Product Manual

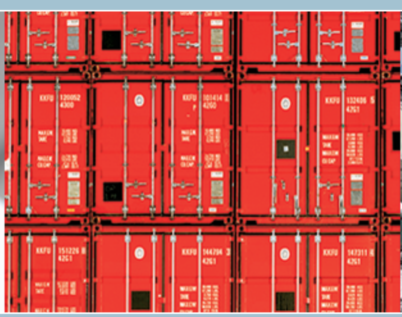
Mechatronic Drive Unit

MOVIGEAR® performance DAC

MGF..-DAC (AS-Interface)

Edition 02/2025

31546056/EN



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1 General information

1.1 About this documentation

The documentation at hand is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, contact SEW-EURODRIVE.

1.2 Other applicable documentation

Refer to the corresponding documentation for all other components.

Always use the latest edition of the documentation and software.

The SEW-EURODRIVE website (www.sew-eurodrive.com) provides a wide selection of documents for download in various languages. If required, you can order printed and bound copies of the documentation from SEW-EURODRIVE.

1.3 Structure of the safety notes

1.3.1 Meaning of signal words

The following table shows the graduation and meaning of the signal words in the safety notes.

Signal word	Meaning	Consequences if not observed
⚠ **DANGER**	Imminent danger	Death or severe injuries
⚠ **WARNING**	Possibly dangerous situation	Death or severe injuries
⚠ **CAUTION**	Possibly dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

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1.3.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

1.3.3 Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing
	Warning about suspended load
	Warning of automatic restart

1.3.4 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous step.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD!** Type and source of danger. Possible consequence(s) if disregarded. Measure(s) to prevent danger.

1.4 Decimal separator in numerical values

In this document, a period is used to indicate the decimal separator.

Example: 30.5 kg

1.5 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

1.6 Recycling, reprocessing, reuse

When manufacturing products, SEW-EURODRIVE makes sure to keep the use of new natural resources in the interests of the circular economy to a minimum. Key aspects here are the recycling of materials as well as the inspection and/or processing of returned components and their reuse in new products. These processes are only used at SEW-EURODRIVE if the resulting materials and components correspond to the quality of new products.

1.7 Product names and trademarks

The product names mentioned in this documentation are trademarks or registered trademarks of the respective titleholders.

1.8 Copyright notice

2 MOVIGEAR® performance safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following is carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- The national and regional regulations governing safety and the prevention of accidents
- Product safety label on the product
- All other associated project planning documents, installation and startup instructions, as well as connection and wiring diagrams
- Do not assemble, install, or operate damaged products
- All system-specific specifications and regulations

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

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2.3 Target group

Specialist for mechanical work

Any mechanical work may be performed only by adequately qualified specialists. Specialists in the context of this documentation are persons who are familiar with the design, mechanical installation, troubleshooting, and maintenance of the product, and who possess the following qualifications:

- Qualifications in the field of mechanics in accordance with the national regulations
- Familiarity with this documentation

Specialist for electrotechnical work

Any electrotechnical work may be performed only by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons who are familiar with electrical installation, startup, troubleshooting, and maintenance of the product, and who possess the following qualifications:

- Qualifications in the field of electrical engineering in accordance with the national regulations
- Familiarity with this documentation

Additional qualifications

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation.

The persons must have the express authorization of the company to operate, program, parameterize, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transport, storage, installation, operation and waste disposal may only be carried out by persons who are trained and instructed appropriately. These instructions must enable the persons to carry out the required activities and work steps safely and in accordance with regulations.

2.4 IT security

2.4.1 Contact

If you need support with the configuration, contact SEW-EURODRIVE Service. You can obtain information about the latest security-related problems via e-mail (cert@sew-eurodrive.com) or by visiting the Product Security Management website (http://go.sew/psm). You will find various contact options there for reporting security-related problems.

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2.4.2 IT security of the environment

For drive and control components that are integrated in a network (e.g., fieldbus, WLAN or Ethernet network), settings can even be made from more remote locations. This brings with it the risk of a parameter change not visible externally resulting in unexpected, but not uncontrolled system behavior and this may impact negatively on operational safety and reliability, system availability or data security.

With WLAN or Ethernet-based networked systems and engineering interfaces in particular, make sure that unauthorized access is not possible. Using IT-specific security standards, such as network segmentation, adds to the protection of access to the ports. For an overview of the ports and of the services provided by the communication interfaces, refer to Online Support. The IT security of the product is only guaranteed when used in an environment secured by defense-in-depth strategies.

Ensure that clear responsibility for security is guaranteed during operation. SEW-EURODRIVE recommends an IT security management system in accordance with ISO/IEC 27001 and ISO/IEC 62443-2-4.

2.5 Designated use

The product is intended for installation in electrical systems or machines.

In case of installation in electrical systems or machines, startup of the product is prohibited until it is determined that the machine meets the requirements stipulated in the local laws and directives. For Europe, Machinery Directive 2006/42/EC as well as the EMC Directive 2014/30/EU apply. Observe EN 60204-1 (Safety of machinery - electrical equipment of machines). The product meets the requirements stipulated in the Low Voltage Directive 2014/35/EU.

The standards given in the declaration of conformity apply to the product.

Technical data and information on the connection conditions are provided on the nameplate and in chapter "Technical data" in the documentation. Always comply with the data and conditions.

Unintended or improper use of the product may result in severe injury to persons and damage to property.

Do not use the product as a climbing aid.

2.5.1 Restrictions under the European WEEE Directive 2012/19/EU

Options and accessories from SEW-EURODRIVE may only be used in combination with products from SEW-EURODRIVE.

2.5.2 Lifting applications

The product may not be used for lifting applications.

For applications with inclining tracks, you must only use the product after a risk assessment is performed by the user. For further information, consult the information in the documentation.

2.5.3 Restrictions of use

The following applications are prohibited unless the device is explicitly designed for such use:

- Use in potentially explosive areas.

- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation.
- Use in applications with impermissibly high mechanical vibration and shock loads.
- Use at an elevation of more than 3800 m above sea level.

The product can be used at altitudes above 1000 m above sea level up to 3800 m above sea level under the following conditions:

- The reduction of the nominal output current and/or line voltage is taken into account as per chapter "Technical data" in the associated product manual.
- Above 2000 m above sea level, the air and creepage distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level, limiting measures must therefore be taken that reduce the line side overvoltage from category III to category II for the entire system.
- If a protective electrical separation is required, implement this outside the product at altitudes of more than 2000 m above sea level.

2.6 Functional safety technology

The product includes the STO safety sub-function. As an option, additional safety sub-functions can be included for the product.

The safety sub-functions are deactivated in the delivery state. The product may not perform any safety function without higher-level safety systems.

To use the STO safety sub-function or other safety sub-functions, please follow the product manual and the manual for the optional safety function of this device.

2.7 Transportation

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product or the packaging is damaged, do not assemble, install, connect, or start up the product. If the packaging is damaged, the product itself may also be damaged.

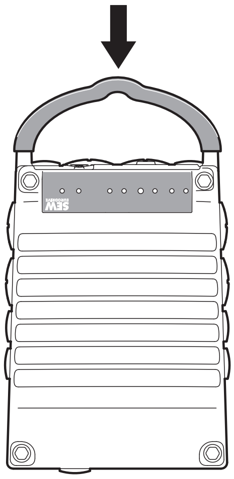
Observe the following notes when transporting the device:

- Ensure that the product is not subject to mechanical impact.
- Do not attach any additional loads.

If necessary, use suitable, adequately dimensioned transport aids.

Observe the notes on the climatic conditions in accordance with chapter "Technical data" in the corresponding product manual.

The following figure shows the positions of the lifting eyes.



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Remove the lifting eye before connecting the PE cable, see chapter "PE connection to MOVIGEAR® with lifting eye" (→ 🗎 236).

Store the lifting eye for future service work.

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2.8 Creating a safe working environment

Before you work on the product, ensure a safe working environment. Observe the following basic safety notes:

2.8.1 Performing work on the product safely

Defective or damaged product

Never install defective or damaged products. Observe the following information to avoid injuries or damage:

- Before installation, check the product for external damage and replace a damaged product.

Use of hazardous substances, lubricants, adhesives

Observe the following information to avoid poisoning or fire hazards:

- Observe the safety data sheets of the used hazardous substances, lubricants and adhesives.
- Wear safety gloves.

Hot surfaces

The surfaces of the product can become very hot during operation. Observe the following information to avoid burns:

- Let the product and its accessories cool down before touching it.
- Do not touch any surfaces of the product during operation, except for the control elements.
- Observe the information signs and product safety labels on the product.

Falling load

Observe the following information to avoid death or severe injury due to falling loads:

- Do not stand under the load.
- Secure the area where loads can fall down.
- Use personal protective equipment (such as helmet and safety shoes).
- Use a suitable lifting tool (chain hoist, forklift) and transport protection.

Rotating parts

When working on the product, there may be a risk of exposed rotating parts and uncontrolled movement of the components. Observe the following information to avoid body parts getting crushed or pulled in:

- Switch off the product before you start working on it.
- Observe all technical data of the product.
- Do not reach into the hazard zone.
- Observe the 5 safety rules.

Sharp edges

Observe the following information to avoid cuts caused by sharp or non-deburred cutting edges:

- Wear safety gloves.

2.8.2 Performing electrical work safely

Observe the following information to perform electrical work safely:

Electrical work may only be performed by an electrically skilled person or an electronically instructed person under the supervision of an electrically skilled person.

The fact that the operation or display elements are no longer illuminated does not indicate that the product has been disconnected from the supply system and no longer carries any voltage.

Dangerous voltage

When the system is switched on, dangerous voltages are present at all power connections as well as any cables and terminals that are connected. This also applies even when the product is inhibited and the motor is in an idle state. Observe the following information to avoid the risk of electric shock:

- Do not touch any exposed live parts (e.g. male contacts, connectors, terminals).
- Secure all open live components with a touch guard.
- Ensure that the connection boxes are closed and screwed down before applying the supply voltage.
- Before applying the supply voltage, make sure that all required covers are mounted.
- Secure the output shaft against rotation when working without touch guard.

Danger due to electric arc

An electric arc may occur when plug-in connections are disconnected or connected while voltage is applied (e.g. connection between drive and control). In order to avoid damaging electrical components, observe the following information:

- Do not disconnect power connections during operation.
- Do not connect power connections during operation.
- Ensure that the product is de-energized before disconnecting and connecting the plug-in connections.

Dangerous voltage

Voltage from charged capacitors can still be present in live product components or power connections after disconnecting from the supply voltage. Observe the following information:

- Observe the following waiting periods before performing electrical work and after disconnecting the supply voltage: **5 minutes**.
- Ensure that the unit is de-energized.
- Observe the information signs and product safety labels on the product.

2.9 Installation/assembly

Ensure that the product is installed and cooled in accordance with the regulations in the documentation.

Protect the product from excessive mechanical strain. The product and its mounted components must not protrude into the path of persons or vehicles. Ensure that no components are deformed or no insulation spaces are modified, particularly during transportation. Electrical components must not be mechanically damaged or destroyed.

Observe the notes in chapter "Mechanical installation" in the documentation.

2.10 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with IEC 61800-5-1. The connected signal circuits must meet requirements according to SELV (**S**afety **E**xtra **L**ow **V**oltage) or PELV (**P**rotective **E**xtra **L**ow **V**oltage) to ensure protective separation. The installation must meet the requirements for protective separation.

In order to avoid exceeding the permitted contact voltages in SELV or PELV power circuits in the event of a fault, continuous equipotential bonding is required in the vicinity of these power circuits. If this is not possible, other protective measures must be taken. These protective measures are described in IEC 61800-5-1.

2.11 Electrical installation

The preventive measures and protection devices must comply with the applicable regulations (e.g. EN 60204-1 or EN 61800-5-1).

2.11.1 Stationary application

The necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	Ground connection

2.11.2 Regenerative operation

The drive is operated as a generator due to the kinetic energy of the system/machine. Before opening the connection box, secure the output shaft against rotation.

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2.12 Startup/operation

Observe the safety notes in chapters "Startup" and "Operation" in the associated product manual.

Depending on the degree of protection, products may have live, uninsulated, and sometimes moving or rotating parts as well as hot surfaces during operation.

Never plug or unplug connectors while they are energized.

Do not separate the connection to the product during operation. This may result in dangerous electric arcs damaging the product.

If you disconnect the product from the voltage supply, do not touch any live components or power connections because capacitors might still be charged. Observe the following minimum switch-off time:

5 minutes.

Observe the corresponding information signs on the product.

The fact that the operation LED and other display elements are no longer illuminated does not indicate that the product has been disconnected from the supply system and no longer carries any voltage.

Mechanical blocking or internal protective functions of the product can cause a motor standstill. Removing the cause of this problem or performing a reset can result in the machine or the system re-starting on its own. First, disconnect the product from the supply system before you start troubleshooting.

Risk of burns: The surface temperature of the product can exceed 60 °C during operation. Do not touch the product during operation. Let the product cool down before touching it.

2.13 Magnetic fields

The device contains permanent magnets that create strong magnetic fields even when de-energized. These fields can lead to malfunctions in active medical implants. Persons with such implants must stay away from the device.

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3 Product description

3.1 System overview of MOVI-C® for decentralized installation

Consistent – connected – complete

The basis of the new product portfolio is the MOVI-C® decentralized drive electronics. It is the same for all products from the new decentralized portfolio and can be installed either integrated in the motor or close to the motor.

MOVI-C® decentralized drive electronics is suitable for all applications with speed control, with and without encoders, through to positioning applications.

3.1.1 Highlights of the decentralized product portfolio

End-to-end solution	MOVI-C® allows users to switch between control cabinet installation and decentralized installation. The consistency of the functions and features is not dependent on the product family or type of installation.
Modularity	Identical drive electronics for all product families, whether integrated in the product or installed close to the motor, is the ideal supplement to the control cabinet inverters of the MOVI-C® modular automation system.
Flexibility	The decentralized product range provides flexible support for connections to various higher-level systems.
Single-axis automation	• DBC – Direct Binary Communication • DAC – Direct AS-Interface Communication • DFC – Direct Fieldbus Communication (PROFINET, EtherNet/IP™, Modbus TCP)
Motion slave	• DSI – Direct System Bus Installation (EtherCAT®) • DFC – Direct Fieldbus Communication (POWERLINK CiA402)
Motion/automation control	• DSI – Direct System Bus Installation (SBus^{PLUS})
Simple installation	On the supply side, installation is made easier using terminals or connectors along with digital motor integration when installed close to the motor (single-cable technology).
Decentralized electronics performance class	2.0 A, 2.5 A, 3.2 A, 4.0 A, 5.5 A, 7.0 A, 9.5 A, 12.5 A, 16.0 A

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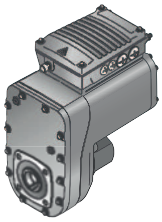
Drive units without decentralized inverter

MOVIGEAR® classic

MGF..-DSM-C

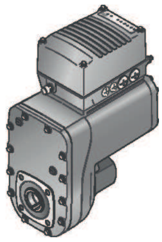
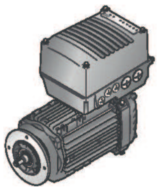
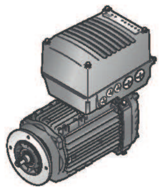
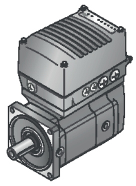


8 – 400 Nm continuous output torque motor

475 Nm maximum short-time torque motor

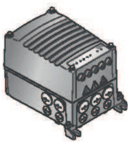
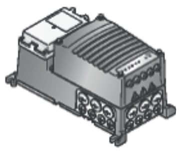
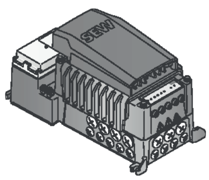
Can be combined with all MOVI-C® inverters (e.g. MOVIMOT® flexible)

Drive units with decentralized inverters

MOVIGEAR® performance	**MOVIMOT® advanced DRN..**	**MOVIMOT® advanced DR2C..**	**MOVIMOT® performance**
Mechatronic drive unit (≙ IE5)	Asynchronous motor (≙ IE3)	Synchronous motor (≙ IE5)	Synchronous motor (≙ IE5)
			
0.8 – 2.2 kW nominal motor power or 4 – 10 Nm rated motor torque	0.37 – 7.5 kW nominal power	0.69 – 7.38 kW nominal power	0.75 – 4.19 kW nominal power or 3.6 – 20 Nm rated torque

Decentralized inverters for mounting close to the motor

MOVIMOT® flexible

MMF1.	MMF31	MMF32
		

2 – 16.0 A nominal output current,

up to 300% overload capacity

Can be combined with all motors from SEW-EURODRIVE.

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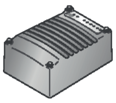
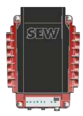
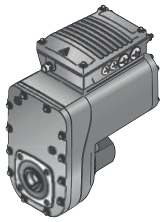
3.1.2 Technical data

MOVI-C® decentralized inverter



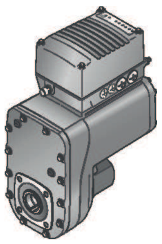
MOVI-C® decentralized inverter (electronics cover)	
Description	Decentralized inverter for mounting to: • MOVIGEAR® performance • MOVIMOT® advanced • MOVIMOT® performance • MOVIMOT® flexible
Nominal output current	 • Size 1 without cooling fins: 2.0 A, 2.5 A, 3.2 A  • Size 1 with cooling fins: 4.0 A, 5.5 A  • Size 2 without fan: 7.0 A, 7.5 A  • Size 2 with fan: 12.5 A, 16.0 A
Overload capacity	Up to 300%
Communication variants	• DBC – Direct Binary Communication • DAC – Direct AS-Interface Communication • DFC – Direct Fieldbus Communication (PROFINET IO, EtherNet/IP™, Modbus TCP, POWER-LINK CiA402) • DSI – Direct System Bus Control (EtherCAT®, SBus^{PLUS})
Options	• Integrated brake control (AC 100 – 525 V) • Integrated safe communication CSB51A/CSL51A/CSS51A (STO, SS1c, ...) • MOVIKIT® Drive software modules

MOVIGEAR® classic



MOVIGEAR® classic (≙ IE5)	
Description	Drive unit consisting of gear unit and synchronous motor (can be combined with electronics close to the motor or control cabinet technology from the MOVI-C® modular automation system).
Output speed range At n_e = 2000 min^{-1}	• MGF..1-DSM-C: 35.7 – 555 min^{-1} • MGF..2-DSM-C: 36.2 – 593 min^{-1} • MGF..4-DSM-C, MGF..4-DSM-C/XT: 35.4 – 566 min^{-1}
Recommended inverter combinations	In connection with MOVIDRIVE® modular, MOVIDRIVE® system, and MOVIDRIVE® technology or the decentralized inverter MOVIMOT® flexible. • MGF..1-DSM-C with inverter nominal output current 2.0 A • MGF..2-DSM-C with nominal inverter output current 2.0 A • MGF..4-DSM-C with nominal inverter output current 4.0 A • MGF..4-C-DSM-C/XT with nominal inverter output current 5.5 A Alternatively, MOVITRAC® LTP-B (380 V – 480 V) can also be used.

MOVIGEAR® performance



MOVIGEAR® performance (≙ IE5)	
Description	Drive unit consisting of synchronous motor, gear unit, and decentralized inverter
Overload capacity	Up to 300%
Power rating	• MGF..2-C: Torque 200 Nm, up to 0.8 kW nominal power • MGF..4-C: Torque 400 Nm, up to 1.5 kW nominal power • MGF..4-C/XT: 400 Nm torque with extended continuous torque, nominal power of up to 2.1 kW
Output speed range	Speed control range 1:40 (without encoder) • MGF..2-C: 0.9 – 593 min^{-1} • MGF..4-C, MGF..4-C/XT: 0.9 – 566 min^{-1} Speed control range 1:2000 (with encoder) • MGF..2-C: 0.02 – 593 min^{-1} • MGF..4-C, MGF..4-C/XT: 0.02 – 566 min^{-1}
Options	• Digital Interface (MOVILINK® DDI) /DI • Multi-turn absolute encoder /AZ1Z • Electrodynamic retarding function DynaStop® /DSP • Connector /IV • Pressure compensation fitting electronics /PE • Integrated braking resistor /BW1 • For more options, see MOVI-C® decentralized inverter options

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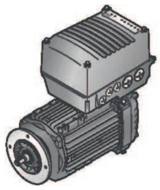
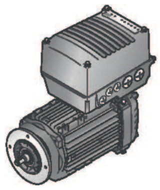
MOVIMOT® advanced with DR2C..A motor



MOVIMOT® advanced with DR2C..A motor (≙ IE5)	
Description	Drive unit consisting of gear unit, synchronous motor and decentralized inverter
Power rating	• 0.69 kW – 6.80 kW • 0.69 kW – 7.38 kW
Overload capacity	Up to 270%[1]
Drive data (Without gear unit)	Torque range[2] • Speed class 2000 min^{-1}: 3.3 Nm – 32.5 Nm • Speed class 3000 min^{-1}: 3.6 Nm – 23.5 Nm Speed range (without encoder): 1:40 • Speed class 2000 min^{-1}: 50 min^{-1}– 2000 min^{-1} • Speed class 3000 min^{-1}: 75 min^{-1}– 3000 min^{-1} Speed range (with encoder)[2]: • Speed class 2000 min^{-1}: 1 min^{-1}– 2000 min^{-1} • Speed class 3000 min^{-1}: 1 min^{-1}– 3000 min^{-1}
Options	• Digital Interface (MOVILINK®-DDI) /DI • Multi-turn absolute encoder /AK8Z[2] • Single-turn encoder /EK9Z[2] • Connector /IV • Motor protection /TF • Switch disconnector with feedback contact /D11 • Integrated braking resistor /BW1 • Pressure compensation fitting electronics /PE • Metal fan /AL • Canopy /C • Reinforced winding insulation /RI • Second shaft end on the motor/brakemotor /2W • For more options, see MOVI-C® decentralized inverter options

1) The value refers to the IE5 torque of the drive unit.
2) Only for MOVIMOT® advanced DFC, DSI

MOVIMOT® advanced with DRN.. motor



MOVIMOT® advanced with DRN.. Motor (≙ IE3)	
Description	Drive unit consisting of gear unit, asynchronous motor and decentralized inverter
Power rating	• With star connection: 0.37 kW – 7.5 kW • With delta connection: 0.55 – 7.5 kW
Overload capacity	Up to 210%[1]
Drive data (Without gear unit)	Torque range[2] • With star connection: 2.5 Nm – 49.4 Nm • With delta connection: 1.81 Nm – 24.7 Nm Speed range (with encoder)[2] • With star connection: 1 min^{-1} – 1400 min^{-1} (size 1) • With star connection: 1 min^{-1} – 1450 min^{-1} (size 2) • With delta connection: 1 min^{-1} – 2900 min^{-1} Speed range (without encoder) • With star connection: 140 min^{-1} – 1400 min^{-1} (size 1) • With star connection: 145 min^{-1} – 1450 min^{-1} (size 2) • With delta connection: 145 min^{-1} – 2900 min^{-1}
Options	• Digital Interface (MOVILINK® DDI) /DI • Single-turn encoder /EI8Z[2] • Safe single-turn encoder /EI7C-FS[2][3] • Multi-turn absolute encoder /AK8Z[2] • Single-turn encoder /EK8Z[2] • Connector /IV • Motor protection /TF • Switch disconnector with feedback contact /D11 • Integrated braking resistor /BW1 or /BW2 • Pressure compensation fitting electronics /PE • Metal fan /AL • Canopy /C • Reinforced winding insulation /RI • Second shaft end on the motor/brakemotor /2W • For more options, see MOVI-C® decentralized inverter options

1) With the exception of DRN132M4 motors with electronics cover D..-0160.. (16 A): max. overload capacity = 200%
2) Only for MOVIMOT® advanced DFC, DSI
3) Only in combination with CSL51 safety option. The encoder can only be used for the SLS safety function, but not for motor control.

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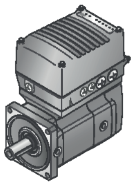
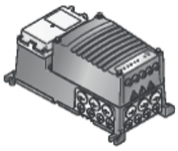
MOVIMOT® performance



MOVIMOT® performance (≙ IE5)	
Description	Drive unit consisting of gear unit, synchronous motor and decentralized inverter
Power rating	• Size 1: 0.75 – 1.88 kW • Size 2: 3.14 kW – 4.19 kW
Overload capacity	Up to 300%
Drive data (Without gear unit)	Torque range • Size 1: 3.6 Nm – 9 Nm • Size 2: 15 Nm – 20 Nm Speed range (with encoder) • Speed class 1000 min^{-1}: 1 min^{-1} – 1000 min^{-1} • Speed class 2000 min-1: 1 min^{-1} – 2000 min^{-1} Speed range (without encoder) • Speed class 1000 min^{-1}: 25 min^{-1} – 1000 min^{-1} • Speed class 2000 min^{-1}: 50 min^{-1} – 2000 min^{-1}
Options	• Digital Interface (MOVILINK® DDI) /DI • Single-turn encoder /EZ2Z • Multi-turn encoder /AZ2Z • Connector /IV • Motor protection /PK • Integrated braking resistor /BW1 or /BW2 • Pressure compensation fitting electronics /PE • For more options, see MOVI-C® decentralized inverter options

MOVIMOT® flexible



MOVIMOT® flexible (motors up to IE5)	
Description	Decentralized inverter
Output power of asynchronous motor	• Size 1 without cooling fins: 0.55 – 1.1 kW • Size 1 with cooling fins: 1.5 kW – 2.2 kW • Size 2 without fan: 3.0 kW – 4.0 kW • Size 2 with fan: 5.5 kW – 7.5 kW
Overload capacity	Up to 300%
Options	• Switch disconnector with feedback contact /D11 • Switch disconnector with feedback contact and line protection /M11 • Switch disconnector /R01 for disconnecting the motor with leading signal contact • MOVILINK® DDI integrated data node /DI • MOVILINK® DDI interface via coaxial cable /CO • DynaStop® electrodynamic retarding function /DSP • Control module BES brake rectifier 24 V /BES • Connector /IV • Pressure compensation fitting electronics /PE • Integrated braking resistor /BW1, /BW2 • Mounting panel /M31, /M32 • External braking resistor /EWB • Line filter /MO • Additional digital inputs /ODI • For more options, see MOVI-C® decentralized inverter options

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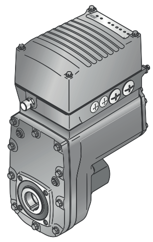
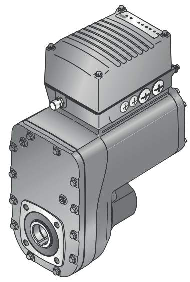
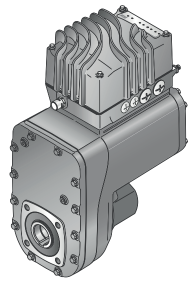
3.2 The MOVIGEAR® performance drive units at a glance

The following table provides an overview of the most important technical data of MOVIMOT® performance drive units:

Drive unit		MGF..2-..-C	MGF..4-..-C	MGF..4-..-C/XT
Technical data				
Output speed	n_a min^{-1}	0.9 – 593.5	0.9 – 566.6	0.9 – 566.6
Continuous output torque	M_a Nm	14 – 200	24 – 390	35 – 400
Max. permitted torque for short-time duty	M_{apk} Nm	22 – 220	54 – 475	53 – 475
Max. permitted overhung load for continuous duty	F_{Ramax} N	Overhung loads are not permitted.		
Gear ratio range	i	3.37 – 55.25	3.53 – 56.49	3.53 – 56.49

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4 Technical data

4.1 General information

4.1.1 Power and torque ratings

The power and torque ratings listed in this documentation refer to mounting position M1 and similar mounting positions in which the input stage is not completely submerged in oil. In addition, the values are based on standard versions with standard lubrication under normal ambient conditions.

4.1.2 Noise levels

All drive units are well within the maximum permissible noise levels set forth in ISO 8579-1 for gear units and EN 60034-9 for motors.

4.1.3 Paint

Drive units are coated with "blue-gray" (RAL 7031 according to DIN 1843) machine paint as standard. Special paintings are available on request.

4.1.4 Surface and corrosion protection

All drive units can also be supplied with special surface protection for applications in extremely humid or chemically aggressive environments upon request.

4.1.5 Air admission and accessibility

When installing the driven machine, make sure there is enough space in axial and radial direction for a sufficient supply of cooling air and unobstructed heat dissipation.

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4.2 General technical data of MOVIGEAR® performance

Interference immunity	EN 61800-3, 2. environment (industrial environment)
Interference emission	EN 61800-3 category C3 **No** EMC category is specified for IT systems.
Ambient temperature	See chapter "Environmental conditions" (→ 🗎 30)
Operating mode	S1, DB (EN 60034-1)
Type of cooling	Natural cooling
Degree of protection	Standard: IP65 or IP66[1)] According to EN 60529 (housing enclosed and all cable entries sealed)
Pollution class	2 in accordance with IEC 60664-1
Overvoltage category	III in accordance with IEC 60664-1
Permitted number of times power may be switched on/off	1 × per minute
Minimum switch-off time for power off	10 s
Startup phase	During the startup phase of the device, signal states may differ from the expected state. The "DRIVE" status LED shows the status of the startup phase, see chapter ""DRIVE" status LED" (→ 🗎 368). For devices that support cyclic data exchange, the end of the startup phase is indicated by the values being reported back to the higher-level controller via the PI data of the inverter.
Required preventive measure	Grounding of the device
Protection functions	• Shutdown caused by overcurrent due to ground fault, short circuit, overload • Shutdown caused by DC link overvoltage • Shutdown caused by overtemperature • Motor monitoring in accordance with UL function
Signaling functions	Display elements to indicate the device state
Current carrying capacity of terminals	See chapter: • "Current carrying capacity of terminals" (→ 🗎 34) • "Permitted cable cross section of the terminals" (→ 🗎 233)
Installation altitude	Up to h ≤ 1000 m without restrictions. The following restrictions apply to altitudes > 1000 m: • From 1000 m to max. 3800 m: I_N reduced by 1% per 100 m • From 2000 m to max. 3800 m: To maintain protective separation and the air gaps and creepage distances according to EN 61800-5-1, an overvoltage protection device must be connected upstream to reduce the overvoltages from category III to category II.
Proof of mechanical strength	See chapter "Environmental conditions" (→ 🗎 30)
Mass	See chapter "Technical data" > "Torque characteristics" (→ 🗎 71)

1) Depending on the configuration.

4.3 Environmental conditions

4.3.1 Climatic conditions

Extended storage	Weatherproof IEC 60721-3-1 class 1K21, non-condensing, no condensation Deviating from the standard: Temperature -25 °C – +70 °C[1)]
Transport	Weatherproof IEC 60721-3-2 class 2K11, non-condensing, no condensation Deviating from the standard: Temperature -25 °C – +70 °C[1)]
Operation	Stationary use, weatherproof IEC 60721-3-3; class 3K22, non-condensing, no condensation Deviating from the standard: Temperature -25 °C – +60 °C[1)]

1) Depending on the configuration.

4.3.2 Special climatic conditions

Extended storage	Weatherproof IEC 60721-3-1 class 1Z1
Operation	Stationary use, weatherproof IEC 60721-3-3 class 3Z1

4.3.3 Biological conditions

Extended storage	Weatherproof IEC 60721-3-1 class 1B1
Transport	Weatherproof IEC 60721-3-2 class 2B1
Operation	Stationary use, weatherproof IEC 60721-3-3 class 3B1

4.3.4 Chemically active substances

Extended storage	Weatherproof IEC 60721-3-1, class 1C2 Deviating from the standard: No salt mist[1)]
Transport	Weatherproof IEC 60721-3-2 class 2C2, no sea water Deviating from the standard: No salt mist[1)]
Operation	Stationary use, weatherproof ISO 9223 class C3 Deviating from the standard: No salt mist[1)]

1) Use is only possible with the wet-area design (option /WA).

4.3.5 Mechanically active substances

Extended storage	Weatherproof IEC 60721-3-1 class 1S10, no conductive dust
Transport	Weatherproof IEC 60721-3-2 class 2S1, no conductive dust
Operation	Stationary use, weatherproof IEC 60721-3-3 class 3S5, no conductive dust

4.3.6 Mechanical conditions

The specifications are characteristic values for the device test. The specifications are based on the test characteristic values according to IEC 60721-3-3 and correspond to class 3M5 according to EN 60721-3-3:1995.

Vibration (sinusoidal)	2 – 200 Hz: 1 g
Vibration (noise)	10 – 200 Hz: 0.3 m^2/s^3 200 – 500 Hz: 0.1 m^2/s^3 Corresponds to approx. 0.95 g_{rms} (g_{rms} = r.m.s. acceleration value)
Shocks (half sine)	10 g at 11 ms shock duration

4.4 Technical data MOVIGEAR® performance

4.4.1 Input

MOVIGEAR® performance		MGF..		
		2-..-C	4-..-C	4-..-C/XT
Electronics cover (inverter)		**..0020..**	**..0032..**	**..0040..**
Nominal supply voltage (to EN 50160)	V_{line}	3 × AC 380 – 500 V		3 × AC 400 V -5% to AC 500 V +10%
Nominal line current	I_{line}	1.6 A	2.8 A	3.7 A
	I_{max}	5.1 A	8.2 A	10.7 A
Line frequency	f_{line}	50 – 60 Hz ±5%		
Maximum permitted rated short-circuit current at the line input	SCCR I_{CC}	65 kA		
Maximum rated current of the supply fuse (branch circuit protection)		40 A		
Power section nominal power loss	P_V	16 W	27 W	45 W

4.4.2 Electronics cover (inverter)

MOVIGEAR® performance		MGF..		
		2-..-C	4-..-C	4-..-C/XT
Electronics cover (inverter)		**..0020..**	**..0032..**	**..0040..**
Nominal output current electronics cover f_{PWM} = 4 kHz	$I_{N\_inverter}$	2.0 A	3.2 A	4.0 A
Apparent output power	S_N	1.4 kVA	2.2 kVA	2.8 kVA
Overload capacity of $I_{N\_inverter}$ at f_{PWM} = 4 kHz	V_{line} = 400 V	300%[1]		
	V_{line} = 500 V	f_{off} < 3 Hz: 270% f_{off} > 3 Hz: 300%		
		The overload capacity may be limited depending on the gear unit ratio. For the maximum torques (M_{apk}), see "Torque characteristics" (→ 🗎 71) chapter		
PWM frequency	f_{PWM}	4, 8, 16 kHz (adjustable)		
Max. output frequency	$f_{max\_inverter}$	CFC: 500 Hz ELSM®: 500 Hz		
Speed control range		CFC: 1 : 2000 ELSM®: 1 : 40		

1) Overload capacity at ELSM® and n < 2% of the nominal motor speed: 150% of the nominal output current of the electronics cover

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4.4.3 Motor

MOVIGEAR® performance		MGF..		
		2-..-C	4-..-C	4-..-C/XT
Electronics cover (inverter)		**..0020..**	**..0032..**	**..0040..**
Nominal motor current	I_N	1.85 A	2.9 A	3.9 A
Nominal motor speed	n_N	2000 min^{-1}		
Nominal motor frequency	f_N	133.3 Hz		
Motor’s mass moment of inertia	J_{mot}	7.64 $kgm^2 \times 10^{-4}$	23.30 $kgm^2 \times 10^{-4}$	30.40 $kgm^2 \times 10^{-4}$

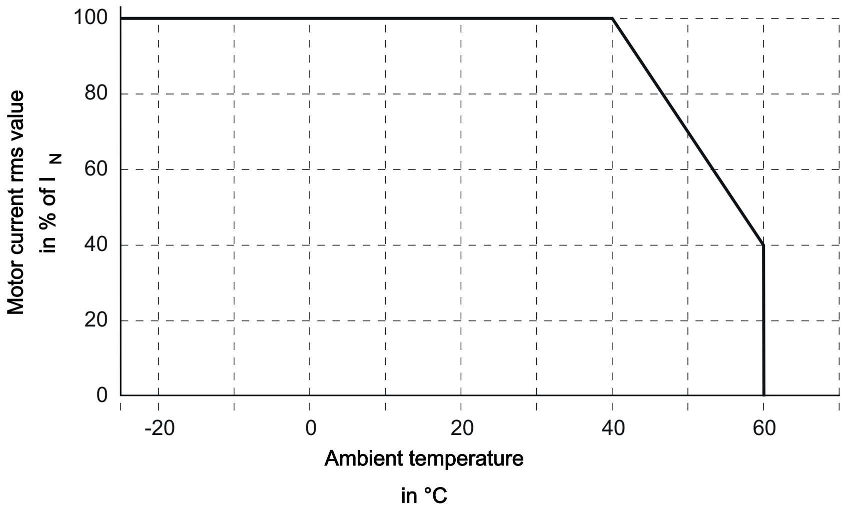
4.4.4 Brake chopper and braking resistor

MOVIGEAR® performance		MGF..		
		2-..-C	4-..-C	4-..-C/XT
Electronics cover (inverter)		**..0020..**	**..0032..**	**..0040..**
Minimum braking resistance	R_{BWmin}	100 Ω		
Brake chopper continuous power		550 W	900 W	900 W
Brake chopper peak power		3.8 kVA	5.9 kVA	7.6 kVA

4.4.5 Derating factors

Derating depending on the ambient temperature

The following figure shows the I_N reduction depending on the ambient temperature:



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I_N reduction: 3% I_N per K at 40 °C to 60 °C

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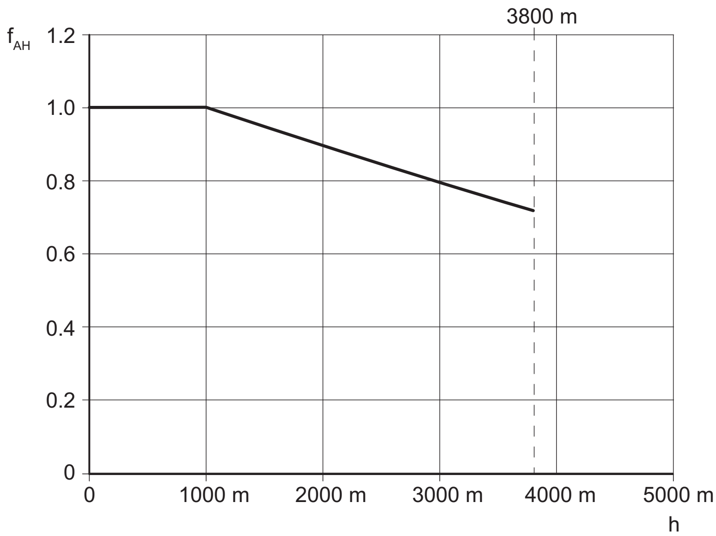
Derating depending on the installation altitude

The following diagram shows the factor f_{AH} (according to IEC 60034-1:2017, Table 12) by which the thermal motor torque has to be reduced depending on the installation altitude H.



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Also observe chapter "Technical data" > "Derating factors" > "Derating depending on ambient temperature".

Notes

INFORMATION

Derating is based on typical operating conditions with a supply voltage of 24 V (sensor supply, input voltage of STO input).

4.4.6 Current-carrying capacity of terminals

Current carrying capacity of terminals		
Line terminals	X1	24 A (max. loop-through current)
Control terminals	X9	10 A (max. loop-through current)

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4.5 Electronics data

4.5.1 DC 24 V supply

Input for the independent backup voltage supply of the electronics		
DC 24 V input	24V_IN	V_{IN} = DC 24 V -10%/+20% according to EN 61131-2
	0V24_IN	

Project planning

INFORMATION

When the external backup voltage supply is used, the external backup voltage supply takes over the entire 24 V supply of the device.

The internal 24 V supply is then no longer active.

Check whether the available current from the electronics cover power supply unit is sufficient for the total current demand of all consumers:

1. Determine the available current from the electronics cover according to the following table:

Electronics cover	Available current without external 24 V supply	Maximum current with external 24 V supply
Size 1 Size 2 without fan	820 mA	1250 mA
Size 2 with fan	1180 mA	1600 mA

2. Sum up the current demand of all consumers according to the following table:

Consumer			Current requirement
	Electronics cover (Basic requirement)	Size 1 Size 2 without fan	210 mA
		Size 2 with fan	570 mA
1.	MOVILINK® DDI encoder (..Z)		120 mA
2.	Keypad (CBG..)		50 mA
3.	Safety technology	STO connected	0 mA
		Internal STO jumpered	20 mA
4.	DC 24 V output		Max. 100 mA

3. Compare the total current demand of all consumers to the available current without external 24 V supply (i.e. 24 V through internal power supply unit):

If the total current demand of all consumers is greater than the available current from the electronics cover power supply unit, you must supply the drive unit with 24 V externally.

In this case, the specified maximum currents must not be exceeded.

Example

The drive unit has the following consumer:

- Basic requirement of electronics cover size 1 (-210 mA).
- MOVILINK® DDI encoder (-120 mA)
- Keypad (-50 mA),
- The STO is internally jumpered in the inverter (-20 mA).

Without an external 24 V supply, 420 mA are still available for the DC 24 V output after deducting the basic requirement and the electricity requirement of the consumer.

820 mA - 210 mA - 120 mA - 50 mA - 20 mA = **420 mA**

However, the electricity requirement of the DC 24 V output is no greater than 100 mA.

Therefore, an external 24 V supply is not required.

4.5.2 DC 24 V output

Internal voltage supply for the sensors		
DC 24 V output X9	24V_OUT	V_{OUT} = DC 24 V -10%/+20% according to EN 61131-2 External-voltage proof and short-circuit proof Permitted output current: $I_{OUT} \leq 100$ mA
	0V24_OUT	

4.5.3 Digital inputs

Digital inputs	
Number of inputs	4
Input type	PLC-compatible according to EN 61131-2 (digital inputs type 3) DI01 – DI04: $R_i \approx 4.5$ kΩ, sampling cycle ≤ 2 ms DI03/DI04: HTL encoder connection for counter function, maximum 120 kHz DI03: Master frequency input, maximum 120 kHz Signal level DC +11 to +30 V = "1" = contact closed DC -3 to +5 V = "0" = contact open
Sensor/actuator supply	DC 24 V according to EN 61131-2, External-voltage proof and short-circuit proof
Maximum cable length	30 m
Permitted total current for internal supply	100 mA (total of all connected sensors/actuators, maximum individual load: 100 mA)
Permitted total current for external supply	100 mA (total of all connected sensors/actuators, maximum individual load: 100 mA)

4.5.4 Relay output

Relay output	
Response time	≤ 15 ms
Contact details	DC 24 V/50 mA (DC 12 according to IEC 60947-5-1) (Only SELV or PELV circuits)

4.6 Encoder

4.6.1 Technical data of encoder option

Encoder option	Single-turn resolution (position resolution per motor revolution)		Multi-turn resolution (max. counter value for complete motor revolutions)		Interface connection:
/AZ1Z Multi-turn absolute encoder	12 bits	4096 inc.	16 bits	+32767 -32768	MOVILINK® DDI, coaxial

4.7 Interfaces

4.7.1 AS-Interface

Description

The AS-Interface interface allows for the device to be integrated into AS-Interface installations. The interface supports various station profiles for cyclic and acyclic data exchange with the AS-Interface master.

Technical data

AS-Interface	
External electronics supply	AS-Interface: 29.5 – 31.6 V (AS-Interface power supply unit according to EN 50295) I_E AS-Interface: ≤ 50 mA (typical 30 mA at 30 V)
Control input	Pin AS+: Connection of AS-interface data lines Pin AS- : Connection of AS-interface data lines

Slave profiles

Station profiles AS-Interface							
Station type	Number of data bits	Station profile	Profile configuration				Address range
			I/O configu-ration	ID code	Ext. ID2 code	Ext. ID1 code	
Binary stations	4 DI/4 DO	S-7.F	7_{hex}	F_{hex}	E_{hex}	F_{hex}[1)]	1 – 31
A/B station	4 DI/4 DO	S-7.A.7	7_{hex}	A_{hex}	7_{hex}	7_{hex}	1A – 31A, and 1B – 31B
	8 DI/8 DO	S-7.A.A	7_{hex}	A_{hex}	A_{hex}	7_{hex}	1A – 31A, and 1B – 31B
Double stations	4 DI/4 DO	A: S-7.A.7	7_{hex}	A_{hex}	7_{hex}	7_{hex}	1A – 31A[2)]
		B: S-7.A.5	7_{hex}	A_{hex}	5_{hex}	7_{hex}	1B – 31B[2)]
	8 DI/8 DO	A: S-7.A.A	7_{hex}	A_{hex}	A_{hex}	7_{hex}	1A – 31A[2)]
		B: S-7.A.5	7_{hex}	A_{hex}	5_{hex}	7_{hex}	1B – 31B[2)]

1) The extended ID1 code can be changed for the binary station.
2) The A station and the B station in one drive have the same numeric station address.

4.8 Technical data – functional safety

4.8.1 STO safety sub-function

The following table shows the technical data of the STO safety sub-function.

The safe digital inputs F_STO_P1 and F_STO_P2 correspond to type 3 according to IEC 61131-2.

Reference potential for the F_STO_P1 and F_STO_P2 is F_STO_M (contact at terminal X9:11).

		Terminal	Technical data		
STO safety contact		X9			
Electrical data of the safe digital inputs F_STO_P1, F_STO_P2			**Minimum**	**Typical**	**Maximum**
Input voltage range		X9:1 and X9:3	DC -3 V	DC 24 V	DC 30 V
Input capacitance against STO_M			–	300 pF	500 pF
Input capacitance against GND			–	300 pF	500 pF
Power consumption at DC 24 V:	F_STO_P1		–	150 mW	200 mW
	F_STO_P2		–	150 mW	200 mW
	Sum[1]		–	300 mW	400 mW
Input voltage for ON state (STO)			DC 11 V	–	–
Input voltage for OFF state (STO)			–	–	DC 5 V
Permitted leakage current of the external safety controller			–	–	1 mA
Minimum voltage rise			1 V/ms		
Maximum cable length			100 m		

1) Each drive unit always requires a power consumption of 300 mW.

4.8.2 Characteristic safety values STO

	Characteristic values	
	EN 61800-5-2	**EN ISO 13849-1**
Tested safety class/standard basis	Safety Integrity Level SIL 3	Performance level e/category 3
Probability of dangerous failure per hour (PFH_D value)	2.5×10^{-9} 1/h	
Service life	20 years, after which the component must be replaced with a new one.	
Proof test interval	> 20 years	–
Safe state	Safe Torque Off (STO)	
Safety sub-function	STO, SS1[1] according to EN 61800-5-2	

1) With suitable external control

INFORMATION

In the case of single-pole wiring, the achievable performance level according to EN ISO 13849-1 is reduced to PL d, and the achievable Safety Integrity Level according to EN 61800-5-2 is reduced to SIL 2. A fault exclusion is necessary for the wiring between the safety relay and the STO input.

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4.9 TSM memory module

The TSM memory module is the only memory of the decentralized inverter. Therefore, all data and settings are saved on this memory module. The data and settings that were loaded onto the device at the time of delivery (delivery state or optional customer-specific parameterization /P "Parameters ex works") are also saved on the memory module.

The settings stored on the memory module are not indicated on the outside.

If you need to replace a device, the system can be started up again in next to no time without additional tools by simply removing the TSM memory module from the old device and plugging it into the replacement.

Make sure that you hear 2 clear clicks when inserting the TSM memory module. The TSM memory module is plugged in correctly and locked only if you hear 2 clear clicks.

TSM memory module		
Housing color	Black	Gray
Part number	28242882	28285271
Description	Memory module • With startup data	Memory module • Without safety key data set and safety key ID • Only for devices without MOVISAFE® CS.. safety option • With startup data

In case of devices with functional safety, the memory module also serves as a safety key. Only use the black memory module for devices with functional safety.

If you order a device with the option /P "Parameters ex works", SEW-EURODRIVE saves the ordered data set to the delivered TSM memory module. However, you cannot recognize the "Parameters ex works" option on the outside of the TSM memory module. Observe this note especially when replacing the device.

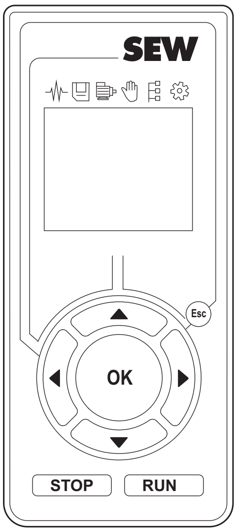
4.10 CBG.. keypads and accessories

4.10.1 CBG11A keypad

Description

The keypad enables convenient startup, operation, parameterization, and diagnostics of inverters of the MOVI-C® modular automation system due to the full-text display.

The keypad has a mini USB interface with gateway function. A connection from the inverter to a PC can be established using this interface for engineering with MOVISUITE®.



CBG11A properties:

- 38 mm monochrome display (1.5")
- Startup of asynchronous motors:
  – with or without brake
  – with or without temperature sensors
  – without encoder
- Diagnostics
- Saving and copying a parameter set
- Firmware update of the inverter via USB connection
- Connection to MOVISUITE® engineering software via keypad
- Determination of load moment of inertia
- Access to all parameters
- Language: EN
- Door mounting frame COG11A available

A CBM22A/K-2.0 wall fixing is available for the keypad.

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Technical data

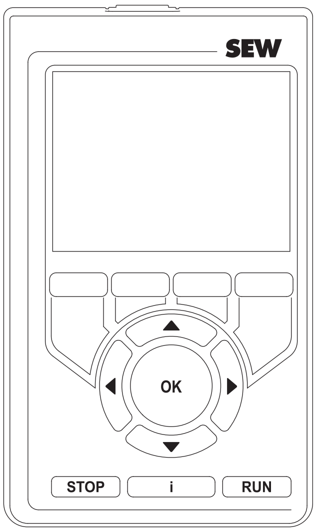
CBG11A keypad	
Part number	28233646
Ambient temperature	0 – 60 °C
Degree of protection	IP40 according to EN 60529
Power consumption	0.6 W
Dimensions in mm (W × H × D)	45 × 100 × 20
Display dimensions in mm (W × H)	28.5 × 23
Diagonal screen measurement	38 mm (1.5")
Screen resolution in pixels (W × H)	78 × 64
Screen type	Monochrome display
Engineering interface	USB 2.0 mini B, female
Connection interface	D-sub 9-pin, female
Mechanical strength	3M5 according to DIN EN 60721-3-3: 1995 5M1 according to DIN EN 60721-3-5: 1997

4.10.2 CBG21A keypad

Description

The keypad enables convenient startup, operation, parameterization, and diagnostics of inverters of the MOVI-C® modular automation system due to the full-text display.

The keypad has a mini USB interface with gateway function. A connection from the inverter to a PC can be established using this interface for engineering with MOVISUITE®.



CBG21A properties:

- 61 mm color display (2.4")
- Startup of asynchronous and synchronous motors:
  - with or without brake
  - with or without temperature sensors
  - with or without encoder
- Diagnostics
- Saving and copying several parameter sets
- Firmware update of the inverter via USB connection
- Connection to MOVISUITE® engineering software via keypad
- Determination of load moment of inertia
- Optimization of the drive train in terms of clearance and stiffness
- Access to all parameters
- Languages: DE/EN/FR/IT/ES/KO/PT/HU/ZH/RU
- Door mounting frame COG11A available

A CBM22A/K-2.0 wall fixing is available for the keypad.

For more information, refer to the manual of the operator panel.

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Technical data

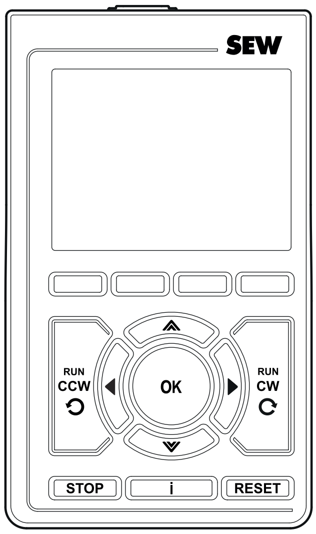
CBG21A keypad	
Part number	28238133
Ambient temperature	-10 – 60 °C
Degree of protection	IP40 in accordance with EN 60529
Power consumption	1.4 W
Dimensions in mm (W × H × D)	65 × 110 × 20
Display dimensions in mm (W × H)	49 × 37
Diagonal screen measurement	61 mm (2.4")
Screen resolution in pixels (W × H)	320 × 240
Screen type	Color display
Engineering interface	USB 2.0 mini B, female
Connection interface	D-sub 9-pin, female
Mechanical strength	3M5 according to DIN EN 60721-3-3: 1995 5M1 according to DIN EN 60721-3-5: 1997
Internal memory	128 MB (sufficient for several hundred data sets) The memory can also be used for images, documents, projects, etc.

4.10.3 CBG22A local keypad

Description

The full-text display of the local keypad enables a convenient display of customer-specific information texts of the higher-level controller. It also enables the operator to perform diagnostics and manual operation.

The local keypad has a mini USB interface with gateway function. A connection from the inverter to a PC can be established using this interface for engineering with MOVISUITE®.



CBG22A properties:

- 61 mm color display (2.4")
- Display of customer-specific information texts of the higher-level controller, diagnostics and manual mode by the operator
- Simple and intuitive manual mode[1)] for continued operation in the event of a system failure
- Comprehensive diagnostics methods
- Exclusively read-only access to parameters in order to protect against incorrect use
- Optional access to functions and states of the control elements and data transfer for Ethernet-based communication methods of the drive systems
- Connection to MOVISUITE® engineering software via keypad
- COG11A door mounting frame available
- Languages: DE, EN, FR, ES, PT, ZH, RU

1) Only in combination with devices with key switch

A CBM22A/K-2.0 wall fixing is available for the keypad.

For more information, refer to the manual of the operator panel.

Technical data

CBG22A local keypad	
Part number	28277554
Ambient temperature	-10 – 60 °C
Degree of protection	IP40 in accordance with EN 60529
Power consumption	1.4 W
Dimensions in mm (W × H × D)	65 × 110 × 20
Display dimensions in mm (W × H)	49 × 37
Diagonal screen measurement	61 mm (2.4")
Screen resolution in pixels (W × H)	320 × 240
Screen type	Color display
Engineering interface	USB 2.0 mini B, female
Connection interface	D-sub 9-pin, female
Mechanical strength	3M5 according to DIN EN 60721-3-3: 1995 5M1 according to DIN EN 60721-3-5: 1997

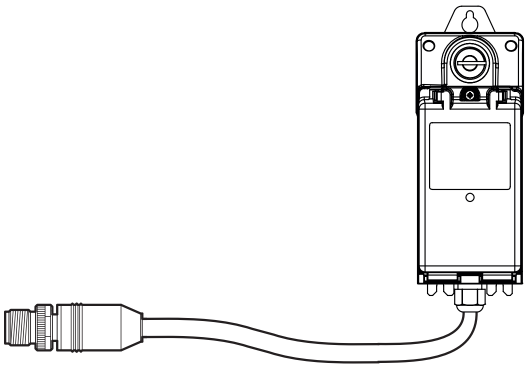
4.10.4 Wall mounting CBM22A/K-20

Description

The CBM22A/K-2.0 wall mounting is used to mount the CBG11A, CBG21A, or CBG22A keypads.

With the integrated key switch, you can activate the functions in conjunction with the CBG22A local keypad (e.g. manual mode).

For connecting to the X4142 engineering interface of the device, the CBM22A/K-2.0 wall mounting has a connection cable with an M12 connector (see the following figure).



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Technical data

Wall mounting CBM22A/K-20	
Part number	28282892
Scope of delivery	• CBM22A/K-2.0 • Connection cable 2 m, type: LEONI L TRAILING CABLE 4X1X0.15
Bending radius of connection cable	Minimum 20 mm (4 × cable diameter)
Connection	M12 connector, 5-pin, male, B-coded
Protection class	IP65 with tightening torque of cover screw 1.2 – 1.4 Nm
Dimensions in mm (H × W × D)	• Closed: 230 × 81 × 71 • Open: 350 × 81 × 71 • With inserted key: 230 × 81 × 85
Installation distance, front flap	min. 200 mm
Mechanical strength	3M5 according to DIN EN 60721-3-3: 1995 5M1 according to DIN EN 60721-3-5: 1997

4.11 USM21A interface adapter

An order using part number 28231449 includes the following parts:

- USM21A interface adapter
- USB connection cable for the USM21A – PC connection
- Serial interface cable with 2 RJ10 connectors

The USM21A interface adapter is used to connect the PC and the engineering interface of the device.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 interface.

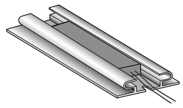
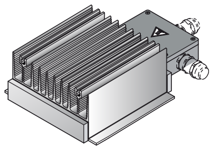
You need the following components for the connection:

Component	Part number
USM21A interface adapter The following connection cables are included in the delivery: • USB 2.0 connection cable – USB type A/USB type B – Length: 1.5 m • RJ10/RJ10 connection cable For connection to the X31 engineering interface – With 2 RJ10 connectors – Length: 3 m	28231449
Connection cable RJ10/M12 (USK15A) For connection to the X4141 engineering interface or to the M12 optional engineering interface at the front module of MMF3...: • With RJ10 connector • With M12 SPEEDCON connector, 5-pin, male, B-coded • Length: 3 m	28139038
M12/M12 Extension cable For extending the RJ10/M12 (USK15A) connection cable to the X4142 engineering interface • With M12 SPEEDCON connector, 5-pin, female, B-coded • With M12 SPEEDCON connector, 5-pin, male, B-coded • Length: 13 m	28168860
RJ10/SUB-D9 connection cable For connection to the SUB-D9 optional engineering interface at the front module of MOVIMOT® flexible MMF3...2.. or MMF3...3..: • With RJ10 connector • With Sub-D9 connector, female • Length: 1.5 m	18123864
Retrofit set M12 engineering interface X4142 M12 SPEEDCON, 5-pin, B-coded, female	28273273

4.12 Braking resistors

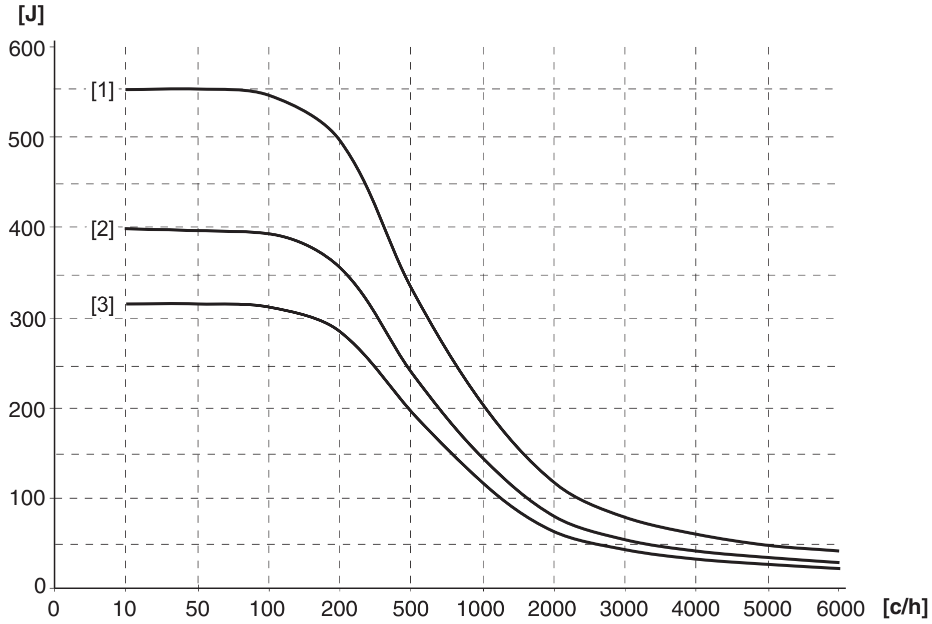
4.12.1 Overview

The drive unit is equipped with a brake chopper. The following table shows the possible uses in regenerative mode:

Use	Dissipation of regenerative energy
	Brake chopper
Small amount of regenerative energy	Integrated braking resistor 
Medium/large amount of regenerative energy	External braking resistor 

4.12.2 Integrated BW1 braking resistor

The following diagram shows the current-carrying capacity of the BW1 braking resistor per braking operation:



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[1] Deceleration ramp 10 s
[2] Deceleration ramp 4 s
[3] Deceleration ramp 0.2 s
c/h Cycles/hour

Calculation example

The known values are:

- Average braking power: 144 W
- Deceleration ramp: 2 s
- 200 brake applications per hour

Calculating the energy from the power of the deceleration ramp:

$$W = P \times t$$
$$W = 144\ W \times 2\ s$$
$$W = 288\ J$$

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For the deceleration ramp of 2 s, you can use deceleration ramp [3] (0.2 s) in the diagram. Use the characteristic curve with the shorter deceleration ramp because a shorter deceleration ramp means more braking energy.

The diagram permits 290 J of braking energy for the 0.2 s deceleration ramp and 200 cycles per hour. In this case, the required 288 J can be dissipated via BW1.

4.12.3 External braking resistor

Operation with external braking resistor is necessary for applications with a large amount of regenerative energy.

Description

Operation with external braking resistor is necessary for applications with a large amount of regenerative energy.

Assignment

4Q operation with external braking resistor is necessary for applications with a large amount of regenerative energy.

NOTICE

In case of incorrect assignment of the inverters, an overload may occur at the braking resistor and damage the braking resistor.

Damage to braking resistor.

- Observe the assignment of the braking resistor to the inverter and the project planning guidelines.

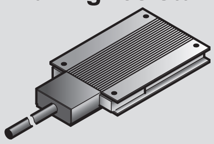
A flat-type resistor has internal thermal protection (fuse cannot be replaced) that interrupts the current circuit in the event of overload. Additional components for thermal monitoring are not necessary.

The following table shows the assignment of the external braking resistors to the electronics covers.

Braking resistance		Electronics cover[1]								
Type	Part number	Size 1 without cooling fins			Size 1 with cooling fins		Size 2 without fan		Size 2 with fan	
		0020	0025	0032	0040	0055	0070	0095	0125	0160
BW150-003/K-1.5	08282927	x	x	x	x	x	x	x	x	x
BW100-005/K-1.5	08282862	x	x	x	x	x	x	x	x	x
BW150-006-T	17969565	x	x	x	x	x	x	x	x	x
BW100-009-T	17969573	x	x	x	x	x	x	x	x	x
BW068-006-T	17970008						x	x	x	x
BW068-012-T	17970016						x	x	x	x
BW050-008-001	17962242						x	x	x	x
BW047-004/K-0.61	28179145						x	x	x	x
BW033-012-01	17962196								x	x

1) "x": You can use the braking resistor together with this electronics cover.

BW100-005/K-1.5, BW150-003/K-1.5, BW047-004/K-0.61

Braking resistance 			**BW100-005/K1.5**	**BW150-003/K-1.5**	**BW047-004/K-0.61**
Braking resistor part number with open cable end			08282862	08282927	28179145
Braking resistor part number with connector (for X2304)			28176448	28176421	–
Peak braking power P_N		kW	9.4	6.3	20
Approval			CE, cURus	CE, cURus	CE, cURus
Current-carrying capacity	100% cdf	kW	0.2	0.1	0.24
	50% cdf	kW	0.3	0.15	0.5
	25% cdf	kW	0.6	0.3	1.0
	12% cdf	kW	1.0	0.5	1.9
	6% cdf	kW	1.8	0.9	3.0
	Observe the regenerative power limit for the inverter.				
Resistance value R_{BW}		Ω	100	150	47
Tripping current I_F		A	1.0	0.6	1.7
Design			Flat design resistor		
Power connections			Connection cable		
PE connection			Connection cable		
Degree of protection			IP65		
Ambient temperature ϑ_{amb}		°C	-25 – 40		
			Derating at ambient temperature > 40 °C: -4% P_N/10 K up to maximum 60 °C		
Mass		kg	0.91	0.65	1.1
Dimensions W × H × D		mm	251 × 80 × 15	145 × 80 × 15	216 × 80 × 30
Cable length approx.		m	1.5	1.5	0.61 (total) 0.26 (with sheath) 0.36 (without sheath)
Assigned grids			BS-005 Part no.: 0813152X		–

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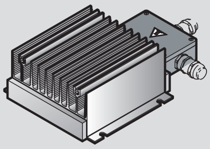
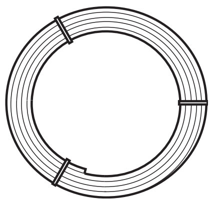
BW150-006.-T, BW100-009-T

 **Braking resistor**			**BW150-006-T**	**BW100-009-T**
Braking resistor part number			17969565	17969573
Connection cable part number (with connector for X2304)			28172558	28172558
Peak braking power P_N		kW	6.3	9.4
Approval			CE, cURus	CE, cURus
Current-carrying capacity	100% cdf	kW	0.6	0.9
	50% cdf	kW	0.9	1.2
	25% cdf	kW	1.8	2.4
	12% cdf	kW	3.8	5.0
	6% cdf	kW	7.5	10.0
	Observe the regenerative power limit for the inverter.			
Resistance value R_{BW}		Ω	150	100
Tripping current I_F		A	2.0	3.0
Design			Compact resistor	
Power connections			Terminals	
Tightening torque		Nm	2	
PE connection			M5 bolt	
Tightening torque PE		Nm	2.5	
Degree of protection			IP66	
Ambient temperature ϑ_{amb}		°C	-25 – 40	
			Derating at ambient temperature > 40 °C: -4% P_N/10 K up to maximum 60 °C	
Mass		kg	3.0	5.5
Dimensions W × H × D		mm	285 × 174 × 75	435 × 174 × 75
Temperature switch			30 V DC, < 1 A, NC contact	
Prescribed connection cables			Shielded cables with a temperature resistance T_{amb} ≥ 90 °C (194 °F)	

Connection cable

The following cable is available for connecting the external braking resistors:

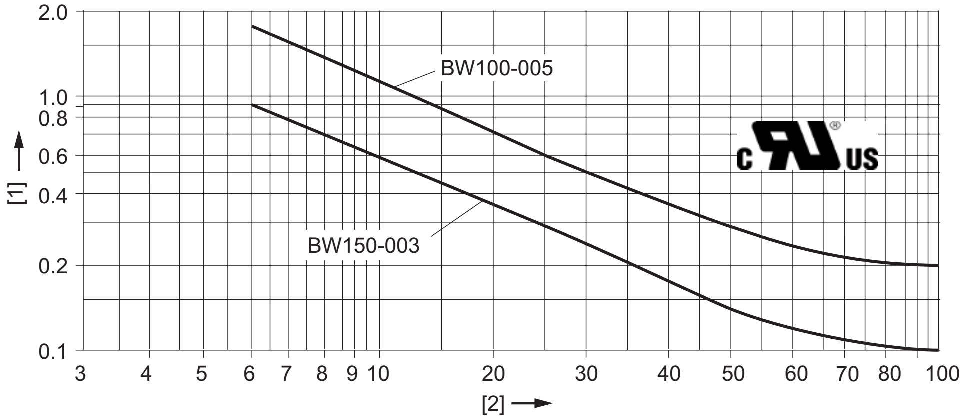
Device	Connection cable	Length	Braking resistor
MOVIMOT® advanced MOVIMOT® performance MOVIGEAR® performance MOVIMOT® flexible	Part number: 13230409 [1)] Type: LEONI LEC 001637 3Gx2.5 mm^2, shielded, halogen-free (cable roll) 	30 m	BW150-006-T BW100-009-T BW068-006-T BW068-012-T BW050-008-01

1) This cable is intended exclusively for the power connection. For braking resistors with a thermo contact (-T), you must also connect a cable for evaluating the thermo contact. For additional information, refer to the data sheet of the braking resistor.

4.12.4 Technical data of BW100-005/K-1.5 and BW150-003/K-1.5

Power diagrams

The following figure shows the rating diagrams of the braking resistors BW100-005/K-1.5, BW150-003/K-1.5:



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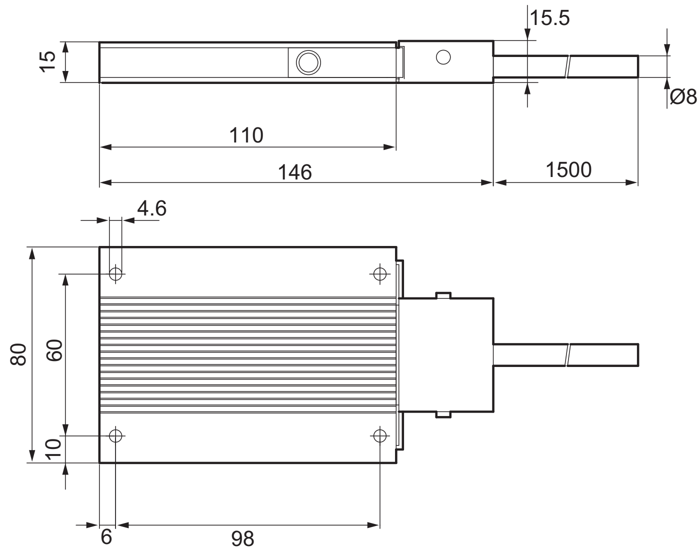
[1] Power in KW
[2] Cyclic duration factor cdf in %

Dimension drawing of BW150-003/K-1.5

The following figure shows the dimensions of the external braking resistor BW150-003/K-1.5:



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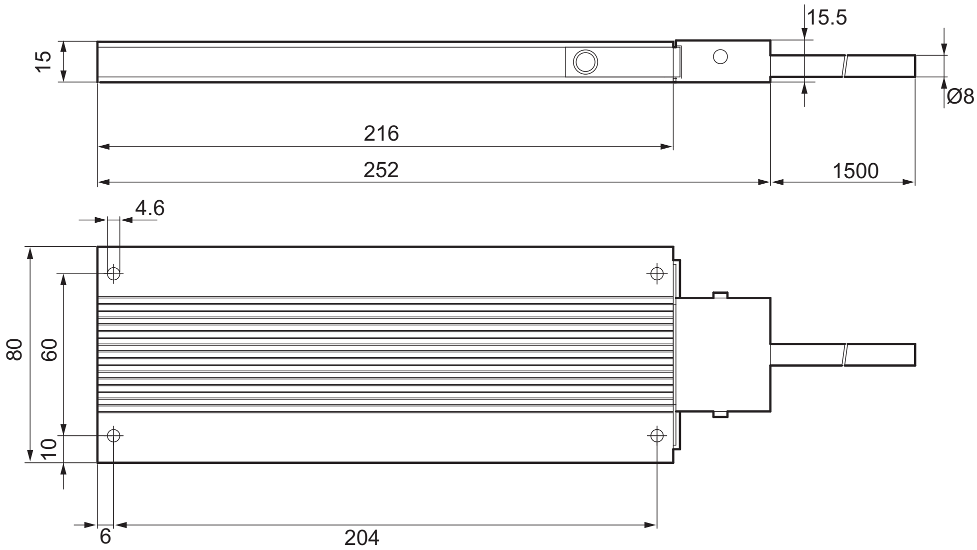
Dimension drawing of BW100-005/K-1.5

The following figure shows the dimensions of the external braking resistor BW100-005/K-1.5:



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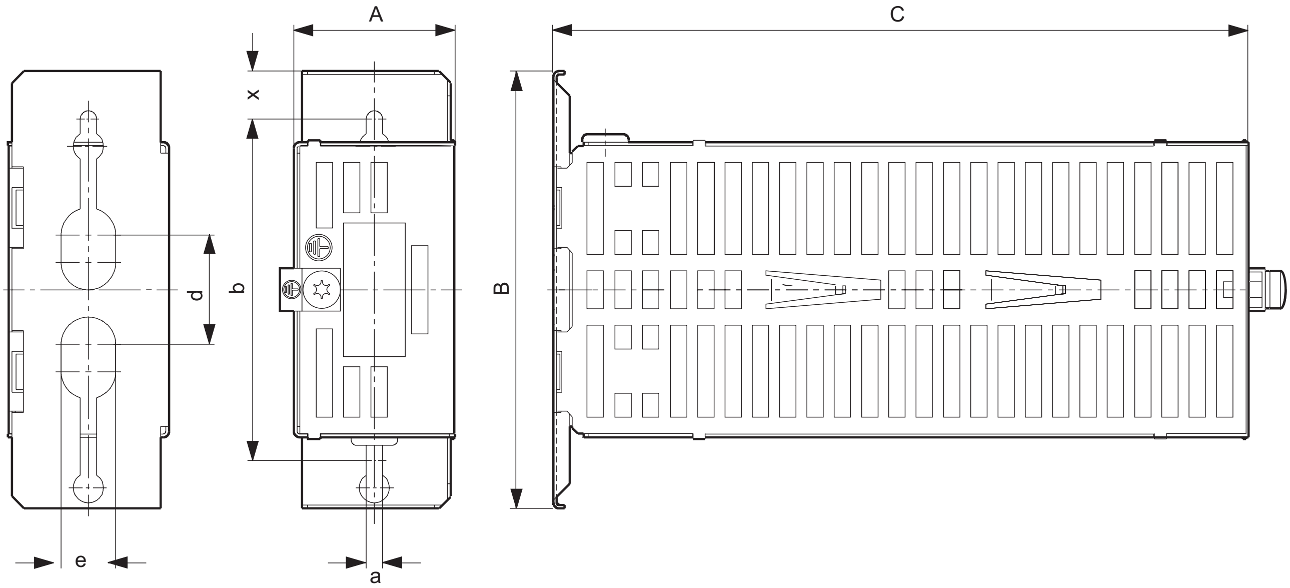
Dimension drawing for the BS-005 protective grid

The following figure shows the dimensions of the BS-005 protective grid:



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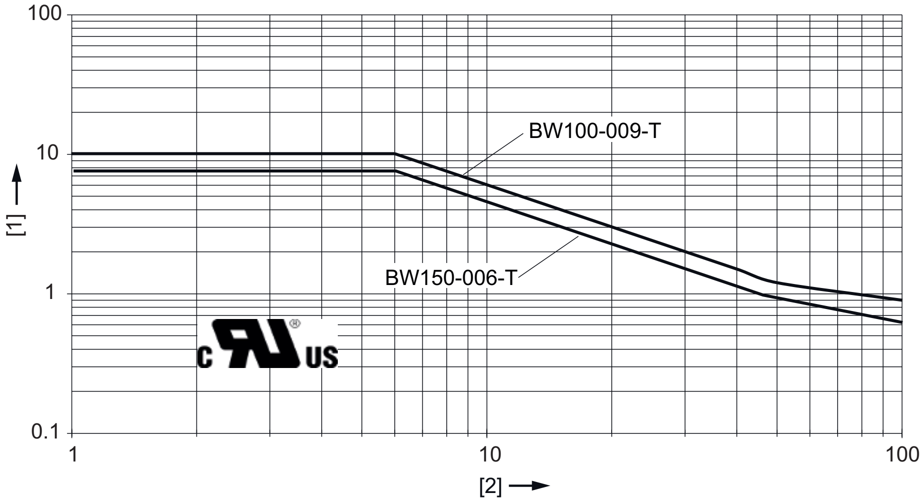
Type	Main dimensions in mm			Mounting dimensions mm					Mass kg
	A	B	C	b	d	e	a	x	
BS-005	60	160	252	125	4	20	6	17.5	0.5

4.12.5 Technical data of BW150-006-T and BW100-009-T

Power diagrams

The following figure shows the rating diagrams of the braking resistors BW150-006-T and BW100-009-T:



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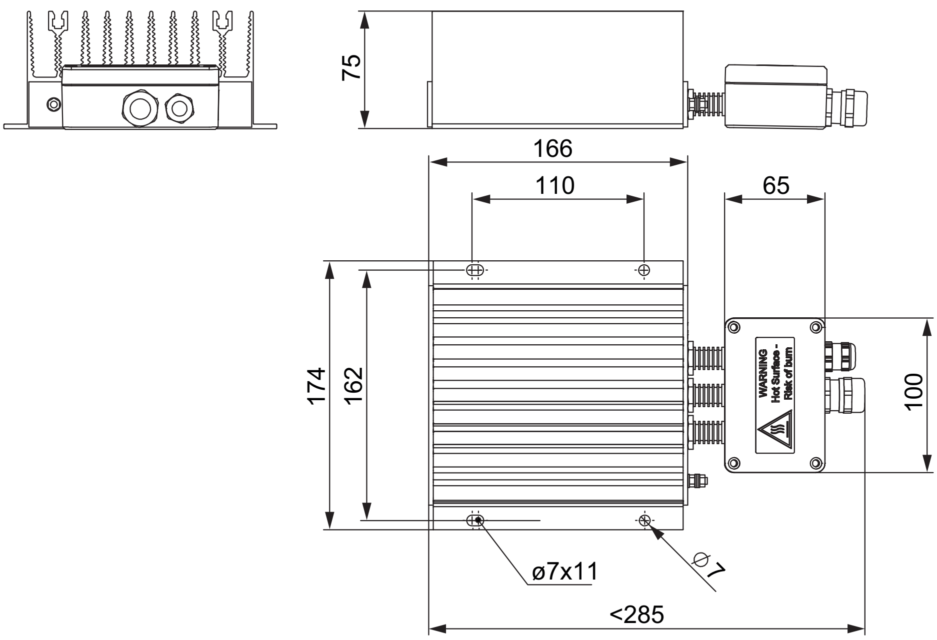
[1] Power in KW
[2] Cyclic duration factor cdf in %
ED Cyclic duration factor of the braking resistor, based on a cycle time of 120 s.

Dimension drawing of BW150-006-T

The following figure shows the dimensions of the external braking resistor BW150-006-T:



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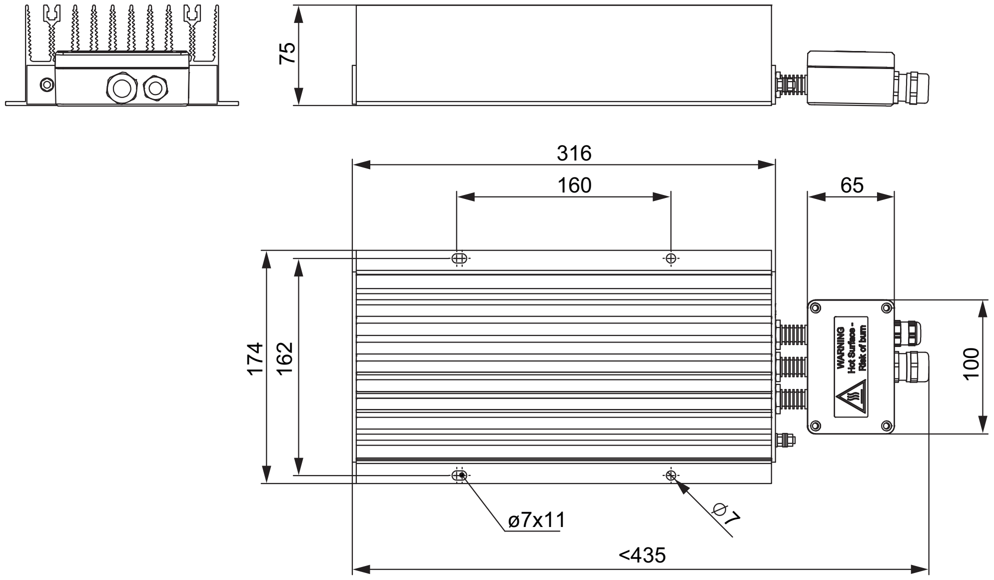
Dimension drawing of BW100-009-T

The following figure shows the dimensions of the external braking resistor BW100-009-T:



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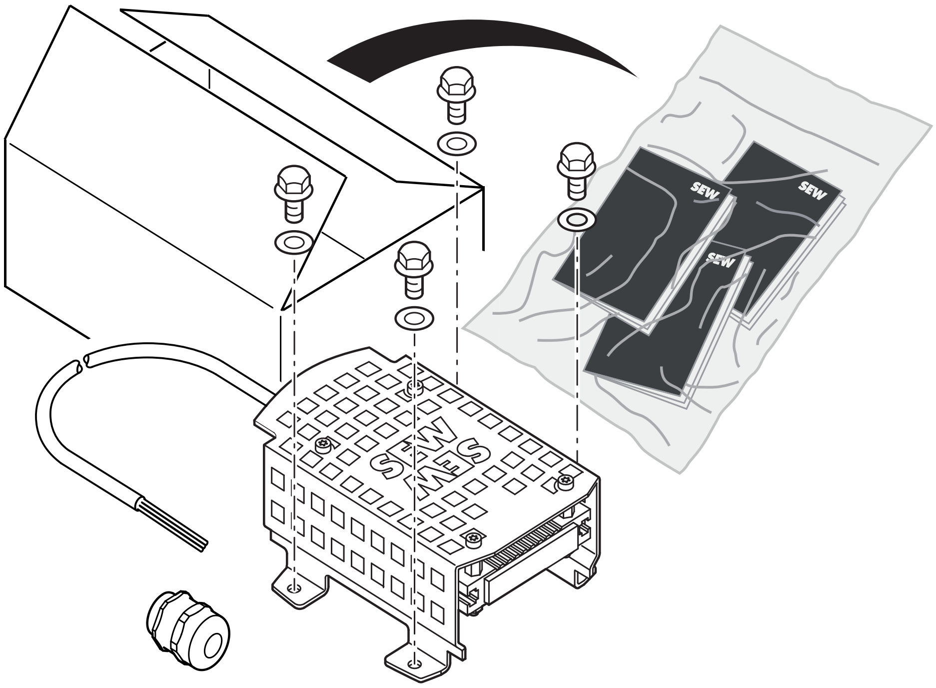
4.13 Mounting kit for braking resistor BW...-.../..C

INFORMATION

- The BW...-.../..C braking resistor must always be mounted and installed by the customer.
- Observe the installation instructions "Braking resistor BW...-.../..C".

The following figure shows the mounting kit for braking resistor BW...-.../..C without connector:



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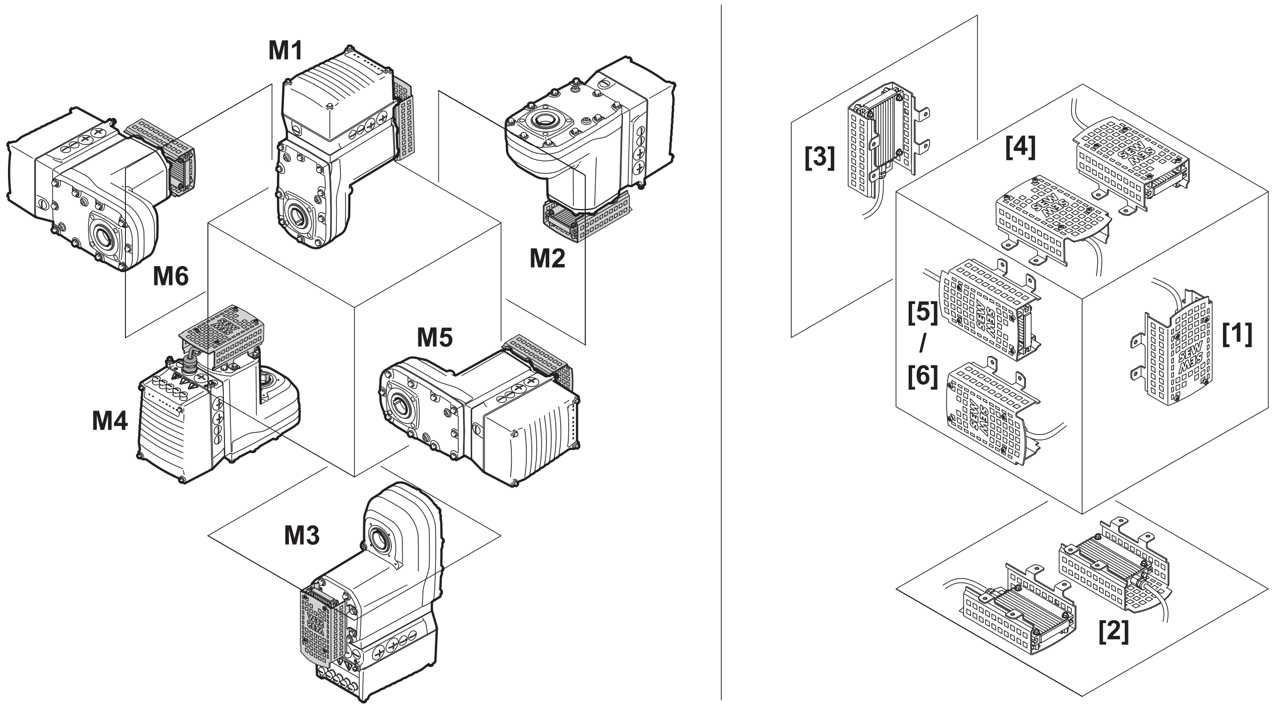
4.13.1 Technical data

Mounting kit **Braking resistance**			**BW100-001/ K-0.14/M2C/IV**	**BW100-001/ K-0.14/M4C/IV**	**BW100-002/ K-0.14/M2C/IV**	**BW100-002/ K-0.14/M4C/IV**
Part number braking resistor with connector for X2304			28306031	28306066	28306058	28306074
Braking resistor without connector			**BW100-001/ K-0.15/M2C**	**BW100-001/ K-0.15/M4C**	**BW100-002/ K-0.15/M2C**	**BW100-002/ K-0.15/M4C**
Braking resistor part number			18272886	18272894	18272908	18272916
Peak braking power P_N		kW	9.4		9.4	
Approval			CE, cURus		CE, cURus	
Current-carrying capacity	100% cdf	kW	0.1		0.2	
	50% cdf	kW	0.15		0.3	
	25% cdf	kW	0.25		0.5	
	12% cdf	kW	0.3		0.6	
	6% cdf	kW	0.5		1.0	
	Observe the regenerative power limit for the inverter.					
Resistance value R_{BW}		Ω	100		100	
Tripping current I_F		A	1.0		1.4	
Design			Flat design resistor			
Power connections			Connection cable			
PE connection			Connection cable			
Degree of protection			IP66			
Ambient temperature ϑ_{amb}		°C	-30 – 40			
			Derating at ambient temperature > 40 °C: -4% P_N/10 K up to maximum 60 °C			
Mass		kg	1.1			
Dimensions W × H × D		mm	116 × 80 × 15		116 × 80 × 51	
Cable length approx.		m	1.5 for braking resistor without connector 0.145 for braking resistor with connector			

4.13.2 Current-carrying capacity

The following figure shows the mounting positions of the MOVIGEAR® performance drive unit with mounting kit:



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BW100-001/.../...	Current-carrying capacity at % cdf in W				
ED	**M1** [1]	**M2** [2]	**M3** [3]	**M4** [4]	**M5/M6** [5] / [6]
100%	100	100	100	100	100
50%	150	150	150	150	150
25%	250	250	250	250	250
12%	300	300	300	300	300
6%	500	500	500	500	500
cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration TD ≤ 120 s					

BW100-002/.../...	Current-carrying capacity at % cdf in W				
ED	**M1** [1]	**M2** [2]	**M3** [3]	**M4** [4]	**M5/M6** [5] / [6]
100%	200	200	200	160	160
50%	300	300	300	240	240
25%	500	500	500	400	400
12%	600	600	600	480	480
6%	1000	1000	1000	800	800
cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration TD ≤ 120 s					

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4.13.3 Assignment of mounting kit for braking resistor with open cable end

The following table shows the assignment of the mounting kits braking resistor with open cable end to the MOVIGEAR performance drive units.

To connect the braking resistor to the device, select the industrial connector "*Connector ext. Braking resistor – M12*"*in position 3* ".

Mounting kit braking resistor			Drive unit
Type	Part number	Continuous power in W	Type
BW100-001/ K-0.15/M2C	18272886	100	MOVIGEAR® MGF..2-..
BW100-002/-K-0.15/M2C	18272908	200	
BW100-001/K-0.15/M4C	18272894	100	MOVIGEAR® MGF..4-.. MGF..4-../XT
BW100-002/K-0.15/M4C	18272916	200	

The braking resistor mounting kits will be assembled at the factory after the corresponding configuration.

4.13.4 Assignment of mounting kit braking resistor with connector

The following table shows the assignment of the mounting kits braking resistor with connector to the MOVIGEAR® performance drive units.

To connect the braking resistor to the device, select the industrial connector "*Connector ext. Braking resistor – M12*"*in position 3* ".

Mounting kit braking resistor			Drive unit
Type	Part number	Continuous power in W	Type
BW100-001/ K-0.14/M2C/IV	28306031	100	MOVIGEAR® MGF..2-../EBW
BW100-002/-K-0.14/M2C/IV	28306058	200	
BW100-001/K-0.14/M4C/IV	28306066	100	MOVIGEAR® MGF..4-../EBW MGF..4-../XT/EBW
BW100-002/K-0.14/M4C/IV	28306074	200	

The braking resistor mounting kits will be assembled at the factory after the corresponding configuration.

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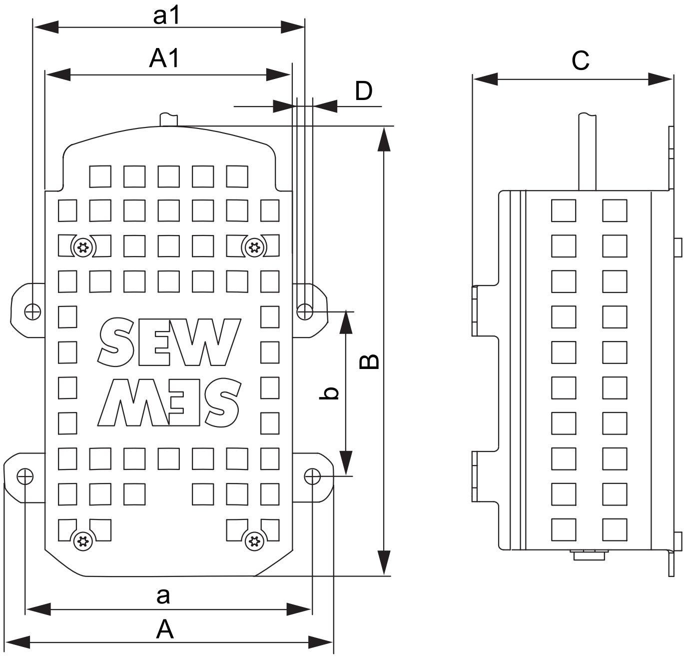
4.13.5 Dimension drawing

The following figure shows the dimension drawing of the mounting kit braking resistor without connector:



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	A	A1	B	C	D	a	a1	b
	mm	mm	mm	mm	mm	mm	mm	mm
BW100-001/K-../M2C	126.0	89.0	148.2	61.8	7	111.0	106.0	54.7
BW100-002/K-../M2C								
BW100-001/K-../M4C	158.0	94.0	149.0	61.8	7	144.0	142.0	82.0
BW100-002/K-../M4C								

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4.14 Line choke

The line choke can be used as an option:

- To support overvoltage protection
- To smoothen the line current
- For protection in the event of distorted line voltage
- To limit the charging current, for example, when several inverters are connected together in parallel on the input end (nominal current of line choke = total of nominal input currents)

4.14.1 UL and cUL approval

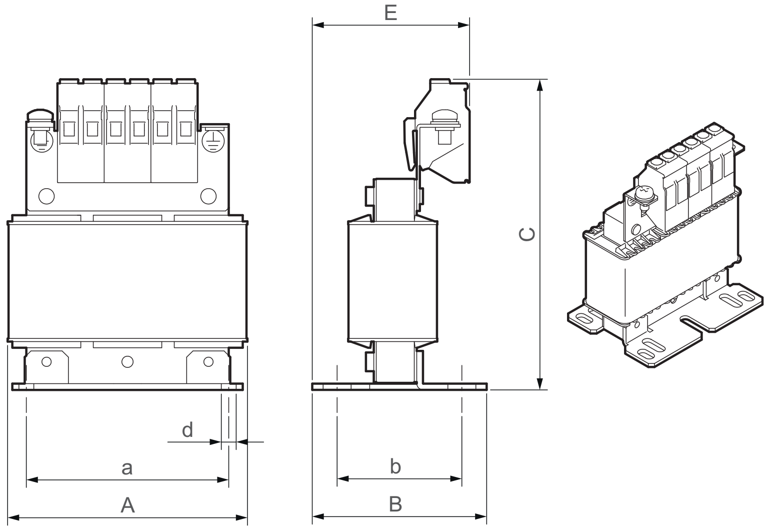
The listed line chokes have cRUus approval independent of the drive unit.

4.14.2 Technical data

Line choke	ND0070-503	ND0160-503	ND0300-503	ND0420-503
Part number	17984173	17984181	17983800	17983819
Nominal line voltage V_L	3 × AC 230 V – 500 V 50/60 Hz			
Nominal current I_N	7 A	16 A	30 A	42 A
Nominal inductance	0.36 mH	0.2 mH	0.1 mH	0.045 mH
Nominal power loss	4 W	9 W	11 W	13 W
Ambient temperature ϑ_{amb}	-10 °C – 45 °C (reduction: 3 % I_N up to maximum 60 °C)			
Connection contacts L1/L2/L3 – L1'/L2'/L3'	0.2 – 4 mm^2		0.2 – 10 mm^2	2.5 – 16 mm^2
Tightening torque L1/L2/L3 – L1'/L2'/L3'	0.5 – 1 Nm		1.2 – 2 Nm	2.5 Nm
PE connection contact	M4		M5	
PE tightening torque	1.5 Nm		3 Nm	
Degree of protection	IPXXB in accordance with EN 60529			
Mass	0.5 kg	1.3 kg	1.95 kg	1.82 kg

4.14.3 Dimension drawing

The following figure shows dimensioned drawing of the line choke.



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Line choke	Main dimensions in mm				Mounting dimensions in mm			Connection
	A	B	C	E	a	b	d	PE
ND0070-503	78	57	105	56	65	40	4.8	M4
ND0160-503	96	70	120	65	71	54	4.8	M4
ND0300-503	121	86	145	86	105	70	4.8	M5
ND0420-503	121	86	150	90	105	70	4.8	M5

4.15 DynaStop® torques

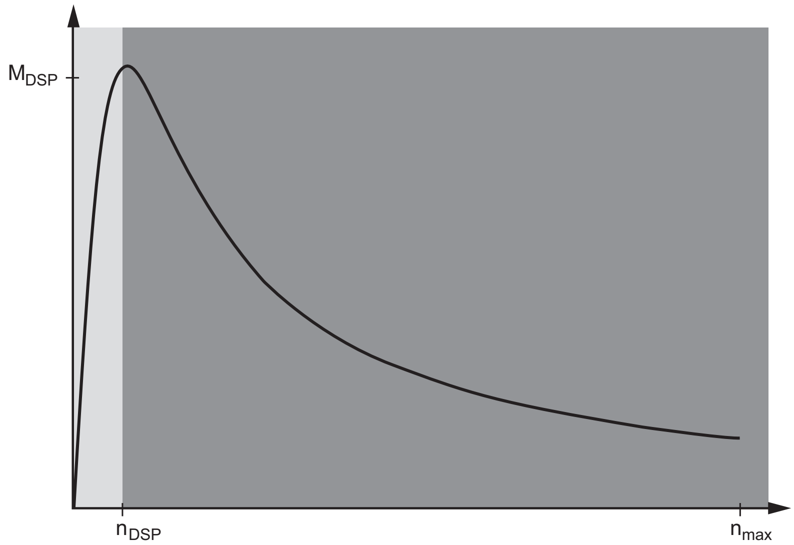
4.15.1 Notes

INFORMATION

For a functional description of DynaStop® refer to chapter "Operation" > "DynaStop®" (→ 352)

4.15.2 Operating range

The following figure depicts the permissible/impermissible operating range of DynaStop®:



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(light grey)	= Continuously permitted range of DynaStop®
(dark grey)	= Impermissible operating range of DynaStop®

4.15.3 MGF..2-..-C

MGF..2-..-C	i_{tot}	DynaStop® torque	
		M_{DSP}	at n_{DSP} (gear shaft speed)
		Nm	min^{-1}
2-stage	3.37	15	44.63
	4.22	19	35.64
	5.00*	22	30.08
	5.34	23	28.16
	6.25*	28	24.06
	7.00*	31	21.49
	8.24	36	18.25
	9.71	43	15.49
	10.37	46	14.50
	12.14	53	12.39
	13.60*	60	11.06
	16.00	70	9.40
	18.52	81	8.12
	19.81	87	7.59
	22.86	101	6.58
3-stage	28.07	124	5.36
	33.02	145	4.55
	37.24	164	4.04
	42.19	186	3.56
	45.03	198	3.34
	51.51	200	2.92
	55.25	200	2.72

(grey) = Preferred gear ratio

* = Ultimate gear unit ratio

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4.15.4 MGF..4-..-C

MGF..4-..-C	i_{tot}	DynaStop® torque	
		M_{DSP}	at n_{DSP} (gear shaft speed)
		Nm	min^{-1}
2-stage	3.53*	27	14.12
	4.34*	33	11.49
	4.99	38	9.99
	5.76	44	8.65
	6.34	49	7.86
	7.44*	57	6.70
	7.88	61	6.33
	8.96	69	5.56
	10.97	85	4.54
	12.66	98	3.94
	13.93	107	3.58
	16.36	126	3.05
	17.33	134	2.88
	19.70	152	2.53
	21.82	168	2.28
	25.72	198	1.94
3-stage	28.88	223	1.73
	34.29	264	1.45
	36.61	282	1.36
	42.86	330	1.16
	48.00*	370	1.04
	56.49	400	0.88

(shaded)	=	Preferred gear ratio
*	=	Ultimate gear unit ratio

4.15.5 MGF..4-..-C/XT

MGF..4-..-C/XT	i_{tot}	DynaStop® torque	
		M_{DSP}	at n_{DSP} (gear shaft speed)
		Nm	min^{-1}
2-stage	3.53*	38	12.65
	4.34*	47	10.29
	4.99	54	8.95
	5.76	62	7.76
	6.34	69	7.05
	7.44*	81	6.00
	7.88	85	5.67
	8.96	97	4.99
	10.97	119	4.07
	12.66	137	3.53
	13.93	151	3.21
	16.36	177	2.73
	17.33	188	2.58
	19.70	213	2.27
	21.82	236	2.05
	25.72	278	1.74
3-stage	28.88	312	1.55
	34.29	371	1.30
	36.61	396	1.22
	42.86	400	1.04
	48.00*	400	0.93
	56.49	400	0.79

(grey) = Preferred gear ratio

* = Finite gear unit ratio

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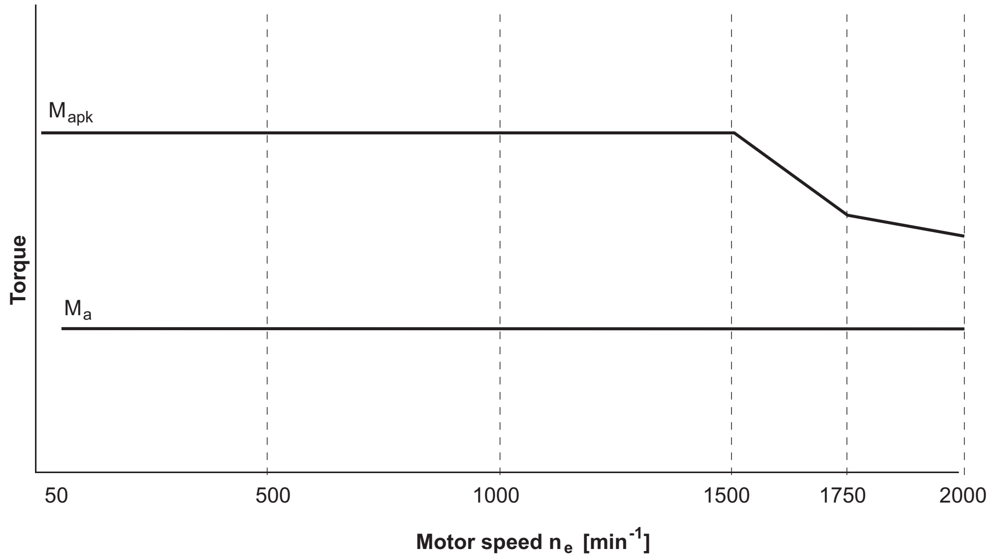
4.16 Torque characteristic curves

4.16.1 Control range 1:40

The following figure shows schematic characteristic curves. The tables below list the exact values.



