SIEMENS

SIMOVERT MASTERDRIVES

Operating Instructions

Active Front End (AFE)
Construction type E to L

Edition: AD

6SE7187-6AX80-2AA0

These Operating Instructions are valid for software release V2.0.

We reserve the right to make changes to functions, technical data, standards, drawings and parameters.

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

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Contents

1 Definitions and Warnings

Qualified personnel

For the purpose of this documentation and the product warning labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up, operation and maintenance of the product. He or she must have the following qualifications:

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

DANGER

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

WARNING

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

CAUTION

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

NOTE

For the purpose of this documentation, "Note" indicates important information about the product or about the respective part of the documentation to which special attention is drawn.

WARNING

Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the warnings can thus result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment

This personnel must be thoroughly familiar with all warning and maintenance procedures contained in this documentation.

The successful and safe operation of this equipment is dependent on correct transport, proper storage and installation as well as careful operation and maintenance.

NOTE

This documentation does not purport to cover all details on all types of the product, 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 documentation shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of SIEMENS AG. The warranty contained in the contract between the parties is the sole warranty of SIEMENS AG. 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 board contains 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 parts, insulated desktops, articles of clothing manufactured from man-made fibers.

Boards must only be placed on conductive surfaces.

Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes or 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 aluminium foil.

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

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

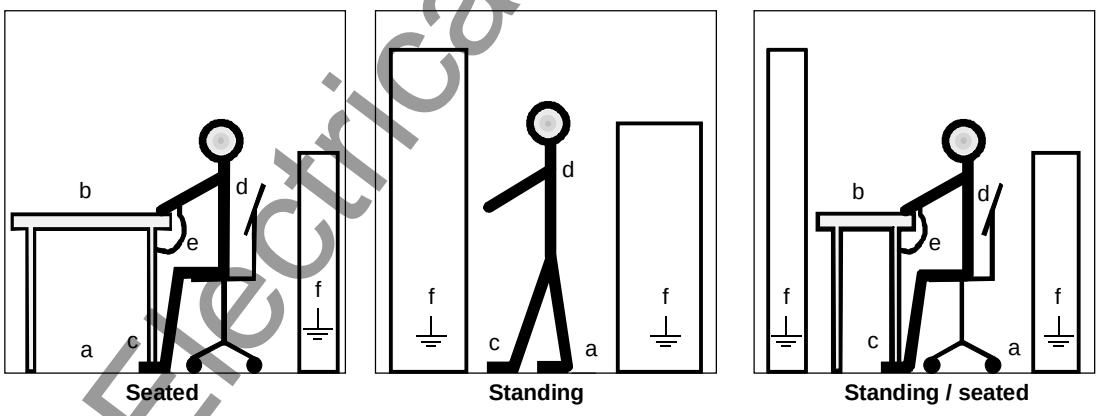


Fig. 1-1 ESD protective measures

Safety and Operating Instructions for Drive Converters

(in conformity with 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 involving transport, installation and commissioning as well as maintenance must be carried out **by qualified personnel** (observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC Report 664 or DIN VDE 0110 and national accident prevention rules).

For the purposes of these basic safety instructions, "qualified 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 mounting in electrical installations or machinery.

In the case of installation in machinery, commissioning of the drive converter (i.e. commencement of normal operation) is prohibited until the machinery has been proven to conform to the provisions of EC Directive 89/392/EEC (Machinery Directive). The provisions of EN 60204 also apply.

Commissioning (i.e. the start of normal operation) is admissible only where conformity with the EMC Directive (89/336/EEC) has been established.

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

The technical data as well as information concerning the supply conditions can be found on the rating plate and in the documentation and must be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use must be carefully followed.

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 and/or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatically sensitive components which are liable to damage through improper use. Electronic 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 installation in accordance with EMC requirements, such as screening, grounding, location of filters and wiring, are contained in the drive converter documentation. These instructions also apply to drive converters bearing a CE marking. Observance of the limit values required by the 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 monitoring and protective devices in accordance with the relevant applicable safety requirements, e.g. legislation governing technical equipment, accident prevention rules, etc. Changes to the drive converters by means of the operating software are permissible.

After disconnection of the drive converters from the voltage supply, live appliance parts and power terminals must not be touched immediately because of the risk of residual capacitor charges. In this respect, the appropriate safety notices on the drive converter must be observed.

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

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

Keep these safety instructions in a safe place!

2 Description

Range of application

SIMOVERT MASTERDRIVES AFE (Active Front End) are power electronics devices of compact design. They operate as a rectifier unit for the 6SE70 SIMOVERT MASTERDRIVES inverters. They can also be used for reactive power compensation. The AFE generates an adjustable DC supply from a three-phase supply. This voltage is kept constant within a range which can be specified, even if the inverter regenerates back into the line supply. The following voltage ranges for the DC output (DC link voltage) are provided:

DC 600 V to 727 V	at line voltage of	3 AC 380 V (-20 %) to 460 V (+5 %)
DC 758 V to 909 V	at line voltage of	3 AC 480 V (-15 %) to 575 V (+5 %)
DC 948 V to 1090 V	at line voltage of	3 AC 600 V (-12 %) to 690 V (+5 %)

Product versions

SIMOVERT MASTERDRIVES AFE are available in the following versions:

1. AFE rectifier/regenerative feedback units
   These consist of:
   - a SIMOVERT MASTERDRIVES DC device (inverter) with CUSA control board,
   - a line filter (Clean Power Filter)

   The basic circuit is illustrated in Fig. 2-1.
2. AFE converters
   These consist of an AFE rectifier/regenerative feedback unit and a SIMOVERT MASTERDRIVES DC device as a motor inverter (see Fig. 2-4).

Mode of operation

The AFE has, contrary to conventional diode- or thyristor rectifier and regenerative feedback units, an inverter with IGBT modules. Thus, the line current can be controlled sinusoidally, i.e. the harmonics fed back into the line supply are minimal.

The AFE is suitable for coupling several inverters to a common DC busbar. This allows energy to be transferred between motoring and generating drives, thus providing a power-saving feature.

One or several inverters can be connected at the output. The sum of the active inverter power may not exceed the rated AFE output. The latter condition must be noted in planning the overall system.

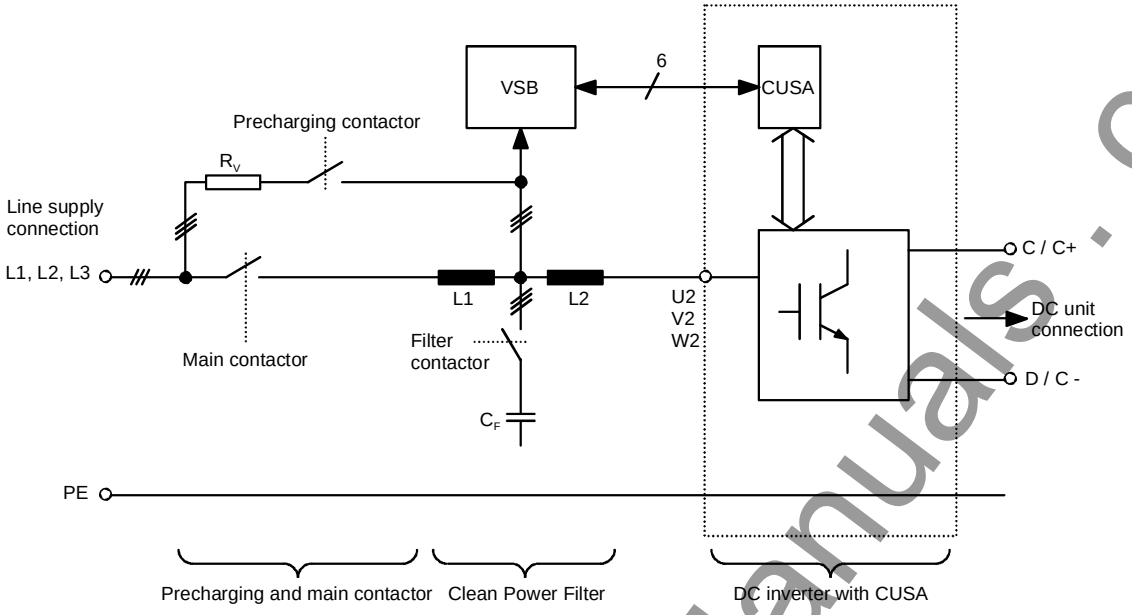


Fig. 2-1 Basic circuit

The operating principle of the Active Front End can be illustrated by the single-phase equivalent circuit diagram shown in Fig. 2-2. Purely sinusoidal quantities have been assumed for the sake of the example. The supply is represented in ideal form by voltage source $\underline{V}_{line}$ and the AFE by a voltage source $\underline{V}_{AFE}$ and a reactor L. Voltage source $\underline{V}_{AFE}$ supplies a variable voltage, thereby allowing line current $\underline{I}_{line}$ to be set. Reactor L absorbs the differential voltage $\underline{V}_L = \underline{V}_{line} - \underline{V}_{AFE}$, allowing the desired line current $\underline{I}_{line} = \underline{V}_L/j\omega L$ to flow. If you wish to set the line current $\underline{I}_{line}$, for example, in phase with the line voltage, then voltage source $\underline{V}_{AFE}$ need merely produce a suitable voltage, as illustrated by the phasor diagram in Fig. 2-3.

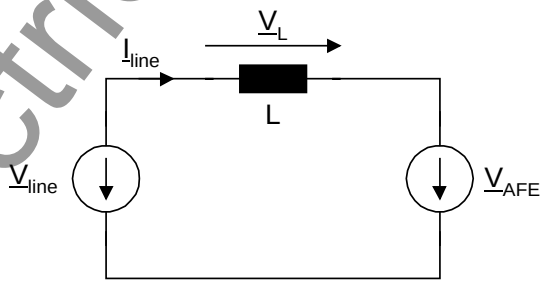


Fig. 2-2 Single-phase equivalent circuit diagram of the AFE

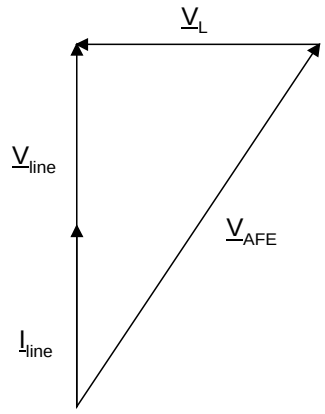


Fig. 2-3 Phasor diagram for cosφ = 1

$$\underline{V}_{AFE} = \underline{V}_{line} - \underline{V}_{L} = \underline{V}_{line} - j\omega L \cdot \underline{I}_{line}$$ (equation 1)

The same principle applies in the three-phase system if the single-phase quantities $\underline{V}_{line}$, $\underline{I}_{line}$ and $\underline{V}_{AFE}$ are replaced by the appropriate space vector $\underline{v}_{line}$, $\underline{i}_{line}$ and $\underline{v}_{AFE}$.

The required three-phase voltage source $\underline{V}_{AFE}$ is simulated by a SIMOVERT MASTERDRIVES (pulse) inverter with integrated CUSA control board. The active power which is absorbed or output by the mains supply is transferred by the line-side inverter to the DC side. The inverter thus fulfils the function of a rectifier/regenerative feedback unit. The line-side SIMOVERT MASTERDRIVES inverter is capable of switching between rectification and regeneration with pulse frequency dynamic response. Load impulses caused by the motor inverter in the DC link are also compensated with pulse frequency dynamic response. "Pulse frequency dynamic response" in this context means that the closed-loop control can actively intervene after a maximum delay of 333 µs, corresponding to a pulse frequency of 3 kHz.

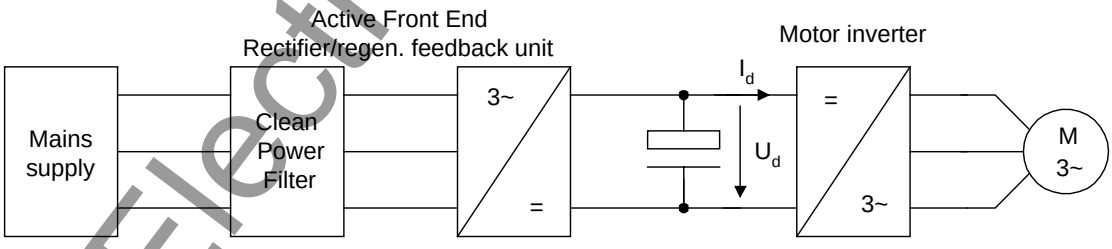


Fig. 2-4 Block diagram of an Active Front End converter

Due to the pulsed mode of operation of the inverter, harmonics in the pulse frequency range and multiples of the pulse frequency occur in addition to the desirable fundamental which sets the line current. The **Clean Power Filter** filters the harmonics out of the current and voltage so as to ensure minimum phase effects on the system irrespective of the prevailing supply conditions. Low-frequency harmonics (e.g. 5th or 7th order) are hardly generated at all (typically < 0.1 % of rated voltage). A block diagram of an AFE converter can be seen in Fig. 2-4. AFE rectifier/regenerative feedback units are available for multi-motor drives on request.

The AFE operates on the principle of a step-up controller, i.e. DC link voltage V_d is always greater than the peak rated voltage value. By actively switching the AFE, it is also possible to keep the DC link voltage at a constant value. This is performed on the AFE by a DC link voltage controller which specifies a line current setpoint. The line current is then regulated to a sinusoidal waveform by means of a high-speed vector current controller.

Line voltage dips can be bridged in voltage step-up operation without altering the DC link voltage value. This can be achieved up to 65 % of rated line voltage without additional components on condition that the power balance defined by Equation 2 can be maintained.

$$\sqrt{3} \cdot V_{line} \cdot I_{max} = V_d \cdot I_d \qquad \text{(Equation 2)}$$

To bridge line voltage dips below 65 % of rated line voltage, the auxiliary power supply must be supported by an external UPS or similar to prevent the contactors from dropping out.

The **Line Current Management** function reduces the reactive current if maximum current has been reached, thus ensuring that the DC link voltage and necessary active power are maintained for as long as possible.

The AFE can of course regenerate reactive power (inductive and capacitive) back to the system. In this respect, it is possible to choose between a constant power factor cosφ (from 0.8 ind. to 0.8 cap.) or a specific reactive power value Q in kVAr. The reactive power can be specified as 0 % to 140 % of the AFE rated apparent power (Equation 3).

$$Q[Var] = \frac{Q[\%] \cdot \sqrt{3} \cdot V_{line} \cdot I_{rated}}{100} \qquad \text{(Equation 3)}$$

Operation and control options

The unit can be controlled and operated via

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

When networked with automation systems, the converter is controlled by means of optional interfaces and technology boards.

Supply voltage sensing

The supply voltage is sensed using the analog board VSB (Voltage Sensing Board) via the two analog inputs on control board CUSA. Furthermore, the 24 V power supply is monitored on this board and a relay provided to control the main contactor.

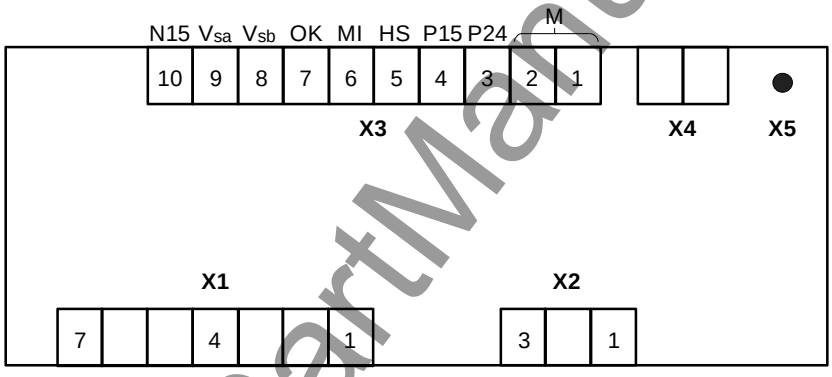
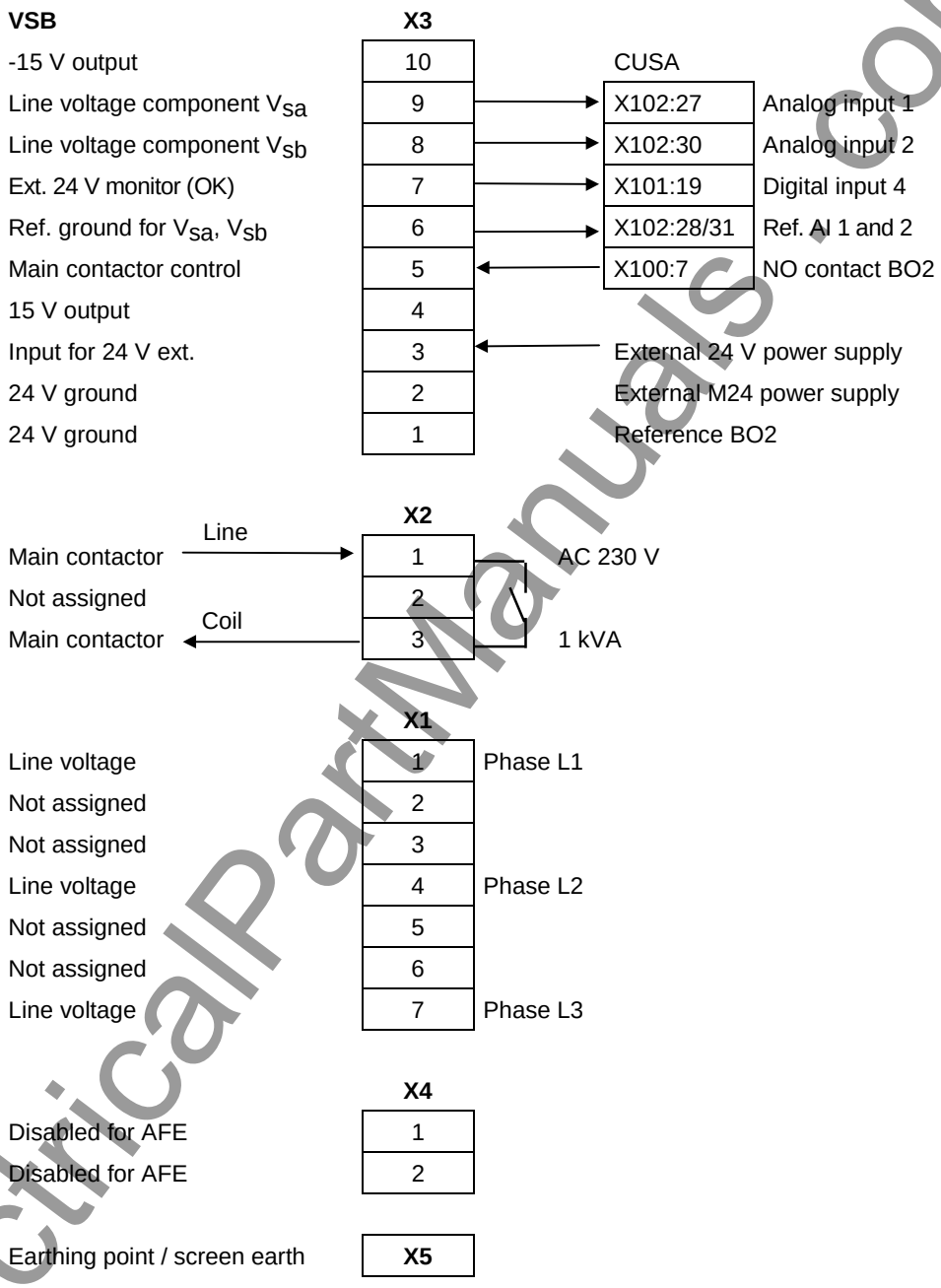


Fig. 2-5 View of option board VSB

Screened cables must be used to make the connection between the VSB board (connector X3) and the CUSA.
The screen must always be bonded over a large area at both cable ends.

For safety reasons, the main contactor is always controlled via binary output 2 and the precharging contactor via binary output 1. Digital outputs 1 and 2 may not be parameterized for other purposes. The two analog inputs are also permanently assigned to line supply voltage sensing and therefore cannot be used for other functions.

Connector assignments



3 Initial start-up

Preparatory measures

- Forming: The DC link capacitors will need to be formed if the AFE has been permanently switched off or not connected at all for more than one year (see Section "Forming").
- Switch on incoming supply or electronics supply for unit with front panel closed.

The AFE is supplied with "Factory settings" (see Section "Parameter List") and access level 2 (standard mode), i.e. the AFE data match the device type defined by the MLFB (order no.) (device is booted).

The converter parameters must be set according to Section "Start-up parameterization".

For a more detailed description of displays and methods by which the AFE can be parameterized and operated via the PMU, please refer to Section "Parameter inputs via PMU".

NOTE

In the event of input errors, it is possible to branch to the appropriate sequence steps at any time subject to the current access level setting (P051) and, in some instances, a function selection (P052). Owing to background calculations, it is advisable to check and/or execute the parameters and function selections after the entry point once again!

4 Installation in Conformance with EMC Regulations

The following points must be noted:

Grounding

The mode of operation of this electrical equipment inevitably produces radio interference. This should be taken back to the source via the lowest possible resistance (ground connection cross-section = phase cross-section).

When installing the converter and optional RI suppression filters, utilize the best possible grounding option (e.g. mounting plate, grounding cable, ground bar). Connect all conductive housings to one another via the largest possible surface area.

As regards RI suppression, it is the contacting surface, rather than the cross-section (note safety regulations in the event of fault), which is important. This is because high-frequency interference currents do not flow through the full cross-section, but mainly along the outer surface of a conductor.

Shielding

In order to reduce noise and ensure adherence to the applicable radio interference levels, is it necessary to

- use shielded cables between the converter output and motor,
- install shielded control cables and
- install control cables and power cables separately with a minimum distance of 20 cm between them.

The shield must make a solid 360° connection at both ends to ground potential.

Where control leads and power cables cross, they must be laid at an angle of 90°.

AFE rectifier/regenerative feedback units are designed for operation in an industrial environment (second environment according to EMC product standard EN 61800-3). The Clean Power Filter reduces the phase effects on the system to such a degree that additional RI suppression measures are not required.

