STÖBER

POSIDYN® SDS 5000

Operation manual

Settings

Interfaces

Communication

V 5.6-S or later

08/2016 en

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1 Introduction

Axis management is integrated in the inverter. This allows for the following operation modes:

- Single axis operation:

  An axis projected in POSITool is used for the connected motor.
- Multi-axis operation:

  2, 3 and 4 axes projected in POSITool are used for the connected motor. The axes can be used sequentially as parameter sets on the motor.
- POSISwitch multi-axis operation:

  Up to 4 motors connected to POSISwitch are sequentially operated with up to 4 axes.

This option requires the following system structure.
The system of the 5th generation of STOBER inverters is divided into two ranges, the global and the axis range. The global range includes programming and parameterization that relates to the inverter. This includes the device controller, the setting of peripheral components such as braking resistors, etc. It is also responsible for the administration of the axis range.

The axis range is divided into up to four axes. Each axis contains the programming and parameterization for a motor and is selected from the global range. The axis range contains the motor setting and the application of the motor. The applications are defined by STOBER in so-called applications or can optionally be freely programmed by the user.

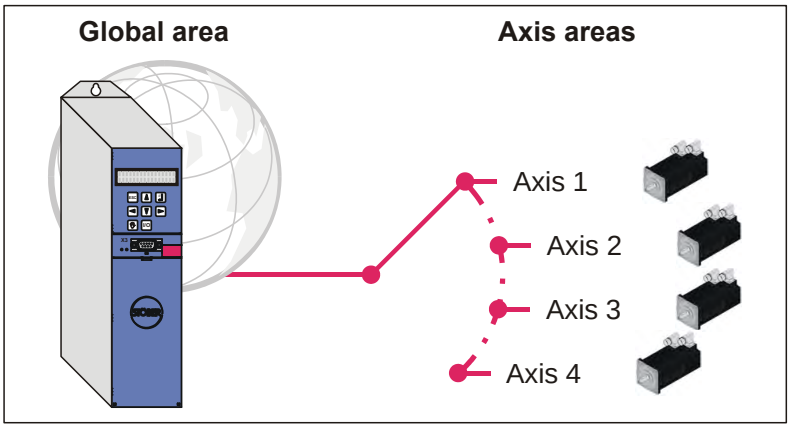

Fig. 1-1: Structure of the global and axis range

1.1 About this manual

This manual provides you with information on the basic operation of the inverter. Here functions in the inverter independent of the standard applications defined by STOBER are explained.

Original version
The original language of this documentation is German.

1.2 Readers

Users who are familiar with the control of drive systems and have a knowledge of commissioning inverter systems are the target group of this manual.

1.3 Further documentation

Manual	Contents	ID
Projecting manual SDS 5000	Installation and connection	442277
Commissioning Instructions SDS 5000	Reinstallation, replacement, function test	442301

You can find the latest document versions at www.stoeber.de.

You can find information on the POSITool software in the following manuals:

Manual	Contents	ID
POSITool operating manual	Information on the basic functions of POSITool	442233
Programming manual	Information on programming with POSITool	441693

You can find the latest document versions at www.stoeber.de.

Note that the programming functionality of POSITool can only be used after training by STOBER. You can find information on training at www. stoeber.de.

The devices of the 5th generation of STOBER inverters can be optionally connected with different fieldbus systems. The connection is described in the following manuals:

Manuals	ID
PROFIBUS DP operating manual	441687
CANopen operating manual	441686
EtherCAT operating manual	441896
PROFINET operating manual	442340

You can find the latest document versions at www.stoeber.de.

The accessories of the inverter are documented in the following manuals:

Manual	Product description	ID
ASP 5001 operating manual	Safe technical integration of the inverter in a machine	442181
Operating instructions POSISwitch AX 5000	Sequential switchover between up to four axes	441689
Control box operating manual	Operating device for parameterization and configuration of the inverter.	441479
Operating manual Absolute Encoder Support AES	For buffering the power supply when using the inductive absolute value encoder EnDat 2.2 digital with battery-buffered multiturn power unit, for example EBI1135, EBI135.	442343

You can find the latest document versions at www.stoeber.de.

1.4 Further support

If you have technical questions that are not answered by this document, please contact:
- Phone: +49 7231 582-3060
- E-mail: applications@stoeber.de

If you have questions about the documentation, please contact:
- E-mail: electronics@stoeber.de

If you have questions about training sessions, please contact:
- E-mail: training@stoeber.de

1.5 Abbreviations

Abbreviations	
AA	Analog output
AES	Absolute Encoder Support
BA	Binary output
BE	Binary input
CAN	Controller Area Network
EMC	Electromagnetic Compatibility
EtherCAT	Ethernet for Control Automation Technology
HTL	High Threshold Logic
IGB	Integrated Bus
MAC	Media Access Control
PE	Protective Earth
PTC	Positive Temperature Coefficient
SPS	Programmable logic controller
SSI	Serial Synchronous Interface
TTL	Transistor-transistor logic

1.6 Trademarks

POSIDRIVE®, POSIDYN® and POSISwitch® are trademarks of STÖBER ANTRIEBSTECHNIK GmbH & Co. KG.

The following names that are used in conjunction with the device, its optional equipment and its accessories are trademarks or registered trademarks of other companies:

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EnDat®	EnDat® and the EnDat® logo are registered trademarks of Dr. Johannes Heidenhain GmbH, Traunreut, Germany.
EtherCAT®, Safety over EtherCAT®, TwinCAT®	EtherCAT®, Safety over EtherCAT® and TwinCAT® are registered trademarks and patented technologies that are licensed by Beckhoff Automation GmbH, Verl, Germany.
PROFIBUS®, PROFINET®	The PROFIBUS®/PROFINET® logo is a registered trademark of PROFIBUS Nutzerorganisation e. V. Karlsruhe, Germany.

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Products that are registered as trademarks are not specially indicated in this documentation. Existing property rights (patents, trademarks, protection of utility models) are to be observed.

2 Notes on safety

The devices can represent a source of danger. Therefore observe
- the safety guidelines, technical rules and regulations given in the following sections and the
- Generally applicable technical rules and regulations.

Always read the corresponding documentation as well. STÖBER ANTRIEBSTECHNIK GmbH & Co. KG shall assume no liability for damage resulting from failure to comply with the instruction manual or relevant regulations. This documentation is purely a production description. It does not include any guaranteed features in terms of a warranty right. We reserve the right to make technical changes for the purpose of improving the devices.

2.1 Component part of the product

As this documentation includes important information for the safe and efficient handling of the product, always keep it in the immediate vicinity of the product until product disposal and ensure it can be accessed by qualified personnel at any time.

Also pass on this documentation if the product is handed over or sold to a third party.

2.2 Risk assessment

Before the manufacturer may bring a machine onto the market, he must conduct a risk assessment according to Machine Directive 06/42/EC. As a result, the risks associated with the use of the machine are determined. The risk assessment is a multi-stage and iterative process. On no account can sufficient insight into the Machine Directive be given as part of this documentation. For this reason, seek detailed information about the norms and legal position. When installing the inverter in machines, commissioning is forbidden until it has been determined that the machine meets the requirements of EC Directive 06/42/EC.

2.3 Ambient conditions

The inverters are products subject to sales restrictions in accordance with IEC 61800-3. In a residential environment this product may cause high-frequency interference. If this occurs the user may be asked to take suitable measures to reduce it.

The inverters are not designed for use in a public low frequency network that supplies residential areas. High-frequency interference can be expected if the inverters are used in a network of this type. The inverters are designed exclusively for operation in TN networks. The inverters are only suitable for use in supply current networks that are able to provide a maximally symmetrical nominal short circuit current at maximally 480 volts according to the following table:

Size	Max. symmetrical nominal short-circuit current
0 and 1	5,000 A
2	5,000 A
3	10,000 A

Install the inverter in a control cabinet in which the admissible surrounding temperature will not be exceeded.

The following applications are prohibited:
- Use in areas subject to explosion hazard
- Use in environments with harmful substances as specified by EN 60721, for example oils, acids, gases, vapors, dust and radiation
- Use with mechanical vibration and impact loads exceeding the limits specified in the technical data in the projecting manuals

Implementation of the following applications is only permitted after approval is obtained from STOBER:
- Use in non-stationary applications

2.4 Qualified personnel

Since the devices may harbor residual risks, all configuration, transportation, installation and commissioning tasks including operation and disposal may only be performed by trained personnel who are aware of the possible risks.

Personnel must have the qualifications required for the job. The following table lists examples of occupational qualifications for the jobs:

Activity	Possible occupational qualifications
Transportation and storage	Worker skilled in storage logistics or comparable training
Configuration	- Graduate engineer (electro-technology or electrical power technology) - Technician (m/f) (electro-technology)
Installation and connection	Electronics technician (m/f)
Commissioning (of a standard application)	- Technician (m/f) (electro-technology) - Master electro technician (m/f)
Programming	Graduate engineer (electro-technology or electrical power technology)
Operation	- Technician (m/f) (electro-technology) - Master electro technician (m/f)
Disposal	Electronics technician (m/f)

In addition, the valid regulations, the legal requirements, the reference books, this technical documentation and, in particular, the safety information contained therein must be carefully

- read,
- understood and
- complied with.

2.5 Transportation and storage

Immediately upon receipt, examine the delivery for any transportation damages. Immediately inform the transportation company of any damages. If damages are found, do not commission the product. If the device is not to be installed immediately, store it in a dry, dust-free room. Please see the documentation for how to commission an inverter after it has been in storage for a year or longer.

2.6 Installation and connection

Installation and connection work are only permitted after the device has been isolated from the power!

The accessory installation instructions allow the following actions during the installation of accessories:
- The housing in the upper slot can be opened
- The housing in the bottom slot can be opened.

Opening the housing in another place or for other purposes is not permitted.

Use only copper conductors. For the line cross sections to be used, refer to DIN VDE 0298-4 or DIN EN 60204-1 Appendix D and Appendix G.

The permissible protection class is protective ground. Operation is not permitted unless the protective ground is connected in accordance with the regulations.

Comply with the applicable instructions for installation and commissioning of motor and brakes.
Main equipment grounding markings: The main ground connections are marked "PE" or with the international ground symbol (IEC 60417, Symbol 5019 ⏚).

The motor must have an integrated temperature monitor with basic isolation in acc. with EN 61800-5-1 or external motor overload protection must be used.

Protect the device from falling parts (pieces of wire, leads, metal parts, and so on) during installation or other tasks in the switching cabinet. Parts with conductive properties inside the inverter can cause short circuits or device failure.

2.7 Commissioning, operation and service

Remove the additional covers before commissioning so that the device will not overheat. Note the minimum open areas specified in the projecting manuals during installation to prevent the inverter and its accessories from overheating.

The inverter housing must be closed before you turn on the power supply voltage. When the power supply voltage is turned on, hazardous voltages may be present on the connection terminals and the cables and motor terminals connected to them. Note that the device is not reliably free of voltage simply because all the displays are blank.

The following actions are prohibited while the supply voltage is applied
- Opening the housing
- Connecting or disconnecting connection clamps and
- Installing/removing or attaching/detaching accessories.

Apply the 5 safety rules in the order stated before performing any work on the machine:

1. Disconnect.
   Also ensure that the auxiliary circuits are disconnected.
2. Protect against being turned on again.
3. Check that voltage is not present.
4. Ground and short circuit.
5. Cover adjacent live parts.

Information
Note that the discharge time of the DC link capacitors is up to 5 minutes. You can only determine the absence of voltage after this time period.

You can carry out work on the inverter later. Repairs may only be performed by STOBER.

Send faulty devices with a fault description to:
STÖBER ANTRIEBSTECHNIK GmbH & Co. KG
Department VS-EL
Kieselbronner Str.12
75177 Pforzheim
GERMANY

2.8 Disposal

Please observe the current national and regional regulations! Dispose of the individual parts separately depending on the quality and currently applicable regulations, e.g. as

- Electronic waste (circuit boards)
- Plastic
- Sheet metal
- Copper
- Aluminum
- Battery

2.9 Residual dangers

The connected motor can be damaged with certain settings of inverters:

- Longer operation against an applied motor halting brake
- Longer operation of self-cooled motors at slow speeds

Drives can reach dangerous excess speeds (e.g., setting of high output frequencies for motors and motor settings which are unsuitable for this). Secure the drive accordingly.

2.10 Presentation of notes on safety

NOTICE

Notice

means that property damage may occur

▶ if the stated precautionary measures are not taken.

⚠ CAUTION!

Caution

with warning triangle means that minor injury may occur

▶ if the stated precautionary measures are not taken.

⚠ WARNING!

Warning

means that there may be a serious danger of death

▶ if the stated precautionary measures are not taken.

⚠ DANGER!

Danger

means that serious danger of death exists

▶ if the stated precautionary measures are not taken.

Information
refers to important information about the product or serves to emphasize a section in the documentation to which the reader should pay special attention.

3 Commissioning an inverter

For the solution of a technical drive task, the programming of the inverter system must conform to the sequence of certain device states. They define the state of the power portion and implement functions such as the restart of the drive. The device state can be changed with control commands and internal events.

The 5th generation of STOBER inverters offers you a choice between a standard state machine and a state machine as per DSP 402.You can select the state machines in the Configuration Assistant of the POSITool software.

Information
Please observe the special features when commissioning an inverter with the safety function *Safe Torque Off* (accessory ASP 5001). Read the instructions in the ASP 5001 operating manual; see section 1.3 Further documentation.

3.1 Standard device state machine

Information
The 24-V power for the accessories must be switched on before or at the same time as the voltage supply of the control unit.

To be able to place an inverter in operation with the standard device state of the machine, the following requirements apply:

- You have connected all power supplies.
- You have connected the motor and, if necessary, the encoder, brake, motor temperature sensor and POSISwitch AX 5000 in accordance with your machine documentation.
- You use the standard device state of the machine with the default settings in your project.
- You have completed all parameter settings, transferred them to the inverter and saved them.

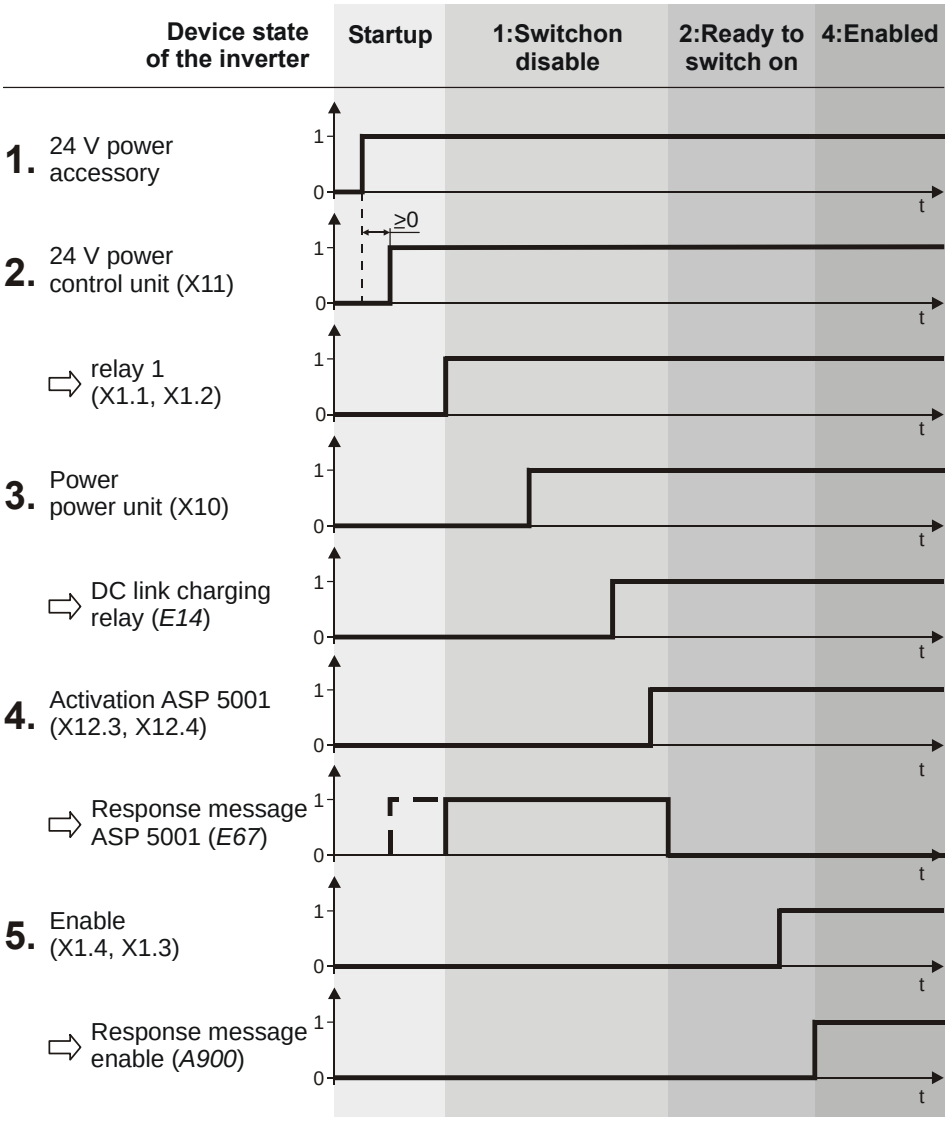
Proceed as follows:

Placing inverter in operation

1. If available, switch on the 24V supply of the accessory (e.g. XEA 5001 X101.18, X101.10).
2. Switch on the 24V supply (X11).
   ⇨ The device starts. If relay 1 is closed (X1.1, X1.2), the inverter changes to the *1:switchONinh* device state.
3. Switch on the power supply of the power stage (X10).
   ⇨ The DC link capacitors are charged (*E14 = 1:active*).
4. If you use safety technology, switch on the controller of the ASP 5001.
   ⇨ The acknowledgement on the ASP 5001 displays that the safety function is not active (*E67 = 0:inactive*). Afterwards the inverter is in the *2:Ready for switch on* device state.

5. Switch on the enable.
   ⇨ The inverter is in the *4:Enabled* device state.

⇨ You have placed the inverter in operation.



The following eight states exist in the standard device state machine in accordance with the DRIVECOM profile for drive technology.

Display	Designation	Behavior
XDS 5000 V5.X Or ±0Rpm 0.0A 0: Self test	Not ready to switch on	• The electronics are powered. • Self-test is running. • Initialization is running. • Drive function[a)] is disabled. • Ready-for-operation relay is open.
±0Rpm 0.0A 1: ONdisable	Switchon disable	• Software/hardware initialization is finished. • The application was reparameterizedn. • The drive function[1] is disabled. • The ready-for operation relay is closed. • The ASP 5001 option (safe torque off) is active.
±0Rpm 0.0A 2: ReadyforON	Ready to switch on	• The application can be reparameterized. • The drive function[1] is disabled. • The ready-for-operation relay is closed.
±0Rpm 0.0A 3: Switched on	Switched on	• The application can be reparameterized. • The drive function[1] is disabled. • The ready-for-operation relay is closed.
±0Rpm 0.0A 4: Enabled	Operation enabled	• The application can be partially parameterized. • The drive function[1] is enabled. • The ready-for-operation relay is closed.
Fault No.X: type of fault	Fault	• The application can be partially parameterized. • The drive function[1] is disabled. • The ready-for-operation relay is closed.
Fault No.X: type of fault	Fault reaction active	• The application can be reparameterized. • An error-dependent action is being executed (disable drive function or quick stop). • The drive function[1] can be enabled. • The ready-for-operation relay is open.
±0Rpm 0.0A 7: Quick stop	Quick stop active	• The application can be reparameterized. • The quick stop function is being executed. • The drive function[1] is enabled. • The ready-for-operation relay is closed.

a) A disabled drive function means the same as a power part which is switched off and a reset application (e.g., reset ramp generator). This means that the drive is not following the reference value.

The following Figure 3 1 shows which state changes are possible. The table below shows which conditions apply.

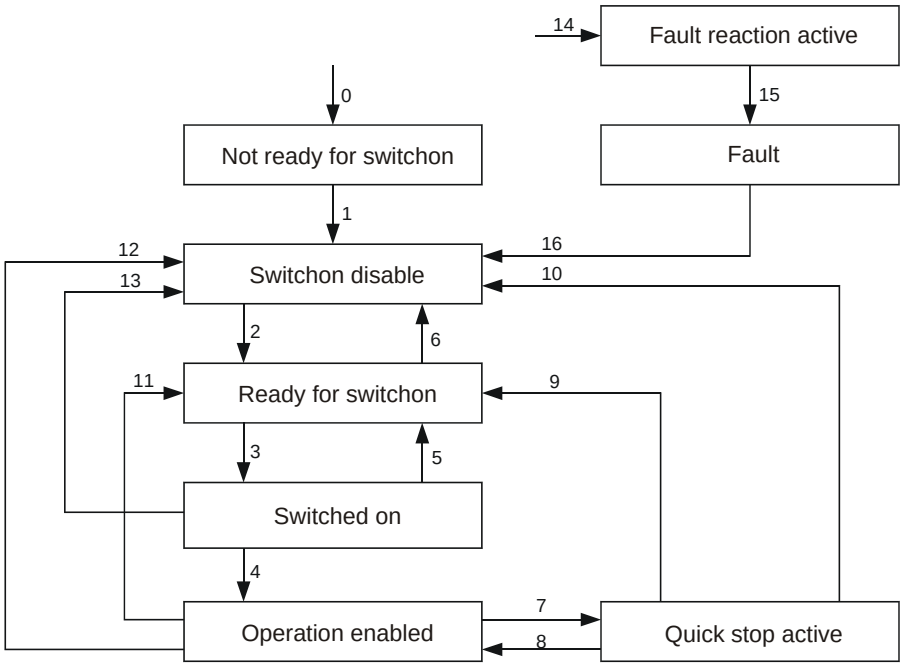


Fig. 3-1: Standard device state machine

Change of state		Conditions
0	Device start-up → Not ready to switch on	Control unit power supply turned on.
1	Not ready to switch on → switch on disable	Self test without errors and initialization completed.
2	Switch on disable → ready to switch on	• Enable on low level (*E19* bit 0 = 0 or *A300* = 0) or for initial start-up autostart active (*A34*) • DC link charged (*E03*) • Option ASP 5001 (Safe Torque Off) is not active (*E67*). • Axis activated (*E84*) • An IGB motion bus is not configured (configuration wizard, step 6, check box) or • No IGB motion bus is configured and either the IGB has reached the state *3:IGB motion bus* (*A155*) or IGB exception mode is activated (*A124*) or local mode is activated.
3	Ready to switch on → switched on	Enable on high level (*E19* bit 0 = 1 and *A300* = 1).
4	Switched on → operation enabled	Enable on high level (*E19* bit 0 = 1 and *A300* = 1).
5	Switched on → ready to switch on	Enable on low level (*E19* bit 0 = 0 or *A300* = 0).

Change of state		Conditions
6	Ready to switch on → switch on disable	• DC link not loaded (*E03*) or • Option ASP 5001 (Safe Torque Off) is active (*E67*). • Axis deactivated (*E84*) • No IGB motion bus is configured (configuration wizard step 6, check box) and the IGB has left the state *3:IGB motion bus* (*A155*) and IGB exception mode is not activated (*A124*) and local mode is not activated.
7	Operation enabled → quick stop active	• Signal *quick stop* on high level (*A302*) or • Enable on low level(*E19* bit 0 = 0 or *A300* = 0) and signal *quick stop with enable off* active (*A44*)
8	Quick stop active → operation enabled	Enable on high level (*E19* bit 0 = 1 and *A300* = 1) and signal *quick stop* on low level (*A302*) and quick stop end reached according to parameterization (*A45*).
9	Quick stop active → ready to switch on	Enable on low level (*E19* bit 0 = 0 or *A300* = 0) and quick stop end reached according to parameterization (*A45*). quick stop is then only regularly moved to end according to *A45* when the quick stop function is active with enable off (*A44*). Quick stop is immediately canceled when the quick stop function is inactive with enable off (*A44*).
10	Quick stop active → switch on disable	Option ASP 5001 (Safe Torque Off) is active (*E67*).
11	Operation enabled → ready to switch on	Enable on low level (*E19* bit 0 = 0 or *A300* = 0) and *quick stop with enable off* inactive (*A44*).
12	Operation enabled → switch on disable	Option ASP 5001 (Safe Torque Off) is active (*E67*).
13	Switched on → switch on disable	• DC link not charged or • Option ASP 5001 (Safe Torque Off) is active (*E67*). • No IGB motion bus is configured (configuration wizard step 6, check box) and the IGB has left the state *3:IGB motion bus* (*A155*) and IGB exception mode is not activated (*A124*) and local mode is not activated.
14	All states → fault response active	Fault detected (*E81*).
15	Fault response active → fault	Fault response completed (*E81*).
16	Fault → switch on disable	There is no fault (*E81*) and rising edge of signal *acknowledgment* (*A301*).

Please note section 11 Integrated Bus, an explanation of IGB states and the IGB exception mode.

3.2 Device state machine acc. to DSP 402

The device state machine according to DSP 402 has the same states as in the standard device state machine. The following table shows the designation of the states according to DSP 402.

Display[a)]	Designation according to DSP 402
XDS 5000 V5.X Or ±0Rpm 0.0A 0: Self test	Not ready to switch on
±0Rpm 0.0A 1: ONdisable	Switch on disabled
±0Rpm 0.0A 2: ReadyforON	Ready to switch on
±0Rpm 0.0A 3: Switched on	Switched on
±0Rpm 0.0A 4: Enabled	Operation enabled
Fault No.X: type of fault (2nd line flashing)	Fault Fault reaction active
±0Rpm 0.0A 7: Quick stop	Quick stop active

a) The display of the device states may be different to the form shown depending on the applications.

The device state machine must receive certain commands for a change in state. The commands are bit combinations in the DSP 402 control word (parameter *A576 Controlword*). The table shows the states of the bits in parameter *A576* and their combination for the commands (the bits marked with X are irrelevant).

Command	Bit of the control word (*A576 control word*)				
	Bit 7 Fault reset	Bit 3 Enable operation	Bit 2 Quick stop	Bit 1 Enable voltage	Bit 0 Switch on
Shutdown	0	X	1	1	0
Switch on	0	0	1	1	1
Disable voltage	0	X	X	0	X
Quick stop	0	X	0	1	X
Disable operation	0	0	1	1	1
Enable operation	0	1	1	1	1
Fault reset	pos. edge	X	X	X	X

The difference between the standard device state machine is the possible state changes and the conditions for the changes. Fig. 3-2 : State machine as per DSP 402shows the possible changes in state.

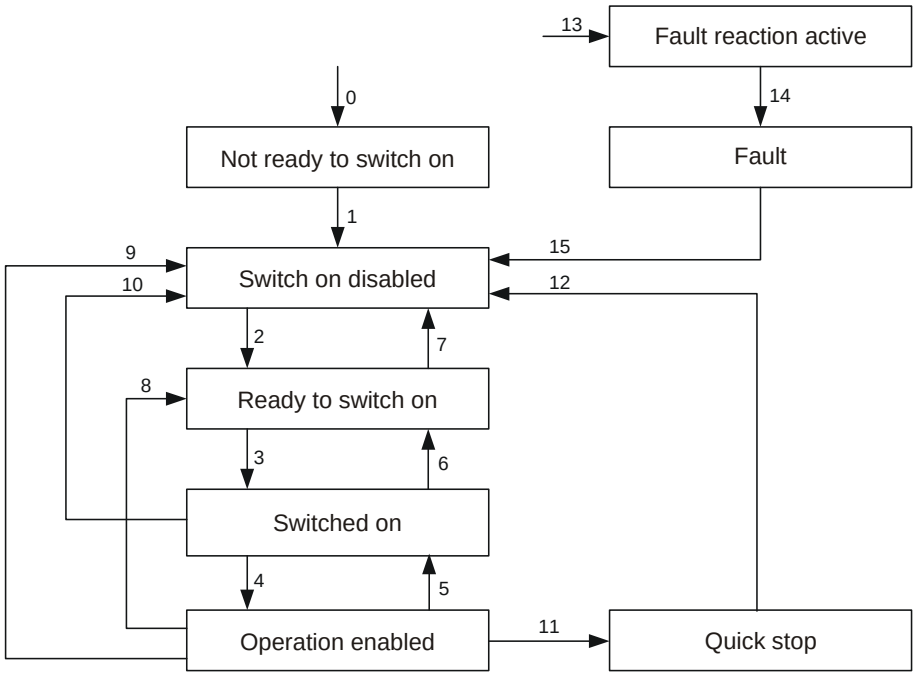


Fig. 3-2: State machine as per DSP 402

The table below shows the conditions for changes in the state machine.

Change of state		Conditions
0	device start-up → Not ready to switch on	Control unit power supply turned on
1	Not ready to switch on → switch on disable	Self test without errors and initialization completed
2	Switch on disable → ready to switch on	• Enable on high level (*E19* bit 0 = 1) and command shutdown (*A576*) and option ASP 5001 (Safe torque off) is not active (*E67*) • An IGB motion bus is not configured (configuration wizard, step 6, check box) or • No IGB motion bus is configured and either the IGB has reached the state *3:IGB motion bus* (*A155*) or IGB exception mode is activated (*A124*) or local mode is activated
3	Ready to switch on → switched on	Enable on high level (*E19* bit 0 = 1) and command switch on (*A576*)
4	Switched on → operation enabled	Enable on high level (*E19* bit 0 = 1) and command enable operation (*A576*)
5	Operation enabled → switched on	Enable on high level (*E19* bit 0 = 1) and command disable operation (*A576*)
6	Switched on → ready to switch on	Enable on high level (*E19* bit 0 = 1) and command shutdown (*A576*)
7	Ready to switch on → switch on disable	• Enable on low level (*E19* bit 0 = 0) or • Command quick stop (*A576*) or • Command disable voltage (*A576*) or • Option ASP 5001 (Safe Torque Off) is active (*E67*) • No IGB motion bus is configured (configuration wizard step 6, check box) and the IGB has left the state *3:IGB motion bus* (*A155*) and IGB exception mode is not activated (*A124*) and local mode is not activated
8	Operation enabled → ready to switch on	Command shutdown (A576)
9	Operation enabled → switch on disable	• Enable on low level (*E19* bit 0 = 0) or • Command disable voltage (*A576*) or • Option ASP 5001 (Safe Torque Off) is active (*E67*).

Change of state		Conditions
10	Switched on → switch on disable	• Enable on low level (*E19* bit 0 = 0) or • Command quick stop (*A576*) or • Command disable voltage (*A576*) or • Option ASP 5001 (Safe Torque Off) is active (*E67*) • SDS 5000: No IGB motion bus is configured (configuration wizard step 6, check box) and the IGB has left the state *3:IGB motion bus* (*A155*) and IGB exception mode is not activated (*A124*) and local mode is not activated
11	Operation enabled → quick stop	Command quick stop (*A576*)
12	Quick stop → switch on disable	• Quick stop complete or • Command disable voltage (*A576*)
13	All states → fault response active	Fault detected
14	Fault response active → fault	Fault response complete
15	Fault → switch on disable	Command fault reset (positive edge) (*A576*)

Please note section 11.3 IGB-Motionbus, an explanation of IGB states and the IGB exception mode.

4 Parameterize

The user interfaces of the 5th generation of STOBER inverters consist of several elements with different functionalities (see figure).

To program a device system of the 5th generation of STOBER inverters, the user needs the POSITool software. With the POSITool software, either an application defined by STOBER or the option of a freely programmed application can be used. POSITool provides a parameter list with which the application can be adjusted. The software also has comprehensive diagnostic functions.

Parameters can also be changed via the operator panel on the front of the inverter. It consists of a keyboard for calling the menu functions and the display for indication. When appropriately programmed, the keyboard can be used to implement functions such as manual operation or tipping. Response messages on the device status are shown by the LEDs on the front.The display provides detailed information.

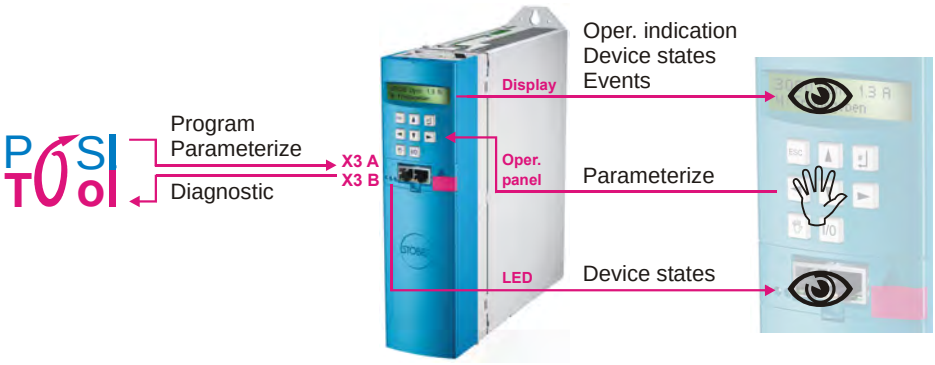


Fig. 4-1: User interface

4.1 Parameters

Parameters perform various tasks in the inverter system:

- Adjust the application to external conditions (e.g., the motor type)
- Indicate the values (e.g. current speed or the torque).
- Trigger actions (e.g., "save values" or "phase test"

Parameters are allocated to the global area or the axis area.

4.1.1 Structure

The parameter structure is set up as shown in the adjacent example::
The axis code identifies an axis parameter when it is shown mixed with global parameters.
The group divides the parameters into functional characteristics.
The line distinguishes the individual parameters in a group.
The element subdivides a parameter (subfunctions).

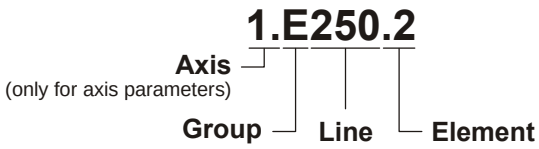


Fig. 4-2: Parameter structure

The individual subject areas of the parameter groups are listed in the table below:

Parameter group	Subject area / dependency
A.. Inverter	Inverter, bus, cycle time
B.. Motor	Motor
C.. Machine	Speed, torque
D.. Reference value	Speed ref. values, reference value generator
E.. Display value	Indication for device and application
F.. Control interface	Analog inputs / outputs, binary inputs / outputs, brake
G.. Technology	Depends on the application (e.g., synchronous running)
H.. Encoder	Encoder
I.. Positioning	Only with positioning applications
J.. Process blocks	Only with positioning application motion block positioning
L.. PLCopen reference values	Only with positioning application PLCopen
N.. Posi.switches	Only with positioning applications
P.. Customer-specific parameters	Only with "free, graphic programming" option
Q.. Customer-specific parameters, dependent on instance	Only with "free, graphic programming" option
R.. Production data[a)]	Production data of inverter
T.. Scope	Scope parameters
U.. Protection functions	Parameterizing the results
Z.. Fault counter	Fault counter of events; In POSITool only visible during online operation

a) Only visible in POSITool during online operation.

4.1.2 Data types

Name	Abbrev. Name	Description	Value Range
Boolean	B	1 bit (internal: LSB in 1 byte)	0 ... 1
Unsigned 8	U8	1 byte, without sign	0 ... 255
Integer 8	I8	1 byte, with sign	-128 ... 127
Unsigned 16	U16	2 bytes - 1 word, without sign	0 ... 65535
Integer 16	I16	2 bytes - 1 word, with sign	-32768 ... 32767
Unsigned 32	U32	4 bytes - 1 douple word, without sign	0 ... 4294967295
Integer 32	I32	4 bytes - 1 douple word, with sign	-2147483648 ... 2147483647
Float	R32	Floating decimal, simple accuracy	in acc. with ANSI / IEEE 754
Double	R64	Floating decimal, double accuracy	
String 8	STR8	Text, 8 characters	
String 16	STR16	Text, 16 characters	
Posi 64	P64	32 bits, increments	-2147483648 ... 2147483647
		32 bits, rest	0 ... 2147483647

4.1.3 Parameter list structure

To address parameters via the fieldbus, the following information is important:
- Value range
- Scaling via fieldbus if this differs form the scaling via POSITool.
- Rounding errors via fieldbus, if present.
- Data type

They are specified in the parameter table in the application description.

The fieldbus addresses are specified as hexadecimal numbers. For CANopen and EtherCAT, the index and subindex can be transferred directly. For PROFIBUS DP-V1 and PROFINET, index = PNU and subindex = index. Further details are in the documentation for the fieldbus interface connection, see section1.3 Further documentation.

4.2 POSITool

The versatile interface between user and inverter is the POSITool software. It offers various possibilities for the configuration of an inverter.

POSITool has an interface to represent programming. In the “free graphic programming” option, blocks are linked and as a result a control sequence is realized.

STOBER also provides predefined applications for programming. This includes applications such as fast reference value application and command positioning that are selected using a wizard.

POSITool provides the user with parameter lists for parameterization. Using the lists, the control sequence is adapted to external conditions such as motor type, rotary encoder or bus systems. Limit values such as maximum speed are also defined or display values such as the current speed are shown.

The program and parameters are transferred to the inverter via a serial interface (RS232). Afterwards it starts processing. Here the user can observe the parameters via the serial connection. A scope function is available to record the different values over time for use in further diagnostics.

