz.

The following operating modes can be selected:

- Closed-loop speed control
- Closed-loop torque control

The following encoders can be used:

- ERN 1387 encoders
- Encoders which are compatible to ERN 1387
- Resolvers

The converter can be controlled via

- the parameterization unit (PMU)
- an optional operator control panel (OP1)
- terminal strip
- a serial interface.

When networked with automation systems, the converter open-loop control is realized via optional interfaces and technology boards.

2 Transport, Unpacking, Installation

2.1 Transport and unpacking

SIMOVERT Master Drives are packed in the manufacturing plant corresponding to that specified when ordered. A product packing label is provided on the carton.

Vibration and jolts must be avoided during transport, e.g. when setting the unit down.

Please observe the instructions on the packaging for transport, storage and professional handling.

The converter can be installed after it has been unpacked and checked to ensure that everything is complete and that the converter is not damaged.

The packaging comprises board and corrugated paper. It can be disposed of corresponding to the appropriate local regulations for the disposal of board products.

If the converter is damaged you must inform your shipping company immediately.

2.2 Storage

The converters must be stored in clean dry rooms.Temperatures between – 25 °C (–13 °F) and + 70 °C (158 °F) are permissible. Temperature fluctuations > 20 K per hour are not permissible.

WARNING

The equipment should not be stored for longer than one year. If it is stored for longer periods of time, the converter DC link capacitors must be formed at start-up.

Forming is described in Section 4.3.12.

2.3 Mounting

The following are required for mounting:

- ♦ G busbar according to EN50035 with screws for mounting
- ♦ One M6 screw for types of construction A to C; two M6 screws for type of construction D
- ♦ Dimension drawing (Fig. 2.2 for types of construction A, B and C, Fig. 2.3 for type of construction D).

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE) must be observed as well as the professional handling of tools and the use of personnal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

The unit must be protected against the ingress of foreign bodies as otherwise the function as well as the operational safety cannot be guaranteed.

Requirements at the point of installation:

The local guidelines and regulations must be observed when mounting and installing the equipment.

Equipment rooms must be dry and dust-free. Ambient and cooling air must not contain any electrically conductive gases, vapors and dusts which could diminish the functionality. Dust-laden air must be filtered.

WARNING

Dimension the cabinet cooling in line with the power loss! (technical data, Section 14)

The converter ambient climate in operating rooms may not exceed the values of code F according to DIN 40040. The drive converter must be de-rated, corresponding to Sections 14.1 and 14.2, for temperatures > 40 °C (104 °F) and installation altitudes > 1000 m.

The unit is mounted corresponding to the dimension drawings in Section 2.4.

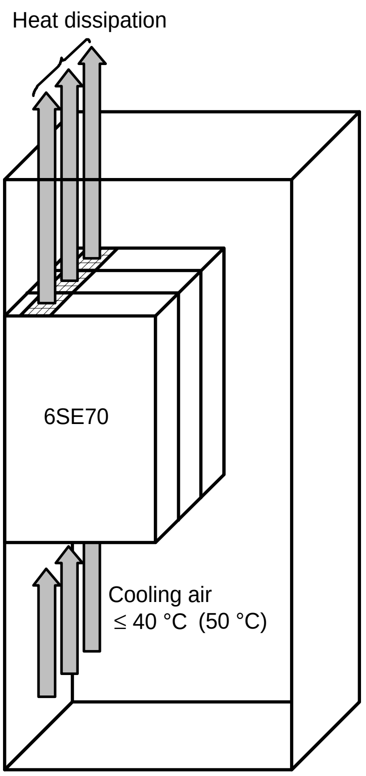


Fig. 2.1 Mounting the converters in cabinets

2.4 Dimension drawings

Kompaktgeräte, Bauform A bis C
Compact units, Type A to C

	a	b	c	d	e
Bauform/Type A	425	48.5	45	90	38.5
Bauform/Type B	425	47	67.5	135	37
Bauform/Type C	600	70	90	180	70

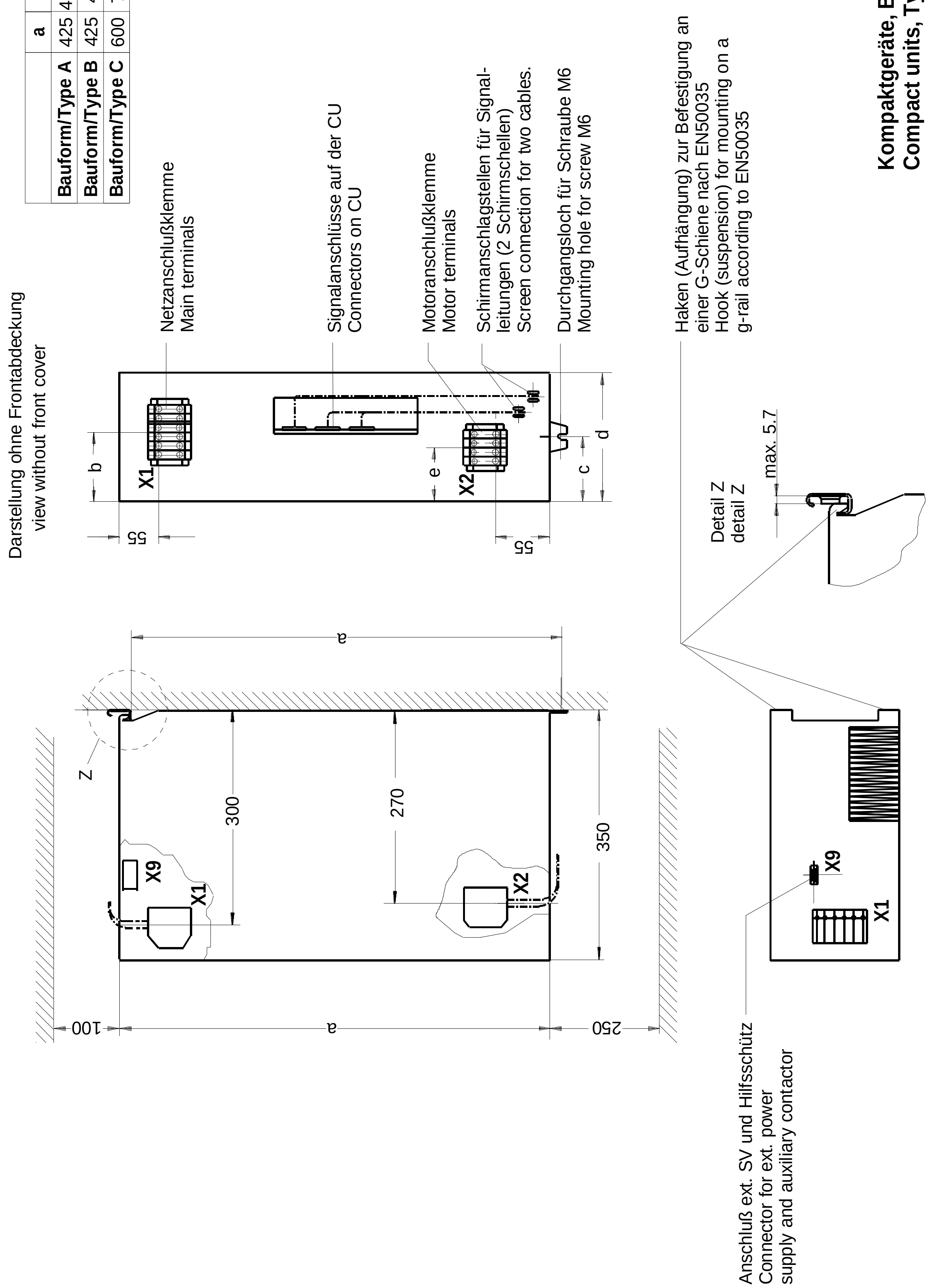


Fig. 2.2 Types A, B and C

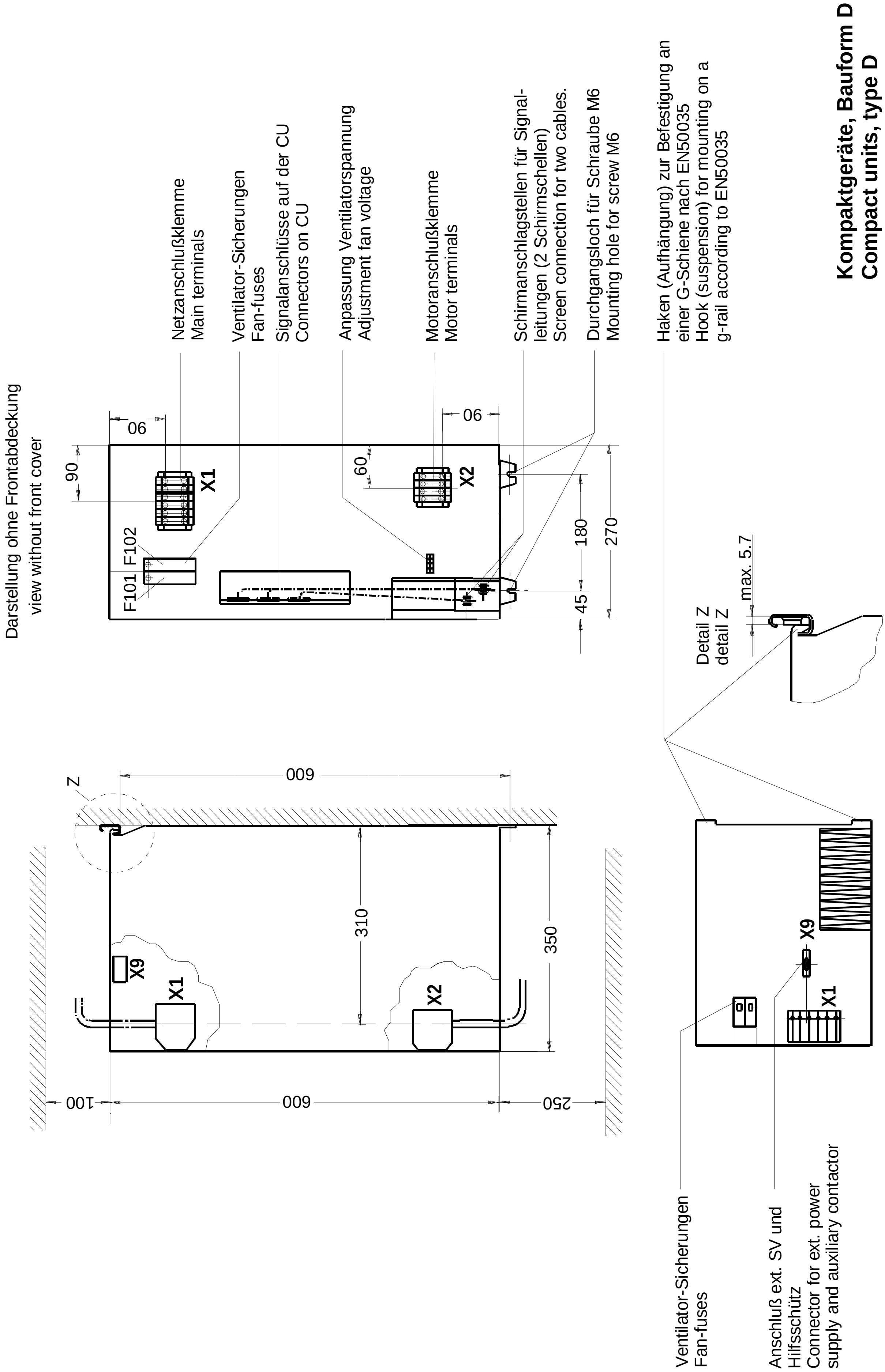

Kompaktgeräte, Bauform D
Compact units, type D
Darstellung ohne Frontabdeckung
view without front cover
Netzanschlußklemme
Main terminals
Ventilator-Sicherungen
Fan-fuses
Signalanschlüsse auf der CU
Connectors on CU
Anpassung Ventilatorspannung
Adjustment fan voltage
Motoranschlußklemme
Motor terminals
Schirmanschlagstellen für Signal-
leitungen (2 Schirmschellen)
Screen connection for two cables.
Durchgangsloch für Schraube M6
Mounting hole for screw M6
Haken (Aufhängung) zur Befestigung an
einer G-Schiene nach EN50035
Hook (suspension) for mounting on a
g-rail according to EN50035
X1
X2
X9
F101
F102
90
90
90
60
180
270
45
Detail Z
detail Z
max. 5.7
Z
600
310
350
100
600
250
Ventilator-Sicherungen
Fan-fuses
Anschluß ext. SV und
Hilfsschütz
Connector for ext. power
supply and auxiliary contactor

Fig. 2.3 Type D

3 Connecting-up

WARNING

SIMOVERT Master Drives are operated at high voltages.

The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out!

Only professionally trained, qualified personnel must work on or with the unit.

Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.

Hazardous voltages are still present in the unit up to 5 minutes after it has been powered-down due to the DC link capacitors. Thus, the appropriate delay time must be observed before opening-up the unit.

The power terminals and control terminals can still be live even though the motor is stationary.

Forming the DC link capacitors:

The storage time should not exceed one year. The converter DC link capacitors must be formed at start-up if the unit has been stored for a longer period of time.

Forming is described in Section 4.3.12.

When working on an opened unit, it should be observed that live components (at hazardous voltage levels) can be touched (shock hazard)

The user is responsible, that the motor, converter and any other associated devices or units are installed and connected-up according to all of the recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be especially observed.

NOTES

- Connection rating: The drive converter is suitable for connection to a line supply with a fault level (line supply) ≤ 100 × rated output (drive converter).
- Cabling: The connecting cables must be dimensioned according to the local regulations and according toTable 3.1. The insulation should be suitable for a temperature of 75 °C.

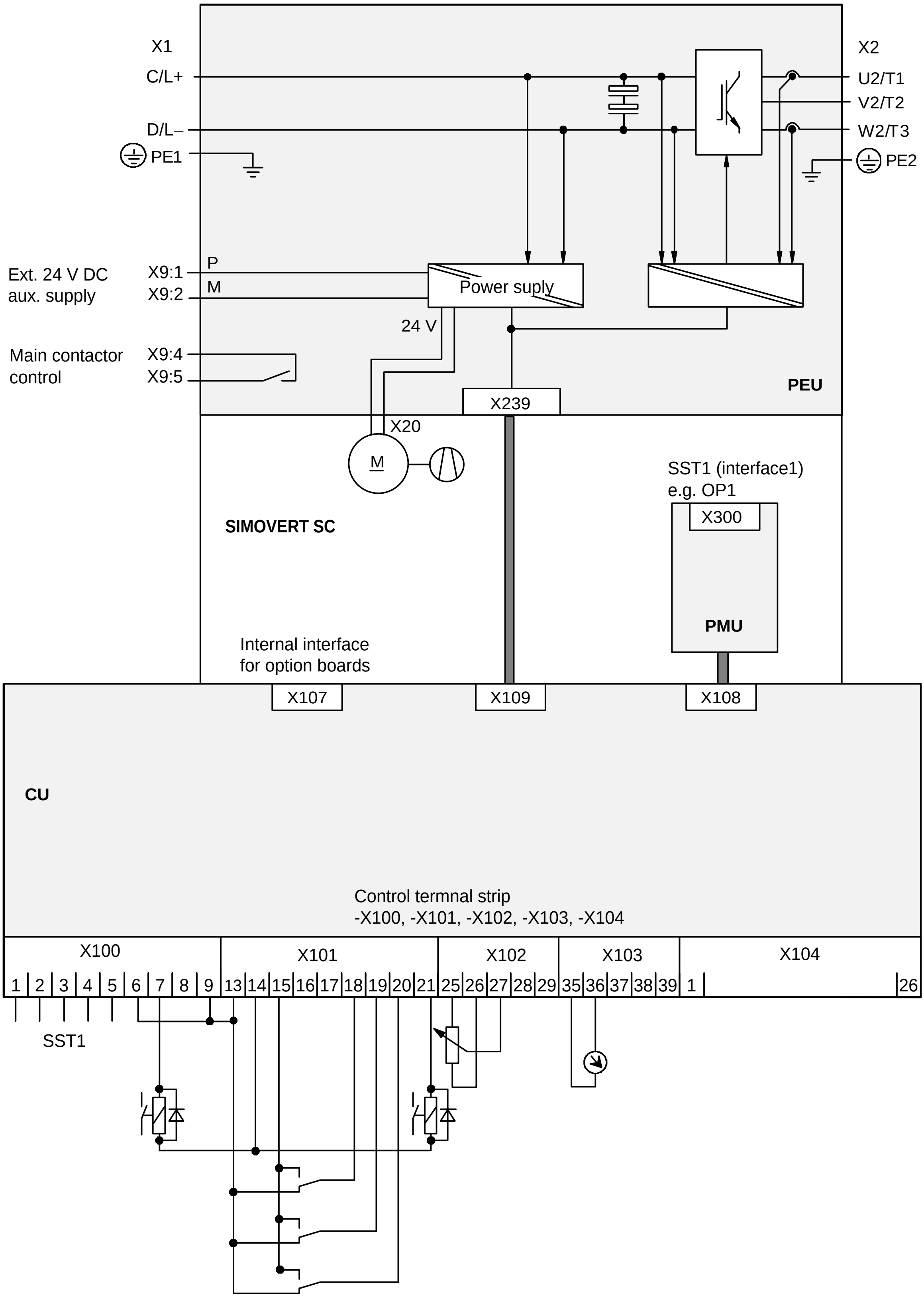


Fig. 3.1 Block diagram, types A, B, and C (24 V DC fan)

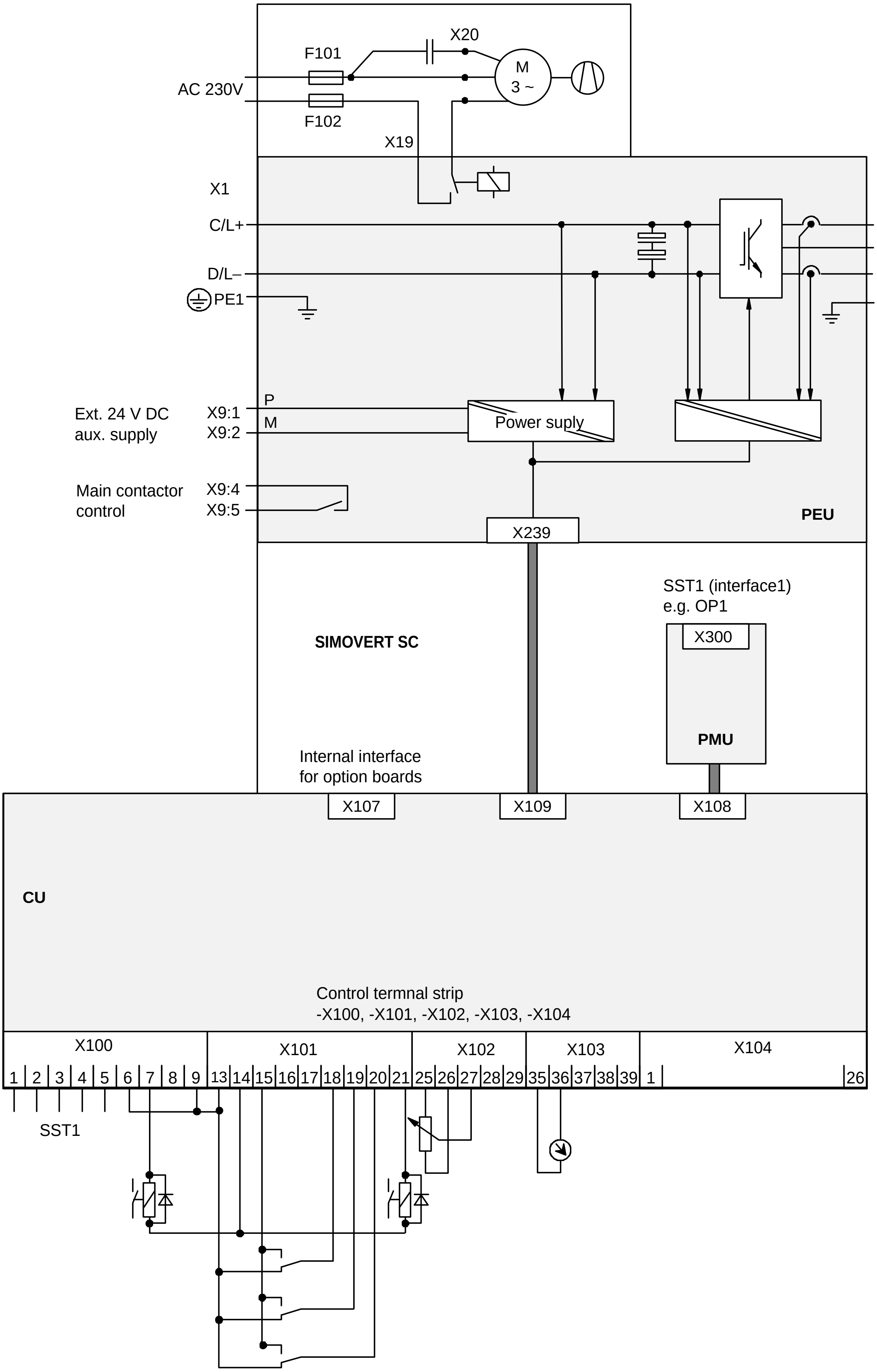


Fig. 3.2 Block diagram, types D (230 V AC fan)

3.1 Power connections

	WARNING
⚠	♦ The drive converter or the rectifier unit could be destroyed if the input terminals are interchanged! ♦ The coils of contactors and relays, which are connected to the same line supply as the drive converter, or are located close to the drive converter, must be provided with overvoltage limiters), e.g. RC elements.

The connecting cable cross-sections, specified in Table 3.1 are determined for copper cable at 40 °C (104 °F) ambient temperature (acc. to DIN VDE 0298 Part 4/02.88 Group 5).

The cross sections, specified in Table 3.2 are the connection cross-sections which are possible with the particular terminal size.

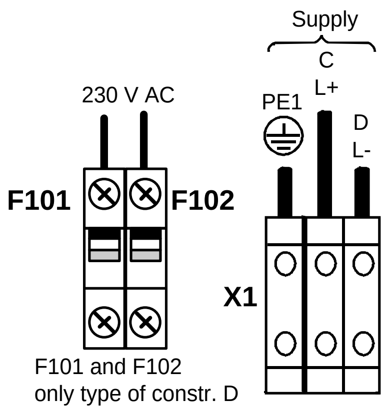


Fig. 3.3 Supply connection

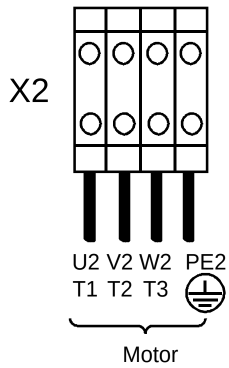


Fig.3.4 Motor connection

NOTE
For type of construction D, an external 230 V AC auxiliary voltage must be connected at F101 and F102. This auxiliary voltage is required for the unit fan.

NOTE
Depending on the motor insulation strength and the length of the motor feeder cable, it may be necessary to install one of the following options between the motor and the converter: ♦ Output reactor ♦ dv/dt-filter ♦ Sinusoidal filter Information regarding selection and dimensioning is provided in Section 9, "Options".

3.1.1 Protective conductor connection

The protective conductor should be connected-up on both the supply- and motor sides. It should be dimensioned according to the power connections. A minimum 10 mm^2 cross-section is required due to the discharge currents through the noise suppression capacitors.

Order-No.	Supply side: Rated DC-Current	Supply side: Cross-section VDE	Supply side: Cross-section AWG1)	Supply side: Recommended fuse		North America			Motor side: Rated output-voltage	Motor side: Rated output-current	Motor side: Cross-section VDE	Motor side: Cross-section AWG
	(A)	(mm^2)		(A)	Type	Type	(V)	(A)	(V)	(A)	(mm^2)	
6SE70					3NE	170M						
	Rated DC voltage 280 V to 310 V											
21-1RA30	10,6	1,5	16	25	8 015	1564	660	50	0 to 230	10,6	1,5	16
21-3RA30	13,3	2,5	14	35	8 003	1564	660	50	0 to 230	13,3	1,5	16
21-8RB30	17,7	4	10	50	8 017	1564	660	50	0 to 230	17,7	2,5	14
22-3RB30	22,9	6	8	80	8 020	1584	660	50	0 to 230	22,9	4	10
23-2RB30	32,2	10	6	100	8 021	1568	660	125	0 to 230	32,2	10	6
24-4RC30	44,2	16	4	125	8 022	1568	660	125	0 to 230	44,2	16	4
25-4RD30	54,0	35	2	160	8 024	1570	660	200	0 to 230	54,0	25	2
27-0RD30	69,0	35	2	160	8 024	1570	660	200	0 to 230	69	25	2
28-1RD30	81,0	50	0	160	4 124	1570	660	200	0 to 230	81	35	0
	Rated DC voltage 510 V to 620 V											
16-1TA30	6,1	1,5	16	25	8 015	1561	660	25	0 to 460	6,1	1,5	16
18-0TA30	8,0	1,5	16	25	8 015	1561	660	25	0 to 460	8,0	1,5	16
21-0TA30	10,2	1,5	16	25	8 015	1564	660	50	0 to 460	10,2	1,5	16
21-3TB30	13,2	4	10	50	8 017	1564	660	50	0 to 460	13,2	2,5	14
21-8TB30	17,5	4	10	50	8 017	1564	660	50	0 to 460	17,5	2,5	14
22-6TC30	25,5	10	6	80	8 020	1568	660	125	0 to 460	25,5	6	8
23-4TC30	34,0	10	6	80	8 020	1568	660	125	0 to 460	34	10	6
23-8TD30	37,5	16	4	125	8 022	1568	660	125	0 to 460	37,5	16	4
24-7TD30	47,0	25	2	125	8 022	1568	660	125	0 to 460	47	16	4
26-0TD30	59,0	35	0	160	8 024	1570	660	200	0 to 460	59	25	2
27-2TD30	72,0	35	0	160	8 024	1570	660	200	0 to 460	72	25	2

INFORMATION AND EXPLANATIONS

1) American Wire Gauge

Table 3.1 Supply values

Type	Order No.	Possible connection cross-section: Finely stranded (mm^2)	Finely stranded AWG	Multi-stranded/solid (mm^2)	Multi-stranded/solid AWG
A	6SE702_-_ _ _30	2,5 to 10	12 to 6	2,5 to 16	12 to 4
B	6SE702_-_ _ _30	2,5 to 10	12 to 6	2,5 to 16	12 to 4
C	6SE702_-_ _ _30	1 to 16	16 to 4	10 to 25	6 to 2
D	6SE702_-_ _ _30	2,5 to 35	12 to 2	10 to 50	6 to 0

Table 3.2 Possible connection cross-sections

3.2 Auxiliary power supply/main contactor or bypass contactor

The auxiliary power supply and the main- or bypass contactor are connected through the 5-pin connector X9.

Connector X9 with the plugs for the control terminal strip are supplied together (loose) with the equipment. 0.2 mm^2 to 2.5 mm^2 (AWG: 24 to 14) can be connected to X9.

The auxiliary power supply is required if the drive converter is supplied via a main- or bypass contactor, and the control functions should be maintained, even if the main- or bypass contactor is opened.

The main- or bypass contactor are controlled via the floating contacts X9.4 and –X9.5 (software default). Additional data are provided in Section 9 Options.

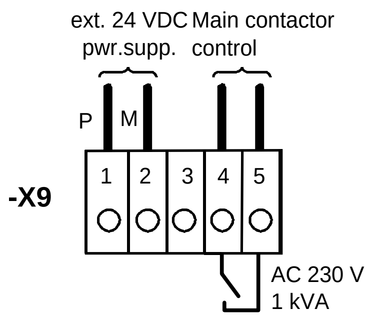


Fig. 3.5 Connecting an external auxiliary 24 V DC power supply and main contactor control

Terminal	**Function description**
1	24 V DC external ≥ 2,1 A (max. 4 A dependent on the options)
2	Reference potential to DC
3	Not assigned
4	Main contactor control
5	Main contactor control

Table 3.3 Connector assignment for –X9, auxiliary power supply and main contactor connection

NOTES
The coil of the main contactor must be provided with overvoltage limiters, e.g. RC elements (Section 9).

3.3 Control terminal strip and serial interface

WARNING
The converter must be disconnected and locked-out before control cables are connected to the CU.

The converter can be controlled via the following interfaces:

- Control terminal strip -X101 to -X104 on the electronics board CU
- RS 485 serial interface; control terminal strip -X100 on the electronics board CU
- OP operator control panel (refer to Section 9, Options)
- RS485 and RS232 serial interfaces on the PMU -X300

CAUTION
The CU board contains components which can be destroyed by electrostatic discharge. These components can be very easily destroyed if not handled with caution. Also refer to the ECB cautionary measures in the Section, General Information.

3.3.1 Connectors for the control terminal strip

The connectors for the control terminal strip are supplied (loose) with the unit. Cables with cross-sections from 0.14 mm^2 to 1.5 mm^2 (AWG: 26 to 16), or 1 mm^2 (AWG: 18) can be connected, using finely stranded wire with lugs at the connector (recommended: 0.5 mm^2 (AWG: 20)). The connectors can be identified using pin numbers (Table 3.4); the connector position on the board is illustrated in Fig. 3.7.

Connector		Labeling							
X100	9-pin, coded	1	2	3	CU3	6	7	8	9
X101	9-pin, coded	13	14	15	CU3	18	19	20	21
X102	5-pin	25	26	27	28	29			
X103	5-pin	35	36	37	38	39			

Table 3.4 Connectors for the control terminal strip are supplied loose

Two screen clamps and four cable ties are required from the loose components supplied to connect the control cables.

The remaining connector X9, included loose with the equipment, is required to control a main contactor and for connecting an external power supply (refer to Section 3.2 „Auxiliary power supply/main contactor“).

3.3.2 Connecting-up the control cables

NOTE
The control cables must be screened and should be routed away from the power cables with a minimum clearance of 20 cm. The screen should be connected at both ends. The screen is connected to the converter housing using screen clamps - as illustrated in Fig. 3.6. Control- and cables must cross each other at an angle of 90 °.

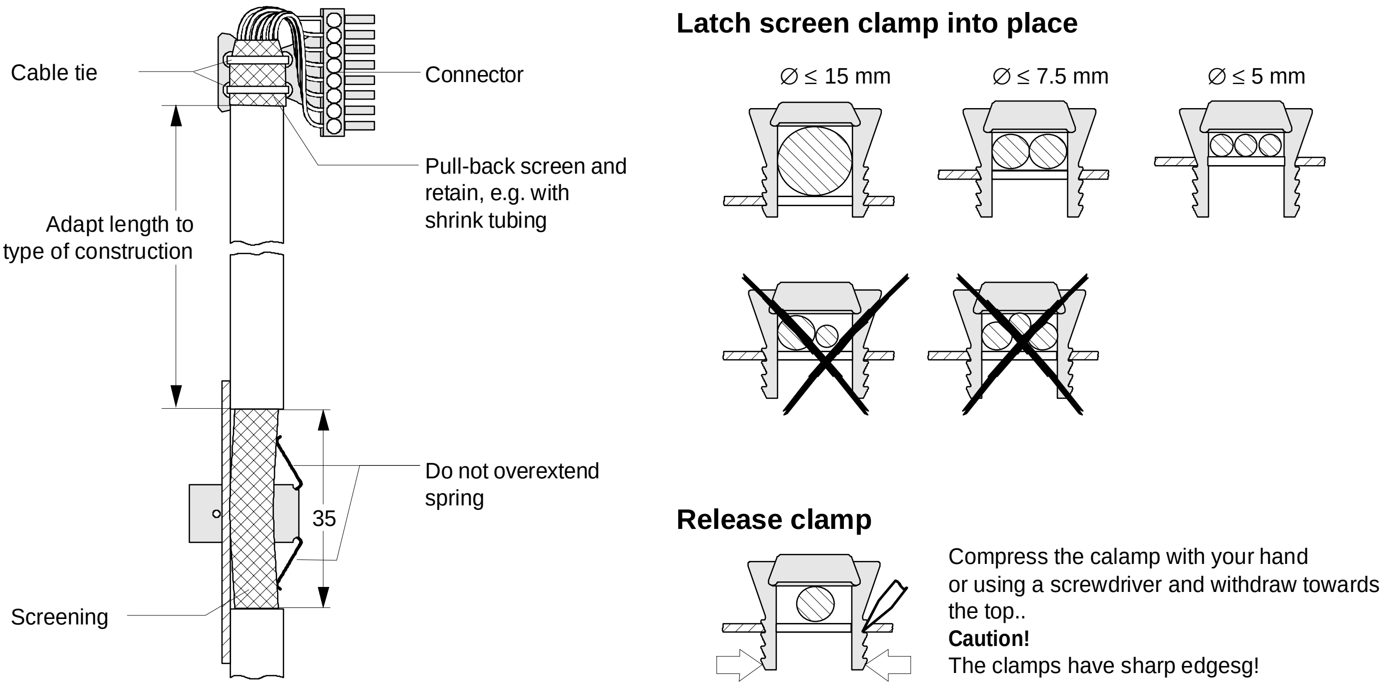
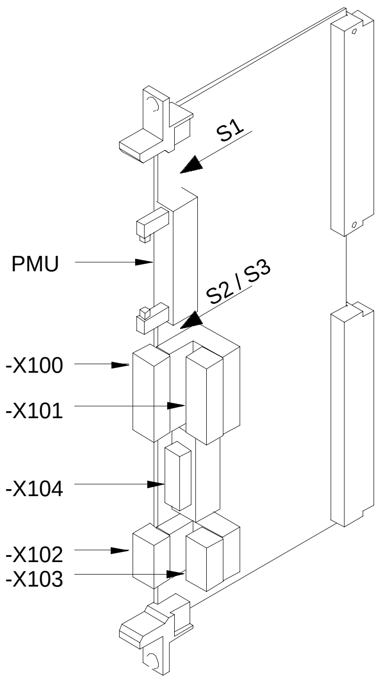


Fig. 3.6 Connecting-up the control cables and the technique for using the screen clamps

The "EMC screened housing" option should be used if so many control cables are required that two screen clamps are not sufficient.

Order No.:

- ♦ Type A 6SE7090-0XA87-3CA0
- ♦ Type B 6SE7090-0XB87-3CA0
- ♦ Type C 6SE7090-0XC87-3CA0
- ♦ Type D 6SE7090-0XD87-3CA0



S1 bis S3 werden im Kapitel 4.3.6 beschrieben.

S1 to S3 are described in Section 4.3.6

Fig. 3.7 Control terminals on CU

3.3.3 Terminal connection

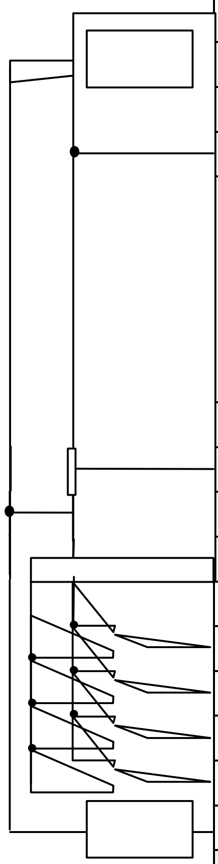
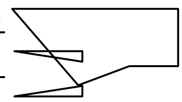
Connecting example	Term.	Function, notes
	-X100	
	1	Transmit- and receive line -RS485, differential input / -output, positive (RS485R/T+)
	2	Transmit- and receive line -RS485, differential input / -output, negative (RS485R/T–)
	3	Transmit output RS485 Standard, differential output, positive (RS485T+)
	4	Transmit output RS485 Standard, differential output, negative (RS485T–)
	5	Reference potential, RS485 interface
	NOTE	In addition to the GSST_2 interface on -X100, a GSST_1 interface -X300 is available on the parameterization unit; ☞ Chapter 4.3.6 „Start-up“.
	6	Binary output 2 relais 1 (changeover contact) reference contact 
	7	Binary output 2 relais 1 (changeover contact) NO contact
	8	Binary output 3, relais 1 (changeover contact) NO contact
	9	Binary output 3, relais 2 (NO contact) reference contact
	NOTE	Load capability of the binary outputs: 60 V AC, 60 VA, cosφ = 1 60 V AC, 16 VA, cosφ = 0.4 60 V DC, 24 W Inductive loads, e.g. contactors, relays, for DC voltage loads, must be damped using a diode or varistor, and for AC loads, with a varistor or RC element.
	-X101	
	13	+24 V, 75 mA for binary inputs and outputs
	14	Ref. potential for 24 V (ground)
	15	Ref. potential for binary inputs 1 to 5 for ext. signal voltage
	16	Binary input 1
	17	Binary input 2
	18	Binary input 3
	19	Binary input 4
	20	Binary input 5
	21	Binary output 3, relais 2 (NO contact) NO contact
	NOTE	Signal sensitivity of the binary inputs: H = 24 V (13 V to 33 V) I_{max} = 15.7 mA L = 0 V (–0.6 V to 3 V)

Table 3.5 Connecting example for control terminal strips -X100 and -X101

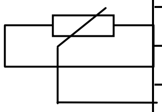
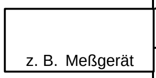
Connecting example	Term.	Function, notes
	-X102	
	25	+10 V / 5 mA, ±2 %, for setpoint pot., non-floating
	26	–10 V / 5 mA, ± 2%, for setpoint pot., non-floating
	27[1)]	Analog input 1 (0 V to ±10 V)
	28	Ref. potential, analog input 1
	29[1)]	Analog input 1 (0 mA to 20 mA or. 4 mA to 20 mA) int. load resistor 250 Ω
	-X103	
	35	Analog output 1 ≤ 5 mA
	36	Ref. potential, analog output 1
	NOTE	Terminals 35 and 36: To increase the noise immunity of the signals, an isolating amplifier should be connected between the analog output and measuring unit for cables > 4 m.
	37	Output of track B, HTL signal level (2048 increments/revolution), max load is 3 mA
	38	Output of track A, HTL signal level (2048 increments/revolution), max load is 3 mA
	39	Output of the zero pulse, HTL signal level (2048 increments/revolution), max load is 3 mA

Table 3.6 Connecting-up example for the control terminal strip -X102 and -X103

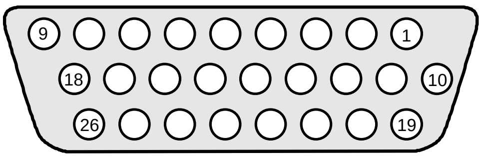


Fig. 3.8 Connection example for the control terminal strip -X104

Terminal	Function, information
X104	
1	Resolver excitation voltage R3
2	Resolver-excitation voltage R1
3	Track C+ of encoders
4	Track C- of encoders
5	Track D+ of encoders
6	Track D- of encoders
7	Sense line 0 V for encoder
8	Reference potential for encoder
9	+5 V power supply for encoder
10	Resolver output voltage, connection S1
11	Resolver output voltage, connection S3
12	Track A+ of encoders
13	Track A- of encoders
14	Track B+ of encoders
15	Track B- of encoders

1) Only one of the two terminals, 27 or 29, may be assigned

Terminal	Function, information
16	+ zero pulse from the encoder
17	- zero pulse from the encoder
18	Sense line + 5 V for encoders
19	Resolver output voltage, connection S2
20	Resolver output voltage, connection S4
21	Connection for the inner screen
22	Connection for the inner screen
23	Connection for the inner screen
24	Connection for the inner screen
25	Input for the motor temperature (KTY84)
26	Reference potential for the motor temperature (KTY84)
NOTE	Safe separation for terminals 25 and 26 must be externally ensured.

Table 3.7 Connection example for control terminal strip -X104

3.3.4 Connecting-up the parameterizing unit (PMU)

A serial connection to automation unit or a PC can be realized via connector X300 on the PMU. Thus, the converter can be controlled and operated from the central control station or control room.
For degree of protection IP20 (option) there is no PMU. The OP1 operator panel must be removed (release two retaining screws on the inside of the door) to connect a PC or an automation unit at X300.

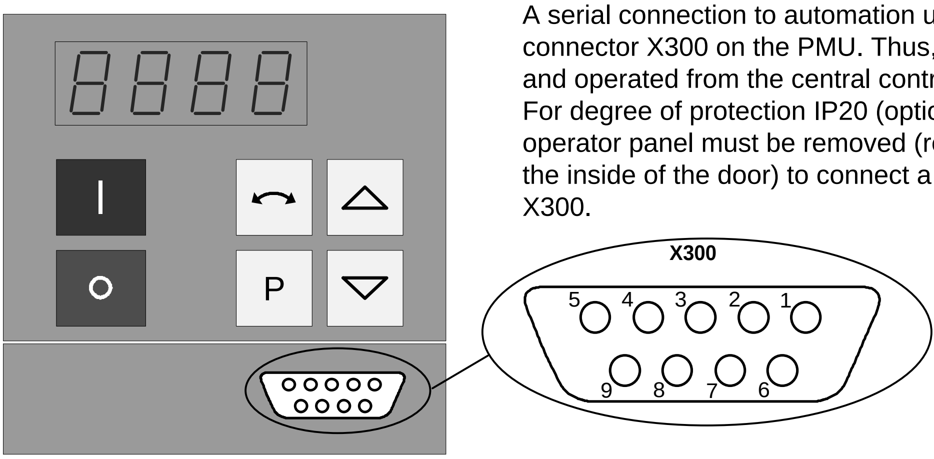


Fig. 3.9 Parameterizing unit (PMU)

PMU -X300	Description
1	Housing ground
2	Receive line, RS232 standard (V.24)
3	Transmit- and receive line, RS485, two-wire, positive differential input/output
4	RTS (request to send)
5	Ref. potential (ground)
6	5 V power supply for OP
7	Transmit line, RS232 standard (V.24)
8	Transmit- and receive line RS485, two-wire, negative differential input/output
9	Ref. potential for RS232- or RS485 interface (EMC suppressed).

Table 3.8 Connector assignment for interface -X300

3.4 Measures to maintain the radio interference suppression regulations

B1 suppression filters must be used to maintain the relevant radio interference suppression regulations.

The following points must be observed regarding radio interference suppression regulations

♦ **Grounding**

Converters generate radio interference noise. This noise should be fed back to the source through the lowest possible ohmic connection (ground connection cross-section ≥ supply connection cross-section, also refer to Section 3.1.2)

Use the best grounding possibility (e.g. mounting panel, grounding cable, grounding bar) when installing converters and optional radio interference suppression filters. Connect all connector housings together through the largest possible surface area.

For radio interference suppression, the cross-section (observe the safety regulations under fault conditions), is not so important, but the contact surface, as high-frequency noise currents do not flow through the complete cross-section, but essentially on the outside surface of a conductor (skin effect).

♦ **Screening**

In order to reduce noise and maintain the radio interference suppression level, the following should be maintained

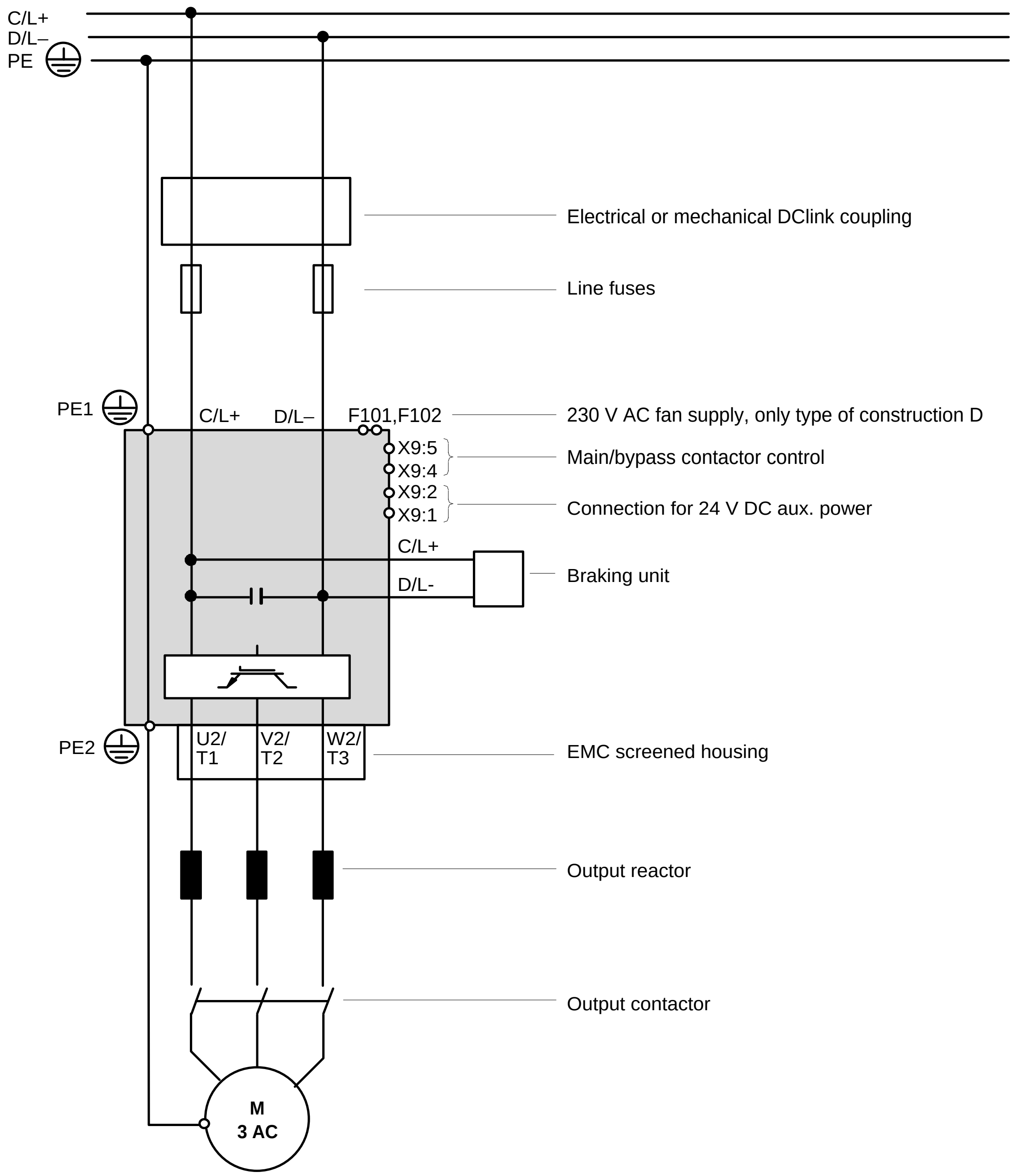
- screened cables should be used between the converter output and motor
- screen control cables must be used.

The screen must be connected to ground potential at both ends.

♦ **Filter**

The radio interference suppression filter must be connected directly in front of the rectifier- or rectifier and regenerative feedback unit. The housings must be connected electrically with one another.

3.5 Recommended circuit



4 Start-up

4.1 Introduction and handling start-up

4.1.1 Handling the start-up instructions

NOTE
♦ Section 4.2 First start-up: First start-up of the converter ♦ Section 4.3 Start-up aids: Index-type reference for start-up and use of the converter, which must only be used when actually required! ♦ Section 4.4 Function diagrams: Graphical overview of the setpoint channel, open-loop/closed-loop control, analog inputs/outputs, and the converter data sets

4.1.2 General explanation of the terminology and functional scope of the converter

Abbreviations:

♦ Abbreviations used: Refer to Section 15 "Information, notes"

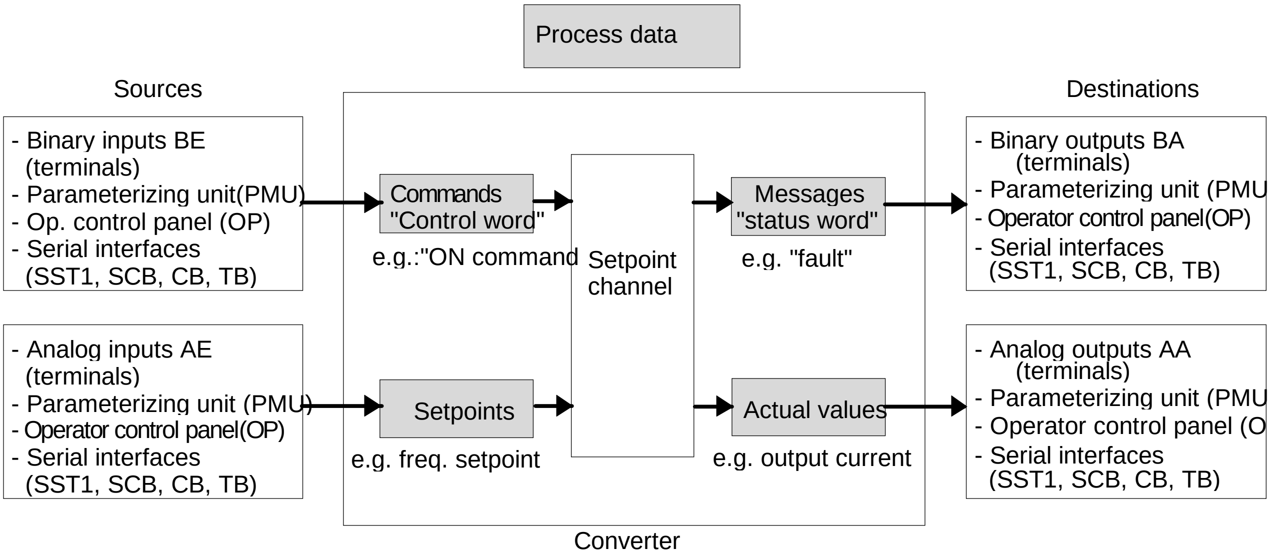
Converter closed-loop control

♦ Simplified block diagrams in Section 4.2.4
(Detailed "function diagrams, open-loop/closed-loop control": refer to Section 4.4)

♦ Common data:	Speed resolution:	0.3 RPM
	Max. frequency:	400 Hz
♦ Applications:	Permanent-magnet synchronous-motor drives, e.g. for actuator drives, winders, etc.	
♦ Control versions:	• Closed-loop speed control • Closed-loop torque control (entering the torque-generating current).	

" Process data ":

♦ "Process data" are commands and setpoints from "outside" fed into the converter as well as signals and actual values which are output from the converter.

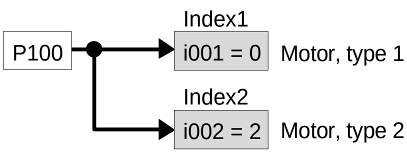


" Indexed" parameters:

i.e. the parameter number is sub-divided into various "indices" (briefly: i001, i002, etc.), in which the particular parameter value can be entered.

The significance of the "indices" of the particular parameter (parameter number) can be taken from the parameter list, in Section 5.

Example:



" Data sets ":

"Indexed" parameters can be sub-divided according to data sets (indexed).

The appropriate data set is selected using a command, via the "control word".

Refer to "function diagram, data set" in Section 4.4.

♦ SDS (setpoint channel data set) 1 to 4:

  4 setpoint channel data sets which can be changed over; e.g. for production-related different drive ramp-up and ramp-down times.

♦ SDS (setpoint channel data set) 1 to 4:

  4 setpoint channel data sets which can be changed over; e.g. for production-related different drive ramp-up and ramp-down times.

♦ Basic/reserve (basic- or reserve setting):

  e.g. for changing over between manual and automatic operation

♦ MDS (motor data set) 1 or 2:

2 motor data sets which can be changed over; e.g. for operating different motor types from one converter.

4.2 First start-up

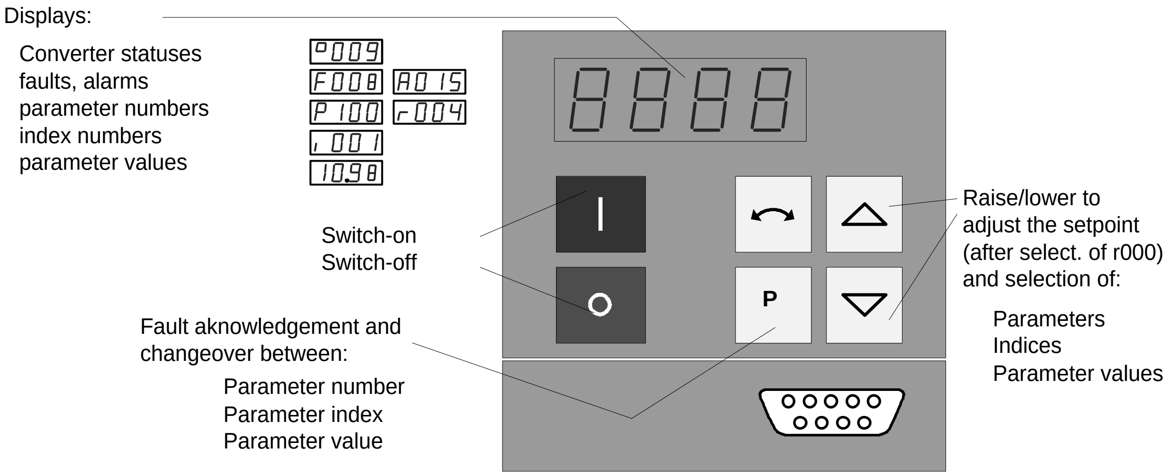
4.2.1 Preparatory measures

- ♦ Transporting, unpacking, assembling: refer to Section 2
- ♦ Connecting-up: Refer to Section 3
- ♦ Read "Introduction and handling the start-up instructions ": Section 4.1

♦ Forming the capacitors: If the converter has been continuously shutdown for longer than one year, or was not connected, then the DC link capacitors must be formed. Also refer to Section 4.3.12

- ♦ Connect-up the supply and electronics power supply of the converter with the front panel closed.

When supplied, the converter is controlled and parameterized by the parameterizing unit (PMU) located on the front side of the converter.



A detailed description of the displays as well as the parameterizing and operator control possibilities of the converter via the PMU, is provided in Section 6 "operator control".

The converter is supplied with the “factory setting“ (refer to Section 5 “Parameter list“) and access stage 2 (standard mode). After the drive converter has been powered-up for the first time, it goes into status 005 “drive settings“ (P052 = 005). This status can be exited after entering valid motor data (refer to Sections 4.2.2 and 4.2.3) (P052 = 000) and the drive can then be powered-up

Parameterization is realize according to Section

4.2.2 as “**Standard application with V/f characteristic without hardware options“** for simple applications with1 FT6 motors.

or **4.2.3** as **„Expert application“** when using motors from other manufacturers, sophisticated applications (e.g.: Close-loop control, data set changeover, interface operation, etc.) or if hardware options are available.

4.2.1.1 Motor list

Settings for motor type P100. The tabulated data for torque, current and output, are nominal values and are valid for a 3-ph. 380 V AC to 460 V AC converter supply voltage. Other motor data (e.g. also data for 3-ph. 208 V to 230 V AC supplies) are provided in the Engineering Manual „1FT6 three-phase servomotors", Section 2.3.3 (motor overview).

PWE	Motor MLFB	Speed n_n [RPM]	Torque M_n [Nm]	Current I_n [A]	Output P_n [kW]	Cooling
1	1FT6031-4AK7_	6000	0.8	1.2	0.47	Self
2	1FT6034-4AK7_	6000	1.4	2.1	0.88	Self
3	1FT6041-4AF7_	3000	2.2	1.7	0.68	Self
4	1FT6041-4AK7_	6000	1.7	2.4	1.1	Self
5	1FT6044-4AF7_	3000	4.3	2.9	1.3	Self
6	1FT6044-4AK7_	6000	3.0	4.1	1.9	Self
7	1FT6061-6AC7_	2000	3.7	1.9	0.77	Self
8	1FT6061-6AF7_	3000	3.5	2.6	1.1	Self
9	1FT6061-6AH7_	4500	2.9	3.4	1.4	Self
10	1FT6061-6AK7_	6000	2.1	3.1	1.3	Self
11	1FT6062-6AC7_	2000	5.2	2.6	1.1	Self
12	1FT6062-6AF7_	3000	4.6	3.4	1.4	Self
13	1FT6062-6AH7_	4500	3.6	3.9	1.7	Self
14	1FT6062-6AK7_	6000	2.1	3.2	1.3	Self
15	1FT6064-6AC7_	2000	9.0	3.8	1.7	Self
16	1FT6064-6AF7_	3000	7.0	4.9	2.2	Self
17	1FT6064-6AH7_	4500	4.8	5.5	2.3	Self
18	1FT6064-6AK7_	6000	2.1	3.5	1.3	Self
19	1FT6081-8AC7_	2000	7.5	4.1	1.6	Self
20	1FT6081-8AF7_	3000	6.9	5.6	2.2	Self
21	1FT6081-8AH7_	4500	5.8	7.3	2.7	Self
22	1FT6081-8AK7_	6000	4.6	7.7	2.9	Self
23	1FT6082-8AC7_	2000	11.4	6.6	2.4	Self
24	1FT6082-8AF7_	3000	10.3	8.7	3.2	Self
25	1FT6082-8AH7_	4500	8.5	11	4.0	Self
26	1FT6082-8AK7_	6000	5.5	9.1	3.5	Self
27	1FT6084-8AC7_	2000	16.9	8.3	3.5	Self
28	1FT6084-8AF7_	3000	14.7	11	4.6	Self
29	1FT6084-8AH7_	4500	10.1	12	4.8	Self
30	1FT6084-8AK7_	6000	4.0	5.8	2.5	Self
31	1FT6084-8SC7_	2000	23.5	12.5	4.9	External
32	1FT6084-8SF7_	3000	22	17	6.9	External
33	1FT6084-8SH7_	4500	20	24.5	9.4	External
34	1FT6084-8SK7_	6000	17	25.5	10.7	External
35	1FT6086-8AC7_	2000	23	10.9	4.8	Self
36	1FT6086-8AF7_	3000	18.5	13	5.8	Self
37	1FT6086-8AH7_	4500	12.0	12.6	5.6	Self
38	1FT6086-8SC7_	2000	33	17.5	6.9	External
39	1FT6086-8SF7_	3000	31	24.5	9.7	External
40	1FT6086-8SH7_	4500	27	31.5	12.7	External
41	1FT6086-8SK7_	6000	22	29	13.8	External
42	1FT6102-8AB7_	1500	24.5	8.4	3.9	Self
43	1FT6102-8AC7_	2000	23	11.0	4.8	Self

PWE	Motor MLFB	Speed n_n [RPM]	Torque M_n [Nm]	Current I_n [A]	Output P_n [kW]	Cooling
44	1FT6102-8AF7_	3000	19.5	13.2	6.1	Self
45	1FT6102-8AH7_	4500	12.0	12	5.6	Self
46	1FT6105-8AB7_	1500	42	14.5	6.6	Self
47	1FT6105-8AC7_	2000	38	17.6	7.9	Self
48	1FT6105-8AF7_	3000	31	22.5	9.7	Self
49	1FT6105-8SB7_	1500	57	21.5	9	External
50	1FT6105-8SC7_	2000	55	28	11.5	External
51	1FT6105-8SF7_	3000	49	35	15.4	External
52	1FT6108-8AB7_	1500	61	20.5	9.6	Self
53	1FT6108-8AC7_	2000	55	24.5	11.5	Self
54	1FT6108-8SB7_	1500	83	31	13	External
55	1FT6108-8SC7_	2000	80	39	16.7	External
56	1FT6132-6AB7_	1500	62	19	9.7	Self
57	1FT6132-6AC7_	2000	55	23	11.5	Self
58	1FT6132-6AF7_	3000	36	23	11.3	Self
59	1FT6132-6SB7_	1500	100	36	15.2	External
60	1FT6132-6SC7_	2000	98	46	20.5	Self
61	1FT6132-6SF7_	3000	90	62	28.3	External
62	1FT6134-6AB7_	1500	75	24	11.8	Self
63	1FT6134-6AC7_	2000	65	27	13.6	Self
64	1FT6134-6SB7_	1500	130	45	20.4	External
65	1FT6134-6SC7_	2000	125	57	26.2	External
66	1FT6134-6SF7_	3000	110	72	34.5	External
67	1FT6136-6AB7_	1500	88	27	13.8	Self
68	1FT6136-6AC7_	2000	74	30	15.5	Self
69	1FT6136-6SB7_	1500	160	55	25	External
70	1FT6136-6SC7_	2000	150	72	31.4	External
71	1FT6034-1AK71-3A.0	6000	1.4	2.1	0.88	Self
72	1FT6044-1AF71-3A.0	3000	4.3	2.9	1.3	Self
73	1FT6061-1AF71-3A.0	3000	3.5	2.6	1.1	Self
74	1FT6062-1AF71-3A.0	3000	4.6	3.4	1.4	Self
75	1FT6064-1AF71-3A.0	3000	7.0	4.9	2.2	Self
76	1FT6082-1AF71-1A.0	3000	10.3	8.7	3.2	Self
77	1FT6084-1AF71-1A.0	3000	14.7	11	4.6	Self
78	1FT6086-1AF71-1A.0	3000	18.5	13	5.8	Self
79	1FT6102-1AC71-1A.0	2000	23	11.0	4.8	Self
80	1FT6105-1AC71-1A.0	2000	38	17.6	7.9	Self

Table 4.1 Motor list

NOTE
It is possible to jump into the appropriate sequence step if incorrect entries have been made, taking into account the access stage (P051) and a function selection (P052) which may be required. It is recommended that the following parameters and function steps after the jump-in position are re-checked and executed due to the background calculations !

4.2.2 Parameterization "Standard application with V/f characteristic without hardware options"

P050 =	Language: 0 = German, 1 = English, 2 = Espanol, 3 = Francais, 4 = Italiano
P051 = 2	Access “stage standard mode“
P052 = 5	Function selection "drive setting"
P071 =	Converter supply voltage [V]
P100.i001 =	Selecting a 1FT6 Siemens motor from the motor list, refer to Section 4.2.1.1
P208.x =	Define the encoder (refer to Section 5, Parameter list): 0: No encoder (not permissible) 1: ERN1387 encoder or compatible 2: Resolver with the motor pole pair number 3: Resolver with pole pair number 1
P420 =	Rated system speed [RPM] Rated motor speed in the Appendix
P452.i001 =	Maximum speed, clockwise phase sequence [RPM]
P453.i001 =	Maximum speed, counter-clockwise phase sequence [RPM]
P462.i001 =	Ramp-up time [s] from standstill up to the rated system freq. (P420)
P464.i001 =	Ramp-down. time [s] from the rated system freq. (P420) down to standstill
P052 = 0 depress P	If fault Ffxx occurs, refer to Section 7 „Fault finding“
P231.i001	If required, adapt the dynamic factor.
Ready	The converter executes a motor identification run after the first power-up (refer to P330.x).

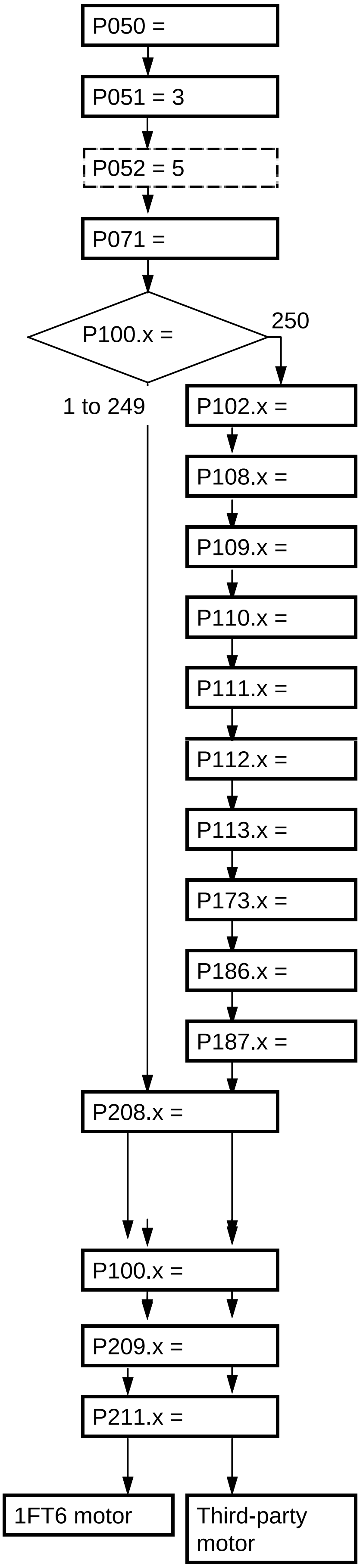
NOTE

If the motor does not start to run after it has been commissioned and a speed setpoint has been entered then the following faults could be present:

1. The phase connection has been interchanged in the power cable between the drive converter and the motor
2. The incorrect encoder type has been parameterized (P208)
3. The incorrect motor type has been parameterized and P208=3
4. The encoder has been incorrectly adjusted
5. The motor brake does not or has not released.

Faults, types 1 or 3 can also cause the motor to accelerate to a fixed speed independent of the speed setpoint after the drive is powered-up.

4.2.3 Parameterization "expert application"



Language:
0: Deutsch, 1: English, 2: Espanol, 3: Francais, 4: Italiano

Access stage "expert mode"

Function selection "drive setting"
If fault "Fxxx", refer to Section 7 " Troubleshooting "

Converter supply voltage [V]

Motor type: 0: No motor
1 to 249: 1FT6 Siemens motor according to the motor list
250: Third-party motor

Rated motor current [A]

Rated motor speed [RPM]

Motor pole pair number

Motor torque constant k_T [Nm/A]

Maximum permissible deviation of torque constant k_T from the set value (P110.x) [Nm/A]

Speed limit, from where the torque constant is adapted [%]

Rated motor torque [Nm]

Maximum motor current [A]

Speed-dependent torque constant [%]

Temperature-dependent torque constant [%]

Define encoder (refer to Section 5, parameter list):
- 0: No encoder (not permissible)
- 1: ERN1387 encoder or compatible
- 2: Resolver with the motor pole pair number
- 3: Resolver with pole pair number 1

P100.x = 1 bis 249: 1FT6-Motor

P100.x = 250: Third-party motor

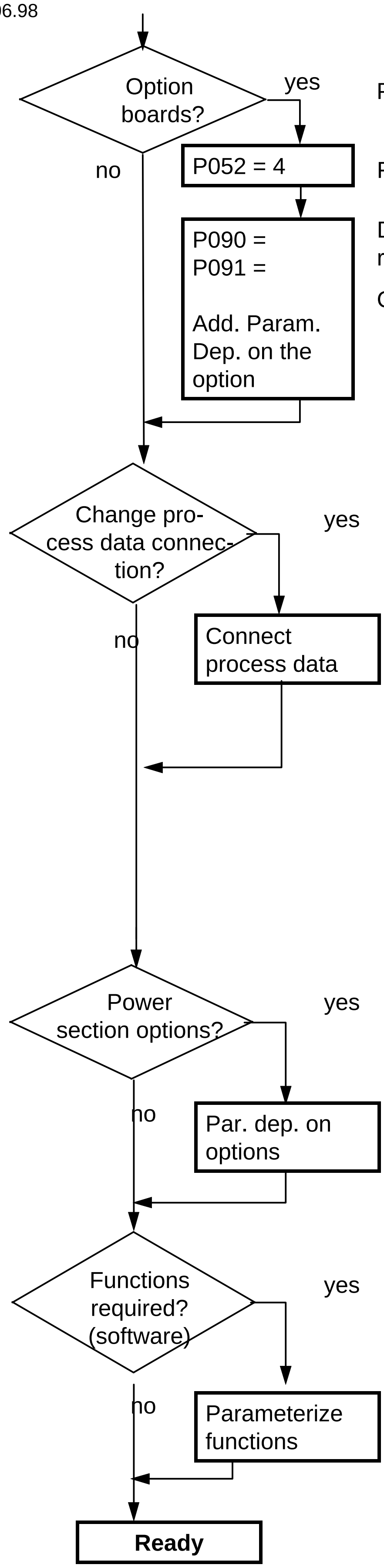
Only for P208.x =1: encoder pulse number (only powers of 2 permissible)

Only for P208.x = 2.3: Resolver field:
- 0: Automatic adaption
- 1 to 7: Manual adaption

1FT6 motor P100.x = 1 to 249:

Third-party motor P100.x = 250:

P213.x =	Only for P208.x =2.3: Resolver offset source: 0: Measured values 1: Value corresponding to the entry in P212.x 2: Transfer the measured value into P212.x
P242.x =	Starting time [s]: Accelerating time from standstill up to the rated speed with the rated motor torque (P113.x)
P272.x =	Motor stator resistance [W]
P330 =	Select motor identification: 0: Only after entering new motor data 1: After every ON command
P331.x =	Voltage amplitude for motor identification [V]
P332.x =	Number of measuring cycles for motor identification
P354 =	Select ground-fault test: 0: No ground-fault test 1: Only after the next ON command 2: After each ON command
P357 =	Current limit for the ground-fault test [A]
P420 =	Rated system speed [RPM] Rated motor speed in the system
P452.x =	Maximum speed, clockwise phase sequence [RPM]
P453.x =	Maximum speed, counter-clockwise phase sequence [RPM]
P462.x =	Accelerating time [s] from standstill up to the rated system speed (P420)
P464.x =	Deceleration time [s] from the rated system speed (P420) down to standstill
P485.x =	Rated system torque referred to the rated motor torque (P113.x) [%]
P761.x =	Pulse frequency [kHz]
P052 = 0 depress P key	If fault "Fxxx", refer to Section 7 „Troubleshooting“. The converter executes a motor identification run after the first power-up (refer to P330.x).



Possible option boards: SCB, CB, TB,

Function selection "Hardware configuration

Define and parameterize the option boards:
refer to the Instruction manual for the option boards

Option boards 0: none
1: CB
2: TB
3: SCB

Change factory setting for:
Command- and setpoint sources,
Destinations for signals and actual values

Process data: refer to Section 4.3.1

- Control word (commands)/status word (messages)
- Setpoint/actual values

  Possible process data sources/destinations: (refer to Sections 4.3.2 to 4.3.6)
  - Binary inputs, binary outputs
  - Analog inputs, analog outputs
  - Serial interface in the basic converter (SST1)
  - Option boards (SCB, TSY, CB, TB)

Simple applications: Refer to Section 4.2.6

Possible options, power section:

- Main contactor,
- Output contactor,
- Braking unit

Define and parameterize power section options:

- Main contactor, output contactor (refer to Section 9 „options")
- Braking unit (refer to the Instruction Manual for the option)

Possible functions:

- Motor identification, first run,
- Restart-on-the-fly,
- Ground-fault test

Parameterize function:
Section 4.3.10 "Functions"
and Section 5 „Parameter list"

NOTE

If the motor does not start to run after it has been commissioned and a speed setpoint has been entered then the following faults could be present:

1. The phase has been interchanged in the power cable between the drive converter and the motor
2. The incorrect encoder type has been parameterized (P208)
3. The incorrect motor type has been parameterized and P208=3
4. The encoder has been incorrectly adjusted
5. The motor brake does not or has not released.

Faults, types 1 or 3 can also cause the motor to accelerate to a fixed speed independent of the speed setpoint after the drive is powered-up.

4.2.4 Simplified block diagrams for setpoint channel and closed-loop control

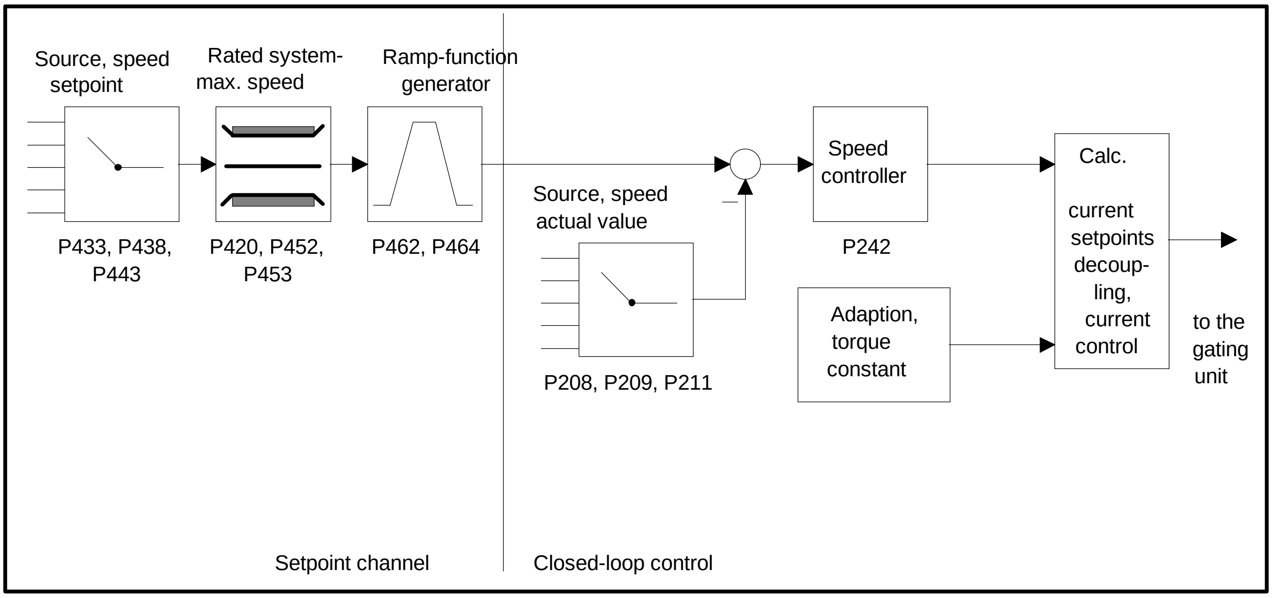


Fig. 4.1 Closed-loop speed control P163 = 4

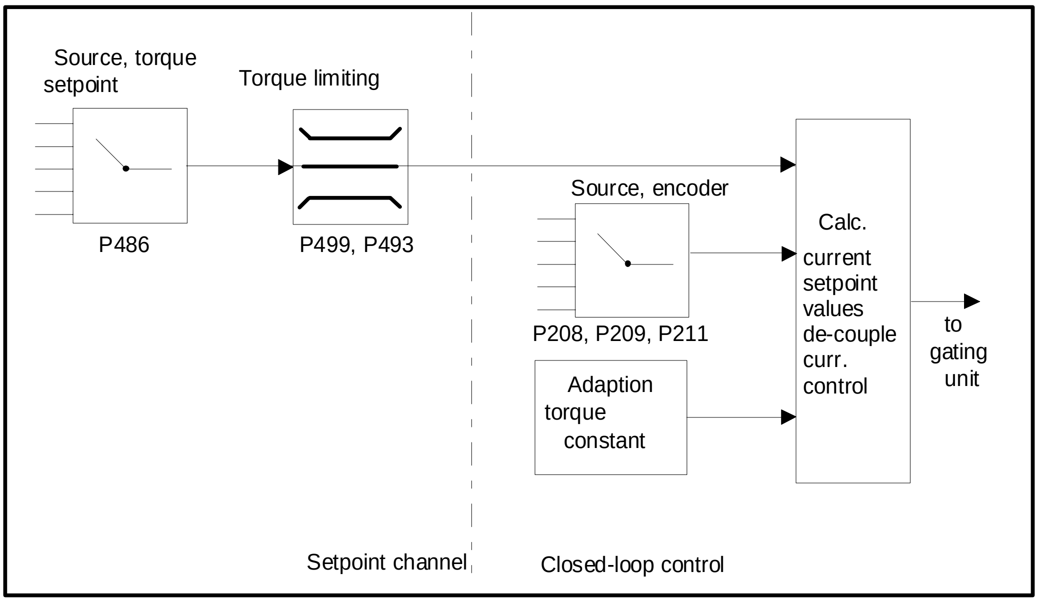


Fig. 4.2 Closed-loop torque control P163 = 5

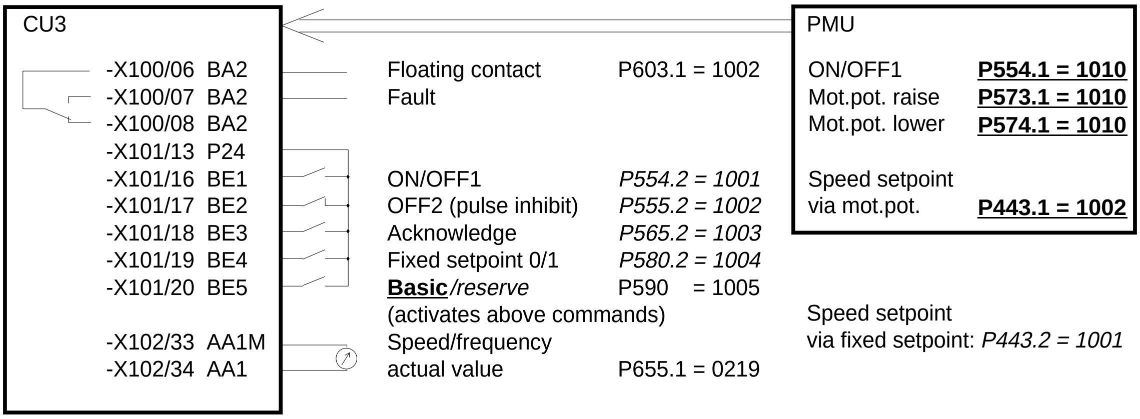
- detailed parameter description: refer to section 5 “Parameter list“
- detailed function diagrams: refer to section 4.9 “Function Diagrams“

4.2.5 Simple application examples for connecting process data with connection assignment

Connecting-up: Refer to Section 3.3 "Control terminal strip"

Factory setting:

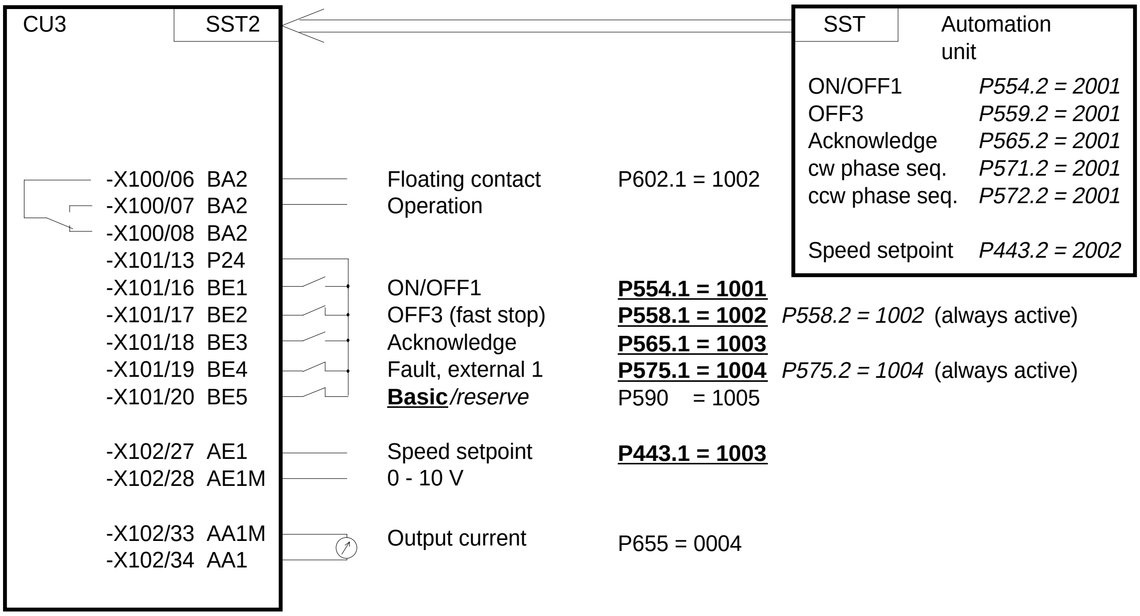
Switch-on/off as well as setpoint input via the PMU, messages and actual values via the terminal strip.
Terminal strip only operational if binary input 5 (BE5) is energized (high signal level corresponds to "reserve").



Manual/automatic operation:

Automatic operation (BE5 high level): Setpoint and command input from the automation unit via serial interface (SST1), OFF3 and monitoring external faults, also possible via terminal strip.

Manual operation (BE5 low level): Setpoint- and command input via terminal strip.



Tip: If a terminal cannot be connected-up as source or destination, it should be checked as to whether it has already been used for other signals.

4.3 Start-up aids

4.3.1 Process data

Process data are commands and setpoints which are entered into the converter from "outside" as well as signals and actual values which the converter outputs.

4.3.1.1 Control word (control word 1 and control word 2)

4.3.1.1.1 Introduction and application example

The two control words 1 (bits 0 to 15) and 2 (bits 16 to 31) output commands and external signals (messages) to the converter. Their status can be read-out via parameter r550 or r967 (control 1) and r551 (control word 2).

An overview is provided in Section 4.3.1.1.2 "Overview of the control word".

The significance of the possible commands and signals, entered externally, is described in Section 4.3.1.1.4 "Significance of the control word commands".

Every control word bit is assigned a selection parameter, which defines from which source(s) this bit can be changed (refer to Section 4.3.1.1.2, righthand column).

The selection parameters for the sources are, with the exception of P590 (source selection for control word bit 30 "basic/reserve setting") and P591 (source selection for control word bit 31 "HS checkback signal") are indexed 2x as follows:

Index	i001	Basic setting
	i002	Reserve setting

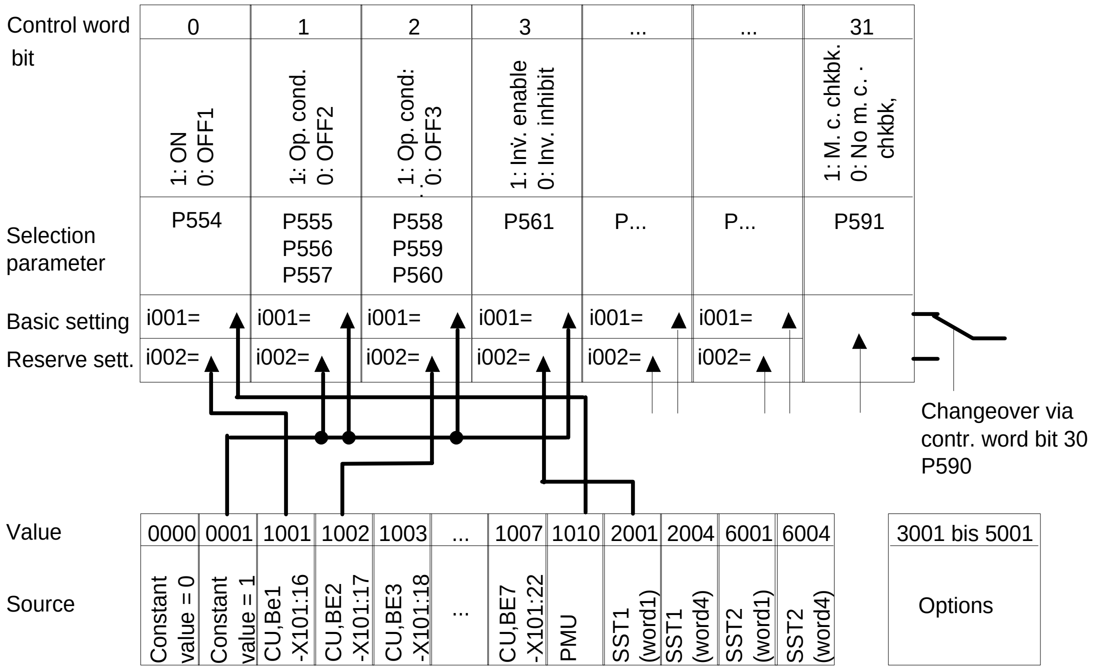
An overview of the possible sources, which are assigned fixed values (0-6004 non-consecutive), is provided in Section 4.3.1.1.3 "Selecting the control word source".

Values 0 and 1 are an exception in this overview; here, no sources are selected, but the bits are permanently set to 0 (LOW) or 1 (HIGH) (also refer to select parameters P554 to P591 in Section 5 "Parameter list").

If a value, which is assigned a terminal (binary input BI) (1001 to 1007, 4101 to 4116, 4201 to 4216, 5001), is assigned once in a select parameter for the source, then it is no longer available in the same index of another select parameter, as a terminal is only suitable for entering a control word bit.

NOTES
The control word commands "OFF2" (bit1), "OFF3" (bit2) and "acknowledge" (bit7) are always simultaneously effective from 3 sources (can be parameterized) !
"Acknowledge" (bit7) is also always effective from the PMU !
If the "on" command (bit 0) is connected to a serial interface (SST1, CB/TB, SCB-SST), then the following must be observed for safety-related reasons:
Additionally, an "OFF2" or "OFF3" command must be parameterized at the terminal strip/PMU, as otherwise the converter cannot be shutdown with a defined command, when communications fail!

Application example:

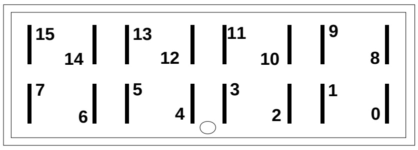


ON/OFF1:	Basic set.:	via PMU (keys I/0)	Reserve set.:	via bin. input 1 of CU
Op. cond/OFF2:	Basic set.:	Constant value= 1 = always op. cond.	Reserve set.:	Constant value = 1 = always op. cond.
Op. cond./OFF3:	Basic set.:	Constant value= 1 = always op. cond.	Reserve set.:	via bi. input 2 of CU

NOTE
For OFF2 and OFF3, 3 selection parameters can be assigned differently in the same index!

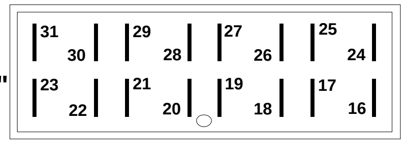
Inv. enable/inhibit:	Basic set.:	Constant value = 1 = always inv. enable.	Reserve set.:	via serial interface SST1 of the CU

4.3.1.1.2 Overview of the control word (control word 1 and control word 2)



PMU-Display

„Control word 1" **„Control word 2"**



„Control word 1" (visualization parameter r550 or r967)				**Source selection**
Bit	**High**	**Low**	**Comments**	
0	ON	OFF1 (stop)	(Priority OFF 2/3/1)	P554
1	Operating condition	OFF2 (electrical)	3 sources simultaneously effective; (Priority OFF 2/3/1)	P555 P556 P557
2	Operating condition	OFF3 (fast stop)	3 sources simultaneously effective; (Priority OFF 2/3/1)	P558 P559 P560
3	Inverter enable	Inhibit inverter	Inverter enable	P561
4	RFG enable	Hinhibit RFG	Ramp-function gen. enable	P562
5	Start RFG	RFG stop	Hold ramp-function generator	P563
6	Setpoint enable	Inhibit setpoint		P564
7	Acknowledge		Simultaneously effective from 3 sources and PMU; Positive edge evaluation	P565 P566 P567
8	Inching 1 ON	Inching 1 OFF		P568
9	Inching 2 ON	Inching 2 OFF		P569
10	Control from the PLC	No control	Only effective via CB, TB, SST1, SST/SCB	
11	Clockwise phase sequence		Logic op. with bit 12	P571
12	Counter-clockwise phase sequence		Logic op. with bit 11	P572
13	Mot. Potentiometer, raise		Logic op. with bit 14	P573
14	Mot. Potentiometer, lower		Logic op. with bit 13	P574
15	No fault, external 1	Fault, external 1		P575
„Control word 2" (visualization parameter r551)				
16	SDS bit 0 (LSB)		Setpoint channel data set	P576
17	SDS bit 1 (MSB)		Logic op. with bit 16	P577
18	MDS bit 0 (LSB)		Motor data set	P578
19			Reserved	
20	FSW bit 0 (LSB)		Logic operation with bit 21	P580
21	FSW bit 1 (MSB)		Logic operation with bit 20	P581
22			Reserved	
23	Enable restart-on-the-fly	Restart-on-the-fly inhibited		P583
24			Reserved	
25	Controller enable	Controller inhibited		P585
26	No fault, external 2	Fault, external 2		P586
27	slave drive	master drive		P587
28	No alarm, external 1	Alarm, external 1		P588
29	No alarm, external 2	Alarm, external 2		P589
30	Reserve setting for setpoints and control word	Basic setting for setpoints and control word		P590
31	HS checkback signal	No HS checkback signal	Can only connected at the converter term. strip or SCB	P591

4.3.1.1.3 Selecting the source for the control word 1 (Bit 0-7)

	Bit	0	1	2	3	4	5	6	7
	Select-P.-**basic setting**.	554.1	555 to 557.1	558 to 560.1	561.1	562.1	563.1	564.1	565 to 567.1
	Select-P.-**reserve setting**.	554.2	555 to 557.2	558 to 560.2	561.2	562.2	563.2	564.2	565 to 567.2
Value	Source								
0000	Constant value = 0	X			x	x	x	x	**xG/R**
0001	Constant value = 1		**xG/R**	**xG/R**	**xG/R**	**xG/R**	**xG/R**	**xG/R**	
1001	CU, BE1, -X101:16	**XR**	x	x	x	x	x	x	x
1002	CU, BE2, -X101:17	X	**xR for 555**	x	x	x	x	x	x
1003	CU, BE3, -X101:18	X	x	x	x	x	x	x	**xR for 565**
1004	CU, BE4, -X101:19	X	x	x	x	x	x	x	x
1005	CU, BE5, -X101:20	X	x	x	x	x	x	x	x
1010	PMU	**XG**	x	x					always
2001	SST1,PMU -X300 (word)	X	x	x	x	x	x	x	x
2004	SST1,PMU -X300 (word4)								
6001	SST2,-X100:1...5 (word1)	X	x	x	x	x	x	x	x
6004	SST2,-X100:1...5 (word4)								
OPTIONS									
3001	CB/TB (word1)	X	x	x	x	x	x	x	x
3004	CB/TB (word4)							x	
4101	SCI 1 and 2,slave1, BE1	X	x	x	x	x	x	x	x
4102	BE2	X	x	x	x	x	x	x	x
...	Consecutively to	X	x	x	x	x	x	x	x
4110	BE10	X	x	x	x	x	x	x	x
4111	only SCI 2,Slave 1,BE11	X	x	x	x	x	x	x	x
4112	BE12	X	x	x	x	x	x	x	x
...	Consecutively to	X	x	x	x	x	x	x	x
4116	BE16	x	x	x	x	x	x	x	x
4201	SCI 1and 2,Slave2,BE1	x	x	x	x	x	x	x	x
4202	BE2	x	x	x	x	x	x	x	x
...	Consecutively to	x	x	x	x	x	x	x	x
4210	BE10	x	x	x	x	x	x	x	x
4211	only SCI 2,Slave 2,BE11	x	x	x	x	x	x	x	x
4212	BE12	x	x	x	x	x	x	x	x
...	Consecutively to	x	x	x	x	x	x	x	x
4216	BE16	x	x	x	x	x	x	x	x
4501	SCB-SST (USS /Peer-t-Peer) (word1)	x	x	x	x	x	x	x	x
4504	SCB-SST (USS /Peer-t-Peer) (word4)								

x: Value for select par. can be assigned! (BE can only be assigned once in the same index of all select par.)

Factory setting: **xG:** for the basic setting
xR: for the reserve setting

4.3.1.1.4 Selecting the source for control word 1 (bits 8-15)

	Bit	8	9	10	11	12	13	14	15
	Select P.-basic setting	568.1	569.1		571.1	572.1	573.1	574.1	575.1
	Select P.-reserve setting	568.2	569.2		571.2	572.2	573.2	574.2	575.2
Value	Source								
0000	Constant value = 0	**xG/R**	**xG/R**		x	x	**xR**	**xR**	**xG/R**
0001	Constant value = 1				**xG/R**	**xG/R**			x
1001	CU, BE1, -X101:16	x	x		x	x	x	x	x
1002	CU, BE2, -X101:17	x	x		x	x	x	x	x
1003	CU, BE3, -X101:18	x	x		x	x	x	x	x
1004	CU, BE4, -X101:19	x	x		x	x	x	x	x
1005	CU, BE5, -X101:20	x	x		x	x	x	x	x
1010	PMU				x	x	**xG**	**xG**	
2001	SST1,PMU -X300 (word1)	x	x		x	x	x	x	x
2004	SST1,PMU -X300 (word4)								
6001	SST2,-X100:1...5 (word1)	x	x		x	x	x	x	x
6004	SST2,-X100:1...5 (word4)								
OPTIONS									
3001	CB/TB (word1)	x	x		x	x	x	x	x
3004	CB/TB (word4)								
4101	SCI 1 and 2,slave1,BE1	x	x		x	x	x	x	x
4102	BE2	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4110	BE10	x	x		x	x	x	x	x
4111	only SCI 2,slave 1,BE11	x	x		x	x	x	x	x
4112	BE12	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4116	BE16	x	x		x	x	x	x	x
4201	SCI 1and2,slave2,BE1	x	x		x	x	x	x	x
4202	BE2	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4210	BE10	x	x		x	x	x	x	x
4211	only SCI 2,slave 2,BE11	x	x		x	x	x	x	x
4212	BE12	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4216	BE16	x	x		x	x	x	x	x
4501	SCB-SST (USS /Peer-t-Peer) (word1)	x	x		x	x	x	x	x
4504	SCB-SST (USS /Peer-t-Peer) (word4)								

x: Value for select par. can be assigned! (BE can only be assigned once in the same index of all select par.)

Factory setting: **xG:** for the basic setting
xR: for the reserve setting

4.3.1.1.5 Selecting the source for control word 2 (Bit 16-23)

	Bit	16	17	18	19	20	21	22	23
	Select P.-basic setting	576.1	577.1	578.1		580.1	581.1		583.1
	Select P.-reserve setting	576.2	577.2	578.2		580.2	581.2		583.2
Value	Source								
0000	Constant value = 0	**xG/R**	**xG/R**	**xG/R**		**xG**	**xG/R**		**xG/R**
0001	Constant value = 1	x	x	x		x	x		x
1001	CU, BE1, -X101:16	x	x	x		x	x		x
1002	CU, BE2, -X101:17	x	x	x		x	x		x
1003	CU, BE3, -X101:18	x	x	x		x	x		x
1004	CU, BE4, -X101:19	x	x	x		**xR**	x		x
1005	CU, BE5, -X101:20	x	x	x		x	x		x
1010	PMU								
2001	SST1,PMU -X300 (word1)								
2004	SST1,PMU -X300 (Wort4)	x	x	x		x	x		x
6001	SST2,-X100:1...5 (word1)								
6004	SST2,-X100:1...5 (word4)	x	x	x		x	x		x
	OPTIONS								
3001	CB/TB (word1)								
3004	CB/TB (word4)	x	x	x		x	x		x
4101	SCI 1 and 2,2lave1,BE1	x	x	x		x	x		x
4102	BE2	x	x	x		x	x		x
...	Consecutively to	x	x	x		x	x		x
4110	BE10	x	x	x		x	x		x
4111	only SCI 2,Slave 1,BE11	x	x	x		x	x		x
4112	BE12	x	x	x		x	x		x
...	Consecutively to	x	x	x		x	x		x
4116	BE16	x	x	x		x	x		x
4201	SCI 1and 2,slave2,BE1	x	x	x		x	x		x
4202	BE2	x	x	x		x	x		x
...	Consecutively to	x	x	x		x	x		x
4210	BE10	x	x	x		x	x		x
4211	only SCI 2,Slave 2,BE11	x	x	x		x	x		x
4212	BE12	x	x	x		x	x		x
...	Consecutively to	x	x	x		x	x		x
4216	BE16	x	x	x		x	x		x
4501	SCB-SST (USS /Peer-t-Peer) (word1)								
4504	SCB-SST (USS /Peer-t-Peer) (word4)	x	x	x		x	x		x

x: Value for select par. can be assigned! (BE can only be assigned once in the same index of all select par.)

Factory setting: **xG:** for the basic setting
xR: for the reserve setting

4.3.1.1.6 Selecting the source for control word 2 (Bit 24-31)

Value	Source / Bit	24	25	26	27	28	29	30	31
	Select P.-basic setting		585.1	586.1	587.1	588.1	589.1	590	591
	Select P.-reserve setting		585.2	586.2	587.2	588.2	589.2	590	591
0000	Constant value = 0		x		**xG/R**			x	
0001	Constant value = 1		**xG/R**	**xG/R**	x	**xG/R**	**xG/R**	x	**x**
1001	CU, BE1, -X101:16		x	x	x	x	x	x	x
1002	CU, BE2, -X101:17		x	x	x	x	x	x	x
1003	CU, BE3, -X101:18		x	x	x	x	x	x	x
1004	CU, BE4, -X101:19		x	x	x	x	x	x	x
1005	CU, BE5, -X101:20		x	x	x	x	x	**x**	x
1010	PMU								
2001	SST1,PMU -X300 (word1)								
2004	SST1,PMU -X300 (word4)		x	x	x	x	x	x	
6001	SST2,-X100:1...5 (word1)								
6004	SST2,-X100:1...5 (word4)		x	x	x	x	x	x	
	OPTIONS								
3001	CB/TB (word1)								
3004	CB/TB (word4)		x	x	x	x	x	x	
4101	SCI 1and 2,slave1,BE1		x	x	x	x	x	x	x
4102	BE2		x	x	x	x	x	x	x
...	Consecutively to		x	x	x	x	x	x	x
4110	BE10		x	x	x	x	x	x	x
4111	only SCI 2,Slave 1,BE11		x	x	x	x	x	x	x
4112	BE12		x	x	x	x	x	x	x
...	Consecutively to		x	x	x	x	x	x	x
4116	BE16		x	x	x	x	x	x	x
4201	SCI 1and 2,Slave2,BE1		x	x	x	x	x	x	x
4202	BE2		x	x	x	x	x	x	x
...	Consecutively to		x	x	x	x	x	x	x
4210	BE10		x	x	x	x	x	x	x
4211	only SCI 2,slave 2,BE11		x	x	x	x	x	x	x
4212	BE12		x	x	x	x	x	x	x
...	Consecutively to		x	x	x	x	x	x	x
4216	BE16		x	x	x	x	x	x	x
4501	SCB-SST (USS /Peer-t-Peer) (word)								
4504	SCB-SST (USS /Peer-t-Peer) (word)		x	x	x	x	x	x	

x: Value for select par. can be assigned! (BE can only be assigned once in the same index of all select par.)

Factory setting: **x:** for P590 / P591
xG: for the basic setting
xR: for the reserve setting

4.3.1.1.7 Significance of control word- (1 and 2) commands

The converters statuses can be read in the operating display r000: e.g. READY-TO-SWITCH-ON r000=009

The function sequences are described in the sequence in which they are realized.

Bit 0: ON command (↑ "ON")

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON (009).

After the command has been accepted:

- Changeover into the status PRE-CHARGING (010)
  Main contactor/bypass contactor (option) are switched-in, if present
  Pre-charging is realized
- Changeover into the RUN status (011)
- Changeover into the RUN status (014)

Bit 0: OFF1 command (L "OFF1")

The OFF1 command (stop) is executed with an L signal.

After the command has been accepted.

- Changeover into the status OFF 1 (015), if the inverter is in an enabled status.
  The setpoint is inhibited at the ramp-function generator input (setpoint=0), so that the drive is decelerated along the parameterized deceleration ramp (P464) down to the OFF shutdown frequency (P514).
  After the OFF shutdown frequency has been reached, and the OFF delay time has expired (P516), the inverter pulses are inhibited and the main contactor, if available, is opened (also refer to "ramp-function generator" Section 4.3.7).
  If the OFF 1 command is again removed during ramp-down (ON command), ramp-down is terminated and the drive again goes into the RUN status (014).
- If one of the statuses PRE-CHARGING (010),
  READY (011),
  is present, the inverter pulses are inhibited and the main contactor, if available, is opened.
- Changeover into the status SWITCH-ON INHIBIT (008)
- If neither an OFF2 nor OFF3 command is present:
  Then the READY-TO-SWITCH-ON status is entered (009)

- For the slave drive, the drive remains active, until a speed is reached, below the OFF shutdown speed P514, as a result of a lower torque reference from the master drive.

Bit 1: OFF2 command (L "OFF2")

The OFF2 command (electrical) is realized with an L signal.

After the command has been accepted:

  - The inverter pulses are inhibited, and the main contactor/bypass contactor (option) is opened
- Changeover into the SWITCH-ON INHIBIT status (008)

NOTE
The OFF2 command is simultaneously effective from three sources (P555, P556 and P557)! The OFF2 command should always be used if the drive converter is used in the slave drive status (closed-loop torque control).

Bit 2: OFF3 command (L "OFF3")

The OFF3 command (fast stop) is executed with the L signal.

After the command has been accepted:

- ♦ Changeover into the status OFF3 (016), if the drive is in a status with the inverter enabled
  - • The setpoint at the RFG input is inhibited (setpoint = 0), so that the drive decelerates along the torque limit down to the OFF shutdown speed (P514).
    After the off shutdown speed has been reached and after the OFF delay time (P516) has expired, the inverter pulses are inhibited, and the main/bypass contactor, if available, is opened. Deceleration is still continued if the OFF3 command is withdrawn while the drive is decelerating.
    (also refer to „ramp-function generator", Section 4.3.7)
- ♦ If one of the statuses PRECHARGING (010), READY (011),
  is present:
  The inverter pulses are inhibited, and the main contactor/bypass contactor, if available, is opened.
- ♦ Changeover into the SWITCH-ON INHIBIT status (008)

NOTE
The OFF 3 command is simultaneously effective from three sources (P558, P559 and P560)!
Priority of the OFF commands OFF**2** > OFF**3** > OFF**1**

Bit 3: Inverter enable command (H "inverter enable")

The INVERTER ENABLE command (inverter enable) is executed with an H signal.

After the command has been accepted:

- ♦ If the drive is in the READY status (011), the system changes into the RUN status (014), and the inverter pulses are enabled.

Bit 3: INVERTER inhibit command (L "inverter inhibit").

The INVERTER INHIBIT command (inverter inhibit) is executed with an (L signal)

After the command has been accepted:

- ♦ If the status RUN (014)
  is available:

  The drive goes into the RUN STATUS (011) and the inverter pulses are inhibited.
- ♦ If the drive is in the OFF1 status (015/stop):
  The inverter pulses are inhibited, the main contactor, if available, is opened, and the drive goes into the SWITCH-ON inhibit status (008).
- ♦ If the status OFF3 (016 / fast stop) is available,
  the command, inverter inhibit is ignored, and fast stop continues.

Bit 4: Ramp-function generator inhibit command (L "inhibit ramp-function generator")

The RAMP-FUNCTION GENERATOR INHIBIT command (inhibit ramp-function generator) is executed for the setpoint with an L signal, only in the RUN status (014).

After the command has been accepted:

- ♦ The ramp-function generator output is set to setpoint = 0.

Bit 5: Ramp-function generator stop command (L "ramp-function generator stop")

The **ramp-function generator stop** command (hold ramp-function generator), is executed for the setpoint, with an L signal, only in the RUN status (014).

After the command has been accepted:

- ♦ The actual setpoint is frozen at the ramp-function generator output.

Bit 6: Setpoint enable command (H "setpoint enable")

The command is executed with an H signal.

After the command has been accepted:

- ♦ The setpoint at the ramp-function generator input is enabled.

Bit 7: Acknowledge command (↑ "Acknowledge")

The command is executed with a positive edge change from L to H (L → H) only in the FAULT status (007).

After the command has been accepted:

- ♦ All actual faults are deleted after having been previously transferred into the diagnostics memory
- ♦ If no faults are present:
  The drive changes into the status SWITCH-ON INHIBIT (008)
- ♦ If actual faults are present:
  The drive remains in the FAULT status (007).

NOTE
The acknowledge command is simultaneously effective from three sources (P565, P566 and P567) and always from the PMU!

Bit 8: Inching 1 ON command (↑ "Inching 1 ON")

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON status (009).

After the command has been accepted

- ♦ an ON command is automatically executed (description, refer to control word bit 0) and inching frequency 1 P448 is enabled in the setpoint channel.
  The ON/OFF1 command (bit 0) is ignored for active inching operation.

Bit 8: Inching 1 OFF command (L "inching 1 OFF")

The command is executed with an L signal.

After the command has been accepted:

- ♦ An OFF 1 command is automatically executed (description, refer to control word bit 0).

Bit 9: Inching 2 ON command (↑ "inching 2 ON")

The command is executed with a positive edge change from L to H (L → H) only in the status READY-TO-SWITCH-ON (009).

After the command has been accepted

- ♦ an ON command (description, refer to control word bit 0) is automatically executed, and inching frequency 2 P449 is enabled in the setpoint channel.
  The ON/OFF1 command (bit 0) is ignored for active inching.

Bit 9: Inching 2 OFF command (L "inching 2 OFF")

The command is executed with the L signal.

After the command has been accepted:

- an OFF1 command (description, refer to control word bit 0) is automatically executed.

Bit 10: Control from the PLC command (H "control from the PLC)

The command is executed with an H signal.

Process data PZD (control word, setpoints) which were sent via the SST1 interface of CU, the CB/TB interface (option) and the SST/SCB interface (option), are only evaluated if the command was accepted.

- If several interfaces are operational, only the process data of the interfaces are evaluated, which transmit the H signal.
- For an L signal, the last values are retained in the appropriate dual port RAM of the interface.

An H signal appears in the visualization parameter r550 "control word 1", if one of the interfaces transmits an H signal!

Bit 11: Clockwise phase sequence command (H "clockwise phase sequence")

The command is executed with an H signal.

After the command has been accepted, the setpoint is influenced depending on the assignment of bit 12 "counter-clockwise phase sequence".

Refer to Section 4.4 "Function diagram, setpoint channel CU (Section 2)"!

Bit 12: Counter-clockwise phase sequence command (H "counter-clockwise phase sequence")

The command is executed with an H signal.

After the command has been accepted, the setpoint is influenced depending on the assignment of bit 11 "clockwise phase sequence".

Refer to Section 4.4 "Function diagram, setpoint channel CU (Section 2)"!

NOTE
The **counter-clockwise phases sequence-** and **clockwise phase sequence** commands have no influence on supplementary setpoint 2, which is added after the ramp-function generator!

Bit 13: Motorized potentiometer, raise command (H "raise motorized potentiometer")

The command is executed with an H signal.

The motorized potentiometer in the setpoint channel is increased after the command has been accepted.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Part 1)"!

Bit 14: Motorized potentiometer, lower command (H "motorized potentiometer, lower")

The command is executed with an H signal.

After the command has been accepted, the motorized potentiometer is lowered in the setpoint channel.

Refer to section 4.4 „Function diagram, setpoint channel CU (Section 1)"!

Bit 15: Fault, external 1 command (L "fault, external 1")

The command is executed with an L signal.

After the command has been accepted:

The drive goes into the FAULT status (007) (fault F035)
The inverter pulses are inhibited and the main contactor, if available, is opened (also refer to Section 7 "Troubleshooting")

Bit 16: Setpoint channel data set SDS bit 0 command

In conjunction with bit 17 "SDS BIT 1" the command allows toggling between four possible setpoint channel data sets.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Part 1) / data sets"!

Bit 17: Setpoint channel data set SDS bit 1 command

In conjunction with bit 16 "SDS BIT 0" this command allows toggling between four possible setpoint channel data sets.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Part 1) / data sets"!

Bit 18: Motor data set MDS bit 0 command

The commands permits toggling between two motor data sets, and is only in the statuses

READY-TO-SWITCH-ON	(009)
PRE-CHARGING	(010)
READY	(011).

Refer to Section 4.4 "Function diagram, data sets"!

Bit 20: Fixed setpoint FSW bit 0 (LSB command):

The command, in conjunction with bit 21 "FSW BIT 1" permits one of the four possible fixed setpoints to be selected.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Section 1) / data sets"!

Bit 21: Fixed setpoint FSW bit 1 (MSB) command:

The command, in conjunction with bit 20 "FSW BIT 0" permits one of the four possible fixed setpoints to be selected.

Refer to Section 4.4 "Function diagram, setpoint channel CU (Section 1) / data sets"!

Bit 23: Restart-on-the-fly enable command (H "enable restart-on-the-fly")

This command enables the restart-on-the-fly function.

Bit 24: Technological controller (H "Technological controller enable")

The command activates the technological controller if the inverter pulses are enabled and the energization time has expired. The technological controller can be parameterized using parameters P525 to P545.

Refer to „Function diagrams, closed-loop control“ Section 4.4 and the „Parameter list“ Section 5.

Bit 25: Controller enable command (H „controller enable")

The command enables the speed controller if the converter inverter pulses are enabled.
Refer to „control function diagrams“, Section 4.4 .

Bit 26: Fault, external 2 command (L "fault, external 2")

The command is identified with an L signal, and is only active after pre-charging has been completed from READY status (011) onwards and an additional 200 ms delay.

After the command has been accepted

- The drive goes into the FAULT status (007) (fault F036)
  The inverter pulses are inhibited, the main contactor, if available, is opened (also refer to Section 7 "Troubleshooting").

Bit 27: Master/slave drive command (H "slave drive"/L "master drive")

The commands switches between speed control (master drive) and torque control (slave drive). For speed controls, the speed setpoint is injected into the control via the setpoint channel as well as the supplementary torque setpoint For torque control, the main torque setpoint is used as input quantity.

Bit 28: Alarm, external 1 command (L "alarm, external 1")

The command is executed with an L signal.

After the command has been accepted

- The operating status is retained. An alarm message (A015) is output (also refer to Section 7 "Troubleshooting")

Bit 29: Alarm, external 2 command (L "alarm, external 2")

The command is executed with an L signal.

After the command has been accepted:

- The operating status is retained.

An alarm message (A016)is output (also refer to Section 7 "Troubleshooting").

Bit 30: Selection, basic/reserve setting command (L "basic setting / H "reserve setting")

The command activates the BASIC SETTING with an L signal and the RESERVE SETTING with an H signal.

After the command has been accepted:

- The parameter settings of the basic- or reserve setting for the control word itself, the setpoint channel, and the closed-loop control are activated (refer to Section 4.4 "Function diagrams, data sets").

Bit 31: HS checkback signal command (H "HS checkback signal")

The command is only processed when the appropriate connections have been made and the main contactor has been parameterized (option) (refer to "Options" in Section 9).

4.3.1.2 Status word (status word 1 and status word 2)

4.3.1.2.1 Introduction and application example

Status words 1 (bits 0 to 15) and 2 (bits 16 to 31) issue messages and commands from the converter to external destinations.

Their particular status can be read-out via parameters r552 or r968 (status word 1) and r553 (status word 2).

An overview is provided in Section 4.3.1.2.2 "Overview of the status word".

The significance of the possible messages and commands to the outside is described in Section 4.3.1.2.4 "Significance of the status word messages".

Each status word bit is assigned a selection parameter, which defines, to which destination this bit is sent (refer to Section 4.3.1.2.2, righthand column).

The selection parameters for the destinations are indexed 3 times as follows:

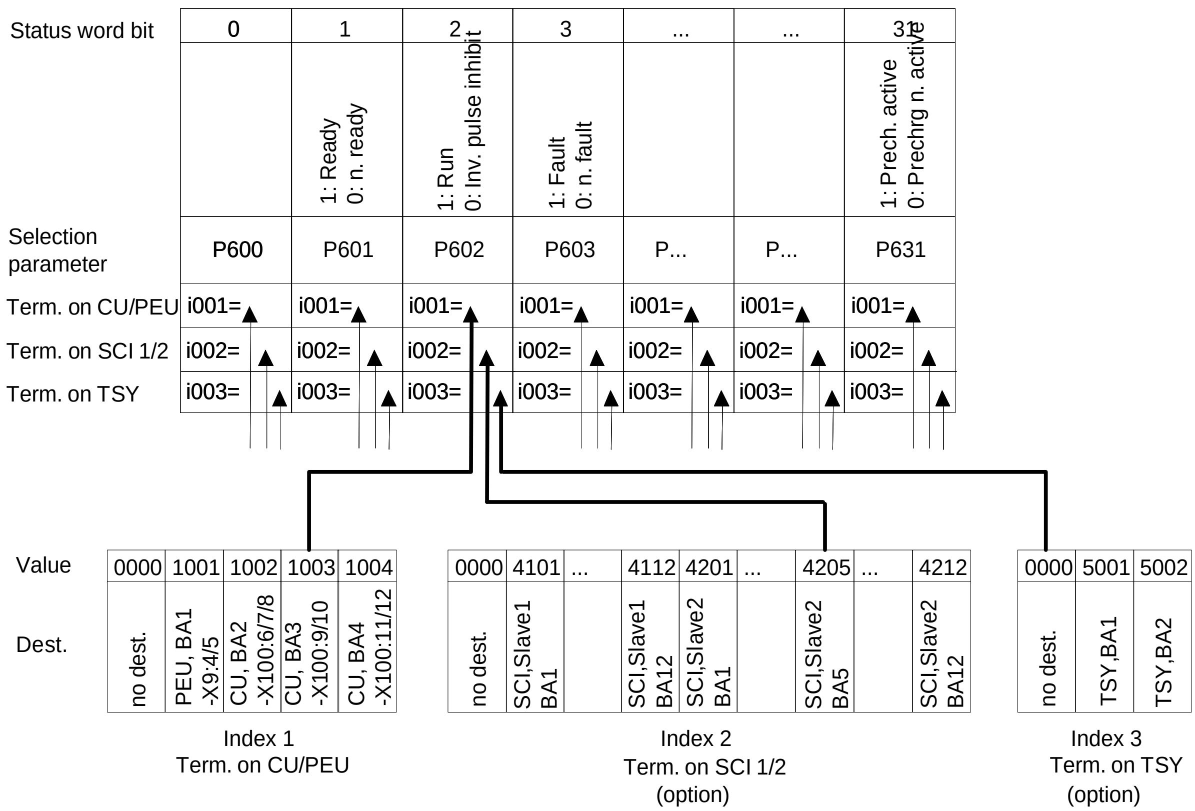
Index:	i001	Selecting a terminal on the CU / PEU board	(basic converter)
	i002	Selecting a terminal on the SCI 1/2 board	(option)
	i003	Selecting a terminal on the TSY board	(option)

An overview of the possible destinations, which are assigned fixed values, is provided in Section 4.3.1.2.3 "Selecting the destinations for the status word".

If a value, which is assigned a terminal (binary output BA), is assigned once to a selection parameter for the destination, then it is no longer available for another selection parameter as a terminal is only suitable for the output of a status bit.

NOTE
For the output of faults, alarms and switch-on inhibit of the status word (**HIGH active**) via the terminal strip, then these are LOW active at the terminals (binary outputs) (i.e.: the relay drops out)! This is also true for possible option boards! Also refer to Section 4.3.3 "Binary outputs"

EXAMPLE:

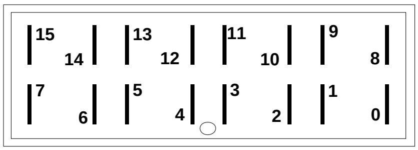


"Run" signal: -at terminal -X100:9/10 of the CU

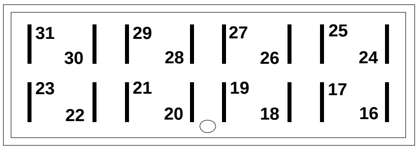
-at the terminal of binary output 5 of the SCI (option), which is coded as slave 2

- no signal at the TSY terminal (option)

4.3.1.2.2 Overview of the status word (status word 1 and status word 2)



PMU-Display
„Status word 1" **„Status word 2"**



Bit	High	Low	Comments	Dest. selection
"Status word 1"	**(visualization parameter r552 or r968)**			
0	Ready-to-switch-on	Not ready to switch on		P600
1	Ready	Not ready		P601
2	Run	Inverter pulses inhibited		P602
3	Fault	No fault	Inverted for terminal strips!	P603
4	No OFF 2	OFF2		P604
5	No OFF 3	OFF3		P605
6	Switch-on inhibit	No switch-on inhibit	Inverted for terminal strips!	P606
7	Alarm	No alarm	Inverted for terminal strips!	P607
8	No setpt. act. val. Deviation	Setpt. act. value deviation	Can be parameterized	P608
9	PZD control requested		Always "High" (for CB,TB,SST1,SST/SCB)	
10	Comparison speed reached	Actual value < comparative speed	Can be parameterized	P610
11	Fault, undervoltage	No undervoltage fault	Inverted for terminal strips!	P611
12	Main contactor energized	Main contactor not energized	Can only be connector for terminals CU1 or SCI!	P612
13	HLG active	Ramp-function generator not active		P613
14	Clockwise phase sequence	Counter-clockwise phase sequence		P614
15			Reserved	
"Status word 2"	**(visualization parameter r553)**			
16			Reserved	
17			Reserved	
18	No overspeed	Overspeed		P618
19	Fault, external 1	No fault, external 1	Inverted for terminal strips!	P619
20	Fault, external 2	No fault, external 2	Inverted for terminal strips!	P620
21	Alarm, external	No alarm, external	Inverted for terminal strips!	P621
22			Reserved	
23	Fault, overtemp., converter	No fault, overtemp. conv.	Inverted for terminal strips!	P623
24	Alarm, overtemp., conv.	No alarm, overtemp., conv.	Inverted for terminal strips!	P624
25	Alarm, motor overtemp.	No alarm, overtemp. mot.	Inverted for terminal strips!	P625
26	Fault, motor overtemp.	No fault, overtemp. mot.	Inverted for terminal strips!	P626
27			Reserved	
28			Reserved	
29	Bypass contactor energized	Bypass contactor not energized	Bypass contactor	P629
30			Reserved	
31	Pre-charging active	Pre-charging not active		P631

4.3.1.2.3 Selecting the destinations for the status word (bits 0 - 31)

For the selection parameters **P600 to P631**, in which the destination of the appropriate bit can be specified, then the indices are uniformly assigned as follows:

Index i001 Selecting a terminal on the CU / PEU board (basic converter)
i002 Selecting a terminal on the SCI 1/2 board (option)
i003 Selecting a terminal on the TSY board (option)

Index i001 Selecting a terminal on the CU / PEU board (basic converter)

Value	Destination		
0000	No destination		**Factory setting, except P602,P603 and P612**
1001	PEU,	BA1, -X9:4/5,	**Factory setting for P612**
1002	CU,	BA2, -X100:6/7/8	**Factory setting for P603**
1003	CU,	BA3, -X100:9/10	**Factory setting for P602**
1004	CU,	BA4, -X100:11/12	

Index i002 Selecting a terminal on the SCI 1/2 board (option)

Value	Destination		
0000	No destination		**Factory setting**
4101	SCI 1 and 2,slave 1,	BA1	
4102		BA2	
4103		BA3	
4104		BA4	
4105		BA5	
4106		BA6	
4107		BA7	
4108		BA8	
4109	Only SCI 2,slave 1,	BA9	
4110		BA10	
4111		BA11	
4112		BA12	
4201	SCI 1 and 2,slave 2,	BA1	
4202		BA2	
4203		BA3	
4204		BA4	
4205		BA5	
4206		BA6	
4207		BA7	
4208		BA8	
4209	Only SCI 2,slave 2,	BA9	
4210		BA10	
4211		BA11	
4212		BA12	

Index i003 Selecting a terminal on the TSY board (option)

Value	Destination		
0000	No destination		**Factory setting P617 and P630**
5001	TSY,	BA1	**Factory setting P617**
5002	TSY,	BA2	**Factory setting P630**

4.3.1.2.4 Significance of the status word messages

NOTE
When faults, alarms and switch-on inhibit of the status word are output (**HIGH active**) via the terminal strip, then these are LOW active at the terminal strips (binary outputs) (i.e.: relay drops out)! This is also valid for possible option boards! Also refer to Section 4.3.3 "Binary outputs"

Bit 0: Signal, "Ready to switch-on" (H)

An H signal indicates that the operating status SWITCH-ON INHIBIT (008) or READY-TO-SWITCH-ON (009) is available. The power supply, the open-loop and closed-loop control are operational, the inverter impulses are inhibited. If an external power supply and a main contactor (option) are available, it is possible that the DC link can be brought into a no-voltage condition in this converter status!