To eliminate the effects of other loads, the application note in Fig. 4-1 must be observed.

RI suppression filters must be fitted on converter equipment installed outside industrial environments.

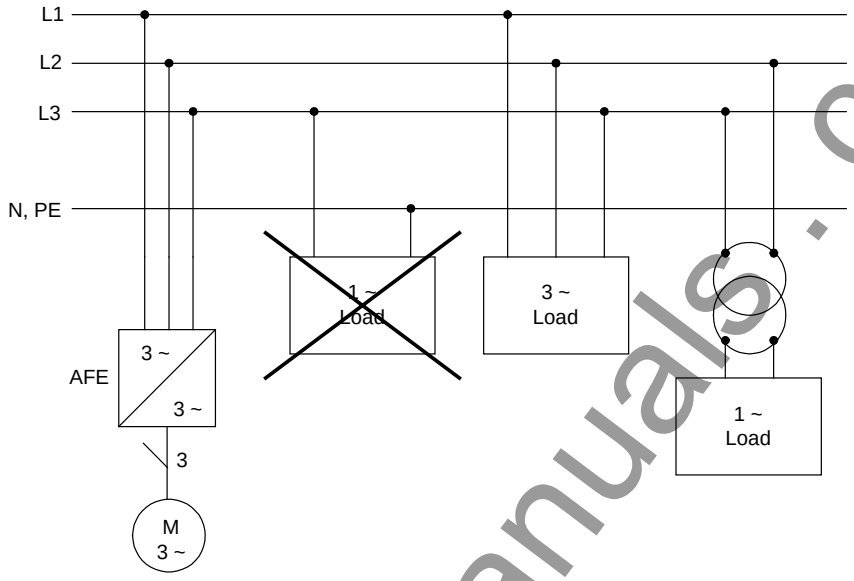


Fig. 4-1 Application note relating to AFE and single-phase loads

5 Connecting-up

WARNING

SIMOVERT MASTERDRIVES converters are operated at high voltages.
The equipment must always be disconnected from the supply before any work is carried out!
Only qualified personnel should be allowed to work on this equipment!
Non-observance of the safety instructions can result in death, severe personal injury or substantial property damage.

Owing to the DC link capacitors, the equipment may remain at a hazardous voltage for up to 5 minutes after disconnection of the power supply. For this reason, wait for at least 5 minutes before commencing work on the converter or DC link terminals.

Voltage may be present at the power and control terminals even when the motor is stopped.

When working on the open converter, remember that live parts are exposed.

The user is responsible for ensuring that all equipment is installed and connected up in accordance with the approved codes of practice of the country concerned and any other regional or local codes that may apply. Special attention must be paid to proper conductor sizing, fusing, grounding, isolation and disconnection measures and to overcurrent protection.

5.1 Control terminals

Standard terminals

The basic version of the converter features the following control terminals on the CUSA board:

- Control terminal strips X100, X101 and X102 on CU electronics board
- Connection for OP1S operator control panel
- One serial interface (USS bus, RS485)
- Serial interfaces RS485 and RS232 (SST1) on PMU X300

ESD symbol 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.
See also ESD precautions outlined in Section "Definitions and warnings".

Connectors for 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 to the connectors (recommended: 0.5 mm^2 (AWG: 20)). The connectors can be identified by the pin numbers (Table 5-1), connector positions on the board are shown in Fig. 5-1.

Two screen clamps and four cable ties are required from the loose components supplied to connect the control cables.

Connector X9 is needed to control the pre-charging operation and to connect an external power supply.

Connector		Label								
X100	eight-pin, coded	1	2	3	CU	6	7	8		
X101	eight-pin, coded	13	14	15	CU	18	19	20		
X102	ten-pin	25	26	27	28	CU	31	32	33	34

Table 5-1

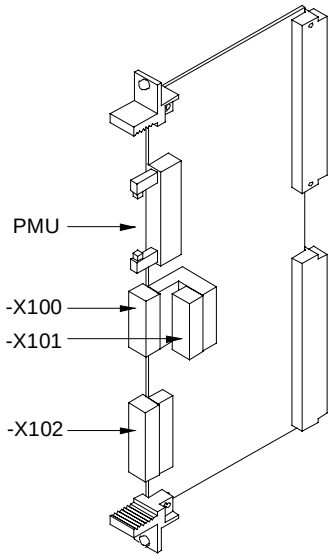


Fig. 5-1 View of CU

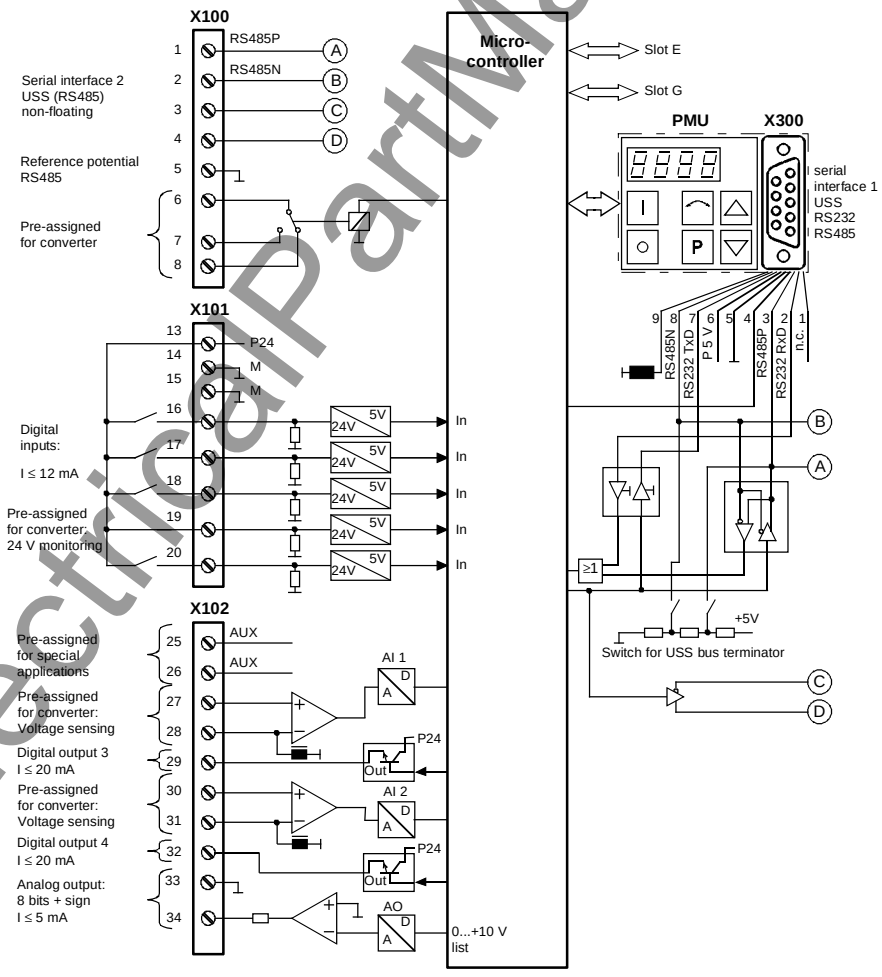


Fig. 5-2 View of standard terminals

5.2 Connecting up 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.

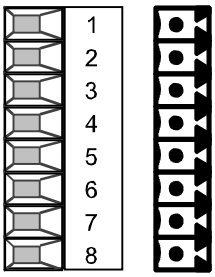
For drives wired in approved factories, internal wiring practices which achieve acceptable noise immunity results may be used for drive connections.

Control and power cables must cross each other at an angle of 90°.

5.3 Terminal assignments

X100 control terminal strip

The terminals on the control terminal strip are as follows:



Terminal	Name	Function
1		Transmit and receive line -RS485, differential input / output, positive (RS485/T+)
2		Transmit and receive line -RS485, differential input / output, negative (RS485/T-)
3		Transmit output RS485 Standard, differential output, positive (RS485T+)
4		Transmit output RS485 Standard, differential output, negative (RS485T-)
5 *)	M RS485	Reference potential RS485
6		Digital output 2, (changeover) reference contact
7		Digital output 2, (changeover) NO contact
8 **)		Digital output 2, (changeover) NC contact

Possible cross-section: 1.5 mm² (AWG 16)

In the assembled state, terminal 1 is at the top.

*) An identical interface to the type on connector -X100 is available on connector -X300 on the parameterizing unit. Only one of these two interfaces may be used, see Section "Interfaces".

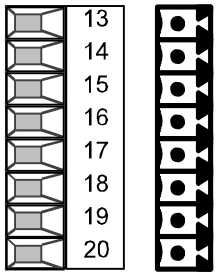
Digital output 1 is available on -X9:4.5

**) Load capability of digital outputs:
AC 60 V, 60 VA, cos φ = 1
AC 60 V, 16 VA, cos φ = 0.4
DC 60 V, 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.

Table 5-2 Control terminal strip X100

X101 control terminal strip



The terminals on the control terminal strip are as follows:

Terminal	Name	Function	Range
13	P24 AUX	Aux. voltage supply	DC 24 V / 150 mA
14	M24 AUX	Reference potential	0 V
15		Reference potential for digital inputs 1 to 5 with ext. signal voltage	
16		Digital input 1	Signal sensitivity of digital inputs: • H = 24 V (13 V to 33 V) • I_{max} = 15.7 mA • L = 0 V (– 0.6 V to 3 V)
17		Digital input 2	
18		Digital input 3	
19 *)		Digital input 4	
20		Digital input 5	

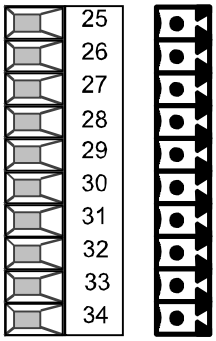
Possible cross-section: 1.5 mm² (AWG 16)

In the assembled state, terminal 1 is at the top.

*) Must be used to monitor the ext. 24 V supply P576.1 = 1004; P576.2 = 1004).

Table 5-3 Control terminal strip X101

X102 -control terminal strip



The terminals on the control terminal strip are as follows:

Terminal	Name	Function	Range
25	Assigned	Analog input 3	0 V to 5 V (for SIPCON only)
26	Assigned	Analog input 4	0 V to 5 V (for SIPCON only)
27	Assigned	Analog input 1	0 V to ± 10 V
28	Assigned	Reference potential for analog inputs 1, 3	
29		Digital output 3	I_{max} = 20 mA
30	Assigned	Analog input 2	0 V to ± 10 V
31	Assigned	Reference potential for analog inputs 2, 4	
32		Digital output 4	I_{max} = 20 mA
33 *)		Reference potential for analog output 1, digital output 3, digital output 4	
34 *)		Analog output 1	0 V to 10 V Rating ≤ 5 mA equals > 2 kΩ

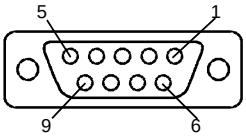
Possible cross-section: 1.5 mm² (AWG 16)

*) NOTE:
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 5-4 Control terminal strip X102

X300 serial interface

A serial connection to an automation unit or PC can be made via connector X300 on the PMU. The unit can therefore be controlled and operated from the central control station or control room



Pin	Name	Function	Range
1	n.c.	Not assigned	
2	RS232 RxD	Receive data via RS232	RS232
3	RS485 P	Data via RS485	RS485
4	RTS	Request to send, for direction reversal with interface converters	
5	M5V	Reference potential for P5V	0 V
6	P5V	5 V aux. voltage supply	+5 V, Imax = 200 mA
7	RS232 TxD	Transmit data via RS232	RS232
8	RS485 N	Data via RS485	RS485
9		Reference potential for RS232 or RS485 interface (with RF suppression for EMC)	

Table 5-5 Serial interface X300

5.4 Interfaces

Digital inputs

Five parameterizable digital inputs (24 V) are available on the control terminal strip (-X101) of the CU board. These inputs can be used to input commands, external faults/alarms and for returning status data to the converter control word.

Connection: See Section "Connecting up control cables".

Parameterization: See Section "Control and status words".

Factory setting: (valid for standby operation)

Digital input	Command HIGH	Command LOW	Control word bit	Parameter
1	ON	OFF1	0	P554.2 = 1001 (standby)
2	ON	OFF2 (electrical)	1	P555.2 = 1002 (standby)
3	Acknowledge 		7	P565.2 = 1003 (standby)
4	Ext. 24 V o.k.	Ext. 24 V not o.k.	16	P576.2 = 1004 (standby)
5	Standby setting	Basic setting	30	P590 = 1005

Table 5-6 Digital inputs

Digital outputs

Digital outputs 1 and 2 on the AFE are pre-wired for the precharging and main contactors. For safety reasons, they cannot be wired up for other purposes.

Two further digital outputs are available for optional functions:

Factory setting:

Digital output	Connector, location	Signal HIGH	Signal LOW	Status-word bit	Para-meter
1	-X9:4,5	Precharging contactor energized	Precharging contactor not energized	29	P629.1 = 1001
2	-X100 on CU board	Main contactor energized	Main contactor not energized	12	P612.1 = 1002

Table 5-7 Digital outputs

HINWEIS

Faults, alarms and starting lockout (HIGH active) are displayed as **LOW active** via the terminal strip (digital outputs). See Section "Status word".

Basic converter interface SST1

The USS protocol (universal serial interface) is implemented on the basic converter interface SST1.

The following documentation is available depending on the particular application of the SST1 basic converter interface:

- Connection of a PC / PG with SIMOVIS software for start-up/servicing/operation:
  The documentation is provided on SIMOVIS floppy disks in files BEDANLTG.TXT (ASCII format) and BEDANLTG.WRI (WRITE format).
- Connection of higher-level PLCs with USS protocol:
  SIMOVERT MASTERDRIVES
  Application of serial interfaces with USS protocol
  Order No.: 6SE7087-6CX87-4KB0

Additional general comments regarding connection and parameterization:

Connection: See Section "Control terminals"

NOTE

A communication link can be made either via the terminal strip on the CU -X100 (RS485 Standard) **or** the interface connection on the PMU -X300 (9-pin SUB D connector / RS232 or RS485 (V24)).

Only one of the above possible connections may be used!

A four-wire connection can be implemented when the SST2 is connected via the terminal strip (-X100) on the CU board. Switchover between two-wire and four-wire connection is automatic.

NOTE

The bus terminating resistors (150 Ω in total) must be set on the last bus node. For positioning of jumpers on S1, see Fig. 5-1.

SST1: Close jumpers S1.1 and S1.2 of DIP-FIX S1 on the CU.

Dual-port RAM (DPR for SCB, TSY, CB, TB)

The dual-port RAM is the internal interface on the CU (-X107) for connection of option boards via the LBA (Local Bus Adapter, option) of the electronics box.

Available option boards:

- TSY (Tachometer and Synchronization Board)
- TB (Technology Board)
- SCB (Serial Communication Board)
- CB (Communication Board)

For further information about connecting option boards and parameterizing the interface, see also the operating instructions for the relevant boards.

For additional information, see Section "Control and status words".

6 Parameterization

The functions stored in the converters are adjusted to suit specific applications by means of parameters. Every parameter is uniquely identified by its name and number. In addition to a parameter name and number, many parameters also have a parameter index. Using these indices, it is possible to store several values for a parameter under one parameter number.

Parameter numbers consist of a letter and a three-digit number. Upper case letters P, U, H and L are the codes for settable parameters and lower case letters r, n, d and c the codes for non-settable visualization parameters.

Examples

DC link voltage r006 = 541	Parameter name:	DC link voltage
	Parameter number:	r006
	Parameter index:	No index
	Parameter value:	541 V
Src ON/OFF1 P554.2 = 20	Parameter name:	Src ON/OFF1
	Parameter number:	P554
	Parameter index:	2
	Parameter value:	20

Parameters can be entered via

- the PMU parameterizing unit integrated in the converter front panel,
- the control terminal strip on the CU (see Section "Control terminals")
- easily via the optional OP1S operator panel or
- the serial interfaces RS485 and RS232 at -X300 on the PMU
- on a PC with the SIMOVIS service program.

The parameters stored in the converters can be altered only under particular conditions. The following conditions must be fulfilled before parameter settings can be changed:

- The relevant parameter must be a settable parameter (identifiable by upper case code letters in parameter number).
- Parameterization authorization must be set (P053 = 6 for parameterization via PMU or OP1S).
- Changes to parameter settings must be permitted by the current converter status (initial parameter settings must be set with the converter switched off).
- The key-lock mechanism must not be activated (deactivate by parameter reset to factory value).

6.1 Setting parameters via the PMU

The parameterization unit (PMU) is provided for direct parameterization, operation and visualization of the converter/inverter. It is an integral component of basic units and features a four-digit, seven-segment display and several keys.

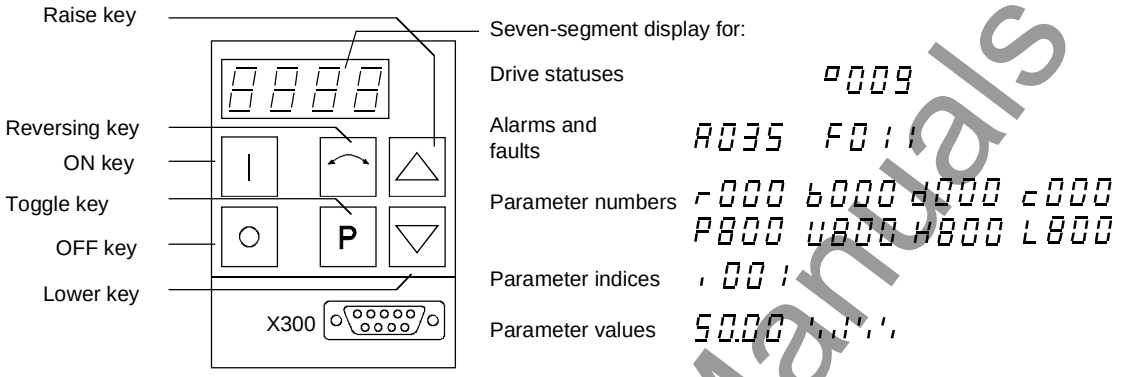


Fig. 6-1 PMU parameterization unit

Key	Meaning	Function
	ON key	• Switch on device (standard) • With active fault: Return to fault display • Command is executed when key is released
	OFF key	• Switch off device with OFF1 or OFF2 depending on parameterization (P554 to P557). Command is executed when key is released.
	Reversing key	• No function
P	Toggle key	• For switching between parameter number and parameter value in the sequence indicated (command becomes effective when the key is released). • If fault display is active: For acknowledging the fault
	Raise key	Increase the display value: • Press and release: Increase value by one increment • Hold down: Value is increased rapidly
	Lower key	Reduce the display value: • Press and release: Decrease value by one increment • Hold down: Value is decreased rapidly
P + P +	Hold toggle key and depress raise or lower key	• Press and hold P, then press second key. The command is executed when key is released (e.g. quick toggle).

Table 6-1 Control elements on the PMU

Toggle key (P key)

Since the seven-segment display on the PMU has only four digits, the 3 descriptive elements of a parameter, i.e.

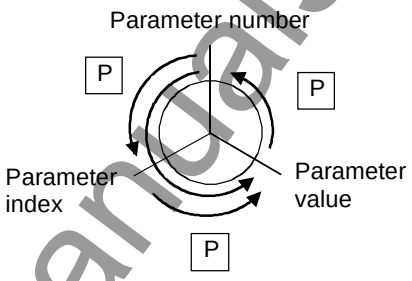
- ♦ parameter number,
- ♦ parameter index (for an indexed parameter) and
- ♦ parameter value

cannot be displayed simultaneously. It is therefore necessary to switch between the 3 elements. The toggle key is provided for this purpose. After the desired level has been selected, the parameter number can be adjusted with the Raise or Lower key.

Using the toggle key, you can switch

- from the parameter number to the parameter index
- from the parameter index to the parameter value
- from the parameter value to the parameter number

If the parameter is not indexed, the toggle key switches directly from the parameter number to the parameter value.



NOTE

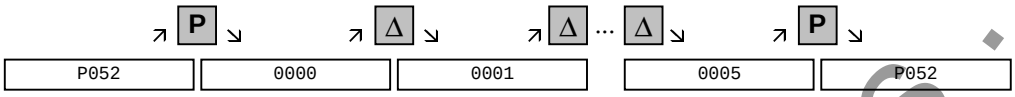
If you change the value of a parameter, the new value normally becomes operative immediately. However, in the case of confirmation parameters (identified by an asterisk " * " in the Parameter List), the new value does not take effect until you switch from the parameter value to the parameter number.

Changes to parameter settings made via the PMU are always stored in the non-volatile EEPROM after confirmation by the toggle key.

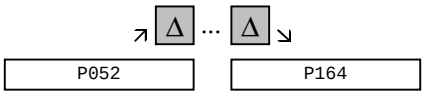
Example

The following example shows the sequence of operator inputs via the PMU required to select operating mode "Reactive power compensation".