More details about the use of POSITool can be found in the corresponding section of the POSITool operating manual or programming manual (see section 1.3 Further documentation).

4.3 Operator panel

The operator panel is used for monitoring and changing parameter values. The operator panel consists of a two-line display with 16 characters each and a keyboard. The keyboard has six keys for menu prompting and two keys for local operation.

ESC	Jumps back to operator level. Resets parameter value.
#	Enter key: Opens the menu level, menu groups and the parameters. Accepts a changed parameter value.
▲ ▼	Selects a parameter in the menu group. During entry, increases/decreases the parameter value (positive/negative).
◄ ►	Selects the menu group. During entry, changes the decade (ones, tens, hundreds, etc.).
	Activates/deactivates local mode (if programmed). In local mode, deactivation also deletes the enable.
I/O	Enable for local mode I/O (if programmed).

Tab. 4-1: Operator panel

The parameter menu of the inverter is divided into menu groups. The menu groups are arranged in alphabetical order, beginning with the group A.. Inverter, B.. Motor, C.. Machine, and so on. Each menu group contains a list of parameters which are identified by the letter of the group and a consecutive number such as *A00*, *A01*, *A02*, etc. To change a parameter, proceed as shown below. Use the Enter key [#↵] to go from the operation indicators to the menu level.

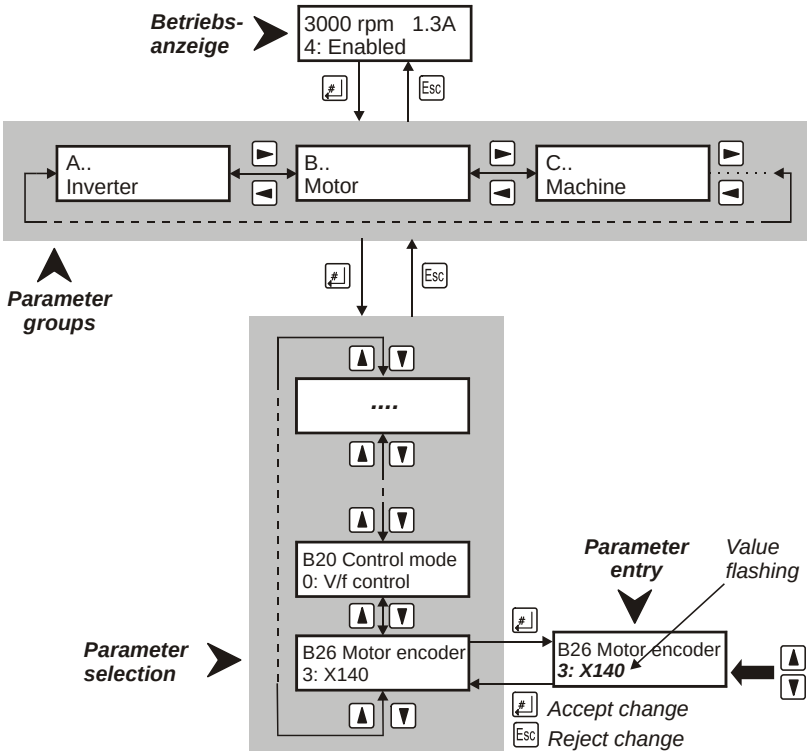


Fig. 4-3: Menu structure

The menu groups are selected with the arrow keys [◄] [►] and activated with [#↵]. Use the [▲] [▼] keys to select the desired parameter within the menu group. You can switch back and forth between the elements in an array parameter with the [◄] [►] keys. A parameter is then activated for change with [#↵]. The value flashes to indicate that it can be changed with [▲] [▼] . The [◄] [►] keys can be used to select which decade (ones, tens, hundreds, and so on) is to be adjusted. The value is then accepted with the [#↵] key or reset with the [ESC] key. Use the [ESC] key to access a higher menu level. To save safe from power failure, all changes must be stored with the *A00 save values = 1:active*!

5 Parameterizing motor data

For the correct operation of the motors, you must enter the characteristic data and control mode. There are several options available to enter the motor data:

- Selection of a STOBER standard motor in the configuration wizard
- Use of an electronic nameplate for servo motors with absolute value encoder
- Direct entry in the parameter lists for motors from other manufacturers or special motors

Information
Refer to the inverter's projecting manual of the inverter for information on connection, see section 1.3 Further documentation.

Information
The number of parameters displayed on the inverter and in the POSITool depends on the access level set in the parameters. The access level in the inverter can be set in the parameter *A10* and in POSITool in Tools/Change access level.

5.1 Selection in the configuration assistant

Information
In control type *0:V/f-control*, no current or torque limitation occurs. Also connection to a rotating motor is not possible (capture).

Proceed as shown below to select a STOBER standard motor in the configuration assistant:

Selecting the motor in the configuration assistant

1. Open the configuration assistant in POSITool.
2. Proceed up to step 5 motor selection.
3. Select your required motor from the list of motors (e.g. asynchronous motor 112 M Y 4 kW).
4. Close the assistant.
5. In POSITool select the parameter list and in parameter *B20* enter the necessary control mode (e.g. *1:Sensorless vector control*).
6. Go online and transfer the settings to the inverter.
7. Save the settings with *A00 Save values*.

⇨ The motor data and the control mode are correctly entered.

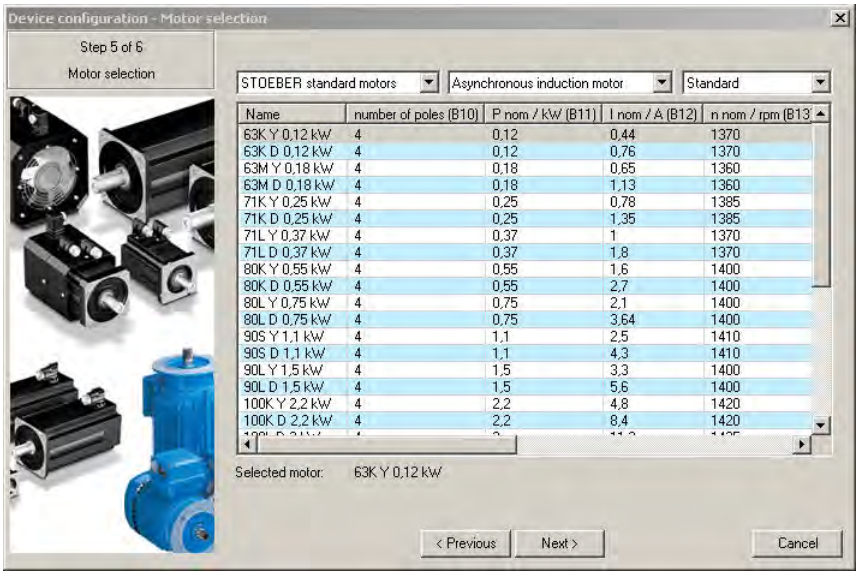


Fig. 5-1: Motor selection in Step 5 of the configuration assistant

5.2 Electronic type plate

STOBER servo motors are generally equipped with absolute value encoders. These encoders offer a special parameter buffer. In the standard configuration, STOBER stores all motor data including the data of an existing holding brake (if one is fitted) as an electronic nameplate in this memory. These data are automatically read into the inverter each time the device starts up.

Information
A correct evaluation of the electronic nameplate is only guaranteed after a change of the parameters *B06* and *B04* after a device restart.

Information
Electronic nameplates of other motor manufacturers cannot be evaluated.

Read all motor data from the electronic nameplate

1. Check whether you have an encoder with electronic nameplate.
2. In POSITool select the parameter list.
3. In *B20*, enter the control type *64:Servo control*.
4. In *B26*, parameterize the encoder interface X4 and activate the interface in *H00* with *64:EnDat*.
5. Set the parameter B06 to *0:electronic nameplate*.
6. In parameter B04, select the setting *1:All data*.
7. Go online and transfer the settings to the inverter.
8. Save the settings with *A00 Save values*.

⇨ The motor data and the control type are entered in the parameters.

Manual changes to the motor data are only effective until the next device start-up, even if the changes have been saved in the Paramodule in non-volatile memory.
Alternatively the commutation offset can only be used from the electronic nameplate. For this purpose chose in parameter *B04* the setting *0:Commutation-offset*.

5.3 Direct entry in the parameters

The specifications of motors which do not have an electronic nameplate and cannot be selected in the configuration assistant must be entered in the parameter list (e.g. motors of other manufacturers and special motors). Depending on the motor type and the type of control, different parameters must sometimes be used.

Information
In control type *0:V/f-control*, no current or torque limitation occurs. Also connection to a rotating motor is not possible (capture).

Direct entry of the motor data

1. Call up the configuration wizard in POSITool.
2. Continue up to step 5 motor selection.
3. Select a motor similar to your motor from the list of motors.
4. Close the assistant.
5. In POSITool select the parameter list.
6. Set the required control type in *B20 Control type*.
7. Enter in *B06 Motor data 1: User defined*.
8. Now edit the following parameters*:*
   - *B02 EMC constant* (only for servo motors)
   - *B05 commutation offset* (only for servo motors)
   - *B10 Motor pole*
   - *B11 Nominal motor output*
   - *B12 Nominal motor current*
   - *B13 Nominal motor speed*
   - *B14 Nominal motor voltage* (only for asynchronous motors)
   - *B15 Nominal motor frequency* (only for asynchronous motors)
   - *B16 cos phi* (only for asynchronous motors)
   - *B17 M0* (only for servo motors)
   - *B52 Stator inductance*
   - *B53 Stator resistance*
   - *B54 Leakage factor* (only for asynchronous motors)
   - *B55 Magnetic saturation coefficient* (only for asynchronous motors)
   - *B62 Moment of inertia*
   - *B73 Stat. friction moment* and
   - *B74 Dyn. friction moment* for an optimized i^2t-model
9. In parameter *B00 motor type*, you can also enter the type designation (max. 16 characters).
10. Go online and transfer the settings to the inverter.
11. Save the settings with *A00 Save values*.

⇨ The motor data and control type are correctly entered.

The following actions will make it easier for you to enter parameters:

- You can calibrate the parameter *B05 Commutation-offset* with the aid of the action *B40 Phase test*.
- The parameters *B52* to *B55* can be determined using action *B41 Autotune motor*.
- The current controller can be adapted using the action *B42 Activate current controller*.

The actions are described in section 12.5 Actions.

5.4 Further motor datas

Information
Since parameters in the parameter lists and assistant are indicated or hidden based on how *B20* is set, all parameters are not always visible for each setting.

5.4.1 Current controller

The parameters *B64* to *B68* are important for the setting of the current controller. If an initial test does not provide the desired running result with the default setting in the parameters, current controller optimization is recommended. It is performed with the action *B42 Optimize current controller*. Now save the measured values with *A00 Save values*.

5.4.2 Thermal model

The parameters *B70*, *B71* and *B72* describe a motor model for the protection of the motor. The default values are usually sufficient.

5.4.3 Absolute Limit values

The parameters *B82 I-max* and *B83 n-max motor* are limit values which may never be exceeded.

5.5 Parameterize the SLVC-HP control mode

The encoderless control type SLVC-HP is available for AC motors. Activate this control mode with *B20* = 3*:SLVC-HP*.

Areas of application for the SLVC-HP are drives with
- high accelerations,
- changing loads and
- large loads when the motor starts up.

The parameters *B46*, *B47* and *B48* are optimized during commissioning of the SLVC-HP control mode. You can perform this automatically with the action *Optimize B45 SLVC-HP* see section 12.5.2.6 Optimize B45 SLVC-HP.

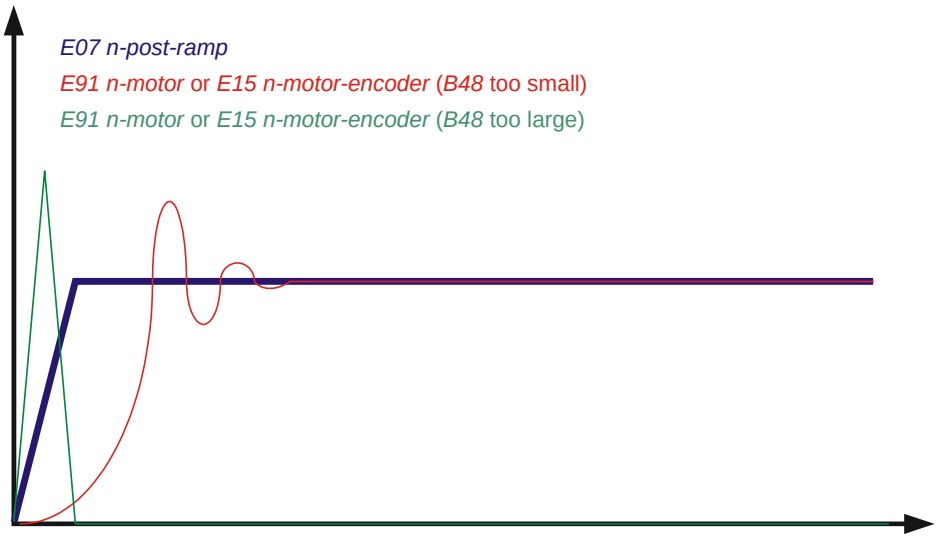
If action *B45* can not be performed, note the following description for a manual setting.

The quality of control of the SLVC-HP control mode also depends on how exact the values *B52 stator inductance*, *B53 stator resistance* and *B54 leakage factor* are. For external motors, you can use the action *B41* to optimize these parameters, s. section 12.5.2.3 B41 Autotuning.

Set ***B48 Integral gain SLVC-HP***
This parameter affects the dynamic properties of the motor. The larger *B48* is, the faster the motor model can follow the actual speed.

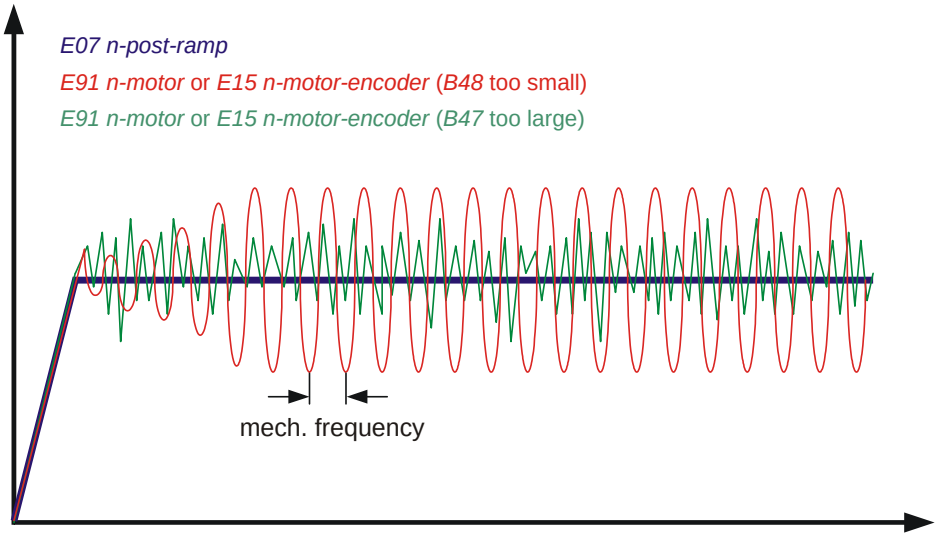
The correct setting can be checked by means of the speed curve. If an encoder is present during commissioning, *E15 n-motor encoder* should be considered, otherwise *E91*.

If the motor can not follow the set speed ramp despite sufficiently large torque limits, *B48* must be increased. Values that are too large lead to the fault *56:Overspeed*.



Set ***B47 Proportional gain SLVC-HP***
This parameter affects the dynamic properties of the motor (especially the stability and overshoot behavior of the speed).

The correct setting can be checked by means of the speed curve. If an encoder is present during commissioning, *E15* should be considered as the actual speed, otherwise *E91*. *B47* should not be smaller than 1 % of *B48*. The drive can become unstable for values that are too small. The resulting vibration oscillates at the mechanical frequency. By increasing *B47*, overshoots in the speed can be dampened. Values that are too large lead to vibrations in the current and speed.



***Set* B46 Feedback ASM Observer**
This parameter affects the accuracy of control type SLVC-HP. For values that are too large or too high, the stationary difference between the reference and actual speed increases. The amount of feedback is an option for reporting to the ASM observer how exact the machine constants *B54 leakage factor*, *B52 stator inductance* and *B53 stator winding resistance* were determined. The smaller the feedback selected, the more the ASM observer depends on these constants.

5.6 Parameterize motor temperature sensor evaluation

Information
Note that evaluation of the temperature sensors is always active. If operation without temperature sensor is permitted, the connections must be bridged on X2. Otherwise a fault will be triggered when the device is switched on.

Information
Note that the evaluation of a Pt1000 is only possible from firmware V 5.6-S. Before using a Pt or KTY sensor, note that motor protection is not ensured to the same extent as when monitoring with PTC triplet.

Connect the motor temperature sensor at terminal X2.

Motor temperature sensor connection
Motor windings are monitored thermally using the motor temperature sensors such as PTC thermistors, KTY temperature sensors or Pt temperature sensors.

PTC thermistors are thermistors whose resistance changes significantly with the temperature. When a PTC reaches its defined nominal response temperature, the resistance increases dramatically, by twice or more the original resistance to several kOhms. As PTC triplets are used, one thermistor monitors each phase of the motor winding. With 3 thermistors, all 3 phases are monitored which brings about effective motor protection.

On the other hand, KTY or Pt temperature sensors are temperature sensors with characteristic resistance curves that follow the temperature linearly. They therefore allow for analog measurements of motor temperatures. However, the measurements are limited to one phase of the motor winding, which also restricts motor protection considerably compared with PTC triplets.

In the *B38 Motor temperature sensor* parameter, set whether you will evaluate a PTC triplet, a KTY 84-1xx or a Pt1000.

B38 = 0:PTC
B38 = 1:KTY 84-1xx
B38 = 2:Pt1000

In *B39 maximum motor temperature*, set the maximum permitted temperature of the motor. If this is reached, the *41:TempMotorTMP* fault is triggered.
The motor temperature measured by the KTY or Pt1000 is displayed in *E12 Motor temperature*.

6 Parameterizing encoder data

The following paragraphs explain the settings for commissioning encoder systems with POSITool. We assume that an encoder system and the appropriate interface have already been chosen for your drive. The settings for the simulation of encoder signals is not described in this chapter.

Various encoder interfaces are provided on the MDS 5000 or SDS 5000. The interfaces must be selected in the parameter *B26 Motor encoder*. Interface X4 which is the interface integrated in the basic system is entered as the default setting. The motor encoder can also be deactivated or set to another interface.

Information
Refer to the inverter's projecting manual of the inverter for information on connection, see section 1.3 Further documentation.

Information
Not all encoder systems are suitable for servo control. In the selections of the H.. parameters *H00*, *H40*, *H120* and *H140*, the functions with servo capability are the ones with numbers greater than or equal to 64. Example: *H00 = 64:EnDat*.

6.1 Deactivating the motor encoders

Select *B26=0:inactive* when an asynchronous motor without speed feedback is to be used (*B20=0:V/f-control* or *1:Sensorless vector control*). This setting is not permitted when servo motors or vector control are used.

6.2 Interface X4

You can evaluate the following encoders on X4:
- Absolute value encoder EnDat 2.1/2.2 digital
- Incremental encoder HTL
- Incremental encoder TTL
- Absolute value encoder SSI

If it is determined during device startup that an SSI encoder is parameterized on an interface, the device waits in device status *self test* until an SSI encoder is detected on the interface. While waiting for the SSI encoder, one of the following indications which varies depending on the SSI interface appears on the display:

Indication on display	Meaning
`waiting for X120-SSI-encoder`	This indication appears when an SSI encoder is expected on X120 and the inverter is the SSI master (setting *H120 = 67:SSI-Master*). The SSI master sends the encoder the request to transmit the positions.
`waiting for X120-SSI-slave`	The indication specifies that an SSI encoder is expected on X120 and the inverter is an SSI slave (setting *H120 = 68:SSI-Slave*). An SSI slave receives the same signal as the master but does not send requests to the encoder.
`waiting for X4-SSI-encoder`	This indication appears when an SSI encoder is expected on X4 and the inverter is the SSI master (setting *H00 = 65:SSI-Master*).

When no encoder is detected within a waiting time of several seconds, the inverter changes to the next device state. If the encoder is needed for position control, fault 37 is triggered with the cause *17:X120-wirebreak*.

Parameterize interface X4

1. From the parameter list, select the parameter *B26*.
2. In *B26*, set *2:X4-encoder*.
3. Open group H.. in the parameter list.
4. In *H00*, set the encoder system which you want to run on X4.
5. Set *H01*, *H02*, *H05*, *H10* und *H11* in accordance with the connected encoder. Note that depending on the encoder system set in *H00*, not every parameter will be displayed.
6. Transfer the settings to the inverter and save them.
7. Switch the inverter off and back on again.

⇨ You have parameterized the X4 interface.

6.3 Connection X101 (binary input encoder)

You can connect the following encoders to X101:
- Incremental encoder HTL
- Incremental encoder TTL (only with REA 5001)
- Pulse train

NOTICE

If a BE encoder is used, the binary inputs BE3, BE4 and BE5 may not be used for any other function in the application.

To be able to use the BE encoder, you need one of the options:
- SEA 5001
- REA 5001
- XEA 5001

BE encoder

1. Open the configuration wizard and select step 6.
2. Enter one of the above options for option 2 and make sure that it is installed and correctly connected in the inverter.
3. If you connect a TTL encoder to the REA 5001, make sure that the sliding switch is correctly set. Observe the connection section in the projecting manual, see 1.3 Further documentation.
4. Close the configuration wizard.
5. Set to *B26 = 1:BE encoder*.
6. Set the encoder system that you want to operate at X101 in *H40*.
7. Set *H41* and *H42* according to the connected encoder.
8. Transfer the settings to the inverter and save them.
9. Switch the inverter off and back on again.
10. You have parameterized the BE encoder.

6.4 Interface X120

You can connect the following encoders to X120:
- Absolute value encoder SSI
- Incremental encoder TTL

You will need one of the following options when you use interface X120:
- REA 5001
- XEA 5001

Remember that X120 is designed as a double interface on the XEA 5001.

Parameterize interface X120

1. Open the configuration assistant and select step 6.
2. In option 2, enter one of the above-named options and make sure that this is actually installed on the inverter and correctly connected.
3. Exit the configuration assistant.
4. In *B26*, enter *4:X120-encoder*.
5. In *H120*, set the encoder system which you want to run on X120.
6. Set *H121*, *H122*, *H125* and *H126* in accordance with the connected encoder.
7. Transfer the settings to the inverter and save them.
8. Switch the inverter off and back on again.

⇨ You have connected interface X120.

If it is determined during device startup that an SSI encoder is parameterized on an interface, the device waits in device status *self test* until an SSI encoder is detected on the interface. While waiting for the SSI encoder, one of the following indications which varies depending on the SSI interface appears on the display:

Indication on display	Meaning
`waiting for X120-SSI-encoder`	This indication appears when an SSI encoder is expected on X120 and the inverter is the SSI master (setting *H120 = 67:SSI-Master*). The SSI master sends the encoder the request to transmit the positions.
`waiting for X120-SSI-slave`	The indication specifies that an SSI encoder is expected on X120 and the inverter is an SSI slave (setting *H120 = 68:SSI-Slave*). An SSI slave receives the same signal as the master but does not send requests to the encoder.
`waiting for X4-SSI-encoder`	This indication appears when an SSI encoder is expected on X4 and the inverter is the SSI master (setting *H00 = 65:SSI-Master*).

When no encoder is detected within a waiting time of several seconds, the inverter changes to the next device state. If the encoder is needed for position control, fault 37 is triggered with the cause *17:X120-wirebreak*.

6.5 Interface X140

You can connect the following encoders to X140:
- Resolver
- Absolute value encoder EnDat 2.1 sin/cos

You will need the this option when you use the X140 interface:
- REA 5001

Parameterize interface X140

1. Open the configuration assistant and select step 6.
2. In option 2, enter the selection REA 5001 and make sure that the option is actually installed on the inverter and correctly connected.
3. Exit the configuration assistant.
4. In *B26*, enter *3:X140-encoder*.
5. In *H140* set the encoder system which you want to run on X140.
6. Set *H142* and *H148* in accordance with the connected encoder.
7. Transfer the settings to the inverter and save them.
8. Switch the inverter off and back on again.

⇨ You have parameterized interface X140.

7 Parameterizing brake data

Motors with holding brakes can be connected to the devices oft the 5th generation of STOBER inverters. There are two ways to activate the brake.

A brake control is integrated in the following applications:

- Fast reference value with brake activation
- Comfort reference value
- Technology controller
- Command positioning (endless and limited position range)
- Synchronous command positioning (endless and limited position range)
- Motion block positioning (endless and limited position range)
- Electronic cam (endless and limited position range)

You can activate the brake control in parameter *F08*. Further adjustments are made depending on the selected control mode.

In addition, a signal source can be parameterized in *F100*. The signal for releasing the brake can be given direct via the source. *F100* is a global parameter and is available in every application.

If *F08* is set to *0:inactive*, the brake is activated together with system enable *A900*. In this case, the brake release times and brake application times are ignored.

In the *F08* = *1:active* setting, the current motor torque is saved when the brake is applied. This torque is applied again when the brake is released. If *F08* is set to *2:Do not save torque*, only the motor magnetization is established when the brake is released.

As the brake controller parameterization depends on the selected control mode, the following sections are subdivided accordingly.

7.1 B20 = 0:V/f-control

Proceed as follows for parameterization:

Parameterize the brake control for *B20 = 0:V/F controller*

1. Activate the brake control in parameter *F08*.
2. Specify which brakes are connected to the brake module in *F09*.
3. Enter the speed when the brake should be set in *F02*.
4. Enter the speed when the brake should be released in *F01*.
5. Enter the time that the brake requires to be set in *F07*. If you use two brakes at the brake module, enter the one with the longer set time.
6. Enter the time that the brake requires to be released in *F06*. If you use two brakes at the brake module, enter the one with the longer release time.
7. Transfer the parameters to the inverter and save them in it.
8. Switch the inverter off and back on again.

⇨ You have now parameterized the brake control.

You can make these settings with the *General settings* assistant on the *Holding brake* page:

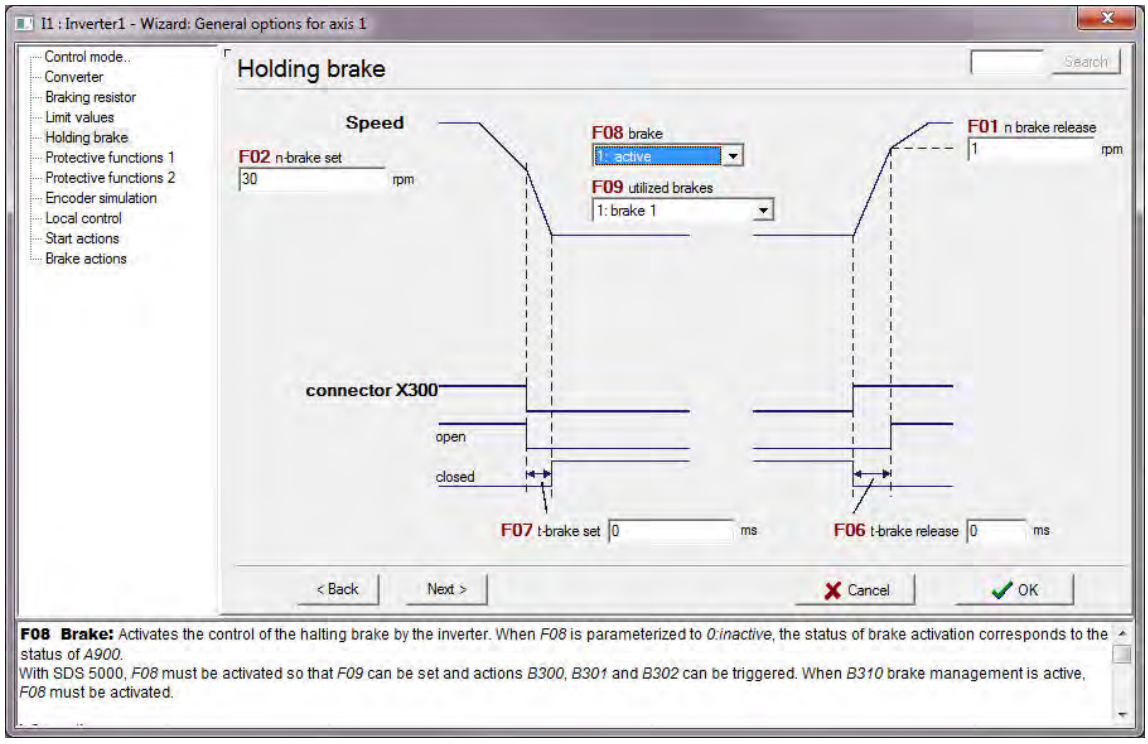


Fig. 7-1*: General settings* assistant, *Holding brake* page

7.2 B20 = 1:Sensorless vector control

Proceed as follows for parameterization:

Parameterize the brake control for *B20 = 1:sensorless vector control*

1. Activate the brake control in parameter *F08*.
2. Specify which brakes are connected to the brake module in *F09*.
3. Enter the speed when the brake should be set in *F02*.
4. Enter the speed when the brake should be released in *F01*.
5. Enter the time for which the motor should remain magnetized after triggering the braking procedure in *B27*.
6. In *B25*, enter the percentage of halt flux that should remain after the time in *B27*.
7. Enter the time that the brake requires to be set in *F07*. If you use two brakes at the brake module, enter the one with the longer set time.
8. Enter the time that the brake requires to be released in *F06*. If you use two brakes at the brake module, enter the one with the longer release time.
9. Transfer the parameters to the inverter and save them in it.
10. Switch the inverter off and back on again.

⇨ You have now parameterized the brake control.

You can make these settings with the *General settings* assistant on the *Holding brake* page:

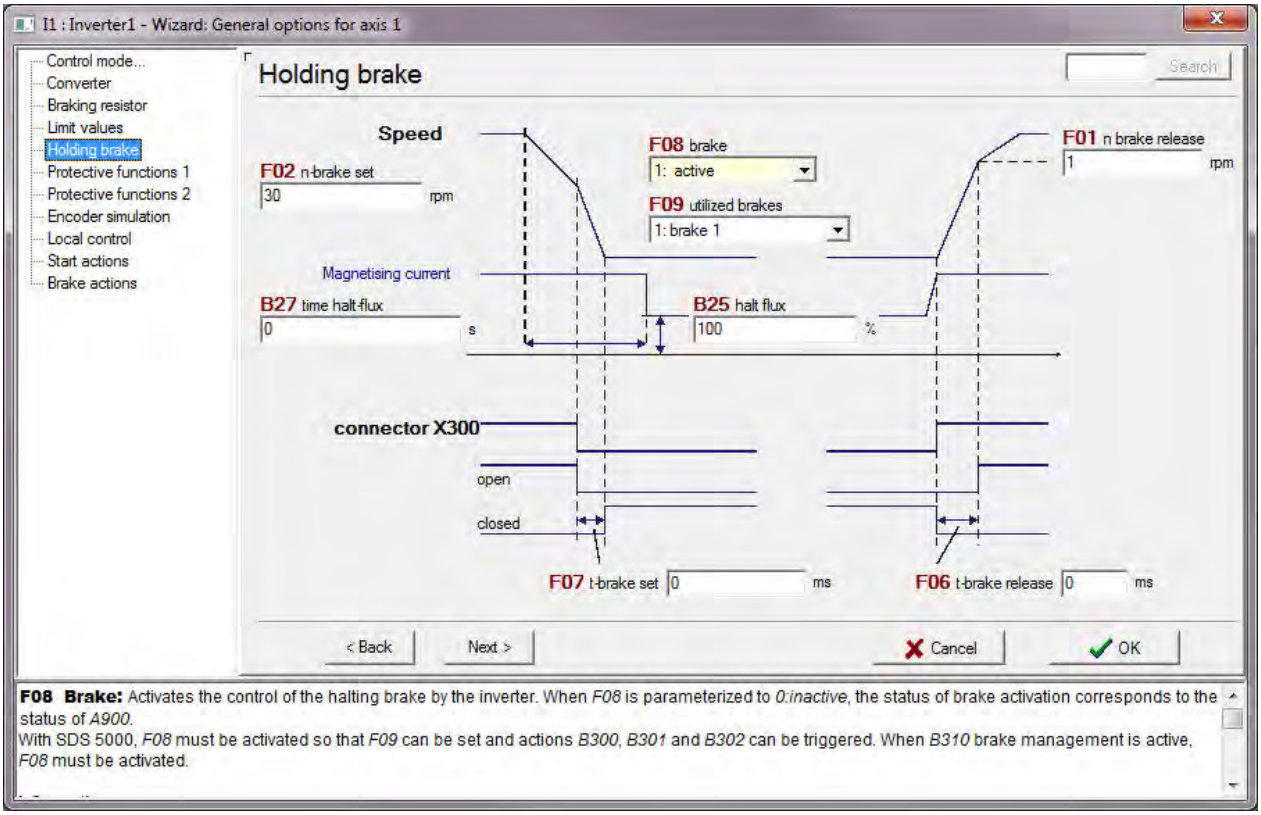


Fig. 7-2: *General settings* assistant, *Holding brake* page

7.3 B20 = 3:SLVC-HP

Proceed as follows for parameterization:

Parameterize the brake control for *B20 = 3:SLVC-HP*

1. Activate the brake control in parameter *F08*.
2. Specify which brakes are connected to the brake module in *F09*.
3. Enter the speed when the brake should be set in *F02*.
4. Enter the speed when the brake should be released in *F01*.
5. Enter the time for which the motor should remain magnetized after triggering the braking procedure in *B27*.
6. In *B25*, enter the percentage of halt flux that should remain after the time in *B27*.
7. Enter the time that the brake requires to be set in *F07*. If you use two brakes at the brake module, enter the one with the longer set time.
8. Enter the time that the brake requires to be released in *F06*. If you use two brakes at the brake module, enter the one with the longer release time.
9. Transfer the parameters to the inverter and save them in it.
10. Switch the inverter off and back on again.

⇨ You have now parameterized the brake control.

7.4 B20 = 2:Vector control

Proceed as follows for parameterization:

Parameterize the brake control for *B20 = 2:vector control*

1. Activate the brake control in parameter *F08*.
2. Specify which brakes are connected to the brake module in *F09*.
3. Enter the time for which the motor should remain magnetized after triggering the braking procedure in *B27*.
4. In *B25*, enter the percentage of halt flux that should remain after the time in *B27*.
5. Enter the time that the brake requires to be set in *F07*. If you use two brakes at the brake module, enter the one with the longer set time.
6. Enter the time that the brake requires to be released in *F06*. If you use two brakes at the brake module, enter the one with the longer release time.
7. Transfer the parameters to the inverter and save them in it.
8. Switch the inverter off and back on again.

⇨ You have now parameterized the brake control.

You can make these settings with the *General settings* assistant on the *Holding brake* page:

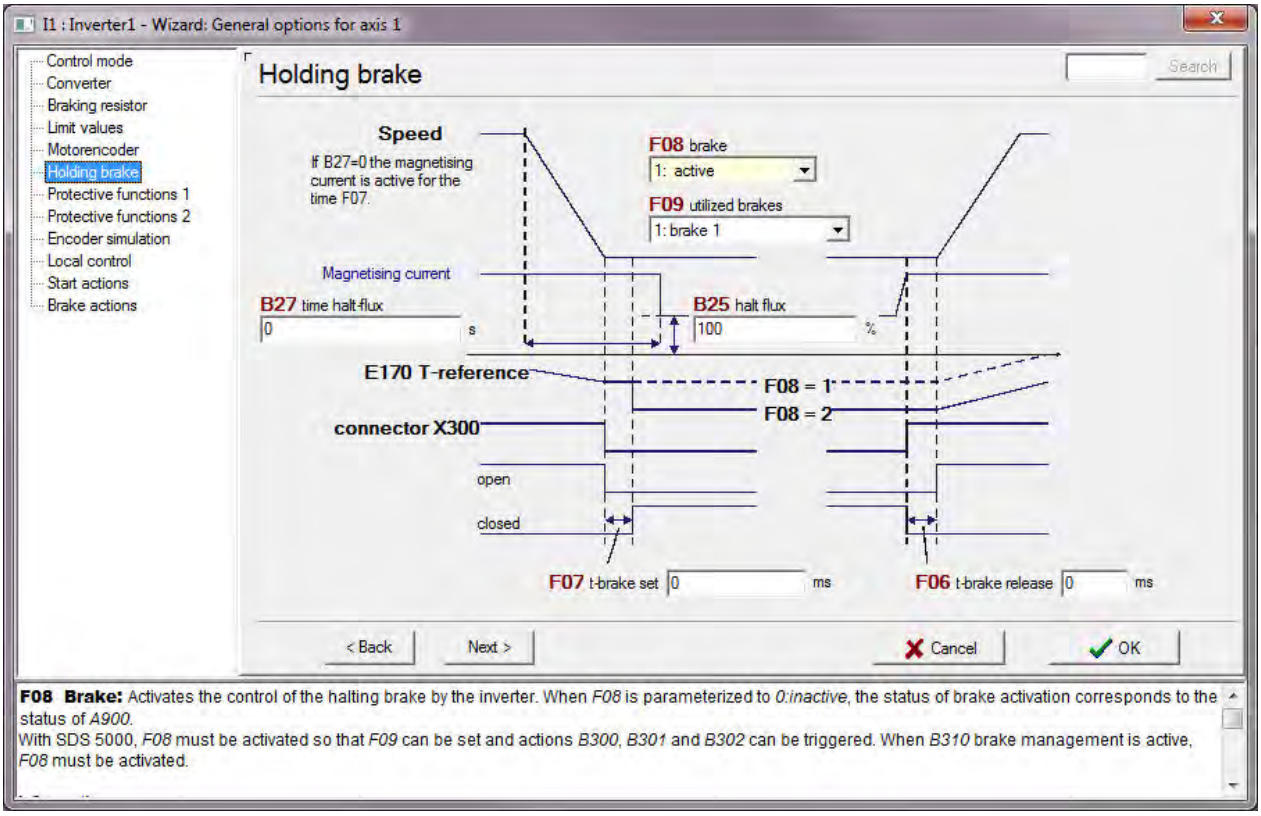


Fig. 7-3: *General settings* assistant, *Holding brake* page

7.5 B20 = 64:Servo-control

The motor holding brake is the brake mounted directly on the motor shaft. Only your data is saved in the electronic name plate.