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MOVIGEAR® performance MGF..2-..-C

The following table shows the torques of MGF..2-..-C:

MGF..2-..-C									
	n_a		M_a	M_{apk}			M_a EmergOff	i_{tot}	Weight
	at n_e= 50 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 5 – 2000 min^{-1}	at n_e= 5 – 1500 min^{-1}	at n_e= 1750 min^{-1}	at n_e= 2000 min^{-1}			
	min^{-1}	min^{-1}	Nm	Nm	Nm	Nm	Nm		kg
2-stage	14.8	593.5	14	41	30	22	65	3.37	16
	11.8	473.9	17	51	38	28	85	4.22	
	10.0	400.0	20	60	45	33	210	5.00*	
	9.4	374.5	21	64	48	35	215	5.34	
	8.0	320.0	25	75	56	41	225	6.25*	
	7.1	285.7	28	84	63	46	235	7.00*	
	6.1	242.7	33	99	74	54	245	8.24	
	5.1	206.0	39	116	87	64	330	9.71	
	4.8	192.9	42	125	93	68	330	10.37	
	4.1	164.7	49	146	109	80	330	12.14	
	3.7	147.1	54	163	122	90	330	13.60*	
	3.1	125.0	64	192	144	106	330	16.00	
	2.7	108.0	74	220	167	122	330	18.52	
	2.5	101.0	79	220	178	131	330	19.81	
	2.2	87.5	91	220	206	151	330	22.86	
3-stage	1.8	71.3	112	220	220	185	330	28.07	17
	1.5	60.6	132	220	220	218	330	33.02	
	1.3	53.7	149	220	220	220	330	37.24	
	1.2	47.4	169	220	220	220	330	42.19	
	1.1	44.4	180	220	220	220	330	45.03	
	1.0	38.8	200	220	220	220	330	51.51	
	0.9	36.2	200	220	220	220	330	55.25	

	=	Preferred gear ratio
*	=	Ultimate gear unit ratio
M_{apk}	=	Maximum permitted torque in short-time duty. If M_{apk} occurs more often than 10 times per hour, a detailed project planning must be carried out using the SEW-Workbench.
$M_{aEmergOff}$	=	Maximum permitted torque for non-cyclical special loads, maximum 1000 cycles
M_a	=	Continuous output torque of MOVIGEAR®
n_a	=	Output speed
n_e	=	Motor speed

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MOVIGEAR® performance MGF..4-..-C

The following table shows the torques of MGF..4-..-C:

MGF..4-..-C									
	n_a		M_a	M_{apk}			M_a EmergOff	i_{tot}	Weight
	at n_e= 50 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 5 – 2000 min^{-1}	at n_e= 5 – 1500 min^{-1}	at n_e= 1750 min^{-1}	at n_e= 2000 min^{-1}			
	min^{-1}	min^{-1}	Nm	Nm	Nm	Nm	Nm		kg
2-stage	14.2	566.6	24	73	68	54	147	3.53*	26
	11.5	460.8	30	90	84	66	165	4.34*	
	10.0	400.8	34	103	96	76	420	4.99	
	8.7	347.2	40	119	111	87	450	5.76	
	7.9	315.5	44	131	122	96	470	6.34	
	6.7	268.8	51	154	144	113	515	7.44*	
	6.3	253.8	54	163	152	120	525	7.88	
	5.6	223.2	62	185	173	136	560	8.96	
	4.6	182.3	76	227	212	167	675	10.97	
	3.9	158.0	87	262	245	192	710	12.66	
	3.6	143.6	96	288	269	211	710	13.93	
	3.1	122.2	113	339	316	248	710	16.36	
	2.9	115.4	120	359	335	263	710	17.33	
	2.5	101.5	136	408	381	299	710	19.70	
	2.3	91.7	151	452	422	331	710	21.82	
	1.9	77.8	178	475	475	391	710	25.72	
3-stage	1.7	69.3	199	475	475	438	710	28.88	27
	1.5	58.3	237	475	475	475	710	34.29	
	1.4	54.6	253	475	475	475	710	36.61	
	1.2	46.7	296	475	475	475	710	42.86	
	1.0	41.7	331	475	475	475	710	48.00*	
	0.9	35.4	390	475	475	475	710	56.49	

(shaded)	=	Preferred gear ratio
*	=	Ultimate gear unit ratio
M_{apk}	=	Maximum permitted torque in short-time duty. If M_{apk} occurs more often than 10 times per hour, a detailed project planning must be carried out using the SEW-Workbench.
$M_{aEmergOff}$	=	Maximum permitted torque for non-cyclical special loads, maximum 1000 cycles
M_a	=	Continuous output torque of MOVIGEAR®
n_a	=	Output speed
n_e	=	Motor speed

MOVIGEAR® performance MGF..4-..-C/XT

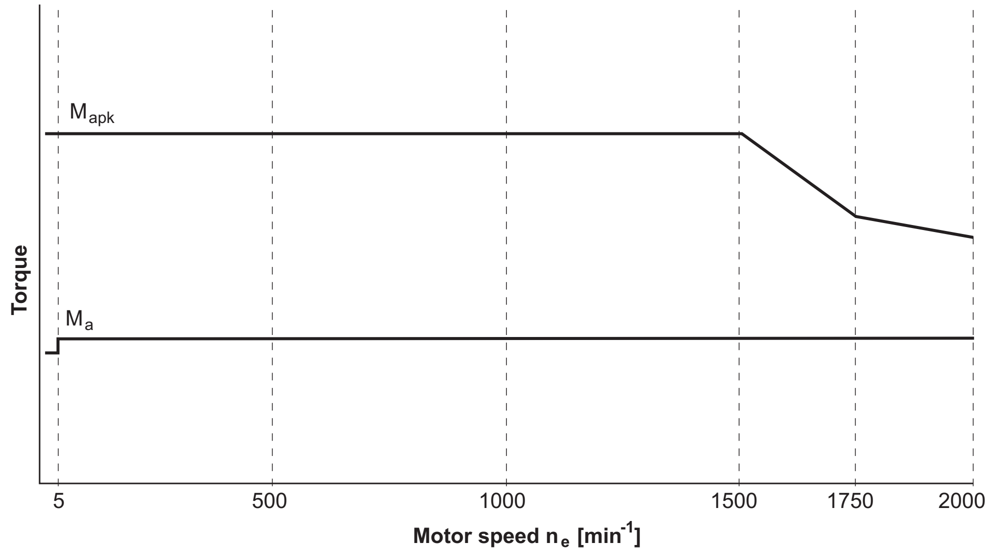
The following table shows the torques of MGF..4-..-C/XT:

MGF..4-..-/XT (increased torque)									
	n_a		M_a	M_{apk}			M_a EmergOff	i_{tot}	Weight
	at n_e= 50 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 5 – 2000 min^{-1}	at n_e= 5 – 1500 min^{-1}	at n_e= 1750 min^{-1}	at n_e= 2000 min^{-1}			
	min^{-1}	min^{-1}	Nm	Nm	Nm	Nm	Nm		kg
2-stage	14.2	566.6	35	106	71	53	147	3.53*	28
	11.5	460.8	43	130	87	65	165	4.34*	
	10.0	400.8	50	150	100	75	420	4.99	
	8.7	347.2	58	173	115	86	450	5.76	
	7.9	315.5	63	190	127	95	470	6.34	
	6.7	268.8	74	223	149	112	515	7.44*	
	6.3	253.8	79	236	158	118	525	7.88	
	5.6	223.2	90	269	179	134	560	8.96	
	4.6	182.3	110	329	219	165	675	10.97	
	3.9	158.0	127	380	253	190	710	12.66	
	3.6	143.6	139	418	279	209	710	13.93	
	3.1	122.2	164	475	327	245	710	16.36	
	2.9	115.4	173	475	347	260	710	17.33	
	2.5	101.5	197	475	394	296	710	19.7	
	2.3	91.7	218	475	436	327	710	21.82	
	1.9	77.8	257	475	475	386	710	25.72	
3-stage	1.7	69.3	289	475	475	433	710	28.88	29
	1.5	58.3	343	475	475	475	710	34.29	
	1.4	54.6	366	475	475	475	710	36.61	
	1.2	46.7	400	475	475	475	710	42.86	
	1.0	41.7	400	475	475	475	710	48.00*	
	0.9	35.4	400	475	475	475	710	56.49	

	=	Preferred gear ratio
*	=	Ultimate gear unit ratio
M_{apk}	=	Maximum permitted torque in short-time duty. If M_{apk} occurs more often than 10 times per hour, a detailed project planning must be carried out using the SEW-Workbench.
$M_{aEmergOff}$	=	Maximum permitted torque for non-cyclical special loads, maximum 1000 cycles
M_a	=	Continuous output torque of MOVIGEAR®
n_a	=	Output speed
n_e	=	Motor speed

4.16.2 Extended control range 1:2000 (/AZ1Z option)

The following figure shows schematic characteristic curves. The tables below list the exact values.



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MOVIGEAR® performance MGF..2-..-C/AZ1Z

The following table shows the torques of MGF..2-..-C/AZ1Z:

MGF..2-..-C/AZ1Z (extended control range)									
	n_a		M_a	M_{apk}			M_a EmergOff	i_{tot}	Weight
	at n_e= 1 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 5 – 2000 min^{-1}	at n_e= 5 – 1500 min^{-1}	at n_e= 1750 min^{-1}	at n_e= 2000 min^{-1}			
	min^{-1}	min^{-1}	Nm	Nm	Nm	Nm	Nm		kg
2-stage	0.30	593.5	14	41	30	22	65	3.37	16
	0.24	473.9	17	51	38	28	85	4.22	
	0.20	400.0	20	60	45	33	210	5.00*	
	0.19	374.5	21	64	48	35	215	5.34	
	0.16	320.0	25	75	56	41	225	6.25*	
	0.14	285.7	28	84	63	46	235	7.00*	
	0.12	242.7	33	99	74	54	245	8.24	
	0.10	206.0	39	116	87	64	330	9.71	
	0.10	192.9	42	125	93	68	330	10.37	
	0.08	164.7	49	146	109	80	330	12.14	
	0.07	147.1	54	163	122	90	330	13.60*	
	0.06	125.0	64	192	144	106	330	16.00	
	0.05	108.0	74	220	167	122	330	18.52	
	0.05	101.0	79	220	178	131	330	19.81	
	0.04	87.5	91	220	206	151	330	22.86	
3-stage	0.04	71.3	112	220	220	185	330	28.07	17
	0.03	60.6	132	220	220	218	330	33.02	
	0.03	53.7	149	220	220	220	330	37.24	
	0.02	47.4	169	220	220	220	330	42.19	
	0.02	44.4	180	220	220	220	330	45.03	
	0.02	38.8	200	220	220	220	330	51.51	
	0.02	36.2	200	220	220	220	330	55.25	

	=	Preferred gear ratio
*	=	Ultimate gear unit ratio
M_{apk}	=	Maximum permitted torque in short-time duty. If M_{apk} occurs more often than 10 times per hour, a detailed project planning must be carried out using the SEW-Workbench.
$M_{aEmergOff}$	=	Maximum permitted torque for non-cyclical special loads, maximum 1000 cycles
M_a	=	Continuous output torque of MOVIGEAR®. At motor speeds of n_e < 5 min^{-1}, the output torque M_a must be reduced to 90%.
n_a	=	Output speed
n_e	=	Motor speed

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MOVIGEAR® performance MGF..4-..-C/AZ1Z

The following table shows the torques of MGF..4-..-C/AZ1Z:

MGF..4-..-C/AZ1Z (extended control range)									
	n_a		M_a	M_{apk}			M_{a} EmergOff	i_{tot}	Weight
	at n_e= 1 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 5 – 2000 min^{-1}	at n_e= 5 – 1500 min^{-1}	at n_e= 1750 min^{-1}	at n_e= 2000 min^{-1}			
	min^{-1}	min^{-1}	Nm	Nm	Nm	Nm	Nm		kg
2-stage	0.28	566.6	24	73	68	54	147	3.53*	26
	0.23	460.8	30	90	84	66	165	4.34*	
	0.20	400.8	34	103	96	76	420	4.99	
	0.17	347.2	40	119	111	87	450	5.76	
	0.16	315.5	44	131	122	96	470	6.34	
	0.13	268.8	51	154	144	113	515	7.44*	
	0.13	253.8	54	163	152	120	525	7.88	
	0.11	223.2	62	185	173	136	560	8.96	
	0.09	182.3	76	227	212	167	675	10.97	
	0.08	158.0	87	262	245	192	710	12.66	
	0.07	143.6	96	288	269	211	710	13.93	
	0.06	122.2	113	339	316	248	710	16.36	
	0.06	115.4	120	359	335	263	710	17.33	
	0.05	101.5	136	408	381	299	710	19.70	
	0.05	91.7	151	452	422	331	710	21.82	
	0.04	77.8	178	475	475	391	710	25.72	
3-stage	0.03	69.3	199	475	475	438	710	28.88	27
	0.03	58.3	237	475	475	475	710	34.29	
	0.03	54.6	253	475	475	475	710	36.61	
	0.02	46.7	296	475	475	475	710	42.86	
	0.02	41.7	331	475	475	475	710	48.00*	
	0.02	35.4	390	475	475	475	710	56.49	

(shaded)	=	Preferred gear ratio
*	=	Ultimate gear unit ratio
M_{apk}	=	Maximum permitted torque in short-time duty. If M_{apk} occurs more often than 10 times per hour, a detailed project planning must be carried out using the SEW-Workbench.
$M_{aEmergOff}$	=	Maximum permitted torque for non-cyclical special loads, maximum 1000 cycles
M_a	=	Continuous output torque of MOVIGEAR®. At motor speeds of n_e < 5 min^{-1}, the output torque M_a must be reduced to 90%.
n_a	=	Output speed
n_e	=	Motor speed

MOVIGEAR® performance MGF..4-..-C/XT/AZ1Z

The following table shows the torques of MGF..4-..-C/XT/AZ1Z:

MGF..4-..-C/XT/AZ1Z (extended control range /AZ1Z and increased torque /XT)									
	n_a		M_a	M_{apk}			M_a EmergOff	i_{tot}	Weight
	at n_e= 1 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 5 – 2000 min^{-1}	at n_e= 5 – 1500 min^{-1}	at n_e= 1750 min^{-1}	at n_e= 2000 min^{-1}			
	min^{-1}	min^{-1}	Nm	Nm	Nm	Nm	Nm		kg
2-stage	0.28	566.6	35	106	71	53	147	3.53*	28
	0.23	460.8	43	130	87	65	165	4.34*	
	0.20	400.8	50	150	100	75	420	4.99	
	0.17	347.2	58	173	115	86	450	5.76	
	0.16	315.5	63	190	127	95	470	6.34	
	0.13	268.8	74	223	149	112	515	7.44*	
	0.13	253.8	79	236	158	118	525	7.88	
	0.11	223.2	90	269	179	134	560	8.96	
	0.09	182.3	110	329	219	165	675	10.97	
	0.08	158.0	127	380	253	190	710	12.66	
	0.07	143.6	139	418	279	209	710	13.93	
	0.06	122.2	164	475	327	245	710	16.36	
	0.06	115.4	173	475	347	260	710	17.33	
	0.05	101.5	197	475	394	296	710	19.70	
	0.05	91.7	218	475	436	327	710	21.82	
	0.04	77.8	257	475	475	386	710	25.72	
3-stage	0.03	69.3	289	475	475	433	710	28.88	29
	0.03	58.3	343	475	475	475	710	34.29	
	0.03	54.6	366	475	475	475	710	36.61	
	0.02	46.7	400	475	475	475	710	42.86	
	0.02	41.7	400	475	475	475	710	48.00*	
	0.02	35.4	400	475	475	475	710	56.49	

	=	Preferred gear ratio
*	=	Ultimate gear unit ratio
M_{apk}	=	Maximum permitted torque in short-time duty. If M_{apk} occurs more often than 10 times per hour, a detailed project planning must be carried out using the SEW-Workbench.
$M_{aEmergOff}$	=	Maximum permitted torque for non-cyclical special loads, maximum 1000 cycles
M_a	=	Continuous output torque of MOVIGEAR®. At motor speeds of $n_e < 5\ min^{-1}$, the output torque M_a must be reduced to 90%.
n_a	=	Output speed
n_e	=	Motor speed

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4.17 Surface protection

4.17.1 General information

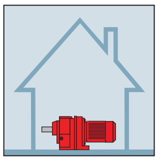
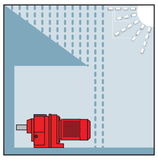
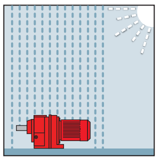
SEW-EURODRIVE offers the following optional preventive measures for operating drive units under special environmental conditions.

- OS surface protection

Special preventive measures are additionally available as an option for output shafts.

4.17.2 Surface protection

The drive unit is optionally available with the following variants of surface protection.

Surface protection		Ambient conditions	Sample applications
Standard		Suitable for machines and systems in buildings and enclosed rooms with neutral atmospheres. Similar to corrosivity category[1]: • C1 (negligible)	• Machines and systems in the automotive industry • Conveyor systems in logistics areas • Conveyor systems at airports
OS1		Suited for environments prone to condensation and atmospheres with low humidity or contamination, such as applications outdoors under roof or with protection. Similar to corrosivity category[1]: • C2 (low)	• Systems in saw mills • Hall gates • Agitators and mixers
OS 2		Suited for environments with high humidity or moderate atmospheric contamination, such as applications outdoors subject to direct weathering. According to corrosivity category[2]: • C3 (moderate)	• Applications in gravel plants • Cable cars
High Corrosion Protection HCP200/ HCP200F[3]		For wet areas in the food and beverage industry with regular acidic and caustic wet cleaning. Additional with HCP200**F**: Operation in ambient conditions with requirements regarding the food grade approval according to US FDA (no. 21 CFR §175.300)	• Conveyors in the beverage industry • "Splash zones" in the food industry

1) According to DIN EN ISO 12 944-2
2) According to DIN EN ISO 12 944-2
3) Only in connection with the optional design for wet areas

For designs with the HPC200 or HPC200F surface protection, follow the instructions in the addendum "MOVIGEAR® drive unit type MGF..-..-C – "Wet-area design /WA" and "Integrated pressure compensation in the gear unit /PG" options".

4.17.3 Special protective measures

Output shafts can be treated with special optional protective measures for operation subject to severe environmental pollution or in particularly demanding applications.

Measure	Protection principle	Suited for
Standard with MOVIGEAR®: FKM oil seal (fluorocarbon rubber)	High-quality material	Drives subject to chemical contamination
Surface treatment on output shaft end	Surface treatment on the contact surface of the oil seal	Severe environmental impact and in conjunction with FKM oil seal (fluorocarbon rubber)
Output shaft made of stainless steel (standard when using the design for use in wet areas)	Surface protection with high-quality material	Particularly demanding applications in terms of surface protection

4.17.4 NOCO-Paste

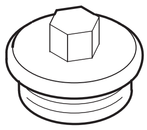
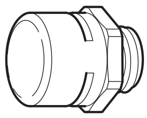
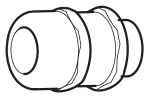
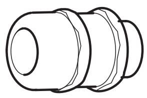
As standard, SEW-EURODRIVE supplies NOCO-Paste corrosion protection and lubricant with every hollow-shaft drive unit. Use NOCO-Paste when installing gear units with hollow shaft. You thereby reduce any fretting corrosion that occurs and make subsequent disassembly easier. NOCO-Paste is also suitable for protecting machined metal surfaces that do not have corrosion protection. These include parts of shaft ends or flanges, for example. You can also order NOCO-Paste in larger quantities from SEW-EURODRIVE.

NOCO-Paste is a food grade substance according to NSF-H1. You can tell that NOCO-Paste is a food grade oil by the NSF-H1 identification label on its packaging.

4.18 Screw fittings

4.18.1 Cable glands / screw plugs / pressure compensation

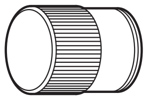
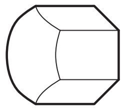
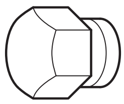
The following table shows the screw fittings and the screw plug that are optionally available from SEW-EURODRIVE:

Screw fitting type	Image	Content	Size	Tightening torque		Outer diameter of cable	Tightening force[1]	Part number
				Threaded jacket	Cable clamping			
Screw plugs external hexagon (stainless steel)		10 pieces	M16 × 1.5	6.8 Nm	–	–	–	18247342
		10 pieces	M25 x 1.5	6.8 Nm	–	–	–	18247350
Pressure compensation screw fittings (made of stainless steel)		1 piece	M16 × 1.5	4.0 Nm	–	–	–	28214617
EMC-compliant cable gland (brass, nickel-plated)		10 pieces	M16 × 1.5	4.0 Nm	3.5 Nm	> 4 to 8 mm	75 N	18204783
		10 pieces	M25 x 1.5	7.0 Nm	5.0 Nm	> 8 to 11 mm	120 N	18204805
						> 11 to 16 mm	130 N	
EMC-compliant cable gland (stainless steel)		10 pieces	M16 × 1.5	4.0 Nm	3.5 Nm	> 4 to 8 mm	75 N	18216366
		10 pieces	M25 x 1.5	7.0 Nm	5.0 Nm	> 8 to 11 mm	120 N	18216382
						> 11 to 16 mm	130 N	

1) The cable fastening in the cable gland must achieve the specified cable pull-out force from the cable gland. This is usually achieved with the specified tightening torque of the cable clamping.

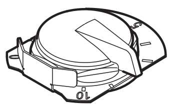
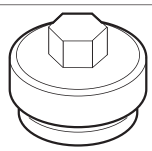
4.18.2 Screw plug connectors

The following table shows the screw plugs for connectors optionally available from SEW-EURODRIVE:

Screw fitting type	Image	Contents	Size	Tightening torque	Part number
M23 plug for connector with male thread (stainless steel)		1 pieces	M23 × 1.5	Tighten to the stop	19094558
M12 plug for connector with male thread (stainless steel)		10 pieces	M12 × 1.0	2.3 Nm	18202799
M12 plug for connector with fe-male thread (stainless steel)		10 pieces	M12 × 1.0	2.3 Nm	18202276

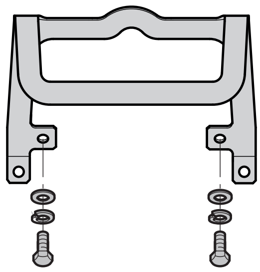
4.18.3 Screw plug / control knob potentiometer

The following table shows the control knob and screw plug that are optionally available from SEW-EURODRIVE:

Screw fitting type	Image	Contents	Size	Tightening torque	Part number
MBK11A control knob for setting the setpoints f1 or f2 NOTICE When installing the con-trol knob, the degree of protection of the device is reduced to max. IP54.		1 pieces	M24 × 1.5	2.5 Nm	28230035
Hexagon head screw plug for potentiometer (stainless steel)		10 pieces	M24 × 1.5	6.8 Nm	18241077

4.19 Guard bracket

The following table shows the guard bracket optionally available from SEW-EURODRIVE:

Designation	Image	Content	Tightening torques screws	Part number
Guard bracket (stainless steel)		1 Guard bracket 2 M5 × 12 screws 2 washers 2 lock washers 1 instruction manual	2.0 – 2.4 Nm	28202717

For a dimension drawing of the guard brackets, see chapter "Dimension drawing of guard bracket" (→ 🗎 117).

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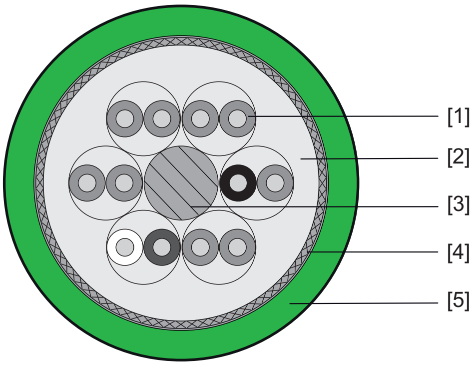
4.20 Connection cables

4.20.1 Specification of signal cables for digital inputs and relay output

Mechanical design

The following table describes the mechanical design of the cable:

<table>
<tr><th colspan="2"></th><th>HELUKABEL® Li9Y91YC11Y-HF</th></tr>
<tr><td colspan="2">Mechanical structure</td><td>

29747895691</td></tr>
<tr><td rowspan="3">[1]</td><td>Conductors</td><td>6 core pairs, 2 × 0.25 mm²
copper</td></tr>
<tr><td>Insulation</td><td>Polypropylene, 0.24 mm</td></tr>
<tr><td>Colors</td><td>DIN 47100
yellow/green, pink/gray, blue/red, black/violet, pink and gray/red and blue, brown/white</td></tr>
<tr><td rowspan="2">[2]</td><td>Inner sheathing</td><td>TPE-O, halogen-free</td></tr>
<tr><td>Color</td><td>Natural</td></tr>
<tr><td>[3]</td><td>Filler</td><td>-</td></tr>
<tr><td>[4]</td><td>Shield</td><td>Braided copper wires, tinned
min. optical coverage 85%</td></tr>
<tr><td rowspan="4">[5]</td><td>Outer cable jacket</td><td>TPU, halogen-free</td></tr>
<tr><td>Color</td><td>Green, similar to RAL2018</td></tr>
<tr><td>Label</td><td>SEW-EURODRIVE
150665
Li9Y91YC11Y-HF ..</td></tr>
<tr><td>Diameter</td><td>15.6 mm</td></tr>
</table>

Technical data

The following table shows the technical data of the signal cable:

Properties	Type: HELUKABEL® Li9Y91YC11Y-HF SEW EURODRIVE 150665
UL properties	UL758 (AWM) UL Style 20223 (sheath) UL Style 10493 (insulation)
RoHS conformity	Yes
Test voltage conductor/con-ductor	AC 1.5 kV 50 Hz/1 min.
Test voltage conductor/shield	AC 1.5 kV 50 Hz/1 min.
Operating voltage	Max. AC 300 V (UL)
Insulation resistance	≥ 500 MΩ/km
Operating temperature	-50 °C to +80 °C (fixed installation) -30 °C to +80 °C (cable carrier) -20 °C to +60 °C (cable carrier with mechanical load)
Outer diameter	15.6 mm
Bending radii	Min. 5 × outer diameter (fixed installation)
	Min. 8 × outer diameter (cable carrier)
Bending cycles	Min. 10 million.
Acceleration	Max. 20 m/s^2
Torsion	Max. ±30 °/m
Chemical characteristics	• Oil resistance according to DIN EN 60811-404, HD 22.10 Appendix A
	• Flame retardant according to IEC 60332-1-2, UL758 cable flame test
	• Halogen-free according to DIN VDE 0472 T.815 • Silicone-free

4.21 Mounting positions

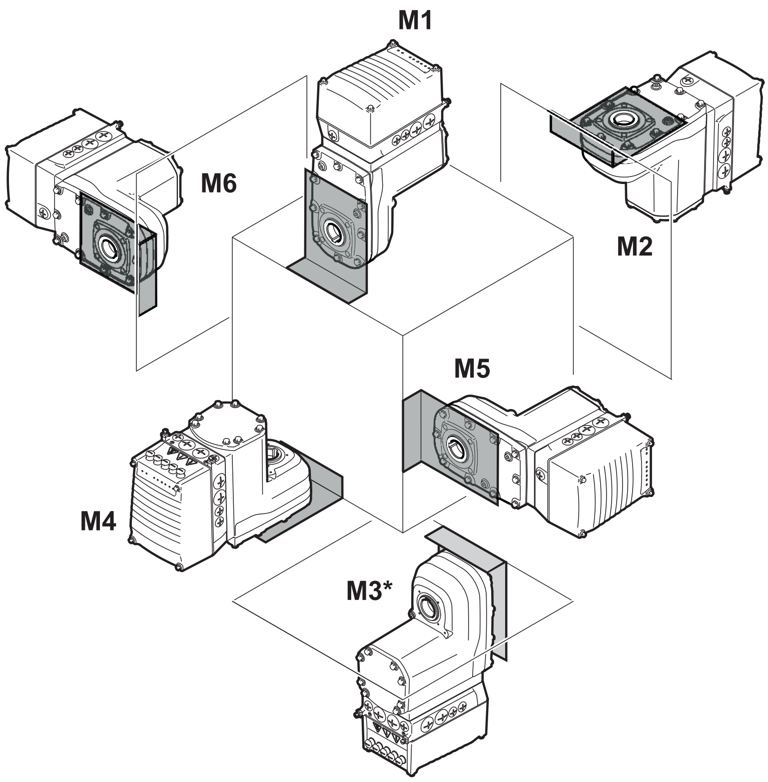
4.21.1 Description of mounting positions

The following mounting positions are possible for the drive units:

- Specified mounting position: M1 or M2 or M3* or M4 or M5 or M6
- Universal use in mounting positions M1, M2, M4, M5, M6
- Universal mounting position: MU (M1, M2, M3, M4, M5, M6) with option "integrated pressure compensation /PG". Observe the addendum "MOVIGEAR® drive unit type MGF..-..-C – "Wet-area design /WA" and "Integrated pressure compensation in the gear unit /PG" options" for this.

Mounting positions M1 to M6

The following figure shows the position of the drive unit when installed in mounting positions M1 to M6:



25417913227

* Mounting position M3 is only possible with the option "integrated pressure compensation /PG". Observe the addendum "MOVIGEAR® drive unit type MGF..-..-C – "Wet-area design /WA" and "Integrated pressure compensation in the gear unit / PG" options" for this.

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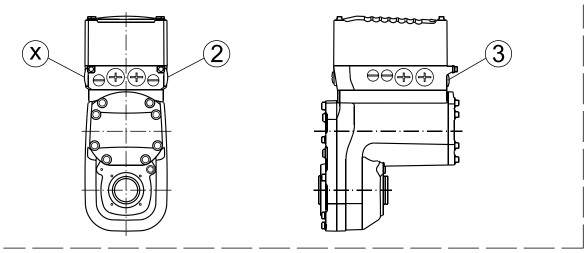
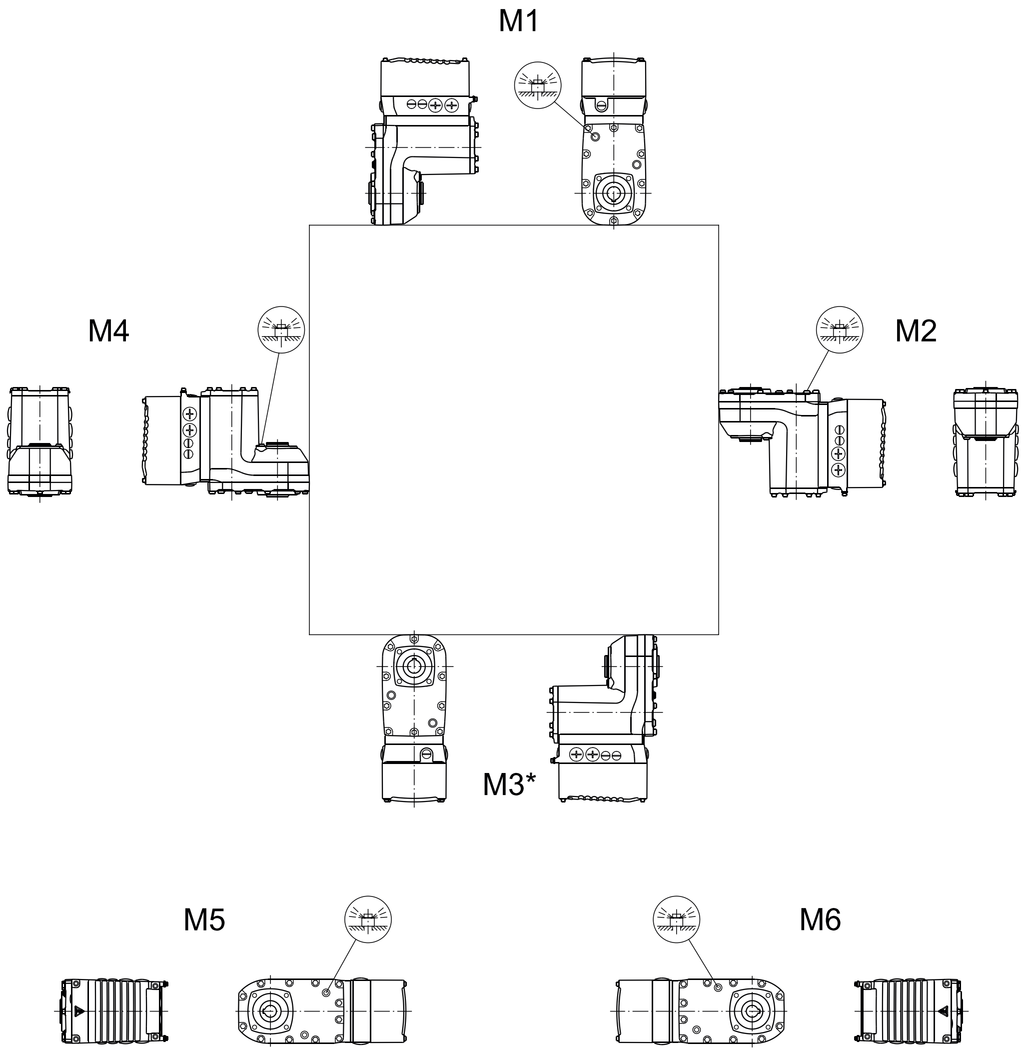
4.21.2 Mounting position sheet

The following figure shows the mounting positions of the MOVIGEAR® performance drive unit:



03 015 00 18



25447227019

* Mounting position M3 is only possible with the option "integrated pressure compensation /PG". Observe the addendum "MOVIGEAR® drive unit type MGF..-..-C – "Wet-area design /WA" and "Integrated pressure compensation in the gear unit /PG" options" for this.

= Breather valve

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4.22 Lubricants

4.22.1 Roller bearing greases

The rolling bearings are filled with the following greases at the factory.

Area of appli-cation	Ambient temperature	Manufacturer	Type
Default	-40 °C to +80 °C	SEW-EURODRIVE	Grease HL 2 E1
	-40 °C to +80 °C	Fuchs	Renolit CX-TOM 15
	-40 °C to +80 °C	Klüber	Petamo GHY 133 N
	-40 °C to +80 °C	SEW-EURODRIVE	Grease HL 2 H1 E1
	-40 °C to +80 °C	Bremer & Leguil	Cassida Grease GTS 2

4.22.2 Lubricant fill quantities

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives with a lubricant fill adapted for the specific gear ratio.

MGF..2-..-C/MGF..4-..-C

MGF..2-..-C	
Gear ratio	**Fill quantities in liters**
i	**for mounting positions** **M1, M2, M3**, M4, M5, M6**
55.25	0.68 l
51.51	
45.03	
42.19	
37.24	
33.02	
28.07	
22.86	0.71 l
19.81	
18.52	
16.00	
13.60*	
12.14	
10.37	
9.71	
8.24	0.76 l
7.00*	
6.25*	
5.34	
5.00*	
4.22	
3.37	

MGF..4-..-C	
Gear ratio	**Fill quantities in liters**
i	**for mounting positions** **M1, M2, M3**, M4, M5, M6**
56.49	1.69 l
48.00*	
42.86	
36.6	
34.29	
28.89	
25.72	1.75 l
21.82	
19.70	
17.33	
16.36	
13.93	
12.66	
10.97	
8.96	1.80 l
7.88	
7.44*	
6.34	
5.76	
4.99	
4.34*	
3.53*	

*	=	Finite gear unit ratio
**	=	Mounting position M3 is only possible with the option "integrated pressure compensation /PG". Observe the addendum "MOVIGEAR® drive unit type MGF..-..-C – "Wet-area design /WA" and "Integrated pressure compensation in the gear unit /PG" options" for this.
(shaded)	=	Preferred gear ratio

4.22.3 Lubricant table

Notes

NOTICE

Selecting improper lubricants may damage the gear unit.

Damage to property.

- Observe the following information.

- The oil viscosity and type (synthetic) that are to be used are determined by SEW-EURODRIVE specifically for each order. This information is noted in the order confirmation and on the gear unit's nameplate.

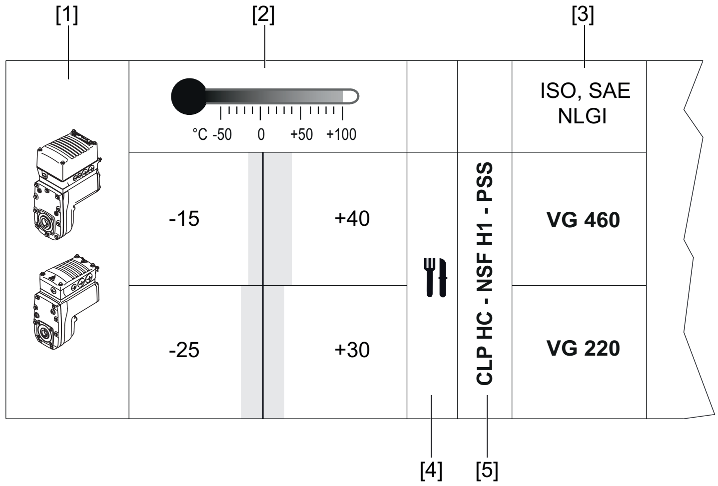
  If you use other lubricants for the gear units and/or use the lubricants at temperatures outside the recommended temperature range, SEW-EURODRIVE does not assume liability.

  The lubricant recommendation in the lubricant table in no way represents a guarantee regarding the quality of the lubricant delivered by each respective supplier. Each lubricant manufacturer is responsible for the quality of their product.
- Do not mix synthetic lubricants!
- Do not mix synthetic and mineral lubricants!
- Oils of the same viscosity class from different manufacturers do not have the same characteristics. In particular, the minimally and maximally permitted oil bath temperatures are manufacturer-specific. These temperatures are specified in the lubricant tables.
- The values specified in the lubricant tables apply as of the time of printing of this document. The data of the lubricants are subject to dynamic change on the part of the lubricant manufacturers. For up-to-date information about the lubricants, visit:

  www.sew-eurodrive.de/lubricants

Information on table structure

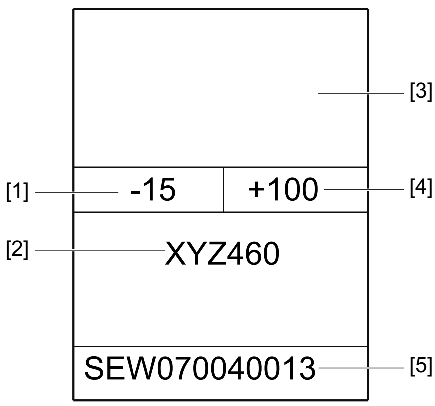
The specified **ambient temperatures** are **guide values for the preselection** of a suitable lubricant. The exact upper and lower temperature limits for project planning are specified in the table with the respective trade name.



9007221408728459

[1] Device type
[2] Ambient temperature range
[3] Viscosity class
[4] Note on special approvals
[5] Lubricant type

Information on the various lubricants



9007221408726027

[1] Lowest oil sump temperature in °C,
may not be undershot in operation
[2] Trade name
[3] Manufacturer
[4] Highest oil sump temperature in °C[1)]
[5] Approvals regarding compatibility of the lubricant with approved oil seals

1) Service life is significantly reduced when exceeded. The lubricant change intervals in chapter "Inspection and maintenance" must be observed.

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Lubricant compatibility with oil seal

Approval	Explanation

SEW07004_ _13:	A lubricant especially recommended with regard to compatibility with the approved oil seal. The lubricant exceeds the state-of-the-art requirements regarding elastomer compatibility.

Approved application temperature range of the oil seals

Oil seal Material class	Permitted Oil sump temperature
FKM	-25°C to +115°C
FKM-PSS	-25°C to +115°C

Limitations of use of oil seals with the specific lubricant are described in the following table:

Material class			Manufacturer		Material		Approved oil sump tempera-ture
S	2	FKM	1	Freudenberg	1	75 FKM 585	-25 °C to +115 °C
			2	Trelleborg	1	VCBVR	
			3	SKF	1	FKM 00934	

Examples:

S2: Only the elastomer FKM meets the requirements of the approval in conjunction with the specific lubricant.

Key to lubricant tables

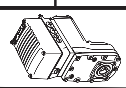
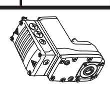
The following table shows the abbreviations and symbols used in the lubricant table and explains what they mean:

Abbreviation/ symbol	Meaning
	Synthetic lubricant (marked gray)
CLP HC	Synthetic hydrocarbons – polyalphaolefins (PAO)
	Lubricant for the food processing industry – NSF-H1-compliant
Oil seal	Oil seal
Premium Sine Seal	"Premium Sine Seal" oil seal. The addendum "PSS" for the lubricant type indicates compatibility with the sealing system.

Lubricant table

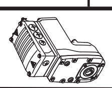
The lubricant table is valid as of the time of printing of this document. See **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limits of the oil seal materials, see chapter "Lubricant compatibility with oil seals" (→ 🗎 91).

MGF..-..C	[1] °C	[2]	[3]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil®	KLÜBER LUBRICATION	Shell	TOTAL
	[4] -25 … +60		CLP HC (-PSS)	VG 220	-30 … +110 GearOil Synth 220 H1 SEW 070040313				-25 … +110 Mobil SHC 630			
	-30 … +50		CLP HC (-PSS)	VG 150	-35 … +105 GearOil Synth 150 E1 SEW 070040313				-30 … +100 Mobil SHC 629			
	[4] -15 … +40		CLP HC - NSF H1 (-PSS)	VG 460	-20 … +110 GearOil Synth 460 H1 E1 SEW 070040313	-15 … +100 Cassida Fluid GL 460	-15 … +100 Optileb GT 460 SEW070040313	-15 … +100 Cassida Fluid GL 460				
	-25 … +30		CLP HC - NSF H1 (-PSS)	VG 220	-30 … +85 GearOil Synth 220 H1 E1 SEW 070040313	-25 … +80 Cassida Fluid GL 220	-25 … +80 Optileb GT 220 SEW070040313	-25 … +80 Cassida Fluid GL 220				

27021623213978507

[1] Ambient temperature range
[2] Note on special approvals
[3] Oil type
[4] Default

MGF..-DSM 	[1] Ambient temperature (°C)	[2]	[3]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil®	KLÜBER LUBRICATION	Shell	TOTAL
	[4] -25 … +60		CLP HC	VG 220	-30 … +110 GearOil Synth 220 H1 SEW 070040313			-25 … +110 Renolin Unisyn GLP 220	-25 … +110 Mobil SHC 630	-25 … +110 Klübersynth GEM 4-220 N	-25 … +110 Shell Omala S4 GX 220	-25 … +110 Carter SH220
	-30 … +50		CLP HC	VG 150	-35 … +105 GearOil Synth 150 E1 SEW 070040313			-30 … +95 Renolin Unisyn GLP 150	-30 … +100 Mobil SHC 629	-30 … +100 Klübersynth GEM 4-150 N	-30 … +100 Shell Omala S4 GX 150	-30 … +95 Carter SH150
	[4] -25 … +60		CLP HC - PSS	VG 220	-30 … +110 GearOil Synth 220 E1 SEW 070040313				-25 … +110 Mobil SHC 630			
	-30 … +50		CLP HC - PSS	VG 150	-35 … +110 GearOil Synth 150 E1 SEW 070040313				-30 … +110 Mobil SHC 629			
	[4] -15 … +40		CLP HC NSF H1	VG 460	-20 … +110 GearOil Synth 460 H1 E1 SEW 070040313	-15 … +100 Cassida Fluid GL 460	-15 … +100 Optileb GT 460 SEW070040313	-15 … +100 Cassida Fluid GL 460		-15 … +105 Klüberoil 4UH1-460 N		
	-25 … +30		CLP HC NSF H1	VG 220	-30 … +90 GearOil Synth 220 H1 E1 SEW 070040313	-25 … +80 Cassida Fluid GL 220	-25 … +80 Optileb GT 220 SEW070040313	-25 … +80 Cassida Fluid GL 220		-25 … +80 Klüberoil 4UH1-220 N		
	[4] -15 … +40		CLP HC - NSF H1 -PSS	VG 460	-20 … +110 GearOil Synth 460 H1 E1 SEW 070040313	-15 … +100 Cassida Fluid GL 460	-15 … +100 Optileb GT 460 SEW070040313	-15 … +100 Cassida Fluid GL 460				
	-25 … +30		CLP HC - NSF H1 -PSS	VG 220	-30 … +90 GearOil Synth 220 H1 E1 SEW 070040313	-25 … +80 Cassida Fluid GL 220	-25 … +80 Optileb GT 220 SEW070040313	-25 … +80 Cassida Fluid GL 220				

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[1] Ambient temperature range
[2] Note on special approvals
[3] Oil type
[4] Default

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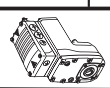
MGF..C /PG	[1] °C	[2]	[3]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil®	KLÜBER LUBRICATION	Shell	TOTAL
	[4] -25 … +60		CLP HC (-PSS)	VG 220	-30 … +110 GearOil Synth 220 H1 SEW 070040313				-25 … +110 Mobil SHC 630			
	-30 … +50			VG 150	-35 … +105 GearOil Synth 150 E1 SEW 070040313				-30 … +100 Mobil SHC 629			
	[4] -15 … +40		CLP HC - NSF H1 (-PSS)	VG 460	-20 … +110 GearOil Synth 460 H1 E1 SEW 070040313	-15 … +100 Cassida Fluid GL 460	-15 … +100 Optileb GT 460 SEW070040313	-15 … +100 Cassida Fluid GL 460				
	-25 … +30			VG 220	-30 … +90 GearOil Synth 220 H1 E1 SEW 070040313	-25 … +80 Cassida Fluid GL 220	-25 … +80 Optileb GT 220 SEW070040313	-25 … +80 Cassida Fluid GL 220				

9007235084859275

[1] Ambient temperature range
[2] Note on special approvals
[3] Oil type
[4] Default

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4.23 Design notes for gear units with hollow shaft and key

4.23.1 Information

Observe the following information:

- Use the supplied NOCO-Paste for mounting. This will prevent contact corrosion and simplify disassembly at a later date.
- The key dimension L12 is determined by the customer and depends on the requirements of the application, as well as on the used materials. See figure "Customer shaft with contact shoulder [A] and without contact shoulder [B]".
- When dimensioning the keyed connection, take into account that the hollow gear shaft (hub) is made of the material C45R(1.1201) or X17CrNi16-2+QT900(1.4057+QT900), depending on the ordered variant.

4.23.2 Installation

SEW-EURODRIVE recommends **2 variants for mounting** the hollow shaft and key onto the input shaft of the driven machine (= customer shaft):

1. Use the provided fastening parts for installation.
2. Use the optional assembly/disassembly kit for installation.

These two variants are described below.

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4.23.3 Mounting using supplied fastening parts

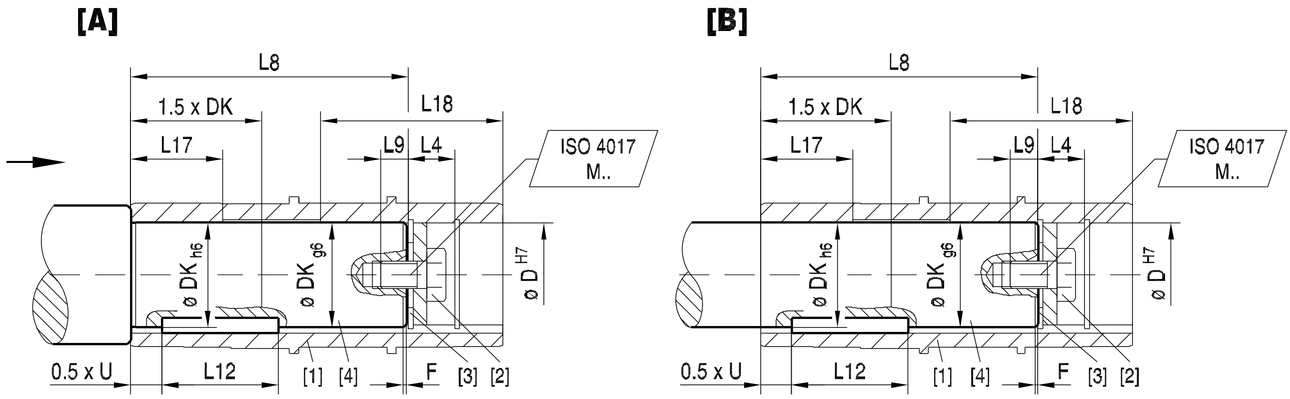
The following fastening parts are provided as standard:

- Retaining screw with washer
- Retaining ring

Customer shaft

The following figure shows the customer shaft with contact shoulder [A] and without contact shoulder [B].

03 001 01 17



[1]	Hollow shaft
[2]	Retaining screw with washer
[3]	Retaining ring
[4]	Customer shaft
L8	Length of customer shaft (With retaining ring positioned outside: Length of customer shaft L8+L4)
L12	Key length
U	Key width
F	Chamfer at the shaft end (always 1 mm with MOVIGEAR®)
DK	Customer shaft diameter
D	Hollow shaft diameter
L9	Screw-in depth of the included retaining screw
L17/L18	Cylinder section length with dimension H7

Dimensions and tightening torque for MGFA.2-..-C/MGFA.4-..-C

Tighten the retaining screw [2] with the tightening torque MS according to the following table:

Gear unit type	D^{H7}	DK 1)	L8 2)	L4 3)	L17	L18	F	U	L9	Supplied retaining screw	MS
	mm	mm	mm	mm	mm	mm	mm	mm	mm	ISO 4017	Nm
MGFA.2-..-C	20	20	84.6	16.4	35	55	1	6 4)	10	M6×16-8.8	8
	25	25	83.8	16.2	35	55	1	8 4)	17	M10×25-8.8	20
	30	30	83.8	16.2	35	55	1	8 4)	17	M10×25-8.8	20
	35	35	80	17.9	45	45	1	10 4)	22	M12×30-8.8	20
	40	40	89	12.85	35	55	1	12 5)	30	M16×40-8.8	40
MGFA.4-..-C	30	30	107.3	16.2	40	60	1	8 4)	17	M10×25-8.8	20
	35	35	105.6	17.9	40	60	1	10 4)	22	M12×30-8.8	20
	40	40	105.5	17.65	40	60	1	12 4)	29	M16×40-8.8	40

1) Up to a distance of at least 1.5 × DK, the diameter of the customer shaft must be ØDKh6, and with the other length ØDKg6
2) Position of retaining ring: **INSIDE**

   The installation length of the customer shaft **with** contact shoulder [A] must be **L8 -1 mm**.

   The installation length of the customer shaft **without** contact shoulder [B] must be **equal L8**.

   With this configuration, the customer shaft can be pressed out using the optional assembly/disassembly kit (doesn't apply to MGF.2-C and 40 mm hollow shaft).
3) Position of retaining ring: **OUTSIDE**

   The installation length of the customer shaft **with** contact shoulder [A] must be **(L8 + L4) -1 mm**.

   The installation length of the customer shaft **without** contact shoulder [B] must be equal to **L8 + L4**.
4) For keyway types: DIN6885-1 (domed type)
5) For keyway types: DIN6885-3 (low type)

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4.23.4 Mounting/dismounting with SEW-EURODRIVE assembly and disassembly kit

You can use the optional assembly/disassembly kit for mounting. You can order the kit for the specific size by quoting the part numbers in the table below. The scope of delivery includes:

- Spacer tube for assembly without contact shoulder
- Retaining screw for assembly
- Forcing washer for disassembly
- Fixed nut for disassembly

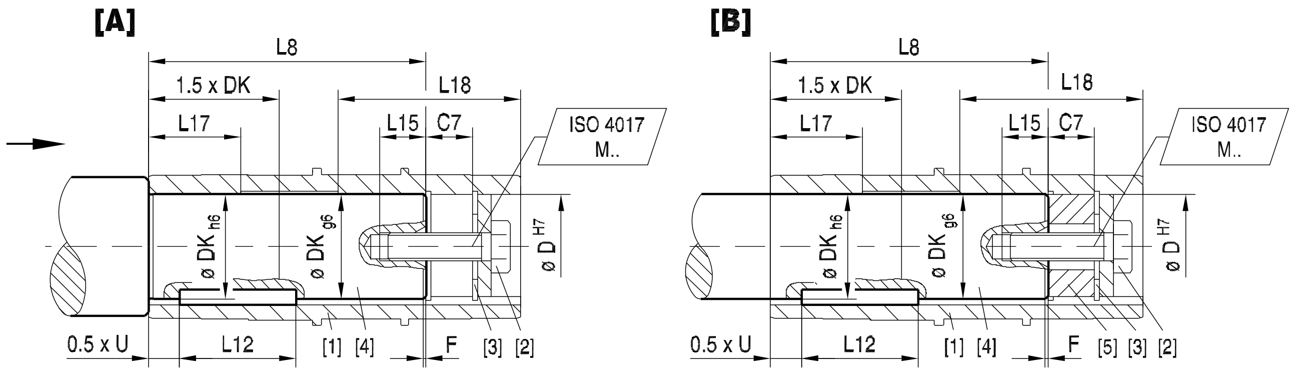
The short retaining screw delivered as standard is not required.

Customer shaft

- The installation length of the customer shaft must be L8. **Do not use the spacer tube if the customer shaft has a contact shoulder [A].**
- The installation length of the customer shaft must be L8. **Use the spacer tube if the customer shaft has no contact shoulder [B]**.

The following figure shows the customer shaft with contact shoulder [A] and without contact shoulder [B].

03 002 01 17



[1]	Hollow shaft
[2]	Retaining screw with washer
[3]	Retaining ring
[4]	Customer shaft
[5]	Spacer tube
L8	Customer shaft length
L12	Key length
U	Key width
F	Chamfer at the shaft end (always 1 mm with MOVIGEAR®)
DK	Customer shaft diameter
D	Hollow shaft diameter
L15	Screw-in depth of the retaining screws included in the assembly/disassembly kit
C7	Dimension of the included spacer or of the included ejector plate and fixed nut
L17/L18	Cylinder section length with dimension H7

Dimensions, tightening torques and part numbers for MGFA.2-..-C/MGFA.4-..-C

The retaining screw [2] must be tightened to the tightening torque MS given in the following table.

Gear unit type	D^{H7}	DK[1)]	L8	C7	L17	L18	F	U	$L15^{+2}$	Fastening screw [2] from the installation/removal kit	MS	Assembly/disassembly kit
	mm	mm	mm	mm	mm	mm	mm	mm	mm	ISO 4017	Nm	Part number
MGFA.2-..-C	20	20	84.6	16	35	55	1	6[2)]	16	M6×25-8.8	8	06436838
	25	25	83.8	16	35	55	1	8[2)]	22	M10×35 - 8.8	20	06436846
	30	30	83.8	16	35	55	1	8[2)]	22	M10×35 - 8.8	20	06436854
	35	35	80	18	45	45	1	10[2)]	28	M12×45 - 8.8	20	06436862
	40	40	89	13	35	55	1	12[3)]	36	M16×50 - 8.8	40	–[4)]
MGFA.4-..-C	30	30	107.3	16	40	60	1	8[2)]	22	M10×35 - 8.8	20	06436854
	35	35	105.6	18	40	60	1	10[2)]	28	M12×45 - 8.8	20	06436862
	40	40	105.5	18	40	60	1	12[2)]	36	M16×50 - 8.8	40	06436870

1) Up to a distance of at least 1.5 × DK, the diameter of the customer shaft must be ØDKh6, and with the other length ØDKg6
2) For keyway types: DIN6885-1 (domed type)
3) For keyway types: DIN6885-3 (low type)
4) Not with the assembly/disassembly kit by SEW-EURODRIVE

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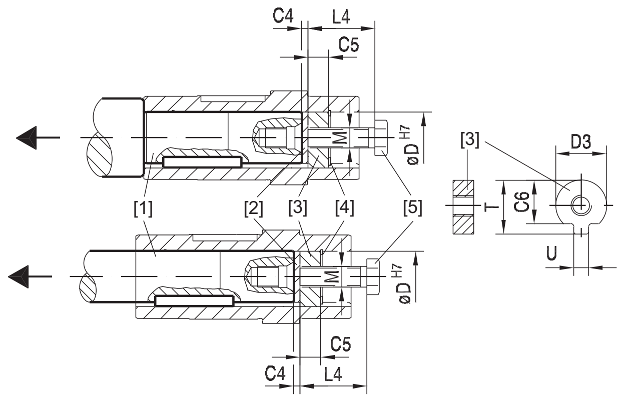
Disassembly

INFORMATION

The depicted assembly kit for attaching the customer shaft is a recommendation by SEW-EURODRIVE.

- Check whether this design can compensate the present axial loads.
- You may need to use another construction for axial securing in certain applications.

The following figure shows the SEW-EURODRIVE assembly/disassembly kit.



25843977355

[1] Customer shaft
[2] Forcing washer
[3] Fixed nut for disassembly
[4] Retaining ring
[5] Retaining screw

The following table lists the dimensions and part numbers of the assembly/disassembly kit:

Gear unit type	D^{H7}	C4	C5	C6	$U^{-0.5}$	$T^{-0.5}$	$D3^{-0.5}$	L4	M[1)]	Assembly/ disassembly kit
	mm	mm	mm	mm	mm	mm	mm	mm		Part number
MGFA.1-..-C[2)]	20	5	6	15.5	5.5	22.5	19.7	25	M6	6436838
MGFA.1-..-C **MGFA.2-..-C**	25	5	10	20	7.5	28	24.7	35	M10	6436846
MGFA.2-..-C **MGFA.4-..-C**	30	5	10	25	7.5	33	29.7	35	M10	6436854
MGFA.2-..-C **MGFA.4-..-C**	35	5	12	29	9.5	38	34.7	45	M12	6436862
MGFA.2-..-C **MGFA.4-..-C**	40	5	12	34	11.5	41.9	39.7	50	M16	6436870

1) Retaining screw
2) Only with MOVIGEAR® classic

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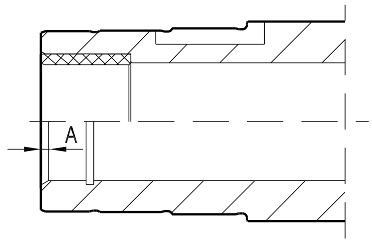
4.24 Drive unit with hollow shafts

4.24.1 Hollow shaft chamfer

The following figure illustrates the hollow shaft chamfer:



25844033035

The following table shows the dimensions of the chamfer:

Gear unit type	Design with hollow shaft (A)
MGFA.1-..-C[1)]	2 × 30°
MGFA.2-..-C	2 × 30°
MGFA.4-..-C	2 × 30°

1) Only with MOVIGEAR® classic

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4.25 Dimension drawings of the drive unit

4.25.1 Information regarding dimension drawings

All dimensions in mm.

Scope of delivery

 = Standard parts supplied by SEW-EURODRIVE.

 = Standard parts not supplied by SEW-EURODRIVE.

Tolerances

Shaft ends

Diameter tolerance:

Ø	≤ 50 mm	→ ISO k6
Ø	> 50 mm	→ ISO m6

Center holes according to DIN 332, shape DR:

Ø	= 7 to 10 mm	→ M3
Ø	> 10 to 13 mm	→ M4
Ø	> 13 to 16 mm	→ M5
Ø	> 16 to 21 mm	→ M6
Ø	> 21 to 24 mm	→ M8
Ø	> 24 to 30 mm	→ M10
Ø	> 30 to 38 mm	→ M12
Ø	> 38 to 50 mm	→ M16

Keys: according to DIN 6885 (domed type).

Hollow shafts

Diameter tolerance:

Ø	→ ISO H7 measured with plug gauge

Breather valves and cable glands

The dimension drawings always show the screw plugs. The contour dimensions may vary slightly due to preinstalled breather valves, connectors or pressure compensation fittings (in conjunction with the design for wet areas).

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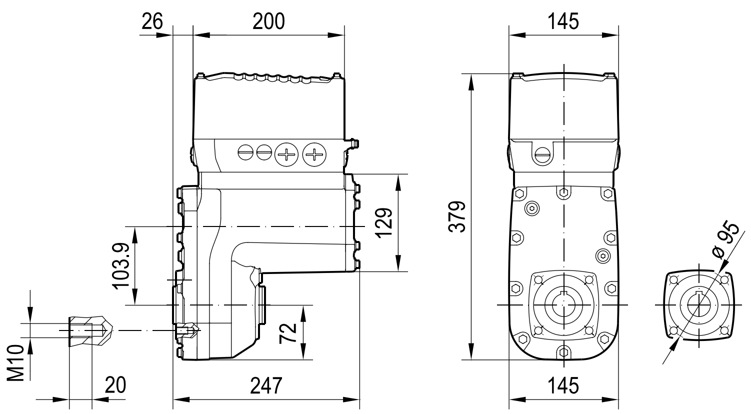
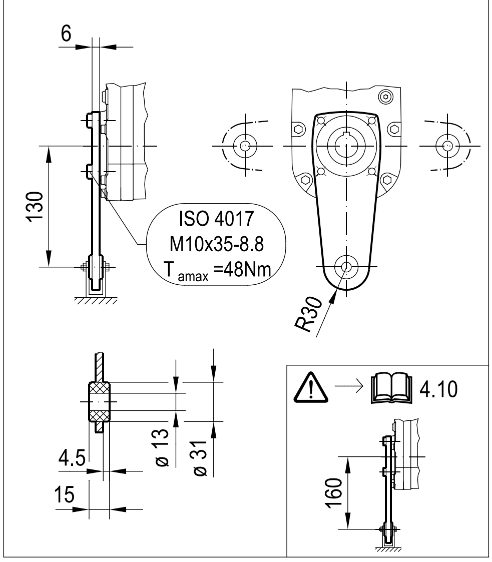
4.25.2 Dimension drawings MGF..2-..-C

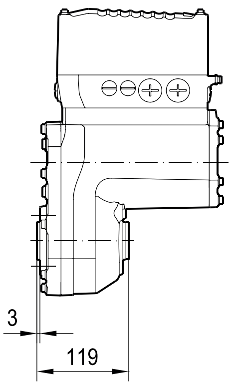
03 002 01 18

MGFAS2..-C

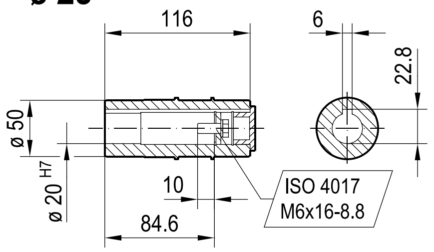


MGF.T2..-C

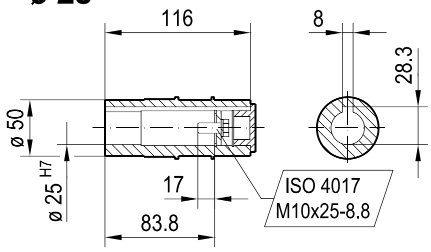




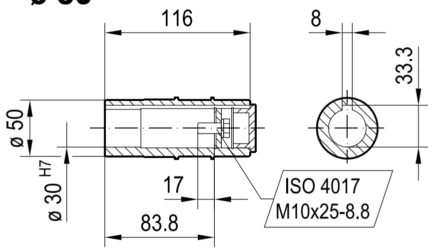
ø 20 H7



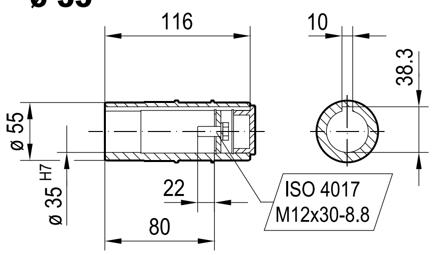
ø 25 H7



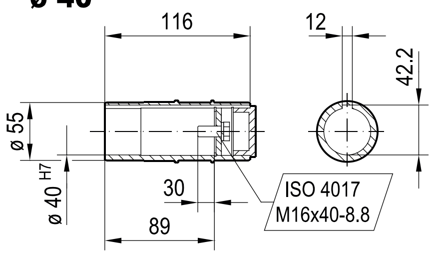
ø 30 H7



ø 35 H7

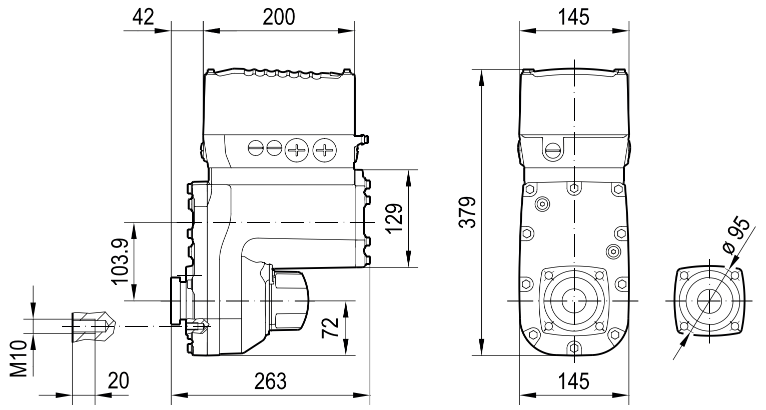


ø 40 H7

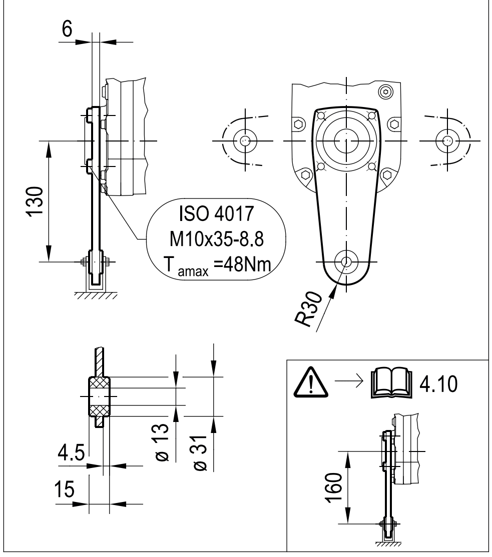


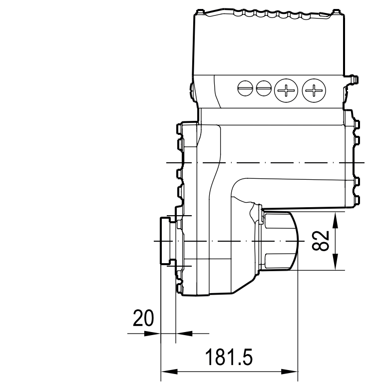
03 004 01 18

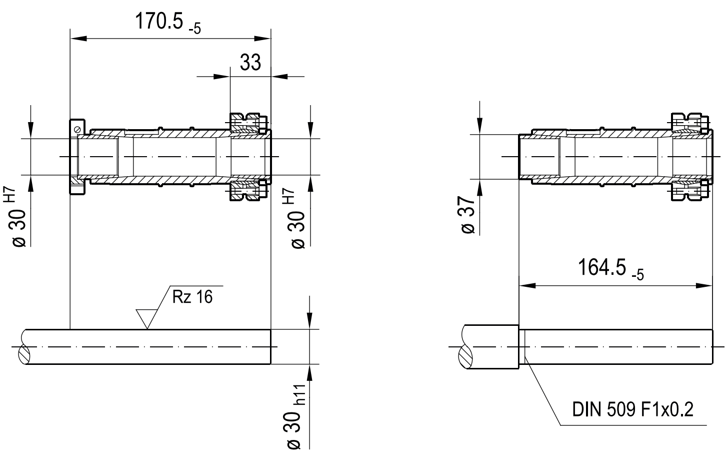
MGFTS2..-C



MGF.T2..-C







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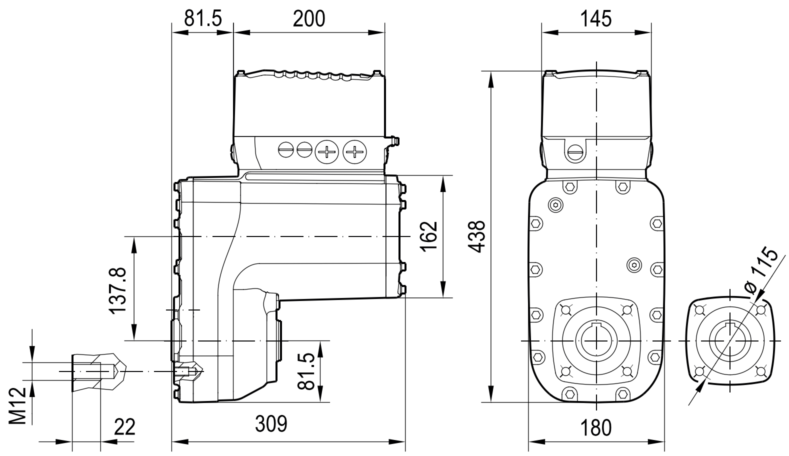
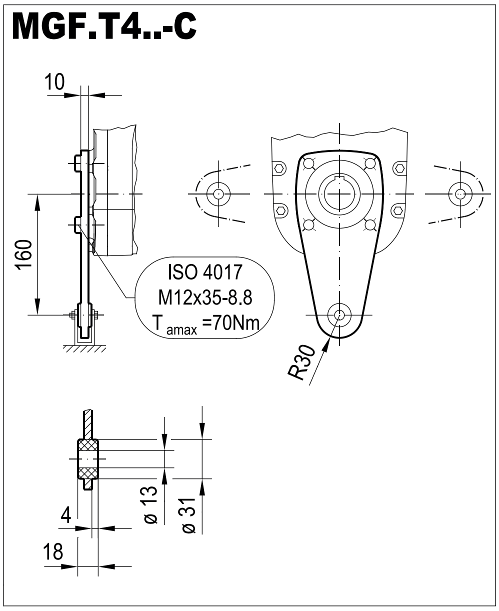
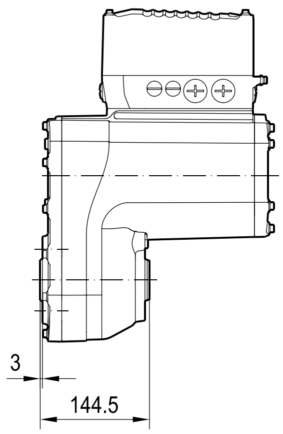
4.25.3 Dimension drawings MGF..4-..-C

03 006 00 18

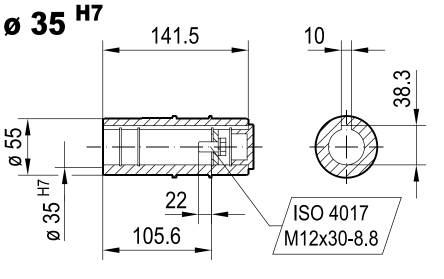
MGFAS4..-C



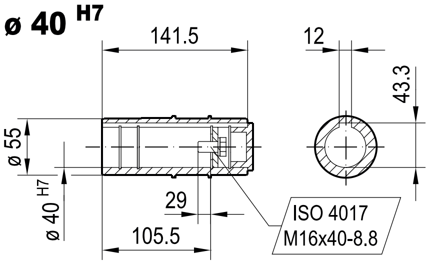




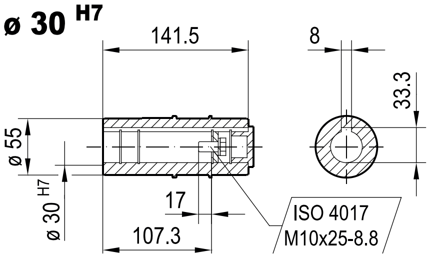
ø 35 H7



ø 40 H7



ø 30 H7



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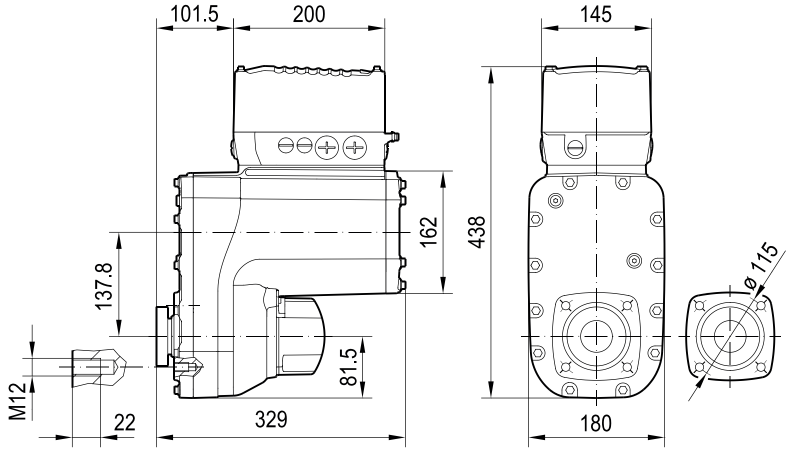
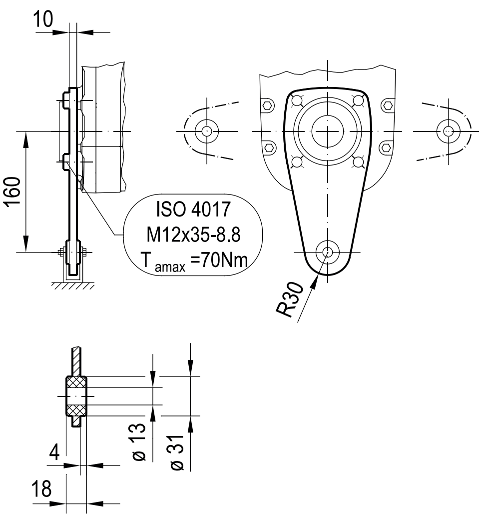
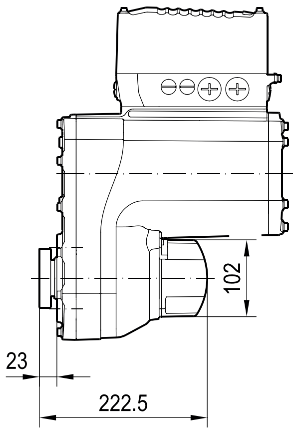
03 007 00 18

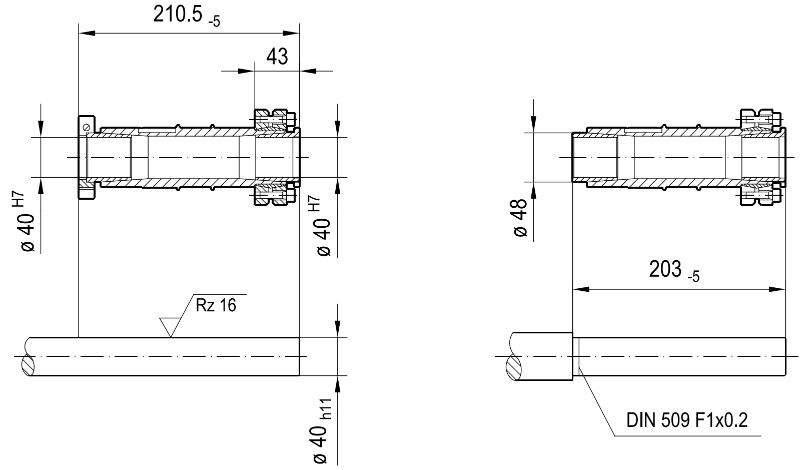
MGFTS4..-C



MGF.T4..-C







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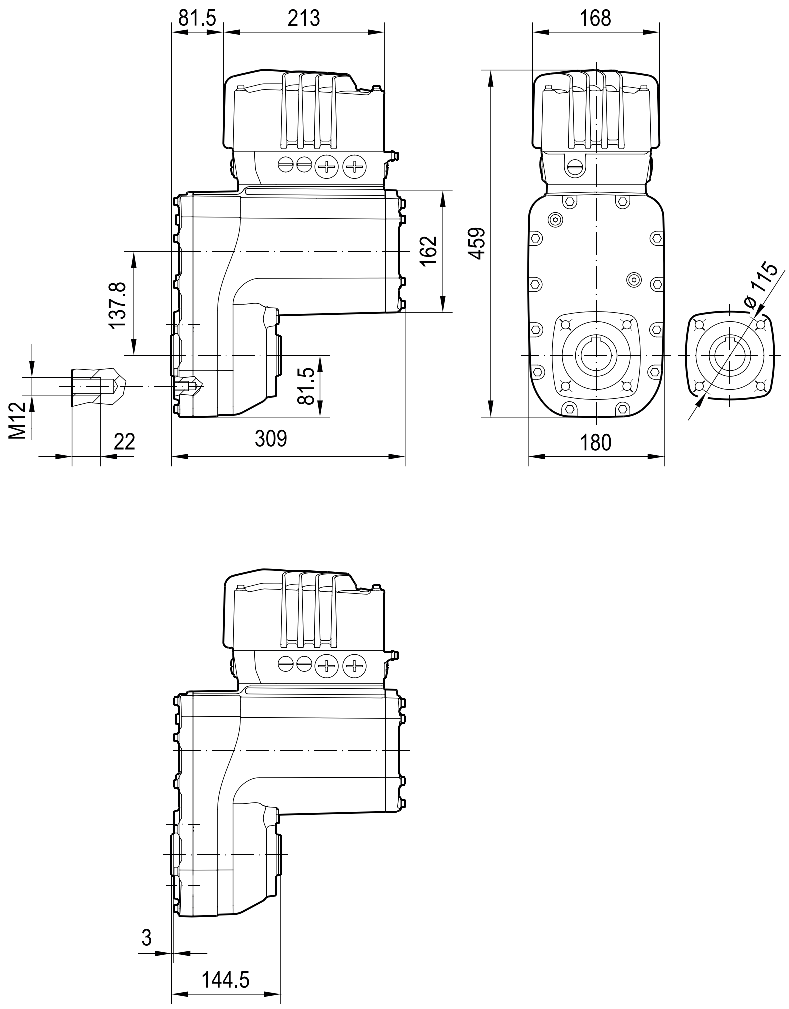
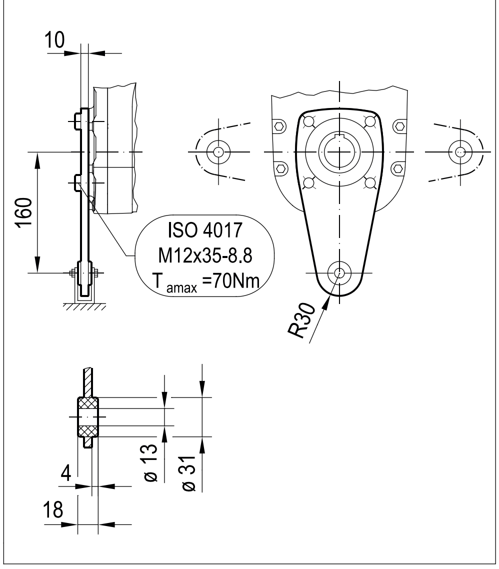
4.25.4 Dimension drawings MGF..4.-C/XT with increased torque

03 008 00 18

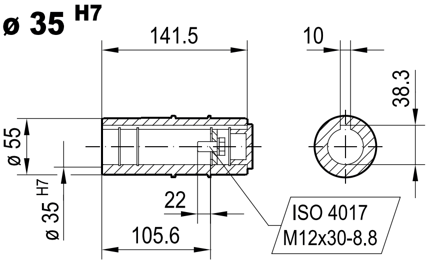
MGFAS4..-C/XT



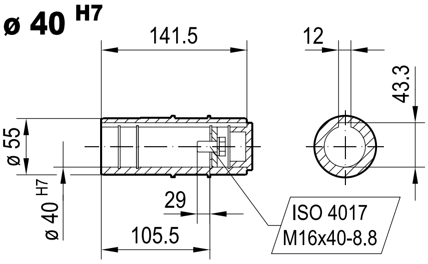
MGF.T4..-C



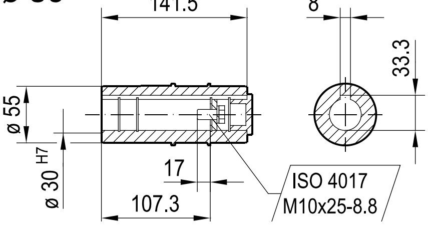
ø 35 H7



ø 40 H7



ø 30 H7



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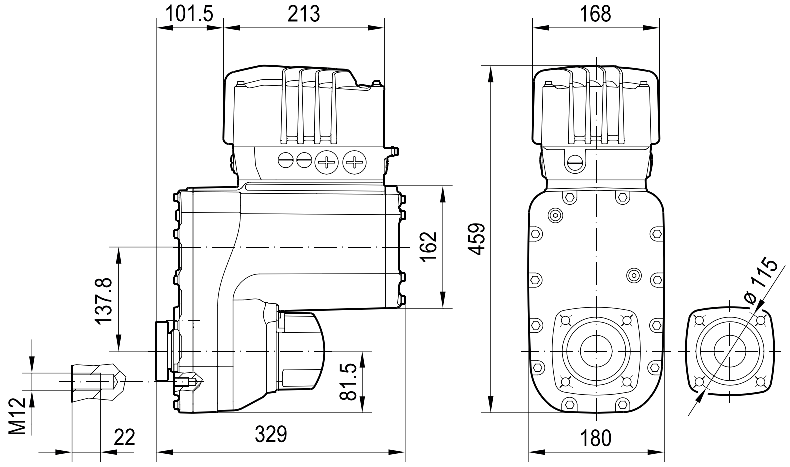
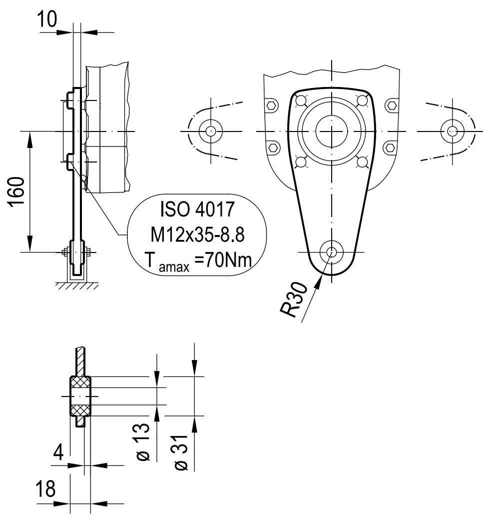
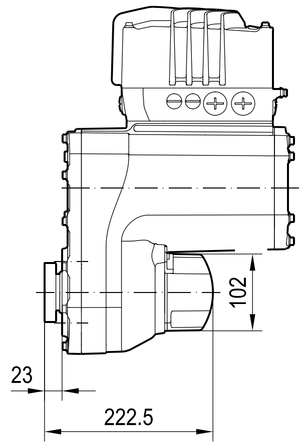
03 009 00 18

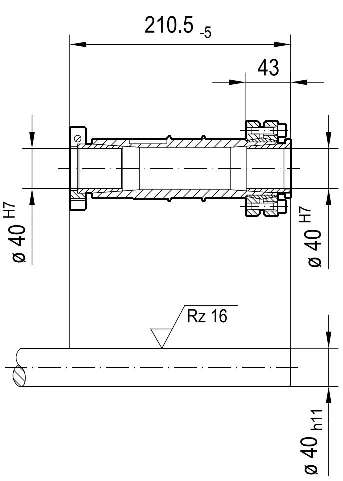
MGFTS4..-C/XT

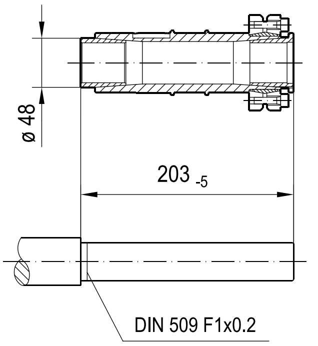


MGF.T4..-C









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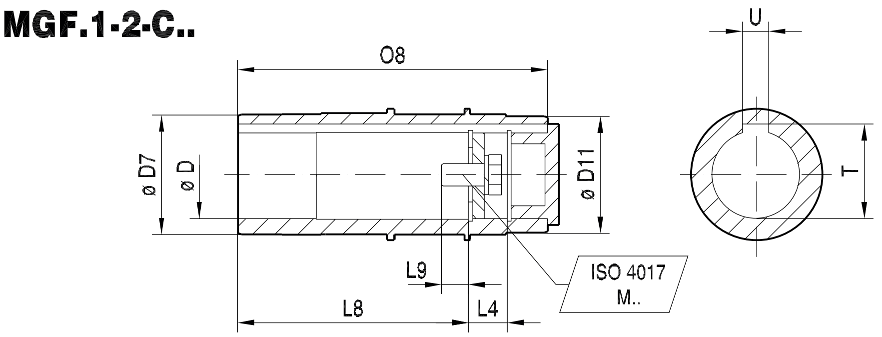
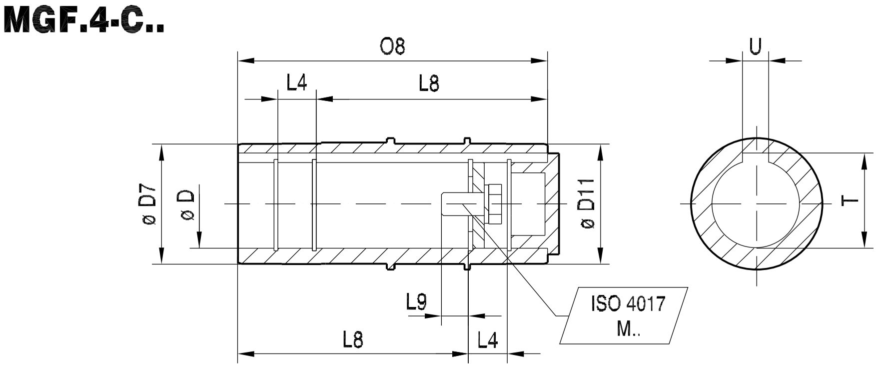
4.25.5 Dimension drawings of shaft designs

Dimension drawing shaft design MGFAS..C/mm

MGFAS1..C only with MOVIGEAR® classic)

03 016 02 17





	ø D H7	ø D7	ø D11	L4	L8	L9	O8	T	U	ISO 4017
MGFAS1..C	20	35	38	16.4	73.6	10	106	22.8	6	M6x16-8.8
MGFAS1..C	25	35	38	16.2	73.8	17	106	27	8	M10x25-8.8

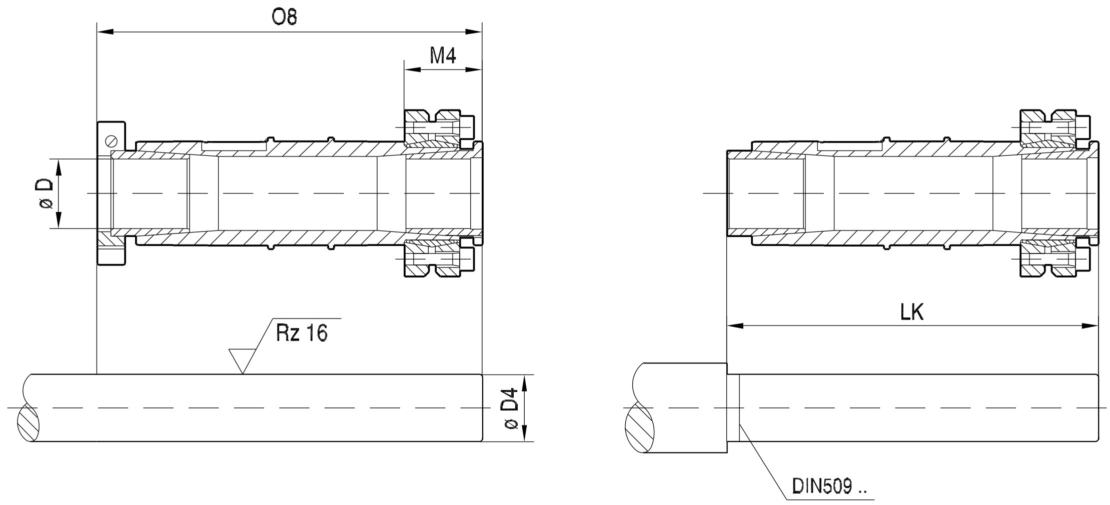
	ø D H7	ø D7	ø D11	L4	L8	L9	O8	T	U	ISO 4017
MGFAS2..C	20	50	45	16.4	84.6	10	116	22.8	6	M6x16-8.8
MGFAS2..C	25	50	45	16.2	83.8	17	116	28.3	8	M10x25-8.8
MGFAS2..C	30	50	45	16.2	83.8	17	116	33.3	8	M10x25-8.8
MGFAS2..C	35	55	50	17.9	80	22	116	38.3	10	M12x30-8.8
MGFAS2..C	40	55	50	12.85	89	30	116	42.2	12	M16x40-8.8

	ø D H7	ø D7	ø D11	L4	L8	L9	O8	T	U	ISO 4017
MGFAS4..C	30	55	55	16.2	107.3	17	141.5	33.3	8	M10x25-8.8
MGFAS4..C	35	55	55	17.9	105.6	22	141.5	38.3	10	M12x30-8.8
MGFAS4..C	40	55	55	17.65	105.5	29	141.5	43.3	12	M16x40-8.8

Dimension drawing shaft design MGFTS..C/mm

MGFTS1..C only with MOVIGEAR® classic)

03 017 01 17



	ø D4 $_{h11}$	ø D $^{+0.1}$	M4	O8 $_{-5}$	LK $_{-5}$	DIN 509
MGFTS1..C	20	20.1	28	157	151	F1x0.2

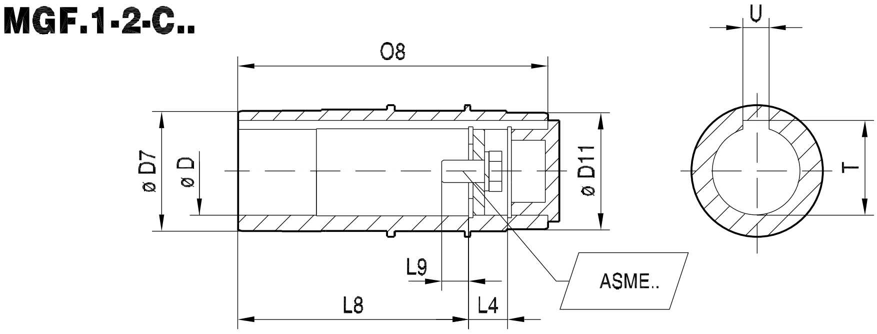
	ø D4 $_{h11}$	ø D $^{+0.1}$	M4	O8 $_{-5}$	LK $_{-5}$	DIN 509
MGFTS2..C	25	25.1	33	170.5	164.5	F1x0.2
MGFTS2..C	30	30.26	33	170.5	164.5	F1x0.2

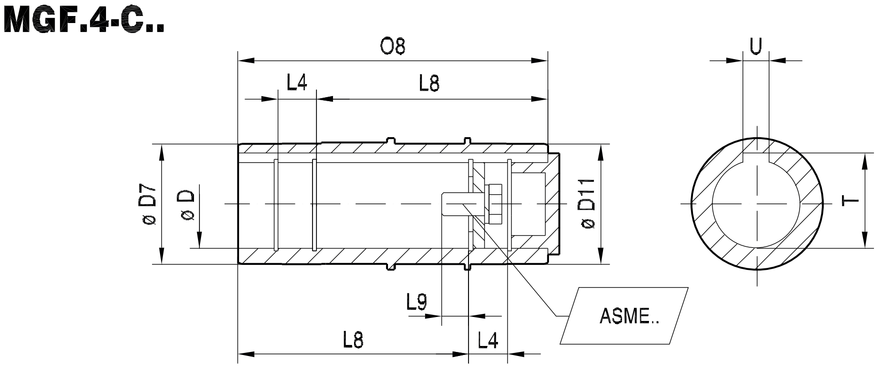
	ø D4 $_{h11}$	ø D $^{+0.1}$	M4	O8 $_{-5}$	LK $_{-5}$	DIN 509
MGFTS4..C	30	30.26	45.2	210.4	202.9	F1x0.2
MGFTS4..C	35	35.03	43	210.5	203	F1x0.2
MGFTS4..C	40	40.1	43	210.5	203	F1x0.2

Dimension drawing shaft design MGFAS..C/inch

MGFAS1..C only with MOVIGEAR® classic)

03 016 00 18





	ø D H7	ø D7	ø D11	L4	L8	L9	O8	T	U	ASME
MGFAS1..C	0.750	1.378	1.496	0.646	2.898	0.347	4.173	0.846	0.187	1/4-20x0.625
MGFAS1..C	0.875	1.378	1.496	0.646	2.937	0.347	4.173	0.965	0.187	1/4-20x0.625
MGFAS1..C	1.000	1.378	1.496	0.638	2.906	0.695	4.173	1.122	0.250	3/8-16x1.00

	ø D H7	ø D7	ø D11	L4	L8	L9	O8	T	U	ASME
MGFAS2..C	1.000	1.969	1.969	0.638	3.339	0.69	4.567	1.122	0.250	3/8-16x1.00
MGFAS2..C	1.250	1.969	1.969	0.638	3.339	0.69	4.567	1.374	0.250	7/16-14x1.00
MGFAS2..C	1.4375	2.165	1.969	0.516	3.494	1.39	4.567	1.610	0.375	5/8-11x1.75

	ø D H7	ø D7	ø D11	L4	L8	L9	O8	T	U	ASME
MGFAS4..C	1.250	2.165	2.165	0.717	4.146	0.69	5.571	1.374	0.250	7/16-14x1.00
MGFAS4..C	1.437	2.165	2.165	0.705	4.154	1.39	5.571	1.610	0.375	5/8-11x1.75
MGFAS4..C	1.500	2.165	2.165	0.705	4.154	1.39	5.571	1.669	0.375	5/8-11x1.75

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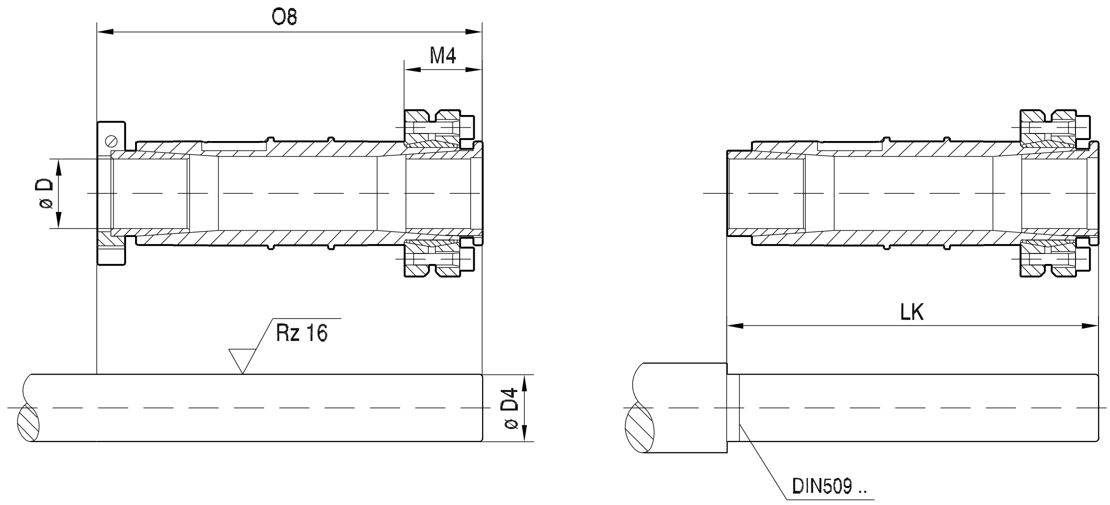
Dimension drawing shaft design MGFTS..C/inch

MGFTS1..C only with MOVIGEAR® classic)

03 017 00 18



	ø D4 $_{h11}$	ø D $^{+0.004}$	M4	O8 $_{-0.197}$	LK $_{-0.197}$	DIN 509
MGFTS1..C	0.750	0.754	1.102	6.181	5.945	F1x0.2

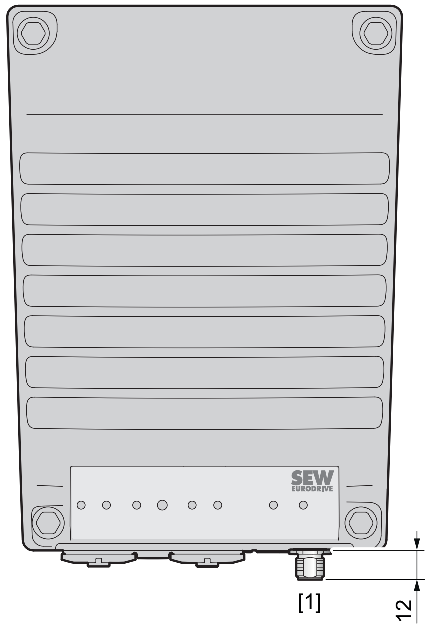
	ø D4 $_{h11}$	ø D $^{+0.004}$	M4	O8 $_{-0.197}$	LK $_{-0.197}$	DIN 509
MGFTS2..C	1.000	1.004	1.299	6.713	6.476	F1x0.2
MGFTS2..C	1.1875	1.191	1.299	6.713	6.476	F1x0.2
MGFTS2..C	1.250	1.254	1.299	6.713	6.476	F1x0.2

	ø D4 $_{h11}$	ø D $^{+0.004}$	M4	O8 $_{-0.197}$	LK $_{-0.197}$	DIN 509
MGFTS4..C	1.250	1.250	1.693	8.287	7.992	F1x0.2
MGFTS4..C	1.375	1.379	1.693	8.287	7.992	F1x0.2
MGFTS4..C	1.4375	1.441	1.693	8.287	7.992	F1x0.2
MGFTS4..C	1.500	1.504	1.693	8.287	7.992	F1x0.2
MGFTS4..C	1.625	1.629	1.693	8.287	7.992	F1x0.2

4.26 Dimension drawings of connectors at the electronics cover

4.26.1 Dimension drawing of the connectors on electronics cover size 1

The following figure shows the additional dimensions of the connector.