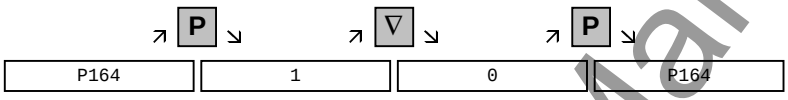
Set P052 to 5: Closed-loop control settings



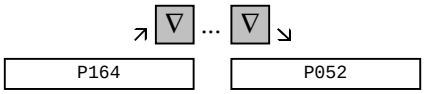
Increase number to P164: Select operating mode



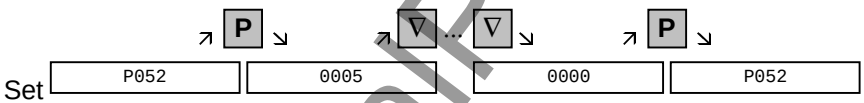
Set P164 to 0: Reactive power compensation



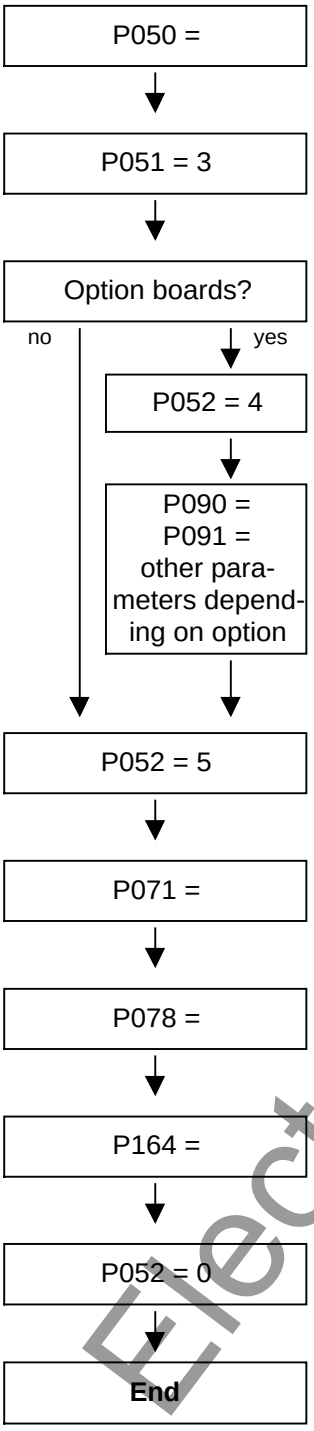
Return to P052: Function selection



Set P052 to 0: Return to previous operating state



6.2 "Start-up" parameterization



Select language:
0 = Deutsch, 1 = English, 2 = Espanol, 3 = Fracais, 4 = Italiano

Access level "Expert Mode"

Possible option boards: SCB, CB, TB, TSY

Select "Hardware Configuration"

Define and parameterize option boards:
Option boards: 0: None
1: CB
2: TB
3: SCB
4: TSY
(right-hand slot P090, centre slot P091)

Menu selection "Closed-loop control settings":
If fault "Fxxx" appears, see Section "Fault and alarm messages"

Input rated supply voltage in V

Input line frequency in Hz

Operating mode:
0: Reactive power compensation mode
1: cos(phi) mode
2: Current control

Select function "Return"

6.2.1 Function selection (P052)

Start-up functions are selected via parameter **P052**. These provide start-up variants specially adapted to start-up mode.

Precondition

Access level 2 (**P051 = 2**) must be set and the converter must not be in the RUN state (014).

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)
- Closed-loop control setting (P052 = 5)
- Forming (P052 = 20)

The "Factory setting" and "Forming" functions are reset automatically on completion, i.e. P052 = 0 (return)!

All other functions must be reset manually.

6.2.2 Factory setting (P052 = 1)

Function

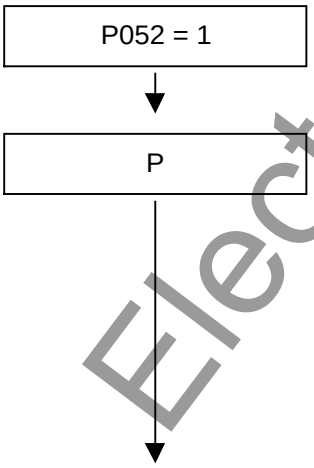
This function resets all parameters (see Section "Parameter List") to their factory values (supplied defaults). Please note the setting of P077!

Condition

The "Factory setting" function can be selected in operating states CONTROL SETTINGS (005), FAULT (007), STARTING LOCKOUT (008) or READY FOR ON (009).

Result

This function sets some converter data according to the device type (dependent on MLFB / P070).



Select factory setting

The numbers of the newly set parameters are displayed consecutively:

- **All** parameters set to factory values acc. to Parameter List (even board configuration P090/P091)
- Device data (derived from MLFB of converter (P070))
  P071 Rated supply voltage
  P072 AFE current (n)
  P078 Line frequency (n)
- Open-loop/closed-loop control parameters
  P173 Imax (maximum current)

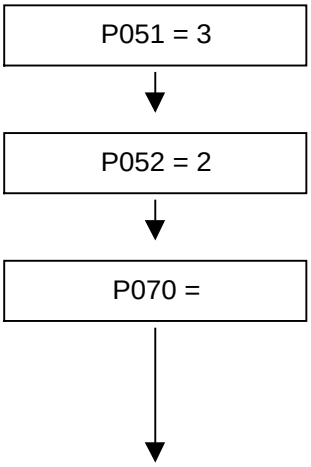
When the parameter have been set to their factory values, status display STARTING LOCKOUT (008) or READY FOR ON (009) appears.

6.2.3 Initialization (MLFB input) (P052 = 2)

Function This function is used to alter the order number (device type) of the converter.

Condition "Initialization" can be selected in operating states CONTROL SETTINGS (005), FAULT (007), STARTING LOCKOUT (008) or READY FOR ON (009).

Result When the order number is **changed,** only **some** parameters are reset to their factory values (shipped status of converter) as a function of the new order number. The process data connection remains unchanged.



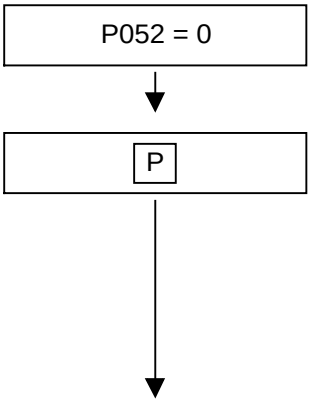
Access level "Expert Mode"
(to change P070)

Select Initialization

Specify MLFB
(= order number of converter, see rating plate)
When the CU board is changed, the appropriate MLFB for the converter must be entered. When setting parameters via PMU, enter the corresponding code number (PWE) according to the table below.

Rated voltage 3AC 380 V (-20 %) to 460 V (+5 %)			
Order number 6SE70..	**Rated output** [kW]	**Rated current** [A]	**PWE**
31-0EE80	45	92	75
31-2EF80	55	124	83
31-5EF80	75	146	91
31-8EF80	90	186	99
32-1EG80	110	210	103
32-6EG80	132	260	109
33-2EG80	160	315	113
33-7EG80	200	370	117
35-1EJ80	250	510	120
36-0EJ80	315	560	123
37-0EJ80	400	655	126
38-6EK80	500	817	127
41-1EK80	630	1045	135
41-3EL80	710	1235	154

Rated voltage 3AC 480 V (-15 %) to 575 V (+5 %)			
Order number 6SE70..	**Rated output** [kW]	**Rated current** [A]	**PWE**
26-1FE80	37	61	61
26-6FE80	45	66	63
28-0FF80	55	79	69
31-1FF80	75	108	79
31-3FG80	90	128	85
31-6FG80	110	156	95
32-0FG80	132	192	101
32-3FG80	160	225	105
33-0FJ80	200	297	110
33-5FJ80	250	354	114
34-5FJ80	315	429	118
35-7FK80	400	541	121
36-5FK80	450	617	124
38-6FK80	630	817	128
41-1FL80	800	1026	155
41-2FL80	900	1168	159
Rated voltage 3AC 600 V (-12 %) to 690 V (+5 %)			
Order number 6SE70..	**Rated output** [kW]	**Rated current** [A]	**PWE**
26-0HF80	55	60	60
28-2HF80	75	82	73
31-0HG80	90	97	77
31-2HG80	110	118	81
31-5HG80	132	145	89
31-7HG80	160	171	97
32-1HG80	200	208	107
33-0HJ80	250	267	111
33-5HJ80	315	319	115
34-5HJ80	400	407	119
35-7HK80	500	513	122
36-5HK80	630	585	125
38-6HK80	800	774	129
41-1HL80	1000	972	156
41-2HL80	1200	1107	160



Select "Return"

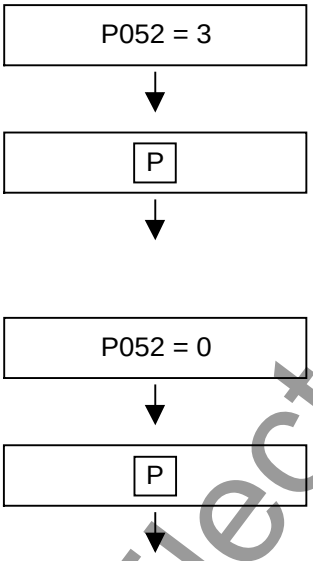
The **operating display** appears and, if the MLFB has been altered, the following parameters are set to new values:
Converter and motor data (as derived from converter MLFB (P070)) and open-loop and closed-loop control parameters ("Automatic parameterization" on all data sets analogous to selection of "Factory setting" function).
The process data connections (e.g. analog inputs/outputs) remain unchanged.

On completion of initialization, status display STARTING LOCKOUT (008) or READY FOR ON (009) appears.

6.2.4 Download (P052 = 3)

Function This function is used to read and alter parameters by means of a PC connected to the SST1 basic converter interface.

Condition Parameters can be "downloaded" in the FAULT (007), STARTING LOCKOUT (008) or READY FOR ON (009) states.



Select "Download"

The **operating display** (021) appears.
Using a PC connected to basic converter interface SST1 and an appropriate application program (e.g. SIMOVIS), it is now possible to read and alter all parameters irrespective of the selected control mode, etc.

Select "Return"

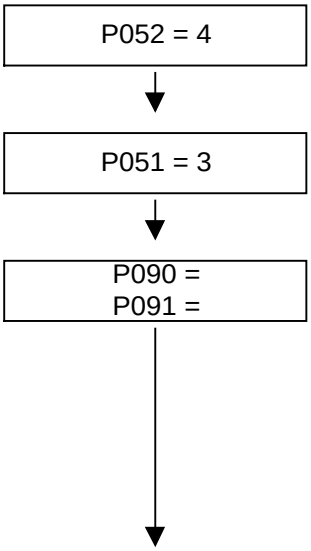
After Return, the STARTING LOCKOUT (008) or READY FOR ON (009) display appears.

6.2.5 Hardware configuration (P052 = 4)

Function The purpose of this function is to define option boards (SCB, TSY, CB, TB) installed in the electronics box of the converter.

Condition The "Hardware configuration" function can be selected in the FAULT (007), STARTING LOCKOUT (008) or READY FOR ON (009) states. The LBA bus link (Local Bus Adapter) is required additionally to install option boards in the electronics box. See Section "Interfaces".

Result All parameters which can be written in the "Hardware configuration" state ("H", see right-hand column in "Parameter List") can be altered.



Select "Hardware configuration"

Access level "Expert Mode"
(to be able to alter the following parameters)

Board in slot 2 (**RIGHT** in electronics box)
Board in slot 3 (**CENTRE** in electronics box!)

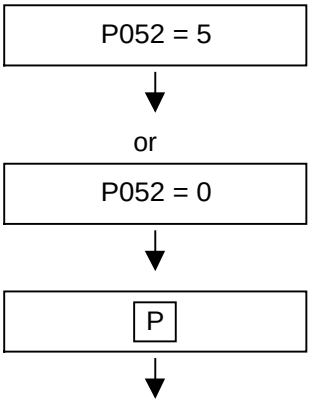
Parameter values for P090/P091:
0: No option board
1: CB Communication Board
2: TB Technology Board (P090 only)
3: SCB Serial Communication Board
4: TSY Digital Tacho and Synchronization Board

Slot in electronics box		Boards
Left	Slot 1 (CU)	CU
Centre	Slot 3 (options)	CB1 / SCB1 / SCB2 / (TSY, not with TB)
Right	Slot 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTE

- Only one of each option board type may be inserted in the electronics box at one time.
- Technology boards (e.g. T300) must always be inserted in slot 2. The TSY board may not be inserted at the same time as a TB.
- If only one option board is in use, it must always be inserted in slot 2.

- Other parameters depending on option boards
  (see relevant Operating Instructions or Parameter List).
- Make selection between:



Select "Closed-loop control settings"
(see Section "Closed-loop control settings")

Select "Return"

The **operating display** (r000) appears. At the same time, parameters and internal quantities are set to new values depending on the function selection.

The hardware is initialized.
If one of the fault messages F050/F070/F080 appears, see Section "Fault and alarm messages".

On completion of the selected function, operating display STARTING LOCKOUT (008) or READY FOR ON (009) appears.

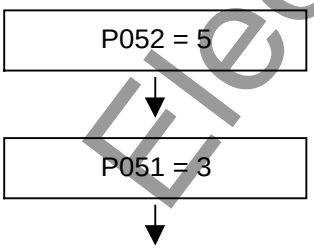
6.2.6 Closed-loop control settings (P052 = 5)

Function This function is used to alter the closed-loop control settings (AFE data).

Condition The "Closed-loop control settings" can be made in the FAULT (007), STARTING LOCKOUT (008) or READY FOR ON (009).

Result All parameters which can be written in the "Closed-loop control settings" state ("A", see right-hand column in Parameter List) can be altered by this function.

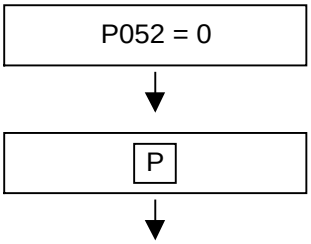
"Closed-loop control settings" is terminated by resetting the status (P052 = 0) with calculation of internal quantities.



Select "Closed-loop control settings"

Access level "Expert Mode"
(in case parameters which require Export Mode need to be altered)

Change selected parameters which can be altered in the "Closed-loop control settings" state.



Select "Return"

The **operating display** (r000) appears. At the same time, parameters and internal quantities are set to new values depending on the function selection.

On completion of the selected function, operating display STARTING LOCKOUT (008) or READY FOR ON (009) appears.

7 Explanation of terminology and functionality of the AFE

Modes of operation of the AFE

- Operating modes are set via P164 "Operating mode"
- See Section "Function diagrams"
- Applications:
  - Supplying the voltage-source DC link of SIMOVERT MASTERDRIVES series 6SE70 converters.
  - Reactive power compensation
  - Regenerative feedback from a DC voltage source to the supply system
- Operating modes:
  - Operating mode "cos(phi) control " (P164 = 1, factory setting):

    The sinusoidal line current is controlled with an adjustable cos(phi) (P120). For a cos(phi) of 1, only active power is taken from or regenerated to the line. A cos(phi) of + 0.8 results in a distribution of the line current into 80 % active current and 60 % reactive current (inductive, as cos(phi) is positive). The sign serves only to distinguish between inductive and capacitive reactive power. In this mode, therefore, a change in the active power automatically changes the reactive power. A higher-level closed-loop DC link voltage controller controls the DC link voltage to the setpoint (r447). The output of this closed-loop DC link voltage controller is the setpoint for the active current.
  - Operating mode "Reactive power compensation" (P164 = 0):

    The reactive power can be input as either capacitive or inductive (P122) (± 140 % of AFE rated apparent power) and is independent of the active power. A higher-level DC link voltage controller controls the DC link voltage to the setpoint (r447). The output of this DC link voltage controller is the setpoint for the active current. If the "sum“ (square-root of the sum of the squares of the absolute values) of the active and reactive power is greater than the maximum apparent power of the AFE, the reactive power is limited (= Line current management).
  - Operating mode "Current control" (P164 = 2):

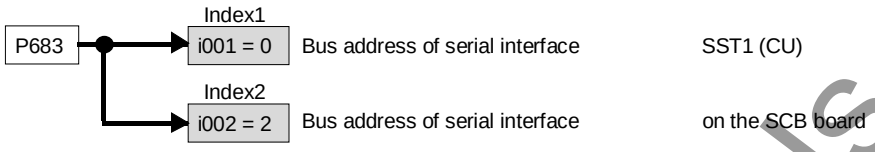
    The active line current can be externally specified via a setpoint node (P486). The DC link voltage is not regulated and must be kept constant using an external voltage source (e.g. battery, solar supply). In order to be able to provide the required reactive current, the DC link voltage must always be significantly higher than the peak value of the current line supply voltage.

Indexed parameters

These parameters are divided into various "indices" (i001, i002, etc.). A separate parameter value can be assigned to each index.

The meaning of the "indices" of the relevant parameter (parameter number) can be found in Section "Parameter List".

Example:



Data sets

"Indexed" parameters are divided according to data sets (indexed).

- GRD/RES (basic or reserve setting):
  These data sets make it possible, e.g. to switch from manual to automatic mode.
- RDS (reserve data set) 1 or 2:
  Two reserve data sets can be parameterized, e.g. for alternating operation of different converter types on one AFE.

The data sets are selected via the "control word" and read out in r012 and r152, see Section "Function diagrams".

8 Control word and status word

8.1 Description of control word bits

Operating states can be read in visualization parameter r001: e.g. READY FOR ON: r001 = 009

The functional sequences are described in the order in which they occur.

Introduction and example of application

An individual source can be parameterized for every control command (fixed values, digital 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, 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 of source connection

The basic setting for the ON command (control word bit 0, control word 1) must be "connected up“ to digital input 1 of the CU (terminal -X101:16):

Control word 1 table shows that the factory setting of parameter P554.1 is 1010 for the basic setting of the ON command source

Table A for the possible sources of the ON command specifies that 1010 is the "PMU operator control panel“ source.

Look for the parameter value for the required source in Tables X and A. The result for digital input 1 (BE1) on the CU can be found in Table X, it is 1001.

This parameter value must now be entered in parameter P554.1.

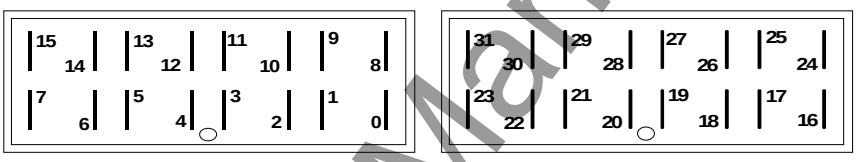
Command	Parameter	Possible sources	Parameter value	Required source connection
ON/OFF1 (GRD)	P554.1	Tab. X,A	1001	BI1 terminal -X101:16

A HIGH signal at terminal -X101:16 switches on the converter while a LOW signal switches it off.

NOTES

- Multiple connections are 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“ (bit 7) is always additionally effective from the PMU!
- If the "ON“ command (bit 0) is connected to a serial interface (SST, CB/TB, SCB-SST), then an "OFF2" or "OFF3" command must also be parameterized on the terminal strip. Otherwise, the converter cannot be switched off via a defined command in the event of a communications failure!

8.1.1 Display of control word on PMU seven-segment display



Control word 1 **Control word 2**

8.1.2 Control word 1 (visualization parameter r550 or r967)

The factory setting applies only when P077 = 0.

Designation Bit No. (meaning)	High / Low values (1 = High, 0 = Low)		Parameter No. GRD (RES)	Fact. setting GRD (RES) (P077 = 0)	Possible sources see 8.1.4
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
2	Reserved				
Inverter enable	Enabled	Inhibited			
3	1	0	P561.1 (2)	0001 (0001)	Tab. X,F
4	Reserved				
5	Reserved				
6	Reserved				
Acknowledge	ON				
7	0 → 1		P565.1 (2) P566.1 (2) P567.1 (2) 1010 (fixed)	0000 (1003) 0000 (0000) 2001 (2001)	Tab. X,C Tab. X,C Tab. X,C
Inching 1 1)	Inching 1 ON	Inching 1 OFF			
8	1	0	P568.1 (2)	0000 (0000)	Tab. X,C
Inching 2 1)	Inching 1 ON	Inching 1 OFF			
9	1	0	P569.1 (2)	0000 (0000)	Tab. X,C
PZD control by PLC	Control	No control			
10	1	0	≥1: SST1/2, CB / TB, SCB 2		
11	Reserved				
12	Reserved				
13	Reserved				
14	Reserved				
External fault 1	No fault	External fault 1			
15	1	0	P575.1 (2)	0001 (0001)	Tab. X,D

1) There is no inching setpoint 1 or inching setpoint 2 on the AFE

8.1.3 Control word 2 (visualization parameter r551)

The factory setting applies only when P077 = 0.

Designation Bit No. (meaning)	High / Low values (1 = High, 0 = Low)		Parameter No. GRD (RES)	Fact. setting GRD (RES) (P077 = 0)	Possible sources see 8.1.4
Ext. 24 V	Ext. 24 V ok	Ext. 24 V not ok			
16 3)	1	0	P576.1 (2)	1004 (1004)	Tab. X,I
17	Reserved				
Reserve data set	RDS 2	RDS 1			
18 4)	1	0	P578.1 (2)	0000 (0000)	Tab. X,I
19	Reserved				
20	Reserved				
21	Reserved				
22	Reserved				
23	Reserved				
24	Reserved				
25	Reserved				
External fault 2	No fault	External fault 2			
26	1	0	P586.1 (2)	0001 (0001)	Tab. X,G
Slave AFE	Slave AFE	Master AFE			
27	1	0	P587.1 (2)	0000 (0000)	Tab. X,I
External alarm 1	No alarm	External alarm 1			
28	1	0	P588.1 (2)	0001 (0001)	Tab. X,G
External alarm 2	No alarm	External alarm 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
31 5)	Reserved				

3) On MASTERDRIVES CUVC, this bit corresponds to bit 0 for the data set of the setpoint channel

4) On MASTERDRIVES CUVC, this bit corresponds to bit 0 for the data set of the motor

5) The AFE always uses a main contactor without check-back

8.1.4 Sources for control words 1 and 2

Table X (external terminals)

1001	BE1 terminal -X101:16
1002	BE2 terminal -X101:17
1003	BE3 terminal -X101:18
1004	BE4 terminal -X101:19
1005	BE5 terminal -X101:20
4101	SCI, slave1, terminal 01
4102	SCI, slave1, terminal 02
4103	SCI, slave1, terminal 03
4104	SCI, slave1, terminal 04
4105	SCI, slave1, terminal 05
4106	SCI, slave1, terminal 06
4107	SCI, slave1, terminal 07
4108	SCI, slave1, terminal 08
4109	SCI, slave1, terminal 09
4110	SCI, slave1, terminal 10
4111	SCI, slave1, terminal 11
4112	SCI, slave1, terminal 12
4113	SCI, slave1, terminal 13
4114	SCI, slave1, terminal 14
4115	SCI, slave1, terminal 15
4116	SCI, slave1, terminal 16
4201	SCI, slave2, terminal 01
4202	SCI, slave2, terminal 02
4203	SCI, slave2, terminal 03
4204	SCI, slave2, terminal 04
4205	SCI, slave2, terminal 05
4206	SCI, slave2, terminal 06
4207	SCI, slave2, terminal 07
4208	SCI, slave2, terminal 08
4209	SCI, slave2, terminal 09
4210	SCI, slave2, terminal 10
4211	SCI, slave2, terminal 11
4212	SCI, slave2, terminal 12
4213	SCI, slave2, terminal 13
4214	SCI, slave2, terminal 14
4215	SCI, slave2, terminal 15
4216	SCI, slave2, terminal 16
5001	TSY, terminal 1

Table A

0000	Constant value 0
1010	PMU operator panel
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 operator panel
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 operator panel
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 MC checkback
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

Bit 0: ON / OFF1 command (↑ "ON") / (L "OFF1")

Condition Positive edge change from L to H (L → H) in READY FOR ON (009) state.

