SC6 drive controller
Manual

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1 Foreword

The compact stand-alone SC6 drive controller allows for sensorless control of STOBER LM series Lean motors. These motors provide energy efficiency at the performance level of a synchronous servo motor. With higher efficiency than that required for comparable IE4 asynchronous motors, they also guarantee investment protection. However, the SC6 can also be used in combination with asynchronous motors and synchronous servo motors, such as the STOBER EZ series, as well as with encoders. The SC6 drive controller is available in three sizes with a nominal output current of up to 19 A: sizes 0 and 1 as a double-axis controller, size 2 as a single-axis controller.

Features

- Sensorless position control by STOBER Lean motors
- Control of rotary synchronous servo motors, asynchronous motors and torque motors
- HIPERFACE DSL One Cable Solution
- Electronic motor nameplate via HIPERFACE DSL or EnDat 2.2 digital encoder interface
- Integrated EtherCAT or PROFINET communication
- STO safety technology using terminals or STO and SS1 using FSoE (Safety over EtherCAT): PL e / SIL 3
- Integrated holding brake activation
- Single-ended load on double-axis controllers for operation of motors with different power
- Energy supply over DC link connection

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2 User information

This documentation covers the SC6 drive controller. You will receive support for the assembly of the individual modules along with the associated components that you will need to operate the drive controllers in the control cabinet.

You will also find information on wiring the modules correctly and checking their functionality in the group with an initial test.

Information

To ensure proper functionality, we recommend using cables from STOBER that are matched to the complete system. In case of use of unsuitable connection cables, we reserve the right to reject claims under the warranty.

2.1 Storage and transfer

As this documentation contains important information for handling the product safely and efficiently, it must be stored in the immediate vicinity of the product until product disposal and be accessible to qualified personnel at all times.

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

2.2 Described product type

This documentation is binding for:

SC6 drive controller in conjunction with the
DriveControlSuite software V 6.3-A or higher and associated firmware V 6.3-A or higher.

2.3 Timeliness

Check whether this document is the most up-to-date version of the documentation. We provide the latest document versions for our products for download on our website: http://www.stoeber.de/en/download.

2.4 Original language

The original language of this documentation is German; all other language versions are derived from the original language.

2.5 Limitation of liability

This documentation was created taking into account the applicable standards and regulations as well as the current state of technology.

STOBER shall assume no responsibility for damage resulting from failure to comply with the documentation or from use that deviates from the intended use of the product. This is especially true for damage caused by individual technical modifications to the product or projecting and operation of the product by unqualified personnel.

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2.6 Formatting conventions

Orientation guides in the form of signal words, symbols and special text markups are used to emphasize specific information so that you are able identify it in this documentation quickly.

2.6.1 Use of symbols

Safety instructions are identified with the following symbols. They indicate special risks when handling the product and are accompanied by relevant signal words that identify the extent of the risk. In addition useful tips and recommendations for efficient and faultless operation are specially highlighted.

ATTENTION!

Notice

This indicates that damage to property may occur

- if the stated precautionary measures are not taken.

⚠ CAUTION!

Caution

This word with a warning triangle indicates that minor personal injury may occur

- if the stated precautionary measures are not taken.

⚠ WARNING!

Warning

This word with a warning triangle means there may be a considerable risk of fatal injury

- if the stated precautionary measures are not taken.

⚠ DANGER!

Danger

This word with a warning triangle indicates that there is a considerable risk of fatal injury

- if the stated precautionary measures are not taken.

Information

Information indicates important information about the product or serves to emphasize a section in the documentation that deserves special attention from the reader.

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2.6.2 Markup of text elements

Certain elements of the continuous text are distinguished as follows.

Quick DC-Link module	Words or expressions with a special meaning
Detailed information	Internal cross-reference
http://www.stoeber.de	External cross-reference

Software and display indicators

The following formatting is used to identify the various information content of elements referenced by the software interface or the drive controller display, as well as any user entries.

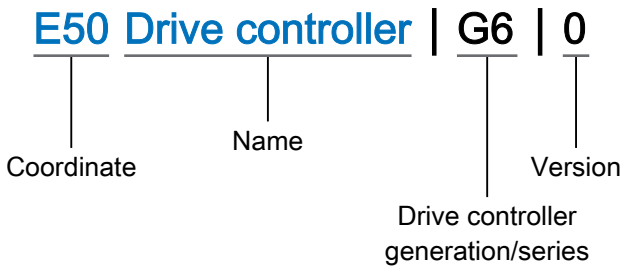
Main menu Settings	Window names, dialog names, page names or buttons, combined proper nouns, functions referenced by the interface
Select `Referencing method A`	Predefined entry
Save your `<own IP address>`	User-defined entry
EVENT 52: COMMUNICATION	Display indicators (status, messages, warnings, faults) for status information referenced by the interface

Keyboard shortcuts and command sequences or paths are represented as follows.

[CTRL], [CTRL] + [S]	Key, shortcut
Table > Insert table	Navigation to menus/submenus (path specification)

Interpretation of parameter identification

Parameter identification consists of the following elements, where short forms are also possible, i.e. only specifying a coordinate or the combination of coordinate and name.



2.7 Symbols, markings and test marks

The following symbols, markings and test marks are used in this document.

Grounding symbol
Grounding symbol in accordance with IEC 60417-5019 (DB:2002-10).

RoHS lead-free marking
Marking in accordance with RoHS directive 2011-65-EU.

CE mark
Manufacturer's self declaration: The product meets the requirements of EU directives.

UL mark
This product is listed by UL for the United States and Canada. Representative samples of this product have been evaluated by UL and meet the requirements of applicable standards.

UL test marks for recognized components
This component or material is recognized by UL. Representative samples of this product have been evaluated by UL and meet applicable requirements.

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2.8 Trademarks

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

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 of patented technologies licensed by Beckhoff Automation GmbH, Verl, Germany.
HIPERFACE®	HIPERFACE® and the HIPERFACE DSL® logo are registered trademarks of SICK STEGMANN GmbH, Donaueschingen, Germany.
PLCopen®	PLCopen® is a registered trademark of the PLCopen Organisation, Gorinchem, Netherlands.
PROFIBUS®, PROFINET®	The PROFIBUS and the PROFINET logo are registered trademarks of PROFIBUS Nutzerorganisation e.V., Karlsruhe, Germany.
speedtec®, springtec®	speedtec® and springtec® are registered trademarks of Intercontec Pfeiffer Industrie-Steckverbindungen GmbH, 94559 Niederwinkling, Germany.

All other trademarks not listed here are the property of their respective owners.

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.

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3 General safety instructions

There are risks associated with the product described in this documentation that can be prevented by complying with the described warning and safety instructions as well as the included technical rules and regulations.

3.1 Directives and standards

The following European directives and standards are relevant to the product specified in this documentation:

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- EN 61326-3-1:2008
- EN 61800-3:2004 and A1:2012
- EN 61800-5-1:2007
- EN 61800-5-2:2007
- EN 50178:1997
- IEC 61784-3:2010

Subsequent references to the standards do not specify the respective year in order to improve readability.

3.2 Qualified personnel

In order to be able to perform the tasks described in this documentation, the persons instructed to perform them must have the appropriate professional qualification and be able to assess the risks and residual hazards when handling the products. For this reason, all work on the products as well as their operation and disposal may be performed only by professionally qualified personnel.

Qualified personal are persons who have acquired authorization to perform these tasks either through training to become a specialist and/or instruction by specialists.

Furthermore, valid regulations, legal requirements, applicable basic rules, this documentation and the safety instructions included in it must be carefully read, understood and observed.

3.3 Intended use

As defined by DIN EN 50178, SC6 drive controllers are electrical devices operating as power electronics to control the flow of energy in high-voltage systems.

They are intended solely for the operation of STOBER LM series Lean motors, synchronous servo motors (e.g. from the STOBER EZ series), asynchronous motors or torque motors.

The connection of other electronic loads constitutes improper use.

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3.4 Transport and storage

Inspect the delivery for any transport damage immediately after you receive it. Notify the transport company of any damage immediately. Do not put a damaged product into operation.

To ensure the faultless and safe operation of the products, they must be professionally set up, installed, operated and maintained. If you have to transport or store the products, you must protect them from mechanical impacts and vibrations as well as observe the recommended transport and storage conditions in the technical data.

Store the products in a dry and dust-free room if you do not install them immediately.

3.5 Operational environment and operation

The products are subject to sales restrictions in accordance with IEC 61800-3.

The products are not designed for use in a public low-voltage network that supplies residential areas. Radio-frequency interference can be expected if the products are used in this type of network.

The products are designed exclusively for operation in TN networks.

The products are intended exclusively for installation in control cabinets with at least protection class IP54.

Always operate the products within the limits specified by the technical data.

The following applications are prohibited:

- Use in potentially explosive atmospheres
- Use in environments with harmful substances as specified by EN 60721, such as oils, acids, gases, vapors, dust and radiation

Implementation of the following applications is permitted only after approval from STOBER:

- Use in non-stationary applications
- The use of active components (drive controllers, supply modules, energy recovery units or discharge units) from third-party manufacturers

The drive controller is exclusively intended for operation in TN networks and only suitable for use in supply grids. At 480 V_{AC}, the drive controllers are permitted to supply a maximum symmetrical nominal short-circuit current in accordance with the following table:

Size	Max. symm. nominal short-circuit current
Size 0 – Size 2	5000 A

Tab. 1: Maximum symmetrical nominal short-circuit current of the drive controller

3.6 Working on the machine

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

- Disconnect (also ensure that the auxiliary circuits are disconnected).
- Protect against being turned on again.
- Check that voltage is not present.
- Ground and short circuit.
- Cover adjacent live parts.

Information

Note that the you can only determine that voltage is no longer present once the discharge time has elapsed. The discharge time depends on the self-discharge of the drive controller. You can find the discharge time in the general technical data.

3.7 Disposal

Observe the current national and regional regulations when disposing of the product! Dispose of the individual product parts depending on their properties, e.g. as:

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

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4 System configuration

For connecting to a controller, we recommend the PROFINET fieldbus in combination with the STOBER Drive Based application. As an alternative, you can use the EtherCAT fieldbus and an application with a CiA 402 interface. You commission the drive controller using the DriveControlSuite software.

The drive controllers offer the STO safety function in accordance with EN 61800-5-2 as an option. For connection to a higher-level safety circuit, different interfaces are available.

The following graphic explains the principle system configuration.

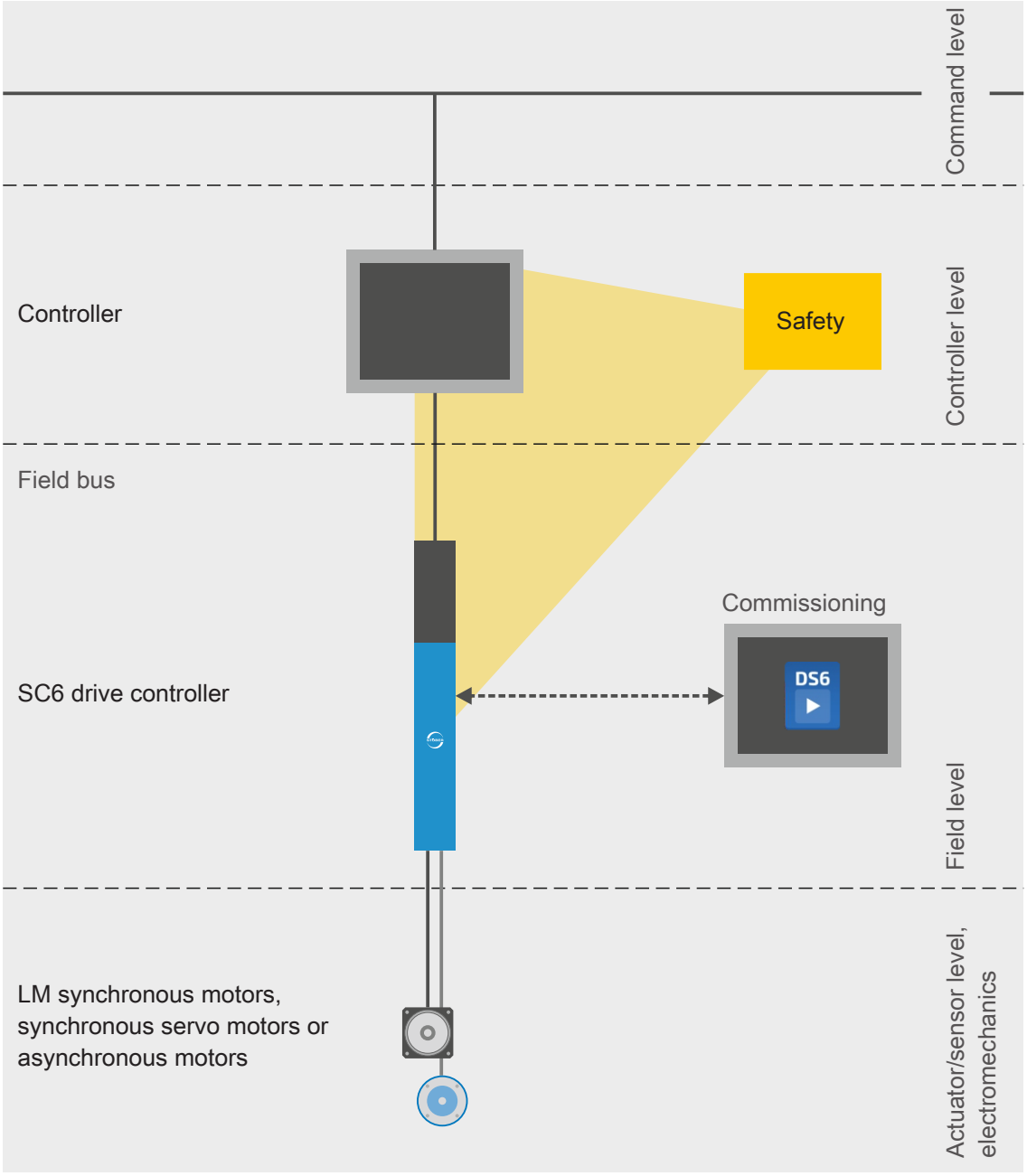


Fig. 1: System overview

4.1 Hardware components

Below you will find an overview of the available hardware components.

4.1.1 Drive controllers

The SC6 drive controller is available in three sizes. In addition, different safety options are available. The type specifications used in this documentation refer to the nameplate located on the side of the drive controller.

4.1.1.1 Nameplate

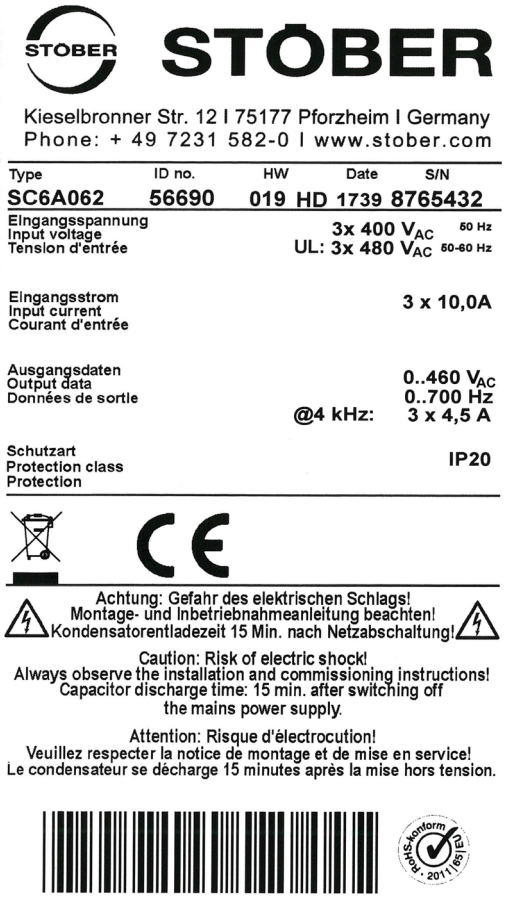


Fig. 2: SC6A062 nameplate

Designation	Value in example	Meaning
Types	SC6A062	Device type according to type designation
ID No.	56690	Identification number of the basic device
HW	019 HD	Production information
Date	1739	Production week in format YYWW, in the example shown here year 2017, week 39
S/N	8765432	Serial number
Input voltage	3 × 400 V_{AC} 50 Hz UL: 3 × 480 V_{AC} 50 – 60 Hz	Input voltage
Input current	3 × 10.0 A	Input current
Output data	0 to 460 V_{AC} 0 to 700 Hz @4 kHz: 3 × 4.5 A	Output voltage Output frequency Output current for 4 kHz clock frequency
Protection class	IP20	Protection class

Tab. 2: Meaning of the specifications on the SC6 nameplate

Information

UL and cUL-certified devices with corresponding test symbols meet the requirements of the standards UL 61800-5-1 and CSA C22.2 No. 274.

4.1.1.2 Variant

On the side of the drive controller next to the nameplate, there is another sticker with the MV and serial number.

Fig. 3: Sticker with MV and serial number

Designation	Value in example	Meaning
MV	MV0000057833	MV number
SN	SN: 600116688	Serial number

Tab. 3: Meaning of the specifications on the sticker

4.1.1.3 Type designation

SC	**6**	**A**	**0**	**6**	**2**	**Z**

Tab. 4: Example code for the SC6 type designation

Code	Designation	Design
SC	Series	ServoCompact
6	Generation	Generation 6
A	Version	
0 – 2	Size	
6	Power output stage	Power output stage within the size
2 1	Axis controller	Double-axis controller Single-axis controller
Z R Y	Safety technology	SZ6: Without safety technology SR6: STO using terminals SY6: STO and SS1 using FSoE

Tab. 5: Meaning of the SC6 example code

4.1.1.4 Sizes

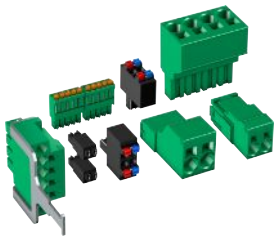
Type	ID No.	Size
SC6A062	56690	Size 0
SC6A162	56691	Size 1
SC6A261	56692	Size 2

Tab. 6: Available SC6 types and sizes

SC6 in sizes 0 to 2

Note that the basic device is delivered without terminals. Suitable terminal sets are available separately for each size.

Terminal set for drive controller



The following designs are available:

ID. No. 138652
Terminal set for SC6A062Z/Y.

ID. No. 138653
Terminal set for SC6A162Z/Y.

ID. No. 138654
Terminal set for SC6A261Z/Y.

4.1.2 Controller

The development of the MC6 motion controller and its integration into the STOBER product portfolio opens up new solutions for drive technology, especially for complex functions with demanding requirements for timing and precision.

The SC6 drive controller is connected over EtherCAT to the MC6.

Detailed information about the MC6 motion controller can be found in the corresponding manual, see the chapter Detailed information [▶ 205].

4.1.3 Operating motors, encoders and brakes

You can use the SC6 drive controller to operate Lean motors of the STOBER LM series, synchronous servo motors (such as those of the STOBER EZ series), asynchronous motors or torque motors.

Evaluation options for feedback are available on the X4 connection for the following encoders:

- EnDat 2.2 digital encoders
- SSI encoders
- Differential TTL and differential HTL incremental encoders (HTL over HT6 adapters)
- Resolver
- HIPERFACE DSL encoders

In addition, evaluation options for the following encoders are available on the X101 and X103 connection:

- Single-ended HTL incremental encoders
- Single-ended HTL pulse train

All device types of the SC6 drive controller have connections for PTC thermistors and can control a 24 V_{DC} brake as standard.

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4.1.4 Accessories

You can find information about the available accessories in the following chapters.

4.1.4.1 Safety technology

The safety modules are used to realize the STO safety function. They prevent the generation of a rotating magnetic field in the power unit of the drive controller. For an external requirement or in the event of error, the safety module switches the drive controller to the STO state. Different user interfaces and additional safety functions are available depending on the selected design of the accessories.

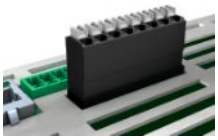
Information

Note that the drive controller is delivered as a standard version without safety technology. If you want a drive controller with integrated safety technology, you must order it together with the drive controller. The safety modules are an integrated part of the drive controllers and must not be modified.

Option SZ6 – Without safety technology

ID No. 56660
Standard version.

SR6 safety module – STO through terminals



ID No. 56661
Optional accessories for using the Safe Torque Off (STO) safety function in safety-relevant applications (PL e, SIL 3) in accordance with DIN EN ISO 13849-1 and DIN EN 61800-5-2. Connection to higher-level safety circuit through terminal X12 (included in the terminal set scope of delivery).

SY6 safety module – STO and SS1 using FSoE

Safety over EtherCAT®

ID No. 56662
Optional accessory for using the Safe Torque Off (STO) and Safe Stop 1 (SS1) safety functions in safety-relevant applications (PL e, SIL 3) in accordance with DIN EN ISO 13849-1 and DIN EN 61800-5-2. Connection to the higher-level safety circuit using Fail Safe over EtherCAT (FSoE).

Detailed information about using the safety technology can be found in the corresponding manual, see chapter Detailed information [▶ 205].

4.1.4.2 Communication

The drive controller has two interfaces for the fieldbus connection on the top of the device as well as an Ethernet service port on the front of the device. Cables for the connection are available separately.

EtherCAT or PROFINET fieldbus system

Please specify the desired fieldbus system when placing your purchase order for the base device.

EtherCAT cables

Ethernet patch cable, CAT5e, yellow.

The following designs are available:

ID No. 49313: Length approx. 0.2 m.
ID No. 49314: length approx. 0.35 m.

PC connecting cables

ID No. 49857
Cable for connecting the X9 service interface to the PC, CAT5e, blue, 5 m.

USB 2.0 Ethernet adapter

ID No. 49940
Adapter for connecting Ethernet to a USB port.

Detailed information about the fieldbus connection can be found in the corresponding manual, see chapter Detailed information [▶ 205].

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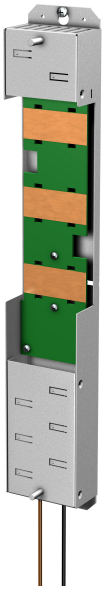
4.1.4.3 DC link connection

If you want to connect SC6 drive controllers into the DC-Link network, you will need Quick DC-Link modules of type DL6A.

You receive the DL6B rear section modules in different designs for a horizontal connection, suitable for the size of the drive controller.

The quick fastening clamps for mounting the copper rails are included in the scope of delivery. The copper rails are not included in the scope of delivery. These must have a cross-section of 5 x 12 mm. Insulation end sections are available separately.

DL6B Quick DC-Link for drive controller



The following designs are available:

DL6B10
ID No. 56655
Rear section module for drive controller of size 0.

DL6B10
ID No. 56656
Rear section module for drive controllers of size 1 or 2.

DL6B Quick DC-Link insulation end section

ID No. 56659
Insulation end sections for the left and right termination of the group, 2 pcs.

4.1.4.4 Braking resistor

STOBER offers braking resistors in different sizes and performance classes. More detailed information can be found in the chapter "Technical data".

4.1.4.5 Battery module for encoder buffering

Absolute Encoder Support (AES)

ID No. 55452
For buffering the power supply when using the EnDat 2.2 digital inductive value encoder with battery-buffered multi-turn stage, for example EBI1135, EBI135.
A battery is included.

Information

Note that the 15-pin extension cable between terminal X4 and AES may be necessary for the connection to the drive controller due to limited space.

AES replacement battery

ID No. 55453
Replacement battery for AES battery module.

4.1.4.6 HTL-to-TTL adapter

HT6 HTL-to-TTL adapter

ID No. 56665
Adapter for level conversion from HTL signals to TTL signals for connecting an HTL differential incremental encoder to terminal X4 of the drive controller.

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4.1.4.7 Interface adapters

AP6A00 interface adapters

ID No. 56498
Adapter (9/15-pin) for connecting resolver cables with 9-pin D-sub connectors to the X4 encoder interface of the drive controller.

4.1.4.8 Product CD

ELECTRONICS 6 product CD

Included in the standard version.

ID No. 442538
The CD-ROM contains the DriveControlSuite project configuration and commissioning software, documentation for drive controller and motion controller as well as the device description files for the drive controller-controller connection.

4.2 Software components

The available software components help you implement your drive system.

4.2.1 Project configuration and parameterization

For project configuration and parameterization, the drive controller can be addressed using the DriveControlSuite commissioning software. The program guides you step by step through the complete project configuration and parameterization process using wizards.

4.2.2 Applications

Drive-based motion control is recommended for the decentralized motion control of sophisticated machines.

The drive-based application package from STOBER is the right choice wherever universal and flexible solutions are needed. For the **STOBER Drive Based** application, the PLCOPEN Motion Control command set provides a drive-based motion controller for positioning, velocity and torque/force. These standard commands have been combined into operating modes for different applications and supplemented with additional functions such as jerk limit, motion block linking, cams and much more. For the Command operating mode, all properties of the movements are specified directly by the controller. The properties of the movements in the drive are predefined in the motion block operating mode so that only a start signal is necessary to perform the movement. Linking can be used to define complete motion sequences. There is a separate operating mode available for applications controlled by velocity or torque/force such as pumps, fans or conveyor belts. This also allows for operation without a controller.

In addition, the following applications are available with CiA interfaces:

The drive-based operating modes of the CiA 402 offer complete movement calculation and design through the drive controller. Using the **CiA 402 Drive Based** application, the reference values for position, velocity and torque/force (pp, pv, pt) are converted into movements accurately and precisely. Referencing and jogging are performed with jerk limitation during commissioning.

Using the **CiA 402 controller based** application in the drive controller, you can implement applications with synchronized, cyclic assignment of reference values (csp, csv, cst, ip) by a motion controller, such as an MC6. In addition, the drive controllers can also independently handle motion tasks, such as referencing and jogging when commissioning.

Detailed information about the available applications can be found in the corresponding manual, see the chapter Detailed information [▶ 205].

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5 Technical data

Technical data for the drive controllers and accessories can be found in the following chapters.

5.1 Drive controller

The following chapters contain specifications for the electrical data, dimensions and weight of the drive controller.

5.1.1 General technical data

The following specifications apply to all drive controller types.

Device features	
Protection class of the device	IP20
Protection class of the installation space	At least IP54
Radio interference suppression	Integrated line filter in accordance with EN 61800-3:2012, interference emission class C3
Overvoltage category	III in accordance with EN 61800-5-1:2008
Test symbols	CE

Tab. 7: Device features

Transport and storage conditions	
Storage/ transport temperature	−20 °C to +70 °C Maximum change: 20 K/h
Relative humidity	Maximum relative humidity 85%, non-condensing
Vibration (transport) in accordance with DIN EN 60068-2-6	5 Hz ≤ f ≤ 9 Hz: 3.5 mm 9 Hz ≤ f ≤ 200 Hz: 10 m/s² 200 Hz ≤ f ≤ 500 Hz: 15 m/s²

Tab. 8: Transport and storage conditions

Operating conditions	
Surrounding temperature during operation	0 °C to 45 °C with nominal data 45 °C to 55 °C with derating −2.5% / K
Relative humidity	Maximum relative humidity 85%, non-condensing
Installation altitude	0 m to 1000 m above sea level without restrictions 1000 m to 2000 m above sea level with −1.5%/100 m derating
Pollution degree	Pollution degree 2 in accordance with EN 50178
Ventilation	Installed fan
Vibration (operation) in accordance with DIN EN 60068-2-6	5 Hz ≤ f ≤ 9 Hz: 0.35 mm 9 Hz ≤ f ≤ 200 Hz: 1 m/s²

Tab. 9: Operating conditions

Discharge times	
Self-discharge of DC link	15 min

Tab. 10: Discharge times of the DC link circuit

5.1.2 Electrical data

The electrical data of the available SC6 sizes as well as the properties of the brake chopper can be found in the following sections.

Information

Direct, repeat activation of the supply voltage is possible for cyclical line on/line off operation in the event that charging capacity is not increased.

An explanation of the symbols used for formulas can be found in Chapter Symbols in formulas [▶ 206].

5.1.2.1 Control unit

Electrical data	All types
U_{1CU}	24 V_{DC}, +20%/−15%
I_{1maxCU}	0.5 A

Tab. 11: Control unit electrical data

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5.1.2.2 Power unit: Size 0

Electrical data	SC6A062
U_{1PU}	3 × 400 V_{AC}, +32% / −50%, 50/60 Hz; 3 × 480 V_{AC}, +10% / −58%, 50/60 Hz
f_{2PU}	0 – 700 Hz
U_{2PU}	0 – max. U_{1PU}
C_{PU}	270 µF
C_{maxPU}	1400 µF

Tab. 12: SC6 electrical data, size 0

The maximum charging capacity depends on the time between energizing two devices:

Information

If a time span of ≥ 15 min is maintained between energizing two devices, the maximum charging capacity C_{maxPU} increases to 1880 µF.

Nominal currents up to +45 °C (in the control cabinet)

Electrical data	SC6A062
$f_{PWM,PU}$	4 kHz
$I_{1N,PU}$	10 A
$I_{2N,PU}$	2 × 4,5 A
I_{2maxPU}	210% for 2 s

Tab. 13: SC6 electrical data, size 0, for 4 kHz clock frequency

Electrical data	SC6A062
$f_{PWM,PU}$	8 kHz
$I_{1N,PU}$	8,9 A
$I_{2N,PU}$	2 × 4 A
I_{2maxPU}	250% for 2 s

Tab. 14: SC6 electrical data, size 0, for 8 kHz clock frequency

Electrical data	SC6A062
U_{onCH}	780 – 800 V_{DC}
U_{offCH}	740 – 760 V_{DC}
R_{2minRB}	100 Ω
P_{maxRB}	6.4 kW
P_{effRB}	2.9 kW

Tab. 15: Brake chopper electrical data, size 0

5.1.2.3 Power unit: Size 1

Electrical data	SC6A162
U_{1PU}	3 × 400 V_{AC}, +32% / −50%, 50/60 Hz; 3 × 480 V_{AC}, +10% / −58%, 50/60 Hz
f_{2PU}	0 – 700 Hz
U_{2PU}	0 – max. U_{1PU}
C_{PU}	940 µF
C_{maxPU}	1400 µF

Tab. 16: SC6 electrical data, size 1

Information

If a time span of ≥ 15 min is maintained between energizing two devices, the maximum charging capacity C_{maxPU} increases to 1880 µF.