9007229877301643

[1] M12 connector design, male

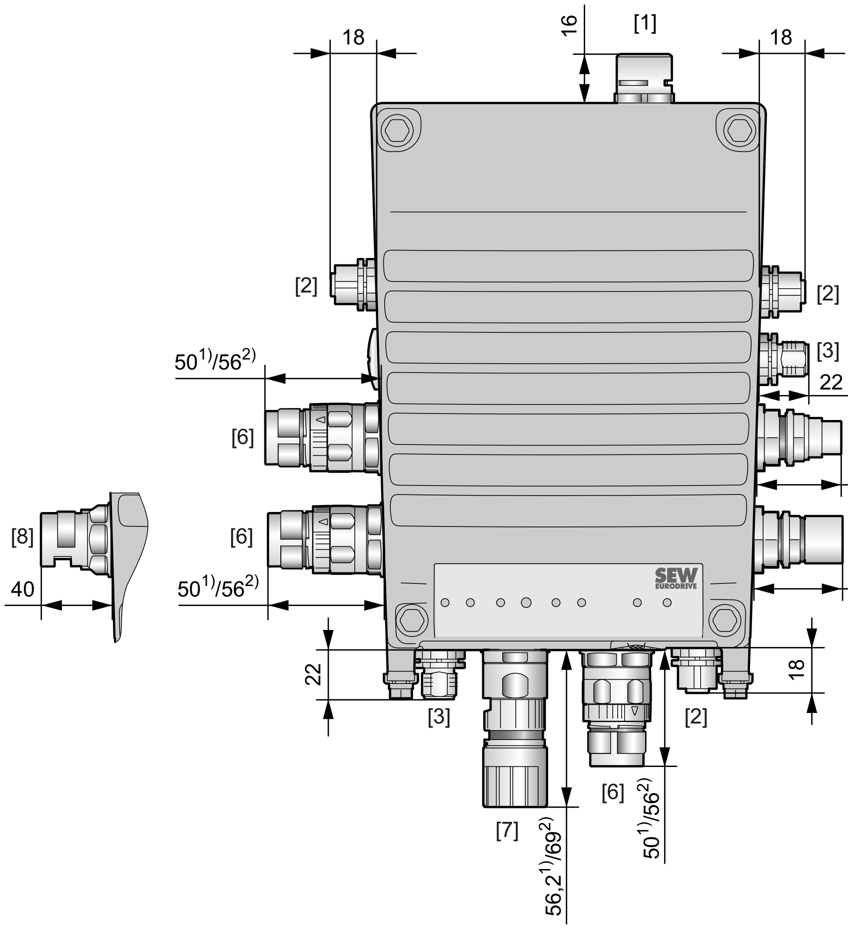
All dimensions in mm.

4.27 Dimension drawings of connectors in the connection box

4.27.1 Dimension drawing connection box size 1 connector

The following figure shows an example of the additional dimensions of the optional connectors for a possible connector configuration.

For more information, refer to chapter "Electrical installation" > "Connector" > "Connector positions ...".



27021623063871755

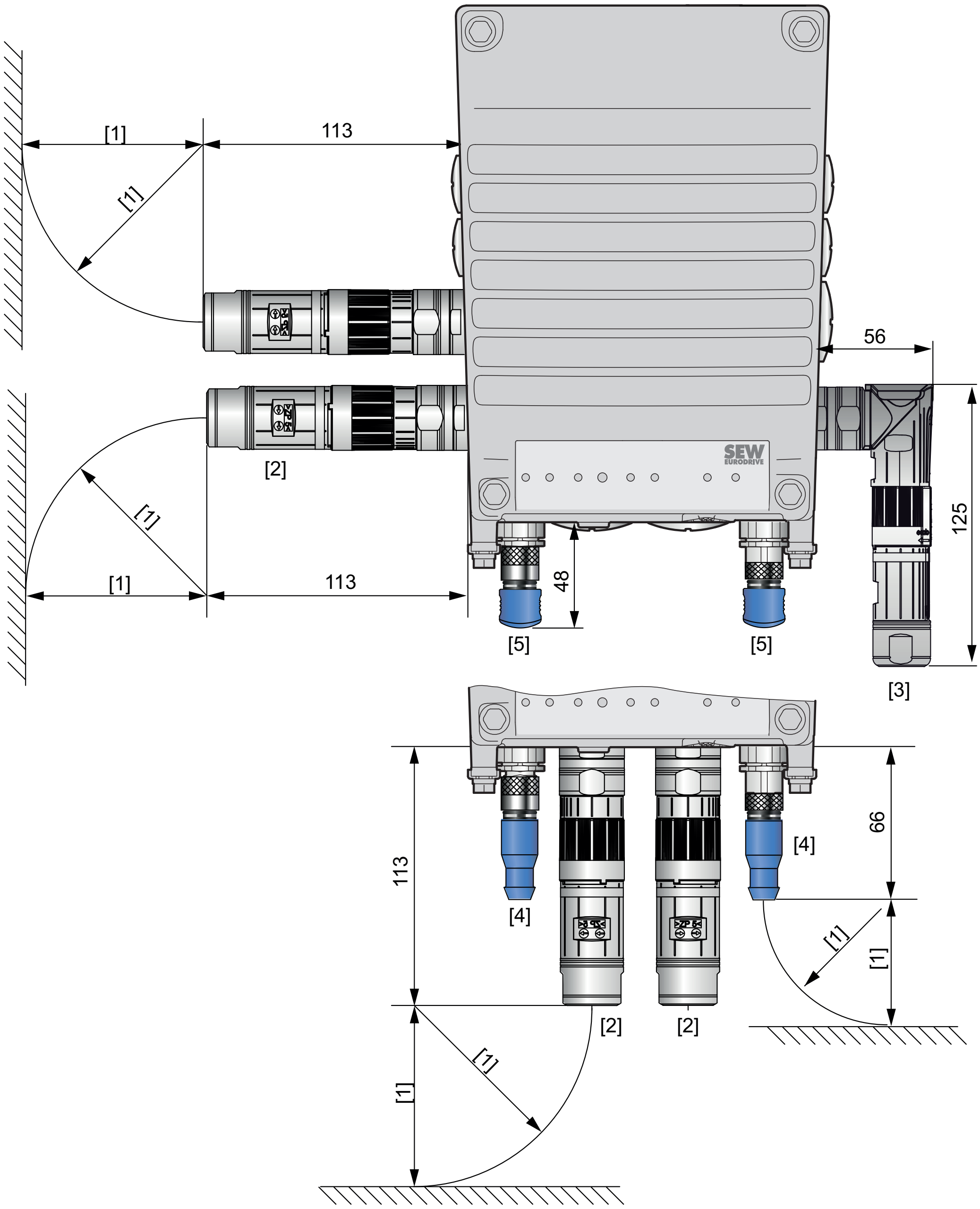
1) "Straight" connector variant
2) "Right-angle" connector variant
[1] Optional pressure compensation
[2] M12 connector design, female
[3] M12 connector design, male
[4] Connector design M15-X-Power, male
[5] Connector design M15-X-Power, female
[6] Connector design TE-Intercontec Products, M23, without union nut
[7] Connector design TE-Intercontec Products, M23, with union nut
[8] Connector design PhoenixContact, QPD W 4PE2.5, female

All dimensions in mm.

4.27.2 Dimension drawing connection box size 1 connector including mating connector

The following image shows the multiple dimensions/bending radii of the optional connector, including mating connector, together with prefabricated cables from SEW-EURODRIVE.

For more information, see chapter "Electrical installation" > "Connectors" > "Connector positions ..".



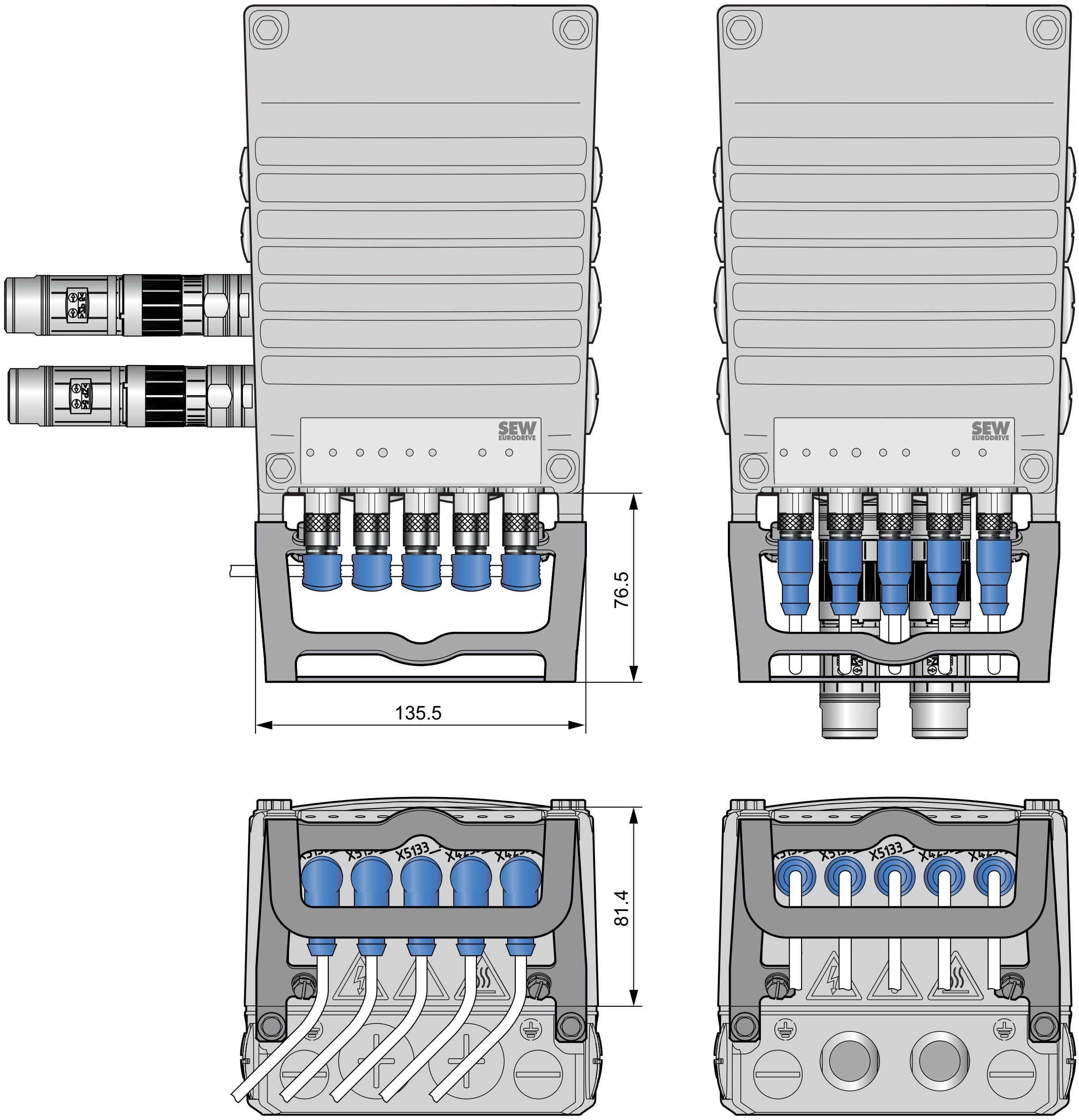
36028822318650763

[1] Distance according to the permitted bending radius of the cable
[2] "Straight" M23 connector design
[3] Connector design M23 "Angled"
[4] "Straight" M12 connector design
[5] "Angled" M12 connector design

All dimensions in mm.

4.28 Dimension drawing of guard bracket

The following figure shows the dimensions of the guard bracket.



35973190923

All dimensions in mm.

5 Project planning for the drive unit

5.1 Preliminary information

INFORMATION

Data may differ due to continuous product development.

5.2 SEW-Workbench

The SEW-Workbench is the central configuration software for inverters from SEW-EURODRIVE.

All necessary configurations can be processed, from entering the application to gear unit, motor and inverter calculations. Other features are optimization of various axis cycles, including accessory selection, and a check for errors regarding dimensioning for the entire drive system.

Of course, the SEW-Workbench can also be used to select and dimension all other products from SEW-EURODRIVE, such as decentralized drives and gearmotors. This means the SEW-Workbench allows for dimensioning drive solutions from the entire range of products from SEW-EURODRIVE. The straightforward operation saves a great deal of time and minimizes complexity.

The key features of the SEW-Workbench are:

- The choice of application
- Gear unit and motor calculation
- Price-optimized configuration
- Comparison of different solutions
- Inverter calculation
- Multi-axis optimization
- Parameterization of cable and accessories selection
- Dimensioning fault check
- Creating parts lists
- Electronic catalog with all products

The planning and configuration software SEW-Workbench is available for download from the official SEW-EURODRIVE website.

To use SEW-Workbench, all you need to do is to register via the Online Support once you have downloaded and installed the software or received the data DVD. An Internet update service ensures that products and functions are continuously updated.

5.3 Data for drive selection/designation

Certain data is required to be able to precisely define the components for your drive. These include:

Data for drive selection/designation		
Abbreviation	**Description**	**Unit**

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Data for drive selection/designation		
Gear unit		
i	Gear unit ratio	
i_{min}	Ideal gear unit ratio	
Torques		
M_A	Peak torque of the motor	Nm
M_N	Nominal motor torque	Nm
M_n	Required application torque in the n^{th} travel section	Nm
M_G	Required application torque with consideration of the efficiency	Nm
M_{eff}	Effective (thermally equivalent S1) torque	Nm
M_{max}	Maximum required application torque	Nm
$M_{a\ max}$	Maximum output torque of the gear unit	Nm
$M_{max\ Motor}$	Maximum required application torque calculated on the basis of the motor shaft	Nm
Rotational speeds		
n_a	Output speed	min^{-1}
n_e	Motor speed	min^{-1}
n_N	Nominal motor speed	min^{-1}
n_{min}	Minimum required application speed	min^{-1}
n_{max}	Maximum required application speed	min^{-1}
$n_{a\ min}$	Minimum output speed	min^{-1}
$n_{a\ max}$	Maximum output speed	min^{-1}
$n_{min\ motor}$	Minimum required application speed calculated on the basis of the motor shaft	min^{-1}
$n_{max\ motor}$	Maximum required application speed calculated on the basis of the motor shaft	min^{-1}
Other		
t_n	Duration of the nth travel section	s
η_L η_{load} η_{app}	Load efficiency	
W	Mean braking work	J
P_{brake}	Mean regenerative power during deceleration	W
IP..	Degree of protection to ISO 20653	
H	Installation altitude above sea level	m
ϑ_{amb}	Ambient temperature	°C

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5.3.1 Determining the motor data

To select the proper drive, you first need the data (weight, speed, setting range, etc.) of the machine to be driven.

This determines the torque and the rotational speed. Refer to the documentation "Drive Engineering – Practical Implementation, Project Planning" or the SEW-Workbench project planning software for assistance.

5.3.2 Selecting the proper drive

Based on the calculated values for torque and rotational speed, the suitable drive can now be configured under adherence of any other mechanical requirements.

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5.4 Schematic workflow for project planning

The following flow diagram illustrates the drive selection procedure for a positioning drive. The drive consists of a gearmotor that is supplied by an inverter.

Required information about the machine to be driven
- Technical data and ambient conditions.
- Positioning accuracy
- Speed setting range
- Calculating the travel cycle

↓

Calculate the relevant application data
- Travel diagram
- Rotational speeds
- Static, dynamic torques
- Regenerative power

↓

Gear unit selection
- Defining gear unit type, gear unit size, gear unit ratio, and gear unit design.
- Checking the positioning accuracy.
- Checking the gear unit load.
- Checking the input speed.

↓

Motor selection
- Maximum torque
- With dynamic drives: effective torque at medium speed
- Maximum speed
- Observe dynamic and thermal torque curves.
- Motor equipment (brake, connector, thermal motor protection, etc.)

↓

Inverter selection
- Selecting the communication variant
- Selecting the safety feature.
- Determining the control mode
- Motor/inverter assignment
- Check if the inverters fulfill the duration and overload requirements.

↓

Select the braking resistor
- Checking if the braking resistor fulfills the duration and overload requirements.
- Observe braking resistor assignment.

↓

Select other system components
- Motor and supply system cables
- Signal and encoder cables
- EMC accessories

↓

Selecting the 24 V voltage supply
- Determine the current demand of the 24 V voltage supply.
- Observe the requirements for the voltage tolerance.

↓

Ensure that all requirements have been met.

5.5 Control mode

The characteristics of the motor connected to the inverter are influenced by the control modes used.

5.5.1 CFC

The CFC control mode is a current-controlled control mode. The CFC control mode allows the operation of asynchronous and synchronous motors with maximum torque dynamics. For this purpose, the current components for the magnetic flux and for the torque generation are controlled separately.

The control mode requires information about the rotor angle and the motor speed. For this reason, an encoder feedback (motor encoder) is always necessary.

For asynchronous motors, only the relative rotor angle is necessary. Thus, an incremental encoder is sufficient.

The control mode requires the absolute position for synchronous motors. In the case of encoder types that do not provide an absolute value, a commutation must be performed before every first enable after booting the system (FCB 18).

The advantage of the CFC control mode is the very high dynamics that can be achieved, as a control reserve for reaching the dynamic maximum torque is always available. For this reason, the CFC control mode is suitable for drives with highly dynamic motion control.

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5.5.2 ELSM®

The ELSM® control mode enables operation of permanent-field synchronous motors without an encoder.

Make sure that the inverter can deliver at least 150% I_0 of the motor.

Switching to a rotating motor is possible (flying start function). Continuous operation is only permitted above a transition speed of approx. 2% of the nominal motor speed.

Speed control

For operation of synchronous motors in the ELSM® control mode, there are 2 modes, i.e. open-loop and closed-loop operation.

Open-loop operation is active when starting from an idle state and below a transition speed. The transition speed is about 2% of the nominal speed. Above this transition speed value, the drive is operated in closed-loop operation.

The time during which the drive is in open-loop operation should be as short as possible since the position of the rotor is not detected in this mode and the drive is only operated in speed-controlled mode.

If the drive is in open-loop operation, a current of at least 150% of the standstill current of the connected motor is impressed to stabilize the drive, which is why the motor heats up significantly at idle state and at low speeds.

Torque control

The ELSM® control mode enables the "Torque control" operating mode; however, only above the transition speed in closed-loop operation.

Practical meaning: The FCB 07 "Torque control" can only be activated when the flying start function is active and above the transition speed (example: winding drive). If the speed is too low, the system shuts down with a fault message.

The transition speed can be reached either by an external drive or by speed control of the inverter in the FCB 05.

5.5.3 Characteristics of the control modes

Overview of the control modes

	V/f	VFC^PLUS		CFC		ELSM®
Principle	Voltage controlled according to characteristic curve	Field-oriented, voltage-controlled, stator flux controller, torque controller		Field-oriented, current controller		Field-oriented, current controller
Motor	ASM/LSPM	ASM	ASM	ASM	SM	SM
Encoder	Without	Without	With	With	With	Without
Dynamics	+	+++	++++	+++++	+++++	++
Energy efficiency	+	+++	+++	++	+++++	++++++
Speed control	✓ 1)	✓		✓		✓
Torque control	–	✓		✓		✓
Positioning	–	–	✓	✓		–
Flying start	– 2)	✓		✓		✓
Typical applications	Group drives, multi-motor drives	General materials handling technology, horizontal drives, vertical drives, pumps/fans, winding drives		Packaging technology, handling technology, highly-dynamic positioning		Horizontal materials handling technology
Characteristics	Maximum robustness	Maximum precision		Maximum dynamics		Maximum energy efficiency

1) Open-loop speed control
2) DC braking

Characteristic values for dynamics

	V/f	VFC^PLUS	CFC	ELSM®
Torque control time	–	≥ 2 ms 1)	≥ 150 µs	
Time constant speed controller	–	≥ 4 – 6 ms	≥ 2 ms	≥ 6 ms
Rotational speed ripple	The speed ripple is mainly determined by the total mass moment of inertia, the torque ripple, and in particular the mechanical structure. It is therefore not possible to specify a general value.			

1) Valid in voltage control range, in field weakening range < 5 ms.

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Characteristic values for setpoint resolution

	V/f	VFC^{PLUS}	CFC	ELSM®
Torque	–	32 bit (0.001% M_{NMot})		
Rotational speed	32 bit (0.0001 min^{-1})			
Position (increment/revolution)	–	16 bit		–
Position (increment absolute)	–	32 bit		–

Characteristic values for accuracy of torque and speed

	VFC^{PLUS} without encoder	VFC^{PLUS} with encoder	
		Motor temperature sensor	
		None	with
Accuracy of the calculated torque	depends on the accuracy of the motor parameters **INFORMATION:** The more accurate the motor parameters, the more accurate the torque. For greater torque accuracy, measure the motor parameters with FCB25.		
Deviation with FCB25	< 5% M_N		
Typical deviation	< 10% M_N		
Maximum deviation[1)]	< 15% M_N	< 25% M_N	< 15% M_N

1) If n is permanently < 20% of the nominal speed.

	CFC without motor temperature sensor	CFC with motor temperature sensor
Accuracy of the calculated torque	depends on the accuracy of the motor parameters and motor temperature	depends on the accuracy of the motor parameters, typical deviation: < 5% M_N

	VFC^{PLUS} without encoder	All control modes with encoders
Accuracy of the calculated speed[1)]	depends on the accuracy of the motor parameters, typical deviation: 0.2 × $f_{nominal\ slip}$.	Maximum deviation: 0.007% n_{nom}, 10^{-4} min^{-1}

1) Stationary inaccuracy is the deviation between the mean value of the exact physical speed and the speed setpoint.

Recommended maximum output frequency

f_{PWM}	V/f	VFC^{PLUS}	CFC	ELSM®
4 kHz	400 Hz	250 Hz	400 Hz	
≥ 8 kHz	599 Hz	250 Hz	500 Hz	

FCBs that can be activated for selected control mode

FCB	Designation	V/f	VFC^PLUS	CFC	ELSM®
01	Output stage inhibit	✓	✓	✓	✓
02	Default stop	✓	✓	✓	✓
04	Manual mode	✓	✓	✓	✓
05	Speed control	✓	✓	✓	✓
06	Interpolated speed control	✓	✓	✓	✓
07	Torque control	–	✓	✓	✓
08	Interpolated torque control	–	✓	✓	✓
13	Stop at application limits	✓	✓	✓	✓
14	Emergency stop	✓	✓	✓	✓
25	Motor parameter measurement	✓	✓	✓	✓
26	Stop at user limits	✓	✓	✓	✓
FCBs requiring a position encoder:					
09	Position control	–	✓	✓	–
10	Interpolated position control	–	✓	✓	–
12	Reference travel	–	✓	✓	✓
18	Rotor position identification	–	–	✓	–
19	Position hold control	–	✓	✓	–
20	Jog	–	✓	✓	–
21	Brake test	–	✓	✓	–

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5.6 FCB concept

The FCB concept describes the modular firmware design of inverters from the MOVI-C® modular automation system with which it is ensured that a wide range of drive functions can be selected or deselected quickly and easily using control words.

All primary functions are selected as FCBs. For example, positioning control requires the FCB 09, while speed control is implemented with FCB 05.

You can switch between different FCBs at any time. Switching to another FCB takes place with a maximum delay of 0.5 ms.

Different priorities are assigned to the FCBs. If an FCB with a higher priority than the currently active FCB is selected, the FCB with the higher priority is activated.

The FCBs are sorted in descending order of their priority in the following list:

- FCB 01 Output stage inhibit
- FCB 14 Emergency stop
- FCB 13 Stop at application limits
- FCB 18 Rotor position identification
- FCB 25 Motor parameter measurement
- FCB 12 Reference travel
- FCB 04 Manual mode
- FCB 20 Jog mode
- FCB 19 Position hold control
- FCB 21 Brake test
- FCB 10 Interpolated position control
- FCB 09 Position control
- FCB 06 Interpolated speed control
- FCB 05 Speed control
- FCB 08 Interpolated torque control
- FCB 07 Torque control
- FCB 26 Stop at user limits
- FCB 02 Default stop

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5.6.1 Description of the FCBs

FCB 01 Output stage inhibit

Activating FCB 01 stops the connected motor via the motor brake. If no brake is installed, the motor coasts to a stop.

FCB 02 Default stop

FCB 02 stops the drive with the preset profile value "Maximum deceleration". This value is limited by the "Application limit – deceleration".

FCB 02 is active (default) when no other FCB is selected.

FCB 02 is selected by the system, not by the operator.

FCB 04 Manual mode

The function block can be selected and activated via the function "Manual mode" using the MOVISUITE® engineering software. Manual mode is used for startup or for setup mode without a higher-level controller.

FCB 04 is selected by the system, not by the operator.

FCB 05 Speed control

The inverter can be operated as a speed-controlled axis.

The user can specify profile values for acceleration, deceleration, and jerk as the basic condition for speed control. The actual speed setpoint for the drive controller is generated in the controller cycle with the specified limit values by a profile generator integrated in the inverter.

FCB 06 Interpolated speed control

FCB 06 is used for cyclic speed setpoint inputs from higher-level controllers.

In multi-axis applications, a controller often calculates a path profile for several drive axes. The axis is only assigned setpoints (speed/torque and torque limits/precontrol values/inertia) that it has to follow. The axis limits the setpoints using the application limits. The path curve profile is controlled by the controller.

The setpoint cycle of the controller usually does not correspond to the setpoint cycle of the axis. If the axis were to "see" the same setpoint for several cycles, a step-shaped actual value would result. To prevent this from happening, the axis interpolates intermediate values. To do so, the setpoint cycle of the controller has to be known.

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FCB 07 Torque control

The inverter can be operated as a torque-controlled axis.

The user can specify profile values for deceleration and jerk as the basic conditions for torque control. The actual torque setpoint for the drive controller is generated in the controller cycle with the specified limit values by a profile generator integrated in the inverter.

During torque control, the maximum speed is restricted by the speed limits so that the drive cannot permanently accelerate with the preset setpoint torque while the counter-torque is too low.

FCB 08 Interpolated torque control

FCB 08 is used for cyclic torque setpoint inputs from a higher-level controller.

This higher-level controller usually calculates a track profile for several drive axes. The axis is then assigned just one setpoint (torque, torque limits, precontrol values, inertia) that it has to follow.

The inverter limits the setpoints using the application limits. The path curve profile is controlled by the controller.

The cycle in which the controller sends the setpoints to the axis normally does not correspond to the setpoint processing cycle of the inverter. If the inverter were to "see" the same controller setpoint for several cycles, a step-shaped actual torque value would result.

To prevent this from happening, the axis can calculate intermediate values (interpolate) if it knows the controller cycle. The inverter can be set to different cycle times of higher-level controllers.

FCB 09 Position control

FCB 09 is used for positioning to make it possible to use a position profile for reaching the target position. This position profile is parameterized by the profile generator. The inverter additionally provides the following positioning modes:

Absolute positioning

The position setpoint in user units is interpreted as an absolute target and is converted and executed in system units.

The travel range in system units is -2^{31} to 2^{31} -1. If this travel range is exceeded after conversion, the FCB issues an error.

Relative positioning

The position setpoint in user units is interpreted as the offset for the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint. If the time calculated in system units is outside the travel range of -2^{31} to 2^{31} -1, the FCB issues an error.

Modulo in positive direction with absolute position specification

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

- Lower limit = "Modulo min."
- Upper limit = "Modulo max."

If the position setpoint is outside this range, a fault is issued.

The drive always turns in a positive direction to reach the target.

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Modulo in negative direction with absolute position specification

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

- Lower limit = "Modulo min."
- Upper limit = "Modulo max."

If the position setpoint is outside this range, a fault is issued.

The drive always turns in a negative direction to reach the new target.

Modulo with shortest distance with absolute position specification

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

- Lower limit = "Modulo min."
- Upper limit = "Modulo max."

If the position setpoint is outside this range, a fault is issued.

The direction of the drive is determined using the last setpoint position (= current actual position after activation without an "In position" message) and the current setpoint position. From here, the shortest distance is determined and the direction of rotation for positioning is specified accordingly.

FCB 10 Interpolated position control

FCB 10 is used for cyclic preselected position setpoints from higher-level controllers.

In multi-axis applications, a higher-level controller usually calculates a track profile for several drive axes. The axis only receives setpoints (position, speed, torque, torque limits, precontrol values, inertia), which it must follow directly. The axis limits the setpoints using the application limits. The path curve profile is controlled by the controller. The setpoint cycle of the controller usually does not correspond to the setpoint cycle of the axis. If the axis were to "see" the same setpoint for several cycles, a step-shaped actual value would result. To prevent this from happening, the axis interpolates intermediate values. To do so, the setpoint cycle of the controller has to be known.

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FCB 12 Reference travel

To perform positioning operations, a drive has to be referenced to a defined start or reference position within the permitted travel distance. From this reference position, positions such as the machine zero can be specified and approached. With each restart of the inverter, referencing the position encoders is always necessary if position encoders do not have an absolute position detection. When using absolute encoders, the absolute position is immediately known when starting the system. An absolute encoder still has to be referenced to match the displayed position with the plant's reference system. Several reference travel types are available for referencing and for finding the reference point:

0: Deactivated

1: Zero pulse – negative end

2: Reference cam – negative end

3: Reference cam – positive end

4: Positive limit switch

5: Limit switch negative

6: Reference cam flush – limit switch positive

7: Reference cam flush – limit switch negative

8: Referencing to reference travel

9: Fixed stop positive

10: Fixed stop negative

11: Absolute position of encoder

FCB 13 Stop at application limits

When FCB 13 is activated, the drive stops with speed control using the preset application limit deceleration.

FCB 14 Emergency stop

When FCB 14 is activated, the drive stops with the preset emergency stop deceleration.

The emergency stop deceleration should always be greater than or equal to the "Application limit deceleration". If a smaller deceleration value than the "Application limit deceleration" is specified for the emergency stop deceleration, the "Application limit deceleration" is used as the emergency stop deceleration.

FCB 18 Rotor position identification

For the operation of permanent magnet synchronous motors, the exact position information of the rotor is required for closed-loop control.

FCB 18 is required for the encoder calibration of rotary and linear synchronous motors with encoder. FCB 18 requires an electrical startup of the drive.

The drive must be separated from the load, i.e. also from the gear unit.

For a third-party motor, it is recommended to run FCB 25 before performing rotor position identification.

FCB 19 Position hold control

When FCB 19 is activated, the drive stops with speed control. After the drive reaches an idle state, the position is kept with position control as long as FCB 19 is active.

FCB 20 Jog mode

FCB 20 is used for the setup mode when a higher-level controller is used.

FCB 20 can only be activated in operating modes with encoder feedback.

FCB 20 allows the user to move an axis in a positive and negative direction.

Control is performed via control signals that are specified by means of control words, via digital inputs of a higher-level controller or via input terminals.

For startup or for setup mode without a higher-level controller, use the manual mode of the MOVISUITE® engineering software, see "FCB 04 Manual mode" (→ 🗎 128).

FCB 21 Brake test

FCB 21 tests the function and performance of up to 2 brakes. The function separately applies an adjustable torque (static test) to the applied brakes.

The brake test can be adapted to various requirements. The test result "passed" (test result OK) or "failed" (test result not OK) is available as feedback for each brake. Other measured values are also available.

An application-specific load torque must be taken into account when specifying the torque. The user can specify values. Alternatively, FCB 21 can determine the current load situation itself, which simplifies startup and offers more flexibility.

FCB 21 works with drive train 1. An encoder feedback that matches the used VFC^{PLUS} or CFC control mode is required.

When testing a brake, the integrated brake control is used.

For testing 2 brakes, you can only use the /BES brake control in conjunction with additional external wiring.

FCB 25 Motor parameter measurement

FCB 25 is used for determining the necessary parameters from the electric equivalent wiring diagram during startup.

The nameplate data of the connected motor is required for motor parameter measurement.

After the motor parameter measurement has been completed, the motor is completely started up electrically. Values that are not yet final at this stage, such as maximum speed and maximum torque, are estimated. The values have to be corrected at a later time to reach the full performance of the motor.

FCB 25 should only be called up if no output filter is used. Otherwise, the FCB provides incorrect results because of the output filter inductance.

Calling up FCB 25 is generally recommended for third-party motors. FCB 18 must be executed afterward for encoder calibration with synchronous motors, if required.

FCB 26 Stop at user limits

FCB 26 is used for stops at user limits. The user limits are either available as local setpoints or initiate the deceleration ramp set via the fieldbus. You can choose between a speed-controlled ramp and a position-controlled ramp. Unlike the other stop FCBs (FCB 13/FCB 14), FCB 26 has a very low priority.

This allows you to select FCB 26 as default (e.g., bit in the control word that selects this FCB is always TRUE). This means that FCB 26 is always active when all other FCBs are deselected. This makes it possible to always stop in a position-controlled manner.

In position-controlled mode, FCB 26 has lag error monitoring. When the stop is reached, the brake remains released and the motor remains energized.

5.6.2 Setpoints and limits in the FCBs

Setpoint connection

The following table shows which setpoints are used by which FCBs.

Parameter	FCB						
	05	06	07	08	09	10	20
Position	–	–	–	–	✓	✓	–
Speed	✓	✓	–	–	–	o	o
Torque	–	–	✓	✓	–	–	–
Acceleration precontrol	–	o	–	–	–	o	–
Mass moment of inertia	–	o	–	✓	–	o	–
Torque precontrol	–	o	–	✓	–	o	–
Correcting value of external position controller	–	o	–	–	–	–	–

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Profile value connection

The following table shows which profile values are used by which FCBs.

Parameter	FCB										
	02	05	06	07	08	09	10	13	14	20	26
Maximum positive speed	–	–	–	✓	✓	✓	–	–	–	–	–
Maximum negative speed	–	–	–	✓	✓	✓	–	–	–	–	–
Maximum acceleration	–	✓	–	–	–	✓	–	–	–	o	–
Maximum deceleration	✓	✓	–	–	–	✓	–	–	–	o	✓
Jerk time	–	✓	–	✓	–	✓	–	–	–	o	✓
Maximum torque Q1 to Q4	–	✓	✓	✓	✓	✓	✓	o	o	–	–

Limit values

The following table shows which limit values are used by which FCBs.

Parameter	FCB														
	02	04	05	06	07	08	09	10	12	13	14	19	20	21	26
Positive speed	–	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	✓	–	–
Negative speed	–	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	✓	–	–
Acceleration	–	✓	✓	–	–	–	✓	–	✓	–	–	✓	✓	–	–
Deceleration	✓	✓	✓	–	–	–	✓	–	✓	✓	–	✓	✓	o	✓
Jerk time	✓	✓	✓	–	✓	–	✓	–	✓	✓	✓	✓	✓	o	✓
Torque	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	o	✓
Apparent output current	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Voltage limit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Emergency stop deceleration	–	–	–	–	–	–	–	–	–	–	✓	–	–	–	–

5.7 Recommendations for motor and inverter selection

The basis for motor selection are the limit characteristic curves of the motors in inverter operation. The limit characteristic curve states the torque characteristic of the motor depending on the speed.

The dynamic and thermal limits must be observed when selecting the motor.

5.7.1 Thermal limit characteristic curve

The mean motor speed and the effective torque are calculated during drive selection to determine the thermal loading of the motor. The operating point of the motor must be below the limit characteristic curve of the motor, otherwise the motor will be thermally overloaded.

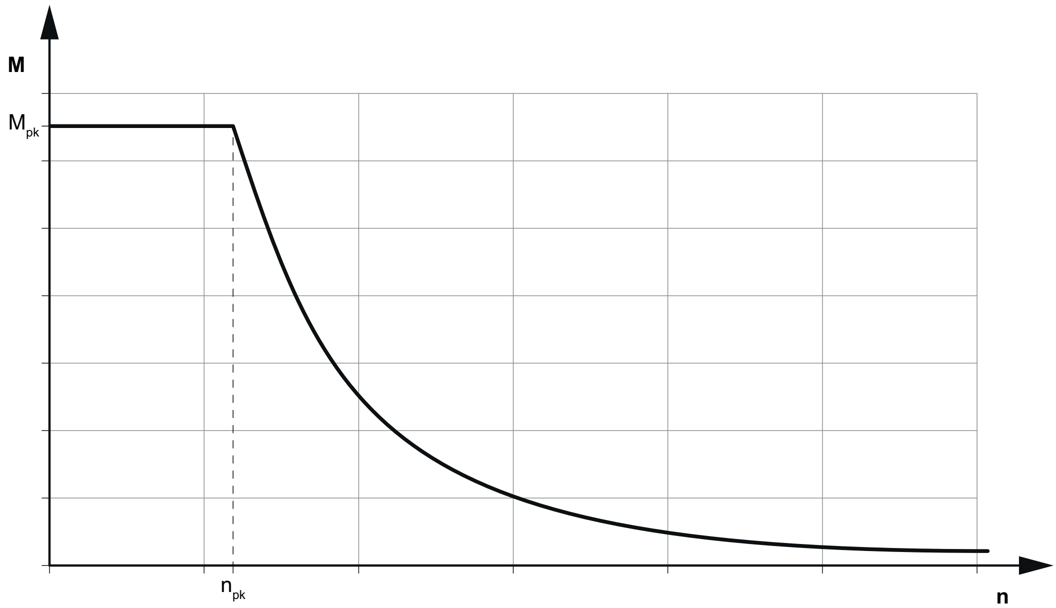
5.7.2 Dynamic limit characteristic curve

The dynamic limit characteristic curve depicts the maximum torque the motor can generate at a certain speed. Note that the inverter must supply sufficient current for the motor to reach its maximum torque.

The base speed is especially important for configuration. The base speed is the available speed up to the maximum motor torque. In inverter operation, the base speed indicates the beginning of field weakening. The motor torque is limited by the voltage limit characteristic curve in the field weakening range, and decreases with increasing speed.

M_N is determined by the motor. M_{pk} and n_{pk} depend on the motor/inverter combination. The values for M_{pk} and n_{pk} in the VFC^{PLUS}, CFC, ELSM® control modes can be found on the website sew-eurodrive.de.

Typical dynamic limit characteristic of an asynchronous motor in the VFC^{PLUS}/CFC control mode



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M_{pk} Maximum torque for the motor-inverter combination
n_{pk} Rotational speed until the maximum torque M_{pk} of the motor-inverter combination is available.

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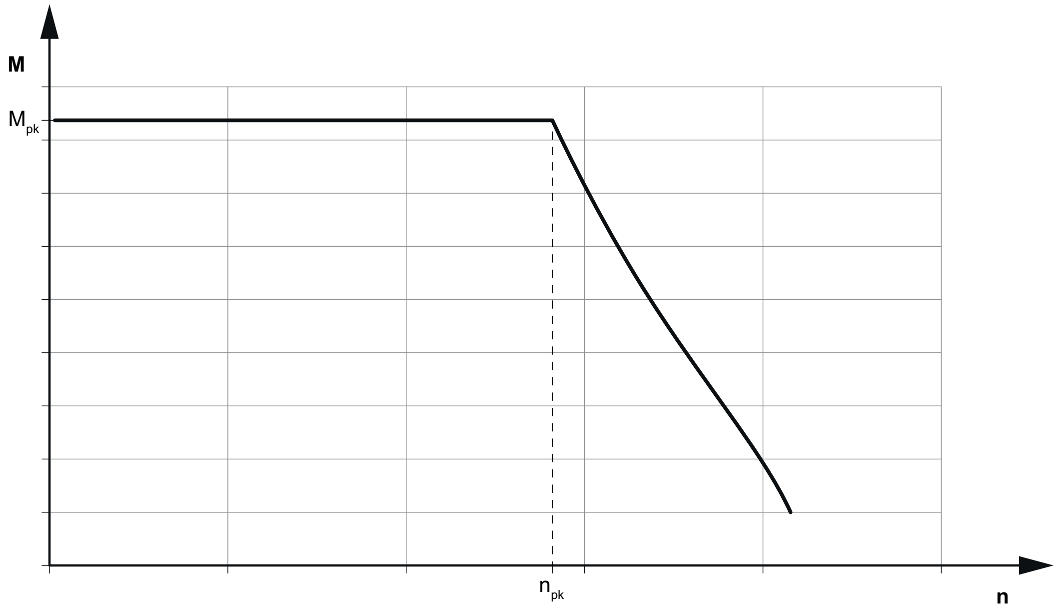
Typical dynamic limit characteristic of a synchronous motor in CFC control mode



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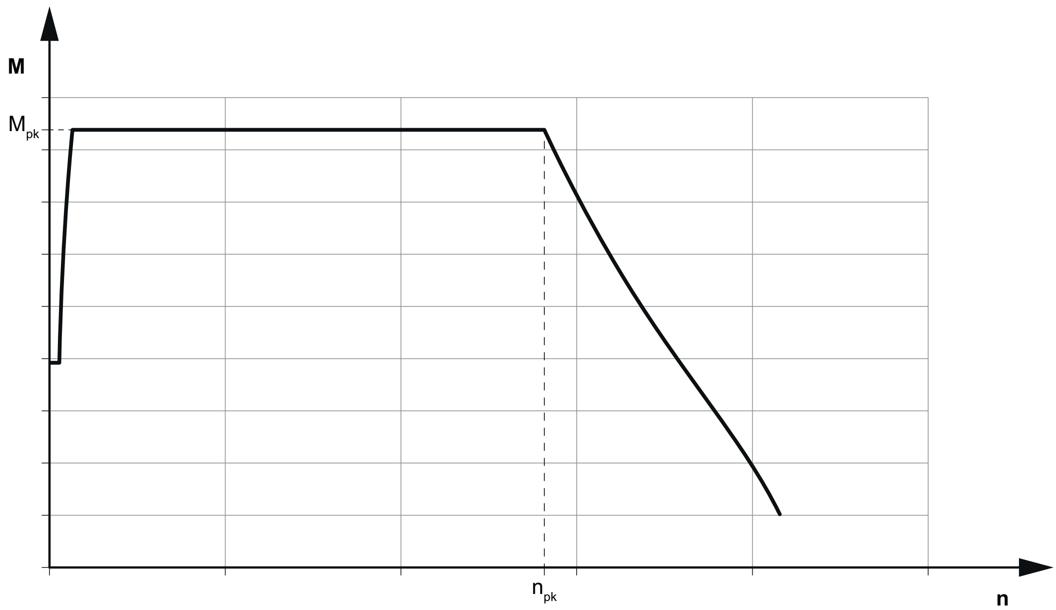
M_{pk} Maximum torque for the motor-inverter combination

n_{pk} Rotational speed until the maximum torque M_{pk} of the motor-inverter combination is available.

Typical dynamic limit characteristic of a synchronous motor in ELSM® control mode



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M_{pk} Maximum torque for the motor-inverter combination

n_{pk} Rotational speed until the maximum torque M_{pk} of the motor-inverter combination is available.

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5.7.3 Motor selection for synchronous motors

The demands made on a servo drive include speed dynamics, stable speed, and positioning accuracy. As a rule, the synchronous servomotors and the corresponding inverters are designed for a high short-time overload. This allows a multiple of the nominal torque.

Synchronous motors in CFC control mode

Technically speaking, these are synchronous motors with permanent magnets on the rotor and an integrated encoder. The mass moment of inertia of the synchronous motor is lower than that of the asynchronous motor. For this reason, these motors are optimally suited to applications requiring dynamic speeds.

Do not configure the maximum speed higher than the rated speed of the motor.

SEW-EURODRIVE recommends a PWM frequency of 8 kHz or 16 kHz for the following motors:

- CMP40/..50/..63 for speeds above 4500 min^{-1}
- CMP71/..80/..100 for speeds above 3000 min^{-1}
- CM3C63/..71/..80/..100 for speeds above 3000 min^{-1}

SEW-EURODRIVE recommends using the following temperature sensors:

- KTY84-130 (SEW-EURODRIVEdesignation: KY)
- Pt1000 (SEW-EURODRIVE designation: PK)

Synchronous motors in ELSM® control mode

For operation of synchronous motors in the ELSM® control mode, there are 2 modes, i.e. open-loop and closed-loop operation.

Open-loop operation is active when starting from an idle state and below a transition speed. The transition speed is about 2% of the nominal speed. In this range, the available torque is limited. In open-loop control, the rated output current of the inverter is 1.5 times the standstill current I_0 of the connected motor, regardless of the load. It is therefore necessary to check whether the inverter can also provide this current at low output frequencies. Check whether the thermal characteristics of the motor are suitable for this. Permanent operation below the transition speed is not permitted.

Above this transition speed value, the drive is operated in closed-loop operation. In closed-loop control, the usable torque depends on the motor as well as on the motor-inverter combination.

The values for the transition speed, base speed and maximum dynamic torque in open-loop and closed-loop control can be found in the speed-torque characteristics. For motor/inverter characteristic curves, refer to the SEW-EURODRIVE website.

The ELSM® control mode allows dynamic use of the entire speed range of the drive. Reversing and moving through the speed 0 are also possible.

Do not configure the maximum speed higher than the rated speed of the motor.

Using the ELSM® control mode for hoists and inclining tracks is not permitted.

SEW-EURODRIVE recommends a PWM frequency of 8 kHz or 16 kHz for the following motors:

- CMP40/..50/..63 for speeds above 4500 min^{-1}
- CMP71/..80/..100 for speeds above 3000 min^{-1}
- CM3C63/..71/..80/..100 for speeds above 3000 min^{-1}

SEW-EURODRIVE recommends using the following temperature sensors:

- KTY84-130 (SEW-EURODRIVEdesignation: KY)
- Pt1000 (SEW-EURODRIVE designation: PK)

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5.8 Motor/inverter characteristic curves

The motor/inverter characteristic curves apply to the edition of these operating instructions. You can find further motor/inverter characteristic curves on the website sew-eurodrive.de under "Online support" > "Engineering & selection" > "Motor/inverter characteristic curves".

5.9 Selecting an inverter

The inverter is selected based on the course of the output current over time. The required current has to be determined from the required torque characteristic of the connected motor.

The inverters are dimensioned for a nominal output current I_N. In many applications, there is a demand for short-time overload operation. For this purpose, the inverters can be operated with a higher nominal output current for a short period of time.

For overload operation, make sure that the inverter is not thermally overloaded. For protection of the power components, inverters have various monitoring mechanisms.

The following thermal monitoring functions are available:

- Dynamic utilization

  The periodic current load of the switching power semiconductors lets them heat and cool down cyclically. Due to the different thermal time constants, large temperature differences can occur between the power semiconductors and the heat sink. Dynamic utilization monitors the permitted temperature of the barrier layer of the power semiconductors.
- Thermal utilization

  The power semiconductors are limited by the maximum permitted temperature during operation. Thermal utilization monitors the heat sink temperature of the power semiconductors.
- Electromechanical utilization (I^2t utilization)

  Electromechanical utilization protects the components that have a large thermal time constant compared to the power semiconductors.

Due to the complexity of the utilization curves, the calculation can only be performed using software. The SEW-Workbench software offers support for dimensioning an inverter.

For a rough selection of the inverter without using software, characteristic load cycles are provided in the following sub-chapters.

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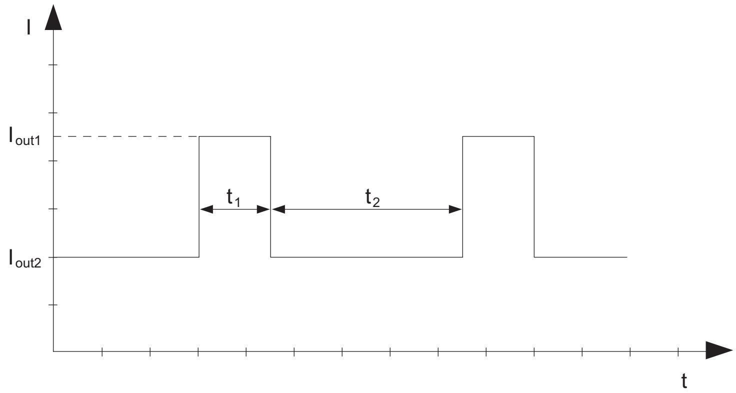
5.9.1 Overload capacity

Load cycle with base load current – typical for the selection of asynchronous and servomotors

The characteristic load cycle consists of a base load and an overload period. In the base load period, the output current must not exceed the specified value. After the base load period, overload is possible again.



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Overload capacity at f_{PWM} = 4 kHz, $f_A \geq$ 3 Hz

Overload current $I_{out\ 1}/I_N$	Overload time t_1	Base load current $I_{out\ 2}/I_N$	Required pause interval t_2	Base load current $I_{out\ 2}/I_N$	Required pause interval t_2
150%	3 s	25%	2 s	50%	2.5 s
200%	3 s	25%	6.5 s	50%	8.0 s
250%	3 s	25%	12.5 s	50%	15 s
350%	3 s	25%	20.5 s	50%	24.5 s

5.9.2 Power reduction factors

Due to the following operating and ambient conditions, a reduction of the output current may be necessary.

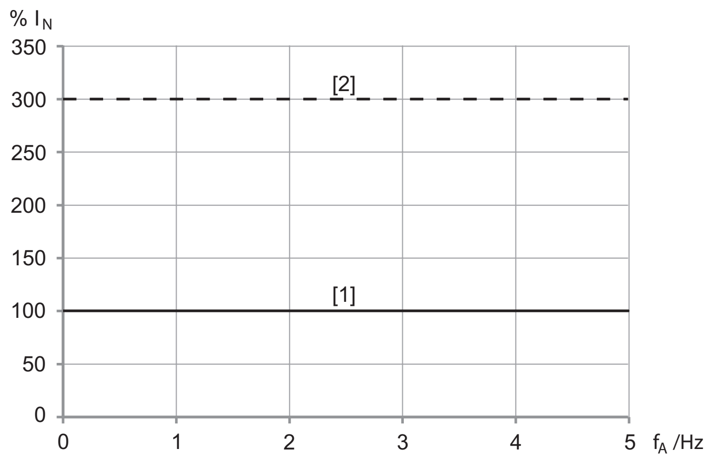
Derating due to the rotary field frequency

The specified nominal output current I_N of the inverter is the effective value. The increased load on the power semiconductors has to be considered especially for slow rotating fields and rotating fields at standstill. In case of a rotating field at standstill, direct current that can correspond to the peak value of the sine current depending on the phase position is flowing.

It is particularly important to consider output frequencies f_A < 3 Hz.

The following characteristic curves show the required derating depending on the output frequency f_A of the various electronics covers:

Electronics cover size 1, $I_N \leq$ 4.0 A

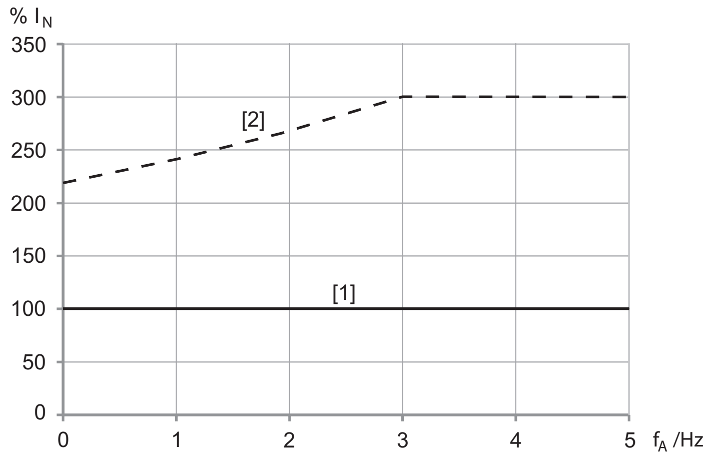


48637660299

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Electronics cover size 1, I_N = 5.5 A

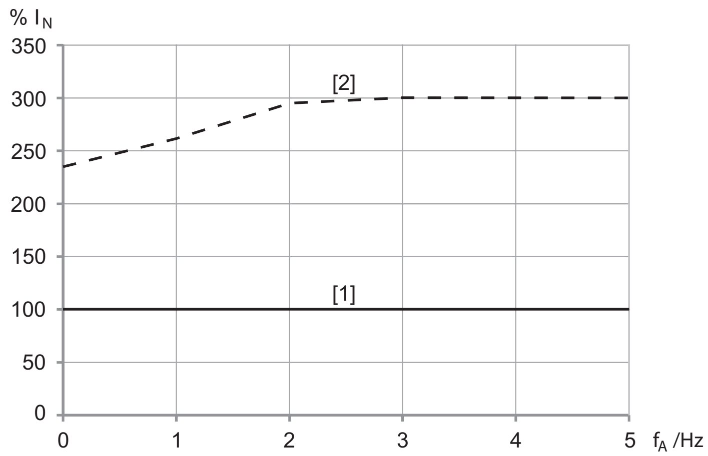


48637898123

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Electronics cover size 2, $I_N \leq$ 9.5 A

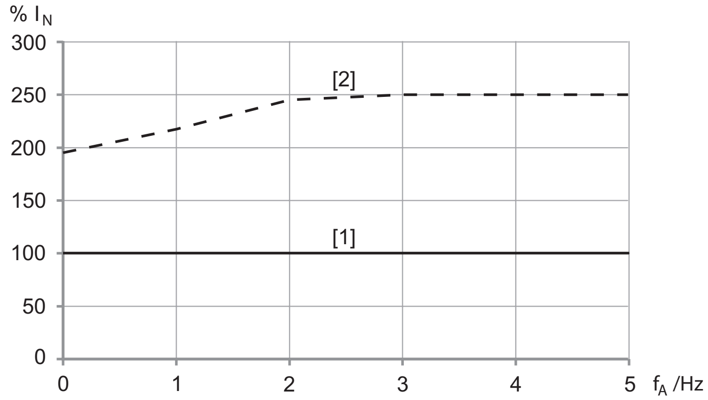


48639185803

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Electronics cover size 2, I_N = 12.5 A

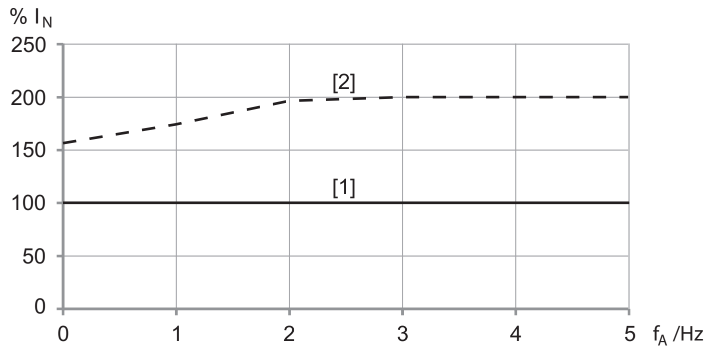


48639193867

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Electronics cover size 2, I_N = 16.0 A



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[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Observe the overload capacity of the device according to chapter "Output at design MMF.1..".

Derating due to the installation altitude

Frequency inverters by SEW-EURODRIVE are designed for overvoltage category III and for altitudes up to 2000 m according to EN 61800-5-1. The air pressure and the air density decrease depending on the installation altitude. This leads to a reduced cooling capacity and to a reduced electrical isolation effect of the air.

No restrictions apply to altitudes < 1000 m.

The following restrictions apply to altitudes ≥ 1000 m:

- From 1000 m to max. 3800 m: I_N reduction by 1% per 100 m
- From 2000 m to max. 3800 m: To maintain protective separation and the air gaps and creepage distances according to EN 61800-5-1, an overvoltage protection device must be connected upstream to reduce the overvoltages from category III to category II.

Derating due to the ambient temperature

Observe the additional derating as described in chapter "Technical data" > ... > "Derating depending on the ambient temperature".

5.10 Selecting the braking resistor

5.10.1 General Information

Using a braking resistor is only required if generator mode is reached during operation. A braking resistor is not required if the device is operated solely in motor mode.

5.10.2 Derating due to the ambient temperature

The following derating applies at ambient temperatures of > 40 °C:

- Reduction of the continuous power by 4% per 10 K
- Reduction of the tripping current by 2% per 10 K

Do not exceed a maximum ambient temperature of 60 °C.

5.10.3 Selection criteria

The braking resistor is selected in the SEW Workbench. The necessary selection parameters for the braking resistor are calculated during the project planning procedure. Depending on these selection parameters, a braking resistor is selected from the table.

The selection parameters in the following sections are the basis for selecting the braking resistor.

Continuous braking power

The minimum required continuous braking power (braking power at 100% cdf) of the braking resistor for load cycles can be calculated using the relative cyclic duration factor cdf and the overload factor k.

If the cyclic duration factor cdf is unknown, it can be calculated from the cycle duration t_{tot} and the braking time t_B using the following formula.

$$cdf = \frac{t_B}{t_{tot}} \times 100\ \%$$

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cdf Cyclic duration factor
t_B Braking time
t_{tot} Cycle duration

INFORMATION

The cycle duration must not exceed 120 s.

The overload factor k can be determined using the diagrams in chapter "Overload factor k" and the cyclic duration factor cdf.

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The value of the average braking power P_B is taken from the project planning data of the application.

$$P_B = \frac{\sum_{i=1}^{n} P_i}{\sum_{i=1}^{n} t_i}$$

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P_B Average braking power
P_i Braking power section i
t_i Braking time section i
n Number of braking sections

The minimum required braking power at 100% cdf is calculated using the following formula:

$$P_{100\%ED} = \frac{P_B}{k}$$

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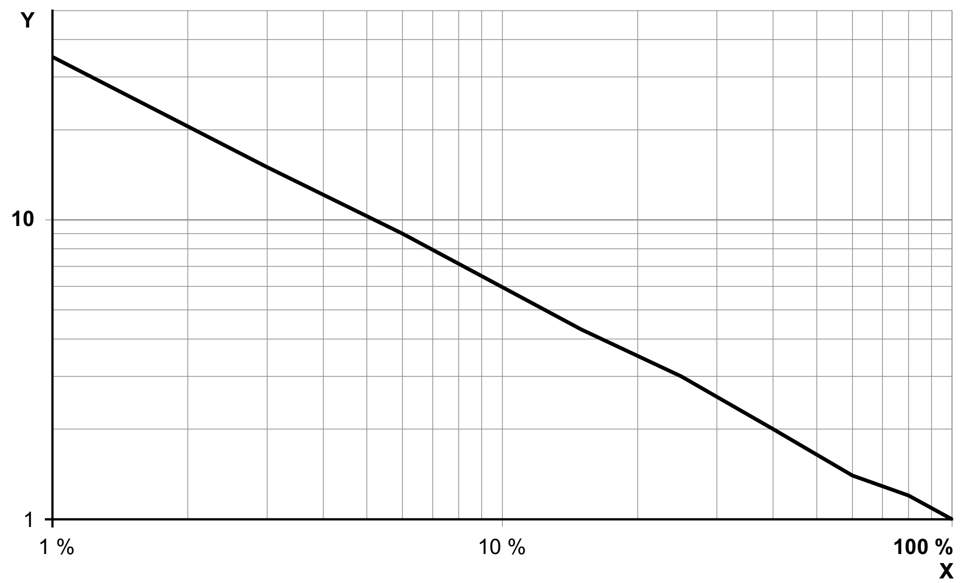
$P_{100\%cdf}$ Braking power at 100% cdf
P_B Average braking power
k Overload factor

The braking power required by the application at 100% cdf must be smaller than or equal to the typical braking power at 100% cdf (continuous braking power) of the braking resistor.

Overload factor OF

Flatpack resistors



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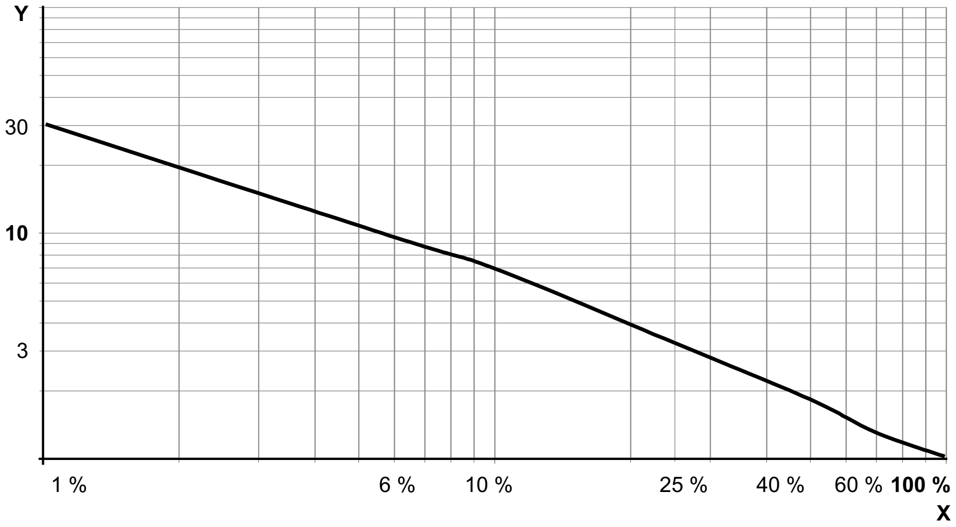
X	Cyclic duration factor in %	1	3	6	15	25	40	60	80	100
Y	Overload factor k	35	15	9	4.3	3	2	1.4	1.2	1

Wire resistors, frame resistors



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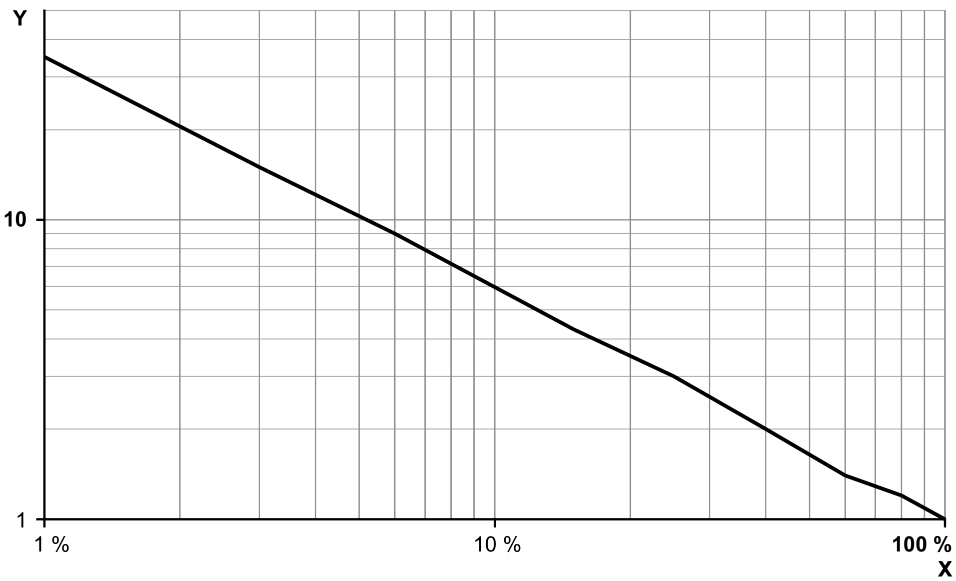
X	**Cyclic duration factor in %**	1	3	6	15	25	40	60	80	100
Y	**Overload factor k**	30	15	9.5	5	3.2	2.2	1.5	1.12	1

Grid resistors



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X	**Cyclic duration factor in %**	1	3	6	15	25	40	60	80	100
Y	**Overload factor k**	20	12	7.6	4	3	2.2	1.5	1.12	1

Peak braking power

The maximum peak braking power that can be achieved is specified by the resistance value and the DC link voltage. It is calculated as follows:

$$P_{\text{max}} = \frac{V^2_{\text{DCL max}}}{R \times 1.4}$$

P_{max}	Maximum peak braking power that the braking resistor can absorb
V_{DCL_max}	Maximum DC link voltage: • 980 V for 400 V units
R	Braking resistance value

The maximum peak braking power required by the application is calculated from the regenerative parts within a cycle.

The peak braking power required by the application must be lower than the maximum peak braking power that can be achieved and absorbed by the braking resistor.

The peak braking power for each braking resistor is specified in chapter "Braking resistors".

Current-carrying capacity of the brake chopper

The resistance value of the braking resistor R_{BR} must not be lower than the minimum permitted braking resistance R_{BRmin}, see chapter "Technical data" (→ 🗎 28). This ensures that the brake chopper is not damaged.

$$R_{BR} \geq R_{BRmin}$$

The continuous braking power toward the braking resistor must not exceed the apparent output power of the inverter.

5.10.4 Calculation example

Given

- Peak braking power: 1 kW
- Average braking power: 0.4 kW
- Braking time: 7 s
- Cycle duration: 28 s

Required

- BW.. braking resistor

Calculation

1. **Determining the cyclic duration factor**
   - Cyclic duration factor cdf = braking time/cycle duration
   - Cyclic duration factor cdf = (7 s/28 s) × 100% = 25%

   When selecting the braking resistor, observe the assignment of inverter and braking resistor, see chapter "Technical data" > "Braking resistors" > ... > "Assignment".
2. **Determining the overload capacity**

Determining the overload factor, e.g. for a flatpack resistor at a cyclic duration factor cdf of 25% from the respective diagram.

- Overload factor OF = 3.0

3. **Calculating the braking power at 100% cdf**
   - Braking power 100% cdf = average braking power/overload factor
   - Braking power 100% ED = 0.4 W/3.0 = 0.133 kW
   - The braking power of the braking resistor at 100% cdf must be ≥ 0,133 kW.
4. **Selecting the braking resistor**
   - The minimum permitted braking resistance value = 100 Ω, see chapter "Technical data" > "Braking resistors BW.../BW...-T".
   - Selected braking resistor: BW100-005/K1.5
   - Resistance value R_{BR} = 100 Ω
   - Peak braking power: 1.8 kW
   - Current-carrying capacity at 100% cdf: 0.2 kW

5.10.5 Supply cable for braking resistor

Use only shielded or twisted cables.

The cable cross section depends on the tripping current I_F.

The nominal voltage of the cable must be at least V_0/V = 450 V/750 V.

The maximum permitted cable length between the inverter and the braking resistor is 15 m.

The temperature resistance of the braking resistor cables must be ≥ 90 °C.

5.10.6 Protection against thermal overload of the braking resistor

To avoid thermal damage of the braking resistor as well as subsequent damage, the braking resistor has to be thermally monitored. SEW-EURODRIVE suggests the following options:

- Integrated temperature switch –T

  Braking resistors with the label –T are equipped with an integrated temperature switch. The temperature switch is thermally coupled to the braking resistor and switches an NC contact in case of overtemperature of the braking resistor. The braking resistor-inverter connection is not interrupted. In case of thermal overload, the regenerative operation has to be terminated. SEW-EURODRIVE recommends shielding the connection cable of the temperature switch.

5.10.7 Parallel connection of braking resistors

It is permitted to connect several identical braking resistors in parallel. The following applies:

- The power connections of the braking resistors must be connected to +R and -R in parallel.
- Each braking resistor requires separate protection against thermal overload.
- The signal contacts (NC contacts) of the protection devices must be connected in series.

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5.11 Supply system cables and motor cables

5.11.1 Supply system cable

The supply system cable is generally dimensioned system-specifically and depends on the design of the line connection. The structure of a line connection is described in chapters "Terminal assignment .." and "Permitted cable cross section of the terminals". Observe the country-specific and system-specific regulations when selecting the cross section of the supply system cable.

5.11.2 Recommended cross section for nominal operation

Dimension the cross section of the supply system cable based on the nominal line current I_{line}. Refer to the data in chapter "Technical data" (→ 🗎 28).

5.12 EMC-compliant installation according to EN 61800-3

The inverters are designed for use as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 "Adjustable-speed electrical drives".

Provided the EMC-compliant installation is observed, the appropriate requirements for a CE marking are met on the basis of the EMC Directive 2014/30/EU.

5.13 Line components

5.13.1 Line contactor

A line contactor is used to separate the inverter from the supply system in the event of a fault and to switch the power supply on and off.

For further information, refer to chapter "Using the line contactor".

5.13.2 NF.. line filters

A line filter reduces interference emission via the supply system cable, which is generated by the inverter. The line filter mainly serves to meet interference voltage limit requirements in the frequency range from 150 kHz to 30 MHz at the line connection. In addition, a line filter dampens the interference from the grid affecting the inverter. The choice of line filter depends on the nominal line current and the line voltage of the inverter.

5.13.3 ND.. line choke

An ND.. line choke can be used as an option:

- To support overvoltage protection
- To smoothen the line current, to reduce harmonics
- For protection in the event of distorted line voltage
- Limiting the charging current when several inverters are connected together in parallel on the input end with a shared line contactor (nominal current of line choke = total of inverter currents)

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5.13.4 Residual current device

For further information, refer to chapter "Electrical installation" > "Installation instructions" > "Selecting the residual current device".

5.14 24 V supply voltage selection

5.14.1 Description

The device has an internal 24 V voltage supply that can also be supported externally.

If the device is supported by an external supply, the entire 24 V supply is provided by the external power supply unit.

5.14.2 Project planning for 24 V supply power

The power consumption of all components is required for dimensioning the 24 V supply voltage. The 24 V voltage supply must provide the sum of all powers.

INFORMATION

The power peaks during switch-on (caused by internal capacitances present in the devices) must not be taken into consideration as those capacitances are very small. Commercially available switched-mode power supplies can reliably switch on the maximum occurring capacities.

5.14.3 Power consumption of the 24 V supply

For technical data of the 24 V supply, refer to chapter "DC 24 V supply" > "Configuration".

5.15 Energy-saving functions

5.15.1 Standby mode

The energy-saving function standby operation is designed for periods in which the operation is paused.

If necessary, activate standby operation with a binary input or a bit of the control word.

Switching from standby operation to operation takes only approx. 500 ms. This is the main difference to switching off the DC 24 V supply voltage. This short changeover time reduces energy consumption even in short pauses.

The following functions are deactivated in standby mode:

- Power section control
- Fan of the power heat sink (if present)
- Binary outputs
- STO function
- CBG functions (display: "standby operation")
- Changing parameters
- Updating the firmware
- Reset to delivery state
- Drive and motor startup
- Optional:
  – Switch off the supply of the encoder and the safety card
  – Encoder evaluation

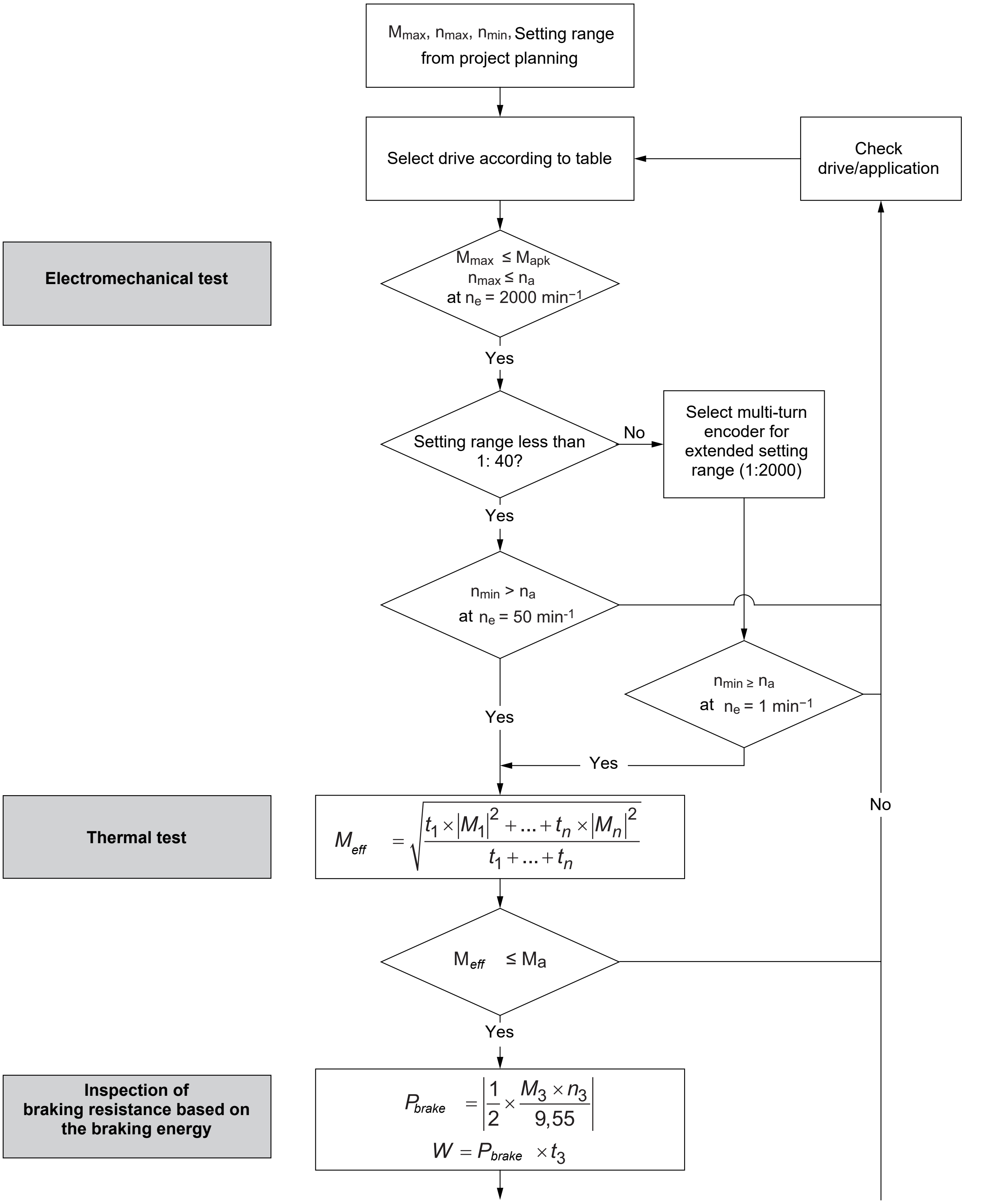
The bus communication remains active without restrictions in standby operation.

Switch the devices with safety option to standby mode every 30 minutes at most.

5.16 MOVIGEAR® performance

5.16.1 Project planning procedure

The following flow diagram illustrates the project planning procedure for a MOVIGEAR® performance drive unit:



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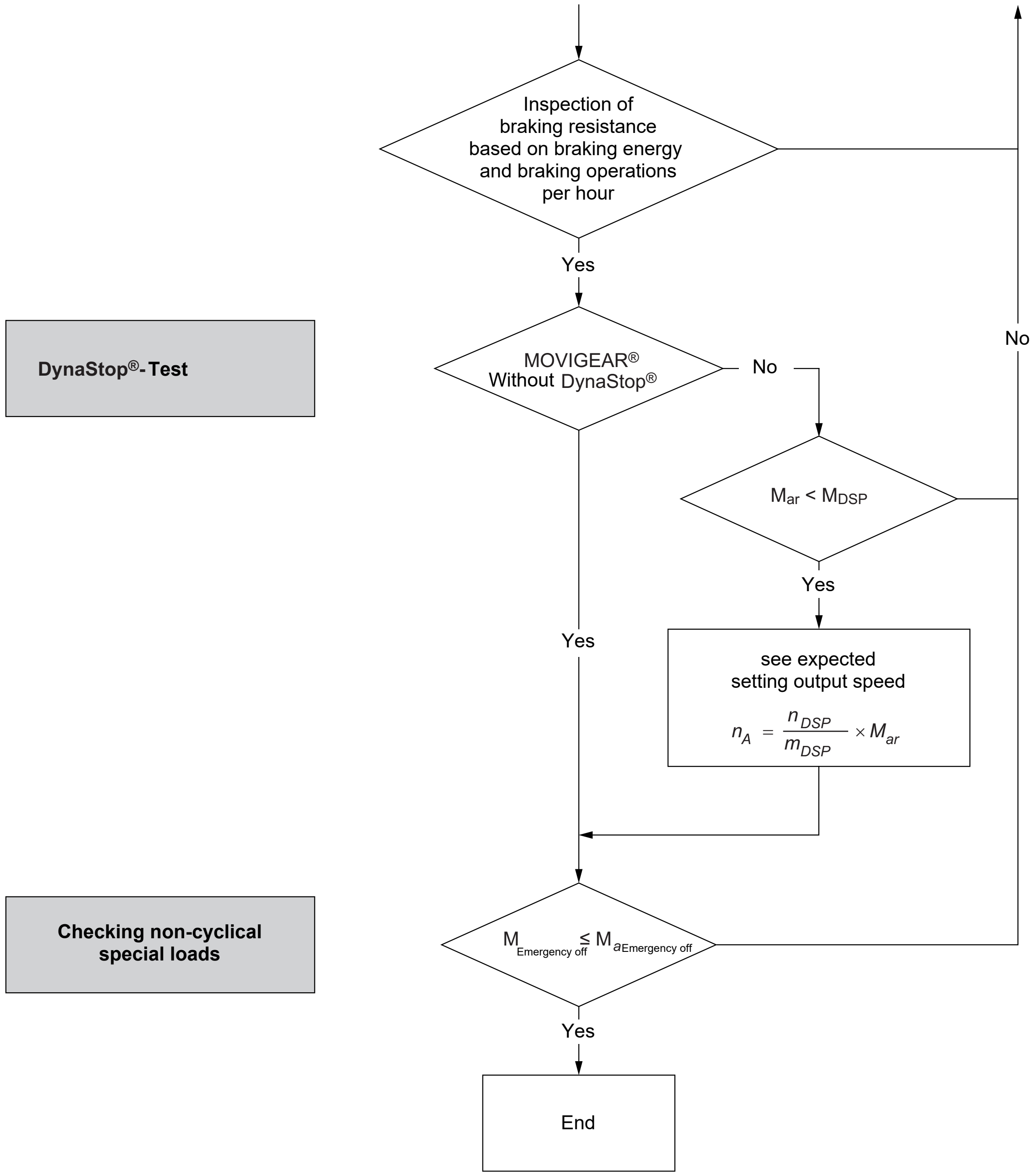

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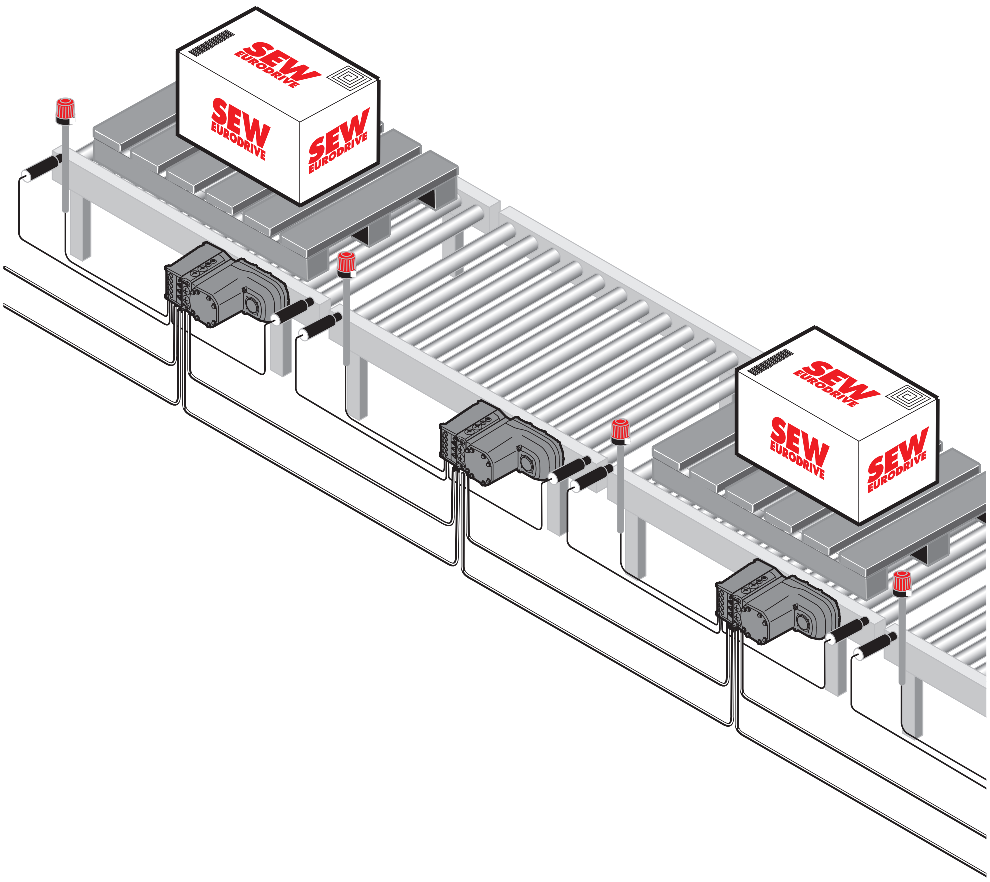
5.16.2 Drive selection using the example of a roller conveyor

Description of the application

This chapter illustrates the selection of a MOVIGEAR® performance drive unit using the example of a roller conveyor for transporting wooden pallets with the following specifications:

Load weight	m	2500 kg
Conveying speed	v	22 m/min
Positioning speed	v	5 m/min
Acceleration	a	0.4 m/s²
Number of rollers	a	8
Efficiency of the application with rollers	η_{app}	0.7
Roller diameter	D	140 mm
Lever arm of the rolling friction (wood/steel)	f	1.2
Bearing diameter	d	28 mm
Bearing friction value	$\mu_{bearing}$	0.005
Switching frequency	c	6 mal/h
Maximum external force at standstill	F_{ext}	800 N

The following figure shows a schematic illustration:



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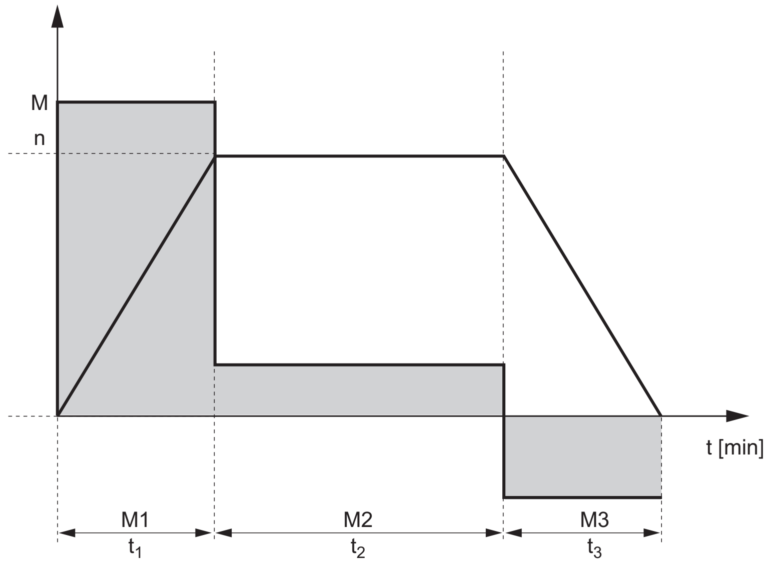
Calculating the application

The travel profile consists of the 3 travel sections acceleration, constant movement, and deceleration.



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The following table shows the calculations for the application that are required to determine the drive units:

Calculations	
Static resistance to vehicle motion	$F_R = \mu \times m \times g$ $\mu = \left[\frac{2}{D} x \left(\mu_{bearing} \times \frac{d}{2} + f \right) + c \right]$ $\mu = \left[\frac{2}{140mm} x \left(0.005 \times \frac{28mm}{2} + 1.2 \right) + 0 \right]$ $\mu = 0.01814$ $F_R = 0.01814 \times 2500kg \times 9.81$ $F_R = 445N$ *9007224477237899*
Dynamic resistance to vehicle motion	$F_{Dyn} = m \times a$ $F_{Dyn} = 2500kg \times 0.4\, m/s^2$ $F_{Dyn} = 1000N$
Torque in range M1	$M_1 = \frac{(F_R + F_{Dyn}) \times D}{2 \times \eta}$ $M_1 = \frac{(445N + 1000N) \times 0.14m}{2 \times 0.7} = 145.5Nm$
Torque in range M2	$M_2 = \frac{F_R \times D}{2 \times \eta} = 45.5Nm$

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Calculations	
Torque in range M3	$M_3 = \left(\frac{F_R}{\eta} - F_{Dyn} \times \eta\right) \times \frac{D}{2}$ $M_3 = \left(\frac{445N}{0.7} - 1000 \times 0.7\right) \times \frac{0.14m}{2} = -4.5Nm$
Output speed	$n_{amin} = \frac{v_{min}}{\pi \times D} = \frac{5\,m/\min}{\pi \times 0.14m} = 11.4\min^{-1}$ $n_{amax} = \frac{v_{max}}{\pi \times D} = \frac{22\,m/\min}{\pi \times 0.14m} = 50.0\min^{-1}$

Selecting the MOVIGEAR® performance drive unit

Observe the following points when selecting the MOVIGEAR® performance drive unit:

1. Which torque class (size) is required?
   - ⇨ **Requirement:** The maximum possible starting torque of the MOVIGEAR® performance drive unit must be higher than the maximum application torque: $M_{max} \leq M_{apk}$
   - ⇨ The application calculations result in a maximum application torque during startup of M_{max} = 145 Nm.
   - ⇨ MGF..2-..-C drive units with i > 10.37 meet these requirements.
   - ⇨ **Result:** A MOVIGEAR® performance drive unit of torque class MGF..2 is selected.
2. Selecting the gear ratio with output speed:
   - ⇨ **Requirement:** The application calculations result in an output speed of n_a = 50 min^{-1}. To achieve a high setting range and an optimum efficiency, the required output speed should be achieved as precisely as possible at an input speed of n_e = 2000 min^{-1}.
   - ⇨ **Result:** The drive with a gear ratio of i_{tot} = 37.24 and an output speed of n_a = 53.7 at n_e= 2000 min^{-1} is selected from the tables in the product manual > chapter "Technical data" > "Torque characteristics" (→ 🗎 71).

MGF..2-..-C									
	n_a	n_a	M_a	M_{apk}			M_a EmergOff	i_{tot}	Mass
	at n_e= 50 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 500 – 2000 min^{-1}	at n_e= 200 – 1500 min^{-1}	at n_e= 1750 min^{-1}	at n_e= 2000 min^{-1}			
	min^{-1}	min^{-1}	Nm	Nm	Nm	Nm	Nm		kg
2-stage	14.8	593.5	14	41	30	22	65	3.37	16
	...	...	...	...	...	...	...	...	
	...	...	...	...	...	...	...	...	
	...	...	...	...	...	...	...	...	

MGF..2-..-C									
	n_a	n_a	M_a	M_{apk}			M_a	i_{tot}	Mass
	at n_e= 50 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 500 – 2000 min^{-1}	at n_e= 200 – 1500 min^{-1}	at n_e= 1750 min^{-1}	at n_e= 2000 min^{-1}	EmergOff		
	min^{-1}	min^{-1}	Nm	Nm	Nm	Nm	Nm		kg
3-stage	1.8	71.3	112	220	220	185	330	28.07	17
	1.5	60.6	132	220	220	218	330	33.02	
	1.3	53.7	149	220	220	220	330	37.24	
	1.2	47.4	169	220	220	220	330	42.19	
	1.1	44.4	180	220	220	220	330	45.03	
	1.0	38.8	200	220	220	220	330	51.51	
	0.9	36.2	200	220	220	220	330	55.25	

3. Check the setting range and minimum speed
   - ⇨ Setting range 5 m/min: 22 m/min ≈ 1:4.4.
   - ⇨ The standard control range of 1:50 is thereby sufficient. The option /AZ1Z (multi-turn encoder with MOVILINK® DDI connection) must not be selected.
   - ⇨ n_a at n_e 40 min^{-1} = 1.1 min^{-1} < n_{min} = 11.4 min^{-1}.
4. Thermal check of the MOVIGEAR®:
   - ⇨ **Requirement:** To avoid any thermal problems, the effective torque of the application must be less than the continuous output torque of the MOVIGEAR® drive unit: $M_{eff} < M_a$

$$t_1 = t_3 = \frac{v}{a} = \frac{22 m/\text{min}}{0.4 \frac{m}{s^2} \times 60} = 0.92 s$$

$$t_2 = 10 \,\text{min} \times 60 \frac{s}{\text{min}} - t1 - t3 = 598.16 s$$

$$M_{eff} = \sqrt[2]{\frac{t_1 \times |M_1|^2 + t_2 \times |M_2|^2 + t_3 \times |M_3|^2}{t_1 + t_2 + t_3}}$$

$$M_{eff} = \sqrt[2]{\frac{0.92 s \times |145.5 Nm|^2 + 598.16 s \times |45.5 Nm|^2 + 0.92 s \times |-4.5 Nm|^2}{0.92 s + 598.16 s + 0.92 s}} = 45.1 Nm$$

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   - ⇨ Based on the application calculation, the effective torque is M_{eff} = 45.1 Nm. The continuous output torque of the selected MOVIGEAR® drive unit amounts to M_a at n_e 2000 min^{-1} = 149 Nm.
   - ⇨ Take any power-reducing factors into consideration (derating for installation altitude and ambient temperature).

- ⇨ **Result:** The requirements are met.

5. Checking the braking resistor
   - ⇨ Calculation of the regenerative power when decelerating:
     $$P_{brake} = \left| \frac{1}{2} \times \frac{M_3 \times n_3}{9.55} \right|$$
     $$P_{brake} = \left| \frac{1}{2} \times \frac{4.5 Nm \times 50 \frac{1}{\min}}{9.55} \right| = 11.8 W$$
   - ⇨ Proceed according to chapter "Regenerative current-carrying capacity of the integrated braking resistor".

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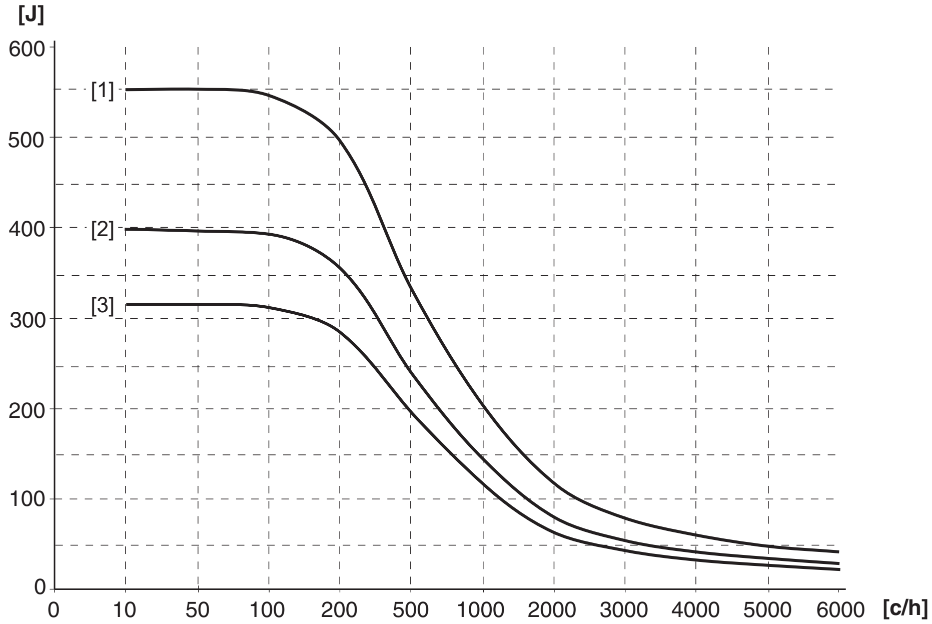
5.16.3 Regenerative load capacity of the integrated braking resistor

The following diagram shows the current-carrying capacity of the BW1 braking resistor per braking operation:



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[1] Deceleration ramp 10 s
[2] Deceleration ramp 4 s
[3] Deceleration ramp 0.2 s
c/h Cycles/hour

Calculation example

The known values are:

- Average braking power: 11.8 W
- Deceleration ramp: 0.92 s
- 6 brake applications per hour

Calculating the energy from the power of the deceleration ramp:

$$W = P \times t = 11.8W \times 0.92s = 10.9J$$

The specified deceleration ramp in seconds refers to a speed change of 3000 min^{-1}.

Calculating the brake ramp of MOVIGEAR®:

a_{ab} = 3000 min^{-1} × 0.92 s / 1863 min^{-1} = 1.5 s.

For the deceleration ramp of 1.5 s, you can use deceleration ramp [3] (0.2 s) in the diagram.

The diagram permits 310 J of braking energy for the 0.2 s deceleration ramp at 6 cycles per hour. In this case, the required 10.9 J can be dissipated via BW1.

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5.17 DynaStop® – The electrodynamic retarding function

5.17.1 Functional description

INFORMATION

For the functional description of DynaStop® refer to chapter "Operation" > "DynaStop®" (→ 352)

5.17.2 Checking whether DynaStop® can be used

Requirement:

To use DynaStop®, the retrodriving torque M_{ar} must be smaller than the maximum deceleration torque M_{DSP}:

$$M_{ar} < M_{DSP}$$

Calculating the retrodriving torque:

Known values of the application:

F_{ex} = 800 N

F_R = 445 N

$$M_{ar} = (F_{ex} - F_R) \times \eta \times \frac{D}{2}$$

$$M_{ar} = (800N - 445N) \times 0.7 \times \frac{0.14m}{2} = 17Nm$$

Result:

In the application, an MGF2 unit with a gear ratio i_{tot} = 37.24 is used.

The maximum deceleration torque M_{DSP} 143 Nm at n_{DSP} 3.08 min^{-1} for this design can be found in the product manual > chapter "Technical data" > "DynaStop® torques" (→ 67).

The retrodriving torque M_{ar} is smaller than the maximum deceleration torque. This means DynaStop® can be used:

$$M_{ar} < M_{DSP}$$
$$17Nm < 143Nm$$

Checking the application speed:

$$n_A = \frac{n_{DSP}}{M_{DSP}} \times M_{ar}$$

$$n_A = \frac{3.08 \frac{1}{\min}}{143Nm} \times 17Nm = 0.37 \frac{1}{\min}$$

$$v = n_a \times D \times \pi = 0.37 \frac{1}{\min} \times 0.14 \times \pi = 0.16 \frac{m}{\min}$$

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Result:

Due to the external force, the speed for the application example is 0.16 m/min.

5.18 UL-compliant installation

INFORMATION

Due to UL requirements, the following chapter is always printed in English and in some cases in French, regardless of the language of this documentation.

Observe the following notes for UL-compliant installation:

The devices are for use only in industrial machinery NFPA 79 applications.

For use in a Pollution Degree 1 or Pollution Degree 2 environmental only.

5.18.1 Field Wiring Power Terminals

- Use 75 °C copper wire only.
- Tighten terminals to 17.7 – 21.24 in-lbs (screw connect terminals only).

5.18.2 Short Circuit Current Rating

Suitable for use on a circuit capable of delivering not more than 65,000 rms symmetrical amperes when protected by 600 V nonsemiconductor fuses (Class CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T) or when protected by 500 V minimum inverse time circuit breakers having an interrupting rating not less than 65kA rms symmetrical amperes.

The max. voltage is limited to 500 V.

Suitable for motor group installation on a circuit capable of delivering not more than 65,000 rms symmetrical amperes when protected by, 600 V maximum nonsemiconductor fuses (Class CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T) or when protected by 500 V maximum inverse time circuit breakers having an interrupting rating not less than 65 kA rms symmetrical amperes.

The max. voltage is limited to 500 V.

5.18.3 Branch Circuit Protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

WARNING - The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

ATTENTION - LE DÉCLENCHEMENT DU DISPOSITIF DE PROTECTION DU CIRCUIT DE DÉRIVATION PEUT ÊTRE DÛ À UNE COUPURE QUI RÉSULTE D'UN COURANT DE DÉFAUT. POUR LIMITER LE RISQUE D'INCENDIE OU DE CHOC ÉLECTRIQUE, EXAMINER LES PIÈCES PORTEUSES DE COURANT ET LES AUTRES ÉLÉMENTS DU CONTRÔLEUR ET LES REMPLACER S'ILS SONT ENDOMMAGÉS. EN CAS DE GRILLAGE DE L'ÉLÉMENT TRAVERSÉ PAR LE COURANT DANS UN RELAIS DE SURCHARGE, LE RELAIS TOUT ENTIER DOIT ÊTRE REMPLACÉ.

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For maximum branch circuit protection see table below.

SCCR: 65 kA /500 V when protected by	
Non-semiconductor fuses (currents are maximum values)	Inverse time circuit breakers (currents are maximum values)
40 A max./600 V	40 A max./500 V min.

5.18.4 Motor Overload Protection

The devices are provided with load and speed-sensitive overload protection and thermal memory retention upon shutdown or power loss.

The trip current is adjusted to 150 % of the rated motor current.

5.18.5 Surrounding Air Temperature Rating

The devices are suitable for an ambient temperature of 40 °C, max. 60 °C with de-rated output current. To determine the output current rating at temperatures above 40 °C, the output current should be de-rated by 3 % per K between 40 °C and 60 °C.

5.18.6 Wiring Diagrams

For wiring diagrams, refer to chapter "Electrical Installation".

6 Project planning for functional safety

6.1 Definitions

- The term "safe" used in this manual refers to the classification as a safe function according to EN ISO 13849-1.
- The SS1 safety sub-function is described according to the currently applicable EN 61800-5-2 as follows:
  – SS1-t corresponds to the former presentation of SS1(c)

6.2 Integrated safety technology

6.2.1 Safety sub-function STO

The STO safety sub-function is always available in the device.

The described safety technology of the device (safety sub-function STO) has been developed and tested according to the following safety requirements:

- SIL 3 according to EN 61800-5-2, EN 61508
- PL e according to EN ISO 13849-1

This was certified by TÜV Rheinland. A copy of the TÜV certificate can be requested from SEW-EURODRIVE.

6.2.2 Safe state

For safety-related operation of the device, Safe Torque Off is defined as a safe state (see "Safety sub-function STO" (→ 🗎 163)). This is the basis of the underlying safety concept.