Bit 1: Signal, "ready" (H)

An H signal, indicates that the operating status READY (011) or PRE-CHARGING (010) is available. The power supply, and the open-loop and closed-loop control are operational. The converter is switched-on, pre-charging has been completed (is executed), and the DC link (is being) run-up to full voltage. The inverter pulses are still inhibited.

Bit 2: Signal, "run" (H)

An H signal indicates that the operating status RUN (014), RESTART-ON-THE-FLY (013), OFF1 (015) or OFF3 (016) is available. The converter is functioning, i.e. the inverter pulses are enabled and voltage is available at the output terminals.

Bit 3: Signal, "Fault" (H)

An H signal indicates that the operating status FAULT (007) is available. If the fault is output at a terminal strip (PEU, CU1, TSY, SCI1/2) an L signal appears there for this fault message.

Bit 4: Signal, "OFF2" (L)

An L signal indicates that an OFF2 command is present via the control word (bit 1).

Bit 5: Signal, "OFF3" (L)

An L signal indicates that an OFF 3 command is available, or/and the operating status OFF3 (016) is(are) available via the control word (bit 2).

Bit 6: Signal, "switch-on inhibit (H)

An H signal indicates that the operating status SWITCH-ON INHIBIT (008) is present. The power supply, open- and closed-loop control are operational. If an external power supply and a main contactor (option) are available, it is possible that the DC link is in a no-voltage condition in this converter status! The message is continuously available as long as an OFF2 command is present via the control word (bit1); or/and an OFF3 command is available via the control word (bit 2) after the setpoint has been reduced; or/and an ON command is still available via the control word (bit 0) (edge evaluation).

If the message is output at a terminal strip (PEU, CU1, SCB1) an L signal appears there for this message.

Bit 7: Signal "alarm" (H)

An H signal indicates that an alarm (Axxx) is present. If the alarm is output at the terminal strip (PEU, CU1, SCB1), an L signal appears there for this alarm.

Bit 8: Signal, setpoint- actual value deviation" (L)

An L signal indicates, that the setpoint-actual value deviation“ alarm is present (A034). This occurs as soon as the absolute value of the difference between the speed setpoint and speed actual value is greater than or equal to a deviation which can be parameterized (P517 „setpoint- actual value deviation, speed) for a time longer than the „setpoint-actual value deviation time“ (P518) The bit is again set to an H as soon as the absolute value of the difference between the speed setpoint and the speed actual value is less than the deviation (P517).

Bit 9: Signal, "PZD control requested" (H)

An H signal is always present.

Bit 10: Signal „comparison speed reached" (H)

An H signal indicates that the absolute value of the speed actual value is greater than or equal to the parameterized comparison speed (P512). The bit is again set to L, as soon as the actual absolute speed value falls below the comparison speed (P512), minus the parameterized comparison speed hysteresis (P513 in % referred to the comparison speed (P512)).

Bit 11: Signal, "fault, undervoltage" (H)

An H signal indicates that the "undervoltage in the DC link" fault is present (F008). Also refer to Section 7 "troubleshooting". If the fault is output at a terminal strip (PEU, CU1, TSY, SCI1/2) an L signal appears there for this fault signal.

Bit 12: Signal, "main contactor energized" (H)

A main contactor (option) can be energized with an H signal when the appropriate connections have been made and the appropriate parameterization. Also refer to Section 9 "Option".

Bit 13: Signal, "RFG active" (H)

An H signal indicates the difference between the RFG input (r460) and the RFG output (r480) exceeds the hysteresis which has been parameterized (P476 as a % of the rated system speed P420).

Bit 14: Signal, "clockwise phase sequence" (H)

An H signal indicates that the speed setpoint for the closed-loop control (n -setpoint, r482) is greater than or equal to 0.

Signal, "counter-clockwise phase sequence" (L)

An L signal indicates that the frequency setpoint for the closed-loop control (n/f setpoint, r482) is less than 0.

Bit 18: Signal, "overspeed" (L)

An L signal indicates that the „overspeed“ alarm (A033) is present. This is realized as soon as the absolute speed actual value exceeds the absolute value of the parameterized maximum speed (P452 for a clockwise phase sequence or P453 for a counter-clockwise phase sequence) in addition to the absolute value of the parameterized hysteresis (P519 in % referred to the appropriate maximum speed). The bit is again set to an H signal as soon as the absolute speed actual value is less than or equal to the absolute value of the corresponding maximum speed.

Bit 19: Signal, "fault, external 1" (H)

An H signal indicates that a "fault, external 1" is present in control word bit 15. If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 20: Signal, "fault, external 2" (H)

An H signal indicates that a "fault, external 2" is present in control word bit 26. If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 21: Signal, "external alarm" (H)

An H signal indicates that an "alarm, external 1" is present in control word bit 28, or an "alarm, external 2" in control word, bit 29.
If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 22: Message "Warning i²t drive converter" (H)

An H signal indicates that the "i2t alarm inverter“ (A025) is present. Also refer to Section 7 „Fault and alarm signals“.

If the alarm is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this alarm message.

Bit 23: Signal "Overtemperature fault signal UMR- (H)"

An H signal indicates that an "inverter temperature too high" fault (F023) is present. Also refer to Section 7 "Troubleshooting".

If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 24: Signal "overtemperature alarm UMR" (H)

An H signal indicates that the "inverter temperature too high" alarm (A022) is present. Also refer to Section 7 "Troubleshooting". If this fault is output at a terminal strip (PEU, CU, SCB1), an L signal appears there for this fault signal.

Bit 25: Signal, "motor overtemperature alarm" (H)

An H signal: Parameterized alarm threshold (P360) was exceeded (also refer to Section 7 „Troubleshooting“).
When output at a terminal strip (PEU, CU, SCB1), an L signal appears there.

Bit 26: Signal " motor overtemperature fault" (H)

H signal: Parameterized fault threshold (P361) was exceeded, "motor thermal overload" fault (F021) present (also refer to Section 7 „troubleshooting“).

When output at a terminal strip (PEU, CU, SCB1) an L signal appears there.

Bit 27: Message „Technological controller actual value is greater than the technological controller setpoint“ (H)

An H signal indicates that the technological controller actual value (r534) is greater than the technological controller setpoint (r529). If the technological controller actual value then again drops below the technological controller setpoint, a hysteresis is also taken into account (P535)

Bit 29: Signal "bypass contactor energized" (H)

Reflects the internal bit to control the pre-charging bypass contactor.

Bit 31: Signal "precharging active" (H)

An H signal indicates that the drive is in the PRECHARGING (010) status after an ON command.

4.3.1.3 Setpoints

The setpoint parameters, in which values or sources can be specified, can be taken from the "function diagrams, setpoint channel and closed-loop control" Section 4.4.
(Additional resources: Section 5 "Parameter list").

Dependent on the setpoint parameter, it is possible to changeover the control word commands:
"Basic- and reserve setting", "setpoint channel data set", "motor data set" and "fixed setpoints".

Refer to Section 4.4 "Function diagrams, data sets"

Special feature: P433 "source, supplementary setpoint 1", P438 "source, supplementary setpoint 2", P443 "source, main setpoint", P486 "source, torque setpoint", P493 "source, torque limit 1", P499 "source, torque limit 2", P506 "source, supplementary torque setpoint.":
In the parameters, setpoint sources are defined using values:

Value entry in	**Index1**	**i001**	**active when "basic setting" selected"**	(control word)
	Index2	**i002**	**active when "reserve setting" selected**	(control word)

Value assignment for P433, P438, P443, P486, P493, P499 and P506:

Value	Source	
0000	Constant setpoint = 0	**Factory setting: P433, P438, P486, P506 i001 and i002**
1001	Fixed setpoint - for source P433, P438 and P443: P421 to P424 - for source P493: P492 - for source P499: P498 - for source P506: P505	⇐ **cannot be selected for torque setpoint P486** **Factory setting: P493,P499 i001 and i002** **P443 i002**
1002	Motorized potentiometer	⇐ only for main setpoint P443 **Factory setting: P443 i001**
1003	CU1, Analog input AE1, -X102	
2002	SST1(PMU -X300) (word2)	
2003	(word 3)	
2004	(word4)	⇐ only if word 4 is not assigned for "control word 1 with 2004 (Section 4.3.1.1)
...	Consecutively to	
2016	(word16)	
6002	SST2(-X100:1...5) (word2)	
6003	(word3)	
6004	(word4)	⇐ only if word4 is not assigned for "control word2" with 6004 (Section 4.3.1.1)
...	Consecutively to	
6016	(word16)	
	OPTIONS	
3002	CB/TB (word 2)	
3003	(word 3)	
3004	(word 4)	⇐ only if word 4 is not assigned for "control word 1 with 3004 (Section 4.3.1.1)
...	Consecutively to	
3016	(word 16)	
4101	SCB1 with SCI 1,slave1,analog input AE1	
4102	AE2	
4103	AE3	
4201	SCB1 with SCI 1,slave2,analog input AE1	
4202	AE2	

4203	AE3	
4501	SCB-SST (peer to peer) (word 1)	⇐ only if word 1 is not assigned for "control word 1 with 4501 (Section 4.3.1.1)
4502	SCB-SST (USS /peer to peer) (word 2)	
4503	(word 3)	
4504	(word 4)	⇐ only if word 4 is not assigned for "control word 1 with 4504 (Section 4.3.1.1)
...	Consecutively to	
4516	(word 16)	

4.3.1.4 Actual values

All available parameter numbers (0 to 999) can be entered into the actual value parameters, sorted according to destinations (refer to the following).
The parameter value of the entered parameter number is output at the selected destination.

Note:
- When specifying parameter numbers, which are indexed, the value of the first index (.i001) is always output!
- When specifying "0", no output is made to the appropriate destination!

Destinations:

P530 "T.Reg.ActVal"
Output at the tech. Controller actual value input
Indices: i001 Value 1 for the technological controller actual value input (P531 = 1100)
i002 Value 2 for the technological controller actual value input (P531 = 1200)
(refer to Section 4.4 "Function diagrams, closed-loop control")

P655 "CU AnaOut Act Val"
Output via the CU control terminal strip (Section 3.3)
Analog output (-X102:34 / reference potential -X102:33)
(refer to Section 4.3.5 "analog outputs")

P680 "SCom1 Act Value"

P681 "SCom2 Act Value"
Output via the basic converter interfaces SST1 and/or SST2
Indices: i001 word 01 of the telegram (PZD)
⇓ ⇓
i016 word 16 of the telegram (PZD)
(refer to Section 4.3.6.1 "basic converter interfaces SST1 and SST2")

Destination, options:

P664 "SCI-AA actual values"
Output via the SCB1 interface with SCI1
(also refer to the Instruction Manual for the option boards)
Indexes i001 Destination: Analog output 1 from slave 1
i002 Destination: Analog output 2 from slave 1
i003 Destination: Analog output 3 from slave 1
i004 Destination: Analog output 1 from slave 2
i005 Destination: Analog output 2 from slave 2
i006 Destination: Analog output 3 from slave 2

P690 "SCB actual values"
Output via the SCB1 interface with peer-to-peer protocol or SCB2
(also refer to the Instruction Manual for the option boards)
Indexes: i001 Destination: Word 01 of the telegram (PZD)
⇓ ⇓
i016 Destination: Word 16 of the telegram (PZD)

P694 "CB/TB actual values"
Output via the CB or TB interface
(also refer to the Instruction Manual for the option boards and Sections 4.3.6.2 "DPR")
Indices: i001 Destination: Word 01 of the telegram (PZD)
⇓ ⇓
i016 Destination: Word 16 of the telegram (PZD)

NOTE
For telegram transfer (P680,P681,P690,P694): ♦ Generally, it is necessary/practical to assign “word 01 of the telegram (PZD)" with the status word 1 (r968 or r552)! ♦ If double-word parameters (type I4) are to be transferred as actual values, the associated parameter number must be entered in 2 consecutive words (indices), as otherwise only the most significant word will be transferred!

4.3.2 Binary inputs

5 binary inputs (24V) which can be parameterized at the control terminal strip (board CU, -X101) to enter commands, external faults/alarms as well as a checkback signal to the converter control word.

Connecting-up: Refer to Section 3.3 "Control terminal strip"

Parameterization: Refer to Section 4.3.1.1 "Control word" .

Factory setting: „pulse inhibit" OFF 2 command

Binary input 1	Basic setting: Reserve setting	not assigned ÔN/OFF1
Binary input 2	Basic setting: Reserve setting:	not assigned OFF2 command „pulse inhibit"
Binary input 3	Basic setting: Reserve setting:	not assigned Acknowledge (control word bit 7)
Binary input 4	Basic setting: Reserve setting:	not assigned Fixed setpoint, bit 0 (control word bit 20)
Binary input 5	Basic setting: Reserve setting:	(control word bit 30) (control word bit 30)

4.3.3 Binary outputs

2 binary outputs, which can be parameterized, for the output of signals and external commands of the converter status word

Connecting-up: Binary output 1 on the PEU (connector - X9):
Refer to Section 3.1.1 "Auxiliary power supply / main contactor"

Binary output 2 on the CU control terminal strip (connector X100 / changeover contact):
Refer to Section 3.3 "Control terminal strip"

Parameterization: Refer to Section 4.3.1.2 "Status word"

Factory setting:

Binary output 1 -X9 on the PEU	Main contactor energized (status word bit 12)
Binary output 2 -X100 on the CU	Fault (status word bit 3)

NOTE

When faults, alarms and switch-on inhibit of the status word (HIGH active) are output via the terminal strip, these are LOW active at the terminal strip (binary outputs) (i.e. relay drops out)!
Also refer to Section 4.3.1.2 "Status word"

4.3.4 Analog input

An analog input, which can be parameterized, at the control terminal strip (CU, -X102 / Section 3.3) as voltage- or current input for setpoint input.

- Voltage inputs:
  - ± 10 V or 0...+1 0V or +2...+10 V (can be parameterized
  - Resolution: < 10 mV (10 bit + sign)
  - Accuracy: < ± 2 %
  - Smoothing: can be parameterized (P651)
  - Offset can be parameterized (P652)
- Current inputs:
  - ± 20 mA or 0 mA...+ 20 mA or + 4 mA...+20 mA (can be parameterized)
  - Resolution: < 0,04 mA (10 bit + sign)
  - Accuracy: < ± 2 %
  - Smoothing: can be parameterized (P651)
  - Offset can be parameterized(P652)

Connecting-up: Refer to "Control terminal strip", Section 3.3

Parameterization: Also refer to the "Function diagrams, analog inputs CU", Section 4.4!

1. Parameterization as setpoint input:

- Connect-up AE as setpoint input in **P443** "main setpoint source" or **P428** "supplementary setpoint source 1" (refer to "Function diagrams, setpoint channel CU (Section 1)" Section 4.4 / "Setpoints", Section 4.3.1.3):

  Enter the value to identify the analog input:

1003 > analog input 1 (AE1)

- Specify the required voltage- and current range in **P650** "CU-AE configuration":

P650 i001 (AE1) = 0 ±10 V , ±20 mA (factory setting)
i002 (AE2) or = 1 0...+10 V, 0...+20 mA
or = 2 +2...+10 V, +4...+20 mA (with wire breakage monitoring)

- The smoothing time constant should be set in **P651** "CU-AE smoothing".
  (Setting range: 0ms to 1000 ms / factory setting: 4 ms)

P652 **i001 (AE1)**

- Set the smoothing time constant in Set the offset (zero point calibration) in P652 "CU-AE offset".
  (Setting range: -20,000 V to +20,000 V / factory setting: +0.000 V ⇔ no offset)

P652 **i001 (AE1)**

- The input signals of the setpoint channel can be influenced as follows:

Supplementary setpoint 1	P436	(invert)
Supplementary setpoint 2	P441	(invert)
Main setpoint	P446	(invert)
Suppl. torque setpoint	P506	(invert, gain)
Main torque setpoint	P486	(invert)
Limit 1	P493	(not)
Limit 2	P499	(not)

Refer to „function diagrams, setpoint channel CU3 (Part 1)" Section 4.4

For the calculation:

Main setpoint (P443) and supplementary setpoint (P428) are entered as percentage quantities

The following is valid:
- 100% = rated system speed in [RPM] (P420).
- Max. range: -200% to +199.99%

P650 = 0 ±10V , ±20mA ⇔ ±100%

$$\Rightarrow \quad \text{PWE in } [\%] = \frac{10\ \%}{\text{V}} \times \left(\text{AE in } [\text{V}] + \text{Offset in } [\text{V}]\right)$$

P650 = 1 0...+10V , 0...+20mA ⇔ 0% to +100%

$$\Rightarrow \quad \text{PWE in } [\%] = \frac{10\ \%}{\text{V}} \times \left(\text{AE in } [\text{V}] + \text{Offset in } [\text{V}]\right)$$

P650 = 2 +2V...+10V , +4...+20mA ⇔ 0% to +100%
< 2mA (1V) wire breakage signal

$$\Rightarrow \quad \text{PWE in } [\%] = \frac{12{,}5\ \%}{\text{V}} \times \left(\text{AE in } [\text{V}] - 2\text{V} + \text{Offset in } [\text{V}]\right)$$

Configuring example - using an analog input as setpoint input:

1st example:

Available: ♦ Rated system speed P420 = 3000 [RPM]

Required: ♦ Voltage input: ± 10 V (or current input ± 20 mA) via analog input 1 for the main setpoint
♦ Control range: –10 V to +10 V corresponds to -3000 RPM to +3000 RPM in the setpoint channel

♦ Analog input 1 connected-up as main setpoint:
Enter 1003 in P443 "main setpoint source":P443 (i001: basic setting./i002: reserve setting.) = 1003

♦ Parameterize analog input 1 as voltage input ± 10 V (or current input ± 20 mA):
P650 i001 = 0 ± 10 V for AE1)

♦ Set offset (zero point offset) for analog input 1:
The following is valid for the selected voltage input (P650 i001 = 0): 0 V ⇔ 0 RPM
Monitoring parameter: r447 "main setpoint"
e.g.: P652 i001 = 0V offset (ideal case: No zero point drift)

♦ The main setpoint control range in the setpoint channel can be influenced:
Inversion for supplementary torque setpoint:
Additional gain: Refer to „function diagrams, setpoint channel CU (Part 1)" Section 4.4

2nd example:

Available: ♦ Rated system speed P420 = 3000 [RPM]

Required: ♦ Current input + 4...20 mA (or voltage input + 2...10 V) via the analog input for the supplementary setpoint

♦ Control range: + 4...20 mA corresponding to 0 to +3000 RPM to the setpoint channel

- ♦ Connect-up the analog input at supplementary setpoint 1:
  Enter the value to identify the analog input in P428 "supplementary setpoint source" P428 (i001: basic setting./i002: reserve setting.) = 1003
- ♦ Parameterize the analog input as current input + 4...20 mA (or voltage input + 2...10 V):
  P650 i002 = 2 (+ 4...20 mA for analog input with wire breakage signal at < 2 mA)
- ♦ Set the offset (zero point offset) for the analog input:
  The following is valid for the selected current input P650: 4 mA ⇔ 0 RPM
  Monitoring parameter: r431 "supplementary setpoint"
  e.g.: P652 i002 = 0 V offset (ideal case: no zero point trip)
- ♦ The supplementary setpoint can be inverted within the setpoint channel via parameter P46=1:
  Refer to „function diagrams, setpoint channel CU (Section 1)" Section 4.4

4.3.5 Analog output

1 analog output, which can be parameterized, at the control terminal strip (board CU, -X102 / Section 3.3) to output actual values and other internal converter quantities.

Analog output:
- Voltage range: ± 10 V
- Resolution: 4.9 mV (11 bits + sign)
- Accuracy: ± 1 %
- Smoothing 20 µs
- Output current: max. ± 5 mA
- Short-circuit proof and non-floating

Connecting-up: Refer to "Control terminal strip", Section 3.3

Parameterization: Also observe "Function diagram, analog output CU", Section 4.4!

- ♦ Enter the parameter number (0 to 999) whose value is to output, in P655 "CU-AA actual values".
- ♦ Set the analog output gain factor in P656 "CU-AA gain".
  (setting range: -320.00 V to +320.00 V / pre-setting: +10.00 V ⇔ gain of 1)
- ♦ Set the offset in P657 "CU-AA offset".
  (setting range: -100.00 V to +100.00 V / pre-setting: +0.00 V ⇔ no offset)

  The following is obtained for the calculation from the "function diagram, analog output CU":

$$= \left(\frac{\text{Parameter value in} \, [\%]}{100 \, [\%]} \times \text{Gain in} \, [\text{V}] \right) + \text{Offset in} \, [\text{V}]$$

  Pre-assignment (gain of 1 and no offset): 100 % = 10 V

  The parameter value in [%] for the appropriate parameter number can be taken from the parameter list, Section 5!

Configuring examples:

Example 1:
- Available: P102 (rated motor current = 40.0 A
- Required: Output current r004 is to represented in the range from 32 A to 160 A as 0.00 V to+10.00 V at the analog output

♦ Connect-up parameter R004 at the analog output

P655 "CU-AA actual values" **= 004**

♦ Converter the required output range in [%]:

r004 should be taken from the parameter list, Section 5:
Analog output: 100% = 4xP102 (in this case: 4x40.0A = 160A)

Thus, the following is obtained for the range to be represented:

32A → 20% (parameter value PWE1) to be represented as V_{off1} = 0.00 V

160A → 100% (parameter value PWE2) to be represented as V_{off2} = +10.00 V

♦ Define gain factor **P656** and offset **P657** for analog output

The following is obtained from the formula shown above:

$$\text{Gain factor}\,[V] = \frac{(U_{off1}\,[V] - U_{off2}\,[V]) \times 100\,\%}{PWE1\,[\%] - PWE2\,[\%]} = \frac{(0{,}00\,V - 10{,}00\,V) \times 100\,\%}{20\,\% - 100\,\%}$$

$$= \frac{-10\,V \times 100\,\%}{-80\,\%} = 12{,}5\,V$$

$$\text{Offset}\,[V] = U_{off1}\,[V] - \left(\frac{\text{Gain factor}\,[V] \times PWE_1\,[\%]}{100\,\%}\right) = 0\,V - \left(\frac{12{,}5\,V \times 20{,}00\,\%}{100\,\%}\right)$$

$$= 0\,V - 2{,}5\,V = -2{,}5\,V$$

To be adjusted: Gain: **P656 = +12.50V**
Offset: **P657 = −2.50V**

Example 2:

- Available: P420 (rated system speed) = 3000 RPM
- Required: Speed/frequency actual value r219 in the range from –10.00 V to + 10.00 V, simulated at the analog output

♦ Connect parameter r218 to the analog output:
P655 "CU-AA actual values" **= 218**

♦ Convert the required output range in [%]:
r218 should be taken from the parameter list, Section 5:
Analog output: 100 % = P420 (in this case: = 3000 RPM)
Thus, following is obtained for the range to be represented:
–3000 RPM → –100 % (parameter value PWE1) referred to V_{Off1} = –10.00 V
+4800 RPM → 160 % (parameter value PWE2) referred to V_{Off2} = +10.00 V

♦ Define gain factor P656 and offset P657:
The following is obtained from the formula shown above:

$$\text{Gain factor}\,[V] = \frac{\left(U_{off1}\,[V] - U_{off2}\,[V]\right) \times 100\,\%}{\text{PWE1}\,[\%] - \text{PWE2}\,[\%]} = \frac{(-10{,}00\text{ V} - 10{,}00\text{ V}) \times 100\,\%}{100\,\% - 160\,\%}$$

$$= \frac{-20\text{ V} \times 100\,\%}{-260\,\%} = 7{,}69\text{ V}$$

$$\text{Offset}\,[V] = U_{off1}\,[V] - \left(\frac{\text{Gain factor}\,[V] \times \text{PWE}_1\,[\%]}{100\,\%}\right) = 0\text{ V} - \left(\frac{7{,}69\text{ V} \times 100\,\%}{100\,\%}\right)$$

$$= 10\text{ V} + 7{,}69\text{ V} = -2{,}31\text{ V}$$

To be adjusted: Gain **P656 = +7.69 V**
Offset **P657 = -2.31 V**

4.3.6 Serial interfaces

4.3.6.1 Basic converter interfaces SST1 and SST2

The USS protocol (universal serial interface) is implemented at the basic converter interfaces SST1 and SST2.

The following documentation is available depending on the particular application of the SST1 basic converter interface:

♦ Connecting a PC / PG with SIMOVIS software for start-up / service operator control:

SIMOVERT Master Drives
SIMOVIS Instruction Manual
Order No.: 6SE7087-6CX87-4KA0

♦ Connecting higher-level PLCs with the USS protocol:

SIMOVERT Master Drives
Using the serial interfaces with USS protocol
Order No.: 6SE7087-6CX87-4KB0

♦ Additional general comments regarding connecting-up and parameterization:

♦ Connecting-up: Also refer to "control terminal strip" Section 3.3

SST1: 9-pin SUB D connector -X300 on the PMU parameterizing unit
SST2: Connector -X100 on the CU control terminal strip

When connecting SST2 via the terminal strip (-X100), of the CU, a four-wire connection can be implemented. The changeover between two- and four-wire connection is realized automatically.

NOTE
The bus terminating resistors (total 150 Ω) must be switched-in at the last bus node (slave). • SST1: Close jumpers S1.1 and S1.2 of DIP-FIX S1 on the CU • SST2: Close jumpers S2.1 and S2.2 of DIP-FIX S2 on the CU

♦ Parameterization:

- Parameterization: **P683 to P687**
- Define the process data (control word, status word, setpoints, actual values) for the interface: Refer to "Process data" Section 4.3.1
- Enabling parameterization: **P053 or P927**

NOTE
The factory setting (refer to "parameter list" Section 5) can be used if the SST1 and/or SST2 basic converter interfaces are not used!

4.3.6.2 Dual port RAM (DPR for SCB, TSY, CB, TB)

The dual port RAM is the internal interface on the CU (-X107) to connect possible option boards via the LBA (Local Bus Adapter, option) of the electronics box.

Possible option boards: TSY (tachometer- and synchronization board); TB (Technology board); SCB (serial communications board); CB (Communications board).

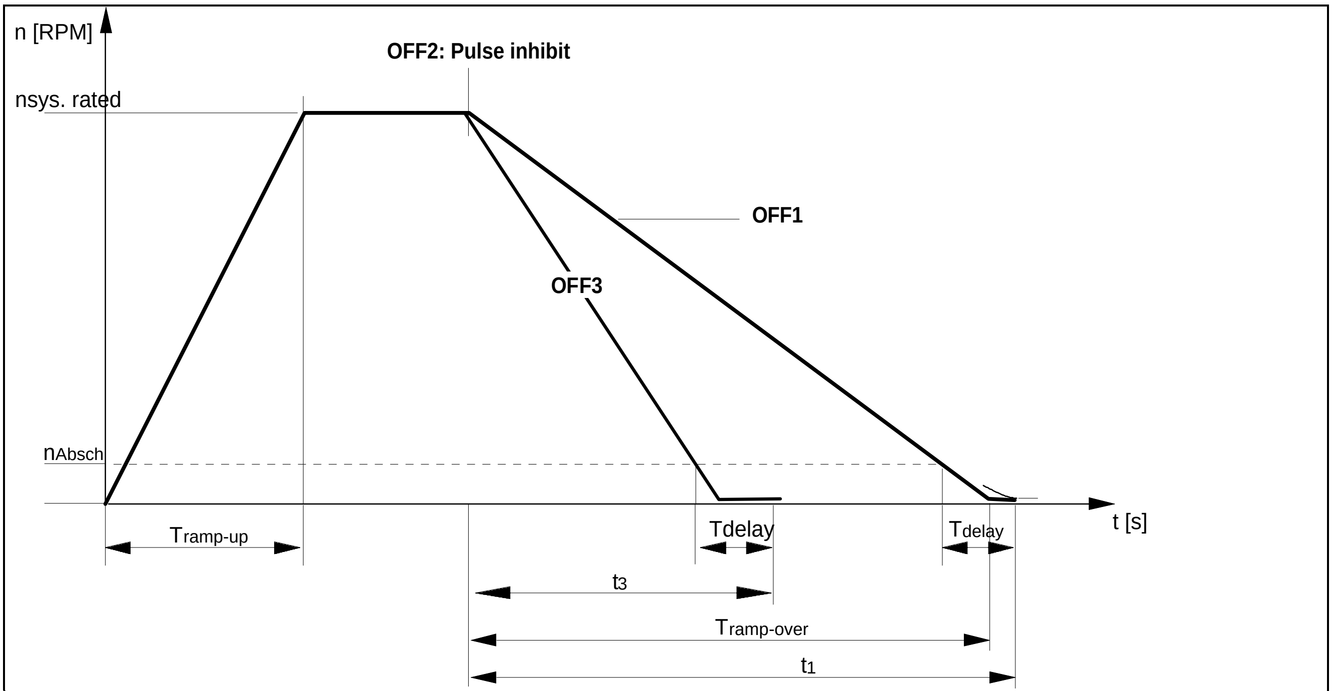
To connect possible option boards and parameterize the interface, also refer to the Section 3.5 "Recommended circuits" as well as in the appropriate Instruction Manuals to the various option boards.

Additional information can be taken from Sections 4.3.1.1 to 4.3.1.4 "Control word, status word, setpoints, actual values".

4.3.7 Ramp-function generator (RFG) and limiting stage in front of the ramp-function generator

A detailed description as supplement to the "Function diagrams", setpoint channel CU1 (Sections 1 to 3)", Section 4.4

4.3.7.1 Ramp-function generator, RFG



Ramp down time for an OFF1 command: $t1 = T_{decel.} \times \frac{n_{set} - n_{off}}{n_{Anl\text{-}start}} + T_{delay}$

OFF3: 0 setpoint is input, ramp-down along the torque limit

Fig. 4.3 Ramp-function generator

For a detailed description of the OFF1-, OFF2- and OFF3 commands, refer to Section 4.3.1.1 "Control word"

Parameters for setting the acceleration time

P420	Rated system speed	1 RPM to 9000 RPM

P462	Acceleration time ($T_{ramp-up}$)	i001: SDS1 to i004: SDS4	0,00 to 99,99 s
Acceleration time in s from standstill up to the rated system frequency, P420			

P464	Deceleration time ($T_{decelerate}$)	i001: SDS1 to i004: SDS4	0,00 to 99,99 s
Deceleration time in s from the rated system frequency (P420) down to standstill			

P514	OFF shutdown speed (n_{off})	i001: SDS1 to i004: SDS4	0.00 to 9000.0 [RPM]
The OFF delay time P516 starts to run as soon as the „speed actual value", r219 reaches the OFF shutdown speed, P514, when the drive is decelerating (OFF1 or OFF3).			

P516	OFF delay time (T_{delay})	i001: SDS1 to i004: SDS4	0.0 s to 60.0 s
Delay time for OFF1 and OFF3 in s. ♦ The OFF delay time starts to run, as soon as the „speed actual value", r219 reaches the OFF shutdown speed, P514 when the drive decelerates. The inverter pulses are then inhibited.			

Further, it is still possible to inhibit or hold the ramp-function generator via the "control word" (Section 4.3.1.1).

4.3.7.2 Limit value stage in front of the ramp-function generator

P452	Max. speed (RDF) Clockwise phase sequence	i001 MDS1 i002 MDS2	-9000.0 [RPM] to +9000.0 [RPM]
Max. setpoint frequency for a clockwise phase sequence			

P453	Maxi. speed (LDF) Counter-clockwise phase sequence	i001 MDS1 i002 MDS2	-9000.0 [RPM] to +9000.0 [RPM]
Max. setpoint speed for counter-clockwise phase sequence			

When changing-over from the IBS converter status drive 005 to ready-to-switch-on 009, it is checked as to whether the maximum speed LDF is less than the maximum speed RDF.

4.3.8 Function selection (P052)

Function selection is activated via parameter P052 and permits various special functions during the start-up phase.

Access stage 2 (**P051 = 2**) must be enabled and the converter may only be in the "run" (R) status.

The following functions are available:

- Return from function selection (P052 = 0)
- Factory setting (P052 = 1)
- Initialization (P052 = 2)
- Download (P052 = 3)
- Hardware configuration (P052 = 4)
- Drive setting (P052 = 5)

The „factory setting“ function is automatically reset after completion, i.e. P052 = 0 ("return").
The remaining functions must be manually reset!

4.3.8.1 Factory setting (P052 = 1)

This function is used to establish the factory setting for all of the parameters according to the "parameter list" (Section 5).

In this case, some converter data are set, as a function of the converter type (MLFB-dependent/P070)).

"Factory setting" can be selected in the following statuses: "switch-on inhibit" (008), "ready-to-switch-on" (009) or "fault" (007).

<u>Procedure:</u>

⇓ P052 = 1 Function selection, "factory setting"

⇓ P key The operating display appears (001), and the following parameters can be re-assigned:

- Factory setting for <u>all</u> parameters according to the parameter list (Section 5)
  (also the board configuration P090/P091)

- Converter data (taken from the converter MLFB (P070))
  P071 Converter supply voltage
  P072 Converter current (n)

⇓ The operating display "switch-on inhibit" (008) or "ready-to-switch-on" (009) appears after the factory setting has been completed (initialization).

4.3.8.2 Initialization (P052 = 2)

This function is used to change the converter MLFB (converter type) and the factory setting is only partially established when changing the MLFB (status when the converter is supplied), dependent on the new MLFB.

"Initialization" can be selected in the following statuses: "Switch-on inhibit" (008), "ready-to-switch-on" (009) or "fault" (007).

Procedure:

⇓ P051 = 3 Access stage Expert mode (used to change P070)

⇓ P052 = 2 Function selection Initialization

⇓ P070 MLFB Specifies the converter MLFB
(Rating plate data on the unit or after an upgrade (retrofit), the new MLFB assigned by the factory)
When parameterizing via the PMU, corresponding to the code number (PWE): Refer to the following table:

Table of the SIMOVERT Master-Drives

Brief description of the table columns:

PWE Parameter value (to be entered at initialization / PMU / P070)

I(n) Rated converter current in A (P072)

U-Kl. Voltage class, voltage range

P(n) Rated converter active output in kW (P073)

f_{Der} 1 De-rating frequency 1 in kHz: De-rating not required up to this pulse frequency (de-rating, refer to Section 14.3)

BF Type

PWE	Order No.	I(n)	U-Kl.	P(n)	fDer1	BF
4	6SE7016-1TA30	6,1	DC 510-620V	2,2	6	A
10	6SE7018-0TA30	8,0	DC 510-620V	3	6	A
12	6SE7021-0TA30	10,2	DC 510-620V	4	6	A
15	6SE7021-1RA30	10,6	DC 280-310V	2,2	6	A
19	6SE7021-3TB30	13,2	DC 510-620V	5,5	6	B
22	6SE7021-3RA30	13,3	DC 280-310V	3	6	A
26	6SE7021-8TB30	17,5	DC 510-620V	7,5	6	B
28	6SE7021-8RB30	17,7	DC 280-310V	4	6	B
33	6SE7022-3RB30	22,9	DC 280-310V	5,5	6	B
36	6SE7022-6TC30	25,5	DC 510-620V	11	6	C
40	6SE7023-2RB30	32,2	DC 280-310V	7,5	6	B
43	6SE7023-4TC30	34,0	DC 510-620V	15	6	C
47	6SE7023-8TD30	37,5	DC 510-620V	18,5	6	D
49	6SE7024-4RC30	44,2	DC 280-310V	11	6	C
53	6SE7024-7TD30	47,0	DC 510-620V	22	6	D
55	6SE7025-4RD30	54,0	DC 280-310V	15	6	D
57	6SE7026-0TD30	59,0	DC 510-620V	30	6	D
65	6SE7027-0RD30	69,0	DC 280-310V	18,5	6	D
67	6SE7027-2TD30	72,0	DC 510-620V	37	6	D
71	6SE7028-1RD30	81,0	DC 280-310V	22	6	D

⇓ P052 = 0 Function selection Return

⇓ P key The operating display appears, and the following parameters are re-assigned once the MLFB has been changed:

- ♦ Converter data (determined from the converter MLFB (P070)). Data sets as for function selection „factory setting"(refer to Section 4.3.9.1); not all of the parameters are reset to the factor settings according to the parameter list!

⇓ The operating display „drive start-up" is displayed after initialization has been completed (005)

4.3.8.3 Download (P052 = 3)

This function is used to read and change all parameters using a PC at the basic converter interfaces SST1 or SST2.

"Download" can be selected in the following statuses: "Switch-on inhibit" (008), "ready-to-switch-on" (009) or "fault" (007).

Procedure:

⇓ P052 = 3 Function selection Download

⇓ P key The operating display appears (021)

- ♦ Using a PC at the basic converter interface SST1 or SST2 and an appropriate application program (e.g.: SIMOVIS), all parameters can now be read and changed independently of the access stage (P051) and function selection (P052)

⇓ P052 = 0 Function selection Return

⇓ P key

⇓ After return, the operating display appears, "switch-on inhibit" (008) or "ready-to-switch-on" (009)

4.3.8.4 Hardware configuration (P052 = 4)

This function is used to define option boards (SCB, TSY, CB, TB) in the converter electronics box.

Further, the LBA bus coupling (Local Bus Adapter) is required for the electronics box!

In order to be able to be able to install the option boards in the electronics box, the LBA (Local Bus Adapter) must be mounted in the box.

Mounting in the LBA – bus expansion:

- Remove the CU board using the handles (lefthand slot in the electronics box) after releasing the connecting cable to the PMU and the two retaining screws
- Insert the LBA bus expansion into the electronics box until it latches into place (refer to the diagram for the position)
- Insert the CU board back into the lefthand slot. Tighten-up the retaining screws at the handles, insert the connecting cable to the PMU
- Insert the option board in slot 2 (right) or slot 3 (center) of the electronics box and screw into place. Every specific option board may be inserted only once in the electronic box. If there is only one option board then this is always inserted in slot 2 (right).

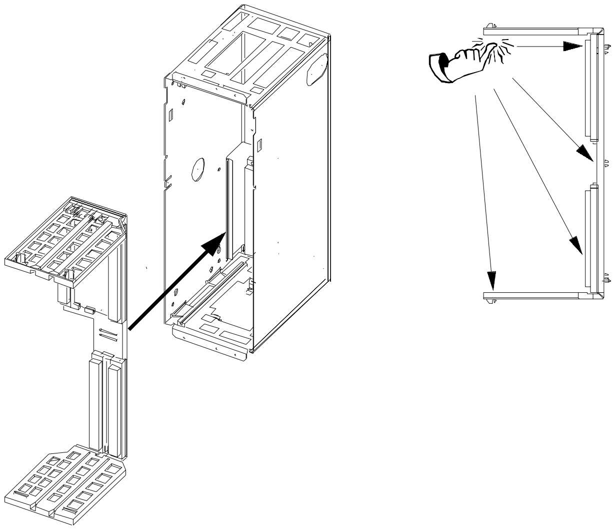


Fig. 4.3 Installing the Local Bus adapter

Examples of possible arrangements	Slot 1	Slot 3	Slot 2
	CU	---	SCB
	CU	SCB	Tx00
	CU	CBx	SCB
	CU	TSY	SCB

All parameters, which can be written into the "hardware configuration" status ("H", refer to the righthand column in the "parameter list", Section 5), can be changed.

The "hardware configuration" selection can be realized in the "switch-on inhibit", "ready-to-switch" or "fault" status.

Procedure:

⇓ P052 = 4 Function selection Hardware configuration

⇓ P051 = 3 Access stage Expert mode (to change the following parameters)

⇓ P090 = Board, slot 2 (To the RIGHT in the electronics box!)
P091 = Board, slot 3 (In the CENTER in the electronics box!)

Parameter values for P090/P091:
0: No option board
1: CB Communications board
2: TB Technology board (only P090)
3: SCB Serial communications board
4: TSY Digital tachometer and synchronization board

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not for T300)
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE
Only one of each option board type may inserted in the electronics box. TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted. If only one option board is used it must always be inserted at slot 2. Option board Order Nos. and their descriptions are found in Section 9 "Options".

⇓ Additional parameters, depending on the option boards (refer to the associated Instruction Manuals or parameter list / Section 5)

⇓ Make a selection:

⇓ P052 = 5 Function selection, "drive setting" (refer to Section 4.3.9.5)

or ⇓ P052 = 0 Return

⇓ P key The operating display (r000) appears, while, depending on the function selection, parameters and internal quantities can be re-assigned

♦ The hardware is initialized

If fault message F050/F070/F080 appears: Refer to Section 7 "Troubleshooting"

⇓ After the selected function selection has been completed, the "switch-on inhibit" (008) or "ready-to-switch-on" (009) operating display appears.

4.3.8.5 Drive setting (P052 = 5)

This function is used to change the drive setting (converter/motor data, system data).

This includes all parameters, which can be written into the "drive setting" status ("A" refer to the righthand column in the "parameter list" Section 5.

Procedure:

⇓

♦ 1FT6 motor: Enter the motor number in P100

♦ Other motors Enter „250“ in P100 and the motor parameter values.

⇓ P208 encoder type,
possibly rated system speed and system torque

⇓ P052 = 0 Switch-on inhibit (008) or ready-to-switch-on (009)

Precise procedure, refer to Section 4.2.2.

4.3.9 Functions (software)

4.3.9.1 Motor identification

P330 Motid = 0: Motor identification is automatic, if there is no motor data available for start-up drive parameters were changed.

= 1: Motor identification after each ON command.

4.3.9.2 Ground-fault test:

P354 = 0: No ground fault test.
= 1: Ground fault test only with the next ON command; parameter is then reset to 0.
= 2: Ground fault test after every ON command.

P357 Ground fault test limit = switch off current

4.3.9.3 Restart-on-the-fly

Restart-on-the-fly“ is set via the following parameters:

Control word bit 23 "restart-on-the-fly enable"
The control word bit must be set to enable the restart-on-the-fly function
Source selection parameter for control word bit: P583
Refer to Section 4.3.1.1 "control word"

Restart-on-the-fly inactive (control word bit):
The drive waits until the motor has come to a standstill before it goes into run.

Restart-on-the-fly active:
Synchronization to a running motor.

4.3.9.4 Technology controller

The technological controller function can be used for simple higher-level control systems, without having to use an additional technological board (TB) (function diagram „Technological controller", refer to section 4.4).

The sampling time of the technological controller is 8xP308 (default 8 ms).

The technological controller computes in the PZD notation, i.e. 100% corresponds to 40000H.

The technological controller setpoint can be entered <and changed via the following parameters:

- ♦ **P525** Technological setpoint (active for P526 = 1001)
- ♦ **P526** Source of the technological setpoint (possible settings, refer to 4.3.1.3)
- ♦ **P527** Technological setpoint gain (–300 % to 300 % corresponds to the factor -3 to 3)
- ♦ **P528** Setpoint smoothing (to prevent setpoint steps)

Parameters P525 to P527 are basic/reserve parameters with **i001** for the basic setting
i002 for the reserve setting

The actual technological setpoint can be visualized using parameters r529.

The technological actual value can be entered and changed via the following parameters:

- ♦ **P530** internal source for the technological actual values. The parameter numbers of the internal drive converter quantities is specified here, which are to be used as technological actual value. This parameter has two indices. The quantity in i001 is selected with P531=1100, that in i002, with P531=1200.
- ♦ **P531** Source of the technological actual value (possible settings, refer to 4.3.1.3)
- ♦ **P532** Technological actual value gain (–300 % to 300 % corresponds to the factor -3 to 3)
- ♦ **P533** Actual value smoothing

Parameters P532 and P532 are basic/reserve parameters with **i001** for the basic setting
i002 for the reserve setting

The actual technological actual value can be visualized with parameter r534.

A binary status bit can be generated from the comparison of the technological setpoint and the technological actual value (status word **P627 „DE.T.Reg.Set.ex"**).

	Technological setpoint positive	**Technological setpoint negative**
HIGH	Technological actual value > technological setpoint	Technological actual value < technological setpoint
LOW	Technological actual value < technological setpoint – hysteresis (**P535**)	Technological actual value > technological setpoint + hysteresis (**P535**)

The actual technological controller is a PID controller.

The input signal is the difference between the technological setpoint and the technological actual value (monitoring parameter r536).

The P component of the PID controller can be adjusted via parameters)537 „DE Reg Kp", the I component via parameter P538 „DE Reg Tn" and the D component via parameter P539 „DE Reg.Tv". The I component can be completely disabled, by setting parameter P538 to 0. The same is true for the D component, which can be disabled by P539=0. This means, that when required, the controller can be used as pure P controller, as PD controller, as PI controller or as PID controller.

The controller output signal can be monitored via parameter r540. the controller is then active, if the inverter impulses are enabled and the technological controller is enabled (control word, bit 24=1, wiring via P584).

The technological controller output can still be limited via two freely adjustable limit values. The upper limit can be defined with parameter P541. This limit may not be exceeded. The lower limit, which also may not be exceeded, is defined using parameter P542.

In order that the technological controller can be smoothly switched-in, a ramp can be set for the upper limit via parameter P543, and a ramp for the lower limit via parameter P544. The limited output value can be checked via parameter r545. If the limiting is active, the I component of the PI controller is held, in order to be able to quickly move away from the limit.

The technological controller output can be wired to the following parameters with word 1020 and parameter **P433**:**"Src AddSetpoint1"**, **P438 "Src AddSetpoint2"**, **P443 "Src MainSetpoint"**, **P486 "Src Torque Setp"**, **P493 "Src FixTorque1"**, **P499 "Src FixTorque2"** and **P506 "Src T FixAddSet"**.

Additional applications of the technological controller:

1. Using P526 and r529 and parameters)531 and r534, process data can be transferred from one interface to the next.

Example:

Setpoints for the TB are to be entered in word05 and word06 via SST1. In order to permit this, the following parameterization must be made:

P526.01 = 2005 (word 05 from SST1)

P527.01 = 100.00% (no gain)

P528 = 0.0s (no smoothing)

P531.01 = 2006 (word 06 from SST1)

P532.01 = 100.00% (no gain)

P533 = 0.0s (no smoothing)

P694.02 = 529 (actual value W02 for TB is therefore word 05 from SST1)

P694.03 = 534 (actual value W03 for TB is therefore word 06 from SST1)

The technological controller does not have to be activated for this function(P584 = 0000).

2. The status bit 27 can be used as any comparator, by entering a comparison value via P525 and P526, and a comparison quantity via P530 and P531.

The technological controller does not have to be activated for this function(P584 = 0000).

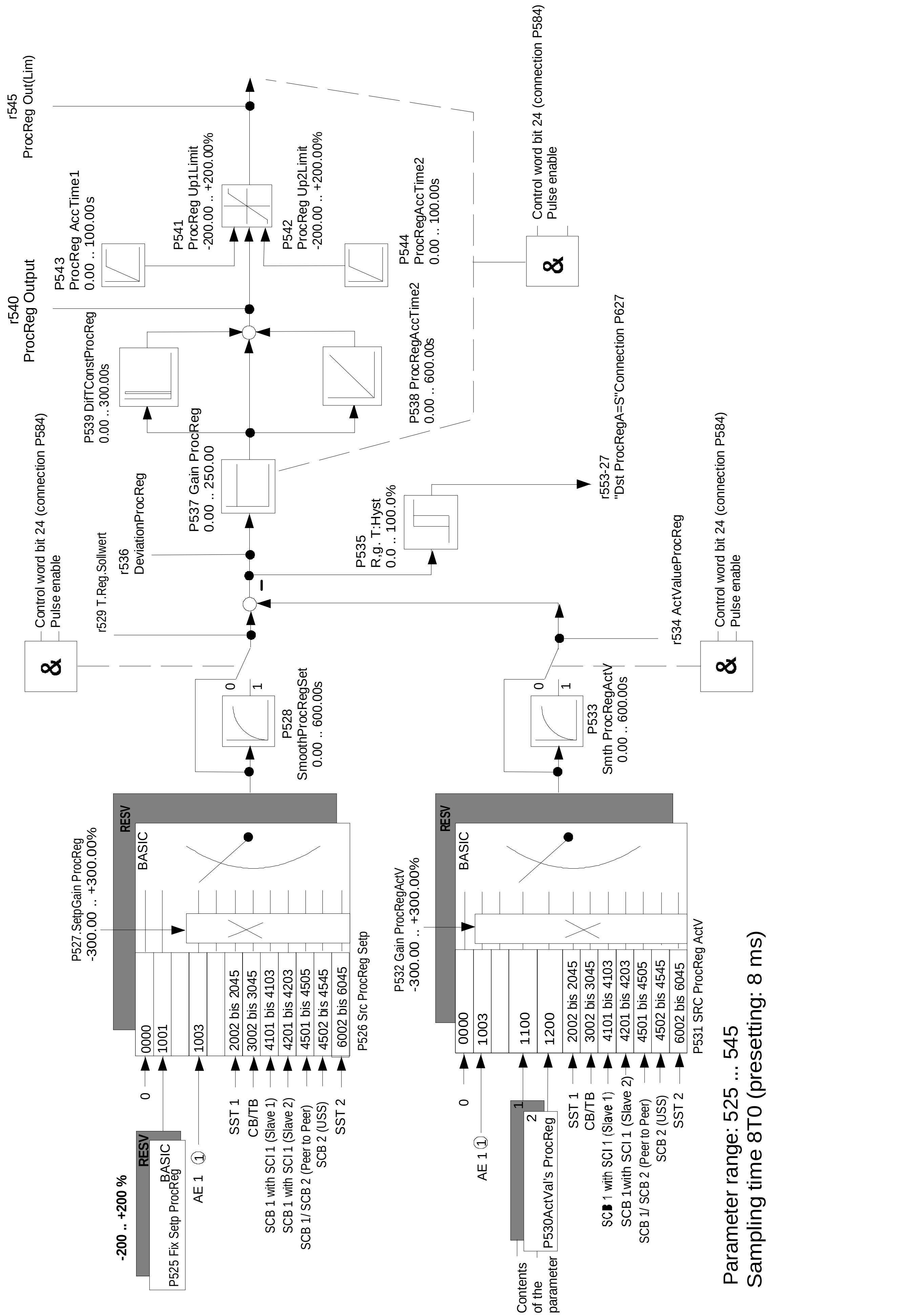


Fig. 4.4 Technology controller SIMOVERT SC

4.3.9.5 Tracer

The tracer is used to quickly trace drive converter quantities (e.g. current, voltage, speed) in the drive converter. This tracer has 8 channels, whereby all of the channels can work independently of one and another. All quantities are possible as trigger- and trace quantities, which are accessible as parameter in the drive converter. It is not possible to trace the parameters of a technological board (TB) (parameter Nos. greater than 1000 or d- or H parameters).

The trace memory includes a total of approximately 3 kbyte which are dynamically distributed, i.e. if 3 channels are activated, 1 kbyte RAM memory is available for each channel.

4.3.9.5.1 Parameterizing the tracer

As the tracer supports 8 independent channels, the parameters required for parameterization are indexed 8 times, whereby the channel number corresponds with the index number..

The **trigger event** is specified using the parameters

- **P735 "TRC Trigger par."**
- **P736 "TRC Trigger value"**
- **P737 "TRC Trigger cond."**
  - 0 Value of the trigger parameter < trigger value
  - 1 Value of the trigger parameter = trigger value
  - 2 Value of the trigger parameter > trigger value
  - 3 Drive converter goes into a fault condition
  - 4 Value of the trigger parameter ≠ trigger value

Example: P735.01 = 1 (drive converter, r001)

P736.01 = 16 (off with fast stop)

P737.01 = 1 (same)

Channel 1 of the tracer is triggered for fast stop active (off 3).

The **trace record function** is parameterized with:

- **P738 "TRC actual values"** Parameters which are to be recorded by the trace channel
- **P739 "TRC sampling time"** sampling time of the trace channel (as a multiple of the basic sampling time) 4,8,12,…, as the monitoring parameters are only updated in steps of 4 x P308.)
- **P740 "TRC Pretrigger"** Percentage of the data in the trace memory before the trigger event

Example: P738.01 = 219 (speed actual value)

P739.01 = 4 (trace sampling time)

P737.01 = 40 (pretrigger)

The speed actual value is sampled with 4xT0 (T0 =P308) whereby 40% of the data in the traced memory are before the trigger event.

A trace channel can be started (1) and stopped (2) with **P741 “TRC start”**. The parameter is automatically reset to 0 if the trace channel has triggered and the trace has been completed.

Reading the trace data:

It is possible to the trace data via all of the interfaces of the drive converter. In this case a differentiation must be made between digital and analog output.

- Digitales Auslesen der Tracedaten über eine serielle Schnittstelle:

  To read-out the trace data, parameters **r751 "TRC data channel1"** to **r758 "TRC data channel8"** are used for trace channels 1 to 8. These parameters are indexed with 116 indices (001 to 116). The complete parameter contents (116 words) can be read –out via the interfaces **SST1, SST2** and **SCB-SST** via the USS protocol with one telegram. The trace data themselves are then in indices i002 to i116; index i001 is used to control the trace data transfer. As the trace memory is greater than 116 words, a data block number can be specified over **P750 "TRC data block".** If the value 0 is in parameter P750.01, trace data 1 to 115 (corresponds to data block 0) of channel1 can be read-out via parameter r751; if P750.01 = 1, trace data 116 to 230 (corresponds to data block 1) can be read-out via r751, etc.

  In order to accelerate data read out, when the complete parameter contents are requested from one of the parameters r751 to r758, the associated data block in P750.0x is automatically incremented by one, so that the master reading out the data only has to request the trace data, without having to adjust the data block number.

  The index i001 of the trace data parameters r751 to r758 is used to secure data and as end identification for trace data,. The data block No of the block returned is coded in the high byte of the i001, and in the low byte, the No. of valid trace data. If the No. of valid traced data is less than 115, the last traced data block has been reached, and the trace channel data have been read.

  In order to read-out the traced data in the fashion described, USS with variable PKW length must be set as protocol (P685.0x=127). Only one trace data word can be read-out via the USS with fixed PKW length or via PROFIBUS-DP (board CB1), so that the read out time is correspondingly extended.

- Analog output via analog outputs:

  The parameter numbers of the trace data parameter (r751 to r758) can be entered in the actual value parameters of the analog output. (**P655 "CU-AA actual values"** and **P664 "SCI-AA actual values")** Trace data output are cyclically output at the relevant analog output. In this case, a trace data parameter cannot be simultaneously output by several analog outputs.

Normalizing the trigger value and the trace data:

Generally, the associated PZD normalization is valid for entering the trigger value (P736) and for the traced data which have been read. This means, that the trigger value in the PZD normalization of the trigger parameter (P735) must be entered. The trace data is also output in the PZD normalization of the traced parameter (P738). When a trace channel is output as analog signal the same conditions are valid as if the parameters recorded by the trace were to be directly output at the analog output.

Example:

The trace channel 2 should trigger if the speed actual value (r214) is greater than 2000 RPM. The frequency setpoint is recorded (r482). The rated analog frequency (P420) is 2000 RPM.

Trigger parameter:	P735.02 = 219
Trigger value:	P736.02 = 16384 (r219 = 100 %, if r219 = P420; 100 % = 4000H =16384)
Trigger condition:	P737.02 = 2 (>)
Trace actual value.	P738.02 = 482

reading-out the trace data r752 (for channel 2). The trace data is available in the normalization of r482 (100 % = 4000H = P420).

NOTE
♦ The trigger conditions (**greater** and **smaller**) are compared without sign. This must be taken into account if signed parameters are to be triggered for negative trigger values.
♦ As a result of the dynamic distribution of the trace memory, a previously inactive trace channel should not be parameterized or started, if another trace channel has triggered, or if the data of a trace channel still has to be read-out. If a trace channel is activated, it will be necessary to re-distribute the trace memory. This means that all of the data in the trace memory become invalid
♦ Only the most significant word is always traced for double-word parameters (type I4).
♦ For each activated trace channel, approximately 1% of the computation time is required, i.e. if several trace channels are activated, it may be necessary to increase the sampling time (**P308**).

4.3.9.6 Pulse encoder simulation

A pulse encoder interface is also available on the CU for a higher-level technology board control (e.g. T300). If an encoder is connected (P208 = 1), then the track signals of the encoder are output at this interface. For the recommended ERN1387, this is 2048 pulses in two tracks, displaced through 90°, as well as a zero pulse at each revolution. If a resolver is connected (P208 = 2,3) then, independent of the resolver type, there is always a simulation with 2048 pulses per mechanical revolution as well as a zero pulse.

The pulse encoder simulation can be accessed:

⇒ as TTL signal at connector X107 (for DORAM interface T300)

⇒ as HTL signal at customer terminals X102:

Zero pulse	terminal 39
Track A	terminal 37
Track B	terminal 38

4.3.10 Start-up after first start-up including subsequent enabling of software functions and hardware options

When starting-up the drive after a first start-up, the procedure (sequence) of the first start-up should be taken into account:

- Standard application; refer to Section 4.2.2
- Expert application: refer to Section 4.2.3

♦ Depending on the required change and taking into account the access stage (P051), and a possibly necessary function selection (P052), a jump can be made to the appropriate step.

♦ Due to background calculations, it is recommended that the following parameters and functions selections are checked/executed after the position jumped to!

For example: Standard application (Section 4.2.2): Changing motor data

♦ P051 = 2 Access stage

♦ P052 = 5 Function selection, "drive setting"

♦ Change motor data

♦ Check subsequent parameters

♦ P052 = 7 Function selection "motor identification at standstill" (background calculations using new motor data)

♦ P051 = 1 Access stage

Description of the "function selection" (P052): Additional information in Section 4.3.9

Subsequent enabling of "functions": Additional information in Section 4.3.10

Subsequent enabling of "hardware options":
Additional information regarding the appropriate options is provided in the Instruction Manuals.

4.3.11 Capacitor forming

The DC link capacitors must be re-formed if the converter has been non-operational for more than one year. If the converter was started-up within one year after having been shipped (serial number on the rating plate), it is not necessary to re-form the DC link capacitors.

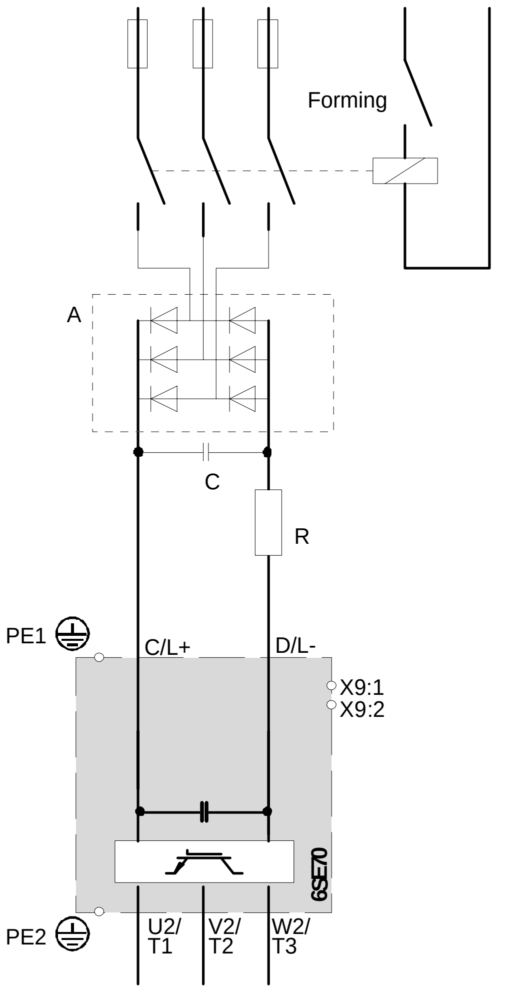
Forming can be realized in one of the following ways:

Version 1 Slowly increase the DC line voltage up to the rated converter input voltage in a forming time which is a function of the time that the converter was not operational (refer to Fig. 4.5).

Version 2 Connect-up a rectifier and resistor to the DC link (Circuit: refer to Fig 4.6). The rectifier is connected-up for a time which is a function of the time that the converter was not operational (refer to Fig. 4.5).

Position	Example	
1 and 2	A-	Manufacturing location
3	E F G	1994 1995 1996
4	1 to 9 O N D	January to September October November December
5 to 14		Not relevant for forming

Table 4.2 Serial number structure: A-E60147512345



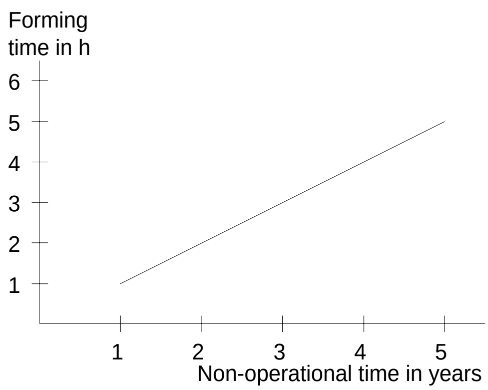


Fig. 4.5 Forming time as a function for the time which the converter was non-operational

	Recommended components		
	A	R	C
280 V < Un < 310 V	SKD 50 / 12	220 Ω / 700 W	22 nF / 1600 V
510 V < Un < 620 V	SKD 62 / 16	470 Ω / 1200 W	22 nF / 1600 V
675 V < Un < 930 V	SKD 62 / 18	680 Ω / 1700 W	22 nF / 1600 V

Fig 4.6 Circuit for forming,Version 2

4.4 Function Diagrams

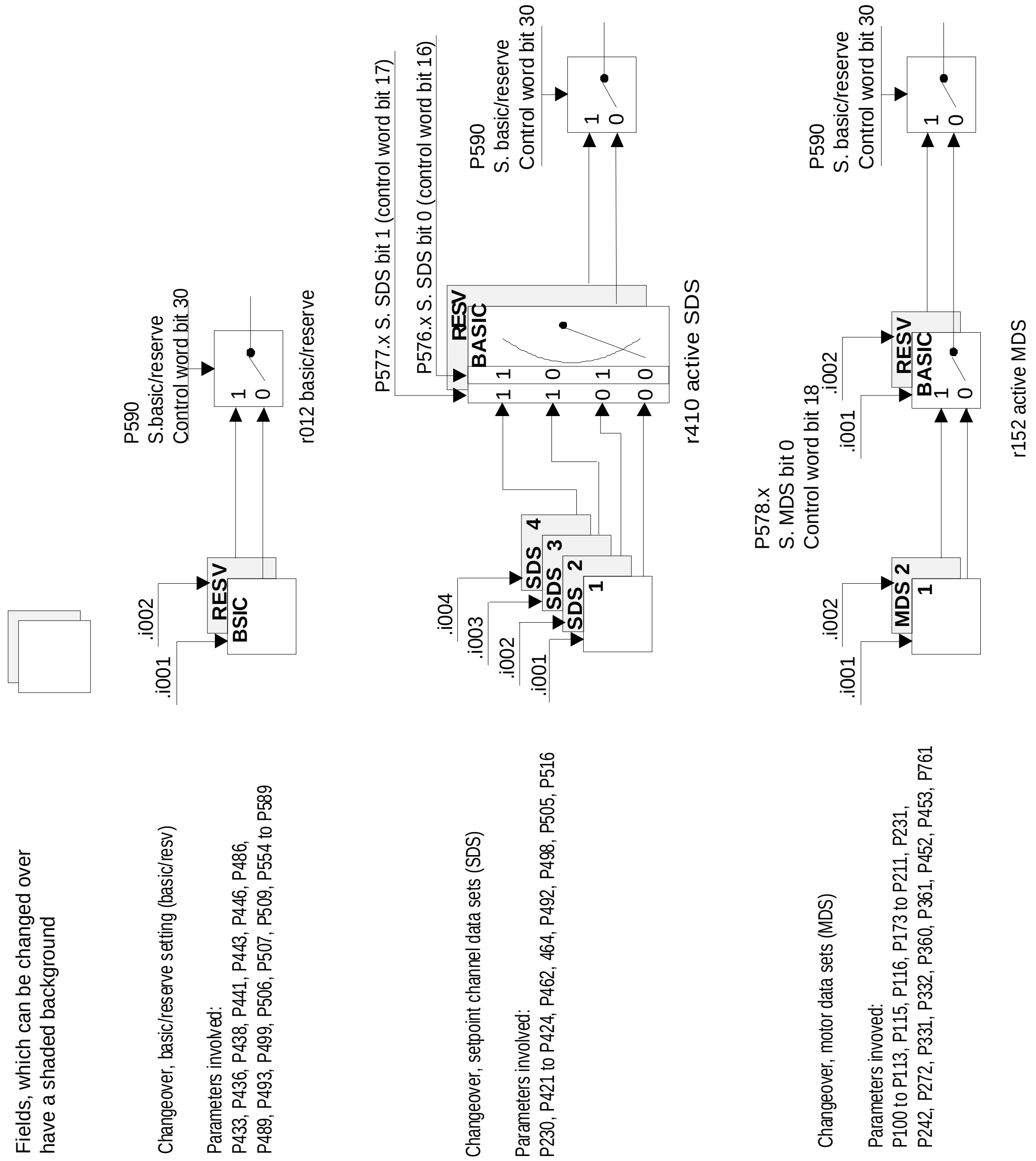


Fig. 4.7 Changeover basic/reserve setting

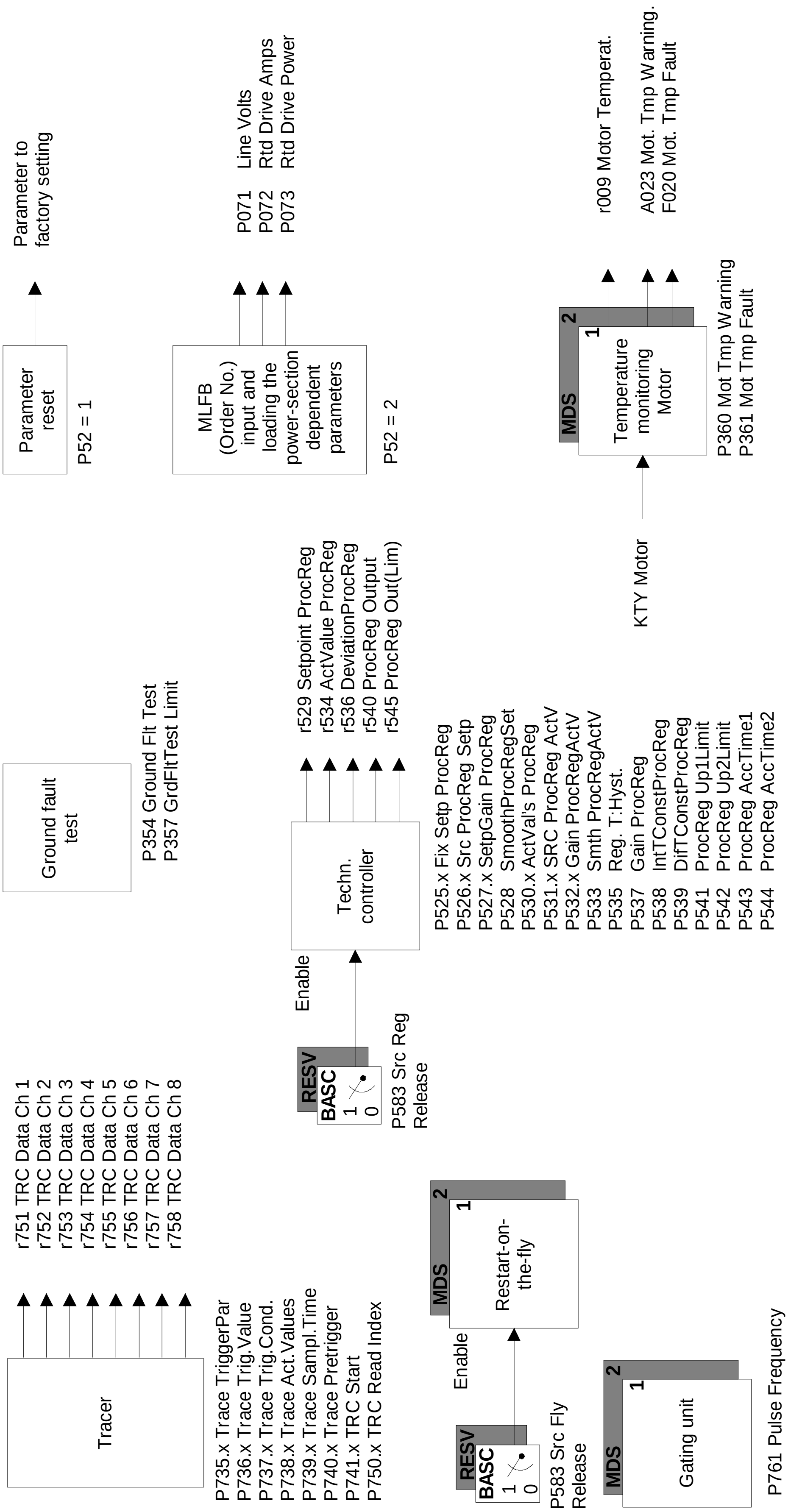


Fig. 4.8 Functions

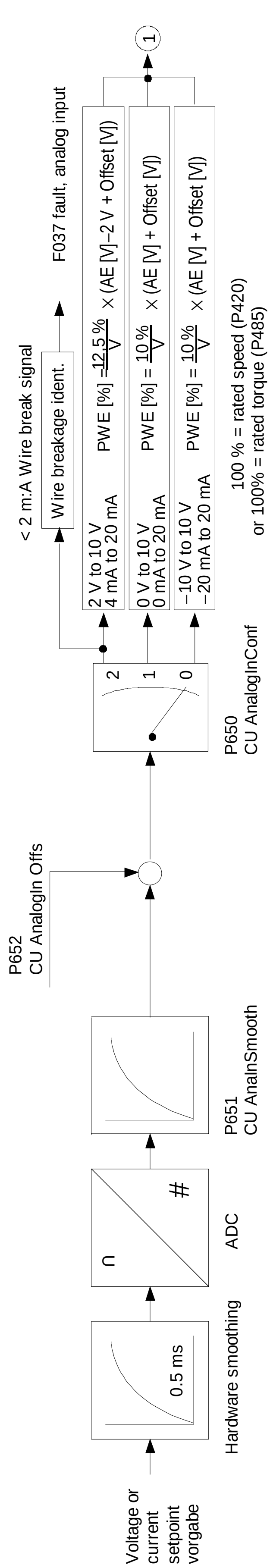


Fig. 4.9 Analog input

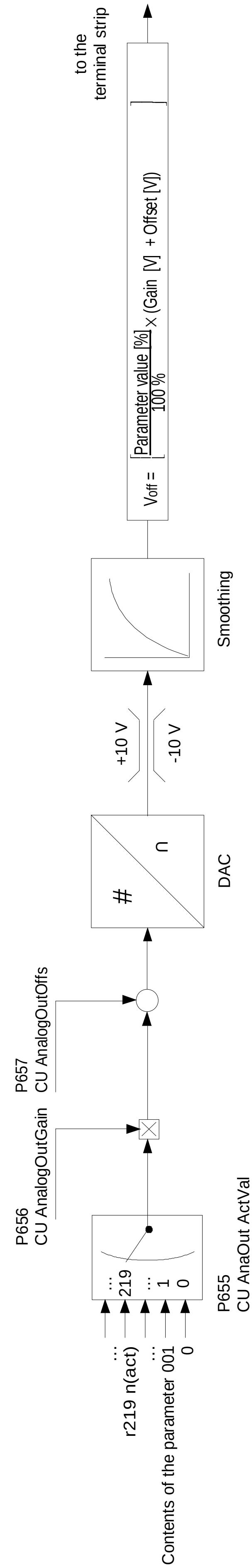


Fig. 4.10 Analog output

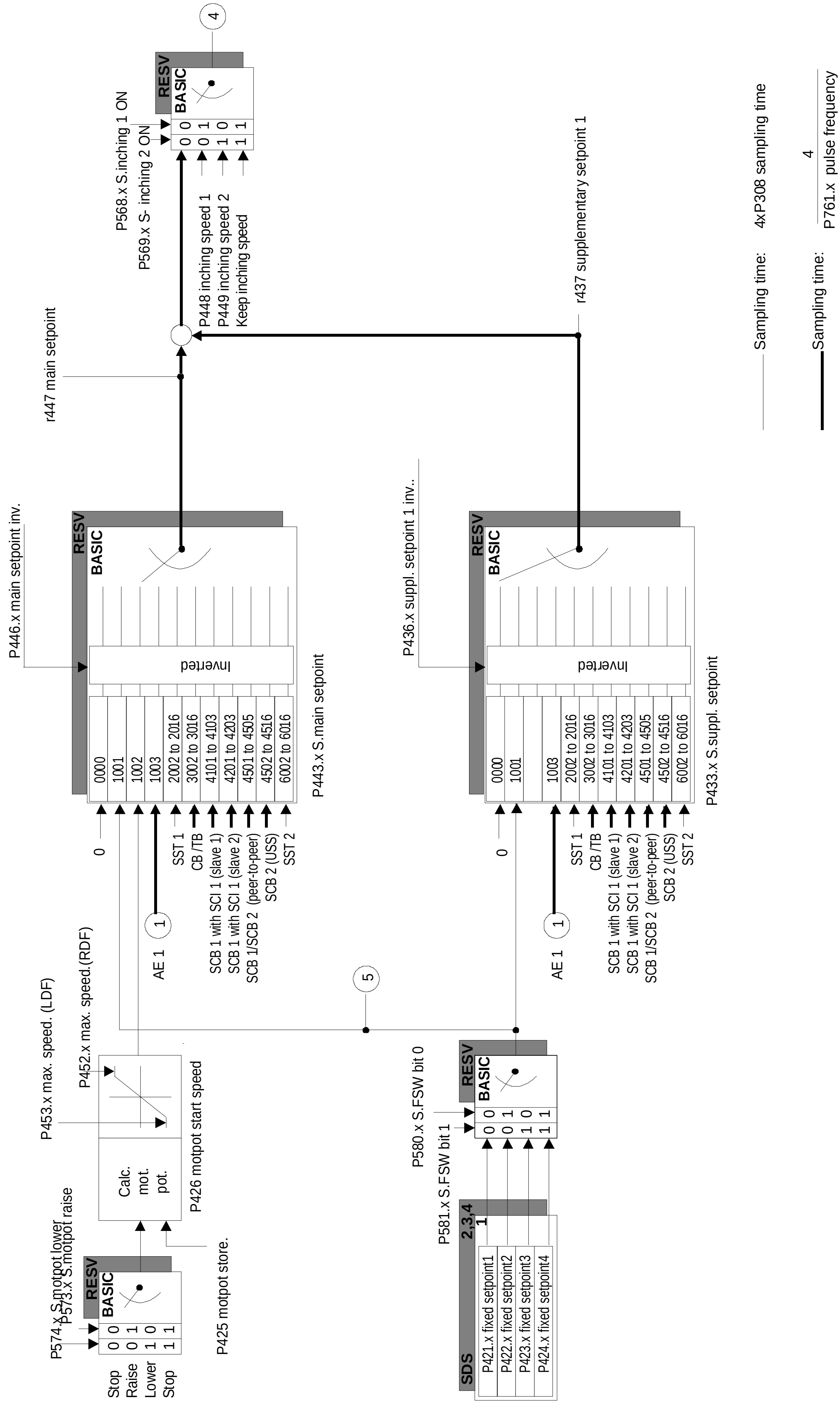


Fig. 4.11 Setpoint channel (Section 1)

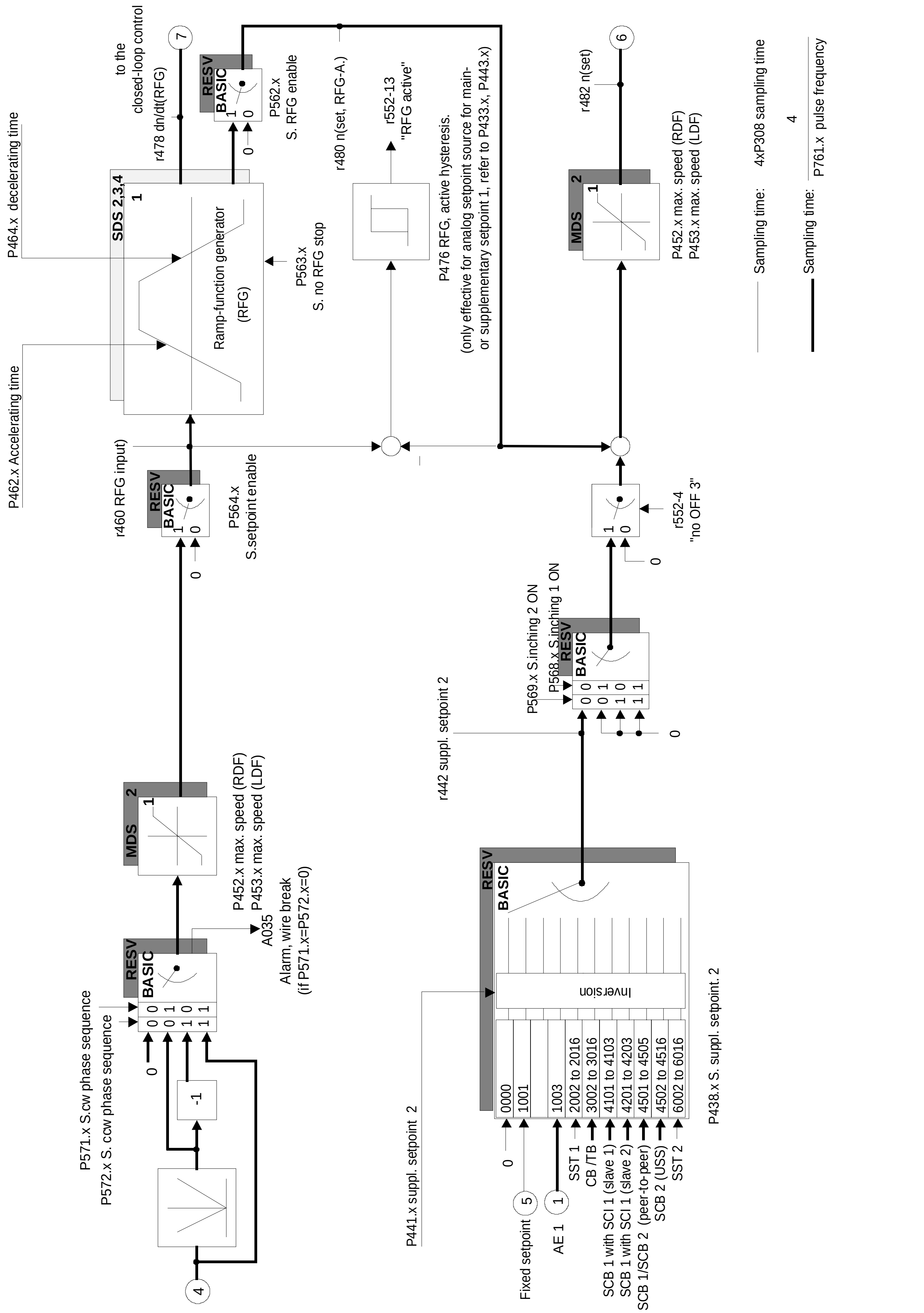


Fig. 4.12 Setpoint channel (Section 2)

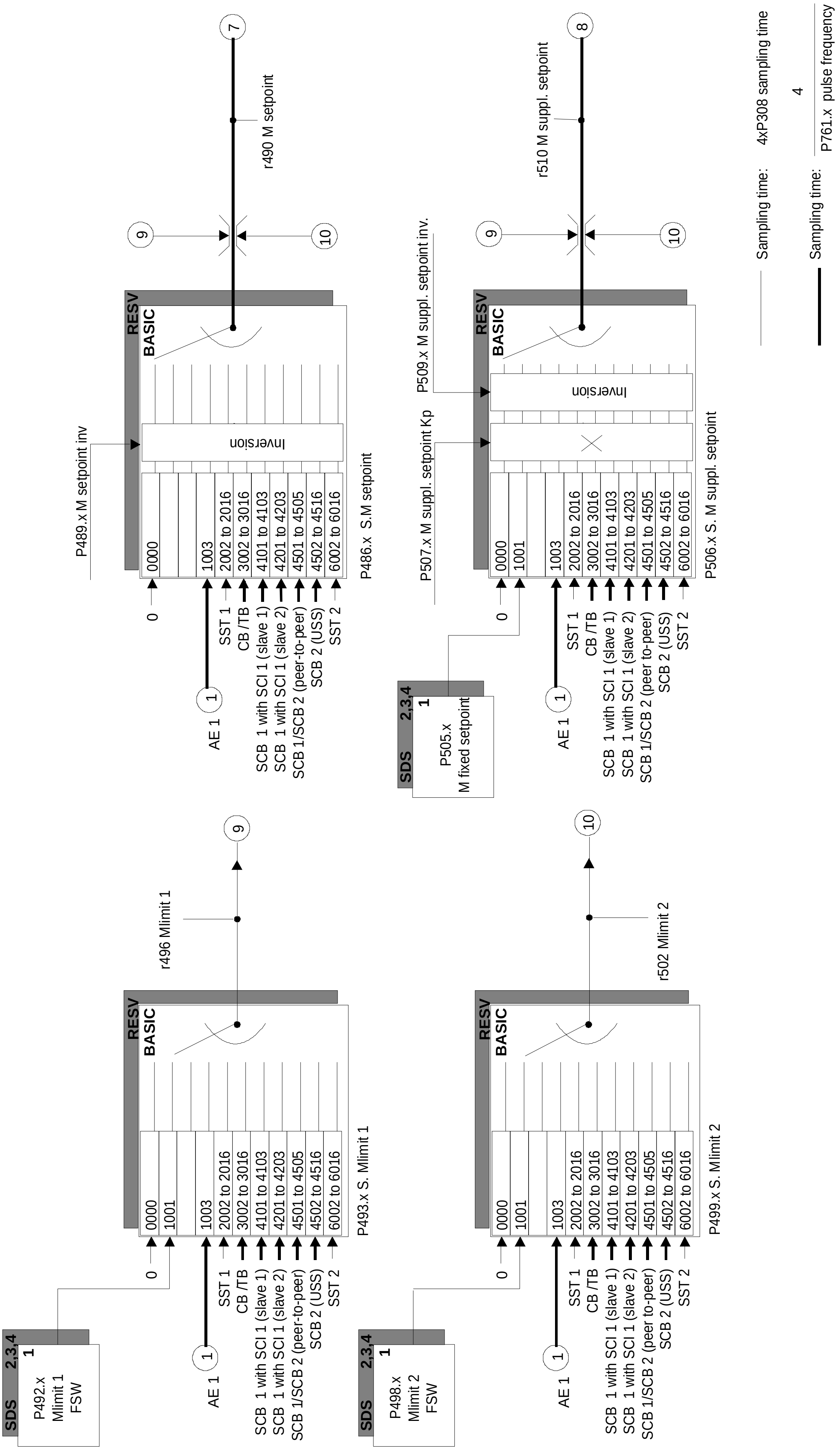


Fig. 4.13 Setpoint channel (Section 3)

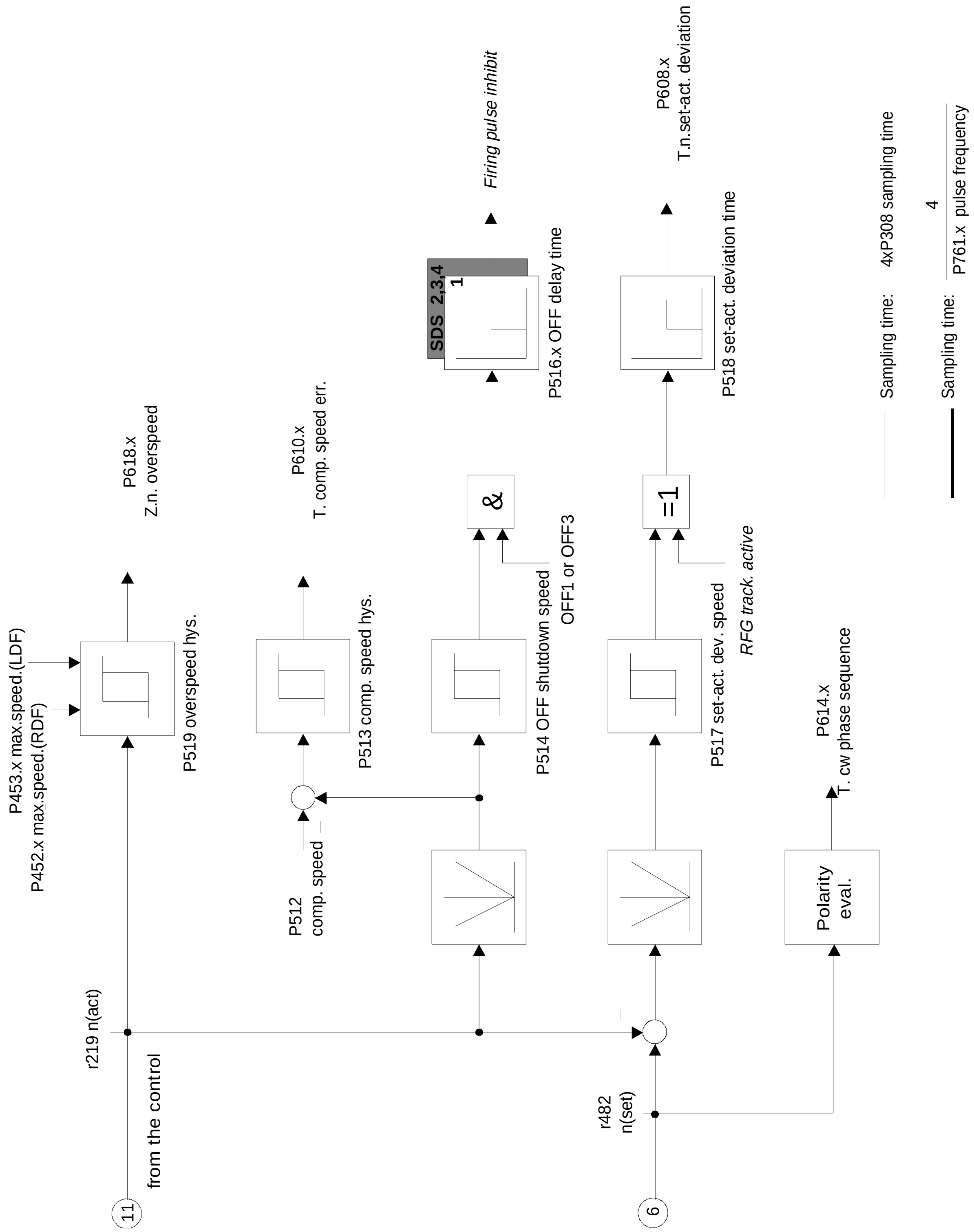


Fig. 4.14 Setpoint channel (Section 4)

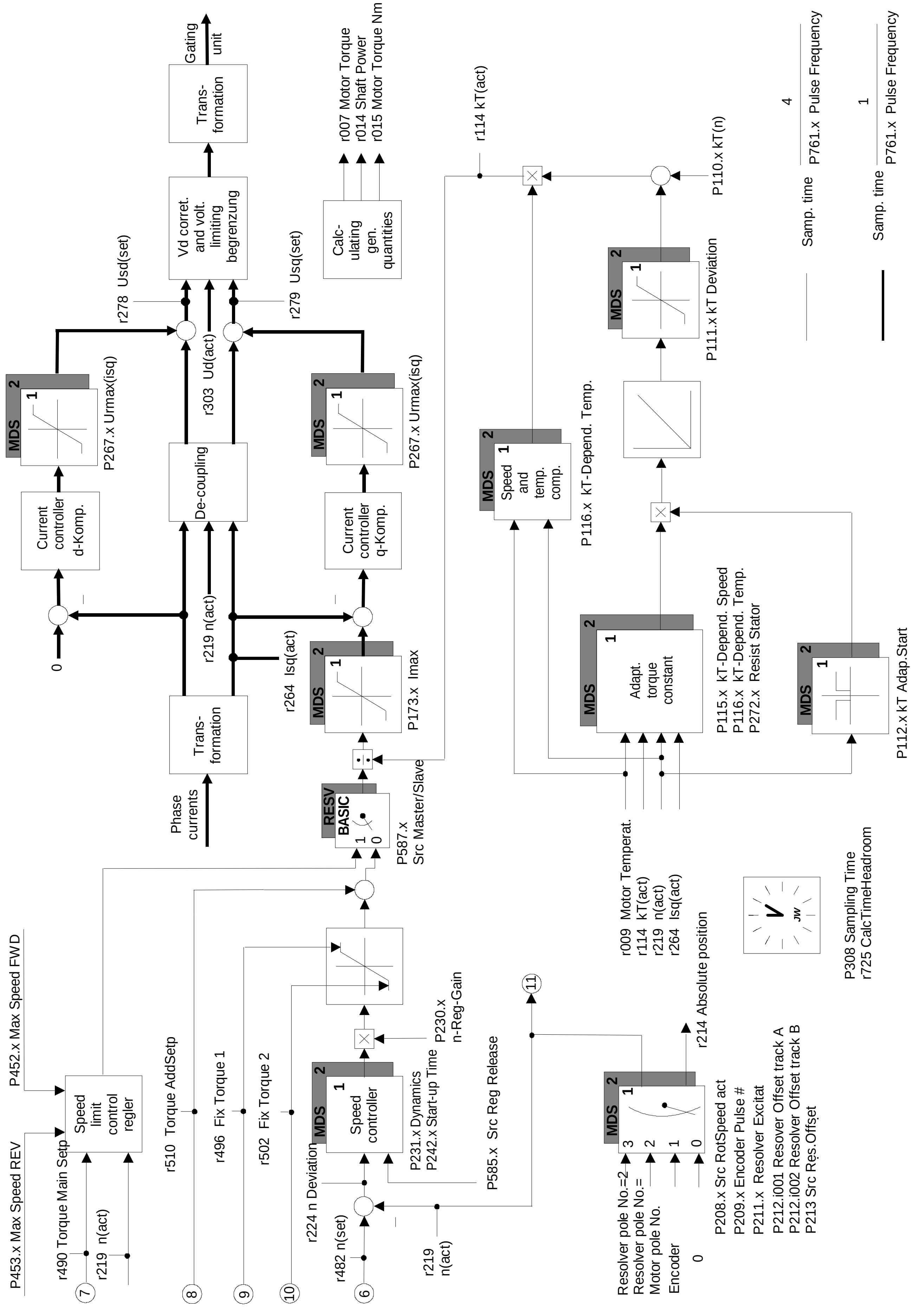


Fig. 4.15 Closed loop control

5 Parameter List

General Observation Parameters	to r013	Contol and Status Word	from r550
General Parameters	from P050	Analog Input/Output	from P650
Drive Data	from P070	Communications	from P680
Hardware Configuration	from r089	Diagnosis	from r720
Motor Data	from P100	Modulator	from P761
Control	from r150	Factory Parameters	from P789
		Special Parameters	from 800
Functions	from r333	Profile Parameters	from P918
Setpoint Channel	from r410	Tech Board Parameters	from 1000

Explanations on the Parameter List

Example:

PNU ***:conf-P**	**Parameter name in OP1** Description	**Range** **[Unit]**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
P999 *1) 3E7Hex	**Parameter name in OP1** Description Typ=I2; 2) PKW: 1Hex=0.01Hz; Process Data Group.: 0 3)	-300.00 to 300.00 [Hz]	2 i001=50.00 i002=50.00	2 5)/ BR 4) 2 5)/ BR 4)

1) Confirmation Parameter: not active before pressing the P-key

2) Parameter Type

O2 16 Bit Value without sign
I2 16 Bit Value with sign
I4 32 Bit Value with sign
V2 Bit coded Quantity

3) Normalization Group for Process Data (PcD)

Process Data Group	Process Data Normalization
0	as Parameter Value Normalization
1	4000Hex = P420 Rated System Frequency
2	1000Hex = P102 Rated Motor Amps
3	1000Hex = P101 Rated Motor Volts
4	1000Hex = r307 Line Volts (AC)
5	4000Hex = P485 Rated system Torque

4) Drive status:

U MLFB Input
H Hardware-Konfiguration
A Hardware Setting
B Ready (Including Fault)
R (Run) Operation (including Fly Restart, Power Ride Thru, Flexible Response)

5) Access Level which is minimum needed to display or change a Parameter

1 Operation
2 Standard Mode
3 Expert Mode

6) Abbreviations for Index Parameters

SDS(2) Setpoint Channel Data Set Parameter with 2 or 4 Indices, to be changed via Control Word 2, Bits 16 and 17
MDS(2) Motor Data Set Parameter with 2 or 4 Indices, to be changed via Control Word 2, Bits 18 und 19
B/R Parameter which can be changed between Base and Reserve setting via Control Word 2, Bit 30

7) Parameter value is pre-assigned after initialization dependent on the MLFB drive converter.

5.1 General Observation Parameters

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r000	**Operation Display** Displays Drive Status, Fault Messages and Warnings; see section 6		-	1 /UHABR
r001 1Hex	**Drive Status** Displays the actual drive status Parameter Values: 0 = Drive MLFB input 1 = Drive initialization 2 = Hardware initialization 3 = Drive system initialization 4 = Hardware settings 5 = Drive system settings 6 = Selection on several drive test functions 7 = Fault 8 = Restart inhibition 9 = Ready for turn-ON 10 = Pre-charging of the DC link bus 11 = Ready for operation 12 = Ground fault test 13 = Flying Restart is active 14 = Drive is operating 15 = Ramp generator decelerating (OFF1) 16 = Quick Stop (OFF3) 17 = DC braking 18 = Motor data identification (standstill test) 19 = Speed regulator optimization 20 = Synchronization active 21 = Download of parameter settings Analog Output: 100% Parameter Value=16384 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 MLFB Input Drive Init H/W Init System Init H/W Setting System Set. Test Fault ON locked Rdy ON Precharging Rdy Operat. Grd Flt TST Fly Restart Operation OFF 1 OFF 2 DC Brake Mot ID Stop n Reg Opt. Synchronize Download	-	2 /UHABR
r002 2Hex	**Rot Speed** Rotational Speed of the motor Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	2 / BR
r003 3Hex	**Output Volts** Drive output voltage (Fundamental rms) Analog Output: 100% @ Parameter Value=4*P101 Typ=O2; PKW: 1HEX=0.1V PcD Gr.: 0	 [V]	-	2 / BR
r004 4Hex	**Output Amps** Drive output current (Fundamental rms) Analog Output: 100% @ Parameter Value=1638.4A Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	 [A]	-	2 / BR
r006 6Hex	**DC Bus Volts** DC Bus voltage (actual value to be displayed on PMU and OP) Analog Output: 100% @ Parameter Value=16384V Typ=I2; PKW: 1HEX=1.0V PcD Gr.: 0	 [V]	-	2 / BR
r007 7Hex	**Motor Torque** Calculated torque in % of rated motor torque P113 Analog Output: 100% @ Parameter Value=400.0% Typ=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	 [%]	-	2 / BR
r009 9Hex	**Motor Temperat.** The motor temperature is measured via a temperature sensor inside the motor (KTY84). Analog Output: 100% @ Parameter Value=16384°C Typ=I2; PKW: 1HEX=1.0°C PcD Gr.: 0	 [°C]	-	2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r012 CHex	**Base/Reserve** Base / reserve settings of the process data wiring for setpoint signals and for control word bits Parameter values: 0: Base setting 1: Reserve setting Analog Output: 100% @ Parameter Value=16384 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 Base Reserve	-	2 / BR
r013 DHex	**Operat. Hours** Operation hours with released inverter pulses (drive status ’operation’). Indices: i001 = Days: days (0..9999) i002 = Hour: hours (0..24) i003 = Sec: seconds (0..3600) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	2 / BR
r014 EHex	**Shaft Power** Shaft Power of the Motor Analog Output: 100% @ Parameter Value=1638.4kW Typ=I2; PKW: 1HEX=0.1kW PcD Gr.: 0	[kW]	-	2 / BR
r015 FHex	**Motor Torque Nm** Calculated Torque Analog Output: 100% @ Parameter Value=1638.4Nm Typ=I2; PKW: 1HEX=0.1Nm PcD Gr.: 0	[Nm]	-	2 / BR

5.2 General Parameters

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P050 * 32Hex	**Language** Display language on the optional operation panel OP and in the PC software SIMOVIS Parameter values: 0: Deutsch 1: English 2: Espanol 3: Francais 4: Italiano Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 Deutsch English Espanol Francais Italiano	- 0	2 /UHABR 2 /UHABR
P051 * 33Hex	**Access Level** Setting of access levels; with higher access levels more parameters can be read and/or written. Parameter values: 1: Operating via PMU or OP with motor operated potentiometer function 2: Standard mode 3: Expert mode Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 3 Operation Standard Expert	- 2	1 /UHABR 1 /UHABR
P052 * 34Hex	**Function Select** Selection of several commissioning steps and special functions. Parameter values: 0 = Return into the former drive status from one of the further described functions 1 = Parameter-Reset: all parameters are reset to their original settings (factory settings). According to the Profibus profile for variable speed drives this function is also accessible via parameter P970. After finishing this function the parameter is automatically reset to 0. 2 = Release for MLFB setting (changing into the drive status 'Drive MLFB input'). To exit this function the parameter must be reset to 0. 3 = Download/Upread (Changing into the drive status 'Download'). To exit this function the parameter must be reset to 0. 4 = Hardware configuration (Changing into the drive status 'Hardware settings'). To exit this function the parameter must be reset to 0. 5 = Drive system settings (Changing into the drive status 'Drive system settings' to parameterize the motor data). To exit this function the parameter must be reset to 0. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 Return Par. Reset Set MLFB Download H/W Setting System Set.	- 0	2 /UHABR 2 /UHAB

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P053 * 35Hex	**Parameter Access** Release of interfaces for the parameterization. At any time all interfaces have write access to this parameter. Parameter values: 0: none 1: COM BOARD (CB) 2: BASE KEYPAD (PMU) 4: BASE SERIAL (SST1) (SST1) 8: Serial I/O (SCB with USS)) (SCB) 16: TECH BOARD (TB) 32: BASE SERIAL2 (SST2) (SST2) Description for Setting: Every interface is coded by a number. Input of the number or the total of several numbers which are related to interfaces, gives parameterization access to these interfaces. Example: The factory setting '6' means, that BASE KEYPAD (PMU) and BASE SERIAL (SST1) have parameterization access. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 63	- 6	1 /UHABR 1 /UHABR
P054 36Hex	**OP Backlight** Backlight for the optional operation panel OP Parameter values: 0 = Backlight always ON 1 = Backlight only ON during operation Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 always ON dur.operat.	- 0	3 / BR 3 / BR

5.3 Drive Data

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P070 * 46Hex	**MLFB (6SE70..)** MLFB (order number) of the base drive Parameter values: see section 4.3.9.2 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 113	- 0	3 /U BR 3 /U
P071 47Hex	**Line Volts** Line voltage of the drive Rated voltage of the feeding AC or DC mains; this parameter is used to calculate the rated DC bus voltage as a basis for the voltage limits of the Vd(max) and the Vd(min) [Power ride thru] regulator (e. g. undervoltage failure limit). Typ=O2; PKW: 1HEX=0.1V PcD Gr.: 0	90.0 to 1320.0 [V]	- ←	2 / ABR 2 / A
P072 48Hex	**Rtd Drive Amps** Rated drive output current Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	5.0 to 200.0 [A]	- ←	2 /U BR 4 /U
P073 49Hex	**Rtd Drive Power** Rated drive output power Type=O2; PKW: 1HEX=0.1kW PcD Gr.: 0	2.2 to 1800.0 [kW]	- ←	3 /U BR 4 /U
P077 * 4DHex	**FactSettingType** Selective factory setting. The parameter can be changed in the status „MLFB input“ (P052 = 2). If an MLFB still hasn’t been entered, after the MLFB number has been entered and the „MLFB input“ has been left (P052=0) then the selected factory setting-type is immediately valid. A selective factory setting can be executed via „Par. reset“ (P052 = 1 or P970 = 0). This parameter value is not changed. Parameter values: 0: Factory setting as before. 1: With this setting, with respect to 0, the following parameters are initialized differently: P554, P568, P571, P572, P573, P574 2: With this setting, with respect to 0, the following parameters are initialized differently: P554, P558, P568, P571, P572, P573, P574, P575, P588, P602, P607 3: With this setting, with respect to 0, the following parameters are initialized differently: P554, P558, P565, P575, P588, P602, P607 Type:O2; PKW: 1 HEX=1.0 PcD Gr.: -	0 to 3 – Normal OP1 OP1 cabinet unit Cabinet terminal	– 0	3 /U BR 3 /U
r089 59Hex	**Baugr. Steckpl.1** Baugruppe auf Steckplatz 1 (links) in der Elektronikbox Parameterwerte: 0 = keine (nur formal notwendig) 1 = CU-Baugruppe für FC 2 = CU-Baugruppe für VC 3 = CU-Baugruppe für SC Typ=O2; PKW: 1HEX=1.0 PZD-Gr.: 0	0 bis 3 keine FC VC SC		3 / B

5.4 Hardware Configuration

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P090 * 5AHex	**Board Position 2** PCB in position #2 (right) of the electronic box Parameter values: 0 = no optional PCBs 1 = CB Communication Board 2 = TB Technology Board 3 = SCB Serial Communication Board 4 = TSY Digital-Tacho and Synchronization Board Description for Setting: Only the following combinations of PCBs and positions are admitted: Position #3(P091) — Position #2(P090) - — CB - — TB - — SCB - — TSY SCB — CB CB — TB SCB — TB CB — SCB CB — TSY TSY — CB SCB — TSY TSY — SCB Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 none CB TB SCB TSY	- 0	3 / H BR 3 / H
P091 * 5BHex	**Board Position 3** PCB in position #3 (center) of the electronic box Description see P090 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4	- 0	3 / H BR 3 / H

5.5 Motor Data

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P100 * 64Hex	**Type of Motor** Automatic parameterization of the drive for a Siemens 1FT6 type motor. The number provided with the documentation of the motor must be entered. If other motors are used the parameter must be set to 250 (P051=3). In this case the motor dependent parameters must be set manually (see 4.2.1) Parameter values 1...249 reserved for SIEMENS 1FT6 (see 4.2.1) 250 other synchonous servo motors MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 250	2 i001=0 i002=0	2 / ABR 2 / A
P102 66Hex	**Motor Rtd Amps** Rated motor current, if P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	0.0 to 200.0 [A]	2 i001=0.0 i002=0.0	3 / ABR 3 / A
P108 6CHex	**Motor Rtd Speed** Rated motor speed; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0min-1 PcD Gr.: 0	0 to 9000 [min-1]	2 i001=0 i002=0	3 / ABR 3 / A
P109 6DHex	**Motor #PolePairs** Number of pole pairs; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 10	2 i001=0 i002=0	3 / ABR 3 / A
P110 6EHex	**Rtd kT** Torque / current ratio constant; if P100 <> 250 the correct value is automatically taken from the motor data list MDS (2) Parameter Typ=O2; PKW: 1HEX=0.01Nm/A PcD Gr.: 0	0.00 to 4.99 [Nm/A]	2 i001=0.00 i002=0.00	3 / ABR 3 / A
P111 6FHex	**kT Deviation** Maximum possible deviation between the adapted torque constant and the value of P110; if P100 <> 250 the correct value is automatically taken from the motor data list MDS (2) Parameter Typ=O2; PKW: 1HEX=0.01Nm/A PcD Gr.: 0	0.00 to 1.00 [Nm/A]	2 i001=0.00 i002=0.00	3 / ABR 3 / A
P112 70Hex	**kT Adap.Start** Speed limit above which the torque constant is adapted in % of rated motor speed; below this speed the torque constant is open loop controlled; if P100 <> 250 the correct value is automatically taken from the motor data list MDS (2) Parameter Typ=O2; PKW: 1HEX=1.0% PcD Gr.: 0	0 to 100 [%]	2 i001=0 i002=0	3 / ABR 3 / A
P113 71Hex	**Motor Rtd Torque** Rated motor torque, if P100 <> 250 the correct value is automatically taken from the motor data list MDS (2) Parameter Typ=O2; PKW: 1HEX=0.1Nm PcD Gr.: 0	0.0 to 1000.0 [Nm]	2 i001=0.0 i002=0.0	3 / ABR 3 / A

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r114 72Hex	**kT(act)** Actual value of the adapted torque constant Analog Output: 100% @ Parameter Value=163.84Nm/A Typ=O2; PKW: 1HEX=0.01Nm/A PcD Gr.: 0	 [Nm/A]	-	2 R
P115 73Hex	**kT-Depend. Speed** Proportional factor between kT and the speed. If P100 <> 250 the correct value is automatically taken from the motor data list. The torque constant depends on speed and temperature: $kT = P110 * [(1 - \frac{P115 * n}{6000\ min^{-1}})^{3/2} * (1 - \frac{P116 * T}{100\ K})]$ MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 25.0 [%]	2 i001=0.0 i002=0.0	3 / ABR 3 / A
P116 74Hex	**kT-Depend. Temp.** Proportional factor between kT and the motor temperature. If P100 <> 250 the correct value is automatically taken from the motor data list. For details see also P115. MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 25.0 [%]	2 i001=0.0 i002=0.0	3 / ABR 3 / A

5.6 Control

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r152 98Hex	**act. MotDataSet** Displays the active motor data set; Parameter values: 0: motor data set 1 1: motor data set 2 2: motor data set 3 3: motor data set 4 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 MotDataSet1 MotDataSet2 MotDataSet3 MotDataSet4	-	3 / ABR
P163 A3Hex	**Control Mode** Parameter values: 4: Speed regulation 5: Torque regulation Control word 2 Bit 27 (master / slave) switches between these values. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	4 to 5 n Regulat. T Regulat.	4	3 / ABR 3 /
P173 ADHex	**Imax** Maximum current (Fundamental rms) Setpoint signal for the current limit to protect the motor and the drive, respectively. If P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	0.0 to 2000.0 [A]	2 i001=0.0 i002=0.0	3 / ABR 3 / AB
P208 D0Hex	**Src RotSpeed act** Type of tachometer Parameter values: 0: not allowed 1: Encoder ERN 1387 or compatible encoder 2: Resolver with same # of pole pairs as the motor 3: Resolver with # of pole pairs '1' MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 none Encoder Resol#p mot Resolv #p=1	2 i001=0 i002=0	2 / ABR 2 / A
P209 D1Hex	**Encoder Pulse #** Number of pulses of the encoder (only for P208=1); the parameter value must be a power of 2; if P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 8192	2 i001=0 i002=0	3 / ABR 3 / A
P211 D3Hex	**Resolver Excitat** For the adaptation to different types of resolvers or different cable lengths the amplitude of the excitation of the resolver can be adjusted in 7 steps Parameter values: 0: automatic adjustment 1 ... 7: manual adjustment of the amplitude (amplitude is P211 * 3.4 V) If P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 7	2 i001=0 i002=0	3 / ABR 3 / A
P212 D4Hex	**Resolver Offset** Offset of the resolver evaluating circuit on the CU board. The offset is automatically measured during motor data identification; see also P213. When P211=0 (automatic excitation adjustment) a value of '1' equates approximately 0.05% of the amplitude. Indices: i001 = Tr A: Offset of resolver track A i002 = Tr B: Offset of resolver track B Typ=I2; PKW: 1HEX=1.0 PcD Gr.: 0	-2048 to 2048	2 i001=0 i002=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P213 * D5Hex	**Src.Res.Offset** Selects, if the resolver offset is taken from the motor data identification program or if the offset is manually changed. Parameter values: 0: The measured offset values are to be used 1: Offset values saved in P212 are to be used 2: The measured values will be saved in P212 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 2 Measure Parameter Save	- 0	3 / ABR 3 / ABR
r214 D6Hex	**Absolute position** Position actual value, measured via a tachometer (P208). For an encoder (P208 = 1) or resolver with pole pair number 1 (P208 = 3), this is the mechanical angle, and for resolvers with the same pole pair number of the motor, the electrical angle. Angular representation: 0000 = 0°, 8000 Hex = 180°, FFFF Hex = 359.995° Analog Output: 100% @ Parameter Value=16384 Type=L2; PKW: 1HEX=1.0 PcD-Gr.: 0		–	3 / BR
r219 DBHex	**n(act)** Actual speed (non-smoothed mechanical speed of the motor shaft) Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	2 / BR
r224 E0Hex	**n Deviation** Control deviation at the input of the speed regulator. Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR
P230 E6Hex	**n-Reg-Gain** Speed regulator gain. SDS(4) Parameter Typ=O2; PKW: 1HEX=0.001 PcD Gr.: 0	0.001 to 16.000	4 i001=1.000 i002=1.000 i003=1.000 i004=1.000	3 / BR 3 / BR
P231 E7Hex	**Dynamics** Sets the speed regulator response time between fast (7) and slow (0); resulting settling times: 0 -> approx. 40 ms 1 -> approx. 29 ms 2 -> approx. 21 ms 3 -> approx. 15 ms 4 -> approx. 11 ms 5 -> approx. 8 ms 6 -> approx. 6 ms 7 -> approx. 4 ms MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 7	2 i001=4 i002=4	2 / BR 2 / B
P242 F2Hex	**Start-up Time** Start-up time of the drive system from standstill to rated system speed at acceleration with rated motor torque (motor without load). The parameter value is allowed for the calculation of the n/f regulator parameters. If P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=0.001s PcD Gr.: 0	0.000 to 10.000 [s]	2 i001=0.000 i002=0.000	3 / ABR 3 / A
P260 104Hex	**VRegMax(isd)** Maximum output voltage of the Id current controller; if P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Type=O2; PKW: 1HEX=0.1V PcD Gr.: 0	0.0 to 999.9 [V]	2 i001=100.0 i002=100.0	3 / ABR 3 / A
r264 108Hex	**Isq(act)** Actual value of the torque generating current component Analog Output: 100% @ Parameter Value=4*P102 Typ=I2; PKW: 1HEX=0.1A PcD Gr.: 0	 [A]	-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P267 10BHex	**VRegMax(isq)** Maximum output voltage of the Iq current controller; if P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Analog Output: 100% @ Parameter Value=1638.4V Type=O2; PKW: 1HEX=0.1V PcD Gr.: 0	0.0 to 999.9 [V]	2 i001=100.0 i002=100.0	3 / ABR 3 / A
P272 110Hex	**ResistStator+Cab** Stator resistance of the motor; if P100 <> 250 the correct value is automatically taken from the motor data list. MDS(2) Parameter Typ=O2; PKW: 1HEX=0.001Ohm PcD Gr.: 0	0.000 to 60.000 [Ohm]	2 i001=0.000 i002=0.000	3 / ABR 3 / AB
r278 116Hex	**Usd(Set)** Flux generating voltage component (total of current regulator output signal and discoupling circuit output). Analog Output: 100% @ Parameter Value=1638.4V Typ=I2; PKW: 1HEX=0.1V PcD Gr.: 0	[V]	-	3 R
r279 117Hex	**Usq(set)** Torque generating voltage component (total of current regulator output signal and discoupling circuit output). Analog Output: 100% @ Parameter Value=1638.4V Typ=I2; PKW: 1HEX=0.1V PcD Gr.: 0	[V]	-	3 R
r303 12FHex	**DC BusVolt (act)** unfiltered actual value of the DC link bus voltage Analog Output: 100% @ Parameter Value=1638.4V Typ=I2; PKW: 1HEX=0.1V PcD Gr.: 0	[V]	-	3 / BR
r307 133Hex	**Line Volts (AC)** Rated line voltage For AC drives: Rated drive input voltage (P071). For DC inverters: fictive AC input voltage which would cause the DC voltage entered in P071 $\left(\frac{P071}{1,35}\right)$. Analog Output: 100% @ Parameter Value=1638.4V Typ=O2; PKW: 1HEX=0.1V PcD Gr.: 0	[V]	-	3 / BR
P308 134Hex	**Sampling Time** Shortest sampling time of the operation system Description for Setting: Before reducing the sampling time the calculation time headroom should be checked (r725). A minimum headroom of 5% should always be guaranteed to prevent the operation program from a slow reaction. If fault message #42 'Calculation time' occurs, the sampling time must be increased. The calculation time loading also depends on the pulse frequency (P761). Typ=O2; PKW: 1HEX=0.1ms PcD Gr.: 0	0.3 to 4.0 [ms]	- 1.0	3 / ABR 3 / A

5.7 Functions

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P330 14AHex	**Mot ID** Selection of the motor data identification program Parameter values: 0: Motor data identification only to be performed after a new motor has been selected (new index value in P100) 1. Motor data identification after every ON command Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 First ON every ON	- 0	3 / ABR 3 / A
P331 14BHex	**Mot ID Amplitude** Voltage amplitude for the motor data identification; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1V PcD Gr.: 0	0.0 to 100.0 [V]	2 i001=0.0 i002=0.0	3 / ABR 3 / A
P332 14CHex	**Mot ID #ofCycles** Number of measurement cycles in the motor data identification program; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 10000	2 i001=0 i002=0	3 / ABR 3 / A
P354 * 162Hex	**Ground Flt Test** Ground fault test; this is not a protective function according to any standard. Parameter values: 0 = no ground fault test to be performed 1 = ground fault test will be performed after the next ON command; afterwards the parameter is reset to ’0’ 2 = ground fault test to be performed after every ON command Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 not active next ON every ON	- 0	3 / ABR 3 / ABR
P357 165Hex	**GrdFltTest Limit** Current limit for recognizing a ground fault within the times defined in P355 and P356. Typ=O2; PKW: 1HEX=0.1A PcD Gr.: 0	0.0 to 5.0 [A]	- 1.0	3 / ABR 3 / AB
P360 168Hex	**Mot Tmp Warning** Limit for the warning message ’Motor overtemperature’ (P625). Example: for isolation class B: <=110°C; EXd<=100°C for isolation class F: <=145°C; EXd<=145°C Description for setting: a parameter value > 0 activates this function. MDS(2) Parameter Typ=I2; PKW: 1HEX=1.0°C PcD Gr.: -	0 to 160 [°C]	2 i001=80 i002=80	2 / BR 2 / BR
P361 169Hex	**Mot Tmp Fault** Limit for the fault message 'Motor overtemperature' (P626). Example: for isolation class B: <=110°C; EXd<=100°C for isolation class F: <=145°C; EXd<=145°C Description for setting: a parameter value > 0 activates this function. MDS(2) Parameter Typ=I2; PKW: 1HEX=1.0°C PcD Gr.: 0	0 to 300 [°C]	2 i001=110 i002=110	2 / BR 2 / BR