If you operate a servo motor at the inverter, there are two options for how to set the brake control:

- Parameterize the brake control with an active (s. 5.2 Electronic type plate) electronic name plate
  - if a STOBER servo motor with electronic name plate and a brake is operated at the inverter or
  - if a STOBER servo motor with electronic name plate and two brakes is operated whereby the motor holding brake has the longer release and set time.

- Parameterize the brake control manually
  - if you do not use the electronic name plate or
  - if a servo motor without electronic name plate is operated at the inverter or
  - if a STOBER servo motor with electronic name plate and two brakes is operated whereby the motor holding brake has the shorter release and set time.

Parameterize the brake control for an active electronic name plate

Parameterize the brake control for *B20 = 64: servo control* and an active electronic name plate

1. Activate the brake control in parameter *F08*.
2. Specify which brakes are connected to the brake module in *F09*.
3. Make sure that *B07 = 0:el. motor-type* is set.
4. Transfer the parameters to the inverter and save them in it.
5. Switch the inverter off and back on again.

⇨ You have now parameterized the brake control.

The values for *F06* and *F07* are then automatically read from the name plate each time the inverter starts up. Manual changes to *F06* and *F07* only apply until the next power on.

Parameterize the brake control manually

Manual parameterization is necessary in the following cases:

- You do not use the electronic name plate.
- A servo motor without electronic name plate is operated at the inverter.
- A STOBER servo motor with electronic name plate and two brakes is operated at the inverter whereby the motor holding brake has the shorter release and set time.

Then proceed as follows:

Parameterize the brake control for *B20 = 64: Manually parameterize the servo control*

1. Activate the brake control in parameter *F08*.
2. Specify which brakes are connected to the brake module in *F09*.
3. If the electronic name plate is active, set *B07 = 1: free setting*.
4. Enter the time that the brake requires to be set in *F07*. If you use two brakes at the brake module, enter the one with the longer set time.
5. Enter the time that the brake requires to be released in *F06*. If you use two brakes at the brake module, enter the one with the longer release time.
6. Transfer the parameters to the inverter and save them in it.
7. Switch the inverter off and back on again.

⇨ You have now parameterized the brake control.

You can make these settings with the *General settings* assistant on the *Holding brake* page:

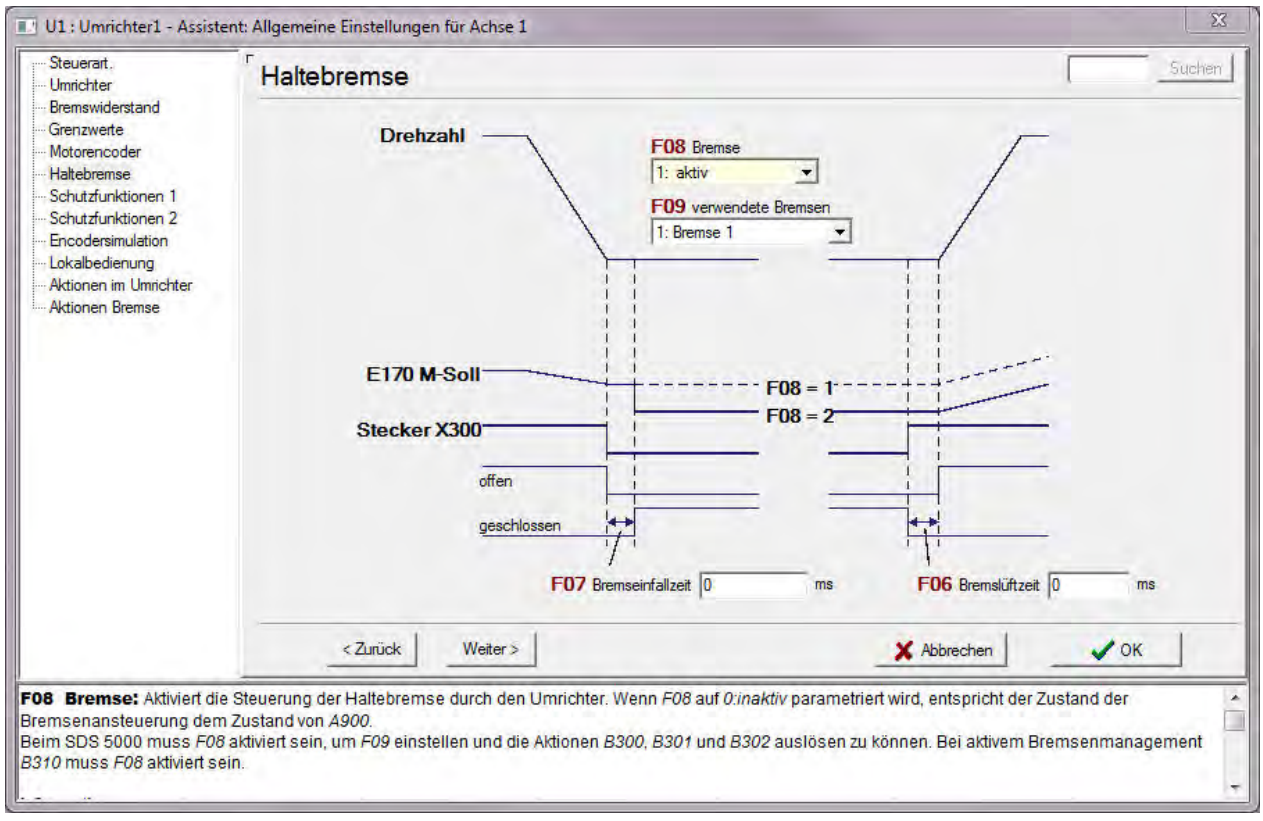


Fig. 7-4: *General settings* assistant, *Holding brake* page

7.6 Brake management

Brake management monitors to ensure brake tests are performed regularly, thereby controlling the functional capability of the brake(s). You can monitor one or two brakes.

The SDS 5000 provides the following options for axis management:
- Single axis operation: An axis projected in POSITool is used for the connected motor.
- Multi-axis operation: 2, 3 or 4 axes projected in POSITool are used for the connected motor.
- POSISwitch multi-axis operation: Up to 4 motors connected to POSISwitch are sequentially operated with up to 4 axes.

The procedure for single axis operation is shown first. Then the special features of multi-axis operation and POSISwitch multi-axis operation will be explained.

Brake management can be used provided the following conditions are met:
- The brakes are operated using the accessory BRS 5001.
- Self-activating brakes are used, which means they brake in a de-energized state.
- The braking torque M_{Brake} must be at least 1.3 times the maximum load torque.
- The drive has an encoder.

Note this information during projecting and during commissioning of the machine.

7.6.1 Single-axis operation

Prerequisite for the activation of brake management:
- You have parameterized brake activation.

Activate brake management as shown below:

Activating brake management

1. Set parameter *B310 brake management* to *1:global*.
2. In parameter *B311*, set the time after which the inverter is to output a message indicating that a brake test is necessary. The maximum operating time that can be set is 1 year = 52 weeks or 8760 hours.
3. Transfer the parameters to the inverter and save them there.
4. Turn the inverter off and on again.

⇨ After startup, brake management is activated.

Brake management works with the following state machine:

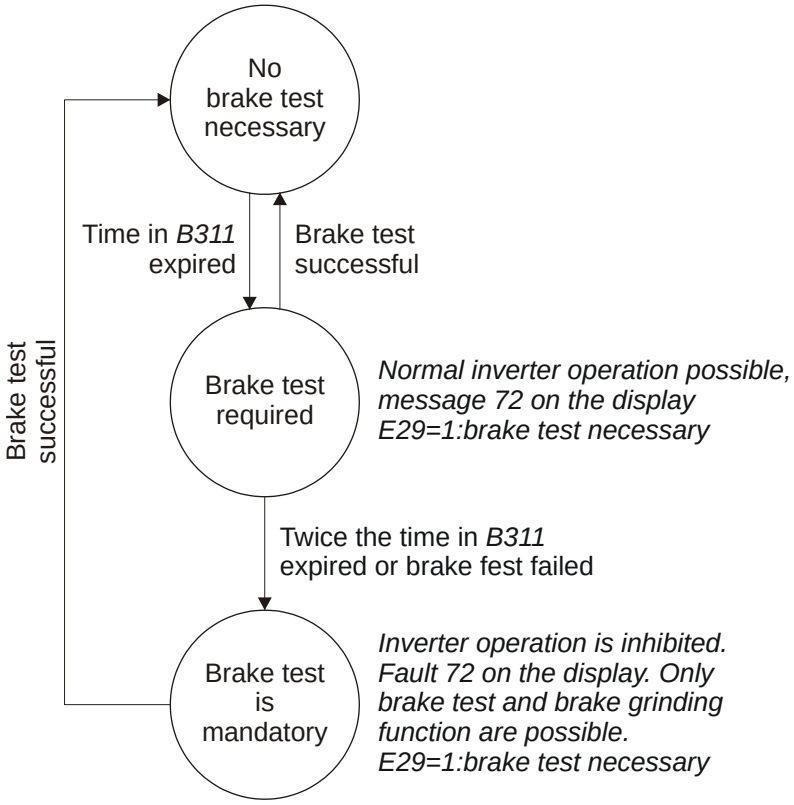


Fig. 7-5: Brake management state machine

The time *B311* of brake management begins running at the time of activation. After the time has expired, a transition is made to the brake test required state. This state is indicated on the inverter display with message *72:brake test*. After you perform a successful brake test in this state, brake management returns to the *no brake test required* state. And the *B311* cycle begins again.

If the time *B311* expires again in the *brake test required* state without a brake test having been performed at all or the brake test was not successful, a transition is made to the *brake test mandatory* state takes place. This state is indicated on the inverter display with fault *72:brake test*. In addition the status is displayed in parameter *E29 Warning*: *perform brake test* (*1:brake test necessary*). To avoid interrupting a production process, the malfunction is only generated if there is no enable. The fault must be acknowledged before the brake test and the brake grinding function can be performed. If the brake test has not been performed successfully 5 minutes after the acknowledgment, the fault appears again on the inverter display. A successful brake test in this state automatically takes you back to the no brake test required state and the *B311* cycle begins again.
If a brake test is not successful in the *brake test mandatory* state, you have the option of grinding the brakes and trying to perform a brake test again. If this brake test also fails, the brake or the motor must be replaced. Brake management remains in the *brake test mandatory* state until a successful brake test is performed after replacement of brake or motor. Time since the last brake test is indicated in parameter *E177 Time passed since last brake test*. The brake test can be started directly on the inverter, in POSITool or from the higher level controller.

7.6.2 Multi-axis operation

In multi-axis operation, several axes (switching parameter records) are used on one motor connected to the inverter. In such cases, you activate brake management with the same settings as for single-axis operation. Please note that the settings are made in the parameters of axis 1.

7.6.3 POSISwitch multi-axis operation

When a POSISwitch is used, up to 8 brakes on 4 motors can be monitored. In such cases, set parameter *B310 = 2:axis-specific*. Parameters *F08*, *F09* and *F311* are set separately for each axis.

A separate state machine exists for each axis that is monitored. All state machines run parallel to each other, regardless of the activation of the axes. If twice the time *B311* expires on one of the state machines without a brake test having been performed, the state machine changes to the state *brake test mandatory*. The state is indicated on the inverter display with events 72 to 75:

- Event 72: The brake test is mandatory for axis 1.
- Event 73: The brake test is mandatory for axis 2.
- Event 74: The brake test is mandatory for axis 3.
- Event 75: The brake test is mandatory for axis 4.

Please note that these events cause the inverter to change to the device state *fault* which inhibits all axes.

7.7 Brake test

The brake test checks whether the brakes can still apply the required holding torque.

For the brake test, an encoder test is first performed with the brake released. Brake 1 then engages and a test torque that can be parameterized is applied to the drive in each permitted direction of rotation. If the drive detects movement, the brake could not apply the required countertorque and the test has failed. The test torques that can be parameterized are entered in the *B304.x* (positive torque) and *B305.x* (negative torque) parameters. This is repeated for brake 2 if available. Finally the encoder is tested again.

⚠ WARNING!

Danger of personal injury or property damage due to defective motor halting brake. Starting the brake test action releases the motor brakes one after the other. During the encoder test and/or in the case of a faulty brake, the drive axis may move.

▶ Please take special precautionary measures - above all for gravity-stressed axes.

⚠ WARNING!

During the action, the motor rotates at approx. 60 Rpm.

Danger due to movement of the drive.

Ensure the following

▶ Before the function starts, make sure the drive is in a position in which it is permissible for it to move at this speed.

▶ Restrict the direction of rotation in *B306* if the drive is not permitted to rotate in a particular direction.

Information
A motor encoder is required for the brake test. Only the configured (slip-free) motor encoder is evaluated.

Information
Please note that the brake test function is defined for the STOBER system (gear motor with brake and, if applicable, ServoStop). It is essential to clarify the technical demands on a system of another manufacturer before you use it.

Information
Please note that the motor torque is restricted to the values in *C03* and *C05*. If greater values are entered in *B304.x* and *B305.x*, they will not be achieved. Check *E62* and *E66* to see whether other torque limits are still active.

Information
Please note, that with thrust axes, the torque to be provided by the motor for the direction of rotation in which loads are lowered, is calculated this way:
$M_{Parameter} = M_{Brake} - M_{Load}$
$M_{Parameter}$: torque to be entered in *B304.x* or *B305.x*
M_{Brake}: stopping torque to be provided by the brake
M_{Load}: load.

Information
During the *brake test* action, the cycle time is set internally to 32 ms. The change occurs when the action is activated. After the action is concluded, the previous cycle time is used again.

Information
If you would like to perform the action and brake management considers a brake test mandatory (fault 72), the fault must be acknowledged before the action starts. Once you have acknowledged the malfunction, you can continue with the *perform brake test* instruction.

7.7.1 Single-axis operation

Prerequisites for the performance of a brake test:
- You have parameterized a brake activation with the parameter *F08* and *F09*.
- In *B304.0* you have entered the torque for brake 1 which the brake must maintain in the positive direction of rotation.
- In *B305.0* you have entered the torque for brake 1 which the brake must maintain in the negative direction of rotation.
- In *B304.1* you have entered the torque for brake 2 which the brake must maintain in the positive direction of rotation.
- In *B305.1* you have entered the torque for brake 2 which the brake must maintain in the negative direction of rotation.
- If the drive is only permitted to rotate in one direction, you have restricted the direction of rotation in parameter *B306* in preparation for the test.
- In *B307* you have entered the angle of rotation which the drive will evaluate as standstill.

To perform the brake test, proceed as shown below:

Performing a brake test

1. Change to the device state *Ready for switch on*.
2. Set parameter *B300.0 brake test & start* to *1:active*.
3. Turn on the enable signal.
   ⇨ The inverter starts the brake test and the motor begins rotating
4. Wait until parameter *B300.1* indicates the result 100 % and parameter *B300.2* the result *0:error free*.
5. Turn off the enable signal.

⇨ You have performed the brake test successfully.

If you did not get the correct results, check the following:

1. *B300.2 = 1:aborted:* The *brake test* action was terminated. Reasons for the termination may include, for example:
   – The enable was switched off during the test.
   – The enable signal has not been switched on within 30 seconds.

   Perform the brake test again.
2. *B300.2 = 2:maximal torque not achieved for brake 1:*

   Brake 1 was unable to maintain the required torque during the test. Perform the brake grinding function for brake 1 or replace brake 1. Then perform the brake test again.
3. *B300.2 = 3:maximal torque not achieved for brake 2:*

   Brake 2 was unable to maintain the required torque during the test. Perform the brake grinding function for brake 2 or replace brake 2. Then perform the brake test again.
4. *B300.2 = 4:Error*. Reasons for the message may include:
   – No brake is parameterized. Set *F08* to *1:active* and *F09* to the brakes being used.
   – No encoder is parameterized. Determine whether an encoder exists and whether the connected motor can be operated in control mode servo-control or vector control. Set B20 accordingly.
   – Brake test has not been activated in the device state "Ready for switch on" (e.g. in the state "Switch on inhibit").
5. *B300.2 = 5: Encoder defective*. Reasons for the message may include:
   – The brake(s) did not release. Test the brakes.
   – The encoder is defective. Call the STOBER hotline at +49 (0) 180 5 786323.
6. *B300.2 = E62/E66 Torque limit*. Reasons for the message may include:
   – *C03*/*C05* are set to low.
   – Other application-relevant torque limits are in effect.
   – The device is overloaded.

The inverter maintains an internal brake test memory with the last 20 results from *B300.2* and the actually achieved stopping torques for brakes 1 and 2 in positive and negative directions. With the result 0:error free, these correspond to the values parameterized in *B304.x* and *B305.x*. If the values in the brake test memory are less than these, the brake test was not successful.
The maximum positioning path during the brake test is approx. 45° in both directions. When the direction of rotation is restricted, the positioning path is approx. 2 x 45° in the permitted direction. In both cases there is also a stopping distance to consider which depends on the torque limit and the inertia. When a mechanism is coupled, you will also have to include the ratio of the gear unit in your calculations. If both directions of rotation are permitted in *B306*, rotation in the positive direction is done first. Please note that this calculation only applies when the brake is intact. If the brake being tested is unable to provide the required stopping torque, the positioning path cannot be calculated. In such cases, the inverter shuts off within < 10 ms and applies the second brake (if one exists). The standstill of the drive is significantly affected by the brake application time and the functionality of the second brake. If a second brake does not exist, the motor coasts down.

7.7.2 Multi-axis operation

Please note that axis 1 must be selected for the action when you use multi-axis operation.

7.7.3 POSISwitch multi-axis operation

Please note that the respective axis must be selected for the action when you use POSISwitch® multi-axis operation

7.8 Brake grinding function

The control unit can activate the brake grinding function separately for each of the two brakes. Use action *B301* for brake 1 and *B302* for brake 2. We will now describe action *B301* for brake 1. The description also applies to brake 2.
During the brake grinding function, the brake is repeatedly applied for approx. 0.7 s and then released for approx. 0.7 s while the motor is rotating with approx. 20 rpm. This grinds off any deposits from the friction surface which may affect the halting function. You can parameterize the following settings:

- How often the brake is applied (*B308*) during rotation.
- How often the drive is to rotate in each direction (*B309*).
- Whether one direction of rotation is inhibited (*B306*).

⚠ WARNING!

Danger of personal injury or property damage due to defective motor halting brake. Starting the brake test action releases the motor brakes one after the other. During the encoder test and/or in the case of a faulty brake, the drive axis may move.

▶ Please take special precautionary measures - above all for gravity-stressed axes.

⚠ WARNING!

Danger due to movement of the drive. During the action, the motor rotates at approx. 20 Rpm and with the torque entered in *C03* or *C05*.

Ensure the following.

▶ Before the function starts, make sure the drive is in a position in which it is permissible for it to move at this speed and torque.

▶ Restrict the direction of rotation in *B306* if the drive is not permitted to rotate in a particular direction.

▶ Check *E62* and *E66* to see whether other torque limits are also in effect.

Information
Please note that the brake grinding function is defined for the STOBER system (gear motor with brake and, if applicable ServoStop). For example, you cannot use the brake grinding function with brakes that are attached to the output power of the gear unit. It is essential to clarify the technical demands on a system from another manufacturer before you use this function.

Information
During the *brake grinding* action, the cycle time is set internally to 32 ms. The change occurs when the action is activated. After the action is concluded, the previous cycle time is used again.

Information
If you would like to perform the action and brake management considers a brake test mandatory (fault 72), the fault must be acknowledged before the action starts. Once you have acknowledge the malfunction, you can continue with the *brake grinding function* instruction.

7.8.1 Single-axis operation

Prerequisites for using the brake grinding function:
- You have parameterized brake activation.
- In *B308* you have entered how often the brake is to be applied while rotating in one direction.
- In *B309* you have entered how often the drive is to grind in each direction.
- In *B306* you have specified whether one direction of rotation is inhibited.
- The brake should be ground with its maximum holding torque. For normal motor-controller combinations this is the case with *C03*/*C05* = ±200 %.
- Check *E62* and *E66* to see whether other torque limits are also in effect.

Proceed as shown below:

Performing the brake grinding function

1. Change to the device state *Ready for switch on*.
2. Set parameter *B301.0 grind & start brake 1* to *1:active*.
3. Turn on the enable signal.
   ⇨ The drive begins to rotate as per the specified parameters.
4. Wait until parameter *B301.1* indicates the result 100 % and parameter *B301.2* the result *0:error free*.
5. Turn the enable off.

⇨ You have successfully performed the brake grinding function.

If you did not get the correct results, check the following:
1. *B300.2* = *1:aborted*: The *brake grinding* action was terminated. Reasons for the termination may include, for example:
   – The enable was switched off during execution.
   – The enable signal has not been switched on within 30 seconds.

   Perform the brake grinding function again.
2. *B301.2* = *4:error*. Reasons for the message may include:
   – Brake 1 is not parameterized. Set *F08* to *1:active* and *F09* to *1:brake 1* or *3:brake 1 and 2*.
   – Brake grinding has not been activated in the state "*Ready for switch on*" (e.g. in the state "*Switch on inhibit*").

The inverter maintains an internal memory containing the operating times of the last 40 successfully executed grinding procedures. All grinding procedures are counted in parameter *E176* regardless of the result. The maximum positioning path is *B308* x 0.5 motor rotations. When mechanics are coupled, you will also have to consider the ratio of the gear unit in your calculations. If *B306* permits both directions of rotation, the positive direction is done first.

The inverter maintains an internal memory containing the operating times of the last 40 successfully executed grinding procedures. All grinding procedures are counted in parameter *E176* regardless of the result.
The maximum positioning path is *B308* x 0.5 motor rotations. When mechanics are coupled, you will also have to consider the ratio of the gear unit in your calculations. If *B306* permits both directions of rotation, the positive direction is done first.

7.8.2 Multi-axis operation

Please note that axis 1 must be selected for the action when you use multi-axis operation

7.8.3 POSISwitch multi-axis operation

Please note that the respective axis must be selected for the action when you use POSISwitch® multi-axis operation.

8 Parameterizing axis management

This section describes axis management. Management of the axes takes place in the global area. Management means the unique control of a maximum of one axis. All axes can be deactivated. The display of the inverter shows which axis is active or whether there is an active axis.

Information
The axis can only be switched when the enable has been switched off and *E48 device state* is not *5:fault*. The option startup disable ASP 5001 may not be active when an axis is switched!

The axes can be combined with motors in different ways. For instance, when only one motor is connected directly to the inverter, several axes can be allocated with applications and switched. In this case, the axes function like parameter sets (see Figure 8 1).

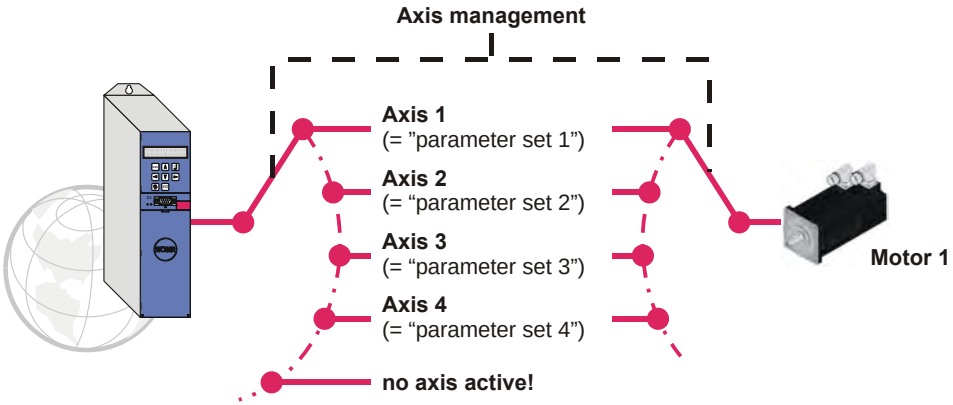


Fig. 8-1: Using the axes as parameter records

An inverter can sequentially control up to four motors. The POSISwitch AX 5000 option must be used for this. POSISwitch AX 5000 is activated by the inverter via encoder interface X4. Servo motors with EnDat absolute encoders are connected to POSISwitch.
Axes can be used like parameter sets with POSISwitch AX 5000 too. The axis-motor combination is determined with parameter *H08*. Separate and defined information exists for each axis as to which encoder is being activated by the axis on POSISwitch AX 5000.
In our example, the motor on encoder port 3 ("*Enc3*") is selected for axis 1.

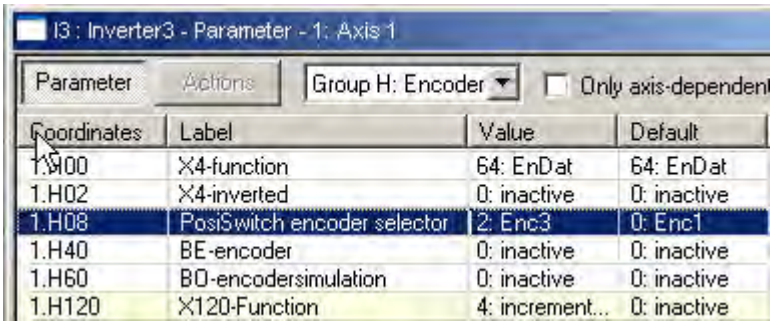


Fig. 8-2: Allocating the axis to encoder port

Selection of an axis is binary-coded via the signals *axis-selector bit 0* and *axis-selector bit 1*. The axis disable signal can be used to disable all axes regardless of the state of the axis selectors.

For which parameters can be used to access these signals, see the descriptions of the applications.

You can view the status of axis management in the parameters *E84* and *E200*, bits 3 to 5.

9 Parameterizing brake resistor

To remove excess braking energy from the DC link, a brake resistor can be connected to the 5th generation of STOBER inverters. You will find information on the types available from STOBER and connection in the configuration manual for the inverter.

Parameters
- *A21 Braking resistor R [Ω]*
- *A22 Braking resistor P [W]*
- *A23 Braking resistor thermal [s]*

are available for the settings.

Enter the value 0 in A22 and the activation of the braking resistor (brake chopper) is deactivated. Note that the brake chopper continues working when most malfunctions occur. The malfunctions that cause the brake chopper to be switched off are documented accordingly in chapter Diagnosis.

Inverters of size 3 have an internal braking resistor. To activate the internal brake resistor, enter *A21* = 30 Ω and *A22* = 1000 W for example.

10 Parameterizing in-/outputs

This chapter discusses the linking of control and status signals with the application.
The system of the control signals will now be explained with the example of quick stop.

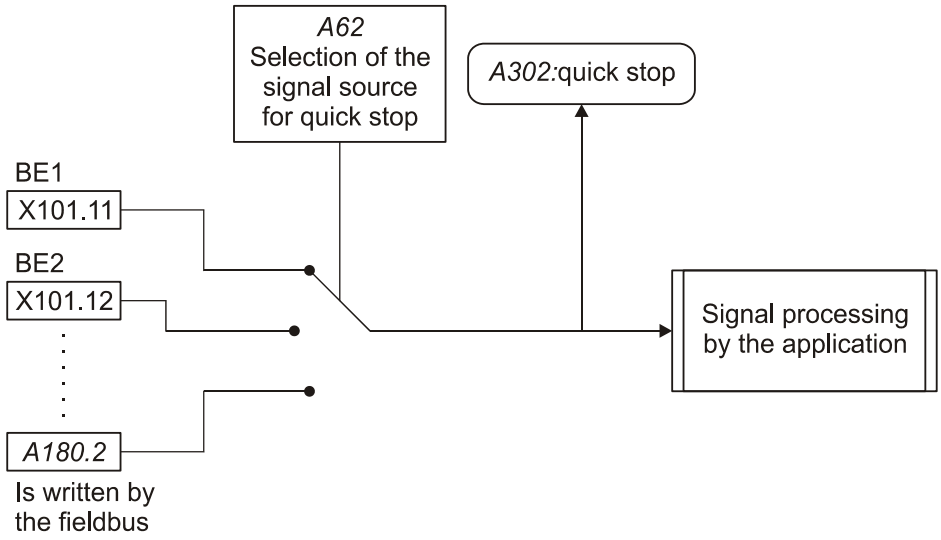


Fig. 10-1: Selection of the signal sources for input signals

The signal can be provided on various binary inputs or via fieldbus. The user makes the selection with a selector (*A62* here). In addition, an indicator parameter exists which shows the signal status (*A302* here). The application descriptions list selection, fieldbus and indicator parameters for each signal.

The output signals are allocated by the specific selection of status signals. The routine is explained with the example of *ref.value reached*.

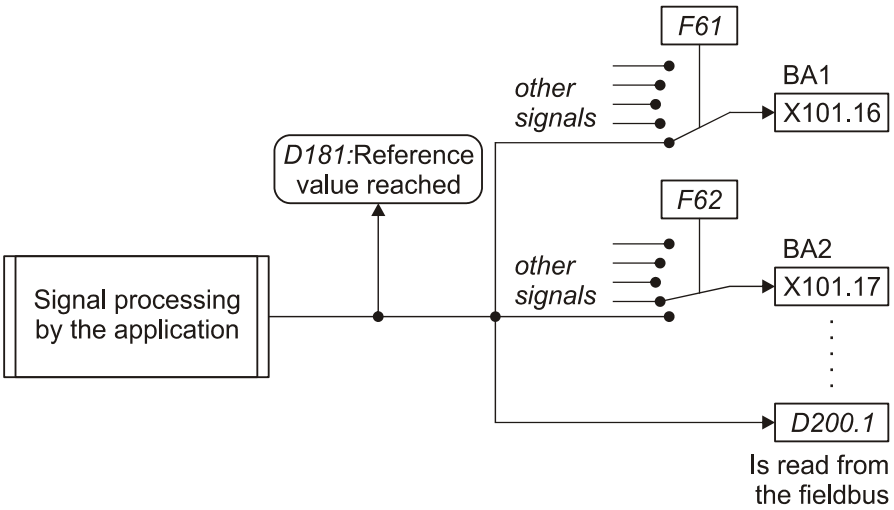


Fig. 10-2: Selection of the signal sources for output signals

All available parameters can be entered in the source parameters.

To be able to poll application status signals, the signals must be allocated to an output (BA, AA, parameter). There is a source parameter for each output in which the signals available for the particular application can be selected / inscribed. Source parameters *F61* and *F62* are used for the binary outputs BA1 and BA2 shown in the diagram. At the same time, the signal is written in a parameter (*D200* bit 1 here). This parameter can be read from a fieldbus system.
The indicator parameter (*D181* in the diagram) shows the signal state after handling by the application. It is used to check the signal path. The application descriptions specifies for each signal the possible outputs and the related selection parameters as well as the fieldbus and indicator parameter.

11 Integrated Bus

The Integrated Bus (IGB) offers the following functions:

- Direct connection
- IGB-Motionbus
- Remote maintenance

You can use the IGB-Motionbus function either with a direct connection or with the remote maintenance function. However, it is not possible to establish both a direct connection and a remote maintenance connection at the same time.
The IGB can only be set up with inverters of the SDS 5000 device family.

11.1 Components

The following figure shows the components used to carry out remote maintenance. You can also use the IGB Motionbus function with this setup. The teleserver that establishes the connection is described in 11.4.

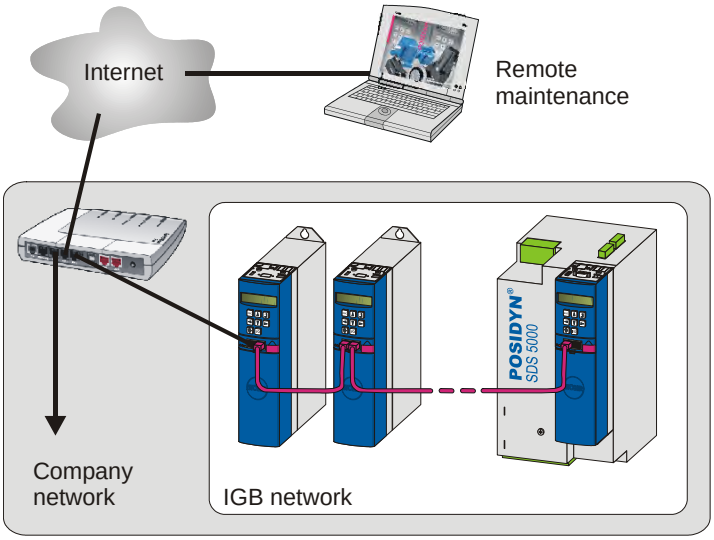


Fig. 11-1: Remote maintenance with the components involved

The following figure shows the setup when a direct connection to the PC is established as well as the IGB Motionbus. A direct connection and remote maintenance can not be set up simultaneously!

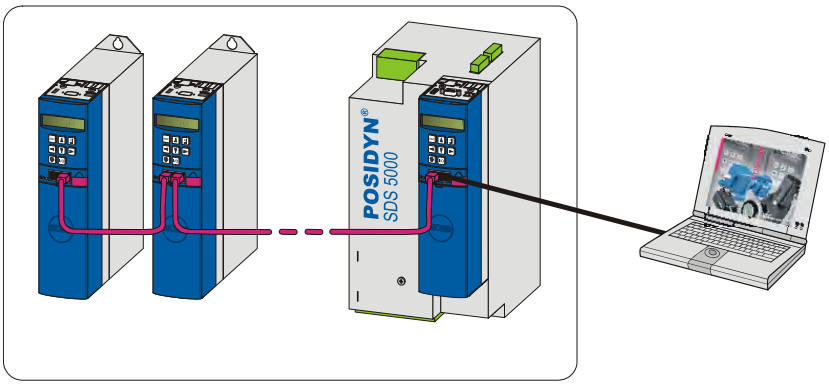


Fig. 11-2: Direct connection to the PC and the components involved

You can also set up communication to a controller via the fieldbus in parallel to the IGB. Observe the fieldbus documentation for this (see section 1.3 Further documentation).

Information
Remember that when a fieldbus and the IGB-Motion bus are used at the same time, the fieldbus communication cannot be synchronized on the controller.

11.1.1 Basics of IGB communication

Information
Remember that an IGB network can never be accessed by remote maintenance and direct connection (PC) at the same time.

Communication uses the following interfaces:
- Direct connection: TCP/IP protocol on port 37915 and UDP/IP protocol on port 37915
- Remote maintenance without proxy server: HTTP protocol on port 80
- Remote maintenance with proxy server: HTTP protocol on port of the proxy server

You may be asked to share this port by the personal firewall. Share these port for your firewall. To do this, contact your network administrator.

The IGB network must meet the following conditions:
- A maximum of 32 SDS 5000s may be connected in one network.
- All inverters involved in the IGB network must be directly connected with each other. No other components such as hubs and switches are permitted between them in the circuit.
- The overall resulting layout must be a line topology.
- The X3 A interfaces may only be connected with X3 B interfaces of other inverters and vice versa.
- Suitable cables must be used. STOBER provides ready-made cables for the layout of the Integrated Bus. These cables must be used to ensure proper functionality. Note also the SDS 5000 projecting manual.

It is also possible to use cables with the following specification:

Plug wiring	Patch or crossover
Quality	CAT5e (or better)
Shielding	SFTP or PIMF (or better)

- The maximum overall extent of the IGB network is 100 m.
- The IGB does not require an explicit master and the extensive configuration typically required for Ethernet is eliminated.