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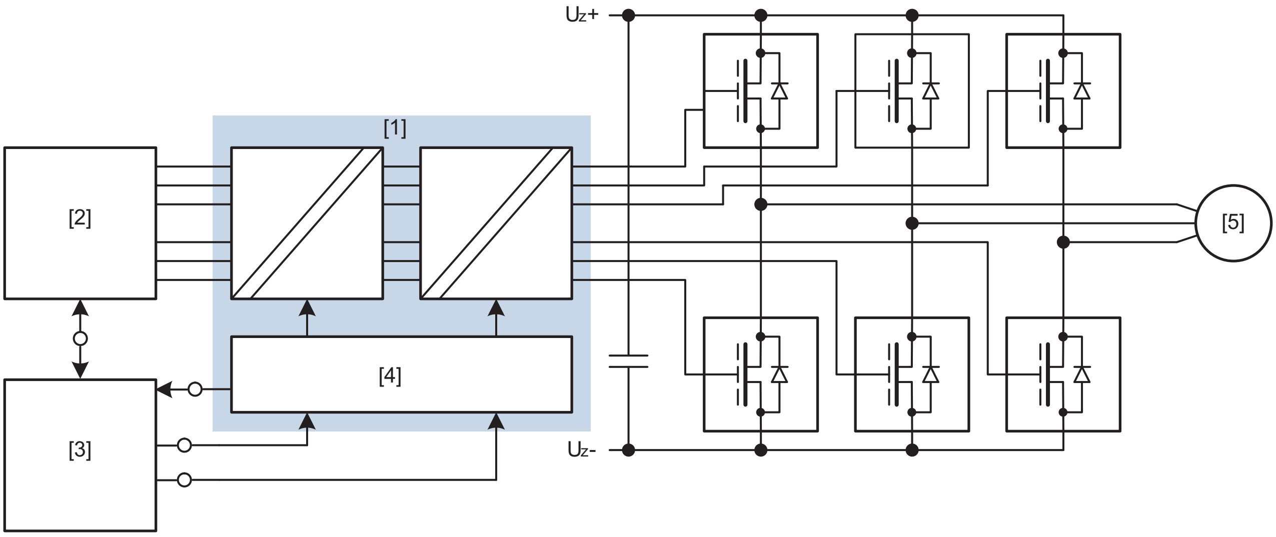
6.2.3 STO safety concept

The device is supposed to be able to perform the safety sub-function "Safe Torque Off" according to EN 61800-5-2:

- The device is characterized by the optional connection of an external safety controller/safety relay. This external safety controller/safety relay disconnects the safety-related STO input via a two-pole 24 V switching signal (e.g., sourcing/sinking) when a connected command device (e.g., emergency stop button with latching function) is activated. This activates the STO function of the device.
- An internal, dual-channel structure with diagnostics prevents the generation of pulse trains at the power output stage (IGBT).
- Instead of a galvanic isolation of the drive from the supply system by means of contactors or switches, the disconnection of the STO input described here safely prevents the activation of the power semiconductors in the output stage. The rotary-field generation for the respective motor is deactivated even though the line voltage is still present.
- When the STO safety sub-function is activated, the generated PWM signals from the device are interrupted by the STO circuit and are not transmitted to the power output stage (IGBTs).
- If the internal diagnostics of the STO circuit detects an error or discrepancy between the two channels, the PWM signals are locked, i.e. STO is activated. This locking requires a reset by switching the DC 24 V supply voltage of the device or the DC 24 V switching signal at the STO inputs F_STO_P1 and F_STO_P2 off and back on.

6.2.4 Schematic representation of the STO safety concept



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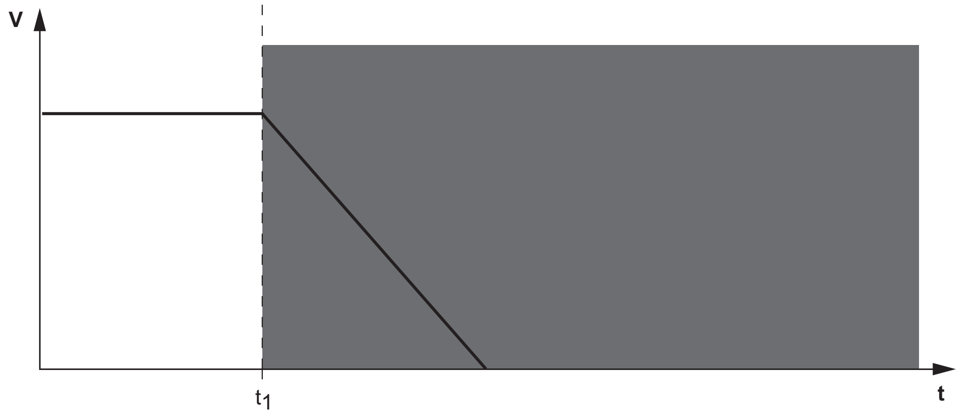
[1] STO function
[2] Drive controller
[3] Internal safety option (optional)
[4] Diagnostics and inhibiting unit
[5] Motor

6.2.5 Safety sub-functions according to EN 61800-5-2

STO – Safe Torque Off

When the STO safety sub-function is active, the power supply to the motor is interrupted and the drive cannot generate any torque. The STO safety sub-function corresponds to a non-controlled stop according to EN 60204-1, stop category 0.



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■	=	STO safety sub-function active
v	=	Speed
t	=	Time
t_1	=	Point in time at which STO is activated.

INFORMATION

The motor coasts to a halt or is stopped mechanically.

Controlled standstill is preferred, if possible.

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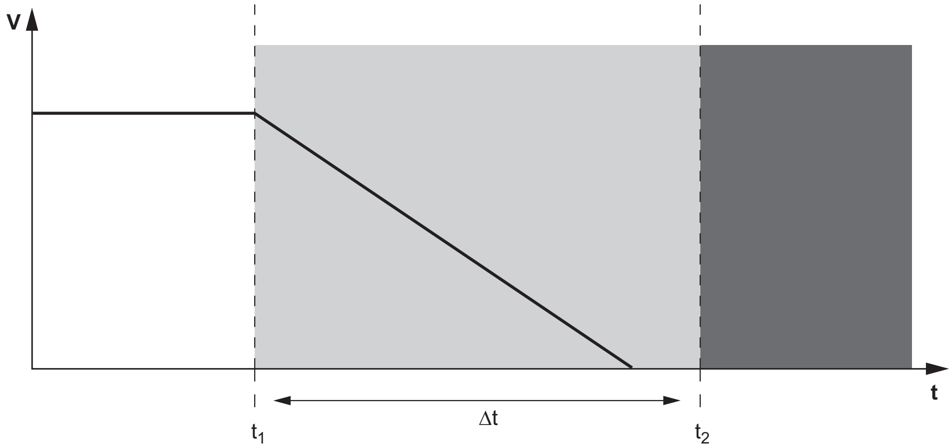
SS1-t – Safe Stop 1 with time control

When the SS1-t safety sub-function is active, the motor is brought to a standstill electrically. The STO safety sub-function will be triggered after a specified, safety-related time.

The SS1-t safety sub-function corresponds to a controlled stop of the drive according to EN 60204-1, stop category 1.



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(light grey)	= SS1-t safety sub-function monitored
(dark grey)	= STO safety sub-function active
v	= Speed
t	= Time
t_1	= Point in time at which SS1-t is activated and motor deceleration is triggered.
t_2	= Point in time at which STO is activated.
Δt	= Safety-related period of time

INFORMATION

- The SS1-t function does not monitor the stopping of the drive.
- The safety-related period of time Δt allows the drive to come to a stop. In the event of a fault, the drive does not come to a stop and becomes de-energized at the time t_2 (STO).

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6.2.6 Restrictions

- It is to be noted that if the drive does not have a mechanical brake or if the brake is defective, the drive may coast to a halt (depending on the friction and mass moment of inertia of the system). In the event of regenerative loads or with axes that are loaded with gravitational forces or driven externally, the drive can even accelerate. This must be taken into account in a risk assessment of the system/machine. Additional safety measures might have to be implemented (e.g. safety brake system).

  The drive unit cannot be used without an additional brake system for application-specific safety sub-functions that require active deceleration (braking) of the dangerous movement.
- When using the SS1-t function, the deceleration ramp of the drive is not monitored with respect to safety. In the case of a fault, the drive might not be decelerated during the delay time, or the drive can accelerate in the worst case. In this case, the safety-related deactivation via the STO function is only activated after the set delay time has passed. The resulting hazard must be taken into account in the risk assessment of the system/machine and may need to be covered through additional safety measures.
- The STO function cannot prevent a possible jerk or DC braking.

⚠ WARNING

The safety concept is suitable only for performing mechanical work on driven system/machine components.

Severe or fatal injuries.

Hazardous voltages are present in the connection box when the STO signal is disconnected.

- Before working on the electric part of the drive system, disconnect it from the supply voltage using an appropriate external disconnecting device and secure it against unintentional reconnection of the voltage supply.

⚠ WARNING

Electric shock due to incompletely discharged capacitors.

Severe or fatal injuries.

- Observe a minimum switch-off time of 5 minutes after disconnecting the power supply.

INFORMATION

The brake and DynaStop® are not safety-related. If the parameter *Apply brake/ DynaStop® in STO state (Index 8501.3)* is enabled, the following is activated when the STO function is triggered:

- The brake is applied.
- DynaStop® is activated.

6.3 Safety requirements

6.3.1 Introduction

The requirement for safe operation is that the safety sub-functions of the device are properly integrated into an application-specific, higher-level safety sub-function. A system/machine-specific risk assessment must be carried out without fail by the system/machine manufacturer and taken into account for the use of the drive system with the device.

The system/machine manufacturer and the user are responsible for the compliance of the system/machine with the applicable safety regulations.

The following requirements are mandatory when installing and operating the device in safety-related applications:

- Use of the approved devices
- Installation requirements
- Requirements for external safety controllers and safety relays
- Startup requirements
- Requirements for operation

6.3.2 Approved devices

The MOVIGEAR® performance device variant is permissible for safety-related applications (STO function):

Drive unit	Nominal output current
MOVIGEAR® performance	2.0 – 5.5 A

6.3.3 Installation requirements

- The wiring technology must comply with the EN 60204-1 standard.
- The safe control cables must be routed in accordance with the EMC requirements. The following points must therefore be observed:
  – Shielded cables must be permanently (fixed) installed and protected against external damage, or equivalent measures must be taken.
  – Adhere to the regulations in force for the application.
  – If the safe outputs and inputs are wired in a 2-channel configuration, the corresponding cables must be routed closely together.
  – The cables must have the same length. A difference in length ≤ 3% of the two cables is permitted.
  – The following maximum cable length must be observed:
    STO: 100 m
  – You must use suitable measures to ensure that the safe control cables are routed separately from the power lines of the drive. This does not apply to cables approved by SEW-EURODRIVE specifically for this application case.
- The STO function does not detect short circuits or interference voltage in the supply line, so you must ensure the following:
  – No parasitic voltages can occur in the STO control cables
  – The external safety controller can detect a crossfault from an external potential to the STO control cables.

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- The values specified for the safety components must be strictly adhered to when designing the safety circuits.
- The STO signals must not be used for feedback.
- Only grounded voltage sources with protective electrical separation (PELV) in accordance with EN 61131-2 and EN 60204-1 may be used for safety controllers/ safety relays.
- When planning the installation, observe the technical data of the device.
- The 0V24_Out and 24V_Out supply voltages of the device may only be used to supply the device-internal STO input. The cable length must not exceed 30 m.

  This connection variant is not permitted for STO group disconnection.
- When the STO control cables are routed into the connection box to terminal X9 of the connection unit, the cable ends must be covered with conductor end sleeves and the cables must be fixed close to terminal X9 using cable ties. Other low-voltage signals can be bundled together with the STO signals.
- For safety-related applications using the device, the jumpers labeled with "Caution, remove Jumper for Safety Operation" at STO terminal X9 must be removed. The unit designs in which the STO connection is made using connectors do not have labeled jumpers. The installed jumper is relevant to the function.

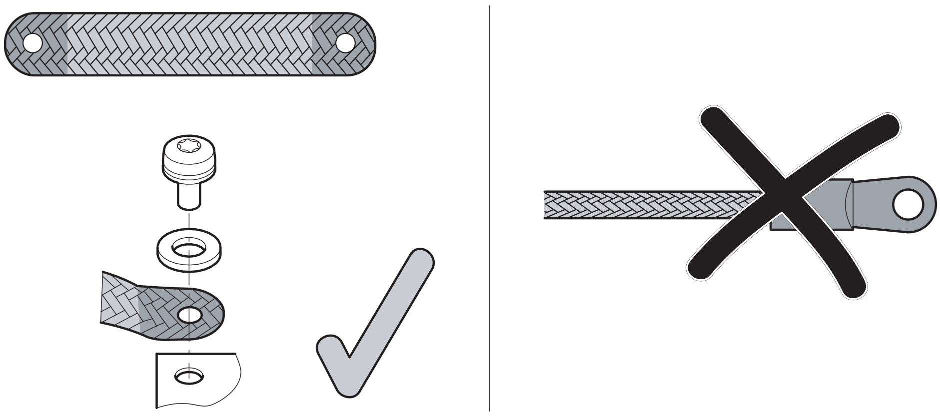
6.3.4 Requirements for EMC-compliant installation

When using functional safety components, SEW-EURODRIVE recommends paying particular attention to proper EMC-compliant installation. This pays off, for example, when using the encoders for safety purposes. Additional diagnostics are performed to detect faults at an early stage. Malfunctions caused by faulty EMC installation can lead to incorrect results during diagnostics and thus restrict the availability of the system.

- You must use suitable measures to ensure that the safe control cables are routed separately from the power cables of the drive. This does not apply to cables approved by SEW-EURODRIVE specifically for this application case.

  Use cable ducts with at least 2 chambers and an uninterrupted separation strip for spatial separation of control cables and energy cables.
- The control cables include the following connection cables:
  - Encoder cables
  - Analog sensor cables
  - Communication cables
  - Extra-low voltage cables
- The energy cables include the following connection cables:
  - Power supply cables
  - Motor cables
  - Brake cable
- Use closed cable ducts made of galvanized sheet steel for the fixed routing of cables in systems so that shielding is provided in all directions. Connect the joints of the cable ducts with each other over a large area.
- When grounding cable ducts (e.g. with grounding straps), ensure that the contact surface is as large as possible due to slotted holes and other mounting openings.

- For high-frequency-suitable grounding, use special grounding straps whose connection points have a sufficiently large surface area. Do not use crimped eyelets.



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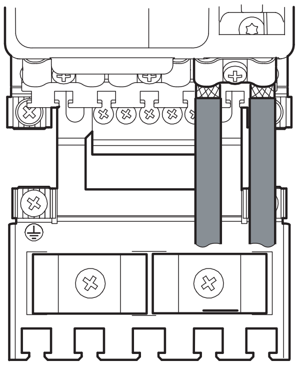
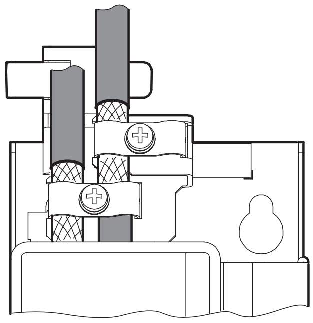
  – Mount grounding straps over the entire surface on well-conducting surfaces. Contact points must be free of paints and other substances. Do not use washers:
- The drag chains are made of plastic. Grounding must be conducted separately.
  – Grounding cables suitable for high-frequency use must be routed separately.
  – Grounding cables suitable for high-frequency use should be designed as short as possible.
  – Grounding cables suitable for high frequencies must not be used as equipotential bonding.
  – The cable should consist of a large number of fine wires (surface, flexibility).
  – The connection pieces should be suitable for HF.
- Cable carriers do not provide shielding or separation of cable types. The following possible solutions are available:
  – Separation of the cable types into several cable carriers.
  – Only use shielded cables.
- Route cables of the various cable types with a distance of at least 200 mm to each other.
- Observe the spatial separation also in distributors. Use metal distributors with partition walls or several individual distributors.
- Always keep the cables short. Observe the permitted cable lengths specified in the product manuals of the products used!
- Keep the necessary reserve loops as short as possible and do not bundle them closely with other cables.
- The shield must be connected on both sides, as shields connected on one side have no effect against the magnetic disturbances.
- Connect shield terminals directly to the local grounding star point.
- For shielded cables, only use connectors with special contact springs for the shield. Follow the manufacturer's instructions.

- Connect the shield to the metal housing over a large area using a suitable cable bushing or shield terminals. Do not use pigtails for shield connection in terminal strips. The pigtail is an antenna that greatly weakens the shielding effect.
- The following figures show examples of the connection of the control cable shielding.



MOVIDRIVE® system
MOVIDRIVE® technology
MOVITRAC® advanced



MOVIDRIVE® modular

6.3.5 Startup requirements

- To validate the implemented safety sub-functions, the safety sub-functions must be checked and documented after successful startup.
- When doing so, the restrictions for the safety sub-functions in chapter "Restrictions" must be taken into consideration. Non-safety-related parts and components which affect the test result (e.g. motor brake) must be deactivated.
- In order to use the device in safety-related applications, it is essential that you perform and record startup checks for the disconnecting device and correct wiring.

INFORMATION

- In order to avoid a hazard in the intended application when a fault occurs, the user must check whether the fault response time of each safety sub-function is shorter than the maximum permissible fault response time of the application. The maximum permissible fault response time must not be exceeded!
- The user must ensure implementation of the requirements of the required safety integrity level (SIL) in accordance with EN 61508 or performance level (PL) pursuant to EN ISO 13849-1.

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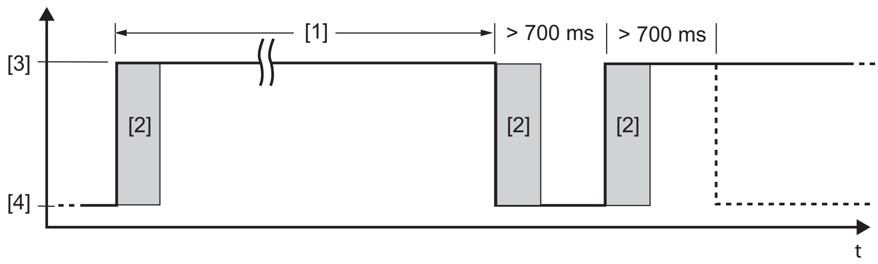
6.3.6 Requirements for the operation of the STO safety sub-function

- Operation is only permitted within the limits specified on the data sheets. This applies to an external safety controller, an external safety relay, as well as to the device and the approved safety options.
- The built-in diagnostic function is limited in the case of a permanently enabled or permanently disabled STO input. Advanced diagnostic functions are performed only upon a level change of the STO signal. The safety sub-function must therefore be requested via the STO input for PL d in accordance with EN ISO 13849-1 and SIL 2 in accordance with EN 61800-5-2 at least once every 12 months, and for PL e in accordance with EN ISO 13849-1 and SIL 3 in accordance with EN 61800-5-2 at least once every 3 months with the line voltage applied in order to achieve full test coverage. Adhere to the following test procedure for this purpose.



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[1] Maximum 12 months for PL d/SIL 2
Maximum 3 months for PL e/SIL 3
[2] Internal diagnostics
[3] High: No STO
[4] Low: STO active

- To achieve complete test coverage after a device reset (e.g. after switching on the supply voltage), the test transition (STO active → STO not active) may be started after > 700 ms at the earliest. The device signals the "ready for operation" or "STO – Safe Torque Off" state if it is not in fault state.
- A detected hardware fault in the internal switch-off channels for STO will lead to a locking fault state in the device. If the fault is reset (e.g. by switching the supply voltage on/off or by a low level at the STO input for at least 30 ms), a complete test with internal diagnostics according to the above-mentioned test procedure must be performed. If the fault occurs again, replace the device or contact SEW-EURODRIVE Service.

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6.3.7 Requirements for the external safety controller

A safety relay can be used as an alternative to a safety controller. The following requirements apply analogously:

- The safety controller and all other safety-related subsystems must be approved for at least the safety class required in the overall system for the respective application-related safety sub-function.

The following table shows an example of the required safety class of the safety controller:

Application	Requirement for safety controller
Performance level d according to EN ISO 13849-1, SIL 2 according to EN 62061	Performance level d according to EN ISO 13849-1 SIL 2 according to EN 61508
Performance level e according to EN ISO 13849-1, SIL 3 according to EN 62061	Performance level e according to EN ISO 13849-1 SIL 3 according to EN 61508

- The wiring of the safety controller must be suitable for the endeavored safety class (see manufacturer's documentation). The STO input of the device can be switched with 2 poles (sourcing output, sourcing/sinking, or serial sourcing), or with 1 pole (sourcing output).
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- Only guards with back-step protection may be used at the STO input of the device. The safeguards must be connected to the device via a safety relay or a safety controller.
- To stop the drive in an emergency in accordance with EN 60204-1, emergency stop control devices must be connected to the STO input of the device as follows:
  - via a safety relay
  - via a safety controller
- To ensure protection against an unexpected restart in accordance with EN ISO 14118, the safe control system must be designed and connected in such a way that resetting the command device alone does not lead to a restart. This means that a restart may only be carried out after a manual reset of the safety circuit.
- If no fault exclusion is used for the STO wiring in accordance with EN ISO 13849-2 or EN 61800-5-2, the external safety device must detect the following faults in the STO wiring within 20 s depending on the connection type:
  - Two-pole sourcing output:

    Short circuit of 24 V at F_STO_P1 or F_STO_P2 (Stuck-at 1)

    Crossfault between F_STO_P1 and F_STO_P2
  - Two-pole sourcing/sinking:

    Short circuit of 24 V at F_STO_P1 (Stuck-at 1)

    Short circuit of 0 V at F_STO_M (Stuck-at 0)
  - Dual-channel serial sourcing output:

    Fault exclusion is mandatory
  - Single-pole sourcing:

    Short circuit of 24 V at F_STO_P (Stuck-at 1)

- Test pulses can take place in the switched on or switched off condition with connection type "Two-pole sourcing output".
  - The test pulses on both sourcing channels must be switched with a time delay. However, additional switch-off test pulses may occur simultaneously.
  - The test pulses in both sourcing channels must not exceed 1 ms.
  - The next switch-off test pulse in one sourcing channel must only occur after a 2 ms time period.
  - A maximum of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any packet before you generate another switch-on test pulse or another switch-on test pulse packet.
  - The signal levels must be read back by the safety controller and compared to the expected value.
  - The signal levels may have a maximum temporal discrepancy of 130 ms. In case of a larger temporal discrepancy, the device changes to the STO fault state (F20.11).
- Test pulses can take place in the switched on or switched off condition with connection type "Two-pole sourcing/sinking".
  - The test pulses in the sourcing and sinking channel must not exceed 1 ms.
  - The next switch-off test pulse in the sourcing or sinking channel must only occur after a 2 ms time period.
  - A maximum of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any packet before you generate another switch-on test pulse or another switch-on test pulse packet.
  - The signal levels must be read back by the safety controller and compared to the expected value.
- Test pulses can take place in the switched on or switched off condition with connection type "Single-pole sourcing output".
  - The test pulse on the sourcing channel must not exceed 1 ms.
  - The next switch-off test pulse may only occur after a time period of 2 ms at the earliest.
  - A maximum of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any packet before you generate another switch-on test pulse or another switch-on test pulse packet.
  - The signal levels must be read back by the safety controller and compared to the expected value.

6.3.8 Acceptance

The system manufacturer must perform an overall evaluation in order to determine the safety of a machine or a system. The effectiveness of each risk minimization must be checked. It must also be checked if the required safety integrity (SIL and/or PL) is reached for each implemented safety function.

To validate the safety integrity level, you can use the "SISTEMA" calculation tool from the "Institut für Arbeitsschutz" (Institute for Occupational Safety and Health of the German Social Accident Insurance).

6.4 Response times

The response time plays a decisive role in the design and implementation of safety sub-functions for systems and machines. In order to match the response time to the requirements of a safety sub-function, the entire system from the sensor (or command device) to the actuator must always be taken into consideration. The following times are of particular importance in connection with the MOVISAFE® CS..A safety option:

- Response time of the connected sensors
- Safe communication cycle time
- Processing time (cycle time) in the safety controller
- Safe communication monitoring time
- Internal response times of the MOVISAFE® CS..A safety option
- Response time of the actuators (e.g. frequency inverters)

Establish the response sequence for each safety sub-function in your application and determine the maximum response time for each case, taking the relevant manufacturer data into consideration. It is particularly important to observe the information in the documentation of the used components.

Details of the maximum response time of the MOVISAFE® CS..A safety option can be found in chapter "Technical data". For detailed information regarding response time consideration for safe PROFIsafe communication, refer to the respective IEC 61784-3-3 standard.

6.4.1 Response times of the STO safety sub-function

The following response times are fixed:

	STO response times	
	Typical	Maximum
Duration from activation of the STO safety sub-function to the shutdown of the rotating field	1.5 ms	10 ms 2 ms[1)]
Duration from deactivation of the STO safety sub-function to the enabling of the rotating field	–	110 ms

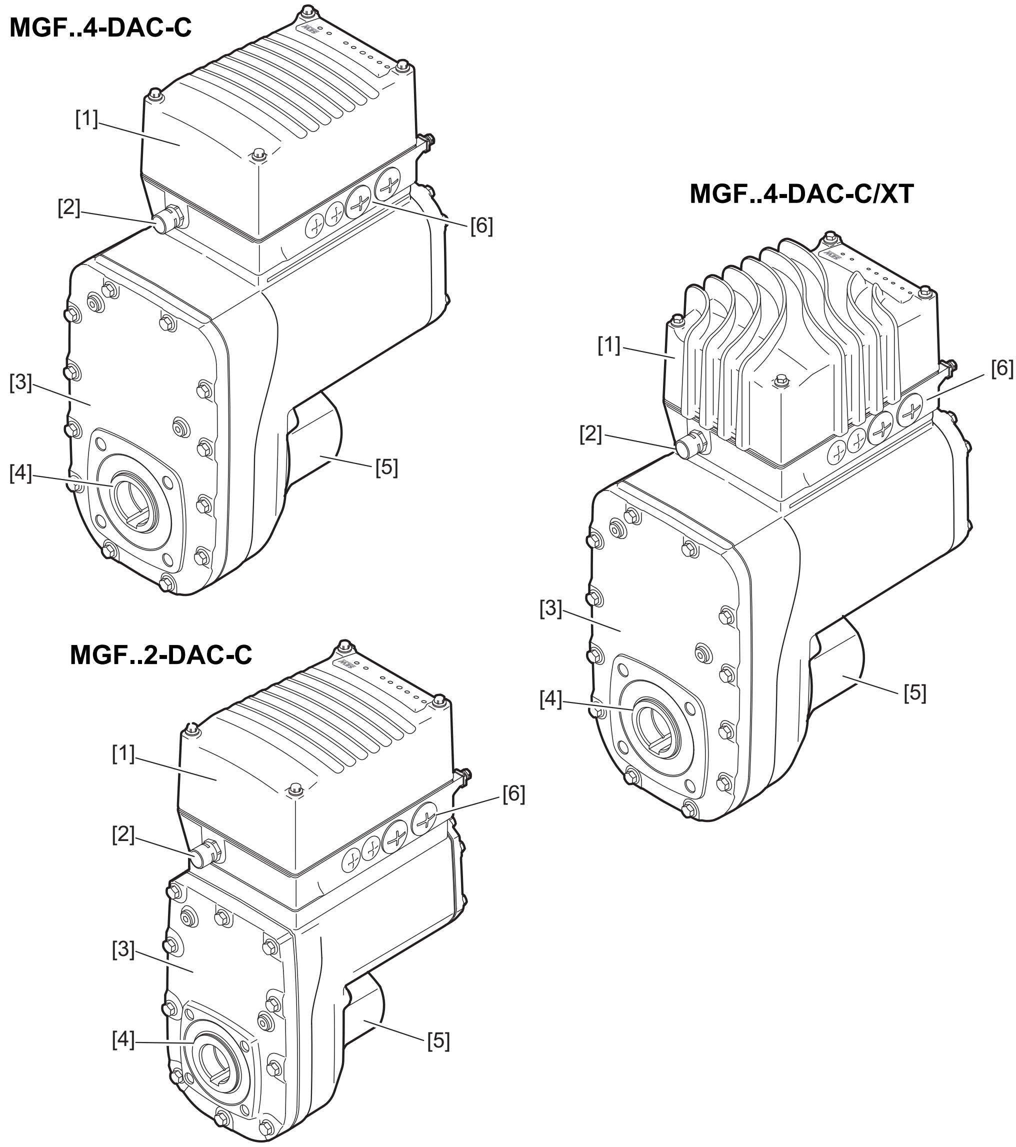
1) Only when STO is being used and controlled via a MOVISAFE® CS..A safety option

7 Device structure

7.1 MOVIGEAR® performance drive unit

7.1.1 MOVIGEAR® performance DAC

MOVIGEAR® performance drive units are made up of the 3 core components gear unit, motor, and decentralized inverter. These 3 core components are included in one die cast aluminum housing (see following figure). In the following chapters the decentralized inverter is called electronics cover.



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[1] Electronics cover

[2] Option /PE (pressure compensation fitting electronics)

[3] Gear unit cover

[4] Output shaft design (pictured here: hollow shaft with keyway)

[5] Optional safety cover

[6] Connection box for cable glands

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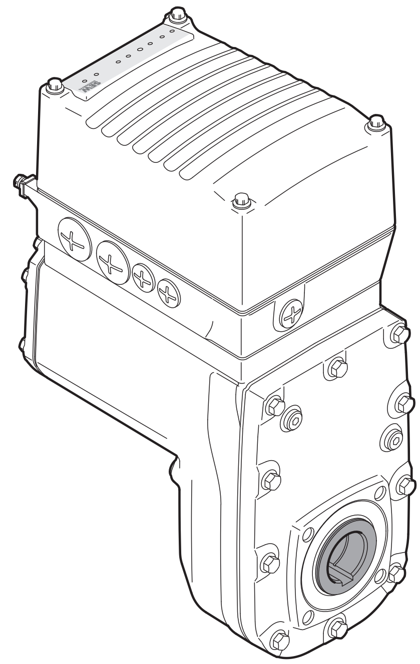
7.2 Shaft designs

7.2.1 MOVIGEAR® performance with hollow shaft and keyway (MGFA..-..-C)

The following figure shows a MOVIGEAR® performance unit with hollow shaft and keyway:



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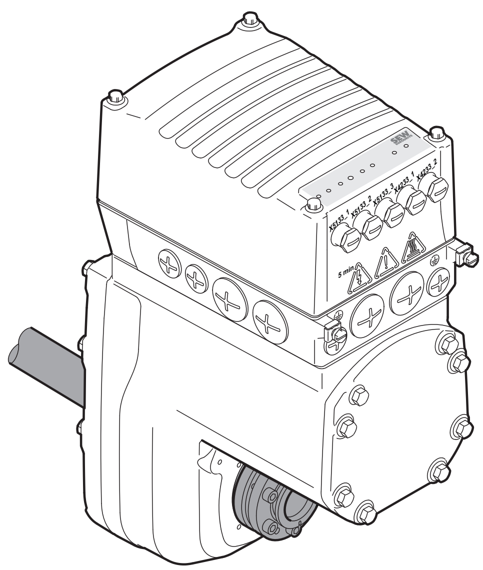
7.2.2 MOVIGEAR® performance with TorqLOC® hollow shaft mounting system (MGFT..-..-C)

The following figure shows a MOVIGEAR® performance unit with TorqLOC® hollow shaft mounting system:



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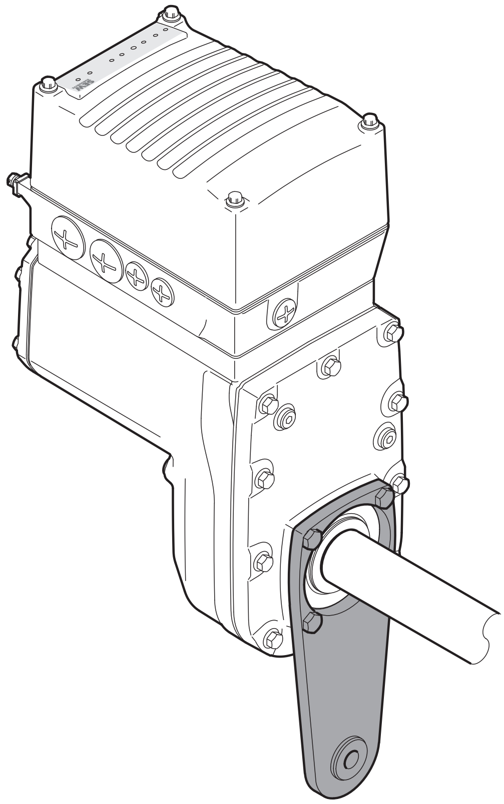
7.3 Mounting the housing

7.3.1 Torque arm (MGF.T.-..-C)

The following figure shows the torque arm for MOVIGEAR® performance:



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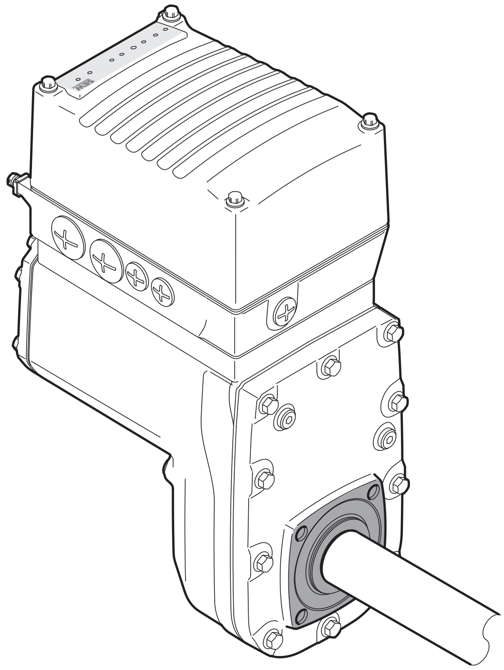
7.3.2 Housing with threads (MGF.S-..-C)

The following figure shows the design "housing with threads" for mounting a torque arm. This design does not include a centering shoulder, which means it is not suitable for direct installation to the system structure:



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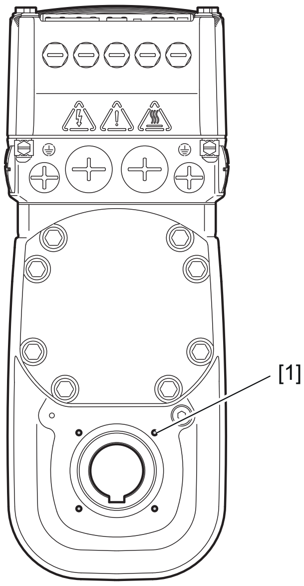
Only mount the drive unit to the system structure together with a torque arm. Installation without a torque arm is not permitted.

7.4 Threads for protective cover

The following figure shows the threads used for fastening the protection cover:



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[1] Threads for protective cover (5×)

Consult SEW-EURODRIVE before using threads for other applications.

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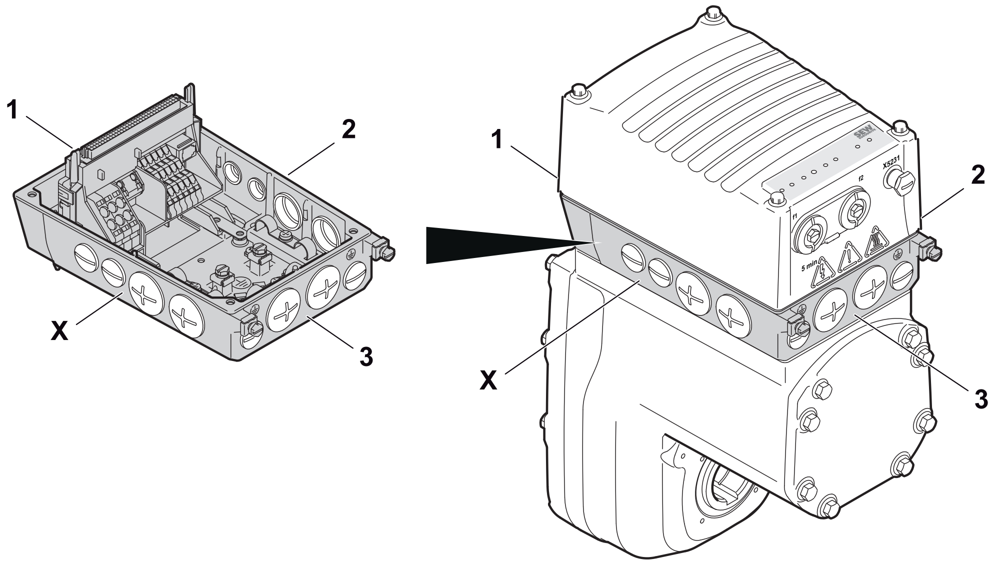
7.5 Cable entry position

The device is equipped with the following cable bushings:

- Position X, 1, 2, 3
  - X: 2 × M25 × 1.5 + 2 × M16 × 1.5
  - 1: 1 x M16 x 1.5 (only for option /PE)
  - 2: 2 × M25 × 1.5 + 2 × M16 × 1.5
  - 3: 2 × M25 × 1.5 + 2 × M16 × 1.5

7.5.1 Overview of MOVIGEAR® performance DBC, DAC

The following figure shows the possible cable entries:



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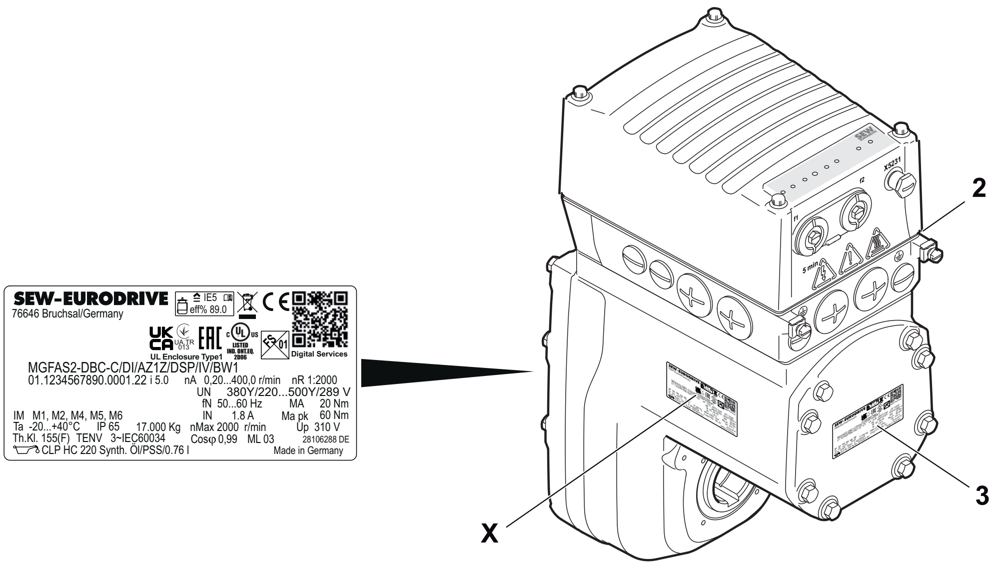
7.6 Nameplate position

The following nameplate positions are possible for MOVIGEAR® performance and MOVIGEAR® classic:

- X
- 2
- 3 (standard position)

7.6.1 Overview of MOVIGEAR® performance DBC, DAC

The following figure shows an example of the position of the nameplates on the device:



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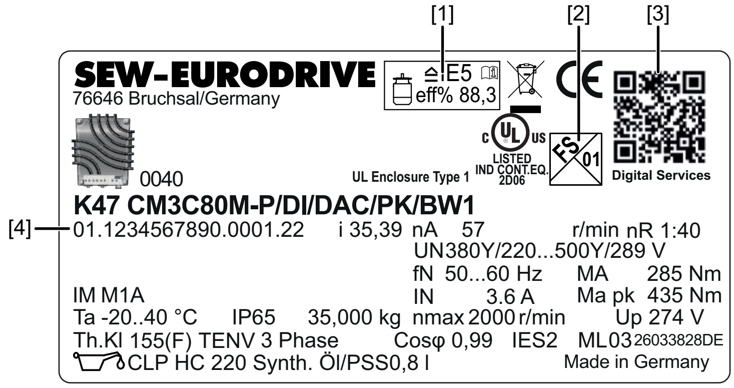
7.7 Example nameplate and type designation of the drive unit

7.7.1 MOVIGEAR® performance DAC nameplate

The following figure shows an example of a drive unit nameplate. The format of the type designation can be found in chapter "Type designation ...".



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[1]	Energy efficiency class
[2]	FS logo
[3]	Product label with QR code. The QR code can be scanned. You will be redirected to the digital services of SEW-EURODRIVE. There, you have access to product-specific data, documents, and further services. **In the "Documentation" > "Data and documents" area, the product manual of the device with further information is available.**
[4]	Unique serial number

Note on the energy efficiency class

The efficiency of AC motors is specified in 2 standards.

- The IEC 60034-30-1 standard specifies the efficiency class (IE codes) for AC motors operating with a fixed supply voltage and frequency (i.e. in grid operation).
- The IEC TS 60034-30-2 standard specifies the efficiency classes (IE codes) for AC motors with variable speed (i.e. in operation with a frequency inverter).

Due to its characteristics, the given drive is basically comparable with the drives described in the IEC TS 60034-30-2 standard. The drive is therefore evaluated with the efficiency classes defined in the standard.

This standard is applied for certain technologies and ratings for motors designed for continuous duty. However, the standard restricts the scope of application.

For this reason, the nameplate has a ≙ symbol in front of the efficiency class.

7.7.2 MOVIGEAR® performance DAC type designation

The following table shows the type designation of the drive unit.

MG	**Product family** MG = MOVIGEAR®
F	**Gear unit type** F = Parallel-shaft helical gear unit
A	**Shaft design** A = Shaft-mounted gear unit (hollow shaft with key) T = TorqLOC® hollow shaft mounting system
S	**Housing mounting type** T = Drive with torque arm S = Housing with threads for mounting a torque arm
2	**Size** 2 = Torque class 200 Nm 4 = Torque class 400 Nm
–	
DAC	**Communication version** DAC = **D**irect **A**S-Interface **C**ommunication
–	
C	**MOVIGEAR® version**
/	
DSP	**MOVIGEAR® option** XT = Increased torque (only in conjunction with size 4) DI = Digital interface (MOVILINK® DDI) AZ1Z = Multi-turn encoder with MOVILINK® DDI connection DSP = DynaStop® electrodynamic retarding function IV = Connector at the connection box PE = Pressure compensation fitting electronics PG = Integrated pressure compensation gear unit BW1 = Integrated braking resistor type: BW1 EBW = External braking resistor (mounting kit, installed ex works)

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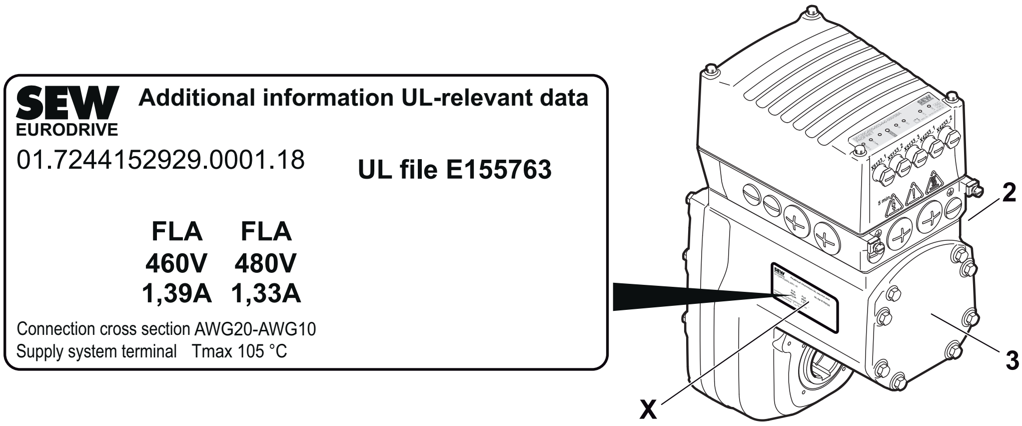
7.8 Example of the optional nameplate "Electrical regulations UL/CE"

The following figure shows an example of the optional nameplate for MOVIGEAR® performance drive units according to electrical regulation UL/CE:



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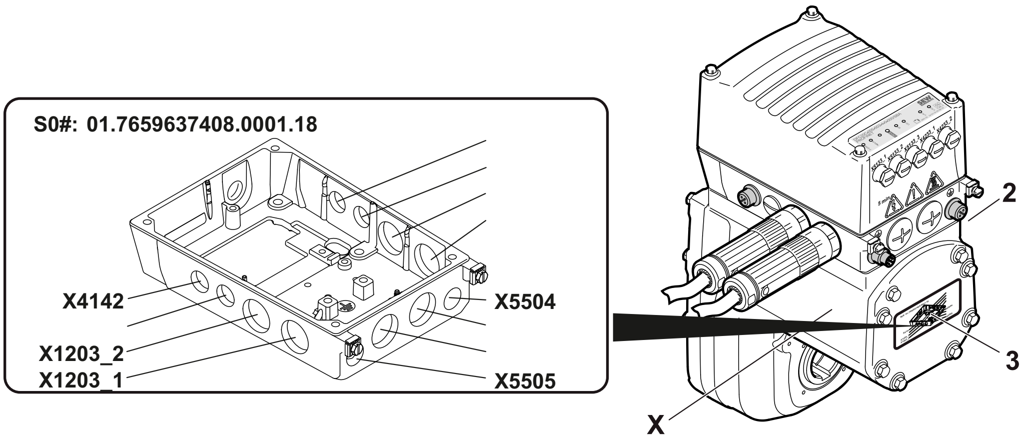
Positions X, 2, or 3 are possible for this nameplate.

Maximally 2 nameplates are attached to the drive unit. In cases that require 3 nameplates, an additional nameplate is included in the delivery.

7.9 Example of the optional nameplate "Connector positions"

The following figure shows an example of the optional nameplate "Connector positions":



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The nameplate shows the designations and positions of the connectors at the terminal box.

Positions X, 2 or 3 are possible for this nameplate.

Maximally 2 nameplates are attached to the drive unit. In cases that require 3 nameplates, an additional nameplate is included in the delivery.

7.10 Electronics

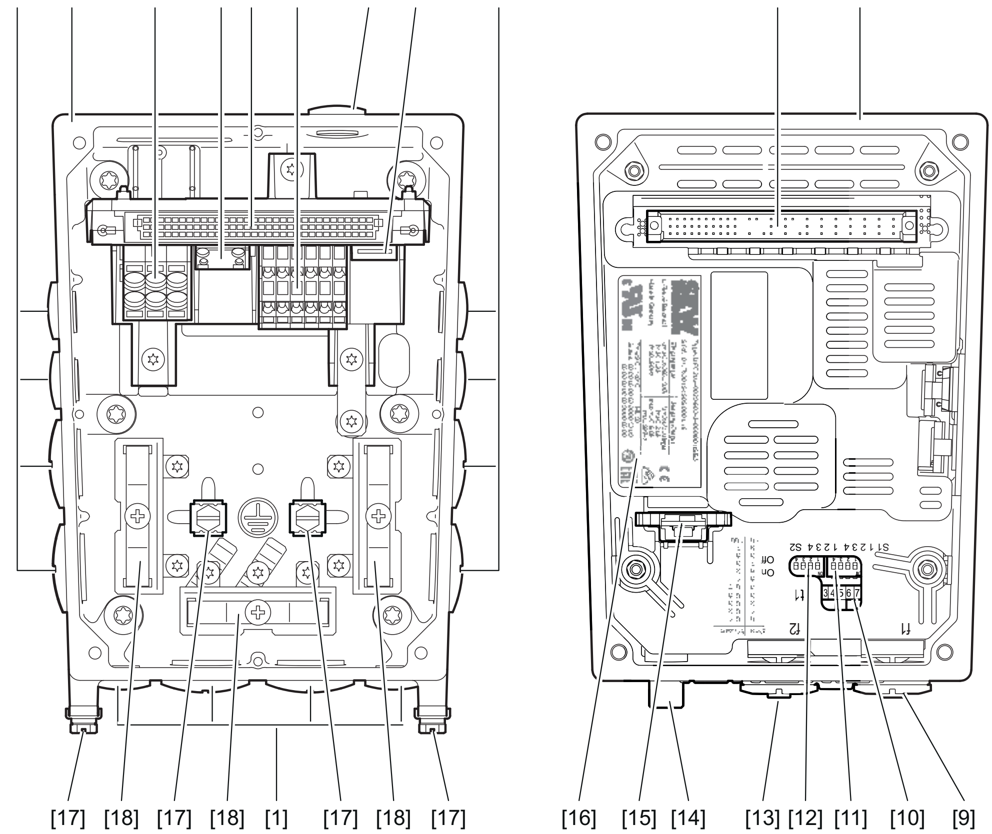
7.10.1 Overview of electronics cover

Devices with the following electronics covers are available depending on the nominal output current:

Electronics cover			
Nominal output current	**Type designation**	**Size**	**Image**
2.0 A	DAC...-0020..	Size 1 without cooling fins	
2.5 A	DAC...-0025..		
3.2 A	DAC...-0032..		
4.0 A	DAC...-0040..	Size 1 with cooling fins	
5.5 A	DAC...-0055..		

7.10.2 Connection box and electronics cover (internal) size 1

The following figure shows the connection box and the bottom side of the electronics cover:



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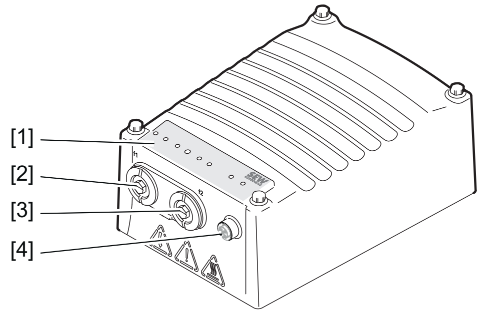
[1] Cable glands
[2] Connection box
[3] Line connection L1, L2, L3
[4] Braking resistor connection
[5] Connector connection unit for electronics cover
[6] Electronics terminal strip
[7] Engineering interface
[8] Electronics cover
[9] Potentiometer f1 (underneath the screw plug)
[10] Potentiometer t1
[11] DIP switches S1/1 – S1/4
[12] DIP switches S2/1 – S2/4
[13] Potentiometer f2 (underneath the screw plug)
[14] Connector
[15] Replaceable memory module with S3 DIP switch
[16] Inner electronics cover nameplate
[17] Screws for PE connection
[18] Shield clamp[1)]

1) Use the shield clamp included in the accessory bag that contains installation equipment.

7.10.3 Electronics cover (outer) size 1

The following figure gives an example of electronics cover designs:



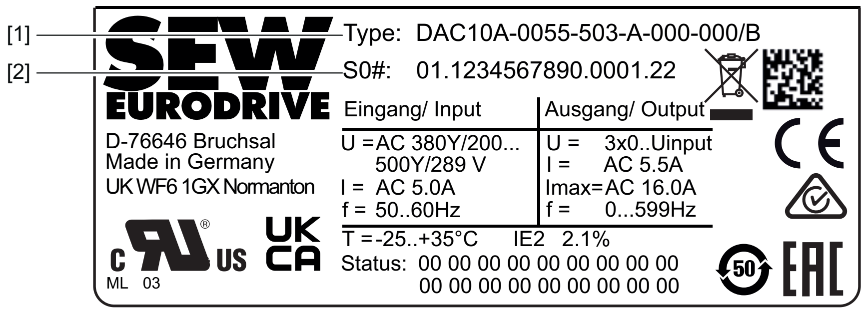
29317784459

[1] "LED displays" (→ 🗎 367)
[2] "Potentiometer f1 (underneath the screw plug)" (→ 🗎 321)
[3] "Potentiometer f2 (underneath the screw plug)" (→ 🗎 323)
[4] "Connector" (→ 🗎 308)

7.11 Example nameplate and type designation of electronics

7.11.1 Inner nameplate of DAC.. electronics cover

The following figure gives an example of a nameplate of the electronics cover. For the structure of the type designation, refer to chapter "Type designation of the electronics cover ...".

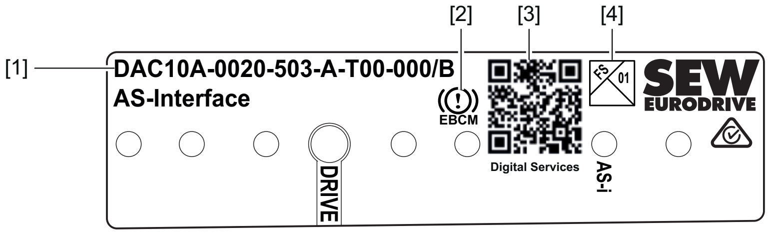


45036025257243403

[1]		Type designation of the electronics cover
[2]		Unique serial number of the electronics cover
(DataMatrix code symbol)		DataMatrix code with the unique serial number of the electronics cover

7.11.2 Outer nameplate of DAC.. electronics cover

The following figure gives an example of a nameplate of the electronics cover. For the structure of the type designation, refer to chapter "Type designation of the electronics cover ...".



18014431494699531

[1] Type designation of the electronics cover
[2] Identification of the optional HV brake control /B
[3] Digital Services — Product label with QR code. The QR code can be scanned. You will be redirected to the digital services of SEW-EURODRIVE. There, you have access to product-specific data, documents, and further services.
In the "Documentation" > "Data and documents" area, the product manual of the device with further information is available.
[4] FS logo

7.11.3 Type designation of DAC.. electronics cover

The following table shows the type designation of the electronics cover:

DAC	**Product family** DAC = Electronics cover **D**irect **A**S-Interface **C**ommunication
1	**Communication type** 1 = AS-Interface
0	**Connection configuration** 0 = M12 connector on electronics cover (standard)
A	**Communication version**
–	
0020	**Nominal output current of the electronics cover** 0020 = 2.0 A 0025 = 2.5 A 0032 = 3.2 A 0040 = 4.0 A 0055 = 5.5 A 0070 = 7.0 A 0095 = 9.5 A 0125 = 12.5 A 0160 = 16.0 A
–	

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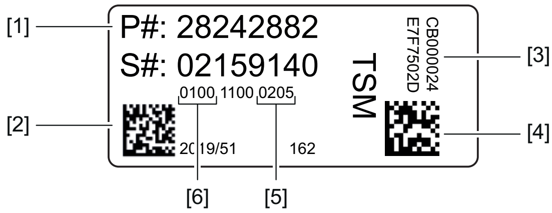
5	**Connection voltage** 5 = AC 500 V
0	**Power section variant EMC** 0 = Basic interference suppression 1 = IT system design
3	**Connection type** 3 = 3-phase
–	
A	**Version**
–	
T	**Device variant** T = Technology profile (fieldbus connection)
0	**Technology level** 0 = Technology level 0 (standard)
0	**Application level** 0 = Application level 0 (standard)
–	
000	**MOVIKIT® version** 000 = No MOVIKIT® module loaded ex-works
/	
B	**Operating mode options** B = Brake control C = Specific customer identification D = Device-specific parameterization of the delivery state P = Customer-specific parameterization

7.11.4 Example: Nameplate of a replaceable memory module

The following figure shows an example of the nameplate for the replaceable memory module:



27021630756665739

[1] Part number of the replaceable memory module
[2] Data Matrix code with unique part number, serial number, and version statuses of the memory module
[3] Unique safety key ID for designs with optional safety card
[4] Data Matrix code with unique safety key ID for designs with optional safety card
[5] Status of safety key data set

- You can use the status 0205 only with devices with the CSB51A safety option.
- You can use the status 1000 only with devices with the CSB.., CSL.., CSS.. safety options.

[6] Status of the motor data required for starting up the DIP switches S3 (available for MOVIMOT® flexible only)

7.12 Example nameplate and type designation of connection unit

7.12.1 Nameplate

The following figure gives an example of a nameplate of the connection unit. For the structure of the type designation, refer to chapter "Type designation of the connection unit".

Type: CUI1H-DFC-5D3-C/CO/DSP
S0#: 01.1234567890.0001.20
00 00 00 00 00 00 00 00 00

27021626020720011

7.12.2 Type designation of connection unit

The following table shows the type designation of the connection unit:

CU	**Product family** CU = Connection unit (motor with electronics cover)
I	**Hardware design** I = for MOVIGEAR® performance/MOVIMOT® performance
1	**Flange dimensions for relevant cover size** 1 = Suitable for electronics cover size 1 (with/without cooling fins) 2 = Suitable for electronics cover size 2 (without fan)[1)]
H	**Fieldbus connection configuration** S = Standard (only with DBC, DAC) H = Hybrid[2)] (for DFC, DSI only)
–	
DFC	**Communication version** DBC = **D**irect **B**inary **C**ommunication DAC = **D**irect **A**S-Interface **C**ommunication DFC = **D**irect **F**ieldbus **C**ommunication DSI = **D**irect **S**ystem bus **I**nstallation
–	
5	**Connection voltage** 5 = AC 500 V
D	**EMC variant** D = EMC filter with limit value category C3 (EN 61800-3)
3	**Connection type** 3 = 3-phase
–	
C	**Version**
/	
CO	**Option** DI = Digital interface (MOVILINK® DDI) CO = Digital interface (MOVILINK® DDI) via coaxial element DSP = DynaStop® electrodynamic retarding function

1) Only for MOVIMOT® performance
2) The field bus connection depends on the connection configuration of the electronics cover.

7.13 Markings

The following table shows an example of the markings on the nameplate.

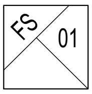
	The CE marking indicates compliance with the following European directives: • Low Voltage Directive 2014/35/EU[1)] • EMC Directive 2014/30/EU • Machinery Directive 2006/42/EC • Directive 2011/65/EU for limiting the use of certain hazardous substances in electrical and electronic equipment • Ecodesign Regulation 2019/1781
	The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU.
	The UL and cUL mark indicates UL approval. cUL is equally eligible for approval by the CSA.
	The UKCA mark indicates compliance with British directives (see UK declaration of conformity or UK declaration of incorporation).
	The EAC mark indicates compliance with the requirements of the technical regulations of the Customs Union (Eurasian Economic Union), Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russia.
	The UA.TR mark declares conformity with the technical regulations of Ukraine.
	The RCM mark indicates compliance with the technical regulations of the Australian Communications and Media Authority (ACMA).
	The China RoHS mark indicates compliance with the directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging.

1) For products with functional safety, the requirements from the Low Voltage Directive are fulfilled by the Machinery Directive.

7.14 FS logo description

The FS logo on the nameplate is based on the combination of safety-related components that is installed.

The following FS logo variants are possible:

	Device with STO connection via terminals or connectors

8 Mechanical installation

8.1 Installation notes

Perform the following steps before installation:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages in the connection box. Severe or fatal injuries.
   De-energize the device. Pay attention to the 5 safety rules in chapter “Carrying out electrical work safely”.
2. Secure the output shaft of permanently excited motors against rotation. You thereby avoid an electric shock from the regenerative operation during the rotation of the shaft.
3. Equip the input and output elements (e.g. customer shaft with contact shoulder or clamping ring, shrink disk) with a touch guard. You will also avoid injuries caused by rapid movements of the output elements.
4. Before releasing shaft connections, make sure that there are no active torsional moments present (tensions within the system).
5. ⚠ **WARNING!** Danger due to installation of the drive unit without torque arm. Severe or fatal injuries.
   Only mount the drive units to the system structure together with a torque arm. Installation without a torque arm is not permitted.

8.2 Required tools and resources

You require the following tools and resources for mechanical installation:

- Set of wrenches, set of screwdrivers, set of socket wrenches
- Torque wrench
- Mounting device
- If necessary, compensation elements (washers, spacing rings)
- Fasteners for output elements
- Lubricant (e.g. NOCO-Paste)
- Standard parts are not included in the delivery

8.3 Installation tolerances for shaft ends

Diameter tolerance in accordance with DIN 748:

- ISO H7 for hollow shafts

8.4 Tolerances for torque ratings

Adhere to the specified tightening torques with a tolerance of +/- 10%.

8.5 Installation requirements

Check that the following conditions have been met:

- The information on the drive unit's nameplate must match the voltage supply system.
- The drive unit is undamaged (no damage caused by shipping or storage).
- Ambient temperature according to the product manual, nameplate and lubricant table in chapter "Lubricants" (→ 🗎 88).
- The drive unit must not be installed in the following ambient conditions:
  - Potentially explosive atmosphere
  - Oils
  - Acids
  - Gases
  - Vapors
  - Radiation
- For special designs: The drive unit is designed in accordance with the actual ambient conditions.
- Clean the output shafts and flange surfaces thoroughly to ensure that they are free of anti-corrosion agents, contamination or similar. Use a commercially available solvent. Do not expose the sealing lips of the oil seals to the solvent – damage to the material.
- When the drive is installed in abrasive ambient conditions, protect the output end oil seals against wear.

8.6 Setting up the drive unit

8.6.1 Notes

Note the following points when you assemble the drive unit:

- Before setting up the drive unit, perform the steps according to chapter "Installation notes" (→ 🗎 195).
- Only mount the drive unit to the system structure together with a torque arm. Installation without a torque arm is not permitted.
- Thoroughly remove any anti-corrosion agent from the shaft end. Use a commercially available solvent. Do not allow the solvent to penetrate the bearings and sealing rings as this could damage the material.
- Align the motor carefully to avoid placing any unacceptable strain on the motor shafts
- Do not jolt or hammer the shaft end.
- Ensure sufficient clearance around the unit to allow for adequate cooling air supply. Warm outlet air of other units must not affect the cooling.
- Use suitable cable glands for the supply leads (use reducing adapters if necessary).
- Seal the cable bushing properly.
- Thoroughly clean the sealing surfaces of the cover before reassembly.
- If the corrosion protection coating is damaged, restore the coating.
- Check whether the degree of protection specified in the operating instructions and on the nameplate is permitted in the ambient conditions on site.

8.6.2 Changing the mounting position

Observe the following information when you operate the drive unit in a mounting position other than indicated in the order:

- Mounting position M3 is only available in combination with the option "integrated pressure compensation /PG".

  Observe the addendum "MOVIGEAR® drive unit type MGF..-..-C – "Wet-area design /WA" and "Integrated pressure compensation in the gear unit /PG" options".
- Adjust the position of the breather valve.
- If present, adjust the position of the pressure compensation fitting.

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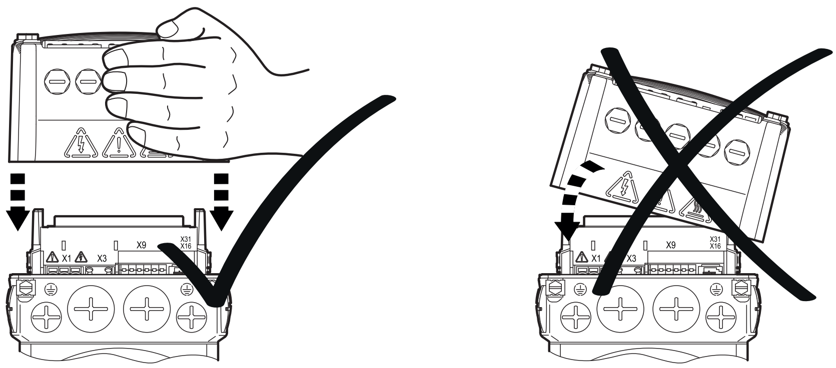
8.6.3 Electronics cover

Installing the electronics cover

Install the electronics cover as follows:

1. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
2. **NOTICE!** Loss of the guaranteed degree of protection. Possible damage to property.
   When the electronics cover is removed from the connection box, you have to protect the electronics cover and the wiring space from humidity, dust or foreign particles.
3. Use only electronics covers that match the size.
4. Fit the electronics cover to the connection box. Make sure that the electronics cover does not become jammed.

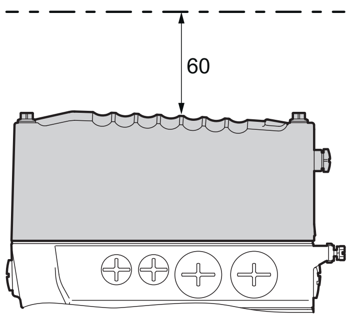


25337980043

5. Screw the electronics cover onto the connection box with 4 screws. Tighten the screws step-by-step in diametrically opposite sequence with a tightening torque of 6.0 Nm.

Minimum installation clearance

Note the minimum installation clearance required to remove the electronics cover.



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Detailed dimension drawings can be found in the product manual > chapter "Dimension drawings of the drive unit" (→ 🗎 103).

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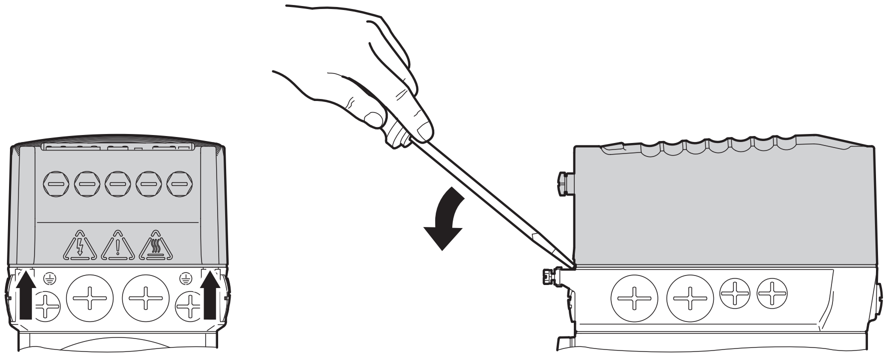
Removing the electronics cover

Remove the electronics cover as follows:

1. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
2. Undo the screws of the electronics cover.
3. Lever the electronics cover off the connection box as shown in the following figure. Pay attention to the intended positions in the figure when doing this.



25337977611

4. **NOTICE!** Loss of the guaranteed degree of protection. Possible damage to property.
   When the electronics cover is removed from the connection box, you have to protect the electronics cover and the wiring space from humidity, dust or foreign particles.

8.6.4 Installation in damp areas or in the open

Drive units are supplied in corrosion-resistant design for use in damp areas or in the open. Repair any damage to the paint work if necessary.

8.6.5 Derating depending on the installation altitude

Follow product manual > chapter "Technical data" > "Derating factors" (→ 🗎 33).

8.6.6 Painting the drive unit

If necessary, paint the drive unit as follows:

1. Perform the steps according to chapter "Installation notes".
2. Clean the surface of the drive unit.
   ⇨ Make sure that the surface of the drive unit is free of grease.
3. **NOTICE!** Breather valves and oil seals might be damaged when painting or repainting. Damage to property.
   Thoroughly cover the breather valves and sealing lip of the oil seals with strips.
4. Paint the drive unit.
5. Remove the designation strips.

8.6.7 Gear unit venting

Drive units with installed breather valve

Except for the mounting position M3, SEW-EURODRIVE delivers all drive units ordered for a specific mounting position with a breather valve that is activated and installed according to the specific mounting position.

Drive units with separately included breather valve

Mounting position M3

For the use of drive units in mounting position M3, you are not permitted to mount the enclosed breather valve on the drive unit.

For drive units in mounting position M3, only use the variant with integrated pressure compensation (/PG option). For more information, refer to the addendum "MOVIGEAR® drive unit type MGF..-..-C – "Wet-area design /WA" and "Integrated pressure compensation in the gear unit /PG" options".

The MGF..1-DSM-C drive unit can be operated in M3 mounting position without breather valve and without any restrictions. The option "/PG" is not available for this size.

Mounting positions M1, M2, M4, M5, M6

SEW-EURODRIVE delivers drive units ordered for universal operation in mounting position M1, M2, M4, M5, M6 with an enclosed breather valve.

In this case, the breather valve is delivered in the hollow shaft of the drive unit. Before startup, replace the highest oil screw plug with the provided breather valve.

Mounting position MU

Information regarding the universal mounting position MU can be found in the product manual > chapter "Mounting positions" (→ 🗎 86).

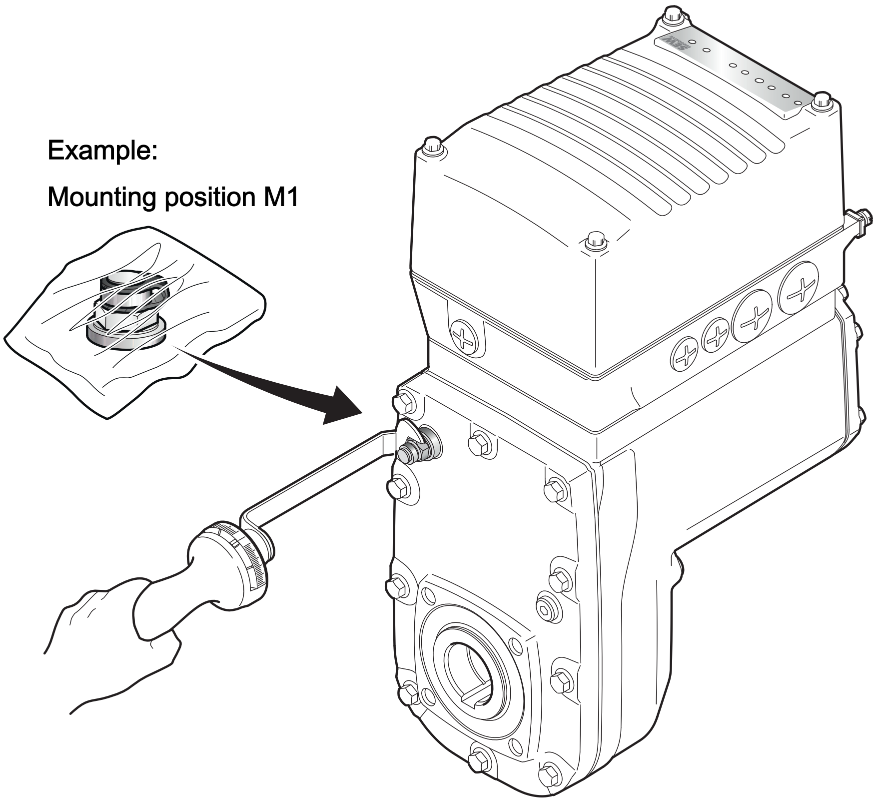
Tightening torque

Tighten the breather valve supplied by SEW-EURODRIVE to 8.0 Nm.

The position of the breather valve depends on the mounting position being used. Observe the product manual > chapter "Mounting positions" (→ 🗎 86).

Mounting the breather valve in mounting position M1

The following figure shows an example of how to mount the breather valve in mounting position M1:



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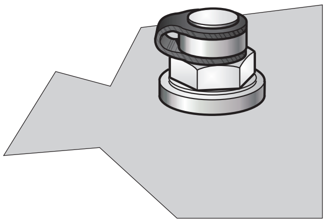
Activating the breather valve

For designs with screwed-in breather valve, check whether the breather valve is activated. If not, you have to remove the transport protection of the breather valve before you start up the drive unit.

Activate the breather valve as follows:

1. Breather valve with transport protection



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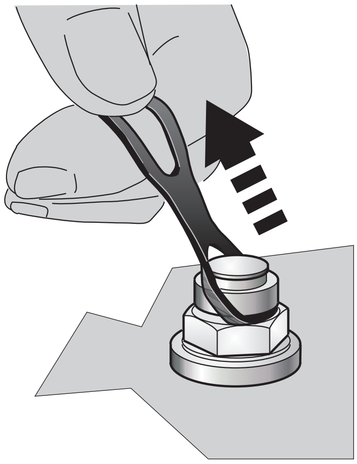
2. Remove the transport protection.



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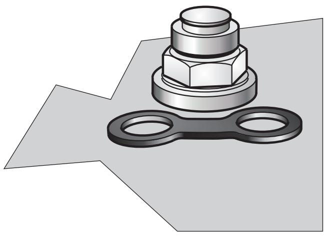
⇨ Breather valve is activated.



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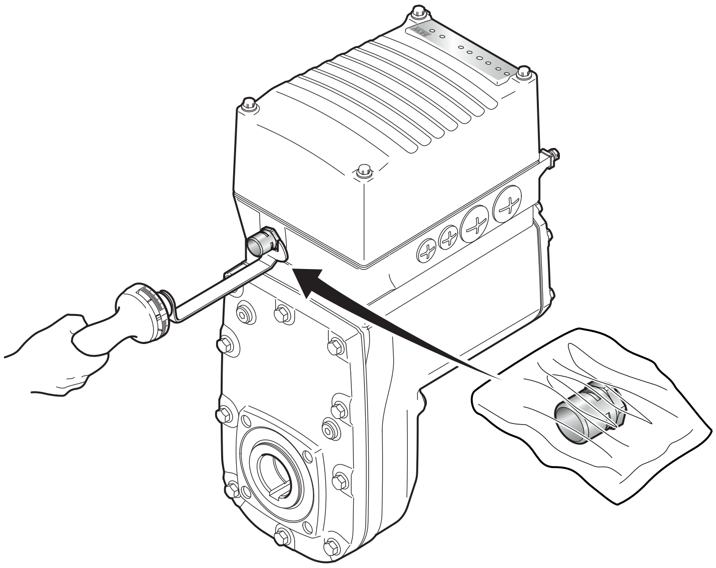
8.6.8 Pressure compensation on electronics (option /PE)

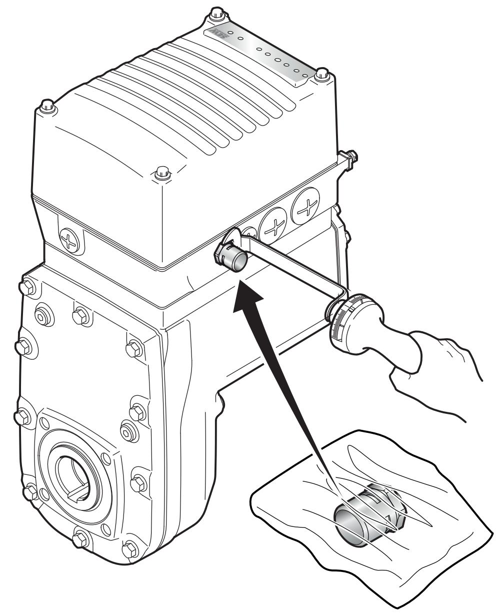
Fitting the provided pressure compensation fitting (option/PE)

For designs with an included pressure compensation fitting (option /PE), install the fitting depending on the mounting position used. The tightening torque is 4.0 Nm.

Pressure compensation fitting installation positions

The following table shows the installation location-dependent mounting positions of the pressure compensation fitting (option/PE):

Mounting position M1, M3*, M5, M6
 25344067723

Mounting position M2, M4
 25344146955

* Mounting position M3 is only possible with the option "integrated pressure compensation /PG". For more information, refer to the addendum "MOVIGEAR® drive unit type MGF..-..-C – "Wet-area design /WA" and "Integrated pressure compensation in the gear unit /PG" options".

8.7 Shaft-mounted gear unit with keyway

INFORMATION

Concerning the customer shaft design, refer to the design notes in the product manual > chapter "Technical data".

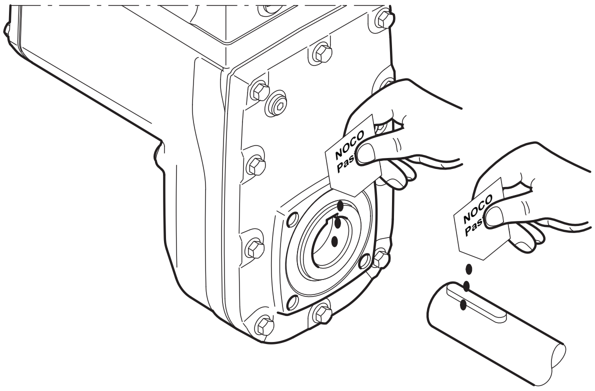
INFORMATION

To avoid contact corrosion, SEW-EURODRIVE recommends that the customer shaft should additionally be lathed down between the 2 contact surfaces!

8.7.1 Mounting the drive unit

Mount the drive unit on the shaft as follows:

1. Perform the steps according to the chapter "Installation notes" (→ 🗎 195).
2. Apply NOCO-Paste.



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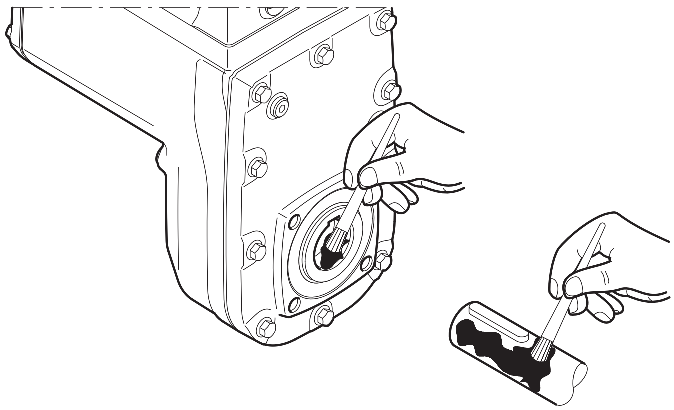
3. Spread NOCO-Paste thoroughly.



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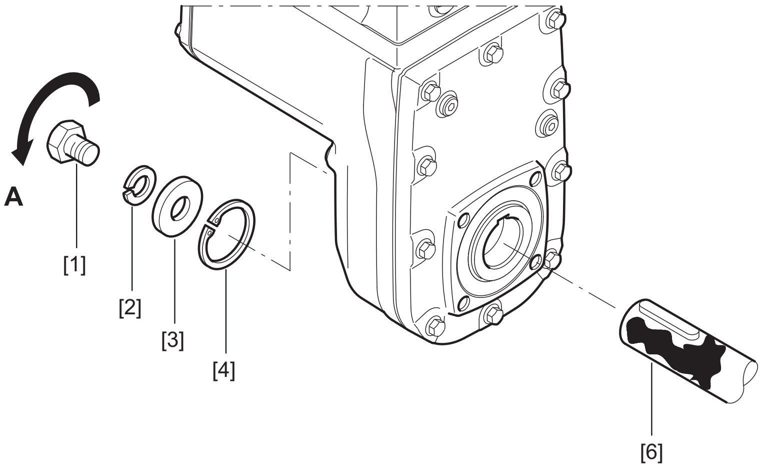
4. Install the shaft and secure it in an axial manner (installation is facilitated by using a mounting device). Refer to the following figure for correct installation.

5. The 3 installation types are described below:

   ⇨ 3A: Standard scope of delivery



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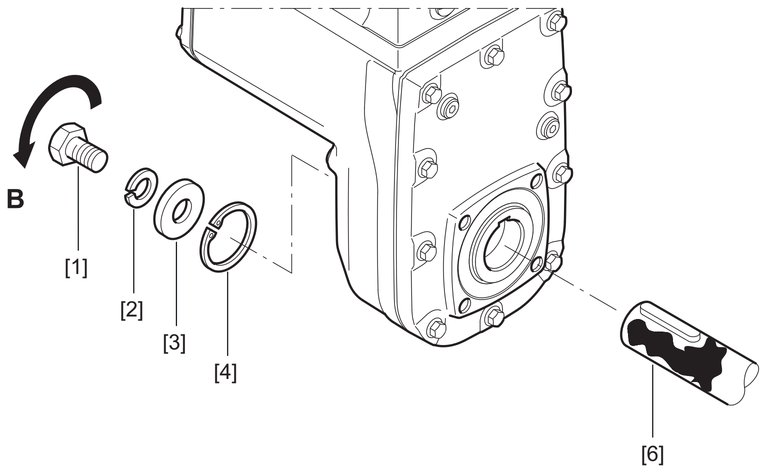
[1] Short retaining screw (standard scope of delivery)
[2] Lock washer
[3] Washer
[4] Retaining ring
[6] Customer shaft

   ⇨ 3B: Assembly/disassembly kit for customer shaft **with** contact shoulder. Observe the information in the product manual > chapter "Design notes for gear units with hollow shaft and key" (→ 🗎 96).



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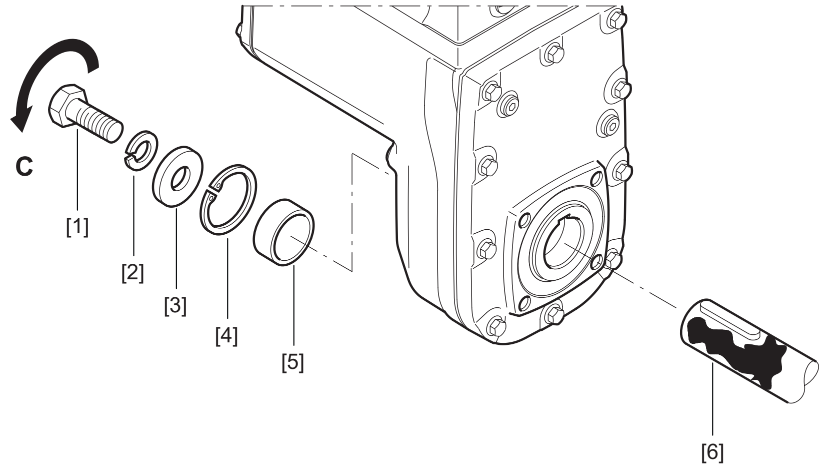
[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[6] Customer shaft with contact shoulder

   ⇨ 3C: Assembly/disassembly kit for customer shaft **without** contact shoulder. Observe the information in the product manual > chapter "Design notes for gear units with hollow shaft and key" (→ 🗎 96).



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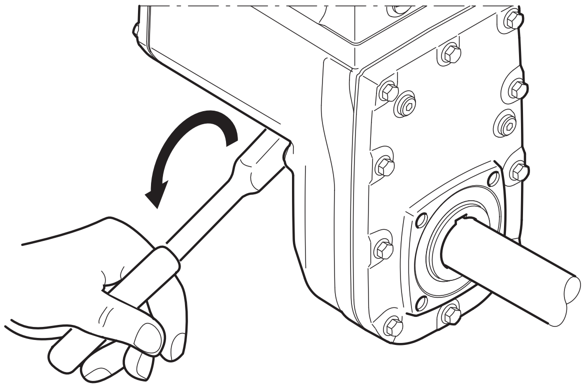
[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Spacer tube
[6] Customer shaft without contact shoulder

6. Tighten the retaining screw with the specified torque (see following chapter "Tightening torques for retaining screws").



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8.7.2 Retaining screw tightening torques

Tighten the retaining screws with the following tightening torques:

Drive	Screw	Tightening torque
MGFA.2-..-C	M10	20 Nm
MGFA.4-..-C	M16	40 Nm

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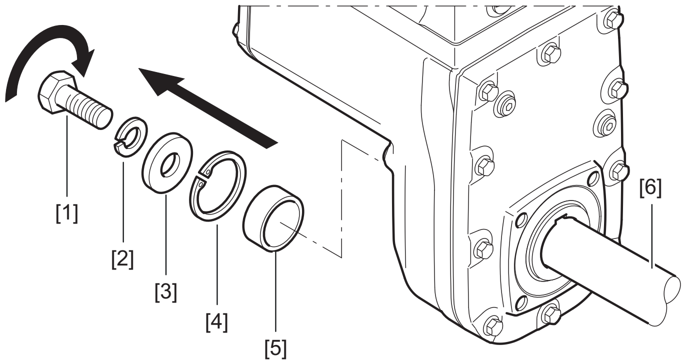
8.7.3 Disassembly notes

INFORMATION

Information regarding the SEW-EURODRIVE assembly/disassembly kit can be found in the product manual > chapter "Design notes for gear units with hollow shaft and key" (→ 🗎 96).

The following description only applies when the drive is assembled using the SEW-EURODRIVE assembly/disassembly kit (see previous description, points 2B or 2C).

1. Perform the steps according to chapter "Installation notes" (→ 🗎 195).
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injury.
   Let the devices cool down sufficiently before touching them.
3. Loosen the retaining screw [1].
4. Remove parts [2] to [4] and, if present, the spacer tube [5].



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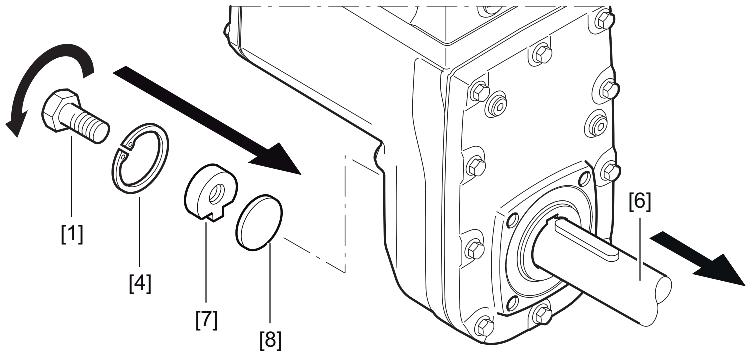
[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Spacer tube
[6] Customer shaft

5. Insert the forcing washer [8] and the fixed nut [7] from the SEW-EURODRIVE assembly/disassembly kit between the customer shaft [6] and the retaining ring [4].

6. Re-insert the retaining ring [4].
7. Screw in the retaining screw [1] again. You can now force the drive from the shaft by tightening the screw.



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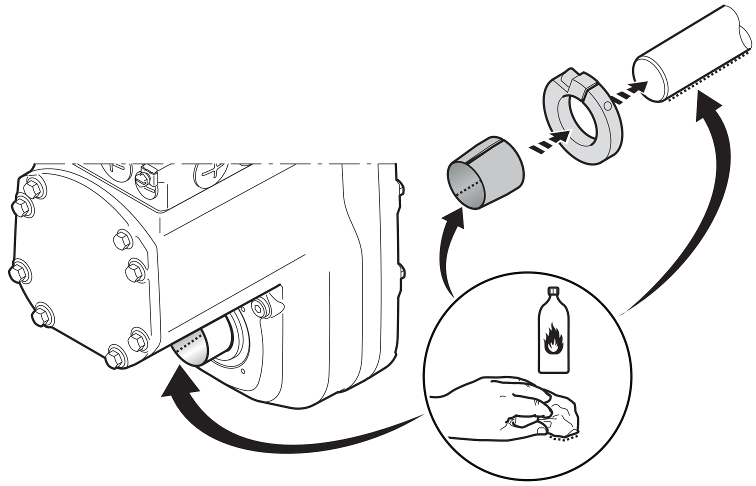
[1] Retaining screw
[4] Retaining ring
[6] Customer shaft
[7] Fixed nut
[8] Forcing washer

8.8 Shaft-mounted gear unit with TorqLOC® (customer shaft without contact shoulder)

Mount the drive unit on the shaft as follows:

1. Perform the steps according to the chapter "Installation notes" (→ 🗎 195).
2. Clean the customer shaft and the inside of the hollow shaft. Make sure that all grease and oil residues are removed.
3. Mount the stop ring and the bushing on the customer shaft.



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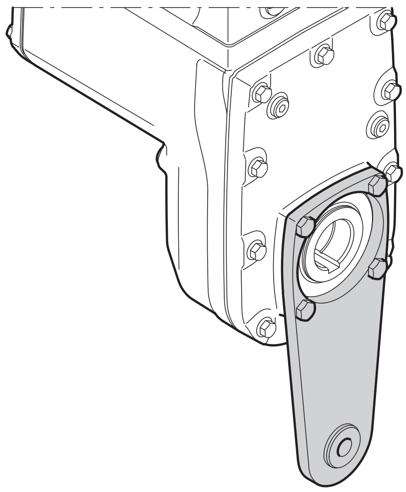
4. ⚠ **WARNING!** Danger due to lack of fastening of the torque arm. Risk of death or severe injuries.
   Attach the torque arm to the drive unit. Observe chapter "Torque arm" (→ 🗎 225).
   Installation of the drive unit without a torque arm is not permitted.



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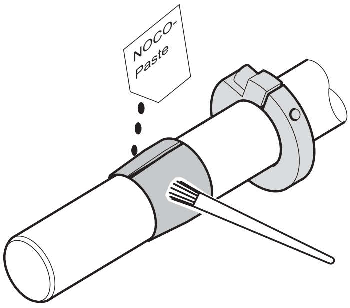
5. Apply NOCO-Paste onto the bushing and spread it carefully.



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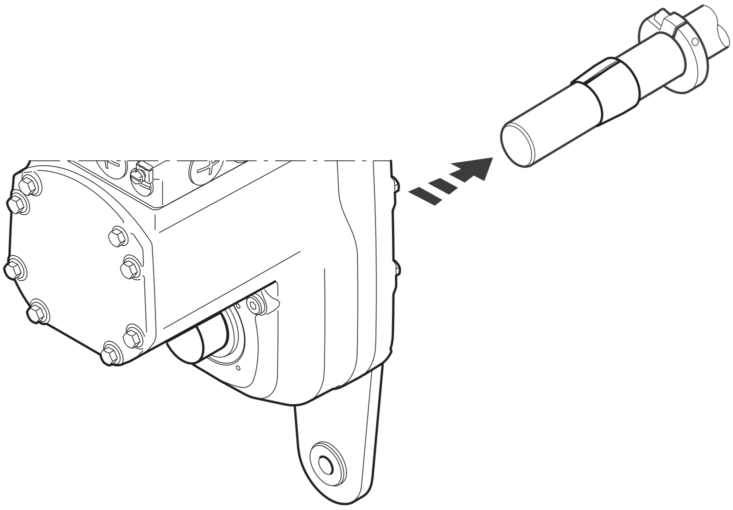
6. Slide the gear unit onto the customer shaft.



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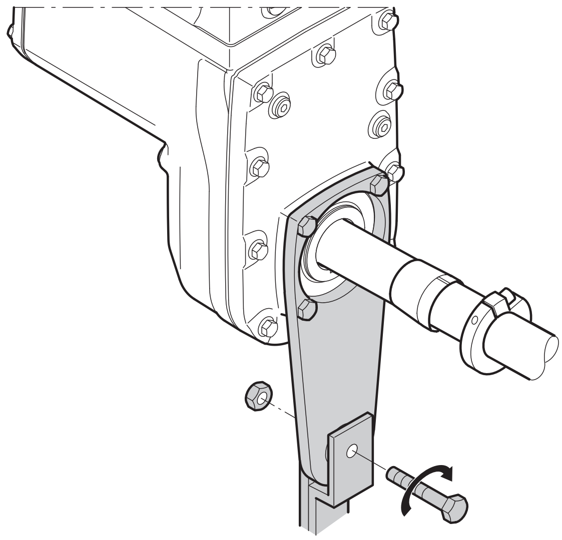
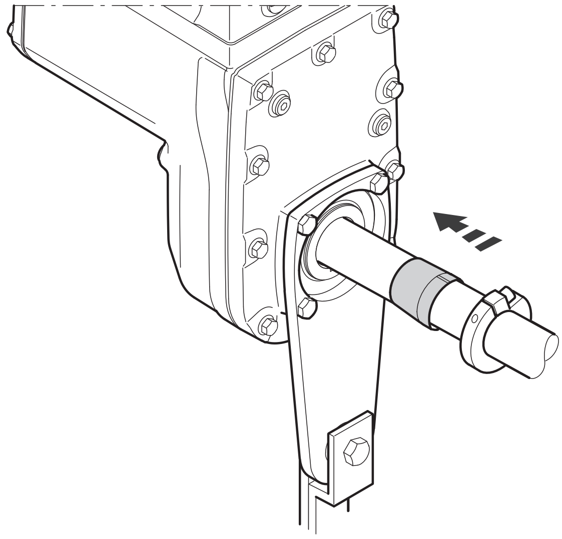
7. Mount the torque arm onto the system structure/holding fixture (do not tighten the screws).



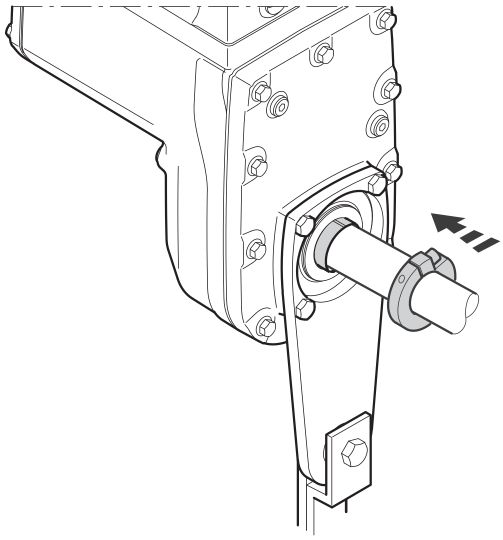
9007220783651595

8. Slide the bushing into the gear unit as far as its stop.



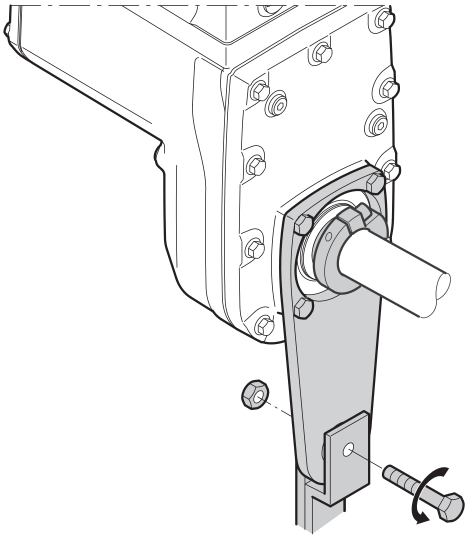
9007220783654027

9. Slide the stop ring onto the bushing. Mark the position of the stop ring.



9007220783656459

10. Remove the torque arm from the holding fixture/system structure.



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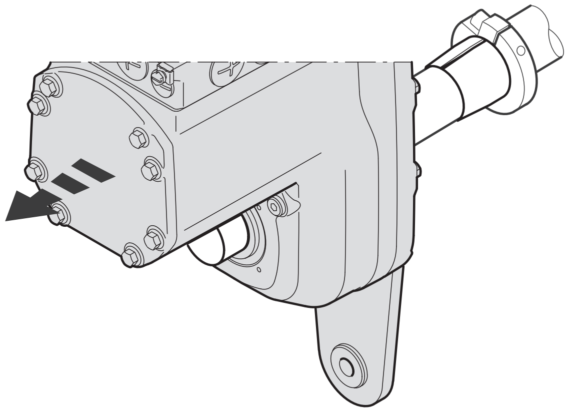
11. Remove the gear unit from the customer shaft until the stop ring is accessible for installation.



9007220783661323

12. Make sure that the position of the stop ring has not changed (note the marking).
13. Tighten the stop ring with the following torque:
    - ⇨ Standard design: 18 Nm
    - ⇨ Stainless steel: 7.5 Nm

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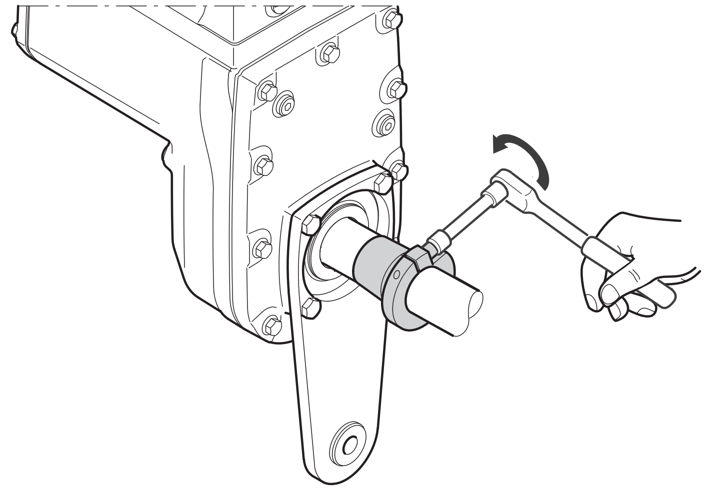
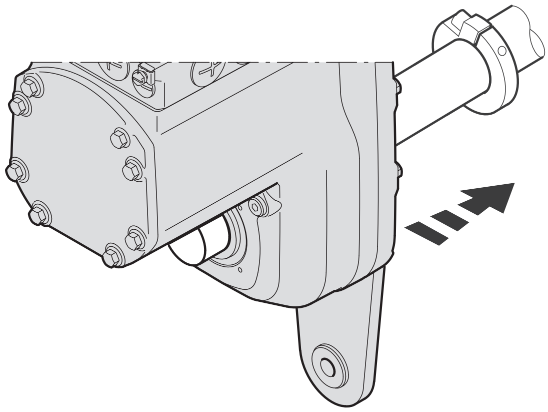


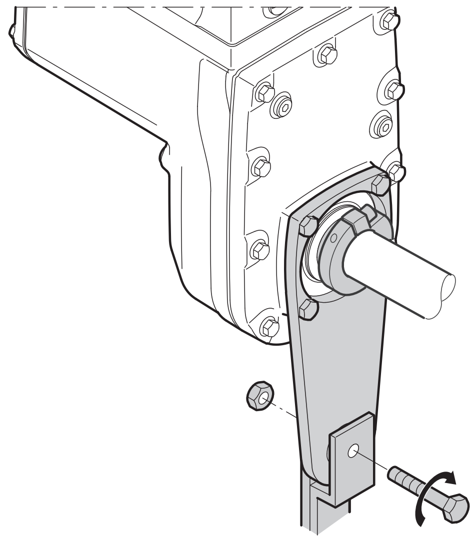
18014420037795339

14. Slide the bushing and the gear unit onto the customer shaft up to the fixed stop ring.



9007220783619979

15. Mount the torque arm onto the system structure/holding fixture again (do not tighten the screws).



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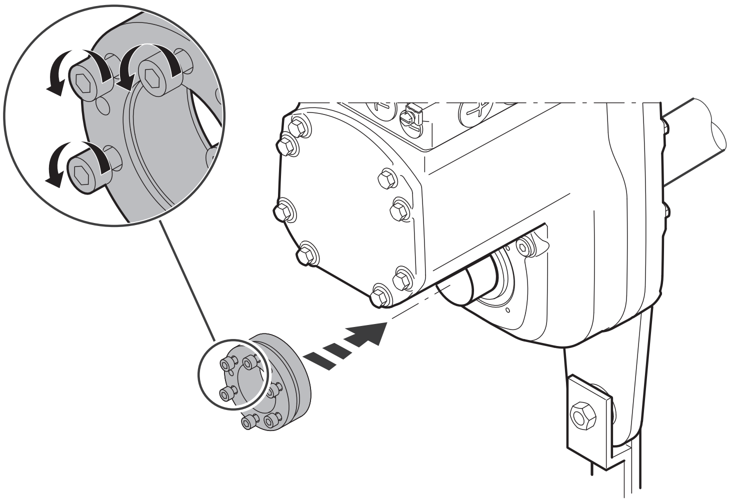
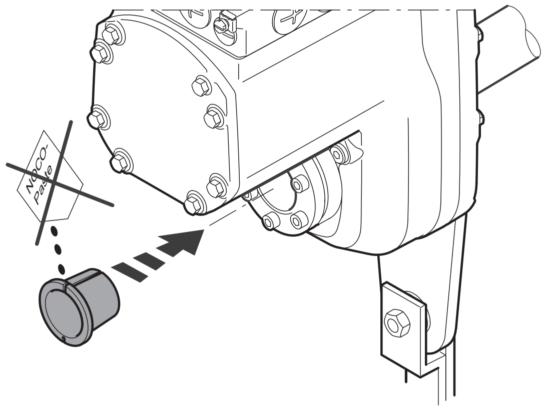
16. Make sure that all screws are loosened and slide the shrink disk onto the hollow shaft.