Result
- PRECHARGING (010)
  The precharging contactor is closed.
  The DC link is precharged, the main contactor then closed and the precharging contactor opened.
- READY TO RUN (011)
- RUN (014).

Bit 1: OFF2 command (L "OFF2") (electrical)

Condition LOW signal

Result
- The inverter pulses are inhibited and the main contactor opened.
- STARTING LOCKOUT (008) until the command is withdrawn.

NOTE The **OFF2** command is simultaneously effective from three sources (P555, P556 and P557)!!

Bit 2: Reserved

Bit 3: Inverter enable command (H "Inverter enable") / (L "Inverter inhibit")

Condition HIGH signal and READY TO RUN (011)

Result
- RUN (014)
  The inverter pulses are enabled.

Condition LOW signal

Result
- In RUN (014):
  Change to READY TO RUN (011) display, inverter pulses are inhibited.

Bit 4: Reserved

Bit 5: Reserved

Bit 6: Reserved

Bit 7: Acknowledge command (↑ "Acknowledge")

Condition	Positive edge change from L to H (L → H) in FAULT (007) state.
Result	♦ Reset all current faults after they have been transferred to the diagnostics memory. ♦ STARTING LOCKOUT (008) if no further faults are active. ♦ FAULT (007) if other faults are still active.
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") / (L "Inching 1 OFF")

Condition	Positive edge change from L to H (L → H) in the READY FOR ON state (009).
Result	♦ An ON command is automatically issued (refer to control word bit 0).
Condition	LOW signal
Result	♦ An OFF1 command is automatically issued (refer to control word bit 0).

Bit 9: Inching 2 ON command (↑ "Inching 2 ON") / (L "Inching 2 OFF")

Condition	Positive edge change from L to H (L → H) in the READY FOR ON state (009).
Result	♦ An ON command is automatically issued (refer to control word bit 0).
Condition	LOW signal
Result	♦ An OFF1 command is automatically issued (refer to control word bit 0).

Bit 10: Control via PLC command (H "Control via PLC")

Condition	HIGH signal; The process data PZD (control word, setpoints) sent via the SST1 interface of the CU, the CB/TB interface (option) and the SST/SCB interface (option) are evaluated only in the case of an accepted command.
Result	♦ When several interfaces are in operation, only the process data of the interfaces sending an H signal are evaluated. ♦ With an L signal, the last values remain in the appropriate dual-port RAM of the interface.
NOTE	An H signal is displayed in visualization parameter r550 "Control word 1" if **one** of the interfaces sends an H signal!

Bit 11: Reserved

Bit 12: Regenerative feedback enable command (H "Regenerative feedback enable")

Condition HIGH signal

Result
- Regenerative feedback operation is enabled.

Bit 13: Reserved

Bit 14: Reserved

Bit 15: External fault 1 command (L "External fault 1")

Condition LOW signal

Result
- FAULT (007) and fault message (F035).
  The inverter pulses are inhibited and the main contactor opened.

See Section "Fault and alarm messages"

Bit 16: Monitoring of external 24 V voltage supply (L "24V not o.k." / H "24V o.k.")

Condition LOW signal

Result
- Alarm A039 in operating states STARTING LOCKOUT (008) and READY FOR ON (009)
- Fault F007 in operating states PRECHARGING (010), READY TO RUN (011) and RUN (014)

Bit 17: Reserved

Bit 18: Reserve data set RDS bit 0 command (L "RDS1" / H "RDS2")

Condition READY FOR ON (009), PRECHARGING (010) or READY TO RUN (011)
A HIGH signal activates RDS2, and a LOW signal RDS1.

Result
- The parameter settings of the appropriate reserve data set in the setpoint channel and closed-loop/open-loop control are activated.

See Section "Function diagrams".

Bit 19: Reserved

Bit 20: Reserved

Bit 21: Reserved

Bit 22: Reserved

Bit 23: Reserved

Bit 24: Reserved

Bit 25: Reserved

Bit 26: External fault 2 command (L "External fault 2")

Condition LOW signal; Command is not activated until converter switches to READY TO RUN (011) and elapse of a 200 ms timer.

Result
- FAULT (007) and fault message (F036).
  The inverter pulses are inhibited and the main contactor (if installed) opened.

See Section "Fault and alarm messages".

Bit 27: Slave/master drive command (H "Slave AFE") / (L "Master drive")

Slave AFE
- The closed-loop control operates with an external line active current setpoint.
  The DC link voltage is no longer regulated.

Master AFE
- The closed-loop control operates with an internal line active current setpoint (= output of DC link voltage controller). The DC link voltage is maintained constantly at the set value.

Bit 28: External alarm 1 command (L "External alarm 1")

Condition LOW signal

Result
- The converter continues to operate in its current status. An alarm message (A015) is output.

See Section "Fault and alarm messages".

Bit 29: External alarm 2 command (L "External alarm 2")

Condition	LOW signal
Result	♦ The converter continues to operate in its current status. An alarm message (A016) is output.
	See Section "Fault and alarm messages".

Bit 30: Select reserve/basic setting (H "Reserve setting") / (L "Basic setting")

Condition	HIGH signal
Result	♦ The parameter values for the reserve setting for the control word itself, the setpoint channel and closed-loop control are activated.
Condition	LOW signal
Result	♦ The parameter values for the basic setting for the control word itself, the setpoint channel and closed-loop control are activated.

Bit 31: Reserved

8.2 Description of status word bits

Introduction and example of application

Status words are process data as defined by the explanation in Section "Process data".

A "destination" at which the bit status can be identified (digital outputs of CU, SCI 1/2 terminals, TSY terminals) can be parameterized for each bit in a status word.

One parameter is available for "wiring up" the destination for each status bit.

As shown below, the selection parameters have three indices:

Index i001 Selection of a terminal on the CU / PEU board (basic unit)

Index i002 Selection of a terminal on the SCI 1/2 board (option)

Index i003 Selection of a terminal on the TSY board (option)

Example of wiring to a destination

The message "motor operation" (status word 1, bit 14) must be "wired up" to digital output 3 (BA3) on the CU (terminal X102:29/33) as a high-active signal:

- "Wiring" of a status bit to a digital output on the CU is parameterized via index i001.
- The table for status word 1 indicates that the message "Motor operation" is assigned to parameter P614.
- Look for the parameter value for the desired destination in the same table. The result is 1003 for digital output 3 on the CU.

This parameter value must now be set in parameter P614.1.

Bit #	Meaning	Parameter	Parameter value	Desired destination connection
Bit 14	Motor operation	P614.1	1003	BA3 terminal -X102:29/33

When a High signal is applied to terminal -X102:29/33, the AFE operates in generator mode and, in the case of a Low signal, in motor mode.

If a value assigned to a terminal (digital output BA) is allocated to a destination once in a selection parameter, then it will not be available in the same index of any other selection parameter as a terminal is only suitable for the output of one status bit.

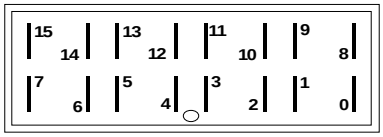
NOTE

Faults, alarms and **starting lockout (HIGH active)** are displayed as **LOW active** via the terminal strip (digital outputs).
This also applies to any option boards!
See Section "Digital outputs".

8.2.1 Status word 1 (visualization parameter r552 or r968)

PMU display

"Status word 1"



Bit #	Value	1 = High 0 = Low	Select destin.
Bit 0	1	Ready for ON	P600.x
	0	Not ready for ON	
Bit 1	1	Ready to RUN	P601.x
	0	Not ready to RUN	
Bit 2	1	Run	P602.x
	0	Inv. pulses inhibited	
Bit 3	1	Fault	P603.x
	0	No fault	
Bit 4	1	No OFF2	P604.x
	0	OFF2	
Bit 5		Reserved	
Bit 6	1	Starting lockout	P606.x
	0	No starting lockout	
Bit 7	1	Alarm	P607.x
	0	No alarm	
Bit 8	1	No setp./act.v. deviation	P608.x
	0	Setp./act. val. deviation	
Bit 9	1	PZD control requested	always 1
	0	(not permitted)	
Bit 10		Reserved	
Bit 11	1	"Undervoltage" fault	P611.x
	0	No "Undervolts." fault	
Bit 12	1	MC energized	P612.x
	0	MC not energized	
Bit 13		Reserved	
Bit 14 1)	1	Generator operation	P614.x
	0	Motor operation	
Bit 15		Reserved	

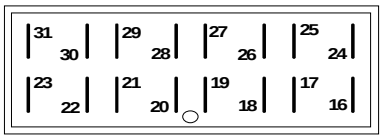
	Value	Destination
x = 1	0000	No destination
	1001	BA1, -X9:4/5
	1002	BA2, -X100:6/7/8
	1003	BA3, -X102:29/33
	1004	BA4, -X102:32/33
x = 2	0000	No destination
	4101	SCI 1/2, slave 1, BA1
	4102	SCI 1/2, slave 1, BA2
	4103	SCI 1/2, slave 1, BA3
	4104	SCI 1/2, slave 1, BA4
	4105	SCI 1/2, slave 1, BA5
	4106	SCI 1/2, slave 1, BA6
	4107	SCI 1/2, slave 1, BA7
	4108	SCI 1/2, slave 1, BA8
	4109	SCI 2 only, slave 1, BA9
	4110	SCI 2 only, slave 1, BA10
	4111	SCI 2 only, slave 1, BA11
	4112	SCI 2 only, 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	SCI 2 only, slave 2, BA9
	4210	SCI 2 only, slave 2, BA10
	4211	SCI 2 only, slave 2, BA11
	4212	SCI 2 only, slave 2, BA12
x = 3	0000	No destination
	5001	TSY, BA1
	5002	TSY, BA2

1) This bit corresponds to bit "CW/CCW rotation" on the MASTERDRIVES CUVC

8.2.2 Status word 2 (visualization parameter r553)

PMU display

"Status word 2"



Bit #	Value	1 = High 0 = Low	Select destin.
Bit 16		Reserved	
Bit 17		Reserved	
Bit 18 [2]	1	Current limit active	P618.x
	0	Current limit not active	
Bit 19	1	External fault 1	P619.x
	0	No external fault 1	
Bit 20	1	External fault 2	P620.x
	0	No external fault 2	
Bit 21	1	External alarm	P621.x
	0	No external alarm	
Bit 22	1	AFE i2t alarm	P622.x
	0	No AFE i2t alarm	
Bit 23	1	AFE overtemp. fault	P623.x
	0	No AFE overtemp. fault	
Bit 24	1	AFE overtemp. alarm	P624.x
	0	No AFE overtemp. alarm	
Bit 25		Reserved	
Bit 26		Reserved	
Bit 27		Reserved	
Bit 28		Reserved	
Bit 29 [3]	1	PC contactor energized	P629.x
	0	PC cntact. not energized	
Bit 30		Reserved	
Bit 31	1	Precharging active	P631.x
	0	Precharging not active	

	Value	Destination
x = 1	0000	No destination
	1001	BA1, -X9:4/5
	1002	BA2, -X100:6/7/8
	1003	BA3, -X102:29/33
	1004	BA4, -X102:32/33
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	SCI 2 only, slave 1, BA9
	4110	SCI 2 only, slave 1, BA10
	4111	SCI 2 only, slave 1, BA11
	4112	SCI 2 only, 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	SCI 2 only, slave 2, BA9
	4210	SCI 2 only, slave 2, BA10
	4211	SCI 2 only, slave 2, BA11
	4212	SCI 2 only, slave 2, BA12
x = 3	0000	No destination
	5001	TSY, BA1
	5002	TSY, BA2

2) This bit corresponds to "Overspeed" bit on the MASTERDRIVES CUVC

3) This bit corresponds to "Bypassing contactor energized" bit on the MASTERDRIVES CUVC

Bit 0: "Ready for ON" signal (H)

HIGH signal STARTING LOCKOUT (008) or READY FOR ON (009) state

Meaning
- The power supply, open-loop control and closed-loop control are all operative.
- The inverter pulses are inhibited.

Bit 1: "Ready to Run" signal (H)

HIGH signal PRECHARGING (010) or READY TO RUN (011) state

Meaning
- The power supply, open-loop control and closed-loop control are all operative.
- The converter is switched on.
- DC link precharging in progress (completed).
- The inverter pulses are still inhibited.

Bit 2: "Run" signal (H)

HIGH signal RUN state (014)

Meaning
- The converter is in operation.
- The inverter pulses are enabled.
- The output terminals are live.

Bit 3: "Fault" signal (H)

HIGH signal FAULT state (007)

Meaning
- A fault (fault type irrelevant) has occurred.

Output at terminal strip (-X9, CU, TSY, SCI1/2) with L signal.

Bit 4: "OFF2" signal (L)

LOW signal OFF2 command is active

Meaning
- An OFF2 command (control word bit 1) has been issued.

Bit 5: Reserved

Bit 6: "Starting lockout" signal (H)

HIGH signal STARTING LOCKOUT state (008)

Meaning
- The power supply, open-loop control and closed-loop control are all operative.
- The signal is continuously applied as long as an OFF2 command via control word bit 1 or an ON command via control word bit 0 is active (edge evaluation).

Output at terminal strip (-X9, CUSA, SCB1) with L signal.

Bit 7: "Alarm" signal" (H)

HIGH signal Alarm (Axxx)

Meaning
- An alarm (type irrelevant) has occurred.
- This signal remains active until the cause has been eliminated.

Output at terminal strip (-X9, CU, SCB1) with L signal.

Bit 8: "Setpoint/actual value deviation" signal (L)

LOW signal "Setpoint/actual value deviation" alarm (A034)

Meaning
- There is currently a deviation between the Vd setpoint and Vd actual value which is greater than the setting in P517 (set/act.val.dev. Vd) and active for longer than P518 (set/act.val.dev.time).
- The bit is reset to an H signal as soon as the deviation decreases to below the setting in parameter P517.

Bit 9: "PZD control requested" signal (H)

HIGH signal This signal is always active.

Bit 10: Reserved

Bit 11: "Undervoltage fault" signal (H)

HIGH signal "Undervoltage in DC link" fault (F008)

Meaning
- The DC link voltage has dropped below the permissible limit value.

See Section "Fault and alarm messages"

Output at terminal strip (-X9, CU, TSY, SCI1/2) with L signal.

Bit 12: "MC energized" signal (H)

HIGH signal The main contactor is energized.

WARNING On the AFE, this status bit is always connected to digital output 2 on the CUSA. It cannot and must not be connected in any other way since the AFE could sustain irreparable damage if the main contactor were to be energized before the DC link had been precharged.

Bit 13: Reserved

Bit 14: "Motor operation" signal (L)

LOW signal AFE operates in rectifier mode (active current >= 0)

Bit 15: Reserved

Bit 16: Reserved

Bit 17: Reserved

Bit 18: "Current limit active" signal (L)

LOW signal AFE operates at the present current limit setting

Meaning

- If the AFE output current is limited, the DC-link voltage can no longer be regulated to the selected setpoint.

Output at terminal strip (-X9, CU, SCB1) with L signal.

Bit 19: "External fault 1" signal (H)

HIGH signal "External fault 1"

Meaning

- An "External fault 1" is active in control word bit 1.

Output at terminal strip (-X9, CU, SCB1) with L signal.

Bit 20: "External fault 2" signal (H)

HIGH signal "External fault 2"

Meaning

- An "External fault 2" is active in control word bit 26.

Output at terminal strip (-X9, CU, SCB1) with L signal.

Bit 21: "External alarm" signal (H)

HIGH signal "External alarm"

Meaning
- An "External alarm 1" is active in control word bit 28 or an "External alarm 2" in control word bit 29.

Output at terminal strip (-X9, CU, SCB1) with L signal.

Bit 22: "AFE i^2t alarm" signal (H)

HIGH signal "AFE i^2t alarm" (A025)

Meaning
- If the converter continues to operate under the current load conditions, the AFE will be thermally overloaded.

Output at terminal strip (-X9, CU, SCB1) with L signal.

Bit 23: "AFE overtemperature fault" signal (H)

HIGH signal "Inverter temperature too high" fault (F023)

Meaning
- The inverter temperature limit value has been exceeded.

See Section "Fault and alarm messages".

Output at terminal strip (-X9, CU, SCB1) with L signal.

Bit 24: "AFE overtemperature alarm" signal (H)

HIGH signal "Inverter temperature too high" alarm (A022)

Meaning
- Alarm-tripping temperature threshold of inverter has been exceeded.

See Section "Fault and alarm messages".

Output at terminal strip (-X9, CU, SCB1) with L signal

Bit 25: Reserved

Bit 26: Reserved

Bit 27: Reserved

Bit 28: Reserved

Bit 29: "PC energized" signal (H)

HIGH signal	The precharging contactor is energized.
WARNING	The status bit is always connected to terminal -X9 on the AFE. It cannot and must not be connected in any other way since the AFE could sustain irreparable damage if the main contactor were to be energized before the DC link had been precharged.

Bit 30: Reserved

Bit 31: "Precharging active" signal (H)

HIGH signal	PRECHARGING state (010)
Meaning	♦ The DC link is precharged as soon as an ON command is issued.

9 Forming

If the converter has been out of operation for more than one year, it will be necessary to re-form the DC link capacitors. Failure to form the capacitors as instructed could result in damage to the converter when the supply voltage is connected.

If the converter is started up within one year of manufacture, it will not be necessary to form the capacitors again. Please refer to the converter serial number for date of manufacture.

Format of serial number

(E.g.: A-J60147512345)

Position	Example	Meaning
1 and 2	A-	Place of manufacture
3	J	1997
	K	1998
	L	1999
	M	2000
4	1 to 9	January to September
	O	October
	N	November
	D	December
5 to 14		Not relevant for forming

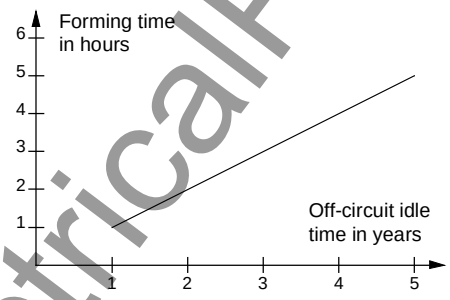


Fig. 9-1 Forming time as a function of converter idle time

DANGER

The "Form DC link" function may be executed only if the AFE and the connected converter(s) are in the same voltage category (9th position of MLFB).

The "Form DC link" function can be selected in the "Ready for ON" (009) state.

Sequence of operations

P408 — **Set forming time (60.0 to 600.0 minutes)**

↓

P052 = 20 — **Select "Form DC link"**

↓

P key — **The operating display appears:**
The AFE must be switched on within 20 s or else a shutdown on faults (F091) will occur (fault value 4).

↓

Switch on AFE

NOTE:
While forming is in progress, the SIMOVERT MASTERDRIVES MC/VC must not be switched on!

- The DC link forming operation is carried out (forming period as set in P408).
- During the forming period set in P408, the pre-charging contactor is energized and de-energized in such a way that the DC link capacitor is charged up to the line voltage peak value.
- The current limit set in P160 is not effective with respect to the forming operation!

↓

End — On completion of the function, operating display "Ready" (009) appears.

10 Converter functions

10.1 Automatic restart (WEA)

Description

The WEA function can be used to automatically acknowledge faults and automatically restart the converter after a power failure (F003, F004, F009, F007), without operating personnel having to intervene.

For fault messages F003 "Line overvoltage“, F004 "Line undervoltage“, F009 "Power failure“ and F007 "Electrical off“, see Section "Fault and alarm messages".

Parameters for setting automatic restart function

P366	WEA on/off	i001: RDS1 i002: RDS2	0 to 2

P366 = 0 (inhibited):

The WEA function is inhibited.

P366 = 1 (power failure acknowledgement after power recovery only):

The fault message (F003, F004, F007 or F009) is acknowledged if this has not occurred in connection with an inching ON command (control word bit 8 or 9). However, fault message F007 is only acknowledged if the external 24 V power supply is available again (power might still be supplied via the charged DC link). The AFE switches to operating status °008 (starting lockout) or °009 (ready for ON). After the power returns, an ON command must be re-entered so that the DC link is re-charged

The converter is not automatically switched on by the WEA function.

P366 = 2 (AFE is powered-up again when the power returns and the DC link is precharged):

The fault message (F003, F004, F007 or F009) is acknowledged if it was not activated in connection with an inching ON command (control word bit 8 or 9). However, fault message F007 is only acknowledged if the external 24 V power supply is available again (power might be supplied from the charged DC link).

The AFE then switches to operating status °010 (precharging). When the power recovers, the drive converter is automatically powered up by the WEA

The unit is only powered up again if the ON command (control word bit 0) is still present after the power returns.
Thus, the WEA function cannot operate in conjunction with a parameterized ON command (control word bit 0) via PMU or OP1

Alarm A065

(Automatic restart function active):

The alarm is set after a power failure when WEA is active and reset after restart by WEA and precharging of DC link.

When the converter is switched on by WEA, the link precharging time is not monitored, thus preventing activation of fault message F002 "DC link precharging fault".

