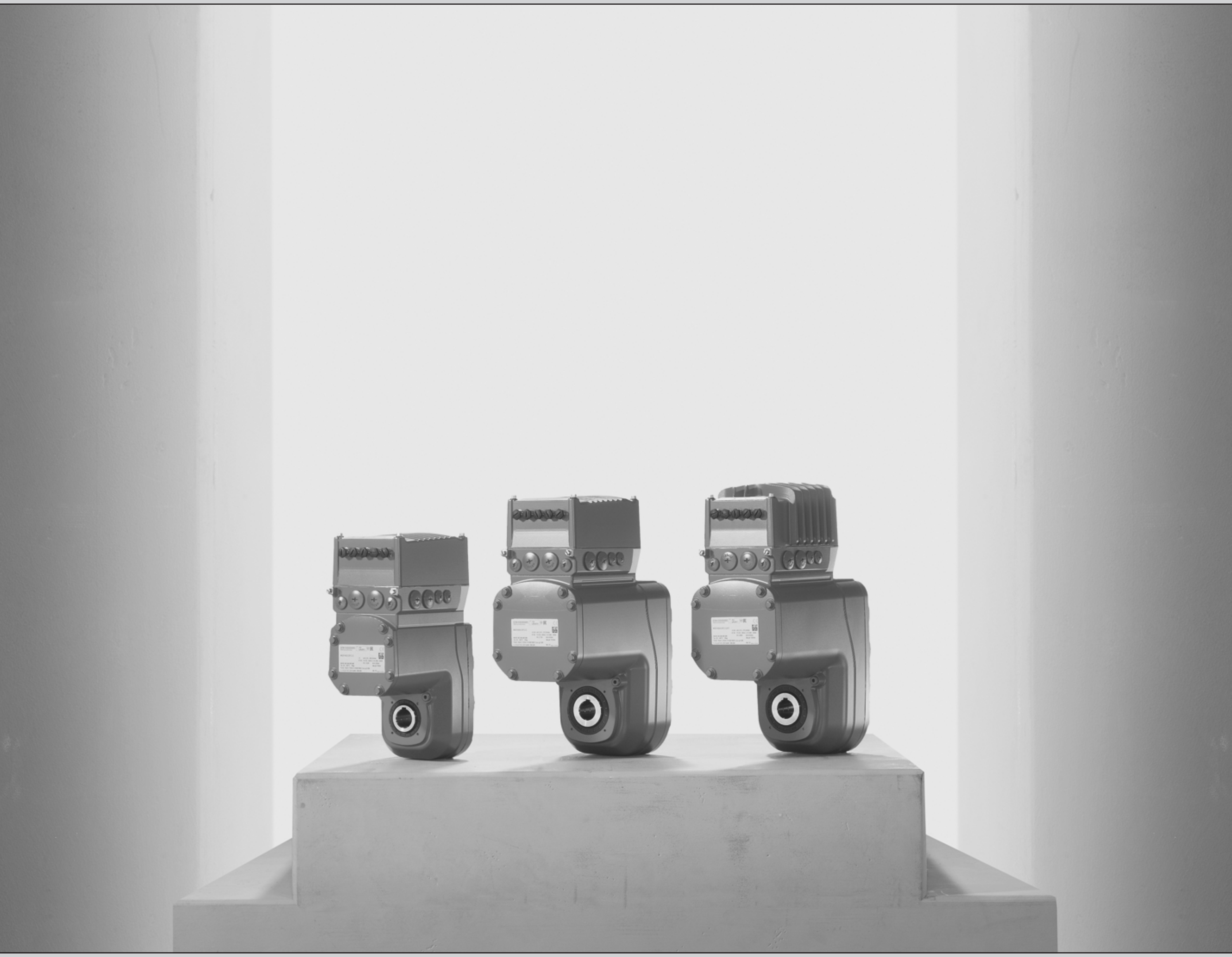
Operating Instructions



Mechatronic Drive Unit

MOVIGEAR® performance

MGF..-DBC-C (Binary)

Edition 10/2019

25887939/EN

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1 General information

1.1 About this documentation

The current version of the documentation 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

Observe the corresponding documentation for all further components.

1.3 Structure of the safety notes

1.3.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible 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.	

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.

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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

1.3.3 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

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

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.

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1.6 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.7 Copyright notice

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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:

- National and regional safety and accident prevention regulations
- Warning and safety signs on the product
- All other relevant project planning documents, installation and startup instructions, and wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and conditions

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.

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 who possess the following qualifications:

- Qualification in the mechanical area 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 who possess the following qualifications:

- Qualification in the electrotechnical area in accordance with the national regulations
- Familiarity with this documentation

Additional qualification

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 transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the instruction is to give persons the ability to perform the required tasks and work steps in a safe and correct manner.

2.4 Designated use

The product is intended for installation in electrical plants 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 the 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.

2.4.1 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 Functional safety technology

The product must not perform any safety functions without a higher-level safety system, unless explicitly allowed by the documentation.

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2.6 Transportation

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product is damaged, it must not be assembled, installed or started up.

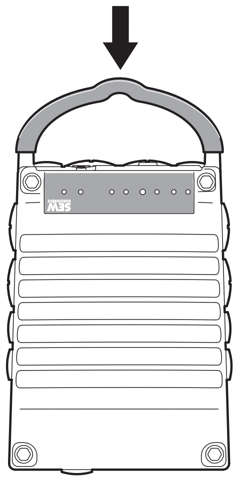
Observe the following notes when transporting the device:

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

If necessary, use suitable, sufficiently dimensioned handling equipment.

Observe the information on climatic conditions in the chapter "Technical data" of the documentation.

The following figure shows the position of the lifting eye.



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Remove the lifting eye before connecting the PE cable, see chapter "Electrical installation" > "Installation instructions".

Store the lifting eyes for future service work, see chapter "Service" > "Unit replacement".

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2.7 Installation/assembly

Ensure that the product is installed and cooled according to the regulations in the documentation.

Protect the product from strong mechanical strain. The product and its mounting parts must never protrude into the path of persons or vehicles. Ensure that components are not deformed and insulation spaces are not changed, particularly during transportation and handling. Electric components must not be mechanically damaged or destroyed.

Observe the notes in chapter Mechanical installation in the documentation.

2.7.1 Restrictions of use

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

- Use in potentially explosive atmospheres
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation
- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1
- 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 the line voltage is considered according to the data in chapter Technical data in the documentation.
- Above 2000 m above sea level, the air and creeping distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level, limiting measures must be taken which reduce the line side overvoltage from category III to category II for the entire system.
- If a protective electrical separation (in accordance with EN 61800-5-1 and EN 60204-1) is required, then implement this outside the product at altitudes of more than 2000 m above sea level.

2.8 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. To ensure protective separation, all connected circuits must also meet the requirements for protective separation.

2.9 Electrical installation

Ensure that all of the required covers are correctly attached after carrying out the electrical installation.

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

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2.9.1 Stationary application

Necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	• Ground connection

2.9.2 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.

2.10 Startup/operation

Observe the safety notes in the chapters Startup and Operation in this documentation.

Make sure the connection boxes are closed and screwed before connecting the supply voltage.

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

When the device is switched on, dangerous voltages are present at all power connections as well as at any connected cables and terminals. This also applies even when the product is inhibited and the motor is at standstill.

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. Eliminating the cause of the problem or performing a reset may result in the drive restarting automatically. If, for safety reasons, this is not permitted for the drive-controlled machine, first disconnect the product from the supply system and then 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.

2.11 Magnetic fields

The device contains permanent magnets that create strong magnetic fields even when de-energized. Magnetic fields may pose a health risk. This especially applies to persons with active medical implants. During operation, additional electromagnetic fields are generated.

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Observe DGUV (German Social Accident Insurance) regulation 15 – "Electromagnetic fields" for use in industrial workplaces. In other countries, the corresponding national and local regulations and provisions must be complied with.