Nominal currents up to +45 °C (in the control cabinet)

Electrical data	SC6A162
$f_{PWM,PU}$	4 kHz
$I_{1N,PU}$	23,2 A
$I_{2N,PU}$	2 × 10 A
I_{2maxPU}	210% for 2 s

Tab. 17: SC6 electrical data, size 1, for 4 kHz clock frequency

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Electrical data	SC6A162
$f_{PWM,PU}$	8 kHz
$I_{1N,PU}$	20,9 A
$I_{2N,PU}$	2 × 9 A
I_{2maxPU}	250% for 2 s

Tab. 18: SC6 electrical data, size 1, for 8 kHz clock frequency

Electrical data	SC6A162
U_{onCH}	780 – 800 V_{DC}
U_{offCH}	740 – 760 V_{DC}
R_{2minRB}	47 Ω
P_{maxRB}	13.6 kW
P_{effRB}	6.2 kW

Tab. 19: Brake chopper electrical data, size 1

5.1.2.4 Power unit: Size 2

Electrical data	SC6A261
U_{1PU}	3 × 400 V_{AC}, +32% / −50%, 50/60 Hz; 3 × 480 V_{AC}, +10% / −58%, 50/60 Hz
f_{2PU}	0 – 700 Hz
U_{2PU}	0 – max. U_{1PU}
C_{PU}	940 µF
C_{maxPU}	1400 µF

Tab. 20: SC6 electrical data, size 2

Information

If a time span of ≥ 15 min is maintained between energizing two devices, the maximum charging capacity C_{maxPU} increases to 1880 µF.

Nominal currents up to +45 °C (in the control cabinet)

Electrical data	SC6A261
$f_{PWM,PU}$	4 kHz
$I_{1N,PU}$	22,6 A
$I_{2N,PU}$	19 A
I_{2maxPU}	210% for 2 s

Tab. 21: SC6 electrical data, size 2, for 4 kHz clock frequency

Electrical data	SC6A261
$f_{PWM,PU}$	8 kHz
$I_{1N,PU}$	17,9 A
$I_{2N,PU}$	15 A
I_{2maxPU}	250% for 2 s

Tab. 22: SC6 electrical data, size 2, for 8 kHz clock frequency

Electrical data	SC6A261
U_{onCH}	780 – 800 V_{DC}
U_{offCH}	740 – 760 V_{DC}
R_{2minRB}	47 Ω
P_{maxRB}	13.6 kW
P_{effRB}	6.2 kW

Tab. 23: Brake chopper electrical data, size 2

5.1.2.5 Parallel operation

The charging capacity of the driver controllers can be increased by a parallel connection only if the power grid supply is connected to all drive controllers simultaneously.

Note the general conditions for parallel connection in the chapter Project configuration [▶ 55].

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5.1.2.6 Binary inputs

X101 specification for binary signals

Electrical data	Binary input	Value
Low level	BE1 – BE4	0 – 8 V_{DC}
High level		12 – 30 V_{DC}
U_{1max}		30 V_{DC}
I_{1max}		16 mA
f_{1max}	BE1 – BE2	10 kHz
	BE3 – BE4	250 kHz
Internal device update rate	BE1 – BE4	Cycle time for the application parameterized in A150; t_{min} = 1 ms; Also applicable for binary inputs BE3 and BE4: with timestamp correction in an accuracy range of 1 µs
Max. cable length		30 m

Tab. 24: X101 electrical data

X103 specification for binary signals

Electrical data	Binary input	Value
Low level	BE6 – BE9	0 – 8 V_{DC}
High level		12 – 30 V_{DC}
U_{1max}		30 V_{DC}
I_{1max}		16 mA
f_{1max}	BE6 – BE7	10 kHz
	BE8 – BE9	250 kHz
Internal device update rate	BE6 – BE9	Cycle time for the application parameterized in A150; t_{min} = 1 ms; Also applicable for binary inputs BE8 and BE9: with timestamp correction in an accuracy range of 1 µs
Max. cable length		30 m

Tab. 25: X103 electrical data

5.1.2.7 Single-ended load on double-axis controllers

Operating 2 motors on one double-axis controller makes it possible to operate one of the motors with a continuous current above the nominal drive controller current if the continuous current of the second connected motor is lower than the nominal drive controller current. This enables economical combinations of double-axis controllers and motors.

The nominal output current for axis B can be determined using the following formula if the output current for axis A is known:

Example 1

$$I_{2PU(B)} = I_{2N,PU} - \left(I_{2PU(A)} - I_{2N,PU} \right) \times \frac{3}{5} \qquad \text{where} \qquad 0 \le I_{2PU(A)} \le I_{2N,PU}$$

Example 2

$$I_{2PU(B)} = I_{2N,PU} - \left(I_{2PU(A)} - I_{2N,PU} \right) \times \frac{5}{3} \qquad \text{where} \qquad I_{2N,PU} \le I_{2PU(A)} \le 1{,}6 \times I_{2N,PU}$$

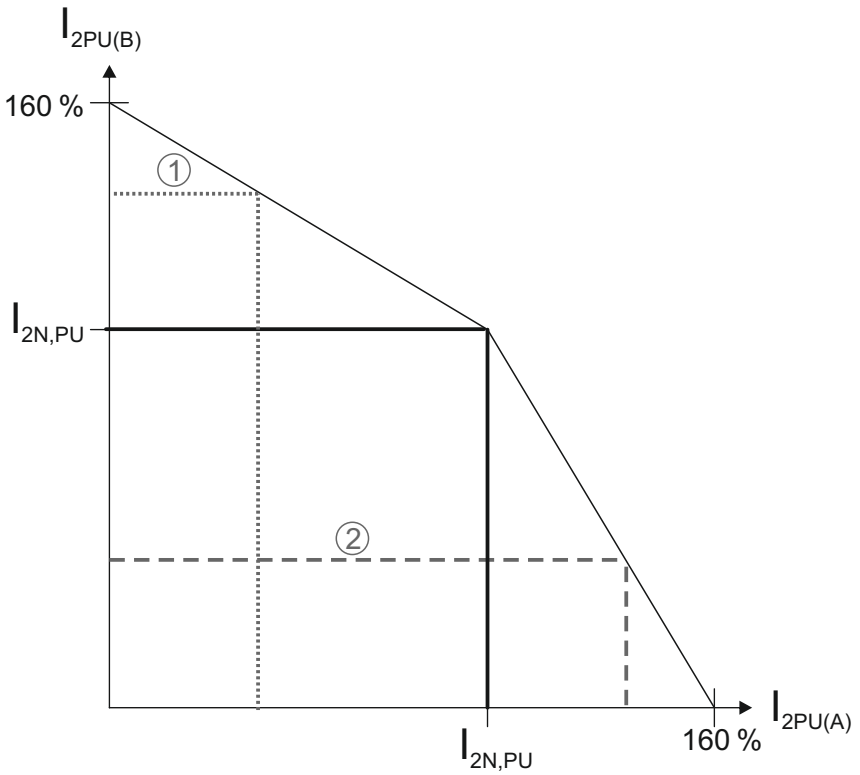

Fig. 4: Single-ended load on double-axis controllers

Information

Note that the available maximum currents $I_{2max,PU}$ of the axis controllers also relative to the nominal output current $I_{2N,PU}$ for a single-ended load.

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5.1.2.8 Power loss data in accordance with EN 50598

Type	Nominal current $I_{2N,PU}$	Apparent power	Absolute losses $P_{V,CU}$[1]	Operating points[2]								IE class[3]	Comparison[4]
				(0/25)	(0/50)	(0/100)	(50/25)	(50/50)	(50/100)	(90/50)	(90/100)		
				Relative losses									
	[A]	[kVA]	[W]	[%]									
SC6A062	4,5	6.2	Max. 10	1.34	1.49	1.86	1.40	1.63	2.19	1.84	2.77	IE2	
SC6A162	10	13.9	Max. 10	0.76	0.92	1.43	0.81	1.04	1.75	1.22	2.29	IE2	
SC6A261	19	13.2	10	0.77	0.95	1.56	0.82	1.08	1.89	1.25	2.43	IE2	
				Absolute losses P_V									
	[A]	[kVA]	[W]	[W]									[%]
SC6A062	4,5	6.2	Max. 10	83.2	92.5	115.2	86.7	100.8	135.8	113.9	171.7	IE2	36.0
SC6A162	10	13.9	Max. 10	105.5	128.3	198.8	113.1	145.1	243.5	170.1	318.7	IE2	40.8
SC6A261	19	13.2	Max. 10	101.2	125.8	206.1	108.5	142.0	249.5	165.6	320.4	IE2	41.0

Tab. 26: Power loss data of the SC6 drive controller in accordance with EN 50598

[1] Absolute losses for a power unit that is switched off
[2] Operating points for relative motor stator frequency in % and relative torque current in %
[3] IE class in accordance with EN 50598
[4] Comparison of the losses for the reference drive controller relative to IE2 in the nominal point (90, 100)

General conditions

The specified losses apply to a drive controller. They apply to both axes together in the case of double-axis controllers.

The loss data applies to drive controllers without any accessories.

The power loss calculation is based on a three-phase supply voltage with 400 V_{AC} / 50 Hz.

The calculated data includes a supplement of 10% in accordance with EN 50598.

The power loss specifications refer to a clock frequency of 4 kHz.

The absolute losses for a power unit that is switched off refer to the 24 V_{DC} power supply of the control electronics.

5.1.2.9 Power loss data of accessories

If you intend to order the drive controller with accessory parts, losses increase as follows.

Type	Absolute losses P_V [W]
SR6 safety module	1
SY6 safety module	2

Tab. 27: Absolute losses in the accessories

Information

Note the absolute power loss of the encoder (usually < 3 W) and of the brake when designing as well.

Loss specifications for other optional accessories can be found in the technical data of the respective accessory part.

5.1.3 Derating

When dimensioning the drive controller, observe the derating of the nominal output current as a function of the clock frequency, surrounding temperature and installation altitude. There is no restriction for a surrounding temperature from 0 °C to 45 °C and an installation altitude of 0 m to 1000 m. The details given below apply to values outside these ranges.

5.1.3.1 Effect of the clock frequency

Changing the clock frequency f_{PWM} affects the amount of noise produced by the drive, among other things. However, increasing the clock frequency results in increased losses. During project configuration, define the highest clock frequency and use it to determine the nominal output current $I_{2N,PU}$ for dimensioning the drive controller.

Information

Select the defined clock frequency using parameter B24. The clock frequency for double-axis controllers always applies to both axis controllers.

5.1.3.2 Effect of the surrounding temperature

Derating as a function of the surrounding temperature is determined as follows:

- 0 °C to 45 °C: No restrictions (D_T = 100%)
- 45 °C to 55 °C: Derating −2.5%/K

Example

The drive controller needs to be operated at 50 °C.

The derating factor D_T is calculated as follows
D_T= 100% − 5 × 2.5% = 87.5%

5.1.3.3 Effect of the installation altitude

Derating as a function of the installation altitude is determined as follows:

- 0 m to 1000 m: No restriction (D_{IA} = 100%)
- 1000 m to 2000 m: Derating −1.5%/100 m

Example

The drive controller needs to be installed at an altitude of 1500 m above sea level.

The derating factor D_{IA} is calculated as follows:
D_{IA} = 100% − 5 × 1.5% = 92.5%

5.1.3.4 Calculating the derating

Follow these steps for the calculation:

1. Determine the highest clock frequency (f_{PWM}) that will be used during operation and use it to determine the nominal current $I_{2N,PU}$.
2. Determine the derating factors for installation altitude and surrounding temperature.
3. Calculate the reduced nominal current $I_{2N,PU(red)}$ in accordance with the following formula:
   $I_{2N,PU(red)} = I_{2N,PU} \times D_T \times D_{IA}$

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5.1.4 Dimensions

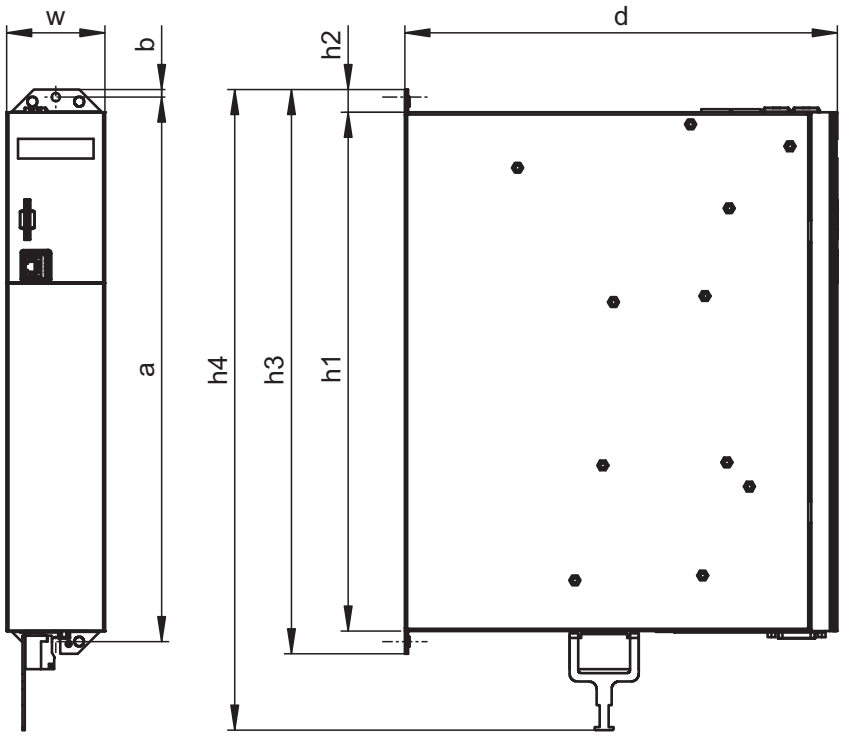

Fig. 5: SC6 dimensional drawing

Dimension			Size 0	Size 1	Size 2
Drive controller	Width	w	45	65	
	Depth	d	265	286	
	Body height	h1	343		
	Fastening clip height	h2	15		
	Height incl. fastening clips	h3	373		
	Total height incl. shield connection	h4	423		
Fastening holes (M5)	Vertical distance	a	360+2		
	Vertical distance to the upper edge	b	5		

Tab. 28: SC6 dimensions [mm]

5.1.5 Weight

Type	Weight without packaging [g]	Weight with packaging [g]
SC6A062	3600	5200
SC6A162	5300	6700
SC6A261	5200	6400

Tab. 29: SC6 weight [g]

5.2 Safety technology

The SR6 option adds the STO safety function to the SC6 drive controller through terminal X12.

Information

If you would like to use STO safety function over terminals, be sure to read the SR6 manual; see the chapter Detailed information [▶ 205].

Specification	Electrical data
STO_a	U_{1max} = 30 V_{DC} (PELV) high level = 15 – 30 V_{DC} low level = 0 – 8 V_{DC} I_{1max} = 100 mA (typically < 30 mA for 24 V_{DC}) I_{max} = 4 A C_{1max} = 10 nF
STO_b	
STO_{status}	$U_2 = U_1 - (1.5\ \Omega * I_1)$
STO_{status} supply	U_1 = +24 V_{DC}, +20%/25% I_{1max} = 100 mA
GND	—

Tab. 30: X12 electrical data for SR6 option

5.3 DC link connection

The following section contains specifications for the electrical data, dimensions and weight of DL6B Quick DC-Link modules.

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5.3.1 General technical data

The following information applies to all Quick DC-Link modules and corresponds to the general technical data for the base device.

Device features	
Protection class of the device	IP20
Protection class of the installation space	At least IP54

Tab. 31: Device features

Transport and storage conditions	
Storage/ transport temperature	−20 °C to +70 °C Maximum change: 20 K/h
Relative humidity	Maximum relative humidity 85%, non-condensing
Vibration (transport) in accordance with DIN EN 60068-2-6	5 Hz ≤ f ≤ 9 Hz: 3.5 mm 9 Hz ≤ f ≤ 200 Hz: 10 m/s² 200 Hz ≤ f ≤ 500 Hz: 15 m/s²

Tab. 32: Transport and storage conditions

Operating conditions	
Surrounding temperature during operation	0 °C to 45 °C with nominal data 45 °C to 55 °C with derating −2.5% / K
Relative humidity	Maximum relative humidity 85%, non-condensing
Installation altitude	0 m to 1000 m above sea level without restrictions 1000 m to 2000 m above sea level with −1.5%/100 m derating
Pollution degree	Pollution degree 2 in accordance with EN 50178
Vibration (operation) in accordance with DIN EN 60068-2-6	5 Hz ≤ f ≤ 9 Hz: 0.35 mm 9 Hz ≤ f ≤ 200 Hz: 1 m/s²

Tab. 33: Operating conditions

5.3.2 DL6B – SC6 assignment

DL6B is available in the following designs suitable for the individual drive controller types:

Type	DL6B10	DL6B11
ID No.	56655	56656
SC6A062	X	—
SC6A162	—	X
SC6A261	—	X

Tab. 34: DL6B to SC6 assignment

5.3.3 Dimensions

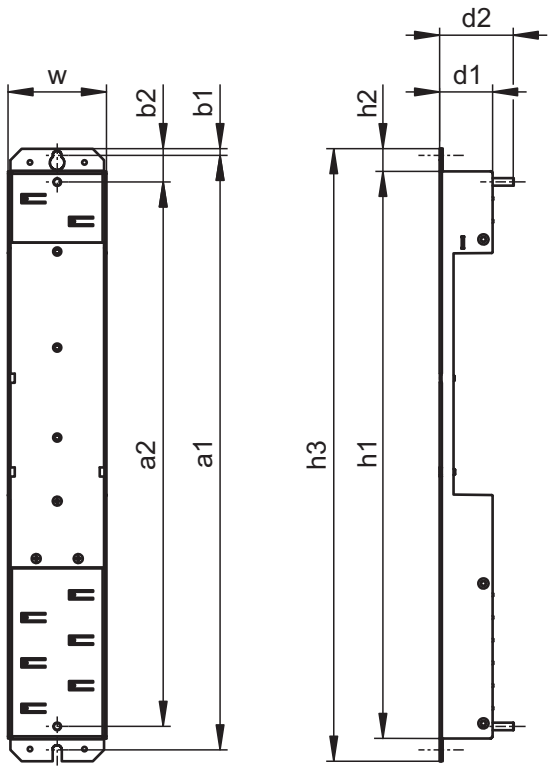

Fig. 6: DL6B dimensional drawing

Dimension			DL6B10	DL6B11
Quick DC-Link	Width	w	45	65
	Depth	d1	35	
	Depth incl. attachment bolts	d2	49	
	Height	h1	375	
	Fastening clip height	h2	15	
	Height incl. fastening clips	h3	405	
Fastening holes	Vertical distance (wall mounting)	a1	393+2	
	Vertical distance (module mounting)	a2	360	
	Vertical distance to the upper edge	b1	4.5	
	Vertical distance to the upper edge	b2	22	

Tab. 35: DL6B dimensions [mm]

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5.3.4 Weight

Type	Weight without packaging [g]	Weight with packaging [g]
DL6B10	420	460
DL6B11	560	600

Tab. 36: DL6B weight [g]

5.4 Operating motors

You can operate the following motors with the specified control modes on the drive controller.

Motor type	B20 Control mode	Encoders	Other settings	Characteristics
LM Lean motor	32: LM - sensorless vector control	No encoder required	Without field weakening (B91 Field weakening = 0: Inactive)	Dynamics, accuracy, constant speed, overcurrent protection
			Without field weakening (B91 Field weakening = 1: Active)	Dynamics, accuracy, constant speed, overcurrent protection, greater speed range, but also higher current requirement
Synchronous servo motor, torque motor	64: SSM - vector control	Absolute encoder required: EnDat 2.1/2.2 digital, SSI, resolver or HIPERFACE DSL encoders	Without field weakening (B91 Field weakening = 0: Inactive)	High dynamics, high accuracy, very constant speed, high overcurrent protection
			Without field weakening (B91 Field weakening = 1: Active)	High dynamics, high accuracy, very constant speed, high overcurrent protection, greater speed range, but also higher current requirement

Motor type	B20 Control mode	Encoders	Other settings	Characteristics
Asynchronous motor	2: ASM - vector control	Encoder required	—	High dynamics, high accuracy, very constant speed, high overcurrent protection
	3: ASM - sensorless vector control	No encoder required	—	Dynamics, accuracy, constant speed, overcurrent protection
	1: ASM - V/f-slip compensated		Linear characteristic curve (B21 V/f-characteristic = 0: Linear)	Very constant speed, accuracy
			Quadratic characteristic curve (B21 V/f-characteristic = 1: Square)	Very constant speed, accuracy, especially suitable for fan applications
	0: ASM - V/f-control		Linear characteristic curve (B21 V/f-characteristic = 0: Linear)	Very constant speed
			Quadratic characteristic curve (B21 V/f-characteristic = 1: Square)	Very constant speed, especially suitable for fan applications

Tab. 37: Motor types and control modes

5.5 Evaluable encoders

The technical data of the evaluable encoder can be found in the following chapters.

5.5.1 X4

EnDat 2.2 digital encoders

Specification	EnDat 2.2 digital
U_2	12 V_{DC} (unregulated)
I_{2max}	250 mA
Encoder design	Single-turn and multi-turn
Clock frequency	4 MHz
Max. cable length	100 m, shielded

Tab. 38: EnDat 2.2 digital specification

SSI encoders

Specification	SSI signals
U_2	12 V_{DC} (unregulated)
I_{2max}	250 mA
Encoder design	Single-turn and multi-turn
Clock frequency	250 kHz
Sampling rate	250 µs
Code	Binary or gray
Format	13, 24 or 25 bits
Transfer	Double or single
Max. cable length	100 m, shielded

Tab. 39: SSI specification

Incremental encoders

Specification	Incremental signals
U_2	12 V_{DC} (unregulated)
I_{2max}	250 mA
f_{max}	1 MHz
Signal level	TTL, differential
Max. cable length	100 m, shielded

Tab. 40: Specification for TTL differential incremental signals

Information

Calculation example – Limit frequency f_{max}
for an encoder with 2,048 pulses per revolution: 3,000 revolutions per minute (equivalent to 50 revolutions per second) * 2,048 pulses per revolution = 102,400 pulses per second = 102.4 kHz << 1 MHz

Information

Using a HT6 adapter for level conversion from HTL signals to TTL signals, it is also possible to connect an differential HTL incremental encoder to terminal X4. Note that, with an external power supply, the maximum level of 20 V_{DC} for the the HTL signals may not be exceeded.

Resolver

Specification	Resolver signals
U_2	−10 V_{DC} to +10 V_{DC}
I_{2max}	80 mA
f_2	7 – 9 kHz
P_{max}	0.8 W
Transfer ratio	0.5 ± 5 %
Number of poles	2, 4 and 6
Signal shape	Sinus
Max. cable length	100 m, shielded

Tab. 41: Specification for resolver signals

HIPERFACE DSL encoders

Specification	HIPERFACE DSL
U_2	12 V_{DC} (unregulated)
I_{2max}	250 mA
Encoder design	Single-turn and multi-turn
Modulation frequency	75 MHz
Max. cable length	100 m, shielded

Tab. 42: Specification for HIPERFACE DSL

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Unsuitable encoder types

The following STOBER encoder types may **not** be connected:

Encoder type	Code according to type designation
ECI 1118	C0
EQI 1130	Q0
ECI 1319	CR
EQI 1329	QP
EQI 1331	QR

Tab. 43: Encoder types with unsuitable input voltage range

5.5.2 X101 for encoders

Electrical data	Binary input	Incremental signals, pulse train signals
Low level	BE1 – BE4	0 – 8 V_{DC}
High level		15 – 30 V_{DC}
U_{1max}		30 V_{DC}
I_{1max}		16 mA
f_{1max}	BE1 – BE2	10 kHz
	BE3 – BE4	250 kHz
Max. cable length	BE1 – BE4	30 m

Tab. 44: Specification for single-ended HTL incremental signals and single-ended HTL pulse train signals

Information

Calculation example – Limit frequency f_{max}
for an encoder with 2,048 pulses per revolution: 3,000 revolutions per minute (equivalent to 50 revolutions per second) * 2,048 pulses per revolution = 102,400 pulses per second = 102.4 kHz < 250 kHz

5.5.3 X103 for encoders

Electrical data	Binary input	Incremental signals, pulse train signals
Low level	BE6 – BE9	0 – 8 V_{DC}
High level		15 – 30 V_{DC}
U_{1max}		30 V_{DC}
I_{1max}		16 mA
f_{1max}	BE6 – BE7	10 kHz
	BE8 – BE9	250 kHz
Max. cable length	BE6 – BE9	30 m

Tab. 45: Specification for single-ended HTL incremental signals and single-ended HTL pulse train signals

Information

Calculation example – Limit frequency f_{max}
for an encoder with 2,048 pulses per revolution: 3,000 revolutions per minute (equivalent to 50 revolutions per second) * 2,048 pulses per revolution = 102,400 pulses per second = 102.4 kHz < 250 kHz

5.6 Controllable brakes

The brake of axis A is connected to X2A. Connect the brake of axis B to X2B for double-axis controllers.

You can control the following brakes:

- 24 V_{DC} brakes connected directly to X2A or X2B (in acc. with the technical data).
- Indirectly connected brakes with a different nominal voltage (controlled via an external 24 V_{DC} switching device).

The brake is supplied over X300.

Electrical data	Brake output
U_2	24 V_{DC}, +25%
I_{2max}	2.5 A
f_{2max}	1 Hz at $I_N \leq 2.1$ A; 0.25 Hz at $I_N > 2.1$ A
E_{2max}	1.83 J

Tab. 46: Electrical data of the brake output

Information

In the case of a nominal brake current > 2.1 A, the system controller must ensure compliance with the maximum switching frequency of 0.25 Hz.

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5.7 Braking resistor

In addition to drive controllers, STOBER offers the following braking resistors described below in various sizes and performance classes. For the selection, note the minimum permitted braking resistors specified in the technical data of the individual drive controller types.

5.7.1 FZMU, FZZMU tubular fixed resistor

Type	FZMU 400×65	FZZMU 400×65
ID No.	49010	53895
SC6A062	X	—
SC6A162	(X)	X
SC6A261	(X)	X

Tab. 47: Assignment of FZMU, FZZMU 400×65 braking resistor – SC6 drive controller

X	Recommended
(X)	Possible
(—)	Useful under certain conditions
—	Not possible

Properties

Specification	FZMU 400×65	FZZMU 400×65
ID No.	49010	53895
Type	Tubular fixed resistor	Tubular fixed resistor
Resistance [Ω]	100	47
Power [W]	600	1200
Therm. time const. τ_{th} [s]	40	40
Pulse power for < 1 s [kW]	18	36
U_{max} [V]	848	848
Weight [kg]	Approx. 2.2	Approx. 4.2
Protection class	IP20	IP20
Test symbols	c UL us CE	c UL us CE

Tab. 48: FZMU, FZZMU 400×65 specification

The internal connections are wired to terminals with heat-resistant, silicone-insulated strands of wire. Also ensure a heat-resistant and stress-resistant design for the connection!

Connection type	Conductor cross-section [mm²]
Rigid	0.5 – 4.0
Flexible with end sleeve	0.5 – 2.5

Tab. 49: FZMU conductor cross-section, FZZM(Q)U 400×65

Dimensions

Dimension	FZMU 400×65	FZZMU 400×65
ID No.	49010	53895
L x D	400 × 65	400 × 65
H	120	120
K	6.5 × 12	6.5 × 12
M	430	426
O	485	450
R	92	185
U	64	150
X	10	10

Tab. 50: FZMU, FZZMU 400×65 dimensions [mm]

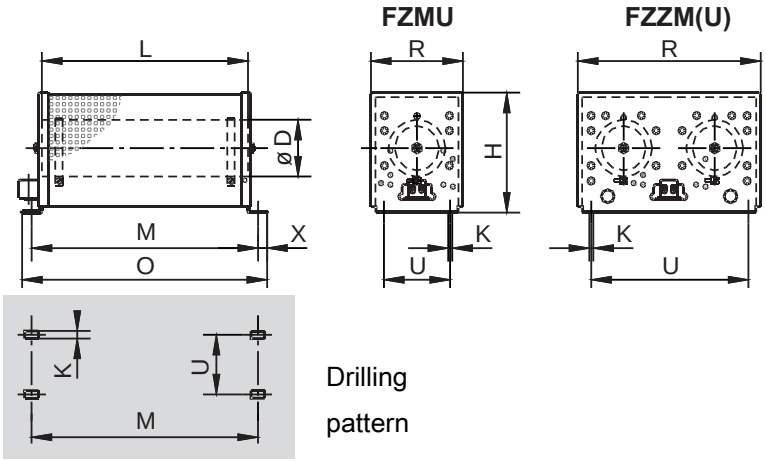

Fig. 7: FZMU, FZZMU 400×65 dimensional drawing

5.7.2 GVADU, GBADU flat resistor

Type	GVADU 210×20	GBADU 265×30	GBADU 335×30
ID No.	55441	55442	55443
SC6A062	X	X	—
SC6A162	(X)	(X)	X
SC6A261	(X)	(X)	X

Tab. 51: Assignment of GVADU, GBADU braking resistor – SC6 drive controller

X	Recommended
(X)	Possible
(—)	Useful under certain conditions
—	Not possible

Properties

Specification	GVADU 210×20	GBADU 265×30	GBADU 335×30
ID No.	55441	55442	55443
Type	Flat resistor	Flat resistor	Flat resistor
Resistance [Ω]	100	100	47
Power [W]	150	300	400
Therm. time const. τ_{th} [s]	60	60	60
Pulse power for < 1 s [kW]	3.3	6.6	8.8
U_{max} [V]	848	848	848
Cable design	Radox	FEP	FEP
Cable length [mm]	500	500	500
Cable cross-section [AWG]	18/19 (0.82 mm²)	14/19 (1.9 mm²)	14/19 (1.9 mm²)
Weight [g]	300	950	1200
Protection class	IP54	IP54	IP54
Test symbols			

Tab. 52: GVADU, GBADU specification

Dimensions

Dimension	GVADU 210×20	GBADU 265×30	GBADU 335×30
ID No.	55441	55442	55443
A	210	265	335
H	192	246	316
C	20	30	30
D	40	60	60
E	18.2	28.8	28.8
F	6.2	10.8	10.8
G	2	3	3
K	2.5	4	4
J	4.3	5.3	5.3
β	65°	73°	73°

Tab. 53: GVADU, GBADU dimensions [mm]

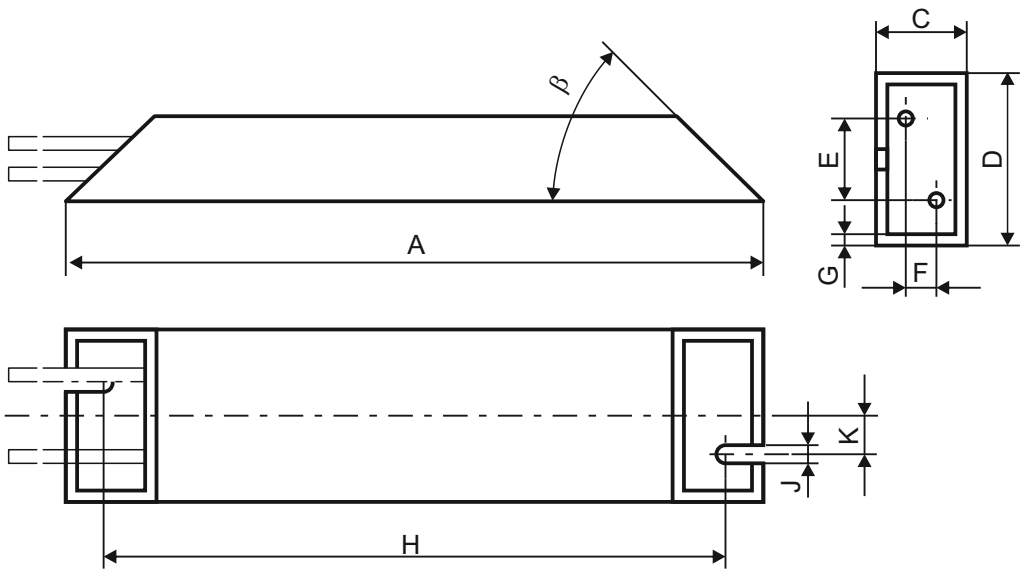

Fig. 8: GVADU, GBADU dimensional drawing

6 Project configuration

Relevant information on the project configuration and design of your drive system can be found in the following chapters.