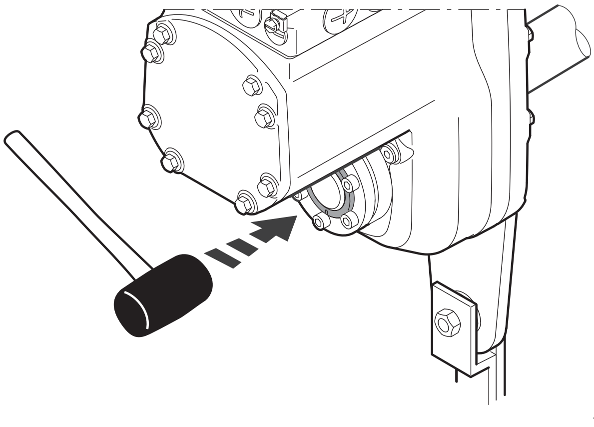
18014420038365835

17. Slide the counter bushing onto the customer shaft and into the hollow shaft.



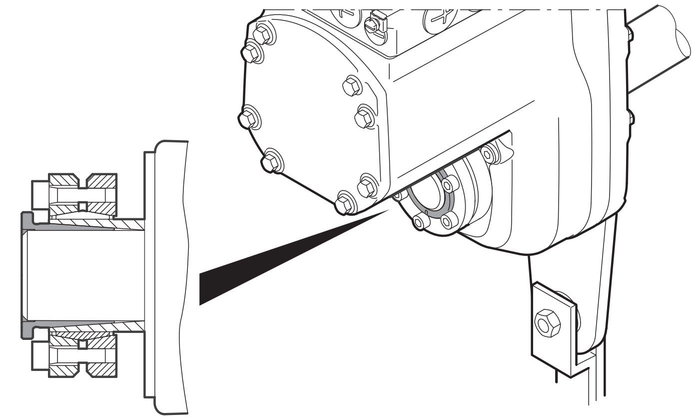
27021619293109259

18. In the case of a gear unit **with shaft shoulder**, mount the shrink disk at the shaft shoulder up to the stop. In the case of a gear unit **without shaft shoulder**, mount the shrink disk at a distance of 6.5 mm to 7.5 mm from the gear unit housing.
19. Lightly hammer on the flange of the counter bushing to ensure that the bushing is firmly seated in the hollow shaft.



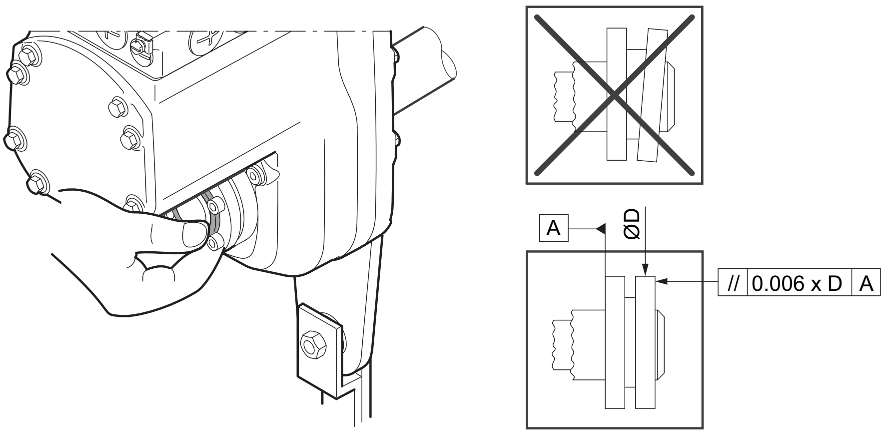
18014420038370699

20. Make sure that the customer shaft is seated in the counter bushing.



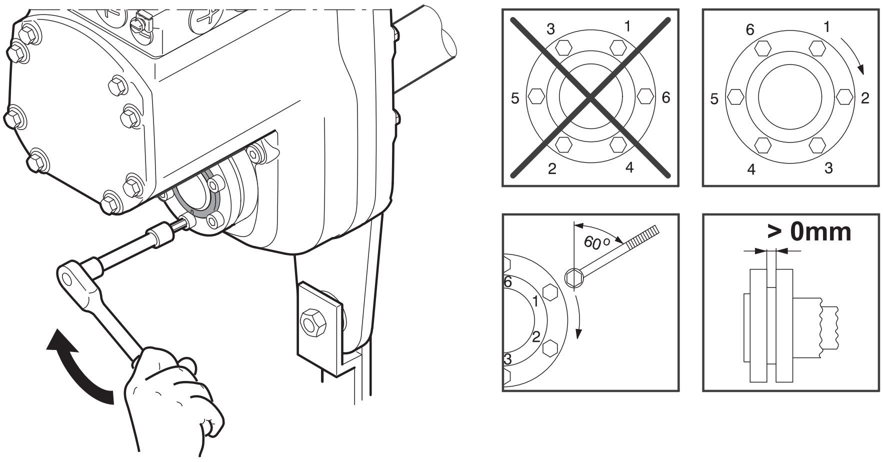
18014420038373131

21. Tighten the screws of the shrink disk only hand-tight and make sure that the outer rings of the shrink disk are plane-parallel.



18014420038375563

22. Tighten the locking screws by working round several times from one screw to the next (not in diametrically opposite sequence):
    ⇨ The exact values for the tightening torques are located on the shrink disk.



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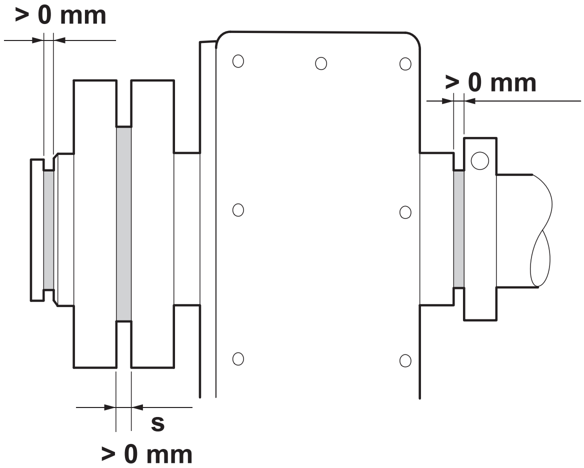
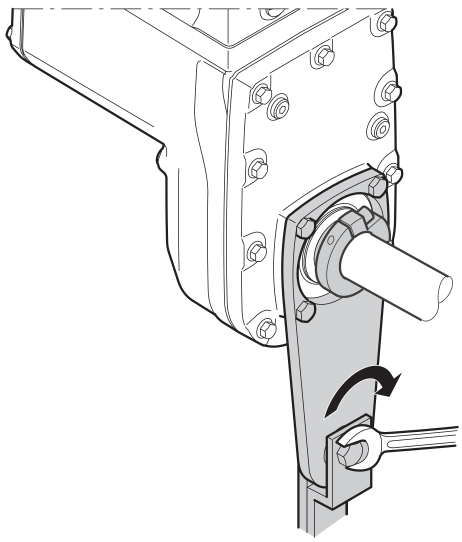
23. After installation, make sure the remaining gap s between the outer rings of the shrink disks is > 0 mm.
    ⇨ The remaining gap between the counter bushing and hollow shaft end, as well as the bushing and stop ring must be > 0 mm.



21528898443

24. Tighten the torque arm sufficiently. Observe chapter "Torque arm" (→ 🗎 225).



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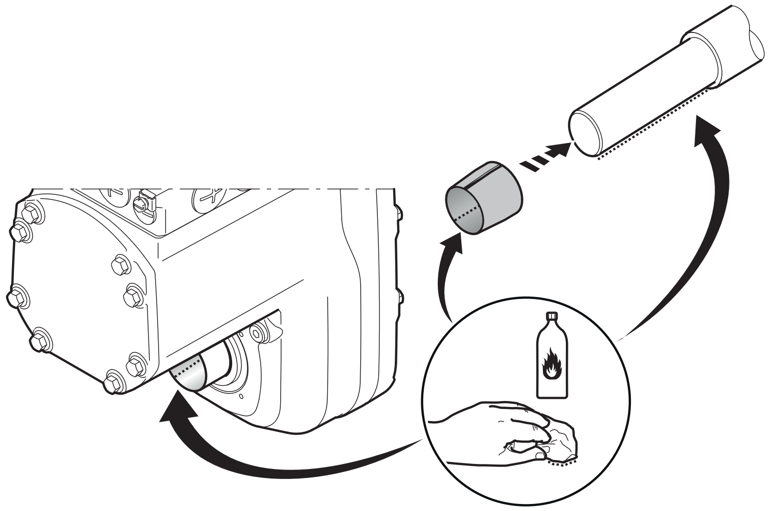
8.9 Shaft-mounted gear unit with TorqLOC® (customer shaft with contact shoulder)

Mount the drive unit on the shaft as follows:

1. Perform the steps according to the chapter "Installation notes" (→ 🗎 195).
2. Clean the customer shaft and the inside of the hollow shaft. Make sure that all grease and oil residues are removed.



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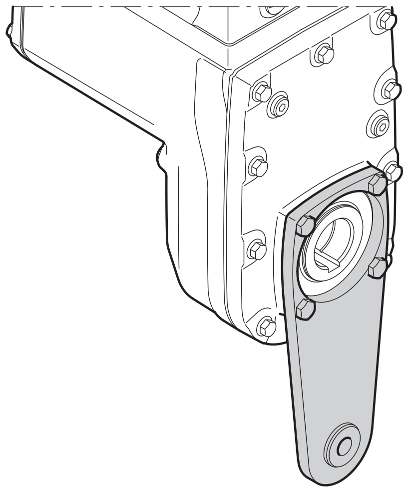
3. ⚠ **WARNING!** Danger due to lack of fastening of the torque arm. Risk of death or severe injuries.
   Attach the torque arm to the drive unit. Observe chapter "Torque arm" (→ 🗎 225). Installation of the drive unit without a torque arm is not permitted.



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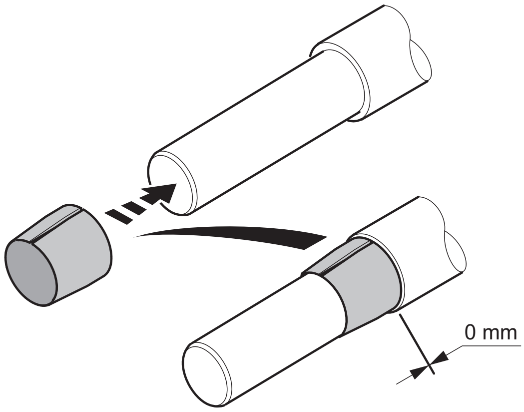
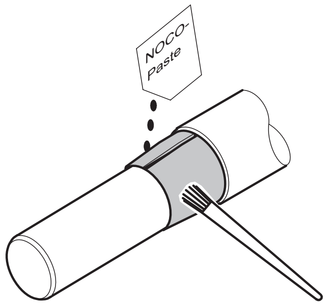
4. Mount the bushing on the customer shaft.



21528993931

5. Apply NOCO-Paste onto the bushing and spread it carefully.



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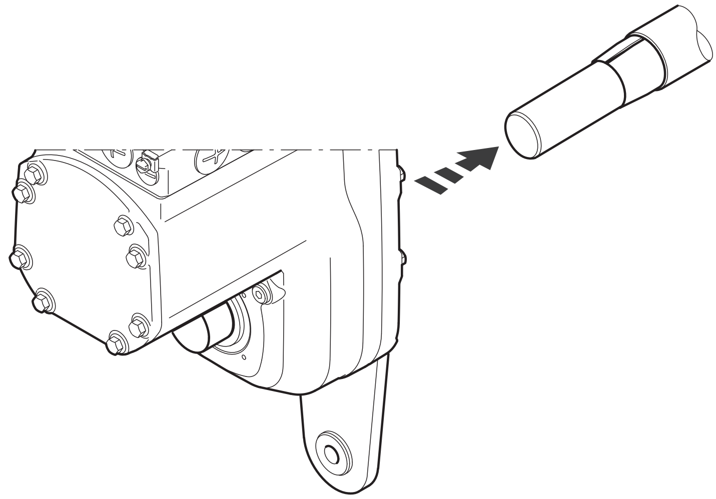
6. Slide the gear unit onto the customer shaft.



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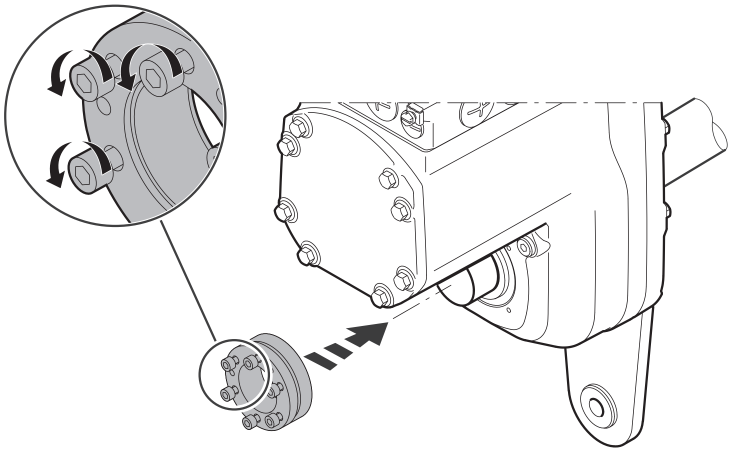
7. Make sure that all screws are loosened and slide the shrink disk onto the hollow shaft.



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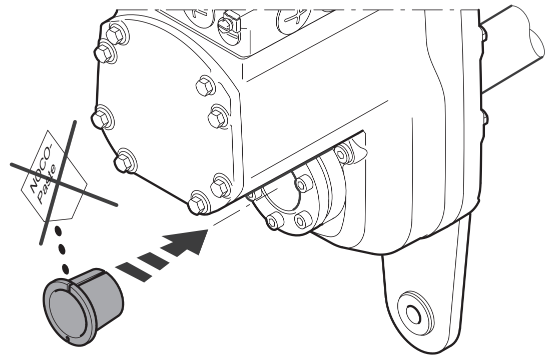
8. Slide the counter bushing onto the customer shaft and into the hollow shaft.



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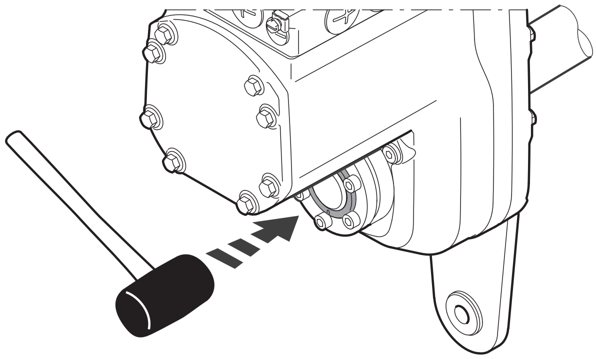
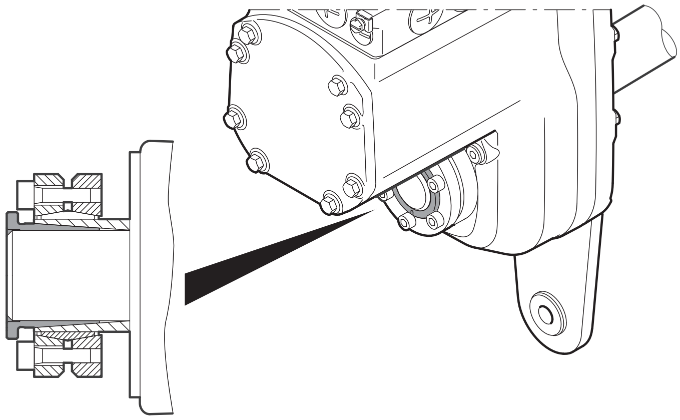
9. In the case of a gear unit **with shaft shoulder**, mount the shrink disk at the shaft shoulder up to the stop. In the case of a gear unit **without shaft shoulder**, mount the shrink disk at a distance of 6.5 mm to 7.5 mm from the gear unit housing.
10. Lightly hammer on the flange of the counter bushing to ensure that the bushing is firmly seated in the hollow shaft.



18014420038488075

11. Make sure that the customer shaft is seated in the counter bushing.



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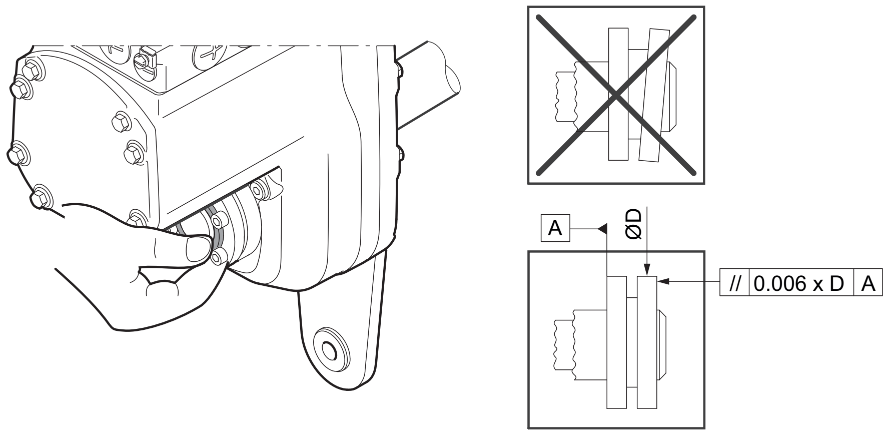
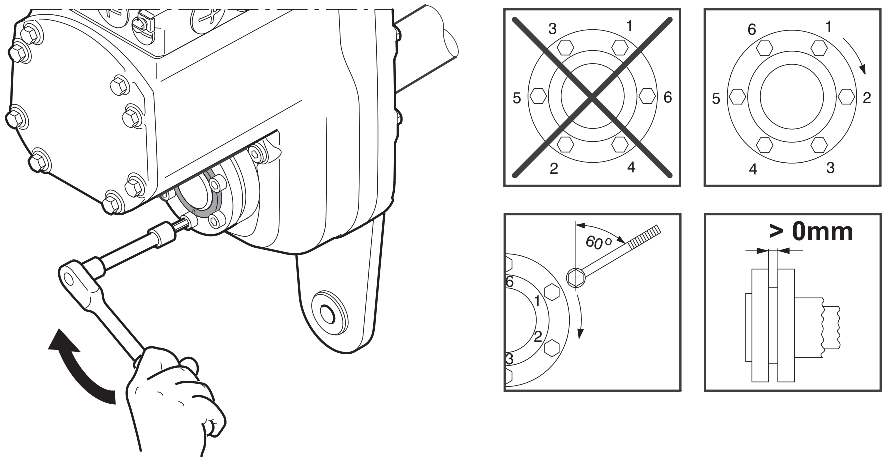
12. Tighten the screws of the shrink disk only hand-tight and make sure that the outer rings of the shrink disk are plane-parallel.



18014420038463755

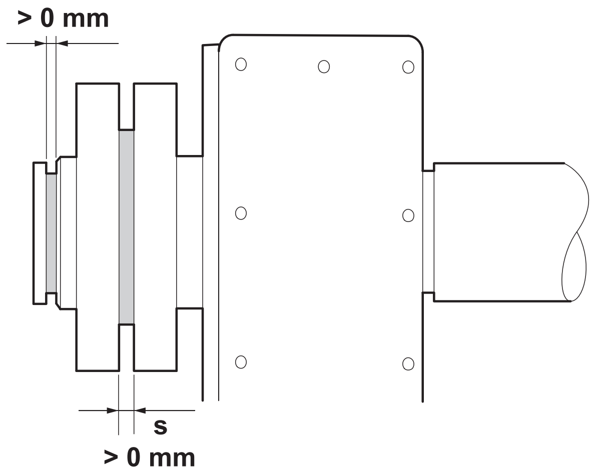
13. Tighten the locking screws by working round several times from one screw to the next (not in diametrically opposite sequence).
    ⇨ The exact values for the tightening torques are located on the shrink disk.



18014420038466187

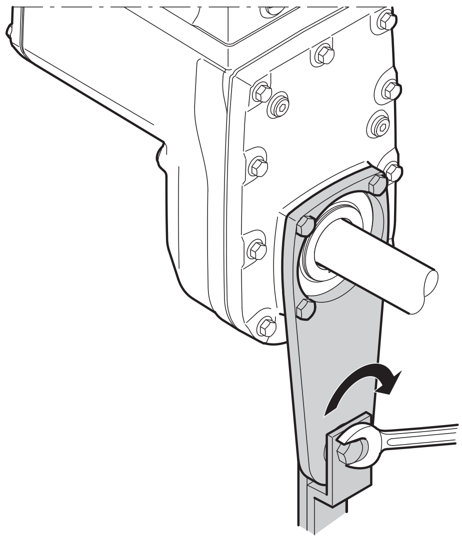
14. After installation, make sure the remaining gap s between the outer rings of the shrink disks is > 0 mm.

15. The remaining gap between the counter bushing and hollow shaft end must be > 0 mm.



21528986635

16. Mount the torque arm and tighten it firmly. Observe chapter "Torque arm" (→ 🗎 225).



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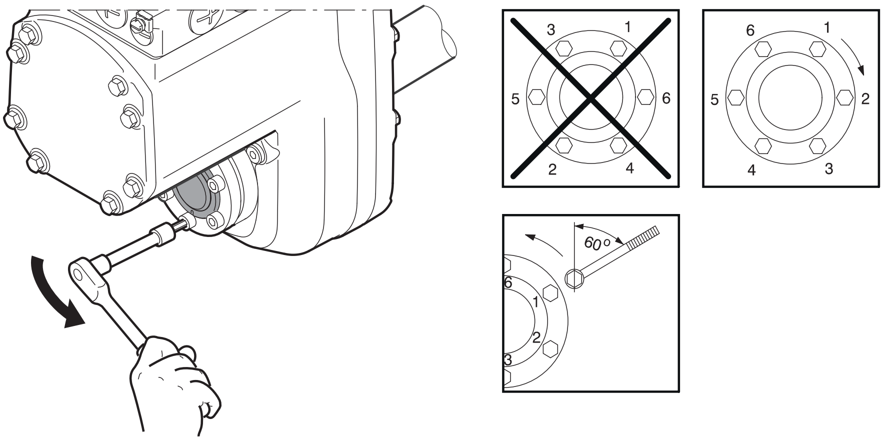
8.10 Shaft-mounted gear unit with TorqLOC® – disassembly, cleaning, lubrication

8.10.1 Removing the drive unit

Remove the drive unit from the shaft as follows:

1. Perform the steps according to chapter "Installation notes" (→ 🗎 195).
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Allow the devices to cool down before touching them.
3. Loosen the locking screws one after the other by a quarter revolution each to avoid tilting the outer rings.



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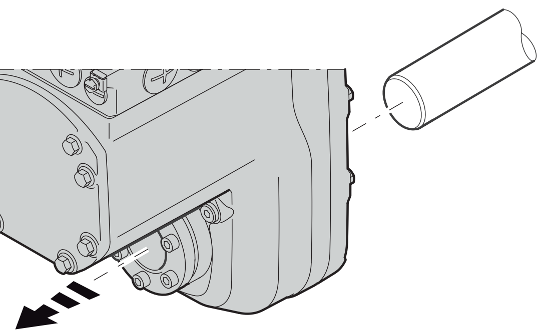
4. Unscrew the locking screws evenly one after the other. Do not remove the locking screws completely.
5. Remove the conical steel bushing. If necessary, use the outer rings as pullers as follows:
   - ⇨ Remove all the locking screws.
   - ⇨ Screw the respective number of screws in the tapped holes of the shrink disk.
   - ⇨ Support the inner ring against the gear unit housing.
   - ⇨ Pull off the conical steel bushing by tightening the screws.
6. Remove the gear unit from the shaft.



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7. Remove the shrink disk from the hub.

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8.10.2 Cleaning and lubrication

There is no need to dismantle removed shrink discs before they are reinstalled.

1. Clean and lubricate the shrink disk if it is dirty.
2. Lubricate the tapered surfaces with one of the following solid lubricants:

Lubricant (Mo S2)	Sold as
Molykote 321 (lube coat)	Spray
Molykote spray (powder spray)	Spray
Molykote G Rapid	Spray or compound
Aemasol MO 19P	Spray or compound
Aemasol DIO-sétral 57 N (lube coat)	Spray

3. Grease the locking screws with a multipurpose grease such as Molykote BR 2 or similar.

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8.11 Installing the protective cover

8.11.1 Installing the fixed safety cover

NOTICE

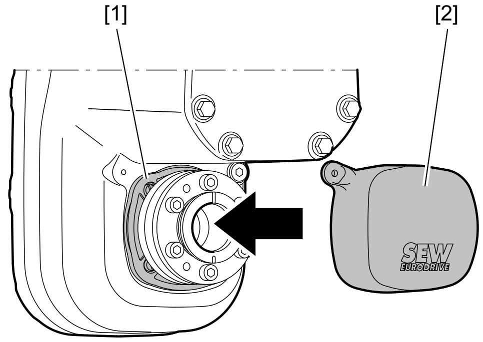
Damage to the drive unit due to improper use of the threads.

Damage to property.

- Consult SEW-EURODRIVE before using threads for other applications.

Install the safety cover as follows:

1. Perform the steps according to chapter "Installation notes" (→ 🗎 195).
2. Fit the safety cover [2] onto the adapter plate [1].



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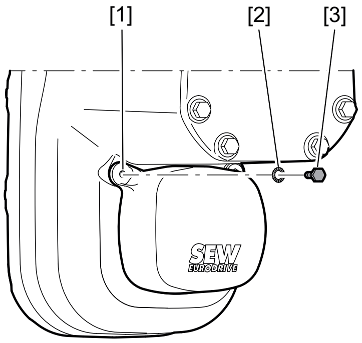
3. Fasten the safety cover in the bore provided for this purpose using the enclosed screw and serrated lock washer.

   ⇨ The permitted tightening torque for the M4x10 screw is 3.3 Nm.



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[1] Bore
[2] Serrated lock washer
[3] M4x10 screw

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8.11.2 Installation without cover

In certain individual cases (e.g. through-shaft), you cannot install the safety cover. In these cases, the safety cover is not necessary if the system or unit manufacturer provides corresponding components to guarantee for the compliance with the required degree of protection.

If this results in additional maintenance, you have to describe this in the operating instructions for the system or component.

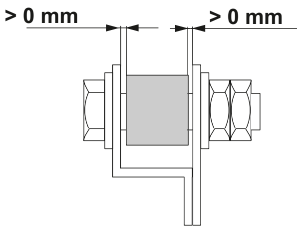
8.12 Torque arm

Note the following points when you mount the torque arm:

- Do not place torque arms under strain during installation.
- Always use bolts of quality 8.8 to fasten torque arms.
- The required screws are optionally available as an accessory bag.
- Store the socket contact de-energized on both sides.

Mount the torque arm as follows:

1. Perform the steps according to chapter "Installation notes".
2. Mount the torque arm with a socket contact as depicted in the following image:



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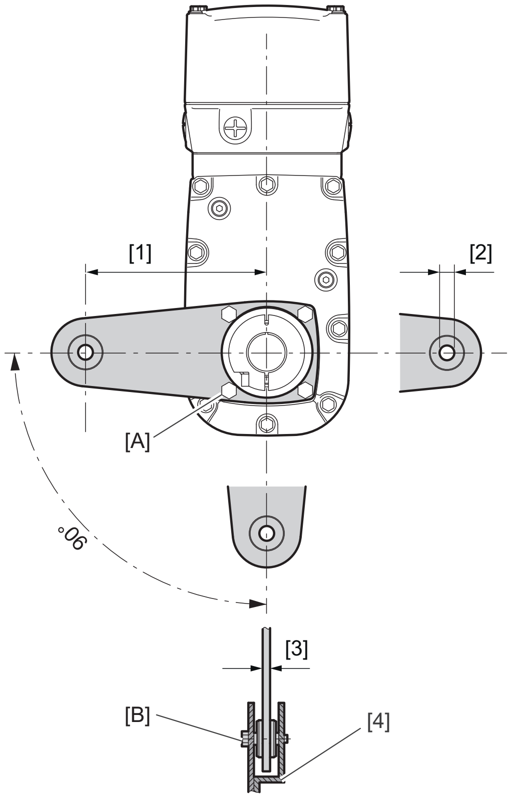
8.12.1 Installation options

The following figure shows the possible mounting positions of the torque arm:



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[1] Torque arm axis length
[2] Bore diameter
[3] Torque arm thickness
[4] Bush with bearings on both ends

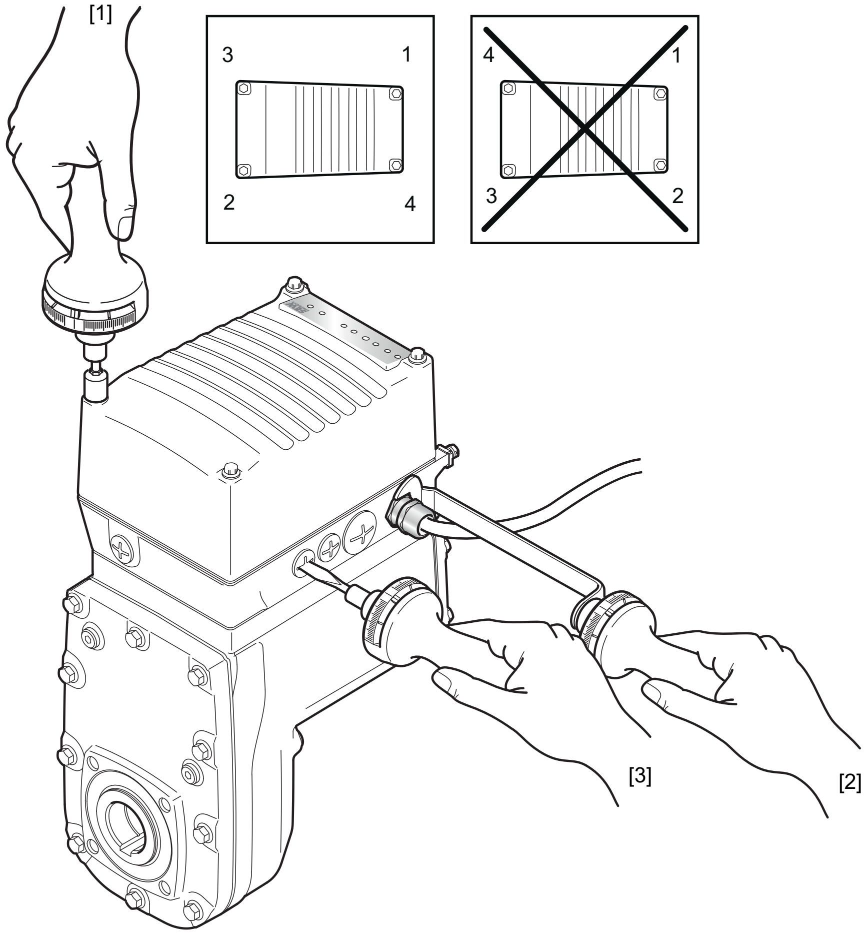
The following table shows the required tightening torques:

Drive	Torque arm				Tightening torque			
	Part number	[1] Axis length	[3] Thickness	[2] Bore Ø	Screw [A]		Screw [B]	
MGF.T2-..-C	24850497	130 mm	6 mm	13 mm	M10	48 Nm	M12	20 Nm
MGF.T2-..-C	24850357	160 mm	10 mm	13 mm	M10	48 Nm	M12	20 Nm
MGF.T4-..-C	24849405	160 mm	10 mm	13 mm	M12	70 Nm	M12	20 Nm

8.13 Tightening torques

8.13.1 Example of MOVIGEAR® performance

The following figure shows an example of the installation of the threaded blanking plugs, cable glands and electronics cover. The number and position of threaded blanking plugs and cable bushings depend on the ordered variant.



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[1] Tighten the screws step by step in a diametrically opposite sequence with a tightening torque of 6.0 Nm.

[2] Tighten the cable gland with a tightening torque according to chapter "Tightening torques for cable glands".

[3] Tighten the threaded plastic blanking plugs supplied by SEW-EURODRIVE with a tightening torque of 2.5 Nm.

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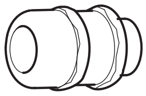
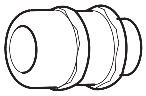
8.13.2 Tightening torques for cable glands

Tighten the EMC cable glands **optionally** included in the delivery by SEW-EURODRIVE with the following torques:

Screw fitting type	Image	Content	Size	Tightening torque		Outer diameter of cable	Tightening force[1]	Part number
				Threaded jacket	Cable clamping			
EMC-compliant cable gland (brass, nickel-plated)		10 pieces	M16 × 1.5	4.0 Nm	3.5 Nm	> 4 to 8 mm	75 N	18204783
		10 pieces	M25 x 1.5	7.0 Nm	5.0 Nm	> 8 to 11 mm	120 N	18204805
						> 11 to 16 mm	130 N	
EMC-compliant cable gland (stainless steel)		10 pieces	M16 × 1.5	4.0 Nm	3.5 Nm	> 4 to 8 mm	75 N	18216366
		10 pieces	M25 x 1.5	7.0 Nm	5.0 Nm	> 8 to 11 mm	120 N	18216382
						> 11 to 16 mm	130 N	

1) The cable fastening in the cable gland must achieve the specified cable pull-out force from the cable gland. This is usually achieved with the specified tightening torque of the cable clamping.

8.13.3 Notes concerning tightening torques

The tightening torques are based on the following friction coefficients:

Friction coefficient $\mu_{G,K}$ for thread and head contact surface	Strength class of screw
0.14	8.8 / 70[1], 80[1]
0.09	10.9, 12.9

1) Stainless steel screws

If screws with a different friction coefficient are used, the tightening torques must be adapted accordingly.

Only use one of the following tools to tighten the screws:

- Torque wrench
- Torque-controlled torque wrench
- Impulse driver, switched off and controlled mechanically
- Torque wrench with light and sound signal
- Motorized torque wrench with dynamic torque measurement
- Torque-controlled, gradual hydraulic tools

9 Electrical installation

9.1 Installation planning taking EMC aspects into account

9.1.1 Notes on arranging and routing installation components

The correct operation of decentralized inverters depends on selecting the correct cables, providing correct grounding, and on a properly functioning equipotential bonding.

Always adhere to the **relevant standards**.

Note the following information.

9.1.2 EMC-compliant installation

INFORMATION

This drive system is not designed for operation on a public low voltage supply system that supplies residential areas.

This is a product with restricted availability in accordance with IEC 61800-3. This product may cause EMC interference. In this case, it is recommended for the user to take suitable measures.

9.1.3 Cable selection, routing and shielding

⚠ WARNING

Electric shock caused by faulty installation.

Severe or fatal injuries.

- Take the utmost care when installing the units.
- Observe the connection examples.

Important information about cable selection, cable routing and cable shielding can be found in chapter "Cable routing and cable shielding" (→ 🗎 260).

9.1.4 Equipotential bonding

Regardless of the PE connection, it is essential that **low-impedance, HF-capable equipotential bonding** is provided (see also EN 60204-1 or DIN VDE 0100-540):

- Provide for a connection over a wide area between the device and the mounting plate.
- To do so, use a ground strap (HF litz wire), for example, to connect the device and the grounding point of the system.

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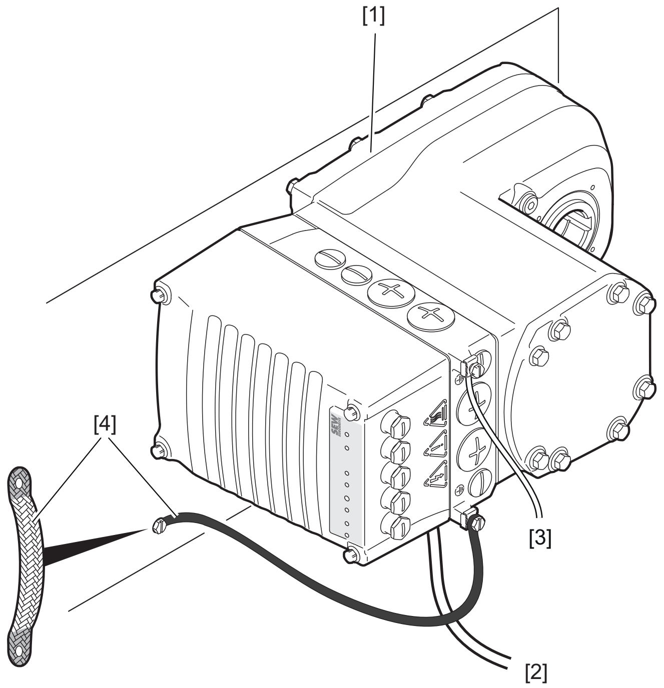
Example

The following figure shows the connection of the equipotential bonding and the PE conductor:



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[1] The mechanical installation of a drive unit **with** hollow shaft does **not** create a conductive connection of drive unit and mounting plate. In this case, a low-impedance, Hf-capable equipotential bonding [4] is required. The mechanical installation of a drive unit **without** hollow shaft creates a conductive connection of drive unit and mounting plate. In this case, the entire contact surface must be electrically conductive (e.g. unpainted).
[2] PE conductor in the supply system cable
[3] 2nd PE conductor via separate terminals
[4] EMC-compliant equipotential bonding, for example using a ground strap (HF litz wire)
The contact surfaces must be electrically conductive (e.g. unpainted). For improved low-impedance grounding at high frequencies, SEW-EURODRIVE recommends using corrosion-resistant connecting elements. The HF grounding option can be combined with LF grounding at the terminal box.

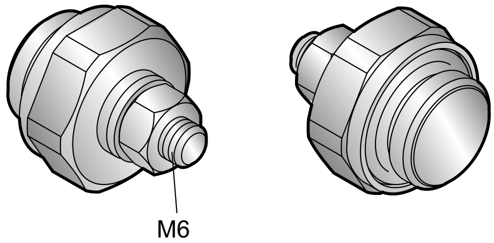
- Do not use the cable shields of signal cables for equipotential bonding.

INFORMATION

For detailed information on equipotential bonding for decentralized inverters and drive units, refer to the manual "EMC in Drive Engineering – EMC-Compliant Installation in Practice" > "Equipotential Bonding of Decentralized Inverters" by SEW-EURODRIVE.

9.2 Equipotential bonding at the connection box

The following cable gland with an M6 threaded bolt provides an additional option for HF-compatible equipotential bonding on a connection box:



9007203139701899

	Tightening torque		Part number
	Cable gland	M6 nut for stud bolt	
M16 cable gland with M6 threaded bolt	4.0 Nm	3.0 Nm	08189234
M25 cable gland with M6 threaded bolt	7.0 Nm	3.0 Nm	08192685

You can install this cable gland in a connection box as long as a cable entry of size M16 or M25 is still free.

Screw the cable gland into the free cable entry and install the grounding cable (with ring cable lug) or the HF litz wire on the M6 threaded bolt.

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9.3 Installation instructions

9.3.1 Permitted voltage systems

Information on voltage supply systems	Information on permissibility
TN and TT systems – voltage systems with directly grounded star point	Use is possible without restrictions.
IT systems – voltage systems with non-grounded star point	Operation with an electronics cover of size 1 in IT system design is permitted (...-513-....)! For devices with electronics cover of size 2, mount an insulating bushing according to chapter "Installing the insulating bushing". • For use in IT systems, SEW-EURODRIVE recommends using insulation monitors with pulse-code measurement. Using such devices prevents false tripping of the insulation monitor due to the earth capacitance of the inverter. • The EMC limit values for interference emission are not specified for IT systems. The EMC limits for interference emission specified in the product manual, chapter "Technical data" do not apply to IT system designs.
Voltage systems with grounded outer conductor	Use is prohibited.

9.3.2 Connecting supply system cables

Observe the following information when connecting the supply system cables:

- The nominal voltage and frequency of the device must correspond with the data of the supply system.
- Dimension the cable cross section according to the input current I_{line} for rated power, see **product manual** > chapter "Technical data" (→ 🗎 28).
- Install safety equipment F11/F12/F13 for line fuses at the beginning of the supply system cable behind the supply bus junction, see chapter "Connection diagram".

  Dimension the safety equipment according to the cable cross section.
- When selecting the fuse, observe the information in the **product manual** > chapter "Technical data" (→ 🗎 28).
- Use only copper conductors with a permitted minimum temperature of 75 °C as connection cables.

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9.3.3 Permitted cable cross section of terminals

Line terminals X1

Observe the permitted cable cross sections for installation:

Line terminals X1	Without conductor end sleeve	With conductor end sleeves (with or without plastic collar)
Connection cross section	0.5 mm² – 6 mm²	0.5 mm² – 6 mm²
Stripping length	13 mm – 15 mm	

Terminals X3 for braking resistor

Observe the permitted cable cross sections for installation:

Terminals X3 for braking resistor	Without conductor end sleeve	With conductor end sleeve (with or without plastic collar)
Connection cross section	0.08 mm² – 4.0 mm²	0.25 mm² – 2.5 mm²
Stripping length	8 mm – 9 mm	

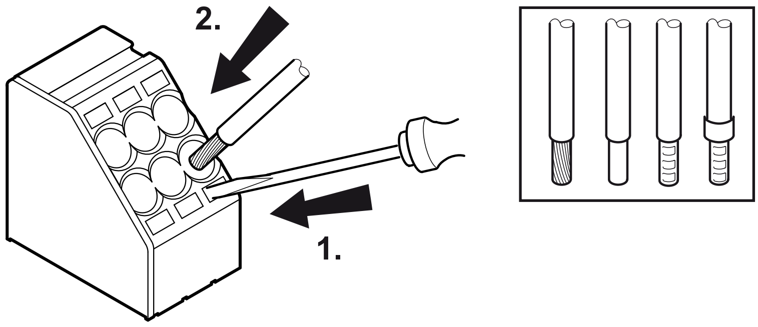
Control terminals X9

Observe the permitted cable cross sections for installation:

Control terminals X9	Without conductor end sleeve	With conductor end sleeve (without plastic collar)	With conductor end sleeves (with plastic collar)
Connection cross section	0.08 mm² – 2.5 mm²	0.25 mm² – 2.5 mm²	0.25 mm² – 1.5 mm²
Stripping length	5 mm – 6 mm		

9.3.4 Activating line terminals X1

Adhere to the following sequence when actuating the line terminals X1:



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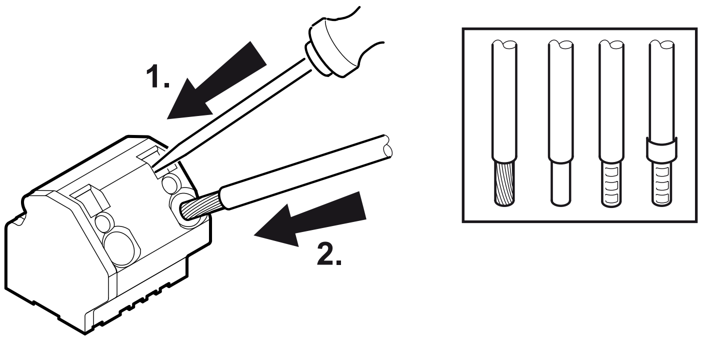
9.3.5 Activating terminals X3 for the braking resistor

Adhere to the following sequence when actuating the X3 terminals for the braking resistor:



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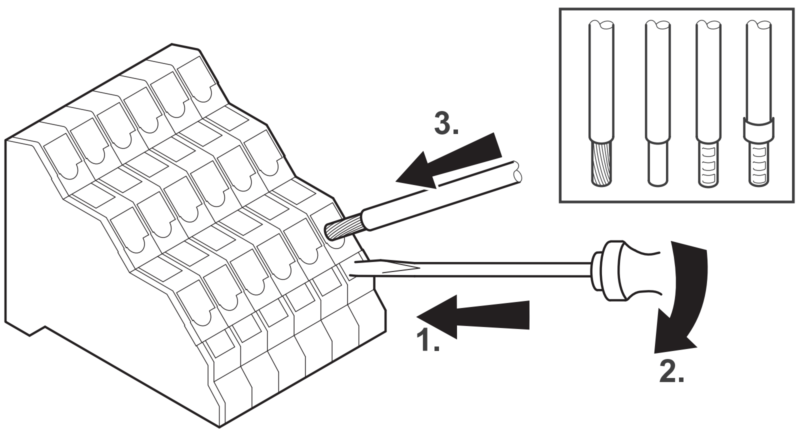
9.3.6 Activating control terminals X9

Observe the following sequence when actuating the X9 control terminals:



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9.3.7 Selecting the residual current device

The inverter can cause a direct current in the PE conductor.

Proceed as follows to select the residual current device:

1. If using a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not using a residual current device.
2. ⚠ **WARNING!** No protection against electric shock if an incorrect type of residual current device is used. Severe or fatal injuries.
   If a residual current device (residual current device RCD or residual current monitor RCM) is provided, use an all-current-sensitive RCD or RCM of type B.
3. If a residual current device is required, select the residual current device according to the requirements for protecting persons, fire protection or system protection. Observe the tripping characteristic, the deceleration and the rated tripping current of the residual current device during selection.
4. During project planning, note that leakage currents which are as low as possible occur in the system for operational reasons.
5. If the operational leakage currents are too high, you can distribute the current supply among several RCDs.

9.3.8 Using the line contactor

Proceed as follows when using the line contractor:

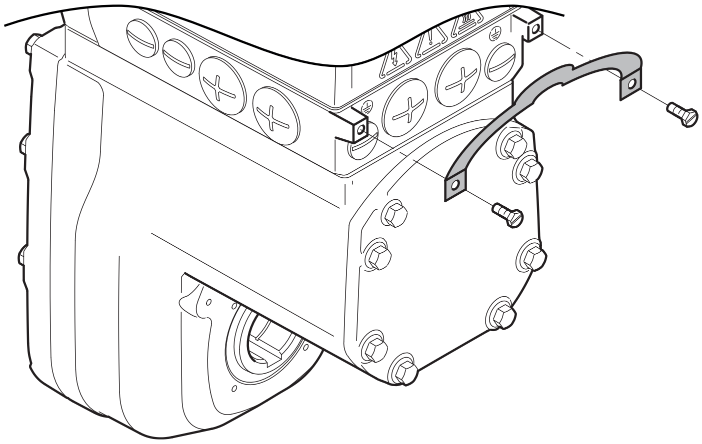
1. Use only a contactor of utilization category AC-3 (EN 60947-4-1) as a line contactor.
2. **NOTICE!** Failing to observe the minimum switch-off time of the line contactor can cause material damage. Irreparable damage to the inverter or unforeseen malfunctions.
   After switching off the voltage supply, keep it switched off for at least 10 s.
   ⇨ Do not switch the voltage supply on or off at the line contactor more than once per minute.

9.3.9 Notes on PE connection

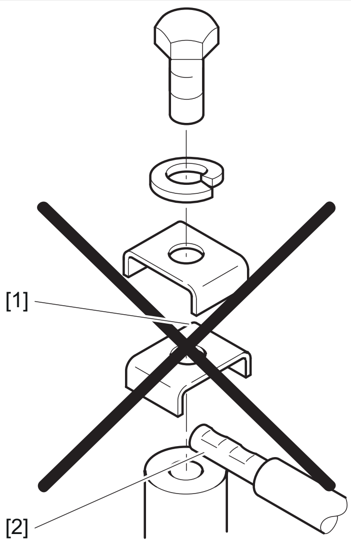
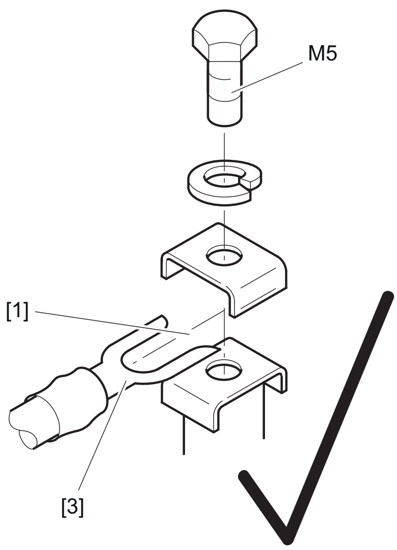
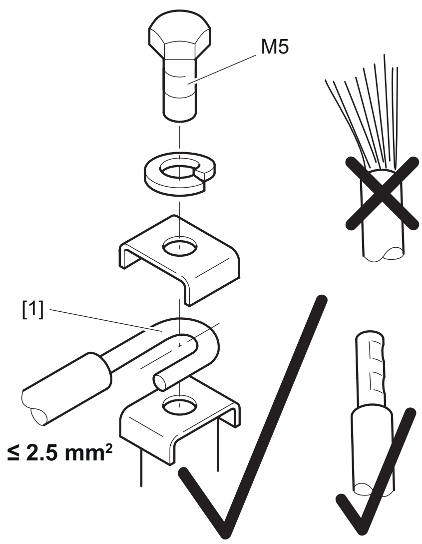
PE connection to MOVIGEAR® with lifting eye

The handle is only used to transport the unit. The handle is **not** required for operation.

1. Remove the lifting eye. Store the lifting eye for future service work.



2. ⚠ **WARNING!** Electric shock due to faulty PE connection. Severe or fatal injuries. Install the PE connection cable to the connection box as follows (screw tightening torque: 2.0 – 2.4 Nm).

Non-permitted mounting	**Recommendation:** **Mounting with forked cable lug**1) **Permitted for all cross sections**	**Mounting with solid connecting wire or litz wire with conductor end sleeve**1) **Permitted for cross sections up to** **maximum 2.5 mm²**
		

1) Use the specified material for the assembly that is included in the accessory bag.

[1] Install the PE connection cable between both U-shaped mounting panels.

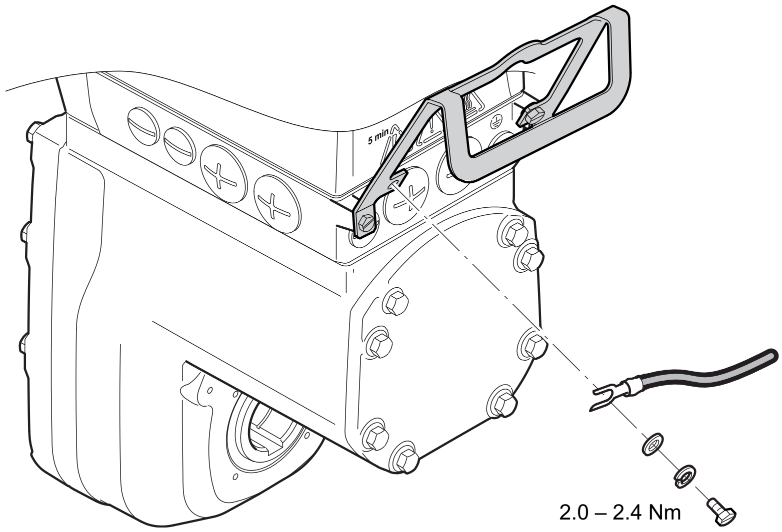
[2] Incorrect installation sequence

[3] Forked cable lug suitable for M5 PE screws

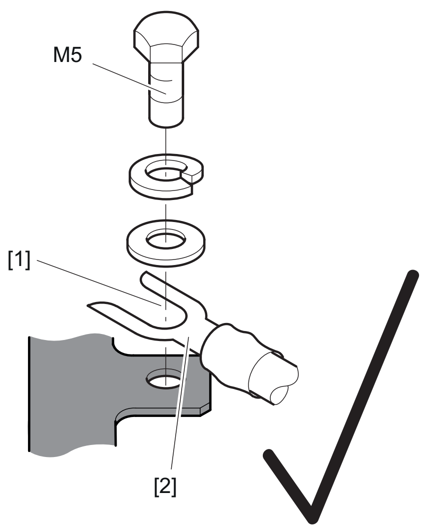
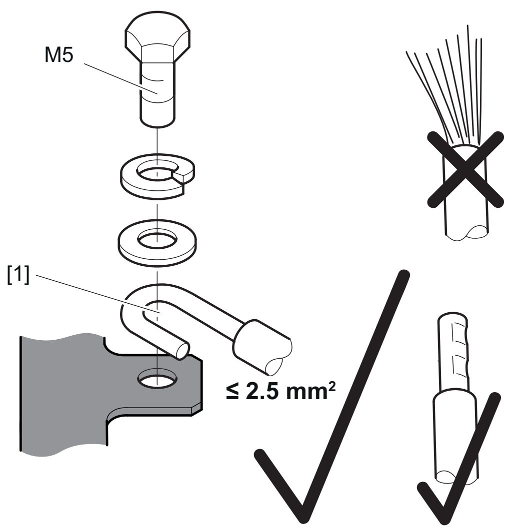
PE connection to MOVIGEAR® with guard bracket

The guard bracket is for the permanent protection of the device. Do not remove the guard bracket.

1. Connect the PE cable to the guard bracket according to the following figure.



2. ⚠ **WARNING!** Electric shock due to faulty PE connection. Severe or fatal injuries. Install the PE cable onto the guard plate as follows (screw tightening torque: 2.0 – 2.4 Nm).

Recommendation: **Mounting with forked cable lug** 1) **Permitted for all cross sections**	**Mounting with solid connecting wire or litz wire with conductor end sleeve** 1) **Permitted for cross section up to max. 2.5 mm²**
	

1) Use the specified material for the assembly that is included in the accessory bag.

[1] Install the PE connection cable between the washer and the guard plate.

[2] Forked cable lug suitable for M5 PE screws

Leakage currents

During normal operation, leakage currents ≥ 3.5 mA may occur. In order to fulfill EN 61800-5-1, observe the following information:

- The ground connection (PE) must be installed in such a way that it meets the requirements for systems with high leakage currents.
- This usually means
  - installing a PE connection cable with a minimum cross section of 10 mm^2 (copper conductor)
  - or installing a second PE connection cable in parallel to the protective earth. The cross section of the second PE connection cable must be at least as large as the cross section of the PE.

    According to DIN EN 61800-5-1, the second PE connection is not required if the line connection is equipped with a connector for industrial applications (according to IEC 60309) and if the supply system cable has a cross section of ≥ 2.5 mm^2.

INFORMATION

According to the IEC 60309-1 standard > chapter "General requirements for connectors, sockets and couplings for industrial applications", the M23 circular connectors from TE Connectivity - Intercontec products of the 723 series comply with connectors for industrial applications.

9.3.10 Installation with protective separation

The electronics cover meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. The connected signal circuits and the DC 24 V voltage supply must meet the requirements according to SELV (**S**afety **E**xtra **L**ow **V**oltage) or PELV (**P**rotective **E**xtra **L**ow **V**oltage) to ensure protective separation. The installation must meet the requirements for protective separation.

9.3.11 Protection devices

- The units come equipped with integrated protection devices against overload and short circuit.
- The power contactor of the supply system cable must be realized through external overload devices.
- The relevant standards must be observed concerning the cable cross section, the voltage drop, and the type of routing that is used.

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9.3.12 Installation above 1000 m amsl

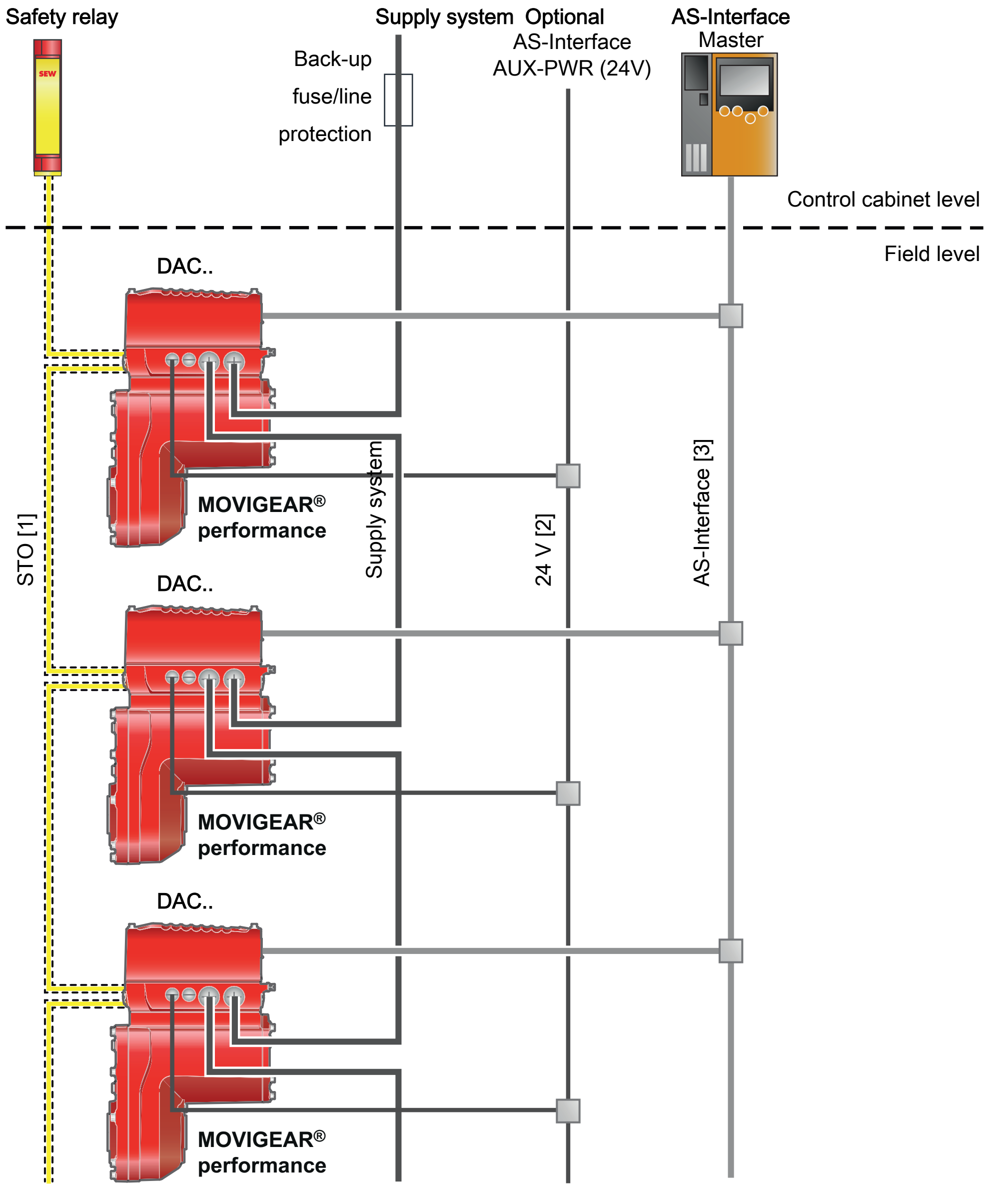
The devices can be used at altitudes above 1000 m above sea level up to 3800 m above sea level under the following marginal conditions. The maximum altitude is limited due to the decreased dielectric strength at lower air density.

- The nominal motor current I_N is reduced due to the reduced cooling above 1000 m, see **product manual** > chapter "Technical data" (→ 🗎 28).
- Above 2000 m above sea level, the air and creepage distances are only sufficient for overvoltage category II. If the installation requires overvoltage category III, you will have to install additional external overvoltage protection to limit overvoltage peaks to 1.5 kV phase-to-phase and 2.5 kV phase-to-ground.
- If safe electrical disconnection is required, it must be implemented outside the device at altitudes of more than 2000 m above sea level (safe electrical disconnection in accordance with EN 61800-5-1).
- At installation altitudes between 2000 m and 3800 m above sea level, measures must be taken that reduce the line side overvoltage from category III to category II for the entire system.

9.4 Installation topologies

9.4.1 Installation topology (example: standard installation)

The following figure shows a basic installation topology with MOVIGEAR® performance:



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[1] The maximum permitted length of the STO cable between the safety relay and the last drive unit is 100 m.
[2] The drive unit is equipped with an integrated DC 24 V supply. As an option, the electronics of the drive unit may be supported by an external DC 24 V supply (AUX-PWR).
[3] AS-Interface communication cable

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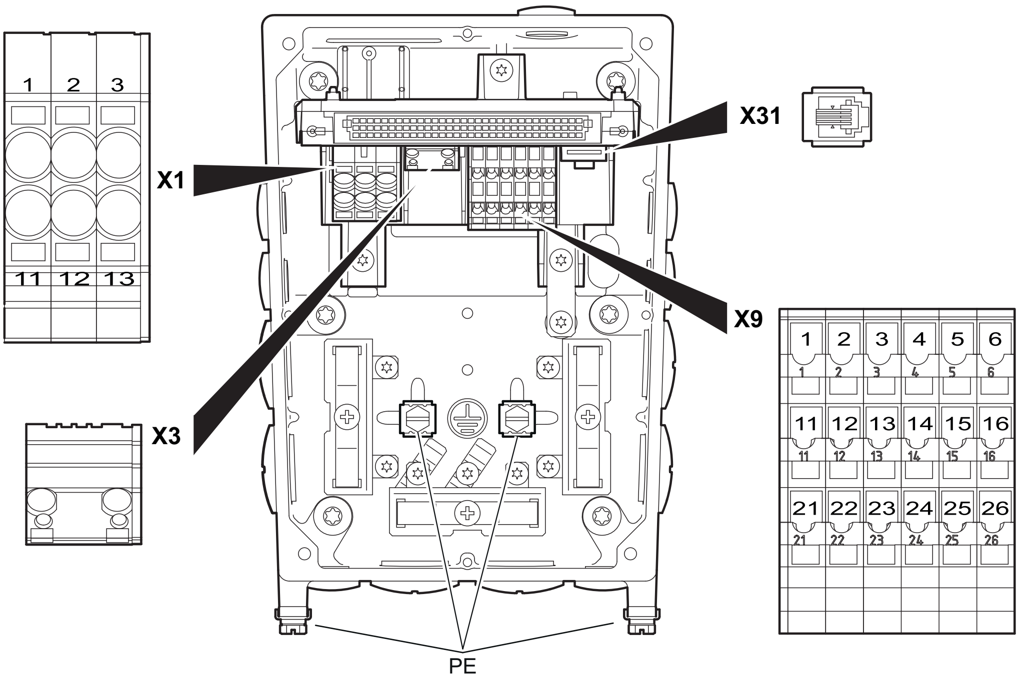
9.5 MOVIGEAR® performance DAC terminal assignment

Attach units without a connector to the terminals as follows:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages in the connection box. Severe or fatal injuries.
   De-energize the device. Pay attention to the 5 safety rules in chapter "Carrying out electrical work safely". Afterwards, wait 5 minutes.
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
3. Secure the output shaft of permanently excited motors against rotation. You thereby avoid an electric shock from the regenerative operation during the rotation of the shaft.
4. Undo the screws of the electronics cover. Remove the electronics cover.
5. Route the cables through the cable glands into the connection box.
6. If terminal X3 for connecting the braking resistor is occupied with an optional internal braking resistor and the capacity of this braking resistor is insufficient, you can alternatively connect an external braking resistor as follows:
   - ⇨ Undo the connections of the internal braking resistor.
   - ⇨ Insulate and fix the connections of the internal braking resistor. Ensure that the connections are electrically isolated from all other components.
   - ⇨ Connect the external braking resistor. When doing this, pay attention to the installation instructions of the unit and the external braking resistor.
7. Connect the unit in accordance with the following terminal assignment.

The following figure shows the terminals of MOVIGEAR® performance DAC:



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The following table shows the terminal assignment of MOVIGEAR® performance DAC:

Terminal	No.	Marking	Function	
X1 line terminals	1	Brown	L1	Line connection, phase L1 – IN
	2	Black	L2	Line connection, phase L2 – IN
	3	Gray	L3	Line connection, phase L3 – IN
	11	Brown	L1	Line connection, phase L1 – OUT
	12	Black	L2	Line connection, phase L2 – OUT
	13	Gray	L3	Line connection, phase L3 – OUT
⏚	–	–	PE	Protective earth connection
X3 braking resistor terminals	1	–	BW	Braking resistor connection
	2	–	BW	Braking resistor connection
X9 control terminals	1	Yellow	F_STO_P1	Input STO+
	2	Yellow	F_STO_P1	Input STO+ (to loop through)
	3	–	0V24_OUT	0 V 24 reference potential for DC 24 V output
	4	–	24V_OUT	DC 24 V output
	5	–	DI01	Digital input DI01
	6	–	DI02	Digital input DI02
	11	Yellow	F_STO_M	Input STO_ground
	12	Yellow	F_STO_M	Input STO_ground (to loop through)
	13	–	24V_IN	DC 24 V supply
	14	–	DOR-C	Relay output DO R, common contact
	15	–	DI03	Digital input DI03
	16	–	DI04	Digital input DI04
	21	Yellow	F_STO_P2	Input STO+
	22	Yellow	F_STO_P2	Input STO+ (to loop through)
	23	–	0V24_IN	0 V 24 reference potential for DC 24 V supply
	24	–	DOR-NO	Relay output DO R, NO contact
	25	–	0V24_OUT	0 V 24 reference potential for output
	26	–	24V_OUT	DC 24 V output

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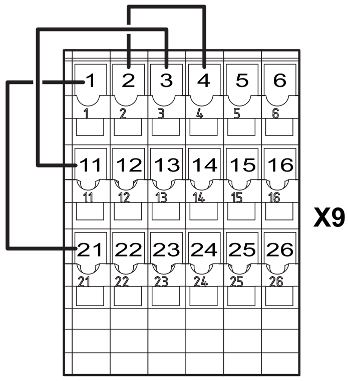
Terminal	No.	Marking	Function	
X31 engineering interface	1	–	0V24_OUT	0 V 24 reference potential for DC 24 V auxiliary output
	2	–	CAN_L	CAN Low connection
	3	–	CAN_H	CAN High connection
	4	–	24V_OUT	DC 24 V auxiliary output

The following figure shows the factory-installed jumpers at the X9 terminals:



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These jumpers are not present in the following designs:

- Designs with connectors with STO function

Additional information is available in the product manual > chapter "Project planning for functional safety" and chapter "Connection variants functional safety".

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9.6 Electrical installation – functional safety

9.6.1 Installation instructions

⚠ WARNING

Only the types of connection described in this documentation may be used.

Severe or fatal injuries.

- Non-compliant connection variants specified in other documentation are not permissible.

9.6.2 Connection variants of the STO safety sub-function

General information

If the safety requirements from this documentation are met, then all connection variants listed in this documentation are generally permitted for safety-relevant applications. This means that you must ensure without fail that the DC 24 V safety inputs are activated by a safety controller or an external safety relay, so that an independent restart is not possible.

All the safety conditions stipulated in the chapters "Integrated safety technology", "Safety conditions", and "Connection variants" must be satisfied on a primary basis for the basic selection, installation, and application of the safety components such as safety relay, emergency stop switch, and the approved connection variants.

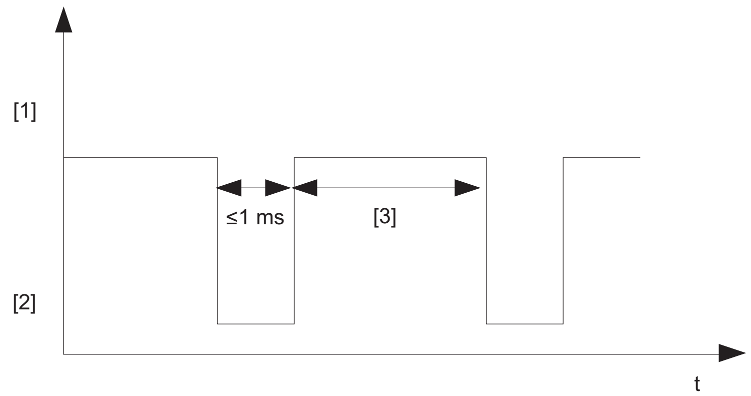
The wiring diagrams in chapter "Electrical installation" are block diagrams whose only purpose is to show the safety sub-function(s) with the relevant components. For reasons of clarity, circuit-related measures that always have to be implemented are not shown in the diagram. These measures are, e.g.:

- Ensuring the availability of touch guards.
- Handling overvoltages and undervoltages.
- Avoiding insulation faults.
- Detecting ground faults or short circuits in externally installed lines.
- Guaranteeing the required interference immunity against electromagnetic interference.

Requirements

Use of safety controllers

The switch-off test pulse of the used safe digital outputs (F-DO) must be ≤ 1 ms and another switch-off test pulse must only occur 2 ms later at the earliest.



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[1] High
[2] Low

INFORMATION

- SEW-EURODRIVE recommends setting the dark tests (switch-off tests) to 0.8 ms due to tolerances in the safety controllers. Please refer to the description of your safety controller for where and how to set this time.
- If the safety-related control voltage at the STO connection is switched off (STO activated), you must observe chapter "Requirements for the external safety controller" (→ 🗎 173) with regard to the test pulses.
- If F_STO_P1 and F_STO_P2 are connected to DC 24 V and if F_STO_M is connected to GND, STO is deactivated.

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Switching off the STO signal for several drive units (STO group disconnection)

The STO signal for several drive units can be provided by a single safety relay. The following requirements must be met:

- The total cable length is limited to max. 100 m. Any other instructions published by the manufacturer on the use of the safety device (for the respective application) must also be observed.
- The maximum output current and the maximally permitted contact load of the safety device must be observed.
- You must comply with the permitted signal levels at the STO input and all other technical data of the device. The routing of the STO control cables and the voltage drop must be considered.
- Other requirements of the safety manufacturer (such as protecting the output contacts against welding) must be strictly observed. The basic requirements for cable routing also apply.
- A calculation based on the technical data of the device must be performed separately for each case of STO group disconnection.
- A maximum of 20 drive units may be connected directly with each other. Additional parallel lines are permitted if the minimum voltage increase described in the technical data is adhered to.

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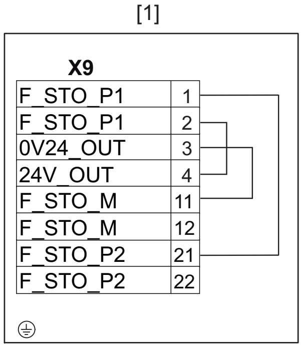
Wiring diagrams of the connection variants

STO connection at terminal X9

For detailed information on terminal X9, refer to chapter "Electrical Installation" > "Terminal assignment".

Delivery state

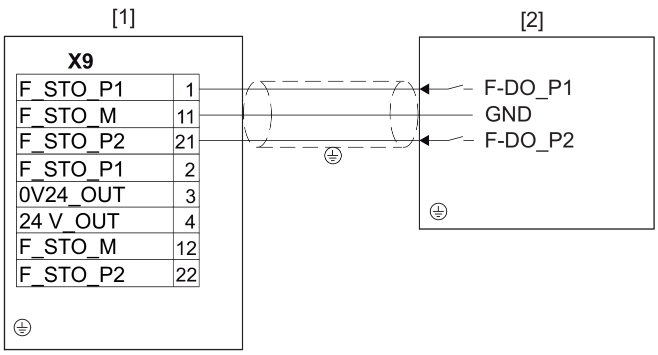
In the delivery state, the following terminals are bridged on STO connection X9. The jumpers are marked with the text "Caution, remove jumper for safety operation". To use the drive unit in safety-related applications, remove the jumpers from the STO terminal X9.



9007222815498379

[1] Drive unit

Two-pole sourcing output



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[1] Drive unit
[2] External safety device

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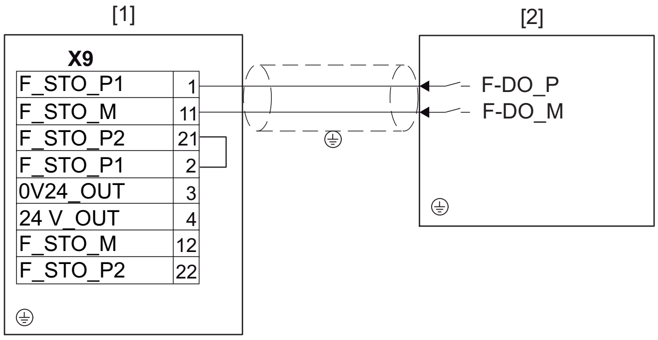
Two-pole sourcing/sinking output

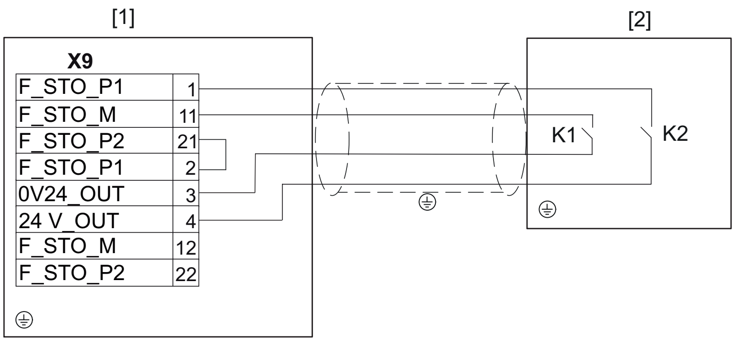
Example 1



9007222818872587

[1] Drive unit
[2] External safety device

Example 2



34106433163

[1] Drive unit
[2] External safety device

Observe the following information:

- The supply voltages 0V24_OUT and 24V_OUT must not be used to supply the external safety device.
- This connection variant (example 2) is only permitted if a fault can be excluded for the cable between the drive unit and the external safety device. Fault exclusion between any 2 conductors in a cable according to EN ISO 13849-2 is possible if the cable is permanently (fixed) installed and protected against external damage, for example, by using cable duct or armored conduit.

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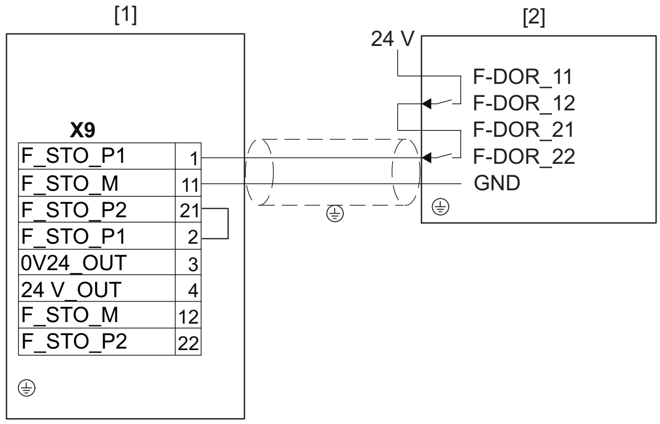
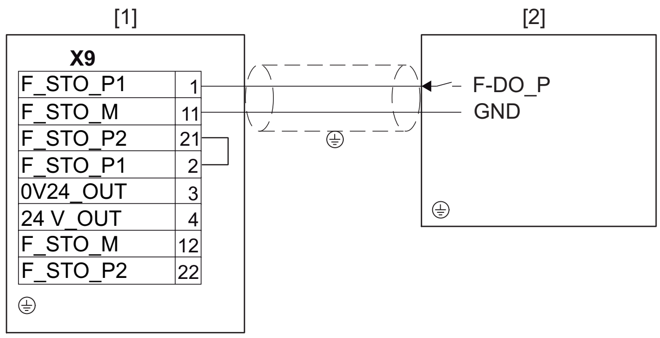
Two-channel serial sourcing output



9007222818944907

[1] Drive unit
[2] External safety device

Single-pole sourcing output



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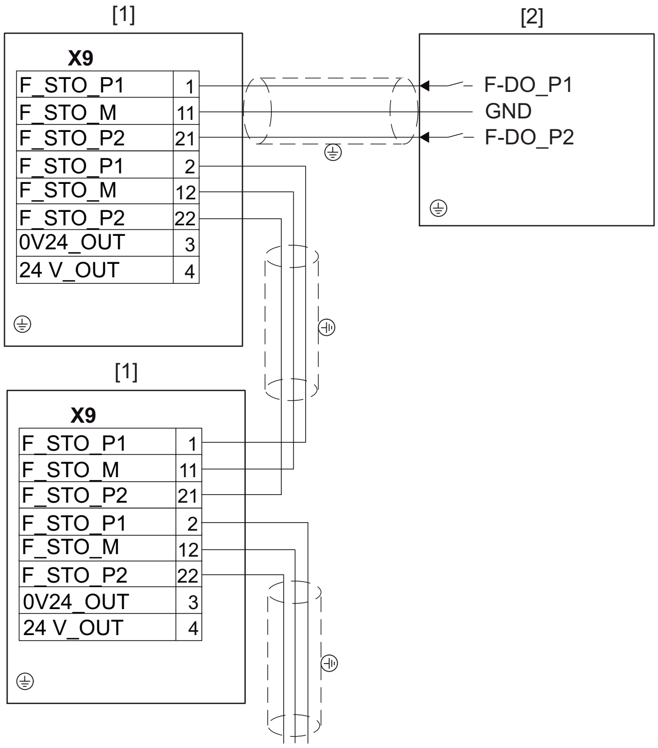
[1] Drive unit
[2] External safety device

STO group disconnection, two-pole, sourcing output



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[1] Drive unit
[2] External safety controller

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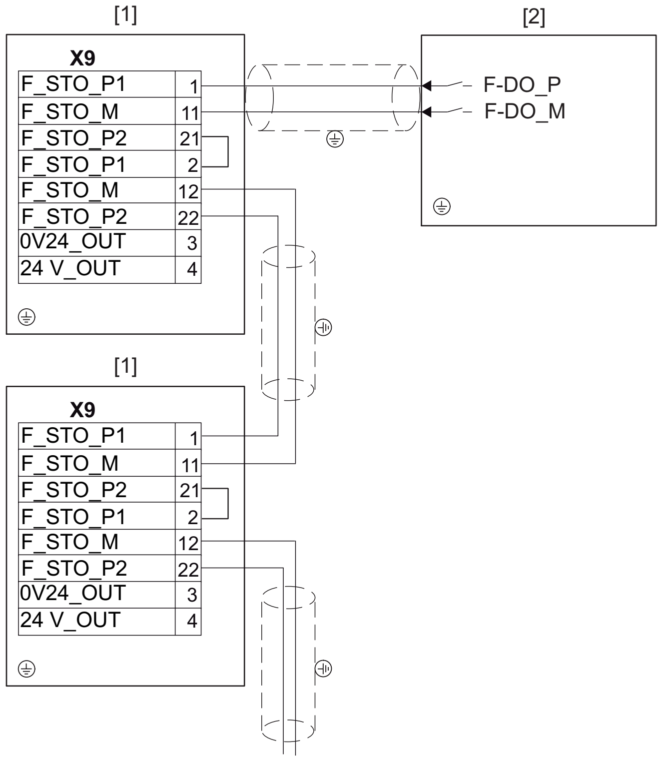
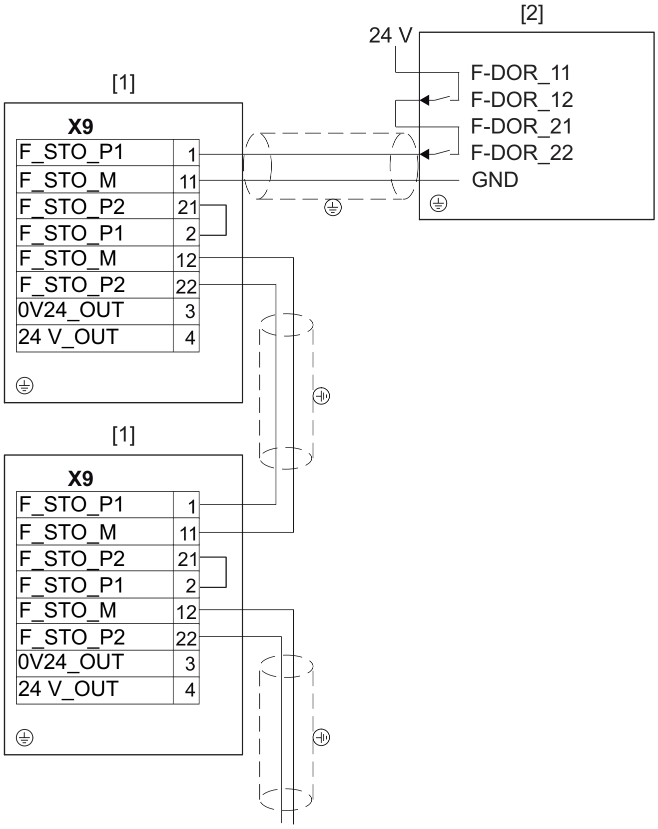
STO group disconnection, two-pole, sourcing/sinking output



25228157067

[1] Drive unit
[2] External safety controller

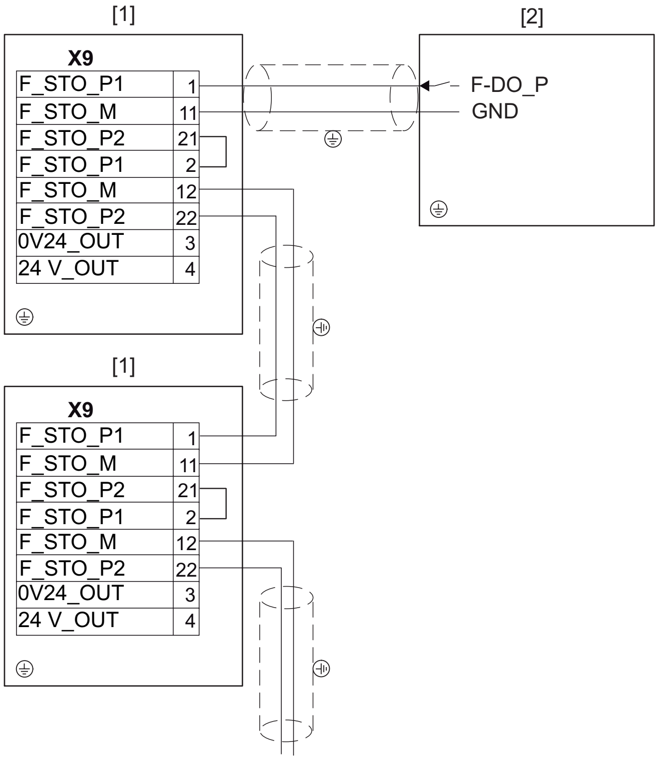
STO group disconnection, two-channel, serial sourcing output



25229441035

[1] Drive unit
[2] External safety controller

STO group disconnection, one-pole, sourcing output



25229445003

[1] Drive unit
[2] External safety controller

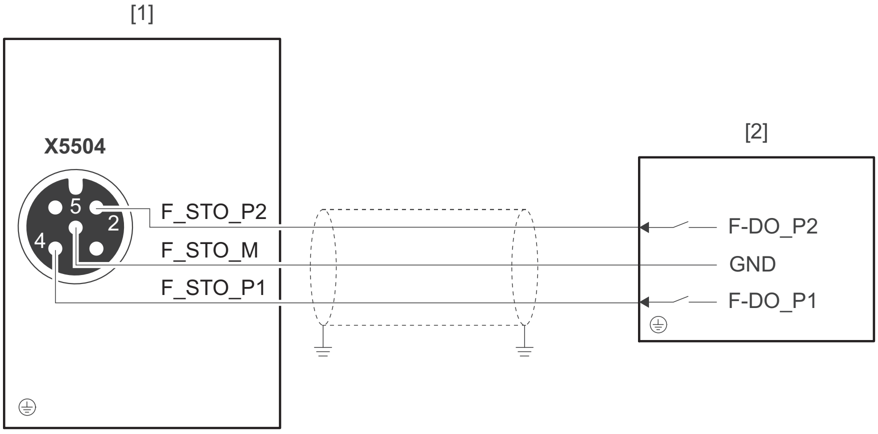
STO connection via M12 connector X5504/X5505

For further information on the connection of X5504/X5505, refer to the **product manual** > chapter "Electrical installation" > "Assignment of optional connectors".

Delivery state

In the delivery state, X5504 is not connected, which means the STO input is active. According to the safety concept, X5504 must be connected or temporarily jumpered using the optionally available STO jumper plug for starting up the device.

Two-pole sourcing output

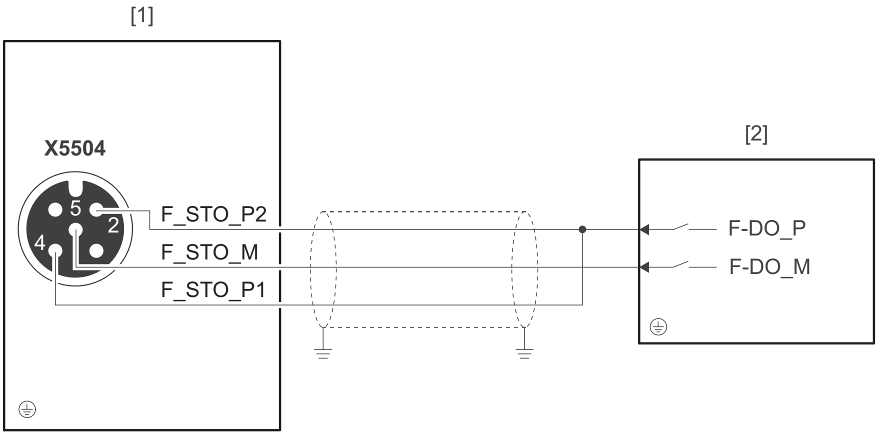


23876274315

[1] Drive unit
[2] External safety device

Two-pole sourcing/sinking output

Example 1



23876260491

[1] Drive unit
[2] External safety device

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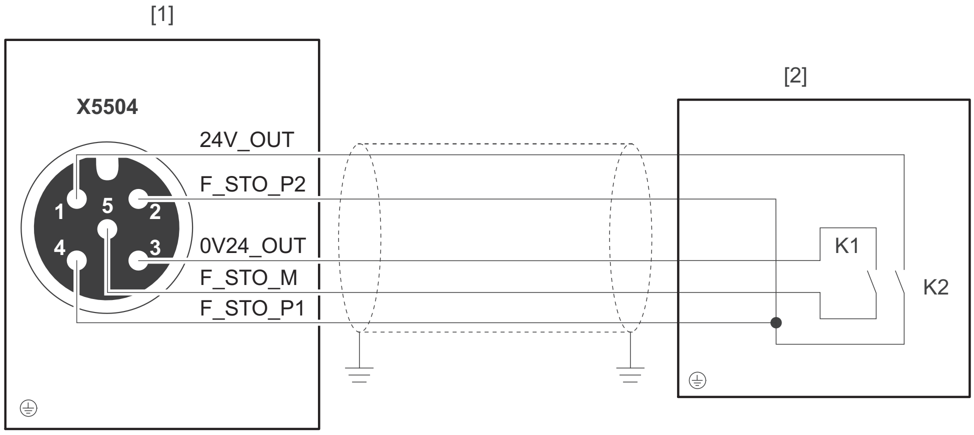
Example 2



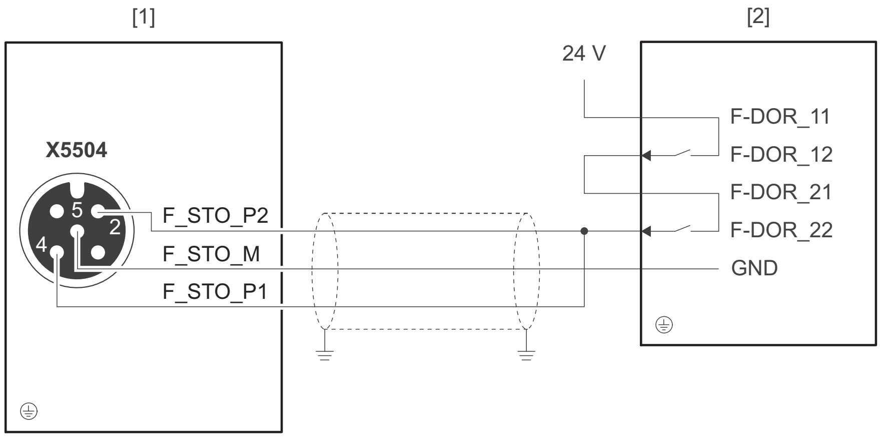
34216188171

[1] Drive unit
[2] External safety device

Observe the following information:

- The supply voltages 0V24_OUT and 24V_OUT must not be used to supply the external safety device.
- This connection variant (example 2) is only permitted if a fault can be excluded for the cable between the drive unit and the external safety device. Fault exclusion between any 2 conductors in a cable according to EN ISO 13849-2 is possible if the cable is permanently (fixed) installed and protected against external damage, for example, by using cable duct or armored conduit.

Two-channel serial sourcing output



23875551243

[1] Drive unit
[2] External safety device

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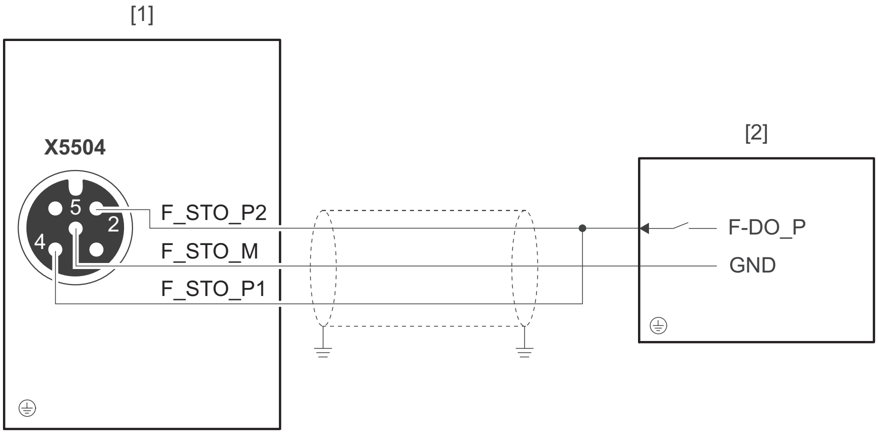
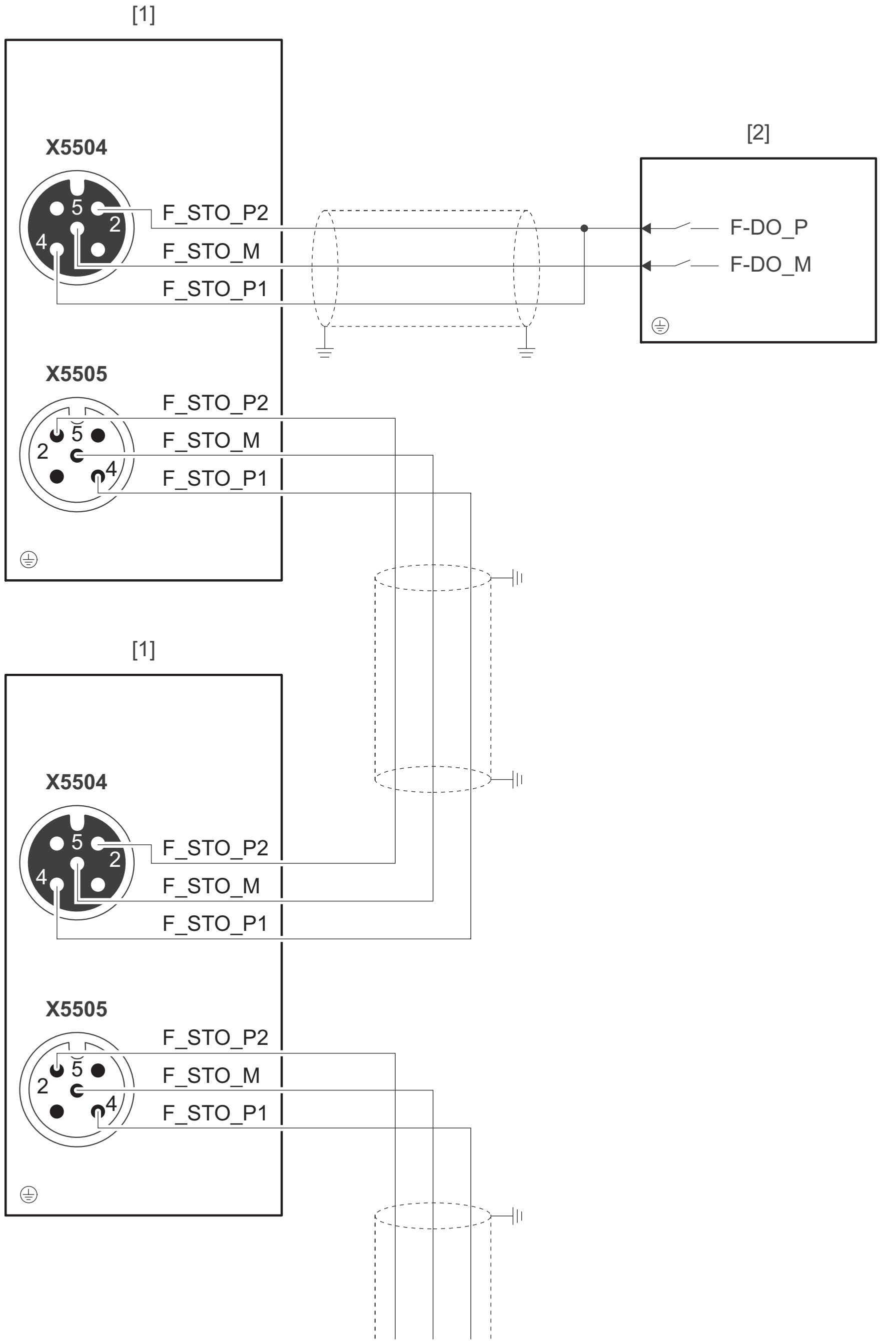
Single-pole sourcing output



[1] Drive unit
[2] External safety device

STO group disconnection, two-pole, sourcing/sinking output



9007223142162187

[1] Drive unit
[2] External safety device

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STO jumper plug (three-pin)

⚠ WARNING

Safe disconnection of the device is not possible when the jumper plug is used.

Severe or fatal injuries.

- Only use the jumper plug if the device is not used to fulfill any safety function.

⚠ WARNING

Disabling of the safety-related disconnection of further devices due to parasitic voltages when using an STO jumper plug.

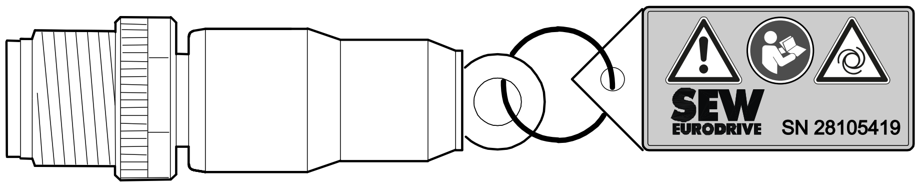
Severe or fatal injuries.

- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

A printed red tag is attached to the STO jumper plug.

The STO jumper plug can be connected to the STO connector X5504 of the device. The STO jumper plug deactivates the safety functions of the device.

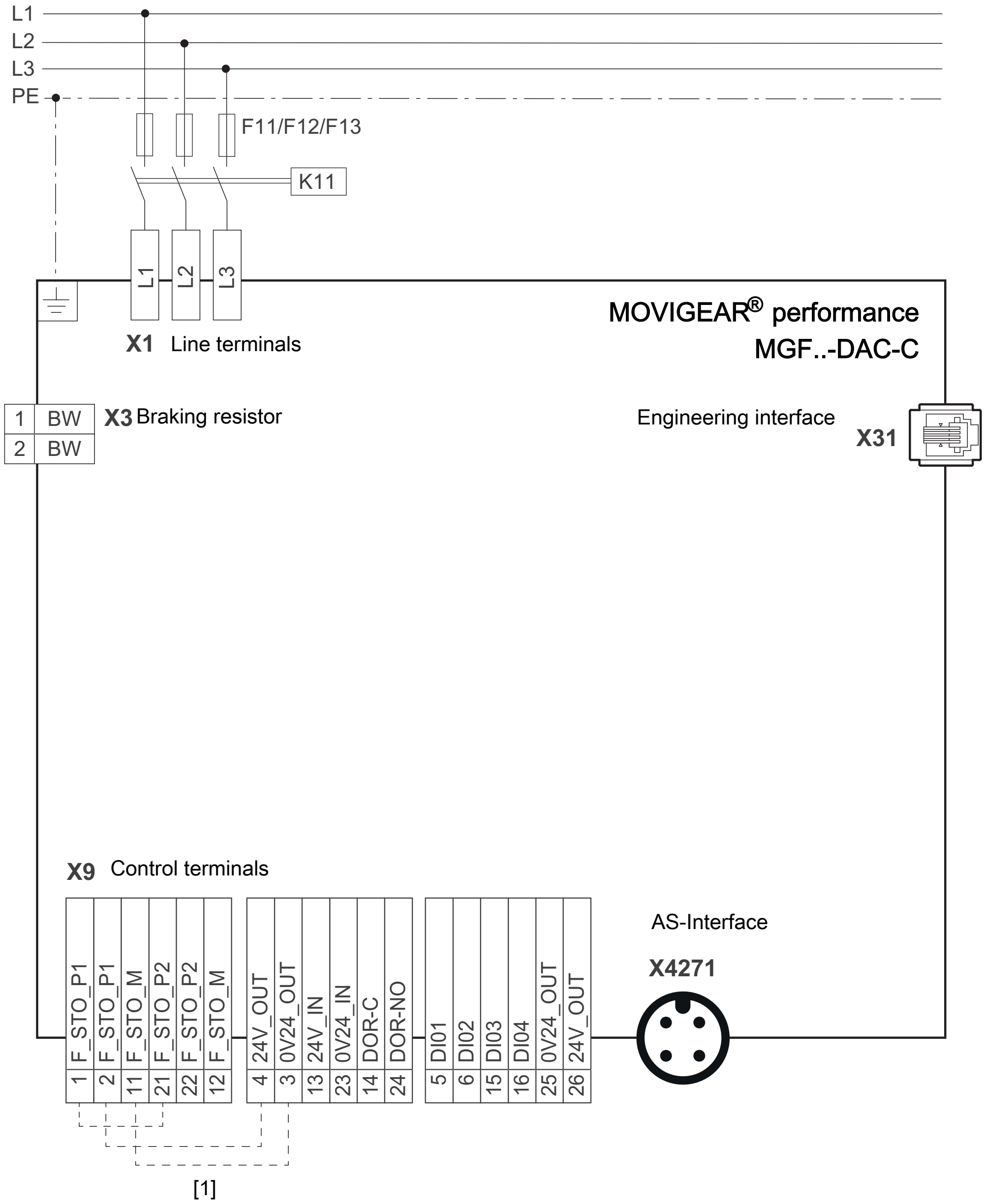
The following figure shows the STO jumper plug with the printed **red** tag, part number 28105419:



25247142411

9.7 MOVIGEAR® performance DAC wiring diagram

The following figure shows the connections of the device:



9007228244603915

[1] Jumpers installed at the factory for designs without connectors with STO function. Further information can be found in the product manual > chapter "Project planning for functional safety".

For the terminal assignment, refer to chapter "MOVIGEAR® performance DAC terminal assignment" (→ 🗎 241).

For the positions of the Connectors, refer to chapter "Connectors" (→ 🗎 266).

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9.8 Cable routing and cable shielding

9.8.1 Accessory bag with installation equipment (part number 18241395)

INFORMATION

For some installation variants, you do not need all the parts of the accessory kit.