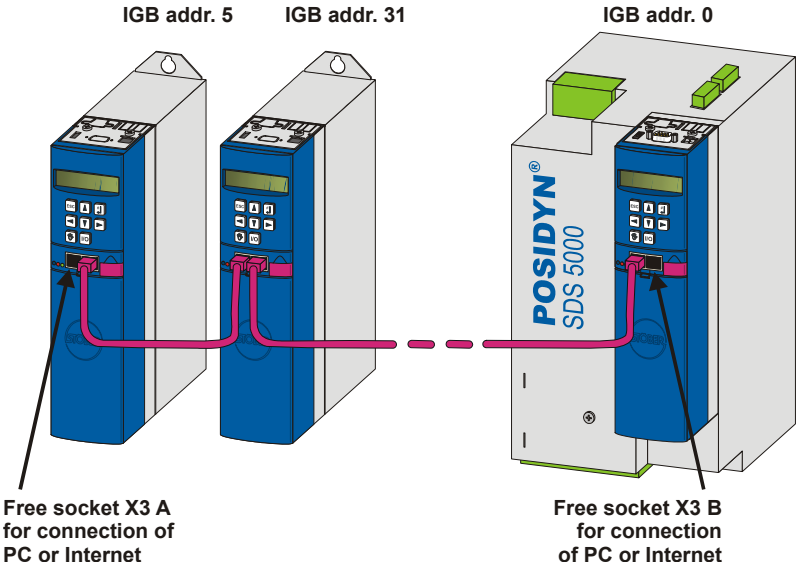


Fig. 11-3: IGB network

PC or the internet are connected to a free outer socket. The IGB network is set up automatically when you turn on at least one inverter. The following conditions apply when integrating additional inverters into the network:

- You have connected these inverters to the IGB network.
- The inverters in the network must be receiving a 24-V power supply.

To start the integration, the 24-V power supply of the inverter in the network must be turned on. When the 24-V power supply is turned on, the IGB network is restructured and up to 32 connected inverters will be integrated.

Information
Remember that sockets X3 A and X3 B are not electrically connected. If you turn off a device in an IGB network or disconnect an IGB cable, two partial networks are created to the left and right of this device or the disconnected cable.

11.1.2 General diagnosis

Information about the IGB is provided by every inverter via the following parameters:

Parameters A153 and A155 are used in every station to diagnose the IGB ...

- *A153 IGB actual node number*: The parameter specifies the number of stations which are currently registered on the IGB.
- *A155 IGB-state*: The parameter specifies information on the following states of the IGB:

Indication in *A155*	Description
0: Booting	The IGB is booting.
1: Single	The SDS 5000 did not find any other SDS 5000s with which it could set up an IGB network. The functions remote maintenance or direct connection may be active.
2: IGB-Running	Several devices can use the remote maintenance or direct connection (with POSITool) functions. The IGB-Motionbus function is not used or cannot be used.
3: IGB-Motionbus	Several SDS 5000s can use the IGB-Motionbus function. The remote maintenance or direct connection (with POSITool) functions can be active at the same time.
4: IGB Error	An error was determined on the bus.

Information related to the specific device is provided by the following parameters:

... while parameters A152, A154 and A156 describe the status of the IGB station.

- *A152 IGB position*: The parameter shows the current position of the SDS 5000 on the IGB bus. You are given the following information:

Indication in *A152*	Description
0: Single	The inverter is not connected with other devices.
1: IGB-internal	Both sockets are connected with other inverters (i.e., additional inverters are connected on both sides of the inverter).
2: Gateway-X3A	The inverter is located on the left, outer end of the IGB (i.e., no inverter is connected to its socket X3 A).
3: Gateway-X3B	The inverter is located on the right, outer end of the IGB (i.e., no inverter is connected to its socket X3 B).

- *A154.x IGB Port X3 A/B*: The array parameter specifies the status of the interface separately for the X3 A and the X3 B. You are given the following information:

Indication in *A154.x*	Description
0:_ERROR	The status of the socket is unknown.
1:noConnection	The socket is not connected with other devices.
2: 10 MBit/s	A connection exists to a station with a transmission rate of 10 Mbit/s.
3: 100 MBit/s	A connection exists to a station with a transmission rate of 100 Mbit/s without full-duplex capability.
4: link OK	A connection exists to a station with a transmission rate of 100 Mbit/s whose communication has full duplex capability.

To be able to set up communication within the IGB network *A154.x = 4: connection OK* must be displayed. If any other message appears, follow this procedure:

- Check whether the IGB network meets the conditions of the section 11.1.1 Basics of IGB communication.
- Check whether an integrated switch, if any, is full duplex capable and capable of transfers at 100 Mbit/s.
- Check the wiring.
- *A156 IGB number bootups*: The parameter shows for each device how often it determined a startup of the IGB since the last time its power was turned on.

11.2 Direct connection

A direct connection means the direct connection of a PC with POSITool to an SDS 5000 or an IGB network via a cable without any other network components for commissioning, diagnostic or maintenance purposes.You can establish a direct connection with an SDS 5000 or an IGB network.

11.2.1 Requirements for a direct connection

Note the following rule for the direct connection:

- The socket of the gateway device and the computer's network connection must have IP addresses on the same subnet.

Information
To coordinate the IP addresses of the gateway device and the computer, you have the option of changing the IP address of either the computer or the gateway device. However, since you generally need administrator rights to change the IP address of the computer, we recommend changing the IP address of the gateway device.

Information
Please note that the device has two RJ45 sockets (X3A and X3B). Since one socket must be access concretely for a direct connection, the related parameters are created as array parameters. Element 0 contains the settings for socket X3A and element 1 for socket X3B. Make the settings described in this section appropriately for the socket with which you will connect the gateway device with the computer.

11.2.2 IP address and subnet mask

An IP address is divided into a network section and a device section by the subnet mask. The subnet mask can be represented in binary format, for example, as a series of numbers with the left side consisting only of the number 1 and the right side consisting only of the number 0.
1111 1111.1111 1000.0000 0000.0000 0000 = 255.248.0.0

The section of the subnet mask with the number 1 shows which part of the IP address indicates the address of the subnet (the network section). The other part with the number 0 shows the part of the IP address that represents the address of the device in the subnet (device section).

The following example illustrates how to calculate the IP address.
The IP address 128.206.17.177 with subnet mask 255.240.0.0 is entered for the network interface of the computer:
Subnet mask:1111 1111.1111 0000.0000 0000.0000 0000
The 12 numbers on the left of the IP address indicate the address of the subnet and must be identical in the IP address of the device. The 20 number of the IP address on the right indicate the address of the computer in the subnet. This section must be different in the IP address of the device.

IP address:	1000 0000.1100	1110.0001 0001.1011 0001
	Network section, must be identical in the device and PC	Device section, must be different in the device and PC

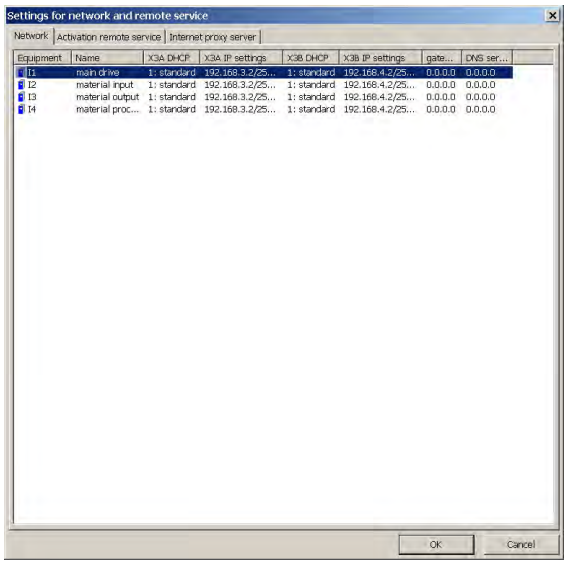
A possible IP address for the device could therefore be:
1000 0000.1100 1111.0001 0001.1011 0001 = 128.207.17.177

11.2.3 Determining the IP address and subnet mask of the PC

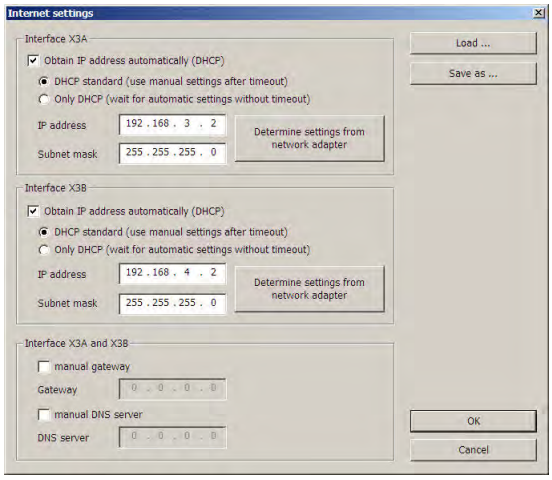
You can determine the IP address and subnet mask of the PC network interface in the system control of the PC but POSITool offers an easier way of finding this information:

Determining the IP address and subnet mask of the PC

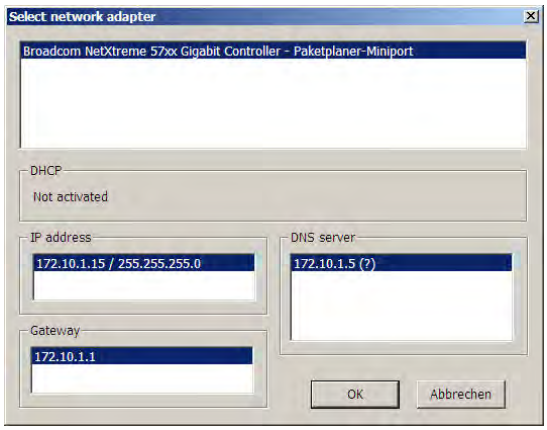
1. In the Project view of POSITool, open the *Network and remote service* assistant.
   ⇨ The following dialog screen appears:



2. Double click an inverter in the list.
   ⇨ The following dialog screen appears:



3. Click one of the two *Determine settings from network adapter* buttons.
   ⇨ The following dialog screen appears:



4. In the top part of the dialog screen, select the network interface which is connected with the direct connection to the inverter.

⇨ The IP address and the subnet mask of the PC on this interface are indicated in the IP address field.

11.2.4 Adjusting the IP address of the inverter

Follow these steps to adjust the IP address of the inverter to the IP address of the computer:

Adjusting the IP address of the inverter

1. Determine the IP address and subnet mask of the computer, for example from the control panel of your computer.
2. Determine an IP address that is in the same subnet as the PC's IP address.
3. Use the operator panel of the gateway device to enter that address in parameter *A164[x]*. Use *A164[0]* if the direct connection is via X3A. Use *A164[1]* if you are connecting the PC via X3B.
4. Check whether either *0:manual* or *1:standard* is entered in *A166[x]*. Note in this case as well that *A166[0]* applies to X3A, while *A166[1]* applies to X3B.
5. If *A166[x]* is not set to *0:manual* or *1:standard*, correct the setting.
6. Save your settings with *A00 Save values*.

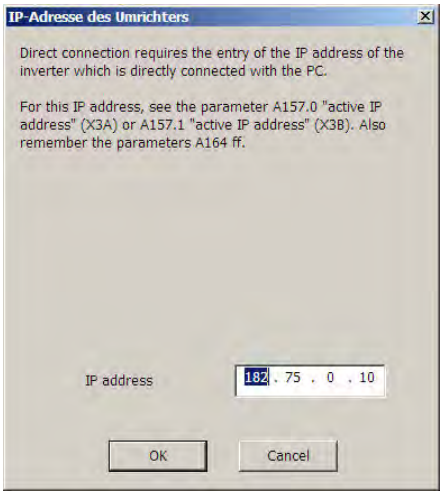
⇨ You have adjusted the IP address of the inverter.

11.2.5 Establishing a direct connection

To establish a direct connection, proceed as follows:

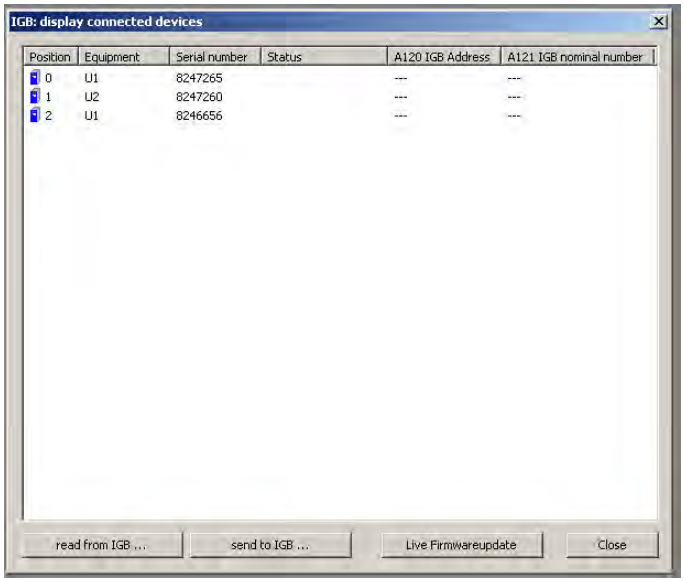
Establish a direct connection

1. Click the  button in the toolbar of POSITool.
   ⇨ The following dialog screen is displayed:



2. Specify the IP address of the RJ45 connector that you have connected to the PC.
3. Click the *OK* button.

⇨ You have established a direct connection and the *IGB: Display connected devices* dialog screen is displayed. The dialog screen shows all devices that are connected via the direct connection to the PC:

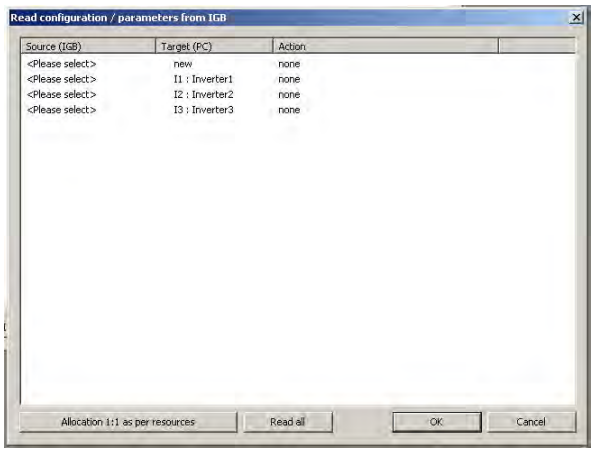


11.2.6 Reading data from the SDS 5000

You must have established a direct connection before you can read data from an SDS 5000. After you have done this, proceed as shown below:

Reading data from the SDS 5000

1. In the *IGB*: *display connected* devices dialog screen, click the *read from IGB…* button.
   ⇨ The following dialog screen appears:



   In the first column of this dialog screen, you can select the inverters which are connected to the PC. The possible targets in your project are shown in the second column.
2. Highlight the line of the inverter entry in POSITool to which the data are to be written. You can select an already existing inverter entry (*I1: Inverter1*) or set up a new inverter entry (*new*).
3. In this line, double click the first column *Source* (*IGB*) (<*Please select*>).
   ⇨ A selection list appears showing all inverters which are connected to the PC.
4. Select the inverter whose data you want to read.
5. Repeat steps 2 to 4 for each source to be read from.
6. Click the *OK* button.

⇨ The data are loaded as you specified and shown in POSITool.

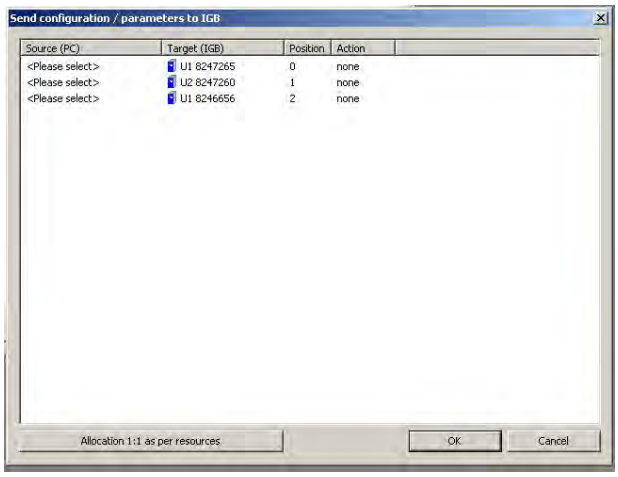
The *Read configuration / parameters from IGB* dialog screen also offers the function of assigning inverters to the inverter entry based on the resources identifier (*Allocation 1:1 as per resources button*). This requires the entry of an unambiguous resource identifier. This button is particularly useful when changes must be made to an already existing project. The resource identifier is entered in the configuration assistant in step 1. You can also make changes in the Project view by clicking the related inverter with the right mouse button. In the context menu which appears, select the item *Rename inverter*. In the next dialog screen that appears, you can make the changes.
When you click the *Read all* button in the *Read configuration / Parameters from IGB* dialog screen, all inverters are read and the data are indicated in POSITool as new inverter entries.

11.2.7 Writing data to the inverter

To write data to the inverter, proceed as shown below:

Writing data to the inverter

1. Click the Send to *IGB...* button in the *IGB: display connected devices* dialog screen.
   ⇨ The following dialog screen appears:



2. Highlight the line of the inverter to which you want to write data.
3. In this line, double click the first column *Source (PC)*.
   ⇨ A selection list appears in which all inverter entries are listed which contain your project.
4. Select the inverter entry which you want to write to the selected inverter.
5. In this line, double click the *Action* column.
   ⇨ A selection list appears in which you can set whether you want an automatic adjustment or whether the previously stored configuration and the parameters are to be overwritten.
6. Select one of the actions.
7. Repeat steps 2 to 6 for each inverter to which you want to write data.
8. Click the *OK* button.

⇨ The data are written to the inverters as specified by you.

11.3 IGB-Motionbus

The IGB-Motionbus allows each SDS 5000 integrated in the IGB network to send its data cyclically to the bus. Every other SDS 5000 in the IGB network can access these data (producer-consumer model). An SDS 5000 can send a maximum of 32 bytes. If you are going to use the IGB-Motionbus function, each inverter in the IGB network must be integrated in the IGB-Motionbus.
The IGB-Motionbus uses the following state machine:

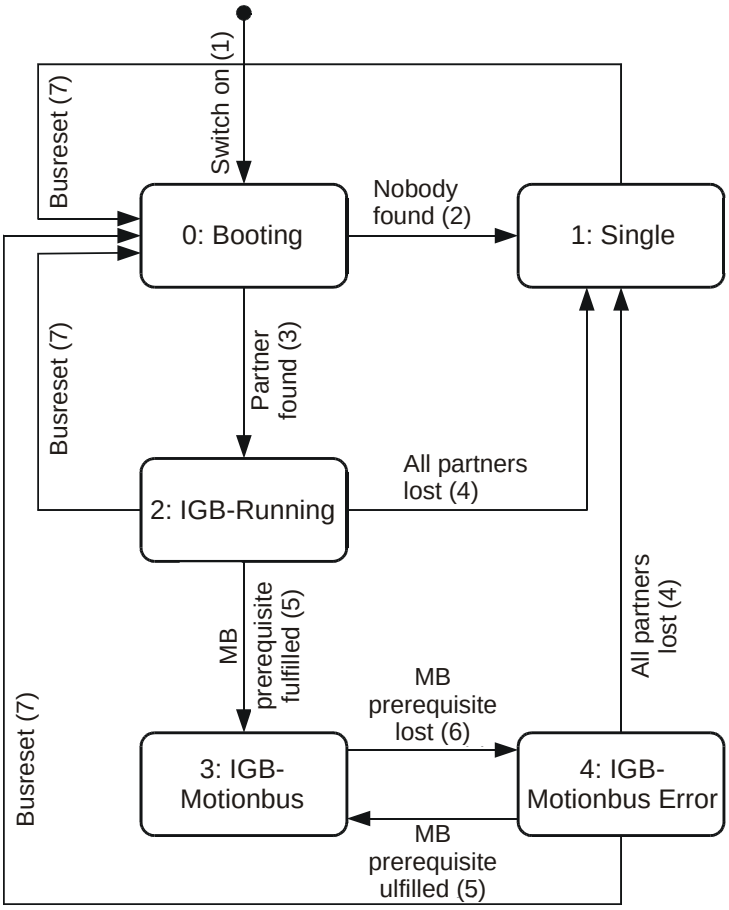


Fig. 11-4: State machine of the IGB-Motionbus

Parameter *A155* indicates the current state of the IGB-Motionbus:

State	Description
0: IGB Booting	The IGB is booting. The connected inverters register on the IGB network and synchronize themselves. In this condition, values for parameters *A120* and *A121* will be sampled and applied for further operation without change.
1: Single	No IGB network with other inverters is currently established. The functions *remote maintenance* or *direct connection* can be used.
2: IGB running	Several inverters have established an IGB network. The functions *remote maintenance* or *direct connection* (with POSITool) can be used. The *IGB-Motionbus* function is not being used or cannot be used for one of the following reasons, • The function was not selected during configuration • The parameter *A120 IGB Address* was not unambiguously set for all stations • *A121 IGB nominal number* was not parameterized. • Because after changing of *A120* or *A121* the values were not saved and the device was switched off and on again, or because no other device has triggered a bus reset.
3: IGB-Motionbus	The inverters in the IGB network are sending and receiving cyclic data. In this state, the addition of further inverters has no effect on the existing IGB-Motionbus.
4: Motionbus Error	The state *A155 = 3:IGB-Motionbus* was already achieved once and was exited due to an error.

The following conditions apply to a change in state:

State	Condition
1: Switch on	Power was turned on
2: Nobody found	Either this SDS 5000 found no other inverter with which it could establish an IGB network or an already existing connection to other inverters via IGB was disconnected.
3: Partner found	At least one directly connected SDS 5000 was found. All partners that were found have organized and synchronized themselves on the IGB.

State	Condition
4: All partners lost	No connection to a partner on either X3A or X3B. This can happen when the cable is disconnected, for example.
5: IGB-Motionbus prerequisite fulfilled	This means the following • The *IGB-Motionbus* function was activated for all inverters in the IGB network • No IGB address was assigned more than once (*A120 IGB Address*) • Every inverter found the same number of partners in the IGB network and this number corresponds to the expected number in *A121* for every inverter • All inverters in the IGB network are synchronized and are receiving valid data • No inverter reported a double error (event 52, causes 9 and 10). • The "save values" and switching off and on again (bus reset) were not forgotten.
6: IGB-Motionbus prerequisite lost	At least one condition of change-in-state no. 5 was violated. This can happen for the following reasons: • The 24-V power for at least one inverter in the IGB network was turned off • Cable break in the IGB network • Double error due to great EMC problems • Loss of synchronization between the inverters • Loss of synchronization within one inverter because POSITool stopped the configuration
7: Busreset received	At least one partner in the IGB network has achieved the state *0:Booting*. If one of the inverters in the IGB network is switched off and on again, this triggers a bus reset all inverters. All will now evaluate their parameters *A120* and *A121* and therefore start the IGB motion bus..

Before you can use the IGB-Motionbus, you will have to:
- first activate the function on all inverters integrated in the IGB network
- and then parameterize the IGB-Motionbus on each inverter.

Chapter 11.3.5 also gives you information on how to parameterize the exchange of the master position via the IGB-Motionbus.

11.3.1 Activation of the IGB-Motionbus

Select the IGB-Motionbus function in the configuration assistant in step 6.

Proceed as shown below to activate the IGB-Motionbus:

How to activate the IGB-Motionbus

1. Open the configuration assistant in POSITool.
2. Configure your application as usual in steps 1 to 5.
3. In step 6, select the inverter family SDS 5000.
4. Activate the checkbox *IGB-Motionbus*.
5. Exit the configuration assistant with the *Weiter* button.
6. Parameterize your application as you normally would.
7. Repeat steps 1 to 6 for each inverter which is integrated on the IGB-Motionbus.
8. Parameterize the IGB-Motionbus (see chapter 11.3.2).
9. Transfer the application to the inverters and save it.
10. Turn the 24 V power of all inverters off and on again.

⇨ You have now activated the IGB-Motionbus.

11.3.2 Parameterization of the IGB-Motionbus

The IGB-Motionbus is parameterized in two steps:
- Configure the IGB-Motionbus
- Parameterize the process data

These steps have to be performed for every inverter. You can simplify this job by using the assistants *IGB-Motionbus configuration* and *IGB-Motionbus process data mapping* which will lead you through the process of parameterizing the entire IGB-Motionbus in a project.

Information
Remember that you can only transmit parameters with PDO capability via the IGB-Motionbus. Parameters with PDO capability are marked in the parameter list with the PDO attribute.

11.3.2.1 Configuration of the IGB-Motionbus

During the configuration of the IGB-Motionbus, unambiguous addresses are set for the inverters and the expected number of stations on the IGB-Motionbus.

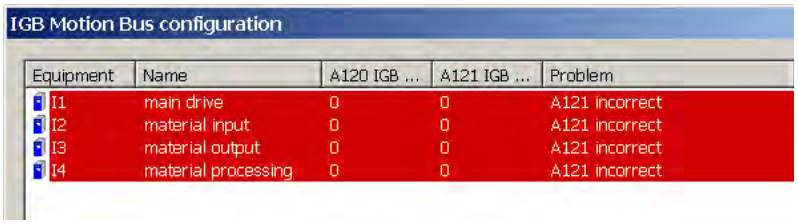
Prerequisites:

- You have entered all inverters which will use the IGB-Motionbus in the project.
- The IGB-Motionbus function has been configured for all inverters.

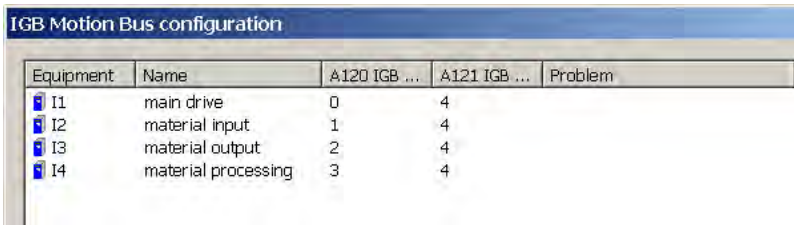
Proceed as shown below:

How to configure the IGB-Motionbus

1. Open the assistant *Configuration IGB-Motionbus*.
   ⇨ The assistant indicates all inverters of the project:



   Since the settings in *A120* und *A121* are not correct, the lines are highlighted in red.
2. Double click the column *A120 IGB Address* for one inverter.
3. Enter the IGB address of the inverter.
4. Double click the column *A121 IGB nominal number* for this inverter.
5. Enter the number stations expected for IGB.
6. Repeat steps 2 to 5 for each inverter which is to use the IGB-Motionbus.
   ⇨ The lines turn white if you have entered the values correctly:



7. Confirm the dialog screen with the *OK* button.

⇨ You have configured the IGB-Motionbus.

Instead of using steps 2 to 6, you can also configure the IGB-Motionbus with the button *Set automatically*. In this case, the inverters are consecutively numbered for the IGB address and the total number of stations is entered in *A121*. If you do not get the right result, check the *Problem* column in the assistant.

11.3.2.2 Parameterization of Process Data

Information
Remember that you can only transmit parameters with PDO capability via the IGB-Motionbus. Parameters with PDO capability are marked in the parameter list with the PDO attribute.

Each SDS 5000 on the IGB-Motionbus has its own memory area in which 32 bytes of data can be sent. These data can be read by all the other inverters which are registered on the IGB network.
The first six bytes are permanently set with the following parameters.

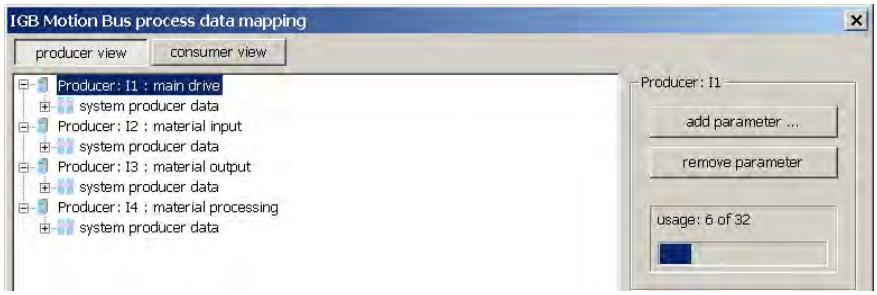
- Byte 0: *E48 Device control state*
- Byte 1: *E80 Operating condition*
- Byte 2: *E82 Event type*
- Byte 3: *A163.0 IGB systembits*
- Byte 4: *A163.1 IGB systembits*
- Byte 5: Reserved

Following this area, you can send up to 24 parameters per inverter with up to a total length of 26 bytes. You can also read up to 32 parameters with a total length of up to 32 bytes from the IGB-Motionbus. The 32 parameters can come from different inverters. To parameterize the process data, proceed as shown below.

To parameterize the process data, proceed as shown below:

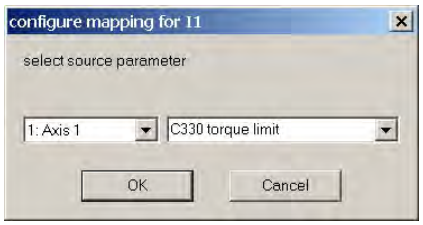
How to parameterize process data

1. Open the *IGB-Motionbus Process Data Mapping* assistant.
   ⇨ The following dialog screen appears:

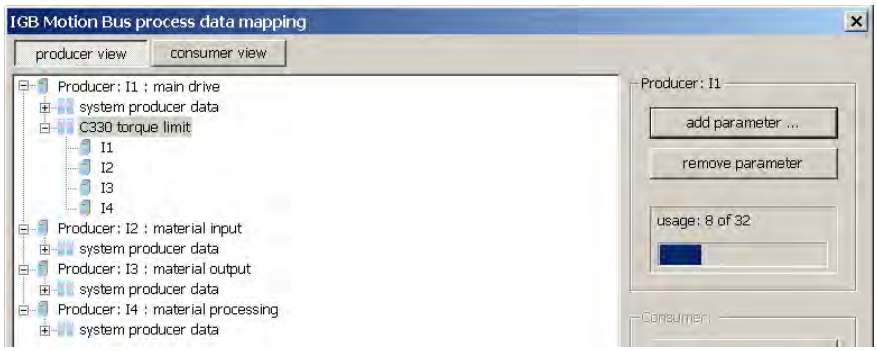


2. Make sure that the button *producer view* is selected in the top part of the screen.
3. In the screen beneath, select an inverter which is to send the data on the IGB-Motionbus.

4. On the right-hand side of the assistant, click the button *add parameter ...*.
   ⇨ The following dialog screen appears:



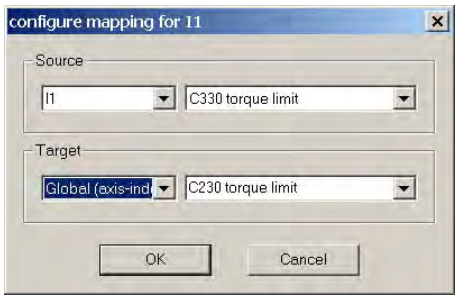
5. In the selection list on the left-hand side, select whether you want to add a parameter from an axis area or from the global area of the inverter.
6. Select the parameter from the selection list to the right.
7. Confirm the dialog screen with the *OK* button.
   ⇨ The parameter appears in the *producer view*.



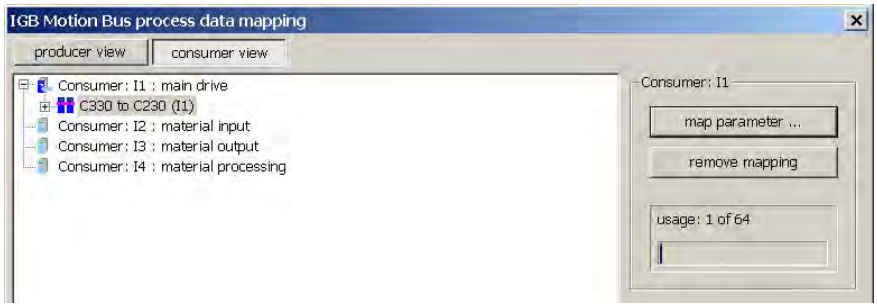
8. Repeat steps 2 to 7 for every inverter which is to send data on the IGB-Motionbus and for every parameter which is to be sent.
9. Click the button at the top of the assistant to change to the *consumer view*.
   ⇨ The following window appears:

10. Select an inverter which is to receive the data from the other inverters.

11. On the right side of the assistant, click the button *map parameter*.
    ⇨ The following dialog screen appears:



12. In the top part of the dialog screen, set the inverter which is to receive data.
13. Set which parameter value is to be read.
14. In the bottom part of the dialog screen, set whether the parameter value is to be written to an axis or a global parameter.
15. Set the parameter to which the value is to be written.
16. Confirm the dialog screen with the *OK* button.
    ⇨ The mapped parameter is indicated as shown below:



17. Repeat steps 10 to 16 for each inverter which is to receive parameters and for each parameter value which is to be received.
18. Confirm the dialog screen with the *OK* button.
19. Transfer the settings to the inverters and save them.
20. Switch the 24-V power supply off and on again for all inverters.

⇨ You have parameterized the process data.

11.3.3 Non-regular IGB operation

⚠ WARNING!

When non-regular IGB operation is activated, there is a risk of asynchronous, undefined movements which may endanger personnel and machines!

▶ Before using *A124*, make sure that the movements cannot inflict personal injury or cause property damage.

When an SDS 5000 is a station on the IGB-Motionbus, the device state machine cannot leave the state *1:Switchon disable* (see *E48 device state*) if the IGB-Motionbus cannot be established (*A155 IGB state* does not indicate *3:IGB-Motionbus*).

Non-regular IGB operation can be activated in *A124* so that the axes can be individually positioned even during commissioning or when the IGB or a device fails. When non-regular IGB operation is activated, enabling is still possible regardless of *A155 IGB-state*.

Information
This parameter cannot be saved. It is pre-assigned with *0:Inactive* during every device startup.

11.3.4 Diagnosis

During IGB-Motionbus operation, each connected inverter sends its data to all the other inverters once every millisecond. This is monitored by parameter *A162.x*.
Parameter *A162.0* is an error density counter for the IGB-Motionbus. It indicates a value for the current error density of the expected but not correctly received data sent once every millisecond. During IGB-Motionbus operation, each SDS sends its data to all the other inverters once every millisecond. If at least one inverter fails to send its data cyclically, this is determined and registered in element 0 of the parameter. This counter is incremented by the number of expected but not received data. When all data from all the inverters connected to the IGB have been received correctly, the error density counter is decremented by 1. As you can see, this parameter provides information on the quality of the IGB network. If the value increases quickly, this probably means that a connection cable of the IGB has been disconnected or an inverter has been turned off.
Parameter *A162.1* indicates the sum of all errors of the IGB-Motionbus which have been registered since the inverter was turned on or during the first startup of the IGB-Motionbus. During operation of the IGB-Motionbus, each SDS 5000 sends its data to all the other inverters once every millisecond. This value is incremented for the expected but not correctly received data during the millisecond cycle.
To prevent any errors which occurred during startup from being counted as real errors, the value is cleared the first time the state *A155 = 3:IGB-Motionbus* is reached.
After this, the value can only be cleared by switching the inverter off.
As you can see, this parameter provides information on the quality of the IGB network. If the value increases quickly, this probably means that a connection cable of the IGB has been disconnected or an inverter has been turned off. If the value increases erratically, the cabling and the environment should be checked for EMC-compatible wiring.

You can use parameter *A138* to analyze events in which several inverters on the IGB-Motionbus are involved. This parameter indicates the global time (in milliseconds) on the IGB-Motionbus. The value goes from 0 to 2^{32} -1 = 4 294 967 295 ms and then begins again at 0. All stations of the IGB-Motionbus work synchronously with each other and use the inter-device clock. You can use *A138* to trigger Scope pictures in different inverters, for example, and then use POSITool to relate the pictures to each other timewise.

11.3.5 Exchanging the master position

To exchange the master position via the IGB-Motionbus, you must

- Send the position of the master to the IGB-Motionbus and
- Read in the position on the slaves.

⚠ WARNING!

Danger of machine malfunction due to an incorrectly reconstructed master reference.

▶ When the master position is distributed over the IGB, the slaves restore the referenced master position after each startup. This reconstruction is not reliable unless an SSI or EnDat® encoder with 4096 multi-turns is set as the source encoder in parameter *G104* of the master.

▶ The restored master position may not be used with other encoders. New referencing is necessary after each switch-on.

Information
Remember that a positioning application with one of the following synchronous functionalities must be used on the slaves.
- Electronic cam
- Motion block positioning
- Synchronous command positioning

To send the master position to the IGB-Motionbus, proceed as shown below:

How to send the master position to the IGB-Motionbus

1. Set parameter *G104* on the master to the source of the master position (e.g., X120).
   ⇨ The master position and the related time stamp are indicated in parameters *E163* or *E164*.
2. Add the parameters *E163* and *E164* to the *IGB-Motionbus Process Mapping* assistant in the *Producer view* of the master.
3. In the *Consumer view* of the slaves, map parameter *E163* on *E102* and *E164* on *E103*.
4. Set parameter *G27* to *6:IGB* on the slaves.
5. Save the parameter assignments in the inverters.
6. Turn the 24-V power supply of the inverters off and on again.

⇨ The master position is sent to the IGB-Motionbus and received by the slaves.

11.4 Remote maintenance

Information
On the usage of remote maintenance it is imperative you observe our maintenance conditions in chapter 11.4.13.

Each indirect connection from the start-up computer via a local network, intranet or the internet with a inverter or an IGB network counts for remote maintenance. You can perform all the functions that are possible via a direct connection with remote maintenance. These are:

- Diagnostic functions
- Changing parameters
- Programming/configuration and
- Live firmware update

⚠ WARNING!