5.8 Setpoint Channel

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r410 19AHex	**act. SetpDataSet** Active setpoint channel data set Parameter values: 0: setpoint data set 1 1: setpoint data set 2 2: setpoint data set 3 3: setpoint data set 4 Analog Output: 100% @ Parameter Value=16384 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 SDS 1 SDS 2 SDS 3 SDS 4	-	3 / BR
P420 1A4Hex	**System Rtd Speed** Rated system speed Reference quantity for acceleration time (P462), deceleration time (P464), hysteresis for 'ramp generator active' message (P476), base setpoint (P445) and for speed / frequency actual values which are issued via analog outputs or serial communications. Via an anlog output actual values up to rated system speed can be issued, via automation system up to double rated system speed. Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	1.0 to 9000.0 [min-1]	- 3000.0	2 / ABR 2 / AB
P421 1A5Hex	**Fixed Freq1(set)** Note: By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. Maximum value: double rated system speed. SDS(4) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	4 i001=3000.0 i002=3000.0 i003=3000.0 i004=3000.0	2 / BR 2 / BR
P422 1A6Hex	**Fixed Freq2(set)** Note: By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. Maximum value: double rated system speed. SDS(4) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	4 i001=-3000.0 i002=-3000.0 i003=-3000.0 i004=-3000.0	2 / BR 2 / BR
P423 1A7Hex	**Fixed Freq3(set)** Note: By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. Maximum value: double rated system speed. SDS(4) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	4 i001=1000.0 i002=1000.0 i003=1000.0 i004=1000.0	2 / BR 2 / BR
P424 1A8Hex	**Fixed Freq4(set)** Note: By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. Maximum value: double rated system speed. SDS(4) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	4 i001=250.0 i002=250.0 i003=250.0 i004=250.0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P425 1A9Hex	**MotPot Storing** Saving of the setpoint which has come from the motor operated potentiometer (MOP) at turn OFF / power outage The saved setpoint signal is active again after a new ON command (P443=1002, main setpoint from MOP). If saving of the MOP setpoint is not active, the MOP start frequency is cleared after an OFF command or a power outage. Parameter values: 0: MOP setpoint is not saved 1 : MOP setpoint is saved Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 OFF ON	- 0	2 / BR 2 / BR
P426 1AAHex	**MOP start speed** Start speed of the motor operated potentiometer (MOP) Description for Setting: This value may also be changed via bits of the control word (P573 (MOP up), P574 (MOP down)). Depending on P425 the actual parameter value is saved or cleared after turn OFF or a power outage. Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	- 0.0	3 / BR 3 / BR
P433 * 1B1Hex	**Src AddSetpoint1** Source of the additional setpoint signal 1 (in front of the ramp generator) Parameter values: 1001: Fixed setpoints (P421 to P424) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P436 1B4Hex	**Invert Add Setp1** Inverting of the additional setpoint signal 1 Parameter values: 0: additional setpoint 1 not inverted 1: additional setpoint 1 inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 not invert. inverted	2 i001=0 i002=0	3 / BR 3 / BR
r437 1B5Hex	**n Add Setpoint 1** Actual additional speed setpoint 1 (in front of the ramp generator) Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR
P438 * 1B6Hex	**Src AddSetpoint2** Source of the additional setpoint signal 2 (behind the ramp generator) Parameter values: 1001: Fixed setpoints (P421 to P424) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P441 1B9Hex	**Invert Add Setp2** Inverting of the additional setpoint signal 2 Parameter values: 0: Additional setpoint 2 not inverted 1: Additional setpoint 2 inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 1 not invert. inverted	2 i001=0 i002=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r442 1BAHex	**n Add Setpoint 2** Actual additional setpoint 2 (behind the ramp generator) Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR
P443 * 1BBHex	**Src MainSetpoint** Source of the speed main setpoint signal. Parameter values: 1002: Motor operated potentiometer (MOP) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1002 i002=1001	2 / BR 2 / BR
P446 1BEHex	**Invert Main Setp** Inverting of the main setpoint signal Parameter values: 0: Main setpoint not inverted 1: Main setpoint inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 not invert. inverted	2 i001=0 i002=0	2 / BR 2 / BR
r447 1BFHex	**n Main Setpoint** Actual speed main setpoint Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	2 / BR
P448 1C0Hex	**Jog Speed 1** Jog speed 1 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	- 200.0	2 / BR 2 / BR
P449 1C1Hex	**Jog Speed 2** Jog speed 2 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	- 1000.0	2 / BR 2 / BR
r451 1C3Hex	**n/f(set,total1)** Frequency setpoint signal at the addition point in front of the ramp generator Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P452 1C4Hex	**Max Speed FWD** Maximum forward speed; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	2 i001=0.0 i002=0.0	2 / ABR 2 / AB
P453 1C5Hex	**Max Speed REV** Maximum reverse speed; if P100 <> 250 the correct value is automatically taken from the motor data list MDS(2) Parameter Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	-9000.0 to 9000.0 [min-1]	2 i001=0.0 i002=0.0	2 / ABR 2 / AB
r460 1CCHex	**n (set,Ramp IN)** Speed setpoint signal at ramp generator input Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P462 1CEHex	**Accel. Time** Ramp generator acceleration time for acceleration from 0 to rated system speed (P420). SDS(4) Parameter Typ=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.00 to 99.99 [s]	4 i001=10.00 i002=10.00 i003=0.01 i004=0.01	2 / ABR 2 / ABR
P464 1D0Hex	**Decel. Time** Ramp generator deceleration time for deceleration from rated system speed (P420) to standstill SDS(4) Parameter Typ=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.00 to 99.99 [s]	4 i001=20.00 i002=20.00 i003=0.01 i004=0.01	2 / ABR 2 / ABR
P476 1DCHex	**RampGen Act Hyst** Hysteresis for the message 'ramp generator active' The message 'ramp generator active' is issued, if |ramp generator input - ramp generator output| >= P476 * P420 . Condition: analog frequency setpoint in front of the ramp generator (see P428 and P443) Typ=O2; PKW: 1HEX=0.1% PcD Gr.: -	0.0 to 20.0 [%]	- 1.0	3 / BR 3 / BR
r478 1DEHex	**dn/dt(ramp gen)** Change of speed of the ramp generator per sampling period (4 * base sampling period (P308)) in min^{-1} / sec. Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1 PcD Gr.: 1		-	3 / BR
r480 1E0Hex	**n/f(set,rampOUT)** Speed setpoint at the output of the ramp generator Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	3 / BR
r482 1E2Hex	**n (set)** Speed setpoint at the input of the control circuit Analog Output: 100% @ Parameter Value=P420 Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	 [min-1]	-	2 / BR
P485 1E5Hex	**System RtdTorque** Rated system torque in % of rated motor torque Scaling reference for torque setpoint signals which are entered via the admitted sources of the setpoint wiring (see process data wiring of the setpoint channel) This scaling is also valid for torque actual values which are issued via output channels (analog outputs, serial communications). Actual values up to P485 * rated motor torque can be issued via analog outputs, up to 2 * P485 * rated motor torque via automation interfaces. Typ=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.1 to 800.0 [%]	- 100.0	3 / ABR 3 / AB
P486 * 1E6Hex	**Src Torque Setp** Source of the torque setpoint signal Parameter values: 1001: not allowed 1002: not allowed other values: see process data wiring of the setpoint channel. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P489 1E9Hex	**Torq setp.Invert** Inverts of the torque setpoint Parameter values: 0: Torque setpoint not inverted 1: Torque setpoint inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 not invert. inverted	2 i001=0 i002=0	3 / BR 3 / BR
r490 1EAHex	**Torque MainSetp** Actual torque setpoint in % of rated motor torque (P113) Analog Output: 100% @ Parameter Value=P485 Typ=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P492 1ECHex	**FixTorque 1 Set** Fixed upper limit of the torque setpoint in % of the rated motor torque. Note: P492 is also the upper torque limit during an external setpoint (P493 <> 1001) SDS(4) Parameter Typ=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-400.0 to 400.0 [%]	4 i001=100.0 i002=100.0 i003=100.0 i004=100.0	3 / BR 3 / BR
P493 * 1EDHex	**Src FixTorque 1** Source of the upper torque limit. Parameter values: 1001: internal upper fixed torque limit (P492) 1002: not allowed other values: see process data wiring of the setpoint channel. Note: The torque limit can only be changed within the range specified by the upper limit for the torque setpoint (P492). B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1001 i002=1001	3 / BR 3 / BR
r496 1F0Hex	**Fix Torque 1** Maximum value of the upper torque limit in % of rated motor torque Display parameter of the output of the upper torque limit (P493) Analog Output: 100% @ Parameter Value=P485 Typ=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P498 1F2Hex	**FixTorq 2 Set** Fixed lower torque limit in % of the rated motor torque. Note: P498 is also the lower torque limit during an external setpoint (P499 <> 1001) SDS(4) Parameter Typ=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-400.0 to 400.0 [%]	4 i001=-100.0 i002=-100.0 i003=-100.0 i004=-100.0	3 / BR 3 / BR
P499 * 1F3Hex	**Src FixTorq 2** Source of the lower torque limit. Parameter values: 1001: upper limit for the torque setpoint (P498) 1002: not allowed other values: see process data wiring of the setpoint channel. Note: The lower torque limit can only be changed within the range specified by the limit for the regenerative operation torque setpoint (P498). B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1001 i002=1001	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r502 1F6Hex	**Fix Torque 2** Maximum value of the lower torque limit in % of rated motor torque. Display parameter of the output of the source of the lower torque limit (P499) Analog Output: 100% @ Parameter Value=P485 Typ=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P505 1F9Hex	**Torque Fix Set** Fixed setpoint for the additional torque % of the rated motor torque (P113).. SDS(4) Parameter Typ=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-150.0 to 150.0 [%]	4 i001=5.0 i002=5.0 i003=5.0 i004=5.0	3 / BR 3 / BR
P506 * 1FAHex	**Src T FixAdd Set** Source of the additional torque setpoint. Parameter values: 1001: Fixed torque setpoint (P505) 1002: not allowed other values: see process data wiring of the setpoint channel. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P507 1FBHex	**T FixAddSet Gain** Proportional gain of the additional torque setpoint B/R Parameter Typ=I2; PKW: 1HEX=0.01 PcD Gr.: 0	0.00 to 128.00	2 i001=1.00 i002=1.00	3 / BR 3 / BR
P509 1FDHex	**InvertFixAddTorq** Inverts of the additional torque setpoint Parameter values: 0: not inverted 1: inverted B/R Parameter Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 not invert. inverted	2 i001=0 i002=0	3 / BR 3 / BR
r510 1FEHex	**Torque AddSetp** Additional torque setpoint in % of rated motor torque; display parameter of the output of the source for the additional torque setpoint (P506) Analog Output: 100% @ Parameter Value=P485 Typ=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P512 200Hex	**Compare Speed** Compare speed for the message ’Compare speed reached’ (status word 1, bit 10 (r552); see also P513 (Hysteresis) Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	0.0 to 9000.0 [min-1]	- 3000.0	3 / BR 3 / BR
P513 201Hex	**Comp Speed Hyst** Hysteresis for the message ’Compare speed reached’ in % of the compare speed (P512) Typ=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 100.0 [%]	- 3.0	3 / BR 3 / BR
P514 202Hex	**OFF Speed** Pulse block speed at turn OFF If after an OFF command (OFF1, OFF3) the actual value of the speed (r219) comes below this value, the pulses are blocked after the OFF wait time (P516). Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	0.0 to 9000.0 [min-1]	- 100.0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P516 204Hex	**OFF Wait Time** Wait time between reaching of the pulse block speed / frequency (P514) and pulse blocking; only for turn OFF via OFF1 or OFF3. SDS(4) Parameter Typ=O2; PKW: 1HEX=0.1s PcD Gr.: 0	0.0 to 60.0 [s]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / BR 3 / BR
P517 205Hex	**Deviation Speed** Deviation speed for the message 'Set/Actual deviation' (status word 1, bit 8 (r552)); the message is issued if the deviation is higher than the parameter value; see also P518 (deviation time) Typ=I4; PKW: 1HEX=0.1min-1 PcD Gr.: 1	0.0 to 9000.0 [min-1]	- 300.0	3 / BR 3 / BR
P518 206Hex	**Deviation Time** Minimum time of the Set/Actual deviation; after this minimum time a Set/Actual deviation (P517) issues the message 'Set/Actual deviation' (status word 1, bit 8 (r552)) Typ=O2; PKW: 1HEX=0.1s PcD Gr.: -	0.0 to 10.0 [s]	- 3.0	3 / BR 3 / BR
P519 207Hex	**Overspeed Hyst** Hysteresis of the message 'overspeed' (status word 2, bit 18 (r553)) Scaling quantity: reference values of P452 (Maximum forward frequency) and P453 (Maximum reverse frequency) Typ=O2; PKW: 1HEX=0.1% PcD Gr.: -	0.0 to 20.0 [%]	- 10.0	2 / BR 2 / BR
P525 20DHex	**Fix Setp ProcReg** Fixed setpoints for the technology controller B/R parameter Type=I4; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.00 %	–200.000 to 200.000 [%]	2 i001=0.000 i002=0.000	3 / BR 3 / BR
P526 * 20EHex	**Src ProcReg Setp** Source for the technology controller setpoint. Parameter values: 1001: Technology setpoint (P525) 1002: Not permissible Additional value: According to PcD wiring of the setpoint channel B/R parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P527 20FHex	**SetpGain ProcReg** Technology controller setpoint gain. Not effective for technology setpoint input via fixed setpoint (P526 = 1001). B/R parameter Type=O2; PKW:1HEX=0.01 % PcD Gr.: 0	–300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
P528 * 210Hex	**SmoothProcRegSet** Technology controller setpoint smoothing time constant. The smoothing first becomes active when the technology controller is activated (control word 2 bit 24 = 1 and RUN status). Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 600.00 [s]	– 0.00	3 / BR 3 / BR
r529 211Hex	**Setpoint ProcReg** Actual technological setpoint Analog output: 100 % for PWE=100.000 % Type=I2; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.00 %	 [%]	–	3 / BR
P530 * 212Hex	**ActVal's ProcReg** Actual values for the technology controller actual value input. Defines which parameter are used as actual values for the technology controller. Indices: i001 = W01: Value1 for technology controller i002 = W02: Value2 for technology controller Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	2 i001=0.0 i002=0.0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P531 * 213Hex	**SRC ProcReg ActV** Source of the technology controller actual value. Parameter values: 1001: Illegal 1002: Illegal 1020: Illegal 1100: Internal technology controller actual value 1 (= contents of P530 index i001) 1200: Internal technology controller actual value 2 (= contents of P530 index i002) Additional values: According to the PcD wiring of the setpoint channel B/R parameter Type=L2; PKW: PKW format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P532 * 214Hex	**Gain ProcRegActV** Technology controller actual value gain. B/R parameter Type=I2; PKW: 1HEX=0.01 % PcD Gr.: 0	–300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
P533 * 215Hex	**Smth ProcRegActV** Smoothing time constant of the technology controller actual value. The smoothing is only active if the technology controller has been activated (control word2 bit 24 = 1 and status RUN). Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 600.00 [s]	– 0.00	3 / BR 3 / BR
r534 216Hex	**ActValue ProcReg** Actual technological actual value Analog output: 100 % at PWE=100.000 % Type=I2; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	[%]	–	3 / BR
P535 * 217Hex	**R,g. T:Hyst.** Hysteresis for the signal - technological setpoint reached. This signal is output, if the technological actual value (r534) is greater than the technological setpoint (r529). The hysteresis is only effective when this signal is withdrawn Type=O2; PKW:1HEX=0.1 % PcD: 4000HEX=100.0 %	0.0 to 100.0 [%]	– 3.0	3 / BR 3 / BR
r536 218Hex	**DeviationProcReg** Control deviation at the input of the technology controller. Analog output: 100 % at PWE=100.00 % Type=I4; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.00 %	[%]	–	3 / BR
P537 219Hex	**Gain ProcReg** Technology controller gain. Type=O2; PKW:1HEX=0.01 PcD: 4000HEX=64.00	0.00 to 250.00	– 1.00	3 / BR 3 / BR
P538 21AHex	**IntTConstProcReg** Technology controller integral action time (I component). Setting information: The technology controller I component is disabled with the value 0.00. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 600.00 [s]	– 0.00	3 / BR 3 / BR
P539 21BHex	**DifTConstProcReg** Technology controller derivative action time (D component). Setting information: The technology controller D component is disabled with the value 0.00. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 300.00 [s]	– 0.00	3 / BR 3 / BR
r540 21CHex	**ProcReg Output** Technology controller output before the limit value stage (P541, P542). Analog output: 100 % at PWE=100.00 % Type=I4; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	[%]	–	3 / BR
P541 21DHex	**ProcReg Up1Limit** Upper limit of the technology controller output. Type=I4; PKW:1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	–200.000 to 200.000 [%]	– 200.000	3 / BR 3 / BR

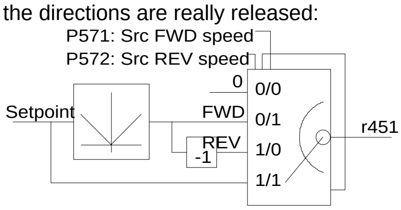
PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P542 21EHex	**ProcReg Up2Limit** Lower limit of the technology controller output. Type=I4; PKW:1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	–200.000 to 200.000 [%]	– 200.000	3 / BR 3 / BR
P543 * 21FHex	**ProcReg AccTime1** Ramp-function generator for the upper limit value of the technology controller output. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 100.00 [s]	– 0.00	3 / BR 3 / BR
P544 * 220Hex	**ProcRegAccTime2** Ramp-function generator for the lower limit value of the technology controller output. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 100.00 [s]	– 0.00	3 / BR 3 / BR
r545 221Hex	**ProcReg Out(Lim)** Limited technology controller output (after the limit value stage). Analog output: 100 % at PWE=100.00 % Type=I4; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	[%]	–	3 / BR

5.9 Control and Status Word

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r550 226Hex	**Control Word 1** Display of the control word 1 (bits 0 to 15); see section 4.3.1.1. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r551 227Hex	**Control Word 2** Display of the control word 2 (bits 16 to 31); see section 4.3.1.1. 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r552 228Hex	**Status Word 1** Display of the status word 1 (bits 0 to 15); see section 4.3.1.1. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r553 229Hex	**Status Word 2** Display of the status word 2 (bits 16 to 31); see section 4.3.1.1. 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
P554 * 22AHex	**Src ON/OFF1** Source of the 'ON/OFF1' command (Control word 1, bit 0) Details see section 4.3.1.1 Parameter values: 0: OFF1 1: not allowed 1001: Binary input 1 of the CU board 1003: Binary input 3 of the CU board 1010: PMU ON/OFF keys 2001: SST1, word 1, bit 0 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Note: For use with the serial IO-system (SCB) the values 4101 or 4201 are recommended. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0		2 P077=0 i001=1010 i002=1001 P077=1,2 i001=2001 i002=1001 P077=3 i001=1003 i002=1001	2 / BR 2 / BR
P555 * 22BHex	**Src1 OFF2(coast)** Source 1 of the 'OFF2' command (Coasting; control word 1, bit 1) Details see section 4.3.1.1 Parameter values: 0: not allowed 1: condition for operation 1002: Binary input 2 of the CU board other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1002	2 / BR 2 / BR
P556 * 22CHex	**Src2 OFF2(coast)** Source 2 of the 'OFF2' command (Coasting; control word 1, bit 1) Description see P555 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P557 * 22DHex	**Src3 OFF2(coast)** Source 3 of the 'OFF2' command (Coasting; control word 1, bit 1) Description see P555 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P558 * 22EHex	**Src1 OFF3(QStop)** Source 1 of the 'OFF3' command (quick stop; control word 1, bit 2); Details see section 4.3.1.1 Parameter values: 0: not allowed 1: condition for operation 1002 binary input 2 of CU board 1010: PMU OFF key other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P559 * 22FHex	**Src2 OFF3(QStop)** Source 2 of the 'OFF3' command (quick stop; control word 1, bit 2); Description see P558 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P560 * 230Hex	**Src3 OFF3(QStop)** Source 3 of the 'OFF3' command (quick stop; control word 1, bit 2); Description see P558 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P561 * 231Hex	**Src InvRelease** Source of the 'inverter release' command (control word 1, bit 3) Details see section 4.3.1.1 Parameter values: 0: Inverter blocked 1: automatic release after wait times other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P562 * 232Hex	**Src RampGen Rel** Source of the 'ramp generator release' command (control word 1, bit 4) Details see section 4.3.1.1 Parameter values: 0: Ramp generator blocked 1: automatic release after wait times other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P563 * 233Hex	**Src RampGen Stop** Source of the 'ramp generator stop' command (control word 1, bit 5) Details see section 4.3.1.1 Parameter values: 0: ramp generator stopped 1: ramp generator released other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P564 * 234Hex	**Src Setp Release** Source of the 'setpoint release' command (control word 1, bit 6) Details see section 4.3.1.1 Parameter values: 0: Ramp generator input is set to '0' 1: Setpoint at ramp generator input other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P565 * 235Hex	**Src1 Fault Reset** Source 1 of the 'reset' command (control word 1, bit 7) Details see section 4.3.1.1 Parameter values: 0: no source selected for reset 1: not allowed 1003: Binary input 3 of the CU board 1004: Binary input 4 of the CU board other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Note: The fault reset command is edge triggered B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,1,2 i001=0 i002=1003 P077=3 i001=1004 i002=1003	2 / BR 2 / BR
P566 * 236Hex	**Src2 Fault Reset** Source 2 of the 'reset' command (control word 1, bit 7) Description see P565 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=0 i002=0	2 / BR 2 / BR
P567 * 237Hex	**Src3 Fault Reset** Source 3 of the 'reset' command (control word 1, bit 7) Description see P565 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=2001 i002=2001	2 / BR 2 / BR
P568 * 238Hex	**Src Jog1 ON** Source of the 'Jog 1' command (control word 1, bit 8) Details see section 4.3.1.1 Parameter values: 0: no Jog operation 1: not allowed 2001: SST1, word 1, bit 8 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=0 i002=0 P077=1,2 i001=2001 i002=0	2 / BR 2 / BR
P569 * 239Hex	**Src Jog2 ON** Source of the 'Jog 2' command (control word 1, bit 9) Description see P568 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=0 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P571 * 23BHex	**Src FWD speed** Source of the 'forward speed' command (control word 1, bit 11) Parameter values: 0: forward speed blocked 1: forward speed released 1010: PMU forward/reverse key 2001: SST1, word 1, bit 11 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Note: *Both* parameters P571 and P572 or the sources defined by them define which of the directions are really released:  B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=1 i002=1 P077=1,2 i001=2001 i002=1	2 / BR 2 / BR
P572 * 23CHex	**Src REV speed** Source of the 'reverse speed' command (control word 1, bit 12) Parameter values: 0: reverse speed blocked 1: reverse speed released 1010: PMU forward/reverse key 2001: SST1, word 1, bit 12 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Note: *Both* parameters P571 and P572 or the sources defined by them define which of the directions are really released; see figure at P571 B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=1 i002=1 P077=1,2 i001=2001 i002=1	2 / BR 2 / BR
P573 * 23DHex	**Src MOP UP** Source of the command 'motor operated potentiometer (MOP) UP' (control word 1, bit 13) Parameter values: 0: not active 1: not allowed 1010: PMU UP key 2001: SST1, word 1, bit 13 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=1010 i002=0 P077=1,2 i001=2001 i002=0	2 / BR 2 / BR
P574 * 23EHex	**Src MOP DOWN** Source of the command 'motor operated potentiometer (MOP) DOWN' (control word 1, bit 14) Parameter values: 0: not active 1: not allowed 1010: PMU DOWN key 2001: SST1, word 1, bit 14 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=1010 i002=0 P077=1,2 i001=2001 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P575 * 23FHex	**Src No Ext Fault1** Source of the message 'external fault 1' (control word 1, bit 15); L-level causes fault trip of the drive Parameter values: 0: not allowed 1: no external fault 1 1003: Binary input 3 of CU board other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 P077=0,1 i001=1 i002=1 P077=2,3 i001=1001 i002=1	2 / BR 2 / BR
P576 * 240Hex	**Src SetpDSetBit0** Source of bit 0 for the selection of the setpoint channel data set (SDS; control word 2, bit 16) Parameter values: 0: SDS bit 0 has value of 0 1: SDS bit 0 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P577 * 241Hex	**Src SetpDSetBit1** Source of bit 1 for the selection of the setpoint channel data set (SDS; control word 2, bit 17) Parameter values: 0: SDS bit 1 has value of 0 1: SDS bit 1 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P578 * 242Hex	**Src MotDSet Bit0** Source of bit 0 for the selection of motor data set (MDS; control word 2, bit 18) Parameter values: 0: MDS bit 0 has value of 0 1: MDS bit 0 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Note: The motor data set can not be changed during operation; a change of this bit will only become effective in the ready state. B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P580 * 244Hex	**Src FixSetp Bit0** Source of bit 0 to select a fixed setpoint FS (control word 2, bit 20) Parameter values: 0: FS bit 0 has value of 0 1: FS bit 0 has value of 1 1004: Binary input 4 of CU board other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=1004	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P581 * 245Hex	**Src FixSetp Bit1** Source of bit 1 to select a fixed setpoint FS (control word 2, bit 21) Parameter values: 0: FS bit 1 has value of 0 1: FS bit 1 has value of 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	2 / BR 2 / BR
P583 * 247Hex	**Src Fly Release** Source of the command 'release of flying restart' (control word 2, bit 23) Parameter values: 0: Flying restart not released 1: Flying restart released with every ON command other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	2 / BR 2 / BR
P584 * 248Hex	**Src.TReg.Enable** Source for the control command, technology controller enable (control word2, bit24) Parameter values: 0: Technology controller not enabled 1: Technology controller enabled other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P585 * 249Hex	**Src Reg Release** Source of the command 'release of the n/f regulator' (control word 2, bit 25) Parameter values: 0: regulator blocked 1: regulator is released with pulse release other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=1 i002=1	3 / BR 3 / BR
P586 * 24AHex	**Src No ExtFault2** Source of the message 'external fault 2' (control word 2, bit 26) If an ON command is active, L-level causes fault trip if drive status >10 and 200 msec after precharging. Parameter values: 0: not allowed 1: no external fault 2 1004: CU binary input 4 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 i001=1 i002=1	2 / BR 2 / BR
P587 * 24BHex	**Src Master/Slave** Source of the switching command 'master / slave drive' (control word 2, bit 15) Parameter values: 0: Master drive: the control circuit operates with internal speed / frequency setpoints (n/f regulation) 1: Slave drive: the control circuit operates with torque setpoints (T regulation, see P486) other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P588 * 24CHex	**Src No Ext Warn1** Source of the message 'external warning 1' (control word 2, bit 28) Parameter values: 0: not allowed 1: no external warning 1 1002: CU binary input 2 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 i001=1 i002=1	3 / BR 3 / BR
P589 * 24DHex	**Src No Ext Warn2** Source of the message 'external warning 2' (control word 2, bit 29) Parameter values: 0: not allowed 1: no external warning 1 other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R Parameter Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 i001=1 i002=1	3 / BR 3 / BR
P590 * 24EHex	**Src Base/Reserve** Source of the switching command 'base / reserve settings' (control word 2, bit 30) Parameter values: 0: base setting 1: reserve setting 1005: Binary input 5 of the CU board other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	- 1005	3 / BR 3 / BR
P591 * 24FHex	**Src ContactorMsg** Source of the message 'main contactor energized' (control word 2, bit 31) Parameter values: 0: not allowed 1: no message; main contactor must be energized within 120 msec after the related command 1001 to 1005: CU terminals 4101 to 4116: SCB-SCI1 terminals (serial I/O) 4201 to 4216: SCB-SCI2 terminals (serial I/O) 5001: TSY terminal 1 Notes: If the function is active, pulses are released as soon as the message is available. No base / reserve settings possible Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	- 1	3 / BR 3 / BR
P600 * 258Hex	**Dst Ready for ON** Destination of the status bit 'ready for turn ON' (status word 1, bit 0) Power is ON, the drive may be turned on. Parameter values: Depending on the selected index all settings according to section 4.3.1.2 (process data wiring of the status word) may be selected. Indices: i001: BD: selection of a base drive terminal i002: SCI : selection of a SCI1/2 terminal i003: TSY : selection of a TSY terminal Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P601 * 259Hex	**Dst Rdy for Oper** Destination of the status bit 'ready for operation' (status word 1, bit 1) The DC bus is charged, pulses may be released. Parameter values, indices: as P600. Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P602 * 25AHex	**Dst Operation** Destination of the status bit 'operation' (status word 1, bit 2) The drive is in operation. Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 P077=0,1 i001=1003 i002=0 i003=0 P077=2,3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P603 * 25BHex	**Dst Fault** Destination of the status bit 'fault' (status word 1, Bit 3) Note: for issuing the fault message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1002 i002=0 i003=0	2 / BR 2 / BR
P604 * 25CHex	**Dst NO OFF2** Destination of the status bit 'no OFF2 command' (status word 1, bit 4) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P605 * 25DHex	**Dst NO OFF3** Destination of the status bit 'no OFF3 command' (status word 1, bit 5) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P606 * 25EHex	**Dst ON blocked** Destination of the status bit 'turn-ON locked' (status word 1, bit 6) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P607 * 25FHex	**Dst Warning** Destination of the status bit 'warning' (status word 1, bit 7) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 P077=0,1 i001=0 i002=0 i003=0 P077=2,3 i001=1003 i002=0 i003=0	2 / BR 2 / BR
P608 * 260Hex	**Trg Bit Deviat.** Destination of the status bit 'set frequency = act. frequency' (status word 1, bit 8) - see P517; for details see section 4.3.1.2 Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P610 * 262Hex	**Dst CompareSpeed** Destination of the status bit 'compare speed reached' (status word 1, bit 10) - see P512; for details see section 4.3.1.2 Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P611 * 263Hex	**Dst Low Voltage** Destination of the status bit 'undervoltage' (status word 1, bit 11) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P612 * 264Hex	**Dst Contactor** Destination of the bit 'energize main contactor' (status word 1, bit 12); H-level: energize contactor! Note: If the message 'main contactor energized' is not selected (P591=1), the main contactor must be energized within 120 ms after the bit 'energize main contactor' is set. Attention: For switching voltages between 50 and 230 V AC only the following relays may be used: - relay on the PEU or the PSU board (driven via binary output 1) or - the relays of the optional SCI boards, which are specified for 230 V AC (see section 9.6) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1001 i002=0 i003=0	3 / BR 3 / BR
P613 * 265Hex	**Dst RampGen act** Destination of the status bit 'ramp generator active' (status word 1, bit 13) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P614 * 266Hex	**Dst FWD speed** Destination of the status bit 'speed direction' (status word 1, bit 14) Meanings: H-level: forward L-level: reverse Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P615 * 267Hex	**Z.KIP aktiv** Destination of the status bit 'power ride thru (PRT) active' (status word 1, bit 15) --- is not activated at SIMOVERT SC --- Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P616 * 268Hex	**Dst Fly Restart** Destination of the status bit 'flying restart active' (status word 2, bit 16) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P618 * 26AHex	**Dst No Overspeed** Destination of the status bit 'no overspeed' (status word 2, bit 18) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P619 * 26BHex	**Dst Ext Fault 1** Destination of the status bit 'external fault 1' (status word 2, bit 19) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P620 * 26CHex	**Dst Ext Fault 2** Destination of the status bit 'external fault 2' (status word 2, bit 20) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). If an ON command is active, L-level causes fault trip after 200 msec. Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P621 * 26DHex	**Dst Ext Warning** Destination of the status bit 'external warning' (status word 2, bit 21) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P622 * 26EHex	**Dst i2t Drive** Destination of the status bit 'warning drive overload' (status word 2, bit 22); see r010 (drive utilization) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P623 * 26FHex	**Dst TmpFlt Drive** Destination of the status bit 'fault drive overtemperature' (status word 2, bit 23); see r011 (drive temperature) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P624 * 270Hex	**Dst TmpWarnDrive** Destination of the status bit 'warning drive overtemperature' (status word 2, bit 24); see r011 (drive temperature) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P625 * 271Hex	**Trg BitWarTmpMot** Destination of the status bit 'warning motor overtemperature' (status word 2, bit 25); Reason: The condition for the warning is met KTY84 sensor monitoring (see r009 (motor temperature), P360 (motor temperature warning)). Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P626 * 272Hex	**Trg BitFltTmpMot** Destination of the status bit 'fault motor overtemperature' (status word 2, bit 26); Reason: The condition for the fault is met KTY84 sensor monitoring (see r009 (motor temperature), P360 (motor temperature warning)). Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P627 * 273Hex	**Dst ProcReg A=S** Destination connection of the status bit „technological setpoint reached“ (status word 2, bit27) Parameter values, indices: As for P600 Type=L2; PKW: PKW format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P628 * 274Hex	**Dst PullOut/Blck** Destination of the status bit 'fault motor pulled out / blocked' (status word 2, bit 28) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). --- is not activated at SIMOVERT SC --- Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P629 * 275Hex	**Dst ChrgRelay ON** Destination of the status bit 'charging relay energized' (status word 2, bit 29) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P631 * 277Hex	**Dst Pre-Charging** Destination of the status bit 'charging active' (status word 2, bit 31) Parameter values, Indices: as P600 Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

5.10 Analog Input/Output

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P650 * 28AHex	**CU AnalogInConf** Configuration of the CU analog inputs; defines the kind of the analog input signals Parameter values — Terminal 27 — Terminal 29 0: -10 V ... + 10 V — - 20 mA ... + 20 mA 1: 0 V ... + 10 V — 0 mA ... + 20 mA 2: — + 4 mA ... + 20 mA Notes: Only one signal can be wired per input; alternatively voltage or current signals can be evaluated. Voltage and current signals must be connected to different terminals. Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar. At setting 2 an input current < 2 mA causes a fault trip (broken wire proof) The offset scaling of the analog inputs is done via P652. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 -10V...+10V 0V...+10V 4mA...20mA	- 0	2 / BR 2 / BR
P651 * 28BHex	**CU AnaInSmooth** Filter time constant of the CU analog inputs. Typ=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	0 to 1000 [ms]	- 4	2 / BR 2 / BR
P652 28CHex	**CU AnalogIn Offs** Offset scaling of the CU analog inputs Description for setting see section 4.3.4 Typ=I2; PKW: 1HEX=0.001V PcD Gr.: 0	-20.000 to 20.000 [V]	- 0.000	2 / BR 2 / BR
P655 * 28FHex	**CU AnaOut ActVal** Actual value output via the CU analog output Description for setting: enter the parameter number of the quantity, which is to be issued. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	- 219	2 / BR 2 / BR
P656 290Hex	**CU AnalogOutGain** Proportional gain of the CU analog output, see section 4.3.5 Parameter values: P656= calculated output voltage at when the displayed parameter has a value of 100% The output voltage V(out) is calculated according to: $V(out) = \frac{\text{value of displayed parameter}}{100\ \%} * P656 + P657$ Note: Maximum value of the output voltage: +/- 10 V Typ=I2; PKW: 1HEX=0.01V PcD Gr.: 0	-320.00 to 320.00 [V]	- 10.00	2 / BR 2 / BR
P657 291Hex	**CU AnalogOutOffs** Offset of the CU analog output; see P656 Typ=I2; PKW: 1HEX=0.01V PcD Gr.: 0	-100.00 to 100.00 [V]	- 0.00	2 / BR 2 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P660 294Hex	**SCI AnalogInConf** Configuration of the SCI analog inputs; defines the kind of the input signals Parameter values — Terminals X428 / 3, 6, 9 — Terminals X428 / 5, 8, 11 0: -10 V ... + 10 V — - 20 mA ... + 20 mA 1: 0 V ... + 10 V — 0 mA ... + 20 mA 2: — 4 mA ... + 20 mA Notes: Only one signal can be wired per input; alternatively voltage or current signals can be evaluated. Voltage and current signals must be connected to different terminals. Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar. At setting 2 an input current < 2 mA causes a fault trip (broken wire proof) The offset scaling of the analog inputs is done via P662. Indices: i001: SI11 Slave 1, analog input 1 i002: SI12 Slave 1, analog input 2 i003: SI13 Slave 1, analog input 3 i004: SI21 Slave 2, analog input 1 i005: SI22 Slave 2, analog input 2 i006: SI23 Slave 2, analog input 3 Condition: the related SCB board must be reported via P090 and P091, respectively Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 -10V...+10V 0V...+10V 4mA...20mA	6 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	3 / BR 3 / BR
P661 295Hex	**SCI AnaInSmooth** Filter time constant of the SCI analog inputs; Formula: $T = 2 \text{ ms} * 2^{P661}$ Indices: see P660 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 15	6 i001=2 i002=2 i003=2 i004=2 i005=2 i006=2	3 / BR 3 / BR
P662 296Hex	**SCI AnalogInOffs** Offset scaling of the SCI analog inputs Description for setting see SCI manual Indices: see P660 Typ=I2; PKW: 1HEX=0.01V PcD: 4000HEX=160V	-20.00 to 20.00 [V]	6 i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	3 / BR 3 / BR
P664 * 298Hex	**SCI AnaOutActVal** Actual value output via SCI analog outputs Description for setting: enter the parameter number of the quantities, which are to be issued; for details see SCI manual. Indices: i001: SI11 Slave 1, analog output 1 i002: SI12 Slave 1, analog output 2 i003: SI13 Slave 1, analog output 3 i004: SI21 Slave 2, analog output 1 i005: SI22 Slave 2, analog output 2 i006: SI23 Slave 2, analog output 3 Condition: the related SCB board must be reported via P090 and P091, respectively Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 1999	6 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	3 / BR 3 / BR
P665 299Hex	**SCI AnaOut Gain** Proportional gain of the SCI analog outputs Description for setting: see SCI manual Indices: see P664 Typ=I2; PKW: 1HEX=0.01 PcD: 4000HEX=160V	-320.00 to 320.00	6 i001=10.00 i002=10.00 i003=10.00 i004=10.00 i005=10.00 i006=10.00	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P666 29AHex	**SCI AnaOut Offs** Offset of the SCI analog outputs Indices: see P664 Typ=I2; PKW: 1HEX=0.01V PcD: 4000HEX=160V	-100.00 to 100.00 [V]	6 i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	3 / BR 3 / BR

5.11 Communications

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P680 * 2A8Hex	**SCom1 Act Value** Actual value output via serial communication SST1 Defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r968) For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred The length (number of words) of the process data part of the telegram is set by P685, i001 Indices: i001=WD01: Word 01 of the (process data part of the) telegram i002=WD02: Word 02 of the (process data part of the) telegram ... i016=WD16: Word 16 of the (process data part of the) telegram Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P681 * 2A9Hex	**SCom2 Act Value** Actual value output via serial communication SST1 Defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r968) For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred The length (number of words) of the process data part of the telegram is set by P685, i001 Indices: i001=WD01: Word 01 of the (process data part of the) telegram i002=WD02: Word 02 of the (process data part of the) telegram ... i016=WD16: Word 16 of the (process data part of the) telegram Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P682 2AAHex	**SCB Protocol** SCB can be operated as - master for the SCI boards or as - serial communications board (see SCB manual). Parameter values: 0 = Master for SCI boards 1 = 4 wire USS 2 = 2 wire USS 3 = Peer to Peer 4 = not used 5 = not used Condition: SCB board must be reported via P090 and 0P91, respectively Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 SCI Module 4 wire USS 2 wire USS Peer 2 Peer Option 1 Option 2	- 0	3 / H BR 3 / H
P683 * 2ABHex	**SCom/SCB BusAddr** Bus address of the serial communication interfaces (see section 4.3.6.1) Indices: i001 = SCo1: bus address of serial comm. interface 1 (CU) i002 = SCB: SCB bus address, if P682=1, 2 i003=SCo2: bus address of serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 31	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P684 * 2ACHex	**SCom/SCB Baud** Serial interfaces baud rate Parameter values: 1: 300 Baud; 2: 600 Baud; 3: 1200 Baud; 4: 2400 Baud; 5: 4800 Baud; 6: 9600 Baud; 7: 19200 Baud; 8: 38400 Baud; 9: 57600 Baud; 10: 76800 Baud; 11: 93750 Baud; 12: 115200 Baud; 13: 187500 Baud Notes: Maximum baud rate for SST1 (i001) 38400 for SST2 (i003) 38400 for SCB dependent on the version and selected protocol, refer to the SCB operating instructions) Indices: i001 = SCo1: baud rate of serial comm. interface 1 (CU) i002 = SCB: SCB baud rate, if P682=1, 2, 3 i003 = SCo2: baud rate of serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 13	3 i001=6 i002=6 i003=6	3 / BR 3 / BR
P685 * 2ADHex	**SCom/SCB PCV** Number of words (16 bit) of the parameter data part in the net data block of the telegram. Parameter values: 0: no parameter data part in the telegram 3, 4 parameter data part is 3 (parameter identifier, Ind, parameter value) ,4 words long 127 variable parameter data length for the transfer of parameter description and texts. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682=1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 127	3 i001=127 i002=3 i003=3	3 / BR 3 / BR
P686 * 2AEHex	**SCom/SCB # PrDat** Number of words (16 bit) of the process data part in the net data block of the telegram. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682=1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 16	3 i001=2 i002=2 i003=2	3 / BR 3 / BR
P687 * 2AFHex	**SCom/SCB TlgOFF** Telegram OFF time of CU and SCB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: Value 0: no monitoring, no fault trip; must be parameterized for sporadic (a-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682=1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Typ=O2; PKW: 1HEX=1.0ms PcD: 4000HEX=1638.4ms	0 to 6500 [ms]	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P689 2B1Hex	**SCB Peer2PeerExt** Immediate transfer on of data received via the peer to peer protocol of SCB. Mark of these words of the received peer to peer telegram which are to be transferred on immediately. Parameter values: 0: no immediate transfer (only to CU) 1: immediate transfer (and passing to CU) Indices: i001 = WD01: Word 01 of the (process data part of the) telegram i002 = WD02: Word 02 of the (process data part of the) telegram ... i016 = WD16: Word 16 of the (process data part of the) telegram Condition: P688 = 3 (peer to peer protocol) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 CU only Transfer	5 i001=0 i002=0 i003=0 i004=0 i005=0	3 / BR 3 / BR
P690 * 2B2Hex	**SCB Act Values** Actual value output via the serial communications interface of the SCB board; defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r968) For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred The length (number of words) of the process data part of the telegram is set by P685, i002 Indices: i001=WD01: Word 01 of the (process data part of the) telegram i002=WD02: Word 02 of the (process data part of the) telegram ... i016=WD16: Word 16 of the (process data part of the) telegram ATTENTION: if P682 = 3 (peer to peer protocol) a maximum of 5 words (i001 to i005) can be transferred Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P694 * 2B6Hex	**CB/TB Act Values** Output of analog values via CB or TB; defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r968) For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred Indices: i001=WD01: Word 01 of the (process data part of the) telegram i002=WD02: Word 02 of the (process data part of the) telegram ... i016=WD16: Word 16 of the (process data part of the) telegram Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P695 * 2B7Hex	**CB/TB TlgOFFTime** Telegram lag time of CB and TB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: Value 0: no monitoring, no fault trip; must be parameterized for sporadic (non-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. Typ=O2; PKW: 1HEX=1.0ms PcD: 4000HEX=1638.4ms	0 to 6500 [ms]	- 10	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P696 2B8Hex	**CB Parameter 1** Communication Board parameter 1; see manual of the used communication board Description for setting: Parameter is only needed if a communication board is reported (P090 or P091 = 1) The communication board checks, if the set value is valid. If the value is not accepted, the fault message 80 is issued with fault value 5 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P697 2B9Hex	**CB Parameter 2** Communication Board parameter 2; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P698 2BAHex	**CB Parameter 3** Communication Board parameter 3; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P699 2BBHex	**CB Parameter 4** Communication Board parameter 4; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P700 2BCHex	**CB Parameter 5** Communication Board parameter 5; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P701 2BDHex	**CB Parameter 6** Communication Board parameter 6; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P702 2BEHex	**CB Parameter 7** Communication Board parameter 7; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P703 2BFHex	**CB Parameter 8** Communication Board parameter 8; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P704 2C0Hex	**CB Parameter 9** Communication Board parameter 9; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P705 2C1Hex	**CB Parameter 10** Communication Board parameter 10; see P696 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H

5.12 Diagnosis

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r720 2D0Hex	**SW Version** Software version of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: Software version of the PCB in position 1 (left) i002: Pos2: Software version of the PCB in position 2 (right) i003: Pos3: Software version of the PCB in position 3 (center) i004: Text: Software version of the text EPROM in position 1 Typ=O2; PKW: 1HEX=0.1 PcD Gr.: 0		4	3 /U BR
r721 2D1Hex	**SW Generat.Date** Software generation date of the CU board. Indices: i001= Year: Year i002= Mon.: Month i003= Day: Day Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	3 /U BR
r722 2D2Hex	**SW ID** Expanded software version code of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: Software code of the PCB in position 1 (left) i002: Pos2: Software code of the PCB in position 1 (right) i003: Pos3: Software code of the PCB in position 1 (center) i004: Text: Software code of the text EPROM in position 1 Note: The TSY board has no software code; the reported code is always '0.0' Typ=O2; PKW: 1HEX=0.1 PcD Gr.: 0		4	3 /U BR
r723 2D3Hex	**PCB Code** Identification code of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: PCB code of the PCB in position 1 (left) i002: Pos2: PCB code of the PCB in position 2 (right) i003: Pos3: PCB code of the PCB in position 3 (center) PCB codes: CU: 100 - 109 CB: 140 - 149 TB: 130 - 139 SCB: 120 - 129 TSY: 110 - 119 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	3 /U BR
r725 2D5Hex	**CalcTimeHeadroom** Calculation time headroom of the CU board CPU in % of the computing power; influenced by pulse frequency (P761) and sampling time (P308). Analog Output: 100% @ Parameter Value=16384% Typ=O2; PKW: 1HEX=1.0% PcD Gr.: 0	[%]	-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r730 2DAHex	**SCB Diagnosis** SCB diagnosis (all values in HEX display). Displayed numbers have an overflow at FF. The meaning of several Indices depends of the selected SCB protocol (P682). Indices: i001: flTC Number of error-free telegrams i002: Terr Number of error telegrams i003: Voff USS: Number of Byte-Frame-errors SCI boards: number of slave power outages i004: Toff USS: Number of Overrun-errors SCI boards: number of fiber optic link interrupts i005: PnoS USS: Parity error SCI boards: number of missing answer telegrams i006: STxL USS: STX-error SCI boards: number of search telegrams to accept a slave i007: ETX ETX-error i008: BcCC USS: Block-Check-error SCI boards: number of configuration telegrams i009: L/Te USS/Peer to Peer: incorrect telegram length SCI modules: required maximum number of terminals according to process data wiring (P554 to P631) . i010: T/An USS: Timeout SCI modules: required analog inputs / outputs according to process data wiring of the setpoint channel and actual value output via SCI (P664) . i011: Res1 Reserve i012: Res2 Reserve i013: Warn SCB/DPR warning word i014: Sl1? Information, if slave 1 needed and if yes, which type 0: no slave 1 needed 1: SCI1 2: SCI2 i015: Sl2? Information, if slave 2 needed and if yes, which type 0: no slave 2 needed 1: SCI1 2: SCI2 i016: IniF: with ’SCI modules’: initialization fault i017: SBJa Year of generation, SCB software (only for SCB SW release > 1.2, otherwise undefined) i018: SBTM Day and month of generation of the SCB software (only for SCB SW release > 1.2, otherwise undefined) i019: Sl1V SCI slave1 SW release (only for SCB- and SCI SW release > 1.2, otherwise undefined) i020: Sl1J Year of generation, SCI slave1 software (only for SCB- and SCI SW release > 1.2, otherwise undefined) i021: Sl1T Day and month of generation of the SCI slave1 software (only for SCB- and SCI SW release > 1.2, otherwise undefined) i022: Sl2V SCI slave2 software release (only for SCB- and SCI SW release > 1.2, otherwise undefined) i023: Sl2J Year of generation, SCI slave2 software (only for SCB- and SCI SW release > 1.2, otherwise undefined) i024: Sl2T Day and month of generation of the SCI slave2 software (only for SCB- and SCI SW release > 1.2, otherwise undefined) Typ=L2; PKW: 1HEX=1.0 PcD Gr.: 0		16	3 / H BR
r731 2DBHex	**CB/TB Diagnosis** For detailed information see manuals of the used communication or technology boards. Typ=L2; PKW: 1HEX=1.0 PcD Gr.: 0		32	3 / H BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P733 * 2DDHex	**Simulated Operat** Simulated operation, allows test operation of the drive with de-energized DC bus. Parameter values: 0: no simulated operation 1: simulated operation Conditions: - 24 V auxiliary power supply must be provided - Drive must be connected to the mains via a main contactor, which is driven by the drive (see P612) Note: Simulated operation can only be selected, when the DC bus voltage (r006) is less than 5% of the rated DC bus voltage Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 off on	- 0	3 / BR 3 / B
P735 * 2DFHex	**Trace TriggerPar** Parameter number of the signal which is to trigger the trace function; this function is realized with 8 channels. The tracer (TRC) can record internal quantities of the drive starting or ending with a certain condition. Related parameters: P735 to P737: trigger condition P738 to P739: trace quantity Indices: i001=Cha1: parameter number of the trigger signal, channel 1 i002=Cha2: parameter number of the trigger signal, channel 2 i003=Cha3: parameter number of the trigger signal, channel 3 i004=Cha4: parameter number of the trigger signal, channel 4 i005=Cha5: parameter number of the trigger signal, channel 5 i006=Cha6: parameter number of the trigger signal, channel 6 i007=Cha7: parameter number of the trigger signal, channel 7 i008=Cha8: parameter number of the trigger signal, channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P736 * 2E0Hex	**Trace Trig.Value** Parameter value for the trigger condition. Parameter value of the trigger signal which will start or stop the trace function Indices: i001=Cha1: parameter value of the trigger signal, channel 1 i002=Cha2: parameter value of the trigger signal, channel 2 i003=Cha3: parameter value of the trigger signal, channel 3 i004=Cha4: parameter value of the trigger signal, channel 4 i005=Cha5: parameter value of the trigger signal, channel 5 i006=Cha6: parameter value of the trigger signal, channel 6 i007=Cha7: parameter value of the trigger signal, channel 7 i008=Cha8: parameter value of the trigger signal, channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P737 * 2E1Hex	**Trace Trig.Cond.** Trigger condition for the trace function. Parameter values: 0: Trigger, when the value of the trigger parameter is < 736.x 1: Trigger, when the value of the trigger parameter is = 736.x 2: Trigger, when the value of the trigger parameter is > 736.x 3: Trigger with a fault trip 4: Trigger, when the value of the trigger parameter is <> 736.x Indices: i001=Cha1: trigger condition for channel 1 i002=Cha2: trigger condition for channel 2 i003=Cha3: trigger condition for channel 3 i004=Cha4: trigger condition for channel 4 i005=Cha5: trigger condition for channel 5 i006=Cha6: trigger condition for channel 6 i007=Cha7: trigger condition for channel 7 i008=Cha8: trigger condition for channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 TRC off TRC Start== TRC Stop== TRC Start>= TRC Stop>= TRC Start<= TRC Stop<=	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P738 * 2E2Hex	**Trace Act.Values** Parameter number of the signal, which is to be recorded by the trace function Indices: i001=Cha1: trace parameter channel 1 i002=Cha2: trace parameter channel 2 i003=Cha3: trace parameter channel 3 i004=Cha4: trace parameter channel 4 i005=Cha5: trace parameter channel 5 i006=Cha6: trace parameter channel 6 i007=Cha7: trace parameter channel 7 i008=Cha8: trace parameter channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P739 * 2E3Hex	**Trace Sampl.Time** Sampling time for recording the trace values in multiples of the base sampling time (P308); this function is realized with 4 channels. Description for Setting: the sampling time is P739 * P308 Indices: i001=Cha1: sampling time channel 1 i002=Cha2: sampling time channel 2 i003=Cha3: sampling time channel 3 i004=Cha4: sampling time channel 4 i005=Cha5: sampling time channel 5 i006=Cha6: sampling time channel 6 i007=Cha7: sampling time channel 7 i008=Cha8: sampling time channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 200	8 i001=1 i002=1 i003=1 i004=1 i005=1 i006=1 i007=1 i008=1	3 / BR 3 / BR
P740 * 2E4Hex	**Trace Pretrigger** Defines the number of data recorderd before and after the trigger condition. Example: a value of 40% means, that 40% of the data have been recorded before and 60% after the trigger condition. Indices: i001=Cha1: sampling time channel 1 Indices: i002=Cha2: sampling time channel 2 Indices: i003=Cha3: sampling time channel 3 Indices: i004=Cha4: sampling time channel 4 Indices: i005=Cha5: sampling time channel 5 Indices: i006=Cha6: sampling time channel 6 Indices: i007=Cha7: sampling time channel 7 Indices: i008=Cha8: sampling time channel 8 Typ=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 100 [%]	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P741 * 2E5Hex	**TRC Start** Start command for trace function. A trace channel can only be started after completion of setting of ots parameters (P735 to P740 must have valid values). After the trace recording has been finished, the parameter is automatically reset. Parameter values: 0: trace channel stopped 1: trace channel has started Indices: i001=Cha1: start channel 1 Indices: i002=Cha2: start channel 2 Indices: i003=Cha3: start channel 3 Indices: i004=Cha4: start channel 4 Indices: i005=Cha5: start channel 5 Indices: i006=Cha6: start channel 6 Indices: i007=Cha7: start channel 7 Indices: i008=Cha8: start channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r748 2ECHex	**Trip Time** Trip times (operating hour meter values, r013) Indices: Day / Hours / Seconds latest trip (1): i001=T1-d, i002=T1-h, i003=T1-s last reset trip(2): i004=T2-d, i005=T2-h, i006=T2-s (last+1) reset trip (3): i007=T3-d, i008=T3-h, i009=T3-s ... oldest saved trip (8): i022=T8-d, i023=T8-h, i024=T8-s Trip description by: r947 Fault number r949 Fault value r951 list of fault numbers P952 number of faults Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		24	2 / BR
P750 * 2EEHex	**TRC Read Index** Number of the trace data block for each trace channel, whcih can be read via r751 to r758. Indices: i001=Cha1: data block number channel 1 i002=Cha2: data block number channel 2 i003=Cha3: data block number channel 3 i004=Cha4: data block number channel 4 i005=Cha5: data block number channel 5 i006=Cha6: data block number channel 6 i007=Cha7: data block number channel 7 i008=Cha8: data block number channel 8 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 255	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
r751 2EFHex	**TRC Data Ch 1** Displays teh trace data of channel 1. The blcok number of the trace data is set in P750. If all data of an array are requested via an automation interface in one order, P750.1 is automatically increased by 1 during the output. This allows an optimized reading of trace data. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r752 2F0Hex	**TRC Data Ch 2** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r753 2F1Hex	**TRC Data Ch 3** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r754 2F2Hex	**TRC Data Ch 4** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r755 2F3ex	**TRC Data Ch 5** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r756 2F4Hex	**TRC Data Ch 6** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r757 2F5ex	**TRC Data Ch 7** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r758 2F6Hex	**TRC Data Ch 8** See r751 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR

5.13 Modulator

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P761 2F9Hex	**Pulse Frequency** Pulse frequency at asynchronous space vector modulation; if P100 <> 250 the correct value is automatically taken from the motor data list Note: The base sampling time (P308) should be increased to 1.5 ms in order to prevent a computation time overflow, if: • pulse frequency > 7 kHz and • option board (T100, T300, CB or SCB) is used and • a serial interface is used, e.g. OP1 MDS(2) Parameter Typ=O2; PKW: 1HEX=0.1kHz PcD Gr.: 0	5.0 to 7.5 [kHz]	2 i001=5.0 i002=5.0	3 / ABR 3 / A

5.14 Factory Parameters

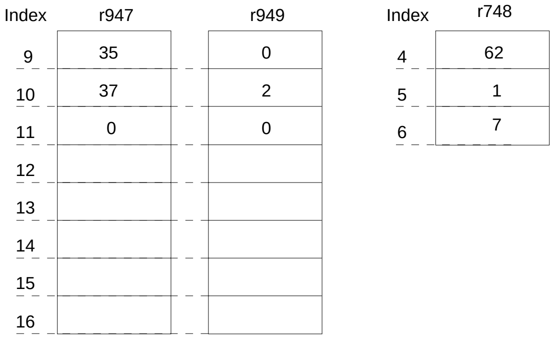
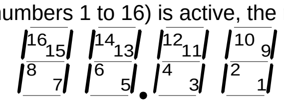
PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P789 315Hex	**RAM Access Value** Value of the memory cell (RAM) which has been addressed by P788 Typ=L2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / BR 4 / BR
P799 * 31FHex	**Special Access** Parameter for special access Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 /U BR 3 /U BR

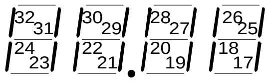
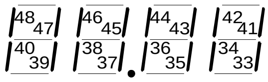
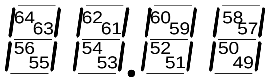
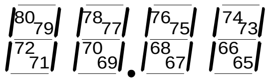
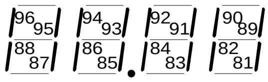
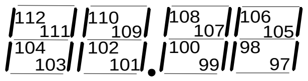
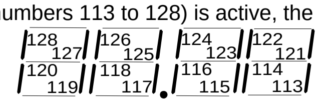
5.15 Special Parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P899 383Hex	**OP setting** Is used to set the drive converter address when several drive converters are controlled from one OP. Note: The parameter can only be displayed at the OP.		–	1 /UHABR 1 /UHABR

5.16 Profile Parameters

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
P917 * 395Hex	**Change rePorts** Defines the interfaces, where active parameters are reported if they are changed. Parameter values: 0: none 1: output via dual port RAM (TB, CB) 2: output via serial comm. interface 1 (SCom1) 4: output via SCB with USS protocol 8: Output via serial comm. interface 2 (SCom2) Description for setting: enter the total of the figures which are related to the interfaces, which are to issue the message. Type=V2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 15	- 0	3 / B 3 / B
P918 396Hex	**CB Bus Address** Protocol depending bus address for communication boards; see manual of these boards Note: The communication board checks, if the set value is valid. If the value is not accepted, the fault message 80 is issued with fault value 5 Condition: P090=1 or P091=1 (communication board installed) Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 126	- 3	3 / H BR 3 / H
P927 * 39FHex	**Parameter Access** Release of interfaces for the parameterization; description see P053. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 63	- 6	3 / BR 3 / BR
P928 * 3A0Hex	**Src Base/Reserve** Source of the switching command ’base / reserve settings’ (control word 2, bit 30); parameter is identical with P590 - description there Typ=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	- 1005	3 / BR 3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r947 3B3Hex	**Fault Memory** Display of the faults which have occurred at the last 8 trips (r748); at every trip up to 8 faults can be saved, related to each of them a fault number (see list of faults, chapter 7) is related. For text display of the faults see r951. Indices: Fault 1 / Fault 2 / ... / Fault 8 latest trip (1): i001=F1-1, i002=F1-2, ..., i008=F1-8 last reset trip (2): i009=F2-1, i010=F2-2, ..., i016=F2-8 (last+1) reset trip (3): i017=F3-1, i018=F3-2, ..., i024=F3-8 ... oldest saved trip (8): i057=F8-1, i058=F8-2, ..., i064=F8-8 Notes: A value of '0' means 'no fault' Number of saved trips: see P952. Example of a trip: last reset trip (2)  Trip time (r748): after 62 days, 1 hour, 7 sec of operation Faults (r947): Fault value (r949): 35 not defined 37 2 Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		64	2 / BR
r949 3B5Hex	**Fault Value** Fault values of the faults; allows a more detailed diagnosis at several faults. The fault values are saved in the same indices as the related fault numbers (r947) - see example at P947. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		64	3 / BR
r951 3B7Hex	**Fault Texts** List of fault texts; every fault text is saved in the index equivalent to its fault number. Example (see P947): Value of P947, i09 is '*35*'. The related fault was (P951, i*35*): 'Ext. Fault1'. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	2 / BR
P952 * 3B8Hex	**# of Faults** Number of saved trips (max. 8). If the parameter is set to '0', the diagnosis memory (r748 - trip times, r947 - fault number, r949 fault value) is cleared. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 8	- 0	2 / BR 2 / BR
r953 3B9Hex	**Warning Param1** If a warning (numbers 1 to 16) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r954 3BAHex	**Warning Param2** If a warning (numbers 17 to 32) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r955 3BBHex	**Warning Param3** If a warning (numbers 33 to 48) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r956 3BCHex	**Warning Param4** If a warning (numbers 49 to 64) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r957 3BDHex	**Warning Param5** If a warning (numbers 65 to 80) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r958 3BEHex	**Warning Param6** If a warning (numbers 81 to 96) is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r959 3BFHex	**Warning Param7** If a warning (numbers 97 to 112 is active, the related bar in the display is ON  Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r960 3C0Hex	**Warning Param8** If a warning (numbers 113 to 128) is active, the related bar in the display is  ON Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r964 3C4Hex	**Drive ID** Drive ID Text string; contains information about the ID# (first 2 bytes of the string, used to identify the drive by Profibus) and about the drive type name (last 24 bytes of the string, used for display in visualization systems). Parameter values: 2 Bytes: ID#: 8022Hex 24 Byte: model name according to the drive type: SIMOVERT SC Note: the parameter is not accessible via PMU or OP. Typ=VS; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r965 3C5Hex	**Profile #** PROFIBUS specific parameter Note: the parameter is not accessible via PMU or OP. Typ=OS; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r967 3C7Hex	**Control Word 1** Display parameter of control word 1 (bit 0-15) Identical with r550 (control word 1) Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r968 3C8Hex	**Status Word 1** Display parameter of status word 1 (bit 0 - 15) Identical with r552 (status word 1) Typ=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
P970 * 3CAHex	**Factory Settings** Parameter reset to factory settings Parameter values: 0: Parameter reset: all parameters are reset to their original values (factory settings); after this the parameter is reset to '1'. 1: no parameter reset Note: This function can also be selected via P052=1. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 FactSetting Return	- 1	3 / B 3 / B
P971 * 3CBHex	**EEPROM Saving** Saves parameter values in the EEPROM with a transition of the parameter value from 0 to 1. Parameter values: 0: no saving of parameter values 1: a transition from 0 to 1 saves the RAM values to the EEPROM Typ=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1	- 0	3 / BR 3 / BR
r980 3D4Hex	**Par # List pt1** List of the available parameter numbers; part 1 The parameter numbers are listed in a positive sequence. The first existing '0' shows, that no more parameter numbers are available. Index range: 1 to 116. As special function the value of i116 is the number of the parameter which contains the next following part of the list. If i116 has a value of '0' then there are no more parts of the list. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r981 3D5Hex	**Par # List pt2** List of the available parameter numbers; part 2; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r982 3D6Hex	**Par # List pt3** List of the available parameter numbers; part 3; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r983 3D7Hex	**Par # List pt4** List of the available parameter numbers; part 4; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r984 3D8Hex	**Par # List pt5** List of the available parameter numbers; part 5; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r985 3D9Hex	**Par # List pt6** List of the available parameter numbers; part 6; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR

PNU *:conf-P	Parameter name in OP1 Description	Range [Unit]	# of. Indices Factory Settings.	read: _/_ write: _/_
r986 3DAHex	**Par # List pt7** List of the available parameter numbers; part 7; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r987 3DBHex	**Par # List pt8** List of the available parameter numbers; part 8; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r988 3DCHex	**Par # List pt9** List of the available parameter numbers; part 9; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r989 3DDHex	**Par # List pt10** List of the available parameter numbers; part 10; see r980. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r990 3DEHex	**Par # List chg1** List of the changed parameters; part 1 The parameter numbers are listed in a positive sequence. The first existing ’0’ shows, that no more parameter numbers are available. Index range: 1 to 116. As special function the value of i116 is the number of the parameter which contains the next following part of the list. If i116 has a value of ’0’ then there are no more parts of the list. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r991 3DFHex	**Par # List chg2** List of the changed parameters; part 2; see r990. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r992 3E0Hex	**Par # List chg3** List of the changed parameters; part 3; see r990. Typ=O2; PKW: 1HEX=1.0 PcD Gr.: 0	116	116	3 / BR

6 Operator control

The converter can be controlled via:

- the PMU (Parameterization Unit)
- the control terminal strip on the CU (section 3.3 “Control terminal strip“)
- the OP1 operator control panel (section 9 “Options“)
- the RS485 and RS232 serial interface on PMU-X300

Operator control using the PMU is described in this section.

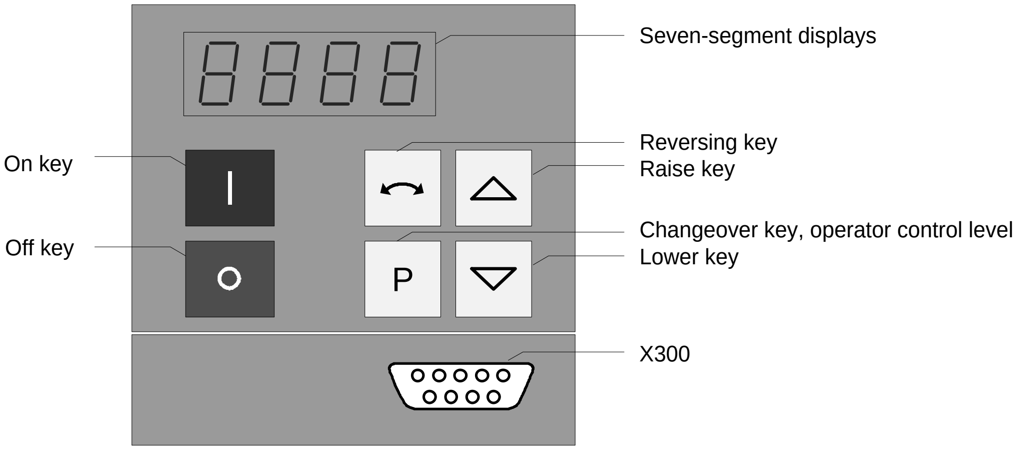


Fig. 6.1 Parameterization unit

6.1 Operator control elements

Operator control elements	Function
I	Converter switch on (standard). For faults: Return to the fault display. Command is effective when the key is released.
O	Converter shutdown depending on the parameterization of OFF1, Off2 or Off3 (P554 to P560). Command becomes effective when the key is released.
↷	Field reversal / reversing for the appropriate parameterization. Command becomes effective when the key is released.
P	Changeover from parameter number to parameter value. In conjunction with other keys, additional functions (refer to Figs. 6.2 to 6.4). Command becomes effective when the key is released.
△, ▽	Values (raise, lower) change as long as the keys are depressed.
P + △ resp. P + ▽	Depress P and hold, then depress the second key. The command becomes effective when the key is released (e.g. fast changeover).

Table 6.1 Function of the operator control elements on the PMU

6.2 Displays 8.8.8.8.

		Parameter number Pos. actual value e.g	 Neg. actual value e.g	Index e.g..	Parameter value e.g.
Visualization parameters	**Basic converter**	r000	r.000	---	°009
	Technology board	d000	d.000		
Setting parameters	**Basic converter**	P005	P.005	ı 000	-2.08
	Technology board	H002	H.002		

Table 6.2 Displaying visualization- and setting parameters on the PMU

	Actual value	Parameter value not possible	Alarm	Fault
Display	-2.08	---- ----	A022	F006

Table 6.3 Status display on the PMU

Note
The parameter description is provided in section 5 “Parameter list“.

6.3 Structure

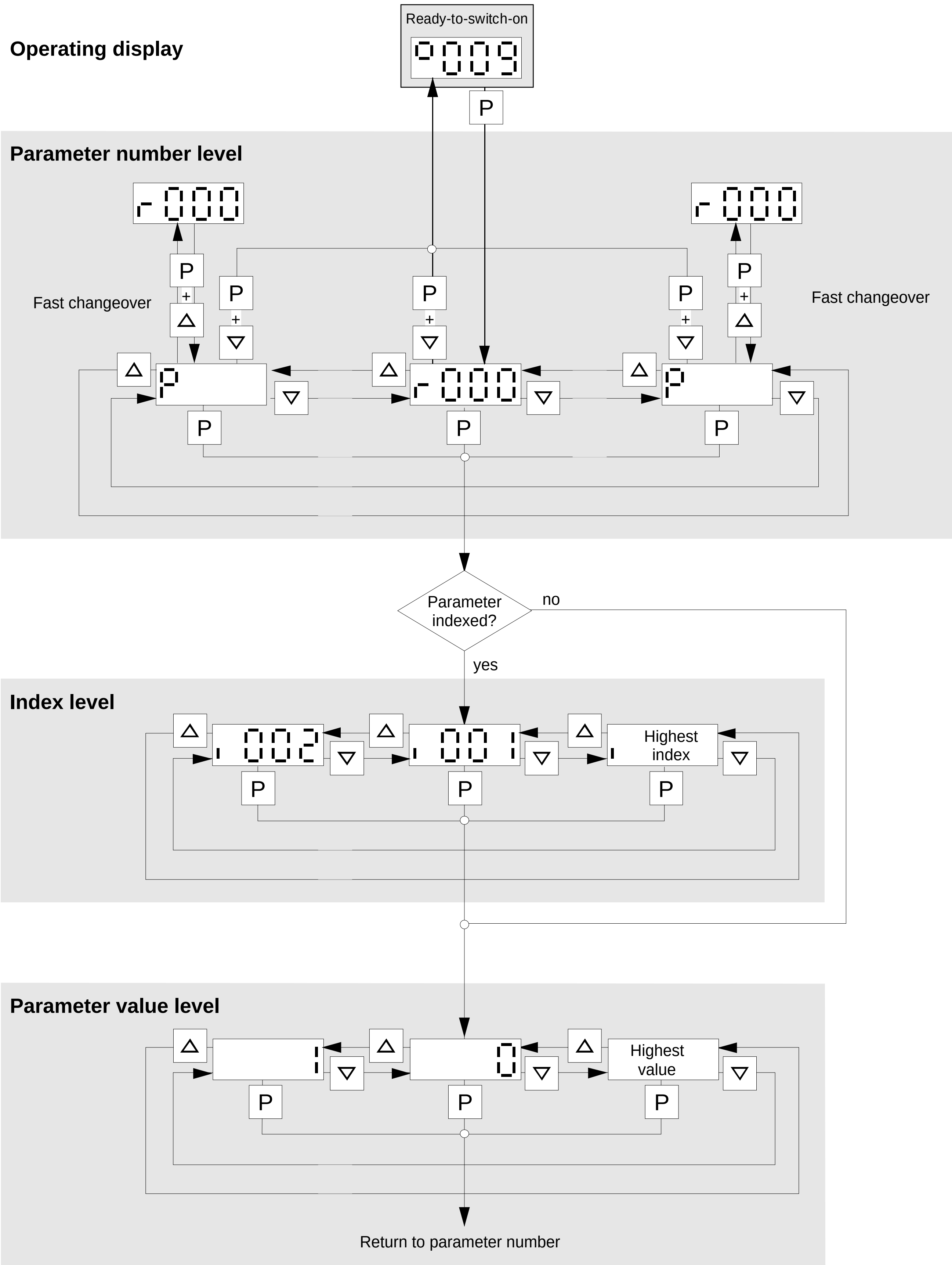
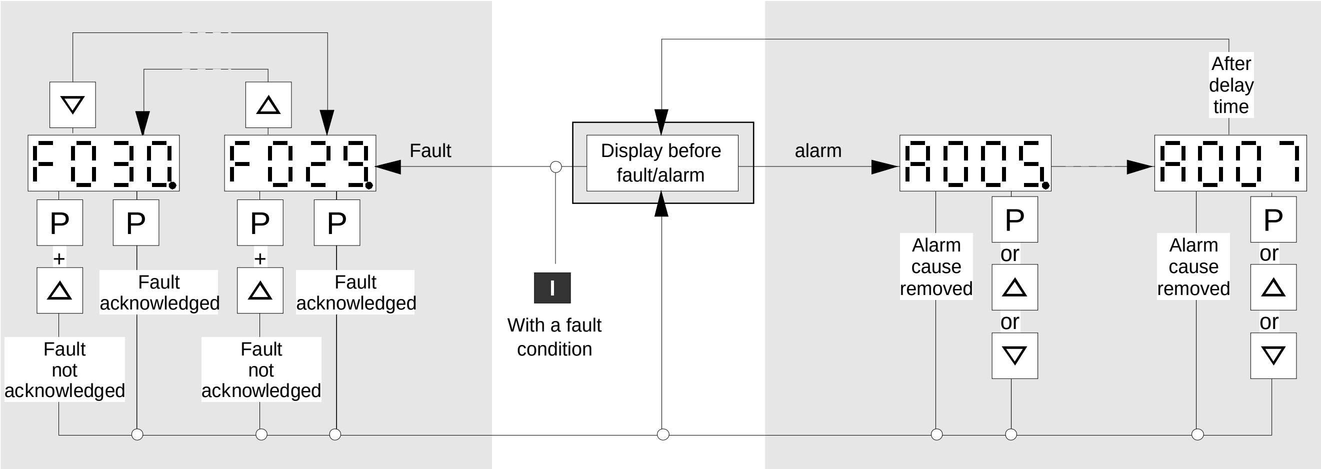


Bild 6.2 Operator control structure using the PMU



The point for fault- or alarm messages is omitted if there is only one alarm or fault.

Figure 6.3 Operator control structure of the PMU for alarms and faults

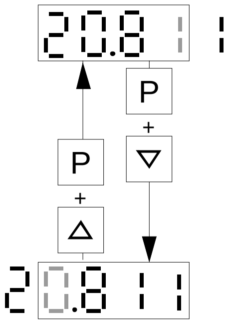


Figure 6.4 Shifting the PMU display for parameters values with more than 4 digits

7 Fault and Alarm Messages

7.1 Fault messages

Fault messages		
No.	**Fault description**	**Counter measures**
F001	**Contact. chckbck.** If a main contactor checkback signal is configured, a checkback signal was not received within 500 ms after the power-up command.	**P591 S.MC chckbck. sign.**, The parameter value must match the main contactor checkback signal connection. Check the main contactor checkback signal circuit. Also refer to section 9.6.
F002	**Pre-charging** When pre-charging, the minimum DC link voltage **P071 Con. supply voltage** of 80 % was not reached. The maximum pre-charging time of 3 s was exceeded.	Check the input DC voltage, Compare with **P071 Conv. supply volt.**.
F006	**DC link overvoltage** Due to an excessive DC link voltage, the unit was shutdown. DC voltage range | Shutdown threshold 280 V to 310 V | 412 V 510 V to 620 V | 819 V	Check the input DC voltage, The converter operates in the regenerative mode without regenerative possibility. Possibly; reduce **P464 ramp-down time**,
F008	**DC link uvolt.** The lower limit of 76 % of the DC link voltage (**P071 conv. supply voltage**) was fallen below. For enabled kinetic buffering, 61 %. DC link undervoltage in ‘standard’ operation (i.e. no SIMULATION).	Check • the DC input voltage - • of the DC link
F011	**Overcurrent** The unit was shutdown due to an overcurrent condition. The shutdown threshold was exceeded,	Check • the converter-output for short-circuit or ground fault • the load for an overload condition • whether the motor and converter are correctly matched • whether the dynamic requirements are too high.
F020	**Motor temp.** The motor limiting temperature has been exceeded.	Check the motor (load, ventilation, etc.). The actual motor temperature can be read in **r009 Motor_temp.** Check **P361 Mot Tmp Fault** Check the KTY84-input at connector -X104:25,26 for a short-circuit.
F023	**Inverter temp.** The inverter limiting temperature has been exceeded.	Measure the air intake and ambient temperature. Please observe the derating curves“ for ϑ >40 ºC. Refer to section 14.1. Check; • whether fan -E1 is connected and is rotating in the correct direction. • that the air entry and discharge openings are not restricted. • temperature sensor at -X30
F025	**UCE ph. L1** There was an UCE shutdown in phase L1.	Check; • phase L1 for short-circuit or ground fault (-X2:U2 including motor). • that the **CU** is correctly inserted.
F026	**UCE ph. L2** There was an UCE shutdown in phase L2.	Check; • phase L2 for short-circuit or ground fault (-X2:U2 including motor). • that the **CU** is correctly inserted.
F027	**UCE ph. L3** There was an UCE-shutdown in phase L3.	Check; • phase L3 for short circuit or ground fault. (-X2:W2 -including motor). • that the **CU** is correctly inserted.

Fault messages		
No.	**Fault description**	**Counter measures**
F035	**Ext. fault1** External fault 1 input, which can be parameterized, was activated.	Check; • if there is an external fault • if the cable to the appropriate binary input is interrupted • **P575 S k fault ext.1** also refer to section 4.3.2.
F036	**Ext. fault2** External fault 2 input, which can be parameterized, was activated.	Check; • if there is an external fault • if the cable to the appropriate binary input is interrupted • **P586 S.k. fault ext. 1** also refer to section 4.3.2.
F037	**Analog input.**	Check the connection to • analog input -X102:27, 28, 29. check parameters • **P650 CU-AE configuration** • **P651 CU-AE smoothing** • **P652 CU-AE offset** also refer to section 3.3.
F040	**AS internal** Incorrect operating status.	Replace the CU board (-A10)
F041	**EEprom fault** A fault occured when storing the values in the EEPROM.	Replace the CU board (-A10)
F042	**Comp. time** Computation time problems	Reduce computation time load, increase **sampling time P308** observe **r725 , free comp time**
F043	**VeCon-FR** VeCon-error at first run-up.	Replace CU3 board (-A10)
F044	**VeCon-SR** Internal coupling error, operating system to VeCon during second run-up	Replace CU3 board (-A10).
F045	**Opt.brd HW** A hardware fault occurred when accessing the option board	Replace CU Check the connection between the subrack and option boards
F046	**Par. con.**	Power the converter off and up again. Replace CU board (-A10).
F047	**VeCon fatal**	Replace CU board (-A10).
F048	**VeCon-int**.	Power the converter off and up again. Replace CU board (-A10).
F049	**SW release** The EPROMs on the CU have different software releases. In this case, the language EPROM is compared with the CU software.	• Replace language PROM
F051	**Speed encod.** Speed encoder is faulted.	Check parameters; • **P208 Src RotSpeed act,** • **P209 Encoder Pulse #,** • **P211 Resolver Excitat** • **P212 Resolver Offset** • **P213 Src.Res.Offset** Check the connection to the encoder. Replace CU.
F060	**MLFB missing** This is set, if the MLFB = 0 when INITIALIZATION is exitted (0.0 kW). MLFB = Order No.	After acknowledgement, in INITIALIZATION enter the correct MLFB in parameter **P070 MLFB (6SE70..)**. (Only possible with the appropriate access stages to both access parameters).
F065	**SST1 telegr** (USS protocol)	Check the connection PMU board -X300. Replace the CU board (-A10).
F066	**SST2 telegr** (USS protocol)	Check the connection CU board -X100:1 to 5. Replace the CU board (-A10).

Fault messages		
No.	**Fault description**	**Counter measures**
F070	**SCB init.** Error when initializing the SCB board	**r 949 =1 or 2** • Check the SCB board to ensure that it is correctly inserted and that the slot coincides with assignment • **r723 board code , – r724 board ID and** • **P090 board slot 2, – P091 board slot 3** **r 949 =5** error, initialization data • Check parameters **P682 and P684** **r 949=6** time-out when initializing and **r949=10** error, configuration channel • Check parameters **P090, P091, P682 and P684**
F072	**SCB heartb.** SCB no longer processes the monitoring counter (heartbeat counter)	Replace SCB Check the connection between the subrack and option board
F073	**Aninput1 SL1** 4 mA at analog input 1, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 1) -X428:4, 5.
F074	**Aninput2 SL1** 4 mA at analog input 2, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 2) -X428:7, 8.
F075	**Aninput3 SL1** 4 mA at analog input 3, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 3) -X428:10, 11.
F076	**Aninput1 SL2** 4 mA at analog input 1, slave 2 fallen below	Check the connection, signal source to the SCI1 (slave1) -X428:4, 5.
F077	**Aninput2 SL2** 4 mA at analog input 2, slave 2 fallen below	Check the connection, signal source to the SCI 1 board (slave 2) -X428:7,8.
F078	**Aninput3 SL2** 4 mA at analog input 3, slave 2 fallen below	Check the connection, signal source to the SCI 1 board (slave 3) -X428:10, 11.
F079	**SCB telegram** (USS, peer-to-peer, CAN)	Check the connections of the SCB1(2) boards Replace SCB1(2) board.
F080	**TB/CB init.** Error when initializing the board at the DPR interface	**r949 = 1** PT/CB not inserted or PT/CB board code incorrect **r949 = 2** PT not compatible **r949 = 3** CB not compatible **r949 = 4** error, initialization data Check the T300/CB board to ensure that is correctly inserted and that the slot and assignment coincide; • **P090 board slot 2, • P091 board slot 3** • **r723 board code, •r724 board ID** **r949 = 5** time-out at initialization **r949 = 10** error, configuration channel Checking the CB initialization parameters; • **P918 CB bus address,** • **696 to P705 CB parameters 1 to 10**
F081	**TB/CB heartb** TB or CB no longer processes the heartbeat counter	Replace TB or CB Check the connection between the subrack and option boards
F082	**DPR telegram fail.**	Check the connections of the CB/TB boards. Replace the CB board. Replace the TB board.
F090	**Par start init** Incorrect parameter at first start-up, initialization program	Check the values of the following parameters: • **P071 Converter voltage** • **P102 Rated motor current** • **P108 Rated speed** • **P109 Pole pair number** • **P110 Torque constant** • **P111 Torque deviation** • **P112 Torque const** • **P113 Rated torque** • **P173 Imax** • **P116 kT-Depend.Temp.** • **P115 kT-Depend.Speed** • **P242 Start. time** • **P260 Vsdmax** • **P761 Pulse frequency** • **P267 Vsqmax**

Fault messages		
No.	**Fault description**	**Counter measures**
F091	**Par FR motK** An error occurred in the motor initialization at the first run-up of the VeCon processor after ready to power-up.	Check the parameter settings as under fault message F090
F096	**InitD MDS1** A parameter error occurred for the converter status init drive.	Acknowledge fault. The erroneous parameter is specified in r949 as fault value. Correct Parameter and leave drive system settings (P052=0)
F097	**InitD MDS2** A parameter error occurred for the converter status init drive	Acknowledge fault. The erroneous parameter is specified in r949 as fault value. Correct Parameter and leave drive system settings (P052=0)
F098	**Motdat can.** Motor data set error. Deletion setting was no able to be found in the motor table	Parameter reset to factory settings (P052=1) Replace the CU board (-A10) if error reoccurs.
F099	**EEPROM org** EEPROM error	Power-down and -up again. Replace the CU board if the error re-occurs.
F102	**GRND control** Error during the ground fault test before the closed-loop control program	The fault value (r949) indicates the module in which the error ocurred: 1 ⇒ phase U, upper valve 15 ⇒ phase U, lower valve 2 ⇒ phase V, upper valve 31 ⇒ phase V, lower valve 3 ⇒ phase W, upper valve 63 ⇒ phase W, lower valve
F255	Fault in the NOVRAM	Power-down the converter and electronics and power-up again. If the fault occurs again, change the CU.

Fatal errors (FF):

Fatal errors are those hardware or software errors which no longer permit normal converter operation. They only appear on the PMU in the form "FF<Nr>". The software is re-booted by actuating any PMU key.

FFxx	Error message	Power-down the converter and power-up again. Call the responsible service department if a fatal error message is re-displayed.
FF01	**Time sector overflow** A fatal time sector overflow was identified in the high-priority time sectors.	• Replace CU • Increase sampling time or reduce pulse frequency
FF02	**Watchdog error** The software monitoring has responded.	• Replace CU
FF03	**NMI error** Several NMIs have occurred one after another due to external option board accesses (busy monitoring).	• Replace CU • Replace BPL • Replace option board
FF04	**RAM error** An error was identified during the RAM memory test.	• Replace CU
FF05	**EPROM error** An error was identified during the EPROM memory test.	• Replace CU • Replace EPROMs
FF06	**Stack overflow** Stack overflow.	• Replace CU • Replace software • Increase sampling time or reduce the pulse frequency
FF07	**Stack underflow** Stack underflow	• Replace CU • Replace software
FF08	**Undefined opcode** An attempt was made to execute an invalid processor command	• Replace CU • Replace software
FF09	**Protection fault** Illegal format for a protected processor command	• Replace CU • Replace software • Replace EPROMs
FF10	**Illegal Word Operand Access** Word access to an uneven address	• Replace CU • Replace software • Replace EPROMs
FF11	**Illegal Instruction Access** Jump command to an uneven address	• Replace CU • Replace software • Replace EPROMs
FF12	**Illegal External Bus Access** Access to an unavailable external bus	• Replace CU • Replace software • Replace EPROMs
FF13	**SW error interrupt proc.** An error has occurred during interrupt processing	• Replace CU • Replace software • Replace EPROMs

7.2 Alarm messages

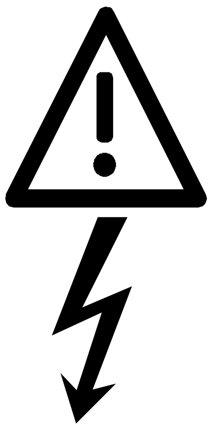
The alarm message is periodically displayed on the PMU by A=alarm and a 3-digit number. An alarm cannot be acknowledged. It is automatically deleted once the cause has been removed. Several alarms can be present. The alarms are then displayed one after another.

When the converter is operated with the OP1 operator control panel, the alarm is indicated in the lowest operating display line. The red LED additionally flashes (refer to the OP1 Instruction Manual).

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A001	**P953** —— 0	**Comp. time** CU board comp. time utilization too high	observe **r725 free computation time** increase **P308, sampling time** or reduce **P761 pulse frequency**.
A014	**P953** —— 13	**Simulation** The DC link voltage is not equal to zero when the simulation mode is selected (P733 = 1).	• set P733 to zero • drop the DC link voltage (remove the inverter from the mains)
A015	**P953** —— 14	**Ext. alarm 1** External alarm input 1, which can be parameterized, was activated	External alarm! check whether the cable to the appropriate binary input is interrupted. Check **parameter P588 S alarm ext. 1.** Also refer to Section 4.3.2.
A016	**P953** —— 15	**Ext. alarm 2** External alarm input 2, which can be parameterized, was activated	External alarm! check whether the cable to the appropriate binary input is interrupted. Check **parameter P589 S alarm ext. 2.** Also refer to Section 4.3.2.
A018	**P954** —— 1	**Match. meas. sys.** Resolver or encoder matching was erroneous at first run-up. This alarm indicates a wrong amplitude of the encoder signal (too low or too big). With resolver parameterized (P208=2,3) and automatic excitation adjustment (P211=0) this alarm indicates that the highest or lowest amplification factor is selected.	Check measuring system! Wrong encoder type ? Cable length ? Shielding ?
A022	**P954** —— 5	**Inv. temp.** The threshold for initiating an alarm, which can be parameterized, was fallen below.	Observe **r011 conv. temp.** Measure the air intake or ambient temperature. Observe the de-rating curves for ϑ >40 ºC Refer to Section 14.1. Check: - whether fan -E1 is connected and is rotating in the correct direction. - the air intake and discharge openings for blockage. - the temperature sensor at -X30.
A023	**P954** —— 6	**Mot temp** The threshold to initialize an alarm, which can be parameterized, was exceeded.	Check the motor (load, ventilation etc.). Read-out the actual temperature in **r009 mot.temp.** Check the KTY84 input at connector -X104:25,26 for a short-circuit condition.
A024	**P954** —— 7	**Mot. Move FR** The motor moved for the motor identification in the first run-up.	Lock the motor rotor
A025	**P954** —— 8	**I2t- inv.** If the instantaneous load condition is maintained, then the inverter will be thermally overloaded.	Check whether the rated output current or the peak current (operating class II) is (was) too high. View **r010 conv. load**
A033	**P955** —— 0	**Overspeed** Bit in **r553 status word** of the setpoint channel. The speed actual value has exceeded the maximum speed plus the selected hysteresis.	**P519 overspeed hys.** plus **P452 max. frequency (RDF)/ max. speed (RDF)** or **P453 max. frequency (LDF)/ max.speed (LDF)** was exceeded. Increase the parameter for the maximum frequencies, or reduce the regenerative load.

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A034	**P955** —— 1	**Setpoint- act. val. diff.** Bit in the **r552 status word 2** of the setpoint channel. The absolute difference between the frequency setpoint and actual value is greater than the parameterized value and the control monitoring time has expired.	Check; - whether an excessive torque requirement is available. - whether the motor was dimensioned too small. increase **P517 setpoint-act. val. diff. frq./setp. act. diff. speed** or **P518 setp.-act. val. diff. time,**
A035	**P955** —— 2	**Wire breakage** Clockwise and/or counter-clockwise rotating field is not enabled, or a wire is interrupted (both control word bits are zero)	Check, whether the cable(s) to the appropriate binary input(s), **P572 S. clockwise phase sequence/P571 S. counter-clockwise phase sequence** is (are) interrupted or withdrawn. Also refer to Section 4.3.2.
A049	**P956** —— **0**	**No slave** For serial I/O (SCB1 with SCI1/2), no slave is connected, opto-cable interrupted or slaves have no power.	**P660 SCI AE config.** • Check slave • Check cable
A050	**P956** —— **1**	**Slave incorrect** For serial I/O, the slaves required according to the parameterized configuration are not present (slave number or slave type).	Check **P660 SCI AE config.**
A051	**P956** —— 2	**Peer bdrate** The peer-to-peer connection is too high or different baud rates have been selected.	Adapt the baud rate in conjunction with the SCB boards, **P684 SST/SCB baud rate**
A052	**P956** —— 3	**Peer PZD-L** for peer-to-peer connection, PZD length selected too high (>5).	Reduce the number of words **P686 SST/SCB PZD No.**
A053	**P956** —— 4	**Peer lng f.** For peer-to-peer connection, the PZD length of sender and receiver do not match.	Adapt the word length for sender and receiver **P686 SST/SCB PZD No.**
A057	**P956** —— 8	**TB-Param** Technology Board Parameter occurs when a technology board is present, but parameterisation commands from the PMU, SST1 or SST2 are not answered by the technology board within 6 seconds	Change TB software
A081.. **A096**	**r958** —— 0...15	**CB alarm** Refer to the User Manual, CB board	
A097.. **A112**	**r959** —— 0...15	**TB alarm 1** Refer to the User Manual, TB board	
A113.. **A128**	**r960** —— 0...15	**TB alarm 2** Refer to the User Manual, TB board	

8 Maintenance



WARNING

SIMOVERT Master Drives are operated at high voltages.

All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VBG4 in Germany).

Maintenance and service work may only be executed by qualified personnel.

Only spare parts authorized by the manufacturer may be used.

The specified maintenance intervals and also the instructions for repair and replacement must be adhered to.

The drive units have hazardous voltage levels up to 5 min after the converter has been powered-down due to the DC link capacitors so that the unit must only be opened after an appropriate delay time.

The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.

If it is absolutely necessary that the drive converter must be worked on when powered-up:

- ♦ never touch any live components.
- ♦ only use the appropriate measuring and test equipment and protective clothing.
- ♦ always stand on an ungrounded, isolated and ESD-compatible pad.

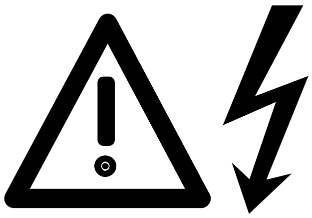
If these warnings are not observed this can result in death, severe bodily injury or significant material damage.

Always have your Master Drive converter Order No. and serial No. available when contacting the service department. These numbers and other important data are located on the drive converter rating plate.

8.1 Maintenance requirements

The fans are designed for a service life of 35000 hours at an ambient temperature of TU = 400C. They must be replaced before their service life expires so that the drive converter availability is guaranteed.

8.2 Replacing components



WARNING
The fan may only replaced by qualified personnel. The drive converters are still at hazardous voltage levels up to 5 min. after the unit has been powered-down as a result of the DC link capacitors. If these warnings are not observed, death, severe bodily injury or considerable material damage could occur.

8.2.1 Relacing the fan

Housing sizes A to C

The fan is located under the converter

- ♦ Remove the M4 x 49 Torx screws
- ♦ Remove the protective cover
- ♦ Remove the fan towards the bottom and withdraw connector X20
- ♦ Install the new fan in the inverse sequence
- ♦ Before commissioning the drive check that the fan can run freely and the air flow direction (arrow towards the top). The air must be blown upwards out of the unit.

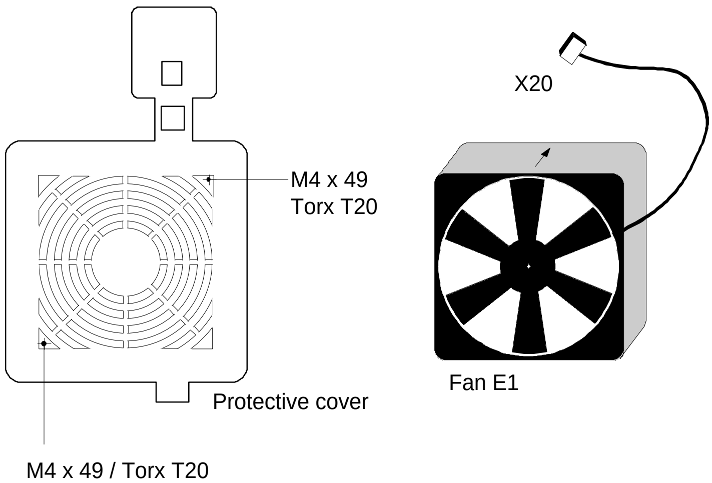


Fig. 8.1 Fan (24 V) and protective cover for housing sizes 1 to 3

Size D

The fan is screwed to a bracket which is located in the lower section of the drive converter.

- ♦ Withdraw connector X20
- ♦ Remove both M5 x 16 Torx screws on the lower part of the converter
- ♦ Withdraw the fan with bracket out of the unit from the bottom
- ♦ Install the new fan in the inverse sequence (the fan is already mounted on the bracket).
- ♦ Before commissioning the drive, check that the fan can rotate freely.

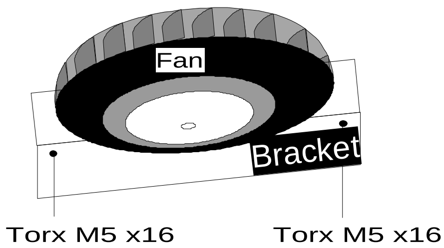
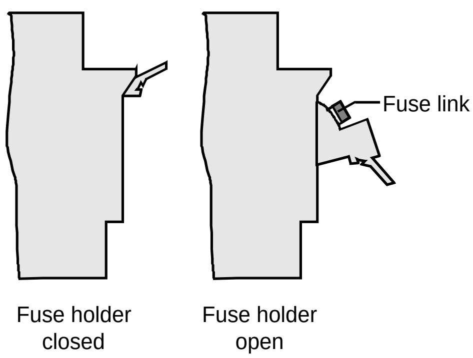


Fig. 8.2 Fan (230 V) with bracket

8.2.2 Replacing the fuses (size D)

The fuses are located in the upper section of the converter in a fuse holder. The fuse holder must be opened to remove the fuses.

Fig. 8.3 Fuse holder (size D)



8.2.3 Replacing boards

WARNING

The boards may only be replaced by qualified personnel.

It is not permissible that the boards are withdrawn or inserted under voltage.

Death, severe bodily injury or significant materal damage might result if these instructions are not observed.

CAUTION

Boards contain components which could be damaged by electrostatic discharge. The human body must be discharged immediately before an electronics board is touched.
This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cubicle components).

8.2.3.1 Replacing boards in the electronics box

- ♦ Loosen the board retaining screws above and below the handles for inserting/withdrawing the boards
- ♦ Carefully remove the board using these handles making sure that the board doesn’t catch on anything
- ♦ Carefully locate the new board on the guide rails and insert it completely into the electronics box
- ♦ Tighten the retaining screws above and below the handles.

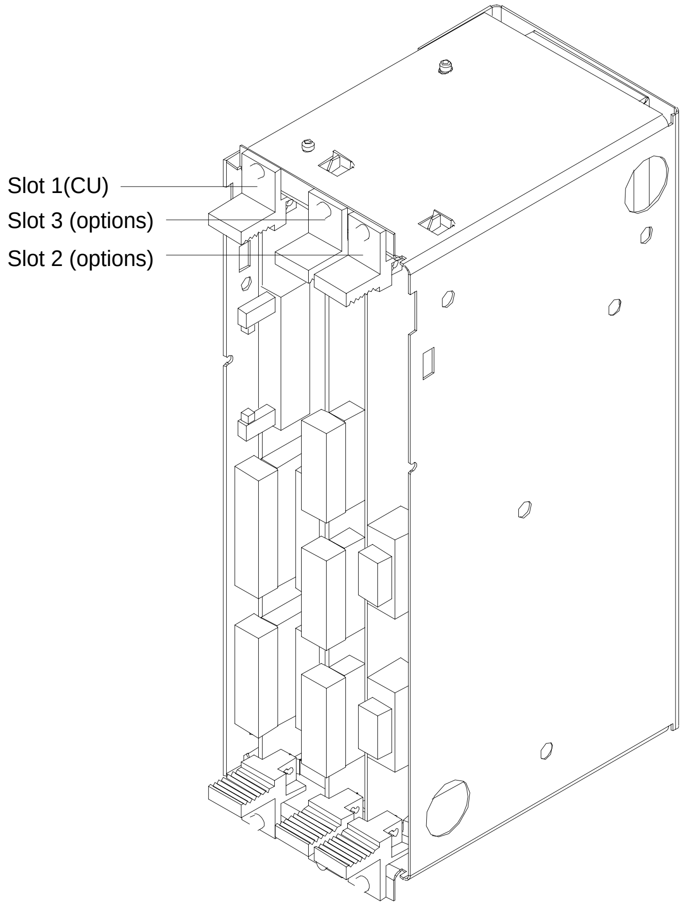


Fig. 8.4 Electronics box equipped with CU (slot 1) and options (slot 2 (left) and 3 (right))

Replacing the PMU

- Release the snaps on the front cover
- Open-up the front cover
- Withdraw connector X108 on the CU
- Carefully depress the latch upwards on the inner side of the front cover using a screwdriver
- Remove the PMU board
- Install the new PMU board in the inverse sequence.

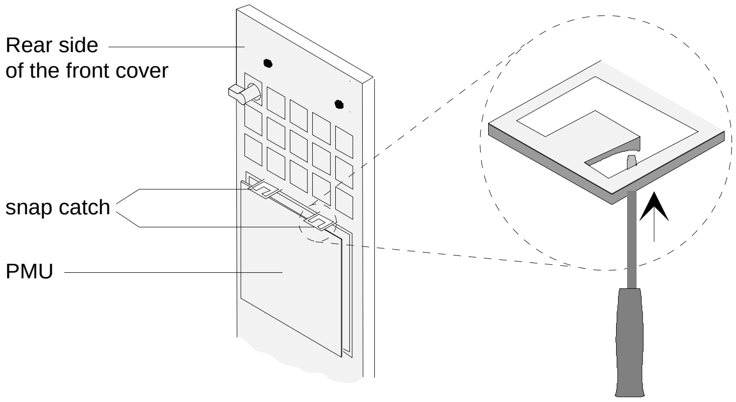


Fig. 8.6 Rear side of the front cover with PMU board

9 Options

9.1 Options which can be integrated into the electronics box

One or two option boards, listed in Table 9.1, can be inserted in the electronics box using the LBA option (local bus adapter).

The options are supplied with the option description.

Desig-nation	Description	Order No.	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7080-0CX84-4HA0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7080-0CX84-0AH0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7080-0CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7080-0CX84-0BD0
	Use of the serial interface with USS protocol	Application description	6SE7087-6CX87-4KB0
CB1	Communications board with interface for SINEC- L2-DP, (Profibus)	Board description	6SE7090-0XX84-0AK0 6SE7087-0CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0

Table 9.1 Option boards and bus adapter

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not for T300)
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE

Only one of each option board type may inserted in the electronics box.

TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.

If only one option board is used it must always be inserted at slot 2.

Table 9.2 Slots in the electronics box

If the converter is supplied through an external main contactor, the option board in the electronics box must be supplied from an external power supply, according to Table 9.3.

These values are required in addition to the current drawn by the basic converter (refer to section 13 “Technical Data“).

Board	**Current drain** (mA)
CB1	190
SCB1	50
SCB2	150
TSY w/out tacho	150
T300 w/out tacho	620
Standard tacho Type: 1PX 8001-1	I_0 95 (190 at 6000 RPM)

Table 9.3 Current drain of the option boards

9.2 Interface boards

The boards, listed in the following table must be externally mounted and wired-up on the external system side.

Desig-nation	**Description**	**Order No.**	
SCI1	Serial I/O board (only in conjunction with SCB1). Analog and binary input and outputs for coupling to the SCB1 via fiber-optic cable	Board description	6SE7090-0XX84-3EA0 6SE7080-0CX84-0BC0
SCI2	Serial I/O board (only in conjunction with SCB1) Binary inputs and outputs for coupling to the SCB1 via fiber-optic cable.	Board description	6SE7090-0XX84-3EF0 6SE7080-0CX84-0BC0

Table 9.4 Interface boards

9.3 Power supplies

Designation	Description	Order number Option	Use with
Power supply 1 A	115 V / 230 V AC - 24 V 1 A DC	6SX7010-0AC15	e.g.: 1 x SCI
Power supply 5 A	115 V / 230 V AC - 24 V 5 A DC	6EP1333-1SL11	Basic converter

Table 9.5 Recommended power supply

NOTE
The external auxiliary power supply must have protective separation according to DIN VDE 0160, otherwise protective separation for the converter control voltage is no longer provided.

9.4 Isolating amplifiers

Input	Output	Order number Option
Input isolating amplifiers for analog inputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–20 mA to +20 mA	–10 V to +10 V	6SX7010-0AC02
4 mA to +20 mA	4 mA to +20 mA	6SX7010-0AC01
Output isolating amplifiers for analog outputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC01
–10 V to +10 V	–20 mA to +20 mA	6SX7010-0AC03
0 V to +10 V	4 mA to +20 mA	6SX7010-0AC04

Table 9.6 Overview of isolating amplifiers

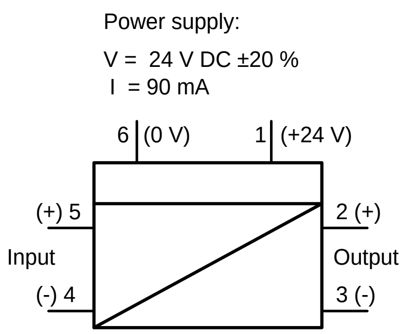


Fig. 9.1 Isolating amplifiers

9.5 Power section

Options	Description/function
Braking unit	For converting the regenerative energy into heat
Braking resistors	Load resistor for the braking unit
Electrical DC link coupling	Switching the DC-AC converter in and out under load
Mechanical DC link coupling	Switching the DC-AC converter in and out in a no-voltage condition
Input rectifier	Input rectifier for one or several DC-AC converters
Input rectifier with line-commutated feedback	Supply rectifier for one or several DC-AC converters for motor or generator operation

Table 9.7 Power section options

9.5.1 Sinusoidal filter

is being prepared

9.5.2 Output reactor, dv/dt filter, sinusoidal filter

The output reactor

- reduces the voltage gradient dv/dt at the motor terminals
- reduces the charge current spikes for long motor cables.

They do not reduce the magnitude of the transient voltage spikes at the motor terminals.

A ferrite reactor must be used as output reactor for SIMOVERT MASTER DRIVES SC.

The pulse frequency may not exceed 6 kHz.

9.6 Bypass- and output contactor

9.6.1 Bypass contactor (electrical DC link coupling)

Using the electrical DC link coupling, it is possible, for a multi-motor group with common DC bus, to connect or disconnect a converter with DC supply input to the DC bus.

This option is used when an inverter section has to be replaced.

Binary output -X9:4,5 is provided to control the contactor.

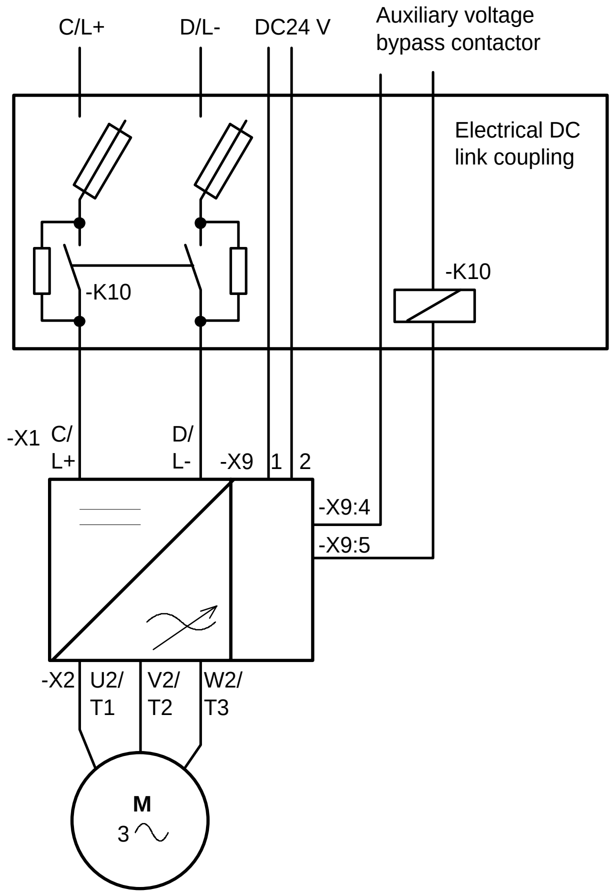


Fig. 9.2 Example for connecting a bypass contactor

9.6.1.1 Bypass contactor without I/R unit

Parameterization for operation with bypass contactor:

Parameter-			**Terminal**
No.	**Name**	**Value**	
P612, i001	ST. MC energized	0000	X9: 4,5
P629, i001	ST.BC energized	1001	X9: 4,5

Table 9.8 Parameterization for the bypass contactor (electrical DC link coupling)

9.6.1.2 Bypass contactor with I/R unit

NOTE
If individual inverters have to be isolated when the DC busbar is supplied through an input/regenerative feedback unit, the appropriate parameter sets of the infeed/regenerative feedback unit must be simultaneously switched-over using the binary input. An optimization run for each required constellation must be executed to determine the appropriate parameters. A maximum of four parameter sets can be selected.

If the DC busbar is to be fed from an infeed/regenerative feedback unit, the control parameter values must be determined for this infeed/regenerative feedback unit. During commissioning, the following steps are required:

♦ Re-parameterization for the optimization run:

Parameter-			**Terminal**	**Information**
No.	**Name**	**Value**		
P629, i001	ST.BC energized	0000	X9: 4,5	
P612, i001	ST.BC energized	1001	X9: 4,5	
P600, i001	ST. ready to switch-on	1001	X9: 4,5	Bypass contactor closes

Table 9.9 Parameterization for the optimization run

- Execute the optimization run to determine the values for the closed-loop control parameters for the infeed/regenerative feedback unit (refer to the Instruction Manual, infeed/regenerative feedback unit).
- Re-parameterize for operation with the bypass contactor:

Parameter-			Terminal	Information
No.	Name	Value		
P600, i001	ST.ready-to-switch-on	0000	X9: 4,5	
P629, i001	ST.BC energiz.	1001	X9: 4,5	
NOTE				
In this case, the converter must be externally supplied with 24 V DC (connector -X9: 1,2)				

Table 9.10 Parameterization for the bypass contactor (electrical DC link coupling)

9.6.1.3 Connecting and disconnecting individual converters to the DC bus

Sequence control	
Switch the converter to the DC bus	**Isolate the converter from the DC bus**
Close the fuse disconnect switch	Output an off command
DC link is pre-charged through the pre-charging resistors	Bypass contactor drops out
Enter an on command	Open the fuse disconnect switch
Bypass contactor is closed	Converter is electrically isolated from the DC bus
	Wait until the DC link capacitors have completely discharged

Table 9.11 Sequence control for connecting/disconnecting individual converters to the bus

9.6.2 Output contactor

It is not necessary that the converter is operated with output contactor.

If the converter is operated with output contactor, binary output-X9:4,5 is provided for contactor control (re-assignment).

The checkback signal can be connected to a binary input (e.g. binary input 3).

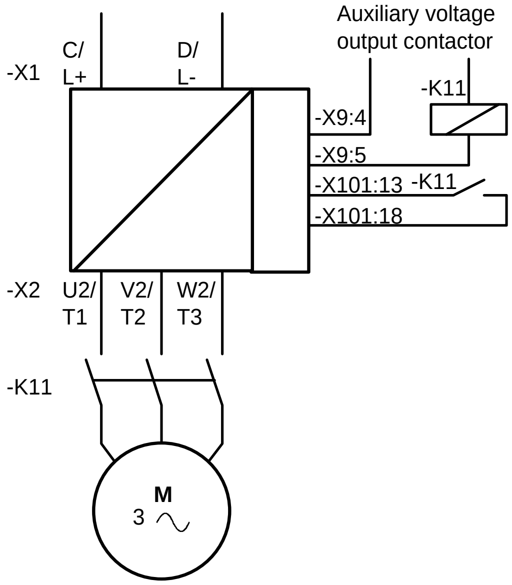


Fig. 9.3 Example for connecting-up a output contactor

Sequence control, on command-operation (effect on the bypass-or output contactor)

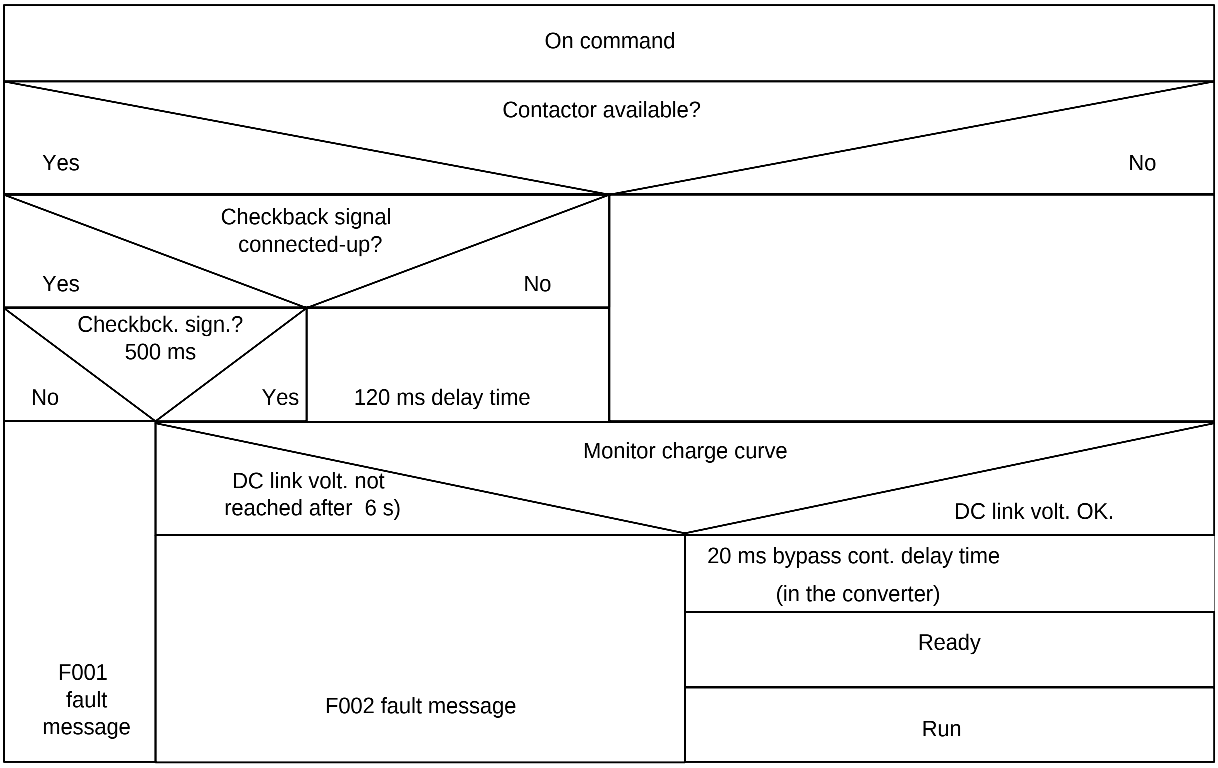


Fig. 9.4 Sequence control, on command- operation

Parameter- No.	Name	Index	Parameter- value	Terminal	With contactor(s)	Contactor(s) with checkback signals
P612	ST.MC energized	i001	1001	X9: 4,5	X	X
P591	ST MC chckbck sig. binary input 3	-	1003	X101:18		X

Table 9.12 Recommended parameterization for the main- and output contactors

NOTES
For the special case, where a customer wishes to connect-up both an electrical DC link coupling as well as an output contactor, then one of the two must be energized through a binary output. For higher ratings, an additional auxiliary contactor must be provided due to the 230 V AC required (contactor coil).

9.7 Operator control

Option	Description
OP1	User-friendly operator control panel with plain text display
SIMOVIS	Floppy disk with program for operator control via PC

Table 9.13 Operator control options

Fig. 9.5 OP1

9.8 Mechanical design

Option	Description
EMC screened housing	For screened cables

Table 9.14 Mechanical options

9.9 Additional equipment series

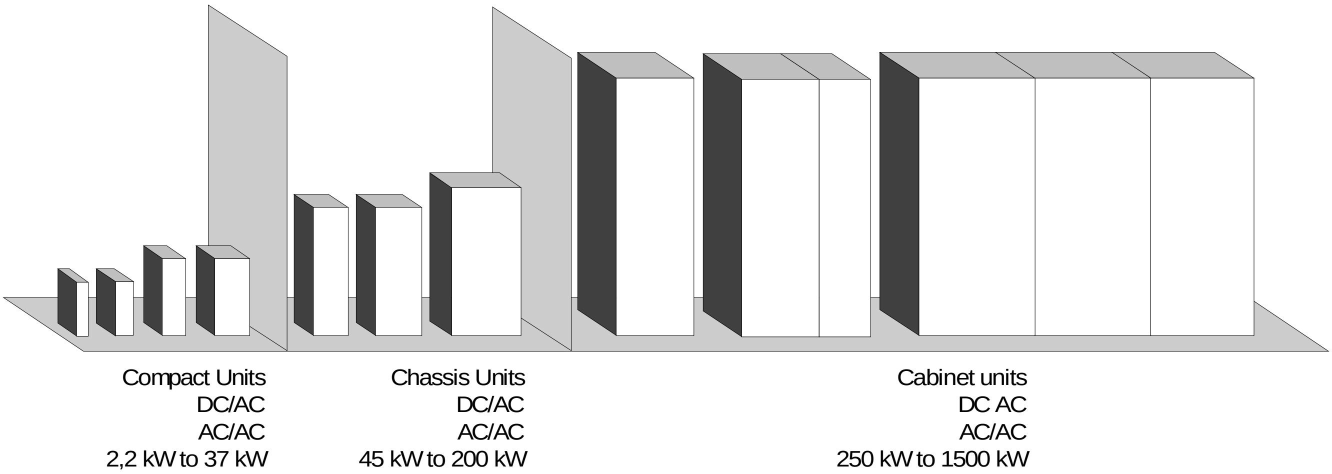


Fig. 9.6 Cabinet- and chassis units

- AC-AC converters FC, VC and SC
- DC-AC converters FC, VC and SC
  - with associated input rectifier
  - with associated input rectifier and line-commutated regenerative feedback

10 Spare Parts

Component code	Designation	Order number	Used in
-A10	CU3	6SE7090-0XX84-0AG0	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	6SE70_ _-_ _A30 6SE70_ _-_ _B30
-A30	PMU	6SE7090-0XX84-2FB0	6SE70_ _-_ _C30 6SE70_ _-_ _D30
-E1	24 V DC fan	6SY7000-0AA48	6SE70_ _-_ _A30
-E1	24 V DC fan	6SY7000-0AA50	6SE70_ _-_ _B30 6SE70_ _-_ _C30
-E1	230 V DC fan	6SY7000-0AA80	6SE70_ _-_ _D30
-F101, -F102	2 A, fuse, 600 V	6SY7000-0AA24	6SE70_ _-_ _D30

Table 10.1 Spare parts

11 Logbook

The logbook must be kept up-to-date by the operating personnel

All service- and maintenance work carried-out on the converter should be briefly entered into the logbook.

Continuous entries are important for maintenance and could be significant when it comes to warranty claims.