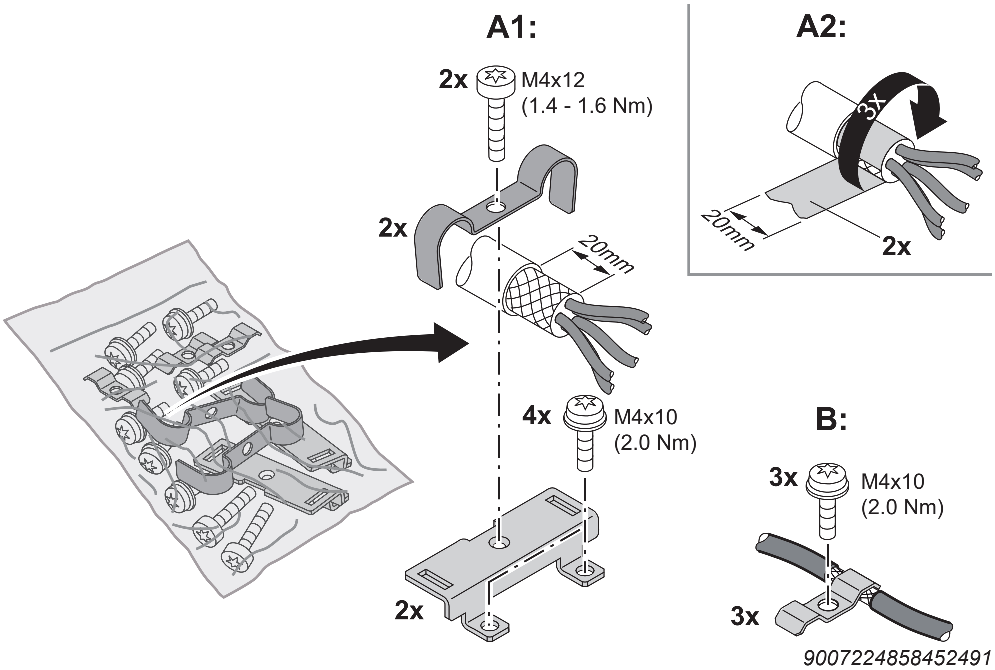
The delivery of each drive unit includes the following accessory bag with installation materials for cable shielding (exception: Does not apply when all possible connections were ordered in connector design):

- **A1: Installation material for line and hybrid cables:**

  2 × shield clamps with shield plate and screws to connect the shield of line cables or hybrid cables (outer shield).
- **A2: Conductive film:**

  2 × pieces of conductive film to wind around the braid shield. Use the conductive film if required.
- **B: Installation equipment for signal lines:**

  3 × shield clamps with screw to connect the shield of line cables (e.g. STO).



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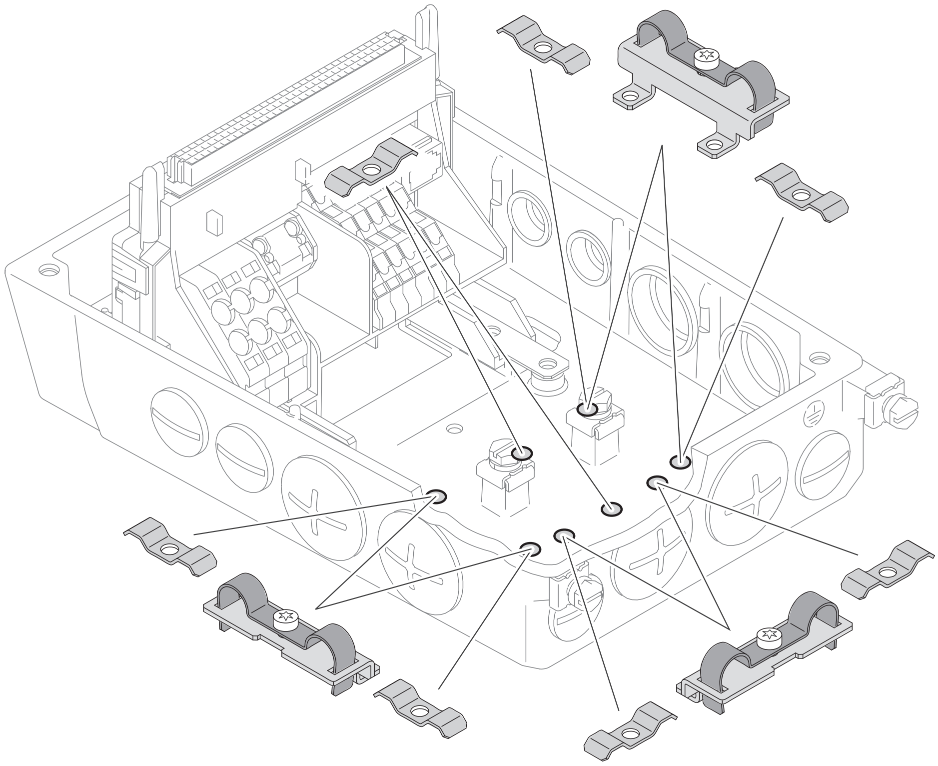
9.8.2 General installation options

The following chapters show common examples and contain important notes on cable selection and cable routing.

Mounting installation material

The following figure shows the mounting positions of the installation material.



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9.8.3 Installation with separately routed AS-Interface/AUX-PWR cable

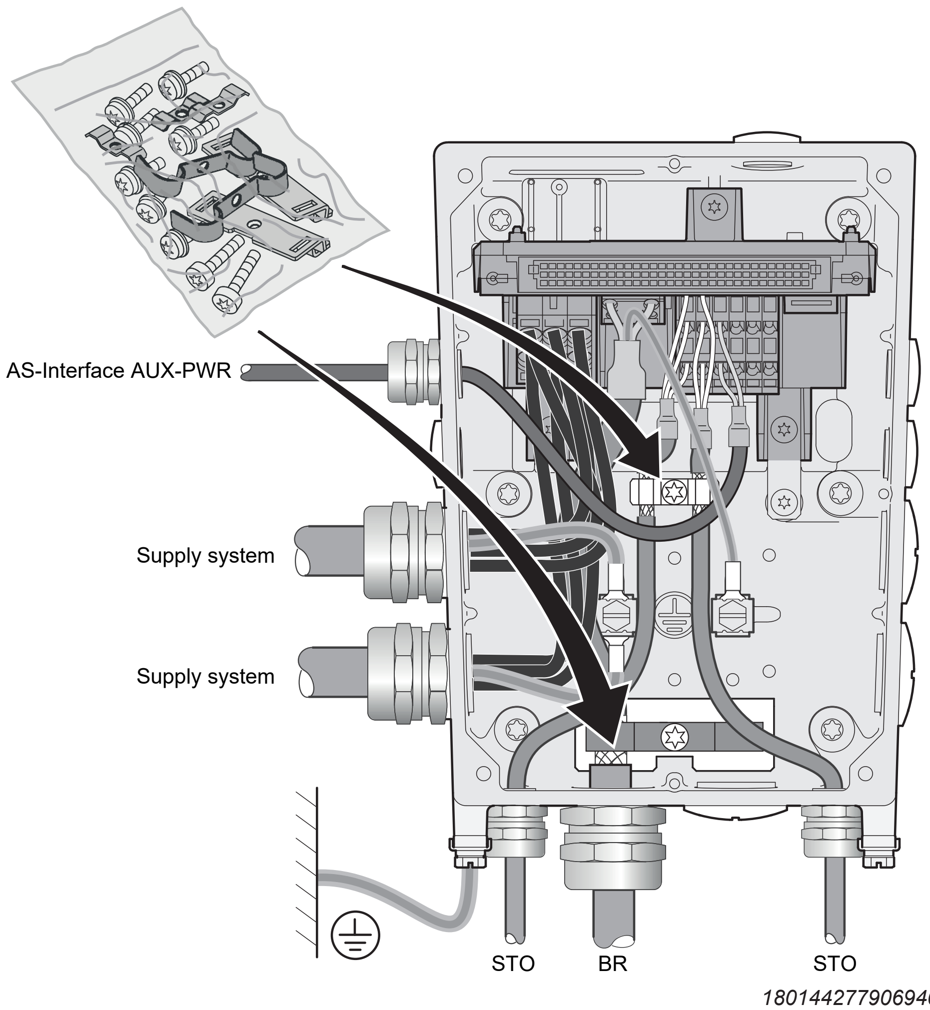
Notes on cable routing and shielding – Recommended cable routing

Note the following points for cable routing and cable shielding:

- Cable selection
  - When selecting cables, observe the recommended connection cables in the product manual > chapter "Technical data" > "Connection cables".
  - You can use unshielded connection cables as line connection cables.
- Cable shielding
  - Connect the shields of the cables to the metal housing of the unit using the shield clamps of the accessory bag. To do so, expose the shield in the area of the shield contact surface.
  - As an alternative, you can use optionally available EMC cable glands to connect the shield of cables, see "EMC cable glands" chapter.
- External braking resistor
  - Also observe the notes in chapter "Terminal assignment ...".
- Observe the permitted bending radii of the cables for cable routing.

Cable routing AS-Interface

The following figure shows an example of the basic cable routing.



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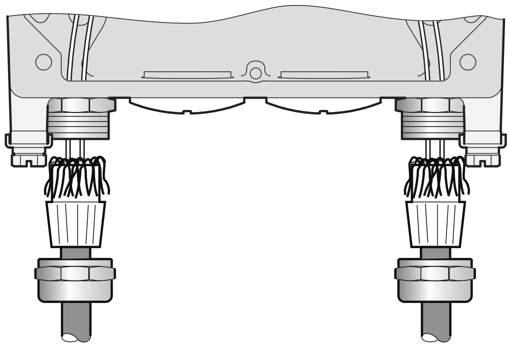
9.9 EMC cable glands

9.9.1 Cable shielding (alternative)

As an alternative to using shield clamps for shielded cables (e.g. control cables, STO cables, power cables), you can use EMC cable glands, which are available as an option, to connect the shield.



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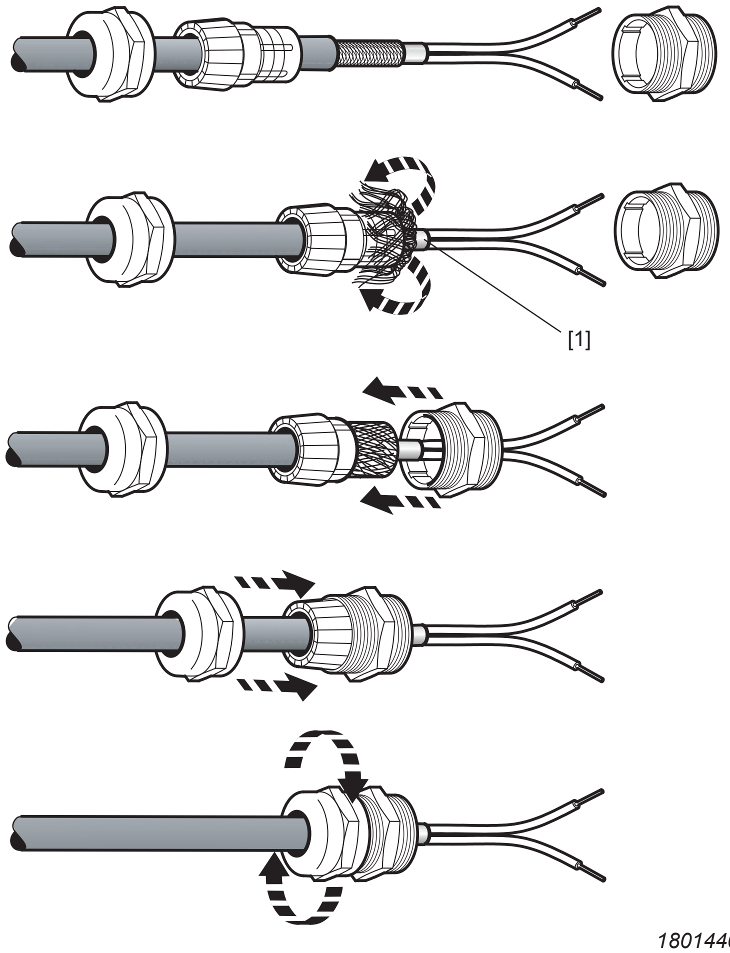
9.9.2 Assembly of EMC cable glands

Assemble the EMC cable glands supplied by SEW-EURODRIVE according to the following figure:



18014401170670731

[1] Cut off insulation foil and fold it back.

9.10 Connectors

9.10.1 Representation of connections

The connection diagrams of the connectors depict the contact end of the connections.

9.10.2 Connection cables

INFORMATION

For more information about cable types, see chapter "Technical data".

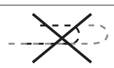
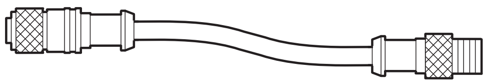
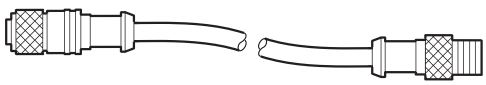
Connection cables are not included in the scope of delivery.

Prefabricated cables for connecting SEW-EURODRIVE components are available to order. For each connection, the available prefabricated cables are listed. Specify the part number and length of the required cable in your order.

The quantity and design of the required connection cables depend on the design of the devices and the components to be connected. This is why you do not need all listed cables.

Cable types

The table below shows the depictions used and what they mean:

Depiction	Meaning
	Suitable for cable carriers
	Not suitable for cable carriers
	Fixed length
	Variable length
	Cable cut off Not prefabricated
	Cable stripped (Partially) assembled

Cable routing

Observe the permitted bending radii of the cables used when routing the cables. Further information can be found in the product manual > chapter "Technical data" > "Dimension drawings of connectors of the connection box" > "Connectors including mating connectors" (→ 🗎 116).

Using prefabricated cables with or without connectors

SEW-EURODRIVE uses prefabricated cables for certifications, type tests, and approval of the devices. The cables available from SEW-EURODRIVE meet all the requirements necessary for the functions of the device and the connected components. Device considerations are always carried out for the basic device including all the components to be connected and the corresponding connection cable.

As such, SEW-EURODRIVE recommends using only the prefabricated cables listed in the documentation.

When using devices with integrated safety functions according to EN ISO 13849, you also have to adhere to all the conditions and requirements for the installation and routing of cables described in the documentation for the devices concerning functional safety.

Using third-party cables with connectors

If third-party cables are used – even if these cables are technically equivalent – SEW-EURODRIVE will not accept any liability and cannot guarantee compliance with device properties or that the device will function correctly.

If you use third-party cables for connecting the device and the connected components, you must ensure that the respective, national provisions are followed. Note that using third-party cables may unintentionally affect the technical characteristics of the device or unit network. This particularly applies to the following properties:

- Mechanical properties (e.g. IP protection class, cable carrier suitability)
- Chemical properties (e.g. silicone and halogen free, resistance to substances)
- Thermal properties (e.g. thermal stability, increase in device temperature, flammability class)
- EMC behavior (e.g. limit values, interference emission, compliance with normative interference immunity values)
- Functional safety (approvals according to EN ISO 13849-1)

Cables that are not explicitly recommended by SEW-EURODRIVE must at least meet the requirements of the following standards and be approved according to these connector standards:

- IEC 60309
- IEC 61984

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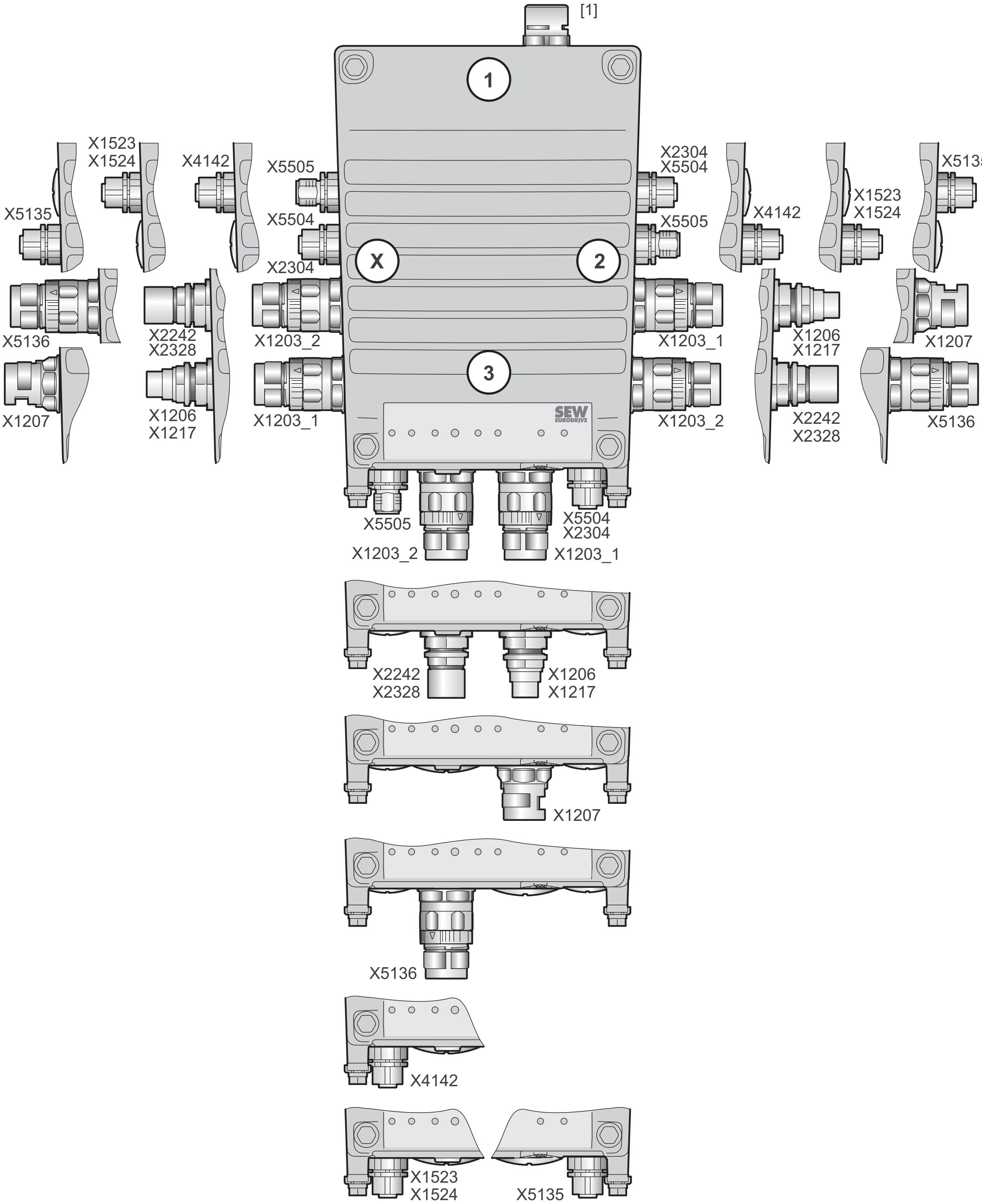
9.10.3 Connector positions of the MOVIGEAR® performance DAC drive unit

The following figure shows possible connector positions:



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Connectors				Not together at a position with the connector:
Designation	Coding ring/ color	Function	Position	
X1203_1	Black	"AC 400 V connection" (→ 🗎 274)[1)	X, 2 or 3	• X1206 • X1207 • X1217
X1203_2	Black	"AC 400 V connection" (→ 🗎 274)	X, 2 or 3	• X2242 • X2328 • X5136
X1206	–	"AC 400 V connection (IN)" (→ 🗎 280)[2)]	X, 2 or 3	• X1203_1 • X1207 • X1217
X2242	–	"AC 400 V connection (OUT)" (→ 🗎 281)	X, 2 or 3	• X1203_2 • X2328 • X5136
X1207	Black	"AC 400 V connection" (→ 🗎 282)	X, 2 or 3	• X1203_1 • X1206 • X1217
X1217	–	"PA hybrid connection (IN)" (→ 🗎 283)[3)] AC 400 V and DC 24 V backup voltage	X, 2 or 3	• X1203_1 • X1206 • X1207
X2328	–	"Hybrid connection PA (OUT)" (→ 🗎 284) AC 400 V and DC 24 V backup voltage	X, 2 or 3	• X1203_2 • X2242 • X5136
X5504	Yellow	"STO" (→ 🗎 285)[4)] (3-wire connection)	X, 2 or 3	• X2304 • X5135
X5505	Gelb	"STO" (→ 🗎 290) (3-wire connection)	X, 2 or 3	• X1523 • X1524 • X4142
X2304	–	"Connection of external braking resistor" (→ 🗎 295)	X, 2 or 3	• X5504 • X5135
X5136	–	"Digital inputs/outputs" (→ 🗎 298)	X, 2 or 3	• X1203_2 • X2242 • X2328
X5135	–	"Digital inputs/outputs" (→ 🗎 297)	X, 2 or 3	• X5504 • X2304
X1523	Light gray	"DC 24 V backup voltage – input" (→ 🗎 301)	X, 2 or 3	• X5505 • X1524 • X4142

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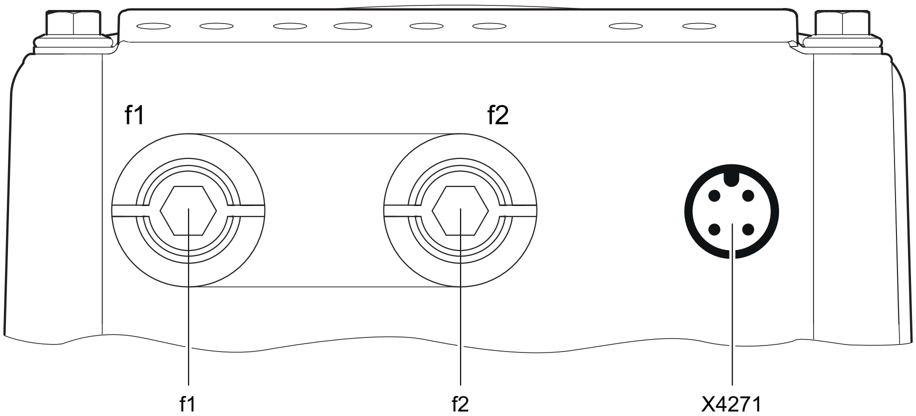
Connectors				Not together at a position with the connector:
Designation	Coding ring/ color	Function	Position	
X1524	Black	"DC 24 V backup voltage" (→ 🗎 305) (AUX-PWR)	X, 2 or 3	• X5505 • X1523 • X4142
X4142	Red	"Engineering interface" (→ 🗎 306)	X, 2 or 3	• X5505 • X1523 • X1524
–	–	[1] Optional pressure compensation	1	–

1) Connector X1203_1 can also be ordered separately (i.e. without connector X1203_2).
2) Connector X1206 can also be ordered separately (i.e. without connector X2242).
3) Connector 1217 can also be ordered separately (i.e. without connector X2328).
4) Connectors X5504 and X5505 can only be ordered together.

9.10.4 Connector positions at the DAC.. electronics cover

The following figure shows an example of the positions of the potentiometers and connectors:



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Designation	Function
f1	"Potentiometer f1" (→ 🗎 321) (underneath the screw plug)
f2	"Potentiometer f2" (→ 🗎 323) (underneath the screw plug)
X4271	"AS-Interface" (→ 🗎 308)

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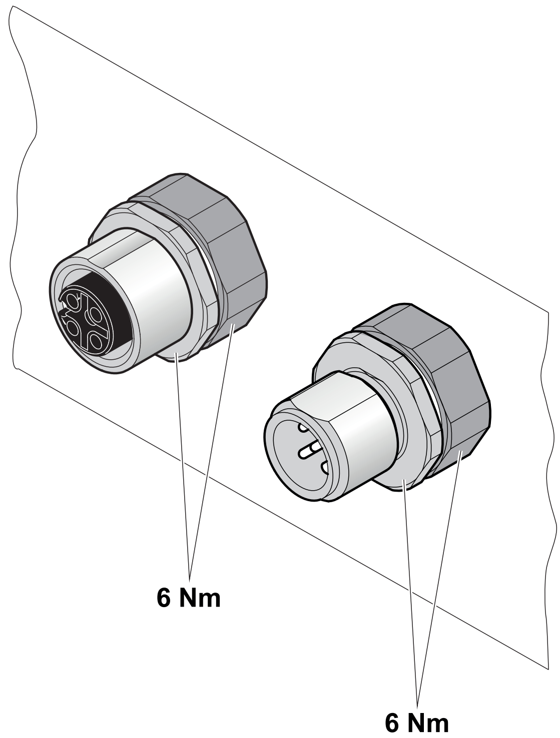
9.10.5 Connector variants

M12 connector at the connection box

M12 connectors at the connection box are pre-installed at delivery so they match the connection cables provided by SEW-EURODRIVE. Customers can adjust the alignment of connectors if required.

The following figure shows a schematic illustration with the permitted tightening torque:



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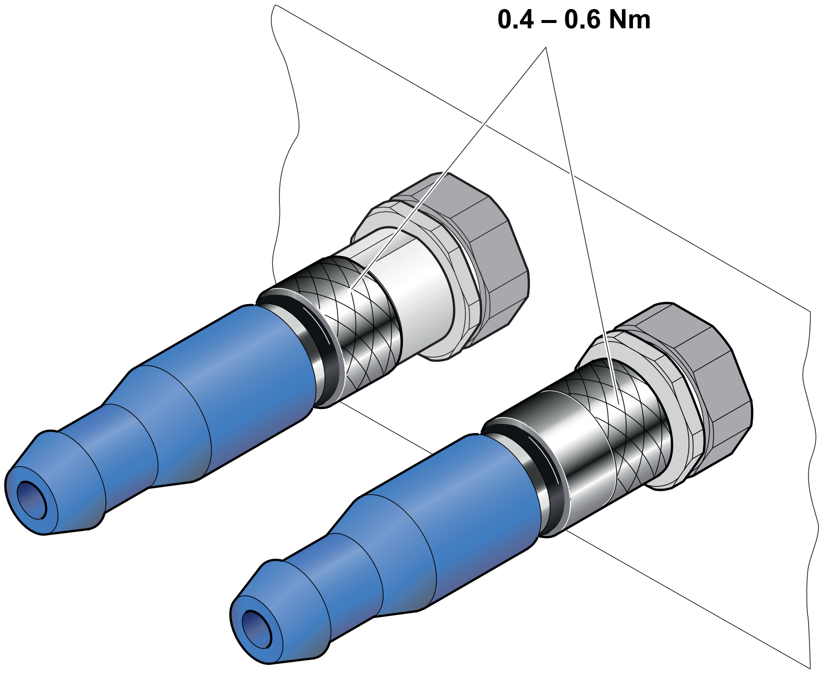
M12 connector with mating connector at connection box or electronics cover

The following figure shows a schematic illustration with the permitted tightening torques:



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INFORMATION

The M12 connectors are usually tightened with a torque of 0.4 – 0.6 Nm. Observe the data sheet of the used prefabricated cables.

M23 connector

The M23 connectors are available in the following variants:

- [1] "Straight" connector
- [2] "Angled" connector

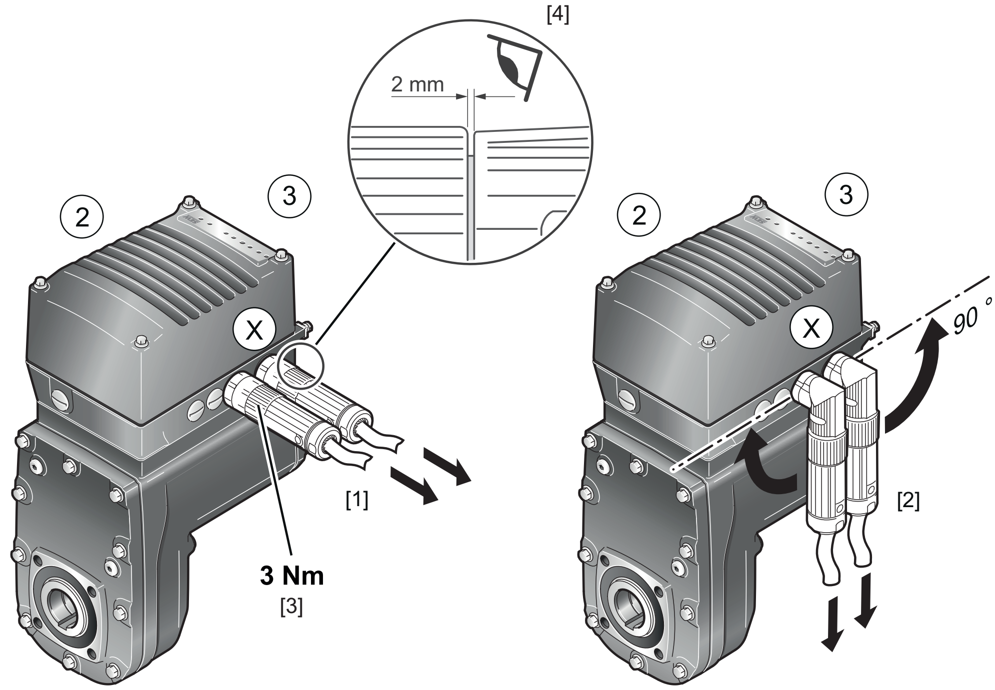
After plugging in the mating connector, you can align the angled connector without the need for additional tools.

Observe the following notes:

- Adjust the connector only when installing and connecting the drive unit.
- Do not use pliers to adjust the right-angle connector.
- Turn the right-angle connector only with plugged-in mating connector.
- The gap between the connector and the socket is approx. 2 mm.
- Tighten the union nut of the M23 connector to 3 Nm.
- Make sure that the connector does not move permanently.

Example of MOVIGEAR® performance

The following figure shows the installation of the straight and angled M23 connector:



9007224476469899

[1] "Straight" design
[2] "Right-angle" design
[3] Tightening torque of the union nut 3 Nm
You can order suitable tools from TE Connectivity – Intercontec products:
- Torque wrench 3 Nm, 1/4" external square: C1.020.00
- Spanner wrench 1/4" square socket, suitable for the 923/723 series with SpeedTec equipment: C6.215.00

[4] Gap of approx. 2 mm between connector and socket

9.10.6 Using connectors assembled by yourself

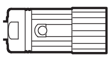
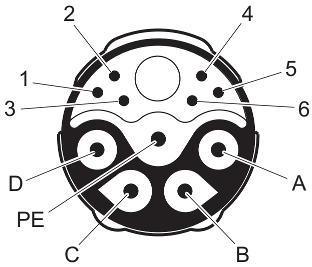
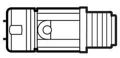
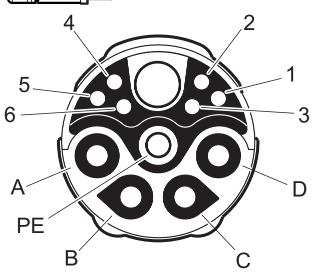
M23 connector by TE connectivity – Intercontec Products

The power connectors for assembling connection cables yourself, and the corresponding assembly tool set is available for order from TE Connectivity - Intercontec products.

Contact TE Connectivity - Intercontec products if the order designation is not available in the online order system of Intercontec.

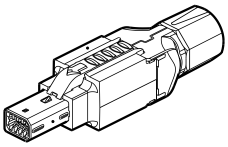
Order information

The table below shows the order designations for connectors by TE Connectivity - Intercontec products with the matching coding for assembly by the customer:

Connector type		**Outer cable diameter/core cross section of crimp contacts**	**Designation for order from the supplier TE Connectivity - Intercontec products**
Connector AC 400 V Coding ring: Black	Cable plug (male, union nut)   	14 mm – 17 mm / $2.5\ mm^2 – 4.0\ mm^2$	H 51 A 019 MR 02 59 0102 000
		9.5 mm – 14.5 mm / $2.5\ mm^2 – 4.0\ mm^2$	H 51 A 019 MR 02 42 0102 000
		9.5 mm – 14.5 mm / $0.35\ mm^2 – 2.5\ mm^2$	H 51 A 019 MR 12 42 0102 000
	Cable socket (female/male thread)   	14 mm – 17 mm / $2.5\ mm^2 – 4.0\ mm^2$	H 52 A 013 FR 02 59 0102 000
		9.5 mm – 14.5 mm / $2.5\ mm^2 – 4.0\ mm^2$	H 52 A 013 FR 02 42 0102 000
		9.5 mm – 14.5 mm / $0.35\ mm^2 – 2.5\ mm^2$	H 52 A 013 FR 17 42 0102 000

Mini-I/O connector

The following tables contains the part numbers and purchase order numbers of the mini-I/O connectors for customer assembly of mini I/O connection cables.

Connector type	Cable Outer diameter Core cross section	Cable Category	Purchase order number TE Connectivity Intercontec products (quantity)	Part number SEW-EURODRIVE (quantity)
Industrial mini I/O connector (male) Type 1 for field installation 	4.7 to 5.7 mm[1)] 4 × AWG22	CAT5e	1-2350278-1 (60 pieces)	25697064[1)] (1 piece)
	5.8 to 8.2 mm 4 × AWG22	CAT5e	1-2350323-1 (60 pieces)	25708775 (1 piece)
	4.7 to 5.7 mm 4 × AWG26 – AWG24	CAT5e	1-2350304-1 (60 pieces)	Not available
	5.7 to 8.2 mm 8 × AWG26 – AWG24	CAT6A	1-2350310-1 (60 pieces)	Not available

1) Suitable for use with PAC/PSC hybrid cables (cable type: HELUKABEL Li9Y11-HF, HELUKABEL Li9YYö)

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9.11 Optional connector assignment

For the positions of the connectors, refer to chapter "Connector positions.." .

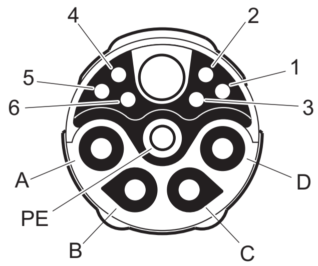
9.11.1 X1203_1 and X1203_2: AC 400 V connection

The following table provides information about this connection:

Function
AC 400 V connection for supplying the device/for looping through

Connection type
M23, SEW-EURODRIVE insert, Series 723, SpeedTec equipment, company: TE Connectivity – Intercontec products, female, coding ring: black, protected against contact

Connection diagram



Assignment		
Contact	**Function**	
A	L1	Line connection, phase L1
B	L2	Line connection, phase L2
C	L3	Line connection, phase L3
D	Res.	Reserved
PE	PE	Protective earth connection
1	Res.	Reserved
2	Res.	Reserved
3	Res.	Reserved
4	Res.	Reserved
5	Res.	Reserved
6	Res.	Reserved

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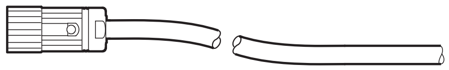
Connection cables

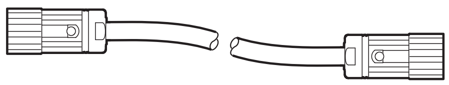
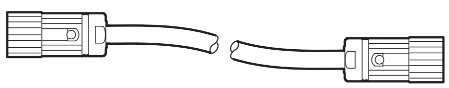
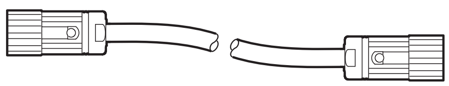
Cable cross section 1.5 mm²

The following table shows the cables available for this connection:

Connection cable	Conformity/part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — Open	CE: 18180094	HELUKABEL® JZ-600	Variable	1.5 mm² / AC 500 V

Cable cross section 2.5 mm²

The following table shows the cables available for this connection:

Connection cable	Conformity/part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18127460	HELUKABEL® TOPFLEX® – 600-PVC	Variable	2.5 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18133959	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable	2.5 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153267	HELUKABEL® – JZ-602	Variable	2.5 mm² / AC 500 V

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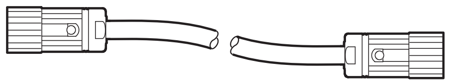
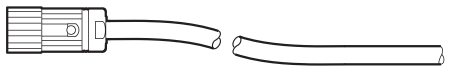
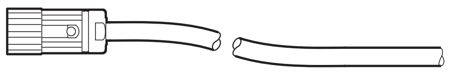
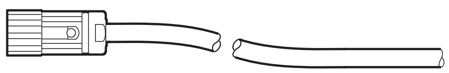
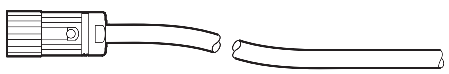
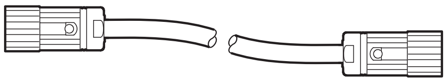
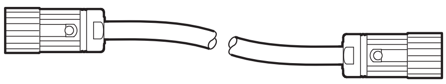
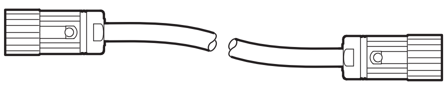
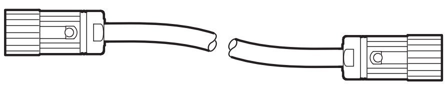
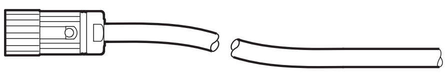
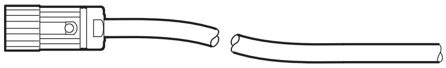
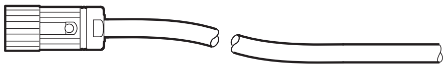
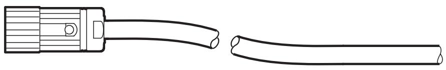
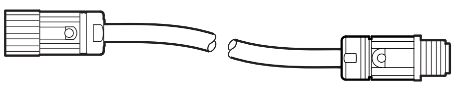
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male M23, coding ring: black, male	UL: 18153275	HELUKABEL® MULTIFLEX® – 512	Variable	2.5 mm² / AC 500 V
 M23, coding ring: black, male Open	CE: 18127479	HELUKABEL® TOPFLEX® – 600-PVC	Variable	2.5 mm² / AC 500 V
 M23, coding ring: black, male Open	CE: 18133967	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable	2.5 mm² / AC 500 V
 M23, coding ring: black, male Open	UL: 18153283	HELUKABEL® – JZ-602	Variable	2.5 mm² / AC 500 V
 M23, coding ring: black, male Open	UL: 18153291	HELUKABEL® MULTIFLEX® – 512	Variable	2.5 mm² / AC 500 V

Cable cross section 4.0 mm²

The following table shows the cables available for this connection:

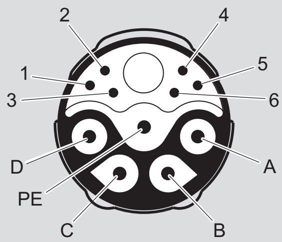
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18127487	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	4.0 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18133975	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable 	4.0 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153305	HELUKABEL® – JZ-602	Variable 	4.0 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153313	HELUKABEL® MULTIFLEX® – 512	Variable 	4.0 mm² / AC 500 V
 M23, coding ring: black, male — Open	CE: 18127495	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	4.0 mm² / AC 500 V

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — Open	CE: 18133983	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable 	4.0 mm^2 / AC 500 V
 M23, coding ring: black, male — Open	UL: 18153321	HELUKABEL® – JZ-602	Variable 	4.0 mm^2 / AC 500 V
 M23, coding ring: black, male — Open	UL: 18153348	HELUKABEL® MULTIFLEX® – 512	Variable 	4.0 mm^2 / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, female	UL: 18166318	HELUKABEL® MULTIFLEX® – 512	Variable 	4.0 mm^2 / AC 500 V

Connection of cables with open end

The following table shows the core assignment of cables with the following part numbers:

Part numbers
18180094, 18127479, 18133967, 18153283, 18153291, 18127495, 18133983, 18153321, 18153348

Assembly					
Open cable end			Description	Prefabricated connector	
					
Core color/ core cross section	Identification	Assembly		Signal	Contact
Black 1.5 mm^2 2.5 mm^2 4.0 mm^2	1	Not prefabricated	Line connection, phase L1	L1	A
Black 1.5 mm^2 2.5 mm^2 4.0 mm^2	2	Not prefabricated	Line connection, phase L2	L2	B
Black 1.5 mm^2 2.5 mm^2 4.0 mm^2	3	Not prefabricated	Line connection, phase L3	L3	C
Green/yellow 1.5 mm^2 2.5 mm^2 4.0 mm^2	-	Not prefabricated	PE connection	PE	PE

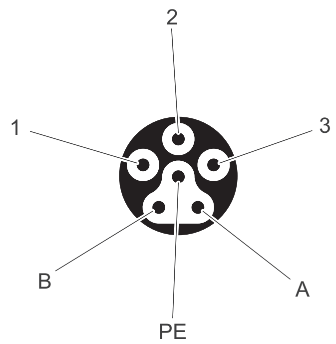
9.11.2 X1206: AC 400 V connection (IN)

The following table provides information about this connection:

Function
AC 400 V connection (IN)

Connection type
M15-X-Power, male, connector without union nut, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (IN)
2	L2	Line connection, phase L2 (IN)
3	L3	Line connection, phase L3 (IN)
PE	PE	Protective earth connection
A	res.	Reserved
B	res.	Reserved

The connector cannot be aligned. You should therefore check whether angled mating connectors can be used.

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of connector.

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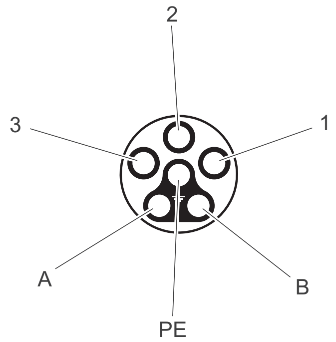
9.11.3 X2242: AC 400 V connection (OUT)

The following table provides information about this connection:

Function
AC 400 V connection (OUT)

Connection type
M15-X-Power, female, connector with union nut, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (OUT)
2	L2	Line connection, phase L2 (OUT)
3	L3	Line connection, phase L3 (OUT)
PE	PE	Protective earth connection
A	res.	Reserved
B	res.	Reserved

The connector cannot be aligned. You should therefore check whether angled mating connectors can be used.

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of connector.

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9.11.4 X1207: AC 400 V connection (IN)

INFORMATION

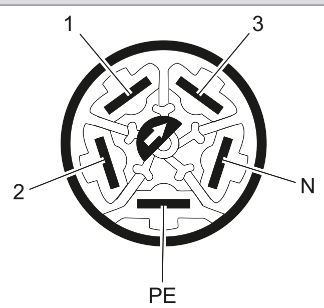
The number of permitted plug-in cycles for this connector is 10 times.

The following table provides information about this connection:

Function
AC 400 V connection (IN)

Connection type
QPD W 4PE2,5, QUICKON connector, coding 3, male, PhoenixContact

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (IN)
2	L2	Line connection, phase L2 (IN)
3	L3	Line connection, phase L3 (IN)
PE	PE	Protective earth connection
Once	Res.	Reserved

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of connector.

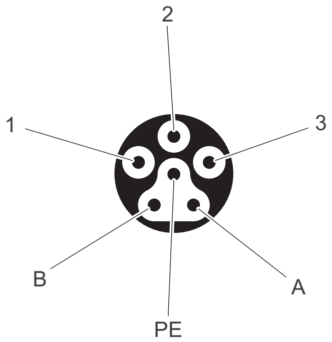
9.11.5 X1217: PA connection for AC 400 V and 24 V backup voltage (IN)

The following table provides information about this connection:

Function
PA connection for AC 400 V and DC 24 V backup voltage (IN)

Connection type
MQ15-X-Power, male, connector without union nut, MURR Elektronik, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (IN)
2	L2	Line connection, phase L2 (IN)
3	L3	Line connection, phase L3 (IN)
PE	PE	Protective earth connection
A	+24 V	DC 24 V input for backup mode (IN)
B	0V24	0 V 24 reference potential for backup mode (IN)

The connector cannot be aligned. You should therefore check whether angled mating connectors can be used.

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of connector.

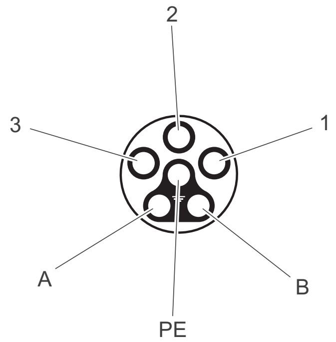
9.11.6 X2328: PA connection for AC 400 V and 24 V backup voltage (OUT)

The following table provides information about this connection:

Function
PA connection for AC 400 V and DC 24 V backup voltage (OUT)

Connection type
MQ15-X-Power, female, connector with union nut, MURR Elektronik, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (OUT)
2	L2	Line connection, phase L2 (OUT)
3	L3	Line connection, phase L3 (OUT)
PE	PE	Protective earth connection
A	+24 V	DC 24 V output for backup mode (OUT)
B	0V24	0 V 24 reference potential for backup mode (OUT)

The connector cannot be aligned. You should therefore check whether angled mating connectors can be used.

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of connector.

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9.11.7 X5504: STO (3 cores)

⚠ WARNING

No safe disconnection of the device.

Severe or fatal injuries.

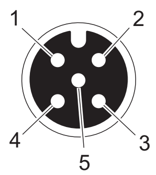
- You may bridge the STO connection with 24 V only if the device is not intended to fulfill any safety functions.

The following table provides information about this connection:

Function
Connection for safe disconnection (STO, 3-core)

Connection type
M12, 5-pin, female, A-coded

Connection diagram



Assignment		
Contact	**Function**	
1	24V_OUT	DC 24 V auxiliary output (permitted only for operation with STO jumper plug)
2	F_STO_P2	Connection F_STO_P2
3	0V24_OUT	0V24 reference potential for DC 24 V auxiliary output (permitted only for operation with STO jumper plug)
4	F_STO_P1	Connection F_STO_P1
5	F_STO_M	F_STO_M connection

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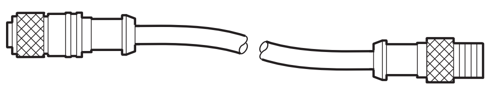
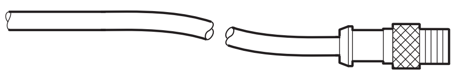
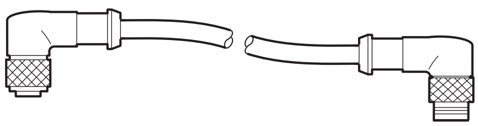
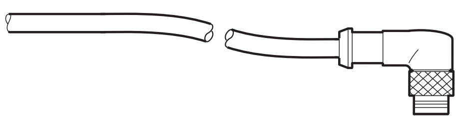
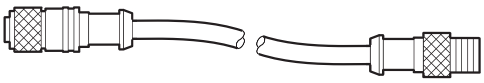
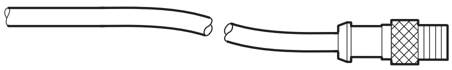
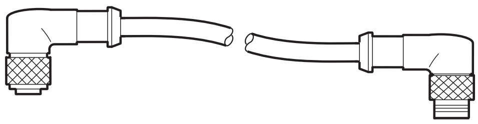
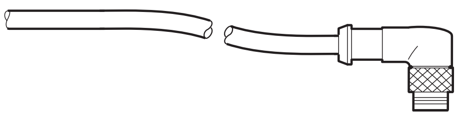
Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable connectors that connect the shield with the device in an HF-capable manner.

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110935	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm² / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28110943	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm² / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110951	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm² / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28110978	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm² / DC 60 V

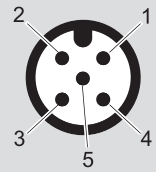
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110994	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28111001	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28111028	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28111036	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V

Connection of cables with open end

HELUKABEL®

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28110978, 28110943

<table>
<tr><th colspan="6">Assembly</th></tr>
<tr><th colspan="3">Open cable end</th><th rowspan="3">Description</th><th colspan="2">Assembled connector</th></tr>
<tr><td colspan="3"></td><td colspan="2">
</td></tr>
<tr><th>Core color/ core cross section</th><th>Identification</th><th>Assembly</th><th>Signal</th><th>Contact</th></tr>
<tr><td></td><td>–</td><td>–</td><td>DC 24 V auxiliary output[1]</td><td>24V_OUT</td><td>1</td></tr>
<tr><td>White 0.5 mm²</td><td>–</td><td>Not prefabricated</td><td>F_STO_P2 connection</td><td>F_STO_P2</td><td>2</td></tr>
<tr><td></td><td>–</td><td>–</td><td>0V24 reference potential for DC 24 V auxiliary output[1]</td><td>0V24_OUT</td><td>3</td></tr>
<tr><td>Brown 0.5 mm²</td><td>–</td><td>Not prefabricated</td><td>F_STO_P1 connection</td><td>F_STO_P1</td><td>4</td></tr>
<tr><td>Green 0.5 mm²</td><td>–</td><td>Not prefabricated</td><td>F_STO_M connection</td><td>F_STO_M</td><td>5</td></tr>
</table>

1) Do not connect these cores in the connector.

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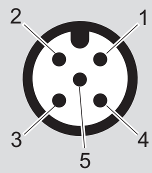
igus chainflex

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28111001, 28111036

Assembly					
Open cable end			Description	Assembled connector	
					
Core color/ core cross section	Identification	Assembly		Signal	Contact
	–	–	DC 24 V auxiliary output[1)]	24V_OUT	1
Black 0.5 mm^2	1	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
	–	–	0V24 reference potential for DC 24 V auxiliary output[1)]	0V24_OUT	3
Black 0.5 mm^2	2	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.5 mm^2	3	Not prefabricated	F_STO_M connection	F_STO_M	5
Green/yellow 0.5 mm^2	–	Not prefabricated	This cores is not used in the connector.	–	–

1) Do not connect these cores in the connector.

9.11.8 X5505: STO (3 cores)

⚠ WARNING

Disabling of the safety-related disconnection of further devices due to parasitic voltages when using an STO jumper plug.

Severe or fatal injuries.

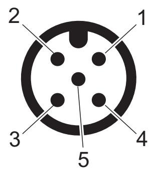
- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

The following table provides information about this connection:

Function
Connection for safe disconnection (STO, 3-core)

Connection type
M12, 5-pin, male, A-coded

Connection diagram



Assignment		
Contact	**Function**	
1	res.	Reserved
2	F_STO_P2	Connection F_STO_P2
3	res.	Reserved
4	F_STO_P1	Connection F_STO_P1
5	F_STO_M	F_STO_M connection

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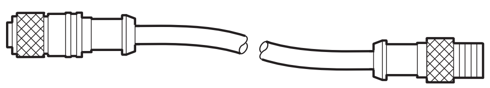
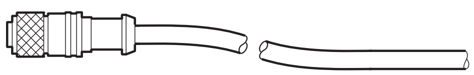
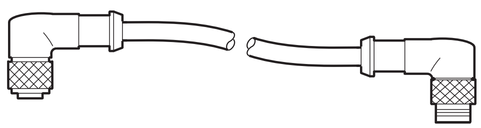
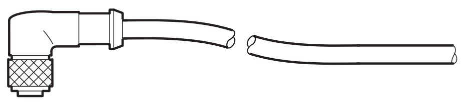
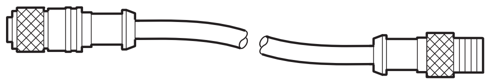
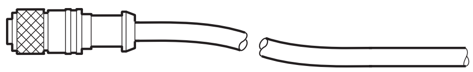
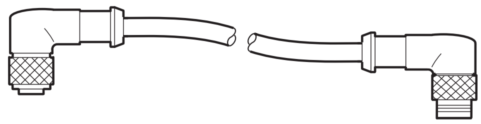
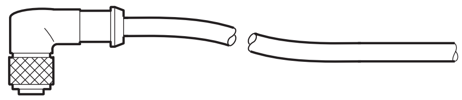
Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable connectors that connect the shield with the device in an HF-capable manner.

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110935	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28117808	HELUKABEL® LiYCY Shielded	Variable 	3 x 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110951	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28110986	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm^2 / DC 60 V

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110994	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28117816	igus chainflex CF78.UL Shielded	Variable 	4 x 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28111028	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28111044	igus chainflex CF78.UL Shielded	Variable 	4 x 0.5 mm^2 / DC 60 V

Connection of cables with open end

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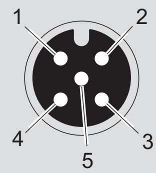
The following table shows the core assignment of cables with the following part numbers:

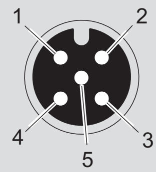
Part numbers
28117808, 28110986

Assembly					
Open cable end			Description	Assembled connector	
					
Core color/ core cross section	Identification	Assembly		Signal	Contact
	–	–	Reserved	res.	1
White 0.5 mm²	–	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
	–	–	Reserved	res.	3
Brown 0.5 mm²	–	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Green 0.5 mm²	–	Not prefabricated	F_STO_M connection	F_STO_M	5

igus chainflex

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28117816, 28111044

Assembly					
Open cable end			**Description**	**Assembled connector**	
					
Core color/core cross section	**Identification**	**Assembly**		**Signal**	**Contact**
	–	–	Reserved	res.	1
Black 0.5 mm^2	1	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
	–	–	Reserved	res.	3
Black 0.5 mm^2	2	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.5 mm^2	3	Not prefabricated	F_STO_M connection	F_STO_M	5
Green/yellow 0.5 mm^2	–	Not prefabricated	This core is not used in the connector.	–	–

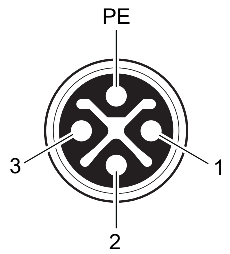
9.11.9 X2304: Connection of external braking resistor

The following table provides information about this connection:

Function
Connection of external braking resistor

Connection type
M12, 4-pin, female, S-coded

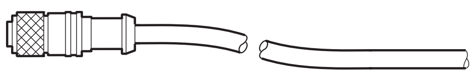
Wiring diagram



Assignment		
Contact	**Function**	
1	BW+	Braking resistor connection +
2	res.	Reserved
3	BW-	Braking resistor connection -
PE	PE	Protective earth connection

Connection cables

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, S-coded, female — Open	CE/UL: 28172558	HELUKABEL® JZ-604-FCY TC	Variable 	3 x 1.5 mm^2 / DC 850 V

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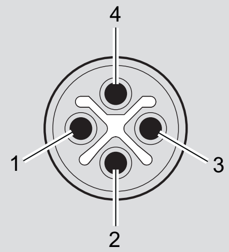
Connection of cables with open end

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28172558

Assembly					
Open cable end			Description	Assembled connector	
					
Conductor color/core cross section	Marking	Assembly		Signal	Contact
Black 1.5 mm^2	1	Not prefabricated	Braking resistor connection +	BW+	1
–	–	Not prefabricated	Reserved[1)]	Res.	2
Black 1.5 mm^2	2	Not prefabricated	Braking resistor connection -	BW-	3
Green/yellow 1.5 mm^2	–	Not prefabricated	Protective earth connection	PE	4

1) Reserved cores must be isolated and fixed in the connection box.

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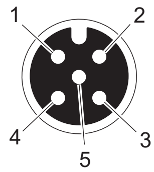
9.11.10 X5135: Digital inputs

The following table provides information about this connection:

Function
Digital inputs

Connection type
M12, 5-pin, female, A-coded, color: black

Connection diagram


Assignment		
Contact	**Function**	
1	+24 V	DC 24 V sensor supply
2	DI02	Digital input DI02
3	0V24	0V24 reference potential for sensors
4	DI01	Digital input DI01
5	FE	Functional earth

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of connector.

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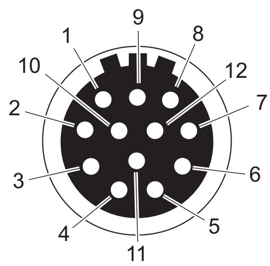
9.11.11 X5136: Digital inputs, relay output

The following table provides information about this connection:

Function
Digital inputs, relay output

Connection type
M23, female, male thread, TE Connectivity-Intercontec products, P insert, SpeedTec equipment, 12-pin, 0°-coded, coding ring: without, protected against contact

Connection diagram



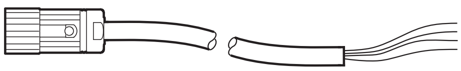
Assignment		
Contact	**Function**	
1	DI01	Digital input DI01
2	DI02	Digital input DI02
3	DI03	Digital input DI03
4	DI04	Digital input DI04
5	Res.	Reserved
6	DOR-C	Relay output DO R, common contact
7	DOR-NO	Relay output DO R, NO contact
8	+24V_O	DC 24 V output
9	0V24_O	0V24 reference potential
10	Res.	Reserved
11	+24V_O	DC 24 V output
12	FE	Functional earth

Connection cable

INFORMATION

Use only shielded cables for this connection and only suitable connectors that connect the shield with the device in an HF-capable manner.

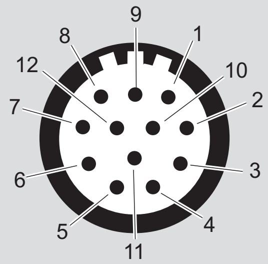
The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, 12-pin, 0°-coded / Open, core end sleeves	CE/UL: 11741457	HELUKABEL Li9Y91YC11Y -HF	Variable 	6 × 2 × 0.25 mm^2 / DC 60 V

Connection of cables with open end

The following table shows the core assignment of cables with the following part numbers:

Part numbers
11741457

<table>
<tr><th colspan="6">Assembly</th></tr>
<tr><th colspan="3">Open cable end</th><th rowspan="3">Description</th><th colspan="2">Prefabricated connector</th></tr>
<tr><td colspan="3"></td><td colspan="2">
</td></tr>
<tr><th>Core color/ core cross section</th><th>Identification</th><th>Assembly</th><th>Signal</th><th>Contact</th></tr>
<tr><td>Pink
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Digital input DI01</td><td>DI01</td><td>1</td></tr>
<tr><td>Gray
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Digital input DI02</td><td>DI02</td><td>2</td></tr>
<tr><td>Red
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Digital input DI03</td><td>DI03</td><td>3</td></tr>
<tr><td>Blue
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Digital input DI04</td><td>DI04</td><td>4</td></tr>
<tr><td>Yellow
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Reserved</td><td>Res.</td><td>5</td></tr>
<tr><td>Green
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Relay output DO R, common contact</td><td>DOR-C</td><td>6</td></tr>
<tr><td>Purple
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Relay output DO R, NO contact</td><td>DOR-NO</td><td>7</td></tr>
<tr><td>Black
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>DC 24 V output</td><td>+24V_O</td><td>8</td></tr>
<tr><td>Brown
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>0V24 reference potential</td><td>0V24_O</td><td>9</td></tr>
<tr><td>White
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Reserved</td><td>Res.</td><td>10</td></tr>
<tr><td>Gray/pink
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>DC 24 V output</td><td>+24V_O</td><td>11</td></tr>
<tr><td>Green/yellow
0.25 mm²</td><td>-</td><td>Not prefabricated</td><td>Functional earth</td><td>FE</td><td>12</td></tr>
</table>

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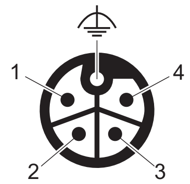
9.11.12 X1523: DC 24 V backup voltage, input

The following table provides information about this connection:

Function
Input DC 24 V backup voltage

Connection type
M12, 5-pin, male, L-coded, color: light gray

Connection diagram

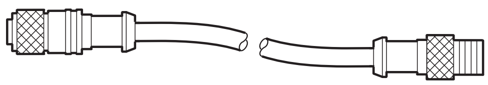
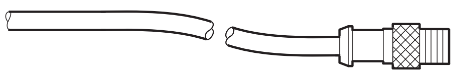
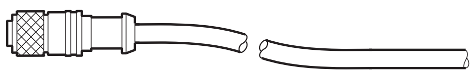
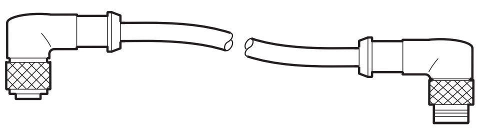
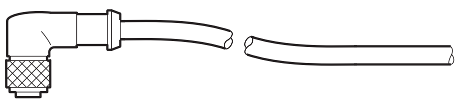


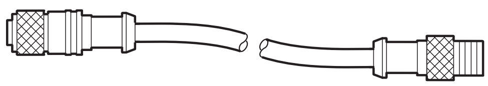
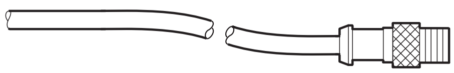
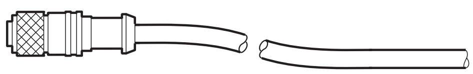
Assignment		
Contact	**Function**	
1	+24V/L1	DC 24 V input/L1 (for backup mode)
2	0V24/N2	0V24 reference potential/N2 (for DC 24 V /BES brake rectifier)
3	0V24/N1	0V24 reference potential/N1 (for backup mode)
4	+24V/L2	DC 24 V connection/L2 (for DC 24 V /BES brake rectifier)
⏚	FE	Functional earth

Devices with X1523 and X2313 connectors include additionally integrated auxiliary terminals. These auxiliary terminals are intended for connecting the second voltage level (contacts 2 and 3) only. Do not change the installation of these auxiliary terminals.

Connection cables

The following table shows the cables available for this connection:

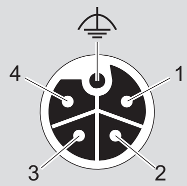
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, L-coded, female — M12, 5-pin, L-coded, male	CE: 28114345	HELUKABEL® JZ-500	Variable	5 × 2.5 mm² / DC 60 V
 Open — M12, 5-pin, L-coded, male	CE: 28117751	HELUKABEL® JZ-500	Variable	5 × 2.5 mm² / DC 60 V
 M12, 5-pin, L-coded, female — Open	CE: 28117786	HELUKABEL® JZ-500	Variable	5 × 2.5 mm² / DC 60 V
 M12, 5-pin, L-coded, female — M12, 5-pin, L-coded, male	CE: 28128184	HELUKABEL® JZ-500	Variable	5 × 2.5 mm² / DC 60 V
 M12, 5-pin, L-coded, female — Open	CE: 28128192	HELUKABEL® JZ-500	Variable	5 × 2.5 mm² / DC 60 V

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, L-coded, female / M12, 5-pin, L-coded, male	CE/UL: 28114353	HELUKABEL® Li9Y11Y-HF	Variable	5 × 2.5 mm^2 / DC 60 V
 Open / M12, 5-pin, L-coded, male	CE/UL: 28117778	HELUKABEL® Li9Y11Y-HF	Variable	5 × 2.5 mm^2 / DC 60 V
 M12, 5-pin, L-coded, female / Open	CE/UL: 28117794	HELUKABEL® Li9Y11Y-HF	Variable	5 × 2.5 mm^2 / DC 60 V

Connection of cables with open end

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28117786

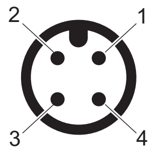
Assembly					
Open cable end			Description	Prefabricated connector	
					
Core color/ core cross section	Identification	Assembly		Signal	Contact
Black 2.5 mm^2	1	Not prefabricated	DC 24 V output/L1 (for backup voltage/supply)	+24V/L1	1
Black 2.5 mm^2	2	Not prefabricated	0V24 reference potential/N2 (for DC 24 V /BES brake rectifier)	0V24/N2	2
Black 2.5 mm^2	3	Not prefabricated	0V24 reference potential/N1 (for backup voltage/supply)	0V24/N1	3
Black 2.5 mm^2	4	Not prefabricated	DC 24 V output/L2 (for DC 24 V /BES brake rectifier)	+24V/L2	4
Black 2.5 mm^2	5	Not prefabricated	Functional earth	FE	⏚

9.11.13 X1524: DC 24 V backup voltage, input (AUX-PWR)

The following table provides information about this connection:

Function
Input of DC 24 V backup voltage / DC 24 V supply (AUX-PWR)

Connection type
M12, 4-pole, male, A-coded, color: black

Connection diagram


Assignment		
No.	**Function**	
1	+24 V	DC 24 V input (AUX-PWR)
2	Res.	Reserved
3	0V24	0V24 reference potential (AUX-PWR)
4	Res.	Reserved

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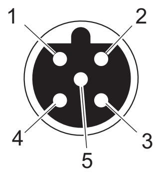
9.11.14 X4142: Engineering interface

The following table provides information about this connection:

Function
Engineering interface (CAN)

Connection type
M12-SPEEDCON, 5-pin, female, B-coded, color: red

Connection diagram



Assignment		
Contact	**Function**	
1	res.	Reserved
2	24V_OUT	DC 24 V auxiliary output[1)]
3	0V24_OUT	0V24 reference potential[2)]
4	CAN_H	CAN High connection
5	CAN_L	CAN Low connection

1) Only use this output to supply components from SEW-EURODRIVE.
2) Only use this output to supply components from SEW-EURODRIVE.

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Connection cables

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Length/installation type	Operating voltage
Connection to USM21A interface adapter: USK15A  M12-SPEED-CON, 5-pin, B-coded, male — RJ10	CE: 28139038	3.0 m 	DC 60 V
Connection to CBG.. keypad: USK25A  M12-SPEED-CON, 5-pin, B-coded, male — D-sub, 9-pin, male, angled	CE: 28139046	3.0 m 	DC 60 V

9.12 Connector assignment at the electronics cover

For the positions of the connectors, refer to chapter "Electrical installation" > "Connector positions at the electronics cover..".

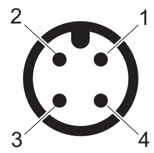
9.12.1 X4271: AS-Interface

The following table provides information about this connection:

Function
AS-Interface

Connection type
M12, 4-pin, male, A-coded, color: black

Connection diagram



Assignment		
Contact	**Function**	
1	ASI+	AS-Interface data line +
2	Res.	Reserved
3	ASI-	AS-Interface data line -
4	Res.	Reserved

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of connector.

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9.13 PC connection

Connect the PC to the drive unit before you start the engineering software MOVISUITE®.

You have several options to connect a PC to the drive unit.

Observe the information in the **product manual** > chapter "Electrical installation" > "PC connection" including the sub-chapters.

9.13.1 Connection via interface adapter USM21A

The USM21A interface adapter is used to connect the PC and the engineering interface of the device.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 interface.

You need the following components for the connection:

Component	Part number

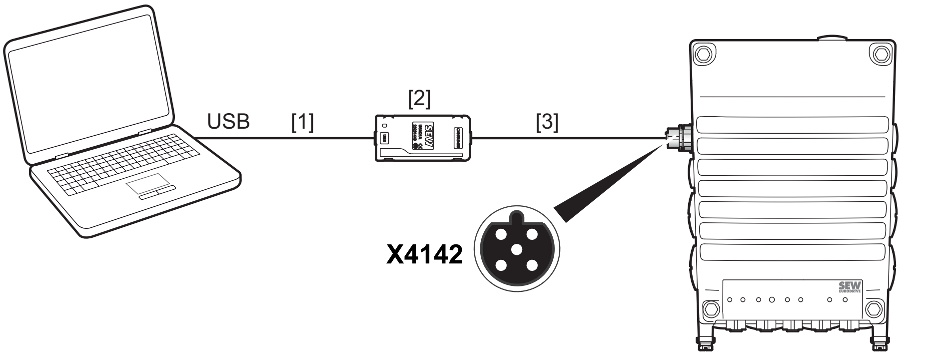
USM21A interface adapter
The following connection cables are included in the delivery:
• USB 2.0 connection cable
  – USB type A/USB type B
  – Length: 1.5 m
• RJ10/RJ10 connection cable
  For connection to the X31 engineering interface
  – With 2 RJ10 connectors
  – Length: 3 m
	28231449

Connection cable RJ10/M12 (USK15A) For connection to the engineering interface X4142 • With RJ10 connector • With M12 SPEEDCON connector, 5-pin, male, B-coded • Length: 3 m	28139038
M12/M12 Extension cable For extending the RJ10/M12 (USK15A) connection cable to the X4142 engineering interface • With M12 SPEEDCON connector, 5-pin, female, B-coded • With M12 SPEEDCON connector, 5-pin, male, B-coded • Length: 13 m	28168860
Retrofit set M12 engineering interface X4142 M12 SPEEDCON, 5-pin, B-coded, female	28273273

Connection to X4142 (M12 at the connection box)

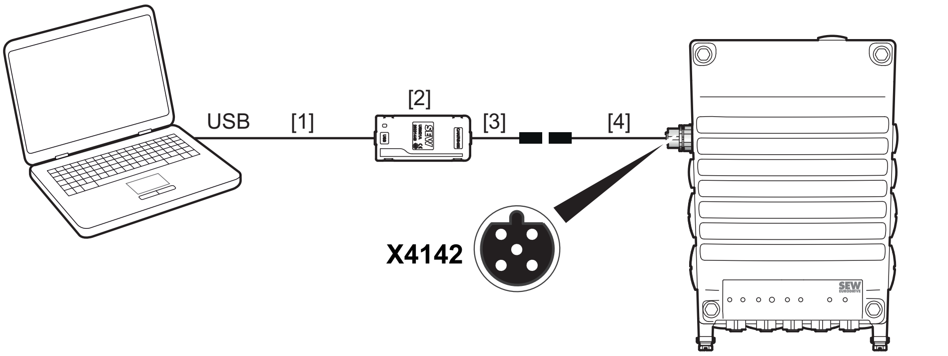
The engineering interface X31 at the connection unit in the connection box is assigned to the internal wiring of X4142 connector.

Connection without extension cable



32385960459

Connection with extension cable



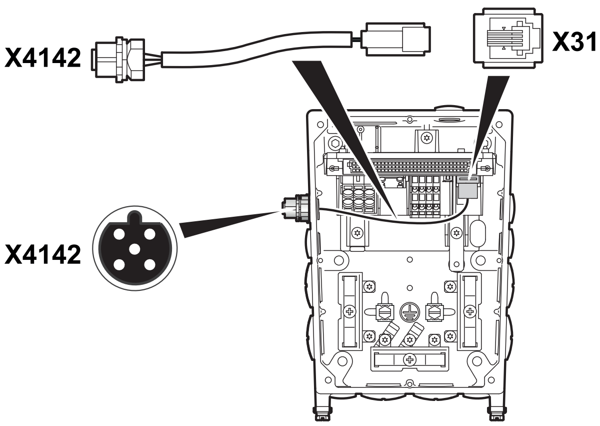
41080931979

[1] USB 2.0 connection cable
(commercially available, included in the scope of delivery of USM21A)
[2] USM21A interface adapter
[3] Connection cable RJ10/M12 (USK15A)
(available for delivery from SEW-EURODRIVE, part number: 28139038)
[4] M12/M12 Extension cable
(available for delivery from SEW-EURODRIVE, part number: 28168860)

Installing the included engineering X4142 connector

SEW-EURODRIVE supplies the engineering X4142 connector in some cases in an accessory bag (part number: 28273273) with the drive unit. In this case, install the engineering X4142 connector to the connection box of the drive unit as follows:

1. It is essential that you observe the startup instructions.
2. Switch off the voltage supply and wait for at least 5 minutes.
3. Loosen the screws and remove the electronics cover from the connection box.
4. Plug in the RJ10 connector from outside through one of the permitted cable bushing bores (for the permitted positions, see chapter "Connector positions"). Push the cable completely into the connection box.
5. Screw M12 connector into the cable bushing bore. Tighten the nut of the M12 connector (tightening torque: 6 Nm).
6. Insert the RJ10 connector into X31 connector in the connection box. The following figure shows an example of the cable routing:



32385963403

7. Plug the electronics cover onto the connection box. Screw on the electronics cover with 4 screws (tightening torque: 6 Nm).

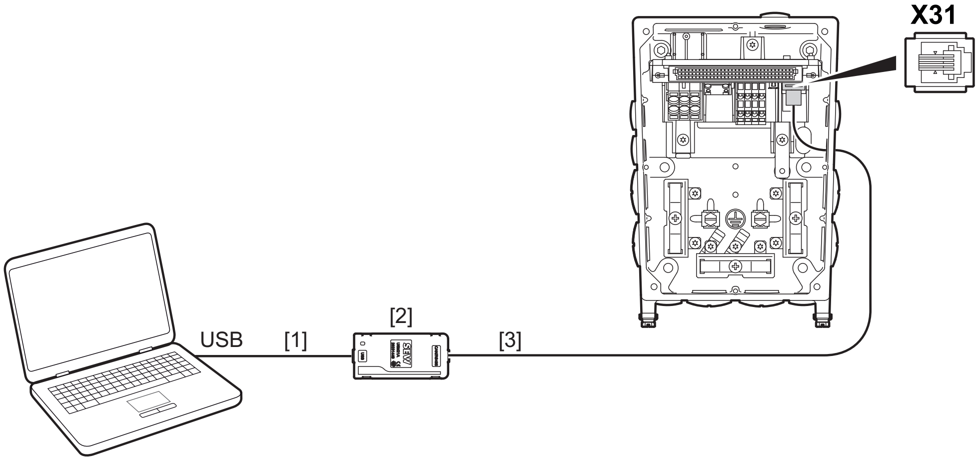
Connection to X31 (RJ10 in the connection box)

NOTICE

Connector X31 provides a 24 V supply voltage for operating the connected options.

Damage to connected options with low nominal voltage.

- Only connect options with a nominal voltage of 24 V to connector X31, such as:
  - Interface adapter USM21A,
  - CBG.. keypads
- Do **not** connect the following options with 5 V nominal voltage to the X31 connector:
  - Interface adapters USB11A, UWS11A, UWS21A
  - Keypads DBG.., GBG21A.



9007224818777355

[1] USB 2.0 connection cable
(commercial, included in the delivery of USM21A)
[2] Interface adapter USM21A
[3] RJ10/RJ10 connection cable
(included in the delivery of the USM21A interface adapter)

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9.13.2 Connection via keypad

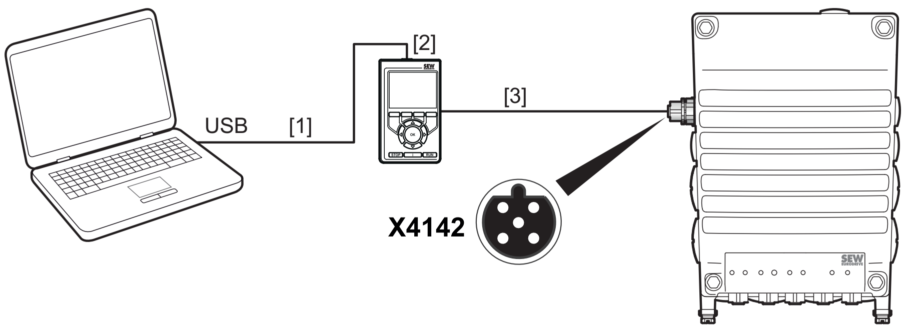
You can establish a connection between the PC and the device's engineering interface using the CBG22A, CBG21A, CBG11A or CBM22A keypads.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 interface.

You need the following components for the connection:

Component	Part number
CBG22A keypad	28277554
CBG21A keypad	28238133
CBG11A keypad	28233646
InstaCBM22A for keypad	28282892
CBG.. connection cable D-sub/RJ10 (USK21A) For connecting the X31 engineering interface to the 24 V supply voltage • With D-sub connector 9-pin, male • With RJ10 connector • Length: 3 m	28117832
USB connection cable USB A/USB 2.0 Mini B For connecting the CBG.. keypad to the USB interface of the PC • With USB A connector • With USB 2.0 Mini B connector • Length: 3 m	25643517
CBG.. connection cable D-sub/M12, B-coded (USK25A) For connecting the X4142 engineering interface to the 24 V supply voltage • With D-sub connector 9-pin, male • With M12 SPEEDCON connector, 5-pin, male, B-coded • Length: 3 m	28139046

Connection to X4142 (M12 at the connection box)



32386058507

[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] Keypad CBG22A, CBG21A, or CBG11A
[3] Connection cable D-Sub/M12 (USK25A)
(available for delivery from SEW-EURODRIVE, part number: 28139046)

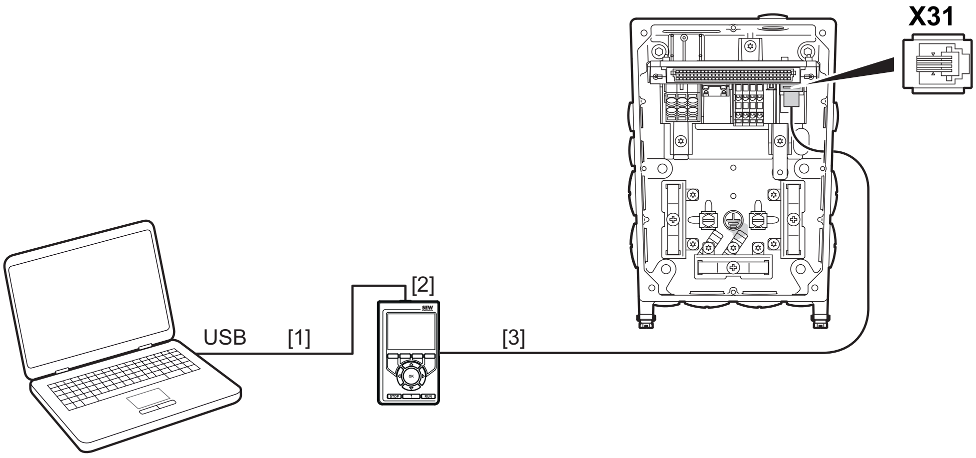
Connection to X31 (RJ10 in the connection box)

NOTICE

Connector X31 provides a 24 V supply voltage for operating the connected options.

Damage to connected options with low nominal voltage.

- Only connect options with a nominal voltage of 24 V to connector X31, such as:
  - Interface adapter USM21A,
  - CBG.. keypads
- Do **not** connect the following options with 5 V nominal voltage to the X31 connector:
  - Interface adapters USB11A, UWS11A, UWS21A
  - Keypads DBG.., GBG21A.



9007224880237067

[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] Keypad CBG22A, CBG21A, or CBG11A
[3] D-sub/RJ10 connection cable
(available for delivery from SEW-EURODRIVE, part number: 28117832)

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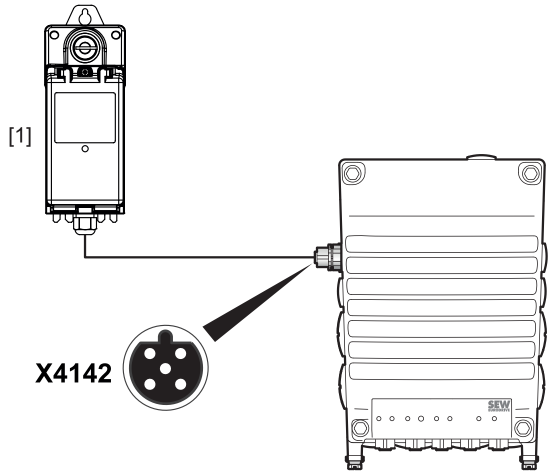
Installation housing CBM22A connection with integrated keypad to X4142 (M12 at connection box)



35684595211

[1] Installation housing CBM22A with integrated keypad

9.13.3 Adapter cables for connection to the engineering interface X4141

As part of product improvement, SEW-EURODRIVE has replaced the optional engineering interface X4141 (M12-A-coded) with the engineering interface X4142 (M12-B-coded).

In this context, SEW-EURODRIVE has also adapted the associated connection cables [3] for connection to the X4142 engineering interface.

The adapter cable M12/M12 (USK54A) [4] allows for connection to the previous engineering interface X4141.

Component	Part number
Adapter cable M12/M12 (USK54A) • with M12-SPEEDCON connector, 5-pin, B-coded, female • with M12 connector, 5-pin, A-coded, male • Length: 0.3 m The adapter cable is required to connect the following connection cables to the engineering interface X4141: • Connection cable RJ10/M12 (USK15A) (for connection to interface adapter USM21A) • D-sub/M12 connection cable (USK25A) (for connection to the CBG.. keypad)	28146530

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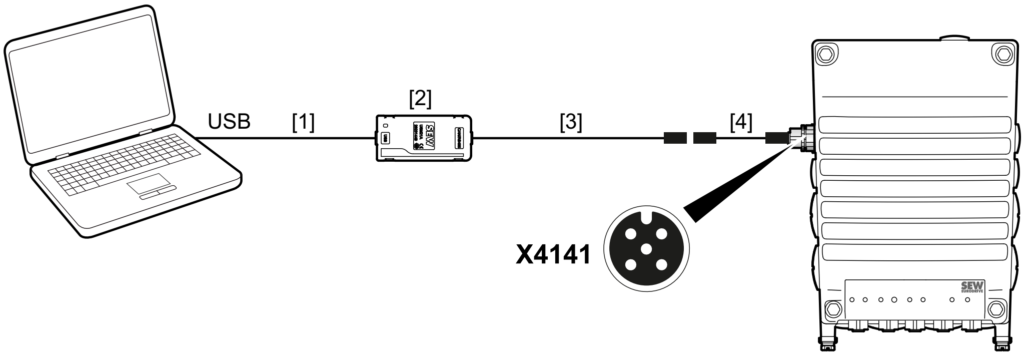
Using the adapter cable in conjunction with the USM21A interface adapter

The engineering interface X31 in the connection box of the drive unit is assigned to the internal wiring of X4141 connector.



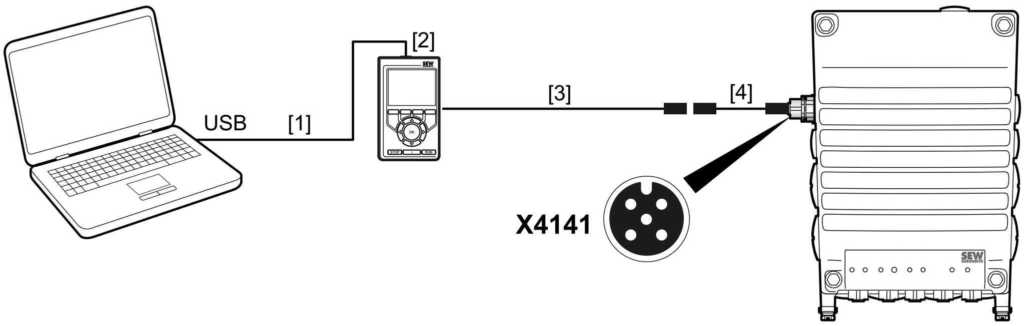
33411071115

[1] USB 2.0 connection cable
(commercially available, included in the scope of delivery of USM21A)
[2] USM21A interface adapter
[3] Connection cable RJ10/M12, B-coded, male (USK15A)
(available for delivery from SEW-EURODRIVE, part number: 28139038)
[4] Adapter cable M12, B-coded, female/M12, A-coded, male (USK54A)
(available for delivery from SEW-EURODRIVE, part number: 28146530)

The adapter cable is required to connect the connection cable RJ10/M12 (USK15A) to the previous engineering interface X4141.

Using the adapter cable with the CBG.. keypad

The X31 engineering interface in the connection box of the drive unit is assigned to the internal wiring of X4141 connector.



33411102731

[1] USB 2.0 connection cable
(commercially available, included in the scope of delivery of USM21A)
[2] CBG.. keypad
[3] Connection cable D-Sub/M12, B-coded, male (USK25A)
(available for delivery from SEW-EURODRIVE, part number: 28139046)
[4] Adapter cable M12, B-coded, female/M12, A-coded, male (USK54A)
(available for delivery from SEW-EURODRIVE, part number: 28146530)

The adapter cable is required to connect the connection cable D-Sub/M12 (USK25A) to the previous engineering interface X4141.

10 Startup

10.1 Startup notes

Perform the following steps before startup:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages in the connection box. Severe or fatal injuries.
   De-energize the device. Pay attention to the 5 safety rules in chapter "Carrying out electrical work safely". Afterwards, wait 5 minutes.
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
3. **NOTICE!** Failing to observe the minimum switch-off time of the line contactor can cause material damage. Irreparable damage to the inverter or unforeseen malfunctions.
   After switching off the voltage supply, keep it switched off for at least 10 s.
   ⇨ Do not switch the voltage supply on or off at the line contactor more than once per minute.
4. Secure the output shaft of permanently excited motors against rotation. You thereby avoid an electric shock from the regenerative operation during the rotation of the shaft.
5. ⚠ **WARNING!** Faulty device behavior due to incorrect device setting. Severe or fatal injuries.
   Observe the following information.
   ⇨ Always have the installation carried out by trained specialists.
   ⇨ Only use settings that are correct for the function.
6. Install the protective covers of the system according to the instructions. This will avoid injuries.
   ⇨ Never start the device if the protective covers are not installed.
7. If necessary, remove the paint protection film from the LED displays.
8. If necessary, remove the paint protection film from the nameplates.
9. Product variants with a customer-specific parameter set ex works (.../P...) can start up automatically.

10.2 Startup requirements

NOTICE

Gear unit overload.

Damage to the gear unit.

- Observe the peak torque of the gear unit when you configure the current limit and torque limit.
- Check the current limits and torque limits and adjust them, if necessary.

Startup is only required when you need to change the factory set parameterization.

In this case, the following conditions apply to startup:

- You have installed the device correctly both mechanically and electrically.
- You have performed a correct project planning for the device.
- Safety measures prevent accidental startup of devices.
- Safety measures prevent danger to people and machines.

Required hardware components:

- PC or laptop according to the product manual > chapter "PC connection" (→ 🗎 309).
- Interface cable and, if applicable, interface adapter according to product manual > chapter "PC connection"

Required software:

- MOVISUITE® engineering software from SEW-EURODRIVE

10.3 Parameterization mode

The following parameterization modes are available to perform the device startup:

Easy mode

Easy startup with predefined control interface.

- Setting parameters, setpoints, and additional functions can only be set using the mechanical setting elements (potentiometer and DIP switch) at the device.
- Startup does not require any software or keypads.
- When you switch to Easy mode, all parameters are reset to the delivery state.
- All device parameters are write-protected.

Exceptions:

- You can also change the parameters for device address configuration and the parameterization mode when the device is set to Easy mode.

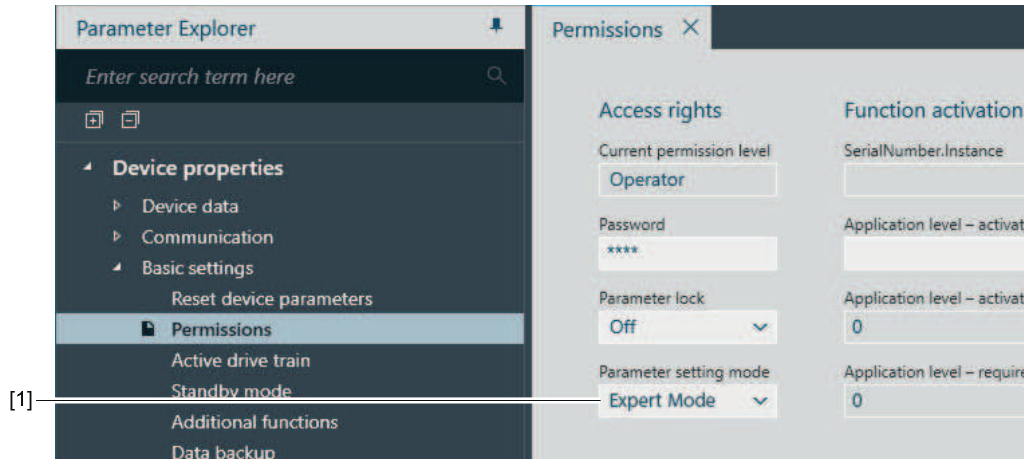
Easy mode is only available up to firmware version < 11.

Expert mode

Expert mode is a parameterization mode that allows full access to all device functions via the MOVISUITE® engineering software or the CBG.. keypad.

- The predefined connection interfaces of the device can be adjusted to the requirements of the application.
- You can deactivate the mechanical setting elements. In this way, you activate their parameterized substitute values.
- You can set the device parameters.

The parameterization mode can be set via the MOVISUITE® engineering software or the CBG.. keypad.



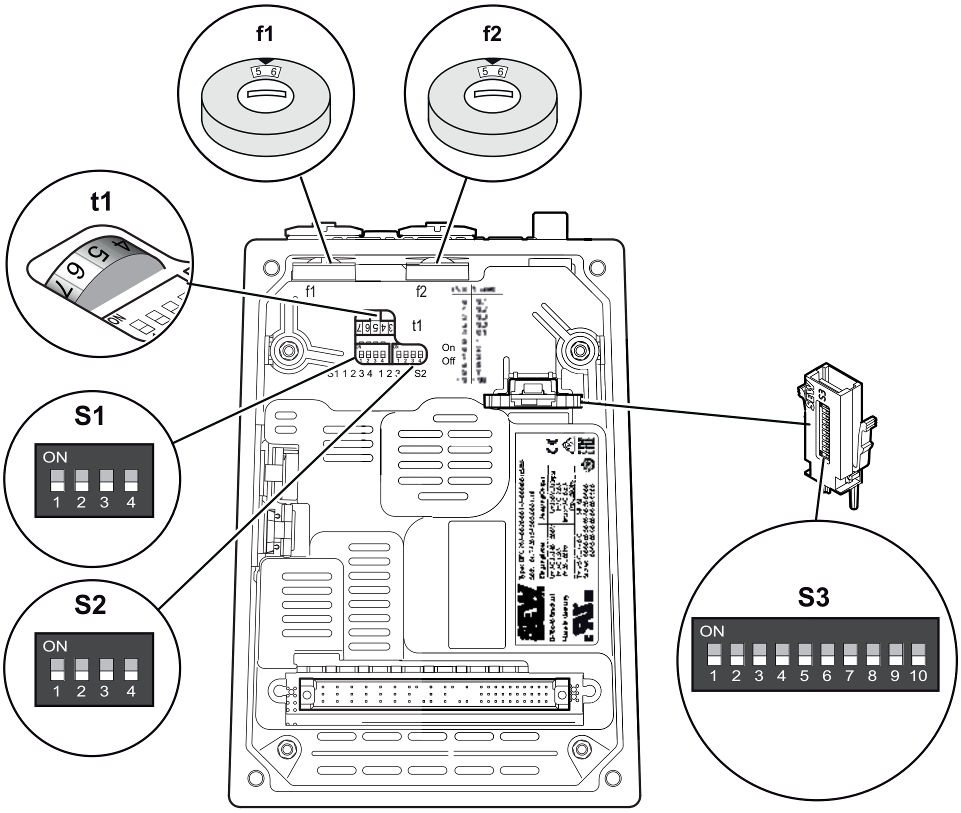
18014427828675339

[1] Basic settings > authorizations > parameterization mode > Expert mode

10.4 Control elements

10.4.1 Overview of control elements

The following figure gives an overview of the control elements at the electronics cover:



9007228265084555

f1 Potentiometer f1 (underneath the screw plug)
f2 Potentiometer f2 (underneath the screw plug)
t1 Potentiometer t1
S1 DIP switch S1
S2 DIP switch S2
S3 DIP switch S3

10.4.2 Potentiometer f1

NOTICE

Loss of the ensured degree of protection if the screw plug of the potentiometer is not installed or not installed correctly.

Damage to the device.

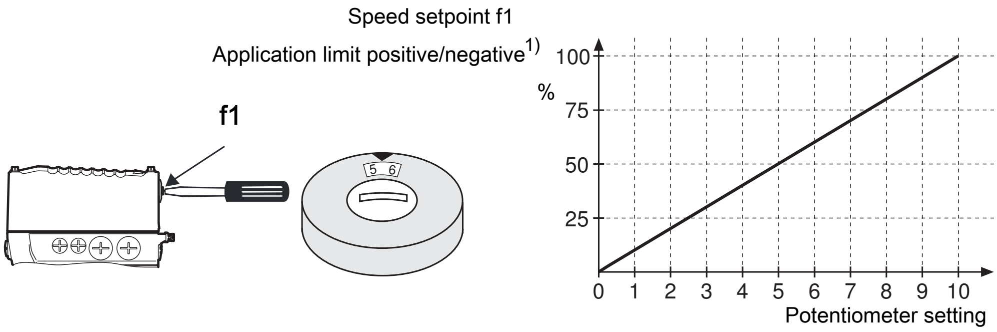
- After setting the setpoint, make sure the screw plug of the potentiometer has a seal and screw it in.

Use the f1 potentiometer to adjust speed setpoint f1.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer f1.

  Easy mode is only available up to firmware version < 11.
- The potentiometer f1 can be deactivated in Expert mode. In this case, the parameterizable replacement value is activated as speed setpoint f1.

The following figure shows how to scale the speed setpoint f1 using potentiometer f1:



18014427521459723

1) Depending on the selected direction of rotation, the parameter *Application limit – positive speed* or the parameter *Application limit – negative speed* are used to scale the speed setpoint f1.
For the application limit, refer to the MOVISUITE® parameter tree in the following menu: *Functions* > *Monitoring functions* > *Limit values* > *Application limit*.

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Parameter application limit speed

The following table shows the default setting of the *Application limit speed* parameter:

Startup	Drive unit	Default setting parameter *Application limit speed*[1]
Automatic startup via the digital interface	MOVIGEAR® performance	2000 min^{-1}
Perform manual startup via MOVISUITE®	The parameter *Application limit speed* is not changed during startup. Check the parameter and set it according to the drive system.	

1) The value may be lower due to possible gear unit limitations.

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10.4.3 Potentiometer f2

NOTICE

Loss of the ensured degree of protection if the screw plug of the potentiometer is not installed or not installed correctly.

Damage to the device.

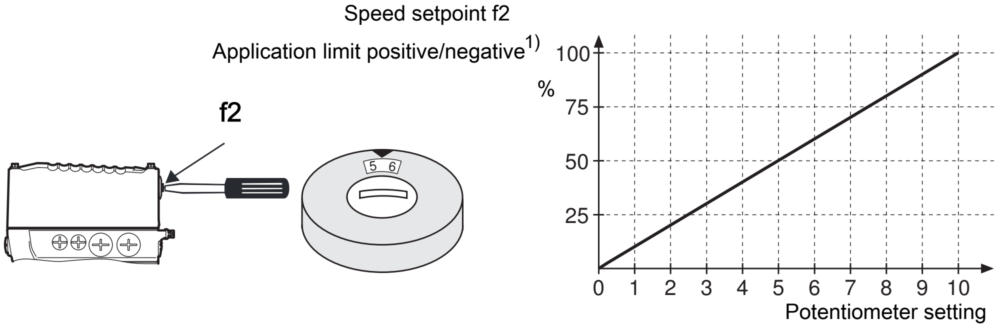
- After setting the setpoint, make sure the screw plug of the potentiometer has a seal and screw it in.

Use the potentiometer f2 to adjust speed setpoint f2.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer f2.

  Easy mode is only available up to firmware version < 11.
- The potentiometer f2 can be deactivated in Expert mode. In this case, the parameterizable replacement value is activated as speed setpoint f2.

The following figure shows how to scale the speed setpoint f2 using potentiometer f2:



27021627046265227

1) Depending on the selected direction of rotation, the parameter *Application limit positive* or the parameter *Application limit negative* are used to scale the speed setpoint f2.
For the application limit, refer to the MOVISUITE® parameter tree in the following menu: *Functions* > *Monitoring functions* > *Limit values* > *Application limit*.

Parameter application limit speed

The following table shows the default setting of the *Application limit speed* parameter:

Startup	Drive unit	Default setting parameter *Application limit speed*[1)]
Automatic startup via the digital interface	MOVIGEAR® performance	2000 min^{-1}
Perform manual startup via MOVISUITE®	The parameter *Application limit speed* is not changed during startup. Check the parameter and set it according to the drive system.	

1) The value may be lower due to possible gear unit limitations.

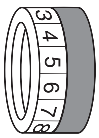
10.4.4 Potentiometer t1

Use the potentiometer t1 to set the acceleration/deceleration setpoint t1.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer t1.

  Easy mode is only available up to firmware version < 11.
- The potentiometer t1 can be deactivated in Expert mode.

  In this case, the parameters *Acceleration 1* and *Deceleration 1* of the fixed setpoint processing are activated.



The following table lists the scaling of acceleration/deceleration setpoint t1 depending on the setting of potentiometer t1:

Potentiometer t1											
Detent position	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Acceleration/deceleration $min^{-1}s^{-1}$	30000	15000	10000	6000	4286	**3000**	1500	1000	600	429	300
Ramp time[1)] s	0.1	0.2	0.3	0.5	0.7	**1**	2	3	5	7	10

1) Alternative information on the equivalent ramp times for acceleration/deceleration based on a speed change of 3000 min-1.

10.5 DIP switches

10.5.1 Overview

NOTICE

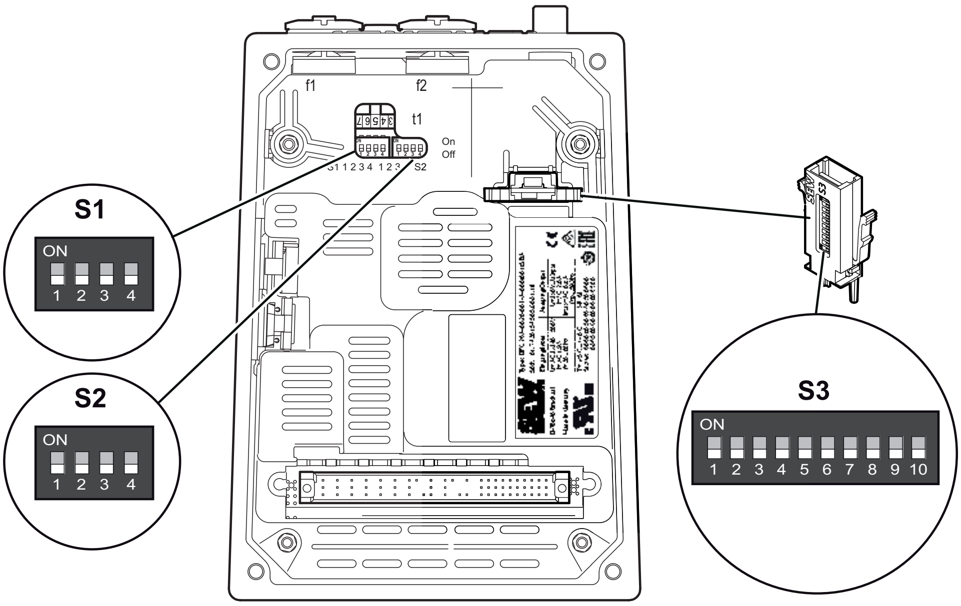
Damage to the DIP switches caused by unsuitable tools.

Damage to property.

- Set the DIP switches only using suitable tools, such as a slotted screwdriver with a blade width of ≤ 3 mm.
- The force used for setting the DIP switches must not exceed 5 N.

DIP switch overview

The following figure shows the DIP switches of the drive unit:



9007228267677579

DIP switch S1

The following table shows the functions of DIP switch S1:

DIP switch	**S1**			
	1	**2**	**3**	**4**
Meaning	**Direction of rotation reversal**	**Release brake/ deactivate DynaStop® with FCB01 – enable**	**Speed monitoring deactivation**	**Reserved**
ON	On	On	Speed monitoring off	On
OFF	**Off**[1]	**Off**[1]	**Speed monitoring On**[2]	**Off**[1]

1) The factory settings are shown in boldface.
2) Factory settings are indicated in bold.

You must not alter the factory setting of the S1/4 DIP switch = OFF.

DIP switch S2

The following table shows the functions of DIP switch S2:

DIP switch	**S2**			
	1	**2**	**3**	**4**
	Reserved	**Selection of AS-Interface slave type/profile**		
		Bit 2^0	**Bit 2^1**	**Bit 2^2**
ON	–	1	1	1
OFF	–	**0**	**0**	**0**

You must not alter the factory setting of the S2/1 DIP switch = OFF.

DIP switch S3

The S3 DIP switches on the memory module are reserved.

Do not change the factory setting of the S3 DIP switches = OFF.

10.5.2 Description of the DIP switches

DIP switch S1/1: Reversing the direction of rotation

INFORMATION

The direction of rotation is reversed depending on the setting of the DIP switch and of the parameter drive train 1 > Controller > *Direction of rotation reversal*. If both settings are active, the speed setpoint is not inverted (logical XOR).