6.1 DC link connection

Braked motors work like generators: Operating with an active drive controller, they convert kinetic energy from movement into electrical energy. This electrical energy is stored in the DC link capacitors of the drive controller. It can be supplied to powered motors with connected DC circuits and be used efficiently as a result.

However, capacitors in the DC link can only accept a limited amount of energy. The DC link voltage increases when a motor decelerates. If the DC link voltage rises above a defined limit, a chopper circuit is activated that tries to convert the excess energy into heat by means of a connected braking resistor. If the permitted maximum voltage is nonetheless reached, any possible damage must be prevented. The drive controller switches to the FAULT state and shuts down.

In a DC link connection, the DC link capacitors of the drive controllers involved are connected in parallel. As a result, the maximum acceptable amount of energy increases in the DC link in comparison to a single unit.

The DC link connection can help save energy and reduce costs, especially in coil winding technology or during regular acceleration and braking cycles.

6.1.1 Information on design and operation

In order to connect the capacitors of multiple drive controllers, you need a separate DL6B type Quick DC-Link module for each drive controller and every supply module in the group.

Information

Note that Quick DC-Link can be subject to system or country-specific standards.

Central braking resistor

During a controlled emergency stop, all drive controllers may brake at the same time. During the design phase, check whether a central braking resistor is necessary to be able to stop certain system parts safely within a prescribed time.

Electrical data of the drive controller

The electrical data of the individual drive controller types must be observed in the design and operation of Quick DC-Link, including the following in particular:

- Self-capacitance C_{PU}
- Charging capacity C_{maxPU}
- Nominal input current $I_{1N,PU}$
- Derating of the nominal input current

You can find the values in the technical data for the drive controller.

Maximum voltage and maximum current

The maximum DC link voltage is 750 V_{DC} and the maximum permitted overall current is 200 A.

Protective measures

Note the information in the following chapters:

- Power grid supply in parallel operation [▶ 69]
- Line fuse in parallel operation [▶ 70]
- Grid connection in parallel operation [▶ 71]

6.1.2 Design

Charging capacity

The charging circuit integrated into a drive controller can charge the DC links of other drive controllers in addition to its own DC link.

Information

For a design with Quick DC-Link, note that the sum of the charging capacities of the drive controllers connected to the grid is greater than or equal to the sum of the self-capacitances of all drive controllers in the DC link group.

Minimum time between energizing two devices

The drive controllers have temperature-dependent resistors in the charging circuit that prevent the devices from being damaged when being connected to the grid after a fault, such as a short-circuited DC link, incorrect wiring, etc. These resistors are heated when charging the DC link. In order to prevent overloading, a specified, minimum time period must be maintained between energizing two devices.

Example – Checking the charging capacity of drive controllers connected to the grid

A SC6A261 drive controller connected to the grid is intended to charge another SC6A261 drive controller.

The DC link capacitance in the group to be charged corresponds to the sum of the self-capacitance values of all drive controllers in the group: 2 × 940 µF = 1880 µF.

The maximum charging capacity of the drive controller connected to the grid is 1400 µF.

Information

If a time span of ≥ 15 min is maintained between energizing two devices, the maximum charging capacity C_{maxPU} increases to 1880 µF.

In this case, Quick DC-Link is permitted only if the minimum time of 15 min between energizing two devices is maintained.

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7 Storage

Store the products in a dry and dust-free room if you do not install them immediately.

Observe the Transport and storage conditions [▶ 29] specified in the technical data.

7.1 Drive controller

The DC link capacitors can lose their electrical strength due to long storage times.

ATTENTION!

Material damage due to reduced electrical strength!

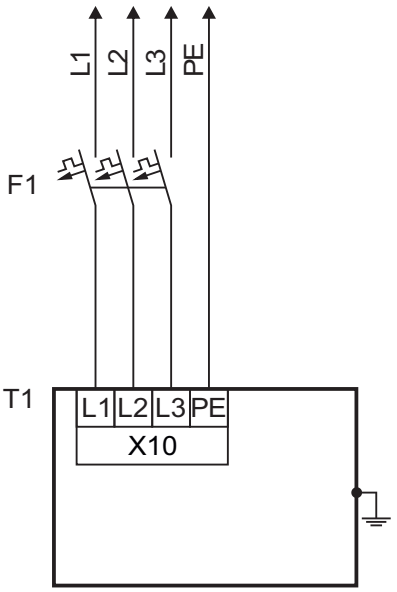
Reduced electrical strength can cause considerable material damage when switching on the drive controller.

- Reform drive controllers in storage annually or before commissioning.

7.1.1 Annual reforming

To prevent damage to stored drive controllers, STOBER recommends connecting stored devices to the supply voltage once per year for one hour.

The following graphics show the basic line connection for 3-phase devices.

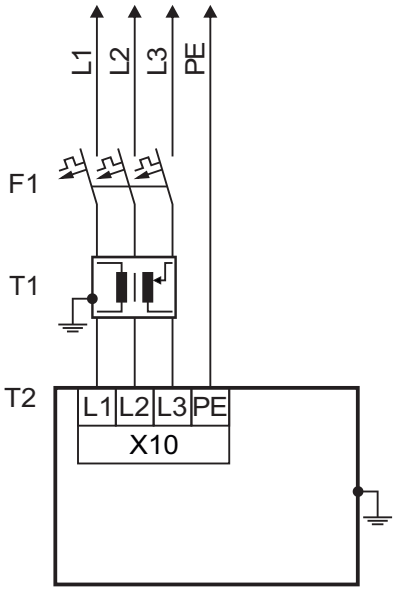


L1 – L3	Lines 1 to 3
N	Neutral conductor
PE	Grounding conductor
F1	Fuse
T1	Drive controller

7.1.2 Reforming before commissioning

If reforming is not possible every year, institute reforming on stored devices before commissioning. Note that the voltage levels depend on the storage time.

The following graphic shows the predominant supply connection.



L1 – L3	Lines 1 to 3
N	Neutral conductor
PE	Grounding conductor
F1	Fuse
T1	Variable transformer
T2	Drive controller

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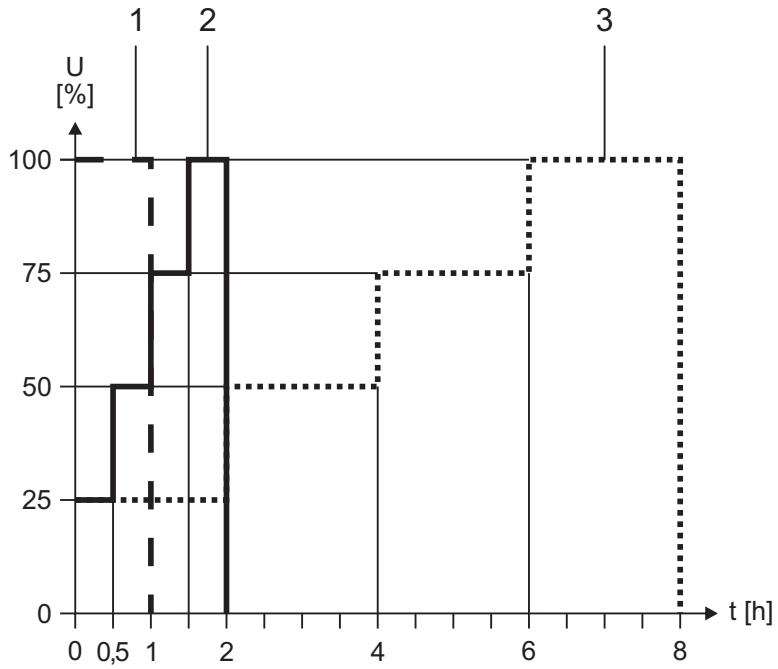

Fig. 9: Voltage levels dependent on storage time

1	Storage time of 1 – 2 years:	Apply voltage for 1 hour before switching on.
2	Storage time of 2 – 3 years:	Implement reforming according to the graph before switching on.
3	Storage time ≥ 3 years:	Implement reforming according to the graph before switching on.
	Storage time < 1 year:	No actions required.

8 Installation

The following chapters describe the installation of a drive controller and the available accessories.

8.1 Safety instructions for installation

Installation work is permitted only when no voltage is present. Observe the 5 safety rules; see the chapter Working on the machine [▶ 16].

Note the minimum clearances specified during installation to prevent the devices from overheating.

Protect the devices against falling parts (bits or strands of wire, pieces of metal, etc.) during installation or other work in the control cabinet. Parts with conductive properties may result in a short circuit inside the devices and device failure as a result.

8.2 Basic assembly instructions

Drive controller

Note the following points for installation:

- Prevent condensation, e.g. with anti-condensation heating elements.
- Note that drive controllers in storage require reforming each year or before commissioning at the latest.
- For reasons related to EMC, use installation plates with a conductive surface (unpainted, etc.).
- Fasten the device to the mounting plate using M5 screws.
- Install the devices vertically.
- Avoid installation above or in the immediate vicinity of heat-generating devices, e.g. output chokes or braking resistors.
- To ensure there is sufficient air circulation in the control cabinet, observe the minimum clearances.

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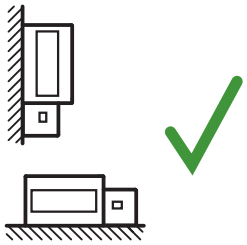
FZMU, FZZMU tubular fixed resistor



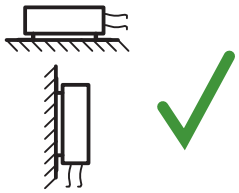
Permitted installation:

- On vertical surfaces with terminals downwards
- On horizontal surfaces
- In control cabinets

Impermissible installation:

- On vertical surfaces with terminals upwards, left or right
- Outside of control cabinets

GVADU, GBADU flat resistor



Permitted installation:

- On vertical surfaces with cables downwards
- On horizontal surfaces
- Installation outside of the control cabinet possible for mechanical protection of the conductors

Impermissible installation:

- On vertical surfaces with cables upwards

8.3 Minimum clearances

Note the minimum clearances for installation below.

Drive controller

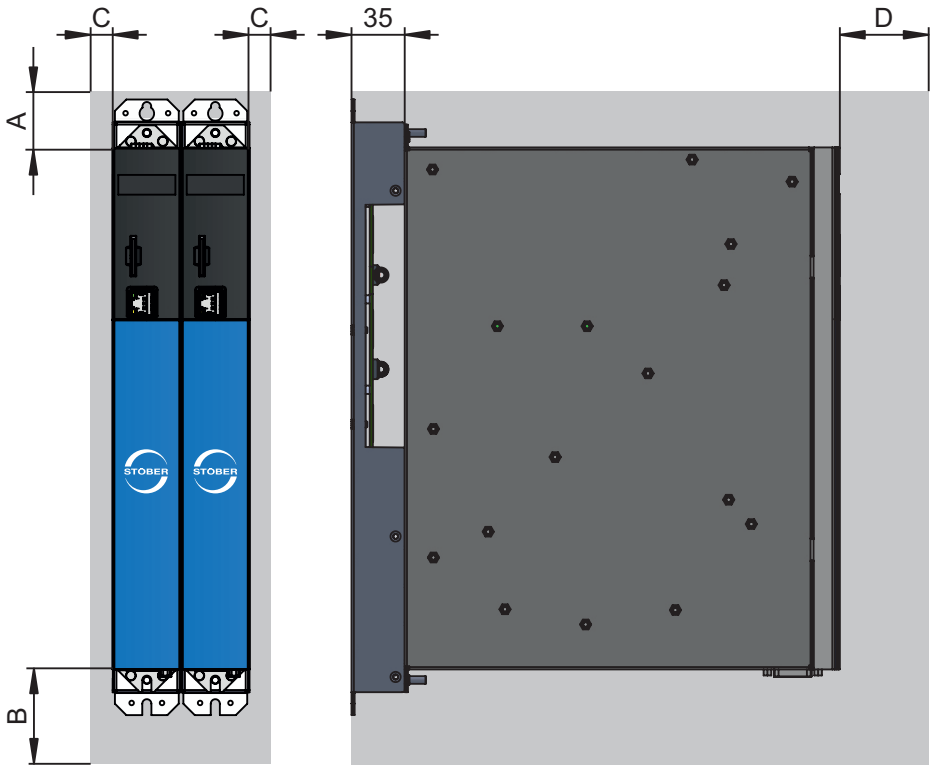


Fig. 10: Minimum clearances

The specified dimensions relate to the outer edges of the drive controller.

Minimum clearance	A (above)	B (below)	C (on the side)	D (in front)
All sizes	100	200	5	50[5]

Tab. 54: Minimum clearances [mm]

Braking resistor

In order for heated air to flow out unimpeded, a minimum clearance of approximately 200 mm must be maintained in relation to neighboring components or walls and approximately 300 mm must be maintained to components above or ceilings.

[5] Minimum clearance to be taken into account for permanent connection of the X9 service interface

8.4 Drilling diagram and dimensions

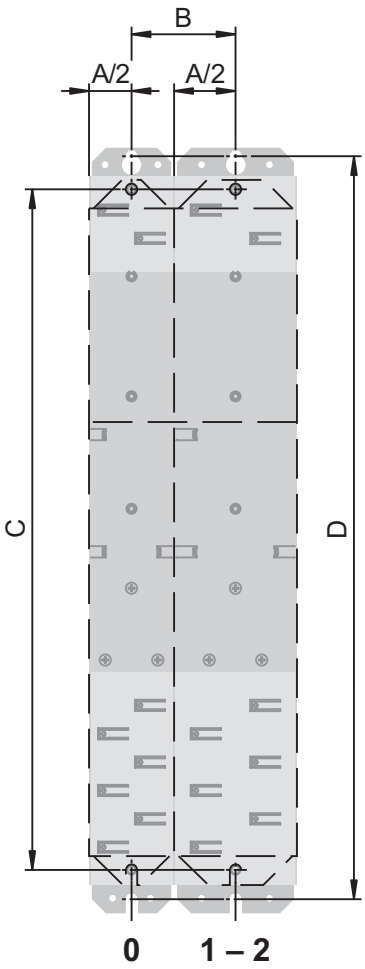


Fig. 11: Bore dimensions for DL6B Quick DC-Link [mm]

SC6 dimensions			Size 0	Size 1, size 2
Horizontal SC6 fastening holes ∅ 4.2 (M5)	A		45	65
	B	Size 0	46±1	56±1
	B	Size 1, size 2	56±1	66±1
Vertical SC6 fastening holes ∅ 4.2 (M5)	C		360+2	360+2

Tab. 55: Bore dimensions for SC6 drive controller [mm]

DL6B dimensions			Size 0	Size 1, size 2
Horizontal fastening holes ∅ 4.2 (M5)	A		45	65
	B	Size 0	46±1	56±1
	B	Size 1, size 2	56±1	66±1
Vertical fastening holes ∅ 4.2 (M5)	D		393+2	393+2

Tab. 56: Bore dimensions for DL6B Quick DC-Link [mm]

8.5 Length of copper rails

For the installation of the Quick DC-Link modules, you require 3 prepared copper rails with a cross-section of 5 × 12 mm.

The length of the copper rails is 5 mm shorter than the total width of the group, i.e. the total width of all DL6B Quick DC-Link modules present in the group:
B = A − 5 mm

Note that the correct length of the copper rails can be determined only after installation of all modules:

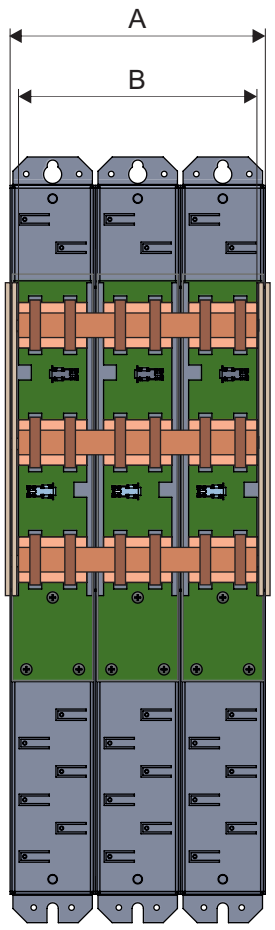


Fig. 12: Determination of the correct length of the copper rails

A Total width of the group after installation

B Length of the copper rails = A − 5 mm

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8.6 Installing the drive controller without a rear section module

This chapter describes the installation of the SC6 drive controller without a rear section module. If you would like to connect SC6 drive controllers in the DC link, you must mount the required rear section modules and then build the appropriate drive controllers over them.

⚠ DANGER!

Electrical voltage! Risk of fatal injury due to electric shock!

- Always switch off all power supply voltage before working on the devices!
- Note the discharge time of the DC link capacitors. You can only determine the absence of voltage after this time period.

Information

Note that drive controllers in storage require reforming each year or before commissioning at the latest.

Tool and material

You will need:

- Fastening screws
- Tool for tightening the fastening screws

Requirements and installation

Perform the following steps for each drive controller within the group and in the specified order.

✓ In accordance with the drilling diagram, taking into consideration the various device dimensions, you have made threaded holes for the threaded bolts on the mounting plate at the installation position.

✓ The mounting plate has been cleaned (free of oil, grease and swarf).

1. Fasten the top of the drive controller on the mounting plate.
2. Fasten the bottom of the drive controller on the mounting plate.

8.7 Installing the DC link connection

⚠ DANGER!

Electrical voltage! Risk of fatal injury due to electric shock!

- Always switch off all power supply voltage before working on the devices!
- Note the discharge time of the DC link capacitors. You can only determine the absence of voltage after this time period.

Tool and material

You will need:

- 3 copper rails with sufficient length and a cross-section of 5 x 12 mm, see the chapter Length of copper rails [▶ 64]
- The nut and washer assemblies (M5) as well as the holding clamps included with the DL6B Quick DC-Link modules
- The insulation end sections for the left and right termination of the group that are available separately
- Fastening screws and tool for tightening the fastening screws

Requirements and installation

Perform the following steps in the specified order.

✓ You have tapped holes for fastening screws on the mounting plate at the installation location in accordance with the drilling diagram and taking into consideration the different device dimensions.

✓ The mounting plate has been cleaned (free of oil, grease and swarf).

✓ The copper rails must be straight, smooth, free of burrs and cleaned (free of oil and grease).

1. Fasten the Quick DC-Link modules onto the mounting plate with the fastening screws.
2. Apply an insulation end section at the left edge of the first module and at the right edge of the last module. Ensure correct alignment of the end section using the marking on the outside and the insertion aids for the copper rails on the inside.
3. Shorten the copper rails to the correct length.
4. Clean the copper rails, especially at the contact points.
5. Insert the three copper rails one after the other and fasten them in place with two holding clamps per rail and Quick DC-Link module. Make certain the contact points of the copper rails do not become contaminated.

⇨ You have installed the Quick DC-Link. In the next step, build over the Quick DC-Link modules with the appropriate drive controllers.

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8.8 Mounting the drive controller on the rear section module

⚠ DANGER!

Electrical voltage! Risk of fatal injury due to electric shock!

- Always switch off all power supply voltage before working on the devices!
- Note the discharge time of the DC link capacitors. You can only determine the absence of voltage after this time period.

Information

Note that drive controllers in storage require reforming each year or before commissioning at the latest.

Tool and material

You will need:

- A suitable terminal set for each drive controller
- A 8 mm hexagonal socket wrench to tighten the nuts

Requirements and installation

Perform the following steps for each drive controller within the group.

✓ There is a circuit diagram of the system that describes the connection of the drive controllers.

✓ For each drive controller, the appropriate DL6B Quick DC-Link rear section modules for the DC link connection have already been installed in the installation position.

1. Remove terminal X22 from the appropriate terminal set. Connect the brown cable D+ of the bottom of the Quick DC-Link module to D+ of terminal X22, and the black cable D- of the Quick DC-Link module to D- of terminal X22. Note that the terminal is only connected at a later point in time.
2. Place the drive controller on the bottom threaded bolt of the Quick DC-Link module and properly align it vertically with the bottom and top threaded bolt.
3. Fasten the drive controller with the nut and washer assemblies (M5) to both threaded bolts of the Quick DC-Link module. The nut and washer assemblies are included with the Quick DC-Link module.
4. Repeat the previous steps for each additional drive controller within the group.

9 Connection

The following chapter describes the connection of the drive controller and the available accessories.

9.1 Safety instructions for connection

Connection work is permitted only when no voltage is present. Observe the 5 safety rules; see the chapter Working on the machine [▶ 16].

If you couple the drive controller in the DC link, ensure that all Quick DC-Link modules are built over with a drive controller.

The device housing must be closed before you turn on the supply voltage.

When the power supply voltage is turned on, hazardous voltages may be present on the connection terminals and the cables connected to them.

The device is not reliably de-energized simply because the voltage supply is switched off and all displays are blank!

Information

Note that the you can only determine that voltage is no longer present once the discharge time has elapsed. The discharge time depends on the self-discharge of the drive controller. You can find the discharge time in the general technical data.

Opening the housing, plugging in or unplugging connection terminals, connecting or removing connecting wiring, and installing or removing accessories are prohibited while the voltage supply is switched on.

Protect the devices against falling parts (bits or strands of wire, pieces of metal, etc.) during installation or other work in the control cabinet. Parts with conductive properties may result in a short circuit inside the devices and device failure as a result.

Use only copper conductors. For the corresponding line cross-sections, consult the standards DIN VDE 0298-4 or DIN EN 60204-1 (Annexes D, G) as well as the relevant terminal specifications in this documentation.

The protection class of the devices is protective grounding. This means operation is permitted only if the protective ground wire is connected according to requirements.

All protective ground connections are identified by "PE" or the international symbol for grounding (IEC 60417, symbol 5019).

The products are not designed for use in a public low-voltage network that supplies residential areas. Radio-frequency interference can be expected if the products are used in this type of network.

9.2 Line routing

Observe the valid provisions for your machine or system, e.g. DIN IEC 60364 or DIN EN 50110, during the installation of electrical equipment.

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9.3 Protective measures

Take the following protective measures into account.

9.3.1 Power grid supply in parallel operation

All drive controllers must be connected to the same supply grid.

ATTENTION!

Damage to device due to the emission of electromagnetic interference!

If the EMC threshold limits are exceeded during the operation of a DC link connection, devices in the immediate area can be interrupted or damaged.

- Take suitable measures to comply with the electromagnetic compatibility.
- Always route the shortest possible connections for DC links. If they are longer than 30 cm, they must be shielded.

ATTENTION!

Damage to device in case of drive controller failure!

The failure of a drive controller in the DC link can result in damage to additional drive controllers.

- A failure must trigger the isolation of the entire DC link group from the grid.

Wiring example

The example in the chapter Parallel operation [▶ 203] illustrates the basic connection of two SC6 drive controllers based on a DC link connection with DL6B Quick DC-Link.

9.3.2 Line fuse

The line fuse ensures the line and overload protection in the drive controller. Observe the requirements described below, which vary based on the configuration.

9.3.2.1 Line fuse in stand-alone operation

Information

To ensure problem-free operation, always comply with the recommended trigger limits and trigger characteristics of the fuse elements.

Information

Note that the charge current after switching on the power supply is less than the nominal input current of the power unit $I_{1N,PU}$.

You can use the following protective devices when operating a single drive controller:

Size	Type	$I_{1N,PU}$ (4 kHz) [A]	Recommended max. line fuse [A]
0	SC6A062	10	10
1	SC6A162	23,2	25
2	SC6A261	22,6	25

Tab. 57: Recommended maximum line fuse in stand-alone operation

9.3.2.2 Line fuse in parallel operation

Every drive controller connected to the grid in the DC circuit group must be protected at the line input against overload and short circuit. To do this, a fuse combination consisting of overload protection and solid state short circuit protection is connected in series. A miniature circuit breaker protects against overload and a safety fuse with gR triggering characteristics protects against short circuit.

Information

The installation of short-circuit fuses is not necessary under ideal prerequisites and ambient conditions. However, if the application conditions pose the risk of contaminating the drive controllers, short-circuit fuses can protect against damage to or failure of other devices within the DC link group.

Information

To ensure problem-free operation, always comply with the recommended trigger limits and trigger characteristics of the fuse elements.

Information

Note that the charge current after switching on the power supply is less than the nominal input current of the power unit $I_{1N,PU}$.

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Size	Type	$I_{1N,PU}$ (4 kHz) [A]	I_{1maxPU} (4 kHz) [A]	Fuse selection	
				Miniature circuit breakers	Safety fuse
0	SC6A062	10	21 A	EATON Type: FAZ-Z10/3, Item No.: 278926 Triggering characteristics: Z 10 A	SIBA Type: URZ, Item No. 50 140 06.25 Triggering characteristics: gR 25 A
1	SC6A162	23,2	48.7 A	EATON Type: FAZ-Z25/3, Item No.: 278929 Triggering characteristics: Z 25 A	SIBA Type: URZ, Item No. 50 140 06.50 Triggering characteristics: gR 50 A
2	SC6A261	22,6	47.4 A	EATON Type: FAZ-Z25/3, Item No.: 278929 Triggering characteristics: Z 25 A	SIBA Type: URZ, Item No. 50 140 06.50 Triggering characteristics: gR 50 A

Tab. 58: Recommended line fuse in parallel operation

Maximum number of drive controllers

Two drive controllers of the same rating can be connected using a common fuse combination. The fuses and the resulting maximum line input current correspond to that of a single drive controller.

In order to prevent gradual damage to the safety fuse, you can operate a maximum of two drive controllers on one fuse combination.

ATTENTION!

Damage due to overload!

In order to ensure an even distribution of charging current on all AC-supplied drive controllers, all circuit breakers must be closed when engaging the power supply.

- In order that the input rectifier is not overloaded in the event of a possible fuse failure in the group, evaluation of the grid monitoring for AC-supplied drive controllers must lead to deactivation of the entire DC link group.

9.3.3 Grid connection in parallel operation

All drive controllers must be connected to the power grid simultaneously. Simultaneously in this case means that the time difference may be a maximum of 20 ms. This condition is generally met if you use contactors of identical design from one manufacturer.

Provided that simultaneous connection to the grid is achieved, the design with one contactor per drive controller is also permitted.

ATTENTION!

Damage due to overload!

If the grid does not connect to all drive controllers simultaneously in the design with one contactor per drive controller, their charging resistors can be damaged.

9.3.4 Residual current protective device

STOBER devices can be protected with a residual current protective device (RCD) to detect residual currents. Residual current protective devices prevent electrical accidents, especially ground fault through the body. They are generally classified by their triggering limit and suitability for detecting different types of residual currents.

Depending on the function, leakage currents may occur when operating drive controllers. Leakage currents are interpreted as residual currents by residual current protective devices and may therefore lead to false triggering. Depending on the relevant power supply connections, residual currents may occur with or without a DC current component. Because of this, you should take into consideration both the magnitude as well as the profile of the possible leakage or residual current when selecting a suitable RCD.

⚠ DANGER!

Electrical voltage! Risk of fatal injury due to electric shock!

Leakage currents with a DC current component may occur in 3-phase installations.

- Always protect 3-phase installations with type B residual current protective devices, sensitive to all currents.

False triggering – Causes

Depending on stray capacitances and imbalances, leakage currents above 30 mA may occur during operation. Undesirable false triggering occurs under the following conditions:

- When connecting installations to the supply voltage. This false triggering can be rectified by using short-time delayed (super-resistant), selective (delayed switch-off) RCDs or RCDs with increased trigger current (e.g. 300 or 500 mA).
- Due to higher frequency leakage currents for long motor cables under normal operating conditions. This false triggering can be rectified for example using low-capacitance cables or an output choke.
- Due to imbalances in the supply grid. This false triggering can be rectified, e.g. using an isolating transformer.

Information

Check whether the use of residual current protective devices with increased trigger current as well as with short-time delayed or delayed switch-off trigger characteristics are permitted in your application.

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⚠ DANGER!

Electrical voltage! Risk of fatal injury due to electric shock!

Leakage and residual currents with a DC current component can restrict the functionality of type A and AC residual current protective devices.

- Always follow the installation instructions for the protective devices you are using.

9.3.5 Housing grounding

Additional requirements for protective equipotential bonding apply in the event of ground leakage currents > 10 mA. At least one of the following conditions must be fulfilled:

- The grounding conductor must have a minimum cross-section of 10 mm² Cu over its overall length
- If the grounding conductor has a cross-section of less than 10 mm², a 2nd grounding conductor must be provided with a cross-section of at least the same size up to the point at which the grounding conductor exhibits the minimum cross-section of 10 mm²

A grounding bolt is mounted to the devices for connecting the 2nd grounding conductor.

Observe the order for assembly:

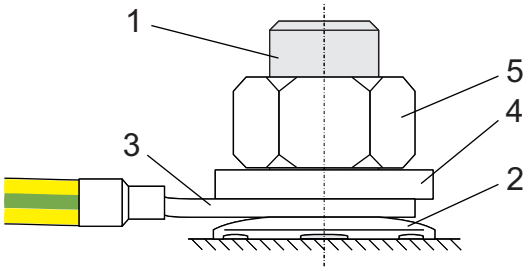

Fig. 13: Connection of the grounding conductor

1 M6 grounding bolt
2 Contact disk
3 Cable lug
4 Washer
5 Nut

The contact disk, washer and nut are supplied with the drive controller.

Note the tightening torque of 4 Nm.

Leakage currents > 10 mA can arise in normal operation. To fulfill DIN EN 61800-5-1 and EN 60204-1, connect the grounding bolt with a copper conductor according to the following table:

Cross-section A Power grid line	Minimum cross-section A_{min} Grounding conductor at grounding bolt
A ≤ 2.5 mm²	2.5 mm²
2.5 < A ≤ 16 mm²	A
16 – 35 mm²	≥ 16 mm²
> 35 mm²	A/2

Tab. 59: Minimum cross-section of the grounding conductor

9.3.6 EMC recommendations

Information

This chapter provides general information on EMC-compliant installation. These are recommendations. Depending on the application, the ambient conditions as well as the legal requirements, measures beyond these recommendations may be required.