Location:			Unit Order No.: Serial No.:	
	Date	Name	Department	Signature
Start-up settings				
Start-up settings change				

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P050	Language	0		
P051	Access stge	2		
P052	Function select.	0		
P053	Param. enable	6		
P054	OP bckgrnd lit	0		
P070	MLFB(6SE70..)	0		
P071	Conv. supp. volt.	400.0		
P072	Conv. current(s)	6.1		
P073	Rtd Drive Power	2.2		
P090	Subrack slot 2	0		
P091	Subrack slot 3	0		
P100	Motor type	i001=0 i002=0	i001= i002=	i001= i002=
P102	Motor type(s)	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P108	Mot. current(s)	i001=0 i002=0	i001= i002=	i001= i002=
P109	Mot. popair no.	i001=0 i002=0	i001= i002=	i001= i002=
P110	kT(n)	i001=0.00 i002=0.00	i001= i002=	i001= i002=
P111	kT deviation	i001=0.00 i002=0.00	i001= i002=	i001= i002=
P112	kT adap.start	i001=0 i002=0	i001= i002=	i001= i002=
P113	Torque(s)	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P115	kT-Depend. Speed	i001=0.0 i002=0.0	i001= i002=	i001= i002=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P116	kT-Depend. Temp.	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P163	Op/cl loop c type	4		
P173	Imax	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P208	S.speed actval.	i001=0 i002=0	i001= i002=	i001= i002=
P209	Pencodpulse no	i001=0 i002=0	i001= i002=	i001= i002=
P211	Resolver exic	i001=0 i002=0	i001= i002=	i001= i002=
P212	Resolver offset	i001=0 i002=0	i001= i002=	i001= i002=
P213	S. res. offset	0		
P230	n cont. vp	i001=1.000 i002=1.000 i003=1.000 i004=1.000	i001= i002= i003= i004=	i001= i002= i003= i004=
P231	Dynamics	i001=4 i002=4	i001= i002=	i001= i002=
P242	Start time	i001=0.000 i002=0.000	i001= i002=	i001= i002=
P260	Urmax(isd)	i001=100.0 i002=100.0	i001= i002=	i001= i002=
P267	Urmax(isq)	i001=100.0 i002=100.0	i001= i002=	i001= i002=
P272	R(stator)	i001=0.000 i002=0.000	i001= i002=	i001= i002=
P308	Sampling Time	1.0		
P330	MotId	0		
P331	MotId amplitude	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P332	MotId cycles	i001=0 i002=0	i001= i002=	i001= i002=
P354	Ground fault test	0		
P357	Grnd test limit	1.0		
P360	Mot.tmp.alarm	i001=80 i002=80	i001= i002=	i001= i002=
P361	Mot.tmp.fault	i001=110 i002=110	i001= i002=	i001= i002=
P420	Sys. rat. freq.	3000.0		

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P421	Fixed setpoint 1	i001=3000.0 i002=3000.0 i003=3000.0 i004=3000.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P422	Fixed setpoint 2	i001=-3000.0 i002=-3000.0 i003=-3000.0 i004=-3000.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P423	Fixed setpoint 3	i001=1000.0 i002=1000.0 i003=1000.0 i004=1000.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P424	Fixed setpoint 4	i001=250.0 i002=250.0 i003=250.0 i004=250.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P425	Motpot. stor.	0		
P426	Motpot. strt. sp.	0.0		
P433	S. suppl. setp. 1	i001=0 i002=0	i001= i002=	i001= i002=
P436	Suppl.setp 1 inv.	i001=0 i002=0	i001= i002=	i001= i002=
P438	S. suppl. setp. 2	i001=0 i002=0	i001= i002=	i001= i002=
P441	Suppl. setp. 2 inv.	i001=0 i002=0	i001= i002=	i001= i002=
P443	S. main setp.	i001=1002 i002=1001	i001= i002=	i001= i002=
P446	Main setp. inv.	i001=0 i002=0	i001= i002=	i001= i002=
P448	Inch speed 1	200.0		
P449	Inch speed 2	1000.0		
P452	Max. speed (RDF)	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P453	Max. speed (LDF)	i001=0.0 i002=0.0	i001= i002=	i001= i002=
P462	Ramp-up time	i001=10.00 i002=10.00 i003=0.01 i004=0.01	i001= i002= i003= i004=	i001= i002= i003= i004=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P464	Ramp-down time	i001=20.00 i002=20.00 i003=0.01 i004=0.01	i001= i002= i003= i004=	i001= i002= i003= i004=
P476	RFG active hys.	1.0		
P485	Rated system M	100.0		
P486	S. torque sepoint	i001=0 i002=0	i001= i002=	i001= i002=
P489	Torque setpoint inv.	i001=0 i002=0	i001= i002=	i001= i002=
P492	M limit (mot) FSW	i001=100.0 i002=100.0 i003=100.0 i004=100.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P493	S. M lim. (mot)	i001=1001 i002=1001	i001= i002=	i001= i002=
P498	M lim. (gen) FSW	i001=-100.0 i002=-100.0 i003=-100.0 i004=-100.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P499	S. M lim (gen)	i001=1001 i002=1001	i001= i002=	i001= i002=
P505	M fixed setpoint	i001=5.0 i002=5.0 i003=5.0 i004=5.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P506	S. suppl. torque setp.	i001=0 i002=0	i001= i002=	i001= i002=
P507	M suppl. setp. Kp	i001=1.00 i002=1.00	i001= i002=	i001= i002=
P509	M suppl. setp. inv.	i001=0 i002=0	i001= i002=	i001= i002=
P512	Comp. speed	3000.0		
P513	Comp. speed hys.	3.0		
P514	OFF shutdown speed	100.0		
P516	OFF delay time	i001=0.0 i002=0.0 i003=0.0 i004=0.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P517	Sp.-act. dev. frq.	300.0		
P518	Sp. act. dev. time	3.0		
P519	Overspeed hys.	10.0		

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P525	Fix Setp ProcReg	i001=0.00 i002=0.00	i001= i002=	i001= i002=
P526	Src ProcReg Setp	i001=0 i002=0	i001= i002=	i001= i002=
P527	SetpGain ProcReg	i001=100.00 i002=100.00	i001= i002=	i001= i002=
P528	SmoothProcRegSet	0.00		
P530	ActVal's ProcReg	i001=0 i002=0	i001= i002=	i001= i002=
P531	SRC ProcReg ActV	i001=0 i002=0	i001= i002=	i001= i002=
P532	Gain ProcRegActV T	i001=100.00 i002=100.00	i001= i002=	i001= i002=
P533	Smth ProcRegActV	0.00		
P535	R,g. T:Hyst.	3.0		
P537	Gain ProcReg	1.00		
P538	IntTConstProcReg	0.00		
P539	DifTConstProcReg	0.00		
P541	ProcReg Up1Limit	200.00		
P542	ProcReg Up2Limit	-200.00		
P543	ProcReg AccTime1	0.00		
P544	ProcRegAccTime2	0.00		
P554	S. ON/OFF1	i001=1010 i002=1001	i001= i002=	i001= i002=
P555	S. 1OFF2 (elec.)	i001=1 i002=1002	i001= i002=	i001= i002=
P556	S.2 OFF2(elec.)	i001=1 i002=1	i001= i002=	i001= i002=
P557	S.3 OFF2 (elec.)	i001=1 i002=1	i001= i002=	i001= i002=
P558	S.1 OFF3 (fst stp)	i001=1 i002=1	i001= i002=	i001= i002=
P559	S.2 OFF3 (fst stp)	i001=1 i002=1	i001= i002=	i001= i002=
P560	S.3 OFF3 (fst stp)	i001=1 i002=1	i001= i002=	i001= i002=
P561	S. inv. enable	i001=1 i002=1	i001= i002=	i001= i002=
P562	S. RFG enable	i001=1 i002=1	i001= i002=	i001= i002=
P563	S. no RFG stop	i001=1 i002=1	i001= i002=	i001= i002=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P564	S.setp. enable	i001=1 i002=1	i001= i002=	i001= i002=
P565	S.1 acknow.	i001=0 i002=1003	i001= i002=	i001= i002=
P566	S.2 acknow.	i001=0 i002=0	i001= i002=	i001= i002=
P567	S.3 acknow.	i001=2001 i002=2001	i001= i002=	i001= i002=
P568	S.inch1 ON	i001=0 i002=0	i001= i002=	i001= i002=
P569	S.inch2 ON	i001=0 i002=0	i001= i002=	i001= i002=
P571	S.CWphseseq	i001=1 i002=1	i001= i002=	i001= i002=
P572	S.CCWphseseq	i001=1 i002=1	i001= i002=	i001= i002=
P573	S.motpot. raise	i001=1010 i002=0	i001= i002=	i001= i002=
P574	S.motpot. low	i001=1010 i002=0	i001= i002=	i001= i002=
P575	S.no fault ext.1	i001=1 i002=1	i001= i002=	i001= i002=
P576	S.SDS bit 0	i001=0 i002=0	i001= i002=	i001= i002=
P577	S.SDS bit 1	i001=0 i002=0	i001= i002=	i001= i002=
P578	S.MDS bit 0	i001=0 i002=0	i001= i002=	i001= i002=
P580	S.FSW bit 0	i001=0 i002=1004	i001= i002=	i001= i002=
P581	S.FSW bit 1	i001=0 i002=0	i001= i002=	i001= i002=
P583	S.restart enable	i001=0 i002=0	i001= i002=	i001= i002=
P584	Src.TReg.Enable	i001=0 i002=0	i001= i002=	i001= i002=
P585	S. con enable	i001=1 i002=1	i001= i002=	i001= i002=
P586	S. n flt ext 2	i001=1 i002=1	i001= i002=	i001= i002=
P587	S. slave drive	i001=0 i002=0	i001= i002=	i001= i002=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P588	S. no alrm ext. 1	i001=1 i002=1	i001= i002=	i001= i002=
P589	S. no alrm ext. 2	i001=1 i002=1	i001= i002=	i001= i002=
P590	S.base/res	1005		
P591	S.MCchckbcksig	1		
P600	ST. rdytswitch-on	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P601	ST. ready	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P602	ST. run	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P603	ST. fault	i001=1002 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P604	ST. no off 2	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P605	ST. no off 3	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P606	ST. swtch-on inhib.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P607	ST. alarm	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P608	ST. n sp.-act dev.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P610	ST. comp frq. err.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P611	ST. undervolt.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P612	ST. MC energized	i001=1001 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P613	ST. RFG active	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P614	ST. CW phseseq.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P618	ST. no oversp.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P619	ST. fault, ext. 1	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P620	ST. fault, ext. 2	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P621	ST. alarm ext.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P622	ST. alarm i2t conv.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P623	ST. flt. otmp cv.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P624	ST. alrm ot. cv.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P625	ST. alrm. ot. mt.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P626	ST. flt ot. mt.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P627	Dst ProcReg A=S	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P628	Dst PullOut/Blck	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P629	ST. BC energize	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P631	ST. pre-chrg act.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P650	CU-AE config.	0		
P651	CU-AE smooth.	4		
P652	CU-AE offset	0.000		
P655	CU-AA actual values	219		
P656	CU-AA gain	10.00		
P657	CU-AA offset	0.00		
P660	SCI-AE config.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P661	SCI-AE smooth.	i001=2 i002=2 i003=2 i004=2 i005=2 i006=2	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P662	SCI-AE offset	i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P664	SCI-AA actual values	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P665	SCI-AA gain	i001=10.00 i002=10.00 i003=10.00 i004=10.00 i005=10.00 i006=10.00	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P666	SCI-AA offset	i001=0.00	i001=	i001=
		i002=0.00	i002=	i002=
		i003=0.00	i003=	i003=
		i004=0.00	i004=	i004=
		i005=0.00	i005=	i005=
		i006=0.00	i006=	i006=
P680	SST1 act. vals	i001=968	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
		i004=0	i004=	i004=
		i005=0	i005=	i005=
		i006=0	i006=	i006=
		i007=0	i007=	i007=
		i008=0	i008=	i008=
		i009=0	i009=	i009=
		i010=0	i010=	i010=
		i011=0	i011=	i011=
		i012=0	i012=	i012=
		i013=0	i013=	i013=
		i014=0	i014=	i014=
		i015=0	i015=	i015=
		i016=0	i016=	i016=
P681	SST2 act. vals	i001=968	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=
		i004=0	i004=	i004=
		i005=0	i005=	i005=
		i006=0	i006=	i006=
		i007=0	i007=	i007=
		i008=0	i008=	i008=
		i009=0	i009=	i009=
		i010=0	i010=	i010=
		i011=0	i011=	i011=
		i012=0	i012=	i012=
		i013=0	i013=	i013=
		i014=0	i014=	i014=
		i015=0	i015=	i015=
		i016=0	i016=	i016=
P682	SCB protocol	0		
P683	SST/SCB bus addr.	i001=0	i001=	i001=
		i002=0	i002=	i002=
		i003=0	i003=	i003=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P684	SST/SCB bd rts	i001=6 i002=6 i003=6	i001= i002= i003=	i001= i002= i003=
P685	SST/SCB PKW No.	i001=127 i002=3 i003=3	i001= i002= i003=	i001= i002= i003=
P686	SST/SCB PZD No.	i001=2 i002=2 i003=2	i001= i002= i003=	i001= i002= i003=
P687	SST/SCB TLG rec.	i001=0 i002=0 i003=0	i001= i002= i003=	i001= i002= i003=
P689	SCB peer exp.	i001=0 i002=0 i003=0 i004=0 i005=0	i001= i002= i003= i004= i005=	i001= i002= i003= i004= i005=
P690	SCB act. values	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P694	CB/TB act. values	i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=
P695	CB/TB TLG rec.	1000		
P696	CB parameter 1	0		
P697	CB parameter 2	0		
P698	CB parameter 3	0		
P699	CB parameter 4	0		
P700	CB parameter 5	0		
P701	CB parameter 6	0		
P702	CB parameter 7	0		
P703	CB parameter 8	0		
P704	CB parameter 9	0		
P705	CB parameter 10	0		
P733	Simulations op.	0		
P735	TRC trigger par.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P736	TRC trigger val.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P737	TRC trigger cond.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P738	TRC act. values	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P739	TRC sample time	i001=1 i002=1 i003=1 i004=1 i005=1 i006=1 i007=1 i008=1	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P740	TRC pre-trig.	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P741	TRC start	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=

Par-No.	Parameter designation	Initialized value	Start-up setting	Start-up setting change
P750	TRC read index	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	i001= i002= i003= i004= i005= i006= i007= i008=	i001= i002= i003= i004= i005= i006= i007= i008=
P761	Pulse freq.	i001=5.000 i002=5.000	i001= i002=	i001= i002=
P789	RAM accss val	0		
P799	SF	0		
P917	Par. chnge rep.	0		
P918	CB bus addr.	3		
P927	Param. enable	6		
P928	S.base/res.	1005		
P952	No. of faults	0		
P970	Factory setting	1		
P971	EEPROM transfer	0		

No.	Date/time	Name/department	Fault- and diagnostic messages	Measures

No.	Date/time	Name/department	Fault- and diagnostic messages	Measures

12 Environmental friendliness

Environmental aspects during the develpment

The number of components has been significantly reduced over earlier converter series by the use of highly integrated components and the modular design of the complete series. Thus, the energy requirement during production has been reduced.

Special significance was placed on the reduction of the volume, weight and variety of metal and plastic components.

Plastic components:	ABS:	Front cover Fan cover PMU support panel
	PP:	Hinges Insulating panel Grip recess Bus retrofit
	PA6:	Insulating foils Terminal housing

Halogen-containing flame retardants were, for all essential components, replaced by environmentally-friendly flame retardants.

Environmental compatibility was an important criterium when selecting the supplied components.

Environmental aspects during production

Purchased components are generally supplied in recyclable packaging materials (board).

Surface finishes and coatings were eliminated with the exception of the galvanized sheet steel side panels.

ASIC devices and SMD devices were used on the boards.

The product is emission-free.

Environmental aspects for disposal

The unit can be broken-down into recyclable mechanical components as a result of the easily releasable screw- and snap connections.

The plastic components and moulded housing are to DIN 54840 and have a recycling symbol.

Units can be disposed of through certified disposal companies. Addresses are available from your local Siemens partner.

13 Technical Data

If you have other application conditions other than those listed in this section, please contact your local Siemens office.

Cooling medium temperature		0 °C to +40 °C
Storage temperature		– 25 °C to +70 °C
Transport temperature		– 25 °C to +70 °C
Environmental class	3K3	DIN IEC 721-3-3 Moisture condensation not permissible
Pollution level	2	DIN VDE 0110 Part 1
Overvoltage category	III	DIN VDE 0110 Part 2
Overvoltage property class	1	E DIN VDE 0160
Degree of protection – Standard	IP20	DIN VDE 0470 Section 1 ≙ EN 60529
Protection class	I	DIN VDE 0106 Section 1
Radio interference level – standard – option	 without B1	DIN VDE 0875 Section 11 ≙ EN 55011 EN55011
Noise immunity		EN50082-1
Mechanical strength		DIN IEC 68-2-6 / 06.90

	Frequency range Hz	Constant amplitude of the deflection mm	Constant amplitude of the acceleration m/s^2 (g)
– when stationary (in op.)	10 to 58	0.075	
	above 58 to 500		9.8 (1)
– during transport	5 to 9	3.5	
	above 9 to 500		9.8 (1)

The converters can also be operated in load class II. The permissible values must be taken from the following tables.

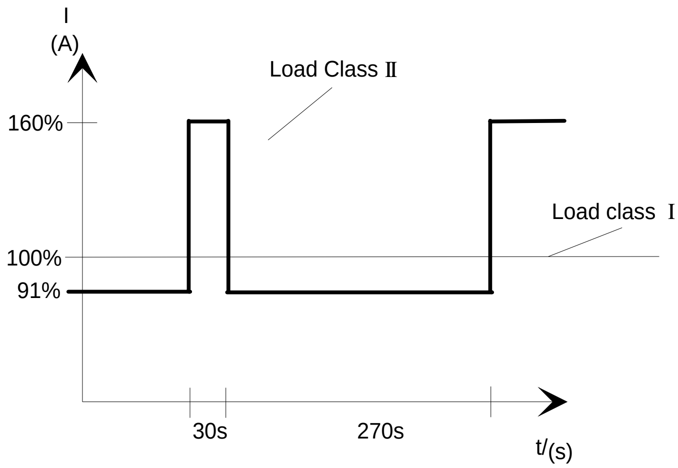


Fig. 13.1 Output according to load class II

DC-AC Converter	6SE70...	21-1RA30	21-3RA30	21-8RB30	22-3RB30	23-2RB30	24-4RC30
Rated voltage, rated frequency, rated current, rated power							
Rated voltage U_n Input Output	V	 DC 280 to 310 ±15 % 3 AC 0 to rated D.C. voltage/ 1.35					
Rated frequency f_n Output:	Hz	 0 ... 400					
Rated current I_n Input Output	A	 12,6 10,6	 15,8 13,3	 21,1 17,7	 27,3 22,9	 38,3 32,2	 52,6 44,2
DC Link U_{dn}	V	= Rated D.C. voltage					
Rated power	kVA	3,8...4,2	4,8...5,3	6,4...7,1	8,3...9,1	11,6...12,8	15,9...17,6
Auxiliary power supply	V	DC 24 (20-30) (2,0 A without Options; with Options refer to Section 9.1)					
Loading class II according to EN 60146-1-1							
Rated current	A	9,6	12,1	16,1	20,8	29,3	40,2
Base load time	s	240					
Over current	A	14,4	18,1	24,1	31,1	43,8	60,1
Over current time	s	60					
Losses, Cooling, Power factor							
Power factor Converter $\cos\varphi_U$		 <0,92 ind.	 <0,92 ind.	 <0,92 ind.	 <0,92 ind.	 <0,92 ind.	 <0,92 ind.
Efficiency η – Pulse frequency 6 kHz		 0,97	 0,97	 0,98	 0,98	 0,98	 0,98
Power loss – Pulse frequency 6 kHz	kW	 0,11	 0,13	 0,15	 0,18	 0,24	 0,31
Air cooling requirements	m^3/s	0,009	0,009	0,022	0,022	0,022	0,028
Pressure drop Δp	Pa	10	10	32	32	32	30
Sound pressure level, Size, Weight							
Sound pressure level	dB(A)	60	60	60	60	60	60
Housing size		A	A	B	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	135 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8	8	12	12	12	24

DC-AC Converter	6SE70...	25-4RD30	27-0RD30	28-1RD30			
Rated voltage, rated frequency, rated current, rated power							
Rated voltage U_n Input Output	V	 DC 280 to 310 ±15 % 3 AC 0 to rated D.C. voltage/ 1,35					
Rated frequency f_n Output:	Hz	 0 ... 400					
Rated current I_n Input Output	A	 64,3 54,0	 82,1 69,0	 96,4 81,0			
DC Link U_{dn}	V	= Rated D.C. voltage					
Rated power	kVA	19,5...21,5	24,9...27,5	29,2...32,3			
Auxiliary power supply	V	DC 24 (20-30) (2,0 A without Options; with Options refer to Section 9.1)					
Auxiliary power supply	V	AC 230 ±15% (0,4 A)					
Loading class II according to EN 60146-1-1							
Rated current	A	64,3	62,8	73,7			
Base load time	s	240					
Over current	A	54,0	93,8	110			
Over current time	s	60					
Losses, Cooling, Power factor							
Power factor Converter $\cos\varphi_U$		 <0,92 ind.	 <0,92 ind.	 <0,92 ind.			
Efficiency η – Pulse frequency 6 kHz		 0,98	 0,98	 0,98			
Power loss – Pulse frequency 6 kHz	kW	 0,49	 0,61	 0,67			
Air cooling requirements	m^3/s	0,054	0,054	0,054			
Pressure drop Δp	Pa	230	230	230			
Sound pressure level, Size, Weight							
Sound pressure level	dB(A)	65	65	65			
Housing size		D	D	D			
Width Height Depth	mm	270 600 350	270 600 350	270 600 350			
Weight	kg	35	35	35			

DC-AC Converter	6SE70...	16-1TA30	18-0TA30	21-0TA30	21-3TB30	21-8TB30	22-6TC30
Rated voltage, rated frequency, rated current, rated power							
Rated voltage U_n Input Output	V	 DC 510 to 620 ±15 % 3 AC 0 to rated D.C. voltage/ 1,35					
Rated frequency f_n Output:	Hz	 0 ... 400					
Rated current I_n Input Output	A	 7,3 6,1	 9,5 8,0	 12,1 10,2	 15,7 13,2	 20,8 17,5	 30,4 25,5
DC Link U_{dn}	V	= Rated D.C. voltage					
Rated power	kVA	4...4,9	5,3...6,4	6,7...8,1	8,7...10,5	11,5...13,9	16,8...20,3
Auxiliary power supply	V	DC 24 (20-30) (2,0 A without Options; with Options refer to Section 9.1)					
Loading class II according to EN 60146-1-1							
Rated current	A	5,6	7,3	9,3	12,0	15,9	23,2
Base load time	s	240					
Over current	A	8,3	10,9	13,9	17,9	23,8	35,0
Over current time	s	60					
Losses, Cooling, Power factor							
Power factor Converter $\cos\varphi_U$		 <0,92 ind.	 <0,92 ind.	 <0,92 ind.	 <0,92 ind.	 <0,92 ind.	 <0,92 ind.
Efficiency η – Pulse frequency 6 kHz		 0,97	 0,98	 0,98	 0,98	 0,98	 0,98
Power loss – Pulse frequency 6 kHz	kW	 0,10	 0,11	 0,13	 0,15	 0,19	 0,31
Air cooling requirements	m^3/s	0,009	0,009	0,009	0,022	0,022	0,028
Pressure drop Δp	Pa	10	10	10	32	32	30
Sound pressure level, Size, Weight							
Sound pressure level	dB(A)	60	60	60	60	60	60
Housing size		A	A	A	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	90 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8	8	8	12	12	24

DC-AC Converter	6SE70...	23-4TC30	23-8TD30	24-7TD30	26-0TD30	27-2TD30	
Rated voltage, rated frequency, rated current, rated power							
Rated voltage U_n Input Output	V	DC 510 to 620 ±15 % 3 AC 0 to rated D.C. voltage/ 1,35					
Rated frequency f_n Input Output: U/f = constant U = constant	Hz	0 ... 100 28 ... 400					
Rated current I_n Input Output	A	40,5 34,0	44,6 37,5	55,9 47,0	70,2 59	85,7 72,0	
DC Link U_{dn}	V	= Rated D.C. voltage					
Rated power	kVA	22,4...27,1	24,7...29,9	30,9...37,4	38,8...47,0	47,4...57,4	
Auxiliary power supply	V	DC 24 (20-30) (2,0 A without Options; with Options refer to Section 9.1)					
Auxiliary power supply	V		AC 230 ±15% (0,4 A)				
Loading class II according to EN 60146-1-1							
Rated current	A	31,0	34,1	42,8	53,6	65,5	
Base load time	s	240					
Over current	A	46,0	51	63,5	80,2	97,2	
Over current time	s	60					
Losses, Cooling, Power factor							
Power factor Converter $\cos\varphi_U$		<0,92 ind.	<0,92 ind.	<0,92 ind.	<0,92 ind.	<0,92 ind.	
Efficiency η (In operation with rated data , f_n = 50/60 Hz)		0,98 0,98	0,98 0,98	0,98 0,98	0,98 0,98	0,98 0,98	
Power loss – at rated current f_n = 50/60 Hz	kW	0,37 0,43	0,49 0,55	0,58 0,67	0,70 0,79	0,86 0,97	
Air cooling requirements	m^3/s	0,028	0,054	0,054	0,054	0,054	
Pressure drop Δp	Pa	30	230	230	230	230	
Sound pressure level, Size, Weight							
Sound pressure level	dB(A)	60	65	65	65	65	
Housing size		C	D	D	D	D	
Width Height Depth	mm	180 600 350	270 600 350	270 600 350	270 600 350	270 600 350	
Weight	kg	24	35	35	35	35	

13.1 De-rating for an increased cooling medium temperature

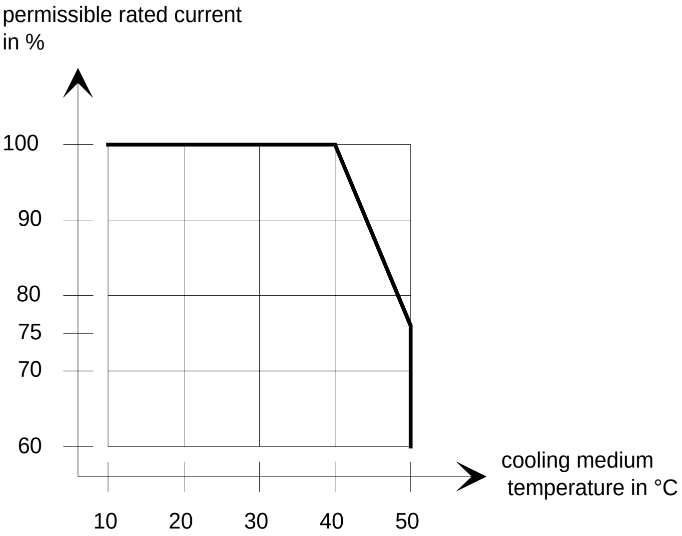


Fig. 13.2 Max. permissible rated current as a function of the cooling medium temperature

13.2 De-rating at installation altitudes > 1000 m above sea level

For installation altitudes > 1000 m above sea level, the rated current must be reduced. For installation altitudes > 2000 m above sea level, the rated voltage must be reduced (see Fig. 13.3). Installation altitudes > 4000 m above sea level are not permissible.

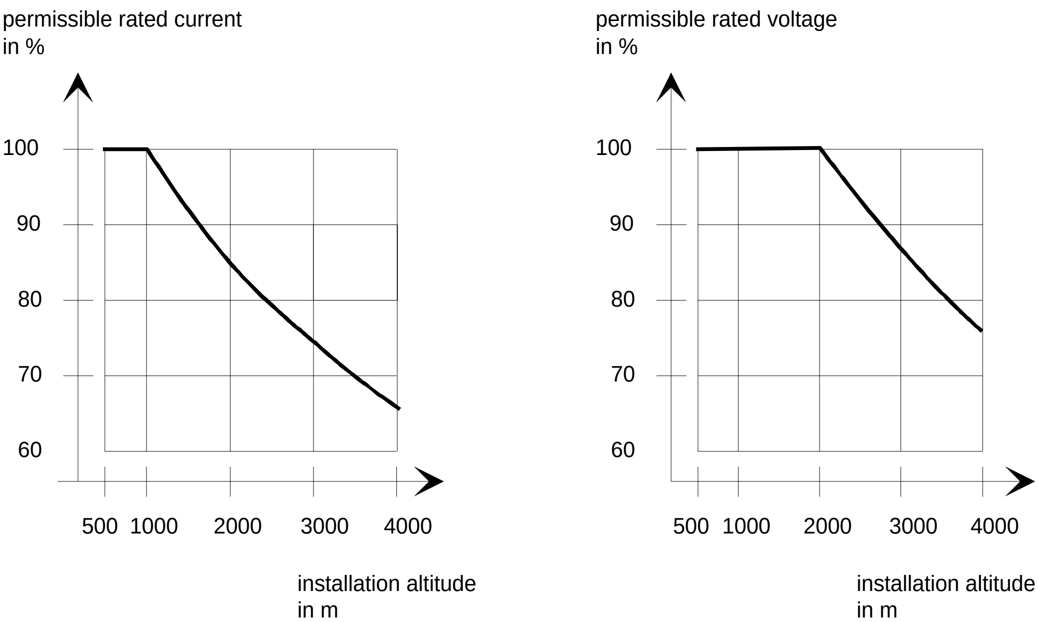


Fig. 13.3 Max. permissible rated current and rated voltage as a function of the installation altitude

13.3 De-rating as a function of the pulse frequency

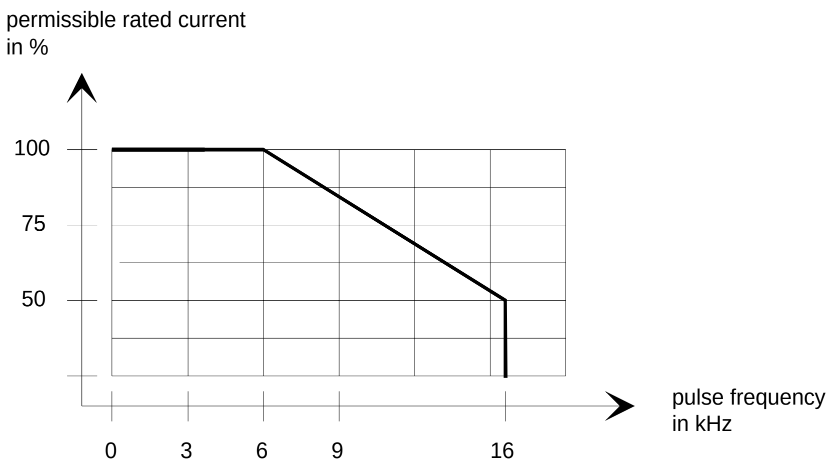


Fig. 13.4 Max. permissible rated current as a function of the pulse frequency

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Kathmandu

OMAN
Waleed Associates
Muscat
oder
Siemens Resident Engineers
Dubai

PAKISTAN
Siemens Pakistan Engineering Co. Ltd.
Karachi
Faisalabad
Islamabad
Lahore
Peshawar
Quetta

PHILIPPINNES
Siemens Inc.
Metro Manila
Maschinen + Technik Inc. (MATEC)
Metro Manila

QATAR
Trags Electrical Engineering and Air Conditioning Co.
Doha
oder
Siemens Resident Engineers
Dubai

SAUDI ARABIA
Arabia Electric Ltd. (Equipment)
Jeddah
Al Khobar
Riyadh

SINGAPORE
Siemens (Pte.) Ltd.
Singapore
Guthrie Engineering (S) Pte. Ltd.
Singapore

SRI LANKA
Dimo Limited
Colombo

SYRIA
Al-Shatta for Technical Engineering (A.S.T.E.)
Damascus

TAIWAN
Siemens Ltd.
Taipei

THAILAND
Advanced Electrical Engineering Systems Ltd.
(AEES)-Bangkok

UNITED ARAB EMIRATES
Electro Mechanical Est.
Abu Dhabi
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Abu Dhabi
Scientechnic
Dubai
oder
Siemens Resident Engineers
Dubai

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Brisbane
Perth
Sydney

NEW ZEALAND
Siemens Limited
Auckland

16 Certificates

SIEMENS

Drives and Standard Products Group

Test certificate

Erlangen, 01.07.1995

Equipment	AC drive
• Type	SIMOVERT MASTER DRIVES
• Order No.:	6SE70... 1)

The routine testing according to these test instructions	475 100.9000.00 QP	for size A - D
	476 100.9000.00 QP	for size E - H
	476 200.9000.00 QP	for size J - M

Tests performed:	I. Product check	• checking of presence of all components acc. to parts list
	II. Isolation test	• DIN VDE 0160 draft 04.91, par. 7.6.1 • CSA 22.2-14.M91, par. 6.8
	III. Functional test acc. to DIN VDE 0558, part1	• power supply • customer terminals and interfaces • power conversion section • protective and monitoring functions
	IV. RUN-IN	• Ambient temperature 55 °C cycled • Duration 24 up to 72 hours • Scampling 10 % to 100 %

The equipment complied with the test requirements.
Test results are documented within the production data file.

1) For complete type, serial number and technical data please see rating plate.

ASI 1 PE D F

Schlögel

ASI 1
System-Based
Drive Technology

SIEMENS

Drives and Standard Products Group

Confirmation

Erlangen, 01.07.1995

This confirms that

Equipment AC drive

- **Type** SIMOVERT MASTER DRIVES
- **Order No.:** 6SE70...

is manufactured in conformance with DIN VDE 0558, Part 2 and DIN VDE 0113, Part 6.2.

This equipment fulfills the shock hazard protection requirements according to DIN VDE 0106, Part 100 when the following safety rules are observed:

- Service work in operation is only permissible at the electronics box
- The converter must be switched into a no-voltage condition and isolated from the supply when replacing any part/component
- All panels must be closed during operation.

Thus, this equipment conforms to the appropriate regulations in Germany according to VBG 4 §2 (2) (VBG is a German regulatory body for safety-related issues).

The local operating regulations (e.g. DIN VDE 0105) must be observed when operating the equipment.

ASI 1 PE D T

Dr. Link

ASI 1
System-Based
Drive Technology

SIEMENS

EG-Herstellererklärung

(nach Art. 4 Abs. 2 der EG-Richtlinie 89/392/EWG MSR)

4SE.475 000 0000.00 HE

Hersteller: Siemens Aktiengesellschaft
Bereich Antriebs-, Schalt- und Installationstechnik
Geschäftsgebiet Antriebstechnik
Geschäftszweig Drehzahlveränderbare Antriebe
Anschrift: Postfach 3269
D-91050 Erlangen

Produktbezeichnung: SIMOVERT
Typ 6 SE 70 Kompaktgeräte AC-AC und DC-AC

Das bezeichnete Produkt ist ausschließlich zum Einbau in eine andere Maschine bestimmt. Die Inbetriebnahme ist solange untersagt, bis die Konformität des Endproduktes mit der Richtlinie 89/392/EWG des Rates, festgestellt ist.

Wir bestätigen die Konformität des oben bezeichneten Produktes mit den Normen:

EN 60204-1 (DIN EN 60204 Teil 1 / VDE 0113 Teil 1)

VDE 0160
VDE 0558 Teil 1

Erlangen, den 10. 02. 1995

Siemens Aktiengesellschaft

i. V.

H. Mickal
Leiter der Produktionseinheit
Drehzahlveränderbare Antriebe

i. V.

G. Löw
Leiter der kaufmännischen Abteilung
Drehzahlveränderbare Antriebe

usicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

The following versions have appeared so far:

Version	Internal Item number
AC	475 344.4100.76 J

Version AC consists of the following chapters

Chapters		Changes	Pages	Version date
0	General			06.98
1	Description	First Edition	2	01.95
2	Transport, Unpacking, Installation	First Edition	4	01.95
3	Connecting-up	Revised Edition	13	06.98
4	Start-up	Revised Edition	64	06.98
5	Parameter List	Revised Edition	49	06.98
6	Operator control	Revised Edition	4	06.98
7	Fault and Alarm Messages	Revised Edition	7	06.98
8	Maintenance	First Edition	4	01.95
9	Options	First Edition	8	01.95
10	Spare Parts	First Edition	1	01.95
11	Logbook	Revised Edition	16	06.98
12	Environmental friendliness	First Edition	1	01.95
13	Technical Data	First Edition	7	01.95
14	Index	First Edition	1	01.95
15	Adressess	First Edition	2	01.95
16	Certificates	First Edition	3	06.98

Siemens AG
Group: Automation and Drives (A&D)
Division: Variable-Speed Drive Systems
Postfach 3269, D-91050 Erlangen

Siemens Aktiengesellschaft

Subject to change without notice

Order No.: 6SE7087-6AD30
Printed in the Federal Republic of Germany
06.98

SIEMENS

SIMOVERT MASTER DRIVES

Vector Control (VC)

Operating Instructions
Part 2

Edition: AB

Order-No.: 6SE7087-6XX20

Overview of the MASTER DRIVES Operating Instructions:

Operating Instructions	consists of Part 1	Part 2
6SE708_-_AD10	6SE708_-_AD70	6SE708_-_XX10
6SE708_-_AD20	6SE708_-_AD70	6SE708_-_XX20
6SE708_-_AD30	6SE708_-_AD70	6SE708_-_XX30
6SE708_-_BD10	6SE708_-_BD70	6SE708_-_XX10
6SE708_-_BD20	6SE708_-_BD70	6SE708_-_XX20
6SE708_-_BD30	6SE708_-_BD70	6SE708_-_XX30
6SE708_-_AH10	6SE708_-_AH70	6SE708_-_XX10
6SE708_-_AH20	6SE708_-_AH70	6SE708_-_XX20
6SE708_-_AH30	6SE708_-_AH70	6SE708_-_XX30
6SE708_-_BH10	6SE708_-_BH70	6SE708_-_XX10
6SE708_-_BH20	6SE708_-_BH70	6SE708_-_XX20
6SE708_-_BH30	6SE708_-_BH70	6SE708_-_XX30
6SE708_-_BM20	6SE708_-_BM70	6SE708_-_XX20

→ You will receive Parts 1 and 2 of the Operating Instructions when you use this Order No. Parts 1 and 2 can be individually ordered by specifying the particular Order No.

_-_ stands for the language code, e.g. 0-0 for German Editions.

The following foreign language Editions of these Operating Instructions are available:

Language	English	French	Spanish	Italian
Language code	7-6	7-7	7-8	7-2

These Operating Instructions are valid for software release V1.3.

Contents

Definitions

- QUALIFIED PERSONAL

  For the purpose of these instructions and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

  1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
  2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
  3. Trained in rendering first aid.

- DANGER

  For the purpose of these instructions and product labels, "Danger" indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.

- WARNING

  For the purpose of these instructions and product labels, "Warning" indicates death, severe personal injury or property damage can result if proper precautions are not taken.

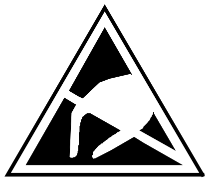
- CAUTION

  For the purpose of these instructions and product labels, "Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.

- NOTE

  For the purpose of these instructions, "Note" indicates information about the product or the respective part of the Instruction Manual which is essential to highlight.

NOTE
These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser’s purposes, the matter should be referred to the local Siemens sales office. The contents of this Instruction Manual shall not become part of or modify any prior or existing agreement, committment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.



CAUTION

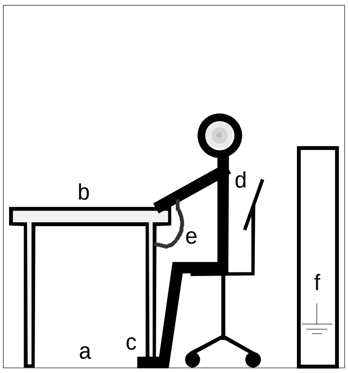
Components which can be destroyed by electrostatic discharge (ESD)

The converters contain components which can be destroyed by electrostatic discharge. These components can be easily destroyed if not carefully handled. If you have to handle electronic boards please observe the following:

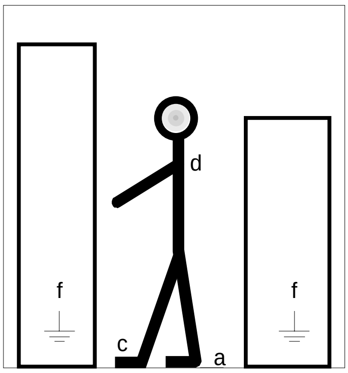
- Electronic boards should only be touched when absolutely necessary.
- The human body must be electrically discharged before touching an electronic board
- Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from man-made fibers
- Boards must only be placed on conductive surfaces
- When soldering, the soldering iron tip must be grounded
- Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes, metal containers)
- If the packing material is not conductive, the boards must be wrapped with a conductive packaging material, e.g. conductive foam rubber or household aluminum foil.

The necessary ECB protective measures are clearly shown in the following diagram:

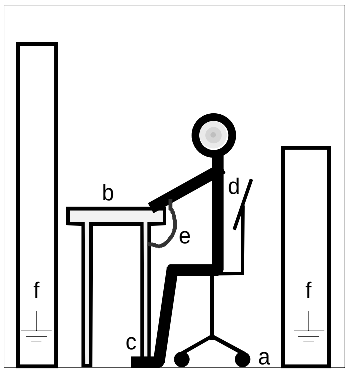
a	=	Conductive floor surface	d	=	ESD overall
b	=	ESD table	e	=	ESD chain
c	=	ESD shoes	f	=	Cubicle ground connection



Sitting



Standing



Standing / Siting

WARNING

Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the safety instructions can result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

Safety and operating instructions for drive converters

Safety and operating instructions for drive converters

(in conformity with the low-voltage directive 73/23/EEC)

1. General

In operation, drive converters, depending on their degree of protection, may have live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces.

In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

For further information, see documentation.

All operations serving transport, installation and commissioning as well as maintenance are to be carried out **by skilled technical personnel** (Observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN/VDE 0110 and national accident prevention rules!).

For the purposes of these basic safety instructions, "skilled technical personnel" means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Intended use

Drive converters are components designed for inclusion in electrical installations or machinery.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 89/392/EEC (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the starting of normal opertion) is admissible only where conformity with the EMC directive (89/336/EEC) has been established.

The drive converters meet the requirements of the low-voltage directive 73/23/EEC. They are subject to the harmonized standards of the series prEN 50178/DIN VDE 0160 in conjunction with EN 60439-1/ VDE 0660, part 500, and EN 60146/ VDE 0558.

The technical data as well as information concerning the supply conditions shall be taken from the rating plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

The installation and cooling of the appliances shall be in accordance with the specifications in the pertinent documentation.

The drive converters shall be protected against excessive strains. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatic sensitive components which are liable to damage through improper use. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

When working on live drive converters, the applicable national accident prevention rules (e.g. VBG 4) must be complied with.

The electrical installation shall be carried out in accordance with the relevant requirements (e.g. cross-sectional areas of conductors, fusing, PE connection). For further information, see documentation.

Instructions for the installation in accordance with EMC requirements, like screening, earthing, location of filters and wiring, are contained in the drive converter documentation. They must always be complied with, also for drive converters bearing a CE marking. Observance of the limit values required by EMC law is the responsibility of the manufacturer of the installation or machine.

6. Operation

Installations which include drive converters shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. Act respecting technical equipment, accident prevention rules etc. Changes to the drive converters by means of the operating software are admissible.

After disconnection of the drive converter from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this respect, the corresponding signs and markings on the drive converter must be respected.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer’s documentation shall be followed.

Keep safety instructions in a safe place!

1 Control terminal strip and serial interface

WARNING
The unit must be disconnected and locked-out before control cables are connected to the CU.

The unit can be controlled via the following interfaces:

♦ Control terminal strip -X101 to -X103 on the electronics board CU

♦ RS485 (SST2) serial interfaces; control terminal strip -X100 on the electronics board CU.

♦ OP operator control panel (Section "Options" in the Operating Instructions, Part 1)

♦ RS485 and RS232 serial interfaces (SST1) on the PMU -X300

CAUTION
The CU board contains components which can be destroyed by electrostatic discharge. These components can be very easily destroyed if not handled with caution. Also refer to the ECB cautionary measures in the Section, General Information.

1.1 Connectors for the control terminal strip

The connectors for the control terminal strip are supplied (loose) with the unit. Cables with cross-sections from 0.14 mm^2 to 1.5 mm^2 (AWG: 26 to 16), or 1 mm^2 (AWG: 18) can be connected using stranded wire with lugs at the connector (recommended: 0.5 mm^2 (AWG: 20)). The connectors can be identified using the pin numbers (Table 1.1); the connector position on the board is illustrated in Fig. 1.1. Two screen clamps and four cable ties are required from the loose components supplied to connect the control cables.

The remaining connector X9, included loose with the equipment, is required to control a main contactor and for connecting an external power supply (Section „Auxiliary power supply/main contactor“ in the Operating Instructions, Part 1).

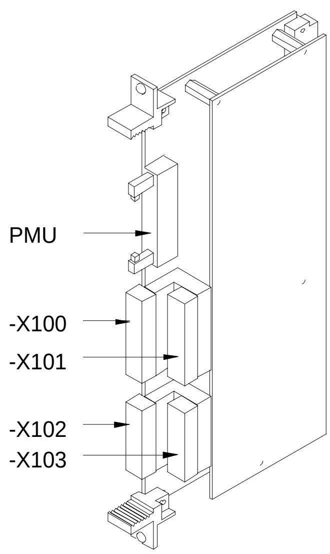


Fig. 1.1 Control terminals on CU

Connector		Labeling										
X100	12-pin, coded	1	2	3	CU2	6	7	8	9	10	11	12
X101	12-pin, coded	13	14	15	CU2	18	19	20	21	22	23	25
X102	10-pin	25	26	27	28	CU2	31	32	33	34		
X103	10-pin, coded	35	36	37	38	CU2	41	42	43	44		

Table 1.1 Connectors for the control terminal strip are supplied loose

1.1.1 Connecting-up the control cables

NOTE
As a general rule, it is recommended that shielded control wiring be used for signals connected directly to the chassis, in order to achieve maximum noise immunity. The shield must be grounded at both ends. To avoid noise coupling, control wires which are directly connected to the chassis should be separated from power wiring by a minimum distance of 20 cm. For drives wired in approved factories, internal wiring practices which achieve acceptable noise immunity results may be used for drive connections. Control- and cables must cross each other at an angle of 90°.

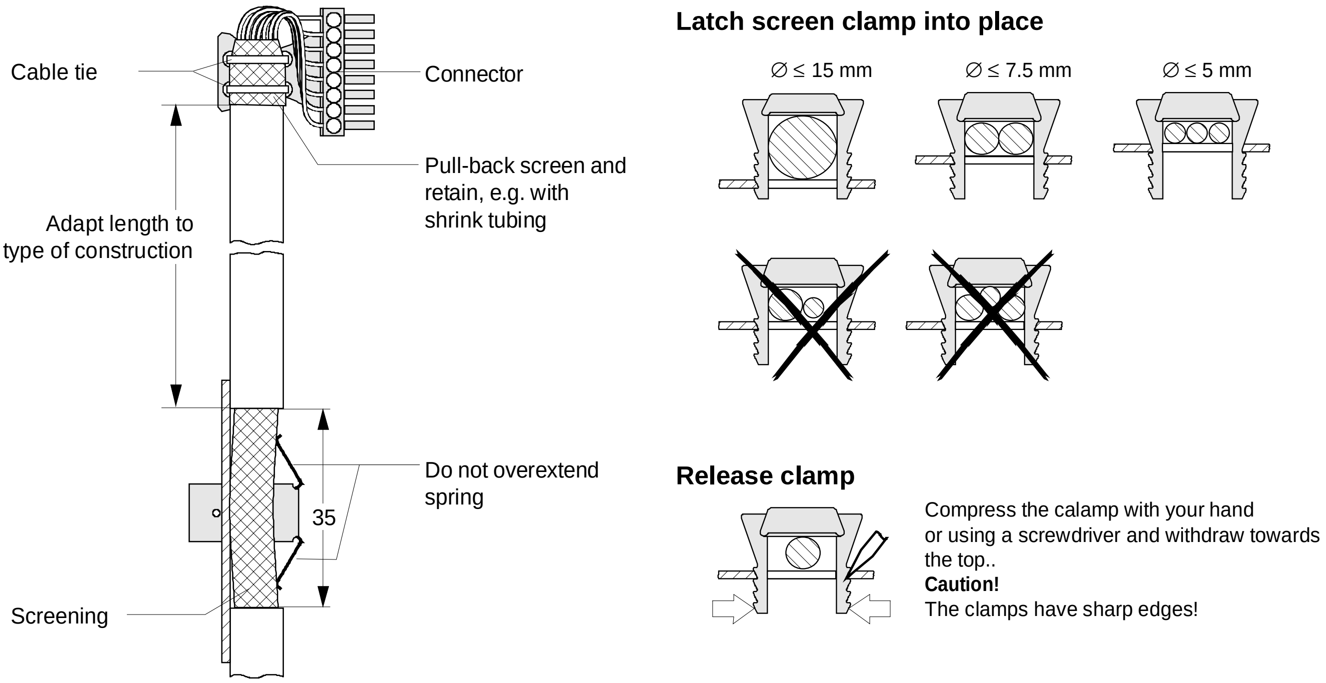


Fig. 1.2 Connecting-up the control cables and the technique for using the screen clamps

The "EMC screened housing" option should be used if so many control cables are required that two screen clamps are not sufficient.

Order No.:
- Type A 6SE7090-0XA87-3CA0
- Type B 6SE7090-0XB87-3CA0
- Type C 6SE7090-0XC87-3CA0
- Type D 6SE7090-0XD87-3CA0

1.2 Terminal connection

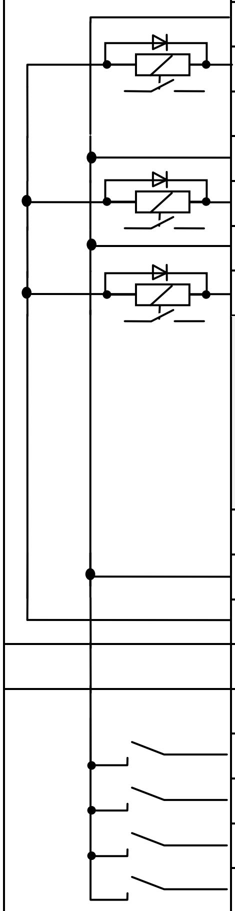
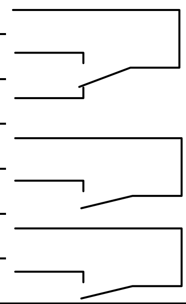
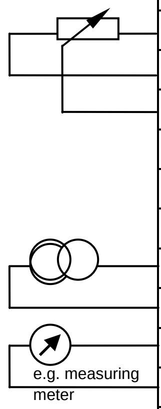
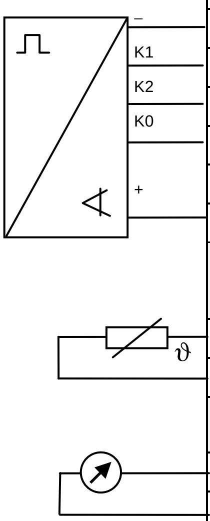
Connecting example	Term.	Function, notes
	-X100	
	1	Transmit- and receive line -RS485, differential input / -output, positive (RS485R/T+)
	2	Transmit- and receive line -RS485, differential input / -output, negative (RS485R/T–)
	3	Transmit output RS485 Standard, differential output, positive (RS485T+)
	4	Transmit output RS485 Standard, differential output, negative (RS485T–)
	5	Reference potential, RS485 interface
	NOTE	In addition to the GSST_2 interface on -X100, a GSST_1 interface -X300 is available on the parameterization unit; ⇒ Chapter 4 „Start-up“.
	NOTE	Binary output 1 is located on -X9: - Contact 4,5 on 5-pole version - Contact 7,9 on 9-pole version
	6	Binary output 2 (changeover contact) reference contact 
	7	Binary output 2 (changeover contact) NO contact
	8	Binary output 2 (changeover contact) NC contact
	9	Binary output 3 (NO contact) reference contact
	10	Binary output 3 (NO contact) NO contact
	11	Binary output 4 (NO contact) reference contact
	12	Binary output 4 (NO contact) NO contact
	NOTE	Load capability of the binary outputs: 60 V AC, 60 VA, cosφ = 1 60 V AC, 16 VA, cosφ = 0.4 60 V DC, 24 W Inductive loads, e.g. contactors, relays, for DC voltage loads, must be damped using a diode or varistor, and for AC loads, with a varistor or RC element.
	-X101	
	13	+24 V, 75 mA for binary inputs and outputs (150 mA if term. 23 unassigned)
	14	Ref. potential for 24 V (ground)
	15	Ref. potential for binary inputs 1 to 7 for ext. signal voltage
	16	Binary input 1
	17	Binary input 2
	18	Binary input 3
	19	Binary input 4
	20	Binary input 5
	21	Binary input 6
	22	Binary input 7
	NOTE	Signal sensitivity of the binary inputs: H = 24 V (13 V to 33 V) I_{max} = 15.7 mA L = 0 V (–0.6 V to 3 V)
	23	+24 V, 75 mA for binary inputs and outputs (150 mA if term. 13 unassigned)
	24	Ref. potential for 24 V

Table 1.2 Connecting example for control terminal strips -X100 and -X101



Connecting example	Term.	Function, notes
	-X102	
	25	+10 V / 5 mA, ±2 %, for setpoint pot., non-floating
	26	–10 V / 5 mA, ± 2%, for setpoint pot., non-floating
	27[1]	Analog input 1 (0 V to ±10 V)
	28	Ref. potential, analog input 1
	29[1]	Analog input 1 (0 mA to 20 mA or. 4 mA to 20 mA) int. load resistor 250 Ω
	30[2]	Analog input 2 (0 V to ±10 V)
	31	Ref. potential, analog input 2
	32[2]	Analog input 2 (0 mA to 20 mA or 4 mA to 20 mA) int. load resistor 250 Ω
	33	Ref. potential, analog output 1
	34	Analog output 1 (0 V to 10 V) permissible load ≤ 5 mA ≙ > 2 kΩ
	NOTE	Terminals 33 and 34: To increase the noise immunity of the signals, an isolating amplifier should be connected between the analog output and measuring unit for cables > 4 m.

Table 1.2 Connecting-up example for the control terminal strip -X102

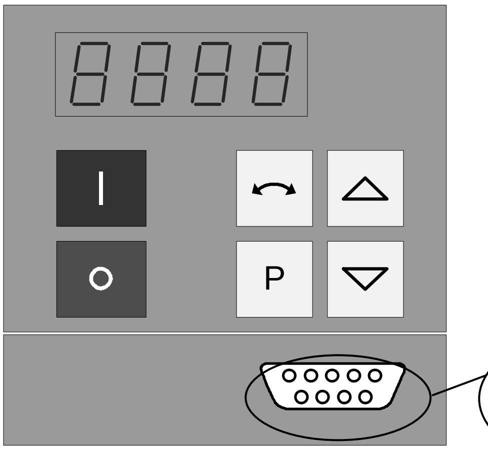


Connecting example	Term.	Function, notes
	-X103	
	35	Ref. potential for digital tacho
	36	Track A, digital tacho
	37	Track B, digital tacho
	38	Zero track, digital tacho
	39	Check input, digital tacho
	40	+15 V, 190 mA, digital tacho power supply
	NOTE	As standard, an HTL encoder without differential outputs can be connected. Option DTI is required for other applications (digital tacho interface).
	41	Ref. potential for the motor temperature sensor
	42	Motor temperature input (KTY84)
	NOTE	Protective separation must be externally guaranteed.
	43	Ref. potential, analog output 2
	44	Analog output 2 (0 V bis 10 V) permissible load ≤ 5 mA ≙ > 2 kΩ
	NOTE	Terminals 43 and 44: Isolating amplifiers should be connected between the analog output and measuring unit to increase the signal noise immunity for cable lengths > 4 m.

Table 1.3 Connecting-up example for control terminal strip -X103

1) Only one of the two terminals, 27 or 29, may be assigned
2) Only one of the two terminals, 30 or 32, may be assigned

1.2.1 Connecting-up the parameterizing unit (PMU)



A serial connection to automation unit or a PC can be realized via connector X300 on the PMU. Thus, the unit can be controlled and operated from the central control station or control room.

For degree of protection IP20 (option), there is no PMU. The OP1 operator control panel must be removed to connect a PC or an automation unit to X300 (to remove OP1, release the 2 mounting screws on the inside of the doors).

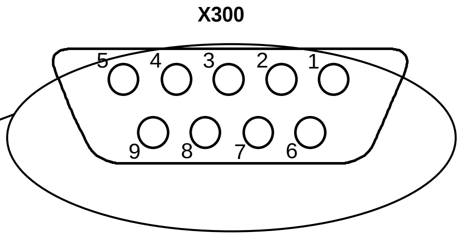


Fig. 1.3 Parameterizing unit (PMU)

PMU -X300	Description
1	Not assigned
2	Receive line, RS232 standard (V.24)
3	Transmit- and receive line, RS485, two-wire, positive differential input/output
4	RTS (request to send)
5	Ref. potential (ground)
6	5 V power supply for OP
7	Transmit line, RS232 standard (V.24)
8	Transmit- and receive line RS485, two-wire, negative differential input/output
9	Ref. potential for RS232- or RS485 interface (EMC suppressed).

Table 1.4 Connector assignment for interface -X300

1.3 Measures to maintain the radio interference suppression regulations

The drives must be installed and mounted according to the „Installation Instructions for EMC-correct installation and mounting of drives“ (Order No. 6SE7087-6CX87-8CE0).

The limit values for industrial environments can be maintained without radio interference suppression filter.
B1 radio interference suppression filters must be used for environments other than industrial environments.

The following points must be observed regarding radio interference suppression regulations:

♦ **Grounding**

Converters generate radio interference noise. This noise should be fed back to the source through the lowest possible ohmic connection (ground connection cross-section ≥ supply connection cross-section).

Use the best grounding possibility (e.g. mounting panel, grounding cable, grounding bar) when installing converters and optional radio interference suppression filters. Connect all connector housings together through the largest possible surface area.

For radio interference suppression, the cross-section (observe the safety regulations under fault conditions), is not so important, but the contact surface, as high-frequency noise currents do not flow through the complete cross-section, but essentially on the outside surface of a conductor (skin effect).

♦ **Screening**

In order to reduce noise and maintain the radio interference suppression level, the following should be maintained

- screened cables should be used between the converter output and motor
- screen control cables must be used.
- route control- and power cables separately; min. clearance, 20 cm.

The screen must be connected to ground potential at both ends.

♦ Control cables and power cables may only cross at an angle of 90 °.

♦ **Filter**

The radio interference suppression filter must be connected directly in front of the rectifier- or rectifier and regenerative feedback unit. The housings must be connected electrically with one another.

2 Operator control

The converter can be controlled via:

- the PMU (Parameterization Unit)
- the control terminal strip on the CU (Chapter 1 „Control terminal strip“)
- the OP1 operator control panel (Chapter „Options“ in the Operating Instructions, Part 1)
- the RS485 and RS232 serial interface on PMU -X300

When the equipment is shipped, the drive converter is controlled and parameterized by the parameterizing unit (PMU) on the front side of the unit.

For option M20 (degree of protection IP20), the unit is controlled and parameterized via the OP1.

Operator control using the PMU is described in this section.

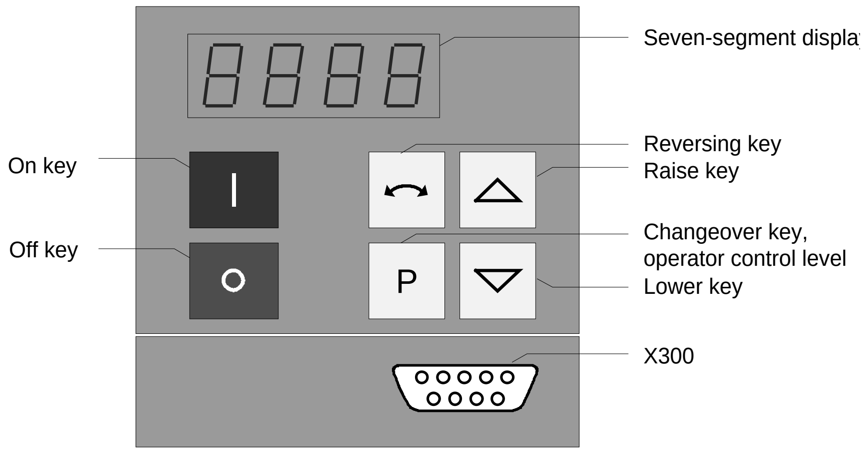


Fig. 2.1 Parameterization unit

2.1 Operator control elements

Operator control elements	Function
I	Converter switch on (standard). For faults: Return to the fault display. Command is effective when the key is released.
O	Converter shutdown depending on the parameterization of OFF1, OFF2 or OFF3 (P554 to P560). Command becomes effective when the key is released.
↷	Field reversal / reversing for the appropriate parameterization (P571 and P572). Command becomes effective when the key is released.
P	Changeover from parameter number to parameter value. In conjunction with other keys, additional functions (refer to Figs. 2.2 to 2.5). Command becomes effective when the key is released.
△ , ▽	Values (raise, lower) change as long as the keys are depressed.
P + △ resp. P + ▽	Depress P and hold, then depress the second key. The command becomes effective when the key is released (e.g. fast changeover).

Table 2.1 Function of the operator control elements on the PMU

2.2 Displays 8.8.8.8.

		Parameter number		Index	Parameter value
		Pos. actual value e.g	Neg. actual value e.g	e.g..	e.g.
Visualization parameters	Basic converter	r000	r.000	---	°009
	Technology board	d000	d.000		
Setting parameters	Basic converter	P005	P.005	ı 000	-2.08
	Technology board	H002	H.002		

Table 2.2 Displaying visualization- and setting parameters on the PMU

	Actual value	Parameter value not possible	Alarm	Fault
Display	-2.08	----	A022	F006

Table 2.3 Status display on the PMU

NOTE
The parameter description is provided in Chapter 11 „Parameter list“.

2.3 Structure

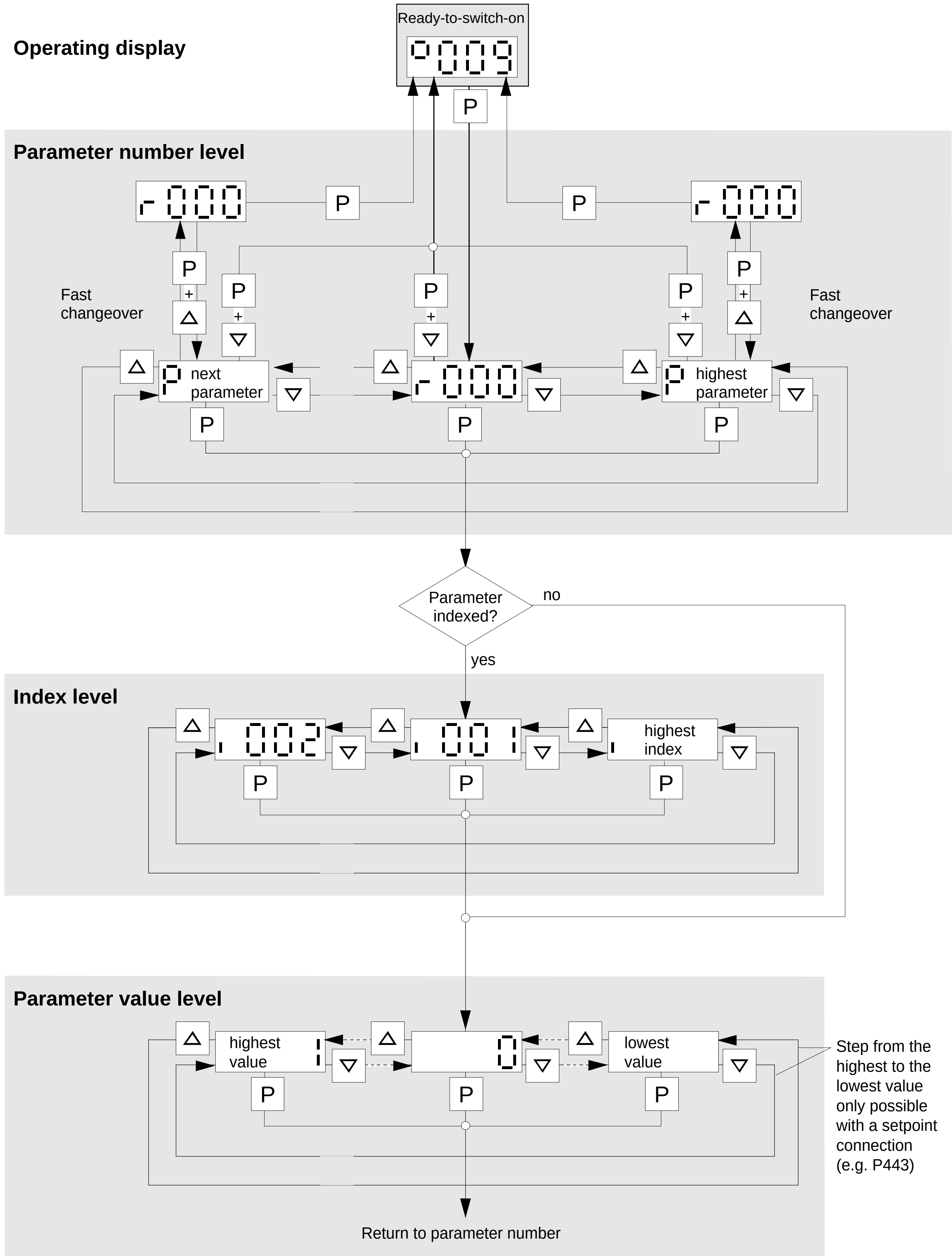
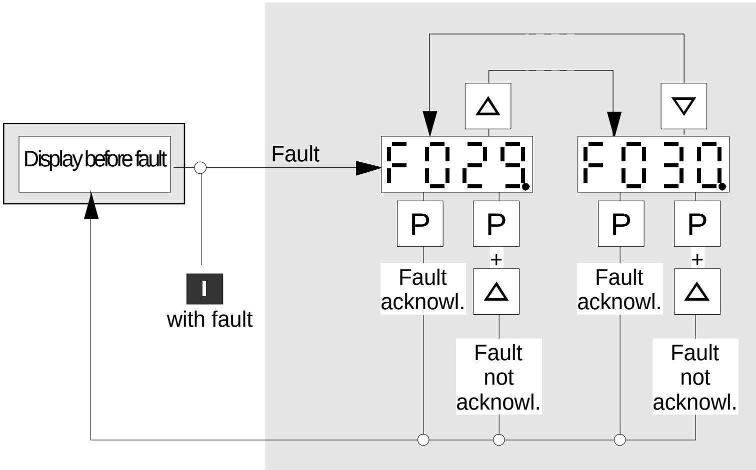


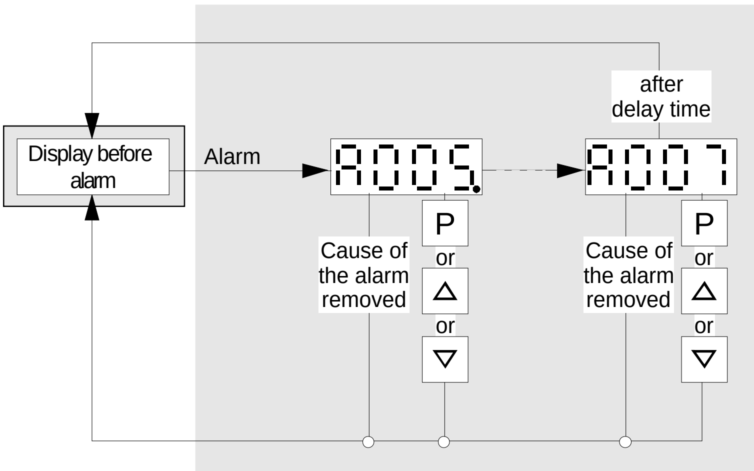
Fig. 2.2 Operator control structure using the PMU



If several fault exist, the particular fault can be selected using the △▽ keys.

P- + △ key: Jump into the parameterizing level, if, e.g., fault acknowledgement is not possible.

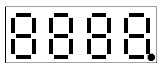
Fig. 2.3 Operator control structure of the PMU for faults

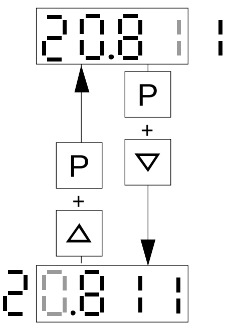


If several alarms are present, then display automatically switches to the higher alarm.

P- + △- or ▽ key: Jump into the parameterizing level independent of the alarms which are present

Fig. 2.4 Operator control structure of the PMU for alarms

If several faults or alarms exist, a point appears at the right in the display .



The shift is only possible in the parameter value level.

Fig. 2.5 Shifting the PMU display for parameter values with more than 4 digits

3 General explanation of the terminology and functional scope of the unit

Abbreviations:

♦ Abbreviations used: ☞ Chapter 14 „Index and Abbreviations“

3.1 Converter open-loop/closed-loop control versions

♦ Open-loop control versions (also suitable for multi-motor drives):

- V/f characteristic:
  Open-loop frequency control with constant voltage/frequency ratio, or a voltage/frequency ratio entered via a characteristic
- V/f characteristic, for textile applications:
  as for the V/f characteristic, however certain functions where the frequency setpoint (☞ function diagrams) is inhibited for textile machine applications.

♦ Closed-loop control versions:V/f + closed-loop speed control (V/f characteristic with higher-level closed-loop speed control):
  In addition to the specified V/f characterstic, in order to achieve an especially high speed accuracy, the motor speed, measured using a tachometer, is fed to a higher-level speed controller.

- Closed-loop frequency control:
  Closed-loop frequency control without tachometer according to the vector control principle (field-oriented control) for medium speed dynamic performance and accuracy.
- Closed-loop speed control:
  Closed-loop speed control with tachometer according to the vector control principle (field-oriented control) for high speed dynamic performance and accuracy.
- Closed-loop torque control:
  Closed-loop torque control with tachometer according to the vector control principle (field-oriented control) for high torque dynamic performance and accuracy.

Tip: For digital tachos and for certain analog tachos, option boards are required!

3.2 Process data

The following is understood under process data:

♦ **Setpoints** and **control commands**, which „directly“ influence the drive operating status,

♦ **Actual values** and **status messages**, which are „directly“ output from the drive.

„Directly“ means: Each process data change is realized immediately and without any acknowledgement - or handshake mechanisms.
Only then can fast process responses be achieved

Contrary to the process data, a parameter value change is subject to a specified mechanism, and consists of task and checkback signal.

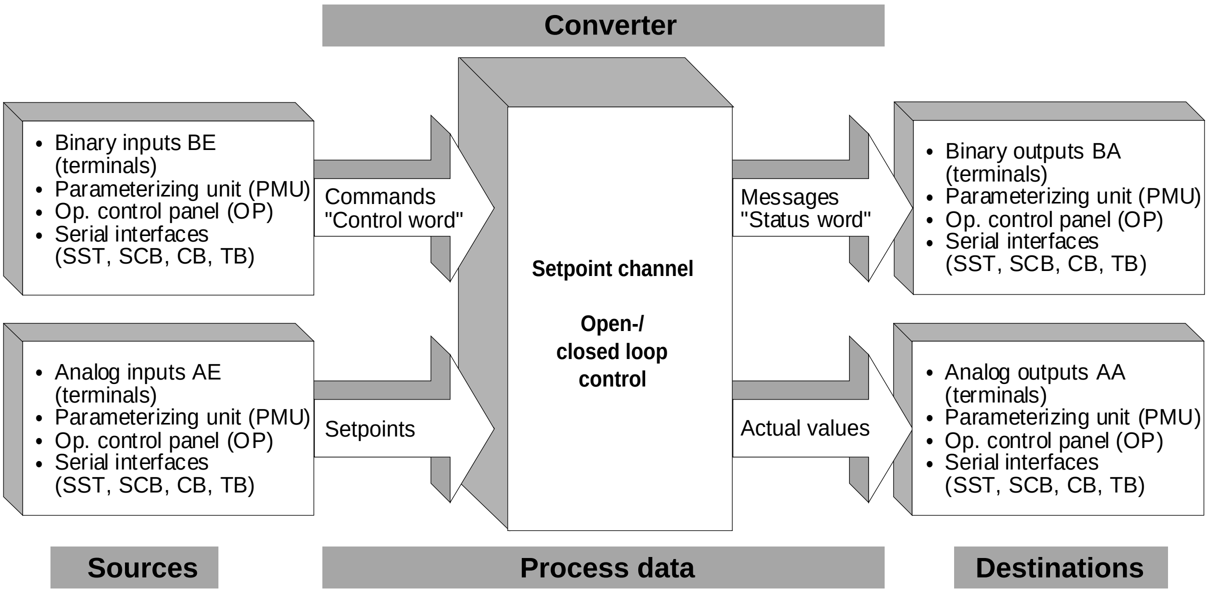


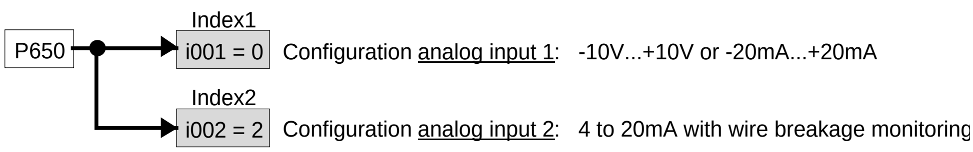
Fig. 3.1 Process data

3.3 Indexed parameters

Indexed parameters are sub-divided into various „indices“ (briefly: i001, i002, etc.), in which the particular parameter values can be entered.

The significance of the „indices“ of the particular parameter (parameter number) can be taken from the chapter 11 „Parameter list“.

Example:



3.4 Data sets

„Indexed“ parameters can be sub-divided according to data sets (indexed).

There are three kinds of data sets:

♦ SDS (setpoint channel data set) 1 to 4:

  4 setpoint channel data sets which can be changed over; e.g. for production-related different drive ramp-up and ramp-down times.

♦ Basic/reserve (basic- or reserve setting):

  e.g. for changing over between manual and automatic operation

♦ MDS (motor data set) 1 to 4:

  4 motor data sets which can be changed over; e.g. for operating different motor types from one converter.

The data sets are selected via the „control word“, and are read-out in r410, r012 and r152.

☞ Chapter 10 „Function diagrams“

4 Start-up

The drive converter must be ready. This means, that it must be installed and connected-up according to the information in the hardware description.

NOTE	
Forming:	If the drive converter was continuously shutdown for longer than a year, or not connected, then the DC link capacitors must be formed.

4.1 Capacitor forming

The DC link capacitors must be re-formed if the converter has been non-operational for more than one year. If the converter was started-up within one year after having been shipped (serial number on the rating plate), it is not necessary to re-form the DC link capacitors

For AC-AC, as well as for DC-AC drive converters, forming is realized by switching-in a rectifier and resistor, which are connected to the DC link (circuit configuration: refer to Figs. Fig. 4.2 and Fig. 4.3). The drive converter feed in this case must be shutdown (disconnected)!
A second possibility exists for DC-AC units. The DC busbar voltage is slowly increased up to the rated drive converter input voltage during the forming time.
The forming time is dependent on the time for which the drive converter stood. (refer to Fig. 4.1)

		Recommended components		
		A	R	C
3AC	208 V to 415 V	SKD 50 / 12	220 Ω / 100 W	22 nF / 1600 V
DC	280 V to 310 V			
3AC	510 V to 620 V	SKD 62 / 16	470 Ω / 100 W	22 nF / 1600 V
DC	380 V to 460 V			
3AC	675 V to 930 V	SKD 62 / 18	680 Ω / 100 W	22 nF / 1600 V
DC	500 V to 690 V			

Table 4.2 Recommended components for circuits acc. to Fig. 4.2 and Fig. 4.3

Position	Example	
1 and 2	A-	Manufacturing location
3	E F H	1994 1995 1996
4	1 to 9 O N D	January to September October November December
5 to 14		Not relevant for forming

Table 4.1 Serial number structure: A-E60147512345

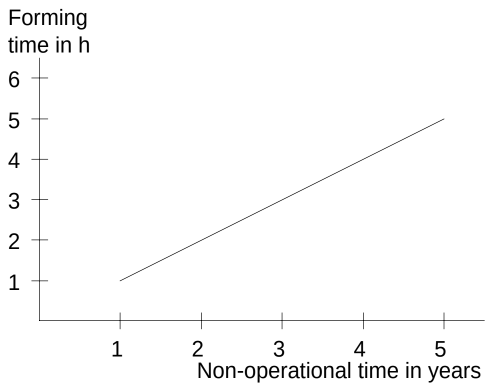


Fig. 4.1 Forming time as a function for the time which the converter was non-operational

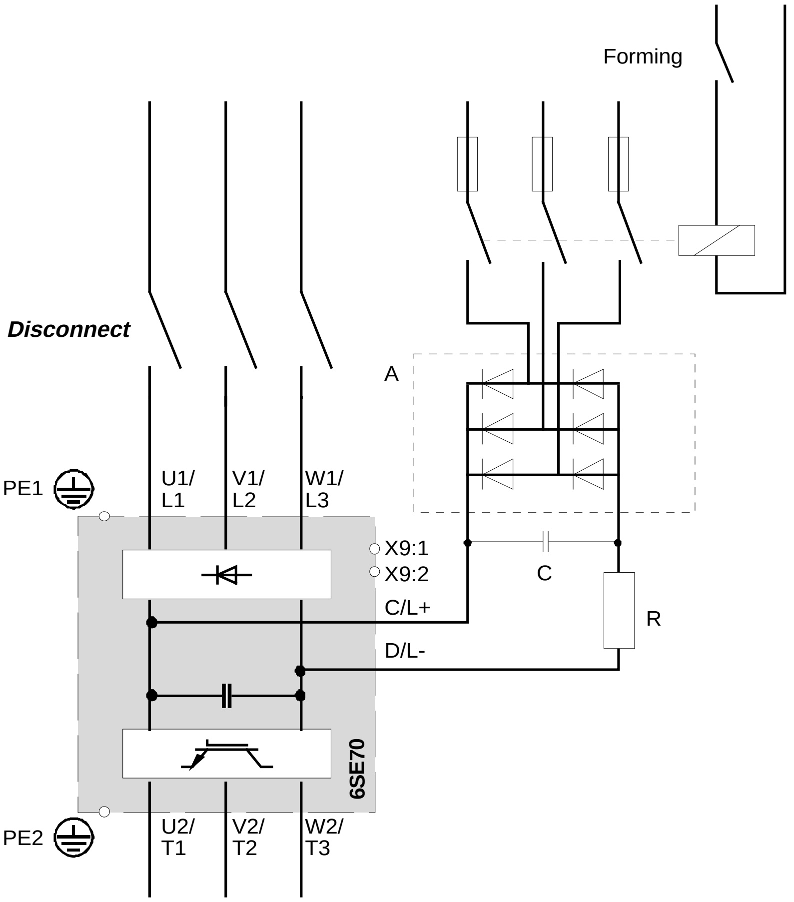


Fig. 4.2 Circuit to form AC-AC units

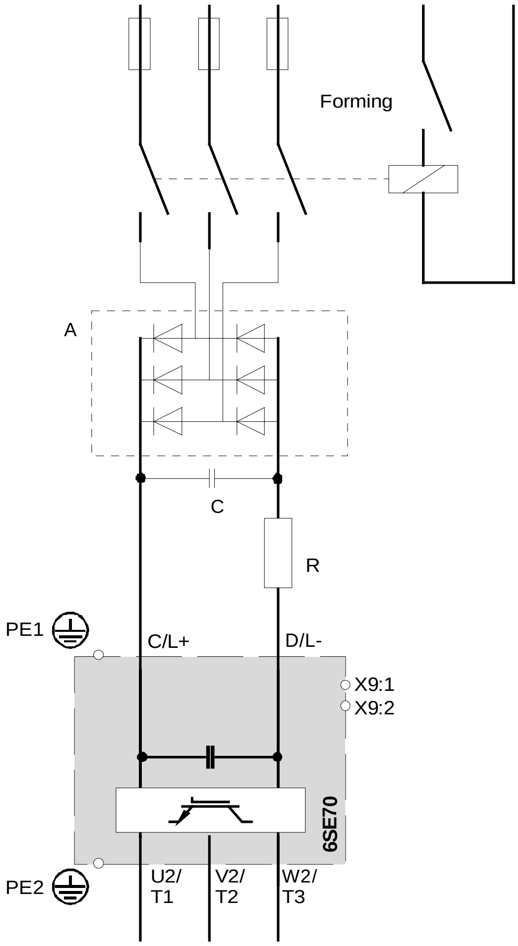


Fig. 4.3 Circuit to form DC-AC units

4.2 First start-up

The converter is supplied with the „Factory setting“ (☞ Chapter 11 „Parameter list“) and access stage 2 (standard mode). That means:

- ♦ The converter data correspond to the converter type, MLFB (Order No.) (converter initialized).
- ♦ A 50 Hz induction motor, adapted to the converter type, is parameterized, which is operated using the V/f control (open-loop).

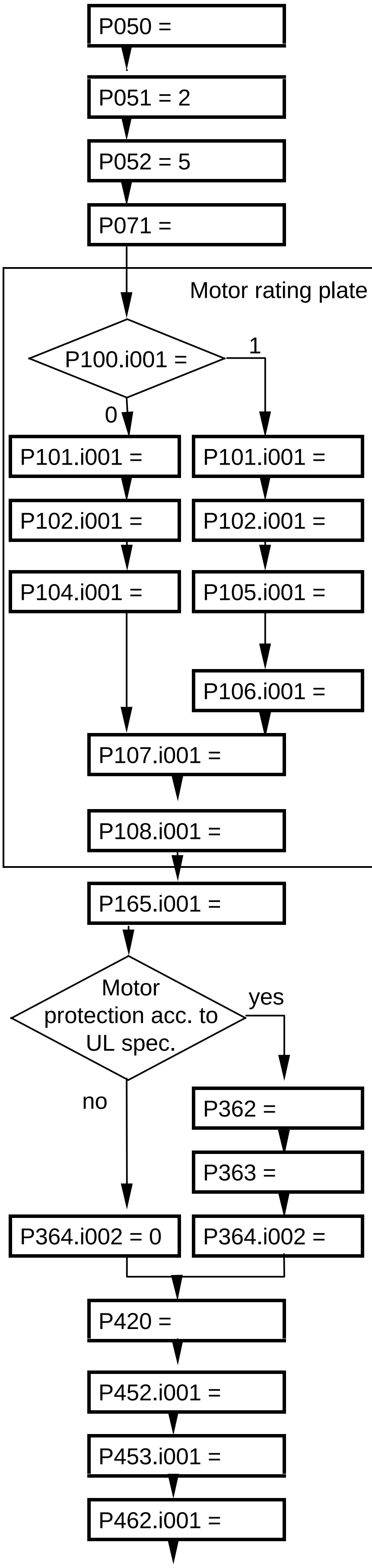
If the required converter functions are already realized with the factory setting, the converter can be immediately switched-on and operated. Further parameterization is not required.

Parameterization is realized according to the following sections:

4.2.1 As „**Standard application with V/f characteristic without hardware options**“ for simple applications.

or **4.2.2** As **„Expert application**“ for sophisticated applications (e.g.: Closed-loop control, data set changeover, interface operation, etc.) of if hardware options are available.

4.2.1 Parameterization „Standard application“



Language:
0 = German, 1 = English, 2 = Espanol, 3 = Francais, 4 = Italiano

Access „stage standard mode“

Function selection. „drive setting“

Converter supply voltage [V] : AC units: Line supply voltage
DC units: DC link voltage

observe config. (star/delta)!

Motor type: 0 = IEC-motor (international standard)
1 = NEMA-motor (US standard)

Rated motor voltage [V]

Rated motor current [A]
(multi-motor drives: sum of all the currents)

IEC motor:: Cos Phi (n)
NEMA motor: Rated output [Hp] (multi-motor drives: sum af all the outputs)

Efficiency [%]

Rated motor frequency [Hz] The maximum frequency is a function of P163 „Control mode“

Rated motor speed [RPM]

Characteristic: 0: linear characteristic (constant-torque drives)
1: parabolic characteristic (fans and pumps)

NOTE
The motor temperature is estimated using the motor current. The motor is reliably protected with the factory setting

Motor cooling: 0: naturally ventilated
1: force ventilated

Motor thermal time constant

Motor load limit 1 ... 300 %

Rated system frequency [Hz]
Rated motor operating frequency in the system

Max. frequency, clockwise phase sequence [Hz]

Max. frequency, counter-clockwise phase sequence[Hz]

Ramp-up time from standstill up to the rated system freq. (P420)

Step	Description
P464.i001 =	Ramp-down time from the rated system freq. (P420) down to standstill
P052 = 7 depress P key Switch on I	Function selection „motor identification at standstill“ (includes „ground fault test“ and „automatic parameterization“)

NOTE
Current flows in the motor and the rotor can align itself

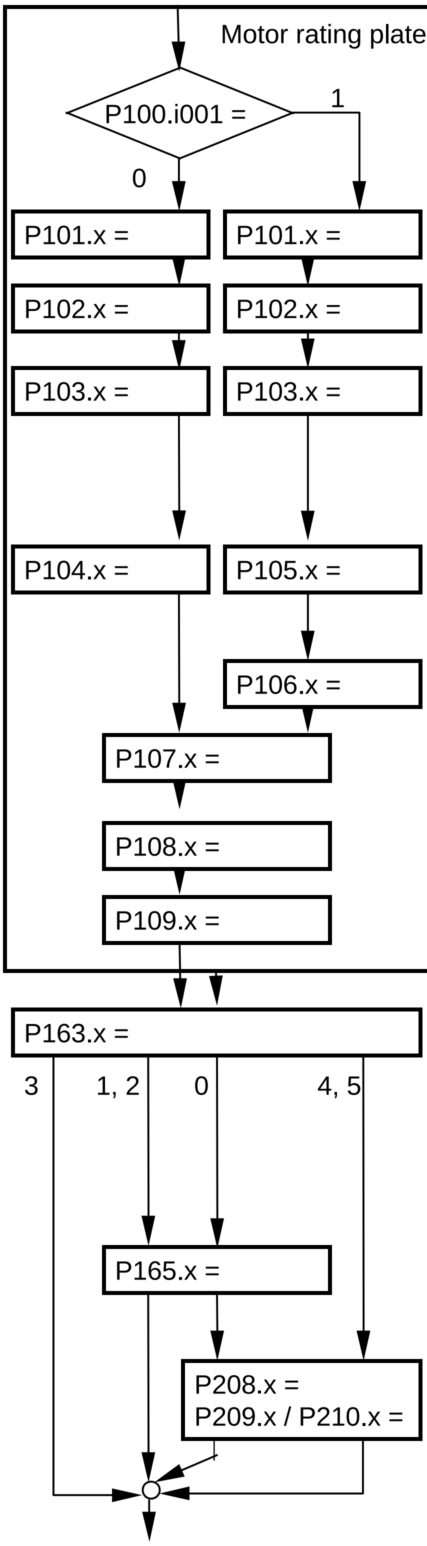
Alarm „A078“ appears after the P key is depressed.The converter must be switched-on within 20 s.

Step	Description
Wait	Wait until the converter is again „ready to switch-on“! (operating display: 009). If error „Fxxx“, ☞ Chapter 12 „Fault and alarm messages“.
Ready	

4.2.2 Parameterization „Expert application“

Step	Description
P050 =	Language: 0: Deutsch, 1: English, 2: Espanol, 3: Francais, 4: Italiano
P051 = 3	Access stage „expert mode“
Options-boards? (yes / no)	Possible option boards: SCB, TSY, CB, TB
yes: P052 = 4	Function selection „hardware configuration“
P090 = P091 = Other parame-ters depend-ing on the option	Define and parameterize the option boards: ☞ Instruction Manuals for the option boards Option boards: 0: none, 1: CB, 2: TB, 3: SCB, 4: TSY
P052 = 5	Function selection „drive setting“ If fault „Fxxx“, ☞ Chapter 12 „Fault and alarm messages“
P071 =	Converter supply voltage [V] AC units: Line supply voltage DC units: DC link voltage
P092 =	Select output filter: 0: without sinusoidal filter 1: with sinusoidal filter 2: with dv/dt filter

Motor rating plate data Observe config. (star/delta)!



Motor type: 0: IEC motor (international standard)
1: NEMA motor (US standard)

Rated motor voltage [V]

Rated motor current [A]
(Multi-motor drives: Sum of all the currents)

No-load current [%]
(Multi-motor drives: Sum of all the no-load currents referred to the sum of all rated motor currents). For 0.0 %, the value is automatically calculated for „motor identification at standstill“ and “automatic parameterization“ (also refer to r196).

IEC motor: Cos Phi (n)
NEMA motor: Rated output [Hp]
(Multi-motor drives: Sum of all the outputs)

Efficiency [%]

Rated motor frequency [Hz] The maximum frequency is a function of P163 „control mode“

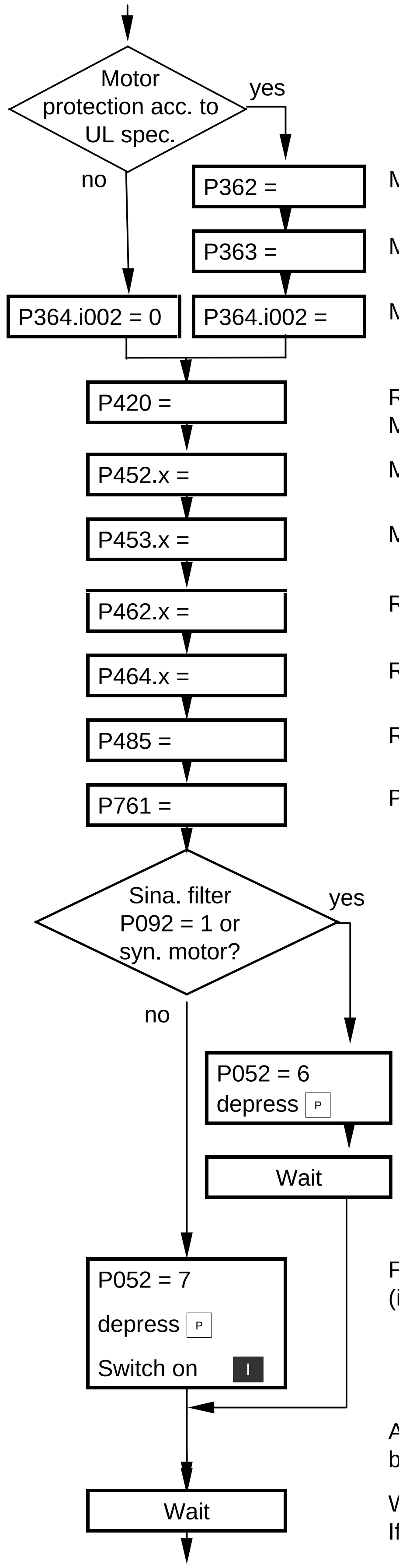
Rated motor speed [RPM]

Motor pole pair number

n/f controller-selection:
0: V/f characteristic with higher-level closed-loop speed control
1: V/f characteristic
2: V/f characteristic for textile applications
3: Closed-loop frequency control (only for induction motors)
4: Closed-loop speed control (only for induction motors)
5: Closed-loop torque control (only for induction motors)

Characteristic: 0: Linear characteristic (constant-torque drives)
1: Parabolic characteristic (fans and pumps)

Define and normalize tachometer (☞ Chapter 11 „Parameter list“)



NOTE
The motor temperature is estimated using the motor current. The motor is reliably protected with the factory setting

Motor cooling: 0: naturally ventilated
1: force ventilated

Motor thermal time constant

Motor load limit 1 ... 300 %

Rated system frequency [Hz]
Motor rated operating frequency in the system

Max. frequency, clockwise phase sequence [Hz]

Max. frequency, counter-clockwise phase sequence [Hz]

Ramp-up time from standstill up to the rated system freq. (P420)

Ramp-down time from the rated system freq. (P420) down to standstill

Rated system torque referred to the rated motor torque

Pulse frequency (☞ Chapter 11 „Parameter list“)

Function selection „automatic parameterizationl“

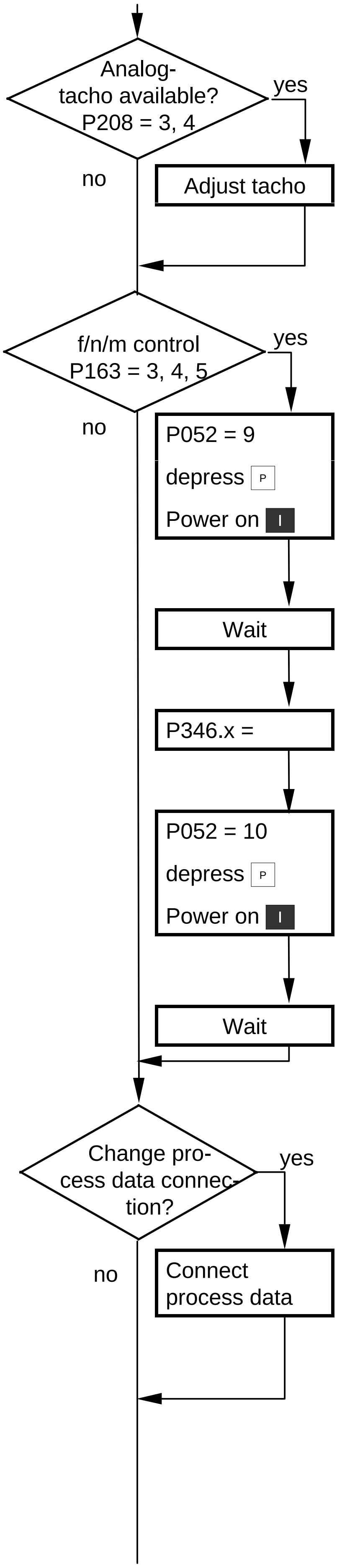
Wait until the converter is ready to switch on! (PMU display: 009)
If fault „Fxxx“ occurs ☞ Chapter 12 „Fault and alarm messages“

Function selection „motor identification at standstill“
(includes „ground fault test“ and „automatic parameterization“)

NOTE
Current flows in the motor and the rotor can align itself!

Alarm „A078“ appears after the P key is depressed. The converter must be switched-on within 20s!

Wait until the converter shuts down!
If fault „Fxxx“ occurs ☞ Chapter 12 „Fault and alarm messages“



Adjust tacho:

- Tacho at ATI: refer to the ATI Instruction Manual
- Tacho at terminal strip CU:
  ☞ Section 6.3 „Analog inputs“

Function selection „no-load measurement“

NOTE
Current flows in the motor and the rotor rotates!

Alarm „A080“ appears after the P key is depressed. The converter must be switched-on within 20 s!

Wait until the converter shuts down!
(operating display: 009 for „ready to switch-on“)
If fault „Fxxx“ occurs, ☞ Chapter 12 „Fault and alarm messages“

Set the required dynamic performance of the speed control loop in [%] for the following „n/f controller optimization“!
(100 % corresponds to an optimum)

Function selection „n/f controller optimization“

NOTE
Current flows in the motor and the rotor rotates!

Alarm „A080“ appears after the P key is depressed. The converter must be switched-on within 20 s!

Wait until the converter shuts down!
(operating display: 009 for „ready to switch-on“)
If fault „Fxxx“ occurs, ☞ Chapter 12 „Fault and alarm messages“

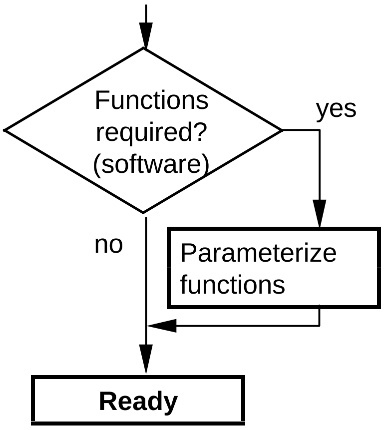
Change factory setting for:
Command- and setpoint sources,
Destinations for signals and actual values

Process data: (☞ Chapter 5 „Process data“)

- Control word (commands)/status word (messages)
- Setpoint/actual values

  Possible process data sources/destinations: (Sections 5.1 to 5.3)
  - Binary inputs, binary outputs
  - Analog inputs, analog outputs
  - Serial interface in the basic converter (SST1, SST2)
  - Option boards (SCB, TSY, CB, TB)

Simple applications: ☞ Section 4.5



Possible functions:
KIP, WEA, restart-on-the-fly, DC braking, selectivity, Vd-max. controller

Parameterize function:
Chapter 9 „Functions“
and Chapter 11 „Parameter list“

- detailed parameter description: ☞ Chapter 11 „Parameter list“
- detailed function diagrams: ☞ Chapter 10 „Function diagrams“

4.3 Drive start-up when the drive converter is controlled through an external main contactor

It is not absolutely necessary that the converter is operated with a main- or output contactor. If the converter control functions have to be maintained with the main contactor open, an external 24 V DC power is required.

Binary output 1 (-X9:4,5) is provided to control the contact (pre-assigned P612).

The checkback signal can be wired to a binary input (e.g. binary input 3).

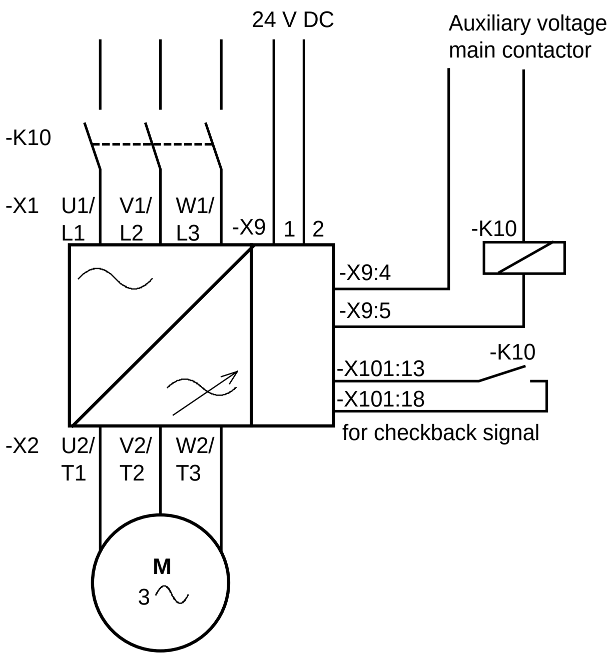


Fig. 4.4 Example for connecting an main- and input contactor

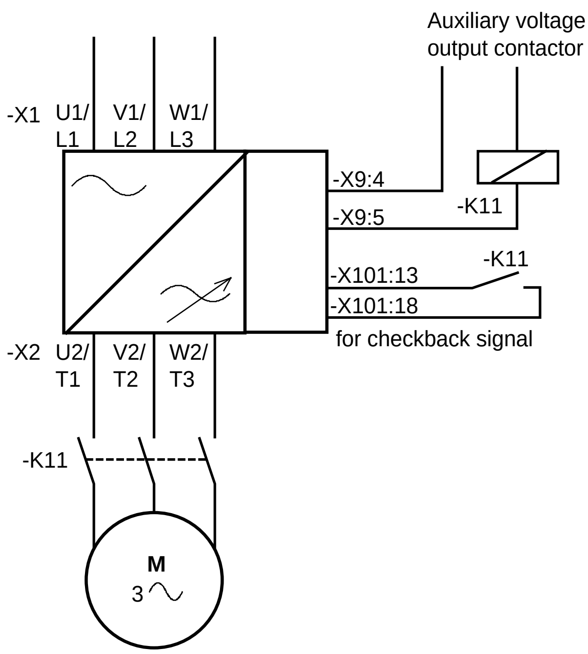


Fig. 4.5 Example for connecting an output contactor

Sequence control, on command-operation (effect on the main- or output contactor).

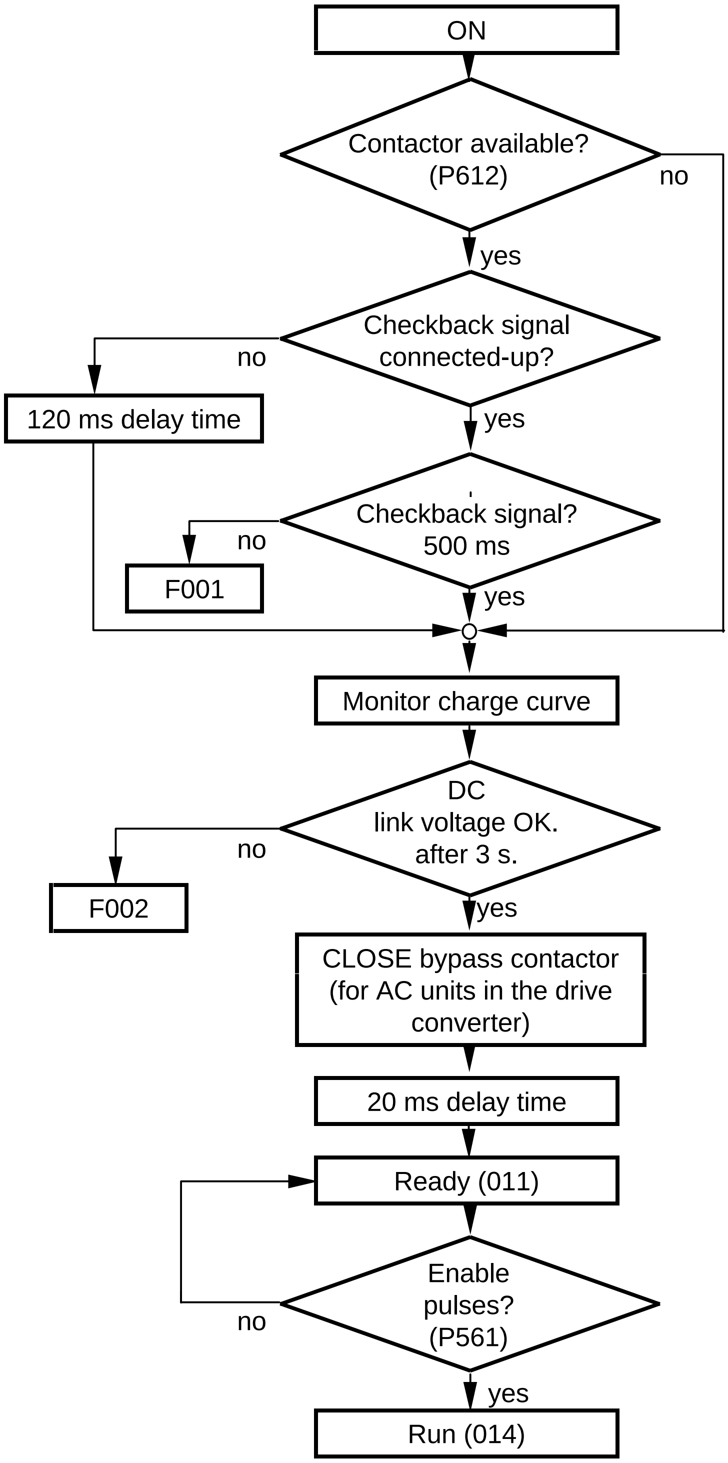


Fig. 4.6 Sequence control, on command- operation

Parameter- No.	Name	Index	Parameter- value	Terminal	With contactor(s)	Contactor(s) with checkback signals
P612	Dst.MC energized	i001	1001	X9: 4,5	X	X
P591	Src MC chckbck sig. binary input 3	-	1003	X101:18		X

Table 4.3 Recommended parameterization for the main- and output contactors

4.4 Drive start-up after enabling additional software functions or hardware options

If new software functions were enabled in the drive converter or hardware options installed, start-up must be repeated. This must be realized using the same steps as for first start-up:

- Standard application; ☞ refer to Section 4.2.1
- Expert application: ☞ refer to Section 4.2.2

NOTES
♦ Depending on the required change and taking into account the access stage (P051), and a possibly necessary function selection (P052), a jump can be made to the appropriate step. ♦ Due to background calculations, it is recommended that the following parameters and functions selections are checked/executed after the position jumped to!

For example:

Standard application (Section 4.2.1): Changing motor data

- ♦ P051 = 2 Access stage
- ♦ P052 = 5 Function selection, „drive setting“
- ♦ Change motor data
- ♦ Check subsequent parameters
- ♦ P052 = 7 Select „motor identification at standstill“ function (background calculations using new motor data)

4.5 Simple application examples for connecting process data with connection assignment

Connecting-up: ☞ Chapter 1 „Control terminal strip“

Multiple use of control word bits and source connections are permitted.

Caution: This excludes undesirable connections; e.g. factory setting basic/reserve changeover connected at binary input 5 (P590 = 1005)

4.5.1 Factory setting

Switch-on/off as well as setpoint input via the PMU, messages and actual values via the terminal strip.

Terminal strip only operational if binary input 5 (BE5) is energized (high signal level corresponds to „reserve“).

If BE5 is open (low signal level), then operator control is realized via the PMU.

The factory setting shown is not valid for cabinet units (compare P077)

Basic setting Controlling via PMU		**Switch-on/off, setpoint input**	**Reserve setting Controlling via terminal strip**	
CU2 -X101/13 P24 -X101/20 BE5			**CU2** -X101/13 P24 -X101/20 BE5	
	PMU			**CU2** -X101/13 P24
P554.1 = 1010	I / O	------------ ON/OFF1 ------------	P554.2 = 1001	-X101/16 BE1
P555.1 = 1	no source	------OFF2 (pulse inhibit) ------	P555.2 = 1002	-X101/17 BE2
P565.1 = 0	only PMU	-----------Aknowledge -----------	P565.2 = 1003	-X101/18 BE3
P573.1 = 1010	▲	---------Mot. pot., raise----------	P573.2 = 0	no source
P574.1 = 1010	▼	---------Mot. pot., lower ---------	P574.2 = 0	no source

Fig. 4.7 Factory setting: Switsch-on/off as well as setpoint input

Examples of output connections:

Messages and setpoints	**Parameter values / terminals**	
		CU2
Floating contact----------------------------------	---------------------	-X100/06 BA2
Fault --	P603.1 = 1002	-X100/07 BA2
Floating contact----------------------------------	---------------------	-X100/09 BA3
Operation--	P602.1 = 1003	-X100/10 BA3
		-X101/13 P24
Basic/reserve--------------------------------------	P590 = 1005	-X101/20 BE5
		-X102/33 AA1M
Speed/frequency actual value-----------------	P665.1 = 0218	-X102/34 AA1
		-X103/43 AA2M
Output current------------------------------------	P665.2= 0004	-X103/44 AA2

Fig. 4.8 Factory setting: Messages and setpoints

4.5.2 Manual/automatic operation (Basic/reserve changeover)

Manual operation (BE5 low signal level): Setpoint- and command input via the terminal strip.

Automatic operation (BE5 high signal level): Setpoint-and command input from the automation unit via serial interface (SST2), the monitoring of external faults via a terminal strip also possible.

Recommended parameterization:

Manual operation, Controlling via terminal strip			**Setpoint- and command input**	**Automatic operation**	
	CU2			**CU2**	
	-X101/13	P24		-X101/13	P24
	-X101/20	BE5		-X101/20	BE5
	-X101/13	P24			
P554.1 = 1001	-X101/16	BE1	------------ON/OFF1 ----------	P554.2 = 6001	SST2 control word
P558.1 = 1002	-X101/17	BE2	-------- OFF3 (fast stop) -------	P559.2 = 6001	
P565.1 = 1003	-X101/18	BE3	---------- Aknowledge ---------	P565.2 = 6001	
P571.1 = 1004	-X101/19	BE4	---------cw phase seq. --------	P571.2 = 6001	
			--------- ccw phase seq.--------	P572.2 = 6001	
P575.1 = 1006	-X101/21	BE6	---------Fault, external 1 -------	P575.2 = 1006	Binary input 6
P586.1 = 1007	-X101/22	BE7	---------Fault, external 2 -------	P586.2 = 1007	Binary input 7
P443.1 = 1004	-X102/30	AE2	---------- Main setpoint ---------	P443.2 = 6002	SST2-word 2
	-X102/31	AE2M			

Fig. 4.9 Manual / automatic: switsch-on/off as well as setpoint input

Examples of output connections:

Messages and setpoints	**Parameter values / terminals**		
		CU2	
Floating contact ---------------------------------	----------------------	-X100/06	BA2
Operation --	P602.1 = 1002	-X100/07	BA2
Floating contact ---------------------------------	----------------------	-X100/09	BA3
RFG activ --	P613.1 = 1003	-X100/10	BA3
Floating contact ---------------------------------	----------------------	-X100/11	BA4
Clockwise phase sequence -------------------	P614.1 = 1004	-X100/12	BA4
Analog speed actual value from ATI ---------	P208.1 = 0003	-X102/27	AE1
		-X102/28	AE1M
Output power ------------------------------------	P655.1 = 0005	-X102/33	AA1M
		-X102/34	AA1
Torque --	P655.2 = 0007	-X102/43	AA2M
		-X102/44	AA2

Fig. 4.10 Manual / automatic: Messages and setpoints

Tip: If a terminal cannot be connected-up as source or destination, it should be checked as to whether it has already been used for other signals.

5 Process data

5.1 Control word (control word 1 and control word 2)

Introduction and application example

An individual source can be parameterized for every control command, from where the control command may be output (fixed values, binary inputs, PMU, PZD part of the telegram from the automation devices).

The selection parameters for the sources are, with the exception of P590 and P591 are indexed 2x as follows:

Index i001: Basic setting (GRD)
Index i002: Reserve setting (RES)

One parameter is available to „connect-up" the source(s) for the control commands.

Example for connecting-up the sources:

The basic setting for the ON command (control word bit 0, control word 1), should be „connected-up" to binary input 1 of the CU (terminal -X101:16):

- From control word 1 table, one can identify that the factory setting of parameter P554.1 is 1010 for the basic setting of the ON command source.
- In Table A for the possible sources of the ON-command, one can see that 1010 corresponds to the „PMU operator control panel" source.
- The parameter value for the required source is searched for in Tables X and A. For binary input 1 (BE1) of the CU, the result is found in table X, it is 1001.
- This parameter value must now be entered into parameter P554.1.

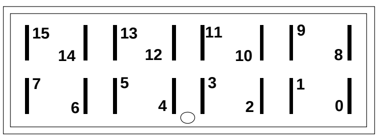
Command	Parameter	Possible sources	Parameter value	Required source connection
ON/OFF1 (GRD)	P554.1	Tab. X,A	1001	BE1 terminal -X101:16

A high signal at terminal -X101:16 powers-up the drive converter; a low signal powers-down the drive converter.

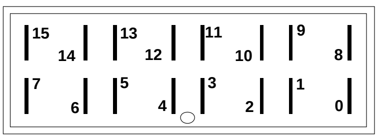
INFORMATION

- Multiple wiring is permitted!
- The control word commands „OFF2" (bit 1), „OFF3" (bit 2) and „acknowledge" (bit 7) are always simultaneously effective from 3 sources (can be parameterized)!
- „Acknowledge" (bit7) is additionally always effective from the PMU!
- If the „on" command (bit 0) is connected to a serial interface (SST, CB/TB, SCB-SST), then the following must be observed for safety-related reasons:
  Additionally, an „OFF2" or „OFF3" command must be parameterized at the terminal strip/PMU, as otherwise the converter cannot be shutdown with a a defined command, when communications fail!

5.1.1 Control word display using the 7-segment display on the PMU



Control word 1



Control word 2

5.1.2 Control word 1 (Visualization parameter r550 or r967)

The factory setting is only valid for P077 = 0.

Designation Bit No. (Significance)	Value High / Low (1 = High, 0 = Low)				Parameter No. BAS (RES)	Fact. setting. BAS (RES) (P077 = 0)	Source selection see 5.1.4
ON / OFF1 (Stop)	ON		OFF1				
0	1		0		P554.1 (2)	1010 (1001)	Tab. X,A
OFF2 (electrical)	ON		OFF2				
1	1		0		& P555.1 (2) P556.1 (2) P557.1 (2)	0001 (1002) 0001 (0001) 0001 (0001)	Tab. X,B Tab. X,B Tab. X,B
OFF3 (fast stop)	ON		OFF3				
2	1		0		& P558.1 (2) P559.1 (2) P560.1 (2)	0001 (0001) 0001 (0001) 0001 (0001)	Tab. X,B Tab. X,B Tab. X,B
Inverter enable	Inverter enable		Inhibit inverter				
3	1		0		P561.1 (2)	0001 (0001)	Tab. X,F
RFG enable	RFG enable		Inhibit RFG				
4	1		0		P562.1 (2)	0001 (0001)	Tab. X,F
Start RFG	Start RFG		RFG stop				
5	1		0		P563.1 (2)	0001 (0001)	Tab. X,F
Setpoint enable	Setpoint enable		Inhibit setpoint				
6	1		0		P564.1 (2)	0001 (0001)	Tab. X,F
Acknowledge	ON						
7	0 → 1				P565.1 (2) P566.1 (2) P567.1 (2)	0000 (1003) 0000 (0000) 2001 (2001) 1010 (fixed)	Tab. X,C Tab. X,C Tab. X,C
Inching 1 / 2	Unchanged	Freq. 2	Freq. 1	No inching			
8	1	0	1	0	P568.1 (2)	0000 (0000)	Tab. X,C
9	1	1	0	0	P569.1 (2)	0000 (0000)	Tab. X,C
Control from the PLC	Control		no control				
10	1		0		≥1 SST1/2 CB / TB SCB 2		
Enable rot. field	Both enab.	ccw ph seq	cw ph seq	No ph seq			
11	1	0	1	0	P571.1 (2)	0001 (0001)	Tab. X,E
12	1	1	0	0	P572.1 (2)	0001 (0001)	Tab. X,E
Motor potentiometer	Stop	Raise	Lower	Stop			
13	0	1	0	1	P573.1 (2)	1010 (0000)	Tab. X,A
14	0	0	1	1	P574.1 (2)	1010 (0000)	Tab. X,A
Fault, external 1	No fault		Fault, external 1				
15	1		0		P575.1 (2)	0001 (0001)	Tab. X,D

5.1.3 Control word 2 (Visualization parameter r551)

The factory setting is only valid for P077 = 0.

Designation Bit No. (Significance)	Value High / Low (1 = High, 0 = Low)				Parameter No. BAS (RES)	Fact. setting. BAS (RES) (P077 = 0)	Source selection see 5.1.4
Setpoint data set	SDS 4	SDS 3	SDS 2	SDS 1			
16	1	0	1	0	P576.1 (2)	0000 (0000)	Tab. X,I
17	1	1	0	0	P577.1 (2)	0000 (0000)	Tab. X,I
Motor data set	MDS 4	MDS 3	MDS 2	MDS 1			
18	1	0	1	0	P578.1 (2)	0000 (0000)	Tab. X,I
19	1	1	0	0	P579.1 (2)	0000 (0000)	Tab. X,I
Fixed setpoint	FS 4	FS 3	FS 2	FS 1			
20	1	0	1	0	P580.1 (2)	0000 (1004)	Tab. X,I
21	1	1	0	0	P581.1 (2)	0000 (0000)	Tab. X,I
Synchronizing	Sync. enable		Sync. inhibit				
22	1		0		P582.1 (2)	0000 (0000)	Tab. X,I
Restart-on-the-fly	Enable		Inhibit				
23	1		0		P583.1 (2)	0000 (0000)	Tab. X,I
Droop/tech. contr.	Enable		Inhibit				
24	1		0		P584.1 (2)	0000 (0000)	Tab. X,I
Controller enable	Enable		Inhibit				
25	1		0		P585.1 (2)	0001 (0001)	Tab. X,I
Fault, external 2	No fault		Fault, external 2				
26	1		0		P586.1 (2)	0001 (0001)	Tab. X,G
Master/slave drive	Slave drive (M contr.)		Master drive (n contr.)				
27	1		0		P587.1 (2)	0000 (0000)	Tab. X,I
Alarm, external 1	No alarm		Alarm, external 1				
28	1		0		P588.1 (2)	0001 (0001)	Tab. X,G
Alarm, external 2	No alarm		Alarm, external 2				
29	1		0		P589.1 (2)	0001 (0001)	Tab. X,G
Basic/reserve	Reserve setting		Basic setting				
30	1		0		P590	1005	Tab. X,I
HS checkback sig.	HS checkback sig.		No HS checkb. sig.				
31	1		0		P591	0001	Tab. X,H

5.1.4 Selecting the source for control words 1 and 2

Table X (external pins)

1001	BE1 Pin -X101:16
1002	BE2 Pin -X101:17
1003	BE3 Pin -X101:18
1004	BE4 Pin -X101:19
1005	BE5 Pin -X101:20
1006	BE6 Pin -X101:21
1007	BE7 Pin -X101:22
4101	SCI, Slave1, Pin 01
4102	SCI, Slave1, Pin 02
4103	SCI, Slave1, Pin 03
4104	SCI, Slave1, Pin 04
4105	SCI, Slave1, Pin 05
4106	SCI, Slave1, Pin 06
4107	SCI, Slave1, Pin 07
4108	SCI, Slave1, Pin 08
4109	SCI, Slave1, Pin 09
4110	SCI, Slave1, Pin 10
4111	SCI, Slave1, Pin 11
4112	SCI, Slave1, Pin 12
4113	SCI, Slave1, Pin 13
4114	SCI, Slave1, Pin 14
4115	SCI, Slave1, Pin 15
4116	SCI, Slave1, Pin 16
4201	SCI, Slave2, Pin 01
4202	SCI, Slave2, Pin 02
4203	SCI, Slave2, Pin 03
4204	SCI, Slave2, Pin 04
4205	SCI, Slave2, Pin 05
4206	SCI, Slave2, Pin 06
4207	SCI, Slave2, Pin 07
4208	SCI, Slave2, Pin 08
4209	SCI, Slave2, Pin 09
4210	SCI, Slave2, Pin 10
4211	SCI, Slave2, Pin 11
4212	SCI, Slave2, Pin 12
4213	SCI, Slave2, Pin 13
4214	SCI, Slave2, Pin 14
4215	SCI, Slave2, Pin 15
4216	SCI, Slave2, Pin 16
5001	TSY, Pin 1

Table A

0000	constant value 0
1010	PMU
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5
6001	SST2 word 1

Table B

0001	constant value 1
1010	PMU
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5
6001	SST2 word 1

Table C

0000	constant value 0
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5
6001	SST2 word 1

Table D

0001	constant value 1
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5
6001	SST2 word 1

Table E

0000	constant value 0
0001	constant value 1
1010	PMU
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5
6001	SST2 word 1

Table F

0000	constant value 0
0001	constant value 1
2001	SST1 word 1
3001	CB/TB word 1
4501	SCB1/2 peer-to-peer, SCB2 USS, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5
6001	SST2 word 1

Table G

0001	constant value 1
2004	SST1 word 4
3004	CB/TB word 4
4501	SCB1/2 peer-to-peer, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, SCB2 USS, word 4
4505	SCB1/2 peer-to-peer, word 5
6004	SST2 word 4

Table H

0001	No HS checkback sig.
4501	SCB1/2 peer-to-peer, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, word 4
4505	SCB1/2 peer-to-peer, word 5

Table I

0000	constant value 0
0001	constant value 1
2004	SST1 word 4
3004	CB/TB word 4
4501	SCB1/2 peer-to-peer, word 1
4502	SCB1/2 peer-to-peer, word 2
4503	SCB1/2 peer-to-peer, word 3
4504	SCB1/2 peer-to-peer, SCB2 USS, word 4
4505	SCB1/2 peer-to-peer, word 5
6004	SST2 word 4

5.1.5 Significance of control word- (1 and 2) commands

The operating statuses can be read in monitoring parameter r001: e.g. READY-TO-POWER-UP: r001=009.

The function sequences are described in the sequence in which they are realized.

Bit 0: ON / OFF1 command (↑ „ON“) / (L „OFF1“)

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON (009).

Folge:
- PRE-CHARGING (010)
  Main contactor/bypass contactor (option) are switched-in, if present
  Pre-charging is realized
- READY STATUS (011)
  If the unit was last powered don using „OFF2“, the drive converter only changes over into the next status after the de-energization time (P371) since the last shutdown instant.
- GROUND FAULT TEST (012), only for selected ground-fault test (P354).
- RESTART-ON-THE-FLY (013), if restart-on-the-fly (control word bit 23 via P583) is enabled**.**
- READY (014).

LOW signal and P163 = 3, 4 (f- /n control)

Result:
- OFF1 (015), if the unit is in a status with inverter enable.
  - For P163 = 3, 4 and slave drive, there is a delay until the higher-level open-/closed-loop control shuts down the drive.
  - For P163 = 3, 4 and master drive, the setpoint at the ramp-function generator input is inhibited (setpoint = 0), so that the drive decelerates along the parameterized down ramp (P464) to the OFF shutdown frequency (P514).

  After the OFF delay time has expired (P516), the inverter pulses are inhibited, and the main contactor, if available, is opened. If the OFF1 command is again withdrawn during ramp-down (e.g. using an ON command), deceleration is interrupted, and the drive goes into the „RUN (014) status.
- The inverter pulses are inhibited, and the main contactor, if available, opened for PRECHARGING (010), READY (011), RESTART-ON-THE-FLY (013) or MOT-ID STANDSTILL (018).
- SWITCH-ON INHIBIT (008)
- SWITCH-ON INHIBIT (009), if „OFF2“ or „OFF3“ is not present.

LOW signal and P163 = 5 (closed-loop torque control)

Result:
- An OFF2 command (electrical) is output.

Bit 1: OFF2 command (L „OFF2“) (electrical)

LOW signal

Result:
- The inverter pulses are inhibited, and the main contact, if available, opened.
- SWITCH-ON INHIBIT (008), until the command is withdrawn.

NOTE
The **OFF2** command is simultaneously effective from three sources (P555, P556 and P557)!