If the WEA function is selected and the DC link is buffered by the drive via the "Kinetic buffering function" (KIP) during the power failure, then the precharging operation may not be completed if the KIP function is incorrectly parameterized, resulting in output of fault message F024 "Precharging resistor overload". This can be prevented by setting the

KIP activation point (with P518 on DC unit) to the peak value of the line voltage (see Section "Kinetic buffering (KIP)").

The converter can also be switched off manually by an OFF command during this power-up phase.
See Section "Fault and alarm messages".

Special case

If other faults have occurred at the same time as F003, F004, F007 or F009, these will also be acknowledged as a function of the setting in parameter P366!

WARNING

The converter can power up again after a power failure when the WEA function is activated (P366 = 2).

If the power fails to recover for a prolonged period, operating personnel may mistakenly believe that the converter has been switched off.

Entering the drive area when the drive is in this state therefore poses the risk of serious or fatal injury or serious damage to equipment.

10.2 Kinetic buffering (KIP)

Description

The KIP function allows brief power supply failures to be buffered by utilizing the kinetic energy, i.e. inertia of the connected load. With this process, the output frequency of the motor inverter(s) is regulated such that sufficient energy is supplied to the converter to cover system losses by the motor operating in generator mode.

Since the losses during a power failure cannot be eliminated, a reduction in the output frequency of the device is unavoidable. The resultant drop in motor speed must be taken into account.

The AFE cannot continue to operate during a power failure and switches to operating state °007 "Fault". The corresponding fault message (F003, F004, F007 or F009) is displayed. The fault must be acknowledged and the AFE switched on again on power recovery. Fault acknowledgement and AFE restart can be performed automatically by the WEA software function (Automatic Restart) (see Section "Automatic restart (WEA)").

At the instant the power returns, power is fed in from the line supply and the output frequency of the drive converter returns to the selected setpoint frequency via a ramp function (ramp-function generator RFG).

The KIP function is set via the following parameters on a DC unit:

DC unit **P517**	KIP
DC unit **P518**	KIP activation point
DC unit **P519**	KIP controller dynamic response

When an AFE is used to supply the drive, the activation point of the KIP (P518 for DC units) should be set approximately to the peak value of the rated supply voltage. When the power returns, a minimum time is required to re-charge the DC link. The current load is also minimized. This also means that the precharging resistor monitoring function (F024) does not respond.

Example

AFE P071 = 400 V "Line voltage"
⇒ Vline,peak = 1.414 * 400 V = 566 V

DC unit P071 = 540 V "Converter supply voltage" = Vd rated
⇒ 564 V / 540 V = 1.05
⇒ P518 = 105 % "KIP activation point"

Parameter P380 enables the KIP activation and deactivation points to be shifted as follows:

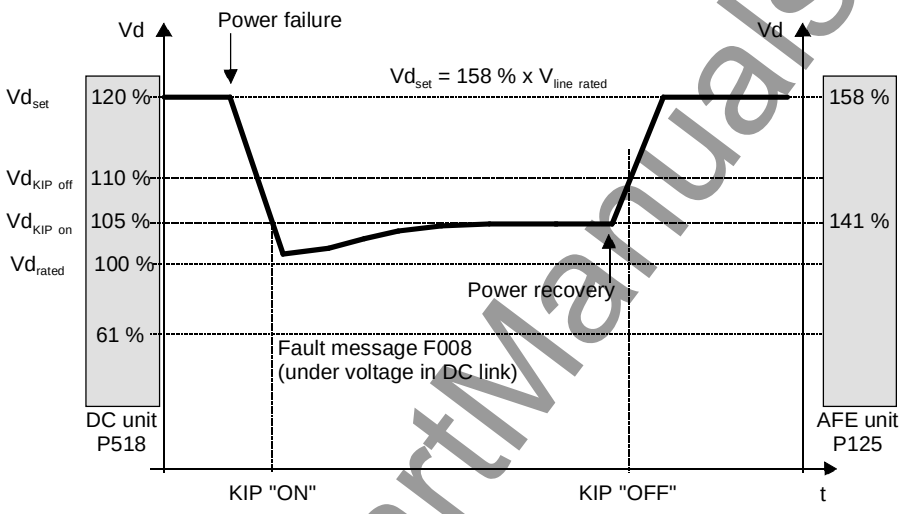


Fig. 10-1 Activation/deactivation thresholds

$V_{d\,KIP\,ON} = P518 \times V_{d\,rated}$ Presetting: P518 = 76 %

$V_{d\,KIP\,OFF} = (P518 + 5\,\%) \times V_{d\,rated}$ Presetting: When P518 = 76 % ⇒ 81 %

$V_{d\,rated} = P071$

11 Function diagrams

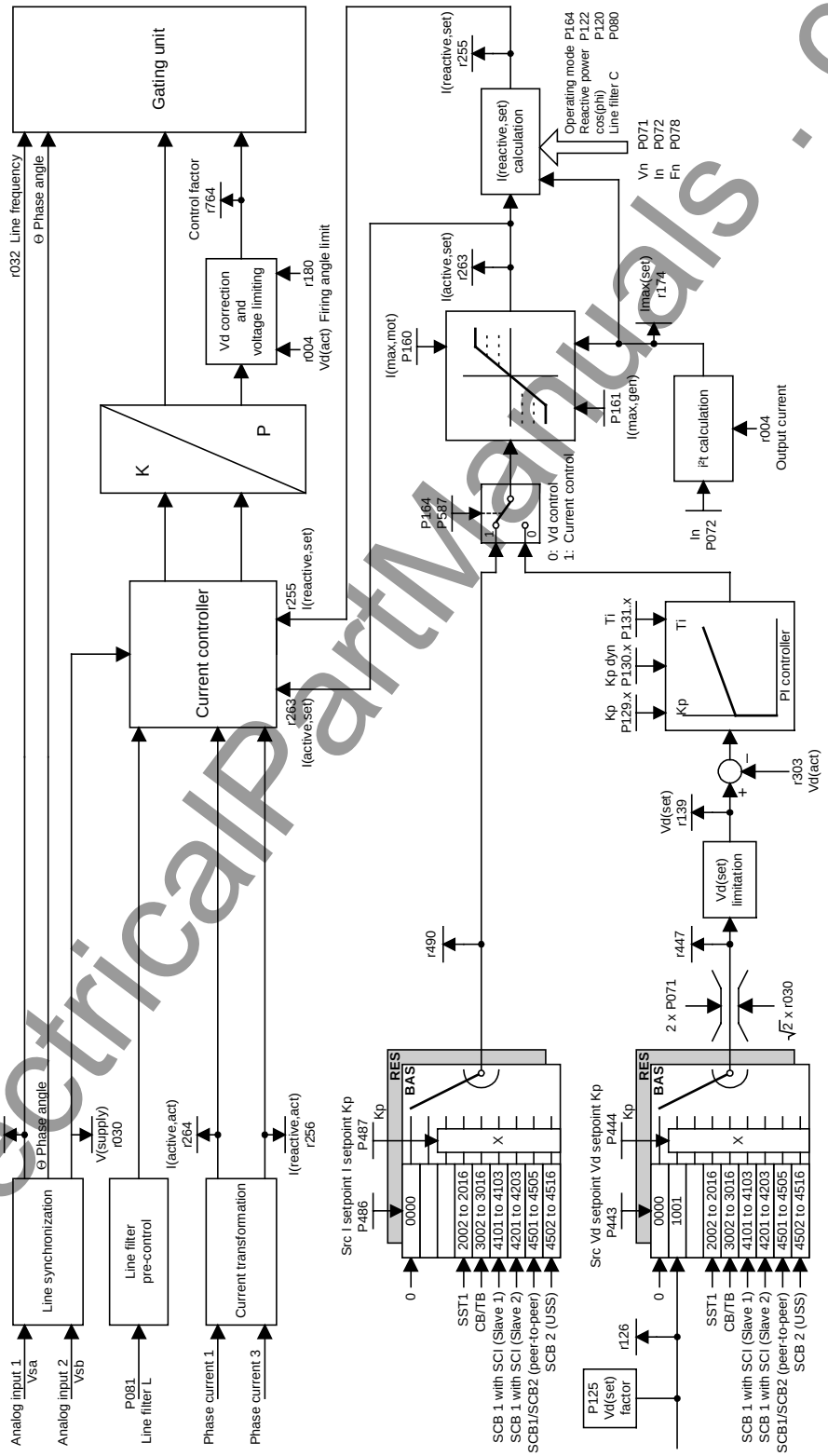


Fig. 11-1 Block diagram of the AFE control

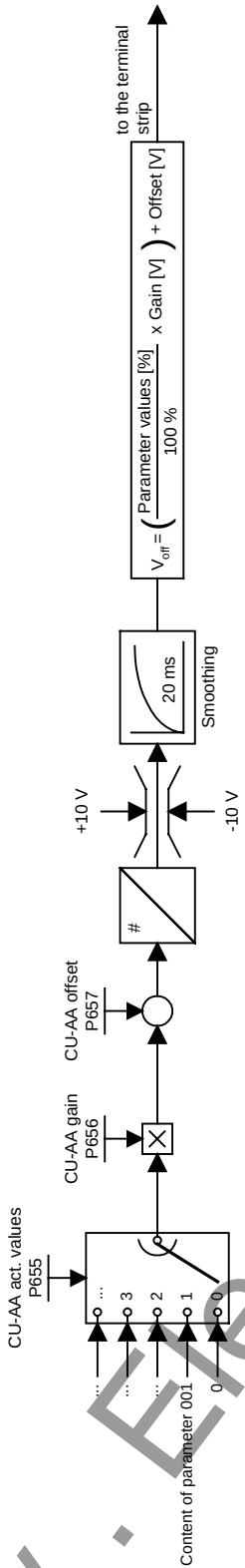


Fig. 11-2 Analog output

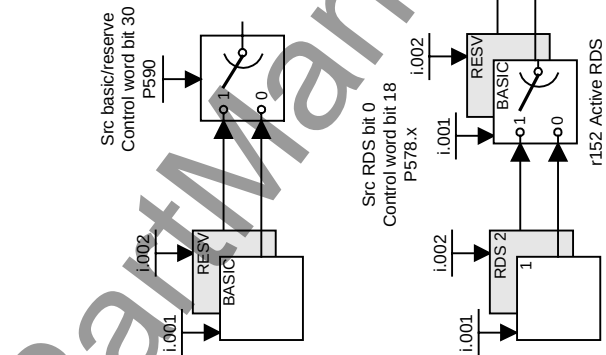


Fig. 11-3 Basic/reserve changeover

Fields which can be switched over have a shaded background.

Switchover, basic/reserve setting (Basic/Resv)

Parameters involved:
P443, P444, P486, P487, P554 to P589

Switchover of reserve data set (RDS)

Parameters involved:
P120, P121, P122, P124, P129, P130, P131, P160, P161, P164, P173, P326, P366, P408, P517, P518

12 Parameter list

Key to 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" RDS(2) parameter**6)** Type=I2; **2)** PKW: 1Hex=0.01 Hz; PZD Gr.: 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: Does not become active until confirmation (press P key)

2) Parameter type
- O2 Unsigned 16-bit value
- I2 Signed 16-bit value
- L2 Nibble-coded quantity
- V2 Bit-coded quantity

3) Normalization group for PZD

PZD group — PZD normalization
- 0 as PKW normalization
- 61000Hex = P072 I(n,AFE)
- 71000Hex = P071 V(n,supply)

Abbreviations:
- PZD Process Data
- PKW Parameter Characteristic Value

4) Operating states:
- U MLFB Input (initialization)
- H Hardware Configuration
- A Control Settings
- B Ready (including Fault)
- R Run

5) Minimum access level which is needed to read or write a parameter.
- 1 Operation via PMU/OP
- 2 Standard Mode
- 3 Expert Mode

6) Abbreviations for indexed parameters
- RDS(2) Reserve data set parameter with 2 indices, switched over via control word 2, bit 18
- B/R Parameter with switchover option for basic and reserve setting in control word 2, bit 30

7) Parameter value is set to a default after initialization. Default settings are determined by the converter MLFB.

12.1 General visualization parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r000	**Operation Display** Displays the operating status, fault and alarm messages See Section “Operator control" for a description		–	1 /UHABR
r001 1Hex	**Operating status** Visualization parameter indicating the current operating state of the AFE Description 0 = AFE MLFB input 1 = AFE initialization 2 = Hardware initialization 3 = Closed-loop control initialization 4 = Hardware settings (H) 5 = Closed-loop control settings (A) 7 = Fault 8 = Starting lockout 9 = Ready for ON 10 = DC-link precharging 11 = Ready to run 14 = Run 18 = Forming 21 = Downloading parameter settings .... Analog output: 100 % with code number (PWE) = 16384 Type = O2; PKW: 1HEX=1 PZD Gr.: 0	MLFB Input Init. MLFB H/W Init System Init H/W Setting System Set. Fault ON locked Rdy ON Precharging Rdy Run Operation Capacitor forming Download	–	2 /UHABR
r004 4Hex	**Output Amps** AFE output current (fundamental r.m.s.) Note: The displayed value corresponds to the current at the inverter (CT). The line current at the AFE input deviates from this value by the current component which flows through the filter capacitor. Analog output: 100 % with code number (PWE) = 4 * P072 Type=O2; PKW: 1HEX=0.1 A PZD Gr.: 6	[A]	–	2 / BR
r006 6Hex	**DC Bus Volts** Actual DC-link voltage value Display quantity for the PMU and OP. Analog output: 100 % with code number (PWE) = 4*P071 Type=I2; PKW: 1HEX=1 V PZD Gr.: 7	[V]	–	2 / BR
r010 AHex	**AFE utilization** Thermal AFE utilization as a result of an I2t calculation of the output current. Loading the AFE with maximum current for • 30 seconds activates an alarm (P622) and for • 60 seconds to a reduction in the load current to 91 % of AFE rated current. Analog output: 100 % with code number (PWE) = 16384 % Type=O2; PKW: 1HEX=1 % PZD Group: 0	[%]	–	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r012 CHex	**Base/Reserve** Basic/reserve settings of the process data connections for setpoints and control word bits Parameter values: 0: Basic setting 1: Reserve setting Analog output: 100 % with code number (PWE) = 16384 Type=O2; PKW: 1HEX=1 PZD Gr.: 0	 Basic Reserve	–	2 / BR
r013 DHex	**Operat. hours** Display of hours run with enabled inverter (in Run operating state). Indices: i001 = Days: Days (0...9999) i002 = Hrs.: Hours (0...24) i003 = Sec.: Seconds (0...3600) Type=O2; PKW: 1HEX=1 PZD Gr.: 0	 d h s	3	2 / BR
r030 1EHex	**Line volts** Actual line voltage (fundamental r.m.s.) Analog output: 100 % with code number (PWE) = 4 * P071 Type=O2; PKW: 1HEX=1 V PZD Gr.: 7	 [V]	–	2 / BR
r032 20Hex	**Line frequency** Actual frequency of line voltage Analog output: 100 % with code number (PWE) = 163.84 Hz Type=O2; PKW: 1HEX=0.01 Hz PZD Gr.: 0	 [Hz]	–	2 / BR

12.2 General parameters

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P050 * 32Hex	**Language** Plain text display language on the optional OP operator panel and in the SIMOVIS PC program Parameter values: 0: German 1: English 2: Spanish 3: French 4: Italian Type=O2; PKW: 1HEX=1 PZD Gr.: -	0 to 5 Deutsch English Espanol Francais Italiano	– 0	2 /UHABR 2 /UHABR
P051 * 33Hex	**Access Level** Access level setting; the higher the access level, the more parameters can be accessed for reading and writing. Parameter values: 1: Operation via PMU/ OP 2: Standard mode 3: Expert mode Type=O2; PKW: 1HEX=1 PZD 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 various commissioning steps and special functions. Parameter values: 0 = Return to the previously active drive status from one of the functions described below. 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. On completion of this function, the parameter is automatically reset to 0. 2 = Enable MLFB setting mode (switch to MLFB Input operating status). The function can be deselected only by resetting the parameter to 0 (Return). 3 = Download/upread (switch to Download operating status). The function can be deselected only by resetting the parameter to 0 (Return). ⇒ Not currently implemented for SIMOVIS! 4 = Hardware configuration (switch to Hardware Settings operating status). The function can be deselected only by resetting the parameter to 0 (Return). 5 = Closed-loop control settings (switch to Closed-Loop Control Settings operating status to parameterize plant data). The parameter must be reset to 0 (Return) to exit the function without modifying parameters internally. 20 = Forming Type=O2; PKW: 1HEX=1 PZD Gr.: -	0 to 20 Return Par. Reset Set MLFB Download H/W Setting Drive Setting Capacitor forming	– 0	2 /UHABR 2 /UHAB
P053 * 35Hex	**Parameter access** Release of interfaces for parameterization. This parameter can always be written at any time from any interface. Parameter values: 0: None 1: COM BOARD (CB) 2: BASE KEYPAD (PMU) 4: BASE SERIAL (SST1) (SST1 and OP) 8: Serial I/O (SCB with USS) (SCB) 16: TECH BOARD (TB) Setting instructions: • Every interface is numerically coded. • Entering the number or the product of several different numbers assigned to different interfaces releases the relevant interface(s) for utilization as a parameterizing interface. Example: A factory setting of 6 indicates that interfaces BASE KEYPAD (PMU) and BASE SERIAL (SST1) are released as parameterizing interfaces. Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 31	– 6	1 /UHABR 1 /UHABR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P054 36Hex	**OP Backlight** Backlighting for operator panel Parameter values: 0 = Panel is always backlit 1 = Panel is only backlit when in use Type=O2; PKW: 1HEX=1 PZD Gr.: -	0 to 1	– 0	3 / BR 3 / BR

12.3 Drive data

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P070 * 46Hex	**MLFB(6SE71..)** MLFB (order number) of basic unit For parameter values, see Section "Initialization" Type=O2; PKW: 1HEX=1 PZD Gr.: -	0 to 255	– 0	3 /U BR 3 /U
P071 47Hex	**Line volts** Line supply voltage for AFE (r.m.s. of line-to-line voltage) This parameter specifies the incoming AC supply voltage. It is used to calculate the setpoint DC link voltage (P125) and the thresholds for fault messages "Line supply overvoltage", "Line supply undervoltage" (P074) and "DC link undervoltage". Type=O2; PKW: 1HEX=1 V PZD Gr.: 0	90 to 1320 [V]	– ←	2 / ABR 2 / A
P072 48Hex	**AFE current(n)** AFE rated output current Type=O2; PKW: 1HEX=0.1 A PZD Gr.: 0	4.0 to 6540.0 [A]	– ←	2 /U ABR 4 /U
P074 4AHex	**Undervoltage threshold** Response threshold for shutdown on line undervoltage. The line supply voltage (P071) is the reference quantity. Note: P155: Maximum power failure time Type=O2; PKW: 1HEX=1 % PZD Gr.: –	6 to 100 [%]	– 65	2 / BR 2 / BR

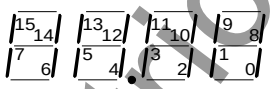
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P077 * 4DHex	**FactSettingType** Selective factory setting This parameter can be changed in the "MLFB Input" state (P052). If no MLFB has yet been entered, the selected factory setting type becomes effective immediately an MLFB number is entered and "MLFB Input" deselected (P052=0). It is possible to activate a specific factory setting by selecting "Par. Reset" (P052 = 1 or P970 = 0). This action does not, however, change the setting in P077. Parameter values: 0: Current factory setting remains valid. 1: AFE with OP1: ⇒not currently implemented 2: AFE cabinet unit with terminal strip: This setting initializes the following parameters to values other than zero: P554, P566, P603 3: Current factory setting remains valid. 3: AFE cabinet unit with OP1: ⇒not currently implemented Type:O2; PKW: 1HEX=1 PZD Gr.: -	0 to 4	– 0	3 /U BR 3 /U
P078 4EHex	**Line frequency** Frequency of incoming AC supply Type=O2; PKW: 1HEX=1 Hz PZD Gr.: -	50 to 60 [Hz]	– 50	2 / ABR 2 / A
P080 50Hex	**Line filter C/mF** Capacitance of the filter capacitors of one phase of the AFE line filter in mF for a "star circuit configuration". If the line filter capacitors are connected in a “delta configuration”, then 300% of the value must be parameterized. Type=O2; PKW: 1HEX=0.001 PZD Gr.: 0	0.000 to 10.000	– 0.000	3 / BR 3 / BR
P081 51Hex	**Line filter L/mH** Inductance L of AFE filter reactor in mH. Type=O2; PKW: 1HEX=0.001 PZD Gr.: 0	0.000 to 20.000	– ←	3 / BR 3 / BR
r082 52Hex	**Line filter L/%** Inductance L of AFE filter reactor in % (calculated from P081). Analog output: 100 % with code number (PWE) = 1638.4 % Type=O2; PKW: 1HEX=0.1 % PZD Gr.: 0	[%]	–	3 / BR
P083 53Hex	**R precharging** Precharging resistance in ohms. Type=O2; PKW: 1HEX=0.1 Ohm PZD Gr.: 0	0.0 to 1000.0 [ohms]	– 0.0	3 / BR 3 / B
r089 59Hex	**Board Position 1** Board in slot 1 (left) in electronics box Parameter values: 0 = None (formal setting only) 6 = CUSA board for AFE Analog output: 100 % with code number (PWE) = 16384 Type=O2; PKW: 1HEX=1 PZD Gr.: 0	None AFE	–	3 / H BR

12.4 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 slot #2 (right) of the electronics box Parameter values: 0 = No option board 1 = Communication Board (CB) 2 = Technology Board (TB) 3 = Serial Communication Board (SCB) 4 = Digital Tacho and Synchronization Board (TSY) Setting instruction: The following are the only permissible board/slot combinations: Slot 3 (P091) Slot 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 PZD Gr.: -	0 to 4 None CB TB SCB TSY	– 0	3 / H BR 3 / H
P091 * 5BHex	**Board Position 3** Board in slot 3 (centre) in electronics box For description, see P090 (board position 2). Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 4	– 0	3 / H BR 3 / H