Changing the parameters may change the properties of a machine during and after remote maintenance.

The person responsible for the machine must

▶ Keep people away from the hazardous areas of the machine during remote maintenance.

▶ After remote maintenance is finished, ensure that the behavior of the machine is correct.

▶ The machine may not be released until after this has taken place. Make sure this sequence is organizationally safeguarded.

Information
Remember that an IGB network can never be accessed by remote maintenance and direct connection (PC) at the same time.

At least two people are always involved in remote maintenance:

- The service employee who performs the remote maintenance. For example, this can be a service employee of STOBER or the machine manufacturer.
- The machine technician initiates and concludes the remote maintenance and ensures that persons are safe at all times. This can be a qualified employee of the machine manufacturer or the user

The following figure shows the components involved in remote maintenance via Internet:

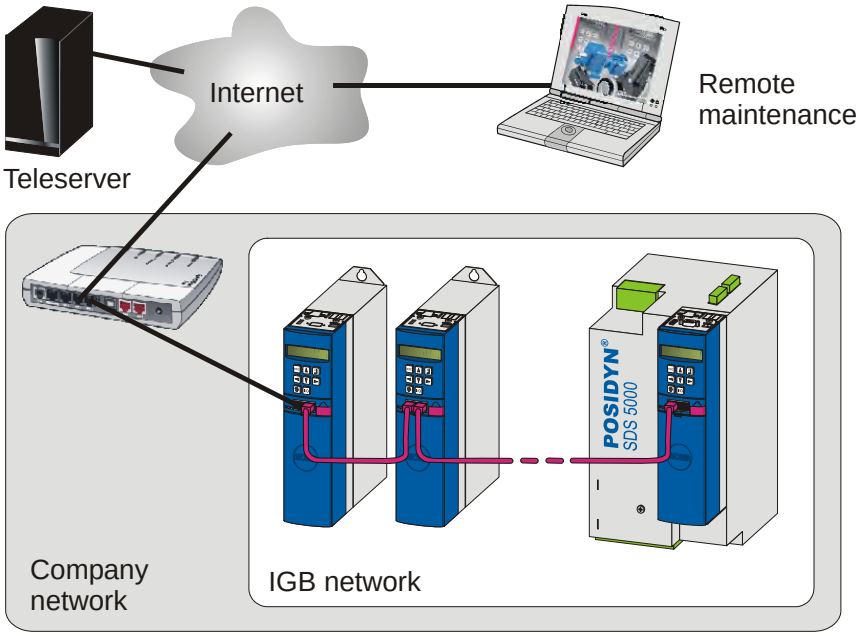


Fig. 11-5. Components involved in remote maintenance via Internet

The following figure shows the components involved in remote maintenance via the local network:

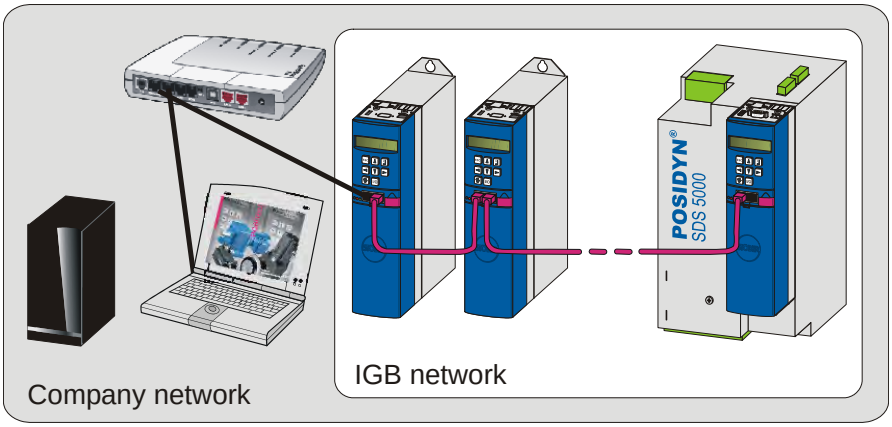


Fig. 11-6: Components involved in remote maintenance via the local network

The Teleserver establishes the connection between the inverter and the PC of the service technician. The Teleserver for the Internet connection is run by STÖBER ANTRIEBSTECHNIK GmbH & Co. KG. This ensures that the Teleserver is always equipped with the latest technology regarding Internet security.

11.4.1 System administration

Information
Networks can be structured very differently. Therefore STOBER is unable to provide universally applicable instructions that cover every case. Because of this, you should discuss the content of the following section with your responsible network administrator so that you can achieve an optimum connection. Note that this applies not only to the inverter, but also to connecting the engineering software!

Information
Make the settings derived from this section on the inverter in the IGB network on which the connection to the internet is set up. This inverter is the gateway device to the network! Note that the connection can only be made on an RJ45 socket. Therefore some of the parameters listed below are designed as arrays. This is identified in the description by the suffix .x in the parameter coordinate. Element 0 applies to X3A (for example *A166.0*), while element 1 applies to X3B (for example *A166.1*). Make the settings derived from this section only for the socket that is the gateway to the network!

These values are set in the *Network and Remote Maintenance* assistant which will now be described. Since the settings for an Internet connection differ from the settings for a LAN connection, they will be distinguished between in the next few sections.

11.4.2 The network and remote service assistant

Call this assistant in POSITool in the Project screen of the IGB by double-clicking its name:

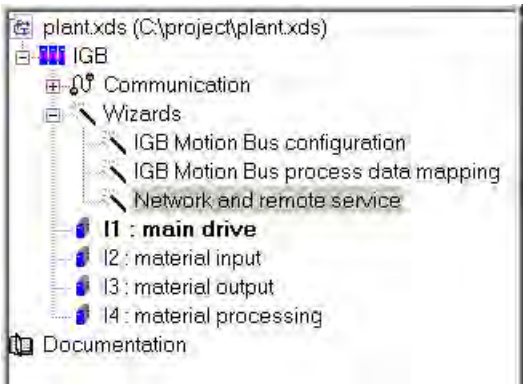


Fig. 11-7: The Network and remote service assistant in the Project view of the IGB

Once opened, the assistant indicates all the inverters that are configured in the IGB network:

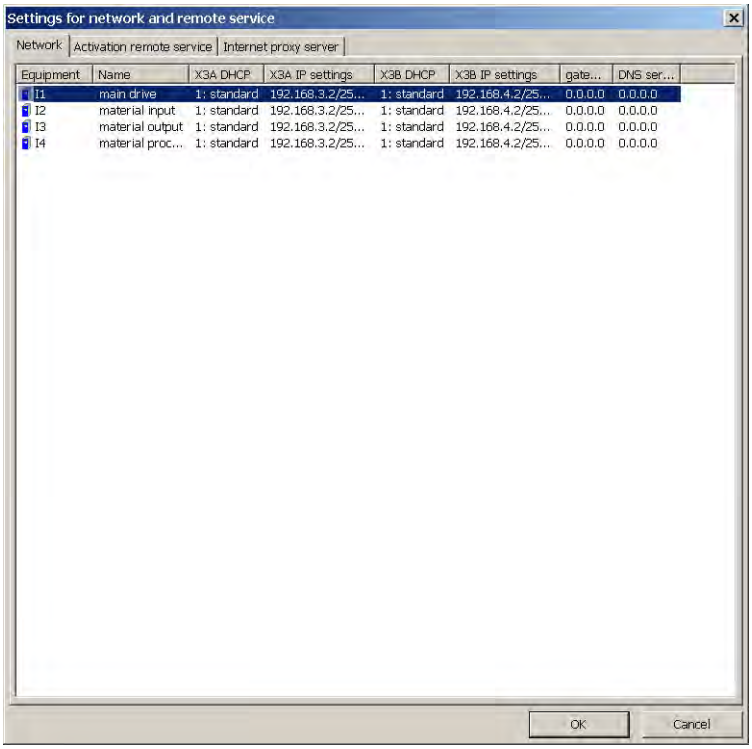


Fig. 11-8: The opened Network and remote service assistant

The assistant is divided into three tabs which can be processed one after the other.

11.4.2.1 The Network tab

After you open the assistant, the Network tab is selected. Select the gateway inverter in the list and double-click this line. The *Network settings* dialog screen appears:

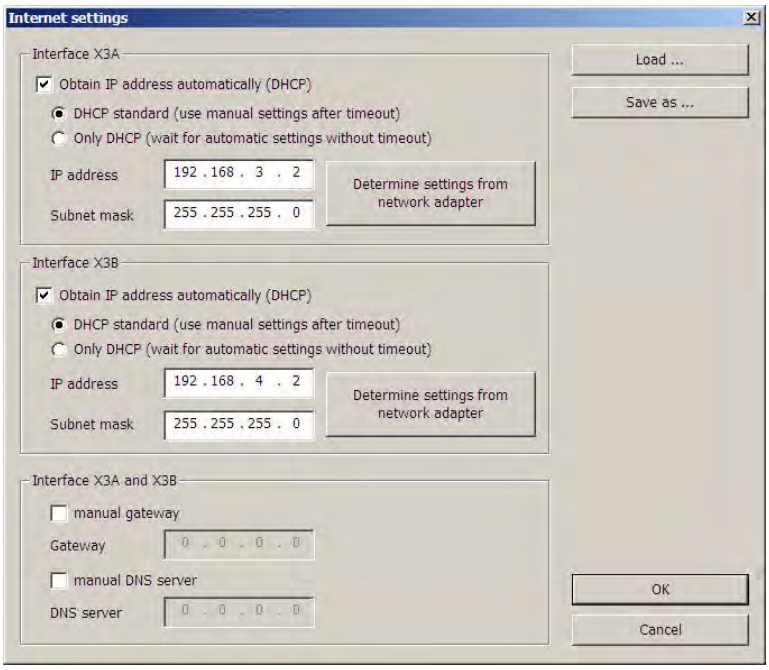


Fig. 11-9: The *Network settings* dialog screen

You can use this dialog screen to set how the IP address is to be obtained for remote maintenance, for example. Remember that the settings must be made for the RJ45 socket (X3 A or X3 B) which is the gateway to the network.

If a DHCP server exists in the network, check the checkbox of the socket and then decide whether to use the *DHCP standard* setting or the *Only DHCP* setting.

When you use the *DHCP standard* setting, the IP address must be entered manually if the DHCP server does not provide an IP address within three minutes. If this does happen, enter the IP address and the subnet mask manually in the fields below.

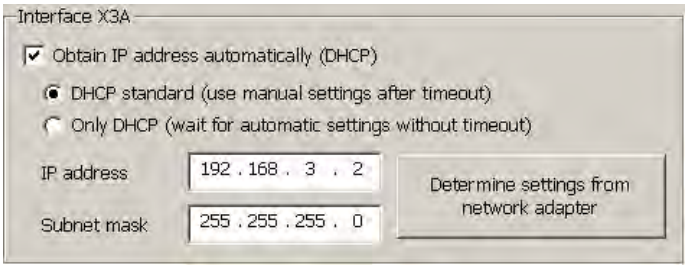


Fig. 11-10: Automatic provision of the IP address for X3 A with the *DHCP standard* setting

When you use the setting *Only DHCP*, you wait for a reply on the DHCP server without a timeout.

If the inverter does not receive an IP address from the DHCP server even though one is present, the address can be enabled by the network administrator. It is possible that the configuration of the DHCP server will also have to be expanded. SDS 5000 inverters can be unambiguously recognized by the DHCP server with the MAC address 00:11:39:xx:xx:xx.

If the network does not have a DHCP server, remove the checkmark from the checkbox and manually enter an IP address and a subnet mask in the fields:

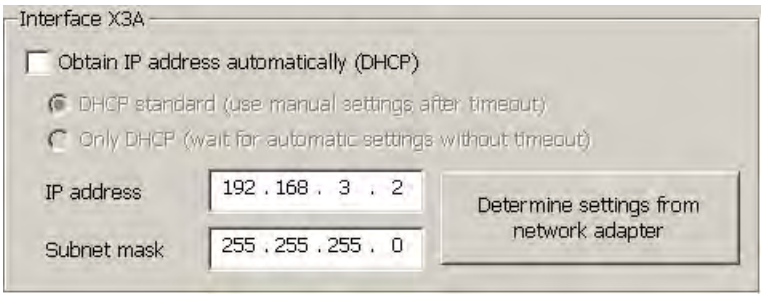


Fig. 11-11: Manual setting of the IP address for X3 A

If the inverter is located in the same network as the PC on which you are making the settings in POSITool, you can use the IP address and the subnet mask from the *Determine settings from network adapter* button. When you click the button, the following dialog screen appears:

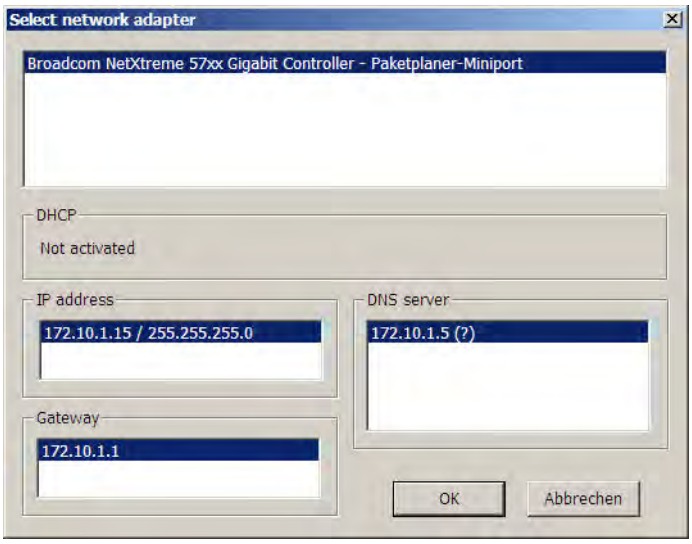


Fig. 11-12: The *Select network adapter* dialog screen

In the top part of this dialog screen, select the network connection of your PC which is connected to the same network as the inverter, and the related IP address, subnet mask and the IP addresses of the standard gateway and the DNS server appear in the bottom part of this screen. Confirm the dialog screen with the *OK* button, and the IP addresses of the standard gateway and the DNS server are used. One position of the IP address of the PC is changed so that the IP addresses of the inverter and the PC are not the same. Remember that no check is made to determine whether the thus determined IP address is being used by another device in the network:

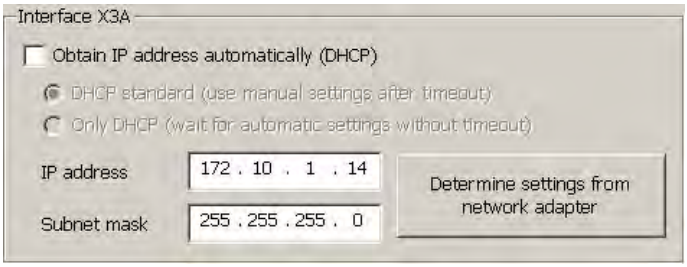


Fig. 11-13: The IP address determined from the network adapter

Note that, although you are only using the above settings for the gateway socket, the settings for the second socket in the dialog screen remain accessible. This means that you can enter an IP address for a direct connection for the second socket.

You can enter the IP address of the standard gateway in the lower part of the *Network settings* dialog screen. This is necessary for an Internet connection when there is DNS server in the network but a proxy server is not used.

Manual entry of the IP address of the DNS server is necessary if there is a DNS server in the network but its IP address is not transmitted by the DHCP server.

11.4.2.2 The Activation remote service tab

For example, you can specify the signal with which remote maintenance is to be activated under the *Activation remote service* tab. Select the gateway inverter from the list and double-click the line. The Set *activation remote service* dialog screen appears:

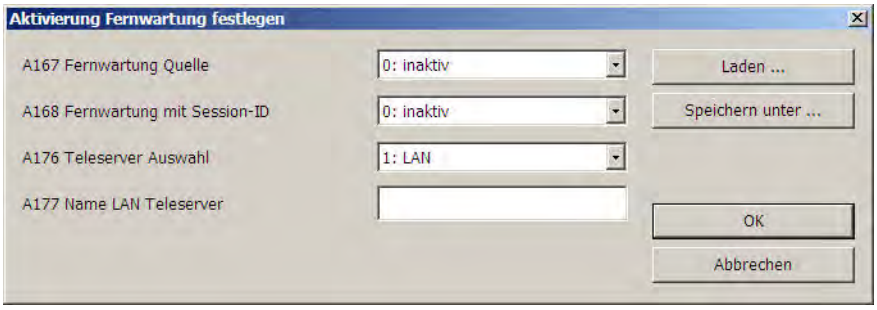


Fig. 11-14: The Set *activation remote service* dialog screen

In parameter *A167 remote service source* you can specify the signal which you will use to activate remote maintenance. You can choose between the binary inputs or their inversion and two parameters. If you set *A167 = 1:A800*, you can activate remote maintenance with the A800 parameter via the operator panel of the inverter. If you set *A167 = 2:A181-Bit 0*, you can start remote maintenance via fieldbus by writing to parameter *A181 Bit 0* via fieldbus.

In parameter *A168* you can specify whether remote maintenance is to be performed with a session ID. After you activate this setting, the service technician can only establish the remote maintenance connection if he/she knows the session ID. Please see also the section 11.4.7 Security.

In *A176 teleserver selection* you can specify whether remote maintenance is to be performed via a LAN connection or an Internet connection.

If you set *A176 = 1:LAN*, you will have to specify in *A177* the PC on which the LAN Teleserver is to be installed. There are two ways to do this:

- Enter the IP address of the computer. This is always possible.
- Enter the complete Fully Qualified Domain Name (FQDN) (e.g., "pc-daddylonglegs.daddylonglegscompany.de"), Please note that this is not always possible (see Figure 11 16).

11.4.2.3 Internet proxy server tab

Information on the proxy server for an Internet connection is entered under the *Internet proxy server* tab. Select the gateway inverter from the list and double-click the line. The Internet proxy server dialog screen appears:

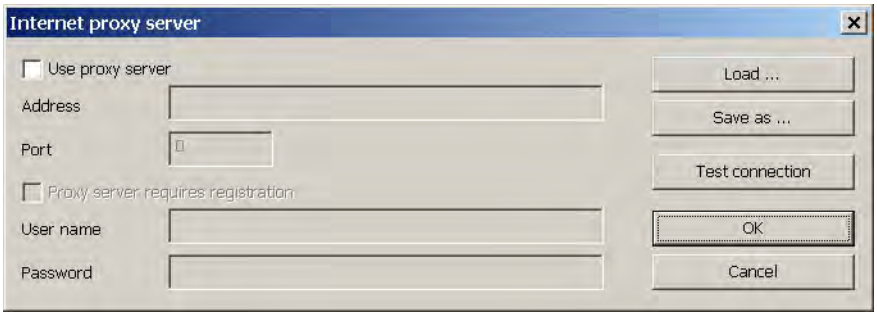


Fig. 11-15: The *Internet proxy server* dialog screen

If there is a proxy server in the network to which the gateway inverter is connected and this is to be used, activate the *Use proxy server* checkbox. Then enter the address of the proxy server. There are two ways to do this:

- Enter the IP address of the proxy server. This is always possible.
- Enter the FQDN (Fully Qualified Domain Name) of the proxy server (e.g., www-proxy.business.de). Please note that this is not always possible (see Figure 11 17)

If the proxy server requires registration, activate the second checkbox and enter the user name and password. You can check the settings by clicking the *Test connection* button. If the connection cannot be established, please talk to your network administrator about the settings.

11.4.3 Administration of remote maintenance settings

Remote maintenance procedures are usually performed for different projects or in different networks and thus with different settings. When only a simple switchover is needed, you can save the settings in a *.cfg file and reload them when necessary.

You can save and load all settings that you make with the *Network and remote service* assistant. Please note that the save and load procedures are performed separately for each of the assistant's tabs. After you have processed the *Network settings* tab, you can use the Save as ... button to save the settings to a *.cfg file. When you then save the settings of the *Activation remote service* tab to the same *.cfg file, the settings of the tab are supplemented. The same applies to the *Internet proxy server* tab.

The settings saved in the assistant can be loaded with the *Load...* button. The load and save procedures must be performed separately for each tab. If all data are stored in the same file, you can use the same file for each load procedure.

11.4.4 Using the remote maintenance settings of the gateway inverter

In case of service (i.e., maintenance), it may be useful to break up an IGB network and access partial networks or each inverter separately via remote maintenance. To prevent the network and remote maintenance settings from having to be parameterized again in such cases, you can use the settings of the gateway inverter for the other inverters in the IGB network.

Prerequisites:

- You have made all the necessary settings for the gateway inverter.

Proceed as shown below:

Using the remote maintenance settings of the gateway inverter

1. Select the *Network* tab.
2. Select the gateway inverter from the list.
3. With the right mouse button, click the line of the gateway inverter.
   ⇨ The following context menu appears:

4. In the context menu, select the entry *set to all inverter*.
5. Repeat steps 2 to 4 for each tab.

⇨ The settings have been accepted for all inverters.

11.4.5 Settings for a LAN connection

To be able to establish a connection via the local network, the LAN Teleserver must be installed on a computer which is connected with the local network. Proceed as shown below:

Operating the LAN Teleserver

1. Start the POSITool-Teleserver.exe file on the computer on which the LAN Teleserver is to be installed.
   ⇨ The following dialog screen appears:

2. Make a note of the FQDN (Fully Qualified Domain Name).

⇨ You are now running the Teleserver on the local network.

The FQDN is the full computer name of a PC (i.e., Fully Qualified Domain Name). Remember that, when setting up a LAN connection, you must specify on the inverter (see Figure 11 16) and in POSITool, the FQDN of the computer on which the LAN Teleserver is installed.
Also note that the LAN teleserver should be installed on a high performance computer with a high level of availability.

Fig. 11-16 : Parameterization with LAN connection shows which settings must be made for which network setup. Remember that this is a logical sequence of decisions and not a processing sequence of the tabs in the *Network and remote service* assistant.

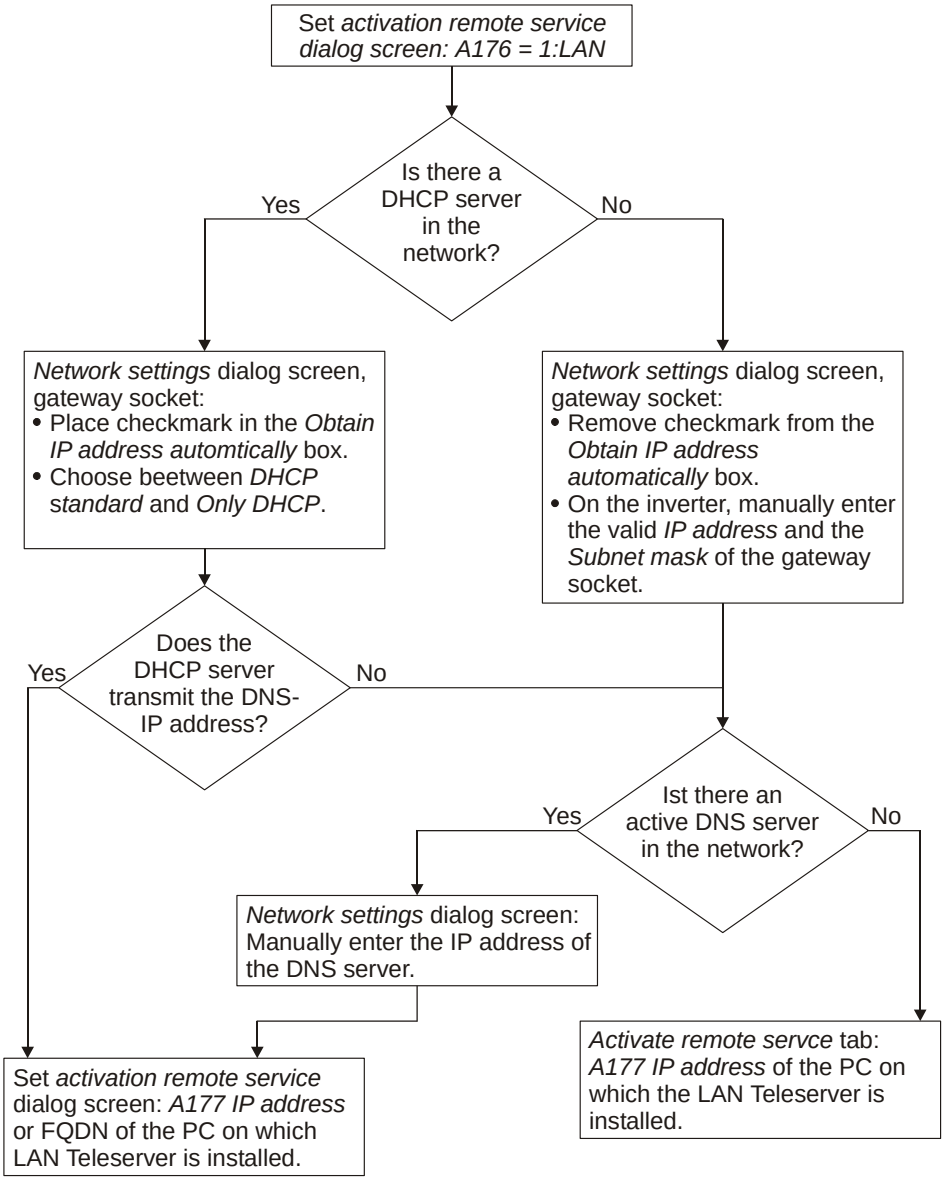


Fig. 11-16: Parameterization with LAN connection

11.4.6 Settings for an internet connection

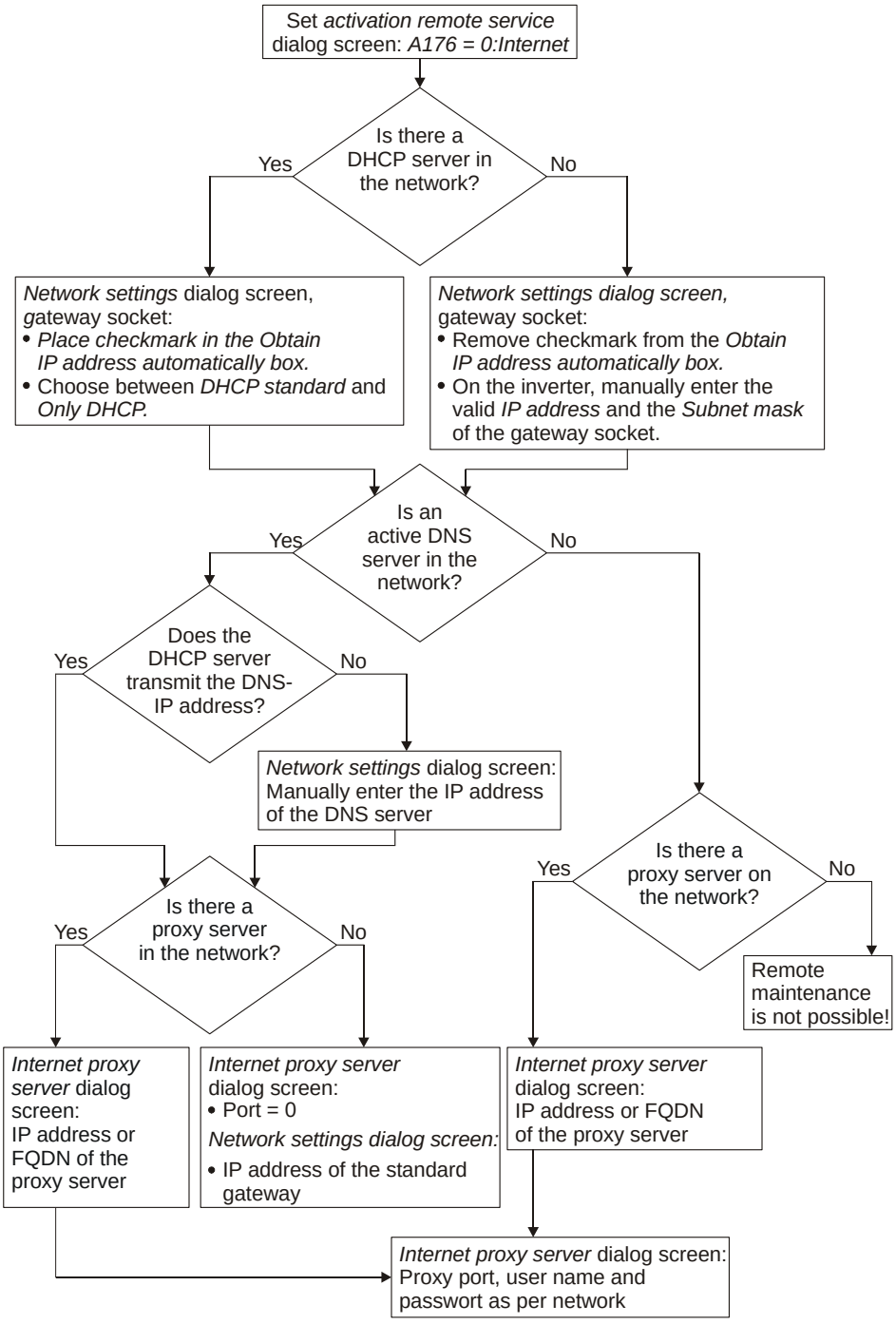


Fig. 11-17: Parameterization for an Internet connection

Comply with the following rules on the Internet connection:

- If possible, avoid the proxy server. This will increase the remote maintenance performance. Ask your network administrator for details.
- If you do use a proxy server, it should be set so that it supports persistent HTTP connections. This will increase the performance of remote maintenance. Ask your network administrator for details.
- The Internet connection uses the HTTP protocol with TCP/IP port 80. This port is usually enabled. Ask your network administrator for details.

11.4.6.1 Internet settings for POSITool

Note that you may have to make settings for POSITool as well for the internet connection. It is assumed that the PC with which remote maintenance will be performed is integrated into the local network. If there is a proxy server present, you must make the setting for the *Internet connection* in the *Tools* menu:

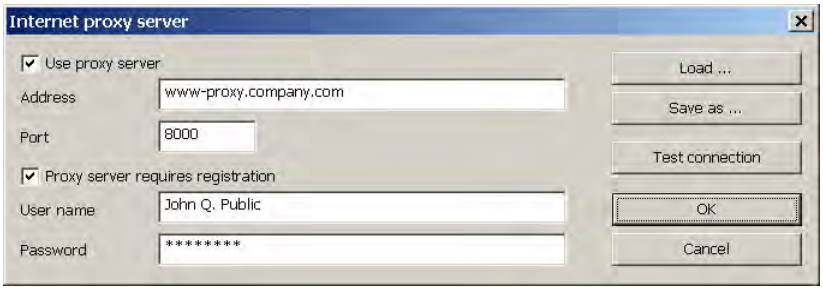


Fig. 11-18: The *Internet settings* dialog in the*Tools* menu

Proceed as shown below:

Making the Internet settings for POSITool

1. Place a checkmark in the checkbox at the top right, if a proxy server exists.
2. Enter the address of the proxy server (IP address or FQDN) and the port.
3. If the proxy server requires registration, place a checkmark in the checkbox underneath and enter your Windows user name and your password.
4. Click the button *Accept for POSITool remote service*.

⇨ You have now made the Internet settings for POSITool. You can check the connection with the *Proxy/Test connection button*.

11.4.7 Security

Here, *Security* means protection against the unauthorized manipulation of data.

Security-relevant parameters of an inverter can also be changed via remote maintenance. The following security mechanisms have been installed to prevent this from being done by unauthorized parties or by accident:

- A remote maintenance procedure can only be started locally on the machine.
- The service technician who performs remote maintenance must know the serial number of the inverter which is to be serviced.
- When the *Session-ID* option is selected (parameter *A168 remote service with session-ID*), the person responsible for the machine must inform the service technician of the temporarily valid session-ID. This appears on the inverter display while remote maintenance is being activated or in parameter *A151*.

These three mechanisms prevent unauthorized access for all practical purposes. However, a small element of risk of unauthorized access remains here (e.g., through a former worker who is intent on sabotage). With a great deal of effort, this worker might still be able to establish a connection at the time of the request before the service technician, if this worker knows this point in time.

Such an unauthorized access is indicated as follows,

- The remote maintenance LED is continuously on
- The connection request of the authorized service technician fails.

Use of a session ID is a little more trouble, but it prevents this from happening.
An outgoing connection is always established when there is a local request on the machine. This always connects to the Teleserver (see Figure 11 19). No other connections are possible. In addition, it is impossible to establish an Internet connection to the SDS 5000 if the connection was not requested on the SDS 5000.

Fig. 11-19: Remote maintenance via the Teleserver

11.4.8 Activation of remote maintenance

Information
As the person responsible for the machine, ensure (e.g., by telephone) that the device is accessed for remote maintenance by an authorized person.
Do not allow a request to exist for an unnecessarily long period of time.

Before you can activate remote maintenance, the following prerequisites must be met:
1. The inverter is connected with the local network, Intranet or Internet.
2. The inverter has been given valid information so that it can communicate via the local network, Intranet or Internet (see chapter 11.4.1 System administration).
3. In parameter *A167 remote service source* you have entered the signal with which remote maintenance can be started (e.g., a binary signal on binary input BE1).
4. On the inverter that is the gateway to the network, you specify in parameter *A168 remote service with session-ID* whether remote maintenance should be protected with a session ID.
5. The service employee has a PC which is connected to the local network, Intranet or Internet and version V 5.4 or later of the POSITool software is installed on this PC.

Proceed as shown below:

Activation of remote maintenance

1. The machine technician switches on the signal parameterized in *A167* for the inverter which is to have remote service.
   ⇨ The inverters register. The LEDs on the front of the inverters suddenly flash once.
   ⇨ After the connection to the Teleserver is established, the blue LEDs on the front of the inverters begin flashing at regular intervals. The inverters indicate their serial number on their displays.
   ⇨ If *A168 = 1:with SessionID* is set on the gateway inverter, the session ID is indicated in addition to the serial number.

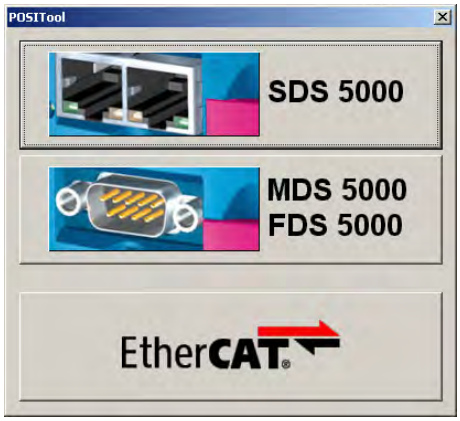
⇨ The person responsible for the machine has activated remote maintenance. He informs the service technician and gives him/her the serial number of a device in the IGB network and, if applicable, the session ID.

The session ID provides additional security for remote maintenance. If Parameter *A168* is set on the gateway inverter so that the session ID is requested for remote maintenance, the service technician cannot establish a connection to the inverter without the session ID.
If the blue LED does not flash even though remote maintenance is activated, parameter *A178* indicates the cause.

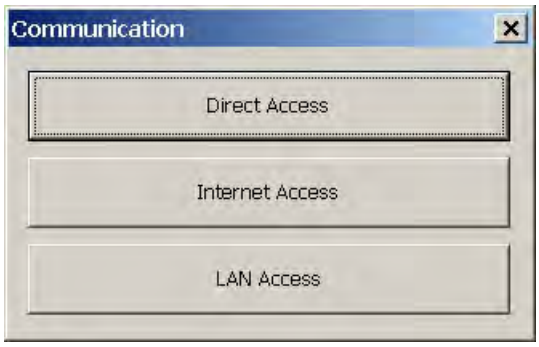
11.4.9 Establishment of a connection

Establishing a connection

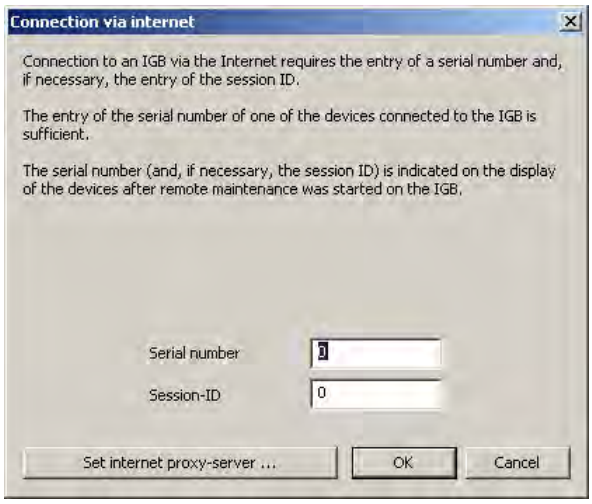
1. The service employee starts POSITool.
2. On the start page of POSITool, the service employee presses the *reverse documentation from connected inverter...* button.
   ⇨ The following dialog screen appears:



3. The service employee presses the SDS 5000 button.
   ⇨ The following dialog screen appears:

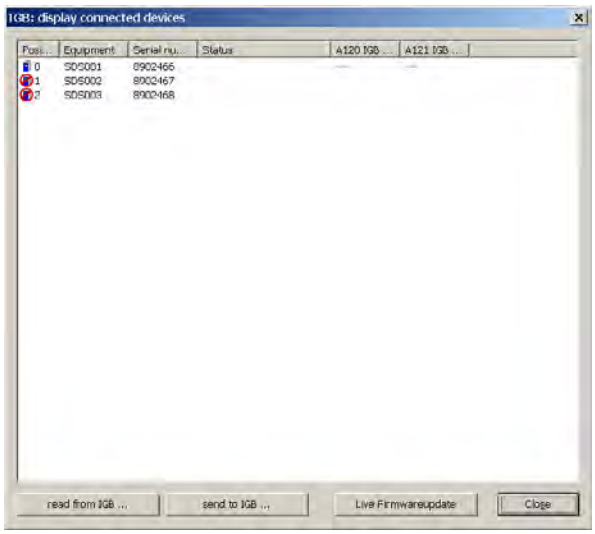


4. The service employee presses the *Internet Access* button or the *LAN Access* button depending on his/her specific application.
   ⇨ If a LAN connection is requested, a dialog screen appears for entry of the FQDN of the computer on which the LAN Teleserver is installed. Enter the FQDN and confirm the dialog screen. The setup of the LAN connection is now identical to the setup of the Internet connection.
   ⇨ The following dialog screen appears:



5. The service employee enters the serial number and, if applicable, the session ID.
6. The service employee presses the *OK* button.
   ⇨ The connection is established.
   ⇨ A reverse documentation is read and indicated in POSITool.
   ⇨ After the connection has been established, the blue LED on the front of the inverter lights up continuously.