Bit 2: OFF3 command (L „OFF3") (fast stop)

LOW signal

Result:
- This command has two possible effects:
  - DC braking is enabled (P372 = 1):
    DC braking (017)
    The drive decelerates along the parameterized down ramp for OFF3 (P466), until it reaches the start of DC braking frequency (P375).
    The inverter pulses are then inhibited for the duration of the de-energization time (P371).
    DC current braking is then realized with an adjustable braking current (P373) with a braking time which can be parameterized (P374).
    The inverter pulses are then inhibited, and the main contactor, if available, is opened.
  - DC braking is not enabled (P372 = 0):
    The setpoint is inhibited at the ramp-function generator input (setpoint = 0), so that the drive decelerates along the parameterized downramp for OFF3 (P466) to the OFF shutdown frequency (P514).
    After the OFF delay time (P516) has expired, the inverter pulses are inhibited, and the main/bypass contactor, if available, is opened.
    If the OFF 3 command is again withdrawn during deceleration, the drive still continues to decelerate.
    ☞ Section 6.6 „Ramp-function generator"
- The inverter pulses are inhibited, and the main/bypass contactor, if available, is opened for PRECHARGING (010), READY (011), RESTART-ON-THE-FLY (013) or MOT-ID STANDSTILL (018).
- If the drive operates as slave drive, then it automatically switches-over to master drive, for an OFF3 command.
- SWITCH-ON INHIBIT (008), until the command is withdrawn.

NOTE
♦ The **OFF 3** command is simultaneously effective from three sources (P558, P559 und P560)!
♦ Priority of the **OFF** commands: **OFF2** > **OFF3** > **OFF1**

Bit 3: Inverter enable command (H „inverter enable") / (L „inverter inhibit")

HIGH signal, READY (011) and expiration of the de-energization time (P371) since the last shutdown instant.

Result:
- RUN (014)
  The inverter pulses are enabled, and the setpoint is approached via the ramp-function generator.

LOW signal

Result:
- For RESTART-ON-THE-FLY (013), RUN (014), KINETIC BUFFERING with pulse enable, SPEED CONTROLLER LOOP OPTIMIZATION (019) or SYNCHRONIZING (020):
  Changeover into the READY (011) status, the inverter pulses are inhibited.
- For OFF1 (015 / stop), the inverter pulses are inhibited, the main contact, if available, opens, and the drive converter changes over into the SWITCH-ON INHIBIT status (008).
- For OFF3 (016 / fast stop), the inverter inhibit command is ignored, and fast stop is continued.

Bit 4: Ramp-function generator inhibit command (L „inhibit ramp-function generator“)

LOW signal in the RUN (014) status.

Result: ♦ The ramp-function generator output is set to setpoint = 0.

Bit 5: Ramp-function generator stop command (L „ramp-function generator stop“)

LOW signal in the RUN status (014).

Result: ♦ The actual setpoint is frozen at the ramp-function generator output.

Bit 6: Setpoint enable command (H „setpoint enable“)

HIGH signal and expiration of the de-energization time (P189).

Result: ♦ The setpoint at the ramp-function generator input is enabled.

Bit 7: Acknowledge command (↑ „Acknowledge“)

Positive edge change from (L → H) in the FAULT status (007).

Result:
- ♦ All of the actual faults are deleted after they have been previously transferred into the diagnostics memory.
- ♦ SWITCH-ON INHIBIT (008), if no actual faults exist.
- ♦ FAULT (007), if additional actual faults exist.

NOTE
The **acknowledge** command is simultaneously effective from three sources (P565, P566 und P567) and alwlays from the PMU!

Bit 8: Inching 1 ON command (↑ „Inching 1 ON“) / (L „Inching 1 OFF“)

Positive edge change from L to H (L → H) in the READY TO SWITCH-ON status (009).

Result: ♦ An ON command (refer to control word, bit 0) is issued, and the inching frequency 1 (P448) is enabled in the setpoint channel.
The ON/OFF1 command (bit 0) is ignored for active inching operation.

LOW signal

Result: ♦ An OFF1 command (refer to control word bit 0) is automatically issued.

Bit 9: Inching 2 ON command (↑ „Inching 2 ON“) / (L „Inching 2 OFF“)

Positive edge change from L to H (L → H) in the READY TO SWITCH-ON (009) status.

Result: ♦ An ON command (refer to control word bit 0) is issued, and inching frequency 2 (P449) is enabled in the setpoint channel.
The ON/OFF1 command (bit 0) is ignored for active inching operation.

LOW signal

Result: ♦ An OFF1 command (refer to control word bit 0) is automatically issued.

Bit 10: Control from the PLC command (H „control from the PLC“)

HIGH signal; Process data PZD (control word, setpoints) which were sent via the SST1 interface of CU, the CB/TB interface (option) and the SST/SCB interface (option), are only evaluated if the command was accepted.

Result:
- ♦ If several interfaces are operational, only the process data of the interfaces are evaluated, which transmit the H signal.
- ♦ For an L signal, the last values are retained in the appropriate dual port RAM of the interface.

NOTE
An H signal appears in the visualization parameter r550 „control word 1“, if **one** of the interfaces transmits an H signal!

Bit 11: Clockwise phase sequence command (H „clockwise phase sequence“)

HIGH signal

Result:
- ♦ The setpoint is influenced in conjunction with bit 12 „counter-clockwise rotating field“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 2)“*

Bit 12: Counter-clockwise phase sequence command (H „counter-clockwise phase sequence“)

HIGH signal

Result:
- ♦ The setpoint is influenced in conjunction with bit 11 „clockwise rotating field“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 2)“*

NOTE
The **counter-clockwise phases sequence-** and **clockwise phase sequence** commands have no influence on supplementary setpoint 2, which is added after the ramp-function generator!

Bit 13: Motorized potentiomenter, raise command (H „raise motorized potentiometer“)

HIGH signal

Result:
- ♦ The motorized potentiometer in the setpoint channel is energized in conjunction with bit 14 „motorized potentiometer, lower“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 1)“*

Bit 14: Motorized potentiometer, lower command (H „motorized potentiometer, lower)

HIGH signal

Result:
- ♦ The motorized potentiometer in the setpoint channel is energized in conjunction with bit 13 „motorized potentiometer, raise“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 1)“*

Bit 15: Fault, external 1 command (L „fault, external 1“)

LOW signal

Result: ♦ FAULT (007) and fault message (F035).
The inverter pulses are inhibited and the main contactor, if available, is opened.

☞ *Chapter 12 „Fault and alarm messages“*

Bit 16: Setpoint channel data set SDS bit 0 command

Result: ♦ One of the four possible setpoint channel data sets are controlled in conjunction with bit 17 „SDS BIT 1“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Part 1) / data sets“*

Bit 17: Setpoint channel data set SDS bit 1 command

Result: ♦ One of the four possible setpoint channel data sets are controlled in conjunction with bit 16 „SDS BIT 0“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Part 1) / data sets“*

Bit 18: Motor data set MDS bit 0 command

READY-TO-SWITCH-ON (009), PRECHARGING (010) or READY (011)

Result: ♦ One of the four posible motor data sets is controlled in conjunction bit 19 „MDS BIT 1“.

☞ *Chapter 10 „Function diagram, data sets“*

Bit 19: Motor data set MDS bit 1 command

READY-TO-SWITCH-ON (009), PRECHARGING (010) or READY (011)

Result: ♦ One of the four posible motor data sets is controlled in conjunction bit 18 „MDS BIT 0“.

☞ *Chapter 10 „Function diagram, data sets“*

Bit 20: Fixed setpoint FSW bit 0 (LSB command)

Result: ♦ One of the four possible fixed setpoints is controlled in conjunction with bit 21 „FSW BIT 1“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 1) / data sets“*

Bit 21: Fixed setpoint FSW bit 1 (MSB) command

Result: ♦ One of the four possible fixed setpoints is controlled in conjunction with bit 20 „FSW BIT 0“.

☞ *Chapter 10 „Function diagram, setpoint channel CU (Section 1) / data sets“*

Bit 22: Synchronizing enable command (H „Synchronizing enable“)

HIGH signal, TSY (option) present and P163 = 2 (V/f characteristic for textile applications).

Result: ♦ The command enables the synchronizing function.

☞ *Operating Instructions for TSY (option).*

Bit 23: Restart-on-the-fly enable command (H „enable restart-on-the-fly“)

HIGH-Signal

Folge: ♦ This command enables the restart-on-the-fly function.

☞ *Chapter 9 „Functions (software)"*

Bit 24: Droop/technology controller enable command (H „droop/technology controller enable“)

HIGH- signal

Result: ♦ This command has two different functions:

- The command enables the droop function if P163 „Control Mode“ is assigned 3 „closed-loop frequency control“ or 4 „closed-loop speed control“, parameter P248 ≠ 0 and the converter inverter pulses are enabled.
  The n/f controller output, which is negatively fed back to the n/f setpoint, can be set via parameters P247 „droop“ and P248 „droop Kp“.
- The command activates the technology controller if the inverter pulses are enabled and the excitation time has expired. The technology controller can be parameterized using parameters P525 to P545.

☞ *Chapter 10 „Function diagrams, closed-loop control“ and Chapter 11 „Parameter list“*

NOTE
If only one of the two functions is to be activated, it must be ensured that the other is disabled. Droop is disabled with P248 = 0 and the technology controller with P526 = 0000. Both functions are disabled as default setting.

Bit 25: Controller enable command (H „controller enable“)

HIGH signal and the drive converter inverter pulses enabled.

Result: ♦ The n-controller output for the appropriate control type (P163 = 0,4,5) is enabled.

☞ *Chapter 10 „Function diagrams, closed-loop control“*

Bit 26: Fault, external 2 command (L „fault, external 2“)

LOW signal; only activated from the READY status (011) with an additional time delay of 200 ms.

Result: ♦ FAULT (007) and fault message (F036).
The inverter pulses are inhibited, the main contactor, if available, is opened.

☞ *Chapter 12 „Fault and alarm messages“*

Bit 27: Master/slave drive command (H „slave drive"/L „master drive")

HIGH signal, P163 (open-loop/closed-loop control type) = 3, 4 (closed-loop frequency/speed control) and the drive converter inverter pulses enabled.

Result: ♦ Slave drive: The closed-loop control operates as a torque control (closed-loop torque control).

LOW signal, P163 (open-loop/closed-loop control type) = 3, 4 (closed-loop frequency/speed control) and the drive converter inverter pulses enabled.

Result: ♦ Master drive: The closed-loop control operates as a speed or frequency control (closed-loop speed/frequency control).

☞ *Chapter 10 „Function diagrams, closed-loop speed control"*

Bit 28: Alarm, external 1 command (L „alarm, external 1")

LOW signal

Result: ♦ The operating status is retained. An alarm message (A015) is output.

☞ *Chapter 12 „Fault and alarm messages"*

Bit 29: Alarm, external 2 command (L „alarm, external 2")

LOW-Signal

Result: ♦ The operating status is retained. An alarm message (A016) is output.

☞ *Chapter 12 „Fault and alarm messages"*

Bit 30: Selection, reserve/basic setting command (H „reserve setting") / (L „basic setting")

HIGH signal

Folge: ♦ The parameter settings of the reserve setting for the control word itself, the setpoint channel, and the closed-loop control are activated.

LOW signal

Result: ♦ The parameter settings of the basic setting for the control word itself, the setpoint channel, and the closed-loop control are activated.

☞ *Chapter 10 „Function diagrams, data sets"*

Bit 31: HS checkback signal command (H „HS checkback signal")

HIGH signal, corresponding to the configuration (wiring) and parameterization of the main contactor (option).

Result: ♦ Checkback signal, „main contactor energized".

☞ *Chapter „Options" in Operating Instructions, Part 1*

5.2 Status word

Introduction and application example

Status words are process data in the sense of the explanation in Section 3.2.

A „destination“ can be parameterized for every bit of a status word, which can be identified by the bit status (binary outputs of the CU, SCI 1/2 terminals, TSY terminals).

A parameter is available to „connect-up“ the destination for each status bit.

The selection parameters are indexed three times as follows:

Index i001 Selecting a terminal on the CU / PEU board (basic drive converter)
Index i002 Selecting a terminal on the SCI 1/2 board (option)
Index i003 Selecting a terminal on the TSY board (option)

Example for connecting-up the destination:

The „ramp-function generator active“ signal (status word 1, bit 13), is to be connected-up as high-active signal at binary output 2 (BA2) of CU (terminal -X100:6/7) :

- The status bit „connection“ to binary output of the CU is parameterized via index i001.
- From the status word 1 table, it can be identified that the „ramp-function generator active“ signal is assigned to parameter P613.
- The parameter value for the required destination is searched for in the same table. The result is 1002 for binary output 2 of the CU.
- This parameter value must now be entered into parameter P613.1.

Bit #	Significance	Parameter	Parameter value	Required destination connection
Bit 13	Ramp-function generator active	P613.1	1002	BA2 terminal -X100:6/7

For a high signal at terminal -X100:6/7, the ramp-function generator is active; it is inactive for a low signal.

If a value, which is assigned a terminal (binary output BA), is assigned once in a select parameter for a destination, then it is no longer available in the same index of another select parameter, as a terminal is only suitable to output one status bit.

INFORMATION

Faults, alarms and **power-on inhibit (HIGH active),** are displayed via the terminal strip (binary outputs) as **LOW active**.

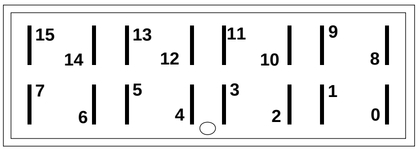
This is also valid for possible option boards!

☞ Section 6.2 „Binary outputs“

5.2.1 Status word 1 (visualization parameter r552 or r968)

PMU display

„Status word 1“



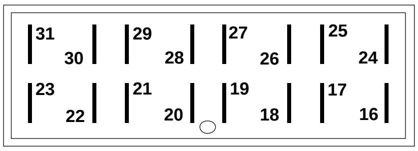
Bit #	Value	1 = High 0 = Low	Select dest.
Bit 0	1	Ready-to-switch-on	P600.x
	0	Not ready to switch on	
Bit 1	1	Ready	P601.x
	0	Not ready	
Bit 2	1	Run	P602.x
	0	Inverter pulses inhibited	
Bit 3	1	Fault	P603.x
	0	No fault	
Bit 4	1	No OFF 2	P604.x
	0	OFF2	
Bit 5	1	No OFF 3	P605.x
	0	OFF3	
Bit 6	1	Switch-on inhibit	P606.x
	0	No switch-on inhibit	
Bit 7	1	Alarm	P607.x
	0	No alarm	
Bit 8	1	No setpt. act. val. deviation	P608.x
	0	Setpt. act. value deviation	
Bit 9	1	PZD control requested	always 1
	0	(not permissible)	
Bit 10	1	Comparison freq. reached	P610.x
	0	Actual val. < comparitive freq.	
Bit 11	1	Fault, undervoltage	P611.x
	0	No undervoltage fault	
Bit 12	1	Main contactor energized	P612.x
	0	Main contactor not energized	
Bit 13	1	HLG active	P613.x
	0	HLG not active	
Bit 14	1	Clockwise phase sequence	P614.x
	0	Counter-clockwise phase seq.	
Bit 15	1	KIP/FLN active	P615.x
	0	KIP/FLN not active	

	Value	Destination
x = 1	0000	No destination
	1001	BA1, -X9:4/5
	1002	BA2, -X100:6/7/8
	1003	BA3, -X100:9/10
	1004	BA4, -X100:11/12
x = 2	0000	No destination
	4101	SCI 1/2, slave 1, BA1
	4102	SCI 1/2, slave 1, BA2
	4103	SCI 1/2, slave 1, BA3
	4104	SCI 1/2, slave 1, BA4
	4105	SCI 1/2, slave 1, BA5
	4106	SCI 1/2, slave 1, BA6
	4107	SCI 1/2, slave 1, BA7
	4108	SCI 1/2, slave 1, BA8
	4109	only SCI 2, slave 1, BA9
	4110	only SCI 2, slave 1, BA10
	4111	only SCI 2, slave 1, BA11
	4112	only SCI 2, slave 1, BA12
	4201	SCI 1/2, slave 2, BA1
	4202	SCI 1/2, slave 2, BA2
	4203	SCI 1/2, slave 2, BA3
	4204	SCI 1/2, slave 2, BA4
	4205	SCI 1/2, slave 2, BA5
	4206	SCI 1/2, slave 2, BA6
	4207	SCI 1/2, slave 2, BA7
	4208	SCI 1/2, slave 2, BA8
	4209	only SCI 2, slave 2, BA9
	4210	only SCI 2, slave 2, BA10
	4211	only SCI 2, slave 2, BA11
	4212	only SCI 2, slave 2, BA12
x = 3	0000	No destination
	5001	TSY, BA1
	5002	TSY, BA2

5.2.2 Status word 2 (visualization parameter r553)

PMU display

„Status word 2“



Bit #	Value	1 = High / 0 = Low	Select dest.
Bit 16	1	Restart-on-the-fly or excit. active	P616.x
	0	Restart-on-the-fly + excit. inactive	
Bit 17	1	Synchronism reached	P617.x
	0	Synchronism not reached	
Bit 18	1	No overspeed	P618.x
	0	Overspeed	
Bit 19	1	Fault, external 1	P619.x
	0	No fault, external 1	
Bit 20	1	Fault, external 2	P620.x
	0	No fault, external 2	
Bit 21	1	Alarm, external	P621.x
	0	No alarm, external	
Bit 22	1	Alarm i2t converter	P622.x
	0	No alarm, i2t converter	
Bit 23	1	Fault, overtemp., converter	P623.x
	0	No fault, overtemp. conv.	
Bit 24	1	Alarm, overtemp., conv.	P624.x
	0	No alarm, overtemp., conv.	
Bit 25	1	Alarm, motor overtemp.	P625.x
	0	No alarm, overtemp. mot.	
Bit 26	1	Fault, motor overtemp.	P626.x
	0	No fault, overtemp. mot.	
Bit 27	1	T. contr. act. val.>T. contr. setp.	P627.x
	0	T. contr. act. val.<T. contr. setp.	
Bit 28	1	Fault, motor stall/lock	P628.x
	0	No fault motor stall/lock	
Bit 29	1	Bypass contactor energized	P629.x
	0	Bypass contactor not energized	
Bit 30	1	Alarm, synchronizing error	P630.x
	0	No alarm, synchronizing error	
Bit 31	1	Pre-charging active	P631.x
	0	Pre-charging not active	

	Value	Destination
x = 1	0000	No destination
	1001	BA1, -X9:4/5
	1002	BA2, -X100:6/7/8
	1003	BA3, -X100:9/10
	1004	BA4, -X100:11/12
x = 2	0000	No destination
	4101	SCI 1/2, slave 1, BA1
	4102	SCI 1/2, slave 1, BA2
	4103	SCI 1/2, slave 1, BA3
	4104	SCI 1/2, slave 1, BA4
	4105	SCI 1/2, slave 1, BA5
	4106	SCI 1/2, slave 1, BA6
	4107	SCI 1/2, slave 1, BA7
	4108	SCI 1/2, slave 1, BA8
	4109	only SCI 2, slave 1, BA9
	4110	only SCI 2, slave 1, BA10
	4111	only SCI 2, slave 1, BA11
	4112	only SCI 2, slave 1, BA12
	4201	SCI 1/2, slave 2, BA1
	4202	SCI 1/2, slave 2, BA2
	4203	SCI 1/2, slave 2, BA3
	4204	SCI 1/2, slave 2, BA4
	4205	SCI 1/2, slave 2, BA5
	4206	SCI 1/2, slave 2, BA6
	4207	SCI 1/2, slave 2, BA7
	4208	SCI 1/2, slave 2, BA8
	4209	only SCI 2, slave 2, BA9
	4210	only SCI 2, slave 2, BA10
	4211	only SCI 2, slave 2, BA11
	4212	only SCI 2, slave 2, BA12
x = 3	0000	No destination
	5001	TSY, BA1
	5002	TSY, BA2

5.2.3 Significance of the status word messages

Bit 0: Signal, „Ready to switch-on“ (H)

HIGH signal: SWITCH-ON INHIBIT (008) or READY-TO-SWITCH-ON (009) status

Significance
- The power supply, the open-loop and closed-loop control are operational.
- The inverter impulses are inhibited.
- If an external power supply and a main contactor (option) are available, it is possible that the DC link can be brought into a no-voltage condition in this converter status!

Bit 1: Signal, „ready“ (H)

HIGH signal: PRE-CHARGING (010) or READY (011) status

Significance
- The power supply, the open-loop and closed-loop control are operational.
- The converter is switched-on.
- Pre-charging is executed (has been completed).
- The DC link is ramped-up to the full voltage (has attained full voltage).
- The inverter pulses are still inhibited.

Bit 2: Signal, „run“ (H)

HIGH signal: RESTART-ON-THE-FLY (013), RUN (014), OFF1 (015) or OFF3 (016) status

Significance
- The converter is functioning.
- The inverter pulses are enabled.
- The output terminals are live.

Bit 3: Signal, „Fault“ (H)

HIGH signal: FAULT (007) status

Significance
- A fault has occured.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 4: Signal, „OFF2“ (L)

LOW signal: OFF2 command present

Significance
- The OFF2 command (control word bit 1) was output.

Bit 5: Signal, „OFF3“ (L)

LOW signal : OFF3 (016) status, and/or OFF3 command available

Significance
- The OFF3 command (control word bit 2) was output.

Bit 6: Signal, „switch-on inhibit“ (H)

HIGH signal: SWITCH-ON INHIBIT (008) status

Significance
- The power supply, open- and closed-loop control are operational.
- If an external power supply and a main contactor (option) are available, it is possible that the DC link is in a no-voltage condition in this converter status!
- The message is continuously available as long as an OFF2 command is present via the control word bit1; or/and an OFF3 command is available via the control word bit 2 after the setpoint has been reduced; or/and an ON command is still available via the control word bit 0 (edge evaluation).

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 7: Signal, „alarm“ (H)

HIGH signal: Alarm (Axxx)

Significance
- An alarm has occured.
- The signal remains until the cause has been removed.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 8: Signal, „setpoint-actual value deviation“ (L)

LOW signal: Alarm „setpoint-actual value deviation“ (A034)

Significance
- The frequency actual value - frequency setpoint deviation is greater than P517 (Deviation Freq.) and remains for longer than the time parameterized in P518 (Deviation Time).
- The bit is again set to an H signal if the deviation is less than the parameter value P517.

Bit 9: Signal, „PZD control requested“ (H)

HIGH signal: It is always present.

Bit 10: Signal, „comparison frequency reached“ (H)

HIGH signal: The parameterized comparison frequency has been reached.

Significance
- The absolute frequency actual value is greater than or the same as the parameterized comparison frequency (P512).
- The bit is again set to L, as soon as the actual absolute frequency value falls below the comparison frequency (P512), minus the parameterized comparison frequency hysteresis (P513 in % referred to the comparison frequency (P512)).

Bit 11: Signal, „fault, undervoltage“ (H)

HIGH signal: Fault „undervoltage in the DC link“ (F008)

Significance
- The DC link voltage has fallen below the permissible limit value.
  ☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 12: Signal, „main contactor energized“ (H)

HIGH signal: The main contactor is energized.

Significance ♦ A main contactor (option) can be controlled with the appropriate „wiring“ and parameterization.
☞ Section „Options“ in Operating Instructions, Part 1

Bit 13: Signal, „RFG active“ (H)

HIGH signal: Ramp-function generator active

Significance
- ♦ The ramp-function generator output value (r480) is not equal to the ramp-function input value (r460).
  A hysteresis, which can be parameterized (P476 in %, referred to the rated system frequency P420) can only be taken into account for an analog setpoint input.
- ♦ When the „synchronizing“ function is selected, alarm A069 is initiated, as long as the ramp-function generator in the setpoint channel of the synchronizing drive converter is active. Synchronizing is not started as long as the ramp-function generator is active.

Bit 14: Signal, „clockwise phase sequence“ (H)/“ counter-clockwise phase sequence“ (L)

HIGH signal: Clockwise phase sequence

Significance ♦ The frequency setpoint for the closed-loop control (n/f setpoint, r482), is greater than or equal to 0).

LOW signal: Counter-clockwise phase sequence

Significance ♦ The frequency setpoint for the closed-loop control (n/f setpoint, r482) is less than 0.

Bit 15: Signal, „KIP/FLN active“ (H)

HIGH signal: The kinetic buffering (KIP) function or the flexible response (FLN) function is active.

Significance
- ♦ KIP: A brief supply failure is buffered using the kinetic energy of the machine.
- ♦ FLN: The drive converter can be operated down to a minimum DC link voltage of 50% of the rated value.
  ☞ Chapter 9 „Functions“

Bit 16: Signal, „restart-on-the-fly active“ (H)

HIGH signal: The restart-on-the-fly function is active or the excitation time (P189) is running.

Significance
- ♦ The drive converter has been switched to a motor which is still rotating.
- ♦ An overcurrent condition is prevented using the restart-on-the-fly function.
  ☞ Chapter 9 „Functions“
- ♦ The energization time is active.

Bit 17: Signal, „synchronism reached“ (H)

HIGH signal: Synchronism has been reached.

Significance ♦ Synchronism has been reached.
☞ Instruction Manual for the TSY and Chapter 12 „Fault- and alarm messages“.

Prerequisite: TSY (option) available and P163 (open-loop/closed-loop control type) = 2 (V/f characteristic for textile application).

Bit 18: Signal, „overspeed“ (L)

LOW signal: Alarm „overspeed“ (A033)

Significance ♦ The frequency actual value is either:
- greater than the maximum frequency for a clockwise phase sequence (P452), plus a hysteresis (P519 in %, referred to P452) or
- is less than the maximum frequency for the counter-clockwise phase sequence (P453) plus a hysteresis (P519 in %, referred to P453).

♦ The bit is again set to an H, as soon as the absolute frequency actual value is less than or equal to the absolute value of the appropriate maximum frequency.

Bit 19: Signal, „fault, external 1“ (H)

HIGH signal: „Fault, external 1“

Significance ♦ A „fault, external 1“ is present in control word bit 15.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 20: Signal, „fault, external 2“ (H)

HIGH signal: „Fault, external 2“

Significance ♦ A „fault, external 2“ is present in control word bit 26.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 21: Signal, „external alarm“ (H)

HIGH signal: „External alarm“

Significance ♦ An „external alarm 1“ is present in control word bit 28, or an „external alarm 2“ in control word bit 29.

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 22: Signal, „alarm i^2t inv.“ (H)

HIGH signal: Alarm „i^2t-Inv.“ (A025)

Significance ♦ If the instantaneous load status remains the same, then the drive converter will be thermally overloaded.
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 23: Signal, „Overtemperature fault signal UMR“ (H)

HIGH signal: „Inverter temperature too high“ fault (F023)

Significance ♦ The inverter temperature limit value was exceeded.
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 24: Signal, „motor overtemperature alarm“ (H)

HIGH signal: Alarm „inverter temperature too high“ (A022)

Significance ♦ Alarm temperature threshold of the inverter was exceeded.
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 25: Signal, „motor overtemperature alarm“ (H)

HIGH signal: „Motor overtemperature“ alarm

Significance
- ♦ It involves an „motor I^2t alarm“ (A029) or an overtemperature alarm using KTY (P360 > 0).
- ♦ The prerequisite for the alarm is the motor load calculation (r008) or by measurement using a KTY 84 sensor (r009).
- ♦ Parameters used in the calculation: P362 (Motor Cooling), P363 (Mot ThermT-Const), P364 (Mot. Load Limits).
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 26: Signal, „motor overtemperature fault“ (H)

HIGH signal: High signal: „motor overtemperature“ fault

Significance ♦ It involves a „motor I^2t fault“ (F021) or an overtemperature fault using KTY (P360 > 1) or PTC thermistor (P361 = 1).
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 27: Signal, „technology controller actual value greater than technology controller setpoint“ (H)

HIGH signal: The technology controller actual value (r534) is greater than the technology controller setpoint (r529).

Significance
- ♦ The signal is set when the technology controller setpoint is exceeded.
- ♦ If the technology controller actual value becomes less than the technology controller setpoint, a hysteresis (P535) is also taken into account.

Bit 28: Signal, „motor stall“ (H)

HIGH signal: „Motor stalled or locked rotor“ fault (F015)

Significance ♦ The drive has either stalled or the rotor is locked.
☞ Chapter 12 „Fault and alarm messages“

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 29: Signal, „bypass contactor energized“ (H)

HIGH signal: The bypass (pre-charging) contactor is energized (closed).

Significance ♦ A bypass contactor (option) can be energized (closed) with the appropriate wiring and parameterization.
☞ Chapter „Options“ in Operating Instructions, Part 1

Bit 30: „Sync. error alarm“ signal (H)

HIGH signal: „Synchronizing error“ alarm (A070)

Significance ♦ After synchronization, the phase deviation is greater than the parameterized tolerance range (P391).
☞ Instruction Manual to TSY and Chapter 12 „Fault- and alarm messages“

Prerequisite: TSY (option) available and P163 (Control Mode) = 2 (V/f characteristic for textile applications).

Output at the terminal strip (PEU, CU, TSY, SCI1/2) with L signal.

Bit 31: „Pre-charging active“ signal (H)

HIGH signal: PRE-CHARGING (010) status

Significance ♦ Pre-charging is executed after an ON command.

5.3 Setpoints

Introduction and application example

The setpoints are process data in the sense of the explanation in Section 3.2.

An individual source can be parameterized for every setpoint, from which the setpoint may be entered (fixed values, analog inputs, PMU, PZD part of the telegram from automation units).

The select parameters for the sources are indexed twice:

Index i001: Basic setting (BASE)
Index i002: Reserve setting (RES)

One parameter is available for the setpoints to „connect“ the source(s).

Example for connecting-up the sources:

The main setpoint should be „connected“ to analog input 1 of the CU (terminal -X102:27,28) as voltage input in the basic setting:

- From the setpoint table, it is possible to identify that the factory setting of parameter P443.1 of the main setpoint value is 1002
- In table B for the possible sources of the main setpoint, it can be seen that 1002 corresponds to the „motorized potentiometer“ source.
- In the setpoint table, it can be seen that the possible sources for the main setpoint are written into tables X, Y and B.
- The parameter value for the required source is searched for in tables X, Y and B. For analog input 1 of the CU, the value is found in Table X. The result is 1003.
- This parameter value must now be entered into parameter P443.1.

Designation	Parameter	Possible sources	Parameter value	Required source wiring
Main setpoint (GRD)	P443.1	Tab.X,Y,B	1003	AE1 terminal -X102:27,28,29

An amplification factor (P444.1) is available for parameter P443.1, which can be set as required.

		Gain	Normalization	Visualization
Speed controller gain adaption	P226	P227	4000Hex = 10	r228
Supplementary setpoint 1	P433	P434	4000Hex = P420	r437
Supplementary setpoint 2	P438	P439	4000Hex = P420	r442
Main setpoint	P443	P444	4000Hex = P420	r447
Torque setpoint	P486	P487	4000Hex = P485	r490
Upper torque limit	P493	P494	4000Hex = P485	r496
Lower torque limit	P499	P500	4000Hex = P485	r502
Torque/current supplementary setpoint	P506	P507	4000Hex = P485	r510
Technology controller setpoint	P526	P527	4000Hex = 100 %	r529
Technology controller actual value	P531	P532	4000Hex = 100 %	r534
Initial angle	P158	–	4000Hex = 90 %	r159, r160

Table 5.1 Interdependecies of the parameters for gain, normalization and visualization

5.3.1 Overview of the setpoints

Designation	Param. No. BAS (RES)	Fac. setting BAS (RES)	Possible sources	Gain BAS (RES)	Fac. set. BAS+RE
Adaption of	P226.1 (2)	1001 (1001)	Tab.X,A	P227.1 (2)	100.00
Supplementary setpoint 1	P433.1 (2)	0 (0)	Tab.X,Y,A	P434.1 (2)	100.00
Supplementary setpoint 2	P438.1 (2)	0 (0)	Tab.X,Y,A	P439.1 (2)	100.00
Main setpoint	P443.1 (2)	1002 (1001)	Tab.X,Y,B	P444.1 (2)	100.00
Torque setpoint	P486.1 (2)	0 (0)	Tab.X,C	P487.1 (2)	100.00
Upper torque limit	P493.1 (2)	1001 (1001)	Tab.X,A	P494.1 (2)	100.00
Lower torque limit	P499.1 (2)	1001 (1001)	Tab.X,A	P500.1 (2)	100.00
Suppl. torque/current setpoint	P506.1 (2)	0 (0)	Tab.X,A	P507.1 (2)	100.00
Technology controller setpoint	P526.1 (2)	0 (0)	Tab.X,Y,A	P527.1 (2)	100.00
Technology controller actual value	P531.1 (2)	0 (0)	Tab.X,Y,D	P532.1 (2)	100.00
Initial angle	P158.1 (2)	0 (0)	Tab.X,Y,C	–	–

Table 5.2 Setpoints

5.3.2 Selecting the possible setpoint sources

Table X

Value	Source
CU BOARD	
0000	Constant setpoint 0
1003	Analog input 1
1004	Analog input 2
2002	SST1 word 2
2003	SST1 word 3
2004	SST1 word 4 1)
…	Consecutively to
2016	SST1 word 16
6002	SST2 word 2
6003	SST2 word 3
6004	SST2 word 4 2)
…	Consecutively to
6016	SST2 word 16
OPTIONS	
Value	**Source**
3002	PT/CB word 2
3003	PT/CB word 3
3004	PT/CB word 4 3)
…	Consecutively to
3016	PT/CB word 16
4101	SCI1, slave1, AE1
4102	SCI1, slave1, AE2
4103	SCI1, slave1, AE3
4201	SCI1, slave2, AE1
4202	SCI1, slave2, AE2
4203	SCI1, slave2, AE3
4501	SCB1/2 (peer to peer) word 1 4)
4502	SCB1/2 (peer to peer, USS) word 2
4503	SCB1/2 (peer to peer, USS) word 3
4504	SCB1/2 (peer to peer, USS) word 4 5)
…	Consecutively to
4505	SCB1/2 (peer to peer, USS) word 5
4506	SCB2 (USS) word 6
…	Consecutively to
4516	SCB2 (USS) word 16

Table Y

Value	Source
CU BOARD	
2032	SST1 double word 2 and 3
2033	SST1 double word 3 and 4 1)
2034	SST1 double word 4 and 5 1)
…	Consecutively to
2045	SST2 double word 15 and 16
6032	SST2 double word 2 and 3
6033	SST2 double word 3 and 4 2)
6034	SST2 double word 4 and 5 2)
…	Consecutively to
6045	SST2 double word 15 and 16
OPTIONS	
Value	**Source**
3032	CB/TB double word 2 and 3
3033	CB/TB double word 3 and 4 3)
3034	CB/TB double word 4 and 5 3)
…	Consecutively to
3045	CB/TB double word 15 and 16
4531	SCB1/2 (peer to peer) word 1 and 2 4)
4532	SCB1/2 (USS, peer to peer) word 2 and 3
4533	SCB1/2 (USS, peer to peer) word 3 and 4 5)
4534	SCB1/2 (USS, peer to peer) word 4 and 5 5)
4535	SCB2 (USS) word 5 and 6
…	Consecutively to
4516	SCB2 (USS) word 15 and16

Table A

Value	Source
1001	Fixed setpoint – for source P226: P225 – for source P433 and P438: P421 to P424 – for source P493: P492 – for source P499: P498 – for source P506: P505 – for source P526: P525
1020	Technology controller output

Table B

Value	Source
1001	Fixed setpoint (P421 to P424)
1002	Motorized potentiometer
1020	Technology controller output

Table C

Value	Source
1020	Technology controller output

Table D

Value	Source
1100	1: P530.1
1200	Technology controller act. val. 2: P530.2

1) only when word4 is not assigned for „control word2“ with 2004 (Section 5.1)

2) only if word4 is not assigned for „control word2“ with 6004 (Section 5.1)

3) only if word4 is not assigned for „control word2“ with 3004 (Section 5.1)

4) only if word1 is not assigned for „control word2“ with 4501 (Section 5.1)

5) only if word4 is not assigned for „control word2“ with 4504 (Section 5.1)

5.4 Actual values

Actual values are process data in the sense of the explanation in Section 3.2.

Four destinations are available in the basic version to output actual values.
Four additional output devices can be parameterized via option boards.

The contents of all available parameters of the basic drive converter can be selected as output values.

In order to connect a parameter to a destination, its parameter number must be entered in the selected destination parameter.

NOTES
♦ When selecting an indexed parameter, the value of the first index is always output!
♦ When entering a „0“ instead of a parameter number, an output is <u>not</u> made to the appropriate destination!

Destinations:

P530 „ActVal's ProcReg“
Output at the technology controller actual value input
Indices: i001 Value 1 for the technology controller actual value input (P531 = 1100)
i002 Value 2 for the technology controller actual value input (P531 = 1200)
☞ Chapter 10 „Function diagrams, closed-loop control“

P655 „CU AnaOut Act Val“
Output via the CU control terminal strip (Chapüter 1)
Indices: i001 analog output 1 (-X102:34 / reference potential -X102:33)
i002 analog output 2 (-X103:44 / reference potential -X103:43)
☞ Section 6.4 „Analog outputs“

P680 „SCom1 Act Value“
P681 „SCom2 Act Value“
Output via the basic converter interfaces SST1 and/or SST2
Indices: i001 Word 01 of the telegram (PZD)
⇓ ⇓
i016 Word 16 of the telegram (PZD)
☞ Section 6.5 „basic converter interfaces SST1 and SST2“

Destination, options:

P664 „SCI-AA actual values“
Output via the SCB1 interface with SCI1
☞ Instruction Manual for the option boards
Indexes i001 Destination: Analog output 1 from slave 1
i002 Destination: Analog output 2 from slave 1
i003 Destination: Analog output 3 from slave 1
i004 Destination: Analog output 1 from slave 2
i005 Destination: Analog output 2 from slave 2
i006 Destination: Analog output 3 from slave 2

P690 „SCB actual values“
Output via the SCB1 interface with peer-to-peer protocol or SCB2
☞ Instruction Manual for the option boards
Indexes: i001 Destination: Word 01 of the telegram (PZD)
⇓ ⇓
i016 Destination: Word 16 of the telegram (PZD)

P694 „CB/TB actual values“
Output via the CB or TB interface
☞ Instruction Manual for the option boards and Sections 6.5.2 „DPR“

Indices: i001 Destination: Word 01 of the telegram (PZD)
⇓ ⇓
i016 Destination: Word 16 of the telegram (PZD)

NOTES
For telegram transfer (P680, P681, P690, P694): ♦ Generally, it is necessary/practical to assign „word 01 of the telegram (PZD)“ with the status word 1 (r968 or r552)! ♦ If double-word parameters (type I4) are to be transferred as actual values, the associated parameter number must be entered in 2 consecutive words (indices), as otherwise only the most significant word will be transferred!

Normalization:

The values of the parameters to be output are weighted with the normalization relationship specified in the parameter list.
For example, r004 (output current) is referred to 4 x P102 (Mot.curr(n)), i.e. 100 % corresponds to 400 % rated motor current.

Examples:

1) Technology controller

The output power (r005) of the control should be fed to the technology controller as second actual value.

P530.02 = 005

P531.01 = 1200 (basic setting)

2) Analog output

The speed setpoint (r482) should be output at analog output 2.

P655.02 = 482

3) SST1

Status word 1 (r968, r552) to word 1; speed setpoint (r482) to word 2 and 3
(double word, I4 parameter)

P680.01 = 968

P680.02 = 482

P680.03 = 482

6 Interfaces

6.1 Binary inputs

Seven binary inputs (24 V) **which can be parameterized** are available at the control terminal strip of board CU (-X101). These inputs can be used to input commands, external faults/alarms as well as checkback signal at the control word of the drive converter.

Connecting-up: ☞ Chapter 1 „Control terminal strip".

Parameterization: ☞ Section 5.1 „Control word".

Factory setting (valid for standby operation)**:**

Binary input	Command		Control word bit	Parameter
	HIGH	LOW		
1	ON	OFF1	0	P554.2 = 1001 (reserve)
2	ON	OFF2 (electrical)	1	P555.2 = 1002 (reserve)
3	Acknowledge		7	P565.2 = 1003 (reserve)
4	FSW-Bit 0 = 1	FSW-Bit 0 = 0	20	P580.2 = 1004 (reserve)
5	Reserve setting	Basic setting	30	P590 = 1005
6	not assigned			
7	not assigned			

Table 6.1 Binary inputs

6.2 Binary outputs

There are **four binary outputs which can be parameterized**.
These outputs can be used to output signals and external commands of the drive converter status word.

Connecting-up: Binary output 1 at the basic drive converter (connector -X9):
☞ Section „Auxilary power supply / main contactor“ in Operating Instructions, Part 1

Binary outputs 2 to 4 on the control terminal strip of the CU board (connector -X100):
☞ Chapter 1 „Control terminal strip“

Parameterization: ☞ Section 5.2 „Status word“.

Factory setting (not valid for cabinet units)**:**

Binary output	Connector, location	Signal HIGH	Signal LOW	Status-word bit	Parameter
1	-X9	Main contactor energized	Main contactor not energized	12	P612.1 = 1001
2	-X100 on the CU	Fault	No fault	3	P603.1 = 1002
3	-X100 on the CU	Run	No operation	2	P602.1 = 1003
4	-X100 on the CU	Not assigned	Not assigned		

Table 6.2 Binary outputs

NOTE
Faults, alarms and power-on inhibit (HIGH active) are displayed as **LOW active via the terminal strip (binary outputs)** ☞ Section 5.2 „Status word“.

6.3 Analog inputs

Control board CU has 2 analog inputs (AI), which can be used to input setpoints via voltage- or current signals or as speed actual value input (Connection ☞ Chapter 1).

Technical data:

Setpoint input via voltage	Setpoint via current	Speed actual value input
♦ Input voltage range: • –10 V to +10 V • 0 V to +10 V • + 2 V to +10 V ♦ Resolution 5 mV (11 bit + sign) ♦ Accuracy ± 0.5 % ♦ Stability at ΔT = 10 K: 0,2 % ♦ Smoothing 0 ms to 1000 ms, can be parameterized (P651)	♦ Input current range: • –20 mA to +20 mA • 0 mA to 20 mA • 4 mA to 20 mA ♦ Resolution 0,01 mA (11 bit + sign) ♦ Accuracy ± 0.7 % ♦ Stability at ΔT = 10 K: 0.2 % ♦ Smoothing 0 ms to 1000 ms, can be parameterized (P651)	♦ Input voltage range: ♦ –10 V to +10 V (use the ATI board for higher tachometer voltages!) ♦ Use a shielded cable and connect at one end to the drive converter.

Table 6.3 Technical data of the analog inputs

Using P208.x, it can be defined as to whether the analog input should be used as tachometer input (refer to Section 6.3.2).

P208.x	Analog input AE1	Analog input AE2
3	Analog tach. input	
4		Analog tach. input

Table 6.4 Speed feedback

6.3.1 Analog input as setpoint input

Signal flow for any setpoint; the overview of the possible setpoints is located in Section 5.3.1. (☞ Function diagrams „Analog inputs“, Chapter 10):

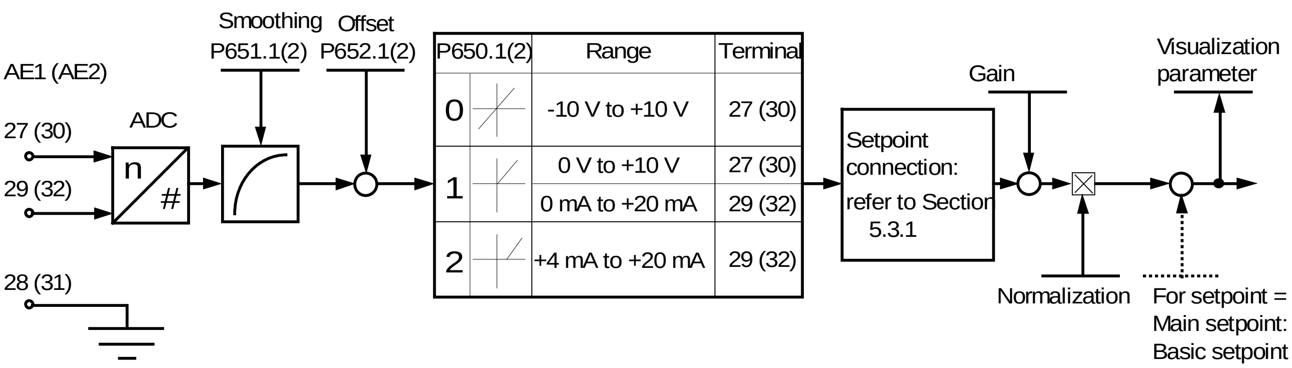


Fig. 6.1 Analog input as setpoint input

Parameters for gain, normalization and visualization belonging to a specific setpoint connection:

		Gain	Normalization	Visualization
Speed controller gain adaption	P226	P227	10 V = 10	r228
Supplementary setpoint 1	P433	P434	10 V = P420	r437
Supplementary setpoint 2	P438	P439	10 V = P420	r442
Main setpoint	P443	P444	10 V = P420	r447
Torque setpoint	P486	P487	10 V = P485	r490
Upper torque limit	P493	P494	10 V = P485	r496
Lower torque limit	P499	P500	10 V = P485	r502
Supplementary torque/current setpoint	P506	P507	10 V = P485	r510
Technology controller setpoint	P526	P527	10 V = 100 %	r529
Technology controller actual value	P531	P532	10 V = 100 %	r534
Initial angle	P158	–	10 V = 90 %	r159, r160

Table 6.5 Inter-relationships between parameters for gain, normalization and visualization

Parameterization:

- ♦ Connect the setpoint to the required analog input (e.g.: P443.1 = 1003: The main setpoint is connected to analog input 1 (basic setting)).
- ♦ P650.1(2) = Defines the input signal for analog input 1(2) (± 10 V, 0 to 10 V / 0 to 20 mA, 4 to 20 mA).

NOTE
For P650 = 2 (4 to 20 mA), setpoints < 2 mA result in a fault trip (wire breakage monitoring function)

- ♦ When required, change the smoothing time constant (P651.1).
- ♦ When required, adjust the zero point (offset adjustment) for setpoint input ‘0’. In this case, P652.1(2) is changed until the setpoint visualization parameter (corresponding to Table 6.5) is ‘0’, e.g. r447.
- ♦ When required, set the gain (parameter according to Table 6.5) e.g. P444.

Calculating the gain using as an example, the main setpoint (including the basic setpoint):

Values X_1 to X_2 at the analog input should be represented at setpoints Y_1 to Y_2.

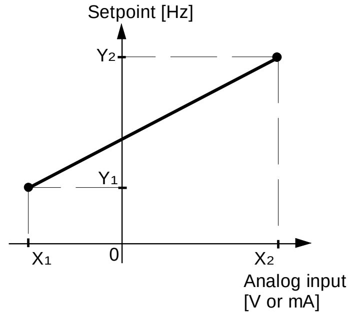


Fig. 6.2 Gain

- ±10 V and 0 to 10 V:

$$P444.x = \frac{10\ V}{X_2 - X_1} \times \frac{Y_2 - Y_1}{P420} \times 100\%$$

$$P445.x = \frac{X_2 Y_1 - X_1 Y_2}{X_2 - X_1} \times \frac{1}{P420} \times 100\%$$

- 4 mA to 20 mA:

$$P444.x = \frac{16\ mA}{X_2 - X_1} \times \frac{Y_2 - Y_1}{P420} \times 100\%$$

$$P445.x = \frac{(X_2 - 4\ mA) \times Y_1 - (X_1 - 4\ mA) \times Y_2}{X_2 - X_1} \times \frac{1}{P420} \times 100\%$$

Example of setpoint input via analog input:

In the basic setting, the main setpoint for motor data set 1 should be entered via analog input 1.

Setting range: 0 to 10 V should correspond to + 15 Hz to + 50 Hz.

Rated system frequency P420 = 50 Hz.

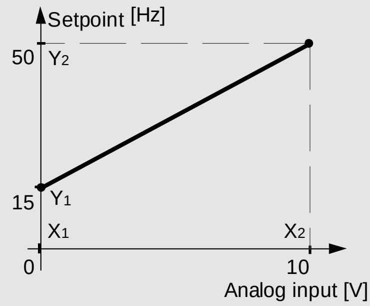


Fig. 6.3 Setpoint input via analog input

Parameterization:

- P443.1 = 1003 The basic setting for the main setpoint is connected to analog input 1.
- P650.1 = 1 The input voltage range for AE1 is set to 0 to 10 V
- P651.1 = 4 The smoothing time constant of AE1 is 4 ms (if required, change).
- P652.1 = 0.000 AE 1 does not have a zero point deviation. When required, change P652.1 until the main setpoint, r447=0, for setpoint input ‘0’.
- Set gain P444.1 and basic setpoint P445.1:

$$P444.1 = \frac{10\ V}{10\ V - 0\ V} \times \frac{50\ Hz - 15\ Hz}{50\ Hz} \times 100\ \% = 70\ \%$$

$$P445.1 = \frac{10\ V \times 15\ Hz - 0\ V \times 50\ Hz}{10\ V - 0\ V} \times \frac{1}{50\ Hz} \times 100\ \% = 30\ \%$$

Example without offset (P420 = 50 Hz):

- P445 = 0
- Setting range ± 10 V ≙ ± 50 Hz : P444 = 100 %
  ± 10 V ≙ ± 100 Hz : P444 = 200 %

6.3.2 Analog input as speed actual value input

For drive converter output frequencies up to 100 Hz, an analog tachometer can be used for speed sensing. Generally, the ATI option is used as interface between the tachometer and board CU.

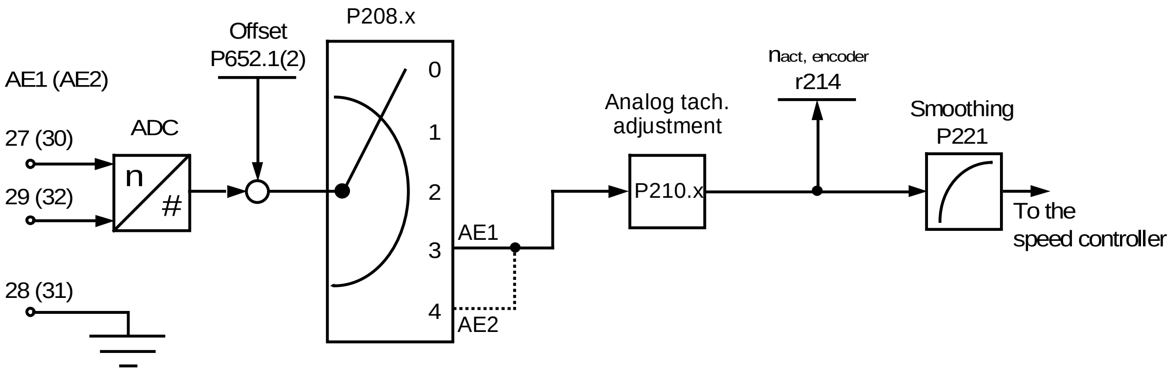


Fig. 6.4 Analog input as speed actual value input

Parameterization:

- P052 = 5 „Drive setting“ function
- P053 = 3 „Expert mode“ access stage
- P208.x = 3 The speed actual value is received via analog input 1,
  or 4 speed actual value is received via analog input 2.
- P210.x = Enter the maximum occuring speed (in RPM) (it is absolutely necessary that the speed overshoot is taken into account - typical value: 10 %!).
  An input signal of 10 V at the analog input corresponds to the speed set here.
- P163.x = 1 control with V/Hz characteristic
  or 3 closed-loop frequency control
- P052 = 0 Return from the „drive setting“ function
- With the motor stationary, select r214 (n(act, encoder)), and if required, adjust the zero point using P652.1(2).
- If possible, de-couple the motor from the load.
- Power-up the unit and operate the drive at various speeds. Measure the speed, for example, using a hand-held tachometer, and adjust the potentiometer on the ATI board so that the measured value coincdies with the display in r214.
- If the motor is operated under no load (no-load operation), it is adjusted, if the setpoint and actual value speeds are the same (r482 = r214).
- P651.1(2) smoothing time constant ineffective, use P221 for smoothing.
- P052 = 5 „Drive setting“ function
- P163.x = 0 V/Hz+speed control
  or 4 speed control
- P052 = 0 Return from „drive setting“
- When required, the speed actual value can be smoothed via P221, and a maximum value for the permissible speed change entered using P215 (☞ the function diagrams in Chapter 10).

Special case: The tachometer voltage at the maximum occuring speed is < 10 V.

- Connect the tachometer voltage directly at the analog input.
- Set P210.x to that speed, where the tachometer voltage is 10 V (the value can exceed the maximum occuring speed).

Example for using the analog input as speed actual value input:

The speed actual value is to be fed in via analog input 2.

Tachometer and system data: Analog tachometer with 30 V / 1000 RPM
Speed at the maximum setpoint: 1700 RPM

Parameterization:

- Ground the tachometer cable shield at 1 end, at the drive converter.
  If noise is coupled-in, connect a 100 nF capacitor to the motor housing.
- P052 = 5 „Drive setting“ function
- P053 = 3 „Expert mode“ access stage
- P208.1 = 4 Connect the speed actual value to analog input 2.
- P210.x = Enter the maximum occuring speed (in RPM):
  1700 RPM + e.g. 8 % for overshoot → 1836 RPM.
- Tachometer voltage at the maximum speed: 55 V -> the ATI board is required.
- P163.1 = 1 Control with V/Hz characteristic
  or 3 frequency control
- P052 = 0 return from the „drive setting“
- With the motor stationary, select r214, and if required, adjust the zero point using P652.2.
- Power-up the unit and operate the drive at various speeds (e.g. 500, 1000 and 1500 RPM). Measure the speed, for example, using a handheld tachometer, and adjust the potentiometer on the ATI board so that the measured value coincides with the display in r214 (the display is realized in Hz).
- Specify additional steps as above.

6.4 Analog outputs

The CU control board has 2 analog outputs (AO) to output actual values and other internal quantities of the drive converter (Connection ☞ Chapter 1).

Technical data:

- Output voltage range –10 V to +10 V
- 5 mV resolution (11 bits + sign)
- Accuracy ± 1 %
- Output current, max. ± 5 mA
- Short-circuit proof
- Not floating

  Additional details, ☞ Function diagram „Analog output“, Chapter 10.

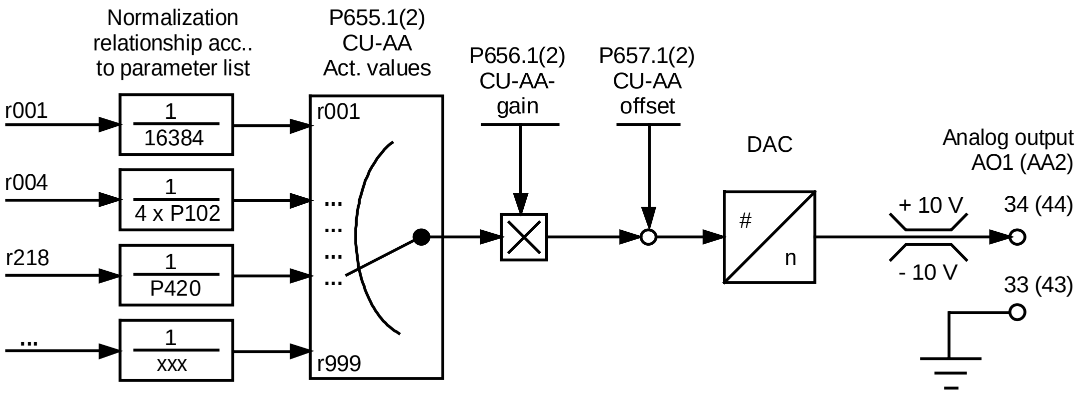


Fig. 6.5 Analog output

Normalization:

The values of the parameters to be output are weighted with the normalization relationships specified in the parameter list (e.g. r004 (output current) referred to 4 x p102 (rated motor current).

Example:

P656 = 10 V
Analog output = 10 V, if r004 = 4 x P102

P656 = 40 V
Analog output = 10 V, if r004 = P102

Parameterization:

- The number of the parameter, whose value is to be output at the analog output, is entered in P655 (CU-AA actual values).

  In this case, index P655.1 corresponds to analog output 1, P655.2 to analog output 2.

  - Corresponding to points X_2,Y_2 and X_1,Y_1, the required analog output characteristics are defined, set gain P656 and offset P657:

$$P656.x = \frac{Y_2 - Y_1}{(X_2 - X_1) \;/\; \text{ref. quantity}}$$

$$P657.x = \frac{(Y_1 X_2) - (Y_2 X_1)}{X_2 - X_1}$$

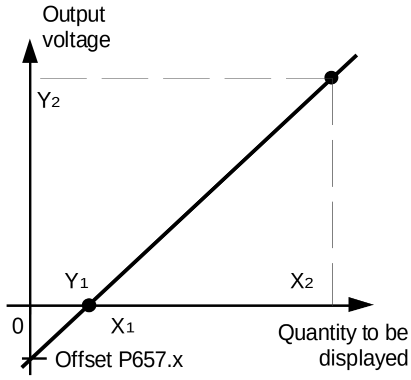


Fig. 6.6 Analog output

Examples:

1. The output current (r004) is to be represented as 0 V to +10 V at analog output 2 in the range 32 A to 160 A.
The rated motor current (P102) is 40.0 A.

Parameterization:

- P655.2 = 004 The output current is connected to analog output 2.
- The reference quantity for r004 is taken from the parameter list. It is 4 x P102.
- Set the gain and offset (index ‘2’ for analog output 2):

$$P656.2 = \frac{10\text{ V} - 0\text{ V}}{(160\text{ A} - 32\text{ A}) \;/\; (4 \times 40\text{ A})} = 12.5\text{ V}$$

$$P657.2 = \frac{(0\text{ V} \times 160\text{ A}) - (10\text{ V} \times 32\text{ A})}{160\text{ A} - 32\text{ A}} = -2.50\text{ V}$$

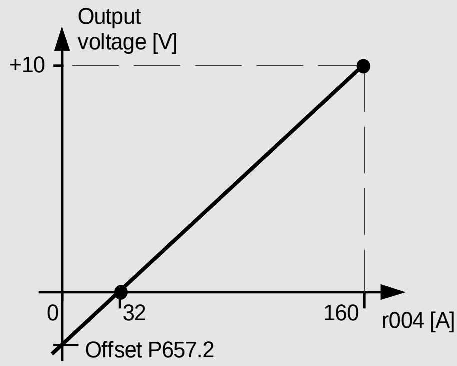


Fig. 6.7 Example, output current at the analog output

2. The frequency actual value (r218) is to be represented as –10 V to +10 V at analog output 1 from –2 Hz to + 5 Hz.

The rated system frequency (P420) is 100 Hz.

Parameterization:

- P655.1 = 218 The frequency actual value is connected to analog output 1.
- Take the reference quantity for r218 from the parameter list. It is P420.
- Set the gain and offset (index ‘1’ for analog output 1):

$$P656.1 = \frac{10\text{ V} + 10\text{ V}}{(5\text{ Hz} + 2\text{ Hz}) \;/\; 100\text{ Hz}} = 285.71\text{ V}$$

$$P657.1 = \frac{(-10\text{ V} \times 5\text{ Hz}) - (10\text{ V} \times (-2\text{ Hz}))}{5\text{ Hz} + 2\text{ Hz}} = -4.29\text{ V}$$

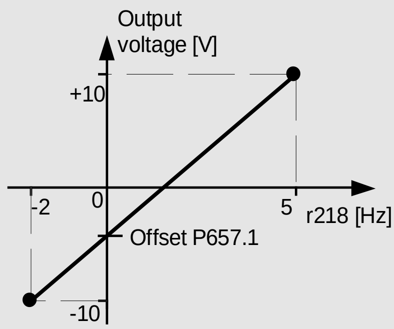


Fig. 6.8 Example, frequenc y actual value at the analog output

6.5 Serial interfaces

6.5.1 Basic converter interfaces SST1 and SST2

The USS protocol (universal serial interface) is implemented at the basic converter interfaces SST1 and SST2.

The following documentation is available depending on the particular application of the SST1 basic converter interface:

- Connecting a PC / PG with SIMOVIS software for start-up / service operator control:
  The documentation is provided on SIMOVIS floppy disks in files BEDANLTG.TXT (ASCII format) and BEDANLTG.WRI (WRITE format).
- Connecting higher-level PLCs with the USS protocol:
  SIMOVERT MASTER DRIVES
  Using the serial interfaces with USS protocol
  Order No.: 6SE7087-6CX87-4KB0

Additional general comments regarding connecting-up and parameterization:

- **Connecting-up:** ☞ Chapter 1 „Control terminal strip“

SST1: 9-pin SUB D connector -X300 on the PMU parameterizing unit (RS 232 or RS 485)
SST2: Connector -X100 on the CU control terminal strip (RS 485)

When connecting SST2 via the terminal strip (-X100), of the CU, a four-wire connection can be implemented. The changeover between two- and four-wire connection is realized automatically.

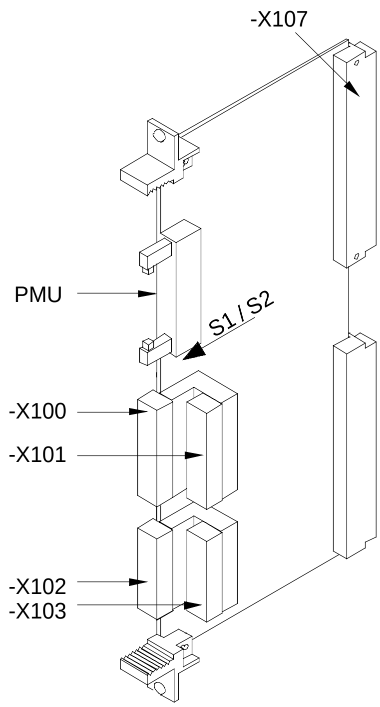


Fig. 6.9 CU

NOTE
The bus terminating resistors (total 150 Ω) must be switched-in at the last bus node (slave). ☞ Fig. 6.9 for the position of the jumpers S1 and S3. • SST1: Close jumpers S1.1 and S1.2 of DIP-FIX S1 on the CU. • SST2: Close jumpers S2.1 and S2.2 of DIP-FIX S2 on the CU.

Parameterization:

- Define the process data: **P683 bis P687**
- Connect process data (control word, status word, setpoints, actual values) to the interfaces
  ☞ Chapter 5 „Process data“
- Enabling parameterization: **P053 oder P927**

6.5.2 Dual port RAM (DPR for SCB, TSY, CB, TB)

The dual port RAM is the internal interface on the CU (-X107) to connect possible option boards via the LBA (Local Bus Adapter, option) of the electronics box.

Possible option boards:

- TSY (tachometer- and synchronization board),
- TB (Technology board),
- SCB (serial communications board),
- CB (Communications board).

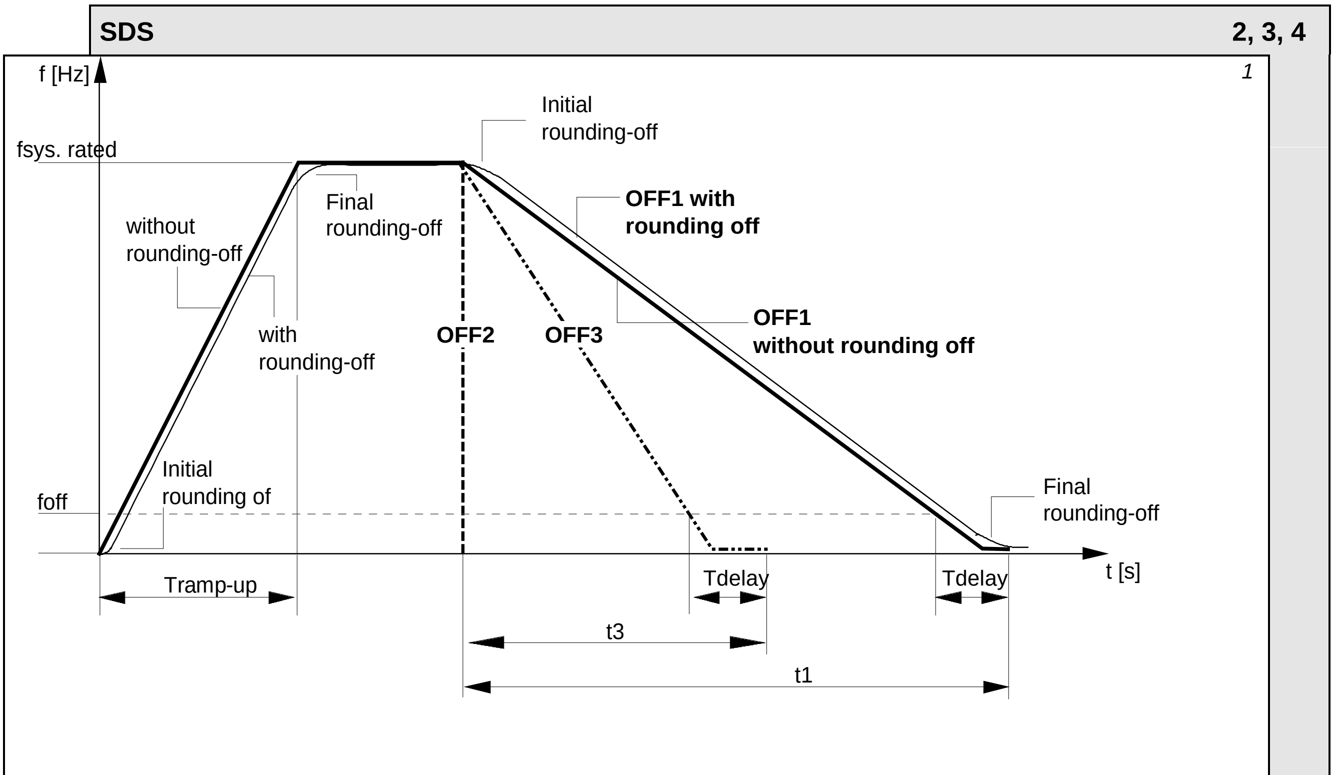
To connect possible option boards and parameterize the interface, ☞ Chapter „Options“ in the Operating Instructions, Part 1 as well as the Operating Instructions of the option boards.

Additional information, ☞ Chapter 5 „Process data“.

6.6 Ramp-function generator (RFG) and limiting stage in front of the ramp-function generator

A detailed description as supplement to the „Function diagrams, setpoint channel CU“, Chapter 10

6.6.1 Ramp-function generator, RFG



Ramp down time for an OFF1 command: $t_1 = T_{OFF1\text{-ramp down}} \times \frac{f_{set} - f_{off}}{f_{Anl\text{-rated}}} + T_{delay}$

Ramp down time for an OFF3 command: $t_3 = T_{OFF3\text{-ramp down}} \times \frac{f_{set} - f_{off}}{f_{Anl\text{-rated}}} + T_{delay}$

Fig. 6.10 Ramp-function generator

For a detailed description of the OFF1-, OFF2- and OFF3 commands, refer to Section 5.1.2 „Control word 1“

Parameters for setting the acceleration time

P420	Rated system frequency ($f_{rated\ system}$)	1.00 Hz to 600.00 Hz

P462	Acceleration time ($T_{acceleration}$)	i001: SDS1 to i004: SDS4	0.0 to 999.9 (Units: ☞ P463)
Acceleration time from standstill up to rated system frequency, (P420)			

P463	Units, acceleration time	i001: SDS1 to i004: SDS4	0: seconds 1: minutes 2: hours
Time units for the acceleration time (P462)			

P464	Deceleration time ($T_{decelerate}$)	i001: SDS1 to i004: SDS4	0.0 to 999.9 (Units: ☞ P465)
Deceleration time from the rated system frequency (P420) down to standstill			

P465	Units, deceleration time	i001: SDS1 to i004: SDS4	0: seconds 1: minutes 2: hours
Time units for the acceleration time (P464)			

P466	OFF3 deceleration time ($T_{OFF3\ deceleration}$)	0.0 s to 999.9 s
Deceleration time for an OFF3 command (if DC braking, P372 is not selected) in s from the rated system frequency (P420) down to standstill. Rounding-off (P469 and P470) is de-activated.		

P467	Protective ramp-up Kp	i001: SDS1 to i004: SDS4	1.0 to 100.0

♦ Closed-loop V/f control (P163 = 0, 1, 2)

Factor from 1.0 to 100.0 referred to the acceleration time, P462, to enter a protective ramp-up time.
This is only effective, if seconds are selected as the ramp-up time units: P463 = 0

Using the protective ramp-up, the acceleration time up to 15% of the rated motor frequency (P107) can be extended (☞ Fig. 6.11 „Protective ramp-up“)

Protective ramp-up is not activated for 1.0.

The total acceleration time can be calculated according to:

$$\text{total run-up} = P462 + P462 \times \frac{15}{100} \times \frac{P107}{P420} \times (P467 - 1)$$

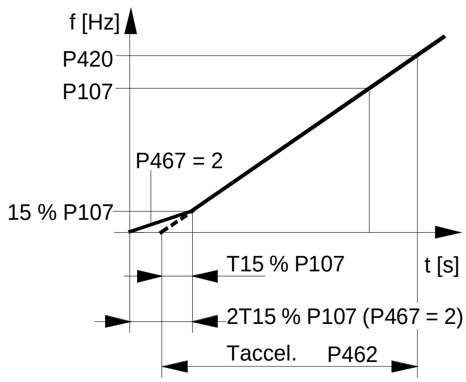


Fig. 6.11 Protective ramp-up

♦ Closed-loop frequency control (P163 = 3)

The protective ramp-function generator is effective up to 110% of the changeover frequency to the EMF model (P284). Ramp-up is also influenced by the current input (P202, P203 and P204) if the EMF model is inactive (P284 = 0).

♦ Closed-loop speed/torque control (P163 = 4. 5)

The protective ramp-function generator is ineffective

P469	Initial rounding-off	i001: SDS1 to i004: SDS4	0 % to 50 %

Initial rounding-off in % referred to the acceleration time, P462, when accelerating or the deceleration time, P464, when decelerating.
When accelerating, this is only effective, if seconds are selected for the acceleration time units: P463 = 0
When decelerating, this is only effective, if seconds are selected for the deceleration time units: P465 = 0

♦ Example: Acceleration time P462 = 10 s, rounding-off = 10 %.
Thus, the acceleration time is extended by 1 s.

When accelerating from standstill up to the rated system frequency (P420), the effective acceleration time is increased to: P462 x (1+ P469/100 % + P470/100 %)

The same is valid for the deceleration time.

♦ If the motorized potentiometer is active (control word bits 13 and 14 set; ☞ Section 5.1), there is no rounding-off

P470	Final rounding-off	i001: SDS1 to i004: SDS4	0 % to 50 %

Final rounding-off in % referred to the acceleration time, P462, when accelerating, or the deceleration time, P464, when decelerating.
When accelerating, this is only effective, if seconds are selected for the acceleration time units: P463 = 0
When decelerating, this is only effective, if seconds are selected for the deceleration time units: P465 = 0

- Example: Acceleration time P462 = 10 s, rounding-off = 10 %.
  Thus, the acceleration time is extended by 1 s.

When accelerating from standstill up to the rated system frequency (P420), the effective acceleration time is increased to: P462 x (1+ P469/100 % + P470/100 %)

The same is valid for the deceleration time.

- If the motorized potentiometer is active (control word bits 13 and 14 set; ☞ Section 5.1), there is no rounding-off

P475	RFG tracking	0.0 % to 50.0 %

Only effective, if P163 (open-/closed-loop control type) = 4 (closed-loop speed control)

For setpoint changes, and when the torque limits are reached (r235 „Mmax n/f control or r236 „Mmin n/f control“), the actual control error is sensed at the speed controller input (r224) (known here as: r224(limit)).
If this value falls below r224 = r224(limit) + P475 x r224(limit), the ramp-function generator tracking is activated.
This means: The ramp-function generator output frequency is increased so fast, that the drive operates at the torque limit (the control error at the speed controller input (r224) is kept constant).
Thus, it is ensured that the ramp-function generator output frequency does not drift when the torque limits are reached, so that it can respond faster when the converter is powered-down or when setpoint changes are made.
Final rounding-off (P470) is <u>not</u> realized if the ramp-function generator tracking is activated.

The ramp-function generator tracking is not activated for 0.0%.

P514	OFF shutdown frequency (f_{off})	0.00 Hz to 600.0 Hz

As soon as the „speed/frequency actual value“ r218 reaches the OFF shutdown frequency, P14 when the drive decelerates (OFF1 or OFF3 without DC braking, P372), then the OFF delay time P516, starts to run. After this, the inverter pulses are inhibited.

P516	OFF delay time (T_{delay})	i001: SDS1 to i004: SDS4	0.0 s to 60.0 s

Delay time for OFF1 and OFF3 (if no DC braking, P372 is selected for OFF3) in s.

As soon as the „speed/frequency actual value“ (r218) reaches the OFF shutdown frequency (P514) when the drive decelerates, the OFF delay time starts to run. The inverter pulses are then inhibited.

Further, it is still possible to inhibit or hold the ramp-function generator via the „Control word“ (Section 5.1).

6.6.2 Limit value stage in front of the ramp-function generator

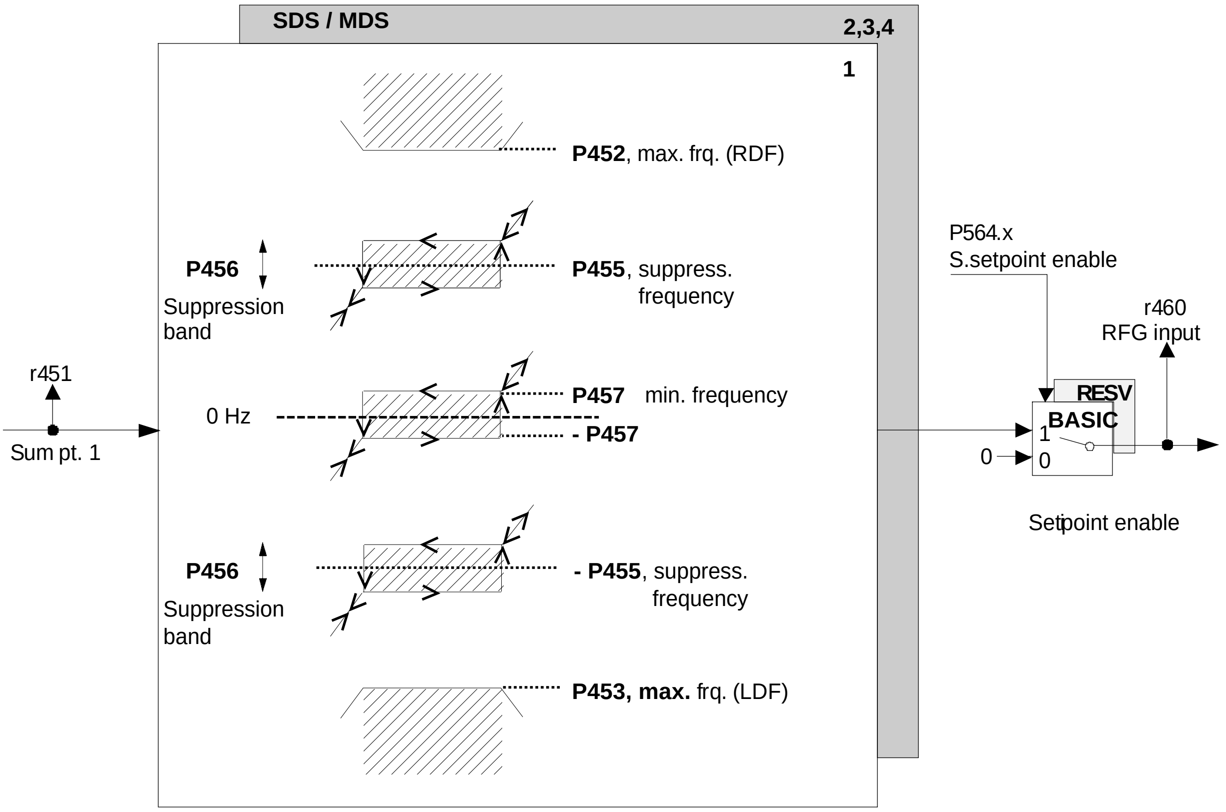


Fig. 6.12 Limit value stage before the ramp-function generator

P452	Max. frequency (RDF) Clockwise phase sequence	i001: MDS1 to i004: MDS4	0.0 Hz to 600.0 Hz
Max. setpoint frequency for a clockwise phase sequence			

P453	Max. frequency (LDF) Counter-clockwise phase sequence	i001: MDS1 to i004: MDS4	–600.0 Hz to 0.0 Hz
Max. setpoint frequency for a counter-clockwise phase sequence			

P455	Suppression frequency	i001: SDS1 to i004: SDS4	0.0 Hz to 600.0 Hz

Frequency suppression of ± ½ x P456 (suppression bandwidth) on each side of the parameterized suppression frequency (is valid for positive and negative setpoints), in order to prevent steady-state drive operation at possible resonant frequencies.

- Steady-state operation in a parameterized suppression bandwidth (P456) is therefore not possible; the range can only be run-through.
- For a setpoint at summation point 1 in front of the ramp-function generator, r451, which lies within the suppression bandwidth, the setpoint, increasing from below is held at the lower limit, and the setpoint decreasing from above is held at the upper limit.
- The suppression bandwidth is not activated when a suppression frequency of 0.0 Hz is entered.

P456	Suppression bandwidth	i001: SDS1 to i004: SDS4	0.0 Hz to 600.0 Hz
Width of the suppression bandwidth when frequency suppression is parameterized (☞ P455)			

<table>
<tr><td>P457</td><td>Min. frequency</td><td>i001: SDS1
to i004: SDS4</td><td>–600.0 Hz to 600.0 Hz
≤ max. frequency LDF/RDF</td></tr>
<tr><td colspan="4">It is possible to realize a 0 Hz frequency suppression using the minimum frequency.
♦ Steady-state operation in the range 0 Hz ± minimum frequency is therefore not possible; the range can only be run-through.
♦ After the drive has been switched-on, and for a setpoint at summation point 1 in front of the ramp-function genertor, r451, in the range from 0 Hz up to the positive minimum frequency, the positive minimum frequency is approached, and in the range 0 Hz up to the negative minimum frequency, the negative minimum frequency.
♦ In operation, and for a setpoint at summation point 1 in front of the ramp-function generator, r451, in the suppression bandwidth (0 Hz ± minimum frequency), the setpoint increasing from below is held at the lower limit, and the setpoint decreasing from above, is held at the upper limit.
♦ The drive can be reversed by entering a reference frequency at summation point 1, which is outside the frequency suppression range.
A negative minimum frequency is only effective for closed-loop torque control and a selected slave drive (☞ Chapter 10 „Function diagrams“)</td></tr>
</table>

7 Open-loop and closed-loop control types

7.1 V/f characteristic

A detailed description as supplement to the „Function diagrams, V/f characteristic“, Chapter 10.

Prerequisite: P163 (Open-/closed-loop control type) = 0, 1 or 2 (V/f characteristics)

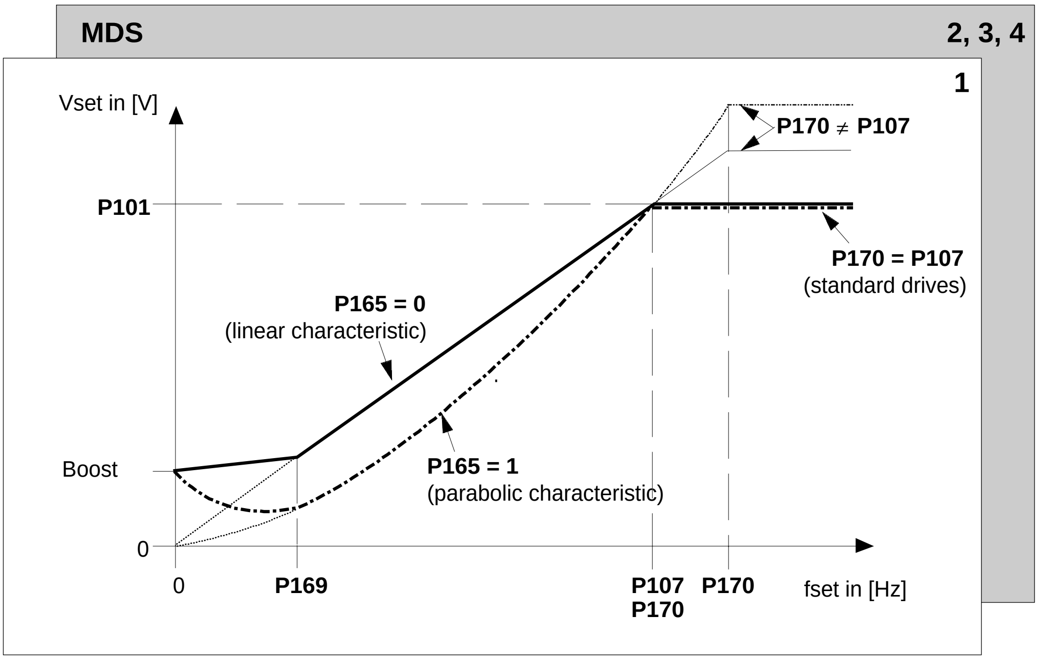


Fig. 7.1 V/f characteristic

Boost:
- P166 = 0: current reference: P167 (taking into account P272)
- P166 = 1: voltage reference: P168
- P171: Acceleration current

P101	Motor voltage (n)	i001: MDS1 to i004: MDS4	115.0 V to 1600.0 V
Rating plate value of the rated motor voltage (observe whether the motor is connected in star or delta!) For SIMOSYN motors: Voltage at the rated drive frequency			

P107	Motor frequency (n)	i001: MDS1 to i004: MDS4	8.0 Hz to 600.0 Hz
Rating plate value of the rated motor frequency			

P165	Characterisic	i001: MDS1 to i004: MDS4	0 and 1
V/f characteristic type: 0: Linear characteristic (constant-torque drives) 1: Parabolic characteristic (fans and pumps)			

P166	Boost	i001: MDS1 to i004: MDS4	0 and 1
Select the boost reference type (for high-inertia starting and compensating the ohmic voltage drops across the motor feeder/stator winding of the drives at low frequencies): 0: Current reference via P167 Voltage for f = 0 Hz for the starting current (conversion using P272 (R (stator + feeder cable)) 1: Voltage reference via P168 Voltage for f = 0 Hz			

P167	Boost current	i001: MDS1 to i004: MDS4	10.0 % to 400.0 %
Only valid for current reference: (P166 = 0) Boost current for f=0 Hz as a % referred to the rated motor current (P102) ♦ The boost current is reduced to 0 when the boost end frequency (P169) is reached. ♦ The boost current is converted into a voltage boost taking into account (P272 (R (stator + feeder cable)).			
NOTE			
P272 (R(stator + feeder cable)) should be calculated or measured using „Automatic parameterization“ or even better, using „motor identification“ (function selection P052, ☞ Section 8.1)!			

P168	Boost voltage	i001: MDS1 to i004: MDS4	10.00 % to 25.00 %
Only valid for voltage reference: (P166 = 1) Boost voltage at f = 0 Hz as a % referred to the rated motor voltage (P101) ♦ The boost voltage is reduced to 0 when the „boost end frequency“ (P169) is reached. ♦ P168 is calculated during „automatic parameterization“ or „motor identification“ (function selection P052, ☞ Section 8.1).			

P169	Boost end frequency	i001: MDS1 to i004: MDS4	0.0 Hz to 300.0 Hz
In the range from 0 Hz up to the boost end frequency, the voltage boost value (P167 or P168) is reduced to 0 ♦ Special case: For P169 = 0.0 Hz and specified voltage boost (P167 ≠ 0 % or P168 ≠ 0 %), the voltage from 0 Hz up to the intersection point of the non-boosted V/f characteristic is kept constant to the value corresponding to the reference entered using P167 or P168 (horizontal boost). ♦ P169 is set to 20% of the rated motor frequency (P107) using the „automatic parameterization“ (function selection P052, ☞ Section 8.1).			

P170	Field weakening frequency	i001: MDS1 to i004: MDS4	8.0 Hz to 600.0 Hz
Frequency at the start of field weakening ♦ The voltage is kept constant above this frequency limit. When the conveter voltage limit (r181) is reached before this frequency, field weakening is started appropriately earlier. The actual field-weakening frequency can be read from parameter r182 (fieldweakfrq(act)). ♦ P170 is set to the rated motor frequency (P107) standard drives during „automatic parameterization“ (function selection P052, ☞ Section 8.1).			

P171	Acceleration current	i001: MDS1 to i004: MDS4	0.0 % to 799.9 %

Acceleration current (supplementary boost current) for active acceleration for high-inertia starting as a [%] referred to the rated motor current (P102)

- The acceleration current is only switched-in up to the „boost end frequency“ (P169).
- The acceleration current is converted into a voltage boost taking into account P272 (R(stator total)).

NOTE

P272 „R(stator, total)“ should be calculated or measured using „automatic parameterization“ or even better using „motor identification“ (function selection P052, ☞ Section 8.1!

Further, it is possible,

- to set load-dependent voltage injection to compensate for voltage drops across the motor feede cables using P172 „IxR compensation Kp“.
- to set soft starting P190 (to ramp-up the characteristic voltage when powering-up within the excitation time P189).

7.2 Vector control types

☞ Function diagrams (Chapter 10) for closed-loop frequency/speed/torque control (P163 = 3, 4, 5).

8 Start-up functions

8.1 Function selection (P052)

Function selection is activated via parameter **P052** and permits various special functions during the start-up phase.

Condition: Access stage 2 (**P051 = 2**) must be enabled and the converter may only be in the „Run“ (R) status.

The following functions are available:

- ♦ Return from function selection (P052 = 0)
- ♦ Factory setting (P052 = 1)
- ♦ Initialization (P052 = 2)
- ♦ Download (P052 = 3)
- ♦ Hardware configuration (P052 = 4)
- ♦ Drive setting (P052 = 5)
- ♦ Automatic parameterization (P052 = 6)
- ♦ Motor identification at standstill (P052 = 7)
- ♦ Automatic parameterization (P052 = 6)
- ♦ Motor identification at standstill (P052 = 7)
- ♦ Complete motor identification (P052 = 8)
- ♦ No-load measurement (P052 = 9)
- ♦ n/f controller optimization (P052 = 10)
- ♦ Self-test (P052 = 11)
- ♦ Tachometer test (P052 = 12)

The „initialize“, „download“, „hardware configuration“, and „drive setting“ functions must be manually reset after completion, i.e. P052 = 0 („return“)!

The remaining functions are automatically reset after completion

P052 = 5 can be exited using P052 = 0, 6, 7, 8, 11.

P052 = 6 can only be selected from the "drive setting" (P052 = 5).

8.1.1 Factory setting (P052 = 1)

Function: This function is used to establish the factory setting (the same as when the unit was shipped) for all of the parameters (☞ Chapter 11 „Parameter list“). Observe the pre-setting of P077!

Condition: The „factory setting“ can be realized in the status DRIVE SETTING (005), FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009).

Result: In this case, several drive converter- and motor data as well as several open-loop/closed-loop control parameters („automatic parameterization“) are set according to the drive converter type (MLFB dependent / P070).

Procedure:

⇓ P052 = 1 Function selection „Factory setting“

⇓ P key The numbers of the newly-assigned parameters are consecutively displayed:

- Factory setting of **all** parameters according to the parameter list (Chapter 11) (also the board configuration P090/P091)
- Drive converter data (determined from the MLFB of the drive converter (P070)
  P071 Drive converter supply voltage
  P072 Drive converter current (n)
  P073 Drive converter output (n)
- Motor data (determined from the MLFB of the drive converter (P070))
  P101 Motor voltage (n)
  P102 Motor current (n)
  P104 Motor cos phi (n)
  P105 Motor output (n)
  P106 Motor efficiency (n)
  P109 Motor pole pair number
  P173 Imax (max. current)
- Open-loop/closed-loop control parameter
  „Automatic parameterization“ is executed (☞ Section 8.1.5). **All** motor data sets are re-assigned.

⇓ After the factory setting has been completed, SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) are displayed

8.1.2 Initialization (MLFB input) (P052 = 2)

Function: This function is used to change the model No. (unit type).

Condition: „Initialization“ can be realized in the DRIVE SETTING (005), FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009).

Result: When the Model No. **is changed** the factory setting is only **partially** established (as when the unit is shipped), depending on the new model No. The process data connection retained.

Procedure:

⇓ P051 = 3 access stage „Expert mode“ (in order to change P070)

⇓ P052 = 2 function selection „Initialization“

⇓ P070 = MLFB (specifies the MLFB (machine-readable product designation = model No.) of the drive converter (☞ type plate).
When changing the CU, the MLFB corresponding to the drive converter must be input.
When parameterizing via the PMU, the appropriate identification number (PWE) must be specfied in accordance with the following table:

Table of SIMOVERT MASTER-DRIVES

minimum pulse frequency = 1.5 kHz
rated pulse frequency = 2.5 kHz

Brief description of the table columns:

PWE parameter value (enter for initialization / PMU / P070)

I(n) rated drive converter current in A (P072)

V cl. voltage class, voltage range

PWE	Model No.	I(n)	U-Kl.	PWE	Model No.	I(n)	U-Kl.
1	6SE7014-5FB20	4,5	3AC 500-575	52	6SE7024-7ED20	47,0	3AC 380-460
2	6SE7014-5UB20	4,5	DC 675-780	53	6SE7024-7TD20	47,0	DC 510-620
3	6SE7016-1EA20	6,1	3AC 380-460	54	6SE7025-4CD20	54,0	3AC 208-230
4	6SE7016-1TA20	6,1	DC 510-620	55	6SE7025-4RD20	54,0	DC 280-310
5	6SE7016-2FB20	6,2	3AC 500-575	56	6SE7026-0ED20	59,0	3AC 380-460
6	6SE7016-2UB20	6,2	DC 675-780	57	6SE7026-0TD20	59,0	DC 510-620
7	6SE7017-8FB20	7,8	3AC 500-575	58	6SE7026-0HF20	60	3AC 660-690
8	6SE7017-8UB20	7,8	DC 675-780	59	6SE7026-0WF20	60	DC 890-930
9	6SE7018-0EA20	8,0	3AC 380-460	60	6SE7026-1FE20	61	3AC 500-575
10	6SE7018-0TA20	8,0	DC 510-620	61	6SE7026-1UE20	61	DC 675-780
11	6SE7021-0EA20	10,2	3AC 380-460	62	6SE7026-6FF20	66	3AC 500-575
12	6SE7021-0TA20	10,2	DC 510-620	63	6SE7026-6UF20	66	DC 675-780
14	6SE7021-1CA20	10,6	3AC 208-230	64	6SE7027-0CD20	69,0	3AC 208-230
15	6SE7021-1RA20	10,6	DC 280-310	65	6SE7027-0RD20	69,0	DC 280-310
16	6SE7021-1FB20	11,0	3AC 500-575	66	6SE7027-2ED20	72,0	3AC 380-460
17	6SE7021-1UB20	11,0	DC 675-780	67	6SE7027-2TD20	72,0	DC 510-620
18	6SE7021-3EB20	13,2	3AC 380-460	68	6SE7028-0FF20	79,0	3AC 500-575
19	6SE7021-3TB20	13,2	DC 510-620	69	6SE7028-0UF20	79,0	DC 675-780
21	6SE7021-3CA20	13,3	3AC 208-230	70	6SE7028-1CD20	81,0	3AC 208-230
22	6SE7021-3RA20	13,3	DC 280-310	71	6SE7028-1RD20	81,0	DC 280-310
23	6SE7021-5FB20	15,1	3AC 500-575	72	6SE7028-2HF20	82,0	3AC 660-690
24	6SE7021-5UB20	15,1	DC 675-780	73	6SE7028-2WF20	82,0	DC 890-930
25	6SE7021-8EB20	17,5	3AC 380-460	74	6SE7031-0EE20	92,0	3AC 380-460
26	6SE7021-8TB20	17,5	DC 510-620	75	6SE7031-0TE20	92,0	DC 510-620
27	6SE7021-8CB20	17,7	3AC 208-230	76	6SE7031-0HG20	97,0	3AC 660-690
28	6SE7021-8RB20	17,7	DC 280-310	77	6SE7031-0WG20	97,0	DC 890-930
30	6SE7022-2FC20	22,0	3AC 500-575	78	6SE7031-1FG20	108,0	3AC 500-575
31	6SE7022-2UC20	22,0	DC 675-780	79	6SE7031-1UG20	108,0	DC 675-780
32	6SE7022-3CB20	22,9	3AC 208-230	80	6SE7031-2HG20	118,0	3AC 660-690
33	6SE7022-3RB20	22,9	DC 280-310	81	6SE7031-2WG20	118,0	DC 890-930
35	6SE7022-6EC20	25,5	3AC 380-460	82	6SE7031-2EF20	124,0	3AC 380-460
36	6SE7022-6TC20	25,5	DC 510-620	83	6SE7031-2TF20	124,0	DC 510-620
37	6SE7023-0FD20	29,0	3AC 500-575	84	6SE7031-3FG20	128,0	3AC 500-575
38	6SE7023-0UD20	29,0	DC 675-780	85	6SE7031-3UG20	128,0	DC 675-780
39	6SE7023-2CB20	32,2	3AC 208-230	88	6SE7031-5HG20	145,0	3AC 660-690
40	6SE7023-2RB20	32,2	DC 280-310	89	6SE7031-5WG20	145,0	DC 890-930
42	6SE7023-4EC20	34,0	3AC 380-460	90	6SE7031-5EF20	146,0	3AC 380-460
43	6SE7023-4TC20	34,0	DC 510-620	91	6SE7031-5TF20	146,0	DC 510-620
44	6SE7023-4FD20	34,0	3AC 500-575	94	6SE7031-6FG20	156,0	3AC 500-575
45	6SE7023-4UD20	34,0	DC 675-780	95	6SE7031-6UG20	156,0	DC 675-780
46	6SE7023-8ED20	37,5	3AC 380-460	96	6SE7031-7HG20	171,0	3AC 660-690
47	6SE7023-8TD20	37,5	DC 510-620	97	6SE7031-7WG20	171,0	DC 890-930
48	6SE7024-4CC20	44,2	3AC 208-230	98	6SE7031-8EF20	186,0	3AC 380-460
49	6SE7024-4RC20	44,2	DC 280-310	99	6SE7031-8TF20	186,0	DC 510-620
50	6SE7024-7FD20	46,5	3AC 500-575	100	6SE7032-0FH20	192,0	3AC 500-575
51	6SE7024-7UD20	46,5	DC 675-780	101	6SE7032-0UH20	192,0	DC 675-780

PWE	Model No.	I(n)	U-Kl.
102	6SE7032-1EG20	210,0	3AC 380-460
103	6SE7032-1TG20	210,0	DC 510-620
104	6SE7032-3FH20	225,0	3AC 500-575
105	6SE7032-3UH20	225,0	DC 675-780
106	6SE7032-1HH20	208,0	3AC 660-690
107	6SE7032-1WH20	208,0	DC 890-930
108	6SE7032-6EG20	260,0	3AC 380-460
109	6SE7032-6TG20	260,0	DC 510-620
112	6SE7033-2EG20	315,0	3AC 380-460
113	6SE7033-2TG20	315,0	DC 510-620
116	6SE7033-7EH20	370,0	3AC 380-460
117	6SE7033-7TH20	370,0	DC 510-620
118	6SE7034-5UK20	452,0	DC 675-780
119	6SE7034-5WK20	452,0	DC 890-930
120	6SE7035-1TJ20	510,0	DC 510-620
121	6SE7035-7UK20	570,0	DC 675-780
122	6SE7035-7WK20	570,0	DC 890-930
123	6SE7036-0TK20	590,0	DC 510-620
124	6SE7036-5UK20	650,0	DC 675-780
125	6SE7036-5WK20	650,0	DC 890-930
126	6SE7037-0TK20	690,0	DC 510-620
127	6SE7038-6TK20	860,0	DC 510-620
128	6SE7038-6UK20	860,0	DC 675-780
129	6SE7038-6WK20	860,0	DC 890-930
130	6SE7041-0UM20	990,0	DC 675-780
131	6SE7041-0WM20	990,0	DC 890-930
132	6SE7041-1UM20	1080,0	DC 675-780
133	6SE7041-1WM20	1080,0	DC 890-930
134	6SE7041-1TM20	1100,0	DC 510-620
135	6SE7041-1TK20	1100,0	DC 510-620
138	6SE7041-2UM20	1230,0	DC 675-780
139	6SE7041-2WM20	1230,0	DC 890-930
140	6SE7041-3TM20	1300,0	DC 510-620
144	6SE7041-4UM20	1400,0	DC 675-780

PWE	Model No.	I(n)	U-Kl.
145	6SE7041-4WM20	1400,0	DC 890-930
148	6SE7041-6UM20	1580,0	DC 675-780
149	6SE7041-6WM20	1580,0	DC 890-930
155	6SE7041-8UR20	1850,0	DC 675-780
156	6SE7041-8WR20	1850,0	DC 890-930
157	6SE7042-4UR20	2450,0	DC 675-780
158	6SE7042-4WR20	2450,0	DC 890-930
159	6SE7042-5UR20	2470,0	DC 675-780
160	6SE7042-5WR20	2470,0	DC 890-930
161	6SE7043-3UR20	3270,0	DC 675-780
162	6SE7043-3WR20	3270,0	DC 890-930
163	6SE7043-1UR20	3090,0	DC 675-780
164	6SE7043-1WR20	3090,0	DC 890-930
165	6SE7044-1UR20	4090,0	DC 675-780
166	6SE7044-1WR20	4090,0	DC 890-930
167	6SE7043-7UR20	3710,0	DC 675-780
168	6SE7043-7WR20	3710,0	DC 890-930
169	6SE7044-8UR20	4900,0	DC 675-780
170	6SE7044-8WR20	4900,0	DC 890-930
171	6SE7044-3UR20	4320,0	DC 675-780
172	6SE7044-3WR20	4320,0	DC 890-930
173	6SE7045-7UR20	5720,0	DC 675-780
174	6SE7045-7WR20	5720,0	DC 890-930
175	6SE7045-0UR20	4940,0	DC 675-780
176	6SE7045-0WR20	4940,0	DC 890-930
177	6SE7046-5UR20	6540,0	DC 675-780
178	6SE7046-5WR20	6540,0	DC 890-930
180	6SE7036-5US20	4940,0	DC 675-780
181	6SE7036-5WS20	4940,0	DC 890-930
182	6SE7038-6US20	6540,0	DC 675-780
183	6SE7038-6WS20	6540,0	DC 890-930

⇓ P052 = 0 Function selection „return“

⇓ P key The operating display appears, and when the MLFB has been changed, the following parameters are re-assigned:

- Equipment data and motor data (from the MLFB of the equipment (P070) determine), as well open-loop/closed-loop control parameters („automatic parameterization“ over **all** data sets as for function selection „factory setting“ (☞ Section 8.1.1)).
  The process data connections (e.g. analog inputs/outputs are retaineid).

⇓ SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) are displayed after initialization has been completed.

8.1.2.1 Download (P052 = 3)

Function: It is used to read and change all parameters using a PC at the basic drive converter interface SST1 or SST2.

Condition: „Download“ is possible in the FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) statuses.

Procedure:

⇓ P052 = 3 Function selection „Download“

⇓ P key Operating display (021).

- ♦ All of the parameters can now be read and changed, independently of the selected control type etc. using a PC connected at the basic drive converter interface SST1 or SST2.

⇓ P052 = 0 Function selection „Return“

⇓ P key

⇓ After return, the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) is displayed.

8.1.3 Hardware configuration (P052 = 4)

Function: It is used to define option boards (SCB, TSY, CB, TB) in the electronics box of the drive converter.

Condition: The „hardware configuration“ is possible in the FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) status.
Further, the bus coupling LBA (Local Bus Adapter) is required for the electronics box!
☞ Chapter „Options“ in the Operating Instructions, Part 1

Result: All parameters, which can be written into the „hardware configuration“ status („H“, ☞ righthand column in the „parameter list“, Chapter 11), can be changed.

Procedure:

⇓ P052 = 4 Function selection „Hardware-configuration“

⇓ P051 = 3 Access stage Expert mode (to change the following parameters)

⇓ P090 = Board, slot 2 (To the **RIGHT** in the electronics box!!)
P091 = Board, slot 3 (To the **CENTER** in the electronics box!!)

Parameter values for P090/P091:
0: No option board
1: CB Communications board
2: TB Technology board (only P090)
3: SCB Serial communications board
4: TSY Digital tachometer and synchronization board

Slots in the electronics box		Boards
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not for TB)
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE

- ♦ Only one of each option board type may inserted in the electronics box.
- ♦ Technology boards (e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.
- ♦ If only one option board is used it must always be inserted at slot 2.
- ♦ Order numbers for option boards and their descriptions, are provided in the Chapter „Options“ in the Operating Instructions, Part 1.

⇓ Additional parameters, depending on the option boards
(☞ associated Operating Instructions and parameter list, Chapter 11)

⇓ Select one of the following:

⇓ P052 = 5 Function selection „drive setting“ (☞ Section 8.1.4)
or ⇓ P052 = 0 return

⇓ P key
- ♦ The operational display (r000) appears during which parameters and internal quantities are re-assigned depending on the function selection.
- ♦ The hardware is initialized.
If a fault message F050/F070/F080 appears, ☞ Chapter 12 „Fault and alarm messages“.

⇓ After the selected function has been completed, the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) display appears.

8.1.4 Drive setting (P052 = 5)

Function: It is used to change the drive setting (drive converter/motor data, system data).

Condition: The „drive setting“ is possible in the FAULT (007), SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) status.

Result:

- ♦ All parameters, which can be written in the „drive setting“ status („A“, ☞ righthand column in the parameter list, Chapter 11) can be changed.
- ♦ After the drive setting has been completed, it can be decided as to whether the „automatic parameterization“ (P052 = 6), „motor identification at standstill“ (P052 = 7), „complete motor identification“ (P052 = 8) or „self test“ (P052 = 11) functions are to be executed, or just the status reset (P052 = 0) without any calculation of additional parameters.
- ♦ If fault F061 occurs when exiting the drive setting, the parameter number, which caused the fault, can be read in fault value r949.

Procedure:

⇓ P052 = 5 Function selection „drive setting“

⇓ P051 = 3 Access stage „expert mode“
(if parameters are to be changed, which require the expert mode)

⇓ Change the selected parameters, which can be written into the drive setting status.

⇓ Make a selection between the following:

either	⇓	P052 = 6	Function selection „automatic parameterization“ (☞ Section 8.1.5)
or	⇓	P052 = 7	Function selection „motor identification at standstill“ (☞ Section 8.1.6)
or	⇓	P052 = 8	Function selection „complete motor identification“ (☞ Section 8.1.6.1)
or	⇓	P052 = 11	Function selection „self test“ (☞ Section 8.1.9)
oder	⇓	P052 = 0	Function selection „return“

⇓ P key The operating display (r000) appears while parameters and internal quantities are re-assigned depending on the particular function selection.

⇓ After the selected function has been completed, the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) function is displayed.

8.1.5 Automatic parameterization (P052 = 6)

Function: It is used to pre-assign open-loop/closed-loop control parameters, dependent on the selected drive setting (drive converter- and motor data) and open-loop/closed-loop control type (P163).

Condition: „Automatic parameterization“ can only be selected from the „drive setting“ status (P052=5).

Result: Only the parameters of the **currently** selected motor data set MDS can be pre-assigned!

Procedure:

⇓ P052 = 5 Function selection „drive setting“

⇓ P051 = 3 Access stage „expert mode“
(if parameters are to be changed, which require the expert mode)

⇓ P052 = 6 Function selection „automatic parameterization“

⇓P key The operating display appears, while the following parameters are re-assigned:

If parameter P103 (no-load motor current) has the value 0.0%, the rated magnetizing current is calculated, and can be subsequently read via r196. Otherwise, the value is retained.

P168 Voltage boost
P169 Boost final frequency
P170 Field-weakening frequency
P172 IxR compensation Kp
P173 Imax (max. current value)
P185 Min. load-dependent flux
P189 Energization time
P191 Smoothing Psi(set)
P198 R(rotor) Ktmp
P215 Delta n(act., permissible)
P216 Smoothing n/f precontrol
P221 Smoothing n/f (act)
P225 n/f controller Kp
P229 n/f controller Tn
P242 Starting time
P243 n/f controller, precontrol Kp
P253 Current controller Kp
P254 Current controller Tn
P261 Smoothing Isq
P272 R(stator + cable)
P287 EMF controller Kp
P289 EMF controller Tn
P294 Slip compensation Kp
P299 Resonant damping Kp
P300 Damping Kp
P312 Motor weight
P369 Restart-on-the-fly, search current
P371 De-excitation time
P770 Deadtime compensation
„X(magnet)“
„Smoothing Isq(set)“
„X(sigma)“
„Transistor voltage compensation“

⇓ After „automatic parameterization“ has been completed, the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) operating display appears.

8.1.6 Motor identification at standstill (P052 = 7)

Function: This function executes „automatic parameterization“ (☞ Section 8.1.5) and then subsequently activates the ground-fault test, test pulse measurement, leakage measurement and carries-out the DC current measurement to improve the control characteristics.
In so doing, the control parameters are re-assigned.

Condition: The „motor identification at standstill“ can be selected from the „drive setting“ (P052 = 5) or READY TO SWITCH-ON (009).

Result:

- Only the parameters of the **currently** selected motor data set MDS are pre-assigned!
- The „motor identification at standstill“ can be interrupted at any time using an OFF command. In this case, fault message F114 „measurement aborted“ is output.
- To display the actual measuring segment of the „motor identification at standstill“ the visualization parameter (display parameter) r333 „measurement section“ is available.
- If a fault/error occurs during measurement, the test is terminated with a fault message.
  The fault message (r947) is stored together with the fault value (r949) in the fault memory. The fault cause is described in detail in the fault value. The fault messages, fault values and alarm messages are described in Chapter 12 „Fault- and alarm messages“.

NOTE
The „motor identification at standstill“ is not possible when operating the drive converter with synchronous motors or for drive convertes with input voltages of between 500 V and 575 V with sinusoidal filter (option)!

Procedure:

⇓ P052 = 7 Function selection, „motor identification at standstill“

⇓ P key The operating display appears:
The alarm message A078 „standstill measurement follows“ is output, and the drive converter must be powered-up within 20 s. Otherwise, F114 fault trip „measurement aborted“ is output.

⇓ Power-up the drive converter
Alarm message A078 „standstill measurement follows“ is reset.

NOTE
The inverter is enabled, current flows through the motor and the rotor can align itself!

⇓ The operational display appears, while the following steps are automatically executed:

- „Automatic parameterization“ is called-up (☞ Section 8.1.5).
- Ground-fault test:
  When the drive converter is operated from a grounded line network, a ground fault in the connected motor (including feeder cables) is identified, if the ground fault current > 5 % $\hat{I}_{\text{rated (drive converter)}}$.
  Further, defective transistors, which are still conductive, are identified in the inverter.

  The tests consists of 7 steps. No transistor is fired in the 1st step, and in additional steps, precisely one transistor is fired.

  In each step, the actual values of the output currents, phases U and W, the UCE checkback signals of the 3 phases, the overcurrent comparator, and the overvoltage comparator monitored.

  The visualization parameter r358 (ground fault test result) is available, from which the measurement result which caused the fault, can be read-out.

Comment: The ground fault test can also be separately called-up using parameter 354 (ground-fault test).

- Test pulses:
  These are used to check the inverter and the connection to the motor. The test result can be interrogated in visualization parameter r344 (test pulse result).

- Leakage measurement:
  By injecting suitable voltage pulses, the referred total leakage x(sigma) of the connected motor is measured.

- DC current measurement and the resulting parameter change:
  With the DC current measurement, a DC current is impressed in the individual drive converter output phases one after another.
  In this case, a maximum DC current, having the magnitude of the peak rated motor current (max. rated drive converter current) is impressed. The drive converter pulse frequency is changed several times during the measurement.
  At the start of the standstill measurement, all parameters are calculated by the „automatic parameterization" (☞ Section 8.1.5).

  Measured/calculated parameter values of the standstill measurement:
  P103 No-load motor current
  P189 Energization time
  P198 R(rotor) Ktmp
  P253 Current controller Kp
  P272 R (stator + cable)
  P287 EMFcontroller Kp
  P289 EMFcontrollerTn
  P371 De-energization time
  P652 CU-AE offset (if an analog tachometer is connected)
  r196 No-load current in A
  r199 R(rotor)
  r200 T(rotor)
  r274 T(sigma)
  „X(magnet)"
  „X(sigma)"
  „Deadtime compensation time"
  „Transistor voltage compensation"

The measured values and the resulting calculated values, are only entered into the parameters after the DC current measurement has been correctly completed. If the measurement is aborted as a result of an off command or default, the parameter values, which were calculated at the start of the measurement in automatic parameterization, are kept.

⇓ The READY TO SWITCH-ON (009) operating display appears after the selected function has been completed.

8.1.6.1 Complete motor identification (P052 = 8)

Function: For vector control types (P163 = 3, 4, or 5), it is used to improved the control characteristics and includes the following functions:

- „Motor identification at standstill“ (includes „automatic parameterization“)
- „No-load measurement“ (includes „tachometer test“)
- „n/f controller optimization“

Condition: The „complete motor identification“ can be selected from the „drive setting“ status (P052 = 5) or READY TO SWITCH-ON (009).

Result:

- Only the parameters of the **currently** selected motor data set MDS or setpoint channel data set SDS are pre-assigned!
- The „complete motor identification“ can be terminated at any time using an OFF command. In this case, fault message F114 „measurement aborted“ is output.
- Visualization parameter r333 (measurement segment) is available to display the actual measurement segment of the „complete motor identification“.
  If an error occurs during the measurement, the test is aborted with an error message. Fault message (r947) is saved, together the the fault value (r949) in the fault memory. The cause of the fault is described in detail in the fault value. The fault messages, fault values and alarm messages are described in Chapter 12 „Fault- and alarm messages“.
- For P163 = 5 (closed-loop torque control), the unit is automatically changed over into the closed-loop speed control mode for the duration of the measurement.
- For P163 = 3 or 4 (closed-loop frequency/speed control and slave drive (refer to P587), the measurement is aborted (F096).
- Parameter P377should be set to 1 (Vdmax controller on) if the drive converter has no possibility of regenerating (rectifier/regenerative feedback unit or brake resistor).
  However, if the drive converter still aborts the measurement with fault F006 (DC link overvoltage), the regenerative power should be limited to approx. –3 % to –0.1 % in parameter P233.

NOTE
The "motor identification at standstill" is not possible when operating the drive converter with synchronous motors or for drive converters with input voltages from 500 V to 575 V with sinusoidal filter (option)!

Procedure:

⇓ P452, P453 = Maximum frequencies
The drive speed during the measurement is limited to the parameter values for the maximum frequencies P452 (Rdf) and P453 (Ldf) in the actual motor data set. The maximum frequencies must be set before the measurement starts, so that a load possibly connected to the motor, is not damaged.

⇓ P492, P498 = Maximum torque during the measurement is limited to the parameter values for torque limits P492 (Mlimit 1) and P498 (Mlimit 2) in the actual motor data set.
The torque limits must be set before the measurement is started, so that a load, possibly connected to the motor, is not damaged.

⇓ P346 = Dynamic performance factor
Set the required dynamic performance (speed) of the speed controller (in %):
Whereby: 10 % (lowest) and 200 % (max. possible)
Note: Possible gearbox play, etc.

⇓ P052 = 8 Function selection, „complete motor identification“

⇓ P key: The operating display appears:

Alarm message A078 „standstill measurement follows“ is output, and the drive converter must be powered-up within 20 s. Otherwise, the unit is fault tripped with F114 „measurement aborted“.

⇓ Power-up the drive converter

Alarm message A078 „standstill measurement follows“ is reset.

NOTE
The inverter is enabled, current flows through the motor and the rotor can align itself!

⇓ The operating display appears while the „motor identification at standstill“ function is being automatically executed (☞ Section 8.1.6).

⇓ After the partial function has been completed, the READY TO SWITCH-ON (009) operating display appears alternating with alarm message A080 „rotating measurement follows“. The drive converter must be powered-up within 20 s, otherwise the unit is fault tripped and F114 „measurement aborted“ is output.

NOTE
When aborted at this point, the parameter changes of the previous „motor identification at standstill“ are saved.

Procedure ⇓ Power-up the drive converter

Alarm message A080 „rotating measurement follows“ is reset.

NOTE
The inverter is enabled, current flows through the motor and the rotor rotates!

⇓ The operating display appears while the following steps are automaticaly executed:

- „No-load measurement“ is called-up“ (☞ Section 8.1.7) including tachometer test for P163 = 4 or 5.
- „n/f controller optimization“ is called-up“ (☞ Section 8.1.8).

⇓ After the selected function has been completed, the READY TO SWITCH-ON (009) operating display appears

8.1.7 No-load measurement (P052 = 9)

Function: It is used, for vector control types (P163 = 3, 4, or 5) to improve the control characteristics and is a partial function of the „complete motor identification“ (☞ Section 8.1.7). The no-load motor current (P103, r196) and main motor reactance are set by the measurement.

Condition: The „no-load measurement“ can be selected in the READY TO SWITCH-ON (009) status.

Result:
- ♦ If closed-loop speed or torque control is selected (P163 = 4 or 5), a tachometer test is additionally executed, and when an analog tachometer is used, the analog tachometer calibration is set (P210).
- ♦ The maximum drive speed during the measurement is limited to the parameter values for the maximum frequencies P452 (RDF) and P453 (LDF).
- ♦ Only the parameters of the **currently** selected motor data set MDS are pre-assigned!
- ♦ The „no-load measurement“ can be aborted at any time using an OFF command; in this case, the fault message F114 „measurement aborted“ is output.
- ♦ If an error occurs during the measurement, a detailed description of the fault message as well as the fault value is provided in Chapter 12 „Fault- and alarm messages“!

Procedure:

⇓ P052 = 9 Function selection „no-load measurement“

⇓ P key The operating display appears:
Alarm message A080 „rotating measurement follows“ is output, and the drive converter must be powered-up within 20 s. Otherwise, the unit is fault tripped and F114 „measurement aborted“ is output.

⇓ Power-up the drive converter
Alarm message A080 „rotating measurement follows“ is reset.

NOTE
The inverter is enabled, current flows through the motor and the rotor rotates!

⇓ The operating display appears, while the following steps are automatically executed:

- ♦ „Ground-fault test“:
(only if selected via P354)
☞ Function „ground-fault test“ for „motor identification at standstill“, Section 8.1.6.
- ♦ „Tachometer test“:
If only the speed- or torque control (P163 = 4 or 5) is selected, in addition, a tachometer test is executed (☞ Section 8.1.10 „tachometer test“). When an analog tachometer is used, the analog tachometer calibration (P210) is set.
- ♦ „No-load measurement“:
In steady-state controlled operation, the following parameters are set from the mesurement:
P103 no-load motor current in %
r196 no-load motor current in A
r200 T(rotor)
„X(magnet)“

⇓ After the selected function has been completed, the READY TO SWITCH-ON (009) operating display appears.

8.1.8 n/f controller optimization (P052 = 10)

Function: For vector control types (P163 = 3, 4, or 5) it is used to improve the control characteristics and is a partial function of the „complete motor identification“ (☞ Section 8.1.6.1).

Condition: The „n/f controller optimization“ can be selected in the READY TO SWITCH-ON (009) status.

Result:

- The function defines the mechanical drive moment of inertia, and adjusts several dependent control parameters.
  If closed-loop speed or torque control is selected(P163 = 4 or 5) a tachometer test is additionally executed.
- For P163 = 5 (closed-loop torque control), for the duration of the measurement, the closed-loop speed control mode is automatically selected.
- For P163 = 3 or 4 (closed-loop frequency/speed control and slave drive) (refer to P587), the measurement is aborted (F096).
- If the drive converter has no possibility of regenerating (rectifier/regenerative feedback unit or brake resistor), then parameter P377 should be set to 1 (Vdmax controller on).
  If the drive converter still aborts the measurement with fault F006 (overvoltage in the DC link, then the regenerative power should be limited to approx. –3 % to –0.1 % in parameter P233.
- Only the parameters of the **currently** selected motor data set (MDS) or the setpoint channel data set SDS should be pre-assigned!
- The „n/f controller optimization“ can be aborted at any time using an OFF command; in this case, fault message F114 „measurement aborted“ is output.
- If a fault/error occured during the measurement, a detailed description of the appropriate fault/error message as well as the fault value is provided in Chapter 12 „Fault- and alarm messages“!
- The „n/f controller optimization“ automatically activates the „n controller pre-control“ (P243).

Procedure:

⇓ P452, P453 = Maximum frequencies
The drive speed during the measurement is limited to the parameter values for the maximum frequencies P452 (Rdf) and P453 (Ldf) in the actual motor data set. The maximum frequencies must be set before measurement is started, so that a load, possibly connected to the motor, is not damaged.

⇓ P492, P498 = Maximum torque
The torque during the measurement is limited to the parameter values for the torque limits P492 (Mlimit 1) and P498 (Mlimit 2) in the actual motor data set. The torque limits must be set before the measurement is started, so that a load, possibly connected to the motor, is not damaged.

⇓ P346 = Dynamic performance factor (speed factor)
Set the required dynamic performance of the speed controller (in %):
Whereby: 10 % (lowest) and 200 % (max. possible)
Note: Possible gearbox play, etc.

⇓ P052 = 10 Function selection, „n/f controller optimization“

⇓ P key The operating display appears:
Alarm message A080 „rotating measurement follows“ is output, and the drive converter must be powered-up within 20 s. Otherwise, the drive converter is fault tripped with F114 „measurement aborted“.

⇓ Power-up the drive converter
Alarm message A080 „rotating measurement follows“ is reset.

NOTE
The inverter is enabled, current flows through the motor, and the rotor rotates!

⇓ The operating display appears, while the following steps are automatically executed:

- „Tachometer test“:
  If only the closed-loop speed or torque control is selected (P163 = 4 or 5), a tachometer test is additionally executed (☞ Section 8.1.10 „Tachometer test“).
- „Controller optimization“:
  By evaluating the torque- and speed characteristic after automatically executed speed setpoint changes, the drive moment of inertia is defined and the speed controller set. The measurement is executed several times one after another.