12.5 Closed-loop control

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P120 78Hex	**CosPhi set** Power factor cos(PHI) setpoint. Parameter values: 0.800 ... 1.000 ⇒ inductive -0.800 ... -1.000 ⇒ capacitive RDS(2) parameter Type=I2; PKW: 1HEX=0.001 PZD Gr.: 4000HEX=4	–1.000 to 1.000	2 i001=1.000 i002=1.000	3 / BR 3 / BR
P122 7AHex	**React. pow.(set)** Reactive power setpoint for “reactive power compensation” mode (P164 = 0). Parameter values: Reactive power setpoint < 0 ⇒ inductive Reactive power setpoint > 0⇒ capacitive RDS(2) parameter Type=I2; PKW: 1HEX=0.1 % PZD Gr.: 4000HEX = 400%	–140.0 to 140.0 [%]	2 i001=0.0 i002=0.0	3 / BR 3 / BR
r123 7BHex	**Reactive power/kVAr** Reactive power setpoint in kVAr calculated from P122 (for the line supply voltage P071) for “reactive power compensation” mode (P164 = 0) Analog output: 100 % with code number (PWE) = 1638.4 kVA Type=I2; PKW: 1HEX=0.1 kVA PZD Gr.: 0	[kVAr]	–	3 / BR
P124 7CHex	**Sm.react.pow.** Smoothing time constant for reactive power setpoint specified in P122. RDS(2) parameter Type=O2; PKW: 1HEX=1 ms PZD Gr.: 0	0 to 900 [ms]	2 i001=50 i002=50	3 / BR 3 / BR
P125 7DHex	**Vd(set) factor** Factor for the fixed setpoint of the DC link voltage. The line supply voltage (P071) is the reference quantity. Visualization parameters: r126: Vd fixed setpoint r447: Vd setpoint of setpoint node (P443) r139: Vd setpoint Type=O2; PKW: 1HEX=0.01 PZD Gr.: –	1.42 to 1.90	– 1.58	3 / BR 3 / BR
r126 7EHex	**Vd (set, par)** Fixed setpoint for the DC link voltage setpoint V (calculated from P125) Note: Settable via P125 Vd(set) factor Analog output: 100 % with code number (PWE) = 4 x P071 Type=O2; PKW: 1HEX=1 V PZD Gr.: 7	[V]	–	3 / BR
P129 81Hex	**Vd reg. Kp** Gain of DC-link voltage (Vd) controller RDS(2) parameter Type=O2; PKW: 1HEX=0.1 PZD Gr.: 0	0.0 to 31.9	2 i001=2.0 i002=2.0	3 / BR 3 / BR
P130 82Hex	**Vd reg. Kp dyn** Dynamic gain of DC-link voltage (Vd) controller RDS(2) parameter Type=O2; PKW: 1HEX=0.1 PZD Gr.: 0	0.0 to 31.9	2 i001=10.0 i002=10.0	3 / BR 3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P131 83Hex	**Vd regulator Ti** Integration time constant of the DC-link voltage (Vd) controller RDS(2) parameter Type=O2; PKW: 1HEX=0.1 ms PZD Gr.: 0	0.5 to 100.0 [ms]	2 i001=20.0 i002=20.0	3 / BR 3 / BR
r139 8BHex	**Ud (set)** Setpoint of DC-link voltage in V Note: The Vd setpoint (r139) can be higher than the set Vd setpoint (r447). For a high line supply voltage and/or a high capacitive reactive current, the DC link voltage is automatically increased so that a minimum modulation reserve is maintained. Analog output: 100 % with code number (PWE) = 4 x P071 Type=O2; PKW: 1HEX=1 V PZD Gr.: 7	[V]	–	3 / BR
r150 96Hex	**Control status** Status word of the closed-loop control Parameter values: Bit00 = 1: Initialization of closed-loop control complete Bit01 = 1: Ext. 24V power supply faulted Bit02 = Reserved Bit03 = 1: Precharging completed Bit04 = 1: Active current >= 0 (motoring, rectifier operation) Bit05 = 1: Reactive current >= 0 (capacitive) Bit06 = 1: Active current at limit Bit07 = 1: Reactive current at limit Bit08 = 1: Absolute current value at limit (r174) Bit09 = 1: Smoothed line supply voltage < 80 % of P071 Bit10 = 1: Smoothed line supply voltage > 105 or 110 % of P071 Bit11 = 1: Control factor at limit Bit12 = 1 Ud2t integrator increasing Bit13 = 1 DC link voltage < 90% of setpoint Bit14 = 1 DC link voltage > 110% of setpoint Bit15 = 1 Smoothed line supply voltage < P074 Coding of bits on the PMU:  Type=V2; PKW: 1HEX=1 PZD Gr.: 0		–	3 / BR
r152 98Hex	**Active RDS** Active reserve data set of the AFE Analog output: 100 % with code number (PWE) = 16384 Type=O2; PKW: 1HEX=1 PZD Gr.: 0		–	2 / ABR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P155 9BHex	**max. t. pow.fail** Maximum time until the power failure fault (F009) or line supply undervoltage fault (F004) is output. If the unsmoothed line supply voltage falls below the threshold parameterized in P074, the inverter firing pulses are inhibited. The main contactor remains closed. If the line supply voltage does not increase above the minimum threshold (P074) within the maximum time for a power failure, the power failure fault F009 is output and the main contactor is opened (de-energized). If the smoothed line supply voltage falls below the threshold parameterized in P074, fault message F004 "line supply undervoltage" is output. Type=O2; PKW: 1HEX=1 s ZD-Gr.: 0	0 to 3000 [ms]	– 100	3 / BR 3 / BR
P160 A0Hex	**I start(mot,max)** Maximum current limit for motor operation. The line current is limited by this parameter. RDS(2) parameter Type=I2; PKW: 1HEX=0.1 % PZD: 4000HEX = 400 %	0.0 to 150.0 [%]	2 i001=150.0 i002=150.0	3 / ABR 3 / A
P161 A1Hex	**I start(gen,max)** Maximum regenerative current limit. The regenerative feedback current is limited to the value set here..0 RDS(2) parameter Type=I2; PKW: 1HEX=0.1 % PZD: 4000HEX = 400 %	–150.0 to 0.0 [%]	2 i001=-150.0 i002=-150.0	3 / ABR 3 / A
P164 A4Hex	**Operating mode** Selection of the operating mode Parameter values: 0: Operating mode “reactive power compensation” The setpoint for the reactive power can be set via P122. 1: Operating mode "cos(PHI)" The setpoint for the cos(PHI) can be set via P120. 2: Operating mode "closed-loop current control" The source of the current setpoint must be entered via P486. RDS(2) parameter Type=O2; PKW: 1HEX=1 PZD Gr.: –	0 to 2	2 i001=1 i002=1	3 / ABR 3 / A

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P173 ADHex	**Imax** Maximum current (fundamental r.m.s.) Setpoint for current limitation (Imax controller) to protect the AFE. Maximum 1.36 x conv.current(n) (P072). Visualization parameters: r174: Actually applied maximum current setpoint (taking derating into account) Note: The maximum current set here must always be so high so that the AFE can handle the power demanded by the drive. If the drive demands more current than the maximum current set here, the AFE shuts down with the “overload” fault (F013). RDS(2) parameter Type=O2; PKW: 1HEX=1 A PZD Gr.: 6	1 to 30000 [A]	2 i001=← i002=←	3 / BR 3 / BR
r174 AEHex	**Imax(set)** Maximum current (setpoint applied) Setpoint applied for current limiting (Imax controller); takes into account the effect of the I²t calculation Note: P173 (parameterized maximum current setpoint) Analog output: 100 % with code number (PWE) = 40 x P072 Type=O2; PKW: 1HEX=1 A PZD Gr.: 6	[A]	–	3 / BR
r179 B3Hex	**Output Amps (rms)** Output current (fundamental rms) (fast actual value for automation purposes) Analog output: 100 % with code number (PWE) = 4*P072 Type=O2; PKW: 1HEX=0.1 A PZD Gr.: 6	[A]	–	3 / BR
r255 FFHex	**I (reactive,set)** Reactive current component setpoint. Limited by the maximum current (r174) and the active current setpoint (r263). Analog output: 100 % with code number (PWE) = 4 x P072 Type=I2; PKW: 1HEX=0.1 A PZD Gr.: 6	[A]	–	3 / BR
r256 100Hex	**I (reactive,act)** Actual value of reactive current component Analog output: 100 % with code number (PWE) = 4 x P072 Type=I2; PKW: 1HEX=0.1 A PZD Gr.: 6	[A]	–	3 / BR
r263 107Hex	**I (active,set)** Setpoint of active current component. Limited by the maximum current (r174). Analog output: 100 % with code number (PWE) = 4 x P072 Type=I2; PKW: 1HEX=0.1 A PZD Gr.: 6	[A]	–	3 / BR
r264 108Hex	**I (active,act)** Actual value of active current component Analog output: 100 % with code number (PWE) = 4 x P072 Type=I2; PKW: 1HEX=0.1 A PZD Gr.: 6	[A]	–	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r303 12FHex	**Vd(act)** Actual unsmoothed DC-link voltage value Analog output: 100 % with code number (PWE) = 4 x P071 Type=I2; PKW: 1HEX=1 V PZD Gr.: 7	[V]	–	3 / BR
P308 134Hex	**Sampling Time** Basic sampling time T0. Setting instructions: • When the sampling time is reduced, the available computing time should be checked via parameter r725 in the "Run" state. At least 5 % of the available computing time should always be left in reserve to avoid any delayed (slow) execution of operator inputs. • If fault F042 "Computing time" occurs, the sampling time setting must be increased again. Type=O2; PKW: 1HEX=0.1 ms PZD Gr.: –	0.8 to 4.0 [ms]	– 1.5	3 / ABR 3 / A
P325 145Hex	**MC switch-on del** Delay time for closing (energizing) the main contactor. By delaying energization of the main contactor, it is possible to charge the DC link up to the line voltage peak value via the precharging resistors. This measure will be necessary if the external DC-link capacitance connected to the AFE is significantly higher than that of the AFE. Type=O2; PKW: 1HEX=0.1 s PZD Gr.: –	0.0 to 30.0 [s]	– 0.0	3 / BR 3 / B
P326 146Hex	**Max.pre-chrg. t.** Maximum precharging time If the DC link is not successfully precharged within this period, fault message Precharging (F002) or, if the line voltage is too low, fault message Line Voltage (F004) is activated. RDS(2) parameter Type=O2; PKW: 1HEX=0.1 s PZD Gr.: 0	0.1 to 30.0 [s]	2 i001=3.0 i002=3.0	3 / BR 3 / B

12.6 Functions

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P366 16EHex	**Auto Restart** Automatic restart (WEA) after power failure Parameter values: 0 = Inhibited 1 = Power failure acknowledgement only after power recovery 2 = AFE is restarted after power recovery CAUTION: External safety devices must be provided to ensure that the AFE does not start accidentally when P366 = 2! RDS(2) parameter Type=O2; PKW: 1HEX=1 PZD Gr.: -	0 to 2	2 i001=0 i002=0	3 / BR 3 / BR
P387 183Hex	**Vd minimum** Response threshold for shutdown DC-link undervoltage in closed-loop current control mode (P164 = 2). The line supply voltage is the reference quantity (P071). Type=O2; PKW: 1HEX=1 % PZD Gr.: –	5 to 140 [%]	– 100	3 / BR 3 / BR
P408 198Hex	**Forming time** DC link forming time This parameter defines the forming period for the DC link when P052=20. RDS parameter Type=O2; PKW: 1HEX=0.1 min PZD Gr.: 0	1.0 to 600.0 [min]	2 i001=10.0 i002=10.0	2 / ABR 2 / AB
P409 199Hex	**Line contac. del.** Delay time for commencement of precharging process. This parameter can be used to implement a time-graded sequence for starting up a number of drive units. Type=O2; PKW: 1HEX=0.1 s PZD Gr.: –	0.0 to 6.5 [s]	– 0.0	3 / BR 3 / B

12.7 Setpoint channel

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P443 * 1BBHex	**Src. Ud (set)** Source for the DC-link voltage setpoint. Parameter values: 1001: Fixed setpoint Other values: Acc. to process data connections of setpoint channel. B/R parameter Type=L2; PKW format(HEX)=param.value PZD Gr.: 0	0 to 4545	2 i001=1001 i002=1001	3 / BR 3 / BR
P444 1BCHex	**Vd (set) Kp** Gain for the DC-link voltage setpoint. B/R parameter Type=I2; PKW: 1HEX=0.1 % PZD: 4000HEX = 400 %	0.0 to 300.0 [%]	2 i001=100.0 i002=100.0	3 / BR 3 / BR
r447 1BFHex	**Vd (set,source)** Setpoint of DC-link voltage from setpoint nodes. The Vd setpoint is always limited to sensible values so as to prevent shutdown on faults as a result of impermissibly high setpoints. Minimum value: Peak value of line voltage = 1.42 x r030 Maximum value: 2x rated line voltage = 2 x P071 Analog output: 100 % with code number (PWE) = 4*P071 Type=O2; PKW: 1HEX=1 V PZD Gr.: 7	[V]	–	3 / BR
P486 * 1E6Hex	**Src.curr.setp.** Source for the setpoint of the active (line) current The parameterized active current setpoint is effective only in "Closed-loop current control" (P164 = 2) or "Slave AFE" modes (CW2, bit 27). Parameter values acc. to process data connections of setpoint channel. B/R parameter Type=L2; PKW format(HEX)=param. value PZD Gr.: 0	0 to 4545	2 i001=0 i002=0	3 / BR 3 / BR
P487 1E7Hex	**Curr.setp. Kp** Gain for the setpoint of the active (line) current in "Closed-loop current control" (P164 = 2) or "Slave AFE" modes (CW2, bit 27). B/R parameter Type=I2; PKW: 1HEX=0.1 % PZD: 4000HEX = 400 %	–300.0 to 300.0 [%]	2 i001=100.0 i002=100.0	3 / BR 3 / BR
r490 1EAHex	**Curr.setp.** Active (line) current setpoint in "Closed-loop current control" (P164 = 2) or "Slave AFE" modes (CW2, bit 27). Analog output: 100 % with code number (PWE) = 400 % Type=I2; PKW: 1HEX=0.1 % PZD: 4000HEX = 400 %	[A]	–	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P517 205Hex	**SetActValDev.Ud** Setpoint/actual value deviation in DC-link voltage Vd In the case of a large deviation between Vd setpoint and actual value, message "Setpoint actual value deviation" (status word 1, bits 8 (r552) is activated. Cf. P518 Minimum time of setpoint/actual value deviation Ref. quantity: Vd(set) (r126) RDS(2) parameter Type=O2; PKW: 1HEX=0.01 % PZD Gr.: 0	0.00 to 100.00 [%]	2 i001=2.00 i002=2.00	3 / BR 3 / B
P518 206Hex	**Deviation Time** Minimum time for setpoint/actual value deviation When there is a deviation between the setpoint/actual value (P517), the message "Setpoint/actual value deviation" (status word 1 bit 8 (r552)) is output when the time in P518 runs out. RDS(2) parameter Type=O2; PKW: 1HEX=0.01 s PZD Gr.: 0	0.0 to 10.00 [s]	2 i001=0.10 i002=0.10	3 / BR 3 / B

12.8 Control and status bit connections

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 control word 1, bits 0 to 15 (see Section "Control word"). Type=V2; PKW: 1HEX=1 PZD Gr.: 0		–	2 / BR
r551 227Hex	**Control Word 2** Display of control word 2, bits16 to 31 (see Section "Control word"). Type=V2; PKW: 1HEX=1 PZD Gr.: 0		–	2 / BR
r552 228Hex	**Status Word 1** Display of status word 1, bits 0 to 15 (see Section "Control word"). Type=V2; PKW: 1HEX=1 PZD Gr.: 0		–	2 / BR
r553 229Hex	**Status Word 2** Display of status word 2, bits 16 to 31 (see Section "Control word"). Type=V2; PKW: 1HEX=1 PZD Gr.: 0		–	2 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P554 * 22AHex	**Src ON/OFF1** Source for ON/OFF1 command (control word 1, bit 0) See Section "Control word" for details Parameter values: 0: OFF1 1: Illegal setting 1001: Digital input 1 CUSA 1003: Digital input 3 CUSA 1010: ON/OFF keys PMU 2001: SST1, word 1,bit 0 Other values: See permissible settings in Section "Control word" (process data connections of control word) Note: A value of 4101 or 4201 is recommended in conjunction with the inputs of the serial IO system. B/R parameter Type=L2; PKW: PKW format(HEX)=param. value PZD Gr.: 0	0 to 5001	2 i001=1010 i002=1001	2 / BR 2 / BR
P555 * 22BHex	**Src1 OFF2(coast)** Source 1 of the OFF2 control command (control word 1, bit 1) See Section "Control word" for details Parameter values: 0: Illegal setting 1: Operating condition 1002: Digital input 2 CUSA Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW: PKW format(HEX)=param. value PZD Gr.: 0	1 to 5001	2 i001=1 i002=1002	2 / BR 2 / BR
P556 * 22CHex	**Src2 OFF2 (coast)** Source 2 of the OFF2 control command (control word 1, bit 1) See P555 for description B/R parameter Type=L2; PKW: PKW format(HEX)=param. value PZD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P557 * 22DHex	**Src3 OFF2 (coast)** Source 3 of the OFF2 control command (control word 1, bit 1) See P555 for description B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P561 * 231Hex	**Src InvRelease** Source for the inverter enable command (control word 1, bit 3) See Section "Control word" for details Parameter values: 0: Disable inverter 1: Automatically when delay timers run down Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD 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: _/_
P565 * 235Hex	**Src1 Fault Reset** Source 1 of "Acknowledge" control command (control word 1, bit 7) See Section "Control word" for details Parameter values: 0: No source selected 1: Illegal setting 1003: Digital input 3 on CUSA Other values: See permissible settings in Section "Control word" (process data connections of control word) Note: The "Acknowledge" control command is edge-triggered. B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	2 i001=0 i002=1003	2 / BR 2 / BR
P566 * 236Hex	**Src2 Fault Reset** Source 2 of "Acknowledge" control command (control word 1, bit 7) See P565 for description B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	2 i001=0 i002=0	2 / BR 2 / BR
P567 * 237Hex	**Src3 Fault Reset** Source 3 of "Acknowledge" control command (control word 1, bit 7) See P565 for description B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	2 i001=2001 i002=2001	2 / BR 2 / BR
P568 * 238Hex	**Src Jog1 ON** Source for the Inching 1 setpoint (control word 1, bit 8) See Section "Control word" for details Parameter values: 0: No inching 1: Illegal setting 2001: SST1, word 1 bit 8 Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	2 i001=0 i002=0	2 / BR 2 / BR
P569 * 239Hex	**Src Jog2 ON** Source for the Inching 2 setpoint (control word 1, bit 8) See Section "Control word" for details Parameter values: 0: No inching 1: Illegal setting 2001: SST1, word 1, bit 8 Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW format(HEX)=param.value PZD 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: _/_
P572 * 23CHex	**Src.regen.enable** Source for control command "Regenerative feedback enabled" (control word 1, bit 12) Parameter values: 0: Regenerative feedback disabled 1: Regenerative feedback enabled 2001: SST1, word 1, bit 8 Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P575 * 23FHex	**Src No Ext Fault1** Source for control command "External fault 1" (control word 1, bit 15) An L signal causes the drive to shut down on faults. Parameter values: 0: Illegal setting 1: No fault 1001: CUSA digital input 1 Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P576 * 240Hex	**Src. ext. 24V ok** Source for the bit for monitoring the external 24 V power supply. This bit is connected to digital input 4 on the CUSA at the factory. Parameter values: 0: Ext. 24V not o.k. 1: Ext. 24V o.k. 1001: CUSA digital input 1 Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2;PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	2 i001=1004 i002=1004	3 / BR 3 / BR
P578 * 242Hex	**Src. RDS bit 0** Source for bit 0 for selection of reserve data set (RDS) (control word 2, bit 18) Parameter values: 0: RDS bit 0 has a value of 0 1: RDS bit 0 has a value of 1 Other values: See permissible settings in Section "Control word" (process data connections of control word) Note: The reserve data set cannot be altered in Run mode. Any change to the bit setting will not take effect until the "Ready" state is reached. B/R parameter Type=L2; PKW: PKW format(HEX)=param. value PZD Gr.: 0	0 to 5001	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: _/_
P586 * 24AHex	**Src No ExtFault2** Source for control command "External fault 2" (control word 2, bit 26) An L signal causes the device to shut down on faults if: • the DC link has been precharged (operating state > 10) and • the 200 ms delay timer after precharging has run down Parameter values: 0: Illegal setting 1: No fault 1004: CUSA digital input 4 Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2;PKW format(HEX)=param.value PZD Gr.: 0	1 to 5001	2 i001=1 i002=1	2 / BR 2 / BR
P587 * 24BHex	**Src.slave AFE** Source for "Master/slave AFE" switchover (control word 2, bit 27) Parameter values: 0: Master AFE (int. current setpoint) 1: Slave AFE (ext. current setpoint) 1002: CUSA digital input 2 Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	2 i001=0 i002=0	3 / BR 3 / BR
P588 * 24CHex	**Src No Ext Warn1** Source for control command "External alarm 1" (control word 2, bit 28) Parameter values: 0: Illegal setting 1: No alarm 1002: CUSA digital input 2 Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	1 to 5001	2 i001=1 i002=1	3 / BR 3 / BR
P589 * 24DHex	**Src No Ext Warn2** Source for control command "External alarm 2" (control word 2, bit 29) Parameter values: 0: Illegal setting 1: No alarm Other values: See permissible settings in Section "Control word" (process data connections of control word) B/R parameter Type=L2; PKW: PKW format(HEX)=param. value PZD 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 for basic / reserve setting switchover command (control word 2, bit 30) Parameter values: 0: Basic setting 1: Reserve setting 1005: CUSA digital input 5 Other values: See permissible settings in Section "Control word" (process data connections of control word) Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	– 1005	3 / BR 3 / BR
P600 * 258Hex	**Dst Ready for ON** Destination of the status bit 'Ready for ON' (status word 1, bit 0) Power is ON, the drive can be switched on. Parameter values: Depending on the selected index, all settings specified in Section "Status word" (process data connections of status word) may be parameterized. Indices: i001: GG: Select a terminal on the basic unit i002: SCI: Select a terminal on SCI1/2 i003: TSY: Select a terminal on TSY Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P601 * 259Hex	**Dst Rdy for Oper** Destination of status bit "Ready to Run" (status word 1, bit 1) The DC link is charged, the pulses can be enabled. Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P602 * 25AHex	**Dst Operation** Destination of status bit "Run" (status word 1, bit 2) The device is running. Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	2 / BR 2 / BR
P603 * 25BHex	**Dst Fault** Destination of status bit "Fault" (status word 1, bit 3) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=0 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 for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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: _/_
P606 * 25EHex	**Dst ON blocked** Destination of the status bit "Starting lockout active" (status word 1, bit 6) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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 "Alarm" (status word 1, bit 7) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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 "DC-link voltage setpoint = Actual DC-link voltage' (status word 1, bit 8) - cf. P517; see Section "Status word" for details Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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 "Low voltage' (status word 1, bit 11) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P612 * 264Hex	**Dst Contactor** Destination of the status bit "Energize main contactor' (status word 1, bit 12); H level: Energize contactor! CAUTION: For safety reasons, this status bit is always connected to digital output 2 on the CUSA board on the AFE. It is not possible or permissible to connect the bit in any other way as it protects the AFE against damage by preventing the main contactor from closing before the DC link has been charged. Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=1002 i002=0 i003=0	3 / BR 3 / BR
P614 * 266Hex	**Dst.Gen.Mot.** Destination of the status bit "Generator/motor operation" (status word 1, bit 14) Meaning: L: Motor-mode operation (rectifier) H: Generator-mode operation (regen. feedback) Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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: _/_
P618 * 26AHex	**DstCurrLimAct.** Destination of the status bit "Current limit active' (status word 2, Bit 18) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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 active' (status word 2, bit 19) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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 active' (status word 2, bit 20) Notes: • The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). • The device accepts the fault after 200 ms provided that an ON command is active. Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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 alarm active' (status word 2, bit 21) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P622 * 26EHex	**Dst.warn.i2tAFE** Destination of the status bit "Inverter overload alarm" (status word 2, bit 22); cf. r010 (AFE utilization) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: -	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P623 * 26FHex	**DstFltOvertmpAFE** Destination of the status bit "Inverter overtemperature fault" (status word 2, bit 23) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD 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	**DstWarOvertmpAFE** Destination of the status bit "Inverter overtemperature alarm" (status word 2, bit 24) Note: The active status (bit has H level) is output via the terminal in inverted form (broken-wire proof). Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR
P629 * 275Hex	**DstPrechrgContEn** Destination of the status bit “Precharging contactor energized” (status word 2, bit 29) Caution: For safety reasons, this status bit on the AFE is always connection to digital output 1 on the PEU. Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=1001 i002=0 i003=0	3 / BR 3 / BR
P631 * 277Hex	**Dst Pre-Charging** Destination connection for the status bit "Precharging active" (status word 2, bit 31) Parameter values, indices as for P600 Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5002	3 i001=0 i002=0 i003=0	3 / BR 3 / BR