⇨ The entire IGB network is shown in POSITool. The inverters which are not enabled for remote maintenance are marked with a red "stop sign." You can use the buttons at the bottom for the inverters which are enabled for remote maintenance to
- read data from the inverters
- trigger the sending of data to the inverters
- execute a live firmware update.



Comply with the following points concerning activated remote maintenance:

- There must be at least one inverter in the IGB network which is enabled for remote maintenance so that the Internet connection can be maintained. When an active Internet connection exists, you can enable or disable inverters in the IGB network at all times.

  This is done with the signal specified in *A167 remote service source*.
- If you are downloading a new configuration via remote maintenance, set the parameters which are relevant to remote maintenance the same as for the configuration up to now so that you avoid a premature termination of the connection due to errors in the parameterization. This refers primarily to the parameter *A167 remote service source* in which the signal which will start remote maintenance is specified..
- If you are performing a live firmware update via remote maintenance and then start the firmware again immediately afterwards, a new start is performed on the inverters. In this case, the remote maintenance connection is disconnected.

11.4.10 Deactivation of remote maintenance

NOTICE

Long timeout times on the teleserver!

Do not deactivate remote maintenance by turning the device off and on again because this will result in long timeout times on the teleserver.

▶ Use one of the following methods to deactivate remote maintenance.

Information
Deactivate remote maintenance immediately after the job is finished. Do not let a request exist for an unnecessarily long period of time.

Remote maintenance can be deactivated by the following events:

- The machine technician switches off the signal (low level) specified in *A167* for all inverters on the IGB network.
- The service employee exits remote maintenance in POSITool by pressing the  button when an Internet connection exists, or the  button for a LAN connection.
- The Internet connection is interrupted (e.g., by a timeout). Any specified session ID is always invalid. The blue LED goes off. To establish a new connection, the procedure in chapter 11.4.8 Activation of remote maintenance must be performed again.

Note the *A178* parameter when you deactivate remote maintenance. A number value is specified here as to why the deactivation occurred and whether it was free of errors.
Also remember that after remote maintenance is concluded in POSITool, the signal specified in *A167* must first be switched to low before remote maintenance can be activated again. Remote maintenance is then activated again the next time a switch to high is made.

11.4.11 Monitoring remote maintenance

The person responsible for the machine has the option of monitoring remote maintenance. This means that the person responsible for the machine will see on the screen which settings the service technician makes in the engineering software.
The person responsible for the machine requires the free subscriber program from Netviewer to do this. The screen below shows the components involved:

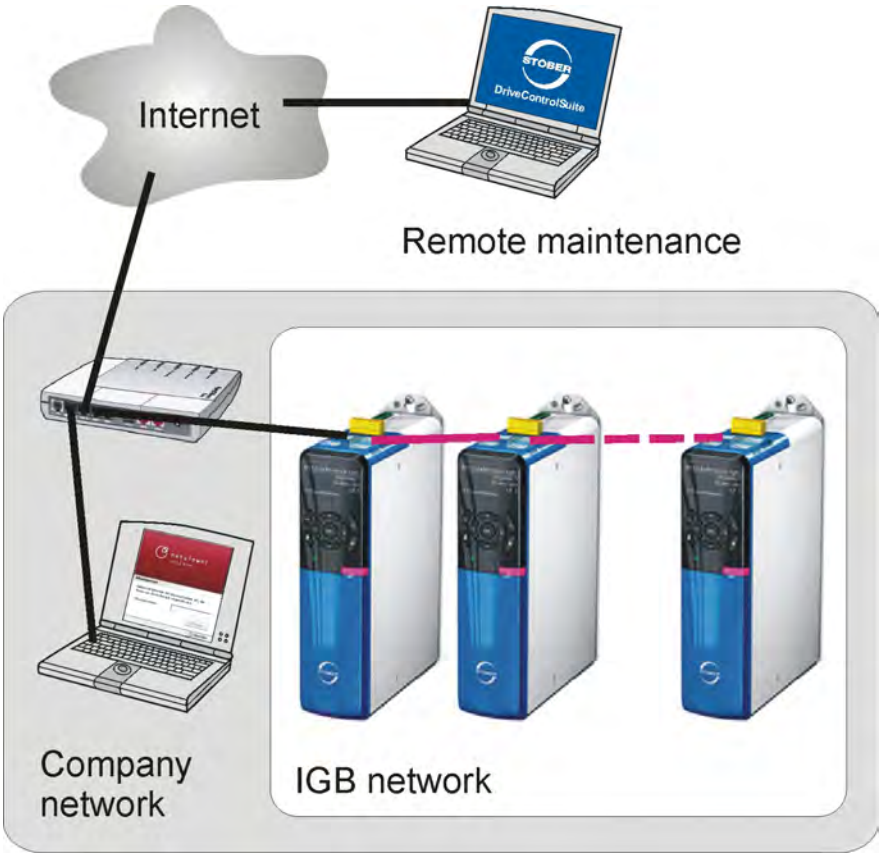


Fig. 11-20: The components involved in monitoring remote maintenance with the Netviewer software

You can also obtain the Netviewer subscriber program at no cost from the homepage www.stoeber.de. The service technician has the consultant program that is used to start a session. If you want to monitor remote maintenance, tell the service technician at the beginning of remote maintenance.

11.4.12 Diagnosis

The blue LED on the front of the inverter and the parameter *A169 remote service advance* (i.e., progress) give you information on the status of the Internet connection:

Indication in *A169*	Blue LED	Meaning
0:off	Off	Remote maintenance is not desired.
1:flash	Flashing very quickly	The connection to the teleserver is being established.
2:blink	Flashing at regular intervals	The device is waiting for the connection to POSITool.
3:on	Continuously on	The connection has been fully established and remote maintenance can begin.

Tab. 11-1: Diagnosis of the remote maintenance status

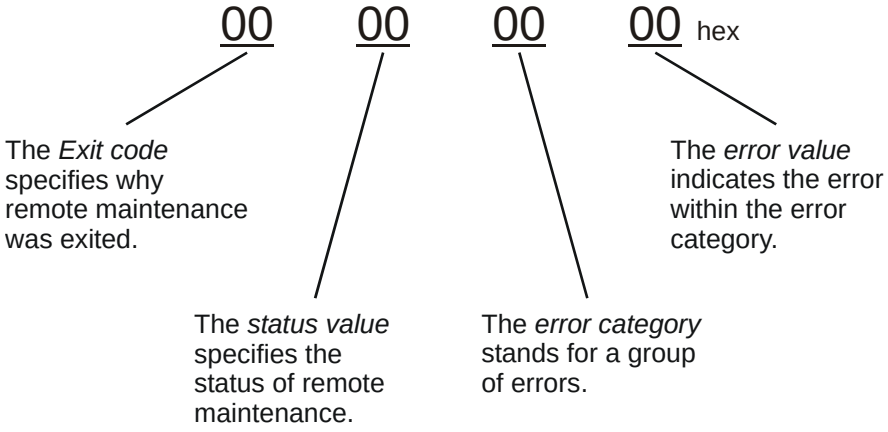
Parameter *A170 remote service acknowledge* (i.e., remote service response message) changes its value like the blue LED on the front:

- 1: LED on
- 0: LED off

You can output this parameter on a binary output so that you can evaluate the signal of the blue LED.

The four bytes of parameter A178 contain the exit code, the status value, the error category and the error value.

Another possibility is the parameter *A178 error remote service*. The parameter indicates a hexadecimal number (length: 32 bits) showing the state of remote maintenance. Each of the four bytes stands for a diagnostic value:



The *Exit Code* indicates the following causes for the conclusion of remote maintenance:

Exit Code	Description
00_{hex}	No remote maintenance is started. This value is the initial value after the inverter is turned on.
01_{hex}	The active gateway was changed.
02_{hex}	Remote maintenance was exited correctly.
03_{hex}	Remote maintenance was exited because no remote maintenance request was found for any inverter in the IGB network.
04_{hex}	Remote maintenance was exited because no remote maintenance request was found for any inverter in the IGB network.
05_{hex}	Remote maintenance was exited because no remote maintenance request was found for any inverter in the IGB network.
06_{hex}	Remote maintenance was concluded by POSITool.
07_{hex}	Remote maintenance was exited due to an error. The error can be determined with the error category and the error value.
08_{hex}	A direct connection was started before the remote maintenance connection was established. Remote maintenance was exited since the direct connection has priority.
09_{hex}	Remote maintenance was terminated since it could not be exited correctly.
$0A_{hex}$	Remote maintenance was terminated since the serial number of the active gateway could not be determined.
$0B_{hex}$	Remote maintenance was terminated since the status of the active gateway could not be determined.
$0C_{hex}$	Remote maintenance was terminated since the serial number of the active gateway could not be determined.
$0D_{hex}$	Remote maintenance was terminated since the serial number of the active gateway could not be determined.
$0E_{hex}$	Remote maintenance was terminated since the serial number of the active gateway could not be determined.
$0F_{hex}$	Remote maintenance was terminated since the active gateway had changed.
10_{hex}	Remote maintenance was terminated since an error was found while looking for the active gateway.

The *status value* specifies the status of remote maintenance:

Status value	Description
00_{hex}	No remote maintenance is started. This value is the initial value after the inverter is turned on.
01_{hex}	The DNS resolver was started.
02_{hex}	Establishment of the connection to the Teleserver was started.
03_{hex}	New establishment of the connection to the Teleserver was started.
04_{hex}	Disconnection of the HTTP connection was started.
05_{hex}	An unknown HTTP event was received.
06_{hex}	An attempt is being made to contact the Teleserver again.
07_{hex}	A timeout occurred during the attempt to contact the Teleserver.
08_{hex}	The Teleserver refused the connection.
09_{hex}	The host cannot be reached.
$0A_{hex}$	An error occurred during the HTTP connection.
$0B_{hex}$	An error occurred during the HTTP connection.
$0C_{hex}$	An error occurred during the HTTP connection.
$0D_{hex}$	An error occurred during the HTTP connection.
$0E_{hex}$	An error occurred during the HTTP connection.
$0F_{hex}$	An error occurred during the HTTP connection.
10_{hex}	An error occurred during the HTTP connection.
11_{hex}	An error occurred during the HTTP connection.
12_{hex}	Waiting until POSITool has connected with the Teleserver.
13_{hex}	The connection to the Teleserver was correctly concluded.
14_{hex}	A timeout occurred while the connection of the HTTP connection was being disconnected.
15_{hex}	The connection to the Teleserver was correctly concluded by POSITool.
16_{hex}	The connection to the Teleserver was closed.
17_{hex}	POSITool has connected with the Teleserver.
18_{hex}	The HTTP connection was started.
19_{hex}	The lower-level TCP/IP connection was interrupted. New establishment is being started.

The *error category* stands for a group of errors:

Error category	Description
00_{hex}	No remote maintenance is active or no error occurred.
01_{hex}	A socket error was determined (problems with the use of the TCP/IP connection).
02_{hex}	A firmware error was determined (internal firmware error).
03_{hex}	An HTTP error was determined (problems at the HTTP communication level).
04_{hex}	A TCP/IP error was determined (problems at the TCP/IP communication level).
05_{hex}	An error of the Teleserver Client application was determined.
06_{hex}	A DNS error was determined (problems with the DNS resolver).
07_{hex}	A proxy error was determined (problems with the proxy settings).

The *Error value* specifies the error in an error category. The error values are specified for each error category in the following.
In error category 00 hex, the error value is always 00_{hex}.

The following errors can occur in error category 01_{hex}:

Error value	Description
00_{hex}	Reserved
01_{hex}	A TCP/IP error occurred during sending or receiving.
02_{hex}	A TCP/IP error occurred during sending or receiving.

The cause of these errors can be a faulty TCP/IP connection. Check the connection and the network settings. The TCP/IP connection may also be blocked by a firewall. Check (e.g., with POSITool) whether the Teleserver can be reached.

The following errors can occur in error category 02_{hex}:

Error value	Description
00_{hex}	Reserved
01_{hex}	Internal error 1
02_{hex}	Too little free memory space available.
03_{hex}	An internal handle is invalid.
04_{hex}	An error occurred while the HTTP application was being executed.
05_{hex}	An internal parameter is invalid.
06_{hex}	An internal parameter is invalid.
07_{hex}	An internal parameter is invalid.
08_{hex}	Too little free memory space available.
09_{hex}	Too little free memory space available.
$0A_{hex}$	Too little free memory space available.

Error value	Description
$0B_{hex}$	Internal access was denied.
$0C_{hex}$	Internal access was denied.
$0D_{hex}$	Internal access was denied.
$0E_{hex}$	An error occurred while sending data.
$0F_{hex}$	An error occurred while sending data.
10_{hex}	An error occurred while receiving data.
11_{hex}	An error occurred while receiving data.
12_{hex}	An unknown HTTP status code was determined.
13_{hex}	An error occurred while remote maintenance was being exited.

There is a wide variety of causes for these errors. First, start the inverter again and check the network settings of the inverter and the company network. If this does not correct the error, contact STÖBER ANTRIEBSTECHNIK GmbH & Co. KG, see chapter 1.4 Further support

The following errors can occur in error category 03_{hex}:

Error value	Description
00_{hex}	Reserviert
01_{hex}	Es kam zu einem Timeout: Der Teleserver antwortete nicht.
02_{hex}	Der HTTP-Status-Code meldet einen HTTP-Fehler.

This error may be caused because the HTTP response of the Teleserver is not reaching the inverter. Check the connection and the network settings. Receipt may also be blocked by a firewall. Check the firewall's settings, too.

Since general causes cannot be given for error categories 04_{hex} and 05_{hex}, these errors were given a cause number. A description of the causes follows the description of the errors in category 05_{hex}.

The following errors can occur in error category 04 $_{hex}$:

Error value	Description	Cause no.
00_{hex}	Reserved	–
01_{hex}	An error occurred while connection to the Teleserver was being established.	1
02_{hex}	The Teleserver refused the connection.	2
03_{hex}	An error occurred while the TCP/IP connection to the Teleserver was being re-established.	1
04_{hex}	An error occurred while the TCP/IP connection to the Teleserver was being re-established.	1
05_{hex}	A timeout occurred during establishment of the TCP/IP connection to the Teleserver.	1
06_{hex}	The Teleserver refused the connection.	2
07_{hex}	The inverter cannot access the IP address of the Teleserver.	3
08_{hex}	The inverter is connected to the Teleserver.	4
09_{hex}	An error occurred while connection to the Teleserver was being established.	1
$0A_{hex}$	An error occurred while connection to the Teleserver was being established.	1
$0B_{hex}$	An error occurred while connection to the Teleserver was being established.	1
$0C_{hex}$	The IP address of the Teleserver is invalid.	3
$0D_{hex}$	The IP address of the Teleserver is invalid.	3
$0E_{hex}$	The IP address of the Teleserver is invalid.	3
$0F_{hex}$	An internal error was found.	5
10_{hex}	The IP address of the Teleserver is invalid.	3

The following errors can occur in error category 05 $_{hex}$:

Error value	Description	Cause no.
00_{hex}	Reserved	–
01_{hex}	An error occurred during flow monitoring between Teleserver and inverter.	6
02_{hex}	An internal error occurred.	5
03_{hex}	An internal error occurred.	5
04_{hex}	A CRC error was determined for the HTTP response from the Teleserver.	7
05_{hex}	An invalid HTTP state was determined during receipt.	8
06_{hex}	An invalid HTTP state was determined during receipt.	8

Error value	Description	Cause no.
07_{hex}	The Teleserver concluded remote maintenance.	9
08_{hex}	The Teleserver rejected the serial number.	10
09_{hex}	The Teleserver rejected the serial number.	10
$0A_{hex}$	An internal error occurred.	5
$0B_{hex}$	An internal error occurred.	5
$0C_{hex}$	The inverter is waiting for the connection to POSITool.	11
$0D_{hex}$	An internal error occurred.	5
$0E_{hex}$	An error occurred during flow monitoring between Teleserver and inverter.	6
$0F_{hex}$	A CRC error was determined for the HTTP response from the Teleserver.	7
10_{hex}	An internal error occurred.	5
11_{hex}	An error occurred during flow monitoring between Teleserver and inverter.	6
12_{hex}	An error occurred during flow monitoring between Teleserver and inverter.	6
13_{hex}	An internal error occurred.	5
14_{hex}	An internal error occurred.	5
15_{hex}	An internal error occurred.	5

Description of the causes

Cause no.	Description
1	Establishment of the TCP/IP connection to the Teleserver failed. Check all network settings and the firewall.
2	The inverter tried to connect with the Teleserver PC, but the specified PC actively denied the attempted connection. Check whether the Teleserver (LAN) was installed correctly and is running. You can check the connection to the Teleserver with POSITool, for example.
3	The inverter cannot access the IP address of the Teleserver with the current network settings (IP address and subnet mask). Check the IP address of the inverter and Teleserver.
4	An attempt was made to establish a TCP/IP connection to a Teleserver which already exists. Exit remote maintenance correctly and start remote maintenance again.
5	An internal error was found. Contact STÖBER ANTRIEBSTECHNIK GmbH & Co. KG, see chapter 1.4 Further support.

Cause no.	Description
6	An error was determined during flow monitoring between Teleserver and inverter Check all network connections.
7	A CRC test of the received data failed. Check all network connections. In particular, check the Ethernet connection and EMC interference.
8	The Teleserver reported an invalid HTTP state. Check all network connections. Check the settings of the proxy server.
9	The Teleserver exited remote maintenance. It is possible that remote maintenance was also terminated. Start remote maintenance again.
10	The Teleserver exited remote maintenance since one or all of the serial numbers of the inverter stations were invalid. Wait 10 minutes and start remote maintenance again. If this also fails, contact STÖBER ANTRIEBSTECHNIK GmbH & Co. KG, see chapter 1.4 Further support.
11	POSITool has not yet been connected with the Teleserver. Establish the connection.

The following errors can occur in error category 06 $_{hex}$:

Error value	Description
00_{hex}	Reserved
01_{hex}	A general DNS error was determined.
02_{hex}	A timeout occurred. The DNS server did not respond.
03_{hex}	A general DNS error was determined.
04_{hex}	A general DNS error was determined.

A possible cause of one of the errors could be that the name resolution of the host name of the Teleserver in the applicable IP address failed. Check the settings of the name server. The name server may have to be enabled for the requests of the SDS 5000.

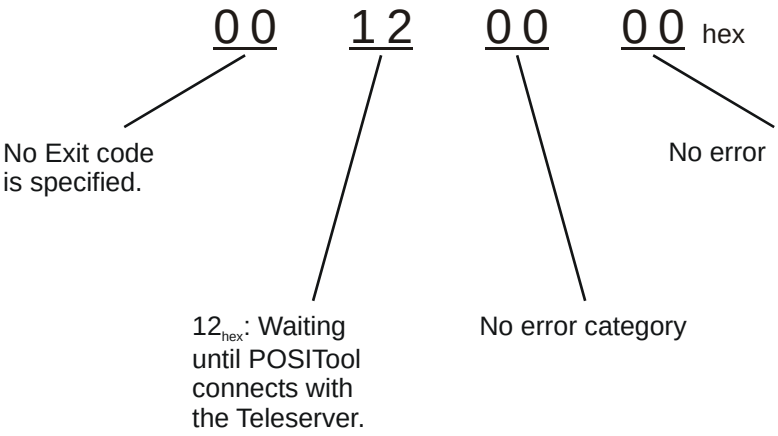
The following errors can occur in error category 07 $_{hex}$:

Error value	Description
00_{hex}	Reserved
01_{hex}	The proxy authorization is invalid.

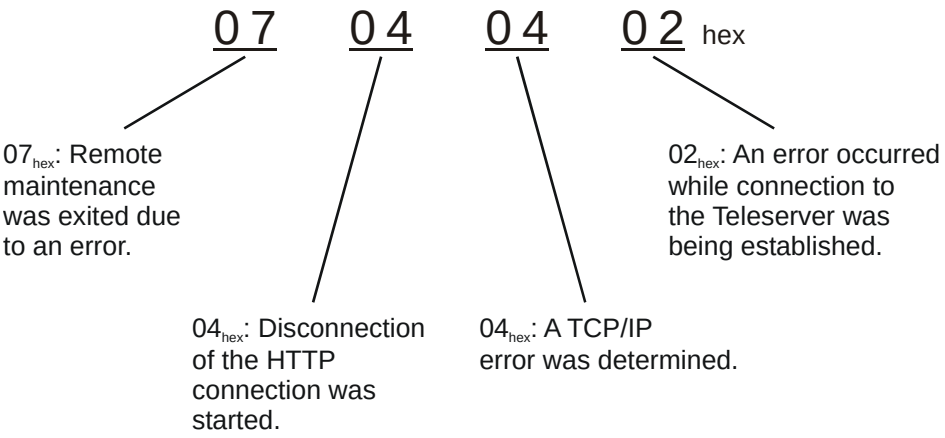
The cause of this case could be an incorrect proxy parameterization on the inverter. Check the proxy settings on the inverter.

Below are some examples of the indication in *A178*:

Example 1



Example 2



11.4.13 General Terms and Conditions of STÖBER ANTRIEBSTECHNIK GmbH & Co. KG for maintenance of the servo Inverter of the 5th generation of STOBER inverters

Date 11/2009

1. Scope

1.1. The present maintenance terms shall apply exclusively to all contractual relationships under which STÖBER ANTRIEBSTECHNIK GmbH & Co. KG (to as "STÖBER ANTRIEBSTECHNIK") carries out maintenance services on the 5th inverter generation for other companies, legal entities under public law or special funds under public law (hereinafter referred to as "Customer"). Contradictory and supplementary terms of the Customer shall not – other than with the prior written consent of STÖBER ANTRIEBSTECHNIK – form part of the Contract, even if STÖBER ANTRIEBSTECHNIK should undertake a contract or carry out services without expressly contradicting such terms.

1.2. These General Terms and Conditions cover the maintenance services for the 5th inverter generation offered by STÖBER ANTRIEBSTECHNIK, such as the provision of standardised software updates, remote maintenance of the servo inverters by remote access, telephone support and maintenance services on site.

1.3. Furthermore, the Terms of Sale and Delivery of STÖBER ANTRIEBSTECHNIK shall apply accordingly, whereby the maintenance terms shall take priority in the event of contradictions between the two documents.

2. Conclusion of Contract, Written Form, Time of Performance

2.1. Quotations by STÖBER ANTRIEBSTECHNIK are subject to confirmation and not binding unless they have been expressly declared as a binding quotation. Orders from the Customer may be made informally by e-mail, telefax or telephone. STÖBER ANTRIEBSTECHNIK can accept the orders from the Customer within two weeks. In case of doubt, the content of the order confirmation by STÖBER ANTRIEBSTECHNIK shall be binding for the Contract unless the Customer has contradicted the content of the order confirmation without delay.

2.2. All notices of termination, setting of deadlines and reminders by the Customer shall require the written form for their validity. Contractual guarantees and undertakings, in particular those going beyond the scope of these General Terms and Conditions, shall require the express and written confirmation of STÖBER ANTRIEBSTECHNIK.Deadlines and dates for fulfillment are not fixed dates unless they have been expressly declared as fixed dates by STÖBER ANTRIEBSTECHNIK in writing. If the Customer sets deadlines or periods of grace for fulfillment or subsequent fulfillment or for remedying a situation, these deadlines or periods must be reasonable, at least 5 working days. Should the fruitless expiry of a deadline or grace period result in the dissolution of the contractual relationship or a reduction in the price to be paid, this must be expressly threatened by the Customer at the time of setting the deadline or grace period. The above declarations shall require the written form for their validity.

3. Payment

3.1. The payment shall be dictated by the order confirmation. Should the Parties agree on payment according to outlay, the outlay shall be shown in the invoice or in a separate annex to the invoice. Should the Customer not contradict the evidenced outlay in writing within two weeks, the Customer shall bear the burden of proof for the incorrectness of the outlay. Additional services requested by the Customer shall be invoiced on the basis of the STÖBER ANTRIEBSTECHNIK price list. In the absence of any other written agreement, the prices in the latest STÖBER ANTRIEBSTECHNIK price list shall apply, according to which services are invoiced according to person-days and hours plus the expenses incurred.

3.2. In the event of an unjustified notification of defects, STÖBER ANTRIEBSTECHNIK can invoice the Customer for the time taken for the troubleshooting on the basis of the current price list, in particular if the Customer reports a fault that cannot be demonstrable or reproducible, or if the fault is not attributable to STÖBER ANTRIEBSTECHNIK.

4. Rights to Software

4.1. All intellectual property rights to the software supplied to the Customer and to the work results, including the documentation (e.g. copyrights, trademark rights, technical property rights), in the relationship with the Customer shall be due to STÖBER ANTRIEBSTECHNIK, even if and insofar as the work results are obtained on the basis of the specifications from or in cooperation with the Customer. STÖBER ANTRIEBSTECHNIK grants the Customer a simple, non-exclusive right of use to the software supplied. The Customer shall only be entitled to use the software for its own purposes in conjunction with the 5th inverter generation.

4.2. The Customer may make the requisite number of backup copies of the software, all of which, however, must bear the STÖBER ANTRIEBSTECHNIK copyright mark and subsequently be kept safely. The Customer may decompile the software and parts thereof (such as interface information) only within the limitation of § 69e German Copyright Act (UrhG) and only when this intention is notified to STÖBER ANTRIEBSTECHNIK in writing with a reasonable period of notice for provision of the necessary information. Information on the source code shall thereby be subject to the strictest confidentiality, irrespective of whether it was provided by STÖBER ANTRIEBSTECHNIK or a third party or became known during the course of decompilation. Furthermore, modifications to and editing of the software (modification, reverse engineering, decoding, translation, etc.) shall require the prior written authorization of STÖBER ANTRIEBSTECHNIK.

4.3. If the software was supplied to the Customer electronically, any passing on of the software by the Customer to third parties - whether or not against payment - shall not be permitted without the prior written authorization of STÖBER ANTRIEBSTECHNIK.

4.4. STÖBER ANTRIEBSTECHNIK grants the rights of use to the software initially only revocably subject to a condition precedent of complete remuneration or payment and can, in the event of a delay in payment and after fruitless expiry of a reasonable grace period, revoke the granting of the rights of use to the extent to which no remuneration or payment has been received.

5. Updates

   STÖBER ANTRIEBSTECHNIK shall send updates to the Customer electronically or shall offer the update for downloading on the company's website. A physical data medium, the source code and the installation on the Customer's premises are not owed. The updates can contain additional functions, whereby the Customer shall have no claim to the implementation of specific functions within the scope of the updates. STÖBER ANTRIEBSTECHNIK shall thus decide alone on the type, scope and frequency of updates for STÖBER ANTRIEBSTECHNIK software. In all other points, the provisions of § 4 shall apply analogously.

6. Testing of Supplied Software

   Before use in production, the software supplied must be adequately tested by the Customer. The contractual software and the documentation supplied must be examined immediately on receipt and any faults discovered reported in detail in writing. § 377 German Commercial Code (HGB) shall apply. If no such immediate notice is given, the service shall be regarded as having been approved, except in cases of non-recognizable faults. Should such a fault be discovered later, notice of the fault must be given immediately on discovery of this fault, otherwise the service shall be regarded as having been approved also with regard to this fault. If STÖBER ANTRIEBSTECHNIK has fraudulently concealed the fault, STÖBER ANTRIEBSTECHNIK may not claim a failure to notify or delayed notification of the fault by the Customer.

7. Customer Hotline

   7.1. STÖBER ANTRIEBSTECHNIK shall provide a 24 h customer hotline for the Customer. STÖBER ANTRIEBSTECHNIK receives fault reports and orders via this hotline and passes them on to the responsible service technicians. The hotline serves furthermore to support the Customer through telephone advice on remedying faults, avoiding faults and working around faults. A fault elimination guarantee and reaction or recovery times are neither assured nor owed.

   7.2. Further maintenance and support services (e.g. on site) shall only be provided on the basis of a separate order and shall be invoiced according to time on the basis of the STÖBER ANTRIEBSTECHNIK price list valid at the time of the placement of the order.

8. Remote Maintenance

   8.1. If the Customer places an order with STÖBER ANTRIEBSTECHNIK for the remote maintenance of the servo inverter, a date for the maintenance will be agreed with the Customer. The remote access is effected via an Internet connection set up by the Customer in accordance with the IGB SDS 5000 manual of the remote access server. For this the Customer must inform STÖBER ANTRIEBSTECHNIK of the serial number of the servo inverter or, if the session ID method is selected, the corresponding temporarily valid session ID number by telephone and then also validate the number to the remote access server.

   8.2. Before the maintenance process, the Customer must ensure the safety of persons and equipment by clearing and cordoning off the whole turning and slewing circle or danger zone of the machine axes controlled by the servo inverter. The maintenance and the safety precautions must be carried out and monitored on the Customer's side by a technician familiar with and trained in the operation

of the servo inverter, in particular with the IGB SDS 5000 manual and these maintenance terms. STÖBER ANTRIEBSTECHNIK assumes no liability for any damage resulting from the failure to observe these safety precautions.

8.3. The maintenance process will be started by STÖBER ANTRIEBSTECHNIK only when after establishing the remote access, a telephone connection to the Customer exists and adequate safety precautions are verified by the Customer. After the corresponding notification, the telephone conversation will be recorded by STÖBER ANTRIEBSTECHNIK. The technician must state his first name and family name, and verify the establishment and maintaining of the personal and equipment safety.

8.4. The telephone conversation will be stored by STÖBER ANTRIEBSTECHNIK for documentation purposes. The recording will not be used by third parties. The Customer must therefore obtain the consent of his employee for the recording and storage.

8.5. Before the end of the maintenance process, the Customer must first deactivate the remote maintenance and establish the safety of the machine by means of a test run. Only after a successful test run is the maintenance process concluded so that the Customer can then allow access to the danger zone of the machine again.

8.6. The remote maintenance by remote access is linked to IT security measures, such as the session ID method, the use of which is decided upon exclusively by the Customer. STÖBER ANTRIEBSTECHNIK is responsible only for its own observance of the IT security measures offered and selected by the Customer. The Customer decides also on the selection of the connection of the inverter to the STÖBER ANTRIEBSTECHNIK remote access server and bears the sole responsibility for its establishment, maintenance and security.

9. Other Cooperation Obligations of the Customer

9.1. The Customer shall report malfunctions, errors and damage without delay. The report must furthermore describe the symptoms of the fault so precisely that STÖBER ANTRIEBSTECHNIK is able to support the Customer in the purposeful remedying of the fault.

9.2. The Customer shall bear the responsibility for a regular data backup and the IT security in accordance with the state-of-the-art. STÖBER ANTRIEBSTECHNIK may assume that all data with which employees of STÖBER ANTRIEBSTECHNIK come into contact have been previously backed up elsewhere by the Customer.

9.3. The warranty of quality and liability do not cover faults or damage resulting from the use of the software in a hardware and software environment that does not meet the technical requirements.

9.4. Further cooperation obligations of the Customer result from the individual order and from the general obligation to maintain safety and the duty to take due care. The risk of damage in the event of infringements of the cooperation obligation must be borne by the Customer. STÖBER ANTRIEBSTECHNIK shall not be responsible for monitoring whether the Customer complies with the cooperation obligations.

9.5. The whole cooperation of the Customer shall be at no expense to STÖBER ANTRIEBSTECHNIK.

10. Defects in Quality and Title of the Software

    The Terms of Sale and Delivery of STÖBER ANTRIEBSTECHNIK shall apply to all defects in quality and title. If, after providing a service, STÖBER ANTRIEBSTECHNIK supplies the Customer with a new software version to remedy defects in quality and title, the Customer shall accept this new software version in order to maintain the warranty rights, insofar as the acceptance is not unreasonable.

11. Acceptance

    11.1. For all services suitable for acceptance testing and for all services for which acceptance testing has been agreed, STÖBER ANTRIEBSTECHNIK may demand a written declaration of acceptance from the Customer or the countersigning of an acceptance protocol immediately after a successfully completed acceptance test. Individual services that can be used independently of one another shall be accepted separately.

    11.2. If no formal acceptance testing is carried out pursuant to 11.1, the Customer shall inspect the results of the work within one month and either declares the acceptance or notify STÖBER ANTRIEBSTECHNIK in detail and in writing of any faults discovered. The unqualified use of the work results in production shall be deemed to be an acceptance.

12. Final Provisions

    12.1. The whole business relationship between STÖBER ANTRIEBSTECHNIK and the Customer shall be subject to the law of the Federal Republic of Germany, to the exclusion of the UN Sales Convention and the provisions of private international law. Place of fulfillment and venue for all disputes arising out of and/or in conjunction with this Contract shall the registered offices of STÖBER ANTRIEBSTECHNIK. In the event of legal disputes, STÖBER ANTRIEBSTECHNIK can also opt to take action at the Customer's general venue.

    12.2. The Customer warrants to have established all necessary preconditions in order that STÖBER ANTRIEBSTECHNIK can carry out the agreed services without infringement of the provision of data protection law.

    12.3. Amendments and supplements to the contracts between STÖBER ANTRIEBSTECHNIK and the Customer must be made in written form for their validity. A notification in text form (e.g. e-mail) shall also be sufficient to meet the written form requirement unless the receiving party insists on notification in written form.

    12.4. Should any of the above provisions be or become invalid or unenforceable, this shall not affect the validity or enforceability of the other provisions. The Contract parties shall make efforts to replace the invalid or unenforceable provision with a valid and enforceable provision coming as close as possible to the business intention of the original invalid or unenforceable provision.

12 Service

This chapter lists various service jobs and explains their performance.

12.1 Replacing inverters

⚠ WARNING!

Electric shock hazard!

Risk of serious injury from contact with live parts!

- ▶ Observe the 5 safety rules.
- ▶ Note that dangerously high voltages can still be present in the inverter even 5 minutes after switching off the power supply due to the residual charge of the DC link capacitors.
- ▶ Ensure that the motor shaft is at a standstill before carrying out work. A rotating rotor can generate high voltages at the terminals.

This chapter provides you with an introduction to the simple replacement of two inverters without additional aids. Only the Paramodule from the replaced inverter must be used on the new inverter. In the Paramodule, the action *A00 save values* stores the programming and the parameterization of the inverter safe from a power failure.

Information
If inverters of different types are replaced or the devices to be configured on the inverter are changed, the entire configuration must be changed with POSITool and checked!

The following conditions apply for the replacement:

- The replacement inverter assumes the task of the inverter that is replaced. There is no change in the drive-related task.
- Inverters of the same device type are replaced.
- The replacement inverter has the same or a higher hardware and software version as the inverter that was replaced.
- No projected devices or components (motor, rotary encoder, option boards, etc.) in the inverter are changed.

Follow these steps:

Replacing the inverter

1. Start the *A00 save values* action. Wait until the action is complete with result *0:error free*.
2. Turn off the power supply voltage of the inverter. Wait until the display goes out.

3. Disconnect the Paramodule that was previously used on the inverter that is being removed!

Inverter that is being removed

4. Connect the Paramodule that was previously used to the inverter that is being installed!

Inverter that is being installed

5. Remove the inverter that is being replaced and install the new inverter. Follow the instructions in the projecting manual!
6. Connect the power supply voltage.
   ⇨ The inverter loads the configuration at the start from the Paramodule that was previously used and takes on the application of the previously installed inverter as it does so.
7. Disconnect the previously used Paramodule.
8. Connect the new Paramodule to the new inverter.
9. Start the *A00 save values* action. Wait until the action is complete with result *0:error free*.

⇨ The inverter is replaced.