  Parameters which are set:

P221	smoothing n/f(act)
P225	n/f controller Kp
P229	n/f controllerTn
P242	Starting time (Accelerating time at rated torque from standstill up to the rated speed)
P243	n/f controller, pre-control Kp
P347	n/f controller dynamic performance (act)
P348	n/f controller, oscillation frequency

- Only if the ramp-up and ramp-down times (P462 / P464) are specified in seconds (P463 / P465 = 0):
  If, during the measurement, it is determined, that the selected ramp-up and ramp-down times cannot be achieved with the specified torque limits, then these can be increased to the minimum possible times:

P462	ramp-up time
P464	ramp-down time
P467	protective RFG Kp (only for closed-loop frequency control: P163 = 3)

⇓ After the function has been terminated, the READY TO SWITCH-ON (009) operating display appears, and the achieved dynamic performance of the speed controller (speed controller speed) is displayed in parameter P347 (n/f controller, dynamic performance (act)).
The achieved dynamic performance possibly deviates from the previously set setpoint (P346) (due to an extremely high moment of inertia, or a noisy speed actual value signal).

8.1.9 Self-test (P052 = 11)

Function: It involves the same function as the „motor identification at standstill“ (☞ Section 8.1.6), **however, no parameter values are changed**.

Condition: The „self-test“ can be realized in the status „drive setting“ (P052 = 5, ☞ Section 8.1.4) or READY TO SWITCH-ON (009).

Result: The „self-test“ is therefore suitable to check the drive converter as well as the connected motor.

NOTE
♦ The „self-test“ is not possible for drive convertes with input voltages from 500 V to 575 V with sinusoidal filter (option!
♦ The inverter is enabled, current flows through the motor, and the rotor can align itself!
♦ Procedure and instructions, ☞ Section 8.1.6 „motor identification at standstill“.

8.1.10 Tachometer test (P052 = 12)

Function: For vector control types with tachometer (P163 = 4 or 5), it is used to check the tachometer (analog tachometer and pulse encoder).

Condition: The „tachometer test“ can be realized in the READY TO SWITCH-ON (009) status.

Result:
- ♦ The „tachometer test“ can be aborted at any time using an OFF command. In this case, fault message F114 „measurement aborted“ is output.
- ♦ If a fault occurs during the measurement, a detailed description of the appropriate fault/error message as well as the fault value is provided in Chapter 12 „Fault- and alarm messages„!

Procedure:

⇓ P052 = 12 Function selection „tachometer test“

⇓ P key The operating display appears.
Alarm message A080 „rotating measurement follows“ is output, and the drive converter must be powered-up within 20 s. Otherwise the drive converter is fault tripped and F114 „measurement aborted“ is output.

⇓ Power-up the drive converter
Alarm message A080 „rotating measurement follows“ is reset.

NOTE
The inverter is enabled, current flows through the motor and rotor rotates!

⇓ The operating display appears while the following tachometer fault is checked:

- ♦ For pulse encoders:
  - – no tachometer signal
  - – incorrect polarity of the tachometer signal
  - – incorrect normalization of the tachometer signal (P209 (pulse encoder pulse number))
  - – a pulse encoder track is missing.
- ♦ For analog tachometer:
  - – no tachometer signal
  - – incorrect tachometer signal polarity
  - – incorrect tachometer signal calibration (P210 (Ana.tach. set.) or potentiometer when ATI is used (option))

The test result can be interrogated in visualization parameter r345 (tachometer test result).

⇓ After the test has been successfully completed, the READY TO SWITCH-ON operating display appears (009).

9 Functions (software)

9.1 WEA (automatic restart)

Description:

The automatic restart function can be used for automatic fault acknowledgement and automatic power-up after a power failure (F008 „DC link undervoltage“) as well as to permanently activate the restart-on-the-fly function without operating personnel having to intervene.

For fault message F008 „DC link undervoltage“ (power failure): ☞ Chapter 12 „Fault and Alarm Messages“

Parameter to set the automatic restart function:

P366	WEA selection	i001: MDS1 to i004: MDS4	0 to 3

P366 = 0 (inhibited):

WEA is inhibited.

P366 = 1 (power failure acknowlegement after the power returns):

Fault message F008 „DC link undervoltage“(power failure) is acknowledged, if this did not occur for an OFF- or INCHING command for motor identification MOTID.

The converter is **not** automatically switched-in by the WEA.

P366 = 2 (Drive restart after the power returns):

Fault message F008 „DC link undervoltage“ (power failure), is acknowledged, if this did not occur for an OFF or inching command or for motor identification MOTID.

If it has been acknowledged, a delay time P367 in (s), which can be parameterized has to expire in the status SWITCH-ON INHIBIT (008), until the drive is automatically restarted by WEA.

If the restart-on-the-fly function is activated via control word bit 23 (Section 5.1), delay time P367 is ignored.

The unit is only switched-in again if the ON command (control word bit 0) is still present after the power returns.
Thus, the WEA function is not possible with a parameterized ON command (control word bit 0) via PMU or OP1!

P366 = 3 (drive is always powered-up with automatic restart-on-the-fly circuit):

As for P366 = 2, however, the restart-on-the-fly function is always activated, independent of control word bit 23 (Section 5.1).

Delay time (P367) is ignored.

The restart-on-the fly function is activated each time the drive is powered-up, even if the power had not previously failed!
A description of the additionally necessary settings for the restart-on-the-fly function is provided in Section „Restart-on-the-fly“.

P367	WEA delay time	i001: MDS1 to i004: MDS4	0 s to 650 s

Delay time between the supply return and when the drive converter is restarted with the WEA function activated.
The delay time is not effective for P366 = 3 or when control word bit 23 is set.

Alarm A065 (Automatic restart function active):

- The alarm is set by WEA after switch-on, and is reset after precharging has been completed.
- When the drive is started by he WEA, the pre-charging time is not monitored, so that fault F002 „DC link precharging fault“ can not occur.
- The converter can be manually shutdown with an OFF command during this switch-on phase.
☞ Chapter 12 „Fault and Alarm Messages“.

Special cases:

- ♦ If the conveter has an external auxiliary supply, a fault is acknowledged and the drive re-started although the supply is still faulted, dependent on parameter P366!
Alarm A065 „automatic restart active“ is continuously present until the supply returns!
- ♦ If additional faults/errors have simultaneously occurred in addition to fault message F008 „DC link undervoltage“ (power failure), these are also acknowledged, dependent on parameter P366 !
- ♦ If the kinetic buffering function is also activated, when the power fails, this is first executed, before fault trip F008 occurs and the WEA intervenes.

WARNING

During power failures and activated WEA (P366 = 2, 3), the converter can automatically restart when the supply returns and after delay time P367 has expired (not valid when the restart-on-the-fly function is activated).

Thus, the drive could be at a standstill for a longer period of time which could be accidentally mistaken for being switched-off.

If the drive area is approached when in this status, severe bodily injury or material damage could occur.

NOTE

If the restart-on-the-fly function is not activated, and **P366 = 2,** overcurrent trip F011 could occur or the motor could be suddenly braked, when the converter is restarted and the motor is still rotating !

Thus, delay time **P367** must be selected high enough, so that it is guaranteed that the motor comes to a standstill before the switch-on command!

9.2 KIP (Kinetic buffering)

Description:

The KIP function allows brief power supply failures to be buffered by utilizing the kinetic energy, i.e. inertia of the connected load.

In this case, the frequency is controlled (closed-loop), so that the system losses are covered by the over-synchronous motor operation.

As the losses remain during the power failure, the converter output frequency has to be lower. The thus reduced speed reduction must be taken into account.

When the supply returns, power is fed in from the supply, and the converter output frequency returns to the selected reference frequency via a ramp-function generator function (RFG).

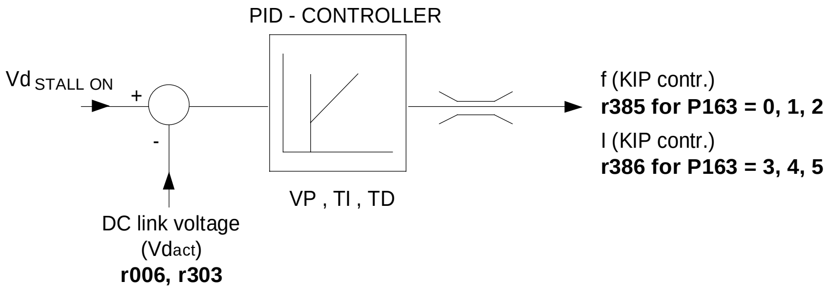


Fig. 9.1 Kinetic buffering

As long as the KIP function is switched-in, the „**KIP active**“ signal is set via **status word bit 15** (☞ Section 5.2).

Parameter to set the kinetic buffering function:

P379	KIP on/off	i001: MDS1 to i004: MDS4	0 to 3
0: Kinetic buffering is not enabled. 1: Kinetic buffering is enabled. 2: Flexible response is enabled with V/f = const. 3: Flexible response is enabled with f = const			

P380	KIP initiation point	i001: MDS1 to i004: MDS4	65 % to 115 %
The kinetic buffering threshold can be set between 65 % and 115 % using this parameter. The switch-off threshold is 5 % above the switch-on threshold (☞ Chapter 10 „Function diagrams“). For closed-loop frequency/speed/torque control (P163 = 3, 4, 5), fault message F008 „DC link undervoltage“ is disabled, if: • 61 % Vd rated is fallen below or • 10 % of the rated motor frequency (P107) is fallen below or • only for closed-loop frequency control (P163 = 3): the closed-loop control changes into the „current model“ range (r286 from 1 „EMF model“ to 0 „current model“)			
NOTE			
For kinetic buffering, values for P380 > 90 % are only practical, if an active front end (AFE) is used as rectifier/regenerative feedback unit.			

P381	KIP controller dynamic	i001: MDS1 to i004: MDS4	0 % to 200 %
The characteristics of the PIB controller can be influenced using this parameter. The factory setting is 50 %. At 0 %, the kinetic buffering function is disabled. The controller output can be visualized via parameters **r385** or **r386**.			

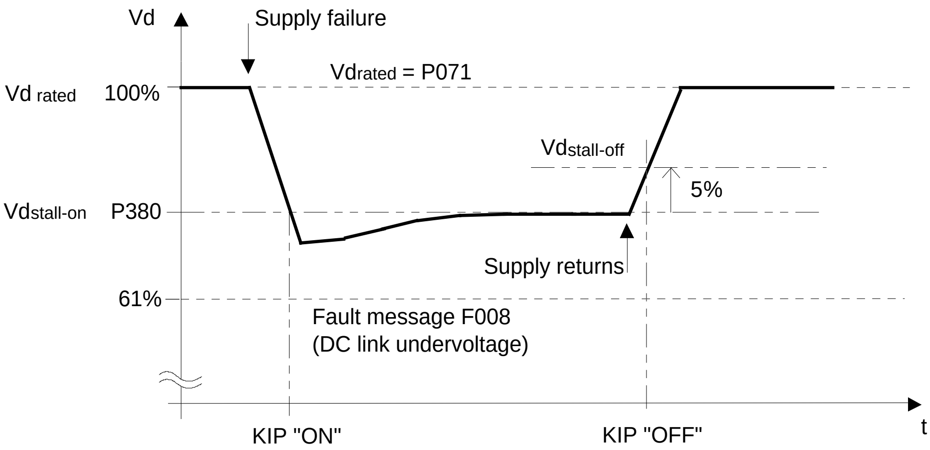


Fig. 9.2 Switch-on/switch-off threshold

$V_{d\ KIP\ ON} = P380 \times V_{d\ rated}$ Pre-assign: P380 = 76 %

$V_{d\ KIP\text{-}OFF} = (P380 + 5\ \%) \times V_{d\ rated}$ Pre-assign: bei P380 = 76 % ⇒ 81 %

$V_{d\ rated} = 1{,}315 \times P071$

9.3 Flexible response

Description:

The „flexible response“ function allows the converter to still operate during supply dips up to a minimum DC link voltage of 50% of the rated value. The maximum converter output is decreased corresponding to the actual line supply voltage. If the „flexible response“ function is enabled, the firing level is limited to the range of the asynchronous vector modulation (reduction of the max. output voltage).

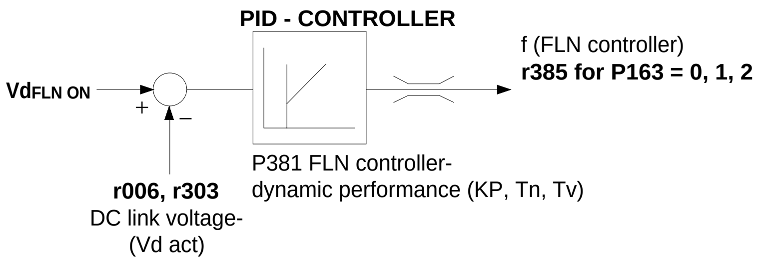


Fig. 9.3 Flexible response

NOTE
The maximum firing level can be taken from parameter r180. The maximum output voltage at the particular operating point can be read-out at parameter r181.

The „FLR active“ signal is set via the **status word bit 15**, (☞ Section 5.2) as long as the „**flexible response**“ function is active.

Conditions:

- ♦ A line commutating reactor von 4 % must be provided.
- ♦ The electronics power supply must be realized using an external 24 V supply at connector X9 (☞ Chapter "Connecting-up" in the Operating Instructions, Part 1).
- ♦ It must be ensured, that if there is an external main contactor, this does not drop-out during the supply dip.
- ♦ When the line voltage supply returns, it is not permissible that the voltage increases 50% to 100% in less than 5 ms.
- ♦ A maximum of 10 dips/hour are permissible with a minimum 10 s time between them.

	WARNING
	If these conditions/instructions are not observed, this can result in erronous function or the drive converter being destroyed.

During a supply dip, the available induction motor output is reduced
- approximately linear for vector control operation,
- over-proportionally for operation with one of the V/f operating modes (P163 = 0,1,2)

Parameter to set the flexible response function:

P379	FLR on/off	i001: MDS1 to i004: MDS4	0 to 3
0: Flexible response is not enabled. 1: Kinetic buffering is enabled. 2: Flexible response is enabled with V/f = const. 3: Flexible response is enabled with f = const. (only for v/f operation P163 = 0, 1, 2).			

P380	FLR initiation point	i001: MDS1 to i004: MDS4	65 % to 115 %
The FLN threshold can be set to between 65% and 115% using this parameter. The switch-off threshold is 5% above the switch-on threshold (☞ Chapter 10 „Function diagrams“).			
NOTE			
For flexible response, values of P380 > 90 % are not practical, as otherwise the function may not be able to be switched-out. When using an active front end (AFE) as rectifier/regenerative feedback unit, the FLN function is automatically included in the AFE.			

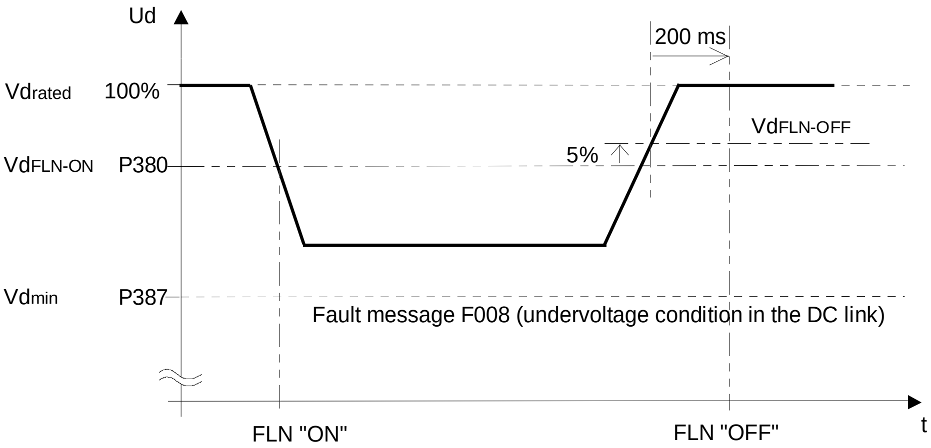
P381	FLN controller dynamic performance	i001: MDS1 to i004: MDS4	0 % to 200 %
The characteristics of the PID controller can be changed using this parameter. The FLN controller is only enabled for V/Hz open-loop/closed-loop control types (P163 = 0, 1, 2) and P379 = 2. The controller ensures that the V/f ratio remains constant. For supply dips/interruptions, the drive converter output frequency and therefore the motor speed can decrease. The factory setting is 50 %. The controller output can be visualized via parameter **r385**.			

P387	FLN Vdmin	i001: MDS1 to i004: MDS4	50 % to 76 %

Using this parameter, the voltage threshold of the fault message F008 (DC link undervoltage) can be reduced from 76 % (factory setting!) to 50 % (☞ Chapter 10 „Function diagrams“).

P189	Energization time	i001: MDS1 to i004: MDS4	0.01 s to 10.00 s

If field weakening is reached during voltage dips, then, for V/Hz open-loop control types (P163 = 0, 1, 2), when the voltage returns, the output voltage is ramped-up which corresponds to twice the excitation time. The excitation time is calculated during automatic parameterization (P052 = 6) and motor identification (P052 = 7, 8).



$V_{d\ FLN\ ON} = P380 \times V_{d\ rated}$ Pre-assigned: P380 = 76 %

$V_{d\ FLN\ OFF} = (P380 + 5\ \%) \times V_{d\ rated}$ Pre-assigned: for P380 = 76 % ⇒ 81 %

$V_{d\ min} = P387 \times V_{d\ rated}$

$V_{d\ rated} = 1.315 \times P071$

Fig. 9.4 Flexible response

9.4 Vdmax closed-loop control

Description:

The Vdmax closed-loop control function allows briefly occurring regenerative loading to be handled without the unit shutting down with fault F006 (DC link overvoltage). In this case, the frequency is controled (closed-loop), so that the motor does not excessively enter over-synchronous operation.

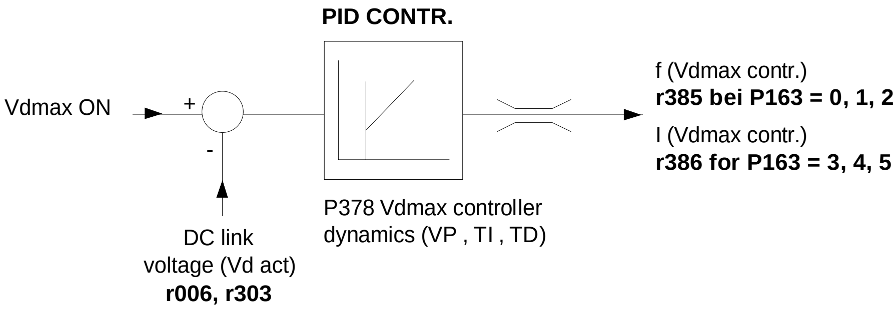


Fig. 9.5 Vdmax closed-loop control

For a steady-state load, the converter output frequency must increase. If a regenerative load excists for too long, the unit is shutdown with F006 when the maximum frequency is reached (P452, P453). If regenerative loading occurs when the machine is decelerating too quickly (P464), then this is automatically reduced, so that the converter is operated at the voltage limit.

The Vdmax control is also optimally suited for regenerative operation, which can occur when the speed stabilizes at the end of ramp-up.

Parameters to set the Vdmax closed-loop control:

P377	Vdmax controller on/off	i001: MDS1 to i004: MDS4	0 to 1
0: The Vdmax controller is inhibited. 1: The Vdmax controller is enabled.			

P378	Dynamic performance of the Vdmax controller	i001: MDS1 to i004: MDS4	0 % to 200 %
The characteristics of the PID controller can be influenced using this parameter. For 0 %, the Vdmax controller is disabled. The factory setting is 50 %. The controller output can be visualized via parameters r385 and r386.			

Alarm A041 „Vdmax controller inhibited“:

The line supply voltage is too high or the drive converter supply voltage (P071) is incorrectly parameterized. The Vdmax controller is inhibited in spite of the fact that the parameter is enabled (P377 = 1), as otherwise, the motor would immediately accelerate to the maximum frequency in operation.

The response threshold when inhibiting the Vdmax controller is calculated as follows:

$$V_{d\,max-ON} = 119\,\% \times \sqrt{2} \times V_{supply,\ rated} = 168\,\%\ V_{supply,\ rated}$$

$$V_{supply,\ rated} = \text{P071 for AC-AC drive converters and}$$

$$V_{supply,\ rated} = \frac{\text{P071}}{1.315} \text{ for DC-AC drive converters}$$

9.5 Setting the short-time overload capability

The setpoint for the current limiting controller is set in parameter 173. The maximum current can be parameterized up to 160 % I_conv.N:

- Voltages 208 ... 230 V, 380 ... 460 V and 500 ... 575 V
- Frame sizes A to H: 2.2 ... 200 kW

Additional boundary conditions are:

- ♦ A vector control type (P163 = 3, 4 or 5) selected
- ♦ No output filter (P092 = 0) connected
- ♦ The DC link voltage is not exceeded for
  - $1.32 \times 1.2 \times V_{supply,max}$ (AC units)
  - $1.2 \times V_{DC}$ (DC units)

If a maximum current > 136 % is set, the permissible load duty cycle changes as follows:

- I_max ≤ 136 % : I_max = 136 % for 60 s, I_max = 91 % for 240 s
- I_max > 136 % : I_max = 160 % for 30 s, I_max = 91 % for 270 s

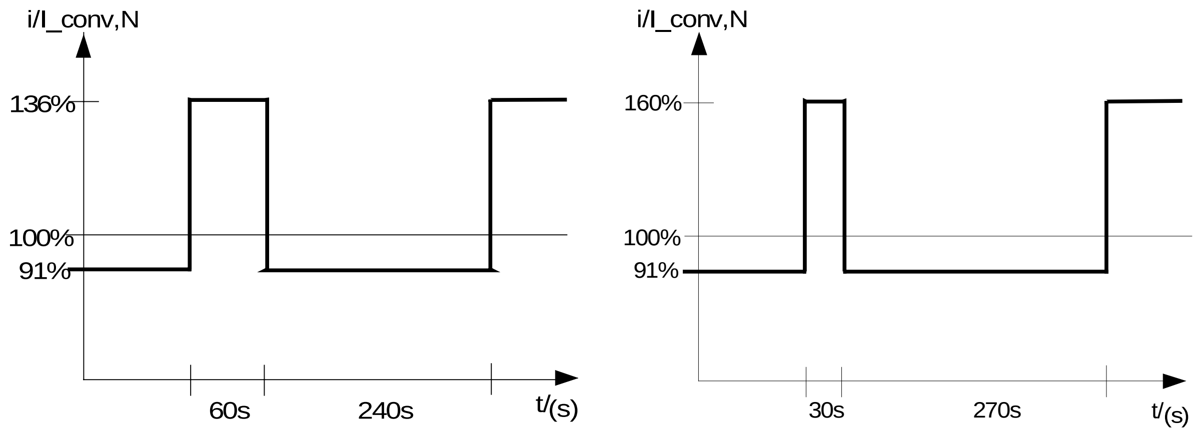


Fig. 9.6 Permissible load duty cycles

If a maximum current of >136% is demanded by the load, the control range is automatically limited to the vector modulation, i.e. the fully output voltage is no longer available.

NOTE
For longer output cables, sporadic overcurrents can occur (alarm A020, fault message F011).

9.6 DC current brake

Description:

The DC brake function allows the drive to be brought to a standstill in the shortest possible time. To realize this, a DC current is impressed in the motor windings, which, for an induction motor, results in a very high braking torque.

NOTE
The „DC current braking“ function is only practical for induction motors! With the „DC current braking“ function, the kinetic energy of the motor is converted into heat **in the motor**. The drive could overheat if it remains in this status for an excessive period of time!

Parameters to adjust the DC current brake:

P371	Motor de-energization time	i001: MDS1 to i004: MDS4	0,01 s to 10,00 s
The minimum delay time between pulse inhibit and pulse enable is set using the parameter. Thus, it should be ensured that the motor is at least de-magnetized to 90% when the pulses are enabled. The parameter is pre-assigned during automatic parameterization and motor identification.			

P372	DC brake on/off	i001: MDS1 to i004: MDS4	0 to 1
0: DC brake on/off. 1: The DC brake is not activated for an OFF3 command (fast stop), the unit is DC current braked.			

P373	DC braking current	i001: MDS1 to i004: MDS4	20 % to 400 %
The current setpoint (as a %, referred to the rated motor current) is set using this parameter, which is impressed for DC current braking			

P374	DC braking duration	i001: MDS1 to i004: MDS4	0.1 s to 99.9 s
The DC current braking duration is adjusted using this parameter.			

P375	Frequency at the start of DC braking	i001: MDS1 to i004: MDS4	0.1 Hz to 600.0 Hz
For an OFF3 command, DC current braking is realized from this frequency.			

Procedure:

- ♦ The DC brake is activated using the OFF3 command.
- ♦ The drive converter decelerates along the parameterized OFF3 ramp (P466) down to the frequency for the start of DC braking (P375). Thus, the motor kinetic energy can be reduced without endangering the drive. However, if the OFF3 ramp-down time (P466) is selected to be too low, there is a potential danger that a fault could occur due to DC link overvoltage (F006).
- ♦ The inverter pulses are inhibited for the duration of the de-energization time (P371).
- ♦ The required current (P373) is then impressed for the selected braking duration (P374).
- ♦ The drive converter changes into the SWITCH-ON INHIBIT (008) or READY TO SWITCH-ON (009) status.

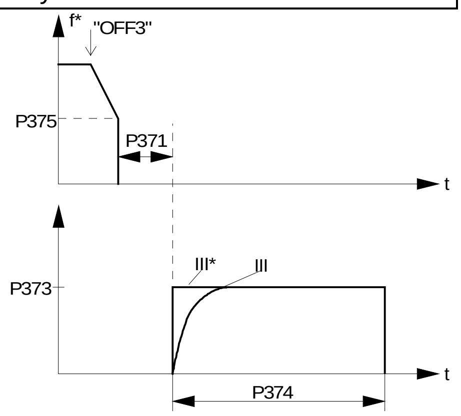


Fig. 9.7 DC current braking

9.7 Restart-on-the-fly

Description:

The restart-on-the-fly function allows the converter to be connected to a motor which is still rotating. If the converter was to be switched-on without the restart-on-the-fly function, an overcurrent condition would occur, as the flux in the motor has to first be built-up, and the open-loop/closed-loop control must be appropriately set.

NOTE
It is not possible to implement a restart-on-the-fly function for multi-motor drives, as the motors have different run-down characteristics!

The following is executed, depending on whether a tachometer is enabled:

Restart-on-the-fly without tachometer (with search) (P208 = 0):

NOTE
„Restart-on-the-fly without tachometer“ (searching) is only practical for induction motors! For „restart-on-the-fly without tachometer“, the „Standstill test“ generates a braking torque which can cause drives with low moments of inertia to be braked to a standstill.

- A standstill test (a DC current is briefly impressed) is executed after the de-energization time (P371) has expired after the supply returns, with WEA (☞ Section 9.1) active, or since the last shutdown time with „OFF 2“ command (inverter inhibit).
- If it is identified that the motor is at standstill, energization and acceleration are started as for a standard start
- If motor standstill has not been identified, searching is started with the maximum frequency, clockwise phase sequence (P452); if only a COUNTER-CLOCKWISE phase sequence is selected (☞ Section 5.1 „Control word“), searching starts with the maximum frequency, clockwise rotating phase sequence (P453).
- The search frequency is linearly reduced down to 0 Hz, and more specifically by the search speed which can be parameterized **P370** (in Hz, referred to 1 second). In this case the search current **P369**, which can be parameterized, is impressed.
  For P163=3 (closed-loop frequency control), the search current is limited to 200 % of the rated magnetizing current (r196).
  - **P163 = 1 or 2 (V/f characteristic):**
    The reference output voltage of the drive converter required for the search current, is compared with the voltage value of the V/f characteristic corresponding to the search frequency.
    When the motor frequency is found using this function, the search frequency is kept constant and the output voltage is changed to the voltage value of the V/f characteristic with the energization time constant (dependent on the energization time (P189)).
  - **P163 = 3 (closed-loop frequency control):**
    The reference output voltage of the drive converter, required for the seach current, is compared with the search frequency corresponding to the EMF setpoint.
    If the motor frequency is found using this function, the search frequency is kept constant, and the flux setpoint is changed to the rated flux with the energization time constant (dependent on the energization time (P189).

The ramp-function generator is then set to the search frequency.
If it is not possible to set the ramp-function generator, as the supplementary setpoint is too high, then the unit is shutdown with **Fault F018** „ramp-function generator could not be set at restart on the fly“. Otherwise the RESTART-ON-THE-FLY status (013) is exited and the motor (via the ramp-function generator) is ramped up to the actual setpoint frequency.

- ♦ If the motor was not found, at 0 Hz search frequency, a standstill test is again executed and a search run made in the appropriate direction of rotation when the phase sequence in the other direction of rotation is enabled. The motor is switched-in at 0 Hz even if the search was not successful.

Example: Restart-on-the-fly without tachometer (search)

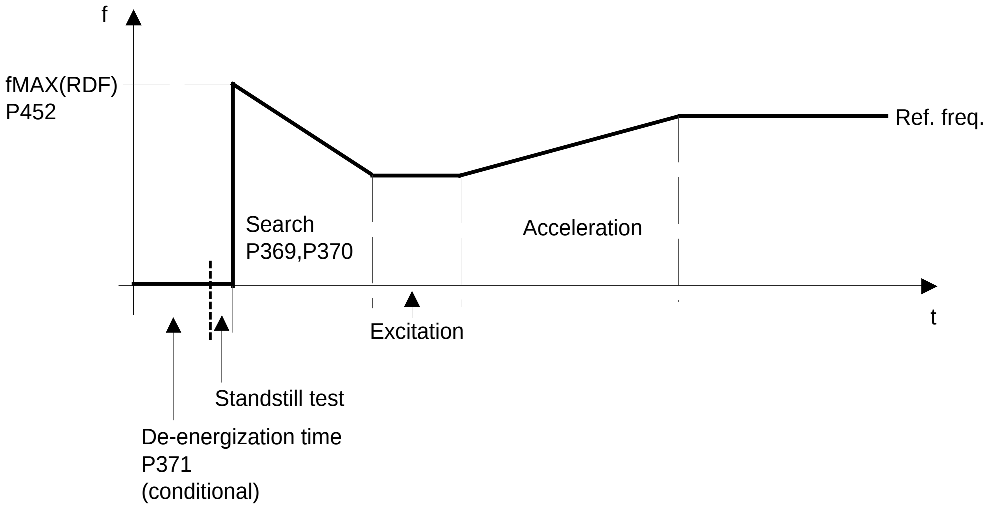


Fig. 9.8 Restart-on-the-fly

Restart-on-the-fly with tachometer (P208 ≠ 0):

- ♦ After the de-energization time has expired (P371), after the supply returns with activated WEA (Section 9.1) or an „OFF2“ command was applied since the last switch-off instant (inverter inhibit), then:
  - For V/Hz mode (open-loop control, the drive converter output voltage is linearly increased, within the energization time (P189) from 0 to the V/Hz characteristic value (determined from the measured, smoothed speed actual value.
  - For vector controls, the required magnetizing current is established within the energization time.
- ♦ After the energization time (P189 has expired, the ramp-function generator is set to the smoothed speed actual value.
  If it is not possible to set the ramp-function generator, because the supplementary setpoint is too high, then the unit is shutdown with **Fault F018** „ramp-function generator was not able to be set for restart-on-the-fly“.
- ♦ Otherwise, RESTART-ON-THE-FLY status (013) is exited, and the motor is ramp-up to the actual setpoint frequency (via the ramp-function generator.
- ♦ For closed-loop torque control (P163 = 5) or a slave drive (refer to P587), the drive continues with the actual torque setpoint

Parameter to select the restart-on-the-fly function:

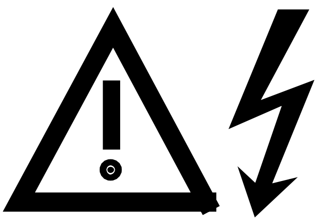
P583 Control word bit 23	Restart-on-the-fly enable	i001: BASIC i002: RES	0 to 1
0: Restart-on-the-fly is not enabled. 1: Restart-on-the-fly is enabled at each on command. Source selection parameter for control word bit: P583 ☞ Section 5.1 „Control word“. **Exception: P366 = 3** The **automatic restart** (☞ Section 9.1) **and restart-on-the-fly** (without taking into account the control word command „restart-on-the-fly enable“ (bit 23)) functions are always activated.			

Only for restart-on-the-fly without tachometer (with search) (P208 = 0):

P369	Restart-on-the-fly search current	i001: MDS1 to i004: MDS4	10 % to 400 % (for closed-loop frequency control, max. 2×r196 realized)
Setpoint of the impressed current when searching for the motor (as a %, referred to the rated motor current (P102)) Presetting during „automatic parameterization“ to „no-load motor current“ (r196)			

P370	Restart-on-the-fly search speed	i001: MDS1 to i004: MDS4	0.1 Hz to 100.0 Hz
Ramp gradient with which the search frequency can be changed (in Hz, referred to 1 second).			

As long as the restart-on-the-fly function is active, the **„restart-on-the-fly active“ message** is set via the **status word bit 16** (☞ Section 5.2).



WARNING

With the „restart-on-the-fly without tachometer“ activated (P366 = 3 with WEA or control word bit 23), the drive may suddenly accelerate as a result of the search current in spite of the fact that the drive is at a standstill and a 0 Hz setpoint !

Death, severe bodily injury or material damage can occur if the drive area is entered!

9.8 Technology controller

Description:

The technology controller function can be used for simple, higher-level closed-loop control functions without requiring an additional technology board (TB)

A freely connectable setpoint is compared with a freely connectable actual value, and the output is tracked via a parameterizable controller characteristic.

The technology controller sampling time is 8×P308 (pre-setting 9.6 ms).

The technology controller computes in the PZD notation, i.e. 100 % corresponds to 4000 0000H.

The function diagram of the technology controller is provided is Chapter 10.

Parameters to set the technology controller:

- **Enable:**

P584 Control word bit 24	Source, technology controller enable	i001: BASIC i002: RES	0 to 6004
Value 0: Technology controller is not enabled Value 1: Technology controller is enabled, if P526 or P531 ≠ 0 additional possible settings, ☞ Section 5.1			

- **Technological setpoint:**

P525	Fixed technological setpoint	i001: BASIC i002: RES	–200 % to 200 %
This value is active for P526 = 1001			

P526	Technological setpoint source	i001: BASIC i002: RES	0 to 6045
Source of the technological setpoint (possible settings, refer to Section 5.3)			

P527	Technological setpoint gain	i001: BASIC i002: RES	–300 % to 300 %
Is not valid for technological controller setpoint input via a fixed setpoint (P526 = 1001)			

P528	Setpoint smoothing	0.00 s to 600.00 s
Smoothing time constant of the setpoint (to prevent setpoint steps)		

r529	Actual technological setpoint
Visualization parameter for the actual technological setpoint in %.	

♦ **Technological actual value:**

P530	Technological actual value	i001: Value 1 i002: Value 2	0 to 999
Internal sources for the technological actual values. The parameter number of the internal drive converter quantity is specified here, which is to be used as technological actual value.			

P531	Source, technological actual value	i001: BASIC i002: RES	0 to 6045
P531 = 1100: Internal technological actual value 1 (= contents of P530.1) P531 = 1200: Internal technlogical actual value 2 (= contents of P530.2) Additional possible settings, refer to Section 5.3			

P532	Gain, technological actual value	i001: BASIC i002: RES	-300 % to 300 %
Gain of the technology controller actual value			

P533	Smoothing, technological actual value	0.00 s to 600.00 s
Smoothing time constant of the actual value (to prevent actual value steps)		

r534	Actual technological actual value
Visualization parameter for the actual technological actual value in %.	

♦ **Setpoint/actual value comparison:**

A binary status bit is generated from the comparison between the technological setpoint and the technological actual value; this can be visualized in status word 2, bit 27.
The status „connection" is realized via parameter P627.

	Technological setpoint, positive	Technological setpoint, negative
HIGH	Techn. actual value > technological setpoint	Techn. actual value < technological setpoint
LOW	Techn actual value < techn. setpoint – hysteresis (P535)	Techn. actual value > techn. setpoint + hysteresis (P535)

P535	Hysteresis of the comparison	0.0 % to 100.0 %
Hysteresis for the „technological setpoint reached" message. The hysteresis is only effective if the message is withdrawn.		

r536	Technological controller error signal
Control error signal at the input of the technological controller in %.	

- **PID controller:**
  Depending on the particular application, the controller can be operated as pure controller, as PD controller, as PI controller or as PID controller.
  The controller is active, if the inverter pulses are enabled, the energization time (P189) has expired, and the technological controller has been enabled (control word bit 24=1, „connection“ via P584).

P537	Technological controller gain (P component)	0.00 to 250.00

P538	Technological controller integral action time (I component)	0.00 s to 600.00 s
The I component can be disabled using the value „0“.		

P539	Technological controller rate time (D component)	0.00 s to 300.00 s
The D component can be disabled using the value „0“.		

r540	Technological controller output signal
Output signal of the technological controller before the limit value stage in %.	

P541	Technological controller limit 1	-200.000 % to 200.000 %
Upper limit of the controller output signals.		

P542	Technological controller limit 2	-200.000 % to 200.000 %
Lower limit of the controller output signal.		

P543	Technological controller ramp-function generator for limit 1	0.00 s to 100.00 s
Ramp-function generator for the upper limit value of the output signal.		

P544	Technological controller ramp-function generator for limit 2	0.00 s to 100.00 s
Ramp-function generator for the lower limit value of the output signal.		

r545	Limited technological controller output signal
Output signal of the technological controller after the limit value stage in %. If limiting is active, the I component of the PI controller is held, in order to permit that the controller quickly leaves the limit.	

The technology controller output can then be connected with value 1020 to parameters **P226 (S.n/f reg. adap)**, **P433 (S.suppl.setpoint1)**, **P438 (S.suppl.setpoint2)**, **P443 (S.main setpoint)**, **P486 (S.torque setpoint)**, **P493 (S.torque limit1)**, **P499 (S.torque limit2)** and **P506 (S.torque/current suppl. setpoint)**.

Additional applications of the technology controller:

1. Using parameters P526 and r529 as well as P531 and r534, process data can be transferred from analog inputs or serial interfaces to supplementary boards.

   Example:

   Setpoints for a technological board are to entered in word 05 and word 06 via SST1. In order to permit this, the parameterization must be as follows:

   P526.1 = 2005 (word 05 from SST1)

   P527.1 = 100.00 % (no gain)

   P528 = 0.0 s (no smoothing)

   P531.1 = 2006 (word 06 from SST1)

   P532.1 = 100.00 % (no gain)

   P533 = 0.0 s (no smoothing)

   P694.2 = 529 (the actual value W02 for TB is thus word 05 from SST1)

   P694.3 = 534 (actual value W03 for TB is thus word 06 from SST1)

   The technological controller must not be activated for this function (P584 = 0).

2. Status bit 27 can be used as any comparitor, by entering a comparison value via parameters P525 and P526, and a comparison quantitiy via P530 and P531.

   The technological controller does not have to be activated for this function (P584 = 0).

9.9 Tracer

Description:

The trace function is used to quickly trace converter quantities/parameters (e.g. current, voltage, speed) in the converter itself. It has 8 channels, whereby all of the channels can operate independently of one another. Any quantity/parameter can be used as trigger- and trace quantity, which are accessible as parameter in the converter. It is **not** possible to record parameters from a technology board (TB) (parameter numbers > 1000 or d- or H parameters).
The trace memory size is approx. 28 kbyte which is dynamically distributed over the active trace channels, i.e., if, for example, 3 channels are activated, then 9.3 kbyte RAM memory is available for each channel.

Parameters to set the tracer:

As the tracer supports eight independent channels, the parameters, necessary for parameterization, are indexed 8x, whereby the channel number corresponds to the index number.

- **Trigger event:**

P735	TRC Trigger parameter	0 to 900
Parameter number of the signal which is to trigger the trace function.		

P736	TRC trigger value	0 to 65535
Parameter value in the PZD normalization, which is to be started or stopped during the trace.		

P737	TRC trigger condition	0 to 4
Trigger condition for the trace function 0 Trigger parameter value < trigger value 1 Trigger parameter value = trigger value 2 Trigger parameter value > trigger value 3 Drive converter goes into a fault condition 4 Trigger parameter value ≠ trigger value		

Example:

P735.1 = 1 (drive converter status, r001)
P736.1 = 16 (off with fast stop)
P737.1 = 1 (the same)
Channel 1 of the tracer triggers when the fast stop is active (OFF3).

- **Trace record:**

P738	TRC actual values	0 to 999
Parameter number of the signal which is to be recorded from the trace channel.		

P739	TRC sampling time	1 to 200
Sampling time of the trace channel (as a multiple of the basic sampling time (P308))		

P740	TRC pre-trigger	0 % to 100 %
Percentage of the data, which are to be recorded before the trigger event.		

Example:

P738.1 = 219 (speed actual value)
P739.1 = 4 (trace sampling time)
P737.1 = 40 (pretrigger)
The speed actual value is sampled with 4×T0 (T0 = P308), whereby 40 % of the data in the trace memory are before the trigger event.

♦ **Trace start:**

P741	TRC start	0 to 1
Start command for the trace channels. A trace channel can only be started, if it is completely parameterized. 0: Trace channel stopped 1: Trace channel started The parameter is automatically set to 0 again after a start, if the trace channel was triggered, and trace data have been read-in.		

Reading-out trace data:

It is possible to read-out trace data via all of the drive converter interfaces. In this case, a differentiation must be made between digital and analog output.

♦ **Analog read-out** via analog outputs:

The parameter numbers of trace data parameters (r751 to r758) can be entered in the actual value parameters of the analog outputs **(P655 (CU-AA actual values)** and **P664 (SCI-AA actual values))**. The trace data are cyclically output at the relevant analog output. In this case, a trace data parameter **cannot** be simultaneously output via several analog outputs.

♦ **Digital read-out** is realized via SIMOVIS (refer to the corresponding documentation).

Normalization of the trigger value and trace data:

The associated PZD normalization is generally valid when entering the trigger value (P736) and for the trace data which are read-out. This means, that the trigger value must be entered in the PZD normalization of the trigger parameter (P375). Further, trace data are output in the PZD normalization of the recorded parameter P738). The same conditions are also valid for the analog output of a trace channel, as if parameters written with the trace, were to be directly output at the analog output.

Example:

Trace channel 2 should trigger, if the speed actual value (r214) is greater than 50 Hz. The frequency setpoint (r482) is to be recorded. The rated system frequency (P429) is 50 Hz.

Trigger parameter:	P735.2 = 214
Trigger value:	P736.2 = 16384 (r214 = 100 %, if r214 = P420; 100 % = 4000H =16384)
Trigger condition:	P737.2 = 2 (>)
Trace actual value:	P738.2 = 482

Trace data read-out via r752 (for channel 2). The trace data are in the PZD normalization of parameter r482 (100 % = 4000H = P420).

NOTES

- Trigger conditions are compared without sign (**greater** and **smaller**). This must be taken into account, if signed parameters are to be triggered for negative trigger values.
- Due to the dynamic distribution of the trace memory, a previously inactive trace channel should not be parameterized or started, if another trace channel was triggered or the data of a trace channel is still to be read-out. When a trace channel is activated, the trace memory must be re-distributed. In this case, all data in the trace memory become invalid.
- For double-word parameters (type I4), the most significant word is always traced.
- Approx. 1% of the computation time is required per activated trace channel. This means, that if several trace channels are activated, it may be necessary to increase the sampling time (P308).

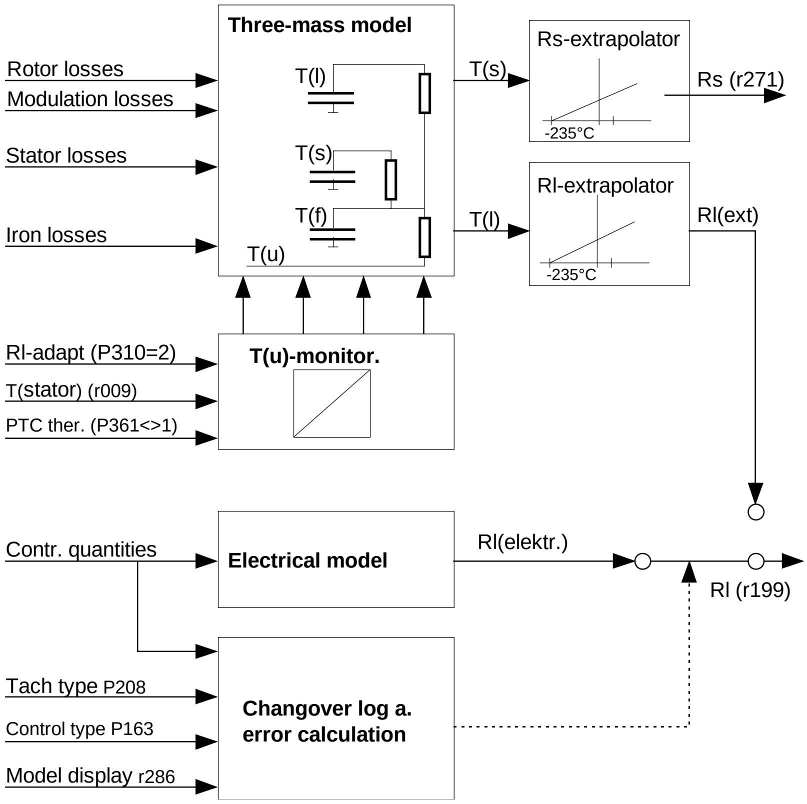
9.10 Temperature adaption

Temperature adaption is used in order to reduce the torque error for n/f/M closed-loop control or speed error for frequency control, which results from the temperature dependency of the stator- and rotor resistances.

The resistances are calculated using a complex thermal 3-mass model and, depending on the operating status, with an electrical motor model.

Temperature adaption can be activated for the three closed-loop vector control types (P163 = 3, 4, 5).

The electrical model only operates for closed-loop speed/torque control (P163 = 4, 5) and if there is a pulse tachometer (P208 =1, 2). In this case, the following error correction P217 should be activated.



T(l) = rotor temperature
T(s) = stator temperature
T(f) = iron temperature
T(u) = ambient temperature
Rl = rotor resistance
Rs = stator resistance

Fig. 9.9 Temperature adaption structure

Parameters to set the temperature adaption:

Basic settings

P310	RotResistTmpAdapt	i001: MDS1 to i004: MDS4	0 to 2
Temperature adaption of the rotor- and stator resistance. 0: Adaption inactive 1: Adaption without measuring the stator temperature 2: Adaption with KTY84 sensor available (connected at customer terminal X103 of the CU) For the temperature measurements (P310=2), the measuring quantity is displayed in **r009**. A temperature sensor should be used if high demands are placed on the torque accuracy.			

P311 (motor series) can be adjusted after adaption has been activated (**P310** > 0). If the motor is included in the listed motor series, this should be selected. It is then automatically determined as to whether the motor has an internal fan and which temperature rise of the motor series it corresponds to. Parameters **P312**, **P313** and **P314** are then suppressed.

P311	Motorseries		(P313) Internal fan	(P314) Overtemperature
1	1LA5	⇒ determine	**no**	**100 %**
2	1LA6	⇒ determine	**no**	**100 %**
3	1LA8	⇒ determine	**yes**	**100 %**
4	1LA1	⇒ determine	**yes**	**100 %**
5	1PH6	⇒ determine	**no**	**130 %**
0	Unlisted motor	no determine	---	----

An unlisted motor is considered to be a motor from another manufacturer (**P311** = 0). In this case, parameters **P312**, **P313** and **P314** must be manually entered (refer to special settings).

P312	Motor weight	i001: MDS1 to 004: MDS4	5 kg to 999 kg
Gesamtgewicht des Motors The motor weight is estimated in the automatic parameterization from the motor output and pole pair number. For a more accurate calculation, the weight can also be taken from the motor catalog.			

If **P311** is reset for a known motor series, then motor weight **P312** is kept for the calculation.
The ambient temperature at the motor identification time (P052=7, 8) should be entered in **P359**.

P362	Motor cooling	i001: MDS1 to 004: MDS4	0 to 1
0: Naturally-ventilated 1: Forced-ventilated (internally automatically assumed, if **P311** = 5)			

After the temperature adaption has been activated (**P310** = 1 or 2) and parameters **P311** to **P314** as well as **P359** and **P362**are assigned, a motor identification run (**P052** = 7, 8) must be executed in order to determine the actual rotor- and stator resistances.

For a more precise stator resistance adaption - especially for long feeder cables, before the motor identification run, the feeder cable resistance **P270** = R(cable), referred to the rated motor impedance, should be entered.

$$P270 = R_{cable}\,[\Omega] \times \frac{1.732 \times P102\,[A]}{P101\,[V]}$$

With activated temperature adaption (**P310** > 0), parameters **P198** „temperature evaluation rotor resistance“ and **P272** „stator- and feeder cable resistance“ should be inhibited for manual access. The adaption itself sets them. The result is displayed in **r199** and **r271**.

r199 Rotor resistance

r271 Stator resistance (incl. the feeder cable resistance **P270**)

At power failure, the actual adaption values are lost. When the supply returns, the values, determined for **P198** and **P272** during the last motor identification run (**P052** = 7 or 8) are used.

If the adaption values are to be kept even when the power fails, the electronic boards must be fed from a separate power supply.

When the adaption is exited (**P310** = 0), the last adaption values are transferred from **r199** and **r271** into parameters **P198** and **P272**. (only for **P310** = 1)
When adaption is exitted with KTY (**P310** = 2) the values are not saved, because **P198** and **P272** are always referred to the ambient temperature **P359**.

It is recommended, necessary when adapting with a KTY sensor, that the motor identification run is executed with the motor in the cold condition, so that when the converter is powered-up after a longer down time, then the correct pre-assignment is automatically made. If there is a KTY sensor, the temperature model is correctly pre-assigned, even after a power failure.

Special settings

For sinusoidal operation (online operation or with an output filter, **P092** = 1), at the rated operating point (rated load, rated voltage, rated current, rated frequency), increased temperatures are obtained in the rotor and stator windings. The difference between these temperatures and the ambient temperature is known as the temperature rise and is specified in K (Kelvin).

The average temperature rises for the adaption are set to **100 K** for the rotor and **80 K** for the stator. For converter operation (pulse frequency 2.5 kHz, no output filter) an average rotor temperature rise of **110 K** is assumed.

If parameter **P314** „temperature rise factor" is to be changed for a motor from a known series (e.g. 1LA5), then **P311 = 0** „unlisted motor" must be entered so that parameters **P313** and **P314** are accessible. Parameter **P313** „internal fan" should be assigned according to the table under the point „basic settings".

If the actual motor temperature rises deviate significantly from the average temperature rises, the temperature rise can be corrected with P314. (100% = average temperature rise.

The factor to correct a temperature rise can be calculated according to one of the following formulas.

- Rotor temp. rise (sinusoidal operation), $\mathrm{P314} = \frac{\text{Rotor temp. rise (sinusoidal operation)}}{100\,\mathrm{K}} \times 100\,\%$
- Rotor temp. rise (converter operation) $\mathrm{P314} = \frac{\text{Rotor temp. rise (converter operation)}}{110\,\mathrm{K}} \times 100\,\%$
- Stator temperature rise $\mathrm{P314} = \frac{\text{Stator temperature rise}}{80\,\mathrm{K}} \times 100\,\%$

10 Function diagrams

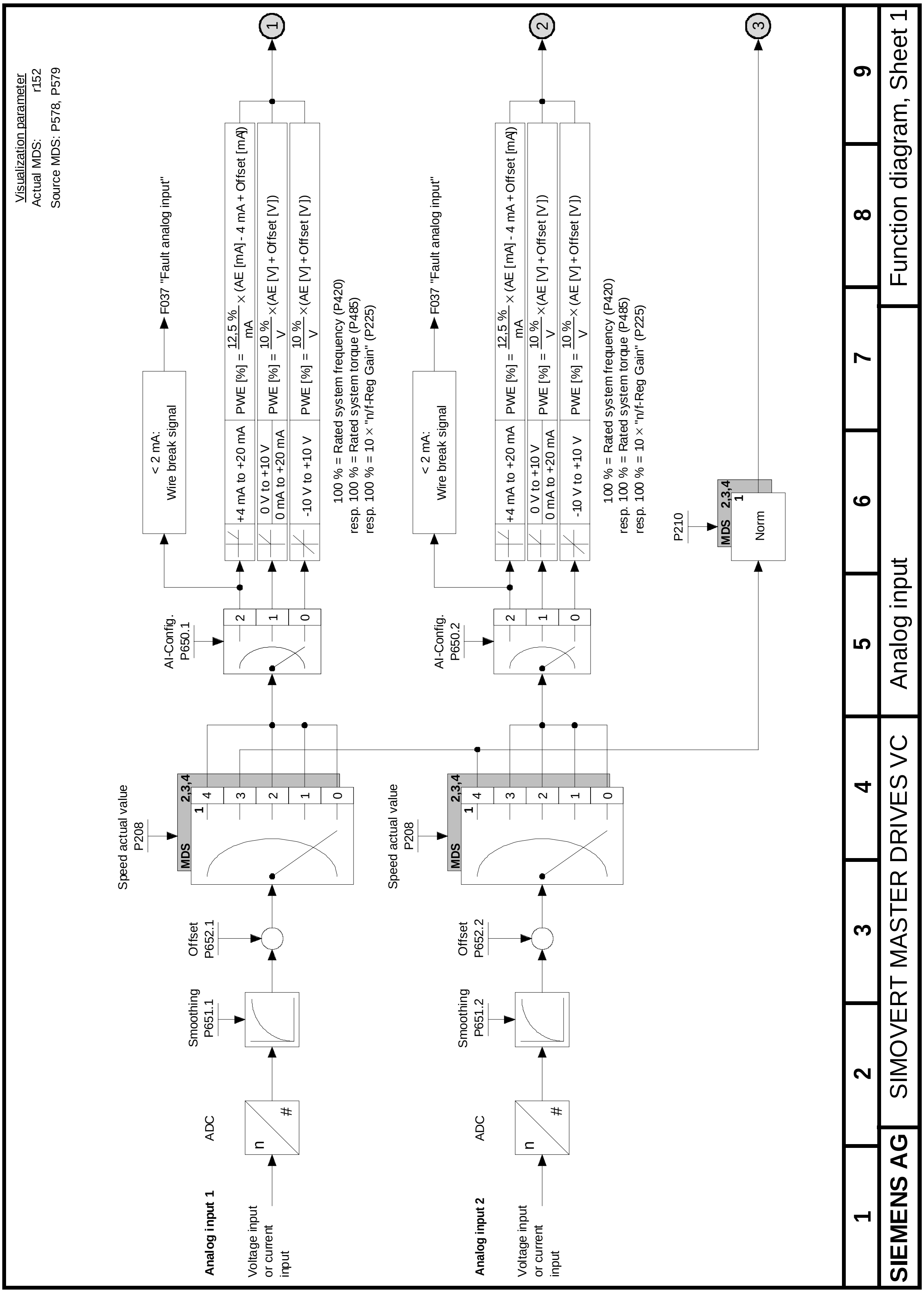


Fig. 10.1 Analog input

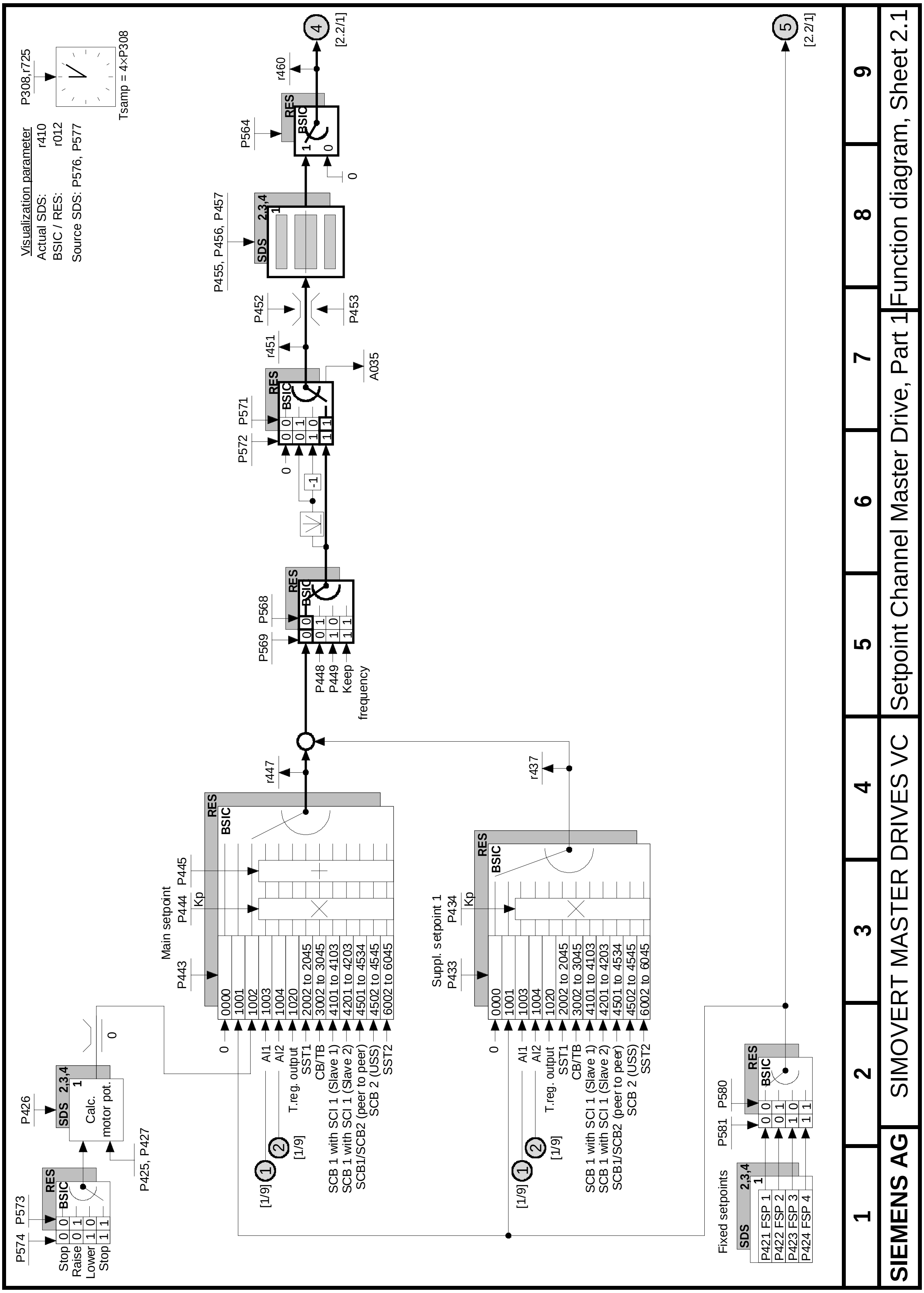


Fig. 10.2 Setpoint Channel Master Drive, Part 1

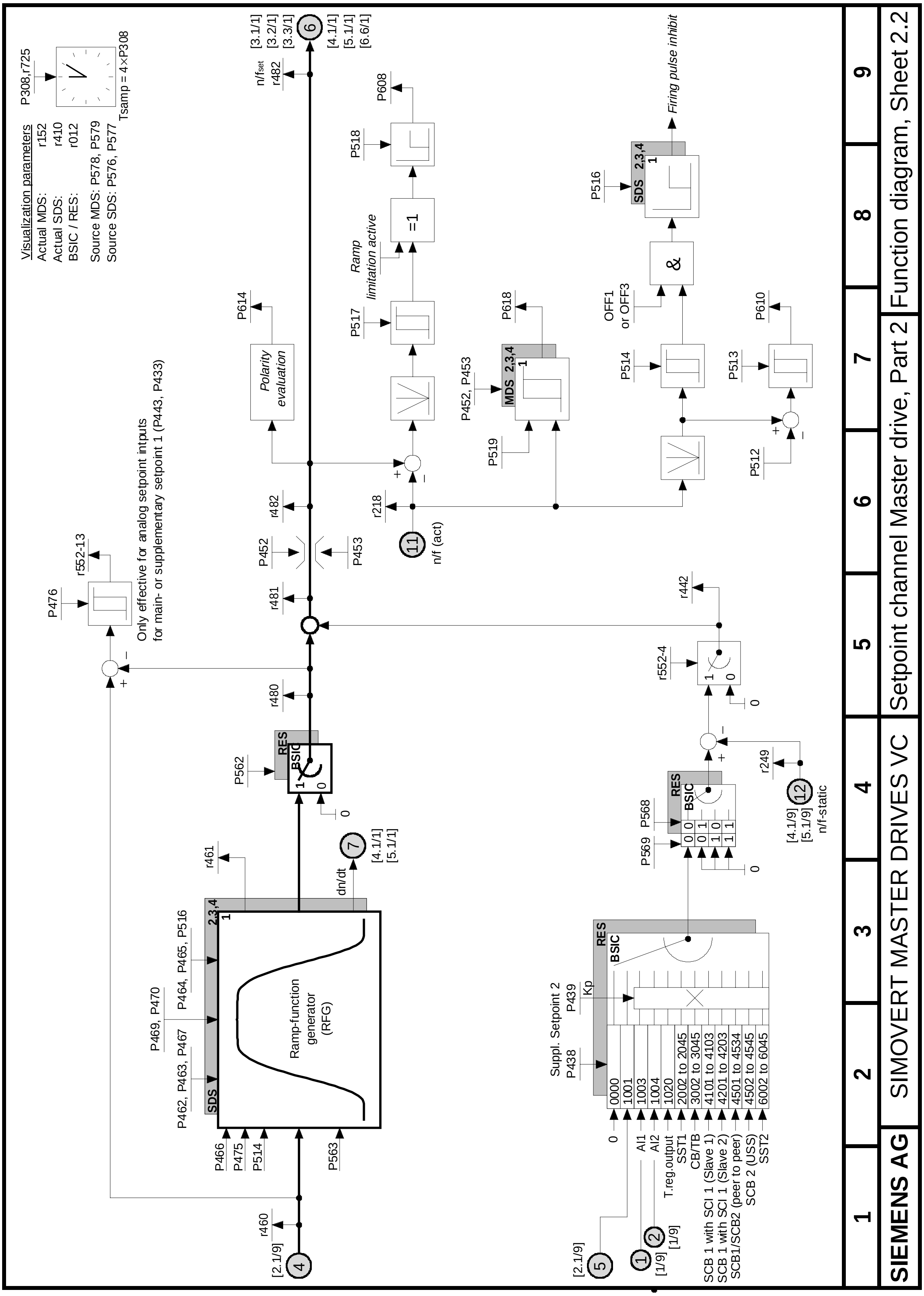


Fig. 10.3 Setpoint Channel Master Drive, Part 2

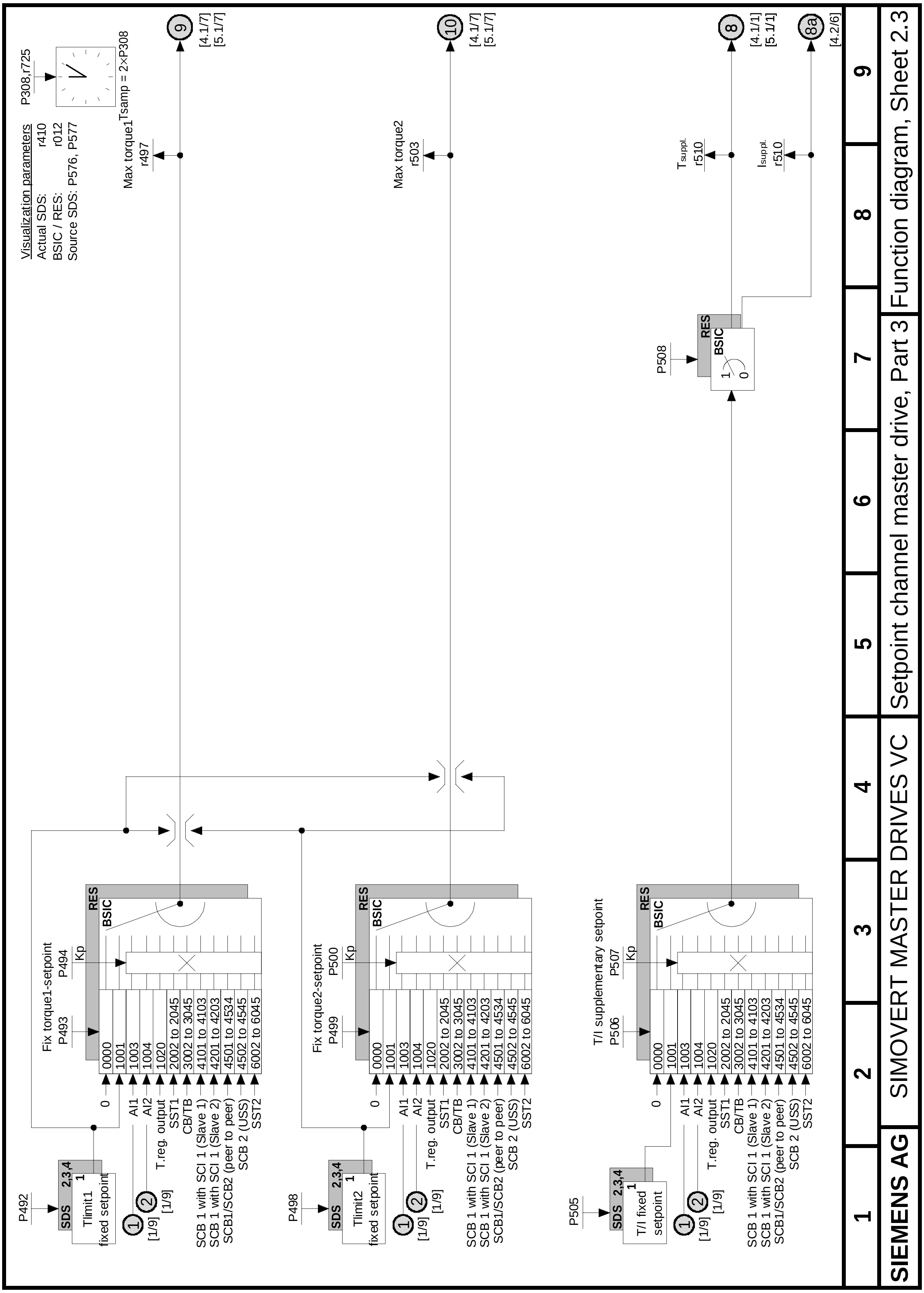


Fig. 10.4 Setpoint Channel Master Drive, Part 3

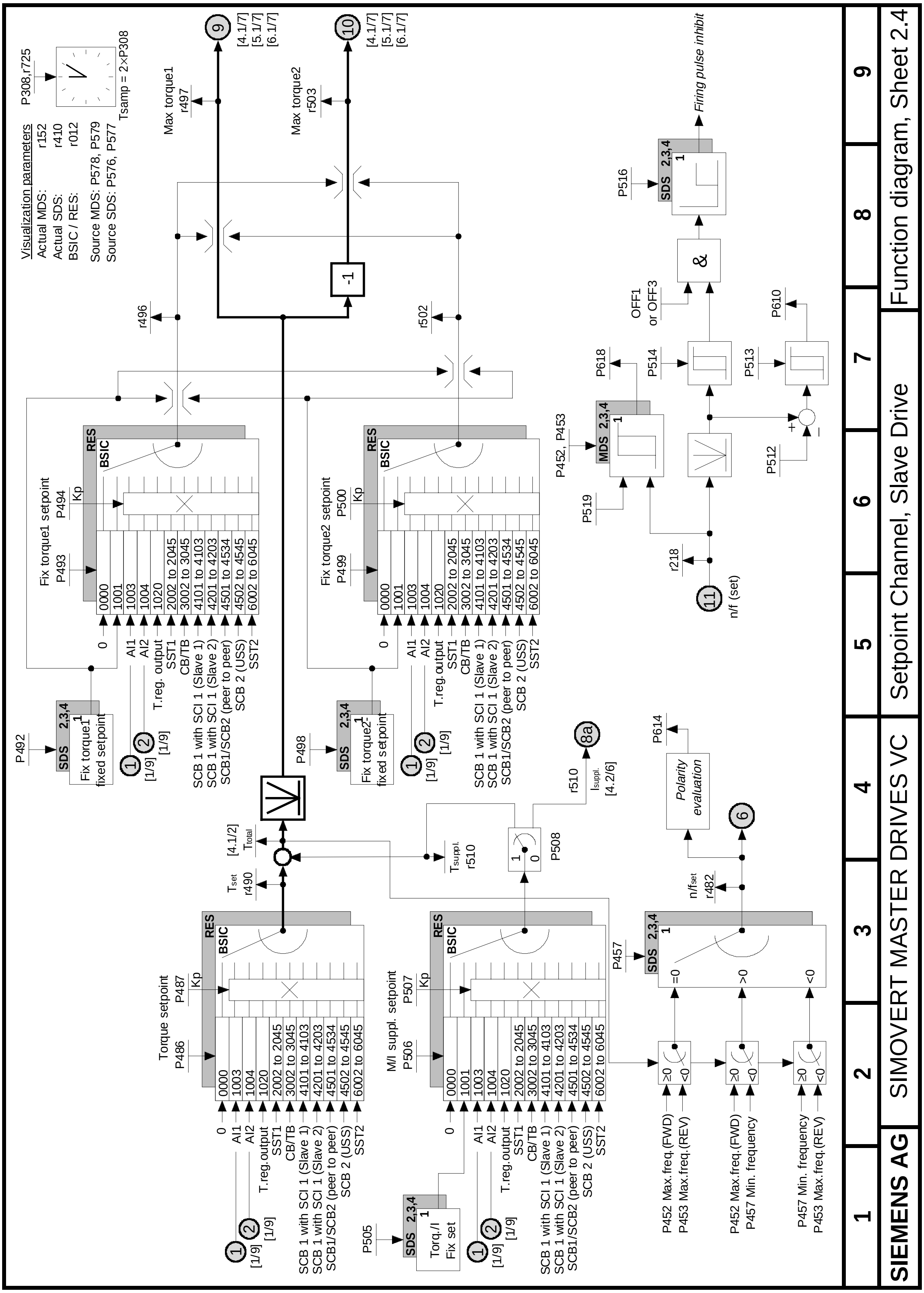


Fig. 10.5 Setpoint Channel Slave Drive

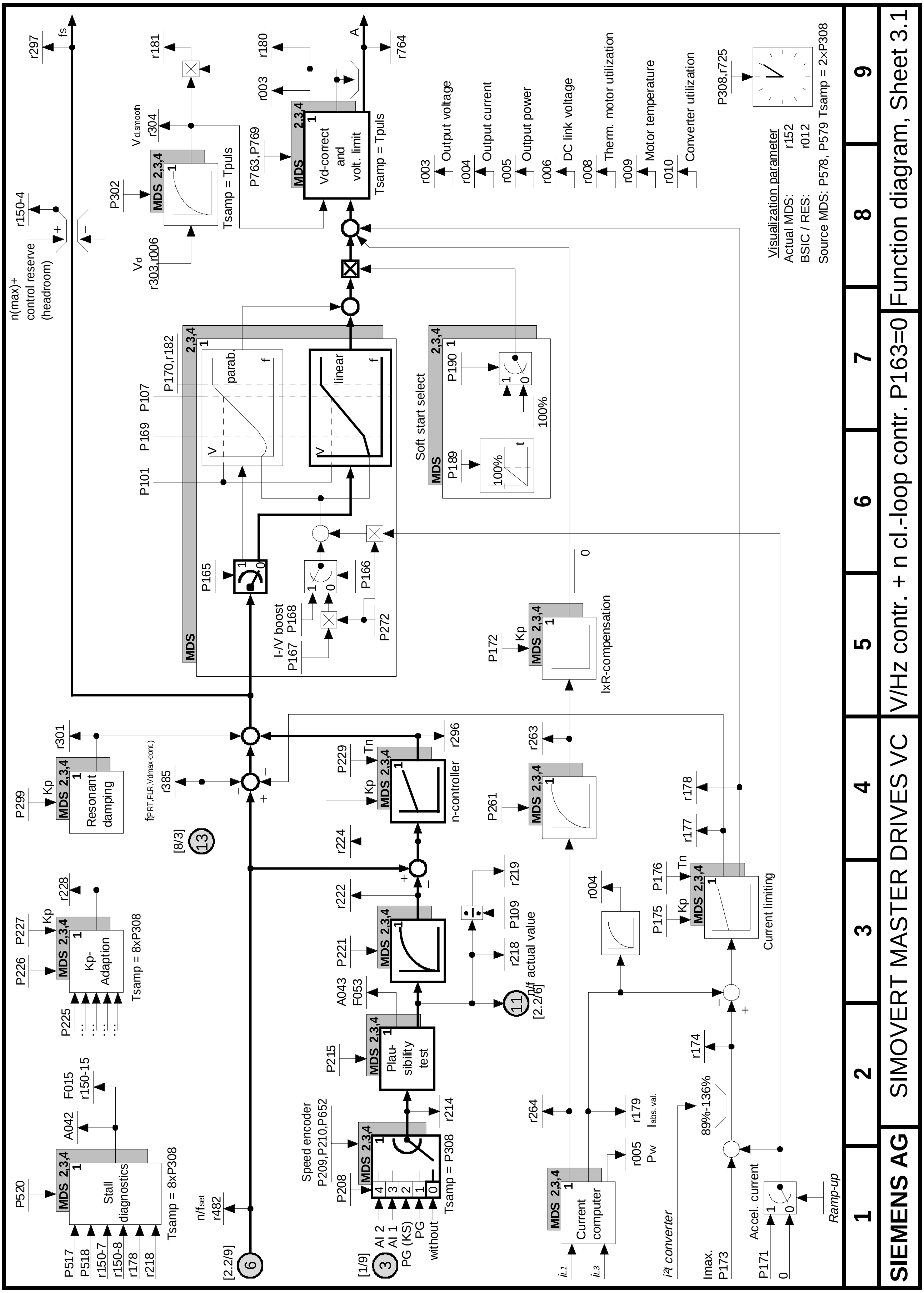


Fig. 10.6 V/Hz control + n closed loop control (P163 = 0)

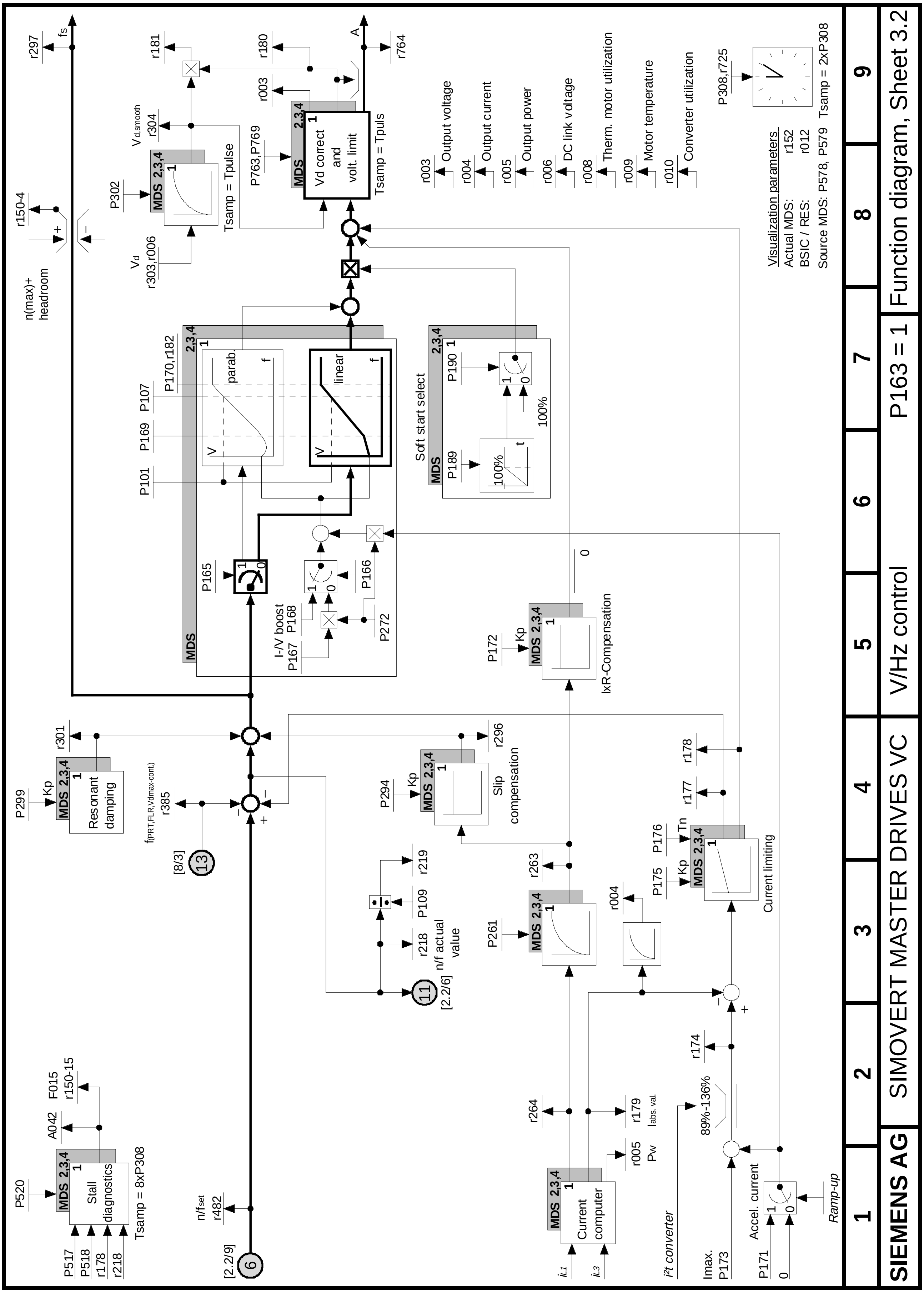


Fig. 10.7 V/Hz control (P163 = 1)

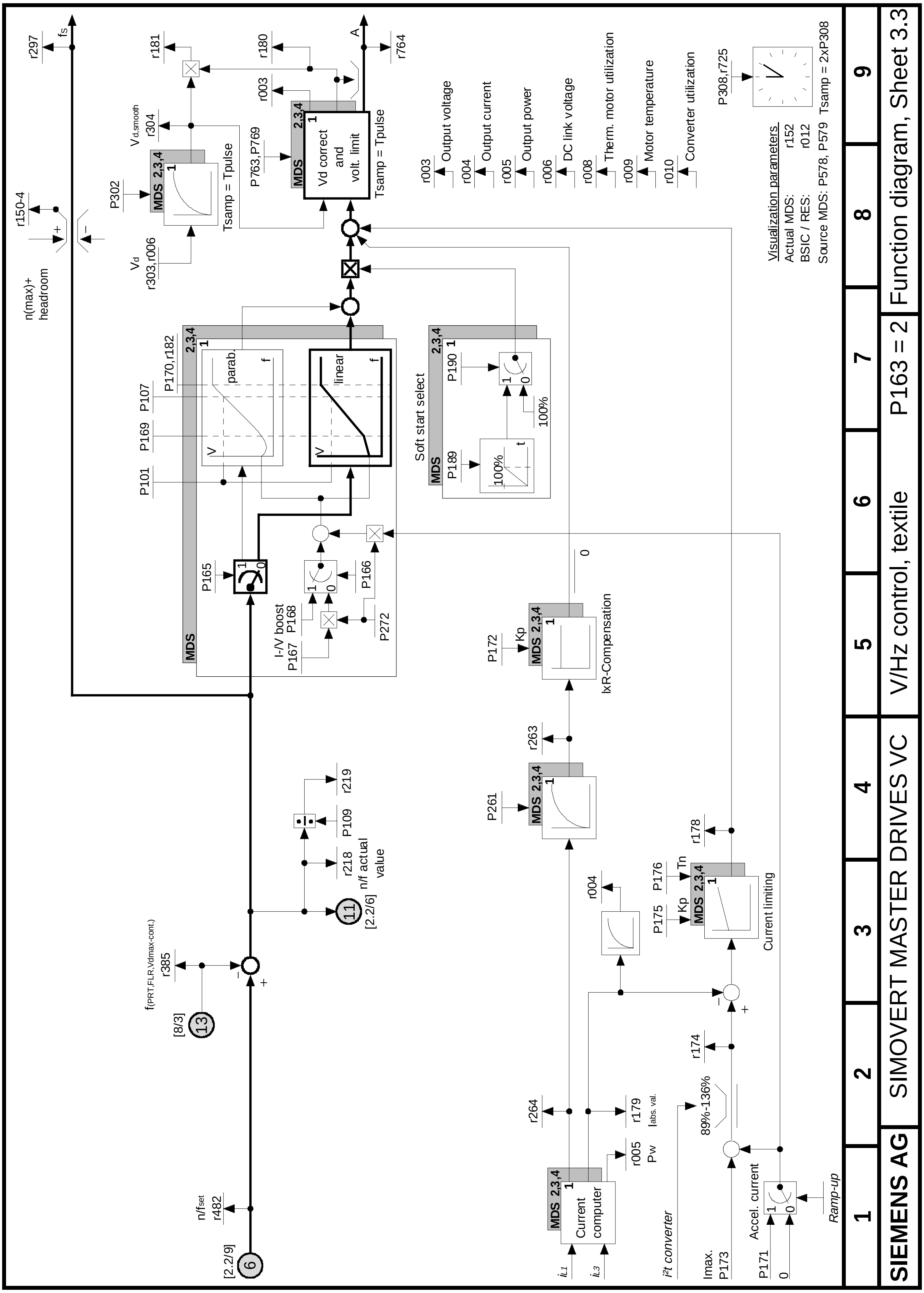


Fig. 10.8 V/Hz control textile (P163 = 2)

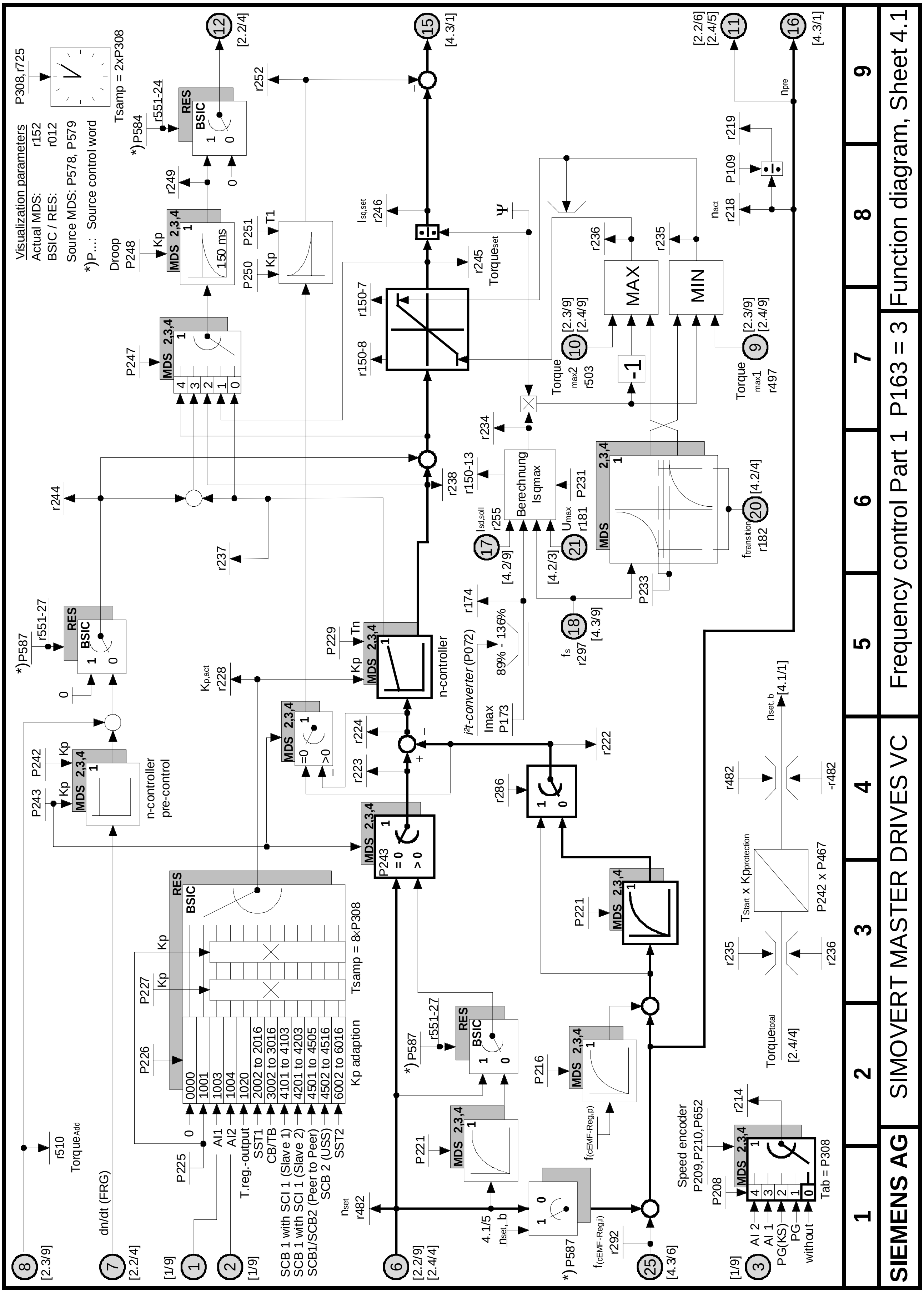


Fig. 10.9 Frequency control, Part 1 (P163 = 3)

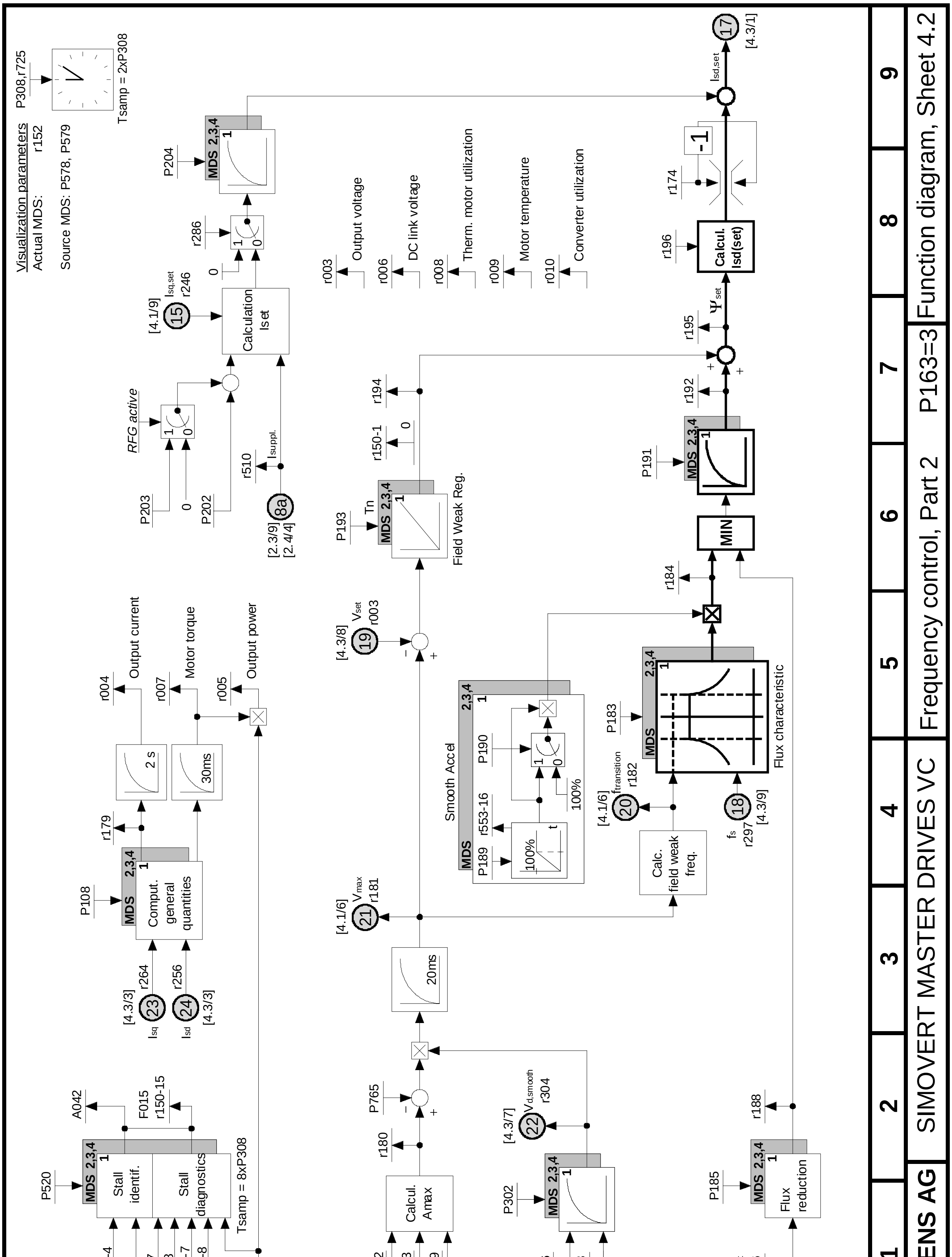


Fig. 10.10 Frequency control, Part 2 (P163 = 3)

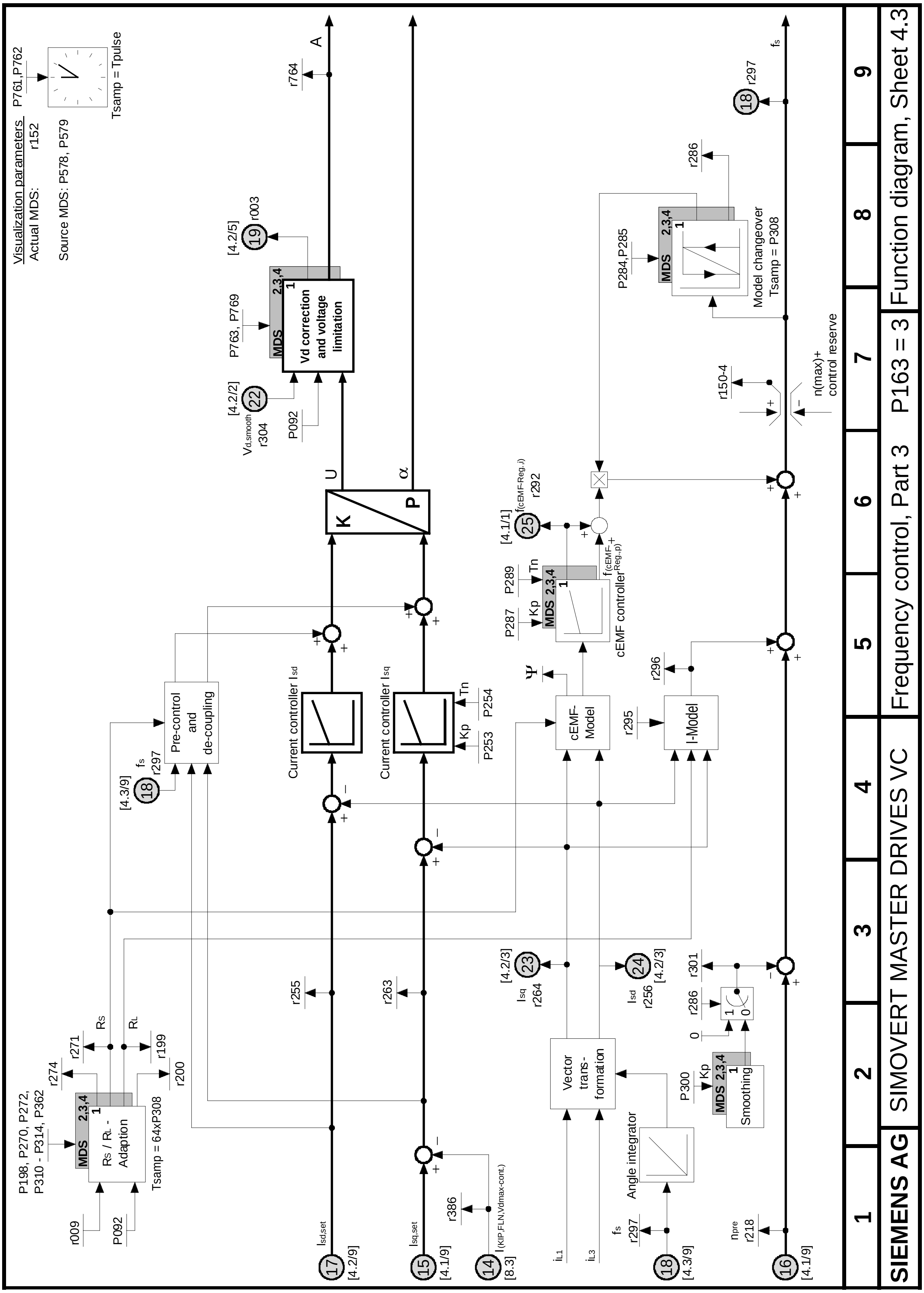


Fig. 10.11 Frequency control, Part 3 (P163 = 3)

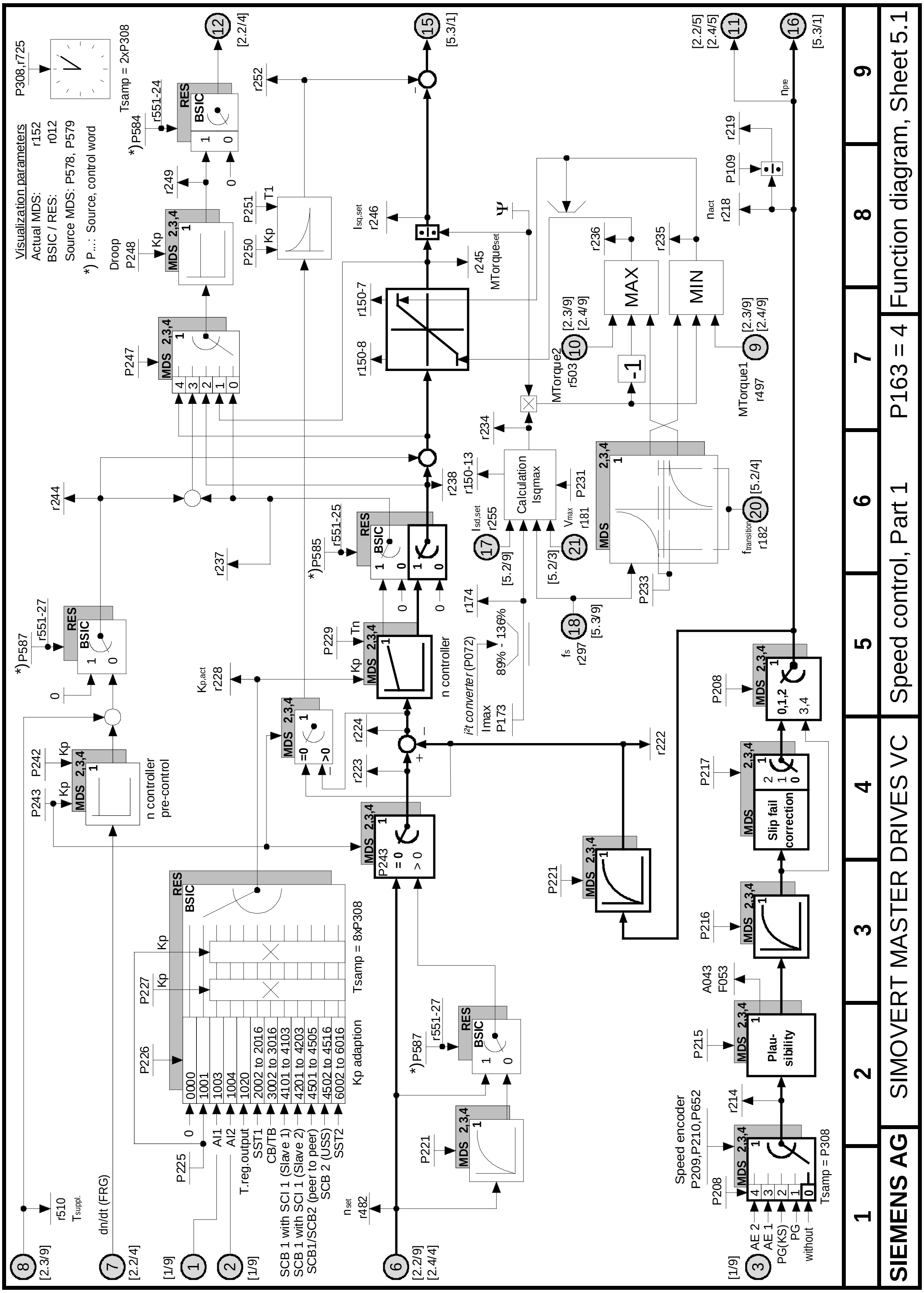


Fig. 10.12 Speed control, Part 1 (P163 = 4)

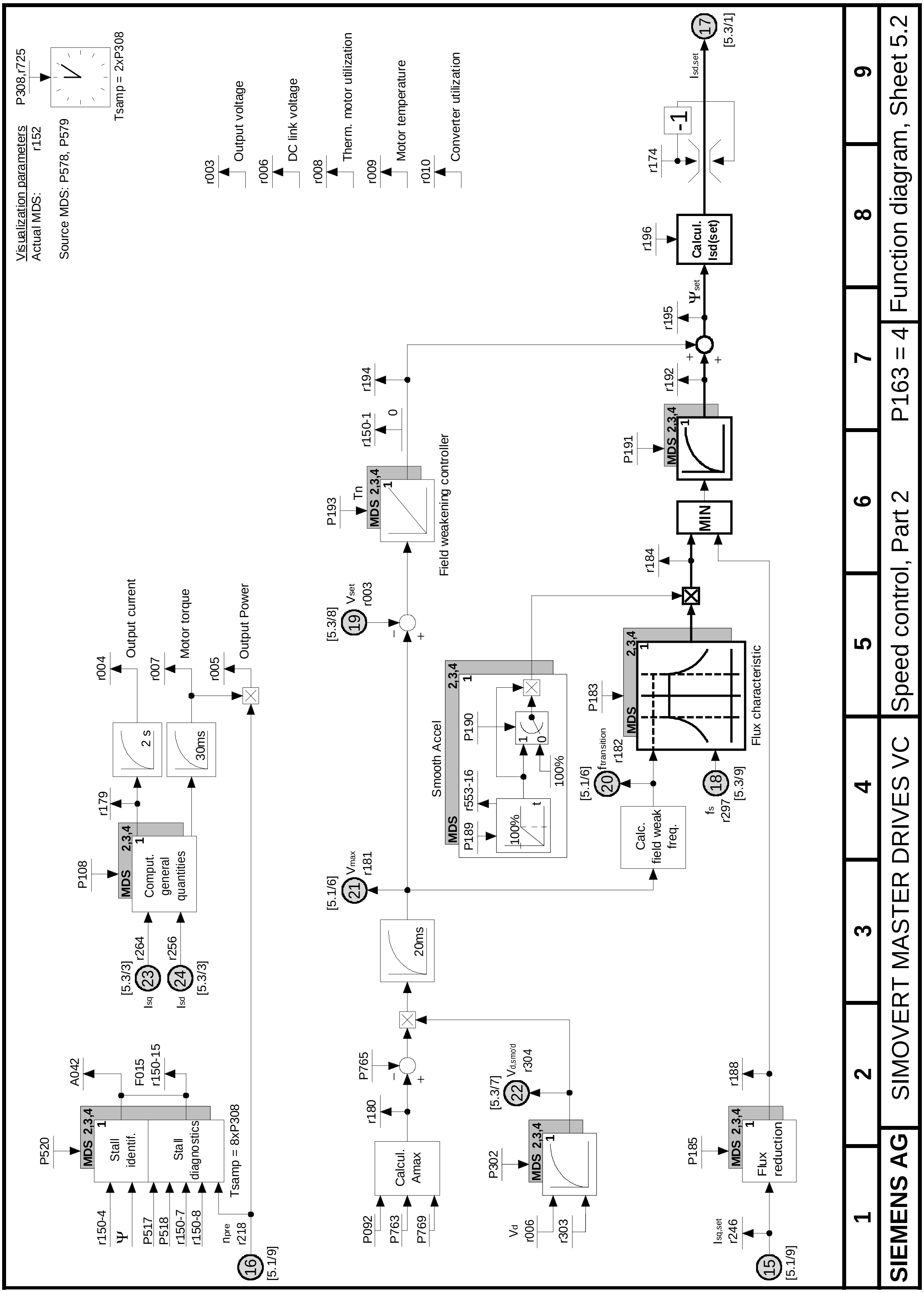


Fig. 10.13 Speed control, Part 2 (P163 = 4)

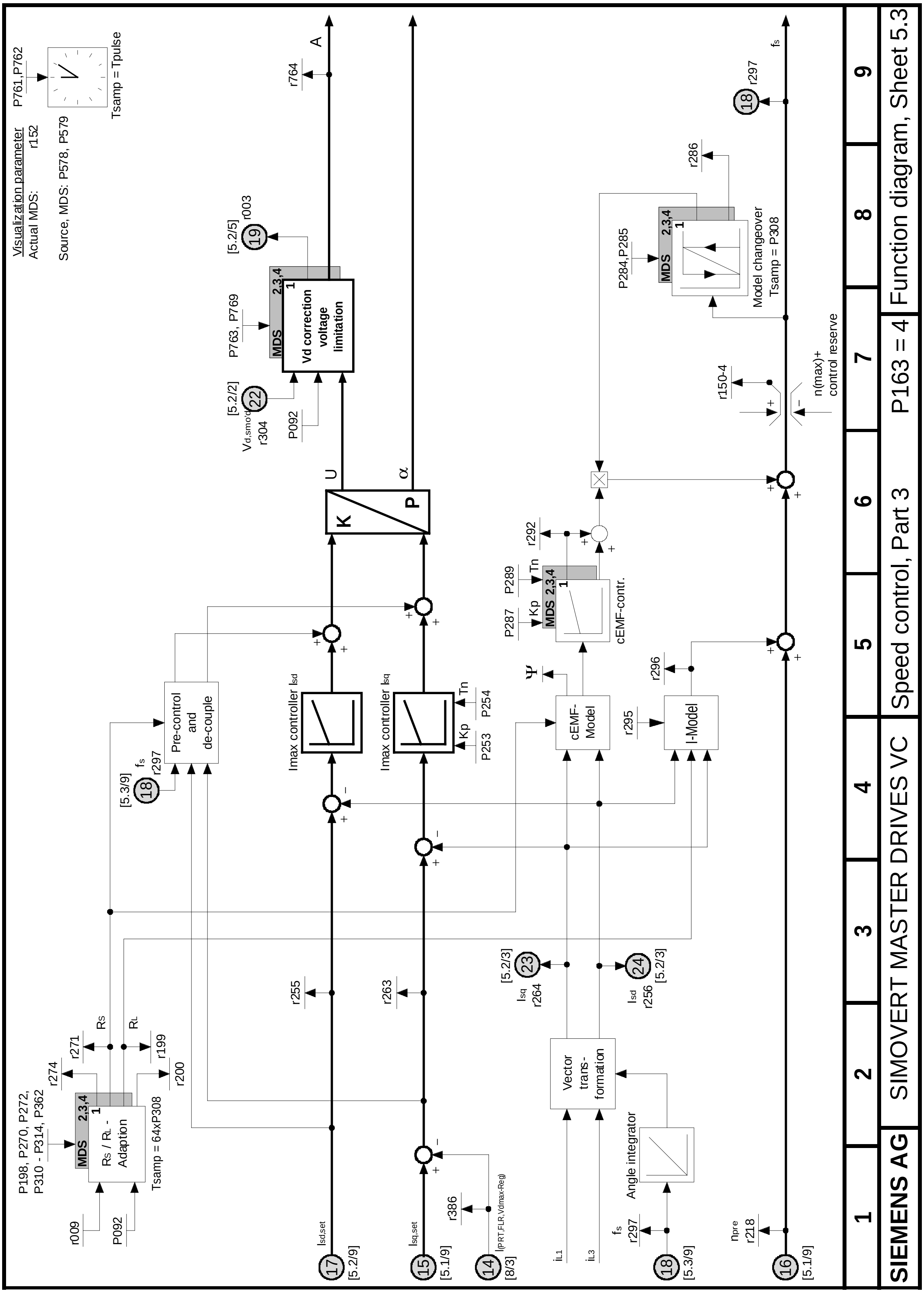


Fig. 10.14 Speed control, Part 3 (P163 = 4)

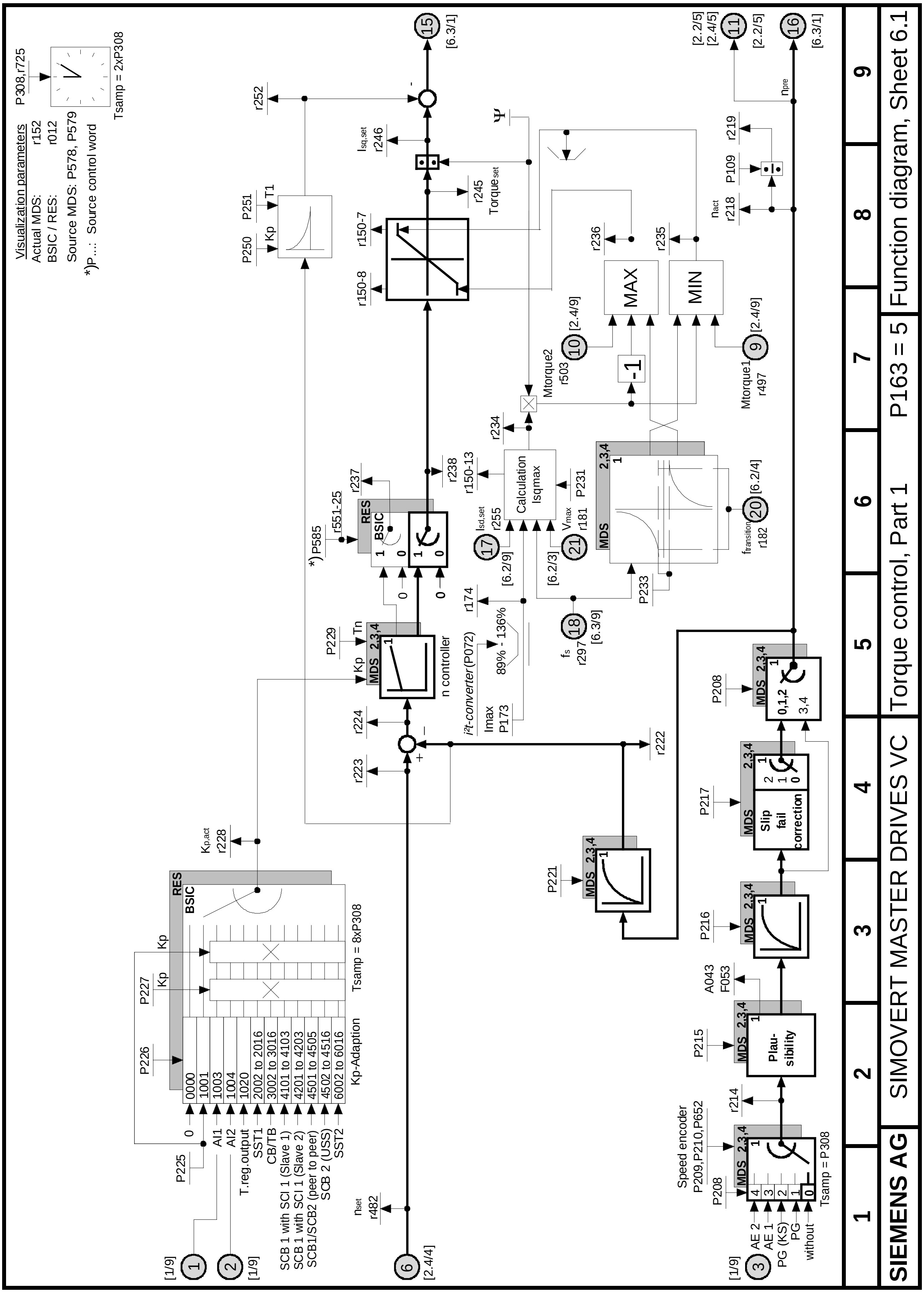


Fig. 10.15 Torque control, Part 1 (P163 = 5)

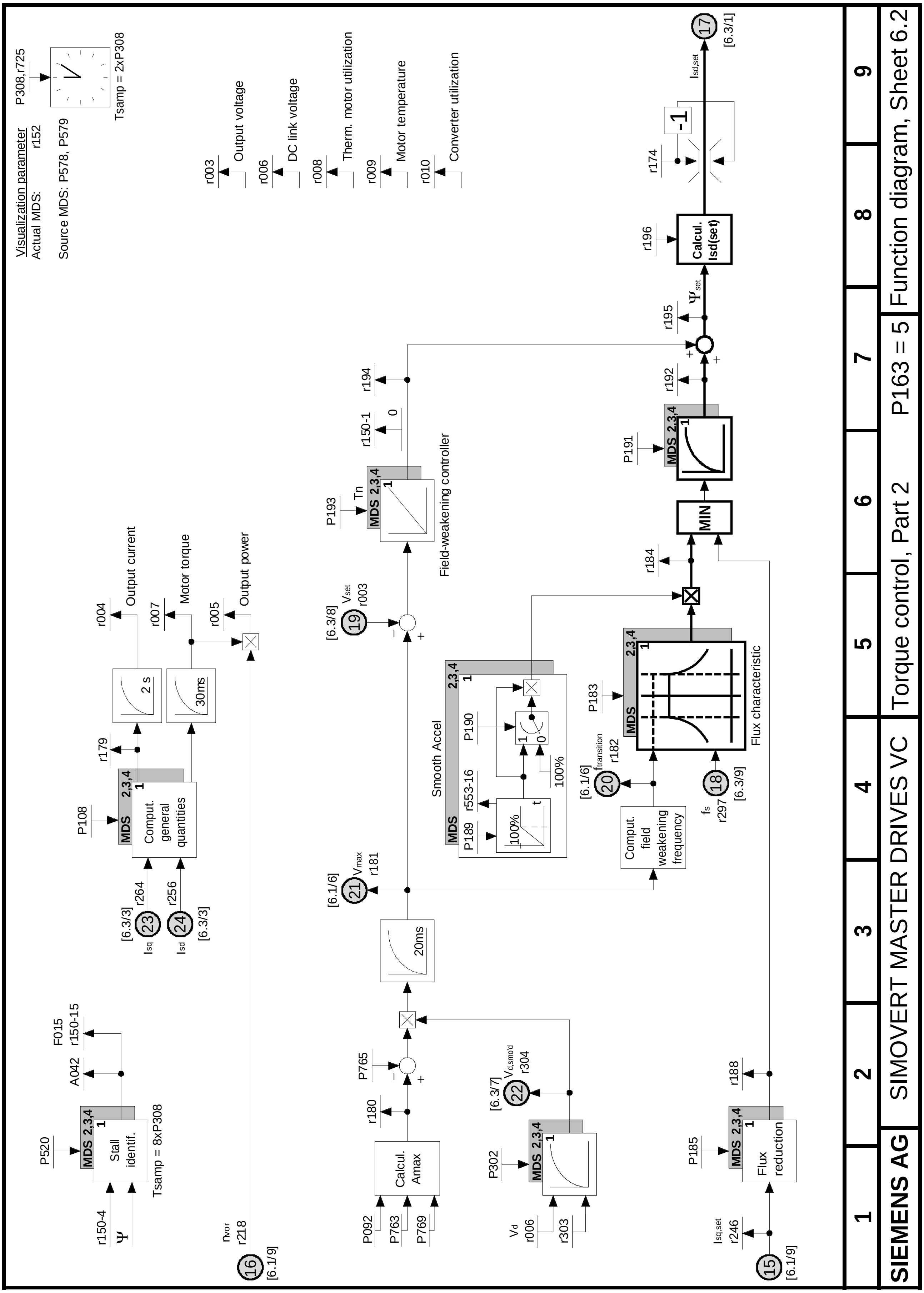


Fig. 10.16 Torque control, Part 2 (P163 = 5)

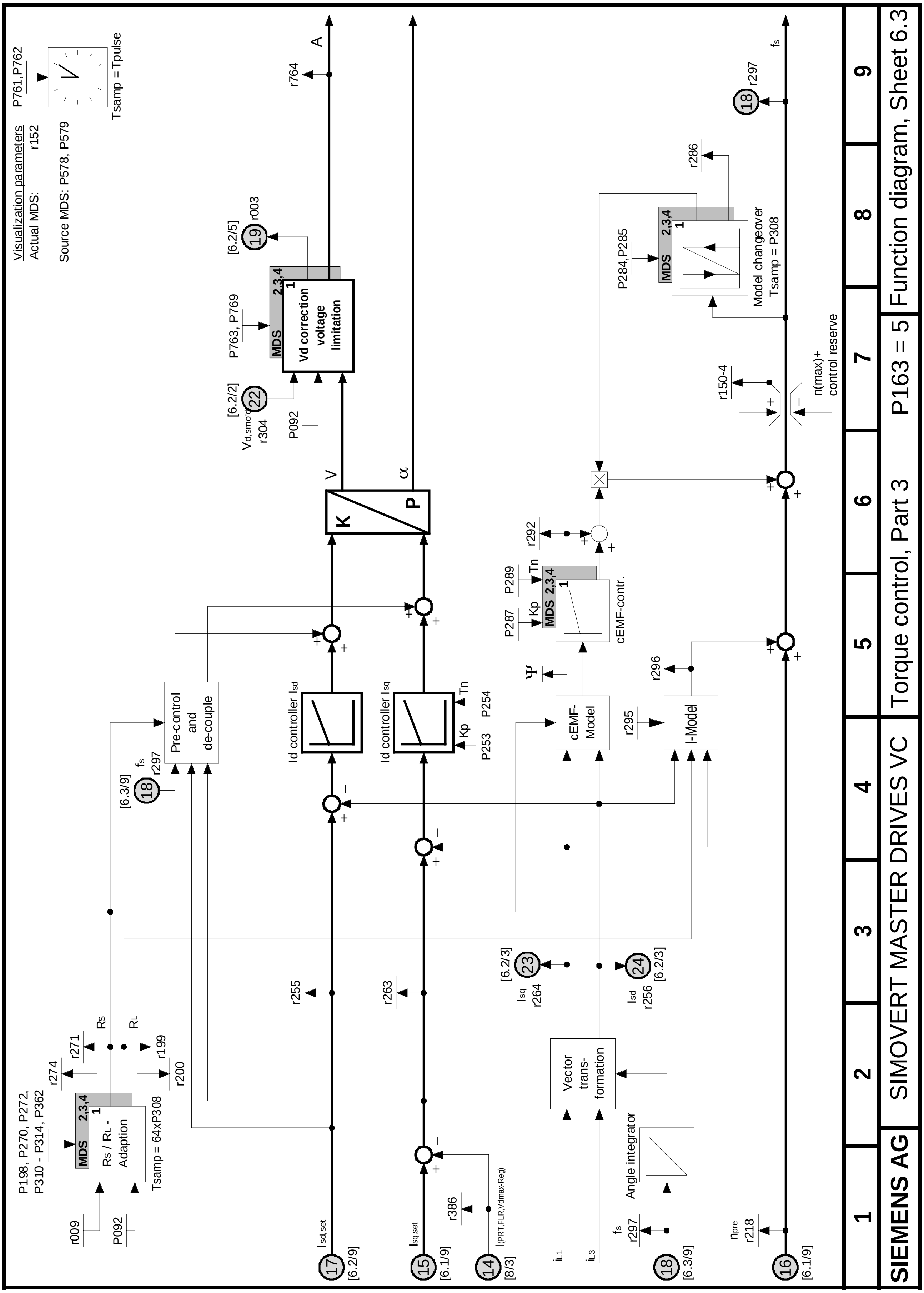


Fig. 10.17 Torque control, Part 3 (P163 = 5)

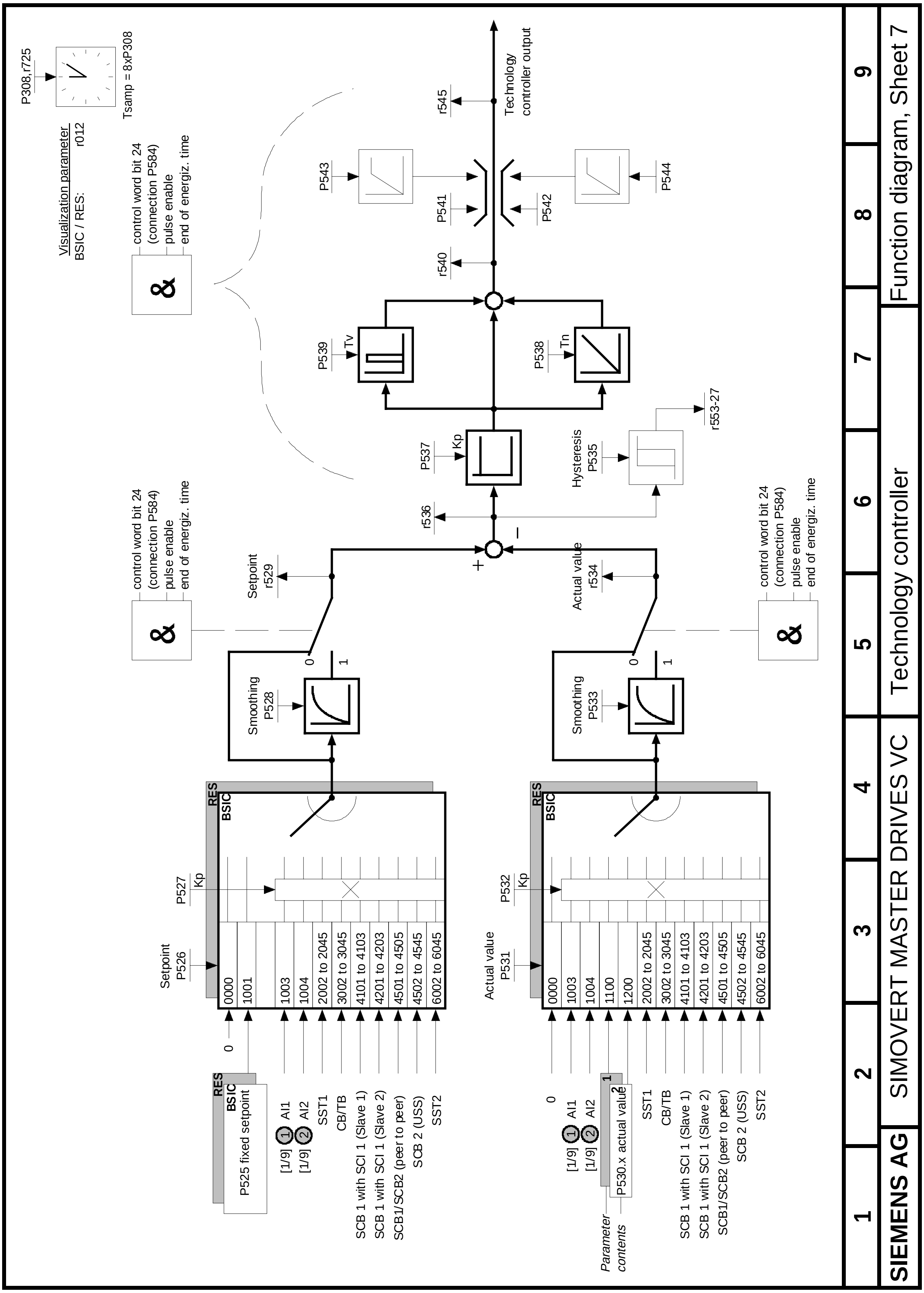


Fig. 10.18 Technology controller

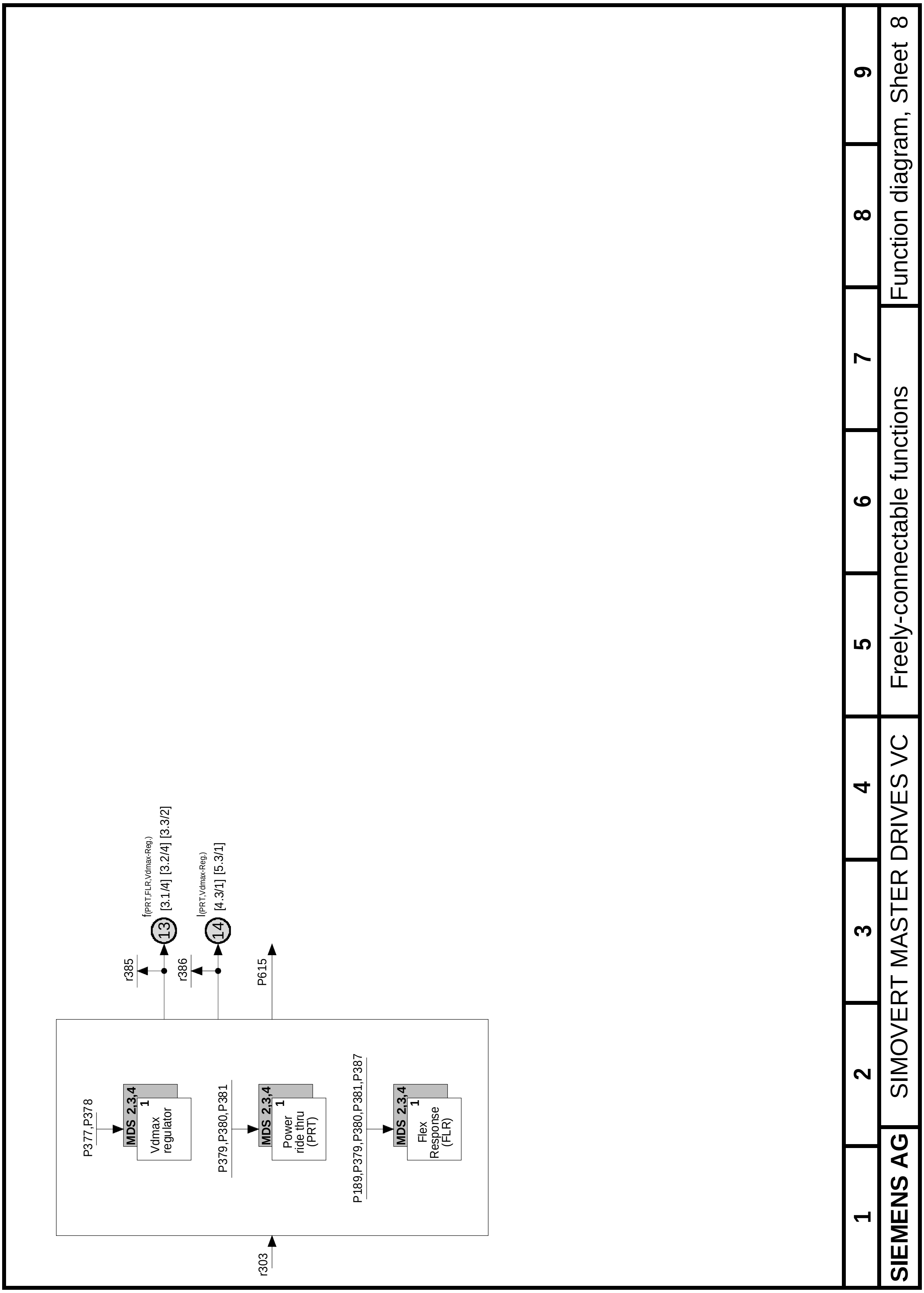


Fig. 10.19 Freely-connectable functions

11 Parameter list

Explanations on the Parameter List

Example:

PNU ***:conf-P**	**Parameter Name in OP1** **Description**	**Range [Unit]** **Value texts**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
P999 ***1)** 3E7Hex	**Parameter Name in OP1** Description SDS(4)-Parameter**6)** Type=I2; **2)** PKW: 1Hex=0.01Hz; Process Data Group.: 0**3)**	-300.00 to 300.00 [Hz]	2 i001=50.00 i002=50.00 or: ¬ **7)**	2**5)**/ BR**4)** 2**5)**/ BR**4)**

1) Confirmation Parameter: not active before pressing the P-key

2) Parameter Type
- O2 16 Bit Value without sign
- I2 16 Bit Value with sign
- I4 32 Bit Value with sign
- L2 Nibble coded Quantity
- V2 Bit coded Quantity

3) Normalization Group for Process Data (PcD)

Process Data Group	Process Data Normalization		
0	as Parameter Value Normalization		
1	4000Hex	=	P420 Rated System Frequency
	4000_0000Hex	=	P420 f(n,anl) bei Ausgabe als PcD-Doppelwort
2	1000Hex	=	P102 Rated Motor Amps
3	1000Hex	=	P101 Rated Motor Volts
4	1000Hex	=	r307 Line Volts (AC)
5	4000Hex	=	P485 Rated system Torque

4) Drive status:
- U MLFB Input
- H Hardware Configuration
- A Hardware Setting
- B Ready (Including Fault)
- R (Run) Operation (including Fly Restart, Power Ride Thru, Synchronising, Flexible Response)

5) Access Level which is minimum needed to display or change a Parameter
- 1 Operation
- 2 Standard Mode
- 3 Expert Mode

6) Abbreviations for Index Parameters
- SDS(4) Setpoint Channel Data Set Parameter with 4 Indices, to be changed via Control Word 2, Bits 16 and 17
- MDS(4) Motor Data Set Parameter with 4 Indices, to be changed via Control Word 2, Bits 18 and 19
- B/R Parameter which can be changed between Base and Reserve setting via Control Word 2, Bit 30

7) Parameter value is pre-assigned after initialization dependent on the MLFB drive converter.