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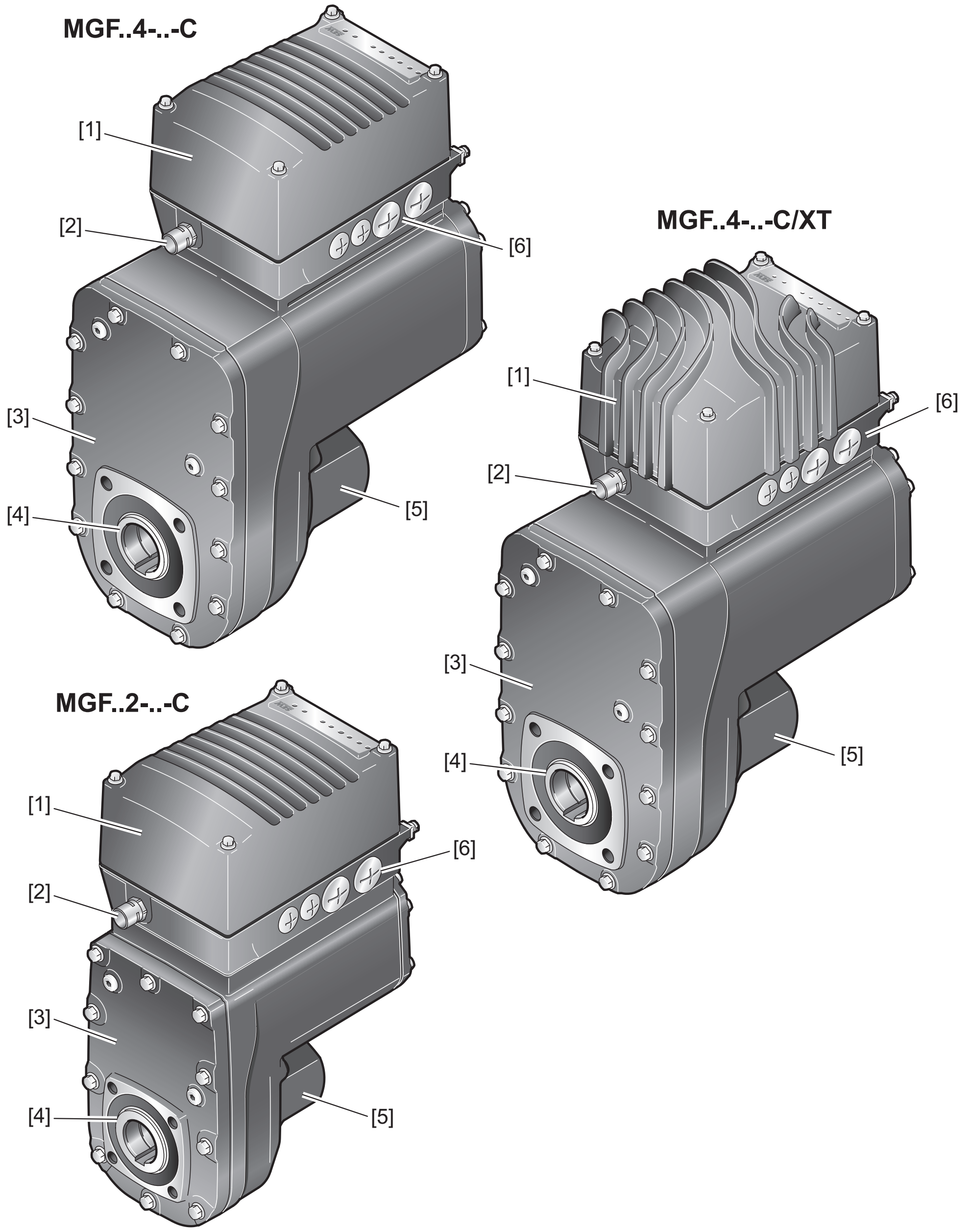
3 Unit structure

3.1 Drive unit MOVIGEAR® performance

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



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[1] Electronics cover
[2] Option /PE (pressure compensation fitting electronics)
[3] Gear unit cover
[4] Output shaft variant (pictured here: hollow shaft with keyway)
[5] Optional safety cover
[6] Connection box for cable glands

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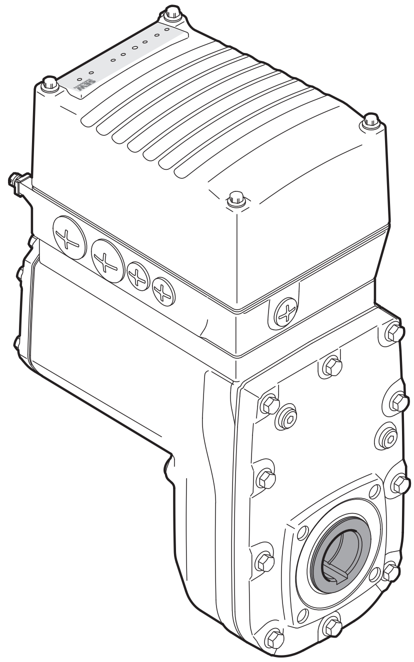
3.2 Shaft designs

MOVIGEAR® performance is available with the following shaft variants:

3.2.1 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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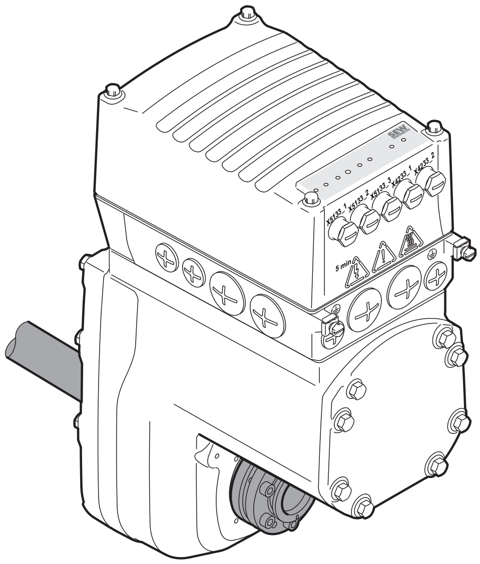
3.2.2 MOVIGEAR® performance with TorqLOC® hollow shaft mounting system (MGFT..-..-C)

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



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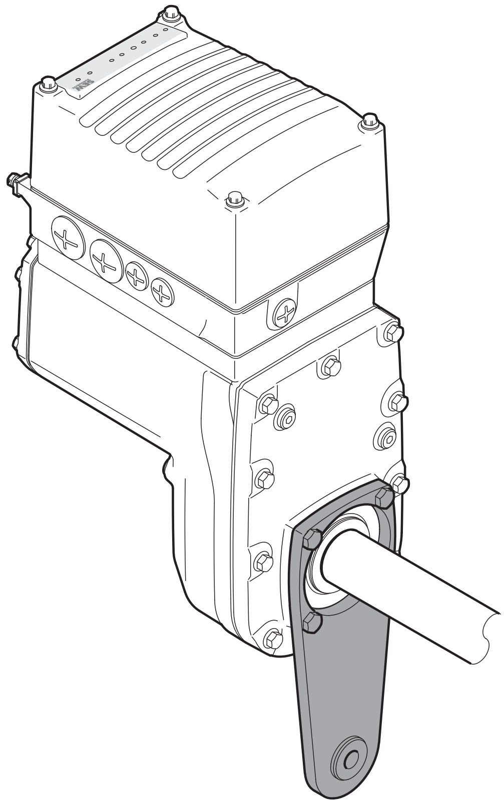
3.3 Mounting the housing

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

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



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

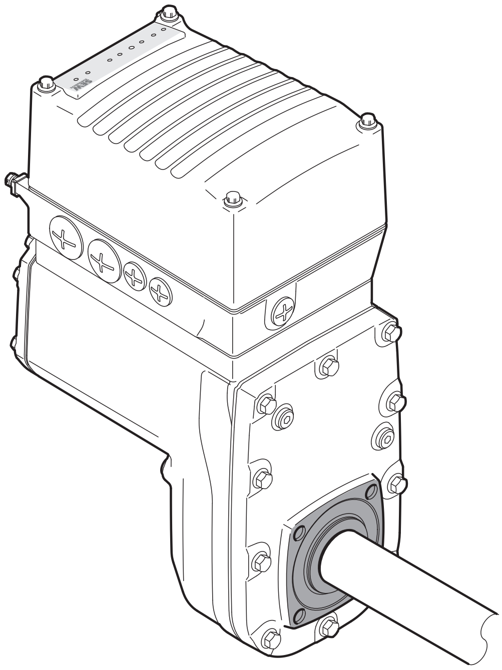
⚠ WARNING

Improper installation of the drive unit without torque arm.

Severe or fatal injuries.

- Only mount the drive units to the plant structure together with a torque arm. Installation without a torque arm is not permitted.

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



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3.4 Threads for protective cover

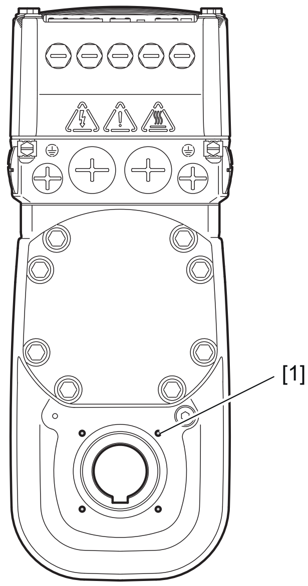
NOTICE

Impermissible use of the threads.

Damage to the drive unit.

- The threads may only be used for other applications after consultation with SEW-EURODRIVE.
- SEW-EURODRIVE assumes no guarantee or liability for resulting product damages.