Lay the power line, motor cable and signal lines separately from each other, e.g. in separate conduits.

Only use shielded, low-capacitance cables as motor cables.

If the brake line is carried in the motor cable, it must be shielded separately.

Connect the shield of the motor cable over large contact areas and in the immediate vicinity of the drive controller. To do this, use the shield clamp and shield contact at terminal X20.

Shield the cable for connection to a braking resistor if it exceeds a length of 30 cm. In this case, connect the shield over large contact areas and in the immediate vicinity of the drive controller.

For motors with terminal boxes, connect the shield to the terminal box over large contact areas. For example, use EMC cable screw connections.

Connect the shield of the control lines on one side with the reference ground of the source, e.g. the PLC or CNC.

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9.4 Drive controller

The following section contains detailed information about the terminals and the correct connection of the drive controller.

9.4.1 Overview

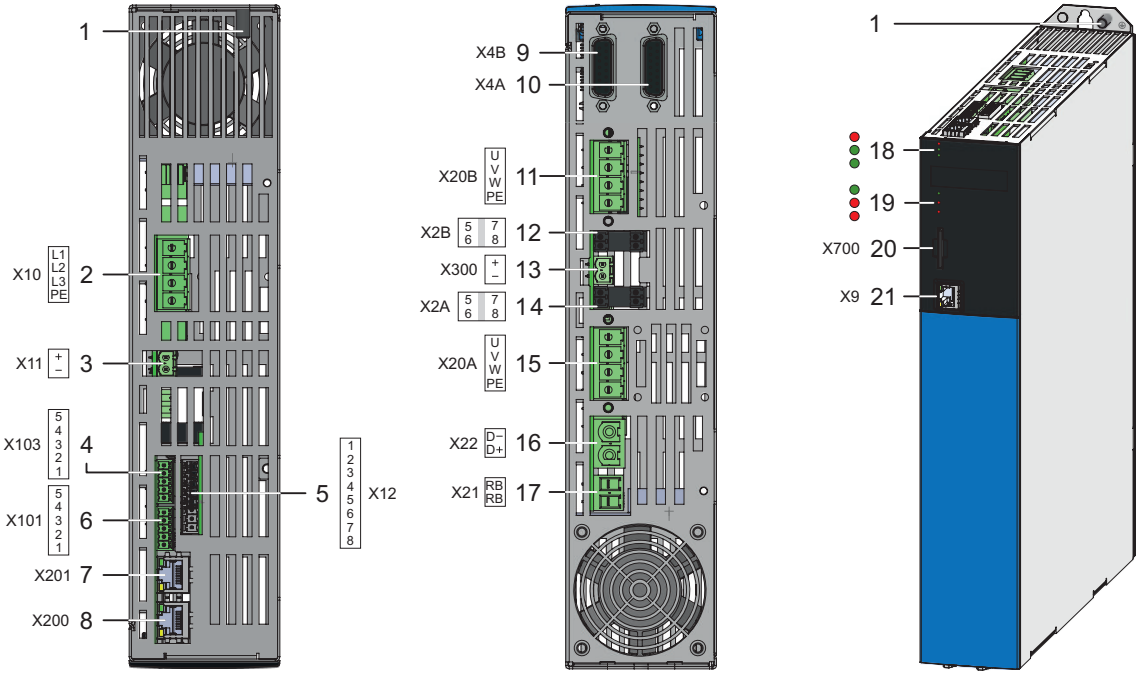


Fig. 14: Connection overview using the example of the SC6A162

	Top of the device		Bottom of the device		Front of the device
1	Ground bolt	9	X4B: Encoder B (only for double axis controllers)	18	3 diagnostic LEDs for communication and safety technology
2	X10: 400 V_{AC} supply	10	X4A: Encoder A	19	3 diagnostic LEDs for drive controller
3	X11: 24 V_{DC} supply	11	X20B: Motor B (only for double-axis controllers)	20	X700: SD slot
4	X103: BE6 – BE9	12	X2B: Motor holding brake B (pin 5/6) and temperature sensor B (pin 7/8); (only for double-axis controllers)	21	X9: Ethernet service interface
5	X12: STO via terminals (only for SR6 option)	13	X300: Brake 24 V_{DC} supply		
6	X101: BE1 – BE4	14	X2A: Motor holding brake A (pin 5/6) and temperature sensor A (pin 7/8)		
7	X201: EtherCAT Out / PROFINET	15	X20A: Motor A		
8	X200: EtherCAT In / PROFINET	16	X22: DC link connection		
		17	X21: Braking resistor		

9.4.2 X2A: Motor holding brake A

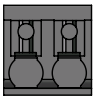
The brake of axis A is connected to X2A. All device types of the SC6 drive controller can control a 24 V_{DC} brake as standard.

Information

Note that motor holding brakes from other manufacturers may be connected only after consultation with STOBER.

Controllable brakes

Note the technical data of the controllable brakes at X2A; see the chapter Controllable brakes [▶ 50].

Term.	Pin	Designation	Function
 5 | 6	5	1BD1	Actuation of the brake
	6	1BD2	Reference potential

Tab. 60: X2A connection description, A motor holding brake

For connecting wiring, observe the terminal specifications in the chapter BCF 3,81 180 SN [▶ 191].

Cable requirements

Motor connection	Max. length of the power cable
Without output choke	50 m, shielded
With output choke	100 m, shielded

Tab. 61: Maximum cable length of the power cable [m]

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9.4.3 X2A: Motor temperature sensor A

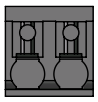
The motor temperature sensor of axis A is connected to terminal X2A. All device types of the SC6 drive controller have connections for PTC thermistors. You can connect a maximum of two PTC triplets to X2A.

Information

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

Information

Note that a temperature sensor does not have to be connected to terminal X2 for a HIPERFACE DSL encoder. In this case, the temperature sensor signal is transferred together with the encoder signal over connector X4.

Term.	Pin	Designation	Function
 7 | 8	7	1TP1+	PTC connection
	8	1TP2−	

Tab. 62: X2A connection description, A motor temperature sensor

For connecting wiring, observe the terminal specifications in the chapter BCF 3,81 180 SN [▶ 191].

Cable requirements

Motor connection	Max. length of the power cable
Without output choke	50 m, shielded
With output choke	100 m, shielded

Tab. 63: Maximum cable length of the power cable [m]

9.4.4 X2B: Motor holding brake B

The brake of axis B is connected to X2B for double-axis controllers. Only X2A is available for single-axis controllers. The connection description of X2B matches the X2A description.

9.4.5 X2B: Motor temperature sensor B

The motor temperature sensor of axis B is connected to X2B for double-axis controllers. Only X2A is available for single-axis controllers. The connection description of X2B matches the X2A description.

9.4.6 X4A: Encoder A

The encoder of axis A is connected to terminal X4A.

ATTENTION!

Risk of encoder destruction!

X4 may not be plugged in or unplugged when the device is switched on!

ATTENTION!

Risk of encoder destruction!

Only encoders with a suitable input voltage range (minimum 12 V_{DC}) may be connected to X4.

Unsuitable encoder types

The following STOBER encoder types may **not** be connected:

Encoder type	Code according to type designation
ECI 1118	C0
EQI 1130	Q0
ECI 1319	CR
EQI 1329	QP
EQI 1331	QR

Tab. 64: Encoder types with unsuitable input voltage range

Evaluable encoders

Note the technical data of the evaluable encoders at X4; see the chapter X4 [▶ 47].

Information

Note that a master encoder must be connected to axis A.

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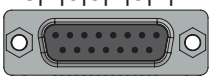
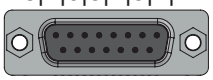
EnDat 2.2 digital and SSI encoders

Socket	Pin	Designation	Function
8|7|6|5|4|3|2|1  15|14|13|12|11| 10|9	1	—	—
	2	GND	Reference for encoder supply to pin 4
	3	—	—
	4	U_2	Encoder supply
	5	Data+	Differential input for DATA
	6	—	—
	7	—	—
	8	Clock+	Differential input for CLOCK
	9	—	—
	10	—	—
	11	—	—
	12	—	—
	13	Data−	Inverse differential input for DATA
	14	—	—
	15	Clock−	Inverse differential input for CLOCK

Tab. 65: X4A connection description for EnDat 2.2 digital encoders and SSI encoders

Differential TTL and differential HTL incremental encoders (HTL over HT6 adapters)

Socket	Pin	Designation	Function
8|7|6|5|4|3|2|1  15|14|13|12|11| 10|9	1	—	—
	2	GND	Reference for encoder supply to pin 4
	3	—	—
	4	U_2	Encoder supply
	5	B+	Differential input for B channel
	6	—	—
	7	N+	Differential input for N channel
	8	A+	Differential input for A channel
	9	—	—
	10	—	—
	11	—	—
	12	—	—
	13	B−	Inverse differential input for B channel
	14	N−	Inverse differential input for N channel
	15	A−	Inverse, differential input for A channel

Tab. 66: X4A connection description for differential TTL and differential HTL (HTL over HT6 adapter) incremental encoders

Information

Using a HT6 adapter for level conversion from HTL signals to TTL signals, it is also possible to connect an differential HTL incremental encoder to terminal X4. Note that, with an external power supply, the maximum level of 20 V_{DC} for the the HTL signals may not be exceeded.

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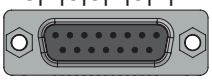
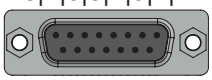
Resolver

Socket	Pin	Designation	Function
8|7|6|5|4|3|2|1  15|14|13|12|11| 10|9	1	Sin+	Sin input
	2	R1 Ref−	Resolver excitation signal
	3	Cos+	Cos input
	4	—	—
	5	—	—
	6	R2 Ref+	Resolver excitation signal
	7	—	—
	8	—	—
	9	Sin−	Inverse sin input
	10	—	—
	11	Cos−	Inverse cos input
	12	—	—
	13	—	—
	14	—	—
	15	—	—

Tab. 67: X4A connection description for resolvers

HIPERFACE DSL encoders

Socket	Pin	Designation	Function
8|7|6|5|4|3|2|1  15|14|13|12|11| 10|9	1	—	—
	2	DSL−	Inverse HIPERFACE DSL signal (motor temperature sensor evaluation over DSL communication)
	3	—	—
	4	DSL+	HIPERFACE DSL signal (motor temperature sensor evaluation over DSL communication)
	5	—	—
	6	—	—
	7	—	—
	8	—	—
	9	—	—
	10	—	—
	11	—	—
	12	—	—
	13	—	—
	14	—	—
	15	—	—

Tab. 68: X4A connection description for HIPERFACE DSL encoders

Cable requirements

Feature	All sizes
Max. cable length	100 m, shielded

Tab. 69: Cable length [m]

Information

To ensure proper functionality, we recommend using cables from STOBER that are matched to the complete system. In case of use of unsuitable connection cables, we reserve the right to reject claims under the warranty.

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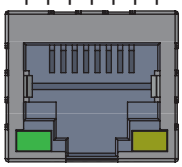
9.4.7 X4B: Encoder B

The encoder of axis B is connected to X4B for double-axis controllers. Only X4A is available for single-axis controllers. The connection description of X4B matches the X4A description.

9.4.8 X9: Ethernet service interface

X9 is used to connect the drive controller to a PC with installed DriveControlSuite commissioning software.

Socket	Pin	Designation	Function
1|2|3|4|5|6|7|8 	1	TxData+	Ethernet communication
	2	TxData−	
	3	RecvData+	
	4	—	—
	5	—	—
	6	RecvData−	Ethernet communication
	7	—	—
	8	—	—

Tab. 70: X9 connection description

Cable requirements

Feature	All sizes
Max. cable length	100 m, shielded

Tab. 71: Cable length [m]

Information

To ensure proper functionality, we recommend using cables from STOBER that are matched to the complete system. In case of use of unsuitable connection cables, we reserve the right to reject claims under the warranty.

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

Feature	Design
Connector wiring	Patch or crossover
Quality	CAT 5e
Shielding	SF/FTP, S/FTP or SF/UTP

Tab. 72: Cable requirements

Device addressing

Information for device addressing can be found in the chapter Device addressing [▶ 204].

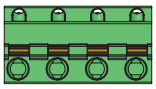
9.4.9 X10: 400 V supply

Terminal X10 serves to connect the drive controller to the supply grid.

Line cross-section for the power connection

When selecting your line fuse, note the maximum permitted conductor cross-section of terminal X10, the routing method and the surrounding temperature.

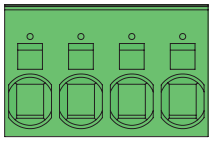
Size 0

Terminal	Pin	Designation	Function
 L1 | L2 | L3 | PE	1	L1	Power supply
	2	L2	
	3	L3	
	4	PE	Grounding conductor

Tab. 73: X10 connection description – Size 0

For connecting wiring, observe the terminal specifications in the chapter GFKC 2,5 -ST-7,62 [▶ 195].

Sizes 1 and 2

Terminal	Pin	Designation	Function
 L1 | L2 | L3 | PE	1	L1	Power supply
	2	L2	
	3	L3	
	4	PE	Grounding conductor

Tab. 74: X10 connection description – Size 1 and 2

For connecting wiring, observe the terminal specifications in the chapter SPC 5 -ST-7,62 [▶ 197].

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9.4.10 X11: 24 V supply

The connection of 24 V_{DC} to X11 is required for the power supply of the control unit.

ATTENTION!

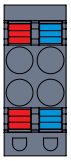
Device damage due to overload!

If the 24 V_{DC} power supply is looped to multiple devices over the terminal, the terminal may be damaged by a current that is too high.

- Make sure that the current over the terminal does not exceed the value 15 A (UL: 10 A).

Electrical data	All types
U_{1CU}	24 V_{DC}, +20%/−15%
I_{1maxCU}	0.5 A

Tab. 75: Control unit electrical data

	Pin	Designation	Function
	+	+24 V_{DC}	24 V_{DC} supply of the control unit, bridged in the terminal; design in accordance with EN 60204: PELV, secondary grounded
+ | −	−	GND	Reference potential for +24 V_{DC}, bridged in the terminal

Tab. 76: X11 connection description

Information

The device may not be connected to a DC supply grid. Instead, supply it over a local 24 V_{DC} power supply.

Connecting wiring

For connecting wiring, observe the terminal specifications in the chapter BLDF 5.08 180 SN [▶ 193].

Cable requirements

Feature	All sizes
Max. cable length	30 m

Tab. 77: Cable length [m]

9.4.11 X12: Safety technology

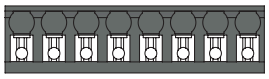
The SR6 option adds the STO safety function to the SC6 drive controller through terminal X12.

Information

If you would like to use STO safety function over terminals, be sure to read the SR6 manual; see the chapter Detailed information [▶ 205].

Technical data

Observe the technical data of the safety options for X12; see the chapter Safety technology [▶ 42].

Terminal	Pin	Designation	Function
 1|2|3|4|5|6|7|8	1	STO_a	Input of safety channel 1
	2		
	3	STO_b	Input of safety channel 2
	4		
	5	GND	Reference potential for STO_a and STO_b, internally bridged with terminal 7
	6	STO_{status}	Acknowledgment signal of safety channels 1 and 2 for diagnostic purposes
	7	GND	Reference potential for STO_a and STO_b, internally bridged with terminal 5
	8	$U_{1status}$	STO_{status} supply

Tab. 78: X12 connection description

Connecting wiring

For connecting wiring, observe the terminal specifications in the chapter BCF 3,81 180 SN [▶ 191].

Cable requirements

Feature	All sizes
Max. cable length	30 m

Tab. 79: Cable length [m]

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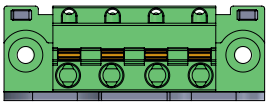
9.4.12 X20A: Motor A

The motor of axis A is connected to X20A.

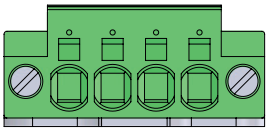
Size 0

Terminal	Pin	Designation	Function
 U | V | W | PE	1	U	Phase U motor connection
	2	V	Phase V motor connection
	3	W	Phase W motor connection
	4	PE	Grounding conductor

Tab. 80: X20A connection description – Size 0

For connecting wiring, observe the terminal specifications in the chapter GFKC 2,5 -ST-7,62 [▶ 195].

Sizes 1 and 2

Terminal	Pin	Designation	Function
 U | V | W | PE	1	U	Phase U motor connection
	2	V	Phase V motor connection
	3	W	Phase W motor connection
	4	PE	Grounding conductor

Tab. 81: X20A connection description – Sizes 1 and 2

For connecting wiring, observe the terminal specifications in the chapter SPC 5 -ST-7,62 [▶ 197].

Cable requirements

Motor connection	Max. length of the power cable
Without output choke	50 m, shielded
With output choke	100 m, shielded

Tab. 82: Maximum cable length of the power cable [m]

Information

To ensure proper functionality, we recommend using cables from STOBER that are matched to the complete system. In case of use of unsuitable connection cables, we reserve the right to reject claims under the warranty.

9.4.12.1 Connection without output choke

Note the following points for the connection of the power cable for a motor without output choke:

- Ground the shield of the power cable on the shield contact on the drive controller intended for this.
- Keep the exposed conductor as short as possible. All devices and circuits that are sensitive to EMC must be kept at a distance of at least 0.3 m.

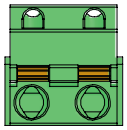
9.4.13 X20B: Motor B

The motor of axis B is connected to X20B for double-axis controllers. Only X20A is available for single-axis controllers. The connection description of X20B matches the X20A description.

9.4.14 X21: Braking resistor

Terminal X21 is available for the connection of a braking resistor.

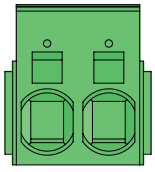
Size 0

Terminal	Pin	Designation	Function
 RB | RB	1	RB	Braking resistor connection
	2	RB	

Tab. 83: X21 connection description – Size 0

For connecting wiring, observe the terminal specifications in the chapter GFKIC 2.5 -ST-7.62 [▶ 196].

Sizes 1 and 2

Terminal	Pin	Designation	Function
 RB | RB	1	RB	Braking resistor connection
	2	RB	

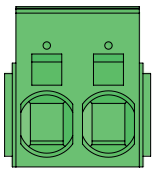
Tab. 84: X21 connection description – Sizes 1 and 2

For connecting wiring, observe the terminal specifications in the chapter ISPC 5 -STGCL-7,62 [▶ 198].

9.4.15 X22: DC link connection

Terminal X22 is available for the DC link connection of the drive controller.

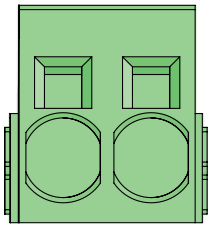
Size 0

Terminal	Pin	Designation	Function
 D− | D+	1	D−	DC link connection
	2	D+	

Tab. 85: X22 connection description – Size 0

For connecting wiring, observe the terminal specifications in the chapter ISPC 5 -STGCL-7,62 [▶ 198].

Sizes 1 and 2

Terminal	Pin	Designation	Function
 D− | D+	1	D−	DC link connection
	2	D+	

Tab. 86: X22 connection description – Sizes 1 and 2

For connecting wiring, observe the terminal specifications in the chapter ISPC 16 -ST-10,16 [▶ 200].

Wiring example

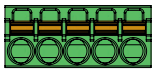
The example in the chapter Parallel operation [▶ 203] illustrates the basic connection of two SC6 drive controllers based on a DC link connection with DL6B Quick DC-Link.

9.4.16 X101: BE1 – BE4

The binary inputs 1 to 4 are available on terminal X101.

X101 for binary signals

For evaluating binary signals at X101, note the specification for the binary inputs in the technical data of the drive controller, see the chapter Binary inputs [▶ 35].

Terminal	Pin	Designation	Function
 5|4|3|2|1	1	BE1	Binary inputs
	2	BE2	
	3	BE3	
	4	BE4	
	5	DGND	Reference ground; not bridged with X103, pin 5

Tab. 87: X101 connection description for binary signals

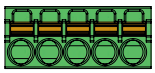
X101 for encoders

If you would like to use X101 as an encoder connection, note the technical data of the evaluable encoders at X101; see the chapter X101 for encoders [▶ 49].

Information

Note that a master encoder must be connected to axis A or terminal X101.

Single-ended HTL incremental encoders

Terminal	Pin	Designation	Function
 5|4|3|2|1	1	BE1	—
	2	BE2	N channel
	3	BE3	A channel
	4	BE4	B channel
	5	DGND	Reference ground; not bridged with X103, pin 5

Tab. 88: X101 connection description for single-ended HTL incremental signals – Axis A

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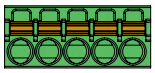
Single-ended HTL pulse train

Terminal	Pin	Designation	Function
 5|4|3|2|1	1	BE1	—
	2	BE2	—
	3	BE3	Frequency
	4	BE4	Direction
	5	DGND	Reference ground; not bridged with X103, pin 5

Tab. 89: X101 connection description for single-ended HTL pulse train signals – Axis A

Connecting wiring

For connecting wiring, observe the terminal specifications in the chapter FMC 1,5 -ST-3,5 [▶ 190].

Cable requirements

Feature	All sizes
Max. cable length	30 m

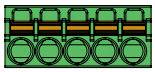
Tab. 90: Cable length [m]

9.4.17 X103: BE6 – BE9

The binary inputs 6 to 9 are available on terminal X103.

X103 for binary signals

For the evaluation of binary signals at X103, observe the technical data of the drive controller; see the chapter Binary inputs [▶ 35].

Terminal	Pin	Designation	Function
 5|4|3|2|1	1	BE6	Binary inputs
	2	BE7	
	3	BE8	
	4	BE9	
	5	DGND	Reference ground; not bridged with X101, pin 5

Tab. 91: X103 connection description for binary signals

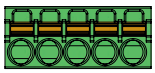
X103 for encoders

If you would like to use X103 as an encoder connection, note the technical data of the evaluable encoders at X103; see the chapter X103 for encoders [▶ 50].

Information

Note that a master encoder must be connected to axis A or terminal X101.

Single-ended HTL incremental encoders

Terminal	Pin	Designation	Function
 5|4|3|2|1	1	BE6	—
	2	BE7	N channel
	3	BE8	A channel
	4	BE9	B channel
	5	DGND	Reference ground; not bridged with X101, pin 5

Tab. 92: X103 connection description for single-ended HTL incremental signals – Axis B

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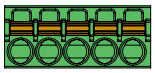
Single-ended HTL pulse train

Terminal	Pin	Designation	Function
 5|4|3|2|1	1	BE6	—
	2	BE7	—
	3	BE8	Frequency
	4	BE9	Direction
	5	DGND	Reference ground; not bridged with X101, pin 5

Tab. 93: X103 connection description for single-ended HTL pulse train signals – Axis B

Connecting wiring

For connecting wiring, observe the terminal specifications in the chapter FMC 1,5 -ST-3,5 [▶ 190].

Cable requirements

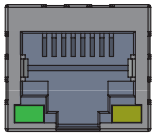
Feature	All sizes
Max. cable length	30 m

Tab. 94: Cable length [m]

9.4.18 X200, X201: EtherCAT

Drive controllers from the SC6 series have the two RJ-45 sockets X200 and X201. The sockets are located on top of the device. The associate pin assignment and color coding correspond to the EIA/TIA-T568B standard.

X200 is to be connected as an input with the cable coming from the EtherCAT master. X201 is to be connected as an output with any subsequent EtherCAT nodes.

Socket	Pin	Designation	Function
1|2| ... |7|8 	1	Tx+	Communication
	2	Tx−	
	3	Rx+	
	4	—	—
	5	—	—
	6	Rx−	Communication
	7	—	—
	8	—	—

Tab. 95: X200 and X201 connection description

Cable requirements

Information

To ensure proper functionality, we recommend using cables from STOBER that are matched to the complete system. In case of use of unsuitable connection cables, we reserve the right to reject claims under the warranty.

STOBER provides ready-made cables for the EtherCAT connection. It is also possible to use cables with the following specification:

Ethernet patch cables or crossover cables meeting the CAT 5e quality level are the ideal cables. The Fast Ethernet technology allows a maximum cable length of 100 m between two nodes.

Information

Ensure that you only use shielded cables with an SF/FTP, S/FTP or SF/UTP design.

Device addressing and fieldbus connection

Information for device addressing can be found in the chapter Device addressing [▶ 204].

Detailed information about the fieldbus connection can be found in the corresponding manual, see chapter Detailed information [▶ 205].

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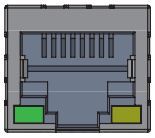
9.4.19 X200, X201: PROFINET

Drive controllers from the SC6 series have the two RJ-45 sockets X200 and X201. The sockets are located on top of the device. The associate pin assignment and color coding correspond to the EIA/TIA-T568B standard.

Connect X200 or X201 with the IO controller and the remaining connection with the next drive controller.

Socket	Pin	Designation	Function
1|2| ... |7|8 	1	Tx+	Communication
	2	Tx−	
	3	Rx+	
	4	—	—
	5	—	—
	6	Rx−	Communication
	7	—	—
	8	—	—

Tab. 96: X200 and X201 connection description

Cable requirements

A PROFINET network generally consists of symmetrical, shielded copper cables twisted in pairs (shielded twisted pair, CAT 5e quality level).

Signals are transmitted according to the 100BASE TX method, i.e. with a transfer rate of 100 Mbps at a frequency of 125 MHz.
A maximum of 1440 bytes can be transferred per frame. The maximum cable length is 100 m.

PROFINET cables exist in different versions that are tailored to different application scenarios and ambient conditions.

We recommend using the cables specified in the PROFINET installation guidelines. They are adjusted for use in automation technology with regard to usage, resistance, EMC properties and color coding.

There are type A, B and C cables, differentiated by installation type:

- Type A
  4-wire shielded copper cable for fixed installation
- Type B
  4-wire shielded copper cable for flexible installation
- Type C
  4-wire shielded copper cable for constant movements

Device addressing and fieldbus connection

Information for device addressing can be found in the chapter Device addressing [▶ 204].

Detailed information about the fieldbus connection can be found in the corresponding manual, see chapter Detailed information [▶ 205].

9.4.20 X300: Brake 24 V supply

X300 is used to supply the brake.

ATTENTION!

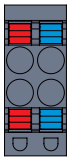
Device damage due to overload!

If the 24 V_{DC} power supply is looped to multiple devices over the terminal, the terminal may be damaged by a current that is too high.

- Make sure that the current over the terminal does not exceed the value 15 A (UL: 10 A).

Electrical data	Single-axis controller	Double-axis controller
U_1	+24 V_{DC}, +25%/−0%	
I_{1max}	2.5 A	2 × 2.5 A

Tab. 97: Electrical data of the control unit brake control

	Pin	Designation	Function
 + | −	+	+24 V_{DC}	Power supply voltage for the brake
	−	GND	Reference potential for supply voltage of the brake

Tab. 98: X300 connection description

Connecting wiring

For connecting wiring, observe the terminal specifications in the chapter BLDF 5.08 180 SN [▶ 193].

Cable requirements

Feature	All sizes
Max. cable length	30 m

Tab. 99: Cable length [m]

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9.4.21 X700: SD slot

The SD slot is used for data backup in the event of service. SD and SDHC cards with storage capacity from 128 MB to 32 GB are supported. SDHC cards with a storage capacity of 64 GB can be used only if they have been first reformatted to max. 32 GB. Since higher capacities increase the controller starting time, STOBER recommends the use of cards with a storage capacity from 2 to 4 GB.

Information

The drive controller has internal configuration memory and can therefore be operated without an inserted SD card. In the DS6 commissioning software, the action A00Save values always saves both to internal configuration memory as well as the inserted SD card. Back up your configuration to a SD card after completing commissioning in order to allow transfer of the configuration to the replacement controller in the event of service. When switching on the replacement controller, the data is loaded giving priority to the inserted SD card. To make a non-volatile back-up in the internal configuration memory, you must run A00Save values.

9.4.22 Connecting a drive controller

⚠ DANGER!

Electrical voltage! Risk of fatal injury due to electric shock!

- Always switch off all power supply voltage before working on the devices!
- Note the discharge time of the DC link capacitors. You can only determine the absence of voltage after this time period.

Tool and material

You will need:

- A suitable terminal set for the drive controller
- Tool for tightening the fastening screws

Requirements and connection

Bottom of the device:

✓ You have a system circuit diagram describing the connection of the drive controller.

1. Connect the braking resistor to terminal X21 and attach the terminal.
2. Optional: Attach the X22 terminal of the Quick DC-Link module.
3. To connect the motor temperature sensor, actuation of the motor holding brake and the motor itself with the drive controller, wire the conductors of the power cable with terminals X2A and X20A.
4. Attach the power cable with the shield clamp to the shield contact of terminal X20A.
5. Attach terminals X20A and X2A.
6. Optional: Connect the supply voltage for the holding brakes to terminal X300 and attach it.

7. For double-axis controllers: Repeat steps 2 to 4 for the terminals X2B and X20B.
8. Optional: Connect an encoder to terminal X4A.
9. Optional for double-axis controllers: Connect an encoder to terminal X4B.

Top of the device:

✓ You have a system circuit diagram describing the connection of the drive controller.

1. Connect the 2nd grounding conductor to the ground bolt. Note the instructions and requirements in the chapter Housing grounding.
2. Connect the power supply to terminal X10 and attach the terminal.
3. Connect the 24 V_{DC} power supply for the control electronics to terminal X11.
4. Options SR6 or SY6: If you need the STO safety function, proceed as described in the corresponding manual, see the chapter Detailed information [▶ 205].
5. Optional: Connect the binary inputs to terminal X101 and X103 and attach the terminal.
6. Connect the fieldbus to the sockets X200 and X201.

You can find examples in the chapter Wiring examples [▶ 202].

9.5 Cables

Note that the motor, cables and drive controller each have electrical properties which influence one another. Unfavorable combinations could possibly result in impermissible voltage peaks on the motor and drive controller and increased wear as a result.

Take into consideration the following instructions when selecting suitable cables:

- Cable cross-sections for connection to the motor:
  Note the permitted continuous stall current for the motor when making your selection.
- Line cross-sections for the line connection:
  Note the line fuse, the maximum permitted conductor cross-section for terminal X10, the routing method and the surrounding temperature when making your selection.
- Also pay attention to the trailing and torsional strength of the leads.
- When using a motor brake, pay attention to the voltage drop in the supply voltage on the line.

Information

To ensure proper functionality, we recommend using cables from STOBER that are matched to the complete system. In case of use of unsuitable connection cables, we reserve the right to reject claims under the warranty.

Information

Please observe the motor connection diagram that is delivered with every STOBER motor.