11.1 General Observation Parameters

PNU ***:conf-P**	**Parameter Name in OP1** **Description**	**Range** **[Unit]** **Value texts**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
r000	**Operation Display** Displays Drive Status, Fault Messages and Warnings; Description, refer to Section 6 operator control „Operator control“ in the Operating Instructions, Part 2.		-	1 /UHABR
r001 1Hex	**Drive Status** Displays the actual drive status Parameter Values: 0 = Drive MLFB input 1 = Drive initialization 2 = Hardware initialization 3 = Drive system initialization 4 = Hardware settings 5 = Drive system settings 6 = Selection on several drive test functions 7 = Fault 8 = Restart inhibition 9 = Ready for turn-ON 10 = Pre-charging of the DC link bus 11 = Ready for operation 12 = Ground fault test 13 = Flying Restart is active 14 = Drive is operating 15 = Ramp generator decelerating (OFF1) 16 = Quick Stop (OFF3) 17 = DC braking 18 = Motor data identification (standstill test) 19 = Speed controller optimization 20 = Synchronization active 21 = Download of parameter settings Analog Output: 100% Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 MLFB Input Drive Init H/W Init System Init H/W Setting System Set. Test Fault ON locked Rdy ON Precharging Rdy Operat. Grd Flt TST Fly Restart Operation OFF 1 OFF 2 DC Brake Mot ID Stop n Reg Opt. Synchronize Download	-	2 /UHABR
r003 3Hex	**Output Volts** Drive output voltage (Fundamental rms) Analog Output: 100% @ Parameter Value=4*P101 Type=O2; PKW: 1HEX=0.1V PcD Gr.: 3	[V]	-	2 / BR
r004 4Hex	**Output Amps** Drive output current (Fundamental rms) Analog Output: 100% @ Parameter Value=4*P102 Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	[A]	-	2 / BR
r005 5Hex	**Output Power** Output active power (calculated value) in % of rated motor power Analog Output: 100% @ Parameter Value=400.0% Type=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	[%]	-	2 / BR
r006 6Hex	**DC Bus Volts** DC Bus voltage (actual value to be displayed on PMU and OP) Analog Output: 100% @ Parameter Value=4*r307 Type=I2; PKW: 1HEX=1.0V PcD Gr.: 4	[V]	-	2 / BR
r007 7Hex	**Motor Torque** Calculated torque in % of rated motor torque Condition: P163 = 3, 4, 5 (vector control types) Analog Output: 100% @ Parameter Value=400.0% Type=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	[%]	-	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r008 8Hex	**Motor Utilizat.** Thermal motor utilization (calculated value) ATTENTION: for an overload protection of the motor which is derived from this parameter sufficient cooling of the motor must be guaranteed. Condition: P363 >= 100 s Analog Output: 100% @ Parameter Value=16384% Type=O2; PKW: 1HEX=1.0% PcD Gr.: 0	[%]	-	2 / BR
r009 9Hex	**Motor Temperat.** The motor temperature is measured via a temperature sensor inside the motor (KTY84). Condition: P360 > 0 or P361 > 1The motor temperature can not be displayed if it is measured via a thermistor (P361 = 1). or P310 = 2 and P361 <> 1, temperature adaption with KTY sensor and no PTC thermistor evaluation Analog Output: 100 % @ Parameter Value=16384 °C Type=I2; PKW: 1HEX=1.0°C PcD Gr.: 0	[°C]	-	2 / BR
r010 AHex	**Drive Utilizat.** Drive utilization Thermal drive utilization as a result of an i^2t calculation of the output current. Maximum load of the drive will have the following reaction: • after 30 sec. a warning message (P622) and • after 60 sec. a reduction of the output current to 91% of the rated drive current. Analog Output: 100% @ Parameter Value=16384% Type=O2; PKW: 1HEX=1.0% PcD Gr.: 0	[%]	-	2 / BR
r012 CHex	**Base / Reserve** Base / reserve settings of the process data wiring for setpoint signals and for control word bits Parameter values: 0: Base setting 1: Reserve setting Analog Output: 100% @ Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	Base Reserve	0 to 1	2 / BR
r013 DHex	**Operat. Hours** Operation hours with released inverter pulses (drive status 'operation'). Indices: i001 = Days: days (0...9999) i002 = Hour: hours (0...24) i003 = Sec: seconds (0...3600) Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	2 / BR

11.2 General Parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P050 * 32Hex	**Language** Display language on the optional operation panel OP and in the PC software SIMOVIS Parameter values: 0: Deutsch 1: English 2: Espanol 3: Francais 4: Italiano Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 Deutsch English Espanol Francais Italiano	- 0	2 /UHABR 2 /UHABR
P051 * 33Hex	**Access Level** Setting of access levels; with higher access levels more parameters can be read and/or written. Parameter values: 1: Operating via PMU or OP with motor operated potentiometer function 2: Standard mode 3: Expert mode Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 3 Operation Standard Expert	- 2	1 /UHABR 1 /UHABR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P052 * 34Hex	**Function Select** Selection of several commissioning steps and special functions. Parameter values:	0 to 12	- 0	2 /UHABR 2 /UHAB
	0 = Return into the former drive status from one of the further described functions.	Return		
	1 = Parameter-Reset: all parameters are reset to their original settings (factory settings). According to the Profibus profile for variable speed drives this function is also accessible via parameter P970. After finishing this function the parameter is automatically reset to 0.	Par. Reset		
	2 = Release for MLFB setting (changing into the drive status ’Drive MLFB input’). To exit this function the parameter must be reset to 0.	Set MLFB		
	3 = Download/Upread (Changing into the drive status ’Download’). To exit this function the parameter must be reset to 0.	Download		
	4 = Hardware configuration (Changing into the drive status ’Hardware settings’). To exit this function the parameter must be reset to 0.	H/W Setting		
	5 = Drive system settings (Changing into the drive status ’Drive system settings’ to parameterize the motor data). To exit this function without internal parameter adaptions, P052 must again be set to 0 (reset). If the motor data or pulse frequency were changed, the function should be exited with P052 = 6, 7 or 8.	System Set.		
	6 = Automatic parameterization: sets the control system parameters based on the motor name plate data and the gating unit configuration (e.g. P761, pulse frequency). Automatic parameter setting (parameterization) can only be called-up from the drive setting (P052 = 5).	Auto Param.		
	7 = Motor data identification at standstill: sets the control system parameters (except speed controller) based on measured motor data; this function contains ground fault test and function 6. (only for P100 = 0, 1 motor type = IEC, NEMA)	Mot ID Stop		
	8 = Complete motor data identification (includes functions 6, 7, 9, 10, 12); only for P163 = 3, 4, 5 (Vector control modes) Note: After alarm A078, the equipment must be powered-up, and measurement at standstill starts. At the end of measurement at standstill, alarm A080 apears, and the drive must be powered-up again. The no-load measurement then starts.	Mot ID All		
	9 = No load measurement; only for P163 = 3, 4, 5 (Vector control modes) (only for P100=0, 1 motor type = IEC, NEMA)	No Load Msr		
	10=Optimization of the n/f controller; only for P163 = 3, 4, 5 (Vector control modes)	Reg. Optim.		
	11=Self test; same as function 7, but without changing any parameter values (only for P100 = 0, 1 motor type = IEC, NEMA)	Auto Test		
	12=Tachometer test; only for P163 = 3, 4, 5 (Vector control modes)	Tach Test		
	Type=O2; PKW: 1HEX=1.0 PcD Gr.: -			

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P053 * 35Hex	**Parameter Access** Release of interfaces for the parameterization. At any time all interfaces have write access to this parameter. Parameter values: 0: none 1: COM BOARD (CB) 2: BASE KEYPAD (PMU) 4: BASE SERIAL (SST1) (SST1) 8: Serial I/O (SCB with USS) (SCB) 16: TECH BOARD (TB) 32: BASE SERIAL2 (SST2) (SST2) Description for Setting: • Every interface is coded by a number. • Input of the number or the total of several numbers which are related to interfaces, gives parameterization access to these interfaces. Example: The factory setting '6' means, that BASE KEYPAD (PMU) and BASE SERIAL (SST1) have parameterization access. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 63	- 6	1 /UHABR 1 /UHABR
P054 36Hex	**OP Backlight** Backlight for the optional operation panel OP Parameter values: 0 = Backlight always ON 1 = Backlight only ON during operation Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 always ON dur.operat.	- 0	3 / BR 3 / BR

11.3 Drive Data

PNU ***:conf-P**	**Parameter Name in OP1** **Description**	**Range** **[Unit]** **Value texts**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
P070 * 46Hex	**MLFB (6SE70..)** MLFB (model number) of the base drive Parameter values: see section „Initialization“ in the Operating Insructions, Part 2 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 151	- 0	3 /U BR 3 /U
P071 47Hex	**Line Volts** Line voltage of the drive Rated voltage of the feeding AC or DC mains; this parameter is used to calculate the rated DC bus voltage as a basis for the voltage limits of the Vd(max) and the Vd(min) [Power ride thru] controller (e. g. undervoltage failure limit). Type=O2; PKW: 1HEX=0.1V PcD Gr.: 0	90.0 to 1320.0 [V]	- ¬	2 / ABR 2 / A
P072 48Hex	**Rtd Drive Amps** Rated drive output current Type=O2; PKW: 1HEX=0.1A PcD Gr.: 0	4.5 to 6540.0 [A]	- ¬	2 /U ABR 4 /U
P073 49Hex	**Rtd Drive Power** Rated drive output power Type=O2; PKW: 1HEX=0.1kW PcD Gr.: 0	2.2 to 1800.0 [kW]	- ¬	3 /U BR 4 /U
P077 * 4DHex	**FactSettingType** Selective factory setting. The parameter can be changed in the status „MLFB input“ (P052 = 2). If an MLFB still hasn’t been entered, after the MLFB number has been entered and the „MLFB input“ has been left (P052=0) then the selected factory setting-type is immediately valid. A selective factory setting can be executed via „Par. reset“ (P052 = 1 or P970 = 0). This parameter value is not changed. Parameter values: 0: Factory setting as before. 1: With this setting, with respect to 0, the following parameters are initialized differently: P554, P568, P571, P572, P573, P574 2: With this setting, with respect to 0, the following parameters are initialized differently: P554, P558, P568, P571, P572, P573, P574, P575, P588, P602, P607 3: With this setting, with respect to 0, the following parameters are initialized differently: P554, P558, P565, P575, P588, P602, P607 Type:O2; PKW: 1 HEX=1.0 PcD Gr.: -	0 to 3 – Normal OP1 OP1 cabinet unit Cabinet terminal	– 0	3 /U BR 3 /U
r089 59Hex	**Board Position 1** PCB in position #1 (left) of the electronic box Parameter Values: 0 = none 1 = SIMOVERT FC CU Board 2 = SIMOVERT VC CU Board 3 = SIMOVERT SC CU Board Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 3 none FC VC SC		3 / B

11.4 Hardware Configuration

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P090 * 5AHex	**Board Position 2** PCB in position #2 (right) of the electronic box Parameter values: 0 = no optional PCBs 1 = CB Communication Board 2 = TB Technology Board 3 = SCB Serial Communication Board 4 = TSY Digital-Tacho and Synchronization Board Description for Setting: Only the following combinations of PCBs and positions are admitted: Position #3 (P091) — Position #2 (P090) - — CB - — TB - — SCB - — TSY SCB — CB CB — TB SCB — TB CB — SCB CB — TSY TSY — CB SCB — TSY TSY — SCB Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 none CB TB SCB TSY	- 0	3 / H BR 3 / H
P091 * 5BHex	**Board Position 3** PCB in position #3 (center) of the electronic box Description see P090 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4	- 0	3 / H BR 3 / H
P092 5CHex	**Output Filter** Defines connected Output Filter Parameter values: 0 = no output filter 1 = sine wave output filter 2 = dV/dt filter Value ’1’ limits the depth of modulation to the range of space vector modulation (see also P763, maximum depth of modulation). After leaving drive settings (see P052 = 5) the pulse frequency (P761) is adapted to the sine wave filter requirements. Notes: • For closed-loop speed/frequency/torque control and for temperature adaption (P310 > 0), the sinusoidal filter for the drive converter is taken into account. • Parameter value 2 limits the adjustable pulse frequency P761 to 3 kHz. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 none sine wave dV/dt	- 0	3 / ABR 3 / A

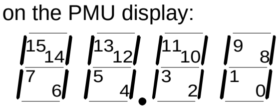
11.5 Motor Data

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P100 64Hex	**Type of Motor** Changes between international (IEC) and US (NEMA) motor data parameterization modes. Input data are for IEC motors: power factor cos(PHI) for NEMA motors: efficiency and rated motor power Parameter values: 0: IEC 1: NEMA 2: - 3: Synchronous permanent magnet (only for special applications!) Note: The selection of a permanent-magnet synchronous motor (3) is only provided for specific special applications. In this case, the following functions are inhibited: Synchronizing (P582), restart-on-the-fly (P583, P369, P370), automatic restart (P366), DC brake (P372), motor identification (P052 = 7, 8, 9, 11), control type (P163 = 0, 2, 4, 5). MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 IEC NEMA Synchronous permanent	4 i001=0 i002=0 i003=0 i004=0	2 / ABR 2 / A
P101 * 65Hex	**Motor Rtd Volts** Rated motor voltage Name plate value of the rated motor voltage; the valid kind of connection (star / delta) must be regarded. Input for Siemosyn motors is the rated voltage at rated motor frequency. Note: For P100 = 3 (motor type = sync. perm.), the motor rated voltage is only used as normalization quantity for the rated motor impedance (refer to P270), to which all resistances and reactances are referred (e.g. P120, P121, r199, r271, P272, P273) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1V PcD Gr.: -	115.0 to 1600.0 [V]	4 ¬	2 / ABR 2 / A
P102 66Hex	**Motor Rtd Amps** Rated motor current; name plate value for the valid kind of connection (star / delta. MDS(4) Parameter Type=O2; PKW: 1HEX=0.1A PcD Gr.: 0	0.6 to 3000.0 [A]	4 ¬	2 / ABR 2 / A
P103 * 67Hex	**Mot No Load Amps** Motor no load current (rated magnetizing current, data sheet value) in % of rated motor Amps. A correct input improves the calculation of motor data and results in a more accurate active current calculation. Pre-set during motor data identification (P052 = 7, 8) and during the no load test (P052 = 9). Condition: P100 = 0, 1 (motor type = IEC, NEMA) Note: for 0 % < P103 < 10 % the value of P196 is set to 10 %. MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 95.0 [%]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / ABR 3 / AB
P104 * 68Hex	**MotPwrFactor** Power factor cos(PHI) of the motor (name plate value) Condition: P100 = 0 (IEC-Motor) MDS(4) Parameter Type=O2; PKW: 1HEX=0.001 PcD: 4000HEX=0.25	0.500 to 0.999	4 ¬	2 / ABR 2 / A

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P105 * 69Hex	**Motor Rtd Power** Rated motor power (name plate value) Condition: P100 = 1 (NEMA-Motor) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1hp PcD Gr.: 0	0.1 to 2000.0 [hp]	4 ¬	2 / ABR 2 / A
P106 * 6AHex	**Motor Rtd Effic.** Rated motor efficiency (name plate value) Condition: P100 = 1 (NEMA-Motor) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=25%	50.0 to 99.9 [%]	4 ¬	2 / ABR 2 / A
P107 6BHex	**Motor Rtd Freq** Rated motor frequency Name plate value of the rated synchronous frequency of the motor. ATTENTION: Changing this parameter may also change the pulse frequency (P761). Notes: P163 = 0, 1: Maximum value is 200Hz P163 = 2: Maximum value is 600Hz P163 = 3, 4, 5: Maximum value is 200Hz The pole pair number (P109) is calculated when parameters are changed For induction motors, a slip (r295) must exist to P108 * P109/60, if the slip compensation function is to operate correctly. MDS(4) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD: 4000HEX=163.84Hz	8.0 to 600.0 [Hz]	4 i001=50.0 i002=50.0 i003=50.0 i004=50.0	2 / ABR 2 / A
P108 * 6CHex	**Motor Rtd Speed** Rated motor speed (name plate value) Note: P163 = 0, 4, 5 (V/Hz control with speed control, speed/torque vector control) is only available with this information The pole pair number (P109) is calculated when parameters are changed For induction motors, a slip (r295) must exist to P107/ P109*60, if the slip compensation function is to correctly operate. MDS(4) Parameter Type=O2; PKW: 1HEX=1.0min-1 PcD Gr.: 0	0 to 36000 [min-1]	4 i001=0 i002=0 i003=0 i004=0	2 / ABR 2 / A
P109 * 6DHex	**Motor #PolePairs** Number of motor pole pairs (calculated from rated frequency (P107) and rated motor speed (P108)); may be checked and - if needed - corrected. Note: For applications with pulse encoder (P208=1, 2, 5, 6), a maximum pole pair number of P109 = 15 is possible. ATTENTION: As the pole pair number is automatically calculated when entering the rated motor freqquency and speed (P107, P108), it is always necessary to check P109. P109 must be written into when downloading (P052 = 3). For machines with name plate data for regenerative operation the automatically calculated number of pole pairs must be increased by 1. MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 99	4 ¬	3 / ABR 3 / A
P110 6EHex	**kT(n)** Torque constant (kTn (100 Kelvin)) Torque/current ratio constant Condition: P100 = 3 (motor type = sync. perm.) MDS(4) parameter Type=O2; PKW: 1HEX=0.01Nm/APcD Gr.:0	0.00 to 4.99 [Nm/A]	4 i001=00.0 i002=00.0 i003=0.00 i004=0.00	3 / ABR 3 / A

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P120 78Hex	**X(magnet.d) tot.** Motor magnetizing reactance (saturated) along the rotor axis (d axis), referred to the rated motor impedance). Automatic parameterization (P052 = 6) should be executed after the parameter value is changed. X(magnet,d) is added to X(sigma) (P273) to calculate the synchronous reactance in the d axis. Condition: P100 = 3 (motor type = sync. perm.) MDS(4) parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=6400%	1.0 to 999.0 [%]	4 i002=150.0 i002=150.0 i003=150.0 i004=150.0	3 / BR 3 / BR
P121 79Hex	**X(magnet.q) tot.** Quadrature motor magnetizing reactance (saturated) (q axis), referred to the rated motor impedance. Automatic parameterization (P052 = 6) should be executed after the parameter value is changed). X(magnet,q) is added to X(sigma) (P273) to calculate the quadrature synchronous reactance (q axis). Condition: P100 = 3 (motor type = sync. perm.) MDS(4) parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=6400%	1.0 to 999.0 [%]	4 i002=150.0 i002=150.0 i003=150.0 i004=150.0	3 / BR 3 / BR

11.6 Control

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r150 96Hex	**Control Status** Status word of the control circuit Parameter values: Bit00 = 1: Ramp generator set command is active Bit01 = 1: Drive is operated in field weakening mode Bit02 = 1: Ud(min) controller is active (power ride thru) Bit03 = 1: Ud(max) controller is active Bit04 = 1: Frequency limitation is active Bit05 = 0: Ramp generator: acceleration lock is active Bit06 = 0: Ramp generator: deceleration lock is active Bit07 = 1: Speed controller output at upper limit Bit08 = 1: Speed controller output at lower limit Bit09 = 1: Ramp generator in protective mode Bit10 = 1: i(max) controller active Bit11 = 1: Initialization of the control circuit is finished Bit12 = 1: Speed controller: Output set command is active Bit13 = 1: Active current setpoint signal is at pull out limit Bit14 = 1: Counter-EMF controller is at the limit Bit15 = 1: Motor pulled out or blocked Coding of bits on the PMU display:  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r152 98Hex	**act. MotDataSet** Displays the active motor data set Parameter values: 0: motor data set 1 1: motor data set 2 2: motor data set 3 3: motor data set 4 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 MotDataSet1 MotDataSet2 MotDataSet3 MotDataSet4	-	3 / ABR
P158 9EHHex	**S. Initial angle** Source of the initial angle The rotor angle (r159) and the position angle (r160) are only set to the new initial angle if the initial angle changes. If a 16-bit value is connected, only r159 and the least significant word of r160 are changed. The most significant word of r160 (number of revolutions) then remains unchanged. r160 and r159 are completely changed when a 32-bit value is entered. If the initial angle remains the same, then r159 and r160 are not set. Parameter values: 0000: 1001: 1003: Analog input 1 1004: Analog input 2 Additional values: In accordance with the PcD connection of the setpoint channel Condition: P208 = 5, 6 (rotary encoder with zero pulse) B/R parameter Type=L2; PKW:PKW format (HEX)=Par Value PcD Gr.:0	0 to 6045	2 i001=0000 i002=0000	3 / BR 3 / BR
r159 9FHex	**Rotor angle** Rotor angle which is sensed via an encoder (P208). Condition: P208 = 5, 6 (rotary encoder with zero pulse) Angle notation: 0000=0°, 8000 Hex = 180°, FFFF Hex = 359.995° Analog output: 100% @ Parameter Value = 16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.:0		- -	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r160 A0Hex	**Position angle** Position actual value over several rotor revolutions (r159). Condition: P208 = 5, 6 (rotary encoder with zero pulse) Angle notation: 0000 = 0°, 8000 Hex = 180°, FFF Hex = 359.995° Analog output: 100% @ Parameter Value = 16384 Type= I4; PKW: 1HEX=1.0 PcD Gr.:0		- -	2 / BR
P163 A3Hex	**Control Mode** Attention: Changing this parameter may also change the pulse frequency (P761). Parameter values: 0: V/Hz control with superposed speed control (only for P100 = 0, 1 IEC, NEMA) 1: V/Hz control 2: V/Hz control for textile applications; allows no frequency corrections e. g. by the current limitation controller (only for P100 = 0, 1 IEC, NEMA) 3: Frequency control (without tachometer) 4: Speed control (only for P100 = 0, 1 IEC, NEMA) 5: Torque control (only for P100 = 0, 1 IEC, NEMA) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 V/Hz+ nReg V/Hz V/Hz Textil f Regulat. n Regulat. T Regulat.	4 i001=1 i002=1 i003=1 i004=1	3 / ABR 3 / A
P165 A5Hex	**V/Hz Mode** V/Hz mode Parameter values: 0: linear characteristic (for constant torque drives) 1: parabolic characteristic (for pumps, fans, etc.) See section „V/Hz mode“ in the Operating Instructions, Part 2 Condition: P163 = 0, 1, 2 (V/Hz mode) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 linear parabolic	4 i001=0 i002=0 i003=0 i004=0	2 / ABR 2 / A
P166 A6Hex	**Boost Mode** Boost mode at f = 0 Hz Parameter values: 0: Current boost: a voltage boost is calculated by means of a starting current (P167) allowing for the measured stator resistance. 1: Voltage boost: the voltage boost of the V/Hz curve is directly entered via P168. See section „V/Hz mode“ in the Operating Instructions, Part 2 Condition: P163 = 0, 1, 2 (V/Hz modes) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 Curr.Boost Volt.Boost	4 i001=1 i002=1 i003=1 i004=1	2 / BR 2 / B
P167 A7Hex	**Boost Amps** Current boost in % of rated motor current is the basis for the voltage boost at f = 0 Hz, allowing for the measured stator resistance. See section „V/Hz mode“ in the Operating Instructions, Part 2 Condition: P163 = 0, 1, 2 (V/Hz modes) P166 = 0 (Current boost) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	10.0 to 400.0 [%]	4 i001=100.0 i002=100.0 i003=100.0 i004=100.0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P168 A8Hex	**Boost Volts** Voltage boost at f = 0 in % of rated motor voltage (P101) The value is pre-assigned for automatic parameter setting (P052 = 6, 7) See section „V/Hz mode" in the Operating Instructions, Part 2 Condition: P163 = 0, 1, 2 (V/Hz modes) P166 = 1 (Voltage boost) MDS(4) Parameter Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=400%	0.00 to 25.00 [%]	4 i001=2.00 i002=2.00 i003=2.00 i004=2.00	2 / BR 2 / BR
P169 A9Hex	**Boost End Freq** End frequency of voltage boost In the range from 0 Hz to the end frequency the voltage boost is reduced to 0. Special case: A value of 0 Hz causes the output voltage to stay constant until crossing the normal V/Hz curve ('horizontal boost'). The value is pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). See section „V/Hz mode" in the Operating Instructions, Part 2 Condition: P163 = 0, 1, 2 (V/Hz modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 300.0 [Hz]	4 i001=10.0 i002=10.0 i003=10.0 i004=10.0	2 / BR 2 / BR
P170 AAHex	**Field Weak Freq** Start frequency for field weakening At higher frequencies the output voltage is kept constant. If the voltage limit is reached below this value, field weakening starts at a lower frequency. See section „V/Hz mode" in the Operating Instructions, Part 2 Note: r182 (real frequency at start of field weakening) The maximum value is limited to 2 * P107 (rated motor frequency). Condition: P163 = 0, 1, 2 (V/Hz modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	8.0 to 600.0 [Hz]	4 i001=50.0 i002=50.0 i003=50.0 i004=50.0	2 / BR 2 / B
P171 ABHex	**Accel Amps** Additional acceleration current in % of rated motor current Additional current setpoint signal for high acceleration torque at low speed. The acceleration current is only active during acceleration and up to the end frequency (P169) of the voltage boost. It may be used to generate a break off torque. See section „V/Hz mode" in the Operating Instructions, Part 2 Condition: P163 = 0, 1, 2 (V/Hz modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 799.9 [%]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / BR 3 / BR
P172 ACHex	**IxR Compens Gain** Compensation of voltage drops on long motor cables in % of the rated motor impedance. Depending on the actual torque generating current component the output voltage is increased . See section „V/Hz mode" in the Operating Instructions, Part 2 Condition: P163 = 0, 1, 2 (V/Hz modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	0.00 to 40.00 [%]	4 i001=0.00 i002=0.00 i003=0.00 i004=0.00	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P173 ADHex	**Imax** Maximum current (Fundamental rms) Setpoint signal for the current limit (Imax controller @ V/Hz modes and current controller @ vector control modes) to protect the motor and the drive, respectively. Setting range: 0.125 to 4,00*rated motor current (P102), but maximum 1.36 or 1.6 * rated drive current (P072). Refer to the Section „Setting the short-time overload capability“ in the Operating Instructions, Part 2. The secondary conditions for P173 > 136% are specified there. After automatic parameterization (P052 = 6) and motor data identification (P052 = 7, 8) the parameter is pre-set to 1,5 * rated motor current (P102). Reaction (derating) may result from the pulse frequency parameter (P761). Related display parameter: r174: realized maximum current setpoint signal; allows for other influences MDS(4) Parameter Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	0.1 to 6535.5 [A]	4 ¬	2 / BR 2 / BR
r174 AEHex	**Imax(set)** Maximum current (realized setpoint signal for current limitation); allows for the influences of the I^2t calculation and the acceleration current (P171) V/Hz modes (P163 = 0, 1, 2): realized setpoint signal for the Imax controller Vector control modes (P163 = 3, 4, 5): realized limitation for the current controllers Dependent Parameter: P173 (maximum current, parameterized value) MDS(4) Parameter Analog Output: 100% @ Parameter Value=4*P102 Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
P175 AFHex	**Imax Reg. Gain** Gain of the current limiting PI controller (Imax controller). The parameter is pre-set during automatic parameterization (P052 = 6) and during motor data identification (P52 = 7, 8). Condition: P163 = 0, 1, 2 (V/Hz modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.001 PcD: 4000HEX=0.25	0.005 to 0.499	4 i001=0.050 i002=0.050 i003=0.050 i004=0.050	3 / BR 3 / BR
P176 B0Hex	**Imax Reg. Time** Integral time constant of the current limiting PI controller (Imax controller). Condition: P163 = 0, 1, 2 (V/Hz modes) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	4 to 32001 [ms]	4 i001=100 i002=100 i003=100 i004=100	3 / BR 3 / BR
r177 B1Hex	**f(Imax-Reg.)** Frequency output of the Imax controller. The sign depends of the sign of the torque generating current component. Note: P163 = 0, 1 (V/Hz modes except textile applications) Analog Output: 100 % @ Parameter Value=163.84Hz Type=I2; PKW: 1HEX=0.1Hz PcD: 4000HEX=163.84Hz	 [Hz]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r178 B2Hex	**V(Imax-Reg.)** Output voltage of the Imax controller to reduce the drive setpoint voltage. Notes: P163 = 0, 1 (V/Hz modes except textile applications): Only active, when the stator frequency setpoint signal is less than the rated slip frequency (r295). P163 = 2 (Textile applications): Active in the complete frequency range but no frequency correction (r177). Analog Output: 100% @ Parameter Value=4*P101 Type=I2; PKW: 1HEX=0.1V PcD Gr.: 3	 [V]	-	3 / BR
r179 B3Hex	**Output Amps(rms)** Output current (fundamental rms); fast actual value for automation purposes. Analog Output: 100% @ Parameter Value=4*P102 Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
r180 B4Hex	**Mod Depth Limit** The modulation depth limit is mainly influenced by the modulator, it is always equal or less than the value of P763 (e. g. when a sine wave filter is present (P091 = 1) or when edge modulation is off (P769 > 0)) Note: The maximum possible control limit (approx. 93 %) of the gating unit at frequencies less than 28 Hz, is only taken into account in r181. Analog Output: 100% @ Parameter Value=400% Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	 [%]	-	3 / BR
r181 B5Hex	**Max Output Volts** Maximum possible output voltage; calculated of the maximum depth of modulation (r180) and the actual value of the DC bus voltage (r304). Note: P163 = 3, 4, 5 (Vector control modes): The headroom in the depth of modulation (P765) is allowed for at vector control modes. Analog Output: 100% @ Parameter Value=4*P101 Type=O2; PKW: 1HEX=0.1V PcD Gr.: 3	 [V]	-	3 / BR
r182 B6Hex	**FieldWeakFrq-act** Frequency at start of field weakening; compared to P170 the available voltage headroom is allowed for. P163 = 0, 1, 2 (V/Hz modes): In combination with the actual value of the frequency this parameter is used to calculate a field weakening curve for the adaptation of the slip in the field weakening range. P163 = 3, 4, 5 (vector control modes): In vector control modes the flux is kept constant up to this frequency, at higher frequencies it is reduced. Analog Output: 100% @ Parameter Value=P420 Type=O2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P183 B7Hex	**Flux(Set)** Flux setpoint signal Psi(set) in % of rated rotor flux of the motor. At values below 100% the motor is operated undermagnetized, at higher values it is overmagnetized. Condition: P163 = 3, 4, 5 (Vector control modes) P100 = 0, 1 (motor type = IEC, NEMA) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	50.0 to 200.0 [%]	4 i001=100.0 i002=100.0 i003=100.0 i004=100.0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r184 B8Hex	**Flux(Curve)** Flux setpoint signal at the output of the flux curve in % of rated rotor flux of the motor Condition: P163 = 3, 4, 5 (Vector control modes) P100 = 0, 1 (motor type = IEC, NEMA) Analog Output: 100% @ Parameter Value=400.0% Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	 [%]	-	3 / BR
P185 B9Hex	**Min.Loaddepend.Flux** Reference value for the rotor flux under no-load conditions for load-adaptive magnetization (lower rotor flux limit). The reference flux increases when loaded, so that the magnetization current corresponds to the torque-generating current (r246). The load-adaptive magnetization in the partial load range restricts the drive dynamic performance. Parameter values: 100.0%: no load-adaptive magnetization <100.0%: load adaptive magneitzation activated Setting instructions: • In this efficiency optimizing mode, the flux reference value (P183) may not exceed approx. 110%. • The smoothing time constant of the flux setpoint (P191) must be selected to be that much higher the lower the load-dependent rotor flux is set (min. 100 ms for speed control and 500 ms for frequency control). Condition: P163 = 3, 4, 5 (vector control types P100 = 0, 1 (motor type = IEC, NEMA) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	50.0 to 100.0 [%]	4 i001=100.0 i002=100.0 i003=100.0 i004=100.0	3 / BR 3 / B
r188 BCHex	**Flux(LoadDepend)** Flux setpoint signal of the load adaptive flux curve in % of the rated rotor flux of the motor. Condition: P163 = 3, 4, 5 (Vector control modes) P185 < 100 (load adaptive flux reduction on) P100 = 0, 1 (motor type = IEC, NEMA) Analog Output: 100% @ Parameter Value=400.0% Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	 [%]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P189 BDHex	**Excitation Time** Motor excitation time Wait time between pulse release and ramp generator release. Within this period the magnetization of the induction motor is built up. The value is pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). Notes: P163 = 0, 1, 2 (V/Hz modes): The magnetization is built up at a frequency of 0 Hz with the selected V/Hz curve voltage (see P167 and P168, respectively) If smooth acceleration mode (P190 = 1) is selected, the voltage increases ramp-like instead of step-like. P163 = 3, 4, 5 (vector control types): The magnetization is ramped-up. If smooth acceleration mode (P190 = 1) is selected, the flux increases in a parabolic way. P100 = 3 (sync. perm): The drive can align itself before the no-encoder open-loop control or control accelerates within the excitation time (also refer to P467) Note: The „restart-on-the-fly active“ status bit (refer to P616) is set during the motor excitation time. MDS(4) Parameter Type=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.01 to 10.00 [s]	4 i001=1.00 i002=1.00 i003=1.00 i004=1.00	3 / BR 3 / BR
P190 BEHex	**Smooth Accel** For smooth starting, the flux in the motor is established with some delay. This is to ensure, that even with residual magnetization, the motor only rotates in the required direction of rotation. P163 = 0, 1, 2 (V/Hz modes): If smooth acceleration mode is selected, at turn on the output voltage increases ramp like to the V/Hz curve voltage within the excitation time (P189). P163 = 3, 4, 5 (Vector control modes) If smooth acceleration mode is selected, at turn on the flux setpoint signal (P183) increases in a parabolic way within the excitation time. Parameter values: 0 = off 1 = on MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 10 to 1 0: off 1: on	4 i001=0 i002=0 i003=0 i004=0	3 / BR 3 / BR
P191 BFHex	**Smooth Flux(Set)** Smoothing time constant (PT1) of the flux setpoint signal Psi(set). The parameter is pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). Description for Setting: Low values cause excellent dynamic response, high values cause excellent smooth running behavior in the field-weakening range and for load-dependent flux reduction < 50 ms: for high dynamic response requirements > 50 ms: for lower dynamic response requirements > 100 ms: for load adaptive flux reduction with speed control (P185) > 500 ms: for load adaptive flux reduction with frequency control (P185) Condition: P163 = 3, 4, 5 (vector control types) P100=0, 1 (motor type = IEC, NEMA) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	4 to 2000 [ms]	4 i001=15 i002=15 i003=15 i004=15	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r192 C0Hex	**Flux(Set,smooth)** Smoothed flux setpoint signal at the output of the flux setpoint filter in % of rated rotor flux of the motor. Dependent parameters: P191 (Smoothing of the flux setpoint signal) P190 (Smooth acceleration mode) P189 (Excitation time) Condition: P163 = 3, 4, 5 (Vector control modes) P100 = 0, 1 (motor type = IEC, NEMA) Analog Output: 100% @ Parameter Value=400.0% Type=O2; PKW: 1HEX=0.1% PcD Gr.: 0	 [%]	-	3 / BR
P193 C1Hex	**FieldWeakRegTime** Integral time constant of the field weakening / Vmax controller. Related display parameters: r150 (Status word of the control system) r194 (Output signal of the field weakening controller) r195 (Flux setpoint signal of the vector control) Condition: P163 = 3, 4, 5 (Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	10 to 32001 [ms]	4 i001=150 i002=150 i003=150 i004=150	3 / BR 3 / BR
r194 C2Hex	**Flux(FieldWkReg)** Output signal of the field weakening controller in % of rated rotor flux of the motor. Flux reduction as output signal of the field weakening controller. When the maximum drive output voltage (r181) is reached, the controller reduces the smoothed flux setpoint signal of the field weakening curve (r192). Condition: P163 = 3, 4, 5 (Vector control modes) P100 = 0, 1 (motor type = IEC, NEMA) Analog Output: 100% @ Parameter Value=400.0% Type=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	 [%]	-	3 / BR
r195 C3Hex	**Flux(Set,Total)** Resulting flux setpoint signal of the vector control in % of rated rotor flux of the motor. Condition: P163 = 3, 4, 5 (Vector control modes) P100 = 0, 1 (motor type = IEC, NEMA) Analog Output: 100% @ Parameter Value=400.0% Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400 %	 [%]	-	3 / BR
r196 C4Hex	**No Load Amps** Rated magnetizing current (see P103, motor no load current) if P103 = 0.0%: r196 is automatically calculated if 0.0% < P103 < 10.0%: r196 = 0.1 * P102 (rated motor current) if P103 >= 10%: r196 = P103 * P102 Condition: P100 = 0, 1 (motor type = IEC, NEMA) Analog Output: 100% @ Parameter Value=4*P102 Type=O2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P198 C6Hex	**RotResistTmpFact** Correction factor to allow for the influence of the rotor temperature on the rotor resistance. Pre-set data automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). Description for setting: Motor under full load (motor warm): 100.0% Motor under partial load (motor cool): 50% - 70% Condition: P163 =3, 4, 5 (Vector control modes) P310 = 0 (Temperature adaption inactive) P100 = 0, 1 (motor type = IEC, NEMA) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD 4000HEX=400%	12.5 to 400.0 [%]	4 i001=80.0 i002=80.0 i003=80.0 i004=80.0	3 / BR 3 / BR
r199 C7Hex	**RotResist** Rotor resistance of the motor in % of the rated motor impedance. If a KTY 84 temperature sensor is connected this parameter follows the motor temperature. Condition: P163 = 3, 4, 5 (Vector control modes) P100 = 0, 1 (motor type = IEC, NEMA) Analog Output: 100% @ Parameter Value = 25.00% Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	 [%]	-	3 / BR
r200 C8Hex	**Rotor Time Const** Rotor time constant of the motor (calculated) or induction motors, the d- and q-axis values are always identical. Indices: i001 = d axis i002 = q axis Condition: P100 = 0, 1 (motor type = IEC, NEMA) Analog output: 100% @ Parameter Value = 16384 ms Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	 [ms] -d -q	2	3 / BR
P202 CAHex	**Torque (static)** Maximum required steady state torque in % of rated motor torque At frequency control (P163 = 3) and non-active counter EMF model (r286 = 0, low frequencies) a constant current is impressed to the motor. The parameter represents the maximum required torque during constant frequency setpoint. For safety reasons the parameter should allow for at least 10 % more than the expected torque. Parameter values: 0 %: constant current is the rated magnetizing current 100 %: constant current is the rated motor current. Setting instructions: During acceleration the transition to the counter EMF model (r286 = 1) is significantly influenced by the protective mode of the ramp generator (P467). A minimum value of approx. 20 % must be used for permanent-magnet synchronous motors (P100 = 3); this allows the drive to align iself when the drive converter is powered-up (refer to P189). Condition: P163 = 3 (Frequency control) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 200.0 [%]	4 i001=80.0 i002=80.0 i003=80.0 i004=80.0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P203 CBHex	**Torque (dynamic)** Maximum additional dynamic torque in % of rated motor torque At acceleration and deceleration additionally to the current for the steady state torque (P202) another current is impressed to improve starting behavior. The total current during acceleration is calculated from the settings of P202 and P203, during steady state operation only from P202. Description for setting: For the only purpose of an acceleration torque the speed controller forward control (P243) can also be used. Condition: P163 = 3 (Frequency control) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 200.0 [%]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / BR 3 / BR
P204 CCHex	**Smooth I(Set)** Smoothing of the current setpoint signal Time constant for smoothing the setpoint signals of the current components described in P202 and P203 . Condition: P163 = 3 (Frequency control) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	4 to 32000 [ms]	4 i001=40 i002=40 i003=40 i004=40	3 / BR 3 / BR
P208 * D0Hex	**Src RotSpeed act** Type of tachometer and type of its connection (for speed or torque control (P163=0, 4, 5) a tachometer must be reported). Parameter values: 0 = no tachometer 1 = Encoder 2 = Encoder with control track 3 = Analog tachometer via analog input #1 4 = Analog tachometer via analog input #2 5 = Pulse encoder with zero pulse 6 = Pulse encoder with zero pulse and check track Notes P208 = 1, 2, 5, 6 (encoder): • Only encoders with a phase shift of 90° between the 2 tracks can be used. • At setting '2' or '6'a low level signal or disconnecting of the control track terminal of the TSY board will cause the fault message F052 in order to report a broken wire. • Set P209 to the number of pulses of the encoder. Please refer to the manual of your encoder or to the TSY manual for details. P208 = 3, 4 (Analog tachometer) • Scale the analog tachometer input via P210 • If the output voltage of the analog tachometer may be > 10 V, the analog tachometer interface (ATI) must be used. Related display parameter: r214 (Actual speed measured by the tachometer) Conditions: P163 = 0 (V/Hz mode with speed control) P163 = 4, 5 (speed or torque control) with analog tachometer: ATI board if needed MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 none Encoder Enc+CtTrack AnalogTach1 AnalogTach2 Pulse width zero Pulse zero check	4 i001=0 i002=0 i003=0 i004=0	3 / ABR 3 / A

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P209 D1Hex	**Encoder Pulse #** Number of pulses of the encoder Description for setting: • Parameter is only needed if an encoder is used (P208 = 1 or 2). • The factor, pulse number * motor frequency (P107) should not exceed 400000, as otherwise the speed computation will be inaccurate Related display parameter: r214 (Actual speed measured by the tachometer) Condition: P208 = 1, 2, 5, 6 (pulse encoder) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	60 to 20000	4 i001=1024 i002=1024 i003=1024 i004=1024	3 / ABR 3 / A
P210 D2Hex	**AnalogTachScale** Analog tachometer scaling Speed which causes 10 V input signal at the analog input (see P208). The gain setting board ATI is required to connect the analog tachometer to the drive if the tachometer voltage may exceed 10 V. ATTENTION: The parameter value is at same time the limit of the speed measurement range. Speed overshoots must be allowed for. Analog tachometers can be used up to drive output frequencies of max. 100 Hz. Description for Setting: Example: Maximum speed is 3000 rpm plus a 10 % overshot, an ATI board is used 1 P210 must be set to 3300 rpm (3000 rpm + 10 %), 2 in V/Hz mode (P163 = 1) the motor must be operated at 3300 rpm (e. g. to be measured with an external rpm meter) ATTENTION: The analog input where the ATI board is connected to must not be parameterized to be a setpoint input! 3. the output voltage of the ATI board, connected to the selected analog input terminal (P208) must be adjusted to 10.00 V. Note: if an analog tachometer is selected (P208 = 3, 4) the parameter is pre-set during motor data identification (P052 = 8, 9). Dependent parameter: The offset of the analog input must be adjusted (P652). Condition: P208 = 3, 4 (analog tachometer) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0min-1 PcD Gr.: 0	500 to 6000 [RPM]	4 i001=3000 i002=3000 i003=3000 i004=3000	3 / ABR 3 / ABR
r214 D6Hex	**Meas'd Rot.Speed** Actual speed value, measured via a tachometer (P208). Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	[Hz]	-	3 / BR
P215 D7Hex	**max. dn/dt** Maximum allowed change of the measured speed actual value in % of rated motor speed (P108) during one sampling period of the control system (P308). The function may identify noise or interrupted speed signals e. g. caused by defective cable shielding or tachometer coupling. ATTENTION: This function limits the rate of change in speed of the drive. If a warning message is reported during acceleration or at load changes it may be needed to increase the parameter value. Pre-set during automatic parameterization (P052 = 6, 7, 8) . Related display parameter: r218 (Actual speed value) Condition: P208 <> 0 (Source of actual speed value) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.1 to 199.9 [%]	4 i001=10.0 i002=10.0 i003=10.0 i004=10.0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P216 D8Hex	**Slip fail corr'n** Smoothing time constant of the n/f actual value forward control Related display parameter: r218 (n/f actual value) @ speed control r220 (n/f-actual value) @ frequency control The value is pre-assigned during automatic parameter setting (P052 = 6), or with the motor identification run (P052 = 7, 8). Condition: P163 = 3, 4, 5 (vector control types) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1ms PcD Gr.: -	0.0 to 20.0 [ms]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / BR 3 / BR
P217 D9Hex	**Slip fail corr'n** slip failure correction for the n/f actual value. The delay correction is only active at speed control with encoder (P208 = 1, 2); it improves the torque accuracy during acceleration. Parameter values: 0 = off 1 = correction with a time constant of about 32 ms 2 = correction with a time constant of about 16 ms Related display parameter: r218 (n/f actual value) Condition: P163 = 4, 5 (speed or torque control) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 none slow normal	4 i001=0 i002=0 i003=0 i004=0	3 / BR 3 / BR
r218 DAHex	**n/f(act)** Actual value of speed / frequency P163 = 0, 3, 4, 5 (V/Hz modes with speed control, Vector control modes): actual speed multiplied with the number of pole pairs of the motor (P109) P163 = 1, 2 (V/Hz mode, V/Hz mode for textile applications) @ slip compensation P294 = 0 %: stator frequency P163 = 1 (V/Hz mode) and slip compensation (P294) active: actual speed multiplied with the number of pole pairs of the motor (P109) Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	3 / BR
r219 DBHex	**n(act)** Actual speed P163 = 0, 3, 4, 5 (V/Hz modes with speed control, Vector control modes): actual speed of the motor P163 = 1, 2 (V/Hz mode, V/Hz mode for textile applications) @ slip compensation P294 = 0 %: stator frequency divided by the number of pole pairs of the motor (P109) P163 = 1 (V/Hz mode) and slip compensation (P294) active: actual speed Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	2 / BR
r220 DCHex	**n/f(FWD Ctrl)** n/f actual value (of the forward control) The value is calculated from the synthetic actual speed value and the smoothed proportional part of the counter-EMF controller; it is used as input signal for the n/f actual value smoothing function (P221). Condition: P163 = 3 (Frequency control) Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P221 DDHex	**Smooth n/f(act)** Smoothing time constant of the actual n/f value for the speed controller (Application, e. g. if the gear box has play). Pre-set during automatic parameter setting (P052 = 6) and during motor data identification (P052 = 7, 8, 10). Related display parameter: r222 (smoothed n/f actual value) Condition: P163 = 0, 3, 4, 5 (V/Hz mode with speed control,Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	0 to 2000 [ms]	4 i001=0 i002=0 i003=0 i004=0	2 / BR 2 / BR
r222 DEHex	**n/f(act,smo'd)** Smoothed n/f actual value at the input of the speed controller Dependent parameter: P221 (Smoothing of the n/f actual value) Condition: P163 = 0, 3, 4, 5 (V/Hz mode with speed control,Vector control modes) Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	2 / BR
r223 DFHex	**n/f(set,Reg-IN)** n/f setpoint signal of the speed controller input At active n/f controller forward control (P243 <> 0) the n/f setpoint signal of the setpoint channel (r482) is filtered with a time constant according to P221. Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	2 / BR
r224 E0Hex	**n/f Deviation** Control deviation at the input of the speed controller. Condition: P163 = 0, 3, 4, 5 (U/f mode with speed control,Vector control modes) Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P225 E1Hex	**n/f Reg. Gain** Proportional gain of the n/f controller; internally pre-set value according to source wiring (P226 = 1001). Pre-set during automatic parameterization (P052 = 6, 7) and during n/f controller optimization (P052 = 8, 10). Related display parameter: r228 (actual n/f controller proportional gain) Condition: P163 = 0, 3, 4, 5 (V/Hz mode with speed control, Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.01 PcD: 4000HEX=64	0.00 to 250.00	4 i001=10.00 i002=10.00 i003=10.00 i004=10.00	2 / BR 2 / BR
P226 * E2Hex	**Src n/f RegAdapt** Source of the adaptation of the proportional gain of the n/f controller (P225) Parameter values: 0000: Gain = 0 (n/f controller locked) 1001: Gain as set in P225 1003: Analog input 1 (smoothed adaptation) 1004: Analog input 2 (smoothed adaptation) other values: according to process data wiring of the setpoint channel. Condition: P163 = 3, 4, 5 (Vector control modes) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1001 i002=1001	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P227 E3Hex	**n/f RegAdaptGain** Proportional gain of the adaptation of the n/f controller if set via analog input or via serial communications (P226). Description for setting: The effective gain (r228) is limited to a value of 30. for analog inputs: $P228\ (\text{effective gain}) = P225 * \frac{P227}{100.00\ \%} * \frac{\text{input signal}}{1\,V}$ for serial communcations input: $P228\ (\text{effective gain}) = P225 * \frac{P227}{100.00\ \%} * \frac{\text{input signal} * 10}{4000h}$ Example: P227 = 100%, input signal at analog input : 1 V -> effective gain of the n/f controller (P228): 1 * P225 B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
r228 E4Hex	**n/f RegGain(act)** Effective gain of the n/f controller - see formula at P227 Condition: P163 = 0, 3, 4, 5 (V/Hz modes with speed control,Vector control modes) Analog Output: 100% @ Parameter Value=64.00 Type=O2; PKW: 1HEX=0.01 PcD: 4000HEX=64		-	3 / BR
P229 E5Hex	**n/f Reg Time** Integral time constant of the speed controller pre-set during automatic parameterization (P052 = 6, 7) and during n/f controller optimization (P052 = 8, 10). Description for setting: With a value of 32001 ms the integral part of the controller is turned off, the controller operates as a P controller. Related display parameter: r237 (integral part of the n/f controller) Condition: P163 = 0, 3, 4, 5 (V/Hz mode with speed control, vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	25 to 32001 [ms]	4 i001=400 i002=400 i003=400 i004=400	2 / BR 2 / BR
P231 E7Hex	**Kp Isq(max)** Correction factor to calculate the maximum torque-generating current components in the field-weakening range (r234 Isqmax). Setting instructions: If the value is set too high, the induction motor can de-magnetize when loaded in the field-weakening range (motor stalls). Condition: P163 = 3, 4, 5 (vector control types) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD 4000HEX=400%	25.0 to 400.0 [%]	4 i001=100.0 i002=100.0 i003=100.0 i004=100.0	3 / BR 3 / BR
P233 E9Hex	**Max Regen Power** Maximum allowed regenerative active power in % of the rated drive power Description for setting: In drives without braking chopper or regenerative front end the parameter should be set to about -10 % in order to support the Vdmax controller. The torque limit should not be used to limit the drive power. Related display parameters: r235 (maximum torque limit) r236 (minimum torque limit) Condition: P163 = 3, 4, 5 (Vector control modes) MDS(4) Parameter Type=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-300.0 to -0.1 [%]	4 i001=-300.0 i002=-300.0 i003=-300.0 i004=-300.0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r234 EAHex	**Isqmax** Maximum amount of the torque generating current component Dependent parameters: P231 (Kp Isq(max)), r174 (Imax), r181 (Vmax), r255 (Isd(set)) Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
r235 EBHex	**Pos Max Torque** Maximum allowed torque (calculated from torque limitation (r497), regenerative active power limit (P233) and maximum current limit (r234)) in % of rated motor torque. At torque control parameter r497 is the limited positive torque setpoint in the setpoint channel. The lower torque limit (r236) may not exceed this upper torque limit. Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	2 / BR
r236 ECHex	**Neg Max Torque** Minimum allowed torque (calculated from torque limitation (r503), regenerative active power limit (P233) and maximum current limit (r234)) in % of rated motor torque. At torque control parameter r503 is the limited negative torque setpoint in the setpoint channel. The upper torque limit (r235) cannot fall below this torque limit. Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	2 / BR
r237 EDHex	**I-Output f Reg** Integral part of the n/f controller output signal (torque setpoint) in % of the rated motor torque Condition: P163 = 0, 3, 4, 5 (V/Hz mode with speed controller, Vector - 3, 4, 5 control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
r238 EEHex	**I-Output n/f Reg** Output signals of the n/f controller (torque reference value/setpoint) before torque limiting, referred to the rated motor torque. Condition: P163 = 3, 4, 5 (Vector control types) Analog output: 100% @ Parameter Value = P485 Typ = I2; PKW: 1HEX=0.1% PcD Gr.:5	 [%]	-	3 / BR
P242 F2Hex	**Start-up Time** Start-up time of the drive system from stand-still to rated motor speed at acceleration with rated motor torque. The parameter value corresponds to the moment of inertia (normalized) and is allowed for the calculation of the n/f controller forward control (P243). Pre-assignment for automatic parameterization (P052 = 6, 7) with P242 = 1.00 s or for n/f reg. optimization (P052 = 8, 10) with the measured value. Condition: P163=3,4,5 (Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.10 to 327.67 [s]	4 i001=1.00 i002=1.00 i003=1.00 i004=1.00	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P243 F3Hex	**n/f RegFWD Gain** Proportional gain of the n/f controller forward control. Based on the changes of the speed setpoint (r478) the acceleration torque is calculated allowing for the inertia (see P242). Acceleration because of the additional setpoint signal 2 in the setpoint channel is not regarded. Pre-assignment for automatic parameterization (P052 = 6, 7) with P243 = 0.0 % or for n/f reg. optimization (P052 = 8, 10) with P243 = 100.0 %. Description for Setting: 0.0%: Forward control off 100.0%: forward control of the n/f controller with the rated torque used for P242. Condition: P163 = 3, 4 (n/f control) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 200.0 [%]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / BR 3 / BR
r244 F4Hex	**Torque(set,add)** Additional torque (added at the output of the n/f controller) in % of rated motor torque Only at n/T control the additional torque results of the acceleration forward control (P243) and the additional torque of the setpoint channel (r510). (for frequency control, only if P508 = 1). Condition: P163 = 3, 4 (Vector control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	[%]	-	3 / BR
r245 F5Hex	**Torque(set,tot)** Limited torque setpoint signal at the output of the speed controller in % of rated motor torque (includes the additional torque (r244)). Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	[%]	-	2 / BR
r246 F6Hex	**Isq(set)** Setpoint signal for the torque generating flux signal Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	[A]	-	3 / BR
P247 F7Hex	**Droop** Selection of the torque quantity for the droop feedback. Parameter values: 0: Feedback of the integral part of the n/f controller (r237) 1: Feedback of the limited torque setpoint signal (r245) 2: Feedback of the n/f controller output signal without additional torque (r238) 3: Feedback of the integral part of the n/f controller incl. the additional torque 4: Feedback of the n/f controller output signal incl. additional torque Dependent parameter: P584 = Source of droop release Condition: P163 = 3, 4 (n/f control) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 Int Output total Outp Reg. Output IntOut+AddT RegOut+Addt	4 i001=0 i002=0 i003=0 i004=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P248 F8Hex	**Droopgain** Gain of the droop feedback Gain of the controller output signal (selection see P247) which is inverted and fed back to the n/f setpoint signal (see r481). Example: At a torque setpoint of 100% at the output of the n/f controller and a parameter value of 0.100 the speed setpoint is reduced by 10% of the rated motor frequency. Setting information: Kp = 0.000 = Droop inactive Kp > 0.000 and no external droop enable (refer to P584) = Droop is calculated (r249), however is not processed by the setpoint channel Kp > 0.000 and external droop enable (refer to P584) = Droop active The second setting should be selected for the master drive, if there is load equalization control between several motors. r249 can then be output, e. g. via the analog interface, without changing the main drive speed setpoint. Dependent parameter: P584 = Source of droop release Condition: P163 = 3, 4 (n/f control) MDS(4) Parameter Type=I2; PKW: 1HEX=0.001 PcD: 4000HEX=0.25	0.000 to 0.499	4 i001=0.000 i002=0.000 i003=0.000 i004=0.000	3 / BR 3 / BR
r249 F9Hex	**n/f(Droop)** Output signal of the droop feedback; is subtracted from the supplementary setpoint 2 in the setpoint channel if the droop is enabled. Dependent parameter: P584 = Source of droop release Condition: P163 = 3, 4 (n/f control) Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P250 FAHex	**n damping Kd** Damping compensation gain of the speed actual value to the setpoint of the torque-generating current. The speed actual value is smoothed (refer to P251), differentiated, and evaluated with this factor (P250) and subtracted from Isq (set) (r246). For torque control (P163 = 5), for a slave drive (P587 = 1), and with the speed controller feed-forward control disabled (P243 = 0.0 %), the damping compensation operates with the speed actual value (r222). For n/f control (as master drive), the damping operates with the n/f control error (r223). The characteristics correspond to a smoothed D component of the n/f controller. The result (r251) is only injected after the torque limiting; otherwise, it would not be effective for the torque control. Condition: P163 = 3, 4, 5 (vector control types) MDS(4) Parameter Type=O2; PKW:1HEX=0.01 PcD: 4000HEX=64	0.00 to 125.00	4 i001=0.00 i002=0.00 i003=0.00 i004=0.00	3 / BR 3 / BR
P251 FBHex	**Smooth. n-damping** Smoothing time constant of the damping compensation of the speed actual value to the setpoint of the torque-generating current Condition: P163 = 3, 4, 5 (vector control types) MDS(4) parameter Type=O2; PKW: 1HEX=0.1 ms PcD Gr.:0	0.0 to 200.0 [ms]4	4 i001=10.0 i002=10.0 i003=10.0 i004=10.0	3 / BR 3 / BR
r252 FCHex	**dIsq (damping)** Damping compensation output and supplementary setpoint of the torque-generating current components at the Isq controller input. Condition: P163 = 3, 4, 5 (vector control types) Analog output: 100% @ Parameter Value = 4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	[A]	- -	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P253 FDHex	**Current Reg Gain** Proportional gain of the PI current controllers (flux and torque generating current components, respectively) in the range of the asynchronous operation of the modulator. The adaptation of this gain is automatically performed depending on the pulse frequency Pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). Note: After the pulse frequency or motor parameter has been changed, the automatic parameterization (parameter setting) or motor identification should be repeated in order to precisely set the controller. Condition: P163 = 3, 4, 5 (Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.001 PcD: 4000HEX=4	0.000 to 2.000	4 i001=0.150 i002=0.150 i003=0.150 i004=0.150	3 / BR 3 / BR
P254 FEHex	**Current Reg Time** Integral time constant of the PI current controllers (flux and torque generating current components, respectively) in the range of the asynchronous operation of the modulator. Pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). Condition: P163 = 3, 4, 5 (Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1ms PcD Gr.: 0	2.0 to 200.0 [ms]	4 i001=10.0 i002=10.0 i003=10.0 i004=10.0	3 / BR 3 / BR
r255 FFHex	**Isd(set,smo'd)** Setpoint signal of the flux generating current component at the input of the Isd controller; limited by the maximum current (r174). Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
r256 100Hex	**Isd(act)** Actual value of the flux generating current component Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
P261 105Hex	**Smooth Isq** Time constant for smoothing the torque generating current component (r264). Pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). Related display parameter: r263 (Isq(set,smo'd)) Condition: P163 = 0, 1 (V/Hz modes except textile applications) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	0 to 3200 [ms]	4 i001=2000 i002=2000 i003=2000 i004=2000	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r263 107Hex	**Isq(set,smo'd)** Smoothed actual value of the torque generating current component For P163 = 1 (V/Hz mode): Smoothed actual value of the torque generating current component; is used for the slip compensation. For P163 = 3, 4, 5 (Vector control modes): Smoothed setpoint signal of the controller for the torque generating current component; smoothing is only active in the field weakening range. Dependent parameter: P261 (Smoothing of Isq) Condition: P163 = 1, 3, 4, 5 (V/Hz modes, Vector control modes) Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
r264 108Hex	**Isq(act)** Actual value of the torque generating current component Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	 [A]	-	3 / BR
P270 10EHex	**Resist Cable** Resistance of the cable between the drive and the motor in % of the rated motor impedance; is part of P272. Rated motor-impedance: $Z_N = \frac{V_N}{1{,}732 \times I_N} = \frac{P101}{1{,}732 \times P102}$ Condition: P163 = 3, 4, 5 (Vector control modes) Must be entered before motor identification (P052 = 7, 8)! MDS(4) Parameter Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	0.00 to 40.00 [%]	4 i001=0.00 i002=0.00 i003=0.00 i004=0.00	3 / BR 3 / BR
r271 10FHex	**Resist Stator ++** Total 'Stator' resistance of the drive in % of the rated motor impedance Contains: Stator resistance of the motor and cable resistance between drive and motor If a KTY 84 sensor of the motor is connected, the value of this parameter is adapted with the motor temperature. Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=25.00% Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	 [%]	-	3 / BR
P272 110Hex	**ResistStator+Cab** Total of the stator resistance of the motor and the cable resistance in % of rated motor impedance. Pre-set during automatic parameterization (P052 = 6). Measurement during motor data identification (P052 = 7, 8) (only if P100 = 0, 1) Condition: P310 = 0 (Temperature adaption inactive) Note: For P100 = 3 (motor type = sync.perm.), after a parameter has been changed, automatic parameterization must be selected to set the current controller. MDS(4) Parameter Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	0.00 to 49.99 [%]	4 i001=3.00 i002=3.00 i003=3.00 i004=3.00	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r274 112Hex	**T(sigma)** Stator leakage time constant of the motor (including cable) Pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). For induction motors, the values for d- and q axes are always identical. Disymmetry can only be achieved for P100 > 1 (motor type) (IEC,NEMA) as a result of the parameterization in P120 and P121. Indices: i001 = d axis i002 = q axis Analog Output: 100% @ Parameter Value=16384ms Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	[ms] -d -q	-	3 / BR
P284 11CHex	**f(AMP->cEMF-mod)** Frequency in % of rated motor voltage where the control circuit switches from the current model to the counter EMF model during increasing output frequency. Condition: P163 = 3, 4, 5 (Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	2.0 to 799.9 [%]	4 i001=10.0 i002=10.0 i003=10.0 i004=10.0	3 / BR 3 / BR
P285 11DHex	**f(cEMF->AMP-mod)** Frequency in % of P284 where the control circuit switches from the couner EMF model to the current model during decreasing output frequency. Example: Frequency value [Hz] = P107 * $\frac{P284}{100\ \%}$ * $\frac{P285}{100\ \%}$ Condition: P163 = 3, 4, 5 (Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=25%	1.0 to 99.0 [%]	4 i001=50.0 i002=50.0 i003=50.0 i004=50.0	3 / BR 3 / BR
r286 11EHex	**act. Motor Model** Active motor model. Parameter values: 0: Current model 1: Counter EMF model Dependent parameters: P284 (f(cEMF->I model)) P285 (f(I->cEMF model)) P287 (cEMF Reg Gain) Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 Curr Model Volt Model	-	3 / BR
P287 11FHex	**cEMF Reg Gain** Proportional gain of the PI controller for the counter EMF model @ rated motor voltage; at low voltage setpoints the gain is increased. Pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). Description for Setting: The control circuit only operates in the current model if the parameter value is set to '0'. Condition: P163 = 3, 4, 5 (Vector control modes) MDS(4) Parameter Type=O2; PKW: 1HEX=0.001 PcD: 4000HEX=4	0.000 to 6.000	4 i001=0.250 i002=0.250 i003=0.250 i004=0.250	3 / BR 3 / BR
P289 121Hex	**cEMF Reg Time** Integral time constant of the PI controller for the counter EMF model. Pre-set during automatic parameterization (P052 = 6) and during motor data identification (P052 = 7, 8). Related display parameter: r292 (f(EMK-Reg.,i)) Condition: P163 = 3, 4, 5 (Vector control modes); MDS(4) Parameter Type=O2; PKW: 1HEX=0.1ms PcD Gr.: 0	4.0 to 999.9 [ms]	4 i001=50.0 i002=50.0 i003=50.0 i004=50.0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r292 124Hex	**f(cEMF Reg,i)** Integral part of the counter EMF controller; in the operating range of the current model (r286 = 0) the value of this parameter is '0'. Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P294 126Hex	**Slip Comp Gain** Proportional gain of the slip compensation (also allowing for the rotor temperature) Description for Setting: 0.0%: Slip compensation off 50 - 70%: Full slip compensation at cool motor (partial load) 100%: Full slip compensation at warm motor (full load) ATTENTION: Name plate data for rated motor current (P102), speed (P108) and -frequency (P107) must be entered correctly and completely. Condition: P163 = 1 (V/Hz mode) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 400.0 [%]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	2 / BR 2 / BR
r295 127Hex	**Motor Rtd Slip** Rated motor slip in % of rated motor frequency (P108). Analog Output: 100% @ Parameter Value=25.0% Condition: P100 = 0, 1 (motor type = IEC, NEMA) Type=O2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	 [%]	-	3 / BR
r296 128Hex	**Slip Frequency** Actual slip frequency of the motor P163 = 0 (V/Hz mode with speed control): Output signal of the speed controller. P163 = 1 (V/Hz mode): Output signal of the slip compensation. P163 = 3, 4, 5 (Vector control modes): Output signal of the current model. Dependent parameters: P294 (Kp of the slip compensation) for P163 = 0 V/f cl. Analog Output: 100% @ Parameter Value=25% Type=I2; PKW: 1HEX=0.01% PcD: 4000HEX=25%	 [%]	-	3 / BR
r297 129Hex	**f(set,stator)** Stator frequency setpoint signal Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.1Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P299 12BHex	**Reson Damp Gain** Proportional gain of the resonance damping circuit The resonant damping circuit is effective in a range from about 5 % to 70 % of rated motor frequency. Description for setting: Too high parameter values cause instability (forward control effect). Note: The resonance damping circuit damps oscillations of the active current. These oscillationa mainly happen during no load operation. The parameter can not be used to optimize the response behavior of V/Hz mode with speed control (P163 = 0). Related display parameters: r264 (Isq(act)) r301 (f (Resonance damping)). Condition: P163 = 0, 1 (V/Hz modes except textile applications) MDS(4) Parameter Type=O2; PKW: 1HEX=0.01 PcD Gr.: 0	0.00 to 0.99	4 i001=0.00 i002=0.00 i003=0.00 i004=0.00	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P300 12CHex	**Damp Gain** Proportional gain of the resonance damping circuit at frequency control The resonance damping circuit damps oscillations in the low speed range. Related display parameter: r301 (f (Resonance damping)) Condition: P163 = 3 (Frequency control) MDS(4) Parameter Type=O2; PKW: 1HEX=0.001 PcD Gr.: 0	0.000 to 10.000	4 i001=0.075 i002=0.075 i003=0.075 i004=0.075	3 / BR 3 / BR
r301 12DHex	**f(Reson Damp)** Output frequency of the resonance damping circuit Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.1Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P302 12EHex	**SmoothDCBusVolts** Time constant for smoothing the DC link bus voltage (r304) for use in the Vd correction circuit. The smoothing is exponentially related to the parameter value. $T_{smooth} \sim 2^{Parameter\ value}$ Related display parameter: r304 (Vd(act,smooth)) Note: if P302 = 16, P304 displays the DC bus voltage calculated from P071 (Line Voltage) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 16	4 i001=9 i002=9 i003=9 i004=9	3 / BR 3 / BR
r303 12FHex	**DC BusVolts(act)** unfiltered actual value of the DC link bus voltage Analog Output: 100% @ Parameter Value=4*r307 Type=I2; PKW: 1HEX=1.0V PcD Gr.: 4	 [V]	-	3 / BR
r304 130Hex	**DCBusVolt(smo'd)** Smoothed actual value of the DC bus voltage; smoothing see P302 Analog Output: 100% @ Parameter Value=4*r307 Type=O2; PKW: 1HEX=0.1V PcD Gr.: 4	 [V]	-	3 / BR
r307 133Hex	**Line Volts (AC)** Rated line voltage For AC drives: Rated drive input voltage (P071). For DC inverters: fictive AC input voltage which would cause the DC voltage ($\frac{P071}{1,35}$). Analog Output: 100% @ Parameter Value=1638.4V Type=O2; PKW: 1HEX=0.1V PcD Gr.: 0	 [V]	-	3 / BR
P308 134Hex	**Sampling Time** Base sampling time T0 of the n/f/T control and the V/Hz control. Description for Setting: • Before reducing the sampling time the calculation time headroom should be checked (r725). A minimum headroom of 5 % should always be guaranteed to prevent the operation program a slow reaction. • If fault message #42 'Calculation time' occurs, the sampling time must be increased. • The calculation time loading also depends on the pulse frequency (P761). Type=O2; PKW: 1HEX=0.1ms PcD Gr.: 0	0.8 to 4.0 [ms]	- 1.2	3 / ABR 3 / A

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P310 * 136Hex	**RotResistTmpAdap** Temperature adaption of the rotor- and stator resistances. Adaption operates at loads from approx. 5 % -10 % and in the range of the EMF model (r286 = 1) with a motor model. As this model is dependent on extremely accurate speed measured values, it is only activated for speed/torque control (P163 = 4, 5) and when a pulse encoder is connected (P208 = 1, 2). The adaption operates with a precise thermal motor simulation (3-mass model) outside of these conditions, e. g. for frequency control (P163 = 3) or in the current model range (r286 = 0). The best adaption results can be achieved for speed/torque control with an pulse tachometer and connected KTY sensor (connector X103). The output temperatures of the 3-mass model and the resistance values are reset, under the following conditions: If the drive temperature has increased or fallen since the last motor identification, if the power supply failed, if a motor data set was changed, parameters P310..P314 were changed, or the drive was re-commissioned (P52 = 2, 5). Setting corresponding to the actual motor temperature can be realized using KTY. A new motor identification run is recommended if there is no KTY available. The stator resistance (r271) can be adapted using the 3-mass model. In order to increase the accuracy of R(stator), before the motor identification run, the feeder resistance (P270) should be determined and entered. Parameter values: 0: Not active 1: Without KTY temperature sensor (not for P100 > 1) 2: With KTY temperature sensor Note: • All motor data (P100 .. P109) should be entered according to the motor name plate. • After parameter P310 has been activated, the motor series (P311) should be selected. In this case, a possibly known feeder resistance is entered in P270, the cooling type selected (P362) and a motor identification run should always be executed (P052 = 8 or 7,9), in order to determine the actual values of R(rotor) and R(stator). • The adaption is automatically calculated, just the same as without KTY sensor, if the sensor feeder cable is open-circuit, is short-circuited or if the PTC thermistor is activated (P361 = 1)! • When the EMF model is switched-out (P287 = 0 or P284 > f(max)), then only the 3-mass model operates for speed/torque control. These settings are not recommended, as the adaption accuracy is obtained from the combination with the electrical model. • A KTY sensor is also recommended for f control (P052 = 3) or speed/torque control with analog tachometer, as this also corrects deviations of the ambient temperature from 20°C, inaccuracies for the rated motor speed (P108: Name plate possibly inaccurate) as well as deviations from standard temperature rises (refer to P314). Dependencies: r009 motor temperature (P310 = 2) (measured stator winding temperature) P092 output filter (for sinusoidal filter: No modulation losses) P198 R(rotor) Ktemp r199 R(rotor) r271 R(stator,total) P272 R(stator+feeder cable) P311 motor series P312 motor weight P313 internal fan (for 1LA1, 1LA8 motors: Always present) P314 K(temp. rise.) P362 motor cooling (not for 1PH6 motors; always an external fan) Condition: P163 = 3, 4, 5 (Vector control types) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 inactive without KTY with KTY	4 i001=0 i002=0 i003=0 i004=0	3 / BR 3 / BR

<table>
<tr><th>PNU

*:conf-P</th><th>Parameter Name in OP1

Description</th><th>Range
[Unit]
Value texts</th><th># of.
Indices
Factory
Settings.</th><th>read: _/_
write: _/_</th></tr>
<tr><td>P311

137Hex</td><td>Motor series
Selects the motor series of the connected motor. When selecting one of the specified series (P311 > 0), known motor characteristics are automatically transferred: Inner fan type (P313) and the average temperature raise factor.
Parameter values: 0: Unlisted motor
1: 1LA5 series
2: 1LA6 series
3: 1LA8 series
4: 1LA1 series
5: 1PH6 series
Setting information:
When selecting unlisted motors, P312 .. P314 can be individually adapted.
This is only recommended, if the motor is unlisted but also, if for example, the motor weight (P312) or the temperature raise factor (P314) has to be changed over the basic setting. Then, it must be ensured that P313 is correctly set (inner fan)!
Condition: P310 > 0 (temperature adaption active)
P100 = 0, 1 (motor type = IEC, NEMA)
MDS(4) Parameter
Type=O2; PKW: 1HEX=1.0 PcD Gr.: -</td><td>0 to 5

Unlisted motor
1LA5
1LA6
1LA8
1LA1
1PH6</td><td>4
i001=1
i002=1
i003=1
i004=1</td><td>3 / BR
3 / BR</td></tr>
<tr><td>P312

138Hex</td><td>Motor Weight
Total motor weight.
The value can be taken from the motor catalog. The more accurately that it is known, then it is easier to estimate the thermal mass relationships.
Pre-assignment for automatic parameterization (P052 = 6, 7, 8)
Condition: Unlisted motor (P311 = 0)
MDS(4) Parameter
Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0</td><td>5 to 9999
[kg]</td><td>4
i001=40
i002=40
i003=40
i004=40</td><td>3 / BR
3 / BR</td></tr>
<tr><td>P313

139Hex</td><td>Internal fan
1LA1 and 1LA8 motor series have a special inner fan (not to be confused with the fan at the end of the motor shaft).
Motor with inner fan and P311 = 0 (unlisted motor) ⇒ P313 = 1
Motor without inner fan and P311 = 0 (unlisted motor) ⇒ P313 = 0
For P311 <> 0, P313 is automatically pre-assigned; manual changes remain ineffective.
Parameter values: 0: Without inner fan
1: With inner fan
MDS(4) Parameter
Type=O2; PKW: 1HEX=1.0 PcD Gr.: -</td><td>0 to 1

without
with</td><td>4
i001=0
i002=0
i003=0
i004=0</td><td>3 / BR
3 / BR</td></tr>
<tr><td>P314

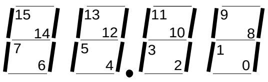
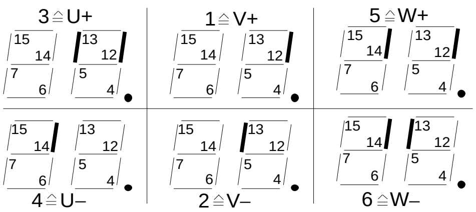
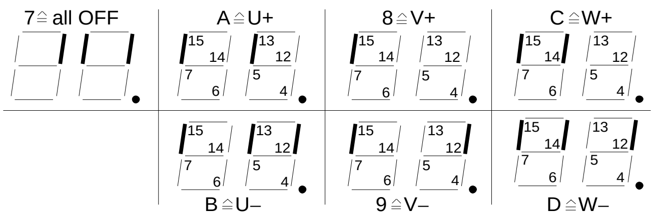
13AHex</td><td>Overtemp. Factor
Evaluates the internally used standard temperature rises for sinusoidal operation (line supply temperature raises - direct on-line temperature rises). There is only one factor to simultaneously evaluate the temperature rises of the stator (80K), rotor (100 K) and iron (50 K).
The temperature rises due to converter operation (modulation losses), which are a function of both the pulse frequency (P761) as also the output filter (P92 = 2) are automatically taken into account.
If the motor rotor temperature rise is known, then the relationship to 100 K can be entered here. If only that of the stator is known, the ratio to 80 K should be entered.
Note:
• For 1PH6 motors (refer to P311), internally a value of 130.0 % is automatically assumed, i. e. the parameter has no effect.
• The factor is 100 % for 1LA motors
Condition: Unlisted motor (P311 = 0)
MDS(4) Parameter
Type=O2; PKW: 1HEX=1.0 PcD: 4000HEX=400 %</td><td>25.0 to 200.0
[%]</td><td>4
i001=100.0
i002=100.0
i003=100.0
i004=100.0</td><td>3 / BR
3 / BR</td></tr>
</table>

11.7 Functions

PNU ***:conf-P**	**Parameter Name in OP1** **Description**	**Range [Unit]** **Value texts**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
r333 14DHex	**Mot ID Status** Displays the actual measuring step of the motor data identification; see also Section „Function selection“ in the Operating Instructions, Part 2; 0: not activated 1: delay time for fan The '100' digit displays the type of measurement: 1xx: ground fault test 2xx: test pulses measurement 3xx: leakage inductance measurement 4xx: DC measurement 5xx: tachometer test 6xx: no load measurement 7xx: optimization of the n/f controller For a ground-fault test and test pulse measurement for converters switched in parallel, the ones position allows a differentiationto be made as to which partial inverter is actually executing the measurement 1x1: ground fault test, inverter 1 1x2: ground fault test, inverter 2 2x1: test pulse measurement, inverter 1 2x2: test pulse measurement, inverter 2 2x3: test pulse measurement of both inverters The '10' digit separates the measurement into several steps; the detailed meaning depends of the '100' digit: 10x: ground fault test selected 11x: no transistor ON 12x: transistor V+ ON 13x: transistor V- ON 14x: transistor U+ ON 15x: transistor U- ON 16x: transistor W+ ON 17x: transistor W- ON 20x: test pulse measurement selected 21x: U+, V–, W– triggered 22x: U–, V+, W+ triggered 23x: U–, V–, W+ triggered 24x: U+, V+, W– triggered 25x: U+, V–, W+ triggered 26x: U–, V+, W– triggered 300: leakage measurement selected 310, 320: measurement in phase direction V 330, 340: measurement in phase direction W 350, 360: measurement in phase direction U 40x: DC measurement selected 41x: measurement in the direction of phase U 42x: measurement in the direction of phase V 43x: measurement in the direction of phase W 44x: saving parameter values 50x, 60x, 70x: function selected 51x, 61x, 71x: drive is accelerating 52x, 62x, 72x: measurement during constant speed 53x, 63x, 73x: measurement during n/f setpoint steps 54x, 64x, 74x: oscillation test 55x, 65x, 75x: saving parameter values The '1' digit displays more details of the steps: 4x0, 5x0, 6x0, 7x0: not active 4x1, 5x1, 6x1, 7x1: waiting 4x2, 5x2, 6x2, 7x2: data recording 4x3, 5x3, 6x3, 7x3: data evaluation 4x4, 5x4, 6x4, 7x4: saving parameter values Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r344 158Hex	**TestPulsesResult** Test pulse results; bit coded display. The index displays the number of the test pulse and the switching status: '1' means, that the described event has happened during the measurement. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Bit 0: VCE W (L3) Bit 1: VCE V (L2) Bit 2: VCE U (L1) Bit 3: Overcurrent Bit 4: VCE W (L3) paralleled inverter #2 Bit 5: VCE V (L2) paralleled inverter #2 Bit 6: VCE U (L1) paralleled inverter #2 Bit 7: Result O. K. Bit 8: Iw > 0 Bit 9: iw < 0 Bit 10: Iu > 0 Bit 11: Iu < 0 Bits 12, 13, 14: switching status of the inverter phase legs W, V and U '1': output terminal connected to + DC bus '0': output terminal connected to - DC bus Bit 15: not used Indices: i00n ≙ Tp0n, n = 1 to 18 Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		18	3 / BR
r345 159Hex	**TachTest Result** Result of the tachometer test. The test is completely performed during P052 = 8, 9, during P052 = 10, 12 parts of the test are performed. Parameter values: 0: Test not active or not yet completed 1: Tachometer signal o. k. 2: The scaling of the analog tachometer (P210) has automatically be performed (only P052 = 8, 9). 3: The calculated scaling of the analog tachometer has been limited to the allowed value (only P052 = 8, 9). 4: No speed signal has been received. 5: The polarity of the speed signal is incorrect 6: One track signal of the encoder is missing 7: The actual scaling of the analog tachometer (P210) is incorrect; it is proposed to run the no load measurement program (P052=9). 8: The number of pulses of the encoder (P209) is set incorrectly. Condition: P163 = 3, 4, 5 (Vector control modes) Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	No Result O.K. Gain corr Gain limit Signal miss Polarity Track miss Gain wrong Pulse #	-	2 / BR
P346 15AHex	**n/f RegDyn(set)** Setpoint for the dynamic behavior of the speed controller; is used for the optimization for the dimensioning of the n/f controller (P052 = 10 or 8). 100% result in excellent dynamic behavior 10% result in the least possible dynamic behavior Note: a change will only become active after the n/f controller optimization program was run (P052 = 8, 10). Condition: P163 = 3, 4, 5 (Vector control modes); MDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	10 to 200 [%]	4 i001=50 i002=50 i003=50 i004=50	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P347 15BHex	**n/f RegDyn(act)** Actual value of the dynamic behavior of the speed controller; this value has been entered by the n/f controller optimization program (P052 = 8, 10) from P346; if needed the value was reduced. 100% result in excellent dynamic behavior. Condition: P163 = 3, 4, 5 (Vector control modes); MDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 200 [%]	4 i001=0 i002=0 i003=0 i004=0	2 / BR 4 / B
P348 15CHex	**n/f Reg Osc Freq** Oscillating frequency measured by the oscillation monitor of the n/f control circuit. A value of '0' means that no oscillations have been monitored. The value is measured during the n/f controller optimization (P052 = 8, 10). Condition: P163 = 3, 4, 5 (Vector control modes); MDS(4) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 100.0 [Hz]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	2 / BR 4 / B
P354 162Hex	**Ground Flt Test** Ground fault test; this is not a protective function according to any standard. Parameter values: 0 = no ground fault test to be performed except during parameter identification 1 = ground fault test will be performed after the next ON command; afterwards the parameter is reset to '0' 2 = ground fault test to be performed after every ON command 3 = ground fault test is always OFF, even during parameter identification Note: During motor data identification (P052 = 7) a ground fault test is performed if P354 = 0, 1, or 2. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 not active next ON every ON OFF	- 1	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r358 166Hex	**GrdFltTestResult** Results of the ground fault test Bit-coded display of the reason which has caused the break of the test.  Parameter values: Bit 0 =1: VCE phase W Bit 1 =1: VCE phase V Bit 2 =1: VCE phase U Bit 3 =1: overcurrent Bit 8 =1: negative I_W Bit 9 =1: positive I_W Bit 10 =1: negative I_U Bit 11 =1: positive I_U ATTENTION! The semiconductor which was triggered or where the fault occurred is coded using Bits 12 to 14 or the highest value nibble on the OP1. Individual converter or Inverter 1 in the parallel circuit:  Bits 12 to 14 all OFF: no semiconductor was in ON-state. Inverter 2 in the parallel circuit:  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		–	3 / BR
P360 * 168Hex	**Mot Tmp Warning** Limit for the warning message 'Motor overtemperature' (P625). Condition: P361 > 1 (only for temperature measurement via KTY sensor) Example: for isolation class B: <= 110°C; EXd <= 100°C for isolation class F: <= 145°C; EXd <= 145°C Description for setting: a parameter value > 0 activates this function. MDS(4) Parameter Type=I2; PKW: 1HEX=1.0°C PcD Gr.: -	0 to 160 [°C]	4 i001=0 i002=0 i003=0 i004=0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P361 * 169Hex	**Mot Tmp Fault** Limit for the fault message 'Motor overtemperature' (P626) and selection of the thermistor temperature measurement, respectively. Example: for isolation class B: <=110^{o}C; EXd <= 100^{o}C for isolation class F: <=145^{o}C; EXd <= 145^{o}C Setting instructions: • The PTC evaluation is activated by setting value 1. The PTC thermistor evaluation identifies an overtemperature conditon, if the PTC thermistor resistance is >1.5 kΩ. • The temperature sensing is activated using a KTY sensor for a setting value > 1. MDS(4) Parameter Type=I2; PKW: 1HEX=1.0°C PcD Gr.: 0	0 to 300 [°C]	4 i001=0 i002=0 i003=0 i004=0	2 / BR 2 / BR
P362 * 16AHex	**Motor Cooling** Motor cooling The motor cooling type has an effect on the calculation of the permissible duty cycle, as well as on the accuracy of the 3-mass model for temperature adaption of the rotor- and stator resistances (P310). Note: For P311 = 5 = 1PH6 motor series, for the temperature adaption, it is automatically assumed that the motor is force-cooled. Parameter values: 0: self cooled 1: forced cooling MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 self cooled forced vent	4 i001=0 i002=0 i003=0 i004=0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P363 16BHex	**Mot ThermT-Const** Thermal time constant of the motor Description for Setting: The i^2t calculation is activated by a parameter value >= 100 sec Example: For a 2-pole 1LA5063 motor, the value should be set to: 8 min (from the table)*60 s/min = 480 s Typical thermal time constants for Siemens motors (in min.): (see table below) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0s PcD Gr.: 0	0 to 16000 [s]	4 i001=100 i002=100 i003=100 i004=100	2 / BR 2 / BR

Type	2-pole	4-pole	6-pole	8-pole	10-pole	12-pole
1LA5063	8	13	-	-	-	-
1LA5070	8	10	12	-	-	-
1LA5073	8	10	12	-	-	-
1LA5080	8	10	12	-	-	-
1LA5083	10	10	12	-	-	-
1LA5090	5	9	12	12	-	-
1LA5096	6	11	12	14	-	-
1LA5106	8	12	12	16	-	-
1LA5107	-	12	-	16	-	-
1LA5113	14	11	13	12	-	-
1LA5130	11	10	13	10	-	-
1LA5131	11	10	-	-	-	-
1LA5133	-	10	14	10	-	-
1LA5134	-	-	16	-	-	-
1LA5163	15	19	20	12	-	-
1LA5164	15	-	-	-	-	-
1LA5166	15	19	20	14	-	-
1LA5183	25	30	-	-	-	-
1LA5186	-	30	40	45	-	-
1LA5206	30	-	45	-	-	-
1LA5207	30	35	45	50	-	-
1LA6220	-	40	-	55	-	-
1LA6223	35	40	50	55	-	-
1LA6253	40	45	50	60	-	-
1LA6280	40	50	55	65	-	-
1LA6283	40	50	55	65	-	-
1LA6310	45	55	60	75	-	-
1LA6313	-	55	60	75	-	-
1LA831.	35	40	45	45	50	50
1LA835.	40	45	50	50	55	55
1LA840.	45	50	55	55	60	60
1LA845.	55	55	60	60	70	70
1LL831.	25	25	30	30	35	35
1LL835.	30	30	35	35	40	40
1LL840.	35	35	35	35	40	40
1LL845.	40	35	40	40	45	45
1LA135.	30	35	40	-	-	-
1LA140.	35	40	45	45	-	-
1LA145.	40	45	50	50	55	55
1LA150.	50	50	55	55	65	65
1LA156.	60	55	60	60	70	70
1LL135.	20	20	25	-	-	-
1LL140.	25	25	30	30	-	-
1LL145.	30	30	30	30	35	35
1LL150.	35	30	35	35	40	40
1LL156.	40	35	35	35	40	40

Type n_n=	3000	2000	1500	1000	500	1/min
1PH610.	25	25	25	20	-	
1PH613.	30	30	30	30	-	
1PH616.	-	35	35	35	-	
1PH618.	40	40	40	40	40	
1PH620.	40	40	40	40	40	
1PH622.	40	40	40	40	40	

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P364 * 16CHex	**Mot Load Limits** Messages of the duty cycle monitor for the motor (in % of rated motor power) The parameter is valid for all motor data sets. Index i001 = WARN: When the entered load value is reached a warning message is edited via P625. Index i002 = FLT: When the entered load value is reached a fault message is edited via P626. Description for Setting: 0: no evaluation Related display parameter: r008 (Motor loading) Type=O2; PKW: 1HEX=1.0% PcD Gr.: 0	0 to 300 [%]	2 i001=100 i002=100	2 / BR 2 / BR
P366 16EHex	**Auto Restart** Auto restart after power outage Parameter values: 0 = blocked 1 = only power outage fault reset after power return (-> status Ready for turn-ON) 2 = When power returns the drive turns on again after the wait time (P367) 3 = Immediately after power return the drive turns on and performs the function ’Flying Restart’. Note: independently of the status of the bit ’release of Flying Restart’ of the control word the ’Flying Restart’ function is active at every turn ON if P366 = 3. Condition: P100 = 0, 1 (motor type = IEC, NEMA) ATTENTION: it must be guaranteed by external safety means that the drive can not start without intention at parameter settings P366 = 2, 3 MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 none Flt Reset Auto Start Fly Auto St	4 i001=0 i002=0 i003=0 i004=0	2 / BR 2 / BR
P367 16FHex	**AutoRestart Wait** Wait time between return of power and automatic drive restart if auto restart is on (P366 = 2). Note: The wait time is not valid if the Flying Restart function is active: (P366 = 3 (auto restart with flying restart), P583 (source for release of flying restart) or if bit ’Flying Restart’ of the control word is set). Description for setting: the wait time should be in the range of the coasting time of the drive system. MDS(4) Parameter Type=O2; PKW: 1HEX=1.0s PcD Gr.: 0	0 to 650 [s]	4 i001=0 i002=0 i003=0 i004=0	2 / BR 2 / BR
P369 171Hex	**Fly Search Amps** Search current used for flying restart if no tachometer is used in % of rated motor current (P102) Conditions: P163 = 1, 3 (V/Hz modes, f control) Flying restart function must be released by the control bit (source see P583) or flying restart function must be released via P366 = 3 (auto restart) P100 = 0, 1 (motor type = IEC, NEMA) Setting instructions: For P163 = 3 (frequency control), a maximum of 200% of the rated magnetizing current (r196) is impressed. MDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD: 4000HEX=400%	10 to 400 [%]	4 i001=50 i002=50 i003=50 i004=50	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P370 172Hex	**Fly Search Speed** Search speed Frequency range which is to be passed during flying restart within 1 sec. Conditions: as for P369 P100 = 0, 1 (motor type = IEC, NEMA) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD: 4000HEX=163.84Hz	0.1 to 100.0 [Hz]	4 i001=1.0 i002=1.0 i003=1.0 i004=1.0	2 / BR 2 / BR
P371 173Hex	**De-magnetizeTime** De-excitation time of the motor Minimum wait time between pulse blocking and pulse release. The induction motor de-magnetizes during this period. Pre-set during automatic parameterization (P052 = 6, 7). Description for setting: About 2.3*rotor time constant (r200), but not more than 3.0s. This setting guarantees that the motor is de-magnetized for at least 90% when pulses are released. ATTENTION: After OFF1, OFF3 and JOG commands the de-excitation time is not active MDS(4) Parameter Type=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.01 to 10.00 [s]	4 i001=1.00 i002=1.00 i003=1.00 i004=1.00	2 / BR 2 / BR
P372 174Hex	**DC Braking** DC injection braking of the motor to brake a DC motor without optional braking equipment (chopper, regenerative front end) ATTENTION: All loss energy concentrates in the motor, the danger of a local overheating in the motor exists! Note: Only for induction motors Overcurrent interventions (alarm A02) can occur for over-dimensioned motors (P102 > P072) when starting the DC brake. In this case, the de-energization time (P371) must be increased. Parameter values: 0: DC injection braking OFF 1: DC injection braking active with OFF3 command ('quick stop'). Condition: P100 = 0, 1 (motor type = IEC, NEMA) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 off on	4 i001=0 i002=0 i003=0 i004=0	2 / BR 2 / BR
P373 175Hex	**DC Braking Amps** Setpoint for the DC injection braking current in % of rated motor current Condition: P372 = 1 (DC injection braking) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD: 4000HEX=400%	20 to 400 [%]	4 i001=100 i002=100 i003=100 i004=100	2 / BR 2 / BR
P374 176Hex	**DC Braking Time** DC injection braking time Condition: P372 = 1 (DC injection braking) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1s PcD: 4000HEX=163.84s	0.1 to 99.9 [s]	4 i001=5.0 i002=5.0 i003=5.0 i004=5.0	2 / BR 2 / BR
P375 177Hex	**DC Braking Freq** Start frequency for DC injection braking; if OFF3 command is active DC injection braking is performed below this frequency Condition: P372 = 1 (DC injection braking) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1Hz PcD: 4000HEX=163.84Hz	0.1 to 600.0 [Hz]	4 i001=300.0 i002=300.0 i003=300.0 i004=300.0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P377 179Hex	**DC Bus Volts Reg** Limitation controller for the DC link bus voltage; limits the DC link bus voltage during regenerative operation (e. g. fast deceleration) to the maximum allowed value. Note: • This function can not replace braking or regenerating equipment when the load actively regenerates energy! • The Vdmax controller should be blocked when braking or regenerating equipment is connected . Parameter values: 0: blocked 1: Vdmax controller released Dependent parameter: P378 (Vdmax controller dynamic behavior): the Vdmax controller is OFF at a controller dynamics setting of 0 %. Related display parameter: r385 (Output signal of the Vdmax controller) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 off on	4 i001=0 i002=0 i003=0 i004=0	3 / BR 3 / B
P378 17AHex	**DC Bus Volts Dyn** Vdmax controller dynamic bahvior Description for setting: Vdmax controller is OFF at a 0 % setting. Condition: P377 = 1 (Vdmax controller) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 200 [%]	4 i001=50 i002=50 i003=50 i004=50	3 / BR 3 / BR
P379 17BHex	**PRT/FLR** Power ride thru (PRT) / Flexible response (FLR) Power ride thru: Operation may be continued during short power outages by regenerating energy from the load / motor to the drive. Loads with high inertia and high speed allow longer sustaining periods. Dependent parameter: P381 (PRT controller speed) Related display parameter: r385 (output signal of the PRT controller for P163 = 0, 1, 2) r386 = (PRT controller output at P163 = 3, 4, 5) Flexible response: The flexible response function allows converter operation for short power outages. The available output power is reduced according to the actual supply voltage and the rated converter current (P072). The firing angle which can be realized when the function is released (P379 = 2, 3) is limited to the vector modulation range. FLR with f = const. is only permissible for V/Hz modes (P163 = 0, 1, 2). Note: For the flexible response function, the electronics power supply must be buffered using an external auxiliary power supply. Dependent parameter: P380 (PRT/FLR LowVolts) P381 (PRT/FLR controller speed; only for P163=0, 1, 2) P387 (FLR Vdmin) Related display parameter: r385 (FLR controller output for P379 = 2, P163 = 0, 1, 2) Parameter values: 0: Inhibited 1: PRT released 2: FLR released with V/f const 3: FLR released with f=const. (only for P163 = 0, 1, 2) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 OFF PwrRideThru FLR V/f = const. FLR f = const.	4 i001=0 i002=0 i003=0 i004=0	3 / BR 3 / B

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P380 17CHex	**PRT/FLR LowVolts** Point at which the PRT control or the FLR is activated. DC link voltage which when fallen below, the PRT or FLR is activated (reference quantity: rated DC link voltage; for AC drive converters P071*1.32, for DC converters, P071). Condition: P379 = 1 (select PRT) or P379 = 2, 3 (select FLR) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	65 to 92 [%]	4 i001=76 i002=76 i003=76 i004=76	3 / BR 3 / BR
P381 17DHex	**PRT/FLR Reg Dyn** Controller dynamic behavior for kinetic buffering (P379 = 1) for all control types and flexible response (P379 = 2, V/f = const.) for V/f characteristic (P163 = 0, 1, 2). A parameter value of 0% turns OFF the function. Condition: P379 = 1 (select PRT) or P379 = 2 (select FLR, V/f = const.) and P163 = 0, 1, 2 MDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 200 [%]	4 i001=50 i002=50 i003=50 i004=50	3 / BR 3 / BR
r385 181Hex	**f(PRT/VdmaxReg)** Output signal of the Vdmax / PRT controller; this frequency is added to the frequency setpoint (r482). Condition: P163 = 0 ,1, 2 (V/Hz modes) Analog Output: 100% @ Parameter Value=P420 Type=I2; PKW: 1HEX=0.01Hz PcD Gr.: 1	[Hz]	-	3 / BR
r386 182Hex	**I(PRT/VdmaxReg)** Output signal of the Vdmax / PRT controller; this current is added to the torque generating current component (r246). Condition: P163 = 3, 4, 5 (Vector control modes); Analog Output: 100% @ Parameter Value=4*P102 Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	[A]	-	3 / BR
P387 183Hex	**FLR Vd min** Minimum DC link bus voltage in % of the rated DC link bus voltage (for AC drives: P071 * 1.32, for DC inverters: P071); lower voltages trip the inverter and an DC link bus undervoltage fault. Condition: P379 = 2, 3 (FLR released) MDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	50 to 76 [%]	4 i001=76 i002=76 i003=76 i004=76	3 / BR 3 / B
r388 184Hex	**Sync Status** Monitoring of the synchronization process: Parameter values: 0 = synchronization OFF 1 = frequency measurement active 2 = phase control active 3 = synchronized 4 = synchronization failure Condition: P090 = 4 or P091 = 4 (TSY board in position 2 or 3 of the electronic box) P163 = 2 (V/Hz mode for textile applications) Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 not active f Evaluat Phi Regulat Synchron´d sync.-fail.	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P389 * 185Hex	**SyncStartDelta f** maximum allowed frequency deviation for starting the synchronization process. Synchronization will not start before |target frequency- frequency of the synchronization drive| < P389. Note: Upper limit is defined by the limit for the synchronization controller (P392) Dependent parameter: P582 (Source Sync. release) P392 (Sync. fmax) Condition: P090 = 4 or P091 = 4 (TSY board in position 2 or 3 of the electronic box) P163 = 2 (V/Hz mode for textile applications) Type=I4; PKW: 1HEX=0.01Hz PcD Gr.: 1	0.00 to 1.00 [Hz]	- 0.10	3 / BR 3 / BR
P390 * 186Hex	**Sync Angle(set)** Phase angle deviation setpoint for the synchronization. Phase angle between the synchronization signal and the synchronizing drive; a negative parameter value means, that the voltage system of the synchronizing drive is delayed against the measured signal. Example: • A drive is to be synchronized to phase R of a voltage system • A measured synchronization signal derives from the delta-voltage V_{R-S} -> P390 is set to -30° (drive compares its own voltage V_R with the measured signal V_{R-S}, which has a phase shift of 30° electr. Dependent parameter: P582 (Source synchronization release) Related display parameter: r394 (Sync. phase angle difference) Condition: P090 = 4 or P091 = 4 (TSY board in position 2 or 3 of the electronic box) P163 = 2 (V/Hz mode for textile applications) Type=I2; PKW: 1HEX=0.1°el PcD: 4000HEX=90°el	-180.0 to 179.9 [°el]	- 0.0	3 / BR 3 / BR
P391 * 187Hex	**Sync Window** Deviation for the synchronization fault message The parameter defines the phase angle deviation which generates a synchronization fault message after synchronization of the frequency. If the tolerance range is exceeded, a formerly issued synchronization command will not be withdrawn, only a warning message and the synchronization fault message (P630) will be issued. Warning, synchronization fault message and the synchronization command will only be withdrawn by canceling the synchronization command (P582) or by an OFF command. Condition: P090 = 4 or P091 = 4 (TSY board in position 2 or 3 of the electronic box) P163 = 2 (V/Hz mode for textile applications) Type=I2; PKW: 1HEX=0.1°el PcD: 4000HEX=90°el	1.0 to 20.0 [°el]	- 2.0	3 / BR 3 / BR
P392 * 188Hex	**Sync f-max** Maximum operating range of the synchronization controller. The output signal of the synchronization controller is limited to this frequency. During synchronization a frequency step of maximum the entered value is possible. The lower value of the setting range is limited by the value of the frequency deviation at the beginning of the synchronization (P389). Condition: P090 = 4 or P091 = 4 (TSY board in position 2 or 3 of the electronic box) P163 = 2 (V/Hz mode for textile applications) Type=I4; PKW: 1HEX=0.01Hz PcD Gr.: 1	0.00 to 1.00 [Hz]	- 0.20	3 / BR 3 / BR

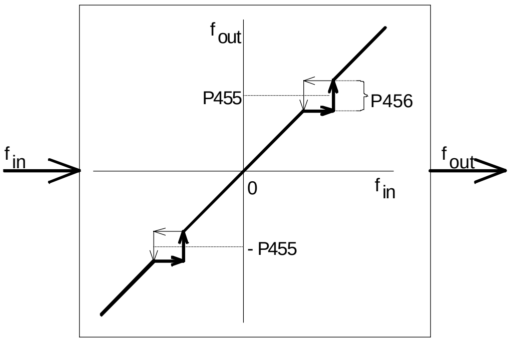
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r393 189Hex	**Sync Target Freq** Measured target frequency during synchronization Maximum value which can be displayed: 8 times rated motor frequency (P107). Condition: P090 = 4 or P091 = 4 (TSY board in position 2 or 3 of the electronic box) P163 = 2 (V/Hz mode for textile applications) Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.01Hz PcD Gr.: 1	 [Hz]	-	3 / BR
r394 18AHex	**Sync Phase Diff** Actual phase angle difference between phase U of the synchronizing drive and the measured synchronization signal of the target voltage system. Note: at P388 = 0, 1 the setpoint angle P390 - 180° el is displayed. Conditions: P090 = 4 or P091 = 4 (TSY board in position 2 or 3 of the electronic box) P163 = 2 (V/Hz mode for textile applications) Analog Output: 100% @ Parameter Value=90.0°el Type=I2; PKW: 1HEX=0.1°el PcD: 4000HEX=90°el	 [°el]	-	3 / BR
P395 18BHex	**Selectivity** In configurations, where one drive is feeding a number of paralleled motors in the case of a failure (short circuit, ground fault, motor blocked) one of these motors may be disconnected from the drive by blowing its fuses. ATTENTION: If the selectivity function is selected, there is no protection available against a terminal short circuit; the overcurrent protection is still active. Parameter values: 0: Selectivity OFF 1: Selectivity ON Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 OFF ON	- 0	3 / BR 3 / B

11.8 Setpoint Channel

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r410 19AHex	**act. SetpDataSet** Active setpoint channel data set Parameter values: 0 = setpoint data set 1 1 = setpoint data set 2 2 = setpoint data set 3 3 = setpoint data set 4 Analog Output: 100% @ Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 SDS 1 SDS 2 SDS 3 SDS 4	-	3 / BR
P420 1A4Hex	**System Rtd Freq** Rated system frequency / speed Reference quantity for acceleration time (P462), deceleration time (P464), hysteresis for 'ramp generator active' message (P476), base setpoint (P445) and for speed / frequency setpoint and actual values which are transfered via analog inputs and outputs or serial communications. Type=I4; PKW: 1HEX=0.01Hz PcD Gr.: 1	1.00 to 600.00 [Hz]	- 50.00	2 / ABR 2 / AB
P421 1A5Hex	**Fixed Freq1(set)** By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. SDS(4) Parameter Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	-600.000 to 600.000 [Hz]	4 i001=50.000 i002=50.000 i003=50.000 i004=50.000	2 / BR 2 / BR
P422 1A6Hex	**Fixed Freq2(set)** By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. SDS(4) Parameter Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	-600.000 to 600.000 [Hz]	4 i001=-50.000 i002=-50.000 i003=-50.000 i004=-50.000	2 / BR 2 / BR
P423 1A7Hex	**Fixed Freq3(set)** By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. SDS(4) Parameter Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	-600.000 to 600.000 [Hz]	4 i001=20.000 i002=20.000 i003=20.000 i004=20.000	2 / BR 2 / BR
P424 1A8Hex	**Fixed Freq4(set)** By setting the correlated bits of the control word (r551) the fixed setpoint is activated from the source defined in P580 / P581. SDS(4) Parameter Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	-600.000 to 600.000 [Hz]	4 i001=5.000 i002=5.000 i003=5.000 i004=5.000	2 / BR 2 / BR
P425 1A9Hex	**MOP saving** Saving of the setpoint which has come from the motor operated potentiometer (MOP) at turn OFF / power outage The saved setpoint signal is active again after a new ON command (P443 = 1002, main setpoint from MOP). If saving of the MOP setpoint is not active (P425 = 0, 2), the MOP start frequency (P426) is cleared after an OFF command or a power outage. The „internal motorized potentiometer rounding-off" (necessary to precisely set a frequency) can be cancelled if the motorized potentiometer (MOP) is to ramp-up extremely quickly. Parameter values: 0: without save with 'internal MOP rounding-off' 1 : with save with 'internal MOP rounding-off' 2: without save without 'internal MOP rounding-off' 3: with save without 'internal MOP rounding-off' Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 OFF ON OFF ON	- 0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P426 1AAHex	**MOP start frequ** Start frequency of the motor operated potentiometer (MOP) The motorized potentiometer setpoint is set to this start frequency if storage is not active (P425 = 0, 2), in the drive converter statuses, swich-on inhibit (r001 =°008), and ready to power-up (r001 = °009). As the motorized potentiometer setpoint can only have positive values, the sign must be specified via the direction of rotation bits (P571, P572). SDS(4) parameter Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	0.000 to 600.000 [Hz]	4 i001=0.000 i002=0.000 i003=0.000 i004=0.000	3 / BR 3 / BR
P427 1ABHex	**Set MOP** The motorized potentiometer is set to the absolute value of the main setpoint. The motorized potentiometer setpoint is set to the absolute value of the main setpoint (r447) when changing-over the main setpoint source to a motorized potentiometer (P443 = 1002; e.g. for basic/reserved changeover). Thus, a continuous transition can be achieved when changing-over from automatic- to manual operation. As the motorized potentiometer setpoint can only be positive, the sign must be specified via the direction of rotation bits (P571, P572). Parameter values: 0: no storage 1: with storage Type=I2; PKW: 1HEX = 0.01 Hz PcD Gr.:1	0 to 1 OFF ON	- 0	2 / BR 2 / BR
P433 * 1B1Hex	**Src AddSetpoint1** Source of the additional setpoint signal 1 (in front of the ramp generator) Parameter values: 1001: Fixed setpoints (P421 to P424) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P434 1B2Hex	**GainAddSetpoint1** Proportional gain of the additional setpoint signal 1 Not effective if the additional setpoint is a fixed setpoint (P433 = 1001). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
r437 1B5Hex	**Add Setpoint 1** Actual additional setpoint 1 (in front of the ramp generator) Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P438 * 1B6Hex	**Src AddSetpoint2** Source of the additional setpoint signal 2 (behind the ramp generator) Parameter values: 1001: Fixed setpoints (P421 to P424) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P439 1B7Hex	**GainAddSetpoint2** Proportional gain of the additional setpoint signal 2 Not effective if the additional setpoint is a fixed setpoint (P438 = 1001). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r442 1BAHex	**Add Setpoint 2** Actual additional setpoint 2 (behind the ramp generator) Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P443 * 1BBHex	**Src MainSetpoint** Source of the (frequency / speed) main setpoint signal. Parameter values: 1002: Motor operated potentiometer (MOP) other values: according to the process data wiring of the setpoint channel data set. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1002 i002=1001	2 / BR 2 / BR
P444 1BCHex	**GainMainSetpoint** Proportional gain of the main setpoint signal Not effective if the setpoint is a fixed setpoint or comes from the MOP (P443 = 1001, 1002). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	2 / BR 2 / BR
P445 1BDHex	**Base Setpoint** Base setpoint of the main setpoint channel in % of rated system frequency (P420); is added to the main setpoint signal. Not effective if the setpoint is a fixed setpoint or comes from the MOP (P443 =1001, 1002). B/R Parameter Type=I2; PKW: 1HEX=0.1% PcD Gr.: 0	-100.0 to 100.0 [%]	2 i001=0.0 i002=0.0	3 / BR 3 / BR
r447 1BFHex	**Main Setp.(act)** Actual main setpoint Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	2 / BR
P448 1C0Hex	**Jog Frequency 1** Jog frequency 1 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	-600.000 to 600.000 [Hz]	- 5.000	2 / BR 2 / BR
P449 1C1Hex	**Jog Frequency 2** Jog frequency 2 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	-600.000 to 600.000 [Hz]	- 10.000	2 / BR 2 / BR
r451 1C3Hex	**n/f(set,total1)** Frequency setpoint signal at the addition point in front of the ramp generator Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	3 / BR
P452 1C4Hex	**Max Freq FWD** Maximum frequency at forward speed Limited by: • double rated motor frequency at P163 = 0, 1, 2 (V/Hz modes) • 5 times rated motor frequency at P163 = 3, 4, 5 (Vector control modes) • Pulse frequency MDS(4) Parameter Type=I4; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 600.0 [Hz]	4 i001=55.0 i002=55.0 i003=55.0 i004=55.0	2 / ABR 2 / AB