You can reverse the direction of rotation of the drive using this DIP switch.

- OFF (S1/1 = OFF): The drive turns clockwise for a positive setpoint and counterclockwise for a negative setpoint.
- ON (S1/1 = ON): The drive turns counterclockwise for a positive setpoint and clockwise for a negative setpoint.

DIP switch S1/2: Releasing the brake / deactivating DynaStop®with FCB 01 – enable

⚠ WARNING

Risk from falling loads.

This can result in severe or fatal injuries.

- Do not enable the function "Releasing the brake / deactivating DynaStop®" for hoist applications and applications with potentially falling loads.

INFORMATION

If the function of this DIP switch is deactivated via parameter access, the last active setting of the relevant parameter is maintained.

Use this DIP switch to enable the function "Releasing the brake / deactivating DynaStop® with FCB 01" even when the drive is disabled.

- OFF (S1/2 = OFF): The function "Releasing the brake / deactivating DynaStop® with FCB 01" is inhibited.
- ON (S1/2 = ON): The function "Releasing the brake / deactivating DynaStop® with FCB 01" is enabled.

  When the function block FCB 01 is active, you can release the brake or deactivate DynaStop® using a digital input or an actuated process data bit.

INFORMATION

You can find more information on deactivating DynaStop® without a drive release in the product manual > chapter "Operation".

DIP switch S1/3: Deactivating the speed monitoring

INFORMATION

If the function of this DIP switch is deactivated via parameter access, the last active setting of the relevant parameter is maintained.

This DIP switch is used to disable speed monitoring.

- Speed monitoring OFF (S1/3 = ON): Speed monitoring is not active.
- Speed monitoring ON (S1/3 = OFF): Speed monitoring is active.

  Speed monitoring is used to protect the drive in case of blockage.

  When speed monitoring is active and the drive operates at the current limit for longer than 1 second (factory settings), the drive unit triggers the fault "Speed monitoring". The drive unit signals the fault, for example via the "DRIVE" status LED. The current limit must be reached permanently for the duration of the delay time before the monitoring function trips.

DIP switches S2/2 – S2/4: Selection of AS-Interface slave type/profile

Use this DIP switch to select the station type and the profile for the AS-Interface communication.

<table>
<tr><th colspan="3">DIP switch</th><th rowspan="2">Station type</th><th rowspan="2">Station profile</th></tr>
<tr><th>S2/2</th><th>S2/3</th><th>S2/4</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>Binary station
4 DI/4 DO</td><td>S-7.F</td></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF</td><td rowspan="2">OFF</td><td rowspan="2">Double station
4 DI/4 DO
A station for
drive controller
B station for
parameter communication</td><td>A station:
S-7.A.7 (CTT3)</td></tr>
<tr><td>B station:
S-7.A.5 (CTT2)</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>A/B station
4 DI/4 DO
A station or
B station[1]</td><td>S-7.A.7 (CTT3)</td></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">ON</td><td rowspan="2">OFF</td><td rowspan="2">Double station
8 DI/8 DO
A station for
drive controller
B station for
parameter communication</td><td>A station[2]:
S-7.A.A (CTT3)</td></tr>
<tr><td>B station:
S-7.A.5 (CTT2)</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>A/B station
8 DI/8 DO
A station or
B station[1]</td><td>S-7.A.A (CTT3)[2]</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td colspan="2">Reserved</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td colspan="2">Reserved</td></tr>
</table>

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DIP switch			Station type	Station profile
S2/2	S2/3	S2/4		
ON	ON	ON	Reserved	

1) Defined by the address of the station.
2) The S-7.A.A profile (8 DI/8 DO) is designed by AS-Interface for analog data transmission, which is why the data bits in the PLC are located in the data blocks for analog data.

10.6 Startup with "ex works parameters"

SEW-EURODRIVE offers the ordering of products with customer-specific parameter settings in the delivery state. This option is known as "ex works parameters". Startup procedures and processes can be optimized in the best possible way using this option. Products with a customer-specific parameter set are marked with .../P... in the type designation.

The "Parameters ex works" data set is stored on the TSM memory module.

10.7 Startup of motors with the MOVILINK® DDI interface

If an inverter has the MOVILINK® DDI interface and is connected to a motor that also has this interface, the motor is started up automatically via its electronic nameplate. The process is started by switching on the inverter. This function is only supported if the inverter is in the delivery state.

The status of the inverter is "AC" (Auto Configuration) during the data transfer from the electronic nameplate. You can obtain more information from the SEW-EURODRIVE hotline.

10.8 Application-related startup

The applications are started up with specific settings using the MOVISUITE® engineering software.

Pay attention to the information in the **Product manual** > chapter "Startup" > "Application-related startup", including the sub-chapters.

10.8.1 Pumps and fans

Observe the following information:

- The control mode to be used depends on the motor type.
- Activate the "Flying start" function.

10.8.2 Hoist

Set the following parameters:

- Preload hoist (index 8404.9): This parameter determines the behavior of the integrator when re-entering control. Example: When the output stage is inhibited (e.g. with FCB 02, FCB 01, FCB 13, FCB 14), the I component (which corresponds to the preload in the case of the hoist) is deleted. The following selections are available to prevent this:
  - "Off" (= default): The integrator always starts with the value "0". Adjustment is made to an existing load torque. The speed controller can usually compensate for sagging of the hoist without additional settings.
  - "Save": The value that was present at the time of opening the speed control loop is retained. If the load torque has not changed, no adjustment is necessary when closing the speed control loop.
  - "Initialization value": If the load torque is known, this can be specified on the speed controller as an initial value via the parameter "Torque bias" in the range -1000% to 1000% of the nominal motor torque. This can be done during startup or optimization of the drive with the MOVISUITE® engineering software or you can use a local setpoint or a channel of the process data buffer. If the direction of rotation is positive in the stroke direction, enter a positive value and vice versa.
- Activate speed monitoring (index 8550.1). You must set the monitoring time (index 8550.2) for the specific application.

Also observe the notes in chapter "Lifting applications".

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10.8.3 Prioritized terminal control

Description

The "Prioritized terminal control" function is a control function that prioritizes control of the drive independently of the parameterized control signal source (e.g. fieldbus) via digital inputs.

Operating behavior

Firmware version 12 of the basic device covers the different operating behaviors of previous firmware versions.

You can use the *Interrupt F-communication* parameter to set the different operating behaviors. The setting of the operating behavior thus ensures compatibility with previous firmware versions.

The following table shows the operating behavior of the basic device for firmware versions ≥ 12.0:

Safety option	Parameter setting	Operating behavior
STO connection via terminals, no safety card	–	You can operate the drive with the prioritized terminal control as long as the safety sub-function is deactivated via the STO signals at the terminals.
Safety card **without** safe inputs	*Interrupt F-communication* = **YES** (default)	When activating the prioritized terminal control, F-communication with the safety card is stopped. The communication timeout of the safety card activates the safety sub-functions and inhibits the drive. You can deactivate the safety sub-functions using the "F-PO muting" function and thus enable the drive again. You can activate the "Muting F-PO" function by starting emergency mode with the CBG21A keypad. **INFORMATION** SEW-EURODRIVE recommends that you **DO NOT** use this parameter setting in conjunction with a safety card without safe inputs.
	Interrupt F-communication = **NO**	When activating the prioritized terminal control, F-communication with the safety card is continued. You can operate the drive with the prioritized terminal control as long as the safety sub-functions are not activated via the control signals at the safety card.

Safety option	Parameter setting	Operating behavior
Safety card **with** safe inputs	*Interrupt F-communication* = **YES** (default)	When activating the prioritized terminal control, F-communication with the safety card is stopped. The communication timeout of the safety card activates the safety sub-functions and inhibits the drive. You can deactivate the safety sub-functions using the "F-PO muting" function and thus enable the drive again. You can activate the "F-PO muting" function with appropriately configured safe digital inputs. **INFORMATION** SEW-EURODRIVE recommends that you use the prioritized terminal control in conjunction with this parameter setting **only** to control the drive independently of the control via F-communication (e.g. for emergency mode).
	Interrupt F-communication = **NO**	When activating the prioritized terminal control, F-communication with the safety card is continued. You can operate the drive with the prioritized terminal control as long as the safety sub-functions are not activated via the control signals at the safety card.

Configuration of the safe digital inputs for activating the "Muting F-PO" function

⚠ WARNING

The active "Muting F-PO" function deactivates the safety sub-functions. This can cause the system to start up immediately.

Severe or fatal injuries.

- Before activating the "Muting F-PO" function, the user must take organizational measures for the protection of personnel and machinery.

Configure the safe digital inputs with the "Assist CS.." parameterization tool as follows:

1. Configure a safe digital input using the "Acknowledge error" function.
2. Configure a safe digital input using the "Muting" function.
3. In the basic setting of the safety option, set the *Selection muting* parameter to *Encoder error and F-PO*.
4. Set the maximum muting time according to the application's requirements.

In addition, observe the notes in chapter "Muting safe process output data (Muting F-PO)"." "" "

Functions

Edge detection after STO and power ON

The *Edge detection after STO and power on* parameter specifies whether the prioritized terminal control is started after the deactivation of the safety sub-function or with a power switch-on by the signal level or by a positive signal edge.

All other states are evaluated only via the signal level.

Parameter	Setting	Meaning
Edge detection after STO and power on	**Signal level**	The prioritized terminal control is activated as soon as the signal for activating the function is set at a digital input or if the signal is already present.
	Positive signal edge	The selection only affects the signal of the direction of rotation enable ("Prioritized terminal control – positive direction of rotation" or "Prioritized terminal control – negative direction of rotation").

F-communication when activated

The *F-communication when activated* parameter defines the behavior of safe communication with the higher-level safety controller when the prioritized terminal control is activated.

Parameter	Setting	Meaning
F-communication when activated	**Yes**	Safe communication is interrupted when the prioritized terminal control is activated. The signals of the higher-level safety controller are no longer active on the inverter. This causes the safety card to signal a safe communication timeout error and the safety sub-functions are activated. The "Muting F-PO" function can be used to deactivate the safety sub-functions and thus enable the drive again.
	No	Safe communication is not interrupted when the prioritized terminal control is activated. The signals of the higher-level safety controller are still active on the inverter.

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Speed source

The *Speed source* parameter defines the behavior of safe communication with the higher-level safety controller when the prioritized terminal control is activated.

Parameter	Setting	Meaning
Speed source	**Prioritized terminal control – speed setpoint**	The "Prioritized terminal control" function applies the speed[1] from the following parameters: • *Prioritized terminal control speed 1* • *Prioritized terminal control speed 2*
	POI data word 1-16	The "Prioritized terminal control" function applies the speed[1] from the configured PO data word 1-16.
	Data Flexibility output data 1-32	The "Prioritized terminal control" function applies the speed[1] from the configured data flexibility output data 1-32.
	Analog input AI x / AIO y	The "Prioritized terminal control" function applies the speed[1] from the respective analog input AI/AIO.
	Total: AI1 + AIO 01	The "Prioritized terminal control" function applies the speed[1] from the sum of AI1 + AIO 01.
	Primary frequency	The "Prioritized terminal control" function applies the speed[1] from the primary frequency setpoint.

1) When the function is active

Digital input functions

The following table shows the operating behavior of the basic device depending on the signal at the digital input.

Signal at digital input	Setting	Operating behavior
Prioritized terminal control – **activation**	–	The "Activation" signal activates the prioritized terminal control and deactivates the current control, e.g. via fieldbus. During activation, the control performs an error reset once. If no direction of rotation enable is selected via further digital inputs, the controller stops the drive with the set deceleration and inhibits the output stage (FCB01).

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Signal at digital input	Setting	Operating behavior
Prioritized terminal control – **positive direction of rotation**	*Edge detection after STO and POWER ON* = **signal level**	If the prioritized terminal control has been activated by a digital input signal, the controller enables the drive in positive direction of rotation via this signal (FCB04). If both directions of rotation are active, the controller inhibits the drive (FCB04).
	Edge detection after STO and POWER ON = **positive edge**	If the prioritized terminal control has been activated by a digital input signal, the controller enables the drive in positive direction of rotation via a positive edge at this same digital input (FCB04). If both directions of rotation are active, the controller inhibits the drive (FCB04).
Prioritized terminal control – **negative direction of rotation**	*Edge detection after STO and POWER ON* = **signal level**	If the prioritized terminal control has been activated by a digital input signal, the controller enables the drive in negative direction of rotation via this signal (FCB04). If both directions of rotation are active, the controller inhibits the drive (FCB04).
	Edge detection after STO and POWER ON = **positive edge**	If the prioritized terminal control has been activated by a digital input signal, the controller enables the drive in negative direction of rotation via a positive edge at this same digital input (FCB04). If both directions of rotation are active, the controller inhibits the drive (FCB04).

⚠ WARNING

Danger due to unexpected startup. If you deactivate the prioritized terminal control, the drive is immediately controlled by the original control source. Depending on the settings of the original control source, the drive may restart unexpectedly.

Severe or fatal injuries.

- Check the parameters and signals of the original control source before deactivating.
- Make sure that the settings of the parameters and signals of the original control source do not pose any risks.

10.9 Startup with MOVISUITE® engineering software

The inverters are started up using the MOVISUITE® engineering software from SEW-EURODRIVE.

The motor is started up in drive train 1.

When using a motor from SEW-EURODRIVE, select the motor type from the catalog or enter the nameplate. You can perform the startup for motors and encoders from SEW-EURODRIVE with an electronic nameplate based on the data contained there.

When using a third-party motor, enter the corresponding nominal motor data. SEW-EURODRIVE recommends performing a motor parameter measurement using the FCB 25 for third-party motors.

The engineering software can be operated intuitively and is not described further in this document.

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10.10 Startup with the CBG21A keypad

Using the CBG21A keypad, startup can be performed intuitively guided by the symbols and functions of the color display.

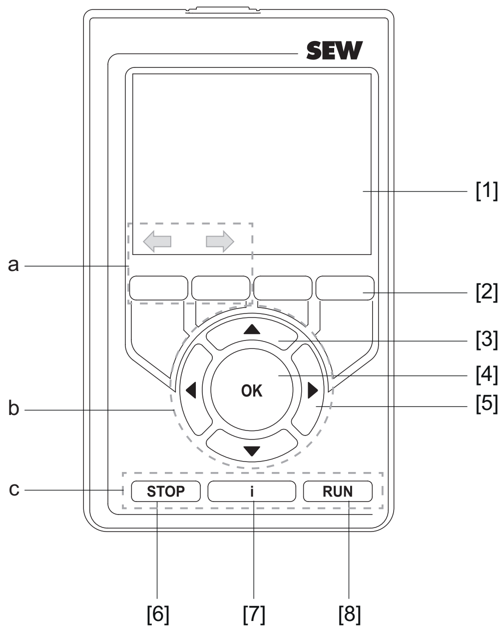
Further information can be found in the **product manual** > chapter "Startup" > "Startup with the CBG21A keypad", including the sub-chapters.

INFORMATION

You cannot take a drive train into operation using a keypad with this drive unit. You can adjust the drive train with the MOVISUITE® engineering software.

10.10.1 CBG21A keypad

The following figure shows the CBG21A keypad:



9007225148764555

[1] Color display
[2] 4 function keys that are assigned according to the context. The assigned functions are shown in the color display above the keys.

a = Permanently assigned with Back/Next

b = Navigate in the menu
[3] <Up/down> arrow keys
[4] <OK> key
[5] <Left/right> arrow keys

c = Manual mode control section
[6] <STOP> key
[7] <I> information key
[8] <RUN> key

The user interface of the CBG21A keypad is multilingual.

Activating a field

Proceed as follows:

1. Select a field using the <up/down> arrow keys.
2. Activate the field with the <OK> key.

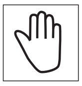
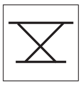
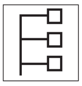
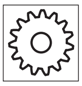
Entering a number

Proceed as follows:

- Change the digit within a number by using the <left/right> arrow keys.
- The editable digit is highlighted.
- Change the value of the digit by using the <up/down> arrow keys.
- Confirm the number with the <OK> key.

Symbols used

The available functions are shown with pictograms in the keypad display.

	Manual operation
	Optimization of the control mode
	Application
	Diagnostics
	Parameter
	Data management
	Settings
	Back
	Next

10.11 Startup with the CBG11A keypad

Using the CBG11A keypad, startup can be performed intuitively guided by the symbols and functions of the color display.

Further information can be found in the **product manual** > chapter "Startup" > "Startup with the CBG11A keypad", including the sub-chapters.

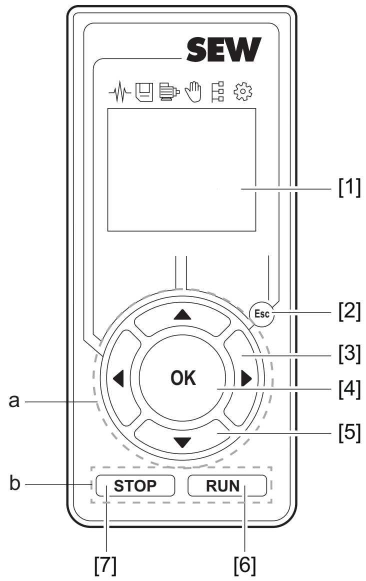
INFORMATION

You cannot start up a motor with encoder using the keypad.

You can carry out this particular startup with the MOVISUITE® engineering software.

10.11.1 CBG11A keypad

The following figure shows the CBG11A keypad:



18014424428189195

[1] Color display
[2] <Esc> key

a = Navigate in the menu
[3] <Left/right> arrow keys
[4] <OK> key
[5] <Up/down> arrow keys

b = Manual mode control section
[6] <RUN> key
[7] <STOP> key

The user interface of the CBG11A keypad is in English.

Selecting a function

Proceed as follows:

1. To open the main menu, press the <Esc> key.
2. Select a function using the <left/right> arrow keys.
3. Confirm your selection with the <OK> key.

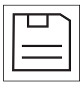
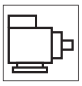
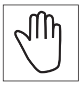
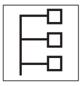
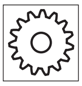
Entering a number

Proceed as follows:

1. Change the digit within a number by using the <left/right> arrow keys.
2. The editable digit is underlined.
3. Change the value of the digit by using the <up/down> arrow keys.
4. Confirm the number with the <OK> key.

Symbols used

The available functions are shown with pictograms in the keypad display.

	Diagnostics
	Data management
	Startup
	Manual operation
	Parameter tree
	Keypad settings

A firmware update of the drive unit is not possible with the CBG11A keypad.

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10.12 Process data configuration

In Easy mode[1] the following process data configuration is active.

In Expert mode, you can assign different functions to the individual data bits.

1) Easy mode is only available up to firmware version < 11.

10.12.1 Control word 1

<table>
<tr><th colspan="5">Control word 1 – Cyclic data bits of the AS-Interface</th></tr>
<tr><th>DO
(AS-Interface)</th><th>PA1[1]
(Device)</th><th>Function</th><th colspan="2">Usable data width of the AS-interface
Slave profile</th></tr>
<tr><td>DO 0</td><td>0</td><td>Positive direction of rotation</td><td rowspan="4">4 bits</td><td rowspan="8">8 bits</td></tr>
<tr><td>DO 1</td><td>1</td><td>Negative direction of rotation</td></tr>
<tr><td>DO 2</td><td>2</td><td>Potentiometer f2</td></tr>
<tr><td>DO 3</td><td>3</td><td>Output stage enable/fault reset</td></tr>
<tr><td>DO 4</td><td>4</td><td>Fixed speed setpoint bit 0</td><td rowspan="12"></td></tr>
<tr><td>DO 5</td><td>5</td><td>Fixed speed setpoint bit 1</td></tr>
<tr><td>DO 6</td><td>6</td><td>FCB 13 Stop at application limit</td></tr>
<tr><td>DO 7</td><td>7</td><td>Release brake/deactivate DynaStop® with FCB 01</td></tr>
<tr><td>–</td><td>8</td><td>No function</td><td rowspan="8"></td></tr>
<tr><td>–</td><td>9</td><td>No function</td></tr>
<tr><td>–</td><td>10</td><td>No function</td></tr>
<tr><td>–</td><td>11</td><td>No function</td></tr>
<tr><td>–</td><td>12</td><td>No function</td></tr>
<tr><td>–</td><td>13</td><td>No function</td></tr>
<tr><td>–</td><td>14</td><td>No function</td></tr>
<tr><td>–</td><td>15</td><td>No function</td></tr>
</table>

1) PA data word 1

10.12.2 Status word 1

Status word 1 – Cyclic data bits of the AS-Interface				
DI (AS-Interface)	PE1[1] (Device)	Function	Usable data width of the AS-interface Slave profile	
DI 0	0	Ready for operation	4 bits	8 bits
DI 1	1	Local mode/manual mode active		
DI 2	2	DI 01		
DI 3	3	DI 02		
DI 4	4	Motor stopped – filtered		
DI 5	5	STO active		
DI 6	6	Electromechanical capacity utilization pre-warning		
DI 7	7	Faults		
–	8	No function		
–	9	No function		
–	10	No function		
–	11	No function		
–	12	No function		
–	13	No function		
–	14	No function		
–	15	No function		

1) PE data word 1

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10.12.3 Control word 2

INFORMATION

You can configure the switch-on state of the parameter bits in the slave configuration in the AS-Interface master. The default setting of the value of the parameter bits is usually "1".

<table>
<tr><th colspan="5">Control word 2 – Acyclic parameter bits of the AS-Interface</th></tr>
<tr><th>PO
(AS-Interface)</th><th>PA2[1]
(Device)</th><th colspan="2">Function</th><th>Usable data width of the AS-interface Device profile</th></tr>
<tr><td>PO 0</td><td>0</td><td colspan="2">No function</td><td rowspan="5">4 bits</td></tr>
<tr><td>PO 1</td><td>1</td><td colspan="2">No function</td></tr>
<tr><td>PO 2</td><td>2</td><td colspan="2">No function</td></tr>
<tr><td rowspan="2">PO 3</td><td rowspan="2">3</td><td>Bits reserved for AS-Interface
-> Bit permanently set to "0"</td><td>A/B slave,
Double device</td></tr>
<tr><td>No function</td><td>Binary device</td></tr>
<tr><td>–</td><td>4</td><td colspan="2">No function</td><td rowspan="12"></td></tr>
<tr><td>–</td><td>5</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>6</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>7</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>8</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>9</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>10</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>11</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>12</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>13</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>14</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>15</td><td colspan="2">No function</td></tr>
</table>

1) PA data word 2

10.13 Deactivating DynaStop® for the startup procedure

10.13.1 Important information about deactivating DynaStop® (option /DSP)

⚠ WARNING

Removing the electronics cover will deactivate DynaStop®.

Severe or fatal injuries.

- If deactivation is not permitted for the plant, you will need to initiate additional measures (e.g. mechanical disconnection).

⚠ WARNING

Electric shock due to regenerative energy created by moving system or machine. The regenerative energy can cause dangerous voltages at the terminals or connectors, even when the supply voltage is disconnected.

Severe or fatal injuries.

- Never touch the wiring space with wiring board and connector.
- If you cannot rule out that the wiring space is touched, provide for suitable protection covers.

NOTICE

Damage to the connector plug between connection unit and electronics cover due to regenerative energy created by movement of the system or machine.

Damage to property.

- To prevent the connection plug from being damaged (destroyed contacts), you must remove the electronics cover completely in order to deactivate DynaStop®!

10.13.2 Steps to deactivate DynaStop®

Note:

INFORMATION

Further information about the DynaStop® function can be found in chapter "Operation" and in the product manual > chapter "Technical data".

Deactivating DynaStop® by removing the electronics cover

Deactivate the DynaStop® function as follows:

1. Observe chapter "Startup information".
2. Observe chapter "Important information about deactivating DynaStop®".
3. De-energize all of the components and safeguard them with an external switch-off device to prevent unintentional activation of the voltage supply.
4. Remove the electronics cover completely.

The DynaStop® function is deactivated as a result. The system/machine can be moved mechanically observing the notes in chapter "Important notes on disabling DynaStop".

Deactivating DynaStop® using a control signal

Alternatively, the DynaStop® function can also be deactivated using a control signal (process data or digital input). When doing this, observe the instructions in the product manual > chapter "Operation" > "Deactivating DynaStop® with FCB01".

10.14 Configuring the drive behavior at standstill (FCB 02, FCB 13, FCB 14)

The parameter *Behavior at standstill* defines the drive behavior in case the drive enable is revoked and the motor is at standstill (path: *Functions* > *Drive functions* > *FCB 02 Stop default*). This parameter is effective when the function blocks FCB 02, FCB 13 and FCB 14 are active.

The following table lists the drive behavior after motor standstill:

Index	Parameter	Setting	Behavior at motor standstill		
			DynaStop®	Motoring position hold control	Effect on the motor shaft
8563.1	*Behavior at standstill* (Path: *Functions > Drive functions > FCB 02 Stop default)*	Drive energized (brake released / DynaStop® deactivated)	DynaStop® is deactivated	Position hold control active	The motor shaft is regulated to rotational speed = "0" by the motor.
		Drive not energized (brake applied / DynaStop® activated)	DynaStop® is activated	The motor is disconnected from the current supply.	The motion of the motor shaft is retarded by DynaStop®.
		Drive not energized (without brake/ DynaStop®)	DynaStop® is deactivated	The motor is disconnected from the current supply.	The motor shaft can rotate freely.

11 Operation

11.1 Manual mode with CBG22A local keypad

With the CBG22A local keypad, you can intuitively operate the drive unit or device and read out faults using the symbols and functions on the color display.

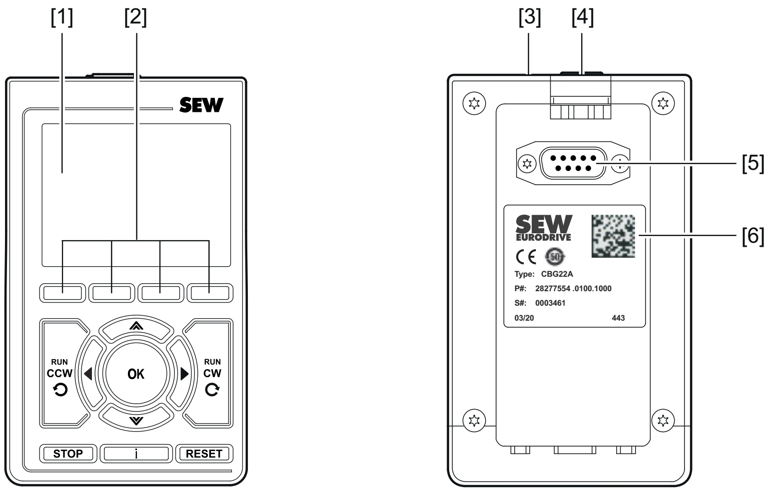
Further information can be found in the **product manual** > chapter "Operation" > "Manual mode with the CBG22A local keypad", including the sub-chapters.

INFORMATION

You cannot take a drive train into operation using a keypad with this drive unit. You can adjust the drive train with the MOVISUITE® engineering software.

11.1.1 CBG22A local keypad

The following figure shows the front and rear of the CBG22A local keypad:

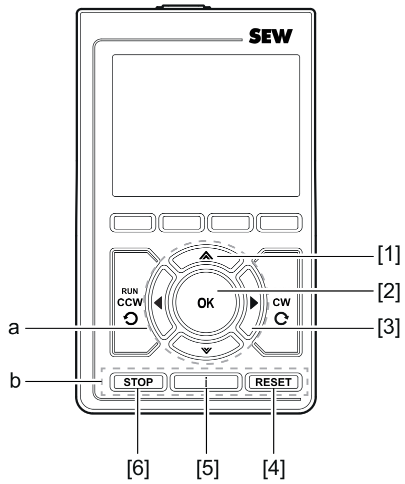


9007233260681483

[1] Color display
[2] 4 function keys that are assigned according to the context. The assigned functions are shown in the color display above the keys.
[3] USB 2.0 Mini B interface, female (PC connection)
[4] Locking element
[5] D-sub interface, 9-pin, female
[6] Nameplate

Keys

The following figure shows the keys of the CBG22A local keypad:



9007233260688395

a = Navigate in the menu		**b = Manual mode control section**	
[1]	<Up/down> arrow keys	[4]	<RESET> key
[2]	<OK> key	[5]	<i> Information key
[3]	<Left/right> arrow keys	[6]	<STOP> key

Activating a field

Proceed as follows:

1. Select a field using the <up/down> arrow keys.
2. Activate the field with the <OK> key.

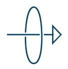
Entering a number

Proceed as follows:

- Change the digit within a number by using the <left/right> arrow keys.
- The editable digit is highlighted.
- Change the value of the digit by using the <up/down> arrow keys.
- Confirm the number with the <OK> key.

Symbols used

The selectable functions are shown on the display of the local keypad in the form of icons.

	Start menu
	Monitoring
	MOVISAFE® CS..
	DIP switch
	Process data
	Digital inputs/outputs
	Operating and energy data
	Device information
	Fault memory
	Gateway operation
	Settings
	Main menu
	Direct control mode active
	Indirect control mode active
	Manual mode

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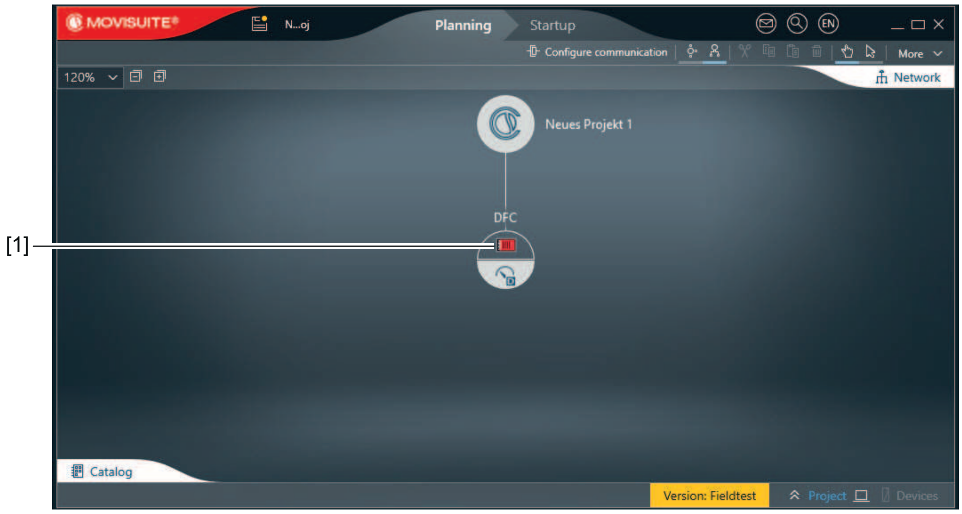
11.2 Manual mode with MOVISUITE®

For manual operation of the device, you can use the manual mode function of the MOVISUITE® engineering software.

1. First connect the PC to the device, see chapter "PC connection".
2. Start the MOVISUITE® engineering software and add the device to MOVISUITE®.
3. Next, click the "Tools" [1] choice box. Select the "Manual mode" menu item.



45036018255868683

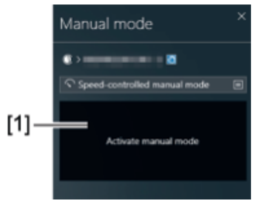
⇨ MOVISUITE® opens the "Manual mode" window.

11.2.1 Activating/deactivating manual mode

Activation

Manual mode can only be activated when the device is inhibited.

To activate manual mode, click the [Activate manual mode] button [1].



27021619746390027

Manual mode remains active even after a fault reset.

Deactivation

⚠ WARNING

Risk of injury if the device starts up unintentionally.

Severe or fatal injuries.

- Before deactivating manual mode, take measures to prevent the device from starting up unintentionally.
- Take additional safety precautions depending on the application to avoid injury to people and damage to machinery.

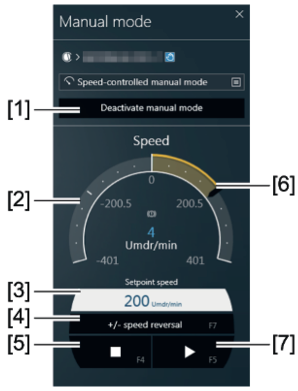
Manual mode is deactivated:

- When you click the [Deactivate manual mode] button
- Or when you close the "Manual mode" window.

11.2.2 Control in manual mode

Manual mode window

Once manual mode has been successfully activated, you can control the device using the controls in the MOVISUITE® "Manual mode" window.



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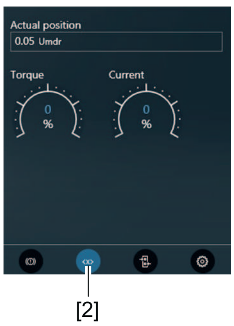
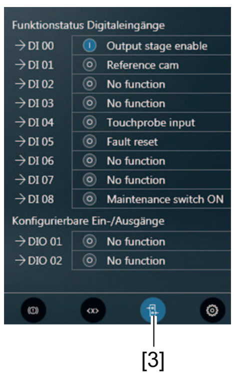
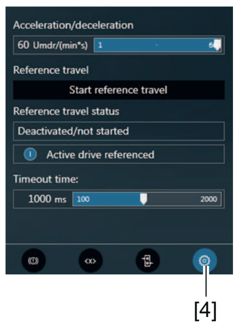
Controller

1. Set the setpoint speed using the edit box [3] or graphic input [6].
2. To specify the direction of rotation, click the button [4].
3. To enable the device, click the button [7].
4. To stop the device, click the button [5].

The "Speed" group [2] shows the actual speed of the device.

Advanced functions and displays of manual mode

The following functions are available in manual mode using MOVISUITE®:

Release brake **Inhibit output stages**	**Actual values**	**Digital inputs and outputs**	**Acceleration** **Reference travel** **Timeout**
			
Key [1]	Key [2]	Key [3]	Key [4]

11.3 Drive unit behavior in case of a voltage failure

The motor of the drive unit has the following function when the drive is in motion:

In case of a voltage failure, the drive unit uses the motion energy (energy recovery) to supply the electronics cover with voltage. The inverter in the electronics cover realizes a controlled motor deceleration.

If the regenerated energy is not sufficient, the inverter activates the holding function.

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11.4 DynaStop®

11.4.1 Functional description

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

Severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When using DynaStop® on ascending/descending sections or vertical conveyors without freely suspended loads, you must comply with the basic safety and health requirements (e.g. EC Machinery Directive 2006/42/EC).
- The behavior of the DynaStop® function must be taken into account for the risk assessment of the application that determines the required safety measures.

NOTICE

Activating the FCB 01 Output stage inhibit when the motor is running will activate DynaStop®. This can cause high torque loads, which may damage the drive components and the system.

Damage to property.

- Activate the FCB 01 Output stage inhibit only when the speed is "0".

The DynaStop® function allows a speed-dependent torque to be generated that acts against the rotational movement.

Within the permitted operating range, this torque prevents an excessive acceleration of the motor shaft by an external force (e.g. lowering at inclining tracks).

11.4.2 DynaStop® torques

INFORMATION

The possible DynaStop® torques can be found in the product manual > chapter "Technical data" > "DynaStop® torques" (→ 🗎 67)

11.5 Function "Release brake/deactivate DynaStop® with FCB01"

11.5.1 Note:

INFORMATION

For information on deactivating the DynaStop® function for startup and assembly work, refer to chapter "Deactivating DynaStop® for startup work" (→ 344).

11.5.2 Activating the function

⚠ WARNING

Danger from falling loads.

Severe or fatal injuries.

- Do **not** use the "Release brake/deactivate DynaStop® for FCB01" function for hoists or applications with potentially falling loads.
- Inhibit the function via the following steps:
  – Deactivate the function of DIP switch S1/2 via parameter *Functions* > *Inputs/ outputs* > *Basic device* > *DIP switch functions* > *Release brake/deactivate DynaStop® for FCB01 – enable* > **"Deactivation"** = **"1"**.
  – Disable the function via parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **"Release brake/deactivate DynaStop® for FCB01 – enable"** = **"0"**.

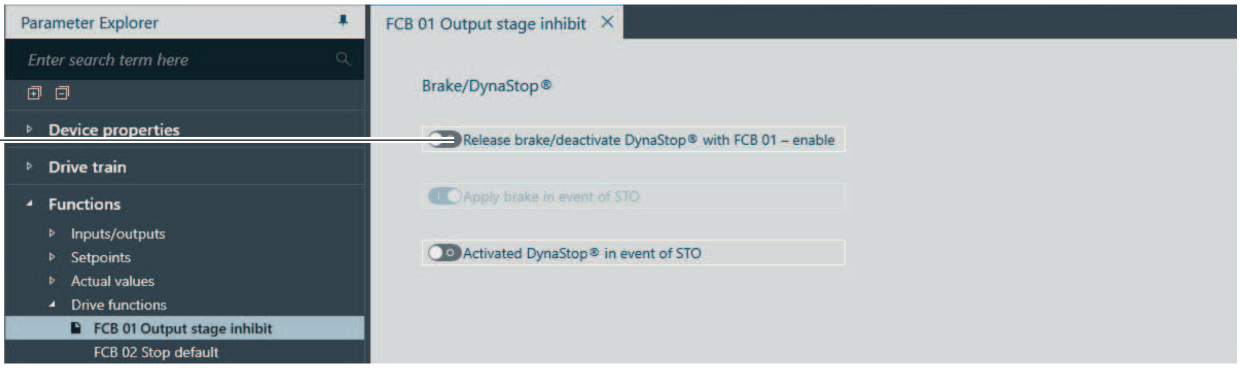
In case the output stage is inhibited by a control signal (digital input or process data bit), the DynaStop® function can be deactivated using the function "Release brake/deactivate DynaStop® with FCB01". For example, this allows to move loads freely using a horizontal conveyor.

Now make the following settings:

1. **Enabling the function**:

   ⇨ **Via DIP switch S1/2**
   Switch DIP switch S1/2 "Release brake/deactivate DynaStop® for FCB01 – enable" = ON.

   ⇨ **Via parameter setting**
   Make sure that DIP switch S1/2 has been deactivated via parameter *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Release brake / deactivate DynaStop® for FCB01 enable* > **"Deactivation"** = **"1"**.
   Enable the function via parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **"Release brake/deactivate DynaStop® with FBC 01- enable"** = **"1"** [1].

[1]


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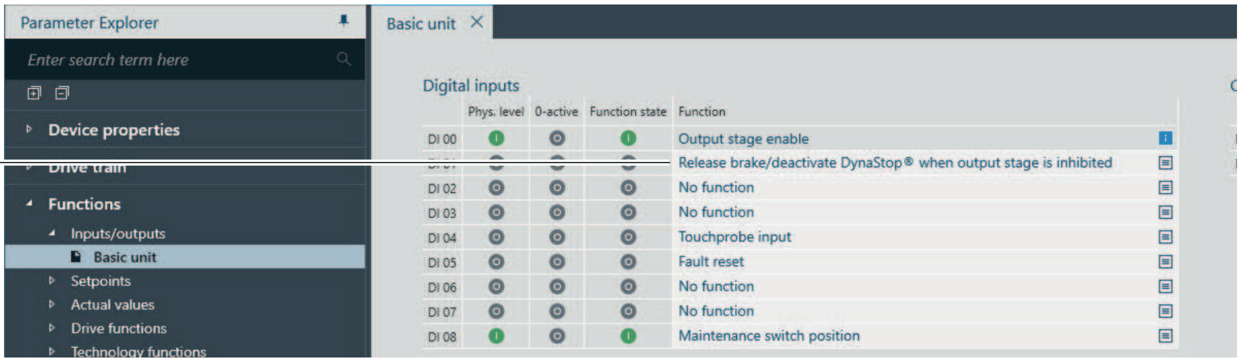
2. **Configuring the control signal**:

   ⇨ **Control via digital input**
   Assign a digital input via the function "Release brake/deactivate DynaStop® when output stage is inhibited" [2].

[2]


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   ⇨ **Control via process data bit** (not available with DBC designs)
   Use the "Release brake" control bit of the MOVIKIT® control word to release the brake/deactivate DynaStop® for FCB01.
   For further information, refer to the corresponding MOVIKIT® documentation.

The set control signal can be used to deactivate DynaStop® when the function block FCB01 is active.

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11.6 DynaStop® in conjunction with STO

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

Severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When using DynaStop® on ascending/descending sections or vertical conveyors without freely suspended loads, you must comply with the basic safety and health requirements (e.g. EC Machinery Directive 2006/42/EC).
- The behavior of the DynaStop® function must be taken into account for the risk assessment of the application that determines the required safety measures.

INFORMATION

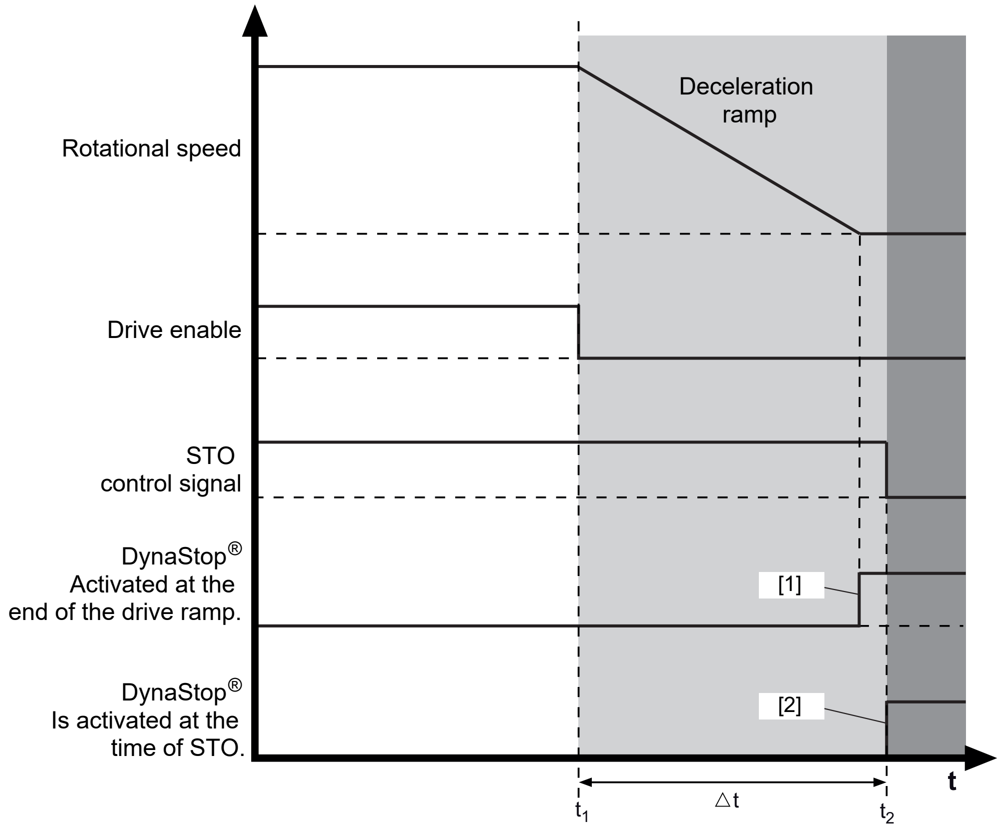
For information about using the STO function, refer to chapter "Project planning for functional safety".

The optional DynaStop® function is not safety-related and it is not part of the safety functions described in chapter "Project planning for functional safety".

11.6.1 Using DynaStop® in conjunction with the STO function

To use the DynaStop® function in conjunction with the STO function, SEW-EURODRIVE recommends control using the SS1-t safety function.

The following figure shows the use of the DynaStop® function in conjunction with the STO function and controller according to SS1-t:



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[1] DynaStop® is activated at the end of the downward ramp at standstill.

Parameter setting:

- *Functions* > *Drive functions* > *FCB02 Stop standard* > **Behavior at standstill** = "Drive not energized (brake applied/DynaStop® activated (factory setting)

[2] At the end of the downward ramp, the motor initially remains energized. DynaStop® is activated when STO is triggered.

Parameter settings:

- *Functions* > *Drive functions* > *FCB02 Stop standard* > **Behavior at standstill** = Drive energized (brake released/DynaStop® deactivated)
- *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > Activate DynaStop® with STO = **"1" (factory setting = "0")**

t	Time
t_1	Point in time at which the deceleration ramp is initiated
t_2	Point in time at which STO is activated
Δt	Time span between initiating the deceleration ramp and STO
(light grey)	Range of safe time delay
(dark grey)	Range with active STO function

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11.6.2 Drive behavior when STO is activated before standstill (rotational speed = "0")

NOTICE

Danger due to incorrect parameter setting.

If the parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO** = **"1"**, the DynaStop® function can be activated outside the permitted operating range.
This can cause high torque loads / high motor currents, which may damage the drive unit and the application.

Possible damage to property.

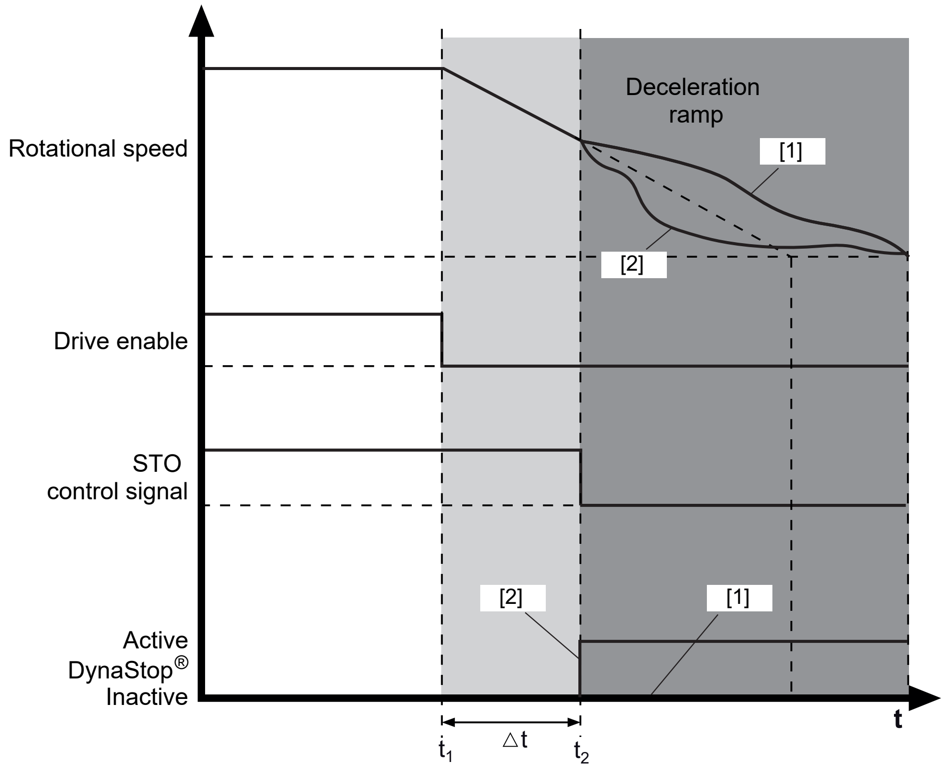
- Use DynaStop® in conjunction with STO with control according to SS1-t.
- Use the factory setting/recommended setting of the parameter.

If STO is activated before speed "0" is reached, If the DynaStop® function behaves according to the setting of parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO**:

Index	Parameter	Setting	Meaning
8501.4	*Functions >* *Drive functions >* *FCB01 Output stage inhibit >* **Activate DynaStop® for STO**	**0 = No** **(Factory setting)**	The DynaStop® status remains unchanged when STO is activated. • Depending on the application, the motor will coast to a stop or even accelerate. • The stopping distance is undefined.
		1 = Yes	DynaStop® is activated (not safety-related) when STO is activated. • If DynaStop® is activated before speed "0" is reached, high torques/motor currents can occur that may damage the drive and the application. • Evaluate the possible consequences. • The stopping distance is undefined.

Recommended setting/factory setting

The following figure shows the behavior when STO is activated before rotational speed "0" is reached:



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[1] Parameter setting:

- *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO** = **0 (No)** factory setting.

[2] Parameter setting:

- *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO** = **1 (Yes)**

t Time
t_1 Point in time at which the deceleration ramp is initiated
t_2 Point in time at which STO is activated
Δt Time span between initiating the deceleration ramp and STO
Range of safe time delay
Range with active, safety-related STO function

Activating the STO function during the deceleration ramp aborts controlled deceleration:

Reasons for early activation of STO can be:

- Delay time Δt selected too short
- Extension of the deceleration ramp when the current limit is reached, e.g. due to too high load

11.7 IT safety

11.7.1 Hardening measures

Perform the following hardening measures:

- Regularly check if updates are available for your products.
- Report incidents concerning IT security by e-mail to cert@sew-eurodrive.com.
- Regularly check which Security Advisories are available in the Online Support of SEW-EURODRIVE.
- Evaluate the fault memories and diagnostics information of your products regularly and check whether there are entries that affect IT security.

11.7.2 Guidelines for secure operation

The engineering protocol from SEW-EURODRIVE allows authorized personnel to activate various service accesses on the device. Authentication is implemented by using static access data. This data is not used to defend against attacks on IT security but to protect against unintentional modification. This is the reason why it cannot be changed.

To prevent misuse of these service accesses, network access must be restricted according to the state of the art. For more information, refer to section "IT security of the environment" (→ 🗎 12).

12 Service

NOTICE

Improper work on the drive units can result in damage.

Damage to property.

- Make sure that the drives from SEW-EURODRIVE are repaired by qualified personnel only.
- Consult SEW-EURODRIVE SERVICE.

12.1 Malfunctions of the mechanical drive

The following table shows troubleshooting options for malfunctions of the mechanical drive:

Fault	Possible cause	Measure
Unusual, regular running noise	Meshing/grinding noise: Bearing damage	Contact SEW-EURODRIVE Service
Unusual, regular running noise	Knocking noise: Irregularity in the gearing	Contact SEW-EURODRIVE Service
Unusual, irregular running noise	Foreign objects in the oil	Stop the drive and contact SEW-EURODRIVE Service
Oil leaking from the gear unit cover	Gear unit cover seal leaking	Contact SEW-EURODRIVE Service
Oil leaking from the connection box	Internal seal defective	Contact SEW-EURODRIVE Service
Oil leaking from the output-side oil seal	Oil seal defective Short-term oil and/or grease leakage at the oil seal is possible in the run-in phase (24 hours running time).	Replace oil seal
Oil leaking from the output-side oil seal	Too much oil Short-term oil and/or grease leakage at the oil seal is possible in the run-in phase (24 hours running time).	Correct the oil quantity

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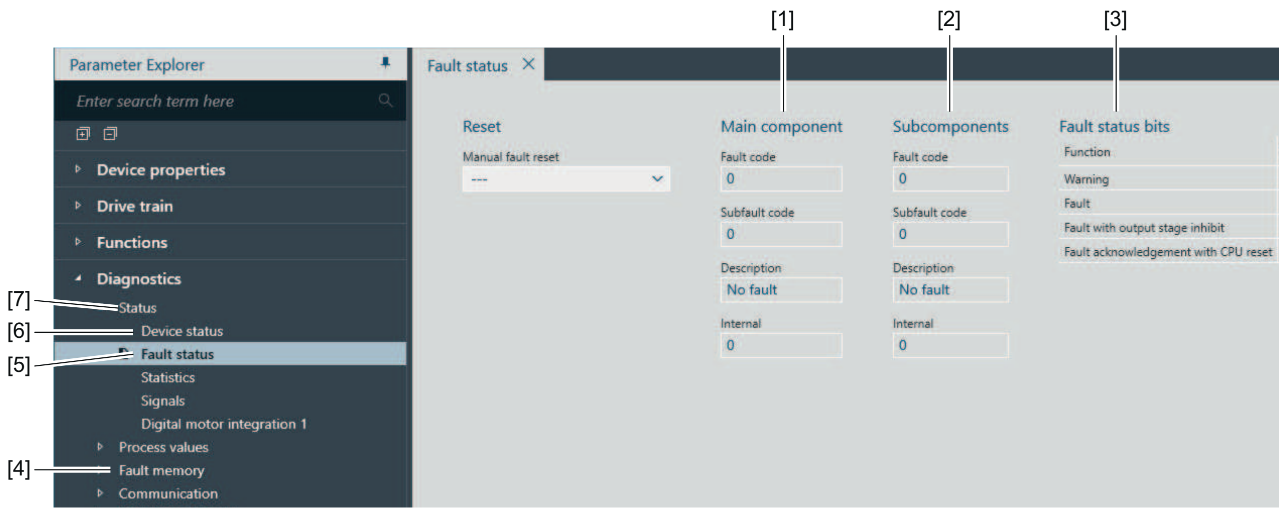
Fault	Possible cause	Measure
Oil leaking from the out-put-side oil seal	Drive installed in the wrong mounting position or breather valve installed in wrong position. Short-term oil and/or grease leakage at the oil seal is possible in the run-in phase (24 hours running time).	Install the breather valve correctly
Output shaft does not rotate even though the motor is running	Shaft-hub connection in gear unit interrupted	Send in the drive unit for repair

12.2 Evaluating fault messages

12.2.1 MOVISUITE®

The following section shows a sample evaluation of a fault message in MOVISUITE®:

1. Open the parameter tree in MOVISUITE®.
2. In the parameter tree, select the "Status" node [7].
   - ⇨ The **current fault messages** can be found in the "Fault status" group [5].
   - ⇨ **Additional information** on the causes for the "Not ready" status can be found in the "Device status" group [6].
   - ⇨ Information on the **history of the fault messages** can be found in the "Fault memory" node [4].



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[1] Fault status of the main component
[2] Fault status of the subcomponent
[3] Display of the status bits
[4] Fault memory
[5] Fault status
[6] Device status
[7] Status

12.3 Resetting fault messages

⚠ WARNING

Eliminating the cause of the problem or performing a reset may result in the drive restarting automatically.

Severe or fatal injuries.

- Prevent unintended startup.

Acknowledge fault message by:

- Switch the supply system off and on again.
- Via the controller/PLC: Send "reset command".

12.4 Fault responses

The following table describes the shut-off responses to faults:

Fault response	Description
No response	The inverter ignores the event.
Warning with self reset	The inverter issues a warning message with self-reset.
Warning	The inverter issues a warning message. The fault is automatically reset after the cause of fault is eliminated.
Application stop (with output stage inhibit)	The inverter stops with the deceleration set for the application limit (index 8357.13). If n = 0: Brake "applied" and output stage "off".
Application stop (with output stage inhibit) with self-reset	
Emergency stop (with output stage inhibit)	The inverter stops with the set emergency stop deceleration. (Index 8357.20)
Emergency stop (with output stage inhibit) with self-reset	
Inhibit output stage with self-reset	The output stage is deactivated and the brake is applied.
Inhibit output stage	

Self-reset means: Eliminating the cause of the fault results in acknowledgment of the fault. The inverter automatically resumes the operation before the fault occurred. The drive can restart automatically.

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12.5 Fault messages with parameterizable response

The following table shows the fault messages with parameterizable responses:

Error	Description	Index no.	Possible error response
Heat sink overtemperature – prewarning	Here you can set the device response when the prewarning threshold for heat sink utilization is exceeded (index 8336.1).	8622.2	• No response • Warning
Positioning lag error	Here you can set the device response to a lag error (lag error window exceeded, index 8509.4).	8622.3	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Line phase failure	Here you can set the device response to a line phase failure.	8622.4	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
External error	Here you can set the device response to an external error (e.g. triggered by terminal or control word).	8622.5	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Fieldbus – timeout	Here you can set how the device responds to a process data timeout on the bus system (timeout time).	8622.6	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage • Warning with self reset • Application stop (with output stage inhibit) with self-reset • Emergency stop (with output stage inhibit) with self-reset • Inhibit output stage with self-reset

Error	Description	Index no.	Possible error response
External synchronization	Here you can set the device response to loss of external synchronization.	8622.7	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage • Warning with self reset • Application stop (with output stage inhibit) with self-reset • Emergency stop (with output stage inhibit) with self-reset • Inhibit output stage with self-reset
Motor temperature prewarning – current parameter set	Motor temperature current parameter set – prewarning.	8442.5	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Electromechanical capacity utilization – prewarning	Here you can set the device response to an exceeded prewarning threshold for electromechanical capacity utilization (index 8336.2).	8622.10	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
HW limit switches – current parameter set		8572.1	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self-reset
SW limit switches – current parameter set		8572.2	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self-reset

Error	Description	Index no.	Possible error response
Encoder – warning	Here you can set the device response to an encoder warning.	8622.13	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Encoder – error	Here you can set the device response to an encoder error.	8622.14	• Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Application heartbeat timeout (only with DSI designs)	Here you can set the device response to a timeout of the application heartbeat.	8622.21	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Error response in the brake voltage supply	Here you can set how the device responds to a missing voltage supply for the optional 24 V brake control / BES.	8622.26	• No response • Warning • Inhibit output stage

12.6 Responses to fault acknowledgement

12.6.1 Fault acknowledgement

When acknowledging an error, the error end state determines which reset type (system restart or warm start) is executed.

Software reset

A reset of the micro-controller takes place in the event of a software reset, which corresponds to a restart.

Response	Effect
System restart with start of the CPU	The behavior is the same as when the device is switched on.
	Reference is lost.
	Fieldbus interface is restarted.
	EtherCAT®/SBus^{PLUS} is restarted.
	The active "fault message" is reset (digital output = 1, system status = 0).

Software restart

A software restart does **not** actually reset the micro controller.

Response	Effect
Software restart	The firmware is restarted without the boot loader becoming active (no display of "b0"!).
	Reference positions of incremental encoder systems are lost.
	Any fieldbus interfaces that are present are not affected.
	The interface between the options and the firmware system is re-initialized. A new boot synchronization to the fieldbus or control option takes place.
	The active "fault message" is reset (digital output = 1, system status = 0)

The ready signal is set again depending on the system state after the reset by the system state control.

Warm start

A warm start only resets the fault code.

Response	Effect
Warm start	The firmware system is not rebooted.
	All reference positions will be maintained.
	Communication is not interrupted.
	The active "fault message" is reset (digital output = 1, system status = 0).

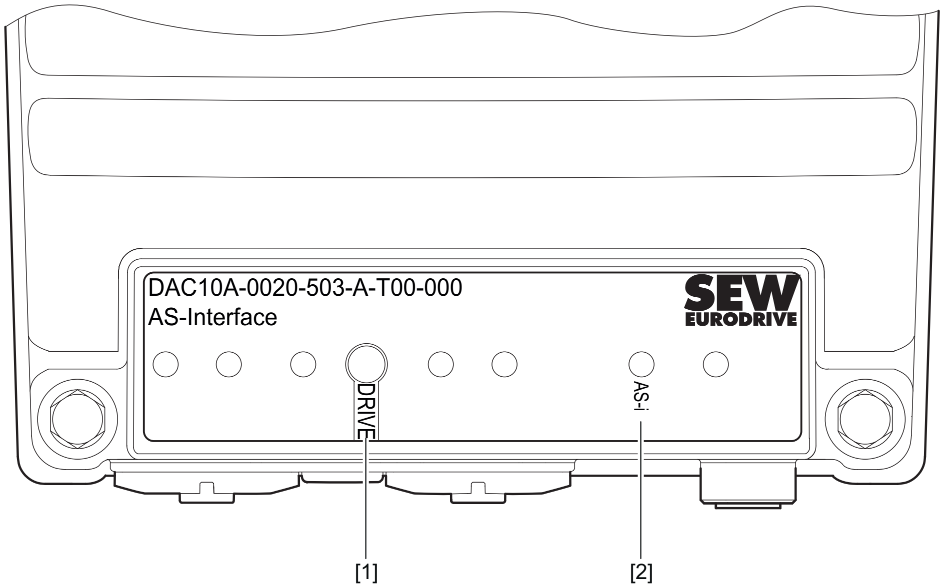
Fieldbus timeout

After manual reset of a fault, the fault message is deleted. The system changes to the state "Waiting for data".

12.7 Description of status and operating displays

12.7.1 LED displays of AS-Interface

The following figure shows an example of the LEDs of the AS-Interface design:



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[1]	"DRIVE" status LED
[2]	LED "AS-i"

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12.7.2 General LEDs

"DRIVE" status LED

The following table describes the display functions of the "DRIVE" LED:

LED	Operating status/ Error code	Suberror code	Meaning	Measure
– **Off**	Not ready for operation		Line voltage absent.	Power on the line voltage.
Yellow **Flashing very rapidly, 4 Hz**	Not ready for operation		Initialization phase	Wait until initialization is complete.
Green/yellow **Flashing with changing colors, 0.5 Hz** **(1 × green, 1 × yellow)**	Ready for operation, but device inhibited.		The "STO" signal is active.	Deactivate the "STO" signal.
Yellow **Flashing slowly, 0.5 Hz**	Ready for operation, but manual mode/ local mode, device inhibited.		Line voltage is OK.	–
Yellow **Flashes rapidly, 2 Hz**	Ready		Deactivating DynaStop® without drive enable active.	–
Yellow **Steady light**	Ready for operation, but device inhibited.		Line voltage is OK. The output stage is inhibited.	–
Green **Flashing slowly, 0.5 Hz**	Device enabled, but condition manual operation/local mode		The output stage is enabled. The motor is in operation.	–
Green **Flashing very rapidly, 4 Hz**	Device enabled, but current limit active.		The drive is at the current limit.	Reduce the load.
Green **Steady light**	Device enabled.		The output stage is enabled. The motor is in operation.	–
Yellow/red **Flashing with changing colors, 1 Hz** **(2 × yellow, 2 × red)**	Ready		A displaying error is present. The output stage is inhibited.	Refer to chapter "Error description" in the product manual for possible measures.

LED	Operating status/ Error code	Suberror code	Meaning	Measure
Green/red **Flashing with changing colors, 1 Hz** **(2 × green, 2 × red)**	Ready		A displaying error is present. The output stage is enabled. The motor is in operation.	Refer to chapter "Error description" in the product manual for possible measures.

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LED	Operating status/ Error code	Suberror code	Meaning	Measure
Red **Flashing, 1 Hz**	3	1	Ground error	Refer to chapter "Error description" in the product manual for possible measures.
	4	1	Brake chopper error	
	6	1	Line error	
	7	1	DC link error	
	8	1, 2, 3	Speed monitoring error	
	9	1, 2, 5, 6, 9, 10	Control mode error	
	10	1, 3 – 11	Data Flexibility error	
	11	1 – 6	Temperature monitoring error	
	12	1, 2	Brake error	
	13	5, 24	Encoder 1 error	
	16	5 – 8, 10, 20 – 27	Startup error	
	19	1 – 9	Process data error	
	20	2, 11	Device monitoring error	
	23	4	Power section error	
	25	2 – 7, 20, 21, 30,31, 61, 70	Parameter memory monitoring	
	26	1, 3	External error	
	28	1, 12 – 14	FCB drive function error	
	29	1 – 4	Hardware limit switch error	
	30	1 – 3	Software limit switch error	
	31	1 – 4, 7, 9	Thermal motor protection error	
	32	2 – 6, 12	Communication error	
	33	11, 12, 13	System initialization error	
	34	1	Process data configuration error	
	35	1 – 5	Function activation error	
	42	1 – 3	Lag error	
	44	2, 3, 4	Error overcurrent phase U, V, W	
	46	2, 3, 50 51, 52	Safety card error	
	51	1	Analog processing error	

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LED	Operating status/ Error code	Suberror code	Meaning	Measure
Red **Steady light**	1	1, 2	Output stage monitoring error	Contact SEW-EURODRIVE Service.
	4	2	Brake chopper error	
	7	2	DC link error	
	9	3, 4, 8	Control mode error	
	10	2, 99	Data Flexibility error	
	11	7, 8	Temperature monitoring error	
	13	1, 3, 6, 7, 8, 9, 11, 13, 15, 22, 23	Encoder 1 error	
	16	2, 11, 12. 30	Startup error	
	17	7	Internal processor error	
	18	1, 3, 4, 7, 8, 9, 10, 12, 13	Software error	
	20	1, 7	Device monitoring error	
	21	1	S-Drive 1 error	
	23	5, 6, 7, 8	Power section error	
	25	10, 12 – 19, 50, 51, 81	Parameter memory monitoring	
	28	13	FCB drive function error	
	33	1, 2, 6, 7, 8, 10	System initialization error	
	46	1	Safety card error	

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12.7.3 Bus-specific LEDs for AS-Interface

LED "AS-i"

The following table describes the display functions of the "AS-i" LED:

LED	Operating status/	Meaning	Measure
– **Off**	Not ready for operation	Line voltage absent.	Power on the line voltage. Wait until initialization is complete.
		The firmware of the subcomponent is not compatible to the used hardware.	Contact SEW-EURODRIVE Service.
		The firmware of the subcomponent cannot be started.	Contact SEW-EURODRIVE Service.
Green **Steady light**	Ready	The device works in normal operation.	–
Yellow **Flashing**	Not ready for operation	A firmware update of the sub component is running.	Wait for the update to be completed.
Red **Flashing**	Not ready for operation	The communication to the AS-Interface master is interrupted.	Check the AS-Interface connection of the device. Check the configuration of the AS-Interface master. Check all connections of the AS-Interface installation.
1 × red, 1 × yellow **Flashing**	Not ready for operation	The device address is set to 0.	Set a valid device address.
2 × red, 2 × yellow **Flashing**	Not ready for operation	The AS-Interface master has detected an address conflict. The address is used by another device.	Set an unused device address.
Red **Steady light**	Not ready for operation	The AS-Interface communication is interrupted.	Check the AS-Interface connection of the device. Check all connections of the AS-Interface installation.

12.8 Fault description

12.8.1 Error 1 Output stage monitoring

Error: 1.1 (0101hex | 257dec)

Description: Overcurrent on motor output terminals

Response: Output stage inhibit

Cause	Measure
Short circuit at the motor output.	– Check motor cable for short circuit. – Remove the short circuit.
Power output stage defective.	Contact SEW-EURODRIVE Service.
Motor current too high.	Connect a smaller motor.

Error: 1.2 (0102hex | 258dec)

Description: Overcurrent in output stage

Response: Output stage inhibit

Cause	Measure
Motor current too high.	Connect a smaller motor.
Current controller of intelligent power supply module set incorrectly.	Contact SEW-EURODRIVE Service.
Ramp time too short.	Increase the ramp time.
One of the following components is faulty: – Internal current supply – Current measurement – Phase module	Contact SEW-EURODRIVE Service.
External DC 24 V supply voltage instable.	Check the DC 24 V supply voltage.
The voltage fluctuations are too strong. The current controller of the intelligent power supply module cannot compensate for them.	– Stabilize the voltage. – Check the supply. – Check the project planning.

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12.8.2 Error 3 Ground fault

Error: 3.1 (0301hex | 769dec)		
Description: Ground fault		
	Response: Output stage inhibit	
	Cause	Measure
	Ground fault in the motor lead.	Eliminate ground fault.
	Ground fault in the inverter.	Contact SEW-EURODRIVE Service.
	Ground fault in the motor.	Eliminate ground fault.
	Ground fault in line components.	Eliminate ground fault.
	Ground fault detected in the storage line.	Eliminate ground fault.
	Ground fault in the storage unit.	Contact the service department of the respective storage manufacturer.

12.8.3 Error 4 Brake chopper

Error: 4.1 (0401hex | 1025dec)		
Description: Overcurrent in brake chopper		
	Response: Output stage inhibit	
	Cause	Measure
	Excessive regenerative power.	Decrease deceleration.
	Short circuit in braking resistor circuit.	Check supply cable to braking resistor.
	Braking resistor impedance too low.	Check the minimum permitted resistance value of the braking resistor and connect a suitable braking resistor.

Error: 4.2 (0402hex | 1026dec)		
Description: Brake chopper defective		
	Response: Output stage inhibit	
	Cause	Measure
	Brake chopper defective.	Contact SEW-EURODRIVE Service.

12.8.4 Error 6 Line fault

Error: 6.1 (0601hex | 1537dec)		
Description: Line phase failure		
	Response: Line phase failure	
	Cause	Measure
	Line phase missing.	Check the supply system cable.
	Poor line voltage quality.	Check supply (fuses, contactor, line components).
	DC link voltage periodically too low.	Check the line voltage.

12.8.5 Error 7 DC link

Error: 7.1 (0701hex | 1793dec) **Description: DC link overvoltage**		
	Response: Output stage inhibit	
	Cause	Measure
	Maximum permitted DC link voltage exceeded.	– Check the connection of the braking resistor. – Decrease deceleration. – Check the configuration of the braking resistor (resistance value).

12.8.6 Error 8 Speed monitoring

Error: 8.1 (0801hex | 2049dec) **Description: Speed monitoring – motor mode**		
	Response: Output stage inhibit	
	Cause	Measure
	Speed controller operates at setting limit (mechanical overload or phase failure in supply system or motor).	– Increase delay time of speed monitoring. – Reduce the load. – Increase current limiting/torque limiting. – Reduce the acceleration. – Check the motor cable, motor, and line phases.
	Encoder not connected correctly.	Check the encoder connection.
	Encoder has incorrect direction of rotation.	Check the direction of rotation.

Error: 8.2 (0802hex | 2050dec) **Description: Speed monitoring – generator mode**		
	Response: Output stage inhibit	
	Cause	Measure
	Speed controller operates at setting limit (mechanical overload or phase failure in supply system or motor).	– Increase delay time of speed monitoring. – Reduce the load. – Increase current limiting/torque limiting. – Decrease deceleration. – Check the motor cable, motor, and line phases.
	Encoder not connected correctly.	Check the encoder connection.
	Encoder has incorrect direction of rotation.	Check the direction of rotation.

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Error: 8.3 (0803hex | 2051dec) Description: Maximum speed at motor shaft exceeded		
	Response: Output stage inhibit	
	Cause	Measure
	The actual speed has exceeded the limit value "Maximum speed at motor shaft". This limit value is set to match the motor and gear unit at startup.	Reduce the maximum motor speed.
	The setpoint is too high.	Reduce the setpoint.
	The motor is driven by the load.	Check the project planning of the drive.

12.8.7 Error 9 Control mode

Error: 9.1 (0901hex | 2305dec) Description: Magnetization of motor not possible		
	Response: Output stage inhibit	
	Cause	Measure
	The user-defined current limit or the output stage monitoring function has reduced the possible maximum current to such an extent that the required magnetizing current cannot be set.	– Reduce output stage utilization by reducing the PWM frequency or the load. – Increase user-defined current limit. – Connect a smaller motor.

Error: 9.2 (0902hex | 2306dec) Description: Operating mode not possible with active control mode		
	Response: Output stage inhibit	
	Cause	Measure
	The active control mode does not support the operating mode selected in the current FCB. EXAMPLE: The V/f control mode does not support the FCB "Position control" or "Torque control".	– Use a control mode that supports the required operating mode. If necessary, connect an encoder. or – Select an operating mode that is supported by the current control mode.

Error: 9.3 (0903hex | 2307dec) Description: Absolute rotor position not available		
	Response: Output stage inhibit	
	Cause	Measure
	The active control mode requires an absolute rotor position. The encoder set as the source of the actual speed does not provide an absolute rotor position.	– Use an absolute encoder. or – Identify the rotor position using FCB 18.

Error: 9.4 (0904hex | 2308dec)		
Description: Correct current supply of motor not possible		
	Response: Output stage inhibit	
	Cause	Measure
	With active current monitoring during premagnetization, the required current could not be impressed into the motor.	– Check motor cable. – Check the motor winding connection (star, delta) – Check motor windings. – If the error occurs repeatedly, contact SEW-EURODRIVE Service. INFORMATION for SEW-EURODRIVE Service: Check output stage.

Error: 9.5 (0905hex | 2309dec)		
Description: Maximum output frequency exceeded		
	Response: Output stage inhibit	
	Cause	Measure
	The maximum output frequency has been exceeded.	– Reduce maximum rotation speed/maximum speed. – Reduce setpoint.

Error: 9.6 (0906hex | 2310dec)		
Description: Maximum model speed exceeded		
	Response: Output stage inhibit	
	Cause	Measure
	The speed calculated in the ELSM® control mode is too high for motor control.	– Reduce the sampling cycle ("Sampling cycle n/x control" parameter). – Reduce the speed.

Error: 9.8 (0908hex | 2312dec)		
Description: Motor protection function – demagnetization		
	Response: Output stage inhibit	
	Cause	Measure
	The motor is blocked.	Check the motor for blockage.
	Motor has already been operated at a speed below the transition speed for too long.	Check the drive selection.
	The motor has not been started up properly.	Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement".

Error: 9.9 (0909hex | 2313dec)		
Description: Parameter measurement not possible with active motor type		
	Response: Output stage inhibit	
	Cause	Measure
	Only the parameters of an asynchronous motor or synchronous motor can be measured.	Omit parameter measurement.

Error: 9.10 (090Ahex | 2314dec)		
Description: Rotor stall monitoring		
	Response: Output stage inhibit	
	Cause	Measure
	Current control cannot hold the load torque.	Reduce the load.

Error: 9.11 (090Bhex | 2315dec)		
Description: Standstill current function not possible		
	Response: Output stage inhibit	
	Cause	Measure
	In ELSM® control mode, the standstill current function can only be used if the rotor position can be measured.	Activate rotor position measurement and perform the drive function "FCB 25 Motor parameter measurement".

Error: 9.13 (090Dhex | 2317dec)		
Description: Torque control not within valid speed range		
	Response: Output stage inhibit	
	Cause	Measure
	Motor speed is too low.	– Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement". – If the error occurs repeatedly, contact SEW-EURODRIVE Service.
	The flying start function is deactivated.	Activate the flying start function.
	The motor is blocked.	Check the motor for blockage.

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Error: 9.14 (090Ehex | 2318dec)		
Description: Transition of open-loop speed control to closed-loop speed control failed		
	Response: Output stage inhibit	
	Cause	Measure
	The motor is blocked.	Check the motor for blockage.
	The motor accelerates too slowly.	Check the setting of the speed controller parameter "Load moment of inertia".
	The ohmic resistance has been measured incorrectly.	If the ohmic resistance of the motor cable is less than 10% of the ohmic resistance of the motor winding, deactivate the "Measure stator resistance" parameter.
	The motor has not been started up properly.	Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement".
	The drive is overloaded by mechanical sluggishness.	– Reduce the load. – Check the mechanical components. – Check the drive selection.

Error: 9.15 (090Fhex | 2319dec)		
Description: Timeout		
	Response: Output stage inhibit	
	Cause	Measure
	The parameterization of the motor model is implausible.	– Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement". – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 9.16 (0910hex | 2320dec)		
Description: Deviation of motor inductance too large		
	Response: Output stage inhibit	
	Cause	Measure
	The measured motor inductance differs greatly from the inductance in the motor data set.	– Check motor startup and perform again. – Check motor winding connection type (star/delta).

12.8.8 Error 10 Data Flexibility

Error: 10.1 (0A01hex | 2561dec)		
Description: Initialization error		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Error detected in the init task. The return code is not equal to 0.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.2 (0A02hex | 2562dec)		
Description: Illegal operation command		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Unknown program command (illegal opcode) detected in Data Flexibility program.	Check the program. Contact SEW-EURODRIVE Service.
	The version of the MOVIKIT® software module in use is not compatible with the current firmware version of the device.	– Adjust the firmware version of the device according to the version overview in the installation notes. or – Adjust the version of the MOVIKIT® software module according to the version overview in the installation notes. In the context menu of the device, execute the [Adjust version and device] menu command.

Error: 10.3 (0A03hex | 2563dec)		
Description: Access to memory defective		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Memory area violated while accessing array. For example, an address that does not exist or is not permitted was addressed.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.4 (0A04hex | 2564dec)		
Description: Stack overflow		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Overflow of Data Flexibility stack detected.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.5 (0A05hex | 2565dec)		
Description: Division by 0		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Division by 0 was performed in the program.	Check the program. Contact SEW-EURODRIVE Service.

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Error: 10.6 (0A06hex | 2566dec) Description: Runtime error		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The watchdog has detected a fault. The program runtime exceeds the permitted time.	Check the program. Contact SEW-EURODRIVE Service.
	Execution time of PDI task or PDO task exceeds permitted time.	– Use slicing mode. – Check the program. Contact SEW-EURODRIVE Service.

Error: 10.7 (0A07hex | 2567dec) Description: Calculation result too large		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Calculation result of multiplication/division command exceeds 32 bits.	Check the program. Contact SEW-EURODRIVE Service.
	Failed to write calculation result of multiplication/division command into result variable.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.8 (0A08hex | 2568dec) Description: Illegal connection		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The parameter index to be linked with the connect command in the init task does not exist or is not permitted for access via process data (see parameter list).	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.9 (0A09hex | 2569dec) Description: CRC error		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The checksum (CRC) is incorrect. This can be due to the following reasons: – The program memory is corrupt. – Unauthorized write access was executed on the program memory.	Adjust the program and load it again.

Error: 10.10 (0A0Ahex | 2570dec) Description: Setpoint cycle time not supported		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The set setpoint cycle time is not supported.	Set the setpoint cycle time to the default value of 1 ms.

Error: 10.11 (0A0Bhex | 2571dec)		
Description: No application program loaded		
	Response: Output stage inhibit	
	Cause	Measure
	No Data Flexibility application program loaded.	– Load program. or – Deactivate Data Flexibility.

Error: 10.12 (0A0Chex | 2572dec)		
Description: Runtime warning		
	Response: Warning	
	Cause	Measure
	The program requires more runtime than has been configured.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.20 (0A14hex | 2580dec)		
Description: Application error – warning		
	Response: Warning	
	Cause	Measure
	Error detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.21 (0A15hex | 2581dec)		
Description: Application error – application stop + output stage inhibit		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Error detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.22 (0A16hex | 2582dec)		
Description: Application error – emergency stop + output stage inhibit		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Error detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.23 (0A17hex | 2583dec)		
Description: Application error – output stage inhibit		
	Response: Output stage inhibit	
	Cause	Measure
	Error detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

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Error: 10.24 (0A18hex | 2584dec)		
Description: Application error – warning with self-reset		
	Response: Warning with self-reset	
	Cause	Measure
	Error detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.25 (0A19hex | 2585dec)		
Description: Application error – application stop + output stage inhibit with self-reset		
	Response: Application stop + output stage inhibit with self reset	
	Cause	Measure
	Error detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.26 (0A1Ahex | 2586dec)		
Description: Application error – emergency stop + output stage inhibit with self-reset		
	Response: Emergency stop + output stage inhibit with self-reset	
	Cause	Measure
	Error detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.27 (0A1Bhex | 2587dec)		
Description: Application error – output stage inhibit with self-reset		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	Error detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Error: 10.99 (0A63hex | 2659dec)		
Description: Unknown error		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Unknown Data Flexibility error.	Contact SEW-EURODRIVE Service.

12.8.9 Error 11 Temperature monitoring

Error: 11.1 (0B01hex | 2817dec)

Description: Heat sink overtemperature

Response: Output stage inhibit

Cause	Measure
The capacity utilization is too high. The maximum permitted heat sink temperature has been exceeded.	– Reduce the load. – Reduce the PWM frequency. – Reduce the ambient temperature.
The air circulation is disrupted. The maximum permitted heat sink temperature has been exceeded.	– Check air circulation. – Ensure sufficient cooling.
The fan (if present) is defective. The maximum permitted heat sink temperature has been exceeded.	Contact SEW-EURODRIVE Service.
The temperature sensor is defective. The maximum permitted heat sink temperature has been exceeded.	Contact SEW-EURODRIVE Service.
The fan (if present) is blocked or dirty.	– Remove foreign objects. – Clean the fan.

Error: 11.2 (0B02hex | 2818dec)

Description: Heat sink utilization – prewarning

Response: Heat sink utilization – prewarning

Cause	Measure
The heat sink of the device is subject to a high thermal load. The prewarning threshold has been reached.	– Reduce the load. – Reduce the PWM frequency. – Reduce the ambient temperature.
The air circulation is disrupted. The prewarning threshold has been reached.	– Check air circulation. – Ensure sufficient cooling.
The fan (if present) is defective. The prewarning threshold has been reached.	Contact SEW-EURODRIVE Service.
The temperature sensor is defective. The prewarning threshold has been reached.	Contact SEW-EURODRIVE Service.
Unfavorable air convection.	Check the air convection.
The fan (if present) is blocked or dirty.	– Remove foreign objects. – Clean the fan.

Error: 11.3 (0B03hex | 2819dec)		
Description: Device utilization		
	Response: Output stage inhibit	
	Cause	Measure
	The mean output current is too high. The device utilization has reached or exceeded the switch-off threshold.	– Reduce the load. – Check motor/inverter combination.
	The PWM frequency is too high. The device utilization has reached or exceeded the switch-off threshold.	Reduce the PWM frequency.
	The ambient temperature is too high. The device utilization has reached or exceeded the switch-off threshold.	Reduce the ambient temperature.
	The air circulation is disrupted. The device utilization has reached or exceeded the switch-off threshold.	– Check air circulation. – Ensure sufficient cooling.
	The fan (if present) is defective. The device utilization has reached or exceeded the switch-off threshold.	Contact SEW-EURODRIVE Service.
	The fan (if present) is blocked or dirty.	– Remove foreign objects. – Clean the fan.

Error: 11.5 (0B05hex | 2821dec)		
Description: Electromechanical utilization		
	Response: Output stage inhibit	
	Cause	Measure
	The electromechanical components of the device are overloaded due to excessive continuous current.	Reduce the load.

Error: 11.6 (0B06hex | 2822dec)		
Description: Electromechanical capacity utilization – prewarning		
	Response: Electromechanical capacity utilization – prewarning	
	Cause	Measure
	High load on electromechanical components of the device due to high continuous current. The prewarning threshold has been reached.	Reduce the load.

Error: 11.7 (0B07hex | 2823dec)		
Description: Wire break at temperature sensor of heat sink		
	Response: Output stage inhibit	
	Cause	Measure
	A wire break was detected at the temperature sensor of the heat sink.	Contact SEW-EURODRIVE Service.

Error: 11.8 (0B08hex | 2824dec)	
Description: Short circuit at temperature sensor of heat sink	
Response: Output stage inhibit	
Cause	Measure
There is a short circuit at the temperature sensor of the heat sink.	Contact SEW-EURODRIVE Service.

Error: 11.9 (0B09hex | 2825dec)	
Description: Overtemperature of signal electronics	
Response: Output stage inhibit	
Cause	Measure
The maximum permitted temperature of the signal electronics has been exceeded.	– Reduce the load. – Reduce the ambient temperature.

Error: 11.10 (0B0Ahex | 2826dec)	
Description: Wire break at temperature sensor of signal electronics	
Response: Output stage inhibit	
Cause	Measure
A wire break was detected at the temperature sensor of the signal electronics.	Contact SEW-EURODRIVE Service.

Error: 11.11 (0B0Bhex | 2827dec)	
Description: Short circuit at temperature sensor of signal electronics	
Response: Output stage inhibit	
Cause	Measure
There is a short circuit at the temperature sensor of the signal electronics.	Contact SEW-EURODRIVE Service.

12.8.10 Error 12 Brake

Error: 12.1 (0C01hex | 3073dec)	
Description: Brake output fault	
Response: Application stop + output stage inhibit	
Cause	Measure
No brake connected.	– Check the brake connection. – Check the startup.
Brake cable disconnected in switched-on state.	Check the connection of the brake.
The brake was overloaded by an overcurrent > 2 A.	– Make sure that the connected brake is permitted. – Check the brake.
The brake was overloaded by frequent connection (> 0.5 Hz).	Reduce the switching frequency of the brake.

Error: 12.2 (0C02hex | 3074dec) Description: DC 24 V brake voltage not within tolerance range		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	DC 24 V supply voltage is not within tolerance range of 24 – 26.4 V.	Check the DC 24 V supply voltage.

Error: 12.3 (0C03hex | 3075dec) Description: Brake temperature not within permitted range		
	Response: Output stage inhibit	
	Cause	Measure
	Brake temperature not within permitted range (too low or too high).	Check the ambient conditions and the application.
	In the case of decentralized devices, the overvoltage of the DC link is dissipated via the brake. As a result, the temperature of the brake is too high.	Check the application for how often generator mode occurs.

Error: 12.4 (0C04hex | 3076dec) Description: Brake control module missing		
	Response: Output stage inhibit	
	Cause	Measure
	Brake control has been activated although the device is not equipped with the matching module.	Select another brake type or brake connection.

Error: 12.5 (0C05hex | 3077dec) Description: Short circuit on the brake		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit in the brake.	Check the brake connection.

Error: 12.7 (0C07hex | 3079dec) Description: Overcurrent in the brake		
	Response: Output stage inhibit	
	Cause	Measure
	Brake coil defective.	Replace the brake.
	The brake requires more current than the brake control electronics can supply.	– Check the parameterization of the brake. – Use a suitable brake/brake control electronics.

Error: 12.8 (0C08hex | 3080dec)		
Description: Supply voltage fault		
	Response: Brake supply voltage fault	
	Cause	Measure
	The error can be caused as follows: – The supply voltage of the brake rectifier is outside the valid range. – The supply voltage of the brake rectifier is not available.	– Check the supply voltage. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 12.9 (0C09hex | 3081dec)		
Description: Plausibility error		
	Response: Output stage inhibit	
	Cause	Measure
	No brake connected.	Connect a brake.
	Brake connected incorrectly.	Check and correct the brake connection.
	Wrong brake taken into operation.	Check the startup.

Error: 12.20 (0C14hex | 3092dec)		
Description: Digital motor integration – critical fault		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	The integrated brake control has detected a critical error.	Observe the error message of the subslave. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

Error: 12.21 (0C15hex | 3093dec)		
Description: Digital motor integration – fault		
	Response: Emergency stop + output stage inhibit with self-reset	
	Cause	Measure
	The integrated brake control has detected an error.	Observe the error message of the subslave. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

Error: 12.22 (0C16hex | 3094dec)		
Description: Digital motor integration – warning		
	Response: Warning with self-reset	
	Cause	Measure
	The integrated brake control signaled a warning.	Observe the warning of the subslave. Identify the exact cause of this warning and take the appropriate measures for elimination.

Error: 12.23 (0C17hex | 3095dec)		
Description: Digital motor integration – timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Communication with the integrated brake control is disrupted.	Check the connection.

Error: 12.24 (0C18hex | 3096dec)		
Description: Digital motor integration – initialization error		
	Response: Output stage inhibit	
	Cause	Measure
	Initialization of integrated brake control failed.	– Acknowledge the error. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

12.8.11 Fault 13 Encoder 1

Error: 13.1 (0D01hex | 3329dec)		
Description: Error during position comparison check		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Error detected when comparing raw position and track counter of absolute encoder.	– Check the wiring of the track signals. – Check for EMC-compliant installation. – Replace the encoder. – Replace the encoder card. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.2 (0D02hex | 3330dec)		
Description: Unknown encoder type		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The encoder type is unknown and is not supported by the device.	– Check the encoder type. – Contact SEW-EURODRIVE Service. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

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Error: 13.3 (0D03hex | 3331dec)		
Description: Invalid data		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn).	Use a different encoder type. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
	The ratio of the motor encoder resolution to the distance encoder resolution is too large.	– Check the startup. – Check the project planning. – Check whether a suitable encoder is being used. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
	The number of pole pairs of the resolver is not equal to 1 in "Single-turn absolute position" position mode.	– Change the positioning mode of the encoder. – Use a resolver that has 1 as its number of pole pairs.

Error: 13.4 (0D04hex | 3332dec)		
Description: Track measurement error		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	A fault was detected during track measurement.	– Switch the device off and on again. – Check the wiring. – Check for EMC-compliant installation. – Check the encoder. Replace if necessary. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.5 (0D05hex | 3333dec)		
Description: Internal warning		
	Response: Encoder – warning	
	Cause	Measure
	The encoder has signaled a warning.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Clean the sensor.

Error: 13.6 (0D06hex | 3334dec) Description: Signal level too low		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The amount resulting from the level of the two track signals A and B is lower than the permitted limit.	– Check the wiring. – Check for EMC-compliant installation. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.7 (0D07hex | 3335dec) Description: Signal level too high		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The amount resulting from both or one of the two track signals A and B exceeds the permitted limit.	Check the gear ratio of the resolver in use.

Error: 13.8 (0D08hex | 3336dec) Description: Error during level monitoring		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The amount resulting from the level of the two track signals A and B exceeds the permitted limit.	Check the mounting position of the resolver.

Error: 13.9 (0D09hex | 3337dec) Description: Error during quadrant check		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	A fault was detected during the quadrant check (sine tracks/cosine tracks).	– Switch the device off and on again. – Check the wiring. – Check for EMC-compliant installation. – Check the encoder. Replace if necessary. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.10 (0D0Ahex | 3338dec) Description: Positional tolerance range exceeded		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Jump in position impermissibly large.	– Check the startup parameters. – Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.11 (0D0Bhex | 3339dec) Description: Encoder data timeout		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	An internal error was detected in the resolver evaluation.	Check for EMC-compliant installation.
	Communication with the encoder has failed.	Contact SEW-EURODRIVE Service.

Error: 13.12 (0D0Chex | 3340dec) Description: Emergency		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The CANopen encoder signals an emergency.	For measures to correct the error, refer to the documentation of the respective encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

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Error: 13.13 (0D0Dhex | 3341dec)		
Description: Initialization error		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	A communication error was detected during initialization.	– Check the wiring. – Check the startup parameters. – Check the encoder settings. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.14 (0D0Ehex | 3342dec)		
Description: Communication error		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Faulty communication with the encoder.	– Check the voltage supply. – Check for EMC-compliant installation. – Check the wiring. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.15 (0D0Fhex | 3343dec)		
Description: System error		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	A system error was detected during encoder evaluation.	– Check the setting of the encoder numerator/denominator factors. – Check whether the frame length matches the set transmission rate. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.16 (0D10hex | 3344dec) Description: High level in data line – critical error		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	A permanent high level of the data signal was detected.	– Check the wiring. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.17 (0D11hex | 3345dec) Description: High level in data line – error		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	A permanent high level of the data signal was detected.	– Check the wiring. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.18 (0D12hex | 3346dec) Description: Low level in data line – critical error		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	A permanent low level of the data signal was detected.	– Check the wiring. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.19 (0D13hex | 3347dec) Description: Low level in data line – error		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	A permanent low level of the data signal was detected.	– Check the wiring. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.20 (0D14hex | 3348dec) Description: SSI encoder – critical error		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The SSI encoder has detected a critical error.	– Check the startup parameters. – Check the settings on the SSI encoder. – Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive even with a faulty external position encoder.

Error: 13.21 (0D15hex | 3349dec) Description: SSI encoder – error		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	SSI encoder detected an error.	– Check the startup parameters. – Check the settings on the SSI encoder. – Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive even with a faulty external position encoder.

Error: 13.22 (0D16hex | 3350dec) Description: Critical internal error		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The encoder has detected an internal error.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

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Error: 13.23 (0D17hex | 3351dec)		
Description: Internal error		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	The encoder has detected an internal error. INFORMATION The encoder error code is displayed in MOVI-SUITE® in the [Diagnostics] > [Fault memory T.] parameter group in the "Internal" parameter.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.24 (0D18hex | 3352dec)		
Description: Travel range exceeded		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	The current position mode does not allow a larger travel range.	– Ensure that the multi-turn encoder remains within the configured track range. – Check the limits. – Check the "Position mode" parameter. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Error: 13.25 (0D19hex | 3353dec)		
Description: Error during encoder startup		
	Response: Output stage inhibit	
	Cause	Measure
	Error during encoder start-up.	Switch the device off, check the connection of the encoder, and switch the device on again.

Error: 13.26 (0D1Ahex | 3354dec)		
Description: Digital motor integration – critical fault		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The encoder of the digital motor integration has detected a fault. The exact cause of the fault is displayed in the fault status of the subslave.	– Check for EMC-compliant installation. – Replace the encoder.

Error: 13.27 (0D1Bhex | 3355dec) Description: Digital motor integration – fault		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	The encoder of the digital motor integration has detected a fault. The exact cause of the fault is displayed in the fault status of the subslave.	– Check for EMC-compliant installation. – Replace the encoder.

Error: 13.28 (0D1Chex | 3356dec) Description: Digital motor integration – warning		
	Response: Encoder – warning	
	Cause	Measure
	The encoder of the digital motor integration has signaled a warning. The exact cause is displayed in the status of the subslave.	Check for EMC-compliant installation.

Error: 13.29 (0D1Dhex | 3357dec) Description: Absolute position invalid		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	A diagnostics error was detected while evaluating the absolute encoder position. Referencing has been canceled.	– Reference the drive again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

12.8.12 Error 16 Startup

Error: 16.1 (1001hex | 4097dec) Description: Writing motor parameters with active FCB 25		
	Response: Output stage inhibit	
	Cause	Measure
	A motor parameter has been written while FCB 25 is still active.	Deactivate FCB 25.

Error: 16.2 (1002hex | 4098dec) Description: Cannot calculate controller parameters		
	Response: Output stage inhibit	
	Cause	Measure
	Long delay of encoder used prevents calculation of required filter coefficients.	Use an encoder with a shorter delay.

Error: 16.3 (1003hex | 4099dec)		
Description: Thermal motor model not possible		
	Response: Output stage inhibit	
	Cause	Measure
	Starting up thermal model not yet completed or its parameterization invalid.	Perform startup again.

Error: 16.5 (1005hex | 4101dec)		
Description: Current limit smaller than magnetizing current of the motor		
	Response: Output stage inhibit	
	Cause	Measure
	Current limit smaller than magnetizing current of motor calculated by active control mode.	Increase the current limit.

Error: 16.6 (1006hex | 4102dec)		
Description: Control mode not possible		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong control mode selected for the motor.	Choose a suitable control mode.
	When starting up a synchronous third-party motor, some control modes and drive functions are only permitted after motor parameter measurement.	Perform a motor parameter measurement using the FCB 25 drive function.

Error: 16.7 (1007hex | 4103dec)		
Description: PWM frequency not possible		
	Response: Output stage inhibit	
	Cause	Measure
	The set speed controller sampling time of 1 ms is not possible with the set PWM frequency.	– Set a PWM frequency of 4, 8, or 16 kHz. or – Adjust the sampling cycle.
	The motor requires a higher PWM frequency than the inverter can provide.	Use an inverter with suitable PWM frequency.
	The ELSM® control mode can only be used with an inverter that supports PWM frequencies of 2.5, 4, or 8 kHz.	Use an inverter with suitable PWM frequency.
	The FCB 25 drive function can only be used with an inverter that supports PWM frequencies of 2.5, 4, or 8 kHz.	Use an inverter with suitable PWM frequency.
	The FCB 18 drive function can only be used with an inverter that supports PWM frequencies of 2.5, 4, or 8 kHz.	Use an inverter with suitable PWM frequency option.

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Error: 16.8 (1008hex | 4104dec)		
Description: Temperature sensor motor 1 – startup error		
	Response: Output stage inhibit	
	Cause	Measure
	Error during startup of temperature sensor of motor 1.	Check the startup parameters.

Error: 16.9 (1009hex | 4105dec)		
Description: Temperature sensor motor 2 – startup error		
	Response: Output stage inhibit	
	Cause	Measure
	Error during startup of temperature sensor of motor 2.	Check the startup parameters.

Error: 16.10 (100Ahex | 4106dec)		
Description: Actual position source not assigned		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	In the selected drive function, an encoder is required for position control that is used as the source for calculating the actual position.	– Assign an encoder for the position control in the drive train configuration. – If no encoder is present, only use FCBs without positioning control.

Error: 16.11 (100Bhex | 4107dec)		
Description: Error calculating motor data		
	Response: Output stage inhibit	
	Cause	Measure
	Motor startup cannot be performed because of inconsistent motor data or wrong device configuration data.	– Check the startup. – If the error occurs repeatedly, contact SEW‑EURODRIVE Service.

Error: 16.12 (100Chex | 4108dec)		
Description: Motor data write sequence not adhered to		
	Response: Output stage inhibit	
	Cause	Measure
	Write sequence not adhered to before writing electrical startup parameters.	Perform startup again.

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Error: 16.13 (100Dhex | 4109dec)	
Description: Several motor protection models active	
Response: Output stage inhibit	
Cause	Measure
Several motor protection models are active in one of the thermal motor monitorings.	– Perform startup again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 16.20 (1014hex | 4116dec)	
Description: Nominal rotational speed too high or nominal frequency too low	
Response: Output stage inhibit	
Cause	Measure
No plausible value could be determined when calculating the number of pole pairs from the nominal speed and nominal frequency.	– Check the settings for nominal speed and nominal frequency. – Perform startup again.

Error: 16.21 (1015hex | 4117dec)	
Description: Negative nominal slip determined	
Response: Output stage inhibit	
Cause	Measure
Negative slip determined at startup.	– Check the settings for nominal speed and nominal frequency. – Perform startup again.

Error: 16.22 (1016hex | 4118dec)	
Description: Number of pole pairs cannot be determined	
Response: Output stage inhibit	
Cause	Measure
It is not possible to calculate the number of pole pairs accurately from nominal frequency and nominal rotational speed.	Enter the number of pole pairs.

Error: 16.23 (1017hex | 4119dec)	
Description: Plausibility check failed	
Response: Output stage inhibit	
Cause	Measure
The estimated nominal power does not match the nominal power entered at startup.	– Check the entered data. – Perform startup again.

Error: 16.24 (1018hex | 4120dec)		
Description: Speed controller sampling time not possible with PWM frequency or control mode		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The set speed controller sampling time of 2 ms is not possible with the set PWM frequency.	– Set the PWM frequency to match the sampling cycle. or – Set sampling cycle to 2 ms (suitable for PWM frequency).
	For ELSM® control mode, the only permitted speed controller sampling times are 1 ms and 2 ms.	Set the sampling cycle to 1 ms or 2 ms.

Error: 16.25 (1019hex | 4121dec)		
Description: User-defined current limit too low for standstill current		
	Response: Output stage inhibit	
	Cause	Measure
	User-defined current limit value too low for configured standstill current.	– Increase user-defined current limit. or – Reduce standstill current.

Error: 16.26 (101Ahex | 4122dec)		
Description: Nominal values incomplete or not plausible		
	Response: Output stage inhibit	
	Cause	Measure
	One or all of the following parameters are not set or are not plausible: – Nominal voltage – Nominal current – Nominal speed – Nominal torque	– Check the entered data. – Perform startup again.

Error: 16.27 (101Bhex | 4123dec)		
Description: Maximum current or maximum torque not plausible		
	Response: Output stage inhibit	
	Cause	Measure
	The following parameters are not set or are not plausible: – Maximum current – Maximum torque	– Check the entered data. – Perform startup again.

Error: 16.30 (101Ehex | 4126dec) Description: Faulty EtherCAT® EEPROM configuration state		
	Response: Warning	
	Cause	Measure
	EtherCAT®/SBusPLUS EEPROM not configured correctly.	Contact SEW-EURODRIVE Service.

Error: 16.40 (1028hex | 4136dec) Description: Startup data set invalid		
	Response: Output stage inhibit	
	Cause	Measure
	The startup data set on the replaceable memory module is not valid for the selected motor.	– Start up a different motor. – Replace the memory module.