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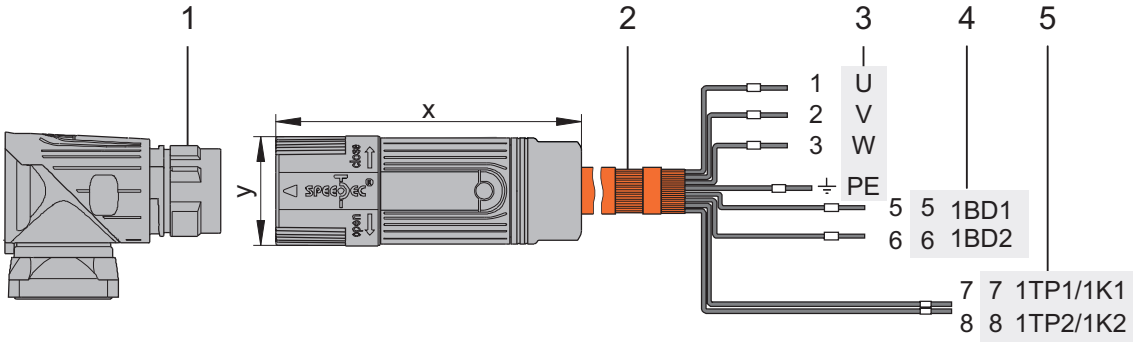
9.5.1 Power cables

Power cables are available depending on the plug size in the following designs:

- springtec quick lock for con.15
- speedtec quick lock for con.23 and con.40



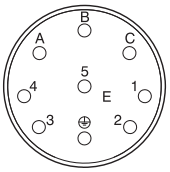
1: Plug connector
2: STOBER power cable, cable shield
3: Connection to terminal X20, motor
4: Connection of terminal X300, brake
5: Connection to terminal X2, temperature sensor

Motor connection	Max. length of the power cable
Without output choke	50 m, shielded
With output choke	100 m, shielded

Tab. 100: Maximum cable length of the power cable [m]

Synchronous servo motors from STOBER are equipped with circular plugs as a standard feature. They can be connected to drive controllers with the following power cables.

Power cables – con.15 plug connector

Motor (1)				Cable (2)	Drive controller (3) – (5)		
Motor connection diagram	Pin	Designation	Int. motor Core color	Core No./ Core color	Pin X20	Pin X300	Pin X2
	A	1U1	BK	1	1	—	—
	B	1V1	BU	2	2	—	—
	C	1W1	RD	3	3	—	—
	1	1TP1/1TP1/ 1K1[a)]	BK/RD/BN	7	—	—	7
	2	1TP2/1TP2/ 1K2[a)]	WH/WH/ WH	8	—	—	8
	3	1BD1	RD	5	—	5	—
	4	1BD2	BK	6	—	6	—
	5	—	—	—	—	—	—
	⏚	PE	GNYE	GNYE	4	—	—
	Housing	Shield	—	—	Shield contact	—	—

Tab. 101: con.15 power cable pin assignment

a) PTC/Pt1000/KTY

Length x [mm]	Diameter y [mm]
42	18.7

Tab. 102: con.15 dimensions

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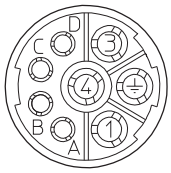
Power cables – con.23 plug connectors

Motor (1)				Cable (2)	Drive controller (3) – (5)		
Motor connection diagram	Pin	Designation	Int. motor Core color	Core No./ Core color	Pin X20	Pin X300	Pin X2
	1	1U1	BK	1	1	—	—
	3	1V1	BU	2	2	—	—
	4	1W1	RD	3	3	—	—
	A	1BD1	RD	5	—	5	—
	B	1BD2	BK	6	—	6	—
	C	1TP1/1TP1/ 1K1[a)]	BK/RD/BN	7	—	—	7
	D	1TP2/1TP2/ 1K2[a)]	WH/WH/ WH	8	—	—	8
	⏚	PE	GNYE	GNYE	4	—	—
	Housing	Shield	—	—	Shield contact	—	—

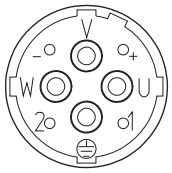
Tab. 103: con.23 power cable pin assignment

a) PTC/Pt1000/KTY

Length x [mm]	Diameter y [mm]
78	26

Tab. 104: con.23 dimensions

Power cables – con.40 plug connectors

Motor (1)				Cable (2)	Drive controller (3) – (5)		
Motor connection diagram	Pin	Designation	Int. motor Core color	Core No./ Core color	Pin X20	Pin X300	Pin X2
	U	1U1	BK	1	1	—	—
	V	1V1	BU	2	2	—	—
	W	1W1	RD	3	3	—	—
	+	1BD1	RD	5	—	5	—
	–	1BD2	BK	6	—	6	—
	1	1TP1/1TP1/ 1K1[a)]	BK/RD/BN	7	—	—	7
	2	1TP2/1TP2/ 1K2[a)]	WH/WH/ WH	8	—	—	8
	⏚	PE	GNYE	GNYE	4	—	—
	Housing	Shield	—	—	Shield contact	—	—

Tab. 105: con.40 power cable pin assignment

a) PTC/Pt1000/KTY

Length x [mm]	Diameter y [mm]
99	46

Tab. 106: con.40 dimensions

BK:	BLACK	PK:	PINK
BN:	BROWN	RD:	RED
BU:	BLUE	VT:	VIOLET
GN:	GREEN	WH:	WHITE
GY:	GRAY	YE:	YELLOW
OG:	ORANGE		

Tab. 107: Cable color – Key

Two-colored core:	WHYE	WHITEYELLOW (white and yellow)
Single-colored core:	BK/BN	BLACK/BROWN (black or brown)

Tab. 108: Formatting conventions

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9.5.2 Encoder cables

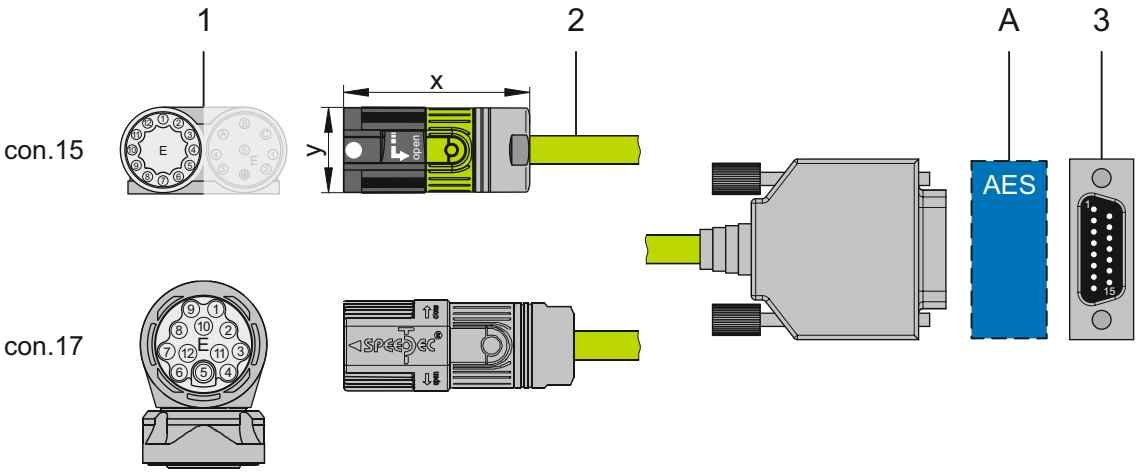
STOBER motors are equipped with encoder systems as standard.

Depending on the respective motor types, different encoder systems and associated plug connectors are used.

The following chapters describe the individual encoder systems, plug connectors and signal assignments for connecting to STOBER drive controllers.

9.5.2.1 EnDat 2.1/2.2 digital encoders

Suitable encoder cables are described below.



1: Plug connector

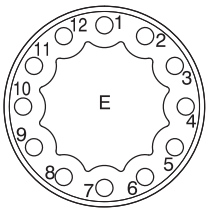
2: STOBER encoder cable

A: Optional Absolute Encoder Support (AES) battery module

3: D-sub X4

Encoder cables – con.15 plug connectors

The voltage supply is buffered for EnDat 2.2 digital "EBI 1135" and "EBI 135" inductive encoders with a multi-turn function. In this case, pin 2 and pin 3 are assigned to the backup battery U_{2BAT}. Note that the encoder cable must not be connected to X4 of the drive controller but to the AES battery module for these encoders.

	Motor (1)			Cable (2)	Drive controller (3)
Connection diagram	Pin	Designation	Core color	Core color	Pin X4
	1	Clock+	VT	YE	8
	2	Sense	BU	PK	12
		U_{2BAT+} [6]			
	3	—	WH	GY	3
		U_{2BAT-} [7]			
	4	—	—	—	—
	5	Data−	PK	BN	13
	6	Data+	GY	WH	5
	7	—	—	—	—
	8	Clock−	YE	GN	15
	9	—	—	—	—
	10	GND	WHGN	BU	2
	11	—	—	—	—
	12	U_2	BNGN	RD	4
	Housing	Shield	—	—	—

Tab. 109: con.15 encoder cable pin assignment

Length x [mm]	Diameter y [mm]
42	18.7

Tab. 110: con.15 dimensions

[6] Only relevant for EBI encoders
[7] Only relevant for EBI encoders

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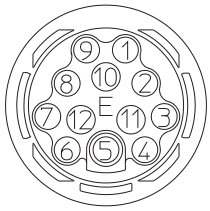
Encoder cables – con.17 plug connectors

The voltage supply is buffered for EnDat 2.2 digital "EBI 1135" and "EBI 135" inductive encoders with a multi-turn function. In this case, pin 2 and pin 3 are assigned to the backup battery U_{2BAT}. Note that the encoder cable must not be connected to X4 of the drive controller but to the AES battery module for these encoders.

Motor (1)				Cable (2)	Drive controller (3)
Connection diagram	Pin	Designation	Core color	Core color	Pin X4
	1	Clock+	VT	YE	8
	2	Sense	BU	PK	12
		U_{2BAT+} [8]			
	3	—	WH	GY	3
		U_{2BAT-} [9]			
	4	—	—	—	—
	5	Data−	PK	BN	13
	6	Data+	GY	WH	5
	7	—	—	—	—
	8	Clock−	YE	GN	15
	9	—	—	—	—
	10	GND	WHGN	BU	2
	11	—	—	—	—
	12	U_2	BNGN	RD	4
	Housing	Shield	—	—	—

Tab. 111: con.17 encoder cable pin assignment

Length x [mm]	Diameter y [mm]
56	22

Tab. 112: Dimensions – con.17 connector size

[8] Only relevant for EBI encoders
[9] Only relevant for EBI encoders

BK:	BLACK	PK:	PINK
BN:	BROWN	RD:	RED
BU:	BLUE	VT:	VIOLET
GN:	GREEN	WH:	WHITE
GY:	GRAY	YE:	YELLOW
OG:	ORANGE		

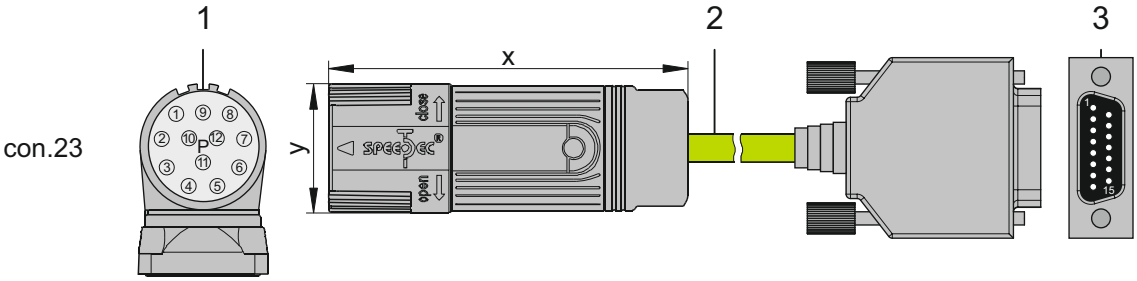
Tab. 113: Cable color – Key

Two-colored core:	WHYE	WHITEYELLOW (white and yellow)
Single-colored core:	BK/BN	BLACK/BROWN (black or brown)

Tab. 114: Formatting conventions

9.5.2.2 SSI encoders

Suitable encoder cables are described below.

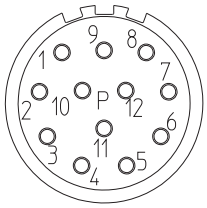


1: Plug connector

2: STOBER encoder cable

3: D-Sub X4

Encoder cables – con.23 plug connectors

Motor (1)				Cable (2)	Drive controller (3)
Connection diagram	Pin	Designation	Core color	Core color	Pin X4
	1	Clock+	VT	YE	8
	2	Sense	BNGN	PK	12
	3	—	—	—	—
	4	—	—	—	—
	5	Data−	PK	BN	13
	6	Data+	GY	WH	5
	7	—	—	—	—
	8	Clock−	YE	GN	15
	9	—	—	—	—
	10	GND	WHGN	BU	2
	11	—	—	—	—
	12	U_2	BNGN	RD	4
	Housing	Shield	—	—	—

Tab. 115: con.23 encoder cable pin assignment

Length x [mm]	Diameter y [mm]
58	26

Tab. 116: con.23 dimensions

BK:	BLACK	PK:	PINK
BN:	BROWN	RD:	RED
BU:	BLUE	VT:	VIOLET
GN:	GREEN	WH:	WHITE
GY:	GRAY	YE:	YELLOW
OG:	ORANGE		

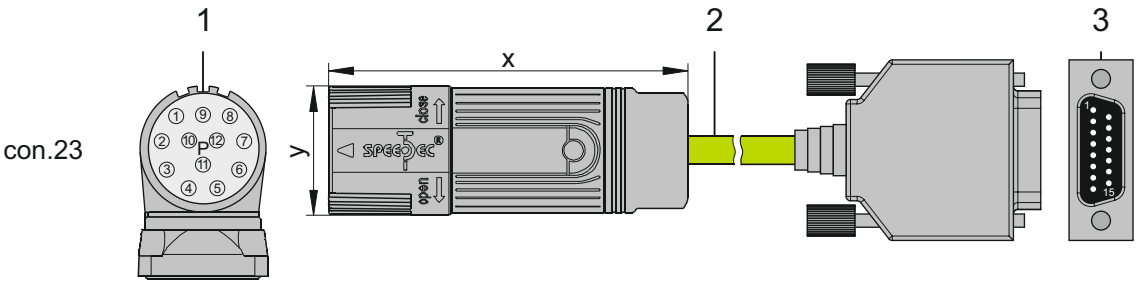
Tab. 117: Cable color – Key

Two-colored core:	WHYE	WHITEYELLOW (white and yellow)
Single-colored core:	BK/BN	BLACK/BROWN (black or brown)

Tab. 118: Formatting conventions

9.5.2.3 Differential HTL incremental encoders

Suitable encoder cables are described below.



1: Plug connector

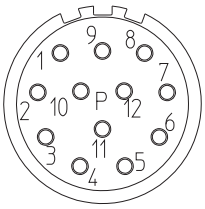
2: STOBER encoder cable

3: D-Sub X4

Information

For the connection of an HTL incremental encoder to terminal X4 of the SC6 or SI6 drive controller, you need the HT6 adapter (ID No. 56665). HT6 is responsible for the level conversion from HTL to TTL signals.

Encoder cables – con.23 plug connectors

	Motor (1)				Cable (2)	Drive controller (3)
Connection diagram	Pin	Designation	Core color up to size 80	Core color size 90 or larger	Core color	Pin X4
	1	/B	PK	BK	YE	9
	2	—	—	YE	—	—
	3	N	BU	PK	PK	3
	4	/N	RD	WH	GY	10
	5	A	GN	GN	BN	6
	6	/A	YE	BN	WH	11
	7	—	—	—	—	—
	8	B	GY	GY	GN	1
	9	—	—	—	—	—
	10	GND	WH	BU	BU	2
	11	—	—	VT	—	—
	12	U_2	BN	RD	RD	4
	Housing	Shield	—	—	—	—

Tab. 119: con.23 encoder cable pin assignment

Length x [mm]	Diameter y [mm]
58	26

Tab. 120: con.23 dimensions

BK:	BLACK	PK:	PINK
BN:	BROWN	RD:	RED
BU:	BLUE	VT:	VIOLET
GN:	GREEN	WH:	WHITE
GY:	GRAY	YE:	YELLOW
OG:	ORANGE		

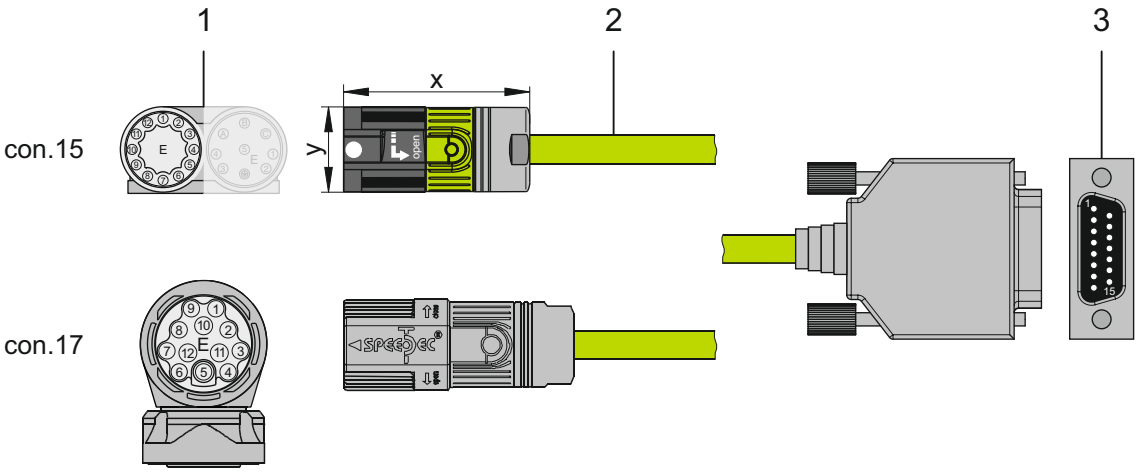
Tab. 121: Cable color – Key

Two-colored core:	WHYE	WHITEYELLOW (white and yellow)
Single-colored core:	BK/BN	BLACK/BROWN (black or brown)

Tab. 122: Formatting conventions

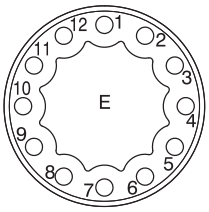
9.5.2.4 Resolver

Suitable resolver cables are described below.



1: Plug connector
2: STOBER encoder cable
3: D-sub X4

Encoder cables – con.15 plug connectors

Motor (1)				Cable (2)	Drive controller (3)
Connection diagram	Pin	Designation	Core color	Core color	Pin X4
	1	S3 Cos+	BK	YE	3
	2	S1 Cos−	RD	GN	11
	3	S4 Sin+	BU	WH	1
	4	S2 Sin−	YE	BN	9
	5	—	—	—	Do not connect
	6	—	—	—	Do not connect
	7	R2 Ref+	YEWH	GY	6
	8	R1 Ref−	RDWH	PK	2
	9	—	—	—	—
	10	—	—	—	—
	11	—	—	—	—
	12	—	—	—	—
	Housing	Shield	—	—	—

Tab. 123: con.15 encoder cable pin assignment

Length x [mm]	Diameter y [mm]
42	18.7

Tab. 124: con.15 dimensions

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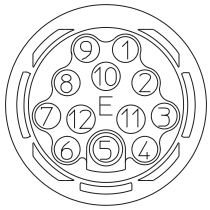
Encoder cables – con.17 plug connectors

Motor (1)				Cable (2)	Drive controller (3)
Connection diagram	Pin	Designation	Core color	Core color	Pin X4
	1	S3 Cos+	BK	YE	3
	2	S1 Cos−	RD	GN	11
	3	S4 Sin+	BU	WH	1
	4	S2 Sin−	YE	BN	9
	5	—	—	—	Do not connect
	6	—	—	—	Do not connect
	7	R2 Ref+	YEWH	GY	6
	8	R1 Ref−	RDWH	PK	2
	9	—	—	—	—
	10	—	—	—	—
	11	—	—	—	—
	12	—	—	—	—
	Housing	Shield	—	—	—

Tab. 125: con.17 encoder cable pin assignment

Length x [mm]	Diameter y [mm]
56	22

Tab. 126: Dimensions – con.17 connector size

BK:	BLACK	PK:	PINK
BN:	BROWN	RD:	RED
BU:	BLUE	VT:	VIOLET
GN:	GREEN	WH:	WHITE
GY:	GRAY	YE:	YELLOW
OG:	ORANGE		

Tab. 127: Cable color – Key

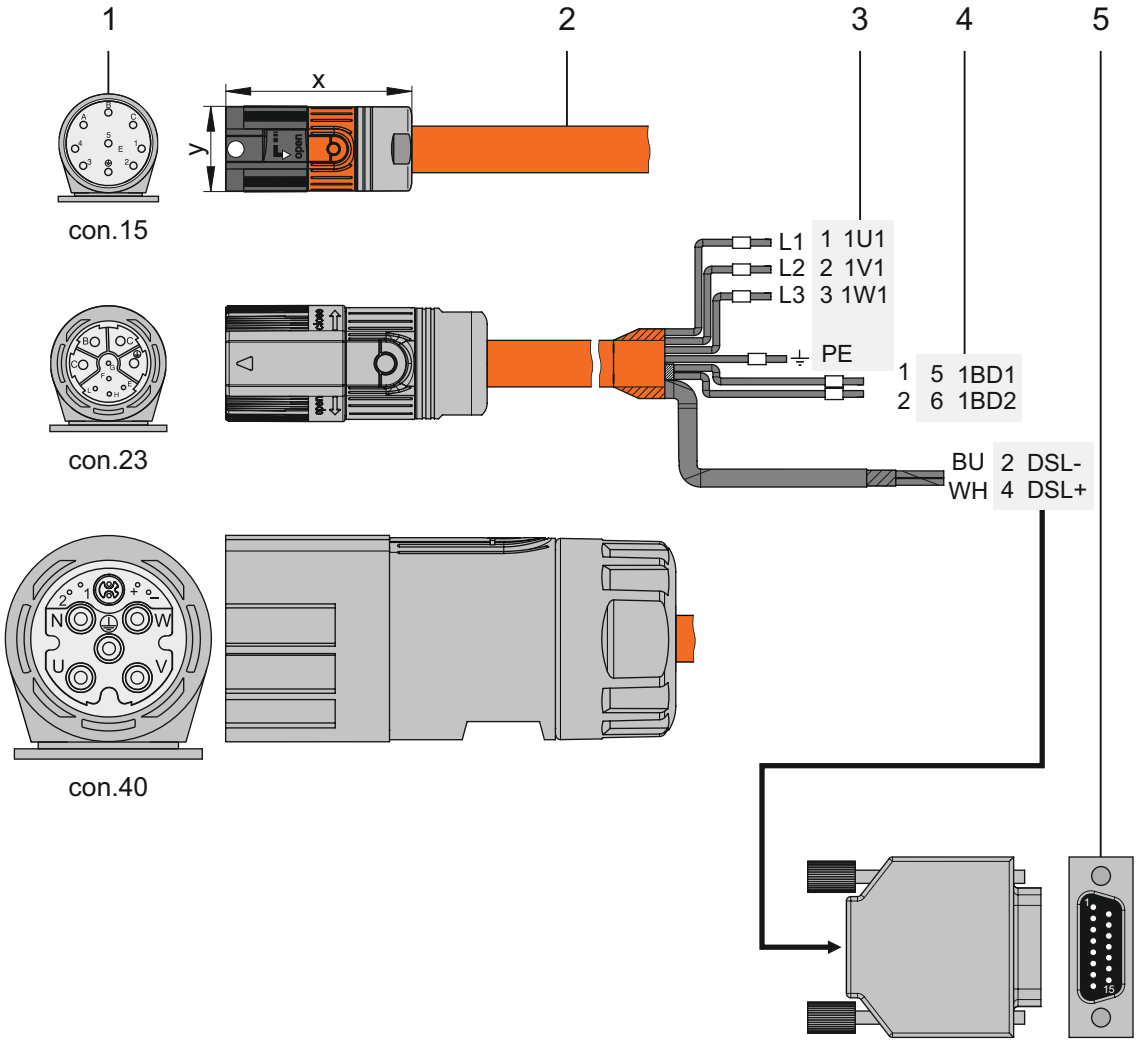
Two-colored core:	WHYE	WHITEYELLOW (white and yellow)
Single-colored core:	BK/BN	BLACK/BROWN (black or brown)

Tab. 128: Formatting conventions

9.5.3 One Cable Solution

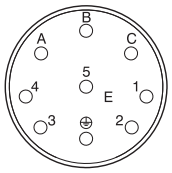
A motor connection as a One Cable Solution (OCS) requires hybrid cables where the encoder communication and power transmission occur on a shared cable. Hybrid cables are available depending on the plug size in the following designs:

- springtec quick lock for con.15
- speedtec quick lock for con.23 and con.40



1: Plug connector
2: STOBER hybrid cable
3: Connection to terminal X20, motor
4: Connection to terminal X2, brake supply
5: D-Sub X4

Hybrid cable – con.15 plug connector

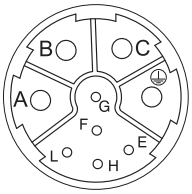
Motor (1)				Cable (2)	Drive controller (3) – (5)		
Connection diagram	Pin	Designa-tion	Wire color	Wire No./ wire color	Pin X20	Pin X2	Pin X4
	A	1U1	BK	L1	1	—	—
	B	1W1	RD	L3	3	—	—
	C	1V1	BU	L2	2	—	—
	1	1BD1	RD	1	—	5	—
	2	1BD2	BK	2	—	6	—
	3	DSL+	GY	WH	—	—	4
	4	DSL−	GN	BU	—	—	2
	5	DSL shield	—	—	—	—	Connect or
	⏚	PE	GNYE	GNYE	4	—	—
	Housing	Shield	—	—	Shield contact	—	—

Tab. 129: con.15 hybrid cable pin assignment

Length x [mm]	Diameter y [mm]
42	18.7

Tab. 130: con.15 dimensions

Hybrid cable – con.23 plug connector

Motor (1)				Cable (2)	Drive controller (3) – (5)		
Connection diagram	Pin	Designa-tion	Wire color	Wire No./ wire color	Pin X20	Pin X2	Pin X4
	A	1U1	BK	L1	1	—	—
	B	1V1	BU	L2	2	—	—
	C	1W1	RD	L3	3	—	—
	E	DSL−	GN	BU	—	—	2
	F	DSL shield	—	—	—	—	Connec tor
	G	1BD1	RD	1	—	5	—
	H	DSL+	GY	WH	—	—	4
	L	1BD2	BK	2	—	6	—
	⏚	PE	GNYE	GNYE	4	—	
	Hous-ing	Shield	—	—	Shield contact	—	—

Tab. 131: con.23 hybrid cable pin assignment

Length x [mm]	Diameter y [mm]
78	26

Tab. 132: con.23 dimensions

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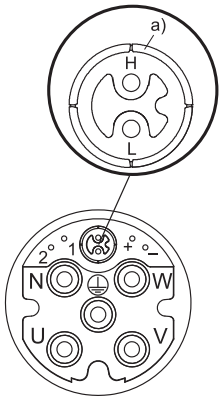
Hybrid cable – con.40 plug connector

Connection diagram	Motor (1) Pin	Designa-tion	Wire color	Cable (2) Wire No./ wire color	Drive controller (3) – (5) Pin X20	Pin X2	Pin X4
	U	1U1	BK	L1	1	—	—
	V	1V1	BU	L2	2	—	—
	W	1W1	RD	L3	3	—	—
	N	—	—	—	—	—	—
	+	1BD1	RD	1	—	5	—
	−	1BD2	BK	2	—	6	—
	F	—	—	—	—	—	—
	G	—	—	—	—	—	—
	H	DSL+	GY	WH	—	—	4
	L	DSL−	GN	BU	—	—	2
	⏚	PE	GNYE	GNYE	4	—	—
	Hous-ing	Shield	—	—	Shield contact	—	—

Tab. 133: con.40 hybrid cable pin assignment

a) Coaxial shield to which the DSL shield is connected.

Length x [mm]	Diameter y [mm]
99	46

Tab. 134: con.40 dimensions

BK:	BLACK	PK:	PINK
BN:	BROWN	RD:	RED
BU:	BLUE	VT:	VIOLET
GN:	GREEN	WH:	WHITE
GY:	GRAY	YE:	YELLOW
OG:	ORANGE		

Tab. 135: Cable color – Key

Two-colored core:	WHYE	WHITEYELLOW (white and yellow)
Single-colored core:	BK/BN	BLACK/BROWN (black or brown)

Tab. 136: Formatting conventions

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10 Commissioning

The following section includes the commissioning of your drive system with the aid of the DriveControlSuite DS6 software.

With regard to the components of your drive model, we require one of the following two combinations:

STOBER synchronous servo motor with EnDat 2.1/2.2 or HIPERFACE DSL encoders (and optionally integrated holding brake)

These motors together with all relevant data for the project configuration are saved in the motor database of DriveControlSuite as well as in the electronic nameplate.
Upon selecting the motor that you want from the database, as well as upon reading out the nameplate, all data is transferred to the corresponding parameters. There is no need for complex parameterization of the motor, encoder and holding brake.

STOBER LM lean motor without encoder (and optionally integrated holding brake)

These motors are stored in the motor database of the DriveControlSuite, along with all the data relevant for projecting. Furthermore, the motor data and the purging and engaging times of the holding brake are part of the firmware.
By selecting the desired motor from the database, all data is transmitted to the corresponding parameters. The purging and engaging times of the holding brake are also stored. If a brake is present, you must only activate this manually. However, complex parameterization of the motor and holding brake is not necessary.

All other motor types need to have their parameters configured manually.

Note that the system nodes must be wired and supplied with control voltage before commissioning.

Information

Always perform the steps included in the following chapters in the specified order!

10.1 Initiating the project

In order to be able to configure all drive controllers and axes of your drive system using DriveControlSuite, you must record them as part of a project.

10.1.1 Projecting the drive controller and axis

Create a new project and project the first drive controller along with the accompanying axis.

Creating a new project

1. Start DriveControlSuite.
2. Click on Create new standard project.

⇨ The projecting window opens and the Drive controller button is active.

Projecting the drive controller

1. Properties tab:
   Establish the relationship between your circuit diagram and the drive controller to be projected in DriveControlSuite.
   Reference: Specify the reference code (equipment code) of the drive controller.
   Designation: Give the drive controller a unique name.
   Version: Version your project configuration.
   Description: If necessary specify supporting additional information such as the change history of the project configuration.
2. Drive controller tab:
   Select the SC6 series and the device type of the drive controller.
3. Option modules tab:
   Safety module: If the drive controller is part of a safety circuit, select the SR6 or SY6 safety module.
4. Device controller tab:
   Device controller: Select the device controller that defines the underlying activation signals for the drive controller.
   Rx process data, Tx process data: If you control the drive controller using a fieldbus, select the fieldbus-specific receive and send process data.
   If you operate the drive controller in combination with the SY6 safety module, select EtherCAT Rx and EtherCAT Tx for transmitting the EtherCAT process data.
   If you operate the drive controller in combination with the SR6 safety module or without safety technology (SZ6), the fieldbus connection is optional. If you do not use a fieldbus, project No transmission.