12.2 Replacing an application

This chapter provides you with a guide to the simple change of an application without extra aids. Only the Paramodule must be replaced. In the Paramodule, the action *A00 save values* stores the programming and the parameterization of the inverter safe from a power failure.
The following conditions apply to the replacement:

- The hardware configuration (option boards, motor settings, etc.) stored on the Paramodule corresponds to the drive which will use the data of the Paramodule in the future.
- The programming and parameterization stored on the Paramodule was tested beforehand.
- After the Paramodule has been exchanged and the drive has been tested, set up the drive again (referencing, parameter optimization, etc.).

Proceed as shown below:

Replacing the application

1. Start the action *A00 save values*. Wait until the action has been concluded with the result *0:error free*.
2. Turn the power supply of the inverter off. Wait until the indication on the display disappears.
3. Remove the Paramodule from the inverter.

4. Install the new Paramodule (Paramodule with changed application) on the inverter!

5. Connect the power supply.

⇨ During startup, the inverter loads the configuration and the new application from the Paramodule and accepts these.

12.3 Copying Paramodule

The following section describes how to copy a Paramodule so that an application can be utilized in additional inverters.

Proceed as shown below:

Copying Paramodule

1. Start the action *A00 save values*. Wait until the action has been concluded with the result *0:error free*.
2. Remove the Paramodule from the inverter.

3. Install the new Paramodule on the inverter!

4. Start the action *A00 save values*. Wait until the action has been concluded with the result *0:error free*.

⇨ You have copied Paramodule.

12.4 Live firmware update

12.4.1 Firmware files

A folder named Download is created in the POSITool directory when POSITool is installed:

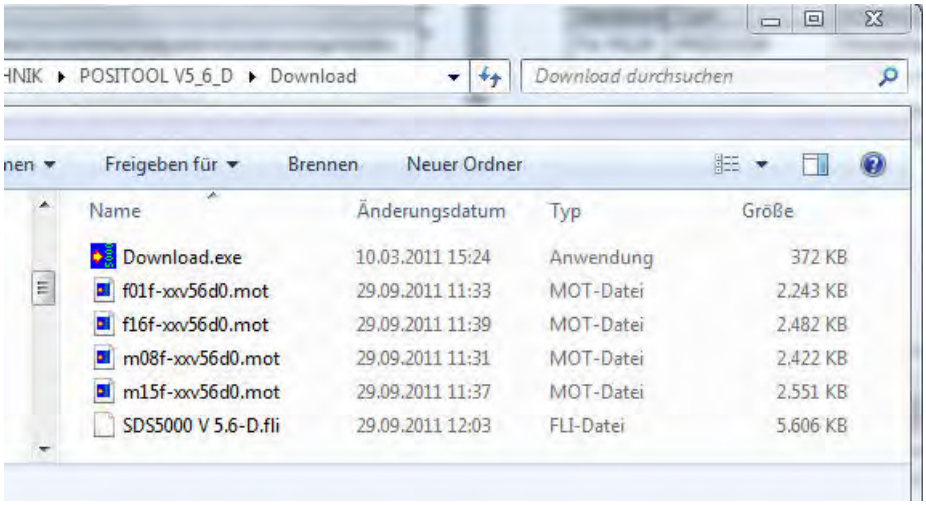


Fig. 12-1: The *Download* folder is in the POSITool directory

The following files are saved in the folder:

- Download.exe: Use this file to download the firmware for MDS 5000 and FDS 5000. Observe section 12.4.2 for the download procedure:
- fx..x.mot: Firmware files for FDS 5000.
- mx..x.mot: Firmware files for MDS 5000.
- SDS5000x..x.fli: Firmware files for SDS 5000.

The correct .fli file version is assigned to the existing SDS 5000 by POSITool. If the files saved on your PC can not be combined with the inverter connected with POSITool, you will receive a message. This can occur when an .fli file of version V 5.4 or V 5.5 is saved in your download folder but you have an A-device available that requires an .fli file of version V 5.6.

You can find different versions of firmware files on the STOBER Electronics CD. This CD is supplied with the inverter.

12.4.2 Replacing the firmware

⚠ WARNING!

Danger of personal injury or material damage due to unsecured loads. The firmware must be activated after the download for a live firmware update. The control part and power stage of the inverter are switched off during activation. Unsecured loads on the drive can therefore slip.

▶ Secure the drive load before activation.

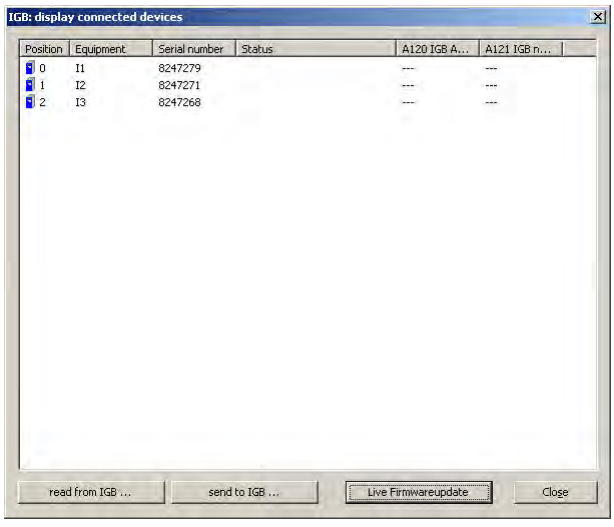
During a live firmware update the firmware is loaded to the firmware download memory without affecting running operation. The firmware does not become active until it is accepted. The firmware stored in the firmware download memory is kept as redundant firmware to increase safety.

Requirements:
- The inverter controller is powered as a minimum (24 V at terminal X11). The power may only be switched off during download if the software gives an appropriate instruction. You can also carry out the live firmware update during ongoing operation.
- You have connected a PC to the SDS 5000 or an IGB network.
- You have configured at least one IGB network in POSITool.

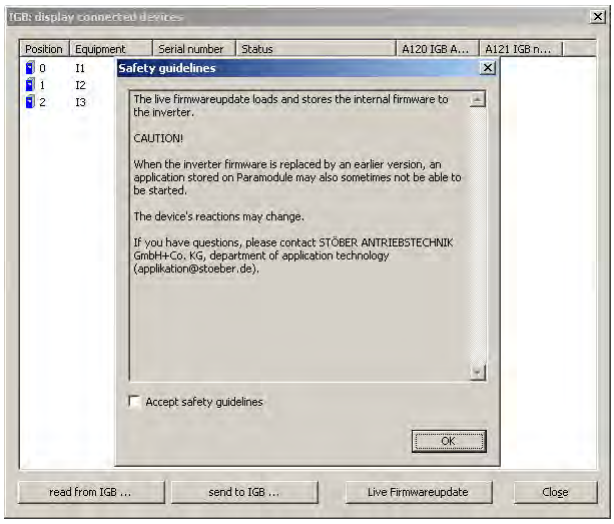
You need:
- POSITool version 5.4 or higher

Carrying out a live firmware update

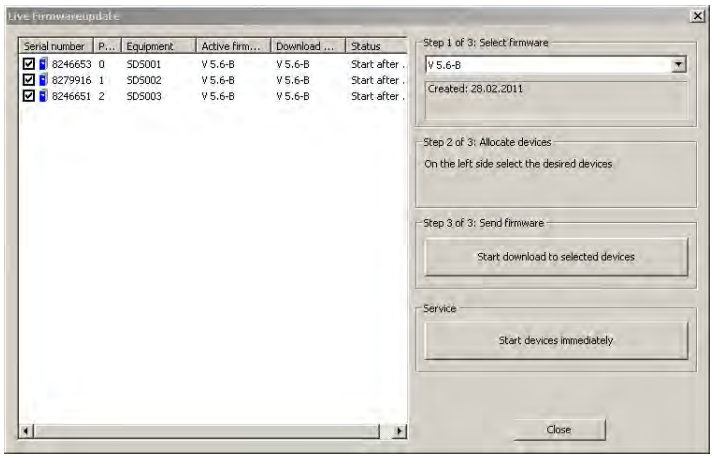
1. In POSITool, open the *IGB: display connected devices*menu entry in the File menu.
   ⇨ You will see the following dialog screen that displays all devices connected to the PC:



2. Click the *Live Firmware update* button.
   ⇨ The following dialog screen is displayed:

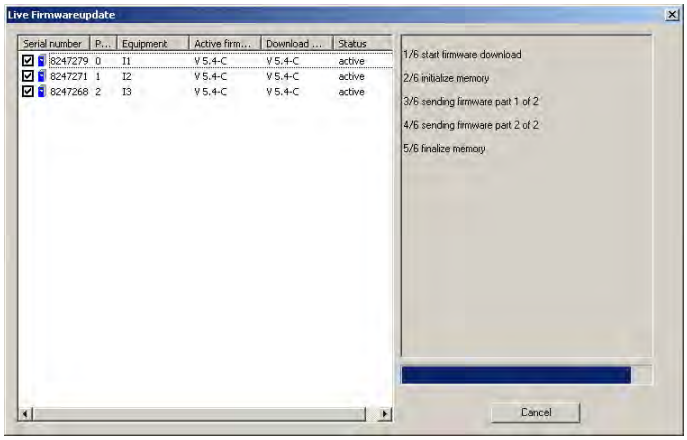


3. Read the safety information.
4. If you accept the safety information, select the *Accept safety guidelines* checkbox.
5. Click the *OK* button.
   ⇨ The following dialog screen is displayed:

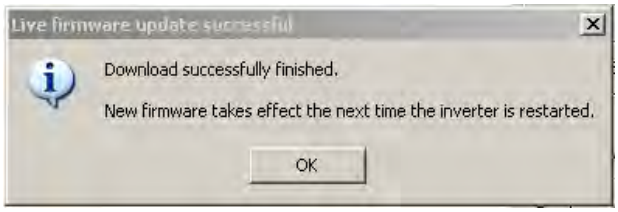


6. Select the firmware that you want to save on the inverter in the list on the right-hand side (steps 1 to 3).
7. Select the inverter to which the chosen firmware is to be transferred by selecting the checkbox on the left-hand side. Note that the inverter is displayed with your serial number for unique identification.

8. Click the *Start download to selected devices* button.
   ⇨ The firmware download starts. Progress is displayed on the right-hand side of the firmware download dialog screen:



   ⇨ Once the download has completed, the following dialog screen is displayed:



9. Click the *OK* button to return to the *Firmware update* dialog screen.

⚠ WARNING!

Danger of personal injury or material damage due to unsecured loads. The firmware must be activated after the download for a live firmware update. The control part and power stage of the inverter are switched off during activation. Unsecured loads on the drive can therefore slip.

▶ Secure the drive load before activation.

10. If you want to activate the firmware immediately, click the *Start firmware immediately* button. Observe the above safety information. Follow the POSITool instructions to carry out activation. If you do not carry out this step, the firmware is automatically activated the next time the device is switched off and on.
11. Close the dialog screen by clicking the *Close* button.
12. For each inverter, check that the correct firmware is entered in the *E51* software version parameter.

⇨ You have completed the live firmware update.

12.5 Actions

Actions are functions which are executed by the inverter automatically after their start.
Actions are controlled and analyzed using special parameters. The parameters contain three elements. You can start the action via the element 0 (e.g. *A00.0*) The element 1 (e.g. *A00.1*) shows you the action's progress. Element 2 (e.g. *A00.2*) shows the result. You can start an action via every interface (operator panel on the inverter, fieldbus or POSITool in online mode).
For some actions, power must be applied to the motor and the motor must be free to turn. For this reason the inverter must be enabled if you want to run these actions. Other actions can be performed without energizing the motor. Since these two action groups are executed differently, they will be described separately below.

12.5.1 Actions without enable

Actions which do not need an enable before they can be executed are:
- *A00 Save values*
- *A37 Reset memorized values*

Proceed as shown below:

Executing actions without enable

1. Set element 0 of 0 to the value 1 (e.g., *A00.0* = 1).
   ⇨ Element 1 indicates the progress of the action (e.g., *A00.1* = 33 %).
2. Wait until element 0 indicates the value 0 again (e.g., *A00.0* = 0)

⇨ Element 2 indicates the results of the action (e.g., *A00.2 = 0:error free*).

12.5.1.1 A00 Save values

When you activate *A00.0*, the inverter's current configuration and the parameter values are stored in Paramodule, safe from loss due to a power failure. After power-off, the inverter starts with the configuration stored in Paramodule.

When it is determined during the saving procedure that the configuration data in Paramodule and the inverter are identical, only the parameters are stored. This speeds up the procedure.

You can read the following results from the third element (*A00.2*):
0: error free
10: write error
11: invalid data
12: write error
14: Warning

With the results *10* to *12* an error was determined while saving to Paramodule. If the results occur repeatedly, the Paramodule should be replaced.
Result 14 means that saving was error-free. At the same time it is determined that the maximum number of approx. 10,000 write cycles has almost been reached. The Paramodule should be replaced as soon as possible (for the ID no. of the Paramodule, see the Accessories Chapter in the projecting manuals of the inverter).

Information
Do not turn off the power of the control section (devices of the /L version: 24 V, devices of the /H version: supply voltage) while the action is still being executed. Turning off the power while actions are being executed will cause data to be lost. The display indicates the fault **ConfigStartERROR parameters lost" or *Paramodul ERROR - Read error*. In such cases, the application must be transferred to the inverter again (POSITool or Paramodul).

12.5.1.2 A37 Reset memorized values

The action *A37* resets memorized values *E33* to *E37* and *E41*. The action can be started in *A37.0*.
The action offers the following result (*A37.2*): *0:error free*.

12.5.2 Actions with enable

Actions which require that the motors be energized before these actions can be executed:
- *B40 Phase test*
- *B41 Autotune motor*
- *B42 Optimize current controller*
- *B43 Winding test*
- *D96 Reference value generator*
- *B300 Brake test*, see chapter 7.7 Brake test
- *B301 Brake grinding*, see chapter 7.8 Brake grinding function

12.5.2.1 Execute

Executing actions with enable

1. Change to the device state Ready for switch on.
2. Set the first element of the action to the value 1 (e.g., *B40.0* = 1).
3. Enable the motor.
   ⇨ Element 1 indicates the progress of the action (e.g., *B40.1* = 33 %).
4. Wait until element 1 indicates the value 100 % (e.g., *B40.1* = 100 %).
5. Turn off the enable.

⇨ Element 2 indicates the result of the action (e.g., *B40.2 = 0:error free*).

Please note that since parameter values be determined directly during these actions, you should perform the action *A00 save values* afterwards so that the values are stored safe from loss due to power failure.

12.5.2.2 B40 Phase test

NOTICE

During this action, the motor shaft will move.

▶ Make sure that the motor can turn freely during the action!

Activate *B40.0* to start the phase test. The phase test can only be used with servo motors. The test checks to determine whether one phase is mixed up when the motor was connected or whether the number of motor poles is set correctly. In addition, the commutation offset is measured.

If a resolver is connected, an amplitude offset of the sine and cosine tracks is performed (improved speed controller performance). This offset is stored directly on the REA 5001. The action should be performed again when the resolver, the option board or the cable is replaced.

During activation of the action, the enable must be inactive. If you have started the action in *B40.0*, you must activate the enable. After the action was concluded, you must deactivate the enable again. You can then read the measured commutation offset in *B05*.

During the action, the cycle time is set internally to 32 msec. When a quick stop is triggered during the action, the drive is halted immediately.

You can read the following results from the third element (*B40.2*):
0: error free: The action was executed without errors and concluded.
1: aborted: The action was aborted by turning off the enable.
2: phase order: It was found that two phases were mixed up.
3: motor poles: The determined number of poles is not the value in *B10*.
4: commutation offset: The measured commutation offset is not *B05*.
5: test run: A test run with the measured commutation offset could not be performed.

12.5.2.3 B41 Autotuning

NOTICE

During this action, the motor shaft will move.

▶ Make sure that the motor can turn freely during the action!

Using the action *B41* the stator resistance (*B53*) and stator inductance (*B52*) are measured on servo motors. On asynchronous motors *Leakage factor (B54)* and *Magnetic saturation coefficient (B55)* are also determined.

During activation, the enable must be inactive. If you have started the action in *B41.0*, you must activate the enable. After the action was concluded, you must deactivate the enable again. You can then read the measured values (*B52* to *B55*).

During the action, the cycle time is set internally to 32 msec.
You can read the following results from the third element (*B41.2*):
0: error free: The action was executed without errors and concluded.
1: abortedn: The action was aborted by turning off the enable.

12.5.2.4 B42 Optimize current controller

NOTICE

During the action, the motor turns at approx. 2000 Rpm.

- For this reason ensure the motor and the mechanism coupled to it are allowed to be operated at this speed and can rotate freely!
- During the action, you hear clicking noises at regular intervals. The action takes approx. 20 minutes.

NOTICE

Danger due to delayed shut-down.

- If you have enable the action via local operation, the action can only be interrupted with a very long delay by deactivating the enable!

When you start the action, the parameters of the current controller are specified again (*B64* to *B68*).

During activation, the enable must be inactive. If you have started the action in *B42.0*, you must activate the enable. After the action was concluded, you must deactivate the enable again. You can then read the measured values in *B64* to *B68*.

If a quick stop request occurs during the action, the drive is halted immediately.
For the duration of the action, the cycle time is set internally to 32 msec.

You can read the following results from the third element (*B42.2*):
0: error free: The action was executed without errors and concluded.
1: aborted: The action was aborted by turning off the enable.

12.5.2.5 B43 Winding test

NOTICE

During this action, the motor shaft will move.

▶ Make sure that the motor can turn freely during the action!

When you start the action, the symmetry of the ohmic resistors of the motor windings are checked.

During activation, the enable must be inactive. If you have started the action in *B43.0*, you must activate the enable. After the action was concluded, you must deactivate the enable again.

During the action, the cycle time is set internally to 32 msec.

You can read the following results from the third element (*B43.2*):
0: error free: The action was executed without errors and concluded.
1: aborted: The action was aborted by turning off the enable.
2: R_SYM_U: The resistance of phase U differs significantly from that of the other phases.
3: R_SYM_V: Same as 2
4: R_SYM_W: Same as 2
5: POLAR_SYM_U: An asymmetry was determined when the polarity changed.
6: POLAR_SYM_V: Same as 5
7: POLAR_SYM_W: Same as 5

Results 5 to 7 are usually an indication of an inverter error.

12.5.2.6 Optimize B45 SLVC-HP

⚠ WARNING!

Risk of injury due to high speeds!

The action accelerates the motor up to twice its nominal speed.

- ▶ Only perform this action when the motor is adequately fastened. Secure feather keys, etc.
- ▶ Make sure that any mechanical systems (gear units, etc.) that are attached can reach these speeds.

NOTICE

Unsuitable optimization results!

The results are falsified if the action is performed with a loaded motor.

- ▶ If possible, only perform the action when the motor is not connected to a mechanical system (gear units, etc.).
- ▶ If it is not possible to disconnect the mechanical system, make sure that the load torque is not more than 10 % of the nominal torque.

The action optimizes the following parameters:

- *B46 Feedback SLVC-HP*,
- *B47 P-gain SLVC-HP* and
- *B48 I-Gain SLVC-HP*.

The enable must be inactive during activation. If you have started the action in *B45.0*, you must activate the enable. If the action has completed, the enable must be deactivated again. The result of the action can be read after removing the enable in *B46*, *B47* & *B48*.

Note that the result is more accurate if you fit the motor with an encoder for this action. This is possible for initial commissioning of a machine series, for example.
In this case, mount and connect the encoder, set control mode *B20 = 2:vector control* and parameterize the encoder. Now perform the action. After you have the dismantled the encoder, set control mode *B20 = 3:SLVC-HP* again.

12.5.2.7 D96 Reference value generator

NOTICE

During this action, the motor shaft will move.

▶ Make sure that the motor can turn freely during the action!

When you start the action, a square-shaped reference value is specified for the motor. You can parameterize the reference value in *D93* to *D95*.

During activation, the enable must be inactive. If you have started the action in *D96.0*, you must activate the enable.

The action can only be concluded by turning off the enable and quick stop! With a quick stop signal, the drive is halted immediately.

During the action, the cycle time is set internally to 32 msec.

You can read the following result from the third element (*D96.2*):
1: aborted: The action was aborted by turning off the enable.

13 Diagnosis

13.1 LED

The LEDs on the front of the inverter provide a quick overview of the device state. A green LED and a red LED light up in different combinations and at different frequencies to provide information about the device state as shown in the table below.
The additional blue LED provides information about remote maintenance.

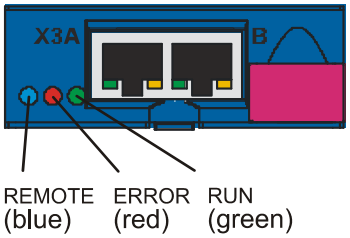
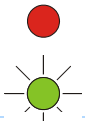
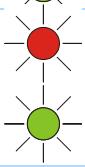
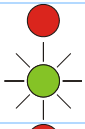
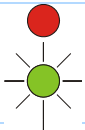
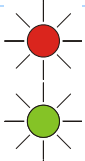
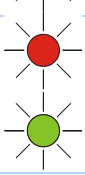
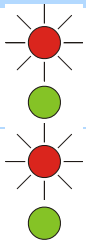


Fig. 13-1: LEDs on the front

LEDs			State of the inverter
ERROR (red) RUN (green)		OFF OFF	No power supply voltage.
ERROR (red) RUN (green)		OFF Flashing at 8 Hz	Data is written on the Paramodul.
ERROR (red) RUN (green)		ON Flashing at 8 Hz	Paramodule is not detected.
ERROR (red) RUN (green)		OFF Flashing at 1 Hz	Ready for operation (not enabled).
ERROR (red) RUN (green)		OFF ON	Operation (enabled).
ERROR (red) RUN (green)		Flashing at 1 Hz ON	Warning.
ERROR (red) RUN (green)		Flashing at 1 Hz Flashes	Warning.

LEDs			State of the inverter
ERROR (red) RUN (green)		ON OFF	Fault.
ERROR (red) RUN (green)		Flashing at 8 Hz OFF	No configuration active.

LEDs			State of the inverter
REMOTE (blue)		OFF	No remote maintenance active.
REMOTE (blue)		Repeatedly lights up very quickly	Connection to the teleserver is being established.
REMOTE (blue)		Steady flashing	Inverter is waiting for the connection to POSITool.
REMOTE (blue)		Continuously lit	Connection is completely set up and remote maintenance can be performed.

13.2 Display

The display gives the user a detailed response message on the state of the inverter. In addition to the indication of the parameters and events, the device states are shown.
The display permits an initial diagnosis without additional aids.

13.2.1 General

After the *self-test* of the inverter, the operation indication appears on the display. Depending on the configuration and the current device state, the first and second line of the display may differ from what is shown in the example. Im Picture shows the configuration *fast ref. value* in the device *state enabled*. See chap. 3 for device states.
If no axis is active, this is indicated with an asterisk (*). The active axis is then shown when it differs from axis no. 1. Only for active brake chopper Bc or active local mode L does the appropriate symbol appear on the display.

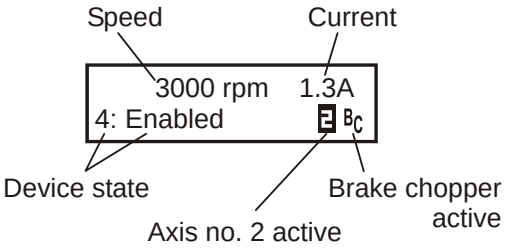


Fig. 13-2: Display indication

13.2.2 Event Indications

Events

Event indications on the display give the user information on the state of the device. The event list (chapter 13.3 Events) gives you a list of the event indications. The following event groups exist.

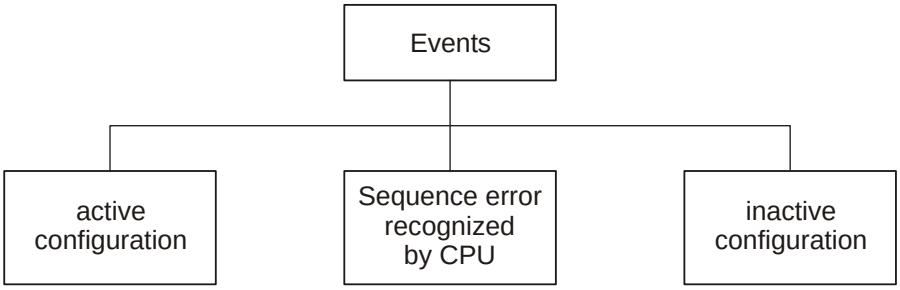


Fig. 13-3: Events

Error during active configuration

Events during active configuration are used to monitor the device during operation. The reaction to one of these events can be set in four levels - inactive, message, warning or fault.

1. When an event is parameterized as a message, it is shown flashing at the bottom of the display. An application is not affected by a message (i.e., the top part of the display does not change). A message is not acknowledged. It is queued until the cause disappears.
2. A warning is shown in the top part of the display with the appropriate logo. The bottom line indicates the flashing event. The upper right corner shows the remaining time after which the warning becomes a fault. If the cause disappears within this parameterized time, the warning is reset. An application is not affected by a warning.
3. When an event with the level "fault" occurs, the device immediately changes to the device state "fault reaction." The event appears flashing in the bottom line of the display. A fault must be acknowledged.

The device provides notes on the cause of some of the events. These events are marked with a number and appear alternately to the event indicators on the display. Causes which are not documented with a number in the event description are only an indication of possible faults. They do not appear on the display.

For additional diagnosis, the occurrence of an event of this group is documented by incrementing a counter. The fault counters are stored in the parameter group Z.. An acknowledgment can be programmed on the operator panel or via binary input for some of these events. These events do not affect communication and device control. The events can be identified by their consecutive numbering.

Sequence faults recognized by the CPU

The 5th generation of STOBER inverters includes a digital computer with microprocessor, memory and I/O modules. When an error occurs which affects this area, the device reacts with an indication on the display. At the same time, the inverter assumes a defined state (power section is turned off). The device must be turned off and on again before it can return to its normal functionality.
At the same time, device control (menu function) and communication with the inverter are not possible. Events of this type are marked on the display with the character "#".

Inactive configuration…

There are two cases when a configuration is inactive:

1. A fault occurs during device start.
2. The configuration was stopped by POSITool.

Events which will lead to an inactive configuration are marked on the display with an asterisk (*).

...during device startup

During device startup, configuration and parameters, flags and signal values are loaded from Paramodul. Afterwards the configuration is started. During both steps detailed error messages can be generated. When a fault occurs during loading from Paramodul, "*ParaModuleERROR" appears in the top line. When a fault occurs while the configuration is being started, "*ConfigStrtERROR" appears. These faults are corrected by turning the device off and on or transferring a configuration.

...after stop by POSITool

If the configuration was stopped by POSITool, the logo of the company STÖBER ANTRIEBSTECHNIK appears on the display.

13.3 Events

13.3.1 31:Short/ground

Triggering	Level	Response	Fault counter
The hardware short-circuit switch-off is active. The output current is too high. If there is no supply voltage when starting the device, the cause may be a device-internal short circuit/ ground fault.	Fault	The motor continues to coast. The brake chopper cuts out. Any existing brakes are engaged if they were not released via *F100* independent of the device controller.	*Z31*

Possible cause	Test	Measure	Acknowledgement
Interwinding fault	Check the motor.	Replace the motor.	Switch the device off/on or programmed acknowledgement
Fault in motor cable	Check the cable	Replace the cable.	
Connection fault	Check the connection, e.g. whether V or W is connected to PE at X20 U.	Correct the connection.	
Braking resistor short circuit	Check the braking resistor.	Replace the braking resistor.	
Device-internal short circuit/ground fault	Check whether the fault only occurs when enabling the inverter.	Replace the inverter.	

13.3.2 32:Short/gr.int

Resolution	Level	Response	Fault counter
An internal test is performed when the controller part power supply is switched on. An existing short-circuit causes a malfunction. A requirement for triggering this event is for the supply voltage to already be present when starting the device.	Malfunction	The inverter cannot be enabled.	*Z32*

Possible cause	Test	Measure	Acknowledgement
There is an internal device fault.	—	Please contact our service department, see section 1.4 Further support	Switch the device on/off or programmed acknowledgement

13.3.3 33:Overcurrent

Triggering	Level	Response	Fault counter
The total motor current exceeds the permitted maximum value.	Fault	The motor always coasts except when U30 Emergency stop is activated. Any existing brakes are engaged if they were not released via *F100* independent of the device controller.	*Z33*

Possible cause	Test	Measure	Acknowledgement
Acceleration times too short.	Extend the ramps.	Apply this setting for operation.	Switch the device off/on or programmed acknowledgement
Incorrectly set torque limits in the *C03* and *C05* parameters.	Set smaller values in *C03* and *C05*.	Apply this setting for operation.	

13.3.4 34:Hardw.fault

Triggering	Level	Response	Fault counter
There is a hardware fault.	Fault	The inverter can no longer be enabled.	*Z34*

Cause	Description	Measure	Acknowledgement
1:FPGA	Fault when loading the FPGA	Replace the inverter.	Not confirmable
2:NOV-ST	Faulty power unit memory (EEPROM)		
3:NOV-LT	Faulty control unit memory (EEPROM)		
4:Brake1	The controller of the brake 1 is faulty or the 24 vdc power supply is missing at the brake module.	Check the wiring and correct it if necessary.	
5:Brake2	The controller of the brake 2 is faulty or the 24 vdc power supply is missing at the brake module.	Check the wiring and correct it if necessary.	
11:CurrentMeas	The current offset measurement for the device start-up indicates a deviation that is too large.	Replace the inverter.	

13.3.5 35:Watchdog

Resolution	Level	Response	Fault counter
The watchdog of the microprocessor is activated.	Malfunction	The motor continues to coast. The brake chopper is switched off while the inverter restarts. Any existing brakes are engaged if they were not released via *F100* independent of the device controller.	*Z35*

Possible cause	Test	Measure	Acknowledgement
The microprocessor is used to capacity or faulty.	• Check the *E191* parameter, it should indicate a value less than 80%. • Check the wiring for EMC-compliant design.	• Set a higher cycle time in the *A150* parameter. • Wire according to EMC regulations.	Switch the device on/off or programmed acknowledgement

13.3.6 36:High voltage

Triggering	Level	Response	Fault counter
The voltage in the intermediate circuit exceeds the permitted maximum (DC link voltage display in *E03*).	Fault	The motor continues to coast. Any existing brakes are engaged if they were not released via *F100* independent of the device controller.	*Z36*

Possible cause	Test	Measure	Acknowledgement
Supply voltage too high	Check whether the supply voltage exceeds the permitted input voltage.	Take measures to adjust the supply voltage.	Switch the device off/on or programmed acknowledgement
No braking resistor connected	Check the wiring.	Connect a braking resistor.	
Brake chopper is deactivated	Check whether *A22* = 0 is set.	Enter the values of the braking resistor in the *A21*, *A22* and *A23* parameters.	
Braking resistor too small or too large	• Check whether *A21* does not reach the permitted value. • Check whether the resistance is suitable to dissipate the power losses arising.	Connect a suitable braking resistor.	
Braking ramps to steep	Observe the DC link voltage during a braking procedure, e.g. using a Scope recording.	• Extend the braking ramps. • Connect a suitable braking resistor. • Check the application of the DC link connection.	
Brake chopper is faulty	Observe the DC link voltage in the Scope. If this increases to the overvoltage limit without hindrance, the brake chopper is faulty.	Please contact our service department, see section 1.4 Further support	

13.3.7 37:Encoder

Triggering	Level	Response	Fault counter
Error due to encoder	Fault	The motor always coasts except when *U30 Emergency stop* is activated. Attention: The reference is deleted for positioning applications due to the event 37:Encoder. Referencing must be repeated after acknowledgement. If the encoder is not connected when switching on the control unit power supply, the encoder supply is permanently switched off. Acknowledgement is then only possible by switching the inverter off and on.	*Z37*

Cause	Description	Measure	Acknowledgement
1:Para<>Encoder	Parameterization is not suitable for the connected encoder.	Check and correct the H-parameter.	Programmed acknowledgement
2:ParaChgOffOn	Parameter change; encoder parameterization can not be changed during operation	Save and then switch the device off/on so that the change is effective.	Programmed acknowledgement
4:X4 chan. A/Clk	Wire break track A/Clock	Check the encoder cable and replace if necessary.	Programmed acknowledgement
5:X4-chan. B/Dat	Wire break track B/Data		Programmed acknowledgement
6:X4-channel 0	Wire break channel 0		Programmed acknowledgement
7:X4-EnDatAlarm	Alarm bit of EnDat encoder present.	Replace the motor.	Switch device off/on
8:X4-EnDatCRC	Errors accumulate during data transfer.	• Check the connection and shielding of the encoder cable. • Reduce the electromagnetic interference.	Programmed acknowledgement

Cause	Description	Measure	Acknowledgement
10:Resol.carrier	The resolver could not be calibrated or optimized.	• Check the encoder cable. • Check whether the specification of the resolver matches the specifications of STOBER.	Programmed acknowledgement
11:X140-undervolt.	Incorrect transfer factor		Switch device off/ on
12:X140-Overvltg			Programmed acknowledgement
14:Resol.failure	Wire break	• Check the encoder cable.	Programmed acknowledgement
15:X120-double transmission	Different positions are frequently determined at X120 during double transmission.		Switch device off/ on
16:X120-Busy	Encoder has not responded for too long; for SSI Slave: No telegram for 5 ms for enabled drive.	• Replace the option board that the encoder is connected to. • Replace the inverter.	Programmed acknowledgement
17:X120-Wire break	A wire break was detected at X120.	• Check the connected cable (encoder or SSI connection). • Check the power supply of the SSI encoder or the source that simulates the SSI signals. • Make sure that the settings of the SSI master are matched to the SSI encoder or the source that simulates the SSI signals. • Check whether a device is correctly parameterized as the source of the SSL signals in the SSI motion bus. • Check whether the devices in the SSI motion bus boot up together.	Programmed acknowledgement

Cause	Description	Measure	Acknowledgement
18:X120-Timeout	No cycle signal was detected from the SSI master.	• Check the connected cable. • Check the power supply of the SSI master. • Make sure that the settings of all devices in the SSI motion bus are matched to each other. • Check whether a device is correctly parameterized as the SSL master in the SSI motion bus. • Check whether the devices in the SSI motion bus boot up together.	Programmed acknowledgement
19:X4 double transmission	Different positions are frequently determined at X4 during double transmission.	• Check the connection and shielding of the encoder cable. • Reduce the electromagnetic interference.	Programmed acknowledgement
20:X4-Busy	Encoder has not responded for too long.	• Check the encoder cable. • Check whether a suitable encoder is connected.	Programmed acknowledgement
21:X4-wire break	A wire break from one or more tracks was detected.	• Check the encoder cable.	Programmed acknowledgement
22:AX5000	Acknowledgement for axis switchover did not occur.	Check the wiring between the inverter and POSISwitch AX 5000.	Programmed acknowledgement
23:AX5000required	A POSISwitch AX 5000 was projected but not connected.	• Match the projection of your hardware. • Check the connection of the POSISwitch AX 5000.	Programmed acknowledgement
24:X120-speed	*B297*, *G297* or *I297* exceeded for the encoder at X120	• Check the connection and shielding of the encoder cable. • Reduce the electromagnetic interference. • Check the parameterization of *B297*, *G297* or *I297*.	Programmed acknowledgement
25:X4-speed	*B297*, *G297* or *I297* exceeded for the encoder at X4		Programmed acknowledgement
26:X4-noEnc.found	No encoder was found at X4 or a wire break was detected at the EnDat/SSI encoder.	• Correct the connection of the encoder. • Check the encoder cable. • Correct the power supply of the encoder. • Check the setting of the *H00* parameter.	Programmed acknowledgement

Cause	Description	Measure	Acknowledgement
27:X4-AX5000 gef	A functional AX 5000 option was found at X4 although the incremental encoder or EnDat encoder was parameterized or no EnDat encoder is connected to option AX 5000.	• Check the setting of the *H00* parameter. • Check the connection of the encoder at the POSISwitch AX 5000.	Programmed acknowledgement
28:X4-EnDatfound	An EnDat encoder was detected at X4 although a different encoder was parameterized.	Check the setting of the *H00* parameter.	Programmed acknowledgement
29:AX5000/IncEnc	A faulty POSISwitch AX 5000 option at X4 or a wire break in the A-channel for an incremental encoder was detected.	• Replace the AX 5000 option. • Check the encoder cable of the incremental encoder.	Programmed acknowledgement
30:Opt2 incomp	Option 2 is not the latest version.	Install the latest version of the option board.	Programmed acknowledgement
31:X140EnDatAlar	The EnDat encoder at X140 reports an alarm.	Replace the motor.	Programmed acknowledgement
32:X140EnDatCRC	Errors accumulate during data transfer. The encoder is not available.	• Make sure that the correct encoder type is connected. • Check the connection and shielding of the encoder cable. • Reduce the electromagnetic interference.	Programmed acknowledgement
33:IGB Angle dif.	*G297* exceeded on the IGB	• Check the parameterization of G297. • Check the producer.	Programmed acknowledgement

Cause	Description	Measure	Acknowledgement
34:battery low	When switching on the inverter, it was determined that the voltage of the battery has fallen below the warning limit of the encoder. Referencing of the axis remains intact. However, the remaining service life of the backup battery is limited.	• Replace the AES battery before the next time the inverter is switched off. Note also the Absolute Encoder Support AES operating instructions (see section 1.3 Further documentation).	Programmed acknowledgement
35:battery empty	When switching on the inverter, it was determined that the voltage of the battery has fallen below the minimal voltage of the encoder. Referencing of the axis has been deleted. The backup battery is no longer able to retain the position in the encoder over the time during which the inverter in switched off.	• Referencing the axis. • Replace the AES battery before the next time the inverter is switched off. Note also the Absolute Encoder Support AES operating instructions (see section 1.3 Further documentation).	Programmed acknowledgement

13.3.8 38:TempDev.sens

Triggering	Level	Response	Fault counter
The temperature measured by the device sensor exceeds the permitted maximum value or has fallen below the permitted minimum value. The permitted temperatures are saved in the power unit of the inverter.	Fault	The parameterized fault reaction in the *A29* parameter.	*Z38*

Possible cause	Test	Measure	Acknowledgement
The ambient/control cabinet temperatures are too high or too low.	Correct the surrounding temperature of the inverter.	Take suitable measures to match the surrounding temperature to the operating conditions of the inverter.	Switch the device off/on or programmed acknowledgement
Fan faulty	Switch on the control unit power supply and check whether the fan(s) start up.	Replace the inverter.	