Error: 16.41 (1029hex | 4137dec) Description: Startup data set missing		
	Response: Output stage inhibit	
	Cause	Measure
	No startup data set found on the replaceable memory module for the selected motor.	– Start up a different motor. – Replace the memory module.

Error: 16.50 (1032hex | 4146dec) Description: Brake parameters not initialized		
	Response: Output stage inhibit	
	Cause	Measure
	No brake data available.	Check the startup.

Error: 16.55 (1037hex | 4151dec) Description: PID controller – source of actual value not defined		
	Response: Output stage inhibit	
	Cause	Measure
	The PID controller has been activated but the source of the actual value has not been defined yet.	Define the source of the actual value.

Error: 16.60 (103Chex | 4156dec) Description: Parameter setting for 3-wire control not valid		
	Response: Warning	
	Cause	Measure
	No 3-wire control stop terminal configured.	Set stop terminal parameters.

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12.8.13 Error 17 Internal processor error

Error: 17.7 (1107hex | 4359dec) **Description: Exception**		
	Response: Output stage inhibit	
	Cause	Measure
	Internal computing error (trap) in CPU.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 17.8 (1108hex | 4360dec) **Description: Non-volatile data not loaded**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The CPU has been restarted several times without firmware being fully initialized. The non-volatile data is not loaded, the default values remain active.	– Acknowledge the error. – Check the voltage supply. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

12.8.14 Error 18 Software error

Error: 18.1 (1201hex | 4609dec) **Description: Error in motor management interface**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Error at motor management interface.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 18.3 (1203hex | 4611dec) **Description: Task system – warning**		
	Response: Warning	
	Cause	Measure
	A fault was detected while processing the internal task system.	– Acknowledge the warning. – If the warning occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 18.4 (1204hex | 4612dec)	
Description: Task system – error	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
A fault was detected while processing the internal task system.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 18.7 (1207hex | 4615dec)	
Description: Fatal software error	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
A fatal software error was detected.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 18.8 (1208hex | 4616dec)	
Description: Invalid error code	
Response: Output stage inhibit	
Cause	Measure
An invalid error code was requested.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 18.9 (1209hex | 4617dec)	
Description: Internal software error	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
The software has signaled an unexpected event.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 18.10 (120Ahex | 4618dec)	
Description: Watchdog error	
Response: Output stage inhibit	
Cause	Measure
The watchdog has detected a fault. The software is not operating within the intended cycle time.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 18.12 (120Chex | 4620dec)		
Description: Configuration data faulty		
	Response: Output stage inhibit	
	Cause	Measure
	Configuration data not plausible or cannot be interpreted by active firmware version.	– Perform a firmware update. – Contact SEW-EURODRIVE Service.

Error: 18.13 (120Dhex | 4621dec)		
Description: Calibration data not plausible		
	Response: Output stage inhibit	
	Cause	Measure
	Calibration data not plausible.	Contact SEW-EURODRIVE Service.

Error: 18.14 (120Ehex | 4622dec)		
Description: Energy management error		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	An application that switches supply voltages (e.g. standby mode) off or on could not be stopped or started.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

12.8.15 Error 19 Process data

Error: 19.1 (1301hex | 4865dec)		
Description: Torque profile value violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The set torque profile values are not plausible. The torque limit may only be specified as an absolute value.	Correct the profile values.

Error: 19.2 (1302hex | 4866dec)		
Description: Position setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Position setpoint outside software limit switches.	Check the position setpoint.
	Position setpoint outside modulo positioning range.	Check the position setpoint.
	Position in user unit generates number overflow in system unit.	Check position in user unit.

Error: 19.3 (1303hex | 4867dec)		
Description: Speed setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The speed setpoints in the profile value connection are not plausible. The speed limit may only be specified as an absolute value.	Correct the setpoints.

Error: 19.4 (1304hex | 4868dec)		
Description: Acceleration setpoint violation		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The acceleration setpoint in the profile value connection is not plausible. The acceleration limit may only be specified as an absolute value.	Correct the setpoint.

Error: 19.5 (1305hex | 4869dec)		
Description: Drive function not available		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Non-existent drive function (FCB) selected.	Enter the available FCB number.

Error: 19.6 (1306hex | 4870dec)		
Description: Mass moment of inertia setpoint violation		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The mass moment of inertia setpoint is not plausible. The mass moment of inertia may only be specified as an absolute value.	Correct the setpoint.

Error: 19.7 (1307hex | 4871dec)		
Description: Referencing missing		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The activated function can only be performed with a referenced drive.	Reference the drive.

Error: 19.8 (1308hex | 4872dec)		
Description: Drive train changeover not allowed		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Drive train changeover requested while output stage is enabled.	Inhibit the output stage before changing to another drive train.

Error: 19.9 (1309hex | 4873dec)		
Description: Jerk setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The jerk time is not plausible. The jerk time may only be specified as an absolute value	Adjust the jerk time.

Error: 19.11 (130Bhex | 4875dec)		
Description: Error signal level of direction of rotation reversal at enable time		
	Response: Output stage inhibit	
	Cause	Measure
	At the time of enable, the signal levels of the external direction of rotation reversal are not plausible.	Check the control or cabling.
	A reference signal for the external direction of rotation reversal is parameterized, but no signal for the selection of the external direction of rotation reversal is detected.	Adapt parameterization.

Error: 19.12 (130Chex | 4876dec)		
Description: Error signal level of direction of rotation reversal during enable		
	Response: External direction of rotation reversal	
	Cause	Measure
	When the drive is enabled, the signal levels for selecting the external direction of rotation reversal have changed.	Check the control or cabling

12.8.16 Error 20 Device monitoring

Error: 20.1 (1401hex | 5121dec)		
Description: Supply voltage fault		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Internal electronics supply voltage or externally connected DC 24 V supply voltage not within permitted voltage range.	– Check the voltage level of the external DC 24 V supply voltage and check for correct connection. – Acknowledge the error. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.
	24 V power supply unit overloaded.	Check the project planning for the power demand.

Error: 20.2 (1402hex | 5122dec) Description: Supply voltage overloaded	
Response: Output stage inhibit	
Cause	Measure
The current load on the current paths of the DC 24 V supply voltage inside the device is too high. The signal outputs of the device were therefore de-energized.	– Remove all external consumers: – from the digital outputs of the basic device – from any options that may be present – from all encoder connections – from other consumers at the DC 24 V output voltage terminals – Acknowledge the error. – Reconnect the consumers with the device, one after the other, until the error message appears once again. – Connect a consumer with a lower current consumption or eliminate the short circuit.

Error: 20.7 (1407hex | 5127dec) Description: Internal hardware fault	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
Error detected in device hardware.	– Acknowledge the error. – If the error occurs repeatedly, replace the device.

Error: 20.8 (1408hex | 5128dec) Description: Fan – warning	
Response: Warning with self-reset	
Cause	Measure
The function of the fan is impaired.	– Check fan for contamination. – If the warning occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 20.9 (1409hex | 5129dec) Description: Fan – fault	
Response: Application stop + output stage inhibit	
Cause	Measure
The fan is defective.	Contact SEW-EURODRIVE Service.

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Error: 20.10 (140Ahex | 5130dec) Description: Fan – supply voltage fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Supply voltage of fan missing.	Contact SEW-EURODRIVE Service.

Error: 20.11 (140Bhex | 5131dec) Description: STO – switching delay		
	Response: Output stage inhibit	
	Cause	Measure
	Switching delay between STO signals F-STO_P1 and F-STO_P2.	– Check the STO wiring. – Make sure that both STO signals F-STO_P1 and F-STO_P2 are switched simultaneously. – Make sure that both STO signals F-STO_P1 and F-STO_P2 are switched to low level. Then acknowledge the error.
	The state change of the STO signals is too slow.	Ensure steeper switching edge.
	An internal defect has occurred in the STO circuit.	Contact SEW-EURODRIVE Service.

Error: 20.23 (1417hex | 5143dec) Description: Temperature detection in power section faulty		
	Response: Output stage inhibit	
	Cause	Measure
	Error detected in device hardware. Power section does not provide temperature data.	– Acknowledge the error. – Contact SEW-EURODRIVE Service.

12.8.17 Error 21 Digital motor integration 1

Error: 21.1 (1501hex | 5377dec) Description: Communication error		
	Response: Output stage inhibit	
	Cause	Measure
	A communication error was detected at the interface of digital motor integration.	Check the cabling.

Error: 21.2 (1502hex | 5378dec) Description: Slave required		
	Response: Digital motor integration	
	Cause	Measure
	Device started up with a drive with digital motor integration but no drive with digital motor integration is connected.	– Check the connection of the digital motor integration. – Perform startup again.

Error: 21.3 (1503hex | 5379dec) Description: Incompatible drive		
	Response: Output stage inhibit	
	Cause	Measure
	The connected drive does not match the drive that was started up.	– Connect an appropriate drive. – Perform startup again.

Error: 21.4 (1504hex | 5380dec) Description: Invalid label		
	Response: Output stage inhibit	
	Cause	Measure
	The connected drive contains invalid data.	Replace the drive.

Error: 21.5 (1505hex | 5381dec) Description: Incompatible slave		
	Response: Output stage inhibit	
	Cause	Measure
	The firmware versions of the slaves used are not compatible with one another.	Update the inverter and/or the slave.

Error: 21.6 (1506hex | 5382dec) Description: Overload/short circuit on the interface		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit in the cabling of a slave of digital motor integration.	Check the cabling of the slave.
	The voltage of the slave of digital motor integration is too low.	Check the permitted cable length.

Error: 21.7 (1507hex | 5383dec) Description: High current demand of slave		
	Response: Output stage inhibit	
	Cause	Measure
	The current demand of the slave is too high.	Use a slave with a lower current demand.

Error: 21.8 (1508hex | 5384dec) Description: Parameter error		
	Response: Output stage inhibit	
	Cause	Measure
	Error detected while processing data from digital motor integration slave.	Repeat the process in configuration state.
	The connected drive contains invalid data.	Replace the drive.

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Error: 21.9 (1509hex | 5385dec) Description: Impermissible hot plug		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	A slave of digital motor integration was connected while the drive was enabled.	– Activate the configuration state of the inverter, e.g. by inhibiting the output stage. – Switch the inverter off and on again. – Connect the slave when it is de-energized.
	A slave of digital motor integration was connected while the inverter was in standby mode without switching off the encoder supply.	– Switch off the encoder supply in standby mode. – Connect the slave when it is de-energized.

Error: 21.10 (150Ahex | 5386dec) Description: Connection type not configured correctly		
	Response: Output stage inhibit	
	Cause	Measure
	The connection type of the connected drive cannot be determined.	Set the connection type on the drive correctly.

Error: 21.11 (150Bhex | 5387dec) Description: Impermissible subslave		
	Response: Output stage inhibit	
	Cause	Measure
	The device cannot be operated with a subslave connected via digital motor integration.	Connect another subslave.

Error: 21.12 (150Chex | 5388dec) Description: Slave/subslave not accessible – fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	A slave/subslave of digital motor integration is in the Device Update Manager.	– Update the firmware of the slave/subslave. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 21.13 (150Dhex | 5389dec) Description: Slave/subslave not accessible – warning		
	Response: Warning	
	Cause	Measure
	A slave/subslave of digital motor integration is in the Device Update Manager.	– Update the firmware of the slave/subslave. – If the warning occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 21.14 (150Ehex | 5390dec)		
Description: Missing startup of brake control		
	Response: Output stage inhibit	
	Cause	Measure
	The brake control has not been started up.	Start up brake control or connect another drive.

Error: 21.15 (150Fhex | 5391dec)		
Description: Motor temperature detection not available		
	Response: Output stage inhibit	
	Cause	Measure
	The drive does not have a motor temperature detection function.	– Deactivate temperature evaluation. or – Connect a different drive.

Error: 21.20 (1514hex | 5396dec)		
Description: Slave – critical fault		
	Response: Output stage inhibit	
	Cause	Measure
	A slave of digital motor integration has detected a critical error.	Observe the error message of the subslave. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

Error: 21.21 (1515hex | 5397dec)		
Description: Slave – error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	A slave of digital motor integration has detected an error.	Observe the error message of the subslave. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

Error: 21.22 (1516hex | 5398dec)		
Description: Slave – warning		
	Response: Warning	
	Cause	Measure
	A slave of digital motor integration has signaled a warning.	Observe the warning of the subslave. Identify the exact cause of this warning and take the appropriate measures for elimination.

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12.8.18 Error 23 Power section

Error: 23.4 (1704hex | 5892dec) **Description: Hardware fault**		
	Response: Output stage inhibit	
	Cause	Measure
	A fault was detected on a component of the power section.	– Check for short circuit/ground fault at the output of the inverter. – Reduce the line capacity at the output of the inverter. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.
	Fault detected on switched-mode power supply.	Check the DC 24 V supply voltage.
	Error detected at the gate driver of a power semiconductor.	Contact SEW-EURODRIVE Service.

12.8.19 Error 25 Parameter memory monitoring

Error: 25.1 (1901hex | 6401dec) **Description: Timeout warning**		
	Response: Warning with self-reset	
	Cause	Measure
	Access to memory (read/write) takes longer than expected.	No measure required. The warning will be reset automatically after completed memory access.

Error: 25.2 (1902hex | 6402dec) **Description: Non-volatile memory system – runtime error**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A runtime error was detected in the non-volatile memory system.	– Switch the device off and on again. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery. – If the fault occurs repeatedly, replace the device/memory module. Contact SEW-EURODRIVE Service. – Perform basic initialization. Contact SEW-EURODRIVE Service for this purpose.

Error: 25.6 (1906hex | 6406dec) Description: Incompatible device configuration	
Response: Output stage inhibit	
Cause	Measure
The data set of another device was copied in the device, which differs in device family, power, or voltage from the current device.	– Acknowledge the fault through a manual fault reset. To do so, under [Diagnostics] > [Status] > [Fault status] in the "Manual fault reset" parameter, select the "With parameter set acceptance" setting. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery.
The replaceable memory module of another device that differs from the current device with regard to the device family, power, voltage, or design, for example, has been inserted in the device.	– Insert the correct memory module. – Acknowledge the fault through a manual fault reset. To do so, under [Diagnostics] > [Status] > [Fault status] in the "Manual fault reset" parameter, select the "With parameter set acceptance" setting. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery. – Perform basic initialization. Contact SEW-EURODRIVE Service for this purpose.
The power section has been replaced and differs in its power rating or voltage from the original power section.	– Insert the correct power section. – Acknowledge the fault through a manual fault reset. To do so, under [Diagnostics] > [Status] > [Fault status] in the "Manual fault reset" parameter, select the "With parameter set acceptance" setting. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery.
Subcomponent defective.	Contact SEW-EURODRIVE Service.

Error: 25.7 (1907hex | 6407dec) Description: Non-volatile memory system – initialization error	
Response: Output stage inhibit	
Cause	Measure
The initialization of the non-volatile memory system has failed.	– Switch the device off and on again. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery. – If the error occurs repeatedly, contact SEW-EURODRIVE Service. – Perform basic initialization. Contact SEW-EURODRIVE Service for this purpose.

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Error: 25.10 (190Ahex | 6410dec)		
Description: Power section configuration data – version conflict		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of configuration data of power section.	Contact SEW-EURODRIVE Service.

Error: 25.12 (190Chex | 6412dec)		
Description: Power section configuration data – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty configuration data of power section.	Contact SEW-EURODRIVE Service.

Error: 25.13 (190Dhex | 6413dec)		
Description: Control electronics configuration data – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty configuration data of control electronics.	Contact SEW-EURODRIVE Service.

Error: 25.14 (190Ehex | 6414dec)		
Description: Calibration data of power section – version conflict		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of calibration data of power section.	Contact SEW-EURODRIVE Service.

Error: 25.15 (190Fhex | 6415dec)		
Description: Calibration data of control electronics – version conflict		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of calibration data of control electronics.	Contact SEW-EURODRIVE Service.

Error: 25.16 (1910hex | 6416dec)		
Description: Calibration data of power section – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty calibration data of power section.	Contact SEW-EURODRIVE Service.

Error: 25.17 (1911hex | 6417dec)		
Description: Calibration data of control electronics – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty calibration data of control electronics.	Contact SEW-EURODRIVE Service.

Error: 25.18 (1912hex | 6418dec)		
Description: QA data power section – CRC error		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of power section.	Contact SEW-EURODRIVE Service.

Error: 25.19 (1913hex | 6419dec)		
Description: QA data control electronics – CRC error		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of control electronics.	Contact SEW-EURODRIVE Service.

Error: 25.20 (1914hex | 6420dec)		
Description: Basic device memory – initialization error		
	Response: Output stage inhibit	
	Cause	Measure
	The initialization of the basic device memory has failed.	Contact SEW-EURODRIVE Service.

Error: 25.21 (1915hex | 6421dec)		
Description: Basic device memory – runtime error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error detected in the basic device memory.	Contact SEW-EURODRIVE Service.

Error: 25.30 (191Ehex | 6430dec)		
Description: Replaceable memory module – initialization error		
	Response: Output stage inhibit	
	Cause	Measure
	The formatting of the replaceable memory module does not match.	– Switch the device off and on again. – Restore delivery state. Note that doing so will reset all data in the replaceable memory module to the values at delivery.
	Initialization of replaceable memory module failed after restoring delivery state.	– Contact SEW-EURODRIVE Service. – Perform basic initialization. Contact SEW-EURODRIVE Service for this purpose.

Error: .31 (191Fhex | 6431dec)		
Description: Replaceable memory module – runtime error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error detected in replaceable memory module.	– Insert new memory module and perform startup again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 25.32 (1920hex | 6432dec)		
Description: Incompatible replaceable memory module		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The replaceable memory module is not compatible with the device.	Replace the memory module.

Error: 25.33 (1921hex | 6433dec)		
Description: Replaceable memory module – incompatible device category		
	Response: Output stage inhibit	
	Cause	Measure
	The replaceable memory module is formatted, but it contains data from a device of a different equipment category. The data is not compatible and cannot be used.	– Replace the memory module. – Restore delivery state. Note that doing so will reset all data in the replaceable memory module to the values at delivery.

Error: 25.50 (1932hex | 6450dec)		
Description: Replaceable memory module of safety option – runtime error		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Runtime error detected in the replaceable memory module of the safety option.	Contact SEW-EURODRIVE Service.

Error: 25.51 (1933hex | 6451dec)		
Description: Replaceable memory module of safety option – initialization error		
	Response: Warning	
	Cause	Measure
	Initialization of the replaceable memory module of the safety option failed.	Contact SEW-EURODRIVE Service.

Error: 25.61 (193Dhex | 6461dec) Description: Restore point – failure		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Failed to create restore point.	Create the restore point again.

Error: 25.70 (1946hex | 6470dec) Description: Incompatible card configuration		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The current configuration of the cards does not match the configuration state saved during startup. For example, a card was removed that was still present during startup.	– Restore the original configuration of the cards. – Acknowledge the fault through a manual fault reset. To do so, under [Diagnostics] > [Status] > [Fault status] in the "Manual fault reset" parameter, select the "With parameter set acceptance" setting.

12.8.20 Error 26 External fault

Error: 26.1 (1A01hex | 6657dec) Description: External fault via digital input/control bit		
	Response: External fault	
	Cause	Measure
	Error triggered via a digital input or a bit of a control word.	– Eliminate the external fault. or – Change the response to an external fault under [Functions] > [Setpoints] > [Basic settings].

Error: 26.3 (1A03hex | 6659dec) Description: Power section emergency shutdown		
	Response: Output stage inhibit	
	Cause	Measure
	Power section detected critical fault and requested external emergency shutdown.	Contact SEW-EURODRIVE Service.

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Error: 26.4 (1A04hex | 6660dec)		
Description: Error while monitoring temperature of external braking resistor		
	Response: Response to external braking resistor error	
	Cause	Measure
	The connected temperature switch of the external braking resistor has tripped.	– Check the mounting position of the braking resistor. – Clean the braking resistor. – Check the configuration of the braking resistor. – Install a larger braking resistor. – Check the external trip switch settings. – Optimize the travel cycle so that less regenerative energy is created. – Check the settings of the storage unit discharge function in the affected MOVIKIT® software module. – Check plug connections.

12.8.21 Error 28 FCB drive functions

Error: 28.1 (1C01hex | 7169dec)		
Description: FCB 11/12 – Searching zero pulse timeout		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Failed to find zero pulse of encoder's C track within specified search time during reference travel.	Check the encoder wiring.

Error: 28.2 (1C02hex | 7170dec)		
Description: FCB 11/12 – Hardware limit switch before reference cam		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The hardware limit switch was reached during reference travel. The reference cam was not detected.	Make sure that the reference cam is not installed behind the hardware limit switch.

Error: 28.3 (1C03hex | 7171dec)		
Description: FCB 11/12 – Hardware limit switch and reference cam not flush		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The hardware limit switch and reference cam are not mounted flush.	Make sure that the reference cam and hardware limit switch are mounted flush.

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Error: 28.4 (1C04hex | 7172dec)	
Description: FCB 11/12 – Faulty reference offset	
Response: Emergency stop + output stage inhibit	
Cause	Measure
An error was detected when determining the reference offset.	– Make sure that the reference offset is smaller than the "Modulo maximum" limit value. – When using a single-turn absolute encoder, make sure that the reference offset is not larger than one encoder revolution. – Make sure that an encoder has been set as the source of the actual position when assigning the encoder.

Error: 28.5 (1C05hex | 7173dec)	
Description: FCB 11/12 – Referencing not possible	
Response: Emergency stop + output stage inhibit	
Cause	Measure
In the active drive train during encoder assignment, no encoder was specified as the source of the actual position.	– Set an encoder as the source of the actual position. – Activate the "Referencing all encoders of the drive train" parameter.
The reference travel type "Absolute encoder position" is only permitted for absolute encoders in the position mode "Linear mode" or "Single-turn absolute position".	– Adjust the position mode of the encoder. – Use a different reference travel type
No encoder is assigned in the active drive train.	Assign encoder.

Error: 28.6 (1C06hex | 7174dec)	
Description: FCB 11/12 – Limit switch/reference cam not flush/overlapping with fixed stop	
Response: Emergency stop + output stage inhibit	
Cause	Measure
A hardware limit switch and a reference cam were hit at the same time during reference travel to a fixed stop.	Check whether the position of hardware limit switches and reference cams for reference travel have been set correctly.
During reference travel to a fixed stop and active speed changeover at the hardware limit switch or reference cam, the fixed stop has been reached without the hardware limit switch or reference cam being hit.	Check whether the position of hardware limit switches and reference cams for reference travel have been set correctly.

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Error: 28.7 (1C07hex | 7175dec) Description: FCB 21 – Required total torque too high	
Response: Output stage inhibit	
Cause	Measure
The required total torque is greater than the permitted maximum torque at the motor shaft. The total torque is calculated from the torque specification and the determined/specified load torque.	– Reduce the torque specification. – Change the direction of rotation. – Increase the power of the drive.

Error: 28.8 (1C08hex | 7176dec) Description: FCB 21 – Total torque not reached	
Response: Output stage inhibit	
Cause	Measure
The required total torque (at least 90%) was not reached. The total torque is calculated from the torque specification and the determined/specified load torque.	– Reduce the torque specification. – Check the limit values of the inverter. – Check the motor connection.

Error: 28.9 (1C09hex | 7177dec) Description: FCB 18 – Rotor position identification not possible	
Response: Output stage inhibit	
Cause	Measure
Rotor position identification with an incremental encoder was aborted.	– Restart the rotor position identification. – Check whether the encoder is connected correctly. – Check whether the encoder is defective.
Result of rotor position identification (measured encoder offset) cannot be stored in encoder.	Store the measured encoder offset in the inverter
In the "Automatic" operating mode, the result of rotor position identification (measured encoder offset) cannot be stored in the encoder. In this operating mode, the measured value can only be stored in the inverter	– Set the operating mode to "Manual". or – Store the measured encoder offset in the inverter.

Error: 28.10 (1C0Ahex | 7178dec) Description: FCB 25 – Unbalanced motor phases	
Response: Output stage inhibit	
Cause	Measure
Significantly different values determined in the 3 phases while measuring stator resistances.	– Check whether the motor is connected correctly. – Check all contact points on the motor and inverter. – Check the motor and motor cable for damage.

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Error: 28.11 (1C0Bhex | 7179dec)		
Description: FCB 25 – High impedance motor phase		
	Response: Output stage inhibit	
	Cause	Measure
	At least one motor phase could not be measured during motor parameter measurement.	– Check whether the motor is connected correctly. – Check all contact points on the motor and inverter. – Check the motor and motor cable for damage.

Error: 28.12 (1C0Chex | 7180dec)		
Description: FCB 25 – Stator resistance measurement timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Motor parameter measurement activated while motor is turning.	– Stop motor. – Start motor parameter measurement when the motor is at standstill.

Error: 28.13 (1C0Dhex | 7181dec)		
Description: FCB 25 – Characteristic curve identification not possible		
	Response: Output stage inhibit	
	Cause	Measure
	The characteristic curve cannot be clearly identified by the motor parameter measurement.	Contact SEW-EURODRIVE Service.

Error: 28.14 (1C0Ehex | 7182dec)		
Description: Modulo minimum and modulo maximum not plausible		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The value of the "Modulo minimum" parameter is greater than the value of the "Modulo maximum" parameter.	Correct the parameter values.

Error: 28.15 (1C0Fhex | 7183dec)		
Description: FCB 25 – Timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Measuring of rotor resistance, leakage inductance, and stator inductance not completed.	Contact SEW-EURODRIVE Service.

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Error: 28.18 (1C12hex | 7186dec) Description: FCB 21 – Brake missing		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	No brake has been parameterized in the inverter. However, a brake is required to perform the brake test.	– Parameterize the brake in drive train 1. – Start FCB 21 again.

Error: 28.19 (1C13hex | 7187dec) Description: FCB 21 – Encoder missing		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	No encoder has been parameterized in the inverter. However, an encoder is required to detect a movement of the drive.	– Parameterize the encoder in drive train 1. – Use an encoder for speed control or position control. – Start FCB 21 again.

Error: 28.20 (1C14hex | 7188dec) Description: FCB 21 – Load torque not within tolerance range		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The measured load torque is outside the permitted range. The permitted range is defined by the "Load torque" and "Permitted load torque tolerance" parameters as follows: Load torque ± permitted load torque tolerance	– Check the load torque of the system. – Check the "Load torque" parameter value. – Check the "Permitted load torque tolerance" parameter value.

Error: 28.21 (1C15hex | 7189dec) Description: FCB 09 – Position overshoot through changes to the active travel order		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Due to changing of the target position or profile values during an active travel order, the drive must travel beyond the target and then reverse to adhere to the profile. Reversing is prohibited in the current operating mode, so when the target position is overrun, the drive triggers a fault and stops in the permitted direction.	Change the target position/profile values in such a way that it is still possible to stop at the target position.

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Error: 28.22 (1C16hex | 7190dec)		
Description: FCB 09 – Wrong touchprobe data source		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	For the "Remaining distance from touchprobe 1" operating mode, the data source of the touchprobe used must be set to "Actual position in user unit".	Change the data source of the touchprobe.

Error: 28.23 (1C17hex | 7191dec)		
Description: Minimum speed too high		
	Response: Output stage inhibit	
	Cause	Measure
	The minimum speed is greater than the application limit of the speed.	– Reduce the minimum speed. or – Increase the application limit.

Error: 28.24 (1C18hex | 7192dec)		
Description: FCB 05 – Limits of skip range outside setpoint limits		
	Response: Output stage inhibit	
	Cause	Measure
	The speed range of the active speed resonance skip function is larger than the permitted setpoint range. Both the minimum speed and the application limit are within the skip range. As such, each setpoint falls within the skip range.	– Adjust the range of the speed resonance skip function. – Adjust the minimum speed. – Adjust the application limit.

Error: 28.25 (1C19hex | 7193dec)		
Description: FCB 11/12 – Faulty reference offset of encoder 1		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	A fault was detected when determining the reference offset for encoder 1.	– Make sure that the reference offset is smaller than the "Modulo maximum" limit value. – When using a single-turn absolute encoder, make sure that the reference offset is not larger than one encoder revolution.

Error: 28.27 (1C1Bhex | 7195dec)		
Description: FCB 11/12 – Reference cams and hardware limit switches active		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	During reference travel, the hardware limit switch was hit when the reference cam was active.	– Check the position of the reference cam to the hardware limit switch. – Check the signal of the reference cam.

Error: 28.28 (1C1Chex | 7196dec) Description: FCB 11/12 – Homing not possible		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Position control cannot be performed with the active control mode and the active encoder setting. Homing is performed exclusively in position control.	– Parameterize the encoder as the source of the actual position. or – Deactivate the "Approach home position" parameter.

12.8.22 Error 29 HW limit switches

Error: 29.1 (1D01hex | 7425dec) Description: Positive limit switch hit		
	Response: HW limit switch – current drive train	
	Cause	Measure
	Positive hardware limit switch hit.	– Check the wiring of the hardware limit switch. – Check the target position. – Leave the hardware limit switch in the opposite direction.

Error: 29.2 (1D02hex | 7426dec) Description: Negative limit switch hit		
	Response: HW limit switch – current drive train	
	Cause	Measure
	Negative hardware limit switch hit.	– Check the wiring of the hardware limit switch. – Check the target position. – Leave the hardware limit switch in the opposite direction.

Error: 29.3 (1D03hex | 7427dec) Description: Limit switch missing		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Positive and negative hardware limit switches hit at the same time.	– Check the wiring of the hardware limit switches. – Check the parameter setting of the digital inputs. – Check the parameter setting of the process output data.

Error: 29.4 (1D04hex | 7428dec) Description: Limit switches reversed		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The error can be caused as follows: – The positive hardware limit switch was hit with a negative direction of rotation or – The negative hardware limit switch was hit with a positive rotation.	Check whether the hardware limit switch connections are swapped.

12.8.23 Error 30 SW limit switches

Error: 30.1 (1E01hex | 7681dec) Description: Positive limit switch hit		
	Response: SW limit switches – current drive train	
	Cause	Measure
	Positive software limit switch hit.	– Check the position of the software limit switch. – Check the target position. – Leave the software limit switch in the opposite direction.

Error: 30.2 (1E02hex | 7682dec) Description: Negative limit switch hit		
	Response: SW limit switches – current drive train	
	Cause	Measure
	Negative software limit switch hit.	– Check the position of the software limit switch. – Check the target position. – Leave the software limit switch in the opposite direction.

Error: 30.3 (1E03hex | 7683dec) Description: Limit switches reversed		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Position of negative software limit switch greater than position of positive software limit switch.	Check the positions of the software limit switches.

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Error: 30.4 (1E04hex | 7684dec)		
Description: Distance of software limit switches too small/noise suppression window too large		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The range limited by the positive and negative software limit switches is smaller than the range set in the "SW limit switch noise suppression window" parameter.	– Check the positions of the software limit switches. or – Adjust the width of the noise suppression window.

12.8.24 Error 31 Thermal motor protection

Error: 31.1 (1F01hex | 7937dec)		
Description: Temperature sensor motor 1 – wire break		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Wire break detected at the temperature sensor of the motor.	Check the wiring of the temperature sensor.

Error: 31.2 (1F02hex | 7938dec)		
Description: Temperature sensor motor 1 – short circuit		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit at temperature sensor of motor.	Check the wiring of the temperature sensor.

Error: 31.3 (1F03hex | 7939dec)		
Description: Temperature sensor motor 1 – overtemperature		
	Response: Output stage inhibit	
	Cause	Measure
	The motor temperature determined by the temperature sensor exceeds the maximum permitted motor temperature.	– Let the motor cool down. – Check the motor for overload. – Check whether the correct temperature sensor has been configured.

Error: 31.4 (1F04hex | 7940dec)		
Description: Temperature model motor 1 – overtemperature		
	Response: Output stage inhibit	
	Cause	Measure
	The motor temperature determined by the temperature model exceeds the maximum permitted motor temperature.	– Let the motor cool down. – Check the motor for overload. – Check whether the correct temperature sensor has been configured.

Error: 31.5 (1F05hex | 7941dec)		
Description: Temperature sensor motor 1 – prewarning		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	Motor temperature determined via temperature sensor exceeded prewarning threshold.	Check the motor for overload.

Error: 31.6 (1F06hex | 7942dec)		
Description: Temperature model motor 1 – prewarning		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	Motor temperature determined via motor model exceeded prewarning threshold.	Check the motor for overload.

Error: 31.7 (1F07hex | 7943dec)		
Description: UL temperature model – overtemperature		
	Response: Output stage inhibit	
	Cause	Measure
	The temperature of the active motor determined via the UL temperature model exceeds the maximum permitted motor temperature.	Check the motor for overload.

Error: 31.8 (1F08hex | 7944dec)		
Description: Temperature sensor motor 1 – communication timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Communication with temperature sensor is disrupted (e.g. via MOVILINK® DDI).	Check the wiring of the temperature sensor.

Error: 31.9 (1F09hex | 7945dec)		
Description: Temperature sensor motor 1 – temperature too low		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature detected by temperature sensor fell below -50 °C.	– Check whether the correct temperature sensor has been configured. – Heat the motor.
	Short circuit in the long connection to the temperature sensor of the motor.	Check the wiring of the temperature sensor.

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Error: 31.11 (1F0Bhex | 7947dec)

Description: Temperature sensor motor 2 – wire break

Response: Application stop + output stage inhibit

Cause	Measure
Wire break detected at the temperature sensor of the motor.	Check the wiring of the temperature sensor.

Error: 31.12 (1F0Chex | 7948dec)

Description: Temperature sensor motor 2 – short circuit

Response: Application stop + output stage inhibit

Cause	Measure
Short circuit at temperature sensor of motor.	Check the wiring of the temperature sensor.

Error: 31.13 (1F0Dhex | 7949dec)

Description: Temperature sensor motor 2 – overtemperature

Response: Output stage inhibit

Cause	Measure
The motor temperature determined by the temperature sensor exceeds the maximum permitted motor temperature.	– Let the motor cool down. – Check the motor for overload. – Check whether the correct temperature sensor has been configured.

Error: 31.14 (1F0Ehex | 7950dec)

Description: Temperature model motor 2 – overtemperature

Response: Output stage inhibit

Cause	Measure
The motor temperature determined by the temperature model exceeds the maximum permitted motor temperature.	– Let the motor cool down. – Check the motor for overload. – Check whether the correct temperature sensor has been configured.

Error: 31.15 (1F0Fhex | 7951dec)

Description: Temperature sensor motor 2 – prewarning

Response: No response

Cause	Measure
Motor temperature determined via temperature sensor exceeded prewarning threshold.	Check the motor for overload.

Error: 31.16 (1F10hex | 7952dec)

Description: Temperature model motor 2 – prewarning

Response: No response

Cause	Measure
Motor temperature determined via motor model exceeded prewarning threshold.	Check the motor for overload.

Error: 31.19 (1F13hex | 7955dec) Description: Temperature sensor motor 2 – temperature too low		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature detected by temperature sensor fell below -50 °C.	– Check whether the correct temperature sensor has been configured. – Heat the motor.
	Short circuit in the long connection to the temperature sensor of the motor.	Check the wiring of the temperature sensor.

Error: 31.50 (1F32hex | 7986dec) Description: Error at temperature sensor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Error detected at temperature sensor 1 of the motor.	Observe the error code of the main component. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

Error: 31.51 (1F33hex | 7987dec) Description: Error at temperature sensor 2		
	Response: Output stage inhibit	
	Cause	Measure
	Error detected at temperature sensor 2 of the motor.	Observe the error code of the main component. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

Error: 31.52 (1F34hex | 7988dec) Description: Error at temperature sensor 3		
	Response: Output stage inhibit	
	Cause	Measure
	Error detected at temperature sensor 3 of the motor.	Observe the error code of the main component. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

12.8.25 Error 32 Communication

Error: 32.3 (2003hex | 8195dec) Description: Faulty synchronization signal		
	Response: External synchronization	
	Cause	Measure
	Synchronization signal period is not correct.	Make sure that the EtherCAT®/SBusPLUS configuration in the controller is set correctly.

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Error: 32.4 (2004hex | 8196dec)		
Description: Missing synchronization signal		
	Response: External synchronization	
	Cause	Measure
	No synchronization signal present.	Make sure that the EtherCAT®/SBusPLUS configuration in the controller is set correctly.

Error: 32.5 (2005hex | 8197dec)		
Description: Synchronization timeout		
	Response: External synchronization	
	Cause	Measure
	Timeout while synchronizing to synchronization signal.	Make sure that the EtherCAT®/SBusPLUS configuration in the controller is set correctly.

Error: 32.6 (2006hex | 8198dec)		
Description: Error while transferring parameter set		
	Response: Output stage inhibit	
	Cause	Measure
	An error was detected while transferring the parameter set to the device.	– Check the wiring of system bus and module bus. – Restart the transfer.

Error: 32.7 (2007hex | 8199dec)		
Description: Application heartbeat timeout		
	Response: Application heartbeat – timeout response	
	Cause	Measure
	Communication between the application program (e.g. IEC program or MOVIKIT® from the Drive category) and the device was interrupted.	– Check the status of the application program. – Restart the application program.

Error: 32.8 (2008hex | 8200dec)		
Description: User-timeout timeout		
	Response: User timeout – timeout response	
	Cause	Measure
	The timeout time of the user timeout function has expired.	– Check communication. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 32.12 (200Chex | 8204dec) Description: Manual mode timeout	
Response: Manual mode – timeout response	
Cause	Measure
Communication connection to inverter interrupted in manual mode.	– Check whether too many programs are open on the engineering PC. – Increase the timeout time in manual mode.
New Scope project created.	– Acknowledge the error. – Restart manual mode.
Scope measurement transferred from inverter to project.	– Acknowledge the error. – Restart manual mode.

12.8.26 Error 33 System initialization

Error: 33.1 (2101hex | 8449dec) Description: Error during offset determination of current measurement	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
An error was detected during the current measurement.	Contact SEW-EURODRIVE Service.

Error: 33.2 (2102hex | 8450dec) Description: Firmware – checksum error	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
An error was detected when calculating the firmware checksum.	Contact SEW-EURODRIVE Service.

Error: 33.6 (2106hex | 8454dec) Description: Faulty FPGA configuration	
Response: Output stage inhibit	
Cause	Measure
An error was detected in the FPGA configuration.	Contact SEW-EURODRIVE Service.

Error: 33.7 (2107hex | 8455dec) Description: Function block compatibility error	
Response: Output stage inhibit	
Cause	Measure
An error was detected when checking the compatibility of the function block.	Contact SEW-EURODRIVE Service.

Error: 33.8 (2108hex | 8456dec)		
Description: Software function block not configured correctly		
	Response: Output stage inhibit	
	Cause	Measure
	A fault was detected in the configuration of the software function block.	Contact SEW-EURODRIVE Service.

Error: 33.9 (2109hex | 8457dec)		
Description: Hardware compatibility error of the power section		
	Response: Output stage inhibit	
	Cause	Measure
	The firmware is not compatible with the hardware of the power section.	Contact SEW-EURODRIVE Service.

Error: 33.10 (210Ahex | 8458dec)		
Description: Boot timeout		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Timeout during system boot.	Contact SEW-EURODRIVE Service.

Error: 33.11 (210Bhex | 8459dec)		
Description: Hardware compatibility error		
	Response: Output stage inhibit	
	Cause	Measure
	The firmware is not compatible with the device.	Contact SEW-EURODRIVE Service.

Error: 33.12 (210Chex | 8460dec)		
Description: Memory module plugged		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A plugged-in memory module was detected during device start. However, the internal memory was set as the storage location.	Switch off the device. Remove the memory module and restart the device.

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Error: 33.13 (210Dhex | 8461dec)		
Description: Memory module removed		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Memory module removed from a device that is parameterized for operation with a replaceable memory module.	Switch off the device, insert the memory module, and switch on the device again.
	Replaceable memory module removed during ongoing operation.	Switch off the device, insert the memory module, and switch on the device again.
	Memory module missing for a device that can only be operated with replaceable memory module.	Switch off the device, insert the memory module, and switch on the device again.

Error: 33.15 (210Fhex | 8463dec)		
Description: Firmware configuration conflict in the Device Update Manager		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The firmware does not correspond with the expected configuration in the Device Update Manager.	– Acknowledge the error. Doing so will update the configuration data of the Device Update Manager. – If the fault occurs again after a reset, contact SEW-EURODRIVE Service

Error: 33.18 (2112hex | 8466dec)		
Description: Incompatible fieldbus configuration		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The fieldbus used is not compatible with the basic unit.	– For devices with a pluggable fieldbus card, replace the card. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

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Error: 33.22 (2116hex | 8470dec) Description: Function status too low		
	Response: Output stage inhibit	
	Cause	Measure
	The parameter set to be loaded into the device requires a higher function status.	– Perform a firmware update. – Use a parameter set that matches the device. – Acknowledge the fault with parameter set acceptance. This applies the data and overwrites the parameter set in the device with a lower function status.
	The parameter set in the replaceable memory module requires a higher function status.	– Perform a firmware update. – Use a memory module with a parameter set that matches the device. – Acknowledge the fault with parameter set acceptance. This applies the data and overwrites the replaceable memory module with a lower function status.

12.8.27 Error 34 Process data configuration

Error: 34.1 (2201hex | 8705dec) Description: Changed process data configuration		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Process data configuration changed during active process data operation.	Perform a reset. Doing so will stop the process data, apply the changes, and restart the process data.

12.8.28 Error 35 Function activation

Error: 35.1 (2301hex | 8961dec) Description: Activation level – invalid activation key		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Activation key not entered properly.	Enter the activation key again.
	Activation key not created for this device.	Check the activation key.
	For a double-axis, the activation key of the wrong instance was entered in the device.	Enter the activation key for the assigned instance.
	Activation key entered for technology level in parameter "Application level – activation key".	Enter the activation key in the correct parameter.

Error: 35.2 (2302hex | 8962dec) Description: Application level too low		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The activated software module requires a higher application level.	Determine the required application level ("Application level – required level" parameter) and enter its activation key.

Error: 35.3 (2303hex | 8963dec) Description: Technology level too low		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	An activated technology function requires a higher technology level.	Determine the required technology level ("Technology level – required level" parameter) and enter its activation key.

Error: 35.4 (2304hex | 8964dec) Description: Technology level – invalid activation key		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Activation key not entered properly.	Enter the activation key again.
	Activation key not created for this device.	Check the activation key.
	For a double-axis, the activation key of the wrong instance was entered in the device.	Enter the activation key for the assigned instance.
	Activation key entered for application level in parameter "Technology level – activation key".	Enter the activation key in the correct parameter.

12.8.29 Error 42 Lag error

Error: 42.1 (2A01hex | 10753dec)
Description: Positioning lag error

Response: Positioning lag error

Cause	Measure
Encoder not connected correctly.	Check the encoder wiring.
Position encoder inverted or not installed correctly on the track.	Check the installation and connection of the position encoder.
Motor phases not connected properly.	Check the wiring of the motor.
Acceleration too high.	– Check the profile values. – Increase the torque limit and/or current limit. – Check the project planning.
P component of position controller too small.	Increase the P component of the position controller.
Speed controller parameterized incorrectly.	Check controller parameters.
Lag error window too small.	Increase the lag error window.
Mechanical components cannot move freely or are blocked.	– Check the mechanical components for stiffness. – Check the mechanical components for blockage.
Supply voltage too low or line phase missing.	Check the supply voltage.

Error: 42.2 (2A02hex | 10754dec)
Description: Jog mode lag error

Response: Output stage inhibit

Cause	Measure
Encoder not connected correctly.	Check the encoder wiring.
Position encoder inverted or not installed correctly on the track.	Check the installation and connection of the position encoder.
Motor phases not connected properly.	Check the wiring of the motor.
Acceleration too high.	– Check the profile values. – Increase the torque limit and/or current limit. – Check the project planning.
P component of position controller too small.	Increase the P component of the position controller.
Speed controller parameterized incorrectly.	Check controller parameters.
Lag error window too small.	Increase the lag error window.
Mechanical components cannot move freely or are blocked.	– Check the mechanical components for stiffness. – Check the mechanical components for blockage.
Supply voltage too low or line phase missing.	Check the supply voltage.

Error: 42.3 (2A03hex | 10755dec) Description: Standard lag error		
	Response: Output stage inhibit	
	Cause	Measure
	Encoder not connected correctly.	Check the encoder wiring.
	Position encoder inverted or not installed correctly on the track.	Check the installation and connection of the position encoder.
	Motor phases not connected properly.	Check the wiring of the motor.
	Acceleration too high.	– Check the profile values. – Increase the torque limit and/or current limit. – Check the project planning.
	P component of position controller too small.	Increase the P component of the position controller.
	Speed controller parameterized incorrectly.	Check controller parameters.
	Lag error window too small.	Increase the lag error window.
	Supply voltage too low or line phase missing.	Check the supply voltage.

12.8.30 Error 44 Subcomponent power section

Error: 44.2 (2C02hex | 11266dec) Description: Overcurrent phase U		
	Response: Remote – critical fault	
	Cause	Measure
	The connected motor is too large.	Connect a smaller motor.
	Acceleration too high.	Reduce the acceleration.
	A short circuit occurred.	– Remove the short circuit on the motor connection. – Check the motor phases.
	There is a problem with the output filter.	– Activate the output filter during startup of the drive train. – Check assignment of output filter and inverter.
	Output stage defective.	Contact SEW-EURODRIVE Service.

Error: 44.3 (2C03hex | 11267dec) Description: Overcurrent phase V		
	Response: Remote – critical fault	
	Cause	Measure
	The connected motor is too large.	Connect a smaller motor.
	Acceleration too high.	Reduce the acceleration.
	A short circuit occurred.	– Remove the short circuit on the motor connection. – Check the motor phases.
	There is a problem with the output filter.	– Activate the output filter during startup of the drive train. – Check assignment of output filter and inverter.
	Output stage defective.	Contact SEW-EURODRIVE Service.

Error: 44.4 (2C04hex | 11268dec) Description: Overcurrent phase W		
	Response: Remote – critical fault	
	Cause	Measure
	The connected motor is too large.	Connect a smaller motor.
	Acceleration too high.	Reduce the acceleration.
	A short circuit occurred.	– Remove the short circuit on the motor connection. – Check the motor phases.
	There is a problem with the output filter.	– Activate the output filter during startup of the drive train. – Check assignment of output filter and inverter.
	Output stage defective.	Contact SEW-EURODRIVE Service.

12.8.31 Error 45 Fieldbus interface

Error: 45.1 (2D01hex | 11521dec) Description: No response from fieldbus interface		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Fieldbus interface does not start properly and is therefore not functional.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 45.2 (2D02hex | 11522dec)

Description: Fieldbus interface – error

Response: Fieldbus – timeout response

Cause	Measure
Error detected on device-internal connection to fieldbus interface.	– Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 45.3 (2D03hex | 11523dec)

Description: Process output data timeout

Response: Fieldbus – timeout response

Cause	Measure
Timeout in process data transfer during fieldbus communication.	– Check the communication connection between the fieldbus master and the fieldbus interface for interruption. – Check the configuration of the fieldbus master. – Adjust the timeout monitoring of the fieldbus interface.

Error: 45.5 (2D05hex | 11525dec)

Description: Engineering error

Response: Warning

Cause	Measure
Engineering via fieldbus interface no longer works or only works to a limited extent.	– Switch the device off and on again. – Check the network load in the communication network. – Close unneeded engineering connections that are open in parallel (e.g. parameter access via managing EDGE devices, asset management tools, network scanners, etc.). – If the warning occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 45.7 (2D07hex | 11527dec)

Description: Invalid process output data

Response: Fieldbus – timeout response

Cause	Measure
– The fieldbus master sends invalid process output data. – The fieldbus interface has detected an internal failure of the process data exchange and marks the process output data as invalid.	– Check whether the PLC is in "Stop" state. – Restart the PLC. – Check the configuration of the fieldbus master. – In the event of a failure of the internal process data exchange, switch the device off and then on again.

Error: 45.9 (2D09hex | 11529dec) Description: Warning		
	Response: Warning	
	Cause	Measure
	Inverter detected non-critical fault on device-internal connection to fieldbus interface.	– Switch the device off and on again. – If the warning occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 45.50 (2D32hex | 11570dec) Description: Warning		
	Response: Warning with self-reset	
	Cause	Measure
	Fieldbus interface signals a warning.	Observe the warning of the fieldbus interface subcomponent. Identify the exact cause of this warning and take the appropriate measures for elimination.

Error: 45.51 (2D33hex | 11571dec) Description: Error		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface detected an error.	Observe the error code of the fieldbus interface subcomponent. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

Error: 45.52 (2D34hex | 11572dec) Description: Critical error		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface detected a critical error.	Observe the error code of the fieldbus interface subcomponent. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

12.8.32 Error 46 MOVISAFE® CS..A

Error: 46.1 (2E01hex | 11777dec)

Description: MOVISAFE® CS.. safety option no longer responding

Response: Output stage inhibit

Cause	Measure
No synchronization could be performed with the safety option.	– When using a pluggable safety option, check the device assignment of the basic device and the safety option. – When using a pluggable safety option, check the slot and installation of the safety option. – Switch the device off and on again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 46.2 (2E02hex | 11778dec)

Description: Invalid variant

Response: Output stage inhibit

Cause	Measure
Safety option variant does not match inverter type.	Use the correct safety option variant.
In a double axis of the MOVIDRIVE® modular application inverter, only safety options without encoder interface must be used.	Use the correct safety option variant.

Error: 46.3 (2E03hex | 11779dec)

Description: MOVISAFE® CS.. safety option no longer responding

Response: Output stage inhibit with self-reset

Cause	Measure
Communication between inverter and safety option interrupted.	– When using a pluggable safety option, check the installation. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.
Safety option signaled a warning.	– When using a pluggable safety option, check the installation. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 46.50 (2E32hex | 11826dec)

Description: Warning

Response: Warning with self-reset

Cause	Measure
Safety option signaled a warning	Observe the warning of the safety option subcomponent. Identify the exact cause of this warning and take the appropriate measures for elimination.

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Error: 46.51 (2E33hex | 11827dec)		
Description: Error		
	Response: Emergency stop + output stage inhibit with self-reset	
	Cause	Measure
	Safety option detected an error.	Observe the error code of the safety option sub-component. Identify the exact cause of this error message and take the appropriate measures to eliminate the error.

Error: 46.52 (2E34hex | 11828dec)		
Description: System error/data error/critical error		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	The MOVISAFE® CS.. safety option has detected an error.	Open the error status of the safety option in section [Diagnostics] > [MOVISAFE® CS..]. Identify the exact cause of this error message of highest priority and take the appropriate measures to eliminate the error.

12.8.33 Error 51 Analog processing

Error: 51.1 (3301hex | 13057dec)		
Description: Current at analog current input too small		
	Response: Analog input – 4 mA limit undershot	
	Cause	Measure
	Input current at analog input below 4 mA.	– Check the wiring. – Check the parameterization of the analog input.

12.8.34 Error 52 Category 2 explosion protection function

Error: 52.1 (3401hex | 13313dec)		
Description: Startup error		
	Response: Output stage inhibit	
	Cause	Measure
	One or several parameters of the explosion protection function have been changed.	Before activating the function, take the explosion protection function into operation.

Error: 52.2 (3402hex | 13314dec)		
Description: Invalid function activated		
	Response: Output stage inhibit	
	Cause	Measure
	The explosion protection function and the "standstill current" function may not be active at the same time.	Disable the "standstill current" function.

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Error: 52.3 (3403hex | 13315dec) Description: Nominal inverter current too large		
	Response: Output stage inhibit	
	Cause	Measure
	Ratio of nominal inverter current and nominal motor current too large.	Check the assignment of motor and inverter.

Error: 52.4 (3404hex | 13316dec) Description: Parameterization of current limit characteristic faulty		
	Response: Output stage inhibit	
	Cause	Measure
	Error setting parameters for current limit characteristic.	– Perform startup again. – If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Error: 52.5 (3405hex | 13317dec) Description: Time duration exceeded for f < 5 Hz		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The rotating field frequency must not be below 5 Hz for longer than 60 s. This time period has been exceeded.	– Check the project planning. – Make sure that work is not performed below 5 Hz for a longer period of time. – Check behavior in idle state. For instance, activate the "FCB 01 output stage inhibit" drive function for position hold control on the device.

12.9 Device replacement

12.9.1 Note

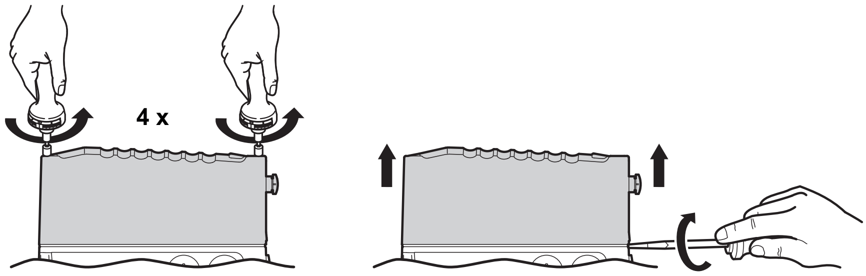
INFORMATION

When activating the delivery state of devices with the option /P (customer-specific parameter set), parameter settings are implemented that deviate from the default delivery state set by SEW-EURODRIVE.

12.9.2 Replacing the electronics cover

Replace the electronics cover as follows:

1. Observe the safety notes in chapter "Creating a safe working environment" (→ 🗎 15).
   ⇨ Make sure the device is de-energized. The 400 V line voltage and the 24 V backup voltage must be disconnected.
2. Loosen the screws and remove the electronics cover from the connection box.



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3. Compare the data on the nameplate of the previous electronics cover with the data on the nameplate of the new electronics cover.

INFORMATION

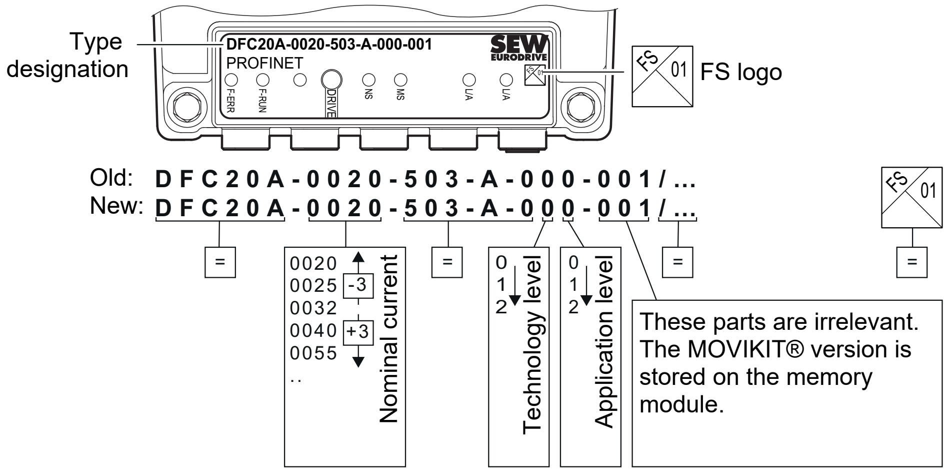
Always replace the electronics cover with an electronics cover with the same type designation.

It is permitted to use an electronics cover with a nominal output current that is up to 3 times higher or lower than the value of the old electronics cover.

- However, if you use an electronics cover with a higher nominal output current, the power at the output shaft will not be increased.
- When you use an electronics cover with a lower nominal output current than the old electronics cover, the power at the output shaft may no longer be high enough to meet the requirements.

INFORMATION

In safety-related applications, replace an electronics cover only with an electronics cover with the same FS logo.



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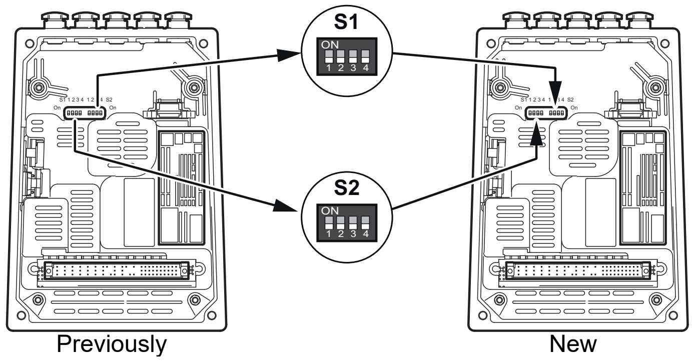
4. Set all the control elements (e.g. DIP switches; see chapter "Startup" (→ 🗎 325)) on the new electronics cover in the same way as the control elements of the previous electronics cover.



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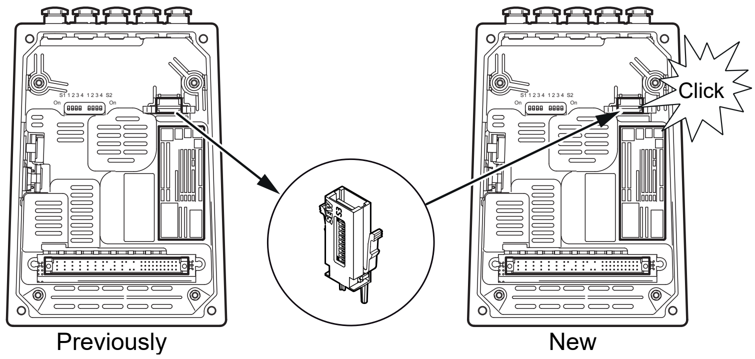
5. Remove the replaceable memory module from the old electronics cover. Insert the replaceable memory module in the new electronics cover.



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6. Place the new electronics cover onto the connection box and screw it in place.

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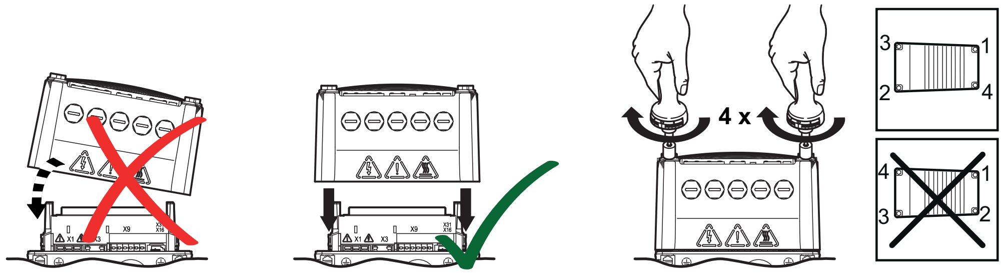

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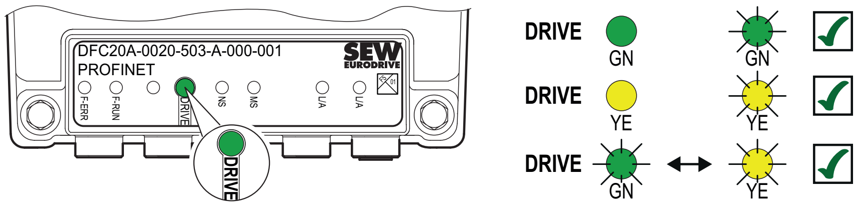
7. Supply the device with voltage.
8. Check the functionality of the new electronics cover.



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9. If the device contains an optional safety card, a safety acknowledgment may be required. This acknowledgment cancels the start inhibit on the safety card.

12.9.3 Replacing the memory module

Replace the memory module as follows:

1. Observe the safety notes in chapter "Creating a safe working environment" (→ 🗎 15).
   ⇨ Make sure the device is de-energized. The 400 V line voltage and the 24 V backup voltage must be disconnected.
2. Loosen the screws and remove the electronics cover from the connection box.
3. Remove the memory module from the old electronics cover.
4. Compare the part number and the status of the memory module.

INFORMATION

The new memory module must have the same part number and the same (or a higher) status as the old memory module.

5. Set the DIP switches on the new memory module in the same way as the control elements of the previous memory module.
6. Insert the new memory module into the electronics cover.
7. Place the electronics cover onto the connection box and screw it in place.
8. Supply the device with voltage.
9. Check the startup of the device.
   ⇨ If required, perform startup again or load a saved startup into the device.
   ⇨ For devices with safety card, check the startup of the safety card. For further information, refer to the product manual > chapter "Project planning for functional safety" > "Safety conditions" > "Startup requirements".
10. Check the functionality of the new electronics cover.

If the device was ordered with the option /P "Parameters ex works", the customer-specific parameter set is saved on the supplied memory module upon delivery.

When ordering a new memory module using the part number, no data set is stored on the memory module.

- Start up the device manually.
- As an alternative, start up the device with a previously saved data set.

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12.9.4 Replacing the drive unit

Replace the drive unit as follows:

1. Observe the safety notes in chapter "Creating a safe working environment" (→ 🗎 15).
2. If a guard bracket is installed on the old drive unit then the guard bracket is also used for transport.
   If no guard bracket is installed on the old drive unit, install the lifting eye on the drive unit, see "Service" > "Device replacement" > "Installing the lifting eye" (→ 🗎 450) chapter.
3. Remove the drive unit. Observe the "removal notes" in chapter "Mechanical installation".
4. Compare the data on the nameplates of the old drive unit with the data on the nameplates of the new drive unit.

INFORMATION

Always replace the drive unit with a drive unit that has the same properties.

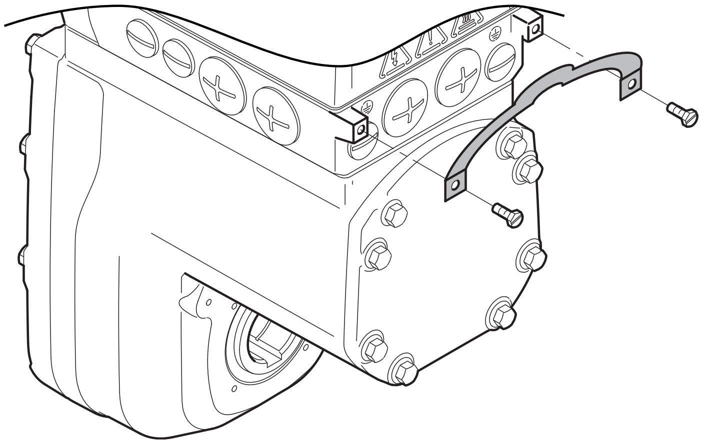
In safety-related applications, replace a drive unit only with a drive unit with the same FS logo.

5. Mount the drive unit. Observe chapter "Mechanical installation" (→ 🗎 195).
6. If a lifting eye is installed on the new drive unit, remove the lifting eye from the drive unit. Store the lifting eyes for future service work.
7. If a guard bracket is enclosed with the new drive unit, install the guard bracket on the drive unit using 2 screws (tightening torque: 2.0 to 2.4 Nm).
8. Perform the installation according to chapter "Electrical installation" (→ 🗎 229).
9. Set all the control elements (e.g. DIP switches, see chapter "Startup" (→ 🗎 325)) on the new electronics cover in the same way as the controls of the previous electronics cover.
10. Remove the memory module from the old electronics cover. Insert this memory module in the new electronics cover.
11. Place the electronics cover onto the connection box and screw it in place.
12. Supply the drive with voltage.
13. Check whether the new drive unit is functioning properly.

12.9.5 Installing the lifting eyes

Install the lifting eye as follows:

1. Remove the PE connection cable.
2. Install the lifting eye for transportation as depicted in the following image:



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12.10 SEW-EURODRIVE Service

12.10.1 Sending in a unit for repair

If a fault cannot be repaired, contact SEW-EURODRIVE Service, see chapter "Contacting SEW-EURODRIVE" (→ 🗎 468).

Always specify the digits of the status label when contacting the SEW-EURODRIVE electronics service team. This will enable our Service personnel to assist you more effectively.

Provide the following information when sending the device in for repair:

- Serial number (see nameplate)
- Type designation
- Unit design
- Short description of the application (application, control type, etc.)
- Type of fault
- Accompanying circumstances
- Your own presumptions
- Unusual events preceding the problems, etc.

12.11 Shutdown

⚠ WARNING

Risk of burns due to hot surfaces.

Severe injuries.

- Let the devices cool down before touching them.

⚠ WARNING

Electric shock caused by dangerous voltages in the connection box. Dangerous voltages can still be present for up to 5 minutes after disconnection from the power supply system.

Severe or fatal injuries.

- Before removing the electronics cover, de-energize the device via a suitable external disconnection device.
- Secure the device against unintended re-connection of the voltage supply.
- Secure the output shaft against rotation.
- Wait for at least the following time before removing the electronics cover: **5 minutes**

To shut down the device, de-energize the device using appropriate measures. Disconnect the 400 V line voltage and the 24 V backup voltage from the device.

12.12 Storage

Observe the following information when shutting down or storing the device:

- If you shut down and store the device for a longer period, you must close open cable bushings and cover contacts with protection caps.
- Make sure that the device is not subject to mechanical impact during storage.
- Observe the information on the storage temperature in the "PxG® integrated.." catalog.

12.13 Extended storage

12.13.1 Drive

NOTICE

Volatilization of the VCI anti-corrosion agent

Damage to property.

- Drive units must be kept tightly closed until they are started up.

INFORMATION

For storage periods longer than 9 months, SEW-EURODRIVE recommends the "Extended storage" design. Drive units in this design are designated with a corresponding label.

The lubricant of those drive units is then mixed with a VCI anti-corrosion agent (**v**olatile **c**orrosion **i**nhibitors). Note that this VCI anti-corrosion agent is only effective in a temperature range of -25 °C to +50 °C. The shaft ends are also treated with an anti-corrosion agent. Drive units of the "extended storage" design are equipped with OS2 surface protection without further notice. Instead of OS2, you can order OS3. For further information refer to chapter "Surface protection".

12.13.2 Storage conditions

Observe the storage conditions listed in the following table with respect to extended storage:

Climate zone	Packaging[1)]	Storage location[2)]	Storage period
Temperate (Europe, USA, Canada, China and Russia with the exception of tropical areas)	Packaged in containers, with desiccant and moisture indicator sealed in the plastic wrap.	Under roof, protection against rain and snow, vibration-free.	Up to 3 years with regular checks of the packaging and moisture indicator (relative humidity < 50%).
	Open	Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity). No sudden temperature fluctuations and controlled ventilation with filter (free of dirt and dust). No aggressive vapors or shocks.	2 years or more with regular inspections. Check for cleanness and mechanical damage during the inspection. Check that the corrosion protection is intact.

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Climate zone	Packaging[1]	Storage location[2]	Storage period
Tropical (Asia, Africa, Central and South America, Australia, New Zealand with the exception of temperate areas)	Packaged in containers, with desiccant and moisture indicator sealed in the plastic wrap. Protected against insect damage and mildew by chemical treatment.	Under roof, protection against rain, vibration-free.	Up to 3 years with regular checks of the packaging and moisture indicator (relative humidity < 50%).
	Open	Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity). No sudden temperature fluctuations and controlled ventilation with filter (free of dirt and dust). No aggressive vapors or shocks. Protected against insect damage.	2 years or more with regular inspections. Check for cleanness and mechanical damage during the inspection. Check that the corrosion protection is intact.

1) The packaging must be carried out by an experienced company using the packaging materials that have been explicitly specified for the particular application.
2) SEW-EURODRIVE recommends storing the drive according to the mounting position.

12.14 IT security guidelines for secure waste disposal

12.14.1 Removing the product from its intended environment

If the data stored on the product is considered relevant for IT security, remove it as described in the section "Secure removal of data stored in the product." (→ 🗎 454)

12.14.2 Removing reference and configuration data in the environment

Reference files, configuration files, log files, and other data belonging to the product can be stored in the environment on other devices, such as a higher-level controller or a local OPC-UA client. If the stored data is considered relevant for IT security, remove it from the corresponding devices.

12.14.3 Secure removal of data stored in the product

You can reset the data saved in the product to the factory settings using the MOVISUITE® engineering software.

This encompasses the following data, if present on the device variant:

- Configuration of the device
- Scope recording of the device
- Fault memory
  - Error number
  - Timestamp
  - Error code, sub-error code, description text
  - Process data
  - States of the digital inputs/outputs
  - Control word and status word
- Device name
- IP address
- Safety-relevant data

The following data is not reset during this procedure and can be modified individually, if it is present in the device variant:

- Function activations
- AS-Interface address
- Data set of the safety option
- EtherCAT®device designation
- PROFINET name
- Last detected options

12.14.4 Removing a customer data backup

You can delete a customer data backup using the MOVISUITE® engineering software. To do so, in the parameter configuration of the corresponding device under [Basic setting] > [Data backup] > [Backup of customer-specific device parameters] click the [Delete] button.

Some of the data of the product is stored on removable storage media. If the data on the removable storage medium is classified as sensitive data from the operator's point of view and is not intended for later use, reset the device to the factory settings before disposing of the data. This also deletes the storage medium content.

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12.15 Waste disposal

Dispose of the product and all parts separately in accordance with their material structure and the national regulations. Put the product through a recycling process or contact a specialist waste disposal company. If possible, divide the product into the following categories:

- Iron, steel or cast iron
- Stainless steel
- Magnets
- Aluminum
- Copper
- Electronic parts
- Plastics

The following materials are hazardous to health and the environment. These materials must be collected and disposed of separately:

- Oil and grease

  Collect used oil and grease separately according to type. Ensure that the used oil is not mixed with solvent. Dispose of used oil and grease correctly.
- Screens
- Capacitors

Waste disposal according to WEEE Directive 2012/19/EU

This product and its accessories may fall within the scope of the country-specific application of the WEEE Directive. Dispose of the product and its accessories according to the national regulations of your country.

For further information, contact the responsible SEW-EURODRIVE branch or an authorized partner of SEW-EURODRIVE.

13 Inspection and maintenance

13.1 Determining the operating hours

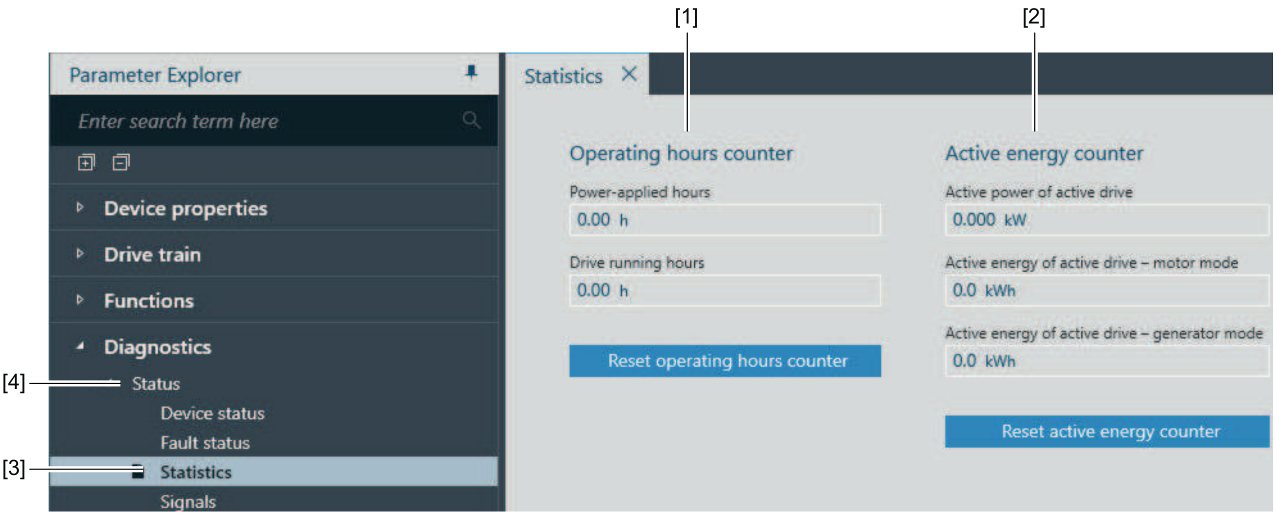
13.1.1 About MOVISUITE®

The device can read out the operating hours so you can plan inspection and maintenance work more easily.

To determine the operating hours performed, proceed as follows:

1. In MOVISUITE®, open the parameter tree of the device.
2. In the parameter tree, select the "Status" node [4].

⇨ The **operating hours** performed can be found in the "Statistics" [3] group.



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[1] Display of operating and drive running hours performed
[2] Display of active power and active energy

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13.2 Inspection and maintenance intervals

The following table shows the inspection and replacement intervals for the drive units:

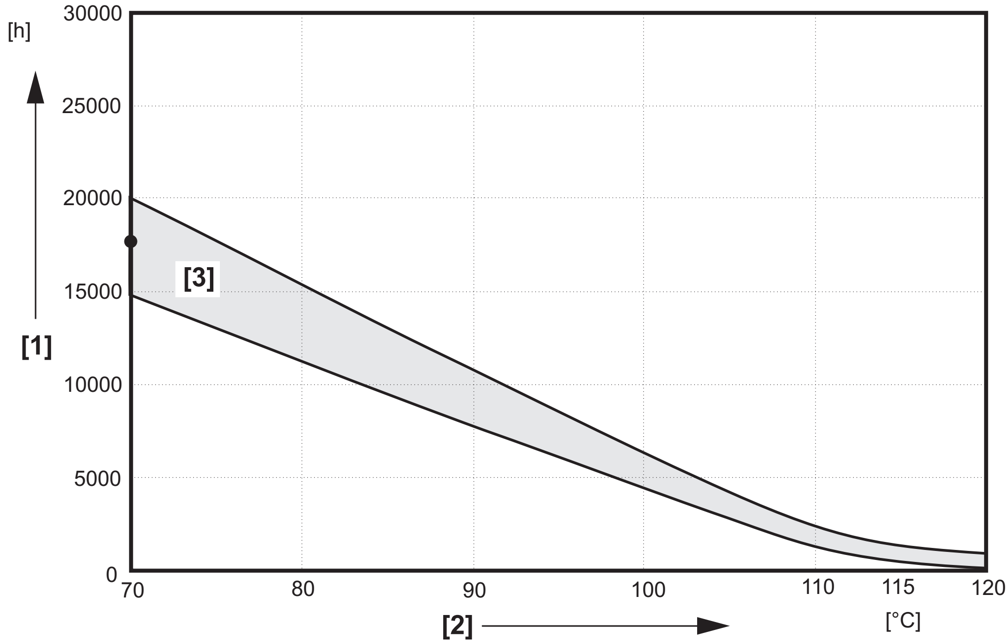
Time interval	What should I do?	Who is permitted to perform the work?
Every 3000 operating hours, at least every 6 months	Check running noise for possible bearing damage	Specialists at customer site
	In the event of bearing damage: Have the bearing replaced by the SEW-EURODRIVE Service team or specialists trained by SEW-EURODRIVE	SEW-EURODRIVE Service
		Qualified specialists trained by SEW-EURODRIVE
	Visual inspection of the seals for leakage:	Specialists at customer site
	• In the event of leakage of the oil seal at the output end: Change the oil seal	Specialists at customer site
	• In the event of leakage at other locations:	
	– Replace the drive unit	Specialists at customer site
	– Recommendation: Contact SEW-EURODRIVE Service.	SEW-EURODRIVE Service
	For gear units with a torque arm: Check the rubber buffer and replace if damaged	Specialists at customer site
Every 20 000 operating hours[1)]	Have the motor inspected by the SEW-EURODRIVE Service team or specialists trained by SEW-EURODRIVE.	SEW-EURODRIVE Service
		Qualified specialists trained by SEW-EURODRIVE
The drive units are equipped with lubrication for life. The oil must be changed at least once every 5 years depending on the operating conditions and oil temperature (see product manual > chapter "Lubricant change intervals).	Change synthetic oil	Specialists at customer site
	Replace the oil seal at the output end (do not install it in the same track as the previous oil seal)	Specialists at customer site

Time interval	What should I do?	Who is permitted to perform the work?
When the cover/electronics cover is opened after an operating period of ≥ 6 months	When the cover/electronics cover is opened after an operating period of ≥ 6 months, the gasket between the connection box and the cover/electronics cover must always be replaced. The 6-month period can be shortened by harsh ambient/operating conditions, e.g. cleaning with aggressive chemicals or frequent temperature variations.	Specialists at customer site
Each time the cover/electronics cover is opened	Visual inspection of the gasket between connection box and cover/electronics cover: The gasket must be replaced in the event of damage.	Specialists at customer site
Varies (depending on external factors)	Touch up or renew the surfaces/corrosion protection coating	Specialists at customer site
	In order to prevent water deposits from accumulating in the B-side safety cover, it must be cleaned at regular intervals.	Specialists at customer site

1) Wear times are influenced by many factors. The system manufacturer must calculate the required inspection and maintenance intervals individually in accordance with the project planning documents.

13.3 Lubricant change intervals

The following figure shows the lubricant change intervals for normal ambient conditions. In case of severe/aggressive ambient conditions, the lubricant must be changed more frequently:



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[1] Operating hours
[2] Sustained oil bath temperature
[3] CLP HC
• Average value per oil type at 70 °C

13.4 Inspection and maintenance work

13.4.1 Preliminary work regarding inspection and maintenance

Carry out the following steps before all inspection and maintenance work:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages in the connection box. Severe or fatal injuries.
   De-energize the device. Pay attention to the 5 safety rules in chapter "Carrying out electrical work safely". Afterwards, wait 5 minutes.
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
3. Secure the output shaft of permanently excited motors against rotation. You thereby avoid an electric shock from the regenerative operation during the rotation of the shaft.

13.4.2 Changing the oil

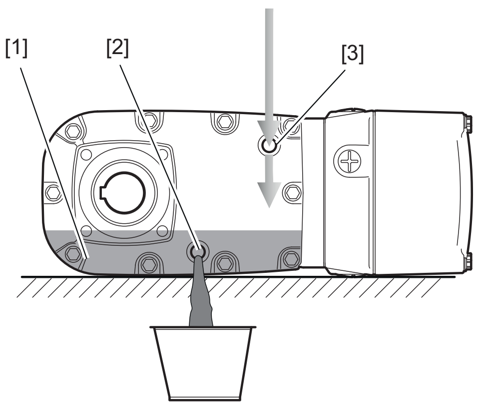
Draining the oil

The gear unit cover may only be opened by the SEW-EURODRIVE Service team or specialists trained by SEW-EURODRIVE.

1. Perform the steps according to chapter "Preliminary work regarding inspection and maintenance" (→ 🗎 459).
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injury.
   Let the device cool down sufficiently before touching it.
   ⇨ However, the gear unit must still be warm, otherwise the low flowability of excessively cold oil will make it more difficult to drain the oil correctly.
3. Remove the drive unit from the system. Otherwise an oil change is not possible.
4. SEW-EURODRIVE recommends draining the oil at the position shown in the figure below.
5. Place a sufficiently large container underneath the drain hole [2].
6. ⚠ **WARNING!** Risk of burns due to hot gear unit oil. Severe injury.
   Let the device cool down sufficiently before touching it.
7. Remove the lowest screw plug [2] or the breather valve installed there (depends on the mounting position used according to the mounting position sheet).
8. The oil draining procedure is facilitated if you remove the upper screw plug [3] or the breather valve that is screwed into the hole (air flows inwards).
9. Drain the oil. All of the residual material [1] that is left in the drive must be extracted by using a suitable device.

Recommended position

The following figure shows the position recommended for draining the oil:



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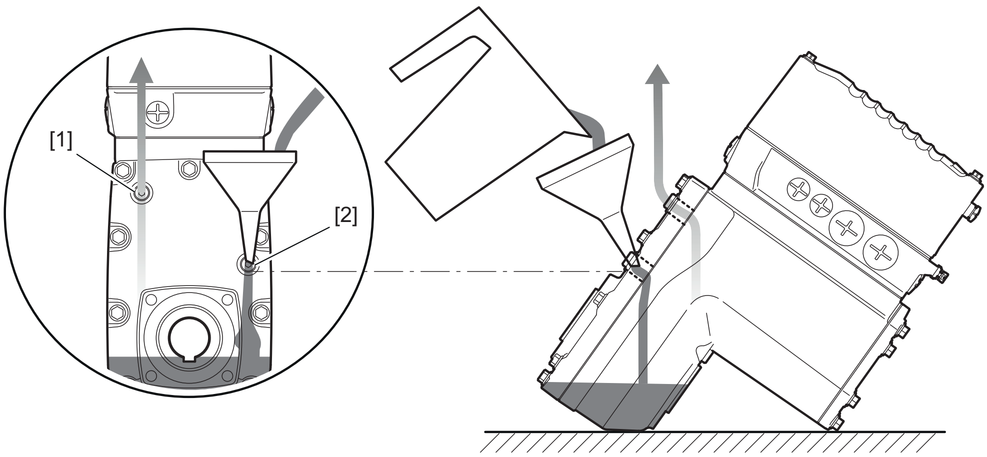
Filling in the oil

The gear unit cover may only be opened by the SEW-EURODRIVE Service team or specialists trained by SEW-EURODRIVE.

1. Perform the steps described in the chapter "Preliminary work for inspection and maintenance" (→ 🗎 459).
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injury.
   Let the device cool down sufficiently before touching it.
   ⇨ However, the gear unit must still be warm, otherwise the high viscosity of excessively cold oil will make it more difficult to fill in the oil correctly.
3. SEW-EURODRIVE recommends filling in the new oil at the position shown in the figure below.
4. **NOTICE!** Filling in the wrong oil may result in significantly different lubricant characteristics. Damage to property.
   Do not mix different synthetic lubricants and do not mix synthetic lubricants with mineral lubricants! As standard lubricant use synthetic oil. Fill in new oil of the same grade via the lower bore [2].
   ⇨ The oil viscosity and type (synthetic) that are to be used are determined by SEW-EURODRIVE specifically for each order. This information is noted in the order confirmation and on the drive unit's nameplate.
   ⇨ It is easier to fill in the oil when you also remove the upper breather plug [1] or breather valve installed there (air can flow out).
   ⇨ For the required oil quantity, refer to the information on the nameplate or, depending on the mounting position, the product manual > chapter "Lubricant fill quantities" (→ 🗎 89).
5. Re-insert the screw plug and the breather valve. The position of the breather valve depends on the mounting position of the drive unit. Observe the mounting position sheet in the product manual > chapter "Mounting positions" (→ 🗎 86).
6. Touch up or renew the surface/corrosion protection coating.

Recommended position

The following figure shows the position recommended for filling in the new oil:



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13.4.3 Replacing the output oil seal

1. Perform the steps according to chapter "Preliminary work regarding inspection and maintenance" (→ 🗎 459).
2. Remove the drive unit from the system.
3. **NOTICE!** If oil seals are below 0 °C, they can be damaged during assembly. Damage to property.
   Store oil seals at an ambient temperature above 0 °C. If necessary, warm up the oil seals prior to assembly. When changing the oil seal, ensure that there is a sufficient grease reservoir between the dirt lip and sealing lip, depending on the design used.
   - ⇨ When using double oil seals, fill one-third of the gap with grease.
   - ⇨ The oil seal must not be reinstalled on the same track.
4. Touch up or renew the surface/corrosion protection coating.

13.4.4 Painting the drive unit

If necessary, paint the drive unit as follows:

1. Perform the steps according to chapter "Preliminary work regarding inspection and maintenance".
2. Clean the surface of the drive unit.
   - ⇨ Make sure that the surface of the drive unit is free of grease.
3. **NOTICE!** Breather valves and oil seals might be damaged when painting or repainting. Damage to property.
   Thoroughly cover the breather valves and sealing lip of the oil seals with strips.
4. Paint the drive unit.
5. Remove the designation strips.

13.4.5 Cleaning the drive unit

Observe the following notes:

- Excessive dirt, dust or chips can have a negative impact on the function of drive units and might even cause them to fail.
- It is therefore important to clean the drive unit at regular intervals, at the latest after one year. This allows you to achieve sufficient heat dissipation.
- Insufficient heat dissipation can have unwanted consequences. The service life of bearings is reduced by operation at impermissibly high temperatures (bearing grease degrades).

13.4.6 Connection cables

Check the connection cables for damage at regular intervals. If the connection cables are damaged, replace them.

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13.4.7 Replacing the gasket between connection box and electronics cover

Spare part kit

The gasket is available as a spare part (1, 10 or 50 pieces) from SEW-EURODRIVE.

Content	Part number of gasket MOVIGEAR® performance MGF..2-..-C MGF..4-..-C MGF..4-..-C/XT
1 piece	18187765
10 pieces	28266161
50 pieces	28266188

Steps

NOTICE

Loss of the guaranteed degree of protection.

Damage to property.

- When the cover is removed from the connection box, the cover and the wiring space must be protected from humidity, dust or foreign particles.

Replace the gasket of the MOVIGEAR® performance as follows:

1. Perform the steps described in the chapter "Preliminary work for inspection and maintenance" (→ 🗎 459).

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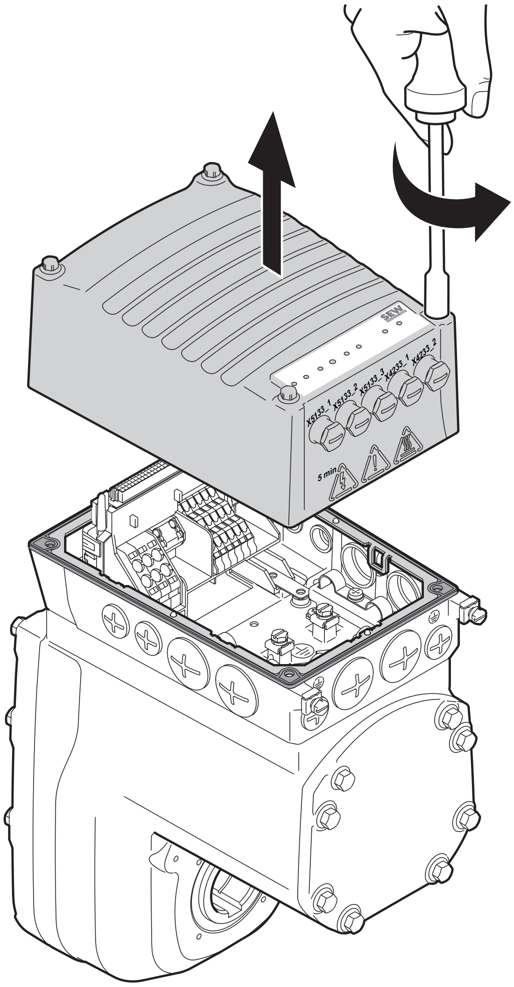
2. Loosen the screws of the electronics cover and remove it.



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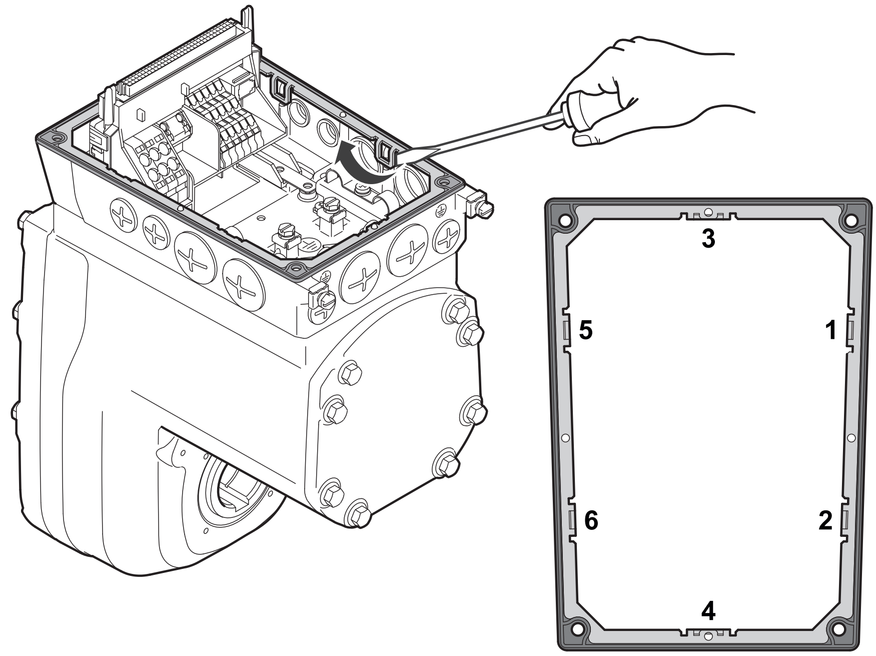
3. **NOTICE!** Loss of the guaranteed degree of protection. Damage to property. Make sure that the sealing surfaces are not damaged when removing the gasket .
   Loosen the used gasket by levering it off the retaining cams.
   ⇨ Disassembly is easier if you adhere to the sequence shown in the following figure.



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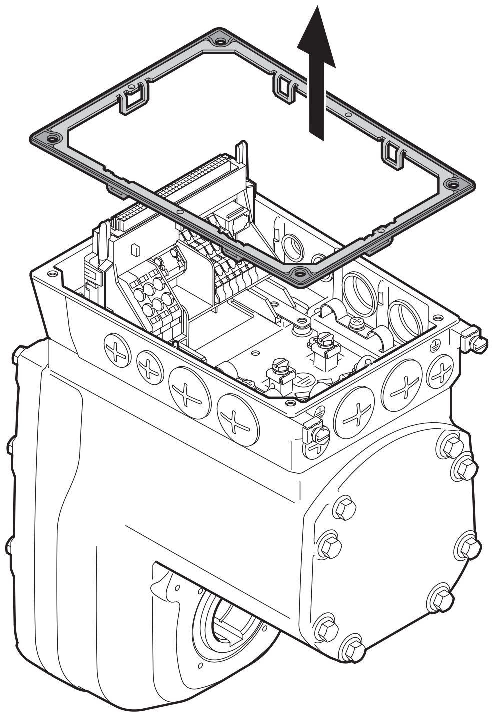
4. Remove the old gasket completely from the connection box.



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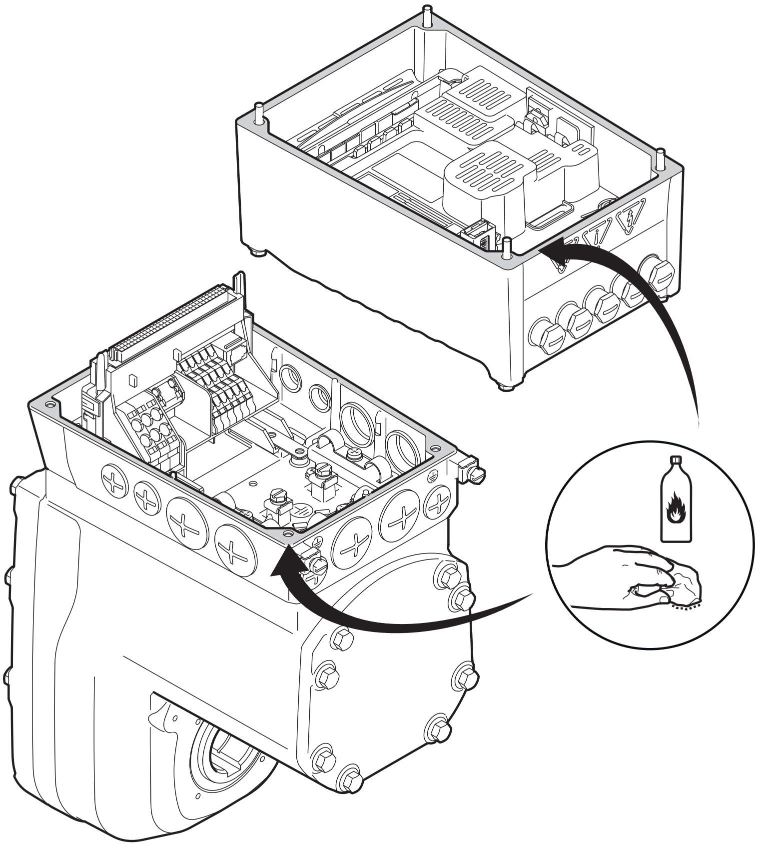
5. ⚠ **CAUTION!** Risk of injury due to sharp edges. Cutting injuries. Use protective gloves when cleaning. Ensure that work is carried out by trained specialists only.
   Carefully clean the sealing surfaces of the connection box and the electronics cover.



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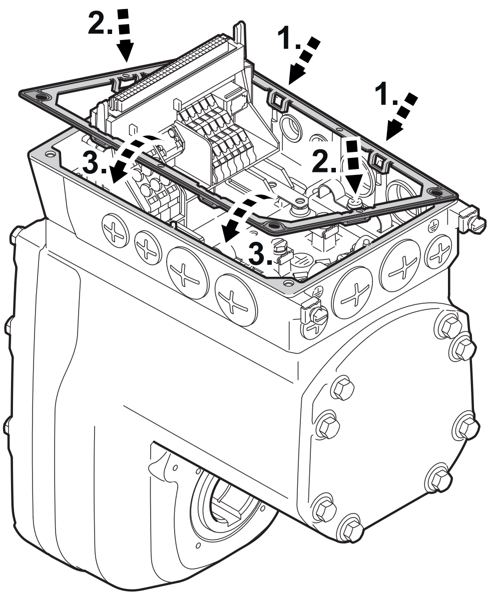
6. Place the new gasket on the connection box and fix it with the retaining cams. Installation is facilitated if you follow the illustrated order.



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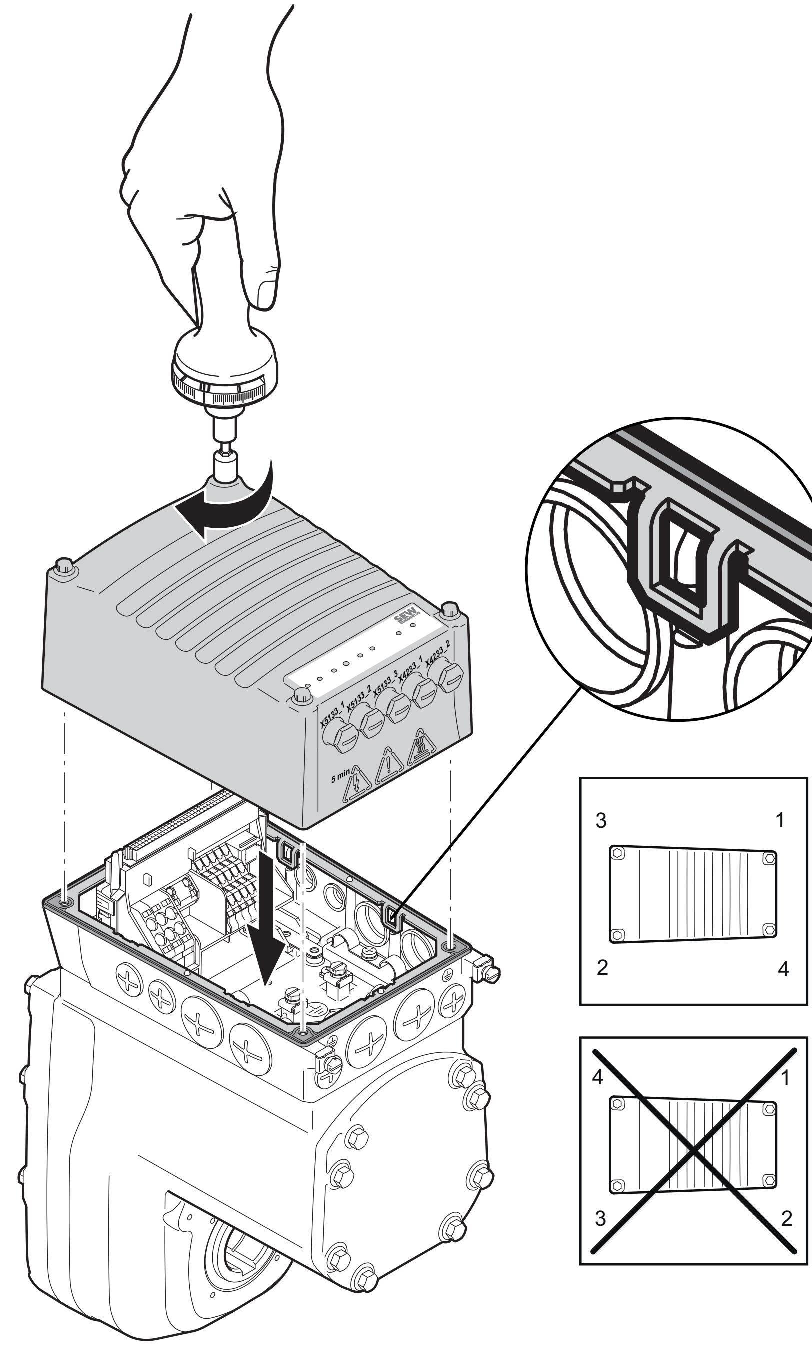
7. Check the installation and startup of the drive unit based on the applicable operating instructions.
8. Place the electronics cover back onto the connection box and secure it.
   ⇨ Pay attention to the following procedure when screwing on the MOVIGEAR® electronics cover: Insert/screw in the screws and tighten them **step by step** in diametrically opposite sequence with a tightening torque of 6.0 Nm.



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14 Contacting SEW-EURODRIVE

You can find the worldwide contact data and locations on the **SEW-EURODRIVE website** via the following link or the QR code shown below.

https://www.sew-eurodrive.de/contacts-worldwide

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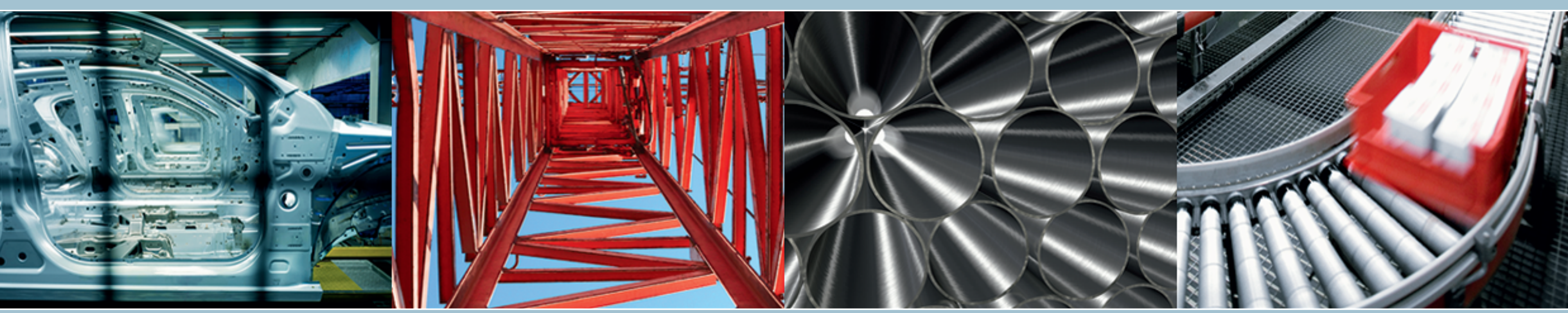

SEW EURODRIVE

SEW-EURODRIVE GmbH & Co KG
Ernst-Blickle-Str. 42
76646 BRUCHSAL
GERMANY
Tel. +49 7251 75-0
Fax +49 7251 75-1970
sew@sew-eurodrive.com
→ www.sew-eurodrive.com