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Projecting the axis

1. Click on Axis 1.
2. Properties tab:
   Establish the connection between your circuit diagram and the axis to be projected in DriveControlSuite.
   Reference: Specify the reference code (equipment code) of the axis.
   Designation: Give the axis a unique name.
   Version: Version your project configuration.
   Description: If necessary specify supporting additional information such as the change history of the project configuration.
3. Application tab:
   Select the desired control or drive-based application.
4. Motor tab:
   Select the motor category, the series and the type of motor operated using this axis. If you are working with motors from third-part suppliers, enter the accompanying motor data at a later time.
5. Repeat steps 2 – 4 for the 2nd axis (only for double-axis controllers).
6. Confirm with OK.

10.1.2 Creating other modules and drive controllers

We recommend sorting all drive controllers of your project in DriveControlSuite either functionally by groups and combining a group under a module, or organizing several drive controllers in corresponding modules based on their distribution to different control cabinets.

1. Highlight your project P1: Project 1 in the project tree > Context menu > New module.
   ⇨ Module M2 Module 2 is created in the project tree.
2. Highlight M2: Module 2 in the project tree > Context menu > New drive controller.
   ⇨ Drive controller T2 drive controller 2 is created in the project tree.
3. Highlight the drive controller T2: drive controller 2 in the project tree.
4. Change to the project menu and click Project configuration.
5. Project the drive controller and specify the newly created module.
6. Repeat the steps for all other drive controllers and modules of your project.

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10.1.3 Specifying a module

After you have created and projected all drive controllers that you want to record under a module, specify the module.

1. Highlight the module M1: Module1 in the project tree.
2. Change to the project menu and click Project configuration.
   ⇨ The Module window opens.
3. Establish the relationship between your circuit diagram and the newly created module in DriveControlSuite.
   Equipment: Specify the equipment code of the module.
   Designation: Give a clear and meaningful name to the module.
   Version: Specify a version for the module.
   Version description: If necessary, specify supporting additional information such as the change history of the module.
4. Confirm with OK.

10.1.4 Specifying the project

Finally, specify your project.

1. Highlight the project P1: Project1 in the project tree.
2. Change to the project menu and click Project configuration.
   ⇨ The Project window opens.
3. Establish the relationship between your circuit diagram and the newly created project in DriveControlSuite.
   Equipment: Specify the equipment code of the project.
   Designation: Give a clear and meaningful name to the project.
   Version: Specify a version for the project.
   Version description: If necessary specify supporting additional information such as the change history of the project.
4. Confirm with OK.

10.2 Mapping the mechanical drive model

Smooth operation of a drive train in combination with one or more drive controllers requires mapping the associated real mechanical environment in DriveControlSuite.

The following chapters provide explanations of the configuration options for rotational and translational drives in combination with different position or motor encoders. Position encoders are generally optional, whereas the use of a motor encoder depends on the control type and motor type.

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10.2.1 Parameterizing a STOBER motor

You have projected one of the following motors:

STOBER synchronous servo motor with EnDat 2.1/2.2 or HIPERFACE DSL encoders (and optionally integrated holding brake)

With the project configuration of the corresponding motor, limit values for currents and torques as well as associated temperature data are automatically transferred to the respective parameters of the individual wizards. All additional data on the holding brake and encoder is transferred at the same time.

STOBER LM lean motor without encoder (and optionally integrated holding brake)

With the project configuration of the corresponding motor, limit values for currents and torques as well as associated temperature data are automatically transferred to the respective parameters of the individual wizards. You only have to parameterize the cable length in use. Even the holding brake purging and engaging times are already stored. All you have to do is activate the brake.

1. Highlight the relevant drive controller in the project tree and click on the first projected axis in the project menu > Wizard section.
2. Select the Motor wizard.
3. B101 Cable length:
   Select the cable length of the power cable in use.
4. Repeat the steps for the 2nd axis (only for double-axis controllers).

Then activate the holding brake.

1. Highlight the relevant drive controller in the project tree and click on the first projected axis in the project menu > Wizard section.
2. Select the Holding brake wizard.
3. F00 Brake:
   Select 1: Active.
4. Repeat the steps for the 2nd axis (only for double-axis controllers).

10.2.2 Parameterizing the axis model

Parameterize the setup of your drive in this order:

- Define the axis model
- Scale the axis
- Limit the axis (optional)
  - Limit the position
  - Limit the velocity, acceleration and jerk
  - Limit the torque and force

10.2.2.1 Define the axis model

1. Highlight the relevant drive controller in the project tree and click on the first projected axis in the project menu > Wizard section.
2. Select the Axis model wizard.
3. I05 Type of axis:
   In order to individually configure the units of measure and the number of decimal places for specifying and displaying position target values, velocity values and acceleration values, select 0: Free setting, rotational or 1: Free setting, translational.
   If the units of measure and the number of decimal place are to be fixed for specifying and displaying position target values, velocity values and acceleration values, select 2: Rotational or 3: Translational.
4. B26 Motor encoder:
   Define the interface to which the motor encoder is connected.
5. I02 Position encoder:
   Define the interface to which the position encoder is connected.
6. I00 Position range:
   Define the travel range.

10.2.2.2 Scaling the axis

1. Highlight the relevant drive controller in the project tree and click on the first projected axis in the project menu > Wizard section.
2. Select the Axis model > Axis scaling wizard.
3. Scale the axis by configuring the overall gear ratio between the motor and output.
   To simplify this scaling for you, you are provided with the scaling calculator **Conversion of position, velocities, accelerations, torque/force**, which calculates the effects of changed movement variables on the entire system.
4. I06 Decimal places position:
   If you have selected 0: Free setting, rotational or 1: Free setting, translational when defining your axis type, you define the desired number of decimal places in this parameter.
5. I09 Measure unit:
   If you have selected 0: Free setting, rotational or 1: Free setting, translational when defining your axis type, you define the desired unit of measure in this parameter.

Information

Note that a change to parameter I06 moves the decimal sign for all axis-specific values! Ideally, change I06 before parameterizing other axis-specific values and then check them afterwards.

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10.2.2.3 Limiting the axis

If necessary, limit the movement variables for position, velocity, acceleration, jerk as well as torque/force according to the applicable conditions for your drive model.

Limiting the position (optional)

1. Highlight the relevant drive controller in the project tree and click on the first projected axis in the project menu > Wizard section.
2. Select the Axis model > Limit position wizard.
3. If necessary, limit the position of your axis using a software or hardware limit switch to secure the travel range.

Limiting velocity, acceleration, jerk (optional)

The specified default values are designed for slow velocities without gear units. For this reason, adapt the saved values.

Note that the velocity of the motor is parameterized in units other than that of the axis model. Verify the velocity of the motor against the velocity of the output accordingly.

1. Select the Motor wizard.
2. To determine the maximum velocity at the output, copy the value of the B13 Nominal motor speed parameter to the clipboard.
3. Select the Axis model > Scaling axis wizard > Conversion of positions, velocities, accelerations, torque/force section.
4. Velocity line:
   Paste the copied value of the B13 parameter from the clipboard and confirm with ENTER.
   ⇨ The maximum velocity of the motor has been transferred to the output.
5. Select the Axis model > Limit velocity, acceleration, jerk wizard.
6. I10 Maximal speed:
   Limit the maximum velocity of the output taking into account the configured Nominal motor speed in B13.
7. Determine the limiting values for acceleration and jerk if necessary and enter them into the associated parameters.

Limiting torque/force (optional)

The specified default values take into account the rated operation together with the overload reserves.

1. Select the Axis model > Limit torque/force wizard.
2. If the motor force must be limited, adapt the saved values as necessary.

10.3 Testing the project configuration

Before you continue parameterizing your application, we recommend testing your projected axis model using the jog control panel.

Check your projected axis model as well as your configured electrical and mechanical data for plausibility by transferring your project configuration to one of your drive controllers for test purposes and controlling the drive using the jog control panel instead of using a controller.

1. Highlight the relevant drive controller in the project tree and click on the first projected axis in the project menu > Wizard section.
2. Select Jog control panel.
3. The predefined test movement variables are standard values. Check them and, if necessary, change the values such that you can intervene in an emergency before personal injury or material damage can occur.

Information

Always check the reliability of the standard values before the test start. If they appear too large or unsuitable compared with the results of the scaling calculator, always replace them with values that are more suitable for test operation.

Transferring the test configuration

✓ You have verified the predefined test movement variables for plausibility. To be able to transfer a test configuration to a drive controller, you must connect your PC to the network. The relevant drive controller is switched on.

1. In the project tree, highlight the module under which you have recorded the drive controller and click Connection and assignment in the project menu.
   ⇨ The Setting up a connection window opens.
2. Direct connection tab > IP address column:
   Mark the drive controller in question or activate all those listed using the context menu. Confirm your selection with OK.
   ⇨ The Assignment window opens. All drive controllers connected to the selected network interface are displayed.
3. Drive controllers connected via communication:
   Select the drive controller in question and click Ignore > Send to drive controller.
4. Click on Create new and select the drive controller.
5. Repeat steps 3 and 4 for all other drive controllers to which you wish to transmit your test configuration.
6. Click on Establish online connections.

⇨ The test configuration is transmitted to the drive controller.

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Saving the test configuration

1. Highlight the drive controller you have transferred the test configuration to in the project tree and click on the first projected axis in the project menu > Wizard section.
2. Select the Save values wizard > Action management section and click on Save values.
3. As the configuration is only effective after a restart of the drive controller, select the Restart wizard > Action management section and click on Restart.

Activating the control panel and testing the project configuration

1. Select Jog control panel.
2. Click on Control panel on and then on Enable.
   ⇨ The drive is controlled using the activated control panel.
3. Move the axis step-by-step and test the movement direction, velocity, distance, etc. using the Jog+, Jog−, JogStep+ and JogStep− buttons.
4. Optimize your project configuration based on your test results as necessary.
5. To deactivate the control panel, click on Control panel off.

Information

Jog+ and Jog− cause a continual manual movement in the positive or negative direction. If both buttons are active, no movement is executed.

JogStep+ and JogStep− move the drive relative to the current actual value by the step width specified in I14.

Jog+ and Jog− have a higher priority than JogStep+ and JogStep−.

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11 Diagnostics

LEDs on the top and front give you initial information about the device state of the respective device as well as the states of the physical connection and the communication. In the event of an error or fault, you will receive detailed information through the DriveControlSuite commissioning software.

11.1 Drive controller

STOBER drive controllers have diagnostic LEDs that visually indicate the state of the drive controller as well as the states of the physical connection and communication.

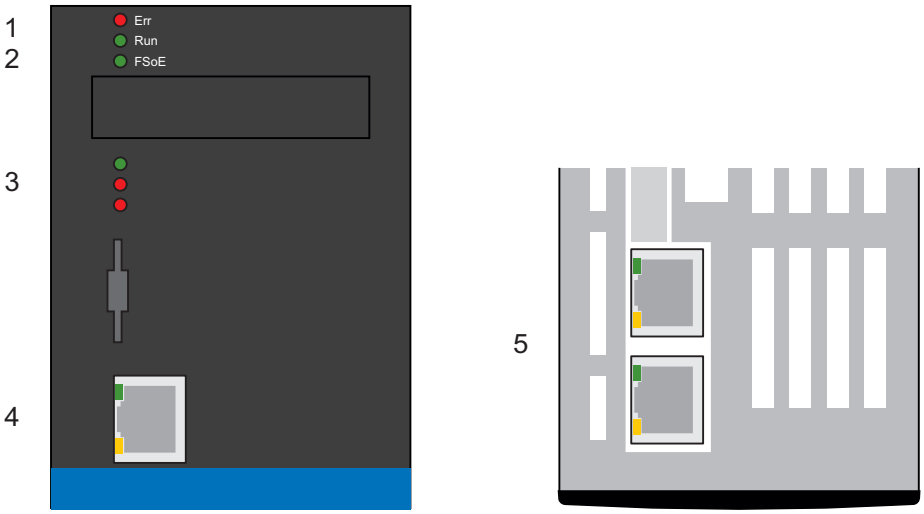

Fig. 15: Positions of the diagnostic LEDs on the front and top of the drive controller

1 Fieldbus state
2 FSoE state
3 Drive controller state
4 Service network connection
5 Fieldbus network connection

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11.1.1 Fieldbus state

The LEDs for the diagnostics of the fieldbus state vary depending on the implemented fieldbus system or communication module.

11.1.1.1 EtherCAT state

There are 2 LEDs on the front of the drive controller that provide information about the connection between EtherCAT master and slave and about the state of the data exchange. This information can also be read out in parameter A255 EtherCAT Device State.

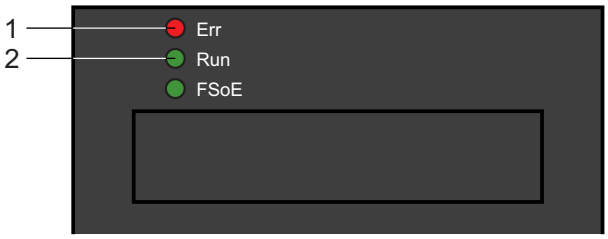

Fig. 16: LEDs for the EtherCAT state

1 Red: Error

2 Green: Run

Red LED	Behavior	Error	Description
	Off	No Error	No error
	Flashing	Invalid Configuration	Invalid configuration
	1x flash	Unsolicited State Change	The EtherCAT slave changed operating states by itself
	2x flash	Application Watchdog Timeout	The EtherCAT slave did not receive new PDO data during the configured watchdog timeout

Tab. 137: Meaning of the red LED (error)

Green LED	Behavior	Operating state	Description
	Off	Init	No communication between the EtherCAT master and slave; the configuration starts, saved values are loaded
	Flashing	Pre-operational	No PDO communication; the EtherCAT master and slave exchange application-specific parameters via SDOs
	1x flash	Safe-operational	The EtherCAT slave sends the current actual values to the EtherCAT master, ignores its reference values and refers to internal default values
	On	Operational	Normal operation: The EtherCAT master and slave exchange target and actual values

Tab. 138: Meaning of the green LED (run)

11.1.1.2 PROFINET state

There are 2 LEDs on the front of the drive controller that provide information about the connection between the IO controller and device and about the state of the data exchange. This information can also be read out in parameter A271 PN state.

Fig. 17: LEDs for the PROFINET state

1 Red: Bus error

2 Green: Run

Red LED	Behavior	Description
	Off	No error
	Rapid flashing	Data exchange with IO controller not active
	On	No network connection

Tab. 139: Meaning of the red LED (BF)

Green LED	Behavior	Description
	Off	No connection
	Flash	Connection is set up to IO controller
	Flash, inverse	IO controller activates DHCP signal service
	Flashing	Existing connection to IO controller; data exchange expected
	On	Existing connection to IO controller

Tab. 140: Meaning of the green LED (run)

11.1.2 FSoE state

If the drive controller includes the SY6 safety module, the STO and SS1 safety functions are activated over EtherCAT FSoE. In this case, an LED on the front of the device provides information about the state of FSoE communication. This information can also be read out in parameter S20 FSoE status.

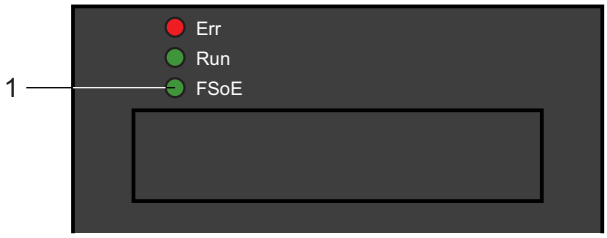

Fig. 18: LED for the FSoE state

1 Green: FSoE

Green LED	Behavior	Possible in FSoE state	Description
	Off	Pre-Reset	Initialization
	Flashing	Reset, session, connection, parameters	Ready for parameterization
	On	Process data	Normal operation
	Single blink	Failsafe data	Failsafe command from FSoE master received
	Rapid blinking	All	Undefined connection error
	Rapid blinking with 1x flash	Parameters	Error in the safety-related communication settings
	Rapid blinking with 2x flash	Parameters	Error in the safety-related application settings
	Rapid blinking with 3x flash	Connection	Incorrect FSoE address
	Rapid blinking with 4x flash	All	Prohibited command received
	Rapid blinking with 5x flash	All	Watchdog error
	Rapid blinking with 6x flash	All	CRC error

Tab. 141: Meaning of the green LED (FSoE state in accordance with IEC 61784-3)

11.1.3 Drive controller state

3 LEDs on the front of the device provide information about the state of the drive controller.

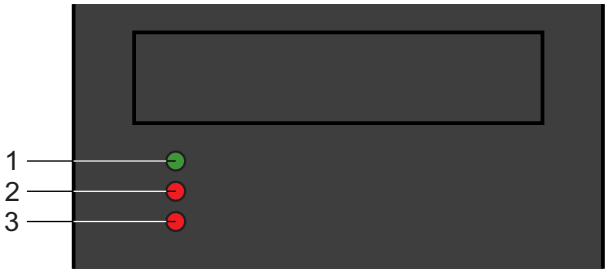

Fig. 19: LEDs for the state of the drive controller

1 Green: Run

2 Red: Error in axis controller A

3 Red: Error in axis controller B (only for double-axis controllers)

Green LED	Behavior	Description
	Off	No supply voltage or axis controller A or B faulty
	Single blink	STO active
	Flashing	At least 1 axis controller ready to switch on; no axis controller faulty
	On	At least 1 axis controller enabled; no axis controller faulty
	Rapid flashing	Data is written to internal memory and the SD card

Tab. 142: Meaning of the green LED (run)

Red LED	Behavior	Description
	Off	No error
	Flashing	Warning
	On	Fault
	Rapid flashing	No configuration active

Tab. 143: Meaning of the red LEDs (error)

Pattern when starting the drive controller

LEDs: Green/Red/Red	Behavior	Description
	On	Short phase while the firmware starts up
	On	
	On	

Tab. 144: States of the LEDS when starting the drive controller

Pattern for the firmware update

The states of the green and red LEDs also apply as described during a live firmware update. In the following exceptional cases, the three LEDs flash in different combinations and frequencies:

LEDs: Green/Red/Red	Behavior	Description
	Off	Deleting the first firmware memory
	Rapid flashing	
	Off	
	Rapid flashing	Copying the second firmware memory into the first
	Off	
	Off	
	Chaser light	Error during firmware update, service required
		
		

Tab. 145: States of the LEDs for firmware updates

11.1.4 Service network connection

The LEDs at X9 on the front of the device display the state of the service network connection.

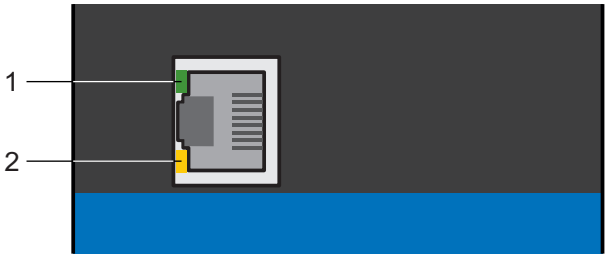

Fig. 20: LEDs for the state of the service network connection

1 Green: Link

2 Yellow: Activity

Green LED	Behavior	Description
	Off	No network connection
	On	Network connection present

Tab. 146: Meaning of the green LED (link)

Yellow LED	Behavior	Description
	Off	No network connection
	Flashing	Individual data packets are sent or received
	On	Active data exchange

Tab. 147: Meaning of the yellow LED (act.)

11.1.5 Fieldbus network connection

The LEDs for communication diagnostics vary depending on implemented fieldbus system or communication module.

11.1.5.1 EtherCAT network connection

The LEDs LA $_{EC}$IN and LA $_{EC}$OUT at X200 and X201 on the top of the device indicate the state of the EtherCAT network connection.

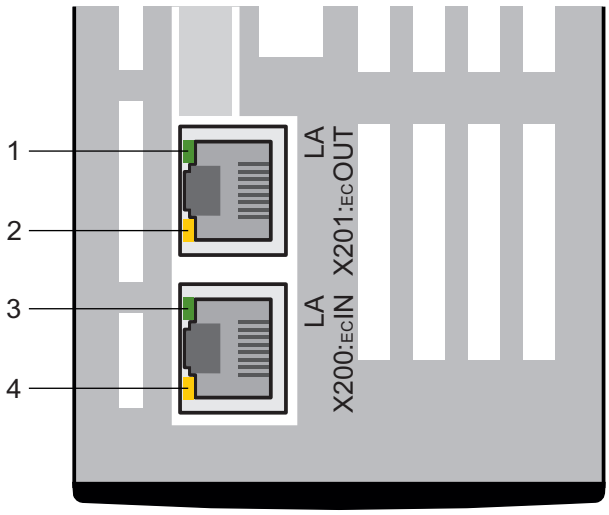

Fig. 21: LEDs for the state of the EtherCAT network connection

1 Green: LA $_{EC}$OUT at X201
2 Yellow: No function
3 Green: LA $_{EC}$IN at X200
4 Yellow: No function

Green LED	Behavior	Description
	Off	No network connection
	Flashing	Active data exchange with other EtherCAT nodes
	On	Network connection exists

Tab. 148: Meaning of the green LEDs (LA)

11.1.5.2 PROFINET network connection

The Act. and Link LEDs at X200 and X201 on the top of the device indicate the state of the PROFINET network connection.

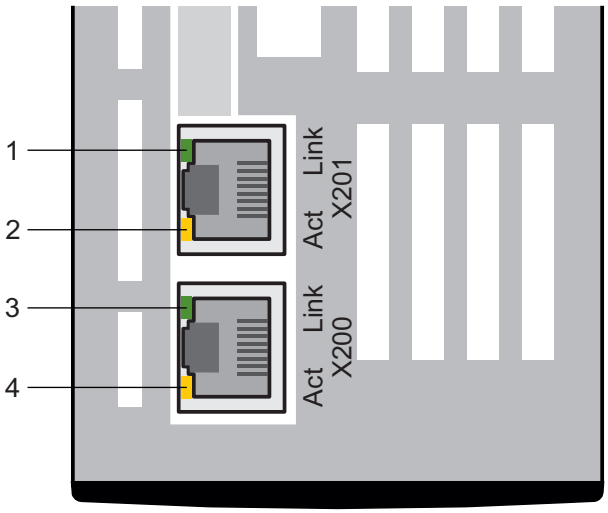

Fig. 22: LEDs for the state of the PROFINET network connection

1 Green: Link at X201
2 Yellow: Activity at X201
3 Green: Link at X200
4 Yellow: Activity at X200

Green LED	Behavior	Description
	Off	No network connection
	On	Network connection exists

Tab. 149: Meaning of the green LEDs (Link)

Yellow LED	Behavior	Description
	Off	No data exchange
	Flashing	Active data exchange with IO controller

Tab. 150: Meaning of the yellow LEDs (Act.)

11.2 Events

The drive controller has a self-monitoring system that uses test rules to protect the drive system from damage. Violating the test rules triggers a corresponding event. There is no possible way for you as the user to intervene in some events, such as event Short/ground. In other cases, such as event Overspeed, you can define the triggering threshold and the response.

Possible responses include:

- Message: Information that can be evaluated by the controller
- Warning: Information that can be evaluated by the controller and becomes a fault after a defined time span has elapsed without the cause being resolved
- Fault: Immediate drive controller response; the drive either stops applying torque/force or is brought to a stop through a quick stop or emergency braking

Events, their causes and suitable measures are listed below. If the cause of the error is corrected, you can usually acknowledge the error immediately. If the drive controller has to be restarted instead, a corresponding note can be found in the measures.

11.2.1 Overview

The following table shows the possible events at a glance.

Event
Event 31: Short/ground [▶ 138]
Event 32: Short/ground internal [▶ 138]
Event 33: Overcurrent [▶ 139]
Event 34: Hardware fault [▶ 140]
Event 35: Watchdog [▶ 140]
Event 36: High voltage [▶ 141]
Event 37: Motor encoder [▶ 142]
Event 38: Temperature drive controller sensor [▶ 145]
Event 39: Overtemperature drive controller i2t [▶ 146]
Event 40: Invalid data [▶ 147]
Event 41: Temp.MotorTMP [▶ 148]
Event 42: TempBrakeRes [▶ 149]
Event 44: External fault 1 [▶ 150]
Event 45: Overtemp.motor i2t [▶ 151]
Event 46: Low voltage [▶ 152]
Event 47: Torque limit [▶ 153]
Event 50: Safety module [▶ 154]
Event 51: Virtual master limit switch [▶ 155]

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Event
Event 52: Communication [▶ 156]
Event 53: Limit switch [▶ 157]
Event 54: Following error [▶ 158]
Event 56: Overspeed [▶ 159]
Event 57: Runtime usage [▶ 160]
Event 59: Overtemperature drive controller i2t [▶ 161]
Event 60: Application event 0 – Event 67: Application event 7 [▶ 162]
Event 68: External fault 2 [▶ 163]
Event 69: Motor connection [▶ 164]
Event 70: Parameter consistency [▶ 165]
Event 71: Firmware [▶ 166]
Event 72: Brake test timeout [▶ 167]
Event 76: Position encoder [▶ 168]
Event 77: Master encoder [▶ 171]
Event 78: Position limit cyclic [▶ 174]
Event 79: Motor / position monitor [▶ 175]
Event 80: Illegal action [▶ 176]
Event 81: Motor allocation [▶ 176]
Event 83: Failure of one/ all phases (mains) [▶ 177]
Event 84: Drop in network voltage when power section active [▶ 178]
Event 85: Excessive jump in reference value [▶ 179]
Event 86: Unknown data record LeanMotor [▶ 180]
Event 87: Reference lostReference loss [▶ 181]
Event 88: Control panel [▶ 182]
Event 89: LM maximum current [▶ 183]

11.2.2 Event 31: Short/ground

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The brake chopper is disabled.

Cause	Check and action
Connection error at the motor	Check the connection and correct it if necessary
Defective motor cable	Check the cable and replace it if necessary
Braking resistor too low	Check the maximum permitted braking resistor power loss for the application and replace the braking resistor if necessary
Short-circuit in the motor winding	Check the motor and replace it if necessary
Short-circuit in the braking resistor	Check the braking resistor and replace it if necessary
Short-circuit/ground fault inside the device	Check whether the fault occurs when switching on the power unit and replace the drive controller if necessary

Tab. 151: Event 31 – Causes and actions

11.2.3 Event 32: Short/ground internal

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The brake chopper is disabled.

Cause	Check and action
Short-circuit/ground fault inside the device	Replacing the drive controller

Tab. 152: Event 32 – Causes and actions

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11.2.4 Event 33: Overcurrent

The drive controller is interrupted if:

- U30 = 0: Inactive

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with emergency braking if:

- U30 = 1: Active and
- A29 = 1: Active for STOBER device controller
  or
- U30 = 1: Active and
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by emergency braking; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)
- At the end of emergency braking, the power unit is disabled and axis movement is no longer controlled by the drive controller

Cause	Check and action
Short acceleration times	Check the actual current using the scope image and reduce the acceleration values if necessary (E00)
Large torque/force limits	Check the actual current using the scope image (E00) and reduce the torque/force limits if necessary (C03, C05)
Wrong drive controller design	Check the design and change the drive controller type if necessary

Tab. 153: Event 33 – Causes and actions

11.2.5 Event 34: Hardware fault

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: FPGA – 12: Timer control board	Defective drive controller	Exchange drive controller; fault cannot be acknowledged
23: FPGA – 30: Internal power supply	Defective drive controller	Exchange drive controller; fault cannot be acknowledged

Tab. 154: Event 34 – Causes and actions

11.2.6 Event 35: Watchdog

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The brake chopper and brake purge override are non-functional while the runtime system restarts.

Cause	Check and action
Microprocessor at full load	Check the runtime utilization using the scope image (E191) and reduce it using a longer cycle time if necessary (A150)
Microprocessor faulted	Check the connection and shielding and correct them if necessary; replace the drive controller if necessary

Tab. 155: Event 35 – Causes and actions

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11.2.7 Event 36: High voltage

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Short delay times	Check the DC link voltage during the braking operation using the scope image (E03) and, if necessary, reduce the delay values, use a (larger) braking resistor or connect a DC link
Brake chopper deactivated	Check the values of the parameterized braking resistor and correct it if necessary (A21, A22, A23)
Braking resistor connection error	Check the connection to the braking resistor and drive controller and correct them if necessary
Braking resistor overloaded	Check that the maximum permitted braking resistor power loss is suitable for the application and replace the braking resistor if necessary
Brake chopper is defective	Check the DC link voltage during the braking operation using the scope image (E03); brake chopper is defective if the DC link voltage exceeds the on limit of the brake chopper (R31) without the DC link voltage dropping; replace the drive controller if necessary
Supply voltage exceeded	Check the supply voltage for an overrun of the permitted input voltage and adjust it if necessary

Tab. 156: Event 36 – Causes and actions

11.2.8 Event 37: Motor encoder

The drive controller is interrupted if:

- U30 = 0: Inactive

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with emergency braking if:

- U30 = 1: Active and
- A29 = 1: Active for STOBER device controller
  or
- U30 = 1: Active and
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by emergency braking; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)
- At the end of emergency braking, the power unit is disabled and axis movement is no longer controlled by the drive controller

Number	Cause	Check and action
1: Parameter <-> encoder	Inconsistent parameterization	Compare the specification of the connected encoder to the corresponding values of the H parameters and correct them if necessary
2: X4 speed	Exceeded encoder maximum velocity	Check the actual velocity during a movement using the scope image (E15) and adjust the permitted encoder maximum velocity if necessary (B297)
	Connection error	Check the connection and shielding and correct them if necessary
6: X4 EnDat encoder found	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00)
7: X4 channel A/ incremental	Connection error	Check the connection and correct it if necessary

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Number	Cause	Check and action
8: X4 no encoder found	Connection error	Check the connection and correct it if necessary; restart the drive controller to switch the encoder supply back on
	Defective encoder cable	Check the cable and replace it if necessary; restart the drive controller to switch the encoder supply back on
	Defective power supply	Check the encoder power supply and correct it if necessary; restart the drive controller to switch the encoder supply back on
	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00); restart the drive controller to switch encoder supply back on
10: X4 channel A/Clk – 11: X4 channel B/Dat	Defective encoder cable	Check the cable and replace it if necessary
13: X4-EnDat alarm	Defective EnDat encoder	Replace the encoder or motor; fault cannot be acknowledged
14: X4 EnDat CRC – 15: X4 double transmission	Connection error	Check the connection and shielding and correct them if necessary
16: X4 busy	Defective encoder cable	Check the cable and replace it if necessary
	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00)
17: EBI encoder low battery – 18: EBI encoder battery empty	EBI encoder battery is too weak or dead	Replace the battery

Number	Cause	Check and action
20: Resolver carrier – 22: Resolver overvoltage	Defective encoder cable	Check the cable and replace it if necessary
	Incompatible resolver	Compare the specification of the resolver to the corresponding specifications from STOBER and replace the resolver or motor if necessary; fault cannot be acknowledged
24: Resolver failure	Defective encoder cable	Check the cable and replace it if necessary
48: X4 zero pulse missing	Defective encoder cable	Check the cable and replace it if necessary
	Connection error	Check the connection and correct it if necessary
	Late zero toe	Check number of encoder increments per rotation and correct it if necessary (H02)
49: X4 zero pulse distance too small	Defective encoder cable	Check the cable and replace it if necessary
	Connection error	Check the connection and correct it if necessary
	Early zero track	Check number of encoder increments per rotation and correct it if necessary (H02)

Tab. 157: Event 37 – Causes and actions

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11.2.9 Event 38: Temperature drive controller sensor

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Surrounding temperatures too high or too low	Check the surrounding temperature of the drive controller and adjust it to the operating conditions of the drive controller if necessary
Too little air circulation in the control cabinet	Check minimum clearance and adjust it if necessary
Defective or blocked fan	Switch on control unit supply; check that the fan starts and replace the drive controller if necessary
Wrong drive controller design	Check the design and change the drive controller type if necessary
Increased or reduced mechanical friction	Check the service status of the mechanics and service them if necessary
Mechanical block	Check the output and remove the block if necessary
Short deceleration/ acceleration times	Check the actual current during the braking process using the scope image (E00); reduce the deceleration and acceleration values if necessary
Clock frequency too high	Check the utilization of the drive, taking into account derating and the configured clock frequency (E20, B24); reduce the configured clock frequency or replace the drive controller if necessary

Tab. 158: Event 38 – Causes and actions

11.2.10 Event 39: Overtemperature drive controller i2t

The possible effects depend on the configured level (U02):

- 0: Inactive
- 1: Message
- 2: Warning
- 3: Fault

The maximum permitted output current is limited to 99% of $I_{2N,PU}$ (R04). If the i^2t value (E24) increases to 105%, event 59: Overtemperature drive controller i2t is triggered.