12.9 Analog inputs/outputs

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P655 * 28FHex	**CUA AnaOut ActVal** Actual value output via the analog output of the CUSA Setting instruction: Enter the number of the parameter whose value is to be displayed. Type=O2; PKW: 1HEX=1 PZD Gr.: 0	0 to 999	– 303	2 / BR 2 / BR
P656 290Hex	**CU AnalogOutGain** Gain factor of the analog output on the CUSA, see Section "Analog outputs" Parameter values: P656 = calculated output voltage when parameter value is set to 100 % The calculation formula for the output voltage is as follows: $V_{out} = \frac{PWE}{100\,\%} \cdot P656 + P657$ Note: The output voltage at the analog output can be maximum ± 10 V. Type=I2; PKW: 1HEX=0.01 V PZD Gr.: 0	–320.00 to 320.00 [V]	– 10.00	2 / BR 2 / BR
P657 291Hex	**CU AnalogOutOffs** Offset of the analog output on the CU, cf. P656 Type=I2; PKW: 1HEX=0.01 V PZD 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 analog inputs on the SCI1 boards, defining the type of 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 processed per input. A choice of voltage or current signals can be evaluated. • Voltage and current signals must be connected to different terminals. • Settings 1 and 2 allow only unipolar signals to be used, i.e. the internal process quantities are also unipolar. • When setting 2 is selected, an input current of < 2 mA causes a shutdown on faults (open-wire monitoring). • Offset adjustment of the analog inputs is parameterized via parameter 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 Precondition: The associated SCB board must be logged on via P090 or P091. Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 2 –10 V...+10 V 0 V...+10 V 4 mA...20 mA	6 i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	3 / BR 3 / BR
P661 295Hex	**SCI AnaInSmooth** Smoothing time constant of analog inputs on SCI boards Formula: T=2 ms x 2^{P661} Indices: See P660 Type=O2; PKW: 1HEX=1.0 PZD 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** Zero offset of analog inputs on SCI boards See SCI Operator's Guide for setting instructions Indices: See P660 Type=I2; PKW: 1HEX=0.01 V PZD: 4000HEX=160 V	–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

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P664 * 298Hex	**SCI AnaOutActVal** Output of actual values via analog outputs on SCI boards Setting instruction: Enter the number of the parameter whose value is to be output. See SCI Operator's Guide for details. 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 Precondition: The associated SCB board must be logged on via P090 or P091. Type=O2; PKW: 1HEX=1.0 PZD 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** Gain for analog outputs via the SCI slaves Setting instruction: See SCI Operator's Guide Indices: See P664 Type=I2; PKW: 1HEX=0.01 PZD: 4000HEX=160	–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 analog outputs on SCI boards Setting instruction: See SCI Operator's Guide Indices: See P664 Type=I2; PKW: 1HEX=0.01 V PZD: 4000HEX=160 V	–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

12.10 Interface configuration

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P680 * 2A8Hex	**SCom1 Act Value** Output of actual values via serial interface SST1 Defines which parameter must be transferred at which telegram position. Notes: • Status word 1 (r968) should be assigned to word 1. • In the case of double word parameters (type I4), the associated parameter number must be entered in two consecutive words or else only the most significant word will be transferred. • The length (number of words) of the process data section in the telegram is set via P685, index i001. Indices: i001 = W01: Word 01 of (process data section) of the telegram i002 = W02: Word 02 of (process data section) of the telegram ... i016 = W16: Word 16 of (process data section) of the telegram Type=O2; PKW: 1HEX=1.0 PZD 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** The SCB board can be operated as a • master for the SCI boards or as a • communications board (see SCB Operator's Guide). Parameter values: 0 = Master for SCI boards 1 = 4-wire USS 2 = 2-wire USS 3 = Peer to Peer 4 = Not assigned 5 = Not assigned Precondition: The associated SCB board must be logged on via P090 or P091 Type=O2; PKW: 1HEX=1.0 PZD 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 serial interfaces (see Section "Serial interfaces") Indices: i001 = SST1: Bus address of serial interface 1 (CUSA) i002 = SCB: Bus address of SCB if P682 = 1, 2 Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 31	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: _/_
P684 * 2ACHex	**SCom/SCB Baud** Baud rate of serial interfaces 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 Indices: i001 = SST1: Baud rate of ser. interface 1 (CUSA) i002 = SCB: Baud rate of SCB if P682 = 1, 2, 3 Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	1 to 13	2 i001=6 i002=6	3 / BR 3 / BR
P685 * 2ADHex	**SCom/SCB PCV** Number of words (16-bit) in PKW section in the net data block of the telegram (see Section "Serial interfaces") Parameter values: 0: No PKW section 3, 4: PKW section is 3 (ident., ind,value), 4 words long 127: Variable PKW length for transmission of parameter description and texts. Indices: i001 = SST1: Serial interface 1 (CUSA) i002 = SCB: SCB if P682 = 1, 2 Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 127	2 i001=127 i002=127	3 / BR 3 / BR
P686 * 2AEHex	**SCom/SCB # PrDat** Number of words (16-bit) of process data section in the net data block of the telegram (see Section "Serial interfaces"). Indices: i001 = SST1: Serial interface 1 (CUSA) i002 = SCB: SCB if P682 = 1, 2, 3 Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 16	2 i001=2 i002=2	3 / BR 3 / BR
P687 * 2AFHex	**SCom/SCB TlgOFF** Telegram failure time for CUSA and SCB Shutdown on faults occurs if no correct telegram is received within the specified time. Setting instructions: • Value 0: No monitoring and no fault shutdown; parameterize for sporadic (acyclic) telegrams (e.g. OP on SST1). • If a TB is installed in slot 2 and an SCB in slot 3, then the setting in i002 is irrelevant. Indices: i001 = SST1: Serial interface 1 (CUSA) i002 = SCB: SCB Type=O2; PKW: 1HEX=1.0 ms PZD: 4000HEX=1638.4 ms	0 to 6500 [ms]	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: _/_
P689 2B1Hex	**SCB Peer2PeerExt** Direct transfer of peer-to-peer receive data of the SCB. Identification of words in received peer-to-peer telegram which must be transferred on directly. Param. values: 0: No immediate transfer (to CUSA only) 1: Direct transfer (incl. transfer to CUSA) Indices: i001 = W01: Word 01 of (process data section of telegram) i002 = W02: Word 02 of (process data section of telegram) ... i005 = W05: Word 05 of (process data section of telegram) Precondition: P682 = 3 (peer-to-peer protocol) Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 1	5 i001=0 i002=0 i003=0 i004=0 i005=0	3 / BR 3 / BR
P690 * 2B2Hex	**SCB Act Values** Output of actual values via the serial interface of the SCB board Defines which parameter must be transferred at which telegram position. Notes: • Status word 1 (r968) should be assigned to word 1. • In the case of double word parameters (type I4), the associated parameter number must be entered in two consecutive words or else only the most significant word will be transferred. • The length (number of words) of the process data section in the telegram is set via P685, index i002. Indices: i001 = W01: Word 01 of (process data section) of the telegram i002 = W02: Word 02 of (process data section) of the telegram ... i016 = W16: Word 16 of (process data section) of the telegram CAUTION: When P682 = 3 (peer-to-peer protocol), a maximum of 5 words can be transferred (i001 to i005). Type=O2; PKW: 1HEX=1.0 PZD 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] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P694 * 2B6Hex	**CB/TB Act Values** Output of actual values via CB or TB Defines which parameter must be transferred at which telegram position. Notes: • Status word 1 (r968) should be assigned to word 1. • In the case of double word parameters (type I4), the associated parameter number must be entered in two consecutive words or else only the most significant word will be transferred. Indices: i001= W01: Word 01 of (process data section) of the telegram i002= W02: Word 02 of (process data section) of the telegram ... i016= W16: Word 16 of (process data section) of the telegram Type=O2; PKW: 1HEX=1.0 PZD 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 failure time for CB and TB Shutdown on faults occurs if no correct telegram is received within the specified time. Setting instructions: Value 0: No monitoring and no fault shutdown; parameterize for sporadic (acyclic) telegrams. Type=O2; PKW: 1HEX=1.0 ms PZD: 4000HEX=1638.4 ms	0 to 6500 [ms]	– 10	3 / BR 3 / BR
P696 2B8Hex	**CB Parameter 1** Communication Board parameter 1 Refer to documentation of installed COM BOARD Setting instructions: • This parameter is relevant only if a Communication Board is configured and parameterized (P090 or P091 = 1) • The validity of the setting is monitored by the board. • If the value is not accepted by the COM BOARD, fault 80 with fault value 5 is displayed. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P697 2B9Hex	**CB Parameter 2** Communication Board parameter 2 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P698 2BAHex	**CB Parameter 3** Communication Board parameter 3 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P699 2BBHex	**CB Parameter 4** Communication Board parameter 4 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P700 2BCHex	**CB Parameter 5** Communication Board parameter 5 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P701 2BDHex	**CB Parameter 6** Communication Board parameter 6 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P702 2BEHex	**CB Parameter 7** Communication Board parameter 7 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P703 2BFHex	**CB Parameter 8** Communication Board parameter 8 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P704 2C0Hex	**CB Parameter 9** Communication Board parameter 9 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P705 2C1Hex	**CB Parameter 10** Communication Board parameter 10 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / H BR 3 / H
P706 2C3Hex	**CB Parameter 11** Communication Board parameter 11 Indices: i001 - i005 See P696 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	5 i001=0 i002=0 i003=0 i004=0 i005=0	3 / H BR 3 / H

12.11 Diagnostic functions

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 electronics box Indices: i001: SPI1: Software version of board in slot 1 i002: SPI2: Software version of board in slot 2 i003: SPI3: Software version of board in slot 3 i004: Spr: Software version of language EPROM in slot 1 Note: The TSY board has no software version. The equivalent identifier is always 0.0. Type=O2; PKW: 1HEX=0.1 PZD Gr.: 0		4	3 /U BR
r721 2D1Hex	**SW Generat.Date** Date of creation of the CUSA software Indices: i001: Year: Year i002: Mon.: Month i003: Day: Day Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		3	3 /U BR
r722 2D2Hex	**SW ID** Expanded software version code of the PCBs in positions 1 to 3 of the electronics box Indices: i001: SPI1: Software code of board in slot 1 i002: SPI2: Software code of board in slot 2 i003: SPI3: Software code of board in slot 3 i004: Spr: Software code of language EPROM in slot 1 Note: The TSY board has no software code. The equivalent code is always 0.0. Type=O2; PKW: 1HEX=0.1 PZD Gr.: 0		4	3 /U BR
r723 2D3Hex	**PCB Code** Identification code of boards in slots 1, 2 and 3 of the electronics box. Indices: i001: SPI1: PCB code of board in slot 1 i002: SPI2: PCB code of board in slot 2 i003: SPI3: PCB code of board in slot 3 PCB codes: CU: 100 - 109 CB: 140 - 149 TB: 130 - 139 SCB: 120 - 129 TSY: 110 - 119 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		3	3 /U BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r725 2D5Hex	**CalcTimeHeadroom** Available CPU computation time reserve on CUSA as % of total computing power. Relevant parameters are sampling time (P308) and pulse frequency (P761). Analog output: 100 % with code number (PWE) = 16384 % Type=O2; PKW: 1HEX=1.0 % PZD Gr.: 0	[%]	–	3 / BR
r730 2DAHex	**SCB Diagnosis** SCB diagnostic information All values displayed in hexadecimal notation Displayed numbers overflow at FF Hex. The meaning of individual indices depends of the selected SCB protocol (P682). Indices: i001: flTC Number of error-free telegrams i002: Terr Number of errored 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 response telegrams i006: STxL USS: STX error SCI boards: Number of search telegrams for slave acceptance i007: ETX ETX-error i008: BcCC USS: Block check error SCI boards: Number of configuration telegrams i009: L/KL USS/Peer to Peer: Incorrect telegram length SCI boards: Highest terminal numbers required acc. to PZD connection (P554 to P631) i010: T/An USS: Timeout SCI boards: Analog inputs/outputs required acc. to PZD connection of setpoint channel and actual value output via SCI (P664). i011: Res1 Reserved i012: Res2 Reserved i013: Warn SCB-DPR alarm word i014: Sl1? Setting indicating whether slave 1 is needed and, if yes, of what type 0: No slave needed 1: SCI1 2: SCI2 i015: Sl2? Setting indicating whether slave 2 is needed and, if yes, of what type 0: No slave needed 1: SCI1 2: SCI2 i016: IniF SCI boards: Initialization error Type=L2; PKW: 1HEX=1.0 PZD Gr.: 0		24	3 / H BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r731 2DBHex	**CB/TB Diagnosis** For detailed information please refer to the operating manuals of the relevant Com board (CB) or Tech board (TB). Type=L2; PKW: 1HEX=1.0 PZD Gr.: 0		32	3 / H BR
r748 2ECHex	**Trip Time** Times of fault events (reading of hours run counter (r013) at the time a fault occurred) Indices: Day Hours Seconds Latest fault (1) i001=S1-d i002=S1-h i003=S1-s Last acknowledged fault (2) i004=S2-d i005=S2-h i006=S2-s 2nd last acknowledged fault (3) i007=S3-d i008=S3-h i009=S3-s ... ... Oldest stored fault (8) i022=S8-d i023=S8-h i024=S8-s Description of faults in: r947 Fault number; r949 Fault value; r951 Fault number list; P952 Number of faults Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		24	2 / BR

12.12 Gating unit

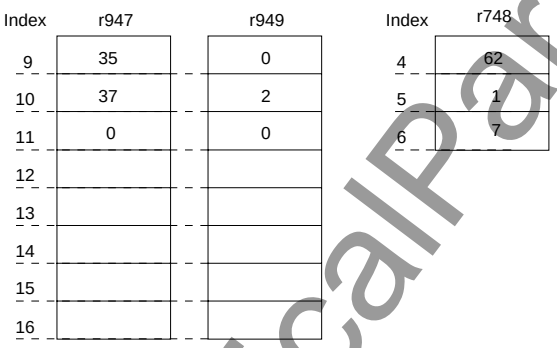
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r764 2FCHex	**Modulation Depth** Control factor of closed-loop control for gating unit. Analog output: 100 % with code number (PWE) = 400 % Type=O2; PKW: 1HEX=0.1 % PZD: 4000HEX=400 %	[%]	–	3 / BR

12.13 Factory parameters

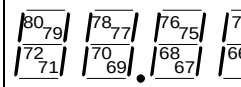
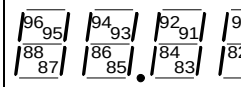
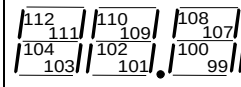
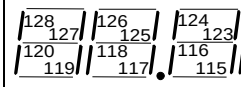
PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
P789 315Hex	**RAM Access Value** Content of a memory location on the CUSA board Type=L2; PKW format(HEX)=param.value PZD Gr.: 0	0 to 65535	– 0	3 / BR 4 / BR
P799 * 31FHex	**Special Access** Parameter for special access Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0	0 to 65535	– 0	3 / BR 3 / BR

12.14 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-dependent bus address for communication boards: see board documentation Note: The validity of the bus address is monitored by the Com Board. If its value is not accepted by COM BOARD, fault F080 with fault value 5 is displayed Precondition: P090 = 1 or P091 = 1 (Communication board logged on) Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 200	– 3	3 / H BR 3 / H
P927 * 39FHex	**Parameter Access** Enabling of interfaces for parameterization See P053 for description. Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 31	– 6	3 / BR 3 / BR
P928 * 3A0Hex	**Src Base/Reserve** Source for basic/reserve setting switchover command (control word 2, bit 30); this parameter is identical to P590. See P590 for description. Type=L2; PKW: PKW format(HEX)=param.value PZD Gr.: 0	0 to 5001	– 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 faults which caused the last 8 fault events (r748); up to 8 faults can be stored for each event. Each fault has its own fault number (see list of faults, Section 7). For plain text information associated with fault numbers: See r951. Indices: Fault 1 Fault 2 ... Fault 8 Latest fault (1) i001=S1-1 i002=S1-2 ... i008=S1-8 Last acknowledged fault (2) i009=S2-1 i010=S2-2 ... i016=S2-8 2nd last acknowledged fault (3) i017=S3-1 i018=S3-2 ... i024=S3-8 ... Oldest fault stored (8) i057=S8-1 i058=S8-2 ... i064=S8-8 Notes: A value of "0" means "No fault". In the event of a power failure, only the current and last acknowledged fault are stored. Indices 17 to 64 are then reset to 0. See P952 for the number of stored fault events. Example of a fault: Last acknowledged fault (2)  Fault time (r748): after 62 days, 1 hour, 7 sec operating hours Faults occurrences (r947): Fault value (r949): 35 No further details 37 2 Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		64	2 / BR
r949 3B5Hex	**Fault Value** Fault value of faults, facilitates troubleshooting for a variety of parameters. The fault values are stored in the same indices as the associated fault numbers (r947) - see example in r947. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		64	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r951 3B7Hex	**Fault Texts** List of fault texts; every fault text is stored under the same index as its fault number. Example (cf. r947): Fault 35 is stored in r947, i009. This is (r951, i035): 'Ext.fault1'. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	2 / BR
P952 * 3B8Hex	**# of Faults** Number of faults Contains the number of fault events stored in the fault memory (max. 8). If the parameter is set to "0", the entire contents of the diagnostic memory (r748 - fault time, r947 - fault number, r949 - fault value) are erased. Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 8	– 0	2 / BR 2 / BR
r953 3B9Hex	**Warning Param1** Alarm parameter 1 If one of the alarms numbered from 1 to 16 occurs, the corresponding bar in the 7-segment display lights up. 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR
r954 3BAHex	**Warning Param2** Alarm parameter 2 If one of the alarms numbered from 17 to 32 occurs, the corresponding bar in the 7-segment display lights up. 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR
r955 3BBHex	**Warning Param3** Alarm parameter 3 If one of the alarms numbered from 33 to 48 occurs, the corresponding bar in the 7-segment display lights up. 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR
r956 3BCHex	**Warning Param4** Alarm parameter 4 If one of the alarms numbered from 49 to 64 occurs, the corresponding bar in the 7-segment display lights up. 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r957 3BDHex	**Warning Param5** Alarm parameter 5 If one of the alarms numbered from 65 to 80 occurs, the corresponding bar in the 7-segment display lights up.  Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR
r958 3BEHex	**Warning Param6** Alarm parameter 6 (CB alarms) If one of the alarms numbered from 81 to 96 occurs, the corresponding bar in the 7-segment display lights up.  Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR
r959 3BFHex	**Warning Param7** Alarm parameter 6 (TB alarms 1) If one of the alarms numbered from 97 to 112 occurs, the corresponding bar in the 7-segment display lights up.  Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR
r960 3C0Hex	**Warning Param8** Alarm parameter 6 (TB alarms 2) If one of the alarms numbered from 113 to 128 occurs, the corresponding bar in the 7-segment display lights up.  Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR
r964 3C4Hex	**Drive ID** Drive identification Character string of the "Text" type. The first 2 characters contain the Ident number for drive identification on the Profibus. The remaining 24 characters contain the model name for displaying the drive model on visualization systems. Parameter values: 2 Byte: Ident number: 8022Hex 24 Byte: Model name (drive type): "MASTERDRIVES FC" Note: This parameter cannot be selected on the PMU; the value cannot be displayed on the OP. Type=VS; PKW: 1HEX=1.0 PZD Gr.: -		–	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r965 3C5Hex	**Profile #** Profibus-specific parameter Note: This parameter cannot be selected on the PMU; the value cannot be displayed on the OP. Analog output: 100 % with code number (PWE) = 16384 Type=OS; PKW: 1HEX=1.0 PZD Gr.: 0		–	3 / BR
r967 3C7Hex	**Control Word 1** Visualization parameter for control word 1 (bits 0 - 15) Identical to r550 (control word 1) Type=V2; PKW: 1HEX=1.0 PZD Gr.: 0		–	2 / BR
r968 3C8Hex	**Status Word 1** Visualization parameter for status word 1 (bits 0 - 15) Identical to r552 (status word 1) Type=V2; PKW: 1HEX=1.0 PZD 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). This parameter is then automatically reset to "1". 1: No parameter reset Note: The same function can be selected with P052 = 1. Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 1	– 1	3 / B 3 / B
P971 * 3CBHex	**EEPROM Saving** Transfer to the EEPROM of parameter values stored in the RAM (to protect data when power is disconnected/fails) when the value of parameter changes from 0 to 1. The parameter must be set to 0 manually. Parameter values: 0: Change parameters 1: Save parameters Type=O2; PKW: 1HEX=1.0 PZD Gr.: -	0 to 1	– 0	3 / BR 3 / BR
r980 3D4Hex	**Par # List Pt1** List of available parameter numbers, part 1 The parameter numbers are listed in ascending sequence. The first 0 to appear in the list indicates that no further parameters are available. Indices: The value range of the index extends from 1 to 116. Index 116 has the special function of referring to the parameter number which contains the next part of the complete list. A value of 0 stored in index 116 indicates that there are no further parts of the complete list. Type=O2; PKW: 1HEX=1.0 PZD 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 available parameter numbers, part 2 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r982 3D6Hex	**Par # List Pt3** List of available parameter numbers, part 3 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r983 3D7Hex	**Par # List Pt4** List of available parameter numbers, part 4 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r984 3D8Hex	**Par # List Pt5** List of available parameter numbers, part 5 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r985 3D9Hex	**Par # List Pt6** List of available parameter numbers, part 6 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r986 3DAHex	**Par # List Pt7** List of available parameter numbers, part 7 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r987 3DBHex	**Par # List Pt8** List of available parameter numbers, part 8 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r988 3DCHex	**Par # List Pt9** List of available parameter numbers, part 9 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r989 3DDHex	**Par # List Pt10** List of available parameter numbers, part 10 See r980. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r990 3DEHex	**Par # List chg1** List of altered parameters, part 1 The parameter numbers are listed in ascending sequence. The first 0 to appear in the list indicates that no further parameters are available. Indices: The value range of the index extends from 1 to 116. Index 116 has the special function of referring to the parameter number which contains the next part of the complete list. A value of 0 stored in index 116 indicates that there are no further parts of the complete list. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR