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



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[1] Threads for protective cover (5×)

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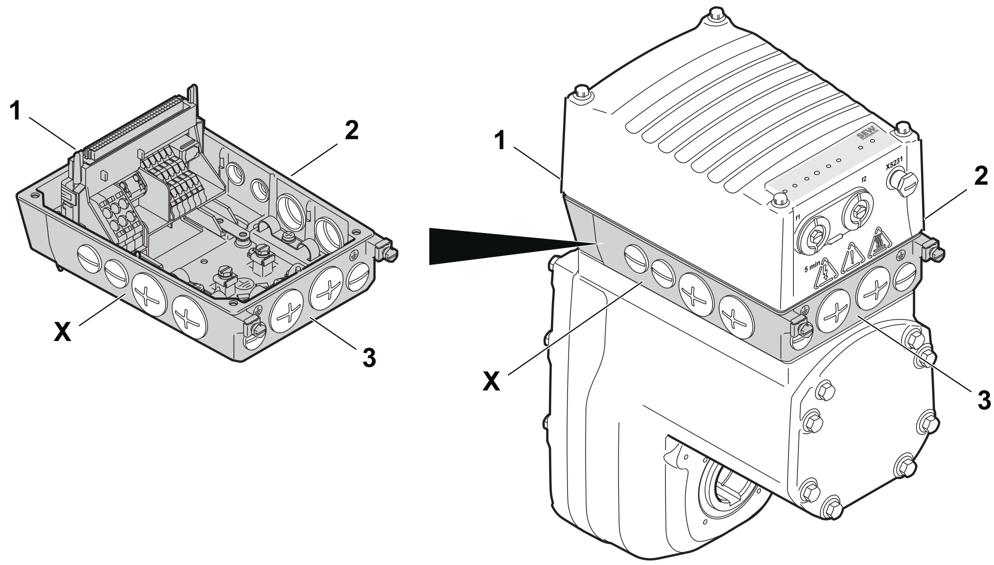
3.5 Cable entry position

The following cable entries are possible for MOVIGEAR® performance MGF..-...-C drive units:

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

3.5.1 Overview

The following figure shows the possible cable entries:



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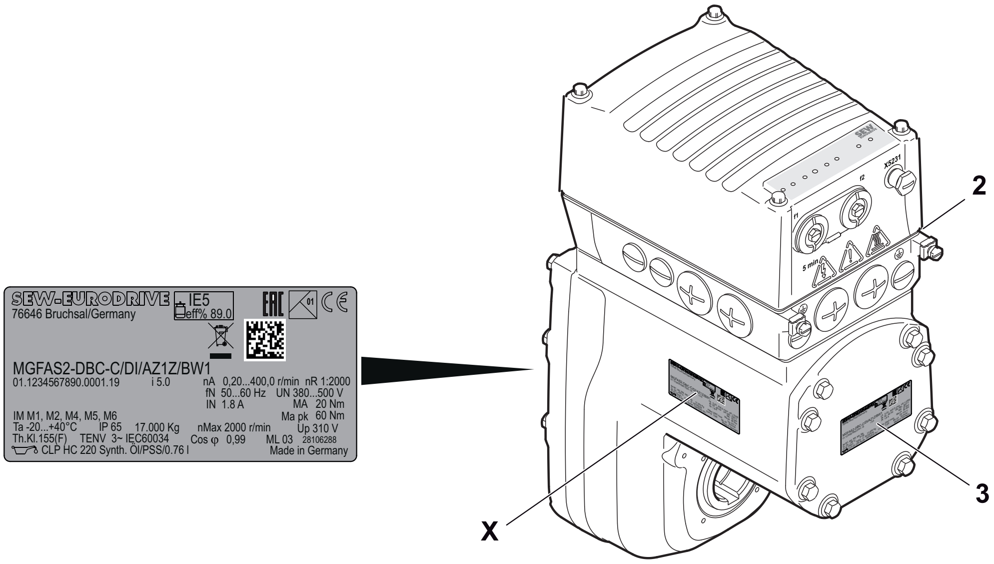
3.6 Nameplate position

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

- X
- 2
- 3 (standard position)

3.6.1 Overview

The following figure shows the possible positions:



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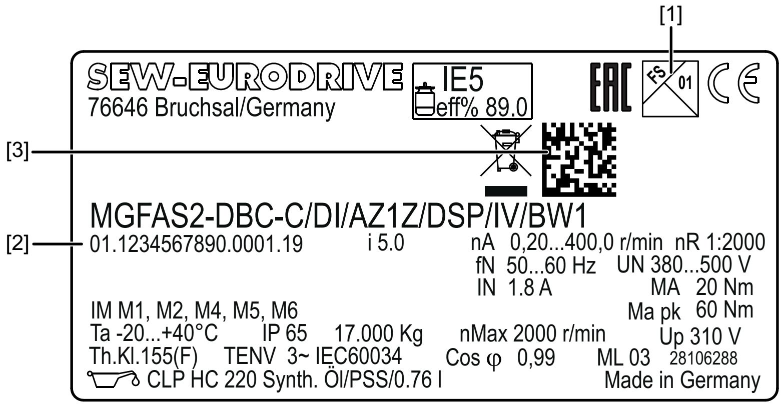
3.7 Example nameplate and type designation of the drive unit

3.7.1 Nameplate

The following figure gives an example of a nameplate for MOVIGEAR® performance. For the structure of the type designation, refer to the chapter "Type designation".



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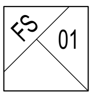
[1] FS logo
[2] Unique serial number
[3] The DataMatrix code on the nameplate indicates the unique serial number.

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 plug connectors.

3.7.2 Type designation

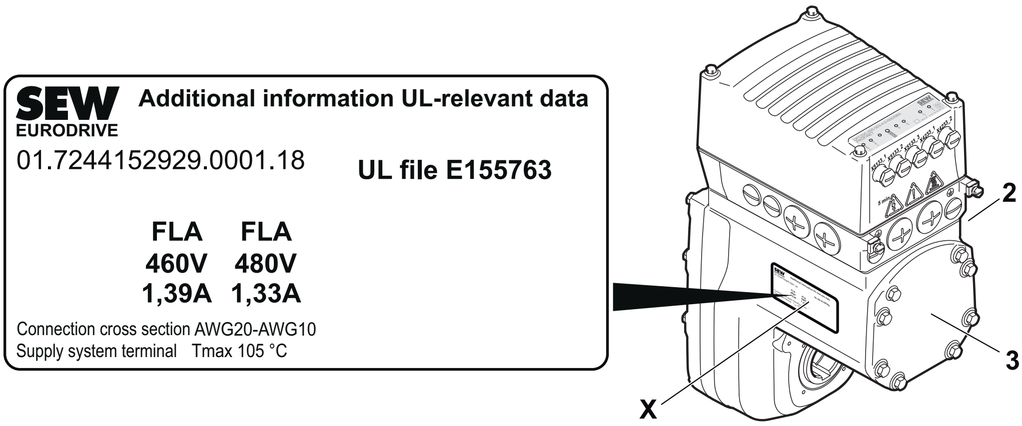
The following table shows the type designation of MOVIGEAR® performance:

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 types** 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

–	
DBC	**Communication version** DBC = **D**irect **B**inary **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 = Plug connector PE = Pressure compensation fitting electronics PG = Integrated pressure compensation gear unit BW1 = Integrated braking resistor type: BW1

3.8 Examples for the optional nameplate "Electrical regulations UL/CE" (in preparation)

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



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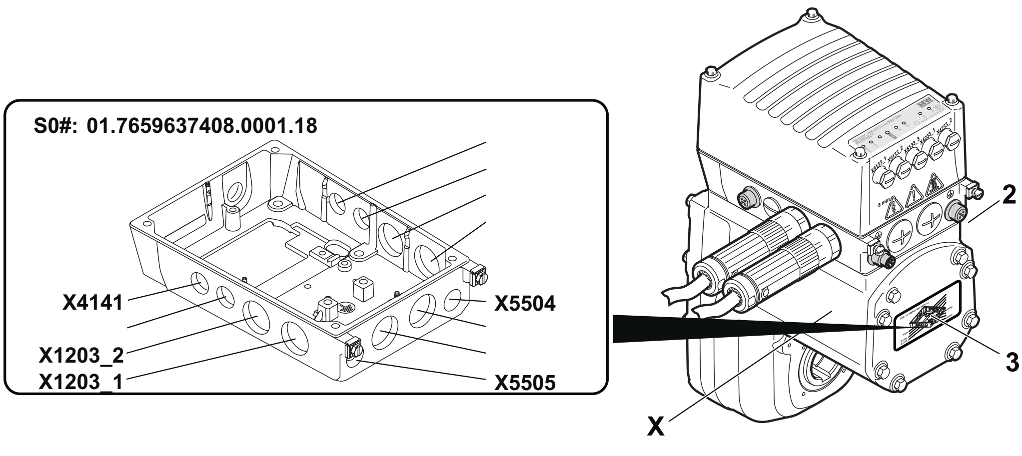
Positions X, 2 or 3 are possible for this nameplate.

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

3.9 Examples for the optional nameplate "Plug connector positions"

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



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

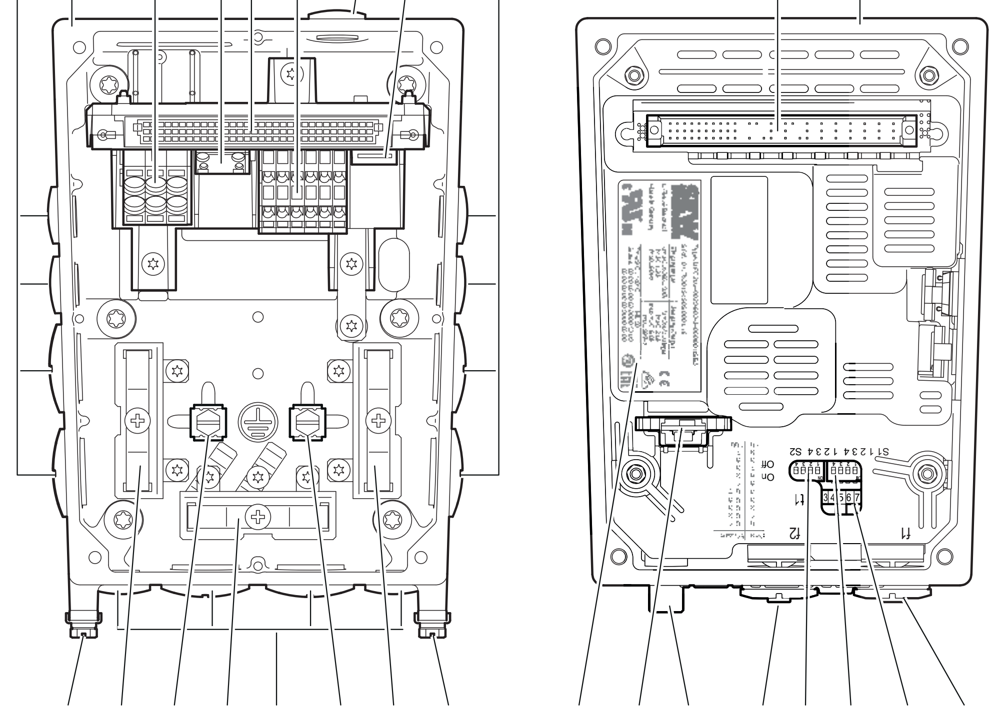
Positions X, 2 or 3 are possible for this nameplate.