PNU ***:conf-P**	**Parameter Name in OP1** **Description**	**Range [Unit]** **Value texts**	**# of. Indices** **Factory Settings.**	**read: _/_** **write: _/_**
P453 1C5Hex	**Max Freq REV** Maximum frequency at reverse speed Limited by: • double rated motor frequency at P163 = 0, 1, 2 (V/Hz modes) • 5 times rated motor frequency at P163 = 3, 4, 5 (Vector control modes) • Pulse frequency MDS(4) Parameter Type=I4; PKW: 1HEX=0.1Hz PcD Gr.: 1	-600.0 to 0.0 [Hz]	4 i001=-55.0 i002=-55.0 i003=-55.0 i004=-55.0	2 / ABR 2 / AB
P455 1C7Hex	**Skip Frequency** Skip frequency for the frequency setpoint in front of the ramp generator. Steady state operation is not possible in the range of the positive and the negative value of the skip frequency.  Note: Frequency skipping is OFF at parameter values between 0.0 Hz and 0.5*P456 SDS(4) Parameter Type=I4; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 600.0 [Hz]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	2 / BR 2 / BR
P456 1C8Hex	**Skip Freq Width** Width of the skip frequency band in the setpoint channel; see P455 SDS(2) Parameter Type=I4; PKW: 1HEX=0.1Hz PcD Gr.: 1	0.0 to 600.0 [Hz]	4 i001=2.0 i002=2.0 i003=2.0 i004=2.0	2 / BR 2 / BR
P457 1C9Hex	**Min Frequency** Minimum frequency f_{min} (amount) of the drive; same as frequency skipping around 0 Hz with a bandwidth of 2 * f_{min}, effective for the setpoint signal in front of the ramp generator Given setpoint f_{set}: realized setpoint • $-f_{min} < f_{set}$ (coming from lower values) $< f_{min}$ → $-f_{min}$ • $-f_{min} < f_{set}$ (coming from higher values) $< f_{min}$ → $+f_{min}$ • $0 <= f_{set}$ (after turn ON) $< f_{min}$ → $+f_{min}$ • $-f_{min} < f_{set}$ (after turn ON) < 0 → $-f_{min}$ • $f_{set} > f_{min}$ → f_{set} • $f_{set} < -f_{min}$ → f_{set} Note: The bits for forward / reverse operation (see P571, P572) are allowed for. SDS(4) Parameter Type=I4; PKW: 1HEX=0.1Hz PcD Gr.: 1	-600.0 to 600.0 [Hz]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	2 / BR 2 / BR
r460 1CCHex	**n/f(set,Ramp IN)** Frequency setpoint signal at ramp generator input Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	 [Hz]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r461 1CDHex	**Ramp Gen Status** Status of the ramp generator Parameter values: 0: ramp generator blocked 1: ramp generator released 2: ramp generator stopped 4: ramp generator set 5: ramp generator following Analog Output: 100% @ Parameter Value=16384 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	 Locked Released STOP Set Following	-	3 / BR
P462 1CEHex	**Accel. Time** Ramp generator acceleration time for acceleration from 0 to rated system frequency (P420). Unit : as defined in P463 (acceleration time unit). Note: during motor data identification (P052 = 8, 10) this value is only increased if the set acceleration time is too low and the unit (P463, P465) for both acceleration and deceleration times is in seconds (the drive can not realize the accelertion time because of the torque limit). SDS(4) Parameter Type=O2; PKW: 1HEX=0.1 PcD Gr.: 0	0.0 to 999.9	4 i001=10.0 i002=20.0 i003=30.0 i004=40.0	2 / ABR 2 / ABR
P463 1CFHex	**Accel. Time Unit** Unit of the ramp generator acceleration time Parameter values: 0: Seconds 1: Minutes 2: Hours SDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 Sec Min Hours	4 i001=0 i002=0 i003=0 i004=0	2 / ABR 2 / ABR
P464 1D0Hex	**Decel. Time** Ramp generator deceleration time for deceleration from rated system frequency (P420) to standstill Unit: as defined in P465 (deceleration time unit). Note: During motor data identification (P052 = 8, 10) this value is only increased if the set acceleration time is too low and the unit (P463, P465) for both acceleration and deceleration times is in seconds (the drive can not realize the accelertion time because of the torque limit). SDS(4) Parameter Type=O2; PKW: 1HEX=0.1 PcD Gr.: 0	0.0 to 999.9	4 i001=20.0 i002=20.0 i003=20.0 i004=20.0	2 / ABR 2 / ABR
P465 1D1Hex	**Decel. Time Unit** Unit of the ramp generator deceleration time Parameter values: 0: Seconds 1: Minutes 2: Hours SDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 Sec Min Hours	4 i001=0 i002=0 i003=0 i004=0	2 / ABR 2 / ABR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P466 1D2Hex	**Decel. Time OFF3** OFF3 deceleration time (quick stop) for deceleration from rated system frequency (P420) to standstill Note: Rounding (P468) is not active during OFF3. Description for setting: • The parameter value must be high enough to prevent an overvoltage fault. • For P163 = 0, 1, 2, 3 (V/f characteristic, f control), the drive could trip if the deceleration time is too low. • For P163 = 3, 4, 5 (vector control types), if deceleration is not realized along the torque limit for OFF3, then P466 can be reduced. Type=O2; PKW: 1HEX=0.1s PcD Gr.: 0	0.0 to 999.9 [s]	- 1.0	2 / BR 2 / BR
P467 1D3Hex	**ProtRampGen Gain** Protective ramp generator: factor, which extends the acceleration time (P462). For P163 = 0, 1, 2 (V/Hz modes): The protective ramp generator is active up to 15 % of rated motor frequency (P107); see section „Ramp-function generator RFG“ in the Instruction Manual, Part 2 For P163 = 3 (Frequency control) The protection ramp generator is active up to 1.1 * P284 (change to counter EMF model). As long as the current model is active, the acceleration is also influenced by the current settings (P202, P203, P204). If permanent-magnet synchronous motors are being controlled (P100 = 3), the protective ramp-function generator should be set (>= 5), so that the drive does not stall when accelerating. Further, at least 20 % must be entered in P202. For P163 = 4, 5 (Speed / torque control) The protection ramp generator is not active. The protection ramp generator is only active, if the unit of the acceleration time (P463) is sec. During motor data identification (P052 = 8, 10) this value is only increased if the set acceleration time is too low and the unit (P463, P465) for both acceleration and deceleration times is in seconds. Description for setting: Parameter value 1,0 turns OFF the protective ramp generator. Condition: P163 = 0, 1, 2, 3 (V/Hz modes, f control) SDS(4) Parameter Type=O2; PKW: 1HEX=0.1 PcD Gr.: 0	1.0 to 100.0	4 i001=1.0 i002=1.0 i003=1.0 i004=1.0	3 / BR 3 / BR
P469 1D5Hex	**Ramp StartSmooth** Start rounding of the ramp generator in % of the acceleration (P462) and deceleration times (P464). At accelerating from 0 to rated system frequency (P420) the real acceleration time will increase to $P462 \times \left(1 + \frac{P469}{100\ \%} + \frac{P470}{100\ \%}\right)$. Condition: P463 = 0, P465 = 0 (acceleration and deceleration times in seconds) SDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 50 [%]	4 i001=10 i002=10 i003=10 i004=10	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P470 1D6Hex	**Ramp End Smooth** End rounding of the ramp generator in % of the acceleration (P462) and deceleration times (P464). At accelerating from 0 to rated system frequency (P420) the real acceleration time will increase to $P462 \times \left(1 + \frac{P469}{100\ \%} + \frac{P470}{100\ \%}\right)$. Condition: P463 = 0, P465 = 0 (acceleration and deceleration times in seconds) SDS(4) Parameter Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 50 [%]	4 i001=10 i002=10 i003=10 i004=10	2 / BR 2 / BR
P475 1DBHex	**Ramp Limitation** Ramp generator following function The frequency change rate of the ramp generator is adapted to the maximum possible acceleration of the drive. The parameter value refers to the frequency deviation at the input of the n/f controller which is needed to accelerate the drive at the torque limit. Description for Setting: At a value of 0.0 the ramp generator following function is OFF. The greater the parameter value is, the greater is the admitted deviation between n/f setpoint and the actual value. Condition: P163 = 4 (n control) Type=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 50.0 [%]	- 0.0	3 / BR 3 / BR
P476 1DCHex	**RampGen Act Hyst** Hysteresis for the message ’ramp generator active’ The message ’ramp generator active’ is issued, if |ramp generator input - ramp generator output| >= P476 * P420 . Condition: analog frequency setpoint in front of the ramp generator (see P433 and P443) Type=O2; PKW: 1HEX=0.1% PcD Gr.: -	0.0 to 20.0 [%]	- 1.0	3 / BR 3 / BR
r480 1E0Hex	**n/f(set,rampOUT)** Frequency setpoint at the output of the ramp generator Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	[Hz]	-	3 / BR
r481 1E1Hex	**n/f(set,total2)** Frequency setpoint at the addition point behind the ramp generator Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	[Hz]	-	3 / BR
r482 1E2Hex	**n/f(set)** Frequency setpoint at the input of the V/Hz control circuit and n/f/T control circuit, respectively Analog Output: 100% @ Parameter Value=P420 Type=I4; PKW: 1HEX=0.001Hz PcD Gr.: 1	[Hz]	-	2 / BR
P485 1E5Hex	**System RtdTorque** Rated system torque in % of rated motor torque Scaling reference for torque setpoint signals which are entered via the admitted sources of the setpoint wiring (see process data wiring of the setpoint channel) This scaling is also valid for torque actual values which are issued via output channels (analog outputs, serial communications). Condition: P163 = 3, 4, 5 (Vector control modes) Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.1 to 800.0 [%]	- 100.0	3 / ABR 3 / AB

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P486 * 1E6Hex	**Src Torque Setp** Source of the torque setpoint signal Parameter values: 1001: not allowed 1002: not allowed other values: see process data wiring of the setpoint channel. Condition: P163 = 3, 4, 5 (Vector control modes) At f/n control only effective, if the drive is operated as a slave drive (control word 2, Bit 27 = 1). B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P487 1E7Hex	**Torque Setp Gain** Proportional gain for the torque setpoint Condition: P163 = 3, 4, 5 (Vector control modes) At f/n control only effective, if the drive is operated as a slave drive (control word 22, Bit 27 = 1). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
r490 1EAHex	**Torque Setpoint** Actual torque setpoint Condition: P163 = 3, 4, 5 (Vector control modes) At f/n control only effective, if the drive is operated as a slave drive (control word 2, Bit 27 = 1). For closed-loop frequency control, in the range of the I model (r286=0), a torque setpoint less than 1% of the rated motor torque causes the drive to be braked. Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P492 1ECHex	**FixTorque 1 Set** Fixed upper limit of the torque setpoint in % of the rated motor torque. If drives without regenerative front end or braking chopper trip with overvoltage, the regenerative power (in reverse operation) must be limited via P233 and the Vdmax controller must be activated (P377). Note: P492 is also the upper torque limit during an external setpoint (P493 <> 1001) Condition: P163 = 3, 4, 5 (Vector control modes) SDS(4) Parameter Type=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-300.0 to 300.0 [%]	4 i001=100.0 i002=100.0 i003=100.0 i004=100.0	3 / BR 3 / BR
P493 * 1EDHex	**Src FixTorque 1** Source of the upper torque limit. Parameter values: 1001: internal upper fixed torque limit (P492) 1002: not allowed other values: see process data wiring of the setpoint channel. Note: The torque limit can only be changed within the range specified by the upper limit for the torque setpoint (P492). Condition: P163 = 3, 4, 5 (Vector control modes) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1001 i002=1001	3 / BR 3 / BR
P494 1EEHex	**FixTorque 1 Gain** Proportional gain of the upper torque limit; not effective for fixed setpoint (P493 = 1001). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r496 1F0Hex	**Fix Torque 1** Maximum value of the upper torque limit in % of rated motor torque Display parameter of the output of the upper torque limit (P493) Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
r497 1F1Hex	**Max Torque 1** Real upper torque limit in % of rated motor torque; this parameter is identical with r496 except for torque control. Note: The value of this parameter may be reduced by the power limit (P223) or the current limit (P173). P235 displays the effective torque limit. Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P498 1F2Hex	**FixTorq 2 Set** Fixed lower torque limit in % of the rated motor torque. If drives without regenerative front end or braking chopper trip with overvoltage, the regenerative power (in forward operation) must be limited via P233 and the Vdmax controller must be activated (P377). Note: P498 is also the lower torque limit during an external setpoint (P499 <> 1001) Condition: P163 = 3, 4, 5 (Vector control modes) SDS(4) Parameter Type=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-300.0 to 300.0 [%]	4 i001=-100.0 i002=-100.0 i003=-100.0 i004=-100.0	3 / BR 3 / BR
P499 * 1F3Hex	**Src FixTorq 2** Source of the lower torque limit. Parameter values: 1001: upper limit for the torque setpoint (P498) 1002: not allowed other values: see process data wiring of the setpoint channel. Note: The lower torque limit can only be changed within the range specified by the limit for the regenerative operation torque setpoint (P498). Condition: P163 = 3, 4, 5 (Vector control modes) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=1001 i002=1001	3 / BR 3 / BR
P500 1F4Hex	**FixTorq 2 Gain** Proportional gain of the lower torque limit; not effective for fixed setpoint (P499 = 1001). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
r502 1F6Hex	**Fix Torque 2** Maximum value of the lower torque limit in % of rated motor torque. Display parameter of the output of the source of the lower torque limit (P499) Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR

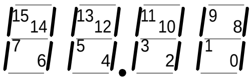
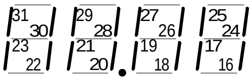
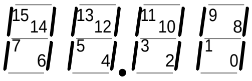
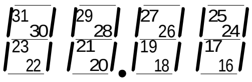
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r503 1F7Hex	**Max Torque 2** Real lower torque limit in % of rated motor torque; this parameter is identical with r502 except for torque control. Note: The value of this parameter may be reduced by the power limit (P233) or the current limit (P173). P235 displays the effective torque limit. Condition: P163 = 3, 4, 5 (Vector control modes) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR
P505 1F9Hex	**Torq/I Fix Set** Fixed setpoint for the additional torque / current setpoint in % of the rated motor torque / current (P102). Notes: • For speed or torque control (P163 = 4, 5): supplementary torque, for frequency control (P163 = 3) and P508 = 1: additonal torque setpoint • For frequency control (P163 = 3): additional current setpoint (if the counter EMF model is not active (r286 = 0) and if P508 = 0. Condition: P163 = 3, 4, 5 (Vector control modes) SDS(4) Parameter Type=I2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	-300.0 to 300.0 [%]	4 i001=5.0 i002=5.0 i003=5.0 i004=5.0	3 / BR 3 / BR
P506 * 1FAHex	**Src T/I FixAddSP** Source of the additional torque / current setpoint. Notes: • For speed / torque control (P163 = 4, 5): source of the additional torque setpoint • For frequency control (P163 = 3): source of the additional current setpoint or additional torque setpoint depending on P508. Parameter values: 1001: Fixed torque setpoint (P505) 1002: not allowed other values: see process data wiring of the setpoint channel. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P507 1FBHex	**T/IFixAddSetGain** Proportional gain of the additional torque / current setpoint Note: Not effective at internal setpoint (P506 = 1001). B/R Parameter Type=I2; PKW: 1HEX=0.01% PcD Gr.: 0	-300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
P508 1FCHex	**T add** For frequency control (P163 = 3), it can be selected as to whether the torque/current supplementary setpoint source (P506) is to be used to impress current in the range of the current model (r286 = 0), for torque feed-forward control (r244) of the frequency controller or as supplementary torque for a slave drive (P587). Parameter values: 0: I supplementary 1: T supplementary B/R parameter Type=O2 PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 no yes	2 i001=1.00 i002=1.00	3 / BR 3 / BR
r510 1FEHex	**Torq/I FixAddSet** Additional torque / current setpoint in % of rated motor torque / rated motor current; display parameter of the output of the source for the additional torque / current setpoint (P506) Analog Output: 100% @ Parameter Value=P485 Type=I2; PKW: 1HEX=0.1% PcD Gr.: 5	 [%]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P512 200Hex	**Compare Freq** Compare frequency for the message 'Compare frequency reached' (status word 1, bit 10 (r552)); see also P513 (Hysteresis) Type=I4; PKW: 1HEX=0.01Hz PcD Gr.: 1	0.00 to 600.00 [Hz]	- 50.00	3 / BR 3 / BR
P513 201Hex	**Comp Freq. Hyst** Hysteresis for the message 'Compare frequency reached' in % of the compare frequency (P512) Type=O2; PKW: 1HEX=0.1% PcD Gr.: 0	0.0 to 100.0 [%]	- 3.0	3 / BR 3 / BR
P514 202Hex	**OFF Frequency** Pulse block frequency at turn OFF If after an OFF command (OFF1, OFF3) the actual value of the frequency (r218) comes below this value, the pulses are blocked after the OFF wait time (P516). Type=I4; PKW: 1HEX=0.01Hz PcD Gr.: 1	0.00 to 600.00 [Hz]	- 0.10	3 / BR 3 / BR
P516 204Hex	**OFF Wait Time** Wait time between reaching of the pulse block frequency (P514) and pulse blocking; only for turn OFF via OFF1 or OFF3. SDS(4) Parameter Type=O2; PKW: 1HEX=0.1s PcD Gr.: 0	0.0 to 60.0 [s]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / BR 3 / BR
P517 205Hex	**Deviation Freq** Deviation frequency for the message 'Set/Actual deviation' (status word 1, bit 8 (r552)); the message is issued if the deviation is higher than the parameter value; see also P518 (deviation time) Depending items: P520 (pull out / blocking wait time) Type=I4; PKW: 1HEX=0.01Hz PcD Gr.: 1	0.00 to 600.00 [Hz]	- 3.00	3 / BR 3 / BR
P518 206Hex	**Deviation Time** Minimum time of the Set/Actual deviation; after this minimum time a Set/Actual deviation (P517) issues the message 'Set/Actual deviation' (status word 1, bit 8 (r552)) Depending items: P520 (pull out / blocking wait time) Type=O2; PKW: 1HEX=0.1s PcD Gr.: -	0.0 to 10.0 [s]	- 3.0	3 / BR 3 / BR
P519 207Hex	**Overspeed Hyst** Hysteresis of the message 'overspeed' (status word 2, bit 18 (r553)) Scaling quantity: reference values of P452 (Maximum forward frequency) and P453 (Maximum reverse frequency) Type=O2; PKW: 1HEX=0.1% PcD Gr.: -	0.0 to 20.0 [%]	- 10.0	3 / BR 3 / BR
P520 208Hex	**PullOut/BlckTime** Wait time between the message 'motor puled out/blocked' and issuing a fault message Dependent parameters: P517 (speed of the set/actual deviation), P518 (set/actual deviation time) MDS(4) Parameter Type=O2; PKW: 1HEX=0.01s PcD Gr.: 0	0.00 to 100.00 [s]	4 i001=50.00 i002=50.00 i003=50.00 i004=50.00	3 / BR 3 / BR
P525 20DHex	**Fix Setp ProcReg** Fixed setpoints for the technology controller B/R parameter Type=I4; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.00 %	–200.000 to 200.000 [%]	2 i001=0.000 i002=0.000	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P526 * 20EHex	**Src ProcReg Setp** Source for the technology controller setpoint. Parameter values: 1001: Technology setpoint (P525) 1002: Not permissible Additional value: According to PcD wiring of the setpoint channel B/R parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P527 20FHex	**SetpGain ProcReg** Technology controller setpoint gain. Not effective for technology setpoint input via fixed setpoint (P526 = 1001). B/R parameter Type=O2; PKW:1HEX=0.01 % PcD Gr.: 0	–300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
P528 * 210Hex	**SmoothProcRegSet** Technology controller setpoint smoothing time constant. The smoothing first becomes active when the technology controller is activated (control word 2 bit 24 = 1 and RUN status). Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 600.00 [s]	– 0.00	3 / BR 3 / BR
r529 211Hex	**Setpoint ProcReg** Actual technological setpoint Analog output: 100 % for PWE=100.000 % Type=I2; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.00 %	 [%]	–	3 / BR
P530 * 212Hex	**ActVal's ProcReg** Actual values for the technology controller actual value input. Defines which parameter are used as actual values for the technology controller. Indices: i001 = W01: Value1 for technology controller i002 = W02: Value2 for technology controller Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	2 i001=0.0 i002=0.0	3 / BR 3 / BR
P531 * 213Hex	**SRC ProcReg ActV** Source of the technology controller actual value. Parameter values: 1001: Illegal 1002: Illegal 1020: Illegal 1100: Internal technology controller actual value 1 (= contents of P530 index i001) 1200: Internal technology controller actual value 2 (= contents of P530 index i002) Additional values: According to the PcD wiring of the setpoint channel B/R parameter Type=L2; PKW: PKW format(HEX)=Par Value PcD Gr.: 0	0 to 6045	2 i001=0 i002=0	3 / BR 3 / BR
P532 * 214Hex	**Gain ProcRegActV** Technology controller actual value gain. B/R parameter Type=I2; PKW: 1HEX=0.01 % PcD Gr.: 0	–300.00 to 300.00 [%]	2 i001=100.00 i002=100.00	3 / BR 3 / BR
P533 * 215Hex	**Smth ProcRegActV** Smoothing time constant of the technology controller actual value. The smoothing is only active if the technology controller has been activated (control word2 bit 24 = 1 and status RUN). Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 600.00 [s]	– 0.00	3 / BR 3 / BR

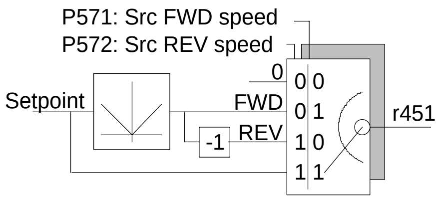
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r534 216Hex	**ActValue ProcReg** Actual technological actual value Analog output: 100 % at PWE=100.000 % Type=I2; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	 [%]	–	3 / BR
P535 * 217Hex	**R,g. T:Hyst.** Hysteresis for the signal - technological setpoint reached. This signal is output, if the technological actual value (r534) is greater than the technological setpoint (r529). The hysteresis is only effective when this signal is withdrawn Type=O2; PKW:1HEX=0.1 % PcD: 4000HEX=100.0 %	0.0 to 100.0 [%]	– 3.0	3 / BR 3 / BR
r536 218Hex	**DeviationProcReg** Control deviation at the input of the technology controller. Analog output: 100 % at PWE=100.00 % Type=I4; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.00 %	 [%]	–	3 / BR
P537 219Hex	**Gain ProcReg** Technology controller gain. Type=O2; PKW:1HEX=0.01 PcD: 4000HEX=64.00	0.00 to 250.00	– 1.00	3 / BR 3 / BR
P538 21AHex	**IntTConstProcReg** Technology controller integral action time (I component). Setting information: The technology controller I component is disabled with the value 0.00. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 600.00 [s]	– 0.00	3 / BR 3 / BR
P539 21BHex	**DifTConstProcReg** Technology controller derivative action time (D component). Setting information: The technology controller D component is disabled with the value 0.00. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 300.00 [s]	– 0.00	3 / BR 3 / BR
r540 21CHex	**ProcReg Output** Technology controller output before the limit value stage (P541, P542). Analog output: 100 % at PWE=100.00 % Type=I4; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	 [%]	–	3 / BR
P541 21DHex	**ProcReg Up1Limit** Upper limit of the technology controller output. Type=I4; PKW:1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	–200.000 to 200.000 [%]	– 200.000	3 / BR 3 / BR
P542 21EHex	**ProcReg Up2Limit** Lower limit of the technology controller output. Type=I4; PKW:1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	–200.000 to 200.000 [%]	– 200.000	3 / BR 3 / BR
P543 * 21FHex	**ProcReg AccTime1** Ramp-function generator for the upper limit value of the technology controller output. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 100.00 [s]	– 0.00	3 / BR 3 / BR
P544 * 220Hex	**ProcRegAccTime2** Ramp-function generator for the lower limit value of the technology controller output. Type=O2; PKW:1HEX=0.01 s PcD Gr.: 0	0.00 to 100.00 [s]	– 0.00	3 / BR 3 / BR
r545 221Hex	**ProcReg Out(Lim)** Limited technology controller output (after the limit value stage). Analog output: 100 % at PWE=100.00 % Type=I4; PKW: 1HEX=0.001 % PcD: 4000_0000HEX=100.000 %	 [%]	–	3 / BR

11.9 Control and Status Word

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r550 226Hex	**Control Word 1** Display of the control word 1 (bits 0 to 15); see section „Control word“ in the Operating Instructions, Part 2  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r551 227Hex	**Control Word 2** Display of the control word 2 (bits 16 to 31); see section „Control word“ in the Operating Instructions, Part 2.  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r552 228Hex	**Status Word 1** Display of the status word 1 (bits 0 to 15); see section „Control word“ in the Operating Instructions, Part 2.  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r553 229Hex	**Status Word 2** Display of the status word 2 (bits 16 to 31); see section „Control word“ in the Operating Instructions, Part 2.  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
P554 * 22AHex	**Src ON/OFF1** Source of the 'ON/OFF1' command (Control word 1, bit 0) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: OFF1 1: not allowed 1001 CU binary input 1 1003: CU binary input 3 1010: PMU ON/OFF keys 2001: SST1, Word 1,Bit 0 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Note: When using the inputs of the serial IO system, values 4101 or 4201 are recommended. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0 i001=1010 i002=1001 P077=1,2 i001=2001 i002=1001 P077=3 i001=1003 i002=1001	2 / BR 2 / BR
P555 * 22BHex	**Src1 OFF2(coast)** Source 1 of the 'OFF2' command (Coasting; control word 1, bit 1) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: not allowed 1: condition for operation 1002: Binary input 1 of the CU board other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1002	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P556 * 22CHex	**Src2 OFF2(coast)** Source 2 of the 'OFF2' command (Coasting; control word 1, bit 1) Description see P555 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P557 * 22DHex	**Src3 OFF2(coast)** Source 3 of the 'OFF2' command (Coasting; control word 1, bit 1) Description see P555 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P558 * 22EHex	**Src1 OFF3(QStop)** Source 1 of the 'OFF3' command (quick stop; control word 1, bit 2) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: not allowed 1: condition for operation 1006 binary input 6 of CU board 1010: PMU OFF key other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 P077=0,1 i001=1 i002=1 P077=2,3 i001=1006 i002=1	2 / BR 2 / BR
P559 * 22FHex	**Src2 OFF3(QStop)** Source 2 of the 'OFF3' command (quick stop; control word 1, bit 2) Description see P558 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P560 * 230Hex	**Src3 OFF3(QStop)** Source 3 of the 'OFF3' command (quick stop; control word 1, bit 2) Description see P558 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6001	2 i001=1 i002=1	2 / BR 2 / BR
P561 * 231Hex	**Src InvRelease** Source of the 'inverter release' command (control word 1, bit 3) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: Inverter blocked 1: automatic release after wait times other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P562 * 232Hex	**Src RampGen Rel** Source of the 'ramp generator release' command (control word 1, bit 4) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: Ramp generator blocked 1: automatic release after wait times other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P563 * 233Hex	**Src RampGen Stop** Source of the ’ramp generator stop’ command (control word 1, bit 5) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: ramp generator stopped 1: ramp generator released other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P564 * 234Hex	**Src Setp Release** Source of the 'setpoint release' command (control word 1, bit 6) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: Ramp generator input is set to '0' 1: Setpoint at ramp generator input other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=1 i002=1	3 / BR 3 / BR
P565 * 235Hex	**Src1 Fault Reset** Source 1 of the 'reset' command (control word 1, bit 7) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: no source selected for reset 1: not allowed 1003 Binary input 3 of the CU board 1004: Binary input 4 of the CU board other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Note: The control command ‘acknowledge’ is edge triggered. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,1,2 i001=0 i002=1003 P077=3 i001=1004 i002=1003	2 / BR 2 / BR
P566 * 236Hex	**Src2 Fault Reset** Source 2 of the 'reset' command (control word 1, bit 7) Description see P565 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=0 i002=0	2 / BR 2 / BR
P567 * 237Hex	**Src3 Fault Reset** Source 3 of the 'reset' command (control word 1, bit 7) Description see P565 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=2001 i002=2001	2 / BR 2 / BR
P568 * 238Hex	**Src Jog1 ON** Source of the 'Jog 1' command (control word 1, bit 8) Details see section „Control word“ in the Operating Instructions, Part 2 Parameter values: 0: no Jog operation 1: not allowed 2001: SST1, Word 1, Bit 8 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=0 i002=0 P077=1,2 i001=2001 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P569 * 239Hex	**Src Jog2 ON** Source of the 'Jog 2' command (control word 1, bit 9) Description see P568 B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 i001=0 i002=0	2 / BR 2 / BR
P571 * 23BHex	**Src FWD speed** Source of the 'forward speed' command (control word 1, bit 11) Parameter values: 0: forward speed blocked 1: forward speed released 1010: PMU forward/reverse key 2001: SST1, Word 1, Bit 11 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Note: Both parameters P571 and P572 or the sources defined by them define which of the directions are really released:  B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=1 i002=1 P077=1,2 i001=2001 i002=1	2 / BR 2 / BR
P572 * 23CHex	**Src REV speed** Source of the 'reverse speed' command (control word 1, bit 12) Parameter values: 0: reverse speed blocked 1: reverse speed released 1010: PMU forward/reverse key 2001: SST1, Word 1, Bit 12 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Note: Welche Drehrichtungen wirklich freigegeben sind, wird über die beiden Parameter P571 und P572 bzw. über die Werte, die von den von diesen Parametern bestimmten Quellen geliefert werden, bestimmt: siehe P571. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=1 i002=1 P077=1,2 i001=2001 i002=1	2 / BR 2 / BR
P573 * 23DHex	**Src MOP UP** Source of the command 'motor operated potentiometer (MOP) UP' (control word 1, bit 13) Parameter values: 0: not active 1: not allowed 1010: PMU UP key 2001: SST1, Word 1, Bit 13 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6001	2 P077=0,3 i001=1010 i002=0 P077=1,2 i001=2001 i002=0	2 / BR 2 / BR

<table>
<tr><th>PNU

*:conf-P</th><th>Parameter Name in OP1

Description</th><th>Range
[Unit]
Value texts</th><th># of.
Indices
Factory Settings.</th><th>read: _/_
write: _/_</th></tr>
<tr><td>P574
*
23EHex</td><td>Src MOP DOWN
Source of the command ’motor operated potentiometer (MOP) DOWN’ (control word 1, bit 14)
Parameter values: 0: not active
1: not allowed
1010: PMU DOWN key
2001: SST1, Word 1, Bit 14
other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word)
B/R Parameter
Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0</td><td>0 to 6001</td><td>2
P077=0,3
i001=1010
i002=0

P077=1,2
i001=2001
i002=0</td><td>2 / BR
2 / BR</td></tr>
<tr><td>P575
*
23FHex</td><td>Src No Ext Fault1
Source of the message 'external fault 1' (control word 2, bit 27); L-level causes fault trip of the drive
Parameter values: 0: not allowed
1: no external fault 1
1001: Binary input 1 of CU board
other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word)
B/R Parameter
Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0</td><td>1 to 6001</td><td>2
P077=0,1
i001=1
i002=1

P077=2,3
i001=1001
i002=1</td><td>2 / BR
2 / BR</td></tr>
<tr><td>P576
*
240Hex</td><td>Src SetpDSetBit0
Source of bit 0 for the selection of the setpoint channel data set (SDS; control word 2, bit 16)
Parameter values: 0: SDS bit 0 has value of 0
1: SDS bit 0 has value of 1
other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word)
B/R Parameter
Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0</td><td>0 to 6004</td><td>2
i001=0
i002=0</td><td>3 / BR
3 / BR</td></tr>
<tr><td>P577
*
241Hex</td><td>Src SetpDSetBit1
Source of bit 1 for the selection of the setpoint channel data set (SDS; control word 2, bit 17)
Parameter values: 0: SDS bit 1 has value of 0
1: SDS bit 1 has value of 1
other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word)
B/R Parameter
Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0</td><td>0 to 6004</td><td>2
i001=0
i002=0</td><td>3 / BR
3 / BR</td></tr>
<tr><td>P578
*
242Hex</td><td>Src MotDSet Bit0
Source of bit 0 for the selection of motor data set (MDS; control word 2, bit 18)
Parameter values: 0: MDS bit 0 has value of 0
1: MDS bit 0 has value of 1
other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word)
Note: The motor data set can not be changed during operation; a change of this bit will only become effective in the ready state.
B/R Parameter
Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0</td><td>0 to 6004</td><td>2
i001=0
i002=0</td><td>3 / BR
3 / BR</td></tr>
</table>

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P579 * 243Hex	**Src MotDSet Bit1** Source of bit 1 for the selection of motor data set(MDS; control word 2, bit 19) Parameter values: 0: MDS bit 1 has value of 0 1: MDS bit 1 has value of 1 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Note: The motor data set can not be changed during operation; a change of this bit will only become effective in the ready state. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P580 * 244Hex	**Src FixSetp Bit0** Source of bit 0 to select a fixed setpoint FS (control word 2, bit 20) Parameter values: 0: FS bit 0 has value of 0 1: FS bit 0 has value of 1 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=1004	2 / BR 2 / BR
P581 * 245Hex	**Src FixSetp Bit1** Source of bit 1 to select a fixed setpoint FS (control word 2, bit 21) Parameter values: 0: FS bit 1 has value of 0 1: FS bit 1 has value of 1 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	2 / BR 2 / BR
P582 * 246Hex	**Src Sync Release** Source of the command 'release of synchronization' (control word 2, bit 22) Parameter values: 0: Synchronization not released 1: Synchronization released other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Condition: P163 = 2; TSY board B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P583 * 247Hex	**Src Fly Release** Source of the command 'release of flying restart' (control word 2, bit 23) Parameter values: 0: Flying restart not released 1: Flying restart released with every ON command other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Dependent parameter: Special behavior in combination with the auto restart function see P366 (auto restart). Condition: P163 = 0.1 (motor type = IEC, NEMA) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	2 / BR 2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P584 * 248Hex	**Src Drp/ProcReg Rel** Source of the „droop enable“ command and technology controller enable (control word2, bit24) Parameter values: 0: Technology controller not enabled droop not enabled 1: Technology controller enabled, if P526 or P531 <> 0; droop released if P248 <> 0 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR
P585 * 249Hex	**Src Reg Release** Source of the command 'release of the n/f controller' (control word 2, bit 25) Parameter values: 0: controller blocked 1: controller is released with pulse release other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Condition: P163 = 0, 4, 5 (V/Hz mode with speed control, speed and torque control). B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=1 i002=1	3 / BR 3 / BR
P586 * 24AHex	**Src No ExtFault2** Source of the message 'external fault 2' (control word 2, bit 26) L-Signal bewirkt eine Störabschaltung des Geräts, wenn • die Vorladung abgeschlossen ist (Umrichterzustand > 10) • und die Wartezeit von 200 ms nach Abschluß der Vorladung abgelaufen ist Parameter values: 0: not allowed 1: no external fault 2 1004: CU binary input 4 other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 i001=1 i002=1	2 / BR 2 / BR
P587 * 24BHex	**Src Master/Slave** Source of the switching command 'master / slave drive' (control word 2, bit 15) Parameter values: 0: Master drive: the control circuit operates with internal speed / frequency setpoints (n/f control) 1: Slave drive: the control circuit operates with torque setpoints (T control, see P486) other values: refer to permissible settings in Section „Control word“ in the Operating Instructions, Part 2 (PcD connection of the control word) Note: At f control (P163 = 3) the acceleration behavior depends on the protection ramp generator when the counter EMF model is not active. B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	2 i001=0 i002=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P588 * 24CHex	**Src No Ext Warn1** Source of the message 'external warning 1' (control word 2, bit 28) Parameter values: 0: not allowed 1: no external warning 1 1002: CU binary input 2 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 P077=0,1 i001=1 i002=1 P077=2,3 i001=1002 i002=1	3 / BR 3 / BR
P589 * 24DHex	**Src No Ext Warn2** Source of the message 'external warning 2' (control word 2, bit 29) Parameter values: 0: not allowed 1: no external warning 1 other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) B/R Parameter Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 6004	2 i001=1 i002=1	3 / BR 3 / BR
P590 * 24EHex	**Src Base/Reserve** Source of the switching command 'base / reserve settings' (control word 2, bit 30) Parameter values: 0: base setting 1: reserve setting 1005: Binary input 5 of the CU board other values: refer to permissible settings in Section „Control word" in the Operating Instructions, Part 2 (PcD connection of the control word) Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	- 1005	3 / BR 3 / BR
P591 * 24FHex	**Src ContactorMsg** Source of the message 'main contactor energized' (control word 2, bit 31) Parameter values: 0: not allowed 1: no message; main contactor must be energized within 120 msec after the related command 1001 to 1005: CU terminals 4101 to 4116: SCB-SCI1 terminals (serial I/O) 4201 to 4216: SCB-SCI2 terminals (serial I/O) 5001: TSY terminal 1 Notes: If the function is active, pulses are released as soon as the message is available. No base / reserve settings possible Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	1 to 5001	- 1	3 / BR 3 / BR
P600 * 258Hex	**Dst Ready for ON** Destination of the status bit 'ready for turn ON' (status word 1, bit 0) Power is ON, the drive may be turned on. Parameter values: Depending on the selected index all settings according to section „Status word" in the Operating Instructions, Part 2 (PcD connection of the status word) may be selected. Indices: i001: BD: selection of a base drive terminal i002: SCI : selection of a SCI1/2 terminal i003: TSY : selection of a TSY terminal Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P601 * 259Hex	**Dst Rdy for Oper** Destination of the status bit 'ready for operation' (status word 1, bit 1) The DC bus is charged, pulses may be released and the drive may be turned ON, respectively. Parameter values, indices: as P600. Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P602 * 25AHex	**Dst Operation** Destination of the status bit 'operation' (status word 1, bit 2) The drive is in operation. Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 P077=0,1 i001=1003 i002=0 i003=0 P077=2,3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P603 * 25BHex	**Dst Fault** Destination of the status bit 'fault' (status word 1, Bit 3) Note: for issuing the fault message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1002 i002=0 i003=0	2 / BR 2 / BR
P604 * 25CHex	**Dst NO OFF2** Destination of the status bit 'no OFF2 command' (status word 1, bit 4) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P605 * 25DHex	**Dst NO OFF3** Destination of the status bit 'no OFF3 command' (status word 1, bit 5) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P606 * 25EHex	**Dst ON blocked** Destination of the status bit 'turn-ON locked' (status word 1, bit 6) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P607 * 25FHex	**Dst Warning** Destination of the status bit 'warning' (status word 1, bit 7) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 P077=0,1 i001=0 i002=0 i003=0 P077=2,3 i001=1003 i002=0 i003=0	2 / BR 2 / BR
P608 * 260Hex	**Dst Deviation** Destination of the status bit 'set frequency = act. frequency' (status word 1, bit 8) - see P517; for details see section „Status word“ in Operating Instructions, Part 2 Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P610 * 262Hex	**Dst CompareFreq** Destination of the status bit 'compare frequency reached' (status word 1, bit 10 - see P512; for details see section „Status word“ in Operating Instructions, Part 2 Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P611 * 263Hex	**Dst Low Voltage** Destination of the status bit 'undervoltage' (status word 1, bit 11) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P612 * 264Hex	**Dst Contactor** Destination of the bit 'energize main contactor' (status word 1, bit 12) H-level: energize contactor! Note: If the message 'main contactor energized' is not selected (P591 = 1), the main contactor must be energized within 120 ms after the bit 'energize main contactor' is set. ATTENTION: For switching voltages between 50 and 230 V AC only the following relays may be used: - relay on the PEU or the PSU board (driven via binary output 1) or - the relays of the optional SCI boards, which are specified for 230 V AC (see section „Bypass- and output contactor“ in the Operating Instructions, Part 1) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=1001 i002=0 i003=0	3 / BR 3 / BR
P613 * 265Hex	**Dst RampGen act** Destination of the status bit 'ramp generator active' (status word 1, bit 13) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P614 * 266Hex	**Dst FWD speed** Destination of the status bit 'speed direction' (status word 1, bit 14) Meanings: H-level: forward L-level: reverse Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P615 * 267Hex	**PRT/FLR active** Destination of the status bit 'power ride thru (PRT) / flexible response (FLR) active' (status word 1, bit 15) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P616 * 268Hex	**Dst Fly Restart** Destination of the status bit 'flying restart active' and 'energization time running' (status word 2, bit 16) (refer to P189) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P617 * 269Hex	**Dst Sync OK** Destination of the status bit 'synchronized' (status word 2, bit 17) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=5001	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P618 * 26AHex	**Dst No Overspeed** Destination of the status bit 'no overspeed' (status word 2, bit 18) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P619 * 26BHex	**Dst Ext Fault 1** Destination of the status bit 'external fault 1' (status word 2, bit 19) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P620 * 26CHex	**Dst Ext Fault 2** Destination of the status bit 'external fault 2' (status word 2, bit 20) Note: • for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). • If an ON command is active, L-level causes fault trip after 200 msec. Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P621 * 26DHex	**Dst Ext Warning** Destination of the status bit 'external warning' (status word 2, bit 21) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P622 * 26EHex	**Dst i2t Drive** Destination of the status bit 'warning drive overload' (status word 2, bit 22); see r010 (drive utilization) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P623 * 26FHex	**Dst TmpFlt Drive** Destination of the status bit 'fault drive overtemperature' (status word 2, bit 23) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P624 * 270Hex	**Dst TmpWarnDrive** Destination of the status bit 'warning drive overtemperature' (status word 2, bit 24) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P625 * 271Hex	**Dst TmpWarnMotor** Destination of the status bit 'warning motor overtemperature' (status word 2, bit 25) Reason: The condition for the warning is met via the motor utilization calculation or via KTY84 sensor monitoring (see r008 (motor utilization), r009 (motor temperature), P360 (motor temperature warning), P362 (motor cooling), P363 (thermal time constant of the motor), P364 (duty cycle monitoring)). Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P626 * 272Hex	**Dst TmpFlt Motor** Destination of the status bit 'fault motor overtemperature' (status word 2, bit 26) Reason: The condition for the fault is met via the motor utilization calculation or via KTY84 sensor monitoring (see r008 (motor utilization), r009 (motor temperature), P360 (motor temperature warning), P362 (motor cooling), P363 (thermal time constant of the motor), P364 (duty cycle monitoring)). Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P627 * 273Hex	**Dst ProcReg A=S** Destination connection of the status bit „technological setpoint reached“ (status word 2, bit27) Parameter values, indices: As for P600 Type=L2; PKW: PKW format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P628 * 274Hex	**Dst PullOut/Blck** Destination of the status bit 'fault motor pulled out / blocked' (status word 2, bit 28) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P629 * 275Hex	**Dst ChrgRelay ON** Destination of the status bit 'charging relay energized' (status word 2, bit 29) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P630 * 276Hex	**Dst Sync Fault** Destination of the status bit 'synchronization fault' (status word 2, bit 30) Note: for issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=5002	3 / BR 3 / BR
P631 * 277Hex	**Dst Pre-Charging** Destination of the status bit 'charging active' (status word 2, bit 31) Parameter values, Indices: as P600 Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

11.10 Analog Input/Output

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P650 * 28AHex	**CU AnalogInConf** Configuration of the CU analog inputs; defines the kind of the analog input signals Parameter values / Terminals 27 and 30 / Terminals 29 and 32 0: -10 V ... + 10 V / - 20 mA ... + 1: 0 V ... + 10 V / 0 mA ... + 2: / + 4 mA ... + 20 mA Notes: • Only one signal can be wired per input; alternatively voltage or current signals can be evaluated. • Voltage and current signals must be connected to different terminals. • Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar. • At setting 2 an input current < 2 mA causes a fault trip (broken wire proof) • The offset scaling of the analog inputs is done via P652. Indices: i001: CU-1: configuration of analog terminal 1 i002: CU-2: configuration of analog terminal 2 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 2 -10V...+10V 0V...+10V 4mA...20mA	2 i001=0 i002=0	2 / BR 2 / BR
P651 * 28BHex	**CU AnaInSmooth** Filter time constant of the CU analog inputs. Indices: i001: CU-1: filter time constant of analog input 1 i002: CU-2: filter time constant of analog input 2 Type=O2; PKW: 1HEX=1.0ms PcD Gr.: 0	4 to 1000 [ms]	2 i001=4 i002=4	2 / BR 2 / BR
P652 28CHex	**CU AnalogIn Offs** Offset scaling of the CU analog inputs Description for setting see section „Analog inputs“ in the Operating Instructions, Part 2 Indices: i001: CU-1: offset of analog input 1 i002: CU-2 offset of analog input 2 Type=I2; PKW: 1HEX=0.001V PcD Gr.: 0	-20.000 to 20.000 [V]	2 i001=0.000 i002=0.000	2 / BR 2 / BR
P655 * 28FHex	**CU AnaOut ActVal** Actual value output via the CU analog outputs Description for setting: enter the parameter number of the quantities, which are to be issued. Indices: i001: CU-1: analog output 1 i002: CU-2: analog output 2 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	2 i001=218 i002=4	2 / BR 2 / BR
P656 290Hex	**CU AnalogOutGain** Proportional gain of the CU analog output, see section „Analog inputs“ in the Operating Instructions, Part 2 Parameter values: P656= calculated output voltage at when the displayed parameter has a value of 100% The output voltage V(out) is calculated according to: $V(out) = \frac{\text{value of displayed parameter}}{100\ \%} * P656 + P657$ Indices: i001: CU-1: calculated output voltage of analog output 1 i002: CU-2: calculated output voltage of analog output 2 Note: Maximum value of the output voltage: +/- 10 V Type=I2; PKW: 1HEX=0.01V PcD Gr.: 0	-320.00 to 320.00 [V]	2 i001=10.00 i002=10.00	2 / BR 2 / BR

<table>
<tr><th>PNU

*:conf-P</th><th>Parameter Name in OP1

Description</th><th>Range
[Unit]
Value texts</th><th># of. Indices
Factory Settings.</th><th>read: _/_
write: _/_</th></tr>
<tr><td>P657

291Hex</td><td>CU AnalogOutOffs
Offset of the CU analog outputs; see P656
Indices: i001: CU-1: offset of analog output 1
i002: CU-2: offset of analog output 2
Type=I2; PKW: 1HEX=0.01V PcD Gr.: 0</td><td>-100.00 to 100.00
[V]</td><td>2
i001=0.00
i002=0.00</td><td>2 / BR
2 / BR</td></tr>
<tr><td>P660

294Hex</td><td>SCI AnalogInConf
Configuration of the SCI analog inputs; defines the kind of the input signals
Parameter values | Terminals X428 / 3, 6, 9 | Terminals X428 / 5, 8, 11
0: | -10 V ... + 10 V | - 20 mA ... +
1: | 0 V ... + 10 V | 0 mA ... +
2: | | 4 mA ... + 20 mA
Notes:
• Only one signal can be wired per input; alternatively voltage or current signals can be evaluated.
• Voltage and current signals must be connected to different terminals.
• Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar.
• At setting 2 an input current < 2 mA causes a fault trip (broken wire proof)
• The offset scaling of the analog inputs is done via P662.
Indices: i001: Sl11 Slave 1, analog input 1
i002: Sl12 Slave 1, analog input 2
i003: Sl13 Slave 1, analog input 3
i004: Sl21 Slave 2, analog input 1
i005: Sl22 Slave 2, analog input 2
i006: Sl23 Slave 2, analog input 3
Condition: the related SCB board must be reported via P090 and P091, respectively
Type=O2; PKW: 1HEX=1.0 PcD Gr.: -</td><td>0 to 2

-10V...+10V
0V...+10V
4mA...20mA</td><td>6
i001=0
i002=0
i003=0
i004=0
i005=0
i006=0</td><td>3 / BR
3 / BR</td></tr>
<tr><td>P661

295Hex</td><td>SCI AnaInSmooth
Filter time constant of the SCI analog inputs;
Formula: T = 2 ms * 2^{P661}
Indices: see P660
Type=O2; PKW: 1HEX=1.0 PcD Gr.: -</td><td>0 to 15</td><td>6
i001=2
i002=2
i003=2
i004=2
i005=2
i006=2</td><td>3 / BR
3 / BR</td></tr>
<tr><td>P662

296Hex</td><td>SCI AnalogInOffs
Offset scaling of the SCI analog inputs
Description for setting see SCI manual
Indices: see P660
Type=I2; PKW: 1HEX=0.01V PcD: 4000HEX=160V</td><td>-20.00 to 20.00
[V]</td><td>6
i001=0.00
i002=0.00
i003=0.00
i004=0.00
i005=0.00
i006=0.00</td><td>3 / BR
3 / BR</td></tr>
<tr><td>P664
*
298Hex</td><td>SCI AnaOutActVal
Actual value output via SCI analog outputs
Description for setting:
Enter the parameter number of the quantities, which are to be issued; for details see SCI manual.
Indices: i001: Sl11 Slave 1, analog output 1
i002: Sl12 Slave 1, analog output 2
i003: Sl13 Slave 1, analog output 3
i004: Sl21 Slave 2, analog output 1
i005: Sl22 Slave 2, analog output 2
i006: Sl23 Slave 2, analog output 3
Condition: the related SCB board must be reported via P090 and P091, respectively
Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0</td><td>0 to 1999</td><td>6
i001=0
i002=0
i003=0
i004=0
i005=0
i006=0</td><td>3 / BR
3 / BR</td></tr>
</table>

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P665 299Hex	**SCI AnaOut Gain** Proportional gain of the SCI analog outputs Description for setting: see SCI manual Indices: see P664 Type=I2; PKW: 1HEX=0.01 PcD: 4000HEX=160V	-320.00 to 320.00	6 i001=10.00 i002=10.00 i003=10.00 i004=10.00 i005=10.00 i006=10.00	3 / BR 3 / BR
P666 29AHex	**SCI AnaOut Offs** Offset of the SCI analog outputs Indices: see P664 Type=I2; PKW: 1HEX=0.01V PcD: 4000HEX=160V	-100.00 to 100.00 [V]	6 i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	3 / BR 3 / BR

11.11 Communications

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P680 * 2A8Hex	**SCom1 Act Value** Actual value output via serial communication SST1 Defines, which parameter is to be transferred at which telegram address. Notes: • Word 1 should be set for status word 1 (r968) • For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred • The length (number of words) of the process data part of the telegram is set by P685, i001 Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P681 * 2A9Hex	**SCom2 Act Value** Actual value output via serial communication SST1 Defines, which parameter is to be transferred at which telegram address. Notes: • Word 1 should be set for status word 1 (r968) • For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred • The length (number of words) of the process data part of the telegram is set by P685, i001 Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P682 2AAHex	**SCB Protocol** SCB can be operated as • master for the SCI boards or as • serial communications board (see SCB manual). Parameter values: 0 = Master for SCI boards 1 = 4 wire USS 2 = 2 wire USS 3 = Peer to Peer 4 = not used 5 = not used Condition: SCB board must be reported via P090 and 0P91, respectively Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 5 SCI Module 4 wire USS 2 wire USS Peer 2 Peer Option 1 Option 2	- 0	3 / H BR 3 / H
P683 * 2ABHex	**SCom/SCB BusAddr** Bus address of the serial communication interfaces (see section „Serial interfaces“ in the Operating Instructions, Part 2) Indices: i001 = SCo1: bus address of serial comm. interface 1 (CU) i002 = SCB: SCB bus address, if P682 = 1, 2 i003 = SCo2: bus address of serial comm. interface 2 (CU) Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 31	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P684 * 2ACHex	**SCom/SCB Baud** Serial interfaces baud rate Parameter values: 1: 300 Baud; 2: 600 Baud; 3: 1200 Baud; 4: 2400 Baud; 5: 4800 Baud; 6: 9600 Baud; 7: 19200 Baud; 8: 38400 Baud; 9: 57600 Baud; 10: 76800 Baud; 11: 93750 Baud; 12: 115200 Baud; 13: 187500 Baud Notes: Maximum baud rate for SST1 (i001) 38400 for SST2 (i003) 38400 for SCB dependent on the version and selected protocol, refer to the SCB operating instructions) Indices: i001 = SCo1: baud rate of serial comm. interface 1 (CU) i002 = SCB: SCB baud rate, if P682 = 1, 2, 3 i003=SCo2: baud rate of serial comm. interface 2 (CU) Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 13	3 i001=6 i002=6 i003=6	3 / BR 3 / BR
P685 * 2ADHex	**SCom/SCB PCV** Number of words (16 bit) of the parameter data part in the net data block of the telegram. (see section „Serial interfaces“ in the Operating Instructions, Part 2) Parameter values: 0: no parameter data part in the telegram 3, 4 parameter data part is 3 (parameter identifier, Ind, parameter value), 4 words long 127 variable parameter data length for the transfer of parameter description and texts. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682 = 1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 127	3 i001=127 i002=3 i003=3	3 / BR 3 / BR
P686 * 2AEHex	**SCom/SCB # PrDat** Number of words (16 bit) of the process data part in the net data block of the telegram. (see section „Serial interfaces“ in the Operating Instructions, Part 2) Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682 = 1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 16	3 i001=2 i002=2 i003=2	3 / BR 3 / BR
P687 * 2AFHex	**SCom/SCB TlgOFF** Telegram OFF time of CU and SCB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: • Value 0: no monitoring, no fault trip; must be parameterized for sporadic (a-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. • If a TB is inserted in slot 2 and an SCB in slot 3, then the value in i002 is ineffective. Indices: i001 = SCo1: serial comm. interface 1 (CU) i002 = SCB: SCB, if P682 = 1, 2, 3 i003 = SCo2: serial comm. interface 2 (CU) Type=O2; PKW: 1HEX=1.0ms PcD: 4000HEX=1638.4ms	0 to 6500 [ms]	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P689 2B1Hex	**SCB Peer2PeerExt** Immediate transfer on of data received via the peer to peer protocol of SCB. Mark of these words of the received peer to peer telegram which are to be transferred on immediately. Parameter values: 0: no immediate transfer (only to CU) 1: immediate transfer (and passing to CU) Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram Condition: P688 = 3 (peer to peer protocol) Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 CU only Transfer	5 i001=0 i002=0 i003=0 i004=0 i005=0	3 / BR 3 / BR
P690 * 2B2Hex	**SCB Act Values** Actual value output via the serial communications interface of the SCB board; defines, which parameter is to be transferred at which telegram address. Notes: • Word 1 should be set for status word 1 (r968) • For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred • The length (number of words) of the process data part of the telegram is set by P685, index i002 Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram ATTENTION: if P682 = 3 (peer to peer protocol) a maximum of 5 words (i001 to i005) can be transferred Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR
P692 * 2B4Hex	**ResPonseTLGfail** Defines how the unit responds when a telegram fails. Parameter values: 0: Immediate fault trip 1: OFF3 (fast stop) and subsequent fault trip Note: This parameter is valid for all interfaces, where a telegram monitoring time is defined (SST1, CB/TB, SCB, SST2) Condition: The particular program monitoring time must be active. (P687 or P695 > 0) Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 1 Fault OFF3(fast stop)	-	3 / BR 3 / BR SW V1.3
P694 * 2B6Hex	**CB/TB Act Values** Output of analog values via CB or TB defines, which parameter is to be transferred at which telegram address. Notes: • Word 1 should be set for status word 1 (r968) • For double word parameters (type I4) the related parameter number must be entered at two subsequent words; otherwise only the most significant word will be transferred Indices: i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram ... i016 = W16: Word 16 of the (process data part of the) telegram Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	16 i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P695 * 2B7Hex	**CB/TB TlgOFFTime** Telegram lag time of CB and TB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: Value 0: no monitoring, no fault trip; must be parameterized for sporadic (non-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. Type=O2; PKW: 1HEX=1.0ms PcD: 4000HEX=1638.4ms	0 to 6500 [ms]	- 10	3 / BR 3 / BR
P696 2B8Hex	**CB Parameter 1** Communication Board parameter 1; see manual of the used communication board Description for setting: • Parameter is only needed if a communication board is reported (P090 or P091 = 1) • The communication board checks, if the set value is valid. • If the value is not accepted, the fault message 80 is issued with fault value 5 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P697 2B9Hex	**CB Parameter 2** Communication Board parameter 2; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P698 2BAHex	**CB Parameter 3** Communication Board parameter 3; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P699 2BBHex	**CB Parameter 4** Communication Board parameter 4; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P700 2BCHex	**CB Parameter 5** Communication Board parameter 5; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P701 2BDHex	**CB Parameter 6** Communication Board parameter 6; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P702 2BEHex	**CB Parameter 7** Communication Board parameter 7; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P703 2BFHex	**CB Parameter 8** Communication Board parameter 8; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P704 2C0Hex	**CB Parameter 9** Communication Board parameter 9; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P705 2C1Hex	**CB Parameter 10** Communication Board parameter 10; refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / H BR 3 / H
P706 2C3Hex	**CB Parameter 11** Communication Board parameter 11 Indices: i001 - i005 Refer to P696 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	5 i001=0 i002=0 i003=0 i004=0 i005=0	3 / H BR 3 / H

11.12 Diagnosis

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r720 2D0Hex	**SW Version** Software version of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: Software version of the PCB in position 1 (left) i002: Pos2: Software version of the PCB in position 2 (right) i003: Pos3: Software version of the PCB in position 3 (center) i004: Text: Software version of the text EPROM in position 1 i005: MWH: Software version CU sub-board MWH Note: The TSY board has no software code; the reported code is always '0.0' Type=O2; PKW: 1HEX=0.1 PcD Gr.: 0		5	3 /U BR
r721 2D1Hex	**SW Generat.Date** Software generation date of the CU board. Indices: i001= Year: CU Year i002= Mon.: CU Month i003= Day: CU Day i004= Y MW: MWH Year i005= M MW: MWH Month i006= D MW: MWH Day Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		6	3 /U BR
r722 2D2Hex	**SW ID** Expanded software version code of the PCBs in positions 1 to 3 of the electronic box (for factory use). Indices: i001: Pos1: Software code of the PCB in position 1 (left) i002: Pos2: Software code of the PCB in position 2 (right) i003: Pos3: Software code of the PCB in position 3 (center) i004: Text: Software code of the text EPROM in position 1 i005: MWH: Software code of the CU sub-board MWH Note: The TSY board has no software code; the reported code is always '0.0' Type=O2; PKW: 1HEX=0.1 PcD Gr.: 0		5	3 /U BR
r723 2D3Hex	**PCB Code** Identification code of the PCBs in positions 1 to 3 of the electronic box. Indices: i001: Pos1: PCB code of the PCB in position 1 (left) i002: Pos2: PCB code of the PCB in position 2 (right) i003: Pos3: PCB code of the PCB in position 3 (center) PCB codes: CU: 100 - 109 CB: 140 - 149 TB: 130 - 139 SCB: 120 - 129 TSY: 110 - 119 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		3	3 /U BR
r725 2D5Hex	**CalcTimeHeadroom** Calculation time headroom of the CU board CPU in % of the computing power; influenced by sampling time (P308) and pulse frequency (P761) (not vor VC), as well as the number activated unit functions. Analog Output: 100% @ Parameter Value=16384% Type=O2; PKW: 1HEX=1.0% PcD Gr.: 0	[%]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r730 2DAHex	**SCB Diagnosis** SCB diagnosis (all values in HEX display). Displayed numbers have an overflow at FF. The meaning of several Indices depends of the selected SCB protocol (P682). Indices: i001: fITC Number of error-free telegrams i002: Terr Number of error telegrams i003: Voff USS: Number of Byte-Frame-errors SCI boards: number of slave power outages i004: Toff USS: Number of Overrun-errors SCI boards: number of fiber optic link interrupts i005: PnoS USS: Parity error SCI boards: number of missing answer telegrams i006: STxL USS: STX-error SCI boards: number of search telegrams to accept a slave i007: ETX ETX-error i008: BcCC USS: Block-Check-error SCI boards: number of configuration telegrams i009: L/Te USS/Peer to Peer: incorrect telegram length SCI modules: required maximum number of terminals according to process data wiring (P554 to P631) . i010: T/An USS: Timeout SCI modules: required analog inputs / outputs according to process data wiring of the setpoint channel and actual value output via SCI (P664) . i011: Res1 Reserve i012: Res2 Reserve i013: Warn SCB/DPR warning word i014: Sl1? Information, if slave 1 needed and if yes, which type 0: no slave 1 needed 1: SCI1 2: SCI2 i015: Sl2? Information, if slave 2 needed and if yes, which type 0: no slave 2 needed 1: SCI1 2: SCI2 i016: IniF: with 'SCI modules': initialization fault Type=L2; PKW: 1HEX=1.0 PcD Gr.: 0		16	3 / H BR
r731 2DBHex	**CB/TB Diagnosis** For detailed information see manuals of the used communication or technology boards. Type=L2; PKW: 1HEX=1.0 PcD Gr.: 0		32	3 / H BR
P733 * 2DDHex	**Simulated OPerat** Simulated operation, allows test operation of the drive with de-energized DC bus. Parameter values: 0: no simulated operation 1: simulated operation Conditions: • 24 V auxiliary power supply must be provided • Drive must be connected to the mains via a main contactor, which is driven by the drive (see P612) Note: Simulated operation can only be selected, when the DC bus voltage (r006) is less than 5% of the rated DC bus voltage Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 off on	- 0	3 / BR 3 / B

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P735 * 2DFHex	**Trace TriggerPar** Parameter number of the signal which is to trigger the trace function; this function is realized with 8 channels. The tracer (TRC) is used to trace drive converter quantities from all up to a specific event. The trigger event is defined in P735 to P737. The quantity, which is to be traced, is defined in P738 and P739. Indices: i001 = Cha1: parameter number of the trigger signal, channel 1 i002 = Cha2: parameter number of the trigger signal, channel 2 i003 = Cha3: parameter number of the trigger signal, channel 3 i004 = Cha4: parameter number of the trigger signal, channel 4 i005 = Cha5: parameter number of the trigger signal, channel 5 i006 = Cha6: parameter number of the trigger signal, channel 6 i007 = Cha7: parameter number of the trigger signal, channel 7 i008 = Cha8: parameter number of the trigger signal, channel 8 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P736 * 2E0Hex	**Trace Trig.Value** Parameter value for the trigger condition. Parameter value of the trigger signal which will start or stop the trace function. Indices: i001 = Cha1: parameter value of the trigger signal, channel 1 i002 = Cha2: parameter value of the trigger signal, channel 2 i003 = Cha3: parameter value of the trigger signal, channel 3 i004 = Cha4: parameter value of the trigger signal, channel 4 i005 = Cha5: parameter value of the trigger signal, channel 5 i006 = Cha6: parameter value of the trigger signal, channel 6 i007 = Cha7: parameter value of the trigger signal, channel 7 i008 = Cha8: parameter value of the trigger signal, channel 8 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P737 * 2E1Hex	**Trace Trig.Cond.** Trigger condition for the trace function. Parameter values: 0: Trigger, when the value of the trigger parameter is < 736.x 1: Trigger, when the value of the trigger parameter is = 736.x 2: Trigger, when the value of the trigger parameter is > 736.x 3: Trigger with a fault trip 4: Trigger, when the value of the trigger parameter is <> 736.x Indices: i001 = Cha1: trigger condition for channel 1 i002 = Cha2: trigger condition for channel 2 i003 = Cha3: trigger condition for channel 3 i004 = Cha4: trigger condition for channel 4 i005 = Cha5: trigger condition for channel 5 i006 = Cha6: trigger condition for channel 6 i007 = Cha7: trigger condition for channel 7 i008 = Cha8: trigger condition for channel 8 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 TRC < TRC == TRC > TRC fault TRC <>	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P738 * 2E2Hex	**Trace Act.Values** Parameter number of the signal, which is to be recorded by the trace function Indices: i001 = Cha1: trace parameter channel 1 i002 = Cha2: trace parameter channel 2 i003 = Cha3: trace parameter channel 3 i004 = Cha4: trace parameter channel 4 i005 = Cha5: trace parameter channel 5 i006 = Cha6: trace parameter channel 6 i007 = Cha7: trace parameter channel 7 i008 = Cha8: trace parameter channel 8 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 999	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P739 * 2E3Hex	**Trace SamPl.Time** Sampling time for recording the trace values in multiples of the base sampling time (P308). Description for Setting: the sampling time is P739 * P308 Indices: i001 = Cha1: sampling time channel 1 i002 = Cha2: sampling time channel 2 i003 = Cha3: sampling time channel 3 i004 = Cha4: sampling time channel 4 i005 = Cha5: sampling time channel 5 i006 = Cha6: sampling time channel 6 i007 = Cha7: sampling time channel 7 i008 = Cha8: sampling time channel 8 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	1 to 200	8 i001=1 i002=1 i003=1 i004=1 i005=1 i006=1 i007=1 i008=1	3 / BR 3 / BR
P740 * 2E4Hex	**Trace Pretrigger** Defines the number of data recorded before and after the trigger condition. Example: a value of 40% means, that 40% of the data have been recorded before and 60% after the trigger condition. Indices: i001 = Cha1: sampling time channel 1 i002 = Cha2: sampling time channel 2 i003 = Cha3: sampling time channel 3 i004 = Cha4: sampling time channel 4 i005 = Cha5: sampling time channel 5 i006 = Cha6: sampling time channel 6 i007 = Cha7: sampling time channel 7 i008 = Cha8: sampling time channel 8 Type=O2; PKW: 1HEX=1.0% PcD Gr.: -	0 to 100 [%]	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
P741 * 2E5Hex	**TRC Start** Start command for trace function. A trace channel can only be started after completion of setting of ots parameters (P735 to P740 must have valid values). After the trace recording has been finished, the parameter is automatically reset. Parameter values: 0: trace channel stopped 1: trace channel has started Indices: i001 = Cha1: start channel 1 i002 = Cha2: start channel 2 i003 = Cha3: start channel 3 i004 = Cha4: start channel 4 i005 = Cha5: start channel 5 i006 = Cha6: start channel 6 i007 = Cha7: start channel 7 i008 = Cha8: start channel 8 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
r743 2E7Hex	**Fault n/f(act)** Frequency / speed actual value (r218) at time of tripping Type=I2; PKW: 1HEX=0.1Hz PcD Gr.: 1	[Hz]	-	2 / BR
r744 2E8Hex	**Fault dn/dt** Change of frequency / speed per sec at time of tripping Type=I2; PKW: 1HEX=0.01Hz PcD: 4000HEX=163.84Hz	[Hz]	-	2 / BR
r745 2E9Hex	**Fault Isq(act)** Actual value of the torque generating current component (r264) at time of tripping Type=I2; PKW: 1HEX=0.1A PcD Gr.: 2	[A]	-	2 / BR
r746 2EAHex	**Fault Out Volts** Actual value of the drive output voltage (r003) at time of tripping Type=O2; PKW: 1HEX=0.1V PcD Gr.: 3	[V]	-	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r747 2EBHex	**Fault CtrlStatus** Status of the control circuit (r150) at time of tripping Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r748 2ECHex	**TriP Time** Trip times (operating hour meter values, r013) Indices: Day Hours Seconds latest trip (1) i001=T1-d i002=T1-h i003=T1-s last reset trip(2) i004=T2-d i005=T2-h i006=T2-s (last+1) reset trip (3) i007=T3-d i008=T3-h i009=T3-s ... oldest saved trip (8) i022=T8-d i023=T8-h i024=T8-s Trip description by: r947 Fault number r949 Fault value r951 list of fault numbers P952 number of faults Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		24	2 / BR
P750 * 2EEHex	**TRC Data Block** Number of the trace data block for each trace channel, which can be read via r751 to r758. Indices: i001 = Cha1: data block number channel 1 i002 = Cha2: data block number channel 2 i003 = Cha3: data block number channel 3 i004 = Cha4: data block number channel 4 i005 = Cha5: data block number channel 5 i006 = Cha6: data block number channel 6 i007 = Cha7: data block number channel 7 i008 = Cha8: data block number channel 8 Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 255	8 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0	3 / BR 3 / BR
r751 2EFHex	**TRC Data Ch 1** Displays the trace data of channel 1. The block number of the trace data is set in P750. If all data of an array are requested via an automation interface in one order, P750.1 is automatically increased by 1 during the output. This allows an optimized reading of trace data. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r752 2F0Hex	**TRC Data Ch 2** Refer to r751 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r753 2F1Hex	**TRC Data Ch 3** Refer to r751 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r754 2F2Hex	**TRC Data Ch 4** Refer to r751 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r755 2F3ex	**TRC Data Ch 5** Refer to r751 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r756 2F4Hex	**TRC Data Ch 6** Refer to r751 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r757 2F5ex	**TRC Data Ch 7** Refer to r751 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR
r758 2F6Hex	**TRC Data Ch 8** Refer to r751 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR 3 / BR

11.13 Modulator

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P761 2F9Hex	**Pulse Frequency** Pulse frequency at asynchronous space vector modulation Description for setting: The setting range of the pulse frequency depends of the type of the drive and of settings of the control circuit ATTENTION: if the pulse frequency is increased, the maximum current (P173) may be reduced. If afterwards the pulse frequency is reduced again, the value of P173 will not be changed back. Note: the setting range of this parameter is also influenced by P092 (output filter). For active noise damping (P762 > 0), the pulse frequency is limited to min. 45*rated motor frequency (P107), otherwise to 30*P107 and up to P107 = 104 Hz to 2.5 kHz. MDS(4) Parameter Type=O2; PKW: 1HEX=0.1kHz PcD: 4000HEX=16.384kHz	1.5 to 16.0 [kHz]	4 i001=2.5 i002=2.5 i003=2.5 i004=2.5	3 / ABR 3 / A
P762 2FAHex	**SIMO Sound** changes the noise characteristics of the motor; at low pulse frequencies this may result in a noise reduction As a result of increased harmonics, when this function is activated, a minimum pulse frequency P761 must be set to 45*rated motor frequency. Only then can SIMO-Sound be enabled. Description for setting: the motor noise is significantly influenced by mechanical oscillations of the drive system; for that reason several settings must be tested. Parameter values: 0: not active 1: sound steps 1 2: sound steps 2 3: sound steps 3 4: sound steps 4 MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 4 OFF Sound 1 Sound 2 Sound 3 Sound 4	4 i001=0 i002=0 i003=0 i004=0	3 / BR 3 / BR
P763 2FBHex	**Max ModulatDePth** Maximum depth of modulation of the modulator; defines the maximum possible output voltage Description for Setting: • High output voltages can be reached by using the edge modulation mode at a high depth of modulation. Low parameter values prevent the change from space vector to edge modulation mode, the reachable output voltage is lower. • The depth of modulation at the change from space vector to edge modulation mode depends of the type of the drive. • Typical values @ 2.5 kHz are: for a rated drive current <= 186 A: about 87% for a rated drive current > 186 A: about 84%. • The change to edge modulation can be prevented via P769. Note: if a sine wave output filter is used (P092 = 1) the maximum depth of modulation is so far reduced, that the modulator only operates in space vector modulation mode. The effective modulation depth limit is displayed in P180. MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	20.0 to 96.0 [%]	4 i001=96.0 i002=96.0 i003=96.0 i004=96.0	3 / BR 3 / BR
r764 2FCHex	**Modulation DePth** Depth of modulation of the modulator Analog Output: 100% @ Parameter Value=1638.4% Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	[%]	-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P765 2FDHex	**ModDePth Headrm** Headroom of the depth of modulation Limit for the depth of modulation (r180) at steady state operation; at dynamic operation this limit may be exceeded up to the value of the maximum depth of modulation (r180). Related display parameter: r181 (maximum output voltage) MDS(4) Parameter Type=O2; PKW: 1HEX=0.1% PcD: 4000HEX=400%	0.0 to 10.0 [%]	4 i001=0.0 i002=0.0 i003=0.0 i004=0.0	3 / BR 3 / BR
P766 2FEHex	**Dead Time ComP.** Dead time compensation. Compensation time of the gating unit interlock Pre-set during automatic motor identification (P052 = 7, 8). Condition: P100 = 3 (motor type = sync.perm.) Setting instructions: • For positioning drives or to improve the smooth running characteristics at low frequencies, it may be practical to disable the compensation (P770 = 0). In this case, it is not permissible that P766 is reset, in order that the missing compensation voltage can be internally calculated from it. (Only for P163 = 3, 4, 5 vector control types). • To improve the smooth running characteristics for V/Hz modes (P163 = 0, 1, 2), the compensation of the interlock time can be changed. Type=O2 PKW: 1HEX=0.01µs PcD Gr.:0	0.00 to 25.55 [us]	- 1.50	3 / BR 3 / BR
P769 301Hex	**ModSystemRelease** Releases edge modulation systems. Parameter values: 0: all systems 1: edge modulation systems above 60 Hz 2: adge modulation systems above 100 Hz 3: no edge modulation systems MDS(4) Parameter Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 3 all syst. FLM from 60 Hz FLM from 100 Hz no FLM	4 i001=0 i002=0 i003=0 i004=0	3 / ABR 3 / A
P770 302Hex	**Deadtime comp.** Selects the deadtime compensation in the gating unit. The deadtime compensation eliminates voltage errors, which are obtained by the interlock times in the gating unit. Compensation is enabled/disabled during automatic parameter setting (P052 = 6) and during automatic motor identification (P052 = 7, 8). Parameter values: 0: No deadtime compensation in the gating unit 1: Deadtime compensation enabled in the gating unit Setting instructions: • For high pulse frequencies, for motors with low stator time constant (r274, positioning drives) and for long feeder cables, it may be practical to disable the compensation in order to improve the smooth running characteristics at low speeds. • In order to compensate the steady-state error in the stator resistance, for vector control types (P163 = 3, 4, 5), an addition transistor voltage is automatically internally added. The current controller dynamic performance is simultaneously increased. For frequency control (P163 = 3), the resonant damping P300 could also be additionally reduced. Type=O2; PKW: 1HEX: = 0.01 µs PcD Gr.: 0	0 to 1 off on	- 1	3 / BR 3 / BR

11.14 Factory Parameters

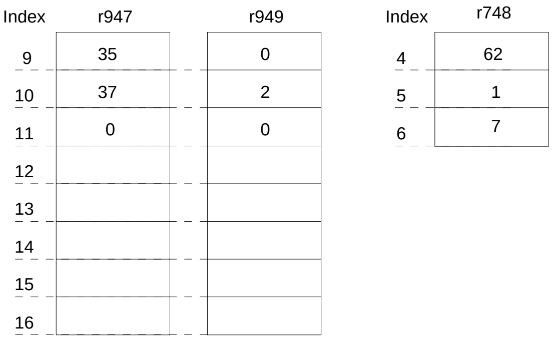
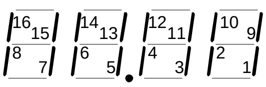
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P791 317Hex	**MWH RAM AccValue** Value of the memory cell of the MWH software Type=L2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / BR 4 / BR
P799 * 31FHex	**SPecial Access** Parameter for special access Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	0 to 65535	- 0	3 / BR 3 / BR

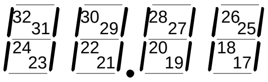
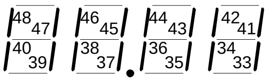
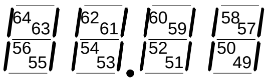
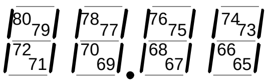
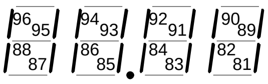
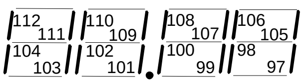
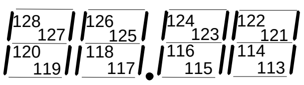
11.15 Special Parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P899 383Hex	**OP setting** Is used to set the drive converter address when several drive converters are controlled from one OP. Note: The parameter can only be displayed at the OP.		–	1 /UHABR 1 /UHABR

11.16 Profile Parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
P917 * 395Hex	**Change rePorts** Defines the interfaces, where active parameters are reported if they are changed. Parameter values: 0: none 1: output via dual port RAM (TB, CB) 2: output via serial comm. interface 1 (SCom1) 4: output via SCB with USS protocol 8: Output via serial comm. interface 2 (SCom2) Description for setting: enter the total of the figures which are related to the interfaces, which are to issue the message. Type=V2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 15	- 0	3 / B 3 / B
P918 396Hex	**CB Bus Address** Protocol depending bus address for communication boards; see manual of these boards Note: The communication board checks, if the set value is valid. If the value is not accepted, the fault message 80 is issued with fault value 5 Condition: P090 = 1 or P091 = 1 (communication board installed) Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 126	- 3	3 / H BR 3 / H
P927 * 39FHex	**Parameter Access** Release of interfaces for the parameterization; description see P053. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 63	- 6	3 / BR 3 / BR
P928 * 3A0Hex	**Src Base/Reserve** Source of the switching command 'base / reserve settings' (control word 2, bit 30); parameter is identical with P590 - description there Type=L2; PKW: PKW-Format(HEX)=Par Value PcD Gr.: 0	0 to 6004	- 1005	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r947 3B3Hex	**Fault Memory** Display of the faults which have occurred at the last 8 trips (r748); at every trip up to 8 faults can be saved, related to each of them a fault number (see list of faults, chapter 7) is related. For text display of the faults see r951. Indices: Fault 1 / Fault 2 / ... / Fault 8 latest trip (1): i001=F1-1, i002=F1-2 ... i008=F1-8 last reset trip (2): i009=F2-1, i010=F2-2 ... i016=F2-8 (last+1) reset trip (3): i017=F3-1, i018=F3-2 ... i024=F3-8 ... oldest saved trip (8): i057=F8-1, i058=F8-2 ... i064=F8-8 Notes: A value of '0' means 'no fault' Number of saved trips: see P952. Example of a trip: last reset trip (2)  Trip time (r748): after 62 days, 1 hour, 7 sec of operation Faults (r947): 35, 37 — Fault value (r949): not defined, 2 Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		64	2 / BR
r949 3B5Hex	**Fault Value** Fault values of the faults; allows a more detailed diagnosis at several faults. The fault values are saved in the same indices as the related fault numbers (r947) - see example at P947. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		64	3 / BR
r951 3B7Hex	**Fault Texts** List of fault texts; every fault text is saved in the index equivalent to its fault number. Example (see P947): Value of P947, i09 is '*35*'. The related fault was (P951, i*35*): 'Ext. Fault1'. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	2 / BR
P952 * 3B8Hex	**# of Faults** Number of saved trips (max. 8). If the parameter is set to '0', the diagnosis memory (r748 - trip times, r947 - fault number, r949 fault value) is cleared. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 8	- 0	2 / BR 2 / BR
r953 3B9Hex	**Warning Param1** If a warning (numbers 1 to 16) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r954 3BAHex	**Warning Param2** If a warning (numbers 17 to 32) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r955 3BBHex	**Warning Param3** If a warning (numbers 33 to 48) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r956 3BCHex	**Warning Param4** If a warning (numbers 49 to 64) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r957 3BDHex	**Warning Param5** If a warning (numbers 65 to 80) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r958 3BEHex	**Warning Param6** If a warning (numbers 81 to 96) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r959 3BFHex	**Warning Param7** If a warning (numbers 97 to 112 is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r960 3C0Hex	**Warning Param8** If a warning (numbers 113 to 128) is active, the related bar in the display is ON  Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r964 3C4Hex	**Drive ID** Drive ID Text string; contains information about the ID# (first 2 bytes of the string, used to identify the drive by Profibus) and about the drive type name (last 24 bytes of the string, used for display in visualization systems). A further 24 characters contain the software release and the date the software was generated Parameter values: 2 Bytes: ID#: 8022Hex 24 Byte: model name according to the drive type: MASTER DRIVES VC 24 Byte: Software release and date that the software was generated V1.3 day.month.year Note: The parameter cannot be selected at the PMU; for OP, the value cannot be displayed. Type=VS; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r965 3C5Hex	**Profile #** PROFIBUS specific parameter Note: The parameter cannot be selected at the PMU; for OP, the value cannot be displayed. Type=OS; PKW: 1HEX=1.0 PcD Gr.: 0		-	3 / BR
r967 3C7Hex	**Control Word 1** Display parameter of control word 1 (bit 0-15) Identical with r550 (control word 1) Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
r968 3C8Hex	**Status Word 1** Display parameter of status word 1 (bit 0 - 15) Identical with r552 (status word 1) Type=V2; PKW: 1HEX=1.0 PcD Gr.: 0		-	2 / BR
P970 * 3CAHex	**Factory Settings** Parameter reset to factory settings Parameter values: 0: Parameter reset: all parameters are reset to their original values (factory settings); after this the parameter is reset to '1'. 1: no parameter reset Note: This function can also be selected via P052=1. Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1 FactSetting Return	- 1	3 / B 3 / B
P971 * 3CBHex	**EEPROM Saving** Saves parameter values in the EEPROM with a transition of the parameter value from 0 to 1. The parameter must be manually reset to '0'. Parameter values: 0: no saving of parameter values 1: a transition from 0 to 1 saves the RAM values to the EEPROM Type=O2; PKW: 1HEX=1.0 PcD Gr.: -	0 to 1	- 0	3 / BR 3 / BR
r980 3D4Hex	**Par # List Pt1** List of the available parameter numbers; part 1 The parameter numbers are listed in a positive sequence. The first existing '0' shows, that no more parameter numbers are available. Index range: 1 to 116. As special function the value of i116 is the number of the parameter which contains the next following part of the list. If i116 has a value of '0' then there are no more parts of the list. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value texts	# of. Indices Factory Settings.	read: _/_ write: _/_
r981 3D5Hex	**Par # List Pt2** List of the available parameter numbers; part 2; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r982 3D6Hex	**Par # List Pt3** List of the available parameter numbers; part 3; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r983 3D7Hex	**Par # List Pt4** List of the available parameter numbers; part 4; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r984 3D8Hex	**Par # List Pt5** List of the available parameter numbers; part 5; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r985 3D9Hex	**Par # List Pt6** List of the available parameter numbers; part 6; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r986 3DAHex	**Par # List Pt7** List of the available parameter numbers; part 7; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r987 3DBHex	**Par # List Pt8** List of the available parameter numbers; part 8; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r988 3DCHex	**Par # List Pt9** List of the available parameter numbers; part 9; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r989 3DDHex	**Par # List Pt10** List of the available parameter numbers; part 10; see r980. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r990 3DEHex	**Par # List chg1** List of the changed parameters; part 1 The parameter numbers are listed in a positive sequence. The first existing ’0’ shows, that no more parameter numbers are available. Index range: 1 to 116. As special function the value of i116 is the number of the parameter which contains the next following part of the list. If i116 has a value of ’0’ then there are no more parts of the list. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r991 3DFHex	**Par # List chg2** List of the changed parameters; part 2; see r990. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0		116	3 / BR
r992 3E0Hex	**Par # List chg3** List of the changed parameters; part 3; see r990. Type=O2; PKW: 1HEX=1.0 PcD Gr.: 0	116	116	3 / BR

12 Fault and alarm messages

12.1 Fault messages

For each fault the following information is available:

Parameter	r947	Fault number
	r949	Fault value
	r951	Fault list
	P952	Number of faults
	r748	Fault time

If a fault code is not reset before the electronic supply is switched off, then the fault code will be present again, when the electronic supply is switched on again. The unit cannot be operated without resetting the fault message. (Exeption: Automatic restart has been selected, see P366).

Fault messages		
No.	**Fault description**	**Counter measures**
F001	**Contact. chckbck.** If a main contactor checkback signal is configured, a checkback signal was not received within 500 ms after the power-up command.	**P591 S.MC chckbck. sign.**, The parameter value must match the main contactor checkback signal connection. Check the main contactor checkback signal circuit. ☞ Section "Connecting-up" in the Operating Instructions, Part 1.
F002	**Pre-charging** When pre-charging, the minimum DC link voltage (**P071 Conv. supply voltage** ∗ 1.34) of 80 % was not reached. The maximum pre-charging time of 3 s was exceeded.	Check the supply voltage, Compare with **P071 Conv. supply volt.**.
F006	**DC link overvoltage** The unit was shutdown due to an excessive DC link voltage. Supply voltage - I DC voltage range I Shutdown threshold 208 V - 230 V I 280 V - 310 V I 412 V 380 V - 460 V I 510 V - 620 V I 819 V 500 V - 575 V I 675 V - 780 V I 1022 V 660 V - 690 V I 890 V - 930 V I 1220 V • **inverters connected in parallel (Size L)** **r949 = 1:** overvoltage in the DC link of the master **r949 = 2:** overvoltage in the DC link of the slave.	Check the supply voltage or the input DC voltage The converter operates in the regenerative mode without regenerative possibility. If the converter supply voltage is at the upper tolerance limit and it is operating under full load conditions, F006 can also be initiated when a line phase fails. Possibly; • **P464** increase decelaration time**,** • **P377** activate the V(d,max)-Controller (first check P071) • **P370** decrease the speed catch speed. • **P233 Pw(gen, max)** to be decreased (only with P163 = 3, 4 or 5)
F008	**DC link uvolt.** The lower limit of 76 % of the DC link voltage (**P071 Line Volts** ∗ 1.34) was fallen below. For enabled kinetic buffering, 61 %. DC link undervoltage in ‘standard’ operation (i.e. no SIMULATION). DC link undervoltage with active kinetic buffering and speed less than 10 % of the rated motor speed. It was a ‘brief supply failure’ which was only detected after the supply returned (WEA-flag).	Check • the supply voltage **P071 Line Volts** • of the input rectifier • of the DC link
F011	**Overcurrent** The unit was shutdown due to an overcurrent condition. The shutdown threshold was exceeded,	Check • the converter-output for short-circuit or ground fault • the load for an overload condition • whether the motor and converter are correctly matched • whether the dynamic requirements are too high.

No.	Fault messages Fault description	Counter measures
F012	**I too low** While the motor was being energized, the current did not rise i(sd,partial load)/8	Only for closed-loop-n/ f/ m control! If a motor is not connected; go into the simulation mode and check **P733 Simulation operation,** current sensing. Check the power section
F015	**Motor stall.** Motor has stalled or is locked: • by the ramp up or down time being too fast, the load change was for faster too great • the static load is too high • by a fault in the parameter for the pulse tacho pulse count P209 or in the scaling of the analog tacho P210. The fault is only generated after the time set in P520. To see if the drive is stalled or has pulled out, see P517 (actual-setpoint difference) and P518. With V/f-control the I(max)-control must be activated (P175). With n/f-control the torque limit (r150 bit7, bit8) or the internal frequency limit (r150 bit4) must be reached before this fault is activated. In the statusword of the control (r150), bit 15 will be set. Not valid with V/f-textile (P163 = 2) control.	• reduce the load • release the brake • increase the current limit • increase P520 stall time • increase the threshold for setpoint-actual comparator P517 ♦ only f/n/M-control (P163 = 3, 4, 5) • increase torque limits or the torque setpoint ♦ only n/M-control or V/f-control with speed loop: (P163 = 0, 4, 5) • check tacho feedback cables • check pulse tacho pulse count • check the scaling of the analog tacho • reduce the smoothing of the speed pre-control P216 (only n/M control) ♦ only f-control: (P163 = 3) • slow down the accelaration time (also P467) • increase current in the bottom of the frequency range (P202, P203, P204) • switch in the speed controller pre-control (P243>0) • set the EMF controller more dynamically to max. approx. 2 (P287,P289) • increase the threshold frequency for the EMF controller (P284) • subsitute for n-control with pulse tacho feedback ♦ only M-control (P163 = 5) or following drive: • feed the speed setpoint together with the speed feedback so that the setpoint-actual difference is always smaller than set at P517.
F017	**Motor not found** Motor was not found (for restart on the fly with tachometer).	Power-up - after coast down. If required, increase **P369, Restart search current**
F018	**F set restart** The found set-frequency was not able to be implemented, as the supplementary setpoint is too high.	Check the supplementary setpoint. Power-up after the motor has coasted to a stop.
F020	**Motor temp.** The motor limiting temperature has been exceeded. **r949 = 1** Motor temperature limit exceeded **r949 = 2** short circuit in the cable to the temperature sensor or sensor defect **r949 = 3** open circuit in the cable to the temperature sensor or sensor defect	Check the motor (load, ventilation, etc.). The actual motor temperature can be read in **r009 Motor_temp.** Check **P361 Mot Tmp Fault** Check the KTY84-input at connector -X103:41,42 for short-circuit or wire breakage.
F021	**Motor I2t** Parameterized limit value of the I^2t-monitoring for the motor was exceeded.	Check: **P363 Mot. temp.T1**

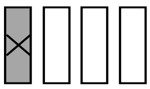
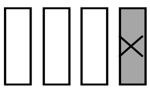
Fault messages		
No.	**Fault description**	**Counter measures**
F023	**Inverter temp.** The temperature limit of the inverter has been exceeded. **r949 = 1** The temperature limit of the inverter has been exceeded. **r949 = 2** Sensor 1: Wire break in the sensor wire or sensor is defect **r949 = 18** Sensor 2: Wire break in the sensor wire or sensor is defect **r949 = 34** Sensor 3: Wire break in the sensor wire or sensor is defect **r949 = 50** Sensor 4: Wire break in the sensor wire or sensor is defect	Measure the air intake and ambient temperature. Please observe the derating curves“ for ϑ >40 ºC. ☞ Section "Technical data" in the Instruction Manual, Part 1 Check; • whether fan -E1 is connected and is rotating in the correct direction. • that the air entry and discharge openings are not restricted. • temperature sensor at -X30
F025	**UCE ph. L1** There was an UCE shutdown in phase L1.	Check; • phase L1 for short-circuit or ground fault (-X2:U2 including motor). • that the **CU** is correctly inserted.
F026	**UCE ph. L2** There was an UCE shutdown in phase L2.	Check; • phase L2 for short-circuit or ground fault (-X2:V2 including motor). • that the **CU** is correctly inserted.
F027	**UCE ph. L3** There was an UCE-shutdown in phase L3.	Check; • phase L3 for short circuit or ground fault. (-X2:W2 -including motor). • that the **CU** is correctly inserted.
F028	**Supply phase** The frequency and amplitude of the DC link ripple indicates a single phase supply failure.	Check the supply voltage
F029	**Meas. val. sens.** The measured value sensing system has developed a fault. • (**r949 = 1)** Offset adjustment not possible in phase L1. • **(r949 = 2)** Offset adjustment not possible in phase L3. • **(r949 = 3)** Offset adjustment not possible in phases L1 and L3. • **(r949=65)** The analog inputs cannot be automatically adjusted	Defective measured value sensing Defective phase section (valve cannot block). Defective CU
F035	**Ext. fault1** External fault 1 input, which can be parameterized, was activated.	Check; • if there is an external fault • if the cable to the appropriate binary input is interrupted • **P575 S k fault ext.1** ☞ Section "Binary inputs" in the Operating Instructions, Part 2
F036	**Ext. fault2** External fault 2 input, which can be parameterized, was activated.	Check; • if there is an external fault • if the cable to the appropriate binary input is interrupted • **P586 S.k. fault ext. 1** ☞ Section „Binary inputs“ in the Operating Instructions, Part 2
F037	**Analog input.**	Check the connection to • analog input -X102:27, 28, 29. • analog input 2 -X102:30 ,31, 32. check parameters • **P650 CU-AE configuration** • **P651 CU-AE smoothing** • **P652 CU-AE offset** ☞ Section "Control terminal strip and serial interface" in the Operating Instructions, Part 2

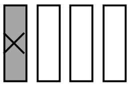
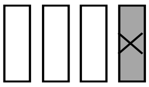
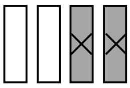
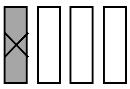
No.	Fault messages Fault description	Counter measures
F040	**AS internal** Incorrect operating status.	Replace the CU board (-A10)
F041	**EEprom fault** A fault occured when storing the values in the EEPROM.	Replace the CU board (-A10)
F042	**Comp. time** Computation time problems	Reduce computation time load, increase **sampling time P308** observe **r725 , free comp time**
F043	**Couping int.** Internal coupling error. One of the two coupling partners does not respond	Replace CU2 board (-A10) Check MWH - CU2 connection
F044	**Parcoupl.int** Error in the internal parameter coupling	Compare MWH software and CU2 software releases regarding the transfer parameters. Replace the CU board (-A10).
F045	**Opt.brd HW** A hardware fault occurred when accessing the option board	Replace CU Check the connection between the subrack and option boards
F046	**Par. con.**	Power the converter off and up again. Replace CU board (-A10).
F047	**Int. comp. time**	Replace CU board (-A10).
F048	**Int. pulse fr.**	Change **P761 pulse frequency**.
F049	**SW release** The EPROMs on the CU have different software releases. The language EPROM is compared with the CU software as well as the MWH software with the CU software.	• Replace language PROM • Replace MWH EPROM or in the case of new versions update
F050	**TSY init.** Error when initializing the TSY board	Check; • is the TSY board correctly inserted • does the parameter setting coincide with the boards used **P090 board, slot 2 - P091 board, slot 3** **r723 board code - 724 board ID**
F051	**Speed encod.** Digital tachometer or analog tachometer sensing are faulted.	Check parameters; • **P208 S. speed act. val.,** • **P209 pulse number,** • **P210 an. tach. norm.** • **P109 mot. pole pair no.** The product of P109 and P210 must be less than 19200. Check or replace the tachometer; or check the connection to the tachometer. Replace CU. ☞ Also refer to Instruction Manual 6SE70876X84-3DF0 analog tachometer interface or 6SE70876X84-3DA0 digital tachometer interface
F052	**n-cntr. input** The fault input on the TSY board was active.	Cancel tachometer with control track **P208 S. speed act. val.** Replace TSY. Check the tacho connection at the TSY board. Depending on the tacho type, several versions are possible, ☞ Also refer to the Instruction Manual 6SE7097-6CX84-0BA0 tachometer- and synchronizing board.
F053	**Tacho dn/dt** The permissible change value of the speed encoder signal **P215 dn(actual, permissible)** was exceeded.	Check the tacho feeder cables to ensure that they are intact. Check the tachometer screen ground. If required, change **P215**

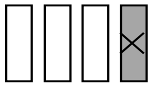
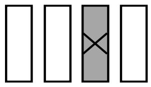
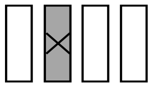
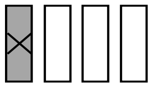
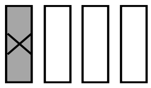
Fault messages		
No.	**Fault description**	**Counter measures**
F060	**MLFB missing** This is set, if the MLFB = 0 when INITIALIZATION is exitted (0.0 kW). MLFB = Order No.	After acknowledgement, in INITIALIZATION enter the correct MLFB in parameter **P070 MLFB (6SE70..)**. (Only possible with the appropriate access stages to both access parameters).
F061	**Incorr param.** A parameter entered when setting the drive is not in the admissible range (e.g. P107 mot. frequency (ies), P108 mot. speed (s)), P761 pulse frequency) (dependent on the control type).	Acknowledge the fault, and change the appropriate parameter value. The erroneous parameter is specified in r949 as fault value.
F062	**Multiparal.** Fault was identified in conjunction with the multi-parallel circuit	• Check ImPI and the communications card and if required, replace • Check the configuration and connections of the multi-parallel circuit • Check parameterization (**P070"MLFB(6SE70..)"**) • Replace CU (-A10). • Replace ImPI
F065	**INT1 telegram** A telegram was not received at interface 1 (SST1/USS protocol) during the telegram failure time	• Check the connection PMU -X300. • Check **P687.01"SST/SCB TLG-fail".** • Replace CU (-A10).
F066	**INT2 telegram** A telegram was not received at interface 2 (SST1/USS protocol) during the telegram failure time	• Check the connection CU -X100:1 to 5 • Check **P687.03"SST/SCB TLG-fail"**. • Replace CU (-A10).
F070	**SCB init.** Error when initializing the SCB board	**r 949 =1 or 2** • Check the SCB board to ensure that it is correctly inserted and that the slot coincides with assignment • **r723 board code , – r724 board ID and** • **P090 board slot 2, – P091 board slot 3** **r 949 =5** error, initialization data • Check parameters **P682 and P684** **r 949=6** time-out when initializing and **r949=10** error, configuration channel • Check parameters **P090, P091, P682 and P684**
F072	**SCB heartb.** SCB no longer processes the monitoring counter (heartbeat counter)	Replace SCB Check the connection between the subrack and option board
F073	**Aninput1 SL1** 4 mA at analog input 1, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 1) -X428:4, 5.
F074	**Aninput2 SL1** 4 mA at analog input 2, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 2) -X428:7, 8.
F075	**Aninput3 SL1** 4 mA at analog input 3, slave 1 fallen below	Check the connection, signal source to the SCI 1 board (slave 3) -X428:10, 11.
F076	**Aninput1 SL2** 4 mA at analog input 1, slave 2 fallen below	Check the connection, signal source to the SCI1 (slave1) -X428:4, 5.
F077	**Aninput2 SL2** 4 mA at analog input 2, slave 2 fallen below	Check the connection, signal source to the SCI 1 board (slave 2) -X428:7,8.
F078	**Aninput3 SL2** 4 mA at analog input 3, slave 2 fallen below	Check the connection, signal source to the SCI 1 board (slave 3) -X428:10, 11.

Fault messages		
No.	**Fault description**	**Counter measures**
F079	**SCB telegram** A telegram was not received from the SCB (USS, peer-to-peer, SCI) during the telegram failure time.	• Check the connections of SCB1(2). • Check **P687.01"SST/SCB TLG-fail".** • Replace SCB1(2). • Replace CU (-A10).
F080	**TB/CB init.** Error when initializing the board at the DPR interface	**r949 = 1** PT/CB not inserted or PT/CB board code incorrect **r949 = 2** PT not compatible **r949 = 3** CB not compatible **r949 = 4** error, initialization data Check the T300/CB board to ensure that is correctly inserted and that the slot and assignment coincide; • **P090 board slot 2, • P091 board slot 3** • **r723 board code, • r724 board ID** **r949 = 5** time-out at initialization **r949 = 10** error, configuration channel Checking the CB initialization parameters; • **P918 CB bus address,** • **696 to P705 CB parameters 1 to 10**
F081	**TB/CB heartb** TB or CB no longer processes the heartbeat counter	Replace TB or CB Check the connection between the subrack and option boards
F082	**TB/CB Tlgr.** No new process data were received from TB or CB during the telegram failure. .	• Check the connections of the CB/TB. • Check **P695 "CB/TB TLG-fail".** • Replace CB. • Replace TB.
F090	**Mess. param.** An error occurred when attempting to change a parameter from the standstill measurement or the rotating measurement (mot. Id.).	Power-down and -up again. If it re-occurs, replace the CU board.
F091	**Mess. time** The rotating measurement takes longer than programmed in a measuring status, possible causes: • load torque too high • load torque not uniform • Ramp-function generator inhibited	Remove the cause and re-start the measurement (power-up the converter again). Replace the CU board if it re-occurs.
F095	**Mess.n(set)** Due to entries for • Permissible phase sequence • Max. frequency, • Min. speed, • Changeover frequency between V- and I model, • Start of field weakening frequency, • Frequency suppression bandwidth, it was not possible to determine a permissible frequency range for the rotating measurement	There must be a 10 % frequency range, which lies above 110 % of the changeover frequency and below 0.9 * of the frequency at the start of field weakening. Possible counter-measures; • Permit both phase sequences • Increase the maximum frequency • Reduce the minimum speed, • Reduce the changeover frequency between V- and I model, • Reduce or remove the frequency suppression bandwidth.

Fault messages

No.	Fault description	Counter measures
F096	**Mess. abort** The rotating measurement was aborted due to an inadmissible interruption from outside.	The fault value in r949 defines the intervention type: 4 Setpoint inhibit 5 Changeover, setpoint channel 8 Unexpected change in the converter status 12 Motor data set changeover (for function selection "complete mot ID) 13 Changeover to the slave drive 14 Motor data set changeover to data set with V/f_chara. 15 Controller inhibit is set 16 Ramp-function generator inhibited 17 "Tacho test" selected for closed-loop frequency control Remove fault
F097	**Mess. meas. val.** The measurements of the nominal ramp-up time when optimizing the controller deviate too greatly Cause: a very unsteady torque	If required increase the torque limit up to 100 %
F098	**Mess. tachof** The rotating measurement identified a speed actual value signal error. The fault value defines the error type. The error message can be erroneously generated, if the drive speed is externally forced (e.g. completely locked drive generates the "no signal" message).	The fault value in r949 defines the intervention type 4 No speed signal available 5 Incorrect signal polarity 6 One track signal missing 7 Incorrect gain 8 Incorrect pulse number Check the measuring cables. ☞ Instruction Manual 6SE7087-6CX84-3DA0 digital tachometer interface. Check the parameters. **P208 S. speed act. val.** **P209 encoder pulse no.**
F100	**GRND init** During the ground fault test, a current not equal to 0 was measured, or a UCE or the overcurrent monitoring responded, although none of the valves were triggered.	The fault cause can be read-out of r358 "ground fault test result". Check the converter output for short-circuit or ground fault (-X2:U2, V2, W2 - including motor). Check that the CU board is correctly inserted. Frame sizes 1 and 2: Check the transistor modules on the PEU board -A23 for short-circuit. Frame sizes 3 and 4: Check the transistor modules -A100, -A200, -A300 for a short-circuit condition.
F101	**GRND UCE** During the ground fault test a UCE monitoring function responded in a phase in which no valve was triggered	Check the power section valves for a short-circuit, and for converters with fiber-optic gating, the gating unit wiring and the UCE checkback signals, for the correct assignment. **r358** can be interrogated to indicate which UCE monitoring has responded.
F102	**GRND phase** During the ground fault test, current flowed in one phase where none of the valves were triggered, or the UCE monitoring in the phase responded in which the valve was triggered.	Read-out the fault value from R949. The digit of the xth position indicates the valve, where the fault occured at power-up.  Digit x = 1 = L2+ x = 2 = L2– x = 3 = L1+ x = 4 = L1– x = 5 = L3+ x = 6 = L3– The digit of the xth position defines the phase, in which I *f* is 0, and thus a valve is defective (always conductive)  Digit x = 1 = Phase 1 Digit x = 3 = Phase 3 Digit x = 4 = Phase 1 and 3 Check the phase assembly for defective valves (always conductive)

Fault messages		
No.	**Fault description**	**Counter measures**
F103	**Ground fault** An earth fault or a fault in the power section is present. During the ground fault test, a current flows from the phase in which a valve was triggered, the overcurrent comparitor responded, or a UCE monitoring in a phase has responded in which a valve was triggered.	Read-out the fault value from r949. The digit of the xth position specifies the valve, which, when triggered, manifested the fault.  x = 1 = V+ x = 2 = V- x = 3 = U+ x = 4 = U- x = 5 = W+ x = 6 =W- Check the motor including feeder cable for ground faults. If there is no ground fault, check the power section for defective valves which remain conductive. The digit of the xth position defines the phase in which I *f* is 0, and therefore a valve must be defective (always conductive).  1 = Current in phase 1 (2 = UCE in phase 2 (V) 3 = Current in phase 3 (W 4 = Only overcurrent The motor speed should be less than 10 % of the rated speed during the ground fault test! 1) A ground fault is present in phase V, or there is a defective valve (always conductive).
F107	**MId I = 0** During the test pulse measurement a fault occured.	Read-out the fault value from r949. The digit of the xth position specifies the voltage direction at which the fault occurred. xx = 01: Both actual current valves remain 0 xx = 02: Connection between the motor-inverter, phase U is broken xx = 03: Connection between the motor-inverter, phase V is broken xx = 04: Connection between the motor-inverter, phase W is broken xx = 05: Actual current valve I1 remains 0 xx = 06: Actual current valve I3 remains 0  xx = 07: Valve U+ cannot be triggered xx = 08: Valve U- cannot be triggered xx = 09: Valve V+ cannot be triggered xx = 10: Valve V- cannot be triggered xx = 11: Valve W+ cannot be triggered xx = 12: Valve W- cannot be triggered xx = 13: Sign of I1 is wrong xx = 14: Sign of I3 is wrong xx = 15: Sign of I1 and I3 is wrong xx = 16: I1 and I3 swapped xx = 17: Sign of I1 and I3 wrong and I1 swapped with I3 The digit of the xth position specifies the voltage direction at which the fault occurred.  x = 0 = Single inverter x = 1 = Inverter 1 x = 2 = Inverter 2 x = 3 = Inverter 1 and 2 Check that all three motor feeder cables and motor windings are not interrupted. Check the connections between the CT and electronics. Check that the correct rating plate data have been entered for the motor data set valid during the measurement.

Fault messages		
No.	**Fault description**	**Counter measures**
F108	**Mess. unsym** During the DC measurement, the measurement results for the individual phases differ significantly. The fault value indicates which quantity(s) is(are) involved, and in which phase the largest deviation occurred.	Read-out fault val. from r949. The dig.of xth pos. spec. the following;  Transverse voltage too high x = 1 = phase R x = 2 = phase S x = 3 = phase T  Dev., stator resistance (1, 2, 3 as above)  Dev., rotor resistance (1, 2, 3 as above)  Dev., dead time compensation (1, 2, 3 as above)  Deviation, valve voltage (1, 2, 3 as above) Motor, power section or actual value sensing are significantly non-symmetrical.
F109	**Mess. R(L)** The rotor resistance, determined during the DC measurement, deviates too significantly from the value, which was calculated by the automatic parameterization from the rated slip.	• Rated speed or rated frequency were incorrectly entered • Incorrect pole pair number
F110	**Mess. di/dt** During the test pulse measurement, the current increased significantly faster than was expected. Thus, for the 1st test pulse, an overcurrent condition occurred within the first half of the minimum switch-on time.	• There could be a short-circuit between two converter outputs • The motor rating plate data were not correctly parameterized. • The motor leakage is too low.
F111	**Error e_fct.** An error occurred while calculating the equalization function.	
F112	**Unsym. l_sigma** The individual leakage test results deviate too significantly.	
F114	**Mess. OFF** The converter automatically aborted the automatic measurement as the time limit was exceeded up to converter power-up, or due to an OFF command during the measurement; the selection in **P052 function selection** is reset.	For **P052, function selection = 7,** restart **motor identification at standstill.** The on command must be provided within 20 s after the warning message **A078 standstill measurement appears.** Withdraw the off command and re-start the measurement.
F115	**KF internal**	Power-down the converter and electronics and power-up again.
F255	Fault in the NOVRAM	Power-down the converter and electronics and power-up again. If the fault occurs again, change the CU.

Fatal errors (FF):

Fatal errors are those hardware or software errors which no longer permit normal converter operation. They only appear on the PMU in the form "FF<Nr>". The software is re-booted by actuating any PMU key.

FFxx	Error message	Power-down the converter and power-up again. Call the responsible service department if a fatal error message is re-displayed.
FF01	**Time sector overflow** A non-removable time sector overflow was identified in the higher priority time sectors.	• Increase the sampling time **(P308)** or reduce the pulse frequency **(P761)** • replace CU
FF03	**Access error, option board** A fatal error occured when accessing the external option boards (CB, TB, SCB, TSY ..)	• replace CU • replace LBA • replace option board
FF06	**Stack-Overflow** Stack overflow.	• Increase the sampling time **(P308)** or reduce the pulse frequency **(P761)** • replace CU
FFxx	**Other fatal errors.**	• replace CU

12.2 Alarm messages

The alarm message is periodically displayed on the PMU by A=alarm and a 3-digit number. An alarm cannot be acknowledged. It is automatically deleted once the cause has been removed. Several alarms can be present. The alarms are then displayed one after another.

When the converter is operated with the OP1 operator control panel, the alarm is indicated in the lowest operating display line. The red LED additionally flashes (refer to the OP1 Instruction Manual).

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A001	**P953** —— 0	**Comp. time** CU board comp. time utilization too high	observe **r725 free computation time** increase **P308, sampling time** or
A014	**P953** —— 13	**Simulation** The DC link voltage is not equal to zero when the simulation mode is selected (P733 = 1).	• set P733 to zero • drop the DC link voltage (remove the inverter from the mains)
A015	**P953** —— 14	**Ext. alarm 1** External alarm input 1, which can be parameterized, was activated	External alarm! check whether the cable to the appropriate binary input is interrupted. Check **parameter P588 S alarm ext. 1.** ☞ Section "Binary inputs" in the Operating Instructions, Part 2
A016	**P953** —— 15	**Ext. alarm 2** External alarm input 2, which can be parameterized, was activated	External alarm! check whether the cable to the appropriate binary input is interrupted. Check **parameter P589 S alarm ext. 2.** ☞ Section "Binary inputs" in the Operating Instructions, Part 2
A020	**P954** —— 3	**Overcurrent** An overcurrent condition has occurred.	Check the driven load for an overload condition. - are the motor and converter matched - are the dynamic performance requirements exceeded.
A021	**P954** —— 4	**Overvoltage** A DC link overvoltage condition has occurred.	Check the supply voltage. Converter regenerates without regeneration possibility.
A022	**P954** —— 5	**Inv. temp.** The threshold for initiating an alarm, which can be parameterized, was fallen below.	Observe **r011 conv. temp.** Measure the air intake or ambient temperature. Observe the de-rating curves for ϑ >40 ºC ☞ Section "Technical data" in the Operating Instructions, Part 1 Check: - whether fan -E1 is connected and is rotating in the correct direction. - the air intake and discharge openings for blockage. - the temperature sensor at -X30.
A023	**P954** —— 6	**Mot temp** The threshold to initialize an alarm, which can be parameterized, was exceeded.	Check the motor (load, ventilation etc.). Read-out the actual temperature in **r009 mot.temp.** Check the KTY84 input at connector -X104:25,26 for a short-circuit condition.
A025	**P954** —— 8	**I2t- inv.** If the instantaneous load condition is maintained, then the inverter will be thermally overloaded.	Check whether the rated output current or the peak current (operating class II) is (was) too high. View **r010 conv. load**
A029	**P954** —— 12	**I2t motor** The parameterized limit value for the motor I2t monitoring was exceeded.	Motor duty cycle is exceeded! Check parameters: **P362 motor cooling** **P363 mot. temp. T1** **P364 mot. load limits**

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A033	**P955** —— 0	**Overspeed** Bit in **r553 status word 2** of the setpoint channel. The speed actual value has exceeded the maximum speed plus the selected hysteresis.	**P519 overspeed hys.** plus **P452 max. frequency (RDF)/ max. speed (RDF)** or **P453 max. frequency (LDF)/ max.speed (LDF)** was exceeded. Increase the parameter for the maximum frequencies, or reduce the regenerative load.
A034	**P955** —— 1	**Setpoint- act. val. diff.** Bit in the **r552 status word 2** of the setpoint channel. The absolute difference between the frequency setpoint and actual value is greater than the parameterized value and the control monitoring time has expired.	Check; - whether an excessive torque requirement is available. - whether the motor was dimensioned too small. increase **P517 setpoint-act. val. diff. frq./setp. act. diff. speed** or **P518 setp.-act. val. diff. time,**
A035	**P955** —— 2	**Wire breakage** Clockwise and/or counter-clockwise rotating field is not enabled, or a wire is interrupted (both control word bits are zero)	Check, whether the cable(s) to the appropriate binary input(s), **P572 S. clockwise phase sequence/P571 S. counter-clockwise phase sequence** is (are) interrupted or withdrawn. ☞ Section "Binary inputs" in the Operating Instructions, Part 2
A041	**P955** —— 8	**DC link overv.** The supply voltage is too high or the converter supply voltage (P071) is incorrectly parameterized. The Vd_max. controller is inhibited, as otherwise the motor would immediataly accelerate in operation up to the maximum frequency.	Check: - the supply voltage. **- P071 conv. supply volt**.
A042	**P955** —— 9	**Mot. stall/lock** Motor has stalled or is locked.	Reduce load. Check: - whether the drive is locked. - whether the drive has stalled.
A043	**P955** —— 10	**n-act. jump** The permissible rate of change of the speed encoder signal (P215) was exceeded..	Only for configured speed encoder **P208 S. speed act. val.** Check! Tacho cable for interruption. Tacho screen grounding.
A049	**P956** —— **0**	**No slave** For serial I/O (SCB1 with SCI1/2), no slave is connected, opto-cable interrupted or slaves have no power.	**P660 SCI AE config.** • Check slave • Check cable
A050	**P956** —— **1**	**Slave incorrect** For serial I/O, the slaves required according to the parameterized configuration are not present (slave number or slave type).	Check **P660 SCI AE config.**
A051	**P956** —— 2	**Peer bdrate** The peer-to-peer connection is too high or different baud rates have been selected.	Adapt the baud rate in conjunction with the SCB boards, **P684 SST/SCB baud rate**
A052	**P956** —— 3	**Peer PZD-L** for peer-to-peer connection, PZD length selected too high (>5).	Reduce the number of words **P686 SST/SCB PZD No.**
A053	**P956** —— 4	**Peer lng f.** For peer-to-peer connection, the PZD length of sender and receiver do not match.	Adapt the word length for sender and receiver **P686 SST/SCB PZD No.**

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A057	**P956** —— 8	**TB-Param** Technology Board Parameter occurs when a technology board is present, but parameterisation commands from the PMU, SST1 or SST2 are not answered by the technology board within 6 seconds	Change TB software
A065	**P957** —— 0	**WEA active** The WEA option **(P366)** always restarts the drive. A possibly parameterized power-up delay time **(P367)** expires, if restart-on-the-fly is not selected. For DC link pre-charging, there is **no** time monitoring, i.e. with an external electronics power supply, it is also switched-in again.	**CAUTION** Personnel could be endangered when the drive automatically restarts. Please check as to whether WEA (automatic restart) is reeally required. If required, change **P366 WEA**.
A066	**P957** —— 1	**fsyn > fmax** The measured target frequency of the external converter (or supply) is greater than the parameterized maximum frequency of the synchronizing converter.	Check that **P452 max. freq. (RDF)/ P453 max. frq. (LDF)** is correctly set, and the correct motor data set is selected **P578 S.MDS bit 0** .
A067	**P957** —— 2	**fsyn < fmin** The measured target frequency of the external converter (or supply) is less than the minimum frequency required for synchronizing.	Check; - **r393 sync. tar. frq.** - Synchronizing cable
A068	**P957** —— 3	**fsyn<>fset** The setpoint frequency of the synchronizing converter is significantly different from the measured target frequency of the external converter (or supply). The permissible deviation can be set in **P389**.	Adjust the complete setpoint (main- and supplementary setpoints) to the target frequency displayed in monitoring parameter **r393**.
A069	**P957** —— 4	**RFG active** Synchronizing is not started as long as the ramp-function generator in the synchronizing converter setpoint channel is active. This alarm is only output if synchronization has been selected.	Wait until acceleration has been completed. Check that **P462 ramp-up time** **P463 units ramp-up time,** have been correctly set.
A070	**P957** —— 5	**Sync. error** This alarm is output, if the phase difference goes outside the synchronizing window **(P 391)** after synchronization.	The alarm can only be deleted after synchronization has been exited
A071	**P957** —— 6	**TSY missing** An attempt was made to start synchronization with either the synchronizing board not inserted or not parameterized.	Insert theTSY board in the subrack, and parameterize **P090 board slot 2** or **P091 board slot 3**.
A076	**P957** —— 11	**t-comp lim.** The determined compensation time was limited to 0.5µs - 1.5µs.	Converter and motor outputs are too different. Check motor data entries **P100 to P109**.
A077	**P957** —— 12	**r-g limit** The measured resistance is limited to the max. value of 49%.	Converter and motor outputs are too different. Check motor data entries **P100 to P109**.
A078	**P957** —— 13	**Stands.meas** The standstill measurement is executed when the converter is powered-up. With this measurement, the motor can align itself several times in any direction of rotation.	If the standstill measurement can be executed without any danger: Power-up the converter.

Alarm No.	Parameter No. —— Bit No.	Description	Counter-measures
A079	**P957** —— 14	**Meas. inv. stop** The rotating measurement was aborted, or cannot start because the inverter stop command is present.	Enable the converter **P561 S. inv. enable** , enable inverter or restart the measurement by powering-up the converter.
A080	**P957** —— 15	**MotId:Dr.M.** When the converter is powered-up, the rotating measurement automatically accelerates the drive. The drive can then only be externally controlled in a very restricted fashion.	If the standstill measurement can be executed without any danger: Power-up the converter.
A081.. **A096**	**r958** —— 0...15	**CB alarm** Refer to the User Manual, CB board	
A097.. **A112**	**r959** —— 0...15	**TB alarm 1** Refer to the User Manual, TB board	
A113.. **A128**	**r960** —— 0...15	**TB alarm 2** Refer to the User Manual, TB board	

13 Logbook

The logbook must be kept up-to-date by the operating personnel

All service- and maintenance work carried-out on the converter should be briefly entered into the logbook.

Continuous entries are important for maintenance and could be significant when it comes to warranty claims.

The logbook is available as file on the SIMOVIS floppy disk supplied, and it can be printed-out at any time.

Format	File name
WINWORD 6.0	LOG_VC.DOC
WRITE	LOG_VC.WRI

Location:			Unit Order No.: Serial No.:	
	Date	Name	Department	Signature
Start-up settings				
Start-up settings change				

No.	Date/time	Name/department	Fault- and diagnostic messages	Measures

14 Index and Abbreviations

14.1 Index

14.2 List of abbreviations

A	Alarm
AA	Analog output
AC	Alternating current
AE	Analog input
AFE	Active front end
AS	Sequence control
ASIC	Application specific integrated circuit
ASM	Asynchronous motor
ATI	Beliebig sinnvoll/sinnloser Kommentar
AWG	American wire gauge
BA	Binary output
BC	Bypass contactor
BE	Binary input
BF	Type of construction
CAN	Controller area network
CB	Communication board (option)
CU	Control unit
CUA	Control unit AFE (control unit of AFE)
DC	Direct current
DPR	Dual-port-RAM
DPRAM	Dual-port-RAM
EA	First run-up
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMF	Electromotive force
EPROM	Erasable programmable read-only memory
ESD	Electrostatic sensitive devices
F	Fault
FC	Frequency control (control version of SIMOVERT MASTER DRIVES)
FF	Fatal fault
FI	Fault current
FSW	Fixed setpoint
G/R	Basic/reserve
GSST(1/2)	Basic drive converter serial interface (1/2)
H	High (binary signal level)
HLG	Ramp-function generator
HTL	High-voltage transistor logic

HW	Hardware
I/O	Input/output
IGBT	Insulated gate bipolar transistor
IGD	IGBT gate drive
IVI	Inverter interface
KIP	Kinetic buffering
L	Low (binary signal level)
LBA	Local bus adapter (option)
LED	Light emitting diode
LSB	Least significant bit
MC	Main contactor
MDS	Motor data set
MLFB	Machine-readable product designation (machine-readable designation)
MSB	Most significant bit
NN	Sea level
OP(1)	Operation panel (1)
Par	Parameter
PC	Personal computer
PEU	Power electronic unit
PG	Programming unit (programmer)
PKW	Parameter ID value
PMU	Parameterization unit
PROFIBUS	Process field bus
PS	Power supply
PSU	Power supply unit
PWE	Parameter value
PZD	Process data
Q	Source
RC	Combination, resistor ® and capacitor (C)
RDS	Reserve data set
RFG	Ramp-function generator
SC	Servo control (control version of SIMOVERT MASTER DRIVES)
SCB(1/2)	Serial communication board (option)
SCI(1/2)	Serial communication Interface (1/2)
SDS	Setpoint data set
SL	Slave
SM	Synchronous motor
SMD	Surface mounted device

SML	Snubber module low
SMU	Snubber module up
SST1/2	Serial interface 1/2
SW	Software
TB	Technology board (option)
TLG	Telegram
TRC	Trace
TSY	Tacho and synchronization (option)
TTL	Transistor-Transistor-Logic
UCE	Voltage (V) collector->emitter (desaturation signal of the transistors)
UMR	Drive converter
USS	Universal serial interface
VC	Vector control (control version of SIMOVERT MASTER DRIVES)
VDU	Voltage-dividing-unit
VS	Precharging contactor
Vsa	Line supply voltage components in the a axis
Vsb	Line supply voltage components in the b axis
VSB	voltage sensing board (line supply voltage sensing board)
WEA	Automatic restart function
WR	Inverter
X9	Terminal strip on the PEU (types A to D), PSU1 (types E to H) and PSU2 (types J to M)
ZK	DC link

The following editions have been published so far:

Edition	Internal Item Number
AA	475 200.4000.76 J AA-76
AB	A5E00863451

Version AB consists of the following chapters:

Chapter		Changes	Pages	Version date
0	General	First edition	10	08.96
1	Control terminal strip and serial interface	reviewed edition	6	02.07
2	Operator control	First edition	4	08.96
3	General explanation of the terminology and functional scope of the unit	First edition	2	08.96
4	Start-up	First edition	12	08.96
5	Process data	First edition	26	08.96
6	Interfaces	First edition	16	08.96
7	Open-loop and closed-loop control types	First edition	3	08.96
8	Start-up functions	First edition	16	08.96
9	Functions (software)	First edition	21	08.96
10	Function diagrams	First edition	19	08.96
11	Parameter list	First edition	92	08.96
12	Fault and alarm messages	reviewed edition	14	02.07
13	Logbook	First edition	1	08.96
14	Index and abbreviations	First edition	5	08.96

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