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Wrong drive controller design	Check the design and change the drive controller type if necessary
Increased or reduced mechanical friction	Check the service status of the mechanics and service them if necessary
Mechanical block	Check the output and correct the block if necessary
Short deceleration/ acceleration times	Check the actual current during the braking process using the scope image (E00); reduce the deceleration and acceleration values if necessary
Clock frequency too high	Check the utilization of the drive, taking into account derating and the configured clock frequency (E20, B24); reduce the configured clock frequency or replace the drive controller if necessary

Tab. 159: Event 39 – Causes and actions

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11.2.11 Event 40: Invalid data

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Fault – 8: Wrong/illegal serial number	Invalid data in the internal memory of the drive controller or option module	Replace the drive controller or option module; fault cannot be acknowledged
32: Electronic nameplate	No data available in the electronic nameplate	Deactivate the evaluation of the nameplate or replace the motor (B04)
33: Electronic motor-type limit	Invalid data in the electronic nameplate	Deactivate the evaluation of the nameplate or replace the motor (B04)

Tab. 160: Event 40 – Causes and actions

11.2.12 Event 41: Temp.MotorTMP

The possible effects depend on the configured level (U15):

- 2: Warning
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Connection error	Check the connection and correct it if necessary
Wrong motor design	Check the design and change the motor type if necessary
Surrounding temperatures too high	Check the surrounding temperature of the motor and adjust it if necessary
Mechanical block	Check the output and remove the block if necessary
Increased or reduced mechanical friction	Check the service status of the mechanics and service them if necessary

Tab. 161: Event 41 – Causes and actions

11.2.13 Event 42: TempBrakeRes

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Short deceleration/ acceleration times	Check the DC link voltage during the braking process using the scope image (E03); reduce the deceleration and acceleration values if necessary
Braking resistor too low	Check that the maximum permitted braking resistor power loss is suitable for the application and replace the braking resistor if necessary
Brake chopper is defective	Check DC link voltage during the braking process using the scope image (E03); the brake chopper is defective if E03 exceeds the on limit of the brake chopper R31 without E03 dropping; replace the drive controller if necessary

Tab. 162: Event 42 – Causes and actions

11.2.14 Event 44: External fault 1

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Application-specific	Application-specific

Tab. 163: Event 44 – Causes and actions

11.2.15 Event 45: Overtemp.motor i2t

The possible effects depend on the parameterized level (U10):

- 0: Inactive
- 1: Message
- 2: Warning
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Wrong motor design	Check the design and change the motor type if necessary
Mechanical block	Check the output and remove the block if necessary
Increased or reduced mechanical friction	Check the service status of the mechanics and service them if necessary

Tab. 164: Event 45 – Causes and actions

11.2.16 Event 46: Low voltage

The possible effects depend on the configured level (U00):

- 0: Inactive
- 1: Message
- 2: Warning
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Supply voltage does not correspond to the configured supply voltage	Check the supply voltage, parameterized supply voltage and undervoltage limit and correct them if necessary (A36, A35)
Supply voltage below undervoltage limit	Check undervoltage limit and correct it if necessary (A35)

Tab. 165: Event 46 – Causes and actions

11.2.17 Event 47: Torque limit

The possible effects depend on the configured level (U20):

- 0: Inactive
- 1: Message
- 2: Warning
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Incorrectly selected torque/force limits	Check the general machine limit and adjust it if necessary (C03, C05); check the application limits and the parameters dependent on the operating mode and adjust them if necessary (STOBER C132, C133 or CiA 402 A559)
Wrong motor design	Check the design and change the motor type if necessary
Mechanical block	Check the output and correct the block if necessary
Holding brake closed	Check the connection, supply voltage and parameterization and correct them if necessary (F00)
Connection error at the motor	Check the connection and correct it if necessary
Connection error at the encoder	Check the connection and correct it if necessary
Wrong encoder measurement direction	Compare the attachment and measurement direction of the encoder with the corresponding values of the H parameters and correct them if necessary

Tab. 166: Event 47 – Causes and actions

11.2.18 Event 50: Safety module

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Inconsistent request (single channel)	Connection error	Check the connection and correct if necessary, error can be confirmed only if STO was previously requested for at least 100 ms across two channels
2: Wrong safety module	The projected safety module E53 does not match the E54[0] detected on the system side	Check the projecting and drive controller and correct the projecting or exchange the drive controller if necessary; fault cannot be acknowledged
3: Internal error	Defective safety module	Exchange drive controller; fault cannot be confirmed

Tab. 167: Event 50 – Causes and actions

11.2.19 Event 51: Virtual master limit switch

The possible effects depend on the configured level (U24).

- 0: Inactive
- 1: Message
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: SW-limit switch positive – 2: SW-limit switch negative	End of the travel range reached	Move in the travel range in the direction opposite the limit switch
	Travel range too small	Check the positions of the software limit switch and correct them if necessary (G146, G147)
3: +/- 31 bit computing limit reached	Computing limit of the data type reached	Check the command sequences for multiple successive commands without a breakpoint 3: MC_MoveAdditive and the number of decimal places of the axis model and reduce them if necessary (G46)

Tab. 168: Event 51 – Causes and actions

11.2.20 Event 52: Communication

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
4: PZD-Timeout	Missing process data	Check the IO cycle time in the PROFINET IO controller and the timeout time in the drive controller and correct them if necessary (A109)
6: EtherCAT PDO-Timeout	Missing process data	Check the task cycle time in the EtherCAT master and the timeout time in the drive controller and correct them if necessary (A258)
7: Reserved	Synchronization error	Check the synchronization settings in the EtherCAT master and correct them if necessary
	Connection error	Check the connection and shielding and correct them if necessary
14: PZD parameter figure faulty	Missing mapping	Check the mapping for unmappable parameters and correct them if necessary

Tab. 169: Event 52 – Causes and actions

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11.2.21 Event 53: Limit switch

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Hardware-Limit-Switch positive – 2: Hardware-Limit-Switch negative	End of the travel range reached	Move in the travel range in the direction opposite the limit switch
	Connection error	Check the connection and source parameters and correct them if necessary (I101, I102)
	Defective connection cable	Check the cable and replace it if necessary
3: SW-limit switch positive – 4: SW-limit switch negative	End of the travel range reached	Move in the travel range in the direction opposite the limit switch
	Travel range too small	Check the positions of the software limit switches and correct them if necessary (STOBERI50, I51 or CiA A570[0], A570[1])
5: +/- 31 bit computing limit reached	Computing limit of the data type reached	Check the command sequences for multiple successive commands without a breakpoint 3: MC_MoveAdditive and the number of decimal places of the axis model and reduce them if necessary (I06)
7: Both limit switches not connected	Connection error	Check the connection and source parameters and correct them if necessary (I101, I102)
	Defective connection cable	Check the cable and replace it if necessary

Tab. 170: Event 53 – Causes and actions

11.2.22 Event 54: Following error

The possible effects depend on the configured level (U22).

- 0: Inactive
- 1: Message
- 2: Warning
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Incorrectly selected torque/force limits	Check the general machine limit and adjust it if necessary (C03, C05); check the application limits and adjust them if necessary (STOBER C132, C133 and the parameters dependent on the operating mode or CiA 402 A559)
Maximum permitted drag distance too small	Check the maximum permitted drag error and correct it if necessary (STOBER I21 or CiA A546)
Mechanical block	Check the output and correct the block if necessary
Holding brake closed	Check the connection, supply voltage and parameterization and correct them if necessary (F00)

Tab. 171: Event 54 – Causes and actions

11.2.23 Event 56: Overspeed

The drive controller is interrupted if:

- U30 = 0: Inactive

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with emergency braking if:

- U30 = 1: Active and
- A29 = 1: Active for STOBER device controller
  or
- U30 = 1: Active and
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by emergency braking; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)
- At the end of emergency braking, the power unit is disabled and axis movement is no longer controlled by the drive controller

Cause	Check and action
Maximum permitted velocity too small	Check the maximum permitted velocity and increase it if necessary (I10)
Overshooting control system	Check the actual velocity using the scope image (E15) and reduce the intensity of the speed regulator if necessary (C31)
Wrong commutation offset	Check the commutation offset using the test phases action (B40)
Faulty encoder	Check the velocity display of the encoder at a standstill (motor: E15; position I88; master G105) and replace the encoder if necessary

Tab. 172: Event 56 – Causes and actions

11.2.24 Event 57: Runtime usage

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
3: RT3 – 5: RT5	Exceeding the cycle time	Check the utilization (E191) and increase the cycle time if necessary (A150)

Tab. 173: Event 57 – Causes and actions

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11.2.25 Event 59: Overtemperature drive controller i2t

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Wrong drive controller design	Check the design and change the drive controller type if necessary
Increased or reduced mechanical friction	Check the service status of the mechanics and service them if necessary
Short deceleration/ acceleration times	Check the actual current during the braking process using the scope image (E00); reduce the deceleration and acceleration values if necessary
Clock frequency too high	Check the utilization of the drive, taking into consideration derating and the configured clock frequency (E20, B24); reduce the configured clock frequency or replace the drive controller if necessary

Tab. 174: Event 59 – Causes and actions

11.2.26 Event 60: Application event 0 – Event 67: Application event 7

The possible effects depend on the configured level (U100, U110, U120, U130, U140, U150, U160, U170):

- 0: Inactive
- 1: Message
- 2: Warning
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Application-specific	Application-specific

Tab. 175: Events 60 – 67 – Causes and actions

11.2.27 Event 68: External fault 2

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Application-specific	Application-specific

Tab. 176: Event 68 – Causes and actions

11.2.28 Event 69: Motor connection

The possible effects depend on the configured level (U12).

- 0: Inactive
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
2: No motor connected	Connection error	Check the connection and correct it if necessary
	Defective motor cable	Check the cable and replace it if necessary
3: Wake and Shake failed	Increased or reduced mechanical friction	Check the service status of the mechanics and service them if necessary
	Mechanical block	Check the output and correct the block if necessary

Tab. 177: Event 69 – Causes and actions

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11.2.29 Event 70: Parameter consistency

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Wrong encoder type	Encoder type unsuitable for control type	Check the control type, motor encoder and encoder and correct them if necessary (B20, B26, H-parameters)
3: B12<->B20	Nominal motor current is higher than the nominal drive controller current (4 kHz)	Check the nominal motor current against 150% of the nominal drive controller current at 4 kHz clock frequency and reduce the nominal motor current or change the drive controller type if necessary (B12, R04[0])
4: B10<->H31	Unsupported combination of resolver/motor number of poles	Check number of poles of the resolver and number of poles of the motor and correct them if necessary (H08, H148, B10)
5: Negative slip frequency	Negative slip	Check the nominal motor velocity, nominal motor frequency and number of poles of the motor and correct them if necessary (B13, B15, B10)
8: v-max (I10) exeeds maximum (B83)	Maximum permitted velocity exceeds the maximum motor velocity	Check the maximum permitted velocity and the maximum motor velocity and correct them if necessary (I10, B83)
11: Reference retaining	Conditions for reference without tracking not met	Check reference upkeep and coverage of the travel range through the measurement range and correct it if necessary (I46, limited travel range I00: Software limit switch must be parameterized; infinite travel range I00: Measurement range must correspond to the revolution length STOBERI01 or CiA 402 A568[1] or an entire multiple)
13: Motor temperature sensor	Unsupported temperature sensors	Check the motor temperature sensor type in the motor and drive controller series and change the motor or drive controller series if necessary

Tab. 178: Event 70 – Causes and actions

11.2.30 Event 71: Firmware

Cause 1:

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause 3:

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Firmware defective	Firmware defective	Update the firmware; fault cannot be acknowledged
3: CRC-error	Firmware defective	Update the firmware; fault cannot be acknowledged

Tab. 179: Event 71 – Causes and actions

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11.2.31 Event 72: Brake test timeout

The possible effects depend on the cause. Cause 1 and 2 lead to a fault, cause 3 is output as a message.

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: B311timeout:B300 mandatory	Brake management is active and the timeout for the brake test runs out twice	Test the brake (B300, S18); can be acknowledged for a period of 5 min in order to be able to carry out the test brake action
2: Brake defective:B300 mandatory	Test holding torque not met during the test brake action	Grind the brake (B301, B302) and repeat the brake test (B300, S18); can be acknowledged for a period of 5 min in order to be able to carry out the brake test
	Faulty encoder test run during test brake action	Replace the encoder or motor and repeat the brake test (B300, S18); can be acknowledged for a time period of 5 min in order to be able to carry out the brake test
3: Brake test necessary	Brake management is active and the timeout for the brake test runs out once	Carry out the test brake action (B300, S18); can be acknowledged for a period of 5 min in order to be able to carry out the brake test

Tab. 180: Event 72 – Causes and actions

11.2.32 Event 76: Position encoder

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The reference is deleted (I86).

Number	Cause	Check and action
1: Parameter <-> encoder	Inconsistent parameterization	Compare the specification of the connected encoder to the corresponding values of the H parameters and correct them if necessary
2: X4 speed	Exceeded encoder maximum velocity	Check the actual velocity during a movement using the scope image (E15) and adjust the permitted encoder maximum velocity if necessary (B297)
	Connection error	Check the connection and shielding and correct them if necessary
6: X4 EnDat encoder found	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00)
7: X4 channel A/ incremental	Connection error	Check the connection and correct it if necessary

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Number	Cause	Check and action
8: X4 no encoder found	Connection error	Check the connection and correct it if necessary; restart the drive controller to switch the encoder supply back on
	Defective encoder cable	Check the cable and replace it if necessary; restart the drive controller to switch the encoder supply back on
	Defective power supply	Check the encoder power supply and correct it if necessary; restart the drive controller to switch the encoder supply back on
	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00); restart the drive controller to switch encoder supply back on
10: X4 channel A/Clk – 11: X4 channel B/Dat	Defective encoder cable	Check the cable and replace it if necessary
13: X4-EnDat alarm	Defective EnDat encoder	Replace the encoder or motor; fault cannot be acknowledged
14: X4 EnDat CRC – 15: X4 double transmission	Connection error	Check the connection and shielding and correct them if necessary
16: X4 busy	Defective encoder cable	Check the cable and replace it if necessary
	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00)
17: EBI encoder low battery – 18: EBI encoder battery empty	EBI encoder battery is too weak or dead	Replace the battery

Number	Cause	Check and action
20: Resolver carrier – 22: Resolver overvoltage	Defective encoder cable	Check the cable and replace it if necessary
	Incompatible resolver	Compare the specification of the resolver to the corresponding specifications from STOBER and replace the resolver or motor if necessary; fault cannot be acknowledged
24: Resolver failure	Defective encoder cable	Check the cable and replace it if necessary
48: X4 zero pulse missing	Defective encoder cable	Check the cable and replace it if necessary
	Connection error	Check the connection and correct it if necessary
	Late zero toe	Check number of encoder increments per rotation and correct it if necessary (H02)
49: X4 zero pulse distance too small	Defective encoder cable	Check the cable and replace it if necessary
	Connection error	Check the connection and correct it if necessary
	Early zero track	Check number of encoder increments per rotation and correct it if necessary (H02)

Tab. 181: Event 76 – Causes and actions

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11.2.33 Event 77: Master encoder

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The reference is deleted (G89).

Number	Cause	Check and action
1: Parameter <-> encoder	Inconsistent parameterization	Compare the specification of the connected encoder to the corresponding values of the H parameters and correct them if necessary
2: X4 speed	Exceeded encoder maximum velocity	Check the actual velocity during a movement using the scope image (E15) and adjust the permitted encoder maximum velocity if necessary (B297)
	Connection error	Check the connection and shielding and correct them if necessary
6: X4 EnDat encoder found	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00)
7: X4 channel A/ incremental	Connection error	Check the connection and correct it if necessary

Number	Cause	Check and action
8: X4 no encoder found	Connection error	Check the connection and correct it if necessary; restart the drive controller to switch the encoder supply back on
	Defective encoder cable	Check the cable and replace it if necessary; restart the drive controller to switch the encoder supply back on
	Defective power supply	Check the encoder power supply and correct it if necessary; restart the drive controller to switch the encoder supply back on
	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00); restart the drive controller to switch encoder supply back on
10: X4 channel A/Clk – 11: X4 channel B/Dat	Defective encoder cable	Check the cable and replace it if necessary
13: X4-EnDat alarm	Defective EnDat encoder	Replace the encoder or motor; fault cannot be acknowledged
14: X4 EnDat CRC – 15: X4 double transmission	Connection error	Check the connection and shielding and correct them if necessary
16: X4 busy	Defective encoder cable	Check the cable and replace it if necessary
	Inconsistent parameterization	Compare the connected encoder to the parameterized encoder and correct it if necessary (H00)
17: EBI encoder low battery – 18: EBI encoder battery empty	EBI encoder battery is too weak or dead	Replace the battery

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Number	Cause	Check and action
20: Resolver carrier – 22: Resolver overvoltage	Defective encoder cable	Check the cable and replace it if necessary
	Incompatible resolver	Compare the specification of the resolver to the corresponding specifications from STOBER and replace the resolver or motor if necessary; fault cannot be acknowledged
24: Resolver failure	Defective encoder cable	Check the cable and replace it if necessary
48: X4 zero pulse missing	Defective encoder cable	Check the cable and replace it if necessary
	Connection error	Check the connection and correct it if necessary
	Late zero toe	Check number of encoder increments per rotation and correct it if necessary (H02)
49: X4 zero pulse distance too small	Defective encoder cable	Check the cable and replace it if necessary
	Connection error	Check the connection and correct it if necessary
	Early zero track	Check number of encoder increments per rotation and correct it if necessary (H02)

Tab. 182: Event 77 – Causes and actions

11.2.34 Event 78: Position limit cyclic

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Illegal direction	Target position outside of the software limit switch	Check the target position in the controller and software limit switch in the drive controller and correct it if necessary (STOBER I50, I51 or CiA 402 A570)
2: Reference value outside of circular length I01	Target position outside of the travel range	Check the target position in the controller and travel range in the drive controller and correct it if necessary (STOBER I01 or CiA 402 A568)
3: Maximum extrapolation time I423 exceeded	Missing update of the target position	Check the task cycle time in the fieldbus master of the controller and maximum permitted extrapolation in the drive controller and correct it if necessary (I423)

Tab. 183: Event 78 – Causes and actions

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11.2.35 Event 79: Motor / position monitor

The possible effects depend on the configured level (U28).

- 0: Inactive
- 1: Message
- 3: Fault

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Connection error	Check the connection and shielding and correct them if necessary
Slip	Check the mechanics between the motor and position encoder and maximum permitted slip and correct them if necessary (I291, I292)
Mechanical damage	Check the mechanics between the motor and position encoder and correct any damage if necessary

Tab. 184: Event 79 – Causes and actions

11.2.36 Event 80: Illegal action

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Illegal	Not supported by the control type	Check the control type and correct it if necessary (B20)
2: Brake	Loaded axis	Remove the axis load and start the action again

Tab. 185: Event 80 – Causes and actions

11.2.37 Event 81: Motor allocation

The drive controller is interrupted:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Depending the cause, data for the motor (in the case of a change to the motor or motor type), the current regulator (in the case of a change to the motor type), the holding brake (in the case of a change to the holding brake or motor type) and the temperature sensor (in the case of a change to the temperature sensor or motor type) are read out of the electronic nameplate and entered in the respective parameters. In the event of a change to the motor, motor type or even just the commutation (B05), the commutation offset is reset.

Number	Cause	Check and action
1: Different motor type – 131: Different brake & temperature sensor	Modified motor assignment	Check the change to the motor assignment and save the new motor assignment if necessary (A00)
150: Temperature sensor unknown	Motor with unknown temperature sensor type	Update the firmware or change the motor

Tab. 186: Event 81 – Causes and actions

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11.2.38 Event 83: Failure of one/ all phases (mains)

Upon the occurrence of an event, a warning is output initially, becoming a fault after a 10 s warning period.

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Failure of one or all line phases	Check the line fuse and connection and correct them if necessary

Tab. 187: Event 83 – Causes and actions

11.2.39 Event 84: Drop in network voltage when power section active

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Decrease in supply voltage under load	Check the supply voltage for load stability and stabilize the network if necessary
Sporadic power failures	Check the supply voltage for stability and stabilize the network if necessary

Tab. 188: Event 84 – Causes and actions

11.2.40 Event 85: Excessive jump in reference value

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Item	Fast target position change leads to acceleration that cannot be performed	Check the current target acceleration against the maximum permitted acceleration in the drive controller (E64, E69) and reduce the target value change in the controller or change the motor type if necessary
2: Velocity	Fast target velocity change leads to acceleration that cannot be performed	Check the current target acceleration against the maximum permitted acceleration in the drive controller (E64, E69) and reduce the target value change in the controller or change the motor type if necessary

Tab. 189: Event 85 – Causes and actions

11.2.41 Event 86: Unknown data record LeanMotor

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Motor	Motor not supported by firmware	Update the firmware or change the motor (B100)
2: Cable length	Cable length not supported by firmware	Update the firmware or change the cable (B101)

Tab. 190: Event 85 – Causes and actions

11.2.42 Event 87: Reference lostReference loss

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Power unit switched off on moving axis	Reference the drive again and, if necessary, only shut off the power unit when stationary (I199)
Actual position (motor) changes when power unit is shut off	Do not change the actual position (motor) when the power unit is shut off and, if applicable, switch to a motor with a holding brake (F00)

Tab. 191: Event 87 – Causes and actions

11.2.43 Event 88: Control panel

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Cause	Check and action
Commissioning and parameterization computer heavily loaded	Check the number of open windows (DS6) and the number of active programs and reduce the number if necessary
Connection error	Check the connection and correct it if necessary
Defective network cable	Check the cable and replace it if necessary
Faulty network connection	Check the network settings and, if applicable, the switch, router or wireless connections and correct them or contact your network service provider if necessary

Tab. 192: Event 88 – Causes and actions

11.2.44 Event 89: LM maximum current

The drive controller is interrupted if:

- A29 = 0: Inactive for STOBER device controller
  or
- A540 = 0: disable drive, motor is free to rotate for CiA device controller

Response:

- The power unit is disabled and axis movement is no longer controlled by the drive controller
- The holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

The drive controller is interrupted with a quick stop if:

- A29 = 1: Active for STOBER device controller
  or
- A540 = 2: slow down on quick stop ramp for CiA device controller

Response:

- The axis is stopped by a quick stop; meanwhile, the holding brakes are controlled by the drive controller and remain released
- At the end of the quick stop, the power unit is disabled and axis movement is no longer controlled by the drive controller; the holding brakes are no longer controlled by the drive controller and engage in the event of an inactive purge override (F06)

Number	Cause	Check and action
1: Id – 2: Iq	Excessive controller gain at low speeds	Check the controller gain and speed controller factors and reduce them if necessary (I19, C31, B146, B147)

Tab. 193: Event 89 – Causes and actions

12 Replacement

The following chapters describe the replacement of a drive controller and the available accessories.

12.1 Safety instructions for device replacement

Replacement work is permitted only when no voltage is present. Observe the 5 safety rules; see the chapter Working on the machine [▶ 16].

When the power supply voltage is turned on, hazardous voltages may be present on the connection terminals and the cables connected to them.

The device is not reliably de-energized simply because the voltage supply is switched off and all displays are blank!

Information

Note that the you can only determine that voltage is no longer present once the discharge time has elapsed. The discharge time depends on the self-discharge of the drive controller. You can find the discharge time in the general technical data.

Protect the devices against falling parts (bits or strands of wire, pieces of metal, etc.) during installation or other work in the control cabinet. Parts with conductive properties may result in a short circuit inside the devices and device failure as a result.

Opening the housing, plugging in or unplugging connection terminals, connecting or removing connecting wiring, and installing or removing accessories are prohibited while the voltage supply is switched on.

If you couple the drive controller in the DC link, make sure that all Quick DC-Link modules are built over with a drive controller again after replacement.

The device housing must be closed before you turn on the supply voltage.

12.2 Replacing the drive controller

⚠ DANGER!

Electrical voltage! Risk of fatal injury due to electric shock!

- Always switch off all power supply voltage before working on the devices!
- Note the discharge time of the DC link capacitors. You can only determine the absence of voltage after this time period.

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ATTENTION!

Loss of absolute position!

The absolute position in the encoder is lost if the encoder cable is disconnected from the AES battery module.

- Do not disconnect the encoder cable from the AES during service work! Disconnect the AES from the drive controller.

Information

Note that the SD card from the drive controller being replaced can be re-used only for drive controllers of the same series.

Tool and material

You will need:

- Tool for loosening and tightening the fastening screws

Requirements and replacement

✓ Drive controllers of the same series and same power can be replaced interchangeably.

✓ The hardware and firmware of the drive controller being installed have the same or a newer version than the drive controller being replaced. You can find information about firmware updates in the chapter Replacing or updating the firmware [▶ 186].

✓ Optional: The SD card is present in the drive controller being replaced; the original project is stored on the SD card. Or: The control unit of the drive controller being replaced still works; copy the original project to the SD card before removing the drive controller.

1. Optional: If an AES battery module is present, disconnect the AES from the drive controller.
2. Remove all terminals from the drive controller being uninstalled.
3. Release the 2nd grounding conductor from the ground bolt.
4. Loosen the fastening screws and take the drive controller out of the control cabinet.
5. Optional: Insert the SD card with the original project into the drive controller being installed.
6. Install the new drive controller in the control cabinet.
7. Connect the 2nd grounding conductor to the ground bolt. Note the instructions and requirements in the chapter Housing grounding.
8. Attach the terminals again.
9. Optional: If an AES battery module was present, attach it to the drive controller with the associated encoder cable. Tighten the knurled screws so that AES is securely connected to the drive controller.

12.3 Replacing or updating the firmware

Drive controllers from STOBER are normally delivered with the latest firmware version. You can change the firmware at a later point if you need a different firmware version or a device with an older firmware needs to be updated. In order to perform a live firmware update, you have to connect your PC to the network.

✓ Your PC is connected to the drive controller. The drive controller is switched on.

1. Start DriveControlSuite.
2. Click Perform live firmware update.
   ⇨ The Setting up a connection window opens.
3. Direct connection tab > IP address column:
   Highlight the drive controller in question and confirm your selection with OK.
   ⇨ The Assignment window opens. All drive controllers connected to the selected network interface are displayed.
4. Drive controllers connected via communication:
   Click Live firmware update.
5. Confirm the confirmation prompts with OK.
   ⇨ The Live firmware update window opens.
6. Select the firmware version for the corresponding series from the Version list. If you have saved the desired firmware version locally, alternatively click Open file ..., navigate to the directory and load the file.
7. Position column:
   Highlight the drive controller in question.
8. Click Start live firmware update.
   ⇨ The firmware update is transferred.
9. Because the firmware update only takes effect after the drive controller is restarted, click Restart drive controller after completing the transfer.

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13 Service

You can find important information on every aspect of our electronics service in this chapter.

13.1 STOBER electronics service

If you need support, please contact our service department. You can find all of the contact data in the chapter Consultation, service and address [▶ 210].

Please have the following descriptive information on hand so that we can provide you with quick, professional assistance.

Ordering a replacement device

If you would like to order a replacement device, our first level support requires the following information:

- MV and serial number of the drive controller being replaced; see the chapter Variant [▶ 19]
- Information on subsequent changes (e.g. change in option modules, application or firmware)

The MV number indicates the ordered and delivered material variant, i.e. the device-specific combination of all hardware and software components. The serial number is used to determine your customer information. Both numbers are stored in the STOBER enterprise resource planning system and simplify drive controller reordering if service is needed.

Service request

If you need assistance or have any questions regarding commissioning, create reverse documentation for your project as your first step. This makes it easier for our first level support to process your request.

13.2 Creating reverse documentation

If you have questions concerning commissioning and would like to contact our service department, start by first creating reverse documentation and send this to the e-mail address of our first level support (see the chapter Consultation, service and address [▶ 210]).

Creating reverse documentation in a new project

✓ Your PC is connected to the drive controller. The drive controller is switched on.

1. Start DriveControlSuite.
2. Click on Read out project.
   ⇨ The Setting up a connection window opens.
3. Direct connection tab > IP address column:
   Highlight the drive controller in question and confirm your selection with OK.
   ⇨ The Assignment window opens. All drive controllers connected to the selected network interface are displayed.

4. Connected drive controller via communication:
   Click on Establish online connections.
   ⇨ The data connection is established and the projecting data is transmitted from the drive controller to the PC.
   ⇨ The drive controllers are created in the project tree and are active (green status).
5. Then click on Disconnect.
6. Confirm the Reverse documentation ... window with OK.
   ⇨ The connection is disconnected.
   ⇨ The drive controllers are write-protected (lock status with red R).
7. Save the project in a local directory and send the file to us.