13.3.9 39:TempDev i2t

Triggering	Level	Response	Fault counter
The i^2t-model calculated for the inverter exceeds the thermal load of 100% (for firmware 5.6-P or higher, the threshold in A27 can be set).	Inactive, message, warning or malfunction can be parameterized in *U02*	When triggering an event, a current limit initially takes place in the servo and vector control control types. At the same time, a quick stop is triggered as a fault when parameterizing in *U02*. Reducing the current can cause the quick stop to no longer perform correctly.	*Z39*

Possible cause	Test	Measure	Acknowledgement
Inverter overloaded	Check the load situation of your drive.	• Correct the design of the drive. • Check the maintenance condition of the drive (block, lubrication, etc.)	Switch the device off/on or programmed acknowledgement
Cycle frequency too high (*B24*)	Check the load situation of your drive under consideration of the derating.	• Reduce *B24*. • Use a drive with a suitable power rating.	

13.3.10 40:Invalid data

Triggering	Level	Response	Fault counter
A data error was detected when initializing the non-volatile memory.	Fault	The inverter cannot be enabled.	*Z40*

Cause	Description	Measure	Acknowledgement
1:Error	Low level write/read error or timeout.	Replace the inverter.	Not confirmable
2:BlockMiss	unknown data block		
3:DataSecurity	Block has no data security.		
4:CheckSum	Block has a check sum error.		
5:R/O	Block is r/o.		
6:ReadErr	Start-up phase: Block read error		
7:BlockMiss	Block not found		
17:Error	Low level write/read error or timeout		
18:BlockMiss	unknown data block		
19:DataSecurity	Block has no data security.		
20:CheckSum	Block has a check sum error.		
21:R/O	Block is r/o.		
22:ReadErr	Start-up phase: Block read error		
23:BlockMiss	Block not found.		

Cause	Description	Measure	Acknowledgement
32:el. Nameplate	no nameplate data available	• For STOBER standard motor: Please contact our service department, see section 1.4 Further support • For motor from other manufacturers: Set *B06* to *1:arbitrary setting* and manually enter the motor data.	Switch the device off/on or programmed acknowledgement
33:el.typeLim	Nameplate parameter cannot be entered (limit value or existence).	• Check the configuration of the inverter and motor. • Please contact our service department, see section 1.4 Further support	
48:Option module2	Error in memory of option 2 for REA 5000 or REA 5001 and XEA 5000 or XEA 5001.	The option must be sent in for repair.	Not confirmable

13.3.11 41:Temp.MotorTMS

Resolution	Level	Response	Fault counter
Motor temperature sensor reports overtemperature (connection clamp X2).	Warning and malfunction can be parameterized in *U15.*	The parameterized malfunction reaction in the *A29* parameter.	*Z41*

Possible cause	Test	Measure	Acknowledgement
The motor temperature sensor is not connected.	Check whether the motor temperature sensor is connected to X2 and whether the wiring is OK.	Connect the cable properly.	Switch the device on/off or programmed acknowledgement
The motor is overloaded	Check whether the operating conditions have caused the motor to overheat (load state, ambient temperature of the motor, etc.).	• Check and, if necessary, correct the drive design. • Check whether a blockage caused overheating.	
The KTY evaluation is activated although an A-device is not involved.	Your device indicates a HW version of 190 or lower and *B38* is set to *1: KTY 84-1xx*.	• If the motor allows it, set *B38 = 0: PTC*. • Replace the inverter with an A-device (HW version 200 or higher).	

13.3.12 42:TempBrakeRes

Triggering	Level	Response	Fault counter
The i^2t model for the braking resistor exceeds 100% load.	Fault	The parameterized fault reaction in the *A29* parameter.	*Z42*

Possible cause	Test	Measure	Acknowledgement
The braking resistor may not be designed according to the application.	Check whether the load state of the braking resistor has caused overheating.	Check the drive configuration. Consider a DC link connection or the use of a braking resistor with a larger power rating.	Programmed acknowledgement; acknowledgement by switching of/on is not recommended as in this case the i^2t model is reset to 80 %. As a result, there is a risk that the braking resistor will be damaged.

13.3.13 44:External fault

Triggering	Level	Response	Fault counter
Application-specific or by free programming option	Fault	The parameterized fault reaction in the *A29* parameter: • *A29 = 0:inactive* The power unit is switched off, the motor coasts down. The holding brakes are applied when the purge override is inactive. • *A29 = 1:active* The drive is stopped with a quick stop. The holding brakes are applied at the end of a quick stop if the purge override is inactive.	*Z44*

Possible cause	Test	Measure	Acknowledgement
Application-specific or based on free programming option; can be separately programmed for each axis	—	—	Switch the device off/on or programmed acknowledgement

13.3.14 45:oTempMot. i2t

Resolution	Level	Response	Fault counter
The i^2t model for the motor reaches 100% load.	Parameterized as inactive, message or warning in *U10* and *U11*.	The parameterized malfunction reaction in the *A29* parameter.	*Z45*

Possible cause	Test	Measure	Acknowledgement
The motor is overloaded	Check whether the operating conditions have caused the motor to overheat (load state, ambient temperature of the motor, etc.).	• Take measures to meet the requirements for the operating conditions. • Rectify any existing blockages. • If necessary, correct the drive design.	Switch the device off/on or programmed acknowledgement.

13.3.15 46:Low voltage

Resolution	Level	Response	Fault counter
A problem with the supply voltage or DC link voltage was detected.	• Cause 1: Parameterized in *U00* and *U01* • Cause 2: Warning with 10 s warning time • Cause 3: Malfunction	The parameterized malfunction reaction in the *A29* parameter for cause 1 and 2. For cause 3, the motor always coasts except when *U30 Emergency stop* is activated.	*Z46*

Cause	Description	Measure	Acknowledgement
1:low Voltage	The value in *E03 DC link voltage* has fallen below the value parameterized in *A35 Undervoltage limit*.	Check whether the supply voltage corresponds to the specification.	Can be acknowledged for malfunction level by switching the device off/on or programmed acknowledgement.
2:network phase	The line monitoring has detected that a phase is missing when the power stage is switched on.	Check the line fuse and wiring.	
3:drop in network	If the line monitoring detects that the line is missing, the load relay is immediately switched off. Normal operation is maintained. If the line return of the power stage is still switched on, a malfunction is triggered after 0.5 s.	Check whether the supply voltage corresponds to the specification or whether there is a power failure.	

13.3.16 47:TorqueLimit

Resolution	Level	Response	Fault counter
The maximum torque permitted for static operation is exceeded in the control types of servo control, vector control or sensorless vector control (*E62 act. pos. T-max*, *E66 act. neg. T-max*). Note that in many cases, operation at the torque limit is desirable.	Can be parameterized in *U20* and *U21*	The parameterized malfunction reaction in the *A29* parameter.	*Z47*

Possible cause	Test	Measure	Acknowledgement
Incorrect parameterization	Check whether the torque moments in *E62* and *E66* correspond with your projection.	Correct the setting of the parameters in *C03*, *C05*, *C06*, *C130* and *C230*.	Can be acknowledged for malfunction level by switching the device off/on or programmed acknowledgement.
Drive overloaded	Check the load situation of your drive.	Rectify any existing blockages.	

13.3.17 52:Communication

Triggering	Level	Response	Fault counter
Communication malfunction	Fault		*Z52*

Cause	Description	Measure	Acknowledgement
1:CAN LifeGuard	The device detects the *Life-Guarding event* (master no longer sends any Remote Transmit Request).	Check the CANOpen master.	Switch off/on the Esc key of the device at the front of the inverter or rising flank of the enable signal or programmed acknowledgement
2:CAN Sync Error	Sync message was not received within the timeout period that is calculated from the *A201 Cycle Period Timeout* as follows: • *A201* ≤ 20 ms: Timeout period = *A201* * 4, • 20 ms < *A201* ≤ 200 ms: Timeout period = *A201* * 3, • Otherwise: Timeout period = *A201* * 2	• Make sure that the *A201* parameter is correctly set. • Make sure that the master sends the sync message reliably.	Switch off/on the Esc key of the device at the front of the inverter or rising flank of the enable signal or programmed acknowledgement
3:CAN Bus Off	The CAN controller in the inverter has switched off due to critical and repeated CAN bit timing errors. The CAN controller is restarted after a waiting time of 2 s and acknowledgement of the malfunction.	• Make sure that the CAN baud rate was correctly set. • Check the wiring. • Check the bit timing of a different CAN subscriber.	Switch off/on the Esc key of the device at the front of the inverter or rising flank of the enable signal or programmed acknowledgement
4:PZD-Timeout	• Failure of the cyclic data connection (PROFIBUS master no longer sends) or connection is faulty or • PROFINET IO controller no longer sends or the connection is faulty	• Check the PLC (RUN switch, set cycle time). • Check the wiring.	Switch off/on the Esc key of the device at the front of the inverter or rising flank of the enable signal or programmed acknowledgement

Cause	Description	Measure	Acknowledgement
5:USS	Failure of cyclic data connection (USS).	Check the USS master.	Switch off/on the Esc key of the device at the front of the inverter or rising flank of the enable signal or programmed acknowledgement
6:EtherCAT PDO-Ti	The inverter did not receive process data in the time period that was parameterized in *A258*.	• Make sure that the *A252.x, A253.x, A256, A257.x, A258, A259.x, A260, A261.x, A262.x, A263.x, A264.x, A265.x, A266* and *A267.x* parameters are correctly set. • Make sure that the timeout value parameterized in *A258* matches the *A150 cycle time* (of the inverter) and the cycle time of the controller or EtherCAT masters that were selected. • Check the wiring. • Check the EtherCat state of the inverter and the controller or EtherCAT master. • Check whether CoE emergency messages are present in the controller or the EtherCAT master.	Switch the device off/on or programmed acknowledgement. Note that an action must also occur in the controller or the EtherCAT master for complete acknowledgement.

Cause	Description	Measure	Acknowledgement
7:EtherCAT-DcSYN	If the inverter is synchronized to EtherCAT by means of the Distributed Clock, the "SYNC 0" synchronization signal is checked by a watchdog. If this SYNC 0 signal remains for a certain time (that cannot be parameterized), this cause is triggered. This cause can only be triggered for EtherCAT with synchronization by the Distributed Clock.	• Check the controller. • Make sure that the wiring is in accordance with electromagnetic interference regulations. • Replace the ECS 5000. • Please contact our service department, see section 1.4 Further support	Switch the device off/on or programmed acknowledgement. Note that an action must also occur in the controller or the EtherCAT master for complete acknowledgement.
8:IGB µC failure	The microcontroller for the IGB communication has failed.	• Check the wiring for EM-compliant design. • The inverter must be sent in for repair. Please contact our service department, see section 1.4 Further support	Switch the device off/on or programmed acknowledgement
9:IGB Lost Frame	IGB motion bus: The subscriber has detected the loss of min. 2 consecutive data frames (double error). This cause can only occur when the IGB state = *3:Motion bus* and the motor is powered.	• Make sure that all inverters in the IGB network are switched on. • Make sure that all connection cables are plugged in.	Switch the device off/on or programmed acknowledgement
10:IGB P. LostFr	IGB motion bus: A different subscriber has detected a double error and reported this via *A163*. As a result, this inverter is also faulty with this cause. This cause can only occur when the IGB state = *3:Motion bus* and the motor is powered.		Switch the device off/on or programmed acknowledgement

Cause	Description	Measure	Acknowledgement
11:IGB Sync Erro	The synchronization within the inverter is faulty as the configuration was stopped by POSITool. This cause can only occur when the IGB state = *3:Motion bus* and the motor is powered.	• Start the configuration in the inverter. • If the result occurs with this cause for a running configuration, the inverter must be sent in for repair. Please contact our service department, see section 1.4 Further support	Switch the device off/on or programmed acknowledgement
12:IGB ConfigTim	An IGB motion bus consumer block or producer block in the graphical programming was called up at the wrong time. The block was called up too early or closed too late. This cause can only occur when the IGB state = *3:Motion bus* and the motor is powered.	Adjust the run-time sequence of the blocks, transfer the changed configuration to the inverter and save it there. Restart the inverter.	Switch the device off/on or programmed acknowledgement.
13:IGBPartnerSyn	There is a synchronization malfunction for another subscriber in the IGB network (see cause 11). This subscriber reported its fault via *A163*. As a result, this inverter is also faulty with cause 13. This cause can only occur when the IGB state = *3:Motion bus* and the motor is powered.	Check the inverter that displays event 52 with cause 11.	Switch the device off/on or programmed acknowledgement

13.3.18 55:OptionBoard

Resolution	Level	Response	Fault counter
Error when operating with option board.	Malfunction	The parameterized malfunction reaction in the *A29* parameter.	*Z55*

Cause	Description	Measure	Acknowledgement
1:CAN5000Failure	CAN 5000 was detected, installed and failed.	• Uninstall the option, check the contacts and reinstall the option. • Replace the option.	Switch the device on/off or programmed acknowledgement
2:DP5000Failure	DP 5000 was detected, installed and failed.		
3:REA5000Failure	REA 5000 was detected, installed and failed.		
4:SEA5000failure	SEA 5000 was detected, installed and failed.		
5:XEA5000Failure	XEA 5000 or XEA 5001 was detected, installed and failed.		
6:InkSim-Init	Incremental encoder simulation on XEA could not be initialized. The motor may have rotated during initialization.		
7:wrongOption	incorrect or missing option board (see*E54/E58* with *E68/E69*)	• Install the projected option. • Adjust the projection.	Switch device off/on
8:LEA5000failure	LEA 5000 was detected, installed and failed.	• Uninstall the option, check the contacts and reinstall the option. • Replace the option.	Switch the device on/off or programmed acknowledgement
9:ECS5000failure	ECS 5000 was detected, installed and failed.	• Uninstall the option, check the contacts and reinstall the option. • Replace the option.	Switch the device on/off or programmed acknowledgement
10:24Vfailure	Failure of 24V supply for XEA 5001 or LEA 5000.	Check and, if necessary, correct the 24V supply of the option.	Switch device off/on

Cause	Description	Measure	Acknowledgement
11:SEA5001failure	SEA 5001 was detected, installed and failed.	• Uninstall the option, check the contacts and reinstall the option. • Replace the option.	Switch the device on/off or programmed acknowledgement
12:REA5001failure	REA 5001 was detected, installed and failed.	• Uninstall the option, check the contacts and reinstall the option. • Replace the option.	Switch the device on/off or programmed acknowledgement
13:PN5000 Failure1	PN 5000 was detected, installed and failed. Basic hardware tests have detected an error.	• Check whether the PN 5000 accessory was correctly installed. • Check whether suitable EMC measures were taken. • Check whether only PROFINET-certified components were connected to the inverter. • Check whether the cabeling and connections correspond to the PROFINET standard. • Contact the service department, see section 1.4 Further support.	Switch device off/on
14:PN5000 failure2	PN 5000 was detected, installed and failed. Basic software tests have detected an error.		Switch device off/on
15:PN5000 failure3	PN 5000 was detected, installed and failed. The watchdog function of the PN-5000 monitoring system has detected an error.		Switch device off/on
17:opt.2 too old	Option board with old hardware version (XEA5001 HW 9, REA 5000 HW 18).	• Install the latest version of the option.	Switch device off/on

13.3.19 56:Overspeed

Resolution	Level	Response	Fault counter
The measured speed is larger than *C01* x 1.1 + 100 rpm.	Malfunction	The motor always coasts (from V5.0D) except when *U30 Emergency stop* is activated. Any existing brakes are engaged if they were not released via *F100* independent of the device controller.	*Z56*

Possible cause	Test	Measure	Acknowledgement
Incorrect parameterization of the encoder	Check the parameterization of the encoder, e.g. the line number of the incremental encoders.	If necessary, correct the parameters.	Switch the device on/off or programmed acknowledgement
Lag error too large	Use a Scope recording to check whether the value in *E07* is larger than *C01* at the time of the error.	Correct the parameters (ramps, torque limits, etc.).	
Motor overshoots	Use a Scope recording to check the value in *E91* is larger than *E07* at the time of the error.	Optimize the parameterization of the speed controller (*C31* ,*C32*).	
Incorrect commutation offset for the encoder of a servo motor	Perform the *B40 phase test* action.	The *B40 phase test*action must be in accordance with specifications.	
Encoder faulty	Check whether a speed that clearly differs to zero is displayed in *E91* during a motor standstill.	The motor must be sent in for repair. Please contact our service department, see section 1.4 Further support	

13.3.20 57:Runtime usage

Triggering	Level	Response	Fault counter
The cycle time of a real time cycle was exceeded.	Fault	The parameterized fault reaction in the *A29* parameter.	*Z57*

Cause	Description	Measure	Acknowledgement
2:RT2	Cycle time of real time task 2 exceeded (1 ms).	Replace the inverter.	Switch the device off/on or programmed acknowledgement
3:RT3	Cycle time of real time task 3 exceeded (technology task).	Set a higher cycle time in A150.	
4:RT4	Cycle time of real time task 4 exceeded (32 ms).		
5:RT5	Cycle time of real time task 5 exceeded (256 ms)		

13.3.21 58:Grounded

Resolution	Level	Response	Fault counter
Unbalanced motor currents were detected. This involves a hardware from the power stage for MDS 5000 size 3 or SDS 5000 size 3.	Malfunction	The motor continues to coast. Any existing brakes are engaged if they were not released via *F100* independent of the device controller. The brake chopper is switched off as long as the malfunction is present.	*Z58*

Possible cause	Test	Measure	Acknowledgement
Ground fault in motor	Check the motor.	Replace the motor.	Switch the device on/off or programmed acknowledgement
Fault in motor cable	Check the cable.	Replace the cable	
Connection fault	Check the connection, e.g. whether V or W is connected to PE at X20 U.	Correct the connection.	

13.3.22 59:TempDev. i2t

Triggering	Level	Response	Fault counter
The i^2t-model calculated for the inverter exceeds the maximum allowed thermal load of 105% (for firmware 5.6-P or higher, triggering only occurs when A27=100% is set).	Fault	The parameterized fault reaction in the *A29* parameter.	*Z59*

Possible cause	Test	Measure	Acknowledgement
Inverter overloaded	Check the load situation of your drive.	• Reduce any existing loads (lubrications, blockages, etc.). • Use a drive with a suitable power rating.	Switch the device off/on or programmed acknowledgement
Cycle frequency too high	Check the load situation of your drive under consideration of the derating.	• Reduce *B24*. • Use a drive with a suitable power rating.	

13.3.23 60-67:Application events 0-7

Resolution	Level	Response	Fault counter
Application-specific or due to free programming option; can be separately programmed for each axis • Message/warning: Evaluation occurs in 256 ms cycle. • Malfunction: Evaluation occurs in parameterized cycle time (*A150*)	Can be parameterized in the *U100*, *U110, U120*, etc. up to *U170* system parameters.	The parameterized malfunction reaction in the *A29* parameter.	*Z60* to *Z67*

Possible cause	Test	Measure	Acknowledgement
Application-specific or due to free programming option; can be separately programmed for each axis	—	—	Switch the device on/off or programmed acknowledgement

13.3.24 68: External fault 2

Triggering	Level	Response	Fault counter
Application-specific or by free programming option; should be used for application events that may only be parameterized on the fault level.	Fault	The parameterized fault reaction in the *A29* parameter: • *A29 = 0:inactive* The power unit is switched off, the motor coasts down. The holding brakes are applied when the purge override is inactive. • *A29 = 1:active* The drive is stopped with a quick stop. The holding brakes are applied at the end of a quick stop if the purge override is inactive.	*Z68*

Possible cause	Test	Measure	Acknowledgement
Application-specific or by free programming option	—	—	Switch the device off/on or programmed acknowledgement

13.3.25 69:Motor connect.

Triggering	Level	Response	Fault counter
Motor connection error	Can be parameterized as inactive or malfunction in U12	The parameterized fault reaction in the *A29* parameter: • *A29 = 0:inactive* The power unit is switched off, the motor coasts down. The holding brakes are applied when the purge override is inactive. • *A29 = 1:active* The drive is stopped with a quick stop. The holding brakes are applied at the end of a quick stop if the purge override is inactive.	*Z69*

Cause	Description	Measure	Acknowledgement
1:motorNotDiscon	The contactor did not open during the axis change. This cause can only be determined when at least two phases stick and the intermediate circuit is loaded (see E03).	Replace the contactor.	Switch the device off/on or programmed acknowledgement
2:no motor	Possibly no motor connected or the line to the motor is interrupted.	• Check and correct the connection of the motor. • Replace the cable.	

13.3.26 70:Param.consist

Resolution	Level	Response	Fault counter
Conflicting parameterization.	Malfunction	A malfunction is only triggered when enabled for faulty parameterization.	*Z70*

Cause	Description	Measure	Acknowledgement
1:Encoder type	The *B20* control type is set to *servo or Vector Control* but no corresponding encoder is selected (*B26*, H.. parameter).	Correct the parameterization.	Switch the device on/off or programmed acknowledgement
2:X120-direction	X120 is used as the source in a parameter but is parameterized in *H120* as a drain (or vice-versa).	Correct the parameterization.	
3:B12<->B20	*B20* control type is not set to the servo but the rated motor current (*B12*) exceeds the 4 kHz rated current (*R24*) of the device by more than 1.5x.	Correct the parameterization.	Switch the device on/off or programmed acknowledgement
4:B10<->H31	The set motor pole number (*B10*) and the resolver pole number (*H31*) do not match.	Correct the parameterization.	Switch the device on/off or programmed acknowledgement
5:neg. slip	When using the control types U/f, SLVC or Vector Control (*B20*): Control type set to "ASM": The values for the rated motor speed (*B13*), rated motor frequency (*B15*) and motor pole number (*B10*) result in a negative slippage.	Correct the parameterization.	Switch the device on/off or programmed acknowledgement
6:Torque limit	When using the values entered in *C03* or *C05*, the maximum current of the inverter is exceeded. Enter lower torque limits.	Correct the parameterization.	Switch the device on/off or programmed acknowledgement

Cause	Description	Measure	Acknowledgement
7:B26:SSI-Slave	SSI slave must not be used as a motor encoder (synchronisation problems).	Correct the parameterization.	Switch the device on/off or programmed acknowledgement
8:C01>B83	*C01* must not be larger than *B83*.	Correct the parameterization.	Switch the device on/off or programmed acknowledgement
9:E102/E103 faulty	An attempt was made to apply a master position via the IGB but the required *E102* and *E103* parameters are not available.	Correct the parameterization.	Switch the device on/off or programmed acknowledgement
10: G104<->G27	A master position is sent via the IGB Motionbus (i.e. *G104* is not set to *0:inactive*) but the *0:inactive* and *6:IGB* settings valid for this case could not be detected in *G27*.	Correct the parameterization.	Switch the device on/off or programmed acknowledgement

13.3.27 71:Firmware

Triggering	Level	Response	Fault counter
A firmware error was detected.	Fault	Causes 1 and 2 only occur when the device starts so that the inverter can not be enabled. Cause 3 can also occur during operation.	*Z71*

Cause	Description	Measure	Acknowledgement
1:FW defective	Only for SDS 5000: An active firmware error was detected or faulty firmware was detected in the firmware download memory.	Reload the firmware using the POSITool software. Also note the Service section.	Switch device off/on
2:Activate FW!	Only for SDS 5000: The firmware was loaded into the inverter but not yet activated.	Activate the firmware and perform a device restart. Also note the Service section.	
3:CRC error	A firmware error was detected.	Switch off the 24 vdc power supply and switch it on again. If the error occurs repeatedly, replace the inverter.	

13.3.28 72:Brake test

Triggering	Level	Response	Fault counter
For active brake management in the SDS 5000, the time set in *B311* has elapsed without the *B300 Brake test* action having been performed.	Cause 1 and 2: Fault, Cause 3: Message	This fault only occurs with the enable switched off.	*Z72*

Cause	Description	Measure	Acknowledgement
1:B311Timeout	The time entered in *B311 Timeout for brake test B300* has elapsed twice without the *B300 Brake test* action having been performed.	Perform the *B300 brake test* action.	For the *Fault* level, the event can be acknowledged for a duration of 5 minutes to be able to perform the *B300 brake test* action. If this time elapses without the *B300 Brake test* action being successfully performed, the inverter changes to the *Malfunction* state again. If the *B300 brake test* action is successfully performed, the event is automatically acknowledged.
2:Brake defective	When performing the brake test action, the holding torque entered in *B304* or *B305* could not be applied or the encoder test run included in the brake test was completed with errors.	• Perform the brake grinding function and then the brake test. • Replace the motor.	
3:Brake test required	Timeout for brake test has elapsed once without the test brake action being performed.	Perform the action *B300* test brake.	

13.3.29 73:Ax2braketest

Triggering	Level	Response	Fault counter
For active brake management in the SDS 5000, the time set in *B311* has elapsed without the *B300 Brake test* action with active axis 2 having been performed.	Cause 1 and 2: Fault, Cause 3: Message	This fault only occurs with the enable switched off.	*Z73*

Cause	Description	Measure	Acknowledgement
1:B311Timeout	The time entered in *B311 Timeout for brake test B300* has elapsed twice without the *B300 Brake test* action with active axis 2 having been performed.	Perform the *B300 brake test* action.	For the *Fault* level, the event can be acknowledged for a duration of 5 minutes to be able to perform the *B300 brake test* action. If this time elapses without the *B300 Brake test* with active axis 2 being successfully performed, the inverter changes to the *Malfunction* state again. If the *B300 brake test* action is successfully performed, the event is automatically acknowledged.
2:Brake defective	When performing the brake test action with active axis 2, the holding torque entered in *B304* or *B305* could not be applied or the encoder test run included in the brake test was completed with errors.	• Perform the brake grinding function and then the brake test. • Replace the motor.	
3:Brake test required	Timeout for brake test has elapsed once without the test brake action being performed.	Perform the action *B300* test brake.	

13.3.30 74:Ax3braketest

Triggering	Level	Response	Fault counter
For active brake management in the SDS 5000, the time set in *B311* has elapsed without the *B300 Brake test* action with active axis 3 having been performed.	Cause 1 and 2: Fault, Cause 3: Message	This fault only occurs with the enable switched off.	*Z74*

Cause	Description	Measure	Acknowledgement
1:B311Timeout	The time entered in *B311 Timeout for brake test B300* has elapsed twice without the *B300 Brake test* action with active axis 3 having been performed.	Perform the *B300 brake test* action.	For the *Fault* level, the event can be acknowledged for a duration of 5 minutes to be able to perform the *B300 brake test* action. If this time elapses without the *B300 Brake test* with active axis 3 being successfully performed, the inverter changes to the *Malfunction* state again. If the *B300 brake test* action is successfully performed, the event is automatically acknowledged.
2:Brake defective	When performing the brake test action with active axis 3, the holding torque entered in *B304* or *B305* could not be applied or the encoder test run included in the brake test was completed with errors.	• Perform the brake grinding function and then the brake test. • Replace the motor.	
3:Brake test required	Timeout for brake test has elapsed once without the test brake action being performed.	Perform the action *B300* test brake.	

13.3.31 75:Ax4braketest

Triggering	Level	Response	Fault counter
For active brake management in the SDS 5000, the time set in *B311* has elapsed without the *B300 Brake test* action with active axis 4 having been performed.	Cause 1 and 2: Fault, Cause 3: Message	This fault only occurs with the enable switched off.	*Z75*

Cause	Description	Measure	Acknowledgement
1:B311Timeout	The time entered in *B311 Timeout for brake test B300* has elapsed twice without the *B300 Brake test* action with active axis 4 having been performed.	Perform the *B300 brake test* action.	For the *Fault* level, the event can be acknowledged for a duration of 5 minutes to be able to perform the *B300 brake test* action. If this time elapses without the *B300 Brake test* with active axis 4 being successfully performed, the inverter changes to the *Malfunction* state again. If the *B300 brake test* action is successfully performed, the event is automatically acknowledged.
2:Brake defective	When performing the brake test action with active axis 4, the holding torque entered in *B304* or *B305* could not be applied or the encoder test run included in the brake test was completed with errors.	• Perform the brake grinding function and then the brake test. • Replace the motor.	
3:Brake test required	Timeout for brake test has elapsed once without the test brake action being performed.	Perform the action *B300* test brake.	

13.3.32 85:Excessive jump in reference value

Triggering	Level	Response	Counter
If reference value monitoring *C100* is active, the assigned reference values require an acceleration that the motor is unable to maintain while keeping to the maximum output current of the inverter power unit I_{2maxPU} (*R04*R26*) – even in idle.	Fault	Parameterized fault response in *A29*: • *A29 = 0:inactive* The power unit is switched off and the drive becomes torque-free/force-free. The holding brakes are applied when the purge override is inactive. • *A29 = 1:active* The drive is stopped with a quick stop. The holding brakes are applied at the end of a quick stop if the purge override is inactive.	*Z85*

Cause	Description	Measure	Acknowledgement
1: Position	Reference position changes cause acceleration that cannot be executed	Reduce velocity of the reference value changes so that the resulting acceleration is smaller than *E64*.	Switch the device off/on or programmed acknowledgement
2: Velocity	Reference velocity changes cause acceleration that cannot be executed		

13.3.33 #004:illeg.Instr

Triggering	Level	Response
An unknown operation code was detected.	Fault	The motor coasts, the microprocessor is stopped and all device functions are inoperable.

Possible cause	Test	Measure	Acknowledgement
Error in code memory (bit dumped, permanent).	Reestablish the operating conditions at the time of the error and check whether the error occurs again.	• Reload the application in the inverter and save it. • Perform a firmware upgrade.	Switch device off/on
EMC error	Check the wiring for EMC-compliant design.	Wire according to EMC regulations.	

13.3.34 #006:illSlotInst

Triggering	Level	Response
An invalid operation code was detected after a jump command.	Fault	The motor coasts, the microprocessor is stopped and all device functions are inoperable.

Possible cause	Test	Measure	Acknowledgement
Error in code memory (bit dumped, permanent).	Reestablish the operating conditions at the time of the error and check whether the error occurs again.	• Reload the application in the inverter and save it. • Perform a firmware upgrade.	Switch device off/on
EMC error	Check the wiring for EMC-compliant design.	Wire according to EMC regulations.	

13.3.35 #009:CPU AddrErr

Triggering	Level	Response
The address for data access is invalid.	Fault	The motor coasts, the microprocessor is stopped and all device functions are inoperable.

Possible cause	Test	Measure	Acknowledgement
Error in code memory (bit dumped, permanent).	Reestablish the operating conditions at the time of the error and check whether the error occurs again.	• Reload the application in the inverter and save it. • Perform a firmware upgrade.	Switch device off/on
EMC error	Check the wiring for EMC-compliant design.	Wire according to EMC regulations.	

13.3.36 #00c:StackOverfl

Triggering	Level	Response
A stack that is too small was detected.	Fault	The motor coasts, the microprocessor is stopped and all device functions are inoperable.

Possible cause	Test	Measure	Acknowledgement
Error in code memory (bit dumped, permanent).	Reestablish the operating conditions at the time of the error and check whether the error occurs again.	• Reload the application in the inverter and save it. • Perform a firmware upgrade.	Switch device off/on
EMC error	Check the wiring for EMC-compliant design.	Wire according to EMC regulations.	

13.3.37 *ParaModul ERROR:update firmware!

Resolution	Level	Response
The versions of configuration and firmware do not match.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
Old firmware version	—	Apply a suitable configuration or firmware.	—

13.3.38 *ParaModul ERROR: file not found

Resolution	Level	Response
The Paramodule file can not be read.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
May have been switched off during the *A00* action.	—	• Apply a suitable configuration via POSITool and then save it (*A00*) • Attach a suitable Paramodule.	—
Faulty or unformatted Paramodule	—	Replace the Paramodule.	—

13.3.39 *ParaModul ERROR: Checksum error

Resolution	Level	Response
A checksum error was detected when loading from the Paramodule.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
Memory bit dumped.	—	Apply a suitable configuration via POSITool and then save it (*A00*)	—

13.3.40 *ParaModul ERROR: ksb write error

Resolution	Level	Response
An error was detected when writing the configuration in the configuration memory.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
Faulty flash memory.	—	Replace the Paramodule.	—
The configuration is too large for the configuration memory.		• Apply a suitable configuration via POSITool and then save it (*A00*) • Replace the Paramodule.	

13.3.41 *ConfigStartERROR parameters lost

Resolution	Level	Response
No parameter values are saved in the Paramodule.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The control part was switched off while *A00* was active.	—	• Apply a suitable configuration via POSITool and then save it (*A00*) • Replace the Paramodule.	—

13.3.42 *ConfigStartERROR remanents lost

Resolution	Level	Response
No flag values are saved.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The *A00 Save values* action was not performed.	—	• Apply a suitable configuration via POSITool and then save it (*A00*) • Replace the Paramodule.	—

13.3.43 *ConfigStartERROR unknown block

Resolution	Level	Response
The versions of configuration and firmware do not match.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The configuration saved in the Paramodule originates from a newer inverter firmware that recognises more system modules.	—	Apply a suitable configuration or firmware via POSITool.	—

13.3.44 *ConfigStartERROR unknown string

Resolution	Level	Response
The versions of configuration and firmware do not match.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The configuration saved in the Paramodule originates from a newer inverter firmware that recognises more texts (e.g. name of the system standard module parameters).	—	Apply a suitable configuration or firmware via POSITool.	—

13.3.45 *ConfigStartERROR unknown scale

Resolution	Level	Response
The versions of configuration and firmware do not match.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The configuration saved in the Paramodule originates from a newer inverter firmware that recognises more scaling functions.	—	Apply a suitable configuration or firmware via POSITool.	—

13.3.46 *ConfigStartERROR unknown limit

Resolution	Level	Response
The versions of configuration and firmware do not match.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The configuration saved in the Paramodule originates from a newer inverter firmware that recognises more limit value functions.	—	Apply a suitable configuration or firmware via POSITool.	—

13.3.47 *ConfigStartERROR unknown post-wr

Resolution	Level	Response
The versions of configuration and firmware do not match.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The configuration saved in the Paramodule originates from a newer inverter firmware that recognises more PostWrite functions.	—	Apply a suitable configuration or firmware via POSITool.	—

13.3.48 *ConfigStartERROR unknown pre-rd

Resolution	Level	Response
The versions of configuration and firmware do not match.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The configuration saved in the Paramodule originates from a newer inverter firmware that recognises more Pre-read functions (mapping of firmware parameters to configuration parameters).	—	Apply a suitable configuration or firmware via POSITool.	—

13.3.49 *ConfigStartERROR unknown hiding

Resolution	Level	Response
The versions of configuration and firmware do not match.	—	The configuration does not start.

Possible cause	Test	Measure	Acknowledgement
The configuration saved in the Paramodule originates from a newer inverter firmware that knows more hide functions (hide parameters that should be visible depending on other parameters).	—	Apply a suitable configuration or firmware via POSITool.	—

13.3.50 no configuration paramodul error

When displaying *no configuration paramodule error*, the device start-up is ended and an error was detected by the Paramodule during start-up. Note also the events in section 13.3.37 *ParaModul ERROR:update firmware! to 13.3.40 *ParaModul ERROR: ksb write error. Alternating to the event display, STÖBER ANTRIEBSTECHNIK appears.

13.3.51 no configuration start error

When displaying *no configuration start error*, the device start-up is ended and an error was detected when starting the configuration. Note also the events in section 13.3.41 *ConfigStartERROR parameters lost to 13.3.49 *ConfigStartERROR unknown hiding. Alternating to the event display, STÖBER ANTRIEBSTECHNIK appears.

13.3.52 configuration stopped

When displaying *configuration stopped*, the current configuration was stopped. Apply a configuration or switch the inverter off and on again so that the previous configuration can be loaded from the Paramodule.

13.3.53 HW defective FirmwareStartErr

Triggering	Level	Response
A firmware error was detected.	Fault	Cause 1 only occurs when the device starts so that the inverter can not be enabled.

Cause	Description	Measure	Acknowledgement
1:FW defective	The active firmware as well as the firmware in the download memory are faulty.	A "normal" firmware download is not possible. Please contact our Service department.	Not confirmable

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