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

3.10 Electronics

3.10.1 Electronics cover (inside) and connection box

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



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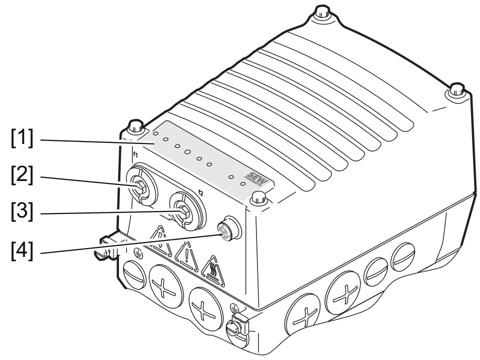
[1] Cable glands
[2] Connection box
[3] Line connection L1, L2, L3
[4] Braking resistor connection
[5] Plug connector connection unit for electronics cover
[6] Electronics terminal strip
[7] Engineering interface
[8] Electronics cover
[9] Potentiometer f1 (underneath the screw plug)
[10] Potentiometer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

3.10.2 Electronics cover (outside)

The following figure shows one of the electronics cover designs using one size as an example:



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[1] LED indicators
[2] Potentiometer f1 (underneath the screw plug)
[3] Potentiometer f2 (underneath the screw plug)
[4] Plug connector

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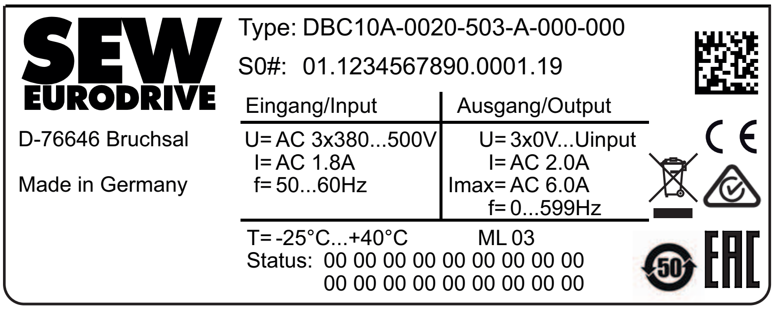
3.11 Example nameplate and type designation of electronics

3.11.1 Nameplate

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".



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3.11.2 Type designation of the electronics cover

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

DBC	**Product family** DBC = Electronics cover **D**irect **B**inary **C**ommunication
1	**Communication type** 1 = Binary
0	**Port configuration** 0 = M12 plug 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
–	
5	**Connection voltage** 5 = AC 500 V
0	**Power section design EMC** 0 = Basic interference suppression 1 = IT system design
3	**Connection type** 3 = 3-phase
–	

A	Version
–	
0	**Device variant** 0 = standard
0	**Technology level** = Technology level 0 (standard)
0	**Application level** 0 = Application level 0 (standard)
–	
000	**MOVIKIT® version** 000 = No MOVIKIT® module loaded at factory settings

3.12 Example nameplate and type designation of connection unit

3.12.1 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#: 01.7659637421.0001.18
00 00 00 00 00 00 00 00 00

18014426765979019

3.12.2 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
1	**Flange dimensions for relevant cover size** 1 = Suitable for electronics cover size 1 (with/without cooling fins)
H	**Fieldbus connection configuration** S = Standard H = Hybrid
–	
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

4 Mechanical installation

4.1 Installation notes

INFORMATION

Adhere to the safety notes during installation.

⚠ WARNING

Improper installation/disassembly of drive unit and mount-on components.

Serious injuries.

- Adhere to the notes about installation and disassembly.
- Before releasing shaft connections, make sure that there are no active torsional moments present (tensions within the system).

⚠ WARNING

Improper installation of the drive unit without torque arm.

Severe or fatal injuries.

- Only mount the drive units to the plant structure together with a torque arm. Installation without a torque arm is not permitted.

⚠ WARNING

Risk of injury if the device starts up unintentionally, and danger of electrical voltage.

Dangerous voltages may still be present for up to 5 minutes after disconnection from the line voltage.

- Disconnect the device from the power supply with suitable external measures before you start working on the device and secure it against unintentional reconnection to the voltage supply.
- Secure the output shaft against rotation.
- Before removing the electronics cover, wait for at least the following time: **5 minutes.**

⚠ WARNING

Risk of injury caused by rapidly moving output elements.

Serious injuries.

- Disconnect the drive unit from the power supply and safeguard it against unintentional power up before you start working on it.
- Equip the input and output elements (e.g. customer shaft with contact shoulder or clamping ring, shrink disk) with a touch guard.

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4.2 Required tools and resources

- Set of wrenches, set of screwdrivers, set of socket wrenches
- Torque wrench
- Mounting device
- Compensation elements (shims and spacing rings), if necessary
- Fasteners for output elements
- Lubricant (e.g. NOCO® fluid)
- Standard parts are not included in the delivery

4.2.1 Installation tolerances for shaft ends

Diameter tolerance in accordance with DIN 748:

- ISO H7 for hollow shafts

4.2.2 Tolerances for torque ratings

The specified torques must be adhered to with a tolerance of +/- 10%.

4.3 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 operating instructions, nameplate and lubricant table in chapter "Technical data" > "Lubricants".
- 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 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.

4.4 Setting up the drive unit

4.4.1 Notes

- Only mount the drive units to the plant structure together with a torque arm. Installation without a torque arm is not permitted.
- Clean the shaft ends thoroughly to ensure they are free of anti-corrosion agents (use a commercially available solvent). Do not expose the bearings and sealing rings to the solvent – damage to the material.
- Carefully align the drive unit and the driven machine to avoid placing any unacceptable strain on the shaft ends.
- Do not butt or hammer the shaft end.
- Ensure that cooling air supply is unobstructed and that air discharged by other units does not influence cooling.
- Use suitable cable glands for the supply leads (use reducing adapters if necessary).
- Seal the cable entry well.
- Clean the sealing faces of the cover well before reassembling the unit.
- Restore the corrosion protection if necessary.
- Check the validity of the degree of protection using the information in the operating instructions and the data on the nameplate.

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 documentation "Integrated Pressure Compensation (Option /PG)".**
- **Adjust the position of the breather valve.**
- **If present, adjust the position of the pressure compensation fitting.**

4.4.2 Electronics cover

⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

- Let the devices cool down before touching them.

NOTICE

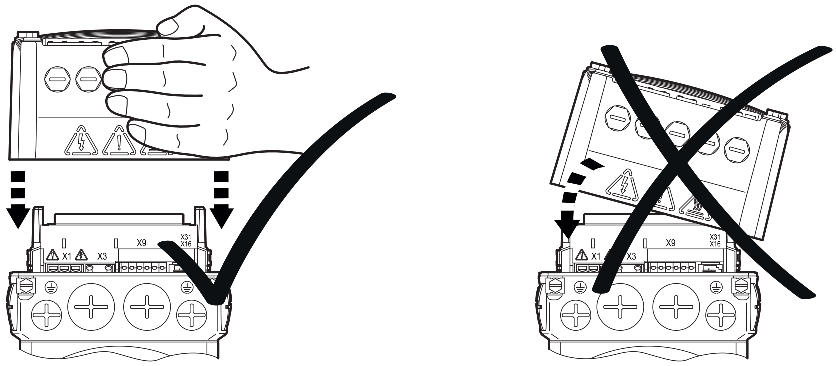
Loss of the guaranteed degree of protection.

Possible damage to property.

- When the cover is removed from the connection box, you have to protect the cover and the wiring space from humidity, dust or foreign particles.
- Make sure that the cover is mounted properly.

Installing the electronics cover

- Use only electronics covers that match the size.
- Be careful not to tilt the electronics cover when placing it on the connection box:



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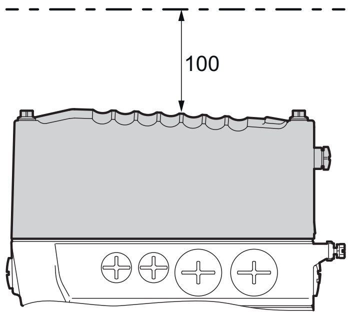
Minimum installation clearance

Note the minimum installation clearance (see following figure) required to remove the electronics cover. For detailed dimension drawings, see the section "Technical Data and Dimension Sheet".



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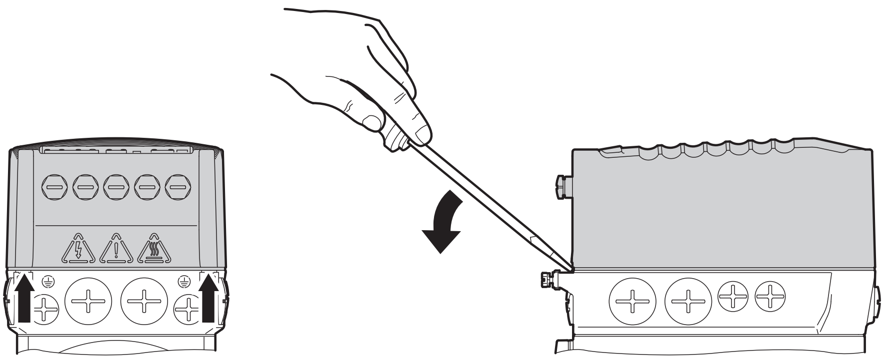
Removing the electronics cover

The following figure shows how you can lever off the electronics cover in the intended places:



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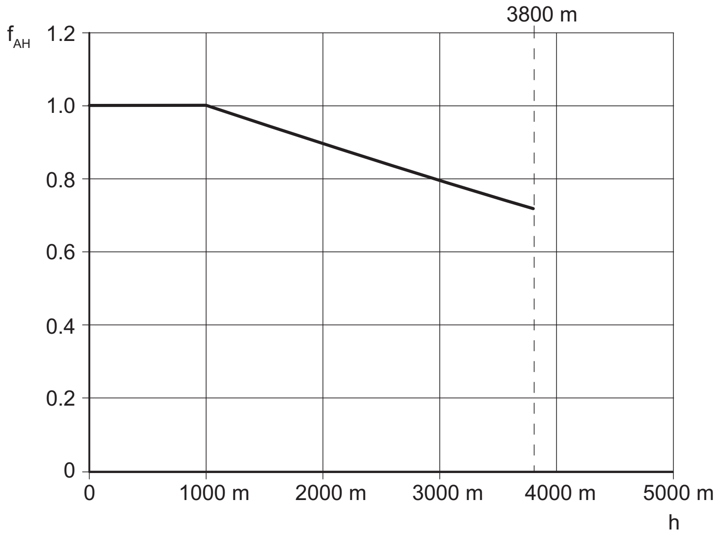
4.4.3 Installation in damp areas or in the open

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.

4.4.4 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. Observe the additional chapter "Technical data and dimension drawings" > "Derating depending on the ambient temperature".



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4.4.5 Painting drive units

NOTICE

Breather valves and oil seals may be damaged during painting or re-painting.

Potential damage to property.

- Clean the surface of the drive unit and make sure it is free from grease.
- Thoroughly cover the breather valves and sealing lip of the oil seals with strips prior to painting.
- Remove the masking strips after painting.

4.4.6 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

NOTICE

The breather valve cannot be used for drive units in mounting position M3.

Possible damage to property

- For drive units in mounting position M3, use the variant with integrated pressure compensation (/PG option). Observe the documentation "Integrated Pressure Compensation (Option /PG)".
- 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.

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.

Tightening torque

Tighten the breather valve from SEW-EURODRIVE included in the delivery with 8.0 Nm.

The following figure shows an example. The position of the breather valve depends on the mounting position in use. Observe chapter "Technical data and dimension sheets" > "Mounting positions".

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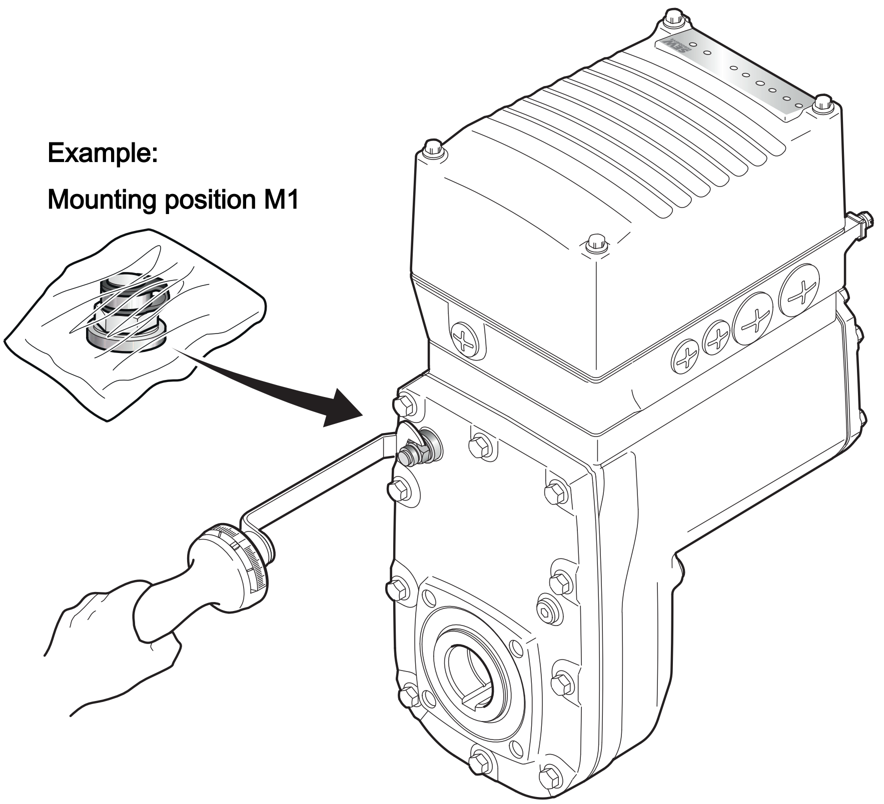
Example: Mounting position M1



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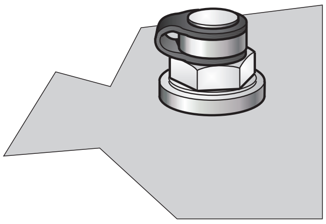
Activating the breather valve

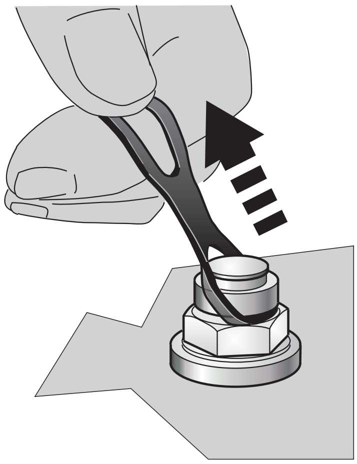
After installing the breather valve, activate it as follows. For designs with the breather valve screwed in: Check whether the breather valve is activated. If not, you have to remove the transport fixture of the breather valve before you start up the drive unit.

1. Breather valve with transport protection



22858542859

2. Remove transport fixture



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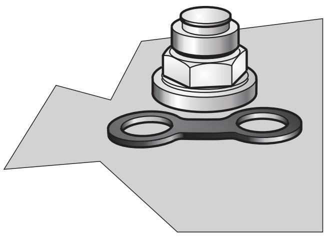
3. Activated breather valve



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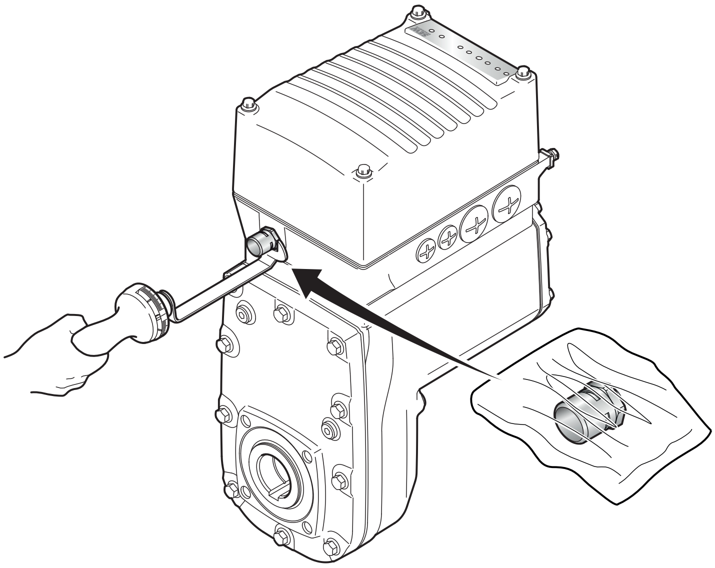
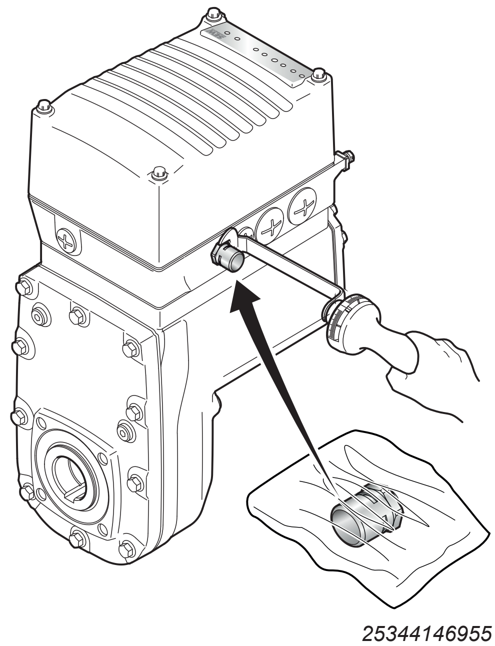
4.4.7 Pressure compensation on electronics (option /PE)

Designs with included pressure compensation fitting (option /PE)

On 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.

The following table shows the installation positions depending on the mounting positions:

Mounting positions

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". Observe the documentation "Integrated Pressure Compensation (Option /PG)".

4.5 Shaft-mounted gear unit with keyway

INFORMATION

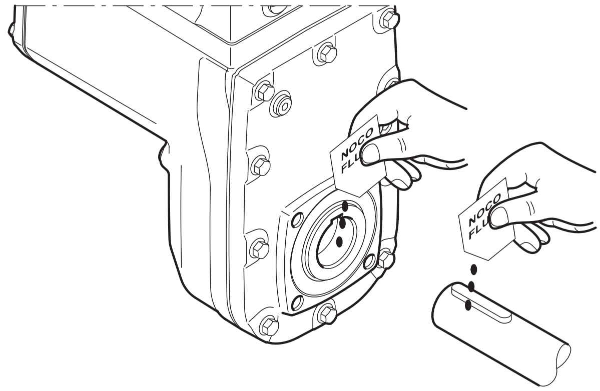
Observe the design notes in chapter "Technical data and dimension sheets" for the customer shaft design.

INFORMATION

To avoid contact corrosion, SEW-EURODRIVE recommends that the customer shaft should additionally be lathed down between the 2 contact surfaces.

4.5.1 Installation notes

1. Apply NOCO® fluid and spread it thoroughly.



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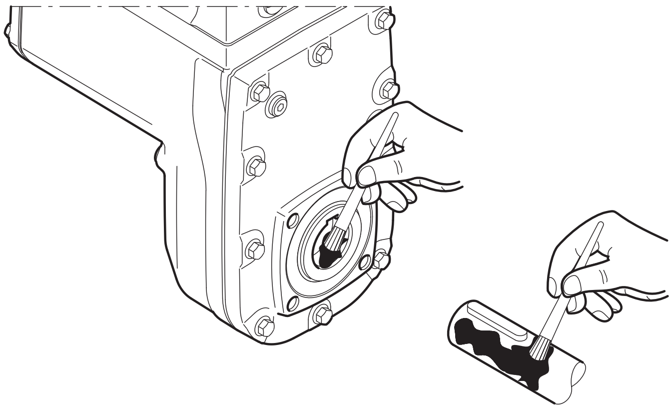

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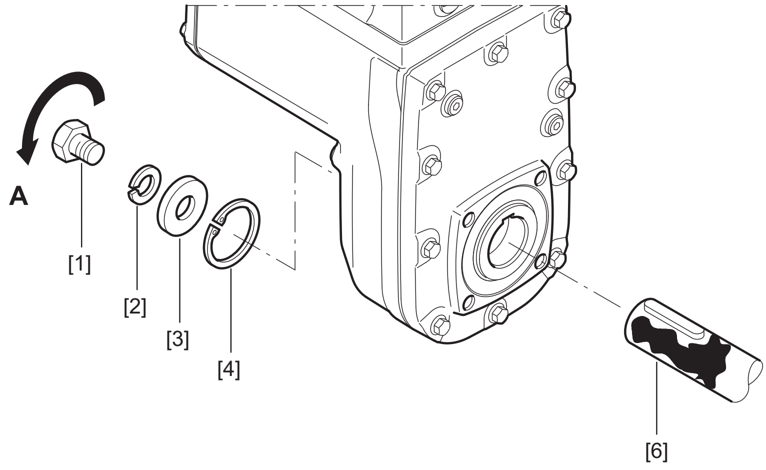
2. Mount the shaft and secure it axially (using a mounting device makes installation easier). The three mounting types are described below:

   ⇨ 2A: Standard scope of delivery



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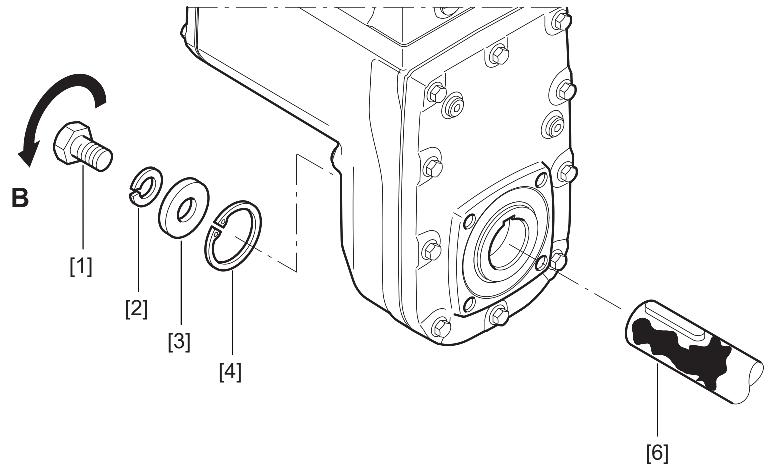
[1] Short retaining screw (standard scope of delivery)
[2] Lock washer
[3] Washer
[4] Retaining ring
[6] Customer shaft

   ⇨ 2B: Assembly/disassembly kit for customer shaft **with** contact shoulder. Observe chapter "Technical data and dimension sheets" > "Design notes for gear units with hollow shaft and key".



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[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[6] Customer shaft with contact shoulder

   ⇨ 2C: Assembly/disassembly kit for customer shaft **without** contact shoulder. Observe chapter "Technical data and dimension sheets" > "Design notes for gear units with hollow shaft and key".

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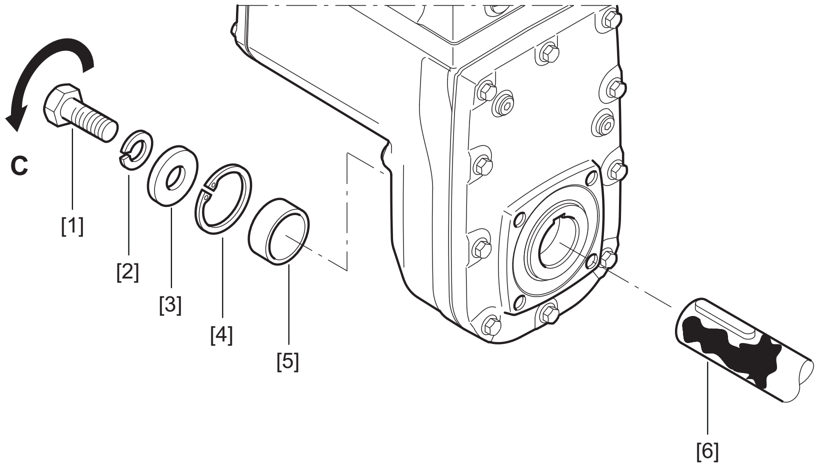

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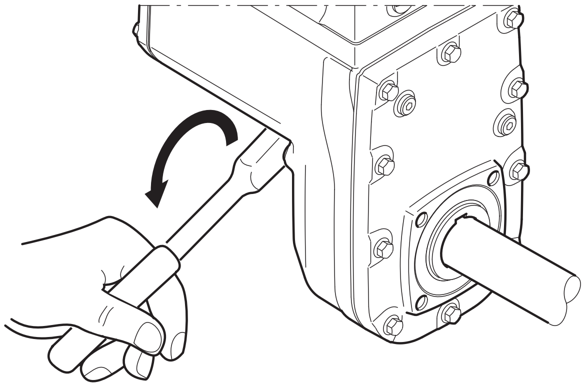
[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Spacer tube
[6] Customer shaft without contact shoulder

3. Tighten the retaining screw with the specified torque (see chapter "Tightening torques for retaining screws").



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4.5.2 Tightening torques for retaining screws

Drive	Screw	Tightening torque
MGFA.2-..-C	M10	20 Nm
MGFA.4-..-C	M16	40 Nm

4.5.3 Disassembly notes

⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

- Let the devices cool down before touching them.

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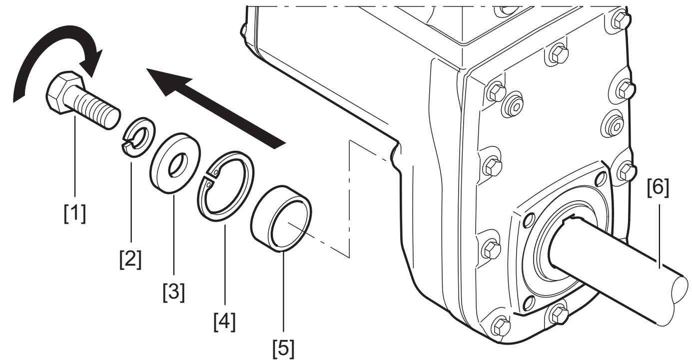
INFORMATION

For information on the SEW-EURODRIVE assembly/disassembly kit, see chapter "Technical data and dimension sheets" > "Design notes".

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. Loosen the retaining screw [1].
2. Remove parts [2] to [4] and, if applicable, the spacer tube [5].



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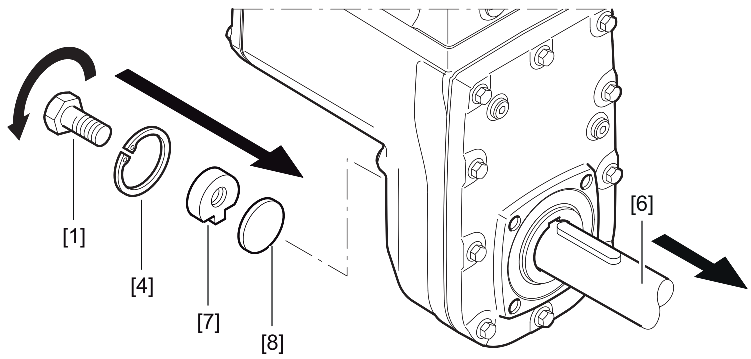
[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Spacer tube
[6] Customer shaft

3. 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].
4. Re-install the retaining ring [4].
5. Screw the retaining screw [1] back in. Now you can force the drive off the shaft by tightening the bolt.



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[1] Retaining screw
[4] Retaining ring
[6] Customer shaft
[7] Fixed nut
[8] Forcing washer

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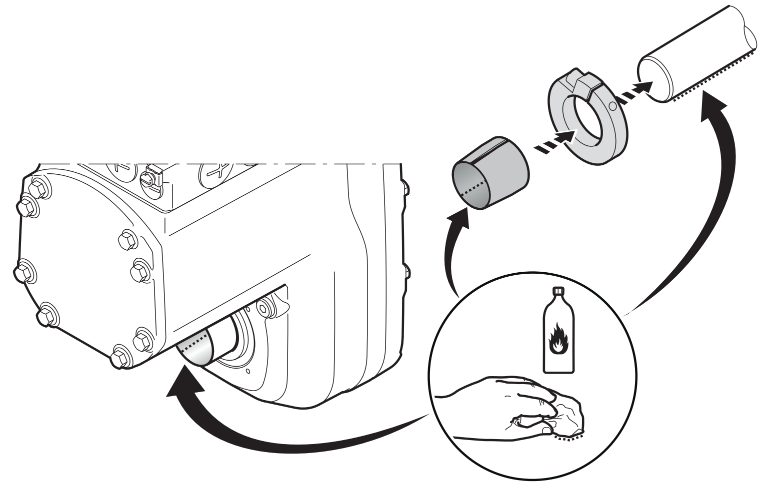
4.6 Shaft-mounted gear unit with TorqLOC® (customer shaft without contact shoulder)

1. Clean the customer shaft and the inside of the hollow shaft. Ensure that all traces of grease or oil are removed.
2. Install the stop ring and the bushing on the customer shaft.



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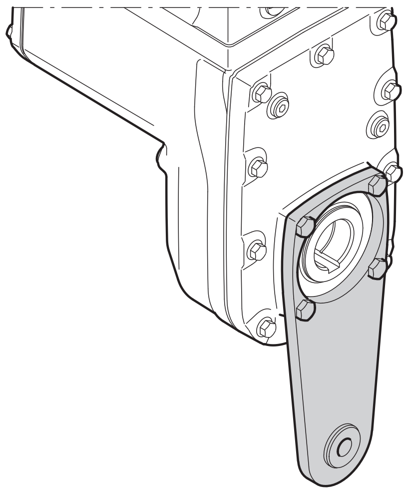
3. Fasten the torque arm on the drive unit; observe chapter "Torque arm".



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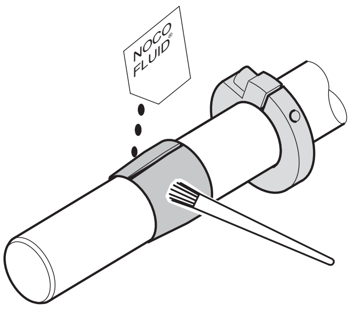
4. Apply NOCO® fluid on the bushing and spread thoroughly.



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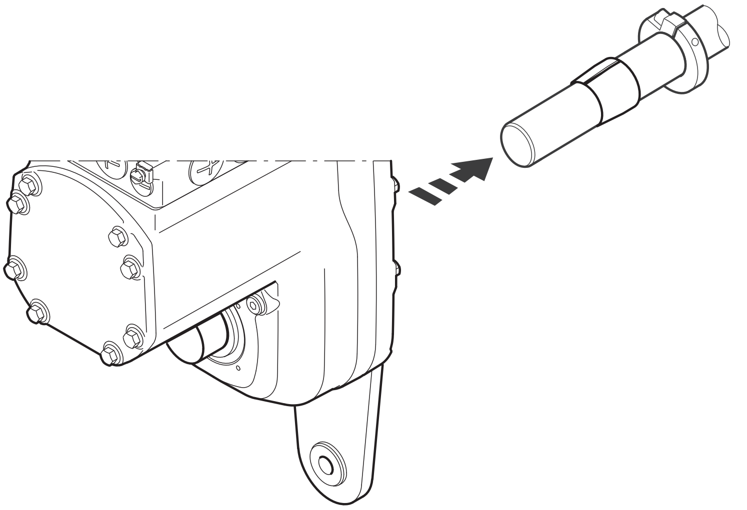
5. Push the gear unit onto the customer shaft.



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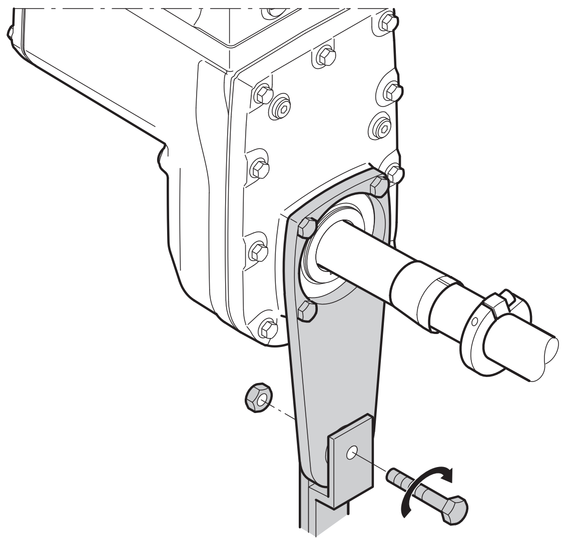
6. Mount the torque arm onto the system structure/holding fixture (do not tighten the screws).



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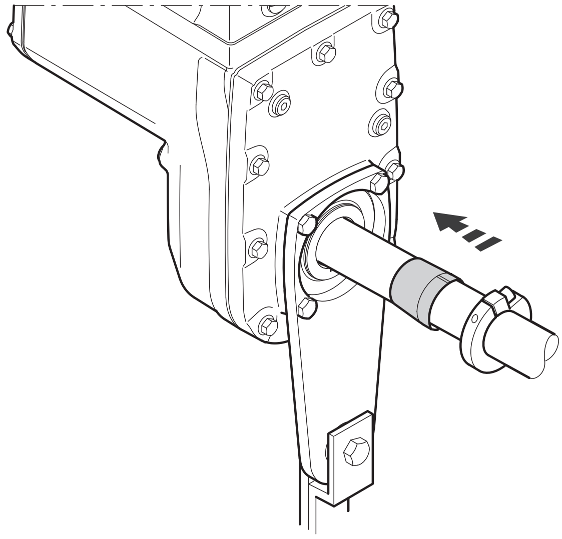
7. Push the bushing into the gear unit up to the stop.



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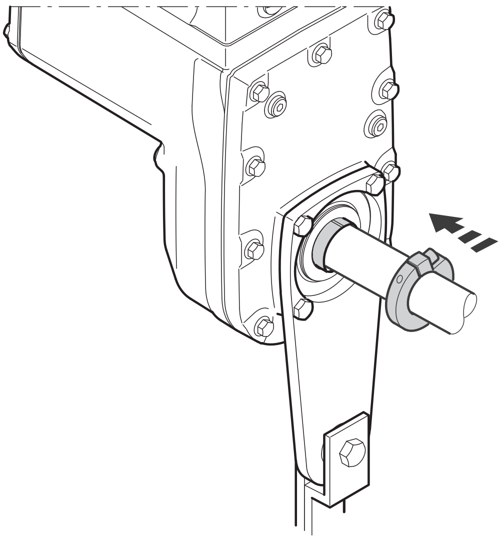
8. Push the stop ring to the bushing. Mark the position of the stop ring.



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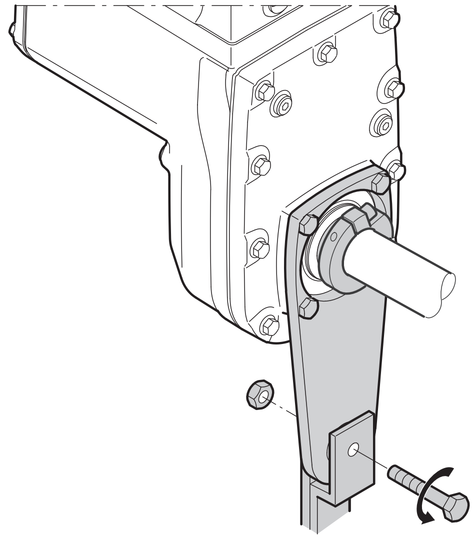
9. Remove the torque arm from the holding fixture/system structure.



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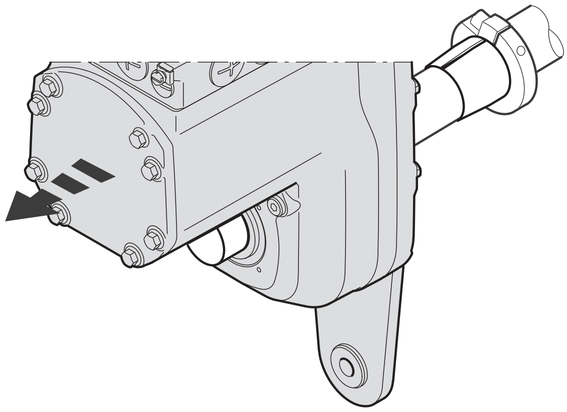
10. Pull the gear unit off the customer shaft until the stop ring is accessible for fastening.



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11. Make sure that the position of the stop ring has not changed (see marking).
12. Tighten the stop ring to the appropriate torque.
    - ⇨ Standard design: 18 Nm
    - ⇨ Stainless steel: 7.5 Nm

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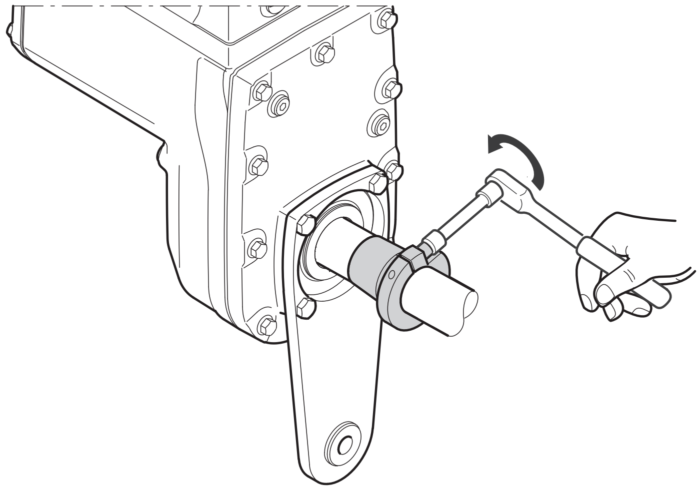

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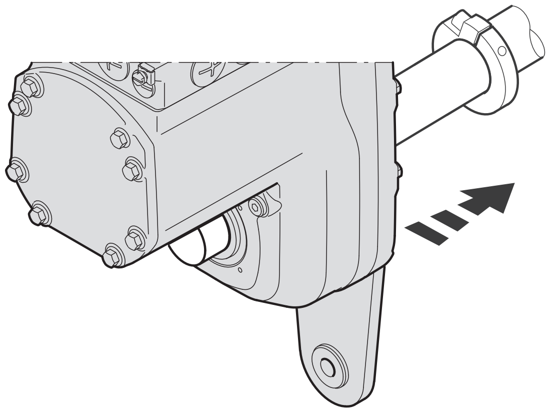
13. Push the bushing and the gear unit onto the customer shaft up to the fixed stop ring.



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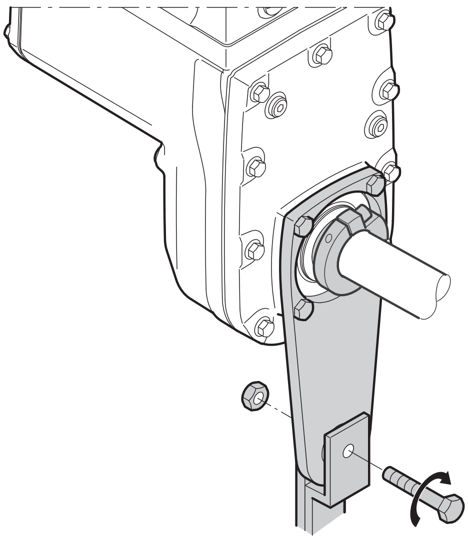
14. Mount the torque arm onto the system structure/holding fixture again (do not tighten the screws).



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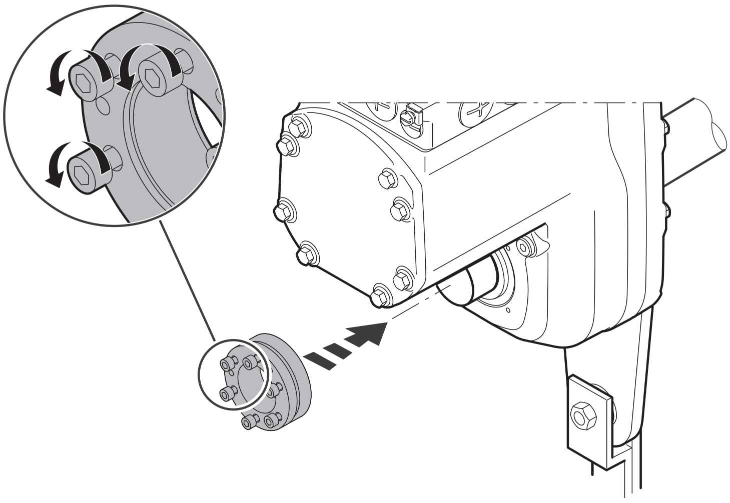
15. Make sure that all screws are loosened and slide the shrink disk onto the hollow shaft.



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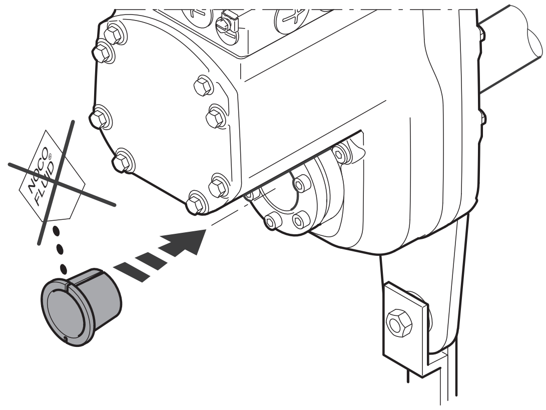
16. Slide the counter bushing onto the customer shaft and into the hollow shaft.



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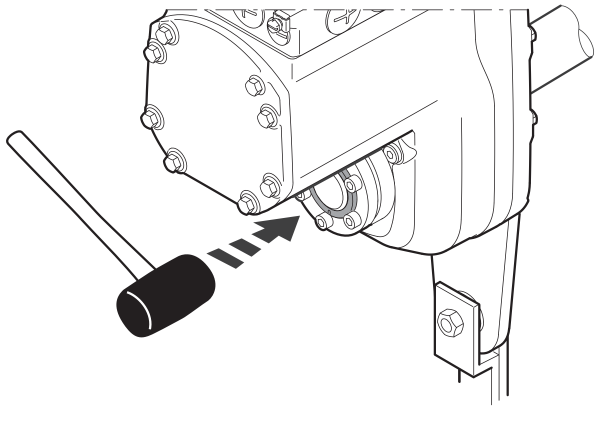
17. In the case of a gear unit **with shaft shoulder**, mount the shrink disk at the shaft shoulder up to the stop. In the case of a gear unit **without shaft shoulder**, mount the shrink disk at a distance of 6.5 mm to 7.5 mm from the gear unit housing.

18. Tap lightly on the flange of the counter bushing to ensure that the bushing is fitted securely in the hollow shaft.



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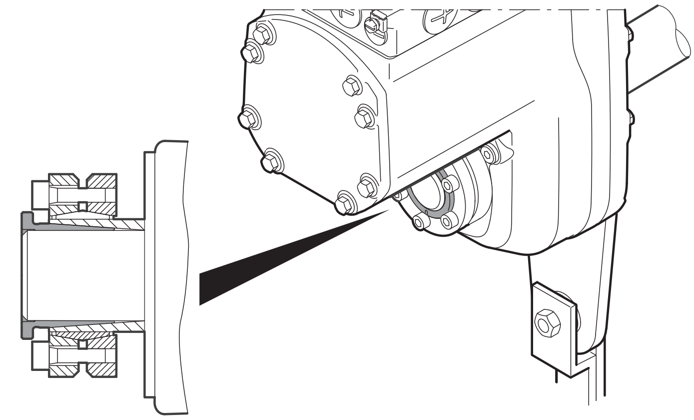
19. Make sure that the customer shaft is seated in the counter bushing.



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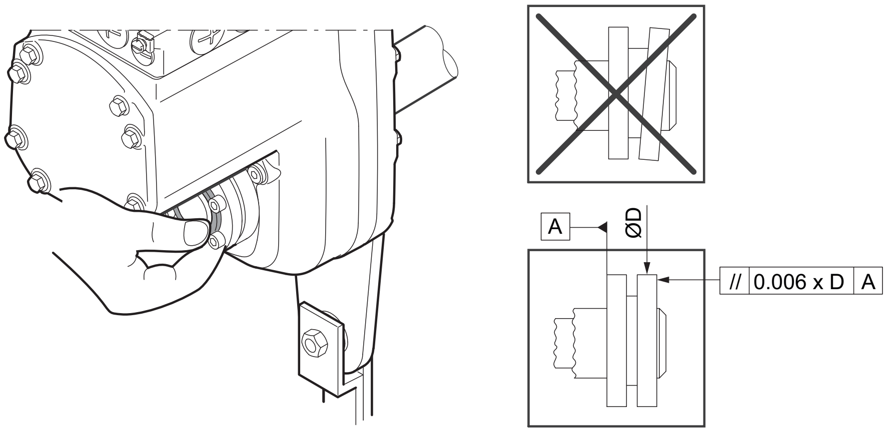
20. Tighten the screws of the shrink disk only hand-tight and ensure that the outer rings of the shrink disk are parallel.



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