PNU *:conf-P	Parameter Name in OP1 Description	Range [Unit] Value Texts	# of Indices Factory Settings	read: _/_ write: _/_
r991 3DFHex	**Par # List chg2** List of altered parameters, part 2 See r990. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR
r992 3E0Hex	**Par # List chg3** List of altered parameters, part 3 See r990. Type=O2; PKW: 1HEX=1.0 PZD Gr.: 0		116	3 / BR

13 Fault and alarm messages

13.1 Fault messages

General information about faults

The available information for each fault event comprises the following parameters:

Parameter	r947	Fault number
	r949	Fault value
	r951	Fault texts
	P952	Number of faults
	r748	Fault time

If a fault message is not acknowledged before the electronics supply voltage is disconnected, then the same fault message will be active again when the supply is next turned on. The drive cannot be started until the message has been acknowledged (exception: Automatic restart function is selected, see P366).

Fault messages

No.	Description of fault	Remedial measures
F002	**Precharging** The DC-link voltage failed to reach the minimum limit (≈ P071 line supply voltage) during precharging. The maximum precharging time (P326) has been exceeded.	Check the line voltage, compare with **P071 Line voltage** Check the maximum precharging time (P326);
F003	**Line overvoltage** The voltage at the input terminals is higher than the response threshold (110 % or 120 % of P071 in inverter disabled or Run states). The voltage at the input terminals is higher than the maximum voltage limit + 5 % (E.g.: 460 V + 5 % = 483 V) and DC-link voltage is higher than the maximum continuous permissible value. Line voltage range / Max. contin. perm. Vd at III >90% P072 / Max. contin. perm. Vd at III ≤ 90% P072 380 V to 460 V: 740 V: 760 V 480 V to 575 V: 922 V: 947 V 600 V to 690 V: 1100 V: 1130 V	Check the line voltage, compare with **P071 Line voltage**
F004	**Line undervoltage** The voltage at the input terminals is less than the response threshold (50 % of P071 during precharging and P074 in operation). The line supply undervoltage fault is also activated if Vsupply < 80 % of P071 and if F013 occurs. If the fault occurs immediately after the drive is started up (for the first time), then the phase sequence may be incorrect. The line must always be connected in a CW phase sequence.	Check the line voltage Check P074 Compare with **P071 Line voltage** Check the line phase sequence

Fault messages		
No.	**Description of fault**	**Remedial measures**
F006	**DC-link overvoltage** The drive has been shut down due to an excessive DC-link voltage. Line voltage range I Shutdown threshold 380 V to 460 V I approx. 820 V 480 V to 575 V I approx. 1020 V 600 V to 690 V I approx. 1220 V	Regenerative feedback power of the connected converter is greater than that of the AFE. Check the following parameters: • **P572 Source regeneration enable** • **P161 Max. generator current limit of AFE** • **P173 Maximum current**
F007	**Electrical off** Electronics voltage supply (external 24 V) has failed	Check the external voltage supply Check the wiring (hardware and software) for the ext. 24 V monitoring function (software FS: 576 = 1004 = digital input 4).
F008	**DC-link undervoltage** The DC-link voltage has dropped below the minimum limit value (≈ line supply voltage)	Check • the main contactor control in cases where the fault occurs immediately after precharging • **P160 Maximum motor current limit** • **P173 Maximum current**
F009	**Supply failure** The line voltage has remained below the undervoltage threshold (P074) for longer than the maximum line failure period (P155). The line failure fault is also activated if the line voltage frequency drops below 40 Hz or exceeds 70 Hz.	Check • the line voltage and line frequency Compare with • the threshold in **Undervoltage threshold P074** • the maximum **Line failure time P155** • the **Line voltage P071**
F011	**Overcurrent** The drive has been shut down as a result of overcurrent. The trip threshold has been exceeded.	Check • the main contactor control in cases where the fault occurs immediately after precharging • the AFE output for short circuit or earth fault
F013	**Overload** The maximum current parameterized in P173 has been exceeded by more than 10% or the load in regenerative feedback mode was so high that the DC-link voltage has reached its maximum value.	Check • the maximum current **P173 Maximum current** • the AFE load
F023	**Inverter temp.** The inverter temperature has exceeded its maximum limit. **r949 = 1** Inverter temperature limit is exceeded **r949 = 2** Sensor 1: Break in sensor lead or sensor defective **r949 = 18** Sensor 2: Break in sensor lead or sensor defective **r949 = 34** Sensor 3: Break in sensor lead or sensor defective **r949 = 50** Sensor 4: Break in sensor lead or sensor defective	Measure inlet or ambient air temperature. Apply reduction curves when ϑ >40 ºC. ☞ Section "Technical Data" in Operator's Guide Check • whether fan -E1 is connected and/or rotating in the correct direction. • the air inlet and outlet openings for dirt/blockage. • the temperature sensor connected to -X30
F024	**Overload precharging resistor** Precharging resistor protection has responded during DC-link forming and automatic restart (WEA). Fault F024 occurs when III > 1 % P072 for longer than 1.5 × P326.	Check • for high-resistance short circuit or earth fault during forming or WEA • whether line voltage < 80 % during WEA

Fault messages		
No.	**Description of fault**	**Remedial measures**
F025	**UCE Ph. L1** A UCE shutdown has occurred in phase L1	Check • phase L1 for short circuit or earth fault (-X2:U2 - including motor). • the contacts on the **CU**.
F026	**UCE Ph. L2** A UCE shutdown has occurred in phase L2	Check • phase L2 for short circuit or earth fault (-X2:V2 - including motor). • the contacts on the **CU**.
F027	**UCE Ph. L3** A UCE shutdown has occurred in phase L3	Check • phase L3 for short circuit or earth fault (-X2:W2 - including motor). • the contacts on the **CU**.
F029	**Meas. val. sensing** A fault has occurred in the measured value sensing circuit. • **(r949 = 1)** Offset cannot be adjusted in phase L1. • **(r949 = 2)** Offset cannot be adjusted in phase L2. • **(r949 = 3)** Offset cannot be adjusted in phases L1 and L3.	Defect in the measured value sensing circuit Defect in the power section (valve is not blocking)
F030	**DC-link short circuit** A short circuit has been detected during DC-link precharging.	Check the DC link
F035	**Ext. fault 1** Parameterizable external fault input 1 has been activated	Check • whether an external fault has occurred • whether the lead to the appropriate digital input is interrupted • **P575 Src No Ext Fault1** ☞ Section "Digital inputs" in Operator's Guide
F036	**Ext. fault 2** Parameterizable external fault input 2 has been activated	Check • whether an external fault has occurred • whether the lead to the appropriate digital input is interrupted • **P586 Src No Ext Fault2** ☞ Section "Digital inputs" in Operator's Guide
F039	**DC link ground fault** An earth fault has been detected during DC-link precharging	Check the DC link
F040	**AS internal** Incorrect operating status	Replace the CU (-A10) board
F041	**EEprom fault** A fault occurred as values were been saved to the EEPROM	Replace the CU (-A10) board
F042	**Comp. time** Computation time problems	Reduce the computation time load, increase **P308 Sampling time**, check **r725 Available computation time**.
F045	**Opt.brd.HW** A hardware fault occurred as an option board was being accessed	Replace the CU board Check the connection between the subrack and option boards
F046	**Par.con.**	Switch the device off and on again. Replace the CU (-A10) board.

Fault messages		
No.	**Description of fault**	**Remedial measures**
F047	**Int.comp.time**	Replace the CU (-A10) board.
F048	**Interf. pulse freq** Fault during power OFF or pulse inhibit	Switch the device off and the on again. Replace the CU (-A10) board if the fault occurs again.
F049	**SW release** The SW versions of the EPROMs on the CU are different. The fault occurs as a result of the comparison of the language EPROM and CU software.	• Replace the language EPROM
F050	**TSY init.** TSY board initialization error	Check whether • the TSY is correctly inserted • the parameter is set correctly for the installed board **P090 Board Position 2** – **P091 Board position 3** **r723 PCB Code** – **724 PCB Code**
F060	**MLFB missing** This fault is set if the MLFB = 0 (0.0 kW) when the device exits the INITIALIZATION state. MLFB = order number.	Enter the appropriate MLFB in parameter **P070 MLFB (6SE70..)** after acknowledgement in INITIALIZATION. (MLFB can be entered only if the appropriate access levels are set in the two access parameters.)
F062	**Multiparal.** Fault in connection with the multiparallel circuit has been detected	• Check ImPI and the communications card and if required, replace • Check configuration and connections of the multiparallel circuit • Check parameter settings (**P070 "MLFB(6SE70..)"**) • Replace the CU (-A10). • Replace the ImPI
F065	**INT1 telegram** No telegram has been received on interface 1 (SST1/USS protocol) within the telegram failure period.	• Check the connection CU -X100:1 to 5 or check connection PMU -X300. • Check **P687.01"SCom/SCB TlgOFF"** • Replace the CU (-A10).
F070	**SCB init.** SCB board initialization error	**r949 = 1 or 2** • Check the contacts on the SCB and whether the board slot matches the appropriate parameter setting. • **r723 PCB Code ,** • **r724 PCB Code and** • **P090 Board Position 2,** • **P091 Board Position 3** **r949 = 5** Error in initialization data • Check parameters **P682 and P684** **r949 = 6** Timeout during initialization and **r949 = 10** Error in configuration channel • Check parameters **P090, P091, P682 and P684**
F072	**SCB hearth.** SCB is no longer processing the monitoring counter (heartbeat counter).	• Replace the SCB • Check the connection between the subrack and option board
F073	**Aninput1 SL1** Amps at analog input 1, slave1, have dropped below 4mA	Check connection from signal source to SCI1 (slave 1) -X428:4, 5.
F074	**Aninput2 SL1** Amps at analog input 2, slave1, have dropped below 4mA	Check connection from signal source to SCI1 (slave 2) -X428:7, 8.
F075	**Aninput3 SL1** Amps at analog input 3, slave1, have dropped below 4mA	Check connection from signal source to SCI1 (slave 3) -X428:10, 11.

Fault messages		
No.	**Description of fault**	**Remedial measures**
F076	**Aninput1 SL2** Amps at analog input 1, slave2, have dropped below 4mA	Check connection from signal source to SCI1 (slave1) -X428:4, 5.
F077	**Aninput2 SL2** Amps at analog input 2, slave2, have dropped below 4mA	Check connection from signal source to SCI1 (slave 2) -X428:7,8.
F078	**Aninput3 SL2** Amps at analog input 3, slave2, have dropped below 4mA	Check connection from signal source to SCI1 (slave 3) -X428:10, 11.
F079	**SCB telegram** A telegram has not been received from the SCB (USS, peer-to-peer, SCI) within the telegram failure time.	• Check the connections of the SCB1(2). • Check **P687.01"SCom/SCB TlgOFF".** • Replace the SCB1(2). • Replace the CU (-A10).
F080	**TB/CB init.** Board initialization error at the DPR interface	**r949 = 1** TB/CB not inserted or TB/CB board code incorrect **r949 = 2** TB is not compatible **r949 = 3** CB is not compatible **r949 = 5** Error in initialization data Check contacts on the T300 / CB board and whether the board slot matches the appropriate parameter setting; • **P090 Board Position 2,** • **P091 Board Position 3** • **r723 PCB Code,** • **r724 PCB Code** **r949 = 6** Timeout during initialization **r949 = 10** Error in configuration channel Check the CB initialization parameters; • **P918 CB Bus Address,** • **696 to P705 CB Parameters 1 to 10**
F081	**TB/CB heartb.** TB or CB is no longer processing the monitoring counter	• Replace the TB or CB • Check the connection between the subrack and option board
F082	**TB/CB Tlgr.** No new process data have been received from the TB or CB within the telegram failure time.	• Check the connections of the CB/TB. • Check **P695 "CB/TB TlgOFFTime".** • Replace the CB. • Replace the TB.
F091	**Form.interrupt** Forming of the DC link has been interrupted. r949 = 1 Abortion due to another fault r949 = 2 Abortion because Vd too low r949 = 3 Abortion by OFF command r949 = 4 Abortion because no ON command within 20 s of forming function selection	• Depending on the fault • Line voltage too low or incorrect line voltage (P071) parameterized • OFF command • No ON command
F255	Fault in NOVRAM	Switch the device off and then on again. Replace the CU if the fault occurs again.

13.2 Fatal faults (FF)

Fatal faults are serious hardware faults or software errors which prevent the device from operating normally again. They are displayed only on the PMU in the form of "FF<No>". Press any key on the PMU to restart the software.

FFxx	Fault message	Switch device off and on again. Call service department if fatal fault is displayed again
FF01	**Time sector overflow** A non-removable time sector overflow has been identified in the higher priority time sectors.	• Increase sampling time **(P308)** or reduce pulse frequency **(P761)** • Replace the CU
FF03	**Access error option board** A fatal fault has occurred as external option boards (CB, TB, SCB, TSY ..) were being accessed	• Replace the CU • Replace the LBY • Replace the option board
FF06	**Stack overflow** Stack overflow.	• Increase sampling time **(P308)** or reduce pulse frequency **(P761)** • Replace the CU
FFxx	**Any other fatal fault.**	• Replace the CU

13.3 Alarm messages

An 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 active simultaneously, in which case they are displayed one after another.

When the converter is operated via the OP1 operator control panel, the alarm is displayed on the bottom line of the operating display. The red LED also flashes (refer to the OP1S Operating Instructions).

Alarm messages			
Warn-No.	**Param-No.** Bit No.	**Description**	**Remedial measures**
A001	**P953** 0	**Comp. time** CU board comp. time utilization too high	Check **r725 Available computation time**. Increase **P308 Sampling time**
A015	**P953** 14	**Ext. alarm 1** Parameterizable, external alarm input 1 has been activated	External alarm is active. Check whether the lead to the appropriate digital input is interrupted. Check parameter **P588 Src No Ext Warn1** ☞ Section "Digital inputs" in Operator's Guide
A016	**P953** 15	**Ext. alarm 2** Parameterizable, external alarm input 2 has been activated	External alarm is active. Check whether the lead to the appropriate digital input is interrupted. Check parameter **P589 Src No Ext Warn2**. ☞ Section "Digital inputs" in Operator's Guide
A020	**P954** 3	**Overcurrent** An overcurrent has been detected.	Check the driven load for an overload condition. • Are the dynamic requirements too high?
A021	**P954** 4	**Overvoltage** A DC-link overvoltage condition has been detected.	Check the line voltage. • Are the dynamic requirements too high?
A022	**P954** 5	**Inv.temp.** The alarm activation threshold has been exceeded.	Check **r011 AFE temperature**. Measure inlet or ambient air temperature. Apply reduction curves when ϑ >40 °C. ☞ Section "Technical Data" in Operator's Guide Check • whether fan -E1 is connected and/or rotating in the correct direction. • the air inlet and outlet openings for dirt/blockage. • the temperature sensor connected to -X30
A025	**P954** 8	**I2t- inv.** The inverter will be thermally overloaded if it continues to operate under the current load conditions.	Check whether the rated output current or peak current (operating class II) is (was) too high. Check **r010 AFE Utilization**

Alarm messages			
Warn-No.	**Param-No.** Bit No.	**Description**	**Remedial measures**
A039	**P955** 6	**Electrical off** The electronics voltage supply is not o.k.	Check • the ext. 24 V voltage supply • the digital input and signal lead for monitoring of the ext. 24 V voltage supply
A040	**P955** 7	**Supply voltage** The voltage at the input terminals is outside the rated range (< 80 % or > 110 % of P071) in operation	Check • the line voltage • **P071 Line voltage**
A047	**P955** 14	**Reactive current limited** The reactive current of the AFE is limited.	Check the • line voltage (r030) • maximum current (P173) • motor-mode current limit (P160) • generator-mode current limit **(P161)**
A048	**P955** 15	**Vd^2t integrator** The monitoring function of the maximum continuous DC link voltage (using the Vd2t-integrator) has reached 50 % of the final value. If the high DC link voltage is caused by a high capacitive reactive current, then this might be limited (A047). If the high DC link voltage is caused by a high line voltage (r030), the line overvoltage fault (F003) message will be activated eventually (depending on the amplitude of Vd).	Check the • line voltage (r030) • DC-link voltage **(r006)**
A049	**P956** **0**	**No slave** On the ser. I/O (SCB1 with SCI1/2), no slave is connected or fiber optic is interrupted or no supply to slaves.	**P660 SCI AnalogInConf** • Check slave. • Check fiber optic.
A050	**P956** **1**	**Slave incorrect** On the ser. I/O, the slaves connected do not correspond to the parameter setting (slave number or slave type).	Check **P660 SCI AnalogInConf**
A051	**P956** 2	**Peer bdrate** Baud rate for peer connection is too high or different.	Match baud rates of SCB boards involved in the link **P684 SCom/SCB Baud**
A052	**P956** 3	**Peer PZD-L** PZD length set too high for peer connection (>5).	Reduce the number of words **P686 SCom/SCB # PrDat.**.
A053	**P956** 4	**Peer Lng f.** The PZD lengths of the sender and receiver in the peer connection do not match.	Match word lengths of sender and receiver **P686 SCom/SCB # PrDat**
A057	**P956** 8	**TB-Param** Alarm occurs if a TB is logged on and connected, but it does not respond to parameter jobs from the PMU, SST1 or SST2 within 6 s.	Replace TB configuration (software).

Alarm messages			
Warn-No.	**Param-No.** Bit No.	**Description**	**Remedial measures**
A065	**P957** 0	**WEA active** The WEA option **(P366)** restarts the drive. **No** time monitor is activated when the DC link is precharging. The automatic restart process can be aborted with an OFF command.	 **CAUTION** The WEA function can place operating personnel at risk. Check whether you really need to use WEA. Change **P366 WEA** if necessary.
A081.. A096	**r958** 0...15	**CB alarm** See Operator's Guide for CB board	
A097.. A112	**r959** 0...15	**TB alarm 1** See Operator's Guide for TB board	
A113.. A128	**r960** 0...15	**TB alarm 2** See Operator's Guide for TB board	

The following editions have been published so far:

Edition	Internal Item Number
A	478 200 4000 76 Ja
AC	478 200 4000 76 J AC-76
AD	478 200 4000 76 J AD-76

Version AD consists of the following chapters:

Chapter		Changes	Pages	Version date
1	Definitions and Warnings	reviewed edition	4	06.99
2	Description	reviewed edition	6	06.99
3	Initial Start-up	reviewed edition	1	06.99
4	Installation in Conformance with EMC Regulations	reviewed edition	2	06.99
5	Connecting-up	reviewed edition	9	06.99
6	Parameterization	reviewed edition	12	06.99
7	Explanation of Terminology and Functionality of the Afe	reviewed edition	2	06.99
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