Creating reverse documentation in an existing project

✓ Your PC is connected to the drive controller. The drive controller is switched on.

✓ A project file for your drive system already exists.

1. Start DriveControlSuite.
2. Click on Open project.
3. Navigate to the directory and load the file.
4. Click on Establish connection.
   ⇨ The Setting up a connection window opens.
5. Direct connection tab > IP address column:
   Mark the network interfaces in question and confirm your selection with OK.
   ⇨ The Assignment window opens. All drive controllers that are connected over the selected network interface are displayed and are ignored by default for the data synchronization.
6. Connected drive controller via communication:
   Select the context menu Set all to "read" in order to activate all drive controllers for data synchronization.
   Then click Establish online connections.
   ⇨ The data connection is established and the projecting data is transmitted from the drive controller to the PC.
   ⇨ The drive controllers are created in the project tree and are active (green status).
7. Then click on Disconnect.
8. Confirm the Reverse documentation ... window with OK.
   ⇨ The connection is disconnected.
   ⇨ The drive controllers are write-protected (lock status with red R).
9. Save the project in a local directory and send the file to us.

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14 Appendix

14.1 Terminal specifications

Relevant information for projecting the connecting wiring can be taken from the following chapters.

DIN EN 60204-1 contains basic recommendations that should be taken into account when selecting conductors. The chapter "Conductors and cables" provides specifications for the maximum current carrying capacity of conductors based on the way they are laid as well as tips for derating, for example in the case of increased surrounding temperatures or lines with multiple loaded individual conductors.

14.1.1 Overview

The following tables clarify which specifications must be observed for which connections depending on the type of drive controller and accessory.

Drive controllers

Type	X2A, X2B	X10	X11, X300	X20A, X20B	X21	X22	X101, X103
SC6A062	BCF 3,81 180 SN [▶ 191]	GFKC 2,5 - ST-7,62 [▶ 195]	BLDF 5.08 180 SN [▶ 193]	GFKC 2,5 - ST-7,62 [▶ 195]	GFKIC 2.5 - ST-7.62 [▶ 196]	ISPC 5 - STGCL-7 ,62 [▶ 198]	FMC 1,5 -ST-3,5 [▶ 190]
SC6A162		SPC 5 - ST-7,62 [▶ 197]		SPC 5 - ST-7,62 [▶ 197]	ISPC 5 - STGCL-7 ,62 [▶ 198]	ISPC 16 - ST-10,16 [▶ 200]	
SC6A261							

Tab. 194: Terminal specifications for the base device

Safety technology

Type	X12
SR6	BCF 3,81 180 SN [▶ 191]

Tab. 195: Terminal specifications of the safety technology

14.1.2 FMC 1,5 -ST-3,5

Feature	Line type	Value
Contact spacing	—	3.5 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 8 A
Max. conductor cross-section	Flexible without end sleeve	1.5 mm²
	Flexible with end sleeve without plastic collar	1.5 mm²
	Flexible with end sleeve with plastic collar	0.75 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	16
Min. conductor cross-section	Flexible without end sleeve	0.2 mm²
	Flexible with end sleeve without plastic collar	0.25 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	24
Insulation stripping length	—	10 mm
Tightening torque	—	—

Tab. 196: FMC 1,5 -ST-3,5 specification

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14.1.3 BCF 3,81 180 SN

Feature	Line type	Value
Contact spacing	—	3.81 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 16 A/10 A/11 A
Max. conductor cross-section	Flexible without end sleeve	1.5 mm²
	Flexible with end sleeve without plastic collar	1.5 mm²
	Flexible with end sleeve with plastic collar	1.0 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	16
Min. conductor cross-section	Flexible without end sleeve	0.14 mm²
	Flexible with end sleeve without plastic collar	0.25 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	26
Insulation stripping length	—	10 mm
Tightening torque	—	—

Tab. 197: BCF 3,81 180 SN BK specification

14.1.4 BFL 5.08HC 180 SN

Feature	Line type	Value
Contact spacing	—	5.08 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 16 A/10 A/10 A
Max. conductor cross-section	Flexible without end sleeve	2.5 mm²
	Flexible with end sleeve without plastic collar	2.5 mm²
	Flexible with end sleeve with plastic collar	2.5 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	12
Min. conductor cross-section	Flexible without end sleeve	0.2 mm²
	Flexible with end sleeve without plastic collar	0.2 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	26
Insulation stripping length	—	10 mm
Tightening torque	—	—

Tab. 198: BFL 5.08HC 180 SN specification

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14.1.5 BLDF 5.08 180 SN

Feature	Line type	Value
Contact spacing	—	5.08 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 14 A/10 A/10 A
Max. conductor cross-section	Flexible without end sleeve	2.5 mm²
	Flexible with end sleeve without plastic collar	2.5 mm²
	Flexible with end sleeve with plastic collar	2.5 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	12
Min. conductor cross-section	Flexible without end sleeve	0.2 mm²
	Flexible with end sleeve without plastic collar	0.2 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	26
Insulation stripping length	—	10 mm
Tightening torque	—	—

Tab. 199: BLDF 5.08 180 SN specification

14.1.6 FKC 2,5 -ST-5,08

Feature	Line type	Value
Contact spacing	—	5.08 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 12 A/10 A/10 A
Max. conductor cross-section	Flexible without end sleeve	2.5 mm²
	Flexible with end sleeve without plastic collar	2.5 mm²
	Flexible with end sleeve with plastic collar	2.5 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	1.0 mm²
	AWG according to UL/CSA	12
Min. conductor cross-section	Flexible without end sleeve	0.2 mm²
	Flexible with end sleeve without plastic collar	0.25 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	0.5 mm²
	AWG according to UL/CSA	26
Insulation stripping length	—	10 mm
Tightening torque	—	—

Tab. 200: Specification for FKC 2,5 -ST-5,08

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14.1.7 GFKC 2,5 -ST-7,62

Feature	Line type	Value
Contact spacing	—	7.62 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 12 A/10 A/10 A
Max. conductor cross-section	Flexible without end sleeve	2.5 mm²
	Flexible with end sleeve without plastic collar	2.5 mm²
	Flexible with end sleeve with plastic collar	2.5 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	1.0 mm²
	AWG according to UL/CSA	12
Min. conductor cross-section	Flexible without end sleeve	0.2 mm²
	Flexible with end sleeve without plastic collar	0.25 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	0.5 mm²
	AWG according to UL/CSA	26/24
Insulation stripping length	—	10 mm
Tightening torque	—	—

Tab. 201: GFKC 2,5 -ST-7,62 specification

14.1.8 GFKIC 2.5 -ST-7.62

Feature	Line type	Value
Contact spacing	—	7.62 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 12 A/10 A/10 A
Max. conductor cross-section	Flexible without end sleeve	2.5 mm²
	Flexible with end sleeve without plastic collar	2.5 mm²
	Flexible with end sleeve with plastic collar	2.5 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	1.0 mm²
	AWG according to UL/CSA	12
Min. conductor cross-section	Flexible without end sleeve	0.2 mm²
	Flexible with end sleeve without plastic collar	0.25 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	0.5 mm²
	AWG according to UL/CSA	26
Insulation stripping length	—	10 mm
Tightening torque	—	—

Tab. 202: Specification for GFKIC 2.5 -ST-7.62

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14.1.9 SPC 5 -ST-7,62

Feature	Line type	Value
Contact spacing	—	7.62 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 32 A/35 A/35 A
Max. conductor cross-section	Flexible without end sleeve	6.0 mm²
	Flexible with end sleeve without plastic collar	6.0 mm²
	Flexible with end sleeve with plastic collar	4.0 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	1.5 mm²
	AWG according to UL/CSA	8
Min. conductor cross-section	Flexible without end sleeve	0.2 mm²
	Flexible with end sleeve without plastic collar	0.25 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	0.25 mm²
	AWG according to UL/CSA	24
Insulation stripping length	—	15 mm
Tightening torque	—	—

Tab. 203: SPC 5 -ST-7,62 specification

14.1.10 ISPC 5 -STGCL-7,62

Feature	Line type	Value
Contact spacing	—	7.62 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 32 A/35 A/35 A
Max. conductor cross-section	Flexible without end sleeve	6.0 mm²
	Flexible with end sleeve without plastic collar	6.0 mm²
	Flexible with end sleeve with plastic collar	4.0 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	1.5 mm²
	AWG according to UL/CSA	8
Min. conductor cross-section	Flexible without end sleeve	0.2 mm²
	Flexible with end sleeve without plastic collar	0.25 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	0.25 mm²
	AWG according to UL/CSA	24
Insulation stripping length	—	15 mm
Tightening torque	—	—

Tab. 204: ISPC 5 -STGCL-7,62 specification

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14.1.11 SPC 16 -ST-10,16

Feature	Line type	Value
Contact spacing	—	10.16 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 55 A/66 A/66 A
Max. conductor cross-section	Flexible without end sleeve	16.0 mm²
	Flexible with end sleeve without plastic collar	16.0 mm²
	Flexible with end sleeve with plastic collar	10.0 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	4.0 mm²
	AWG according to UL/CSA	4
Min. conductor cross-section	Flexible without end sleeve	0.75 mm²
	Flexible with end sleeve without plastic collar	0.75 mm²
	Flexible with end sleeve with plastic collar	0.75 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	0.75 mm²
	AWG according to UL/CSA	20
Insulation stripping length	—	18 mm
Tightening torque	—	—

Tab. 205: SPC 16 -ST-10,16 specification

14.1.12 ISPC 16 -ST-10,16

Feature	Line type	Value
Contact spacing	—	10.16 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 55 A/66 A/66 A
Max. conductor cross-section	Flexible without end sleeve	16.0 mm²
	Flexible with end sleeve without plastic collar	16.0 mm²
	Flexible with end sleeve with plastic collar	10.0 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	4.0 mm²
	AWG according to UL/CSA	4
Min. conductor cross-section	Flexible without end sleeve	0.75 mm²
	Flexible with end sleeve without plastic collar	0.75 mm²
	Flexible with end sleeve with plastic collar	0.75 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	0.75 mm²
	AWG according to UL/CSA	20
Insulation stripping length	—	18 mm
Tightening torque	—	—

Tab. 206: SPC 16 -ST-10,16 specification

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14.1.13 BUZ 10.16IT 180 MF

Feature	Line type	Value
Contact spacing	—	10.16 mm
Nominal current at ϑ_{amb} = 40 °C	—	CE/UL/CSA: 61 A/60 A/60 A
Max. conductor cross-section	Flexible without end sleeve	16.0 mm²
	Flexible with end sleeve without plastic collar	16.0 mm²
	Flexible with end sleeve with plastic collar	10.0 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	4
Min. conductor cross-section	Flexible without end sleeve	0.5 mm²
	Flexible with end sleeve without plastic collar	0.25 mm²
	Flexible with end sleeve with plastic collar	0.25 mm²
	2 conductors, flexible, with double end sleeve with plastic collar	—
	AWG according to UL/CSA	22
Insulation stripping length	—	12 mm
Tightening torque	—	1.2 – 1.5 Nm

Tab. 207: Specification for BUZ 10.16IT 180 MF

14.2 Wiring examples

The following chapters show the basic connection using examples.

14.2.1 Stand-alone operation with direct brake control

The following graphic shows a wiring example for stand-alone operation with direct brake control.

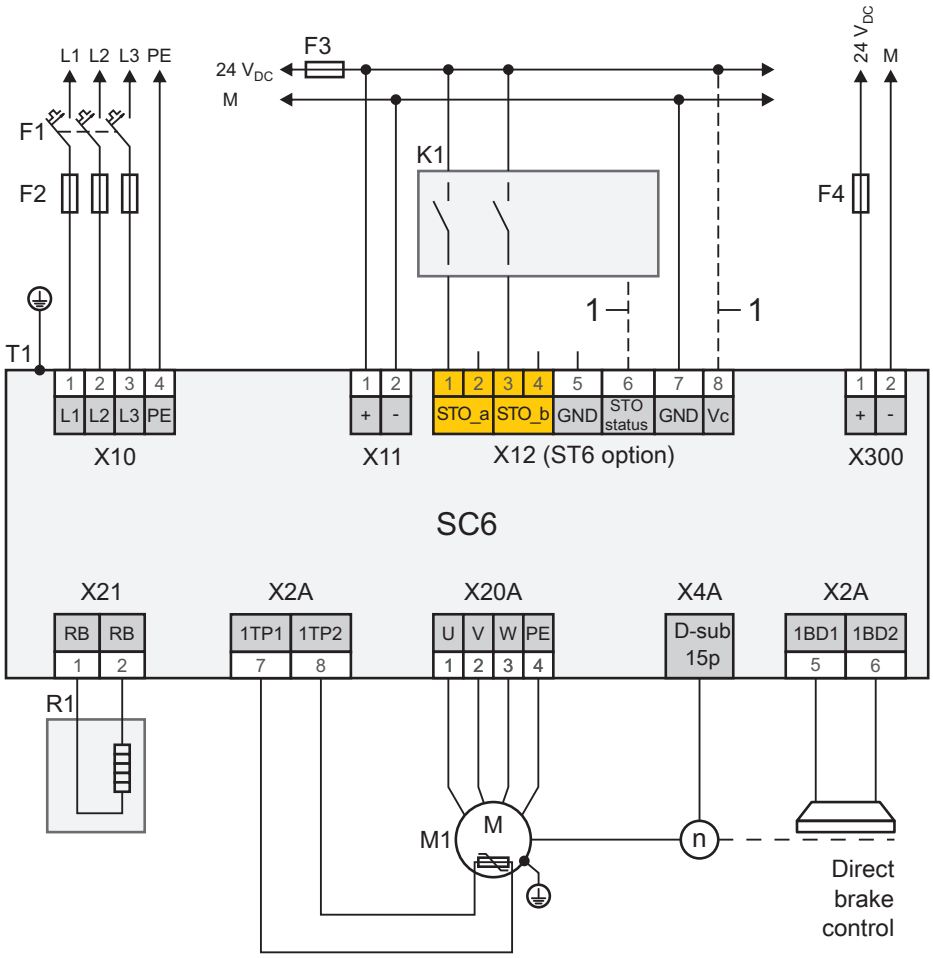

Fig. 23: Wiring example with direct brake control

F1 – F4	Fuse
K1	Safety relay
L1 – L3	Three-phase power supply
M	Reference ground
M1	Motor
R1	Braking resistor
T1	Supply module
T2	Drive controller
1	Optional connection
2	Spring-loaded contact between DL6B and SC6

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14.2.2 Parallel operation

The following graphic shows the basic connection of multiple SC6 drive controllers based on a DC link connection with DL6B Quick DC-Link.

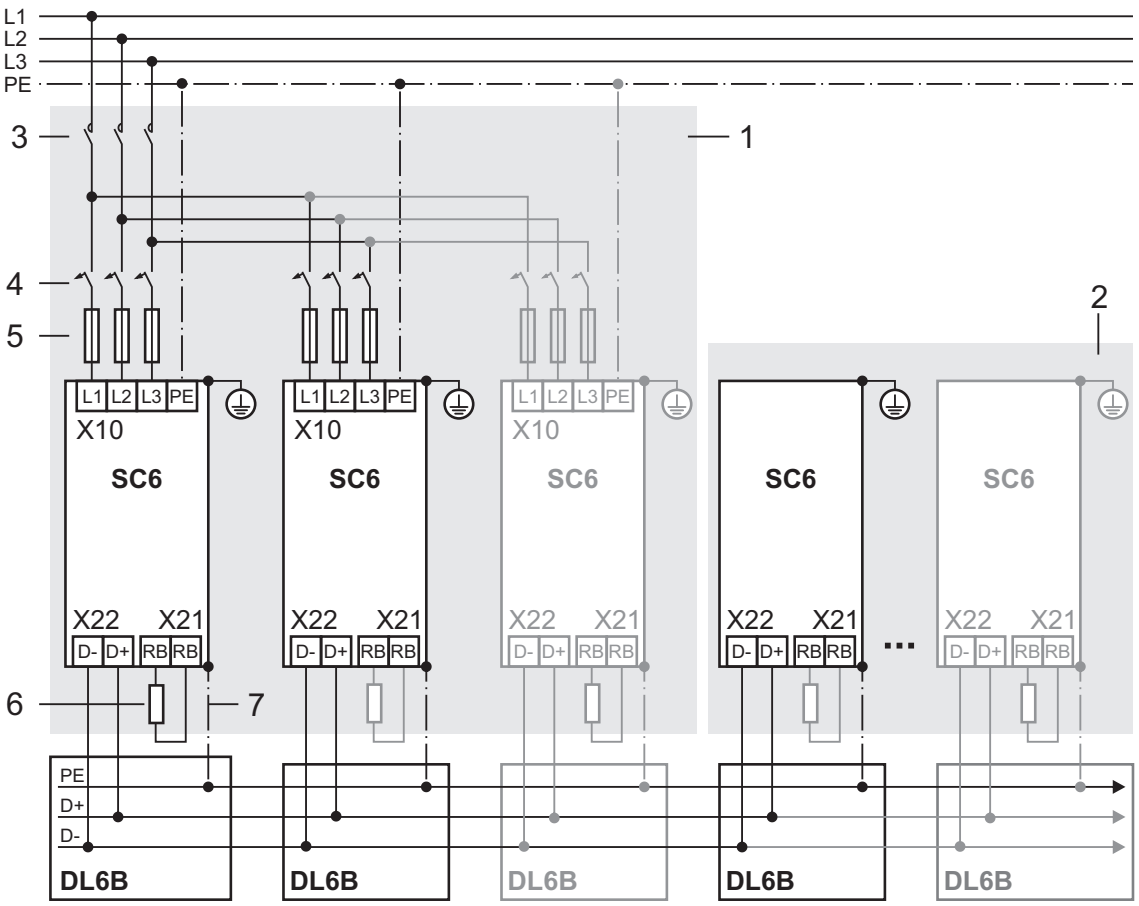

Fig. 24: Wiring example with drive controllers connected in parallel

1 Group 1
2 Group 2
3 Contactor
4 Overload protection
5 Short-circuit protection
6 Braking resistor
7 Spring-loaded contact between DL6B and SC6

14.3 Device addressing

MAC address

A MAC address consists of a fixed and a variable portion. The fixed portion designates the manufacturer and the variable portion distinguishes the individual network nodes and must be universally unique.

The MAC addresses of the interfaces are issued by STOBER and cannot be changed.

Information

The MAC address range of the STOBER hardware is: 00:11:39:00:00:00 – 00:11:39:FF:FF:FF

IP address – Value range

An IPv4 address always consists of 4 decimal numbers, each in a range from 0 to 255, and separated by periods. It must be unique within a (sub)network.

Subnet and subnet mask – Value range

Subnets are created in order to provide standalone networks with their own address range. Each IP address is divided into a network and host address. The subnet mask determines where this division takes place.

Like the IP address, the subnet mask consists of four decimal numbers, each in a range from 0 to 255, separated by periods.

Assignment for direct connection

In the default factory settings, both the IP address and the subnet mask are automatically assigned by DriveControlSuite or using DHCP for a direct connection. Alternatively, you can switch to manual parameterization using parameter A166.

The active address is displayed in parameter A157 and the active subnet mask in parameter A158.

Assignment for fieldbus connection

Note that the IP address and subnet mask are assigned by the controller for a fieldbus connection.

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14.4 Detailed information

The documentation listed in the following table offers additional relevant information. Current document versions can be found at http://www.stoeber.de/en/stoeber_global/service/downloads/downloadcenter.html.

Device/Software	Documentation	Contents	ID
SC6 drive controller	Commissioning instructions	System setup, technical data, storage, installation, connection, commissioning	442793
MC6 motion controller	Manual	Technical data, installation, commissioning, diagnostics	442461
CiA 402 Controller Based (CiA CB) application	Manual	Projecting, configuration, parameterization, function test, more detailed information	442454
CiA 402 Drive Based (CiA DB) application	Manual	Projecting, configuration, parameterization, function test, more detailed information	442708
STOBER Drive Based (STOBER DB) application	Manual	Projecting, configuration, parameterization, function test, more detailed information	442706
SR6 safety technology – STO via terminals	Manual	Technical data, installation, commissioning, diagnostics	442741
SY6 safety technology – STO and SS1 via FSoE	Manual	Technical data, installation, commissioning, diagnostics	442744
EtherCAT communication	Manual	Installation, electrical installation, data transfer, commissioning, detailed information	443025
PROFINET communication	Manual	Installation, electrical installation, data transfer, commissioning, detailed information	443039

Additional information and sources that form the basis of this documentation or are referenced by the documentation:

EtherCAT Technology Group (ETG), 2012. *ETG.1300 : EtherCAT Indicator and Labeling*. ETG.1300 S (R) V1.1.0. Specification. 2012-01-27.

Information concerning PROFINET

You can find general information on PROFINET on the PROFIBUS & PROFINET International (PI) website at http://www.profibus.com. PROFINET-specific guidelines, profiles, presentations, brochures and software are available in the corresponding download area.

14.5 Symbols in formulas

Symbol	Unit	Explanation
C_{1max}	F	Maximum input capacitance
C_{maxPU}	F	Charging capacity of the power unit
C_{PU}	F	Self-capacitance of the power unit
D_{IA}	%	Reduction in the nominal current depending on the installation altitude
D_T	%	Reduction in the nominal current depending on the surrounding temperature
W_{2max}	J	Maximum magnetic energy that can be deactivated
f_{1max}	Hz	Maximum input frequency
f_{2max}	Hz	Maximum output frequency
f_{2PU}	Hz	Output frequency of the power unit
f_N	Hz	Rotating magnetic field frequency at nominal speed
$f_{PWM,PU}$	Hz	Internal pulse clock frequency of the power unit
I_{1max}	A	Maximum input current
I_{1maxCU}	A	Maximum input current of the control unit
I_{1maxPU}	A	Maximum input current of the power unit
$I_{1N,PU}$	A	Nominal input current of the power unit
I_{2max}	A	Maximum output current
I_{2maxPU}	A	Maximum output current of the power unit
$I_{2PU(A)}$	A	Output current of the power unit for axis A
$I_{2PU(B)}$	A	Output current of the power unit for axis B
$I_{2N,PU}$	A	Nominal output current of the power unit
I_N	A	Nominal current
n_N	rpm	Nominal speed: The speed for which the nominal torque M_N is specified
p	–	Number of pole pairs
P_{effRB}	W	Effective power at the external braking resistor
P_{maxRB}	W	Maximum power at the external braking resistor
P_V	W	Power loss
$P_{V,CU}$	W	Power loss of the control unit
R_{2minRB}	Ω	Minimum resistance of the external braking resistor
ϑ_{amb}	°C	Surrounding temperature
$\vartheta_{amb,max}$	°C	Maximum surrounding temperature

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Symbol	Unit	Explanation
t_{min}	ms	Minimum cycle time of the application
τ_{th}	°C	Thermal time constant
U_1	V	Input voltage
U_{1CU}	V	Input voltage of the control unit
U_{1max}	V	Maximum input voltage
U_{1PU}	V	Input voltage of the power unit
U_2	V	Output voltage
U_{2PU}	V	Output voltage of the power unit
U_{max}	V	Maximum voltage
U_{offCH}	V	Switch-off threshold of the brake chopper
U_{onCH}	V	Switch-on threshold of the brake chopper

14.6 Abbreviations

Abbreviation	Meaning
AC	Alternating Current
AEH	End sleeve
AWG	American Wire Gauge
BAT	Battery
BE	Binärer Eingang (en: binary input)
BG	Baugröße (en: size)
CiA	CAN in Automation
CNC	Computerized Numerical Control
csp	Cyclic synchronous position mode
cst	Cyclic synchronous torque mode
csv	Cyclic synchronous velocity mode
DC	Direct Current
EMC	Electromagnetic Compatibility
ETG	EtherCAT Technology Group
EtherCAT	Ethernet for Control Automation Technology
FSoE	Fail Safe over EtherCAT
HTL	High Threshold Logic
ip	Interpolated position mode
IP	International Protection
IP	Internet Protocol
PE	Protective Earth (i.e. grounding conductor)
PELV	Protective Extra Low Voltage
PL	Performance Level
pp	Profile position mode
pt	Profile torque mode
PTC	Positive Temperature Coefficient
pv	Profile velocity mode
RCD	Residual Current protective Device
SIL	Safety Integrity Level
PLC	Programmable Logic Controller

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Abbreviation	Meaning
SS1	Safe Stop 1
SSI	Serial Synchronous Interface
STO	Safe Torque Off
TTL	Transistor-Transistor Logic
UL	Underwriters Laboratories

15 Contact

15.1 Consultation, service and address

We would be happy to help you!

We offer a wealth of information and services to go with our products on our website:
http://www.stoeber.de/en/service

For additional or personalized information, contact our consultation and support service:
http://www.stoeber.de/en/support

Do you need our first-level support?:
Phone +49 7231 582-3060
applications@stoeber.de

Call our 24-hour service hotline:
Phone +49 7231 582-3000

Our address:
STÖBER ANTRIEBSTECHNIK GmbH & Co. KG
Kieselbronner Strasse 12
75177 Pforzheim, Germany

15.2 Your opinion is important to us

We created this documentation to the best of our knowledge with the goal of helping you build and expand your expertise productively and efficiently with our products.

Your suggestions, opinions, wishes and constructive criticism help us to ensure and further develop the quality of our documentation.
If you want to contact us for a specific reason, we would be happy to receive an e-mail from you at:
documentation@stoeber.de

Thank you for your interest.
Your STOBER editorial team

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15.3 Close to customers around the world

We offer you committed, expert advise and support in over 40 countries worldwide:

STOBER AUSTRIA www.stoeber.at Phone +43 7613 7600-0 sales@stoeber.at	**STOBER SOUTH EAST ASIA** www.stober.sg sales@stober.sg
STOBER CHINA www.stoeber.cn Phone +86 10 6590 7391 sales@stoeber.cn	**STOBER SWITZERLAND** www.stoeber.ch Phone +41 56 496 96 50 sales@stoeber.ch
STOBER FRANCE www.stober.fr Phone +33 4 78.98.91.80 sales@stober.fr	**STOBER TAIWAN** www.stober.tw Phone +886 4 2358 6089 sales@stober.tw
STOBER ITALY www.stober.it Phone +39 02 93909570 sales@stober.it	**STOBER TURKEY** www.stober.com Phone +90 212 338 8014 sales-turkey@stober.com
STOBER JAPAN www.stober.co.jp Phone +81 3 5395 678 8 sales@stober.co.jp	**STOBER UNITED KINGDOM** www.stober.co.uk Phone +44 1543 458 858 sales@stober.co.uk
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Glossary

100Base-TX

Ethernet network standard based on symmetrical copper cables in which the nodes are connected to a switch via copper cables twisted in pairs (shielded twisted pair, CAT 5e quality level). 100Base-TX is the subsequent progression from 10Base-T and includes those properties with the option of a transfer speed of 100 Mbps (Fast Ethernet).

Braking resistor

Ballast resistor that is enabled through a brake chopper in order to avoid a hazard to electrical components in the event of significant brake energy by limiting the DC link voltage. Braking energy, which is usually only present for brief periods, is converted into heat in the resistor.

Discharge

A discharge designates the process that causes the discharge of the DC link capacitors. Requirements for the discharge process: the mains supply is disconnected and no energy flows back from the motor to the drive controller.

Discharge time

Period until the DC link capacitors are sufficiently discharged until safe operation of the device is possible.

Electronic nameplate

STOBER synchronous servo motors are generally equipped with absolute value encoders that provide a special memory. This memory includes the electronic nameplate, i.e. all typerelevant master data as well as special mechanical and electronic values of a motor. When you operate a drive controller with a STOBER synchronous servo motor and an absolute value encoder, the electronic nameplate is read and all motor data transferred if the drive controller is connected online. The drive controller automatically determines the associated limit values and control parameters from this data.

Emergency stop

An energy supply to the machine drives that could cause a dangerous situation must either be immediately interrupted (stop category 0) or controlled so that the dangerous movement is stopped as quickly as possible (stop category 1) without creating other risks.

Fail Safe over EtherCAT (FSoE)

Protocol to transfer safety-relevant data via EtherCAT using a FSoE master and an indefinite number of FSoE slaved (i.e. devices that have a Safety over EtherCAT interface). The protocol therefore enables the realization of functional safety via EtherCAT. FSoE and its implementation are TÜV-certified and comply with the SIL 3 requirements according to IEC 61508.

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MV number

The number of the material variant ordered and delivered as stored in STOBER's enterprise resource planning system, i.e. the device-specific combination of all hardware and software components.

Performance Level (PL)

Dimension for the reliability of a safety function or a component according to DIN EN 13849-1. The performance level is rated on a scale of a – e (lowest – highest PL). The higher the PL, the safer and more reliable the function considered.

PTC thermistor

Thermistor whose resistance significantly changes with temperature. When a PTC thermistor reaches its defined nominal response temperature, the resistance increases dramatically, by twice or more the original resistance to several kOhms. PTC thermistors allow for effective motor protection as PTC drillings.

Reverse documentation

A specific STOBER project file that is created with the aid of the DriveControlSuite projecting and commissioning software. The file is a snapshot of the project at the time that the connection between the PC and drive controller is interrupted. It contains all the information about the project, such as the size or version of the hardware and software components in question. The information is used for processing service requests, among other uses.

Safe Stop 1 (SS1)

As per DIN EN 61800-5-2: procedure to stop a PDS(SR). For the safety function SS1, the PDS(SR) performs one of the following functions: a) Initiation and control of the size of the motor delay within defined limits and triggering the STO function when the motor speed drops below a defined limit value, or b) Initiation and monitoring of the size of the motor delay within defined limits and initiation of the STO function when the motor speed drops below a limit value, or c) initiation of the motor delay and initiation of the STO function after an application-specific time delay. SS1 corresponds to the controlled stop according to IEC 60204-1 stop category 1.

Safe Torque Off (STO)

Safety function that immediately interrupts the energy supply to the drive and stops the drive in an uncontrolled manner. It can no longer generate torque after shutdown. STO is the most basic drive-integrated safety function. It corresponds to stop category 0 according to IEC 60204-1.

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Safety Integrity Level (SIL)

In accordance with DIN EN 61800-5-2: Probability of safety function failure. SIL is divided into levels 1 – 4 (lowest – highest level). SIL precisely assesses systems or subsystems based on the reliability of their safety functions. The higher the SIL, the safer and more reliable the function in question is.

Self-discharge

Passive running process that causes the DC link capacitors to discharge even when no electrical load is connected.

Serial number

Consecutive number stored for a product in STOBER's enterprise resource planning system and used for individual identification of the product and for determining the associated customer information.

Time between energizing two devices

Specified time span between energizing two devices.

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STÖBER ANTRIEBSTECHNIK GmbH + Co. KG
Kieselbronner Str. 12
75177 Pforzheim
Germany
Tel. +49 7231 582-0
mail@stoeber.de
www.stober.com

24 h Service Hotline +49 7231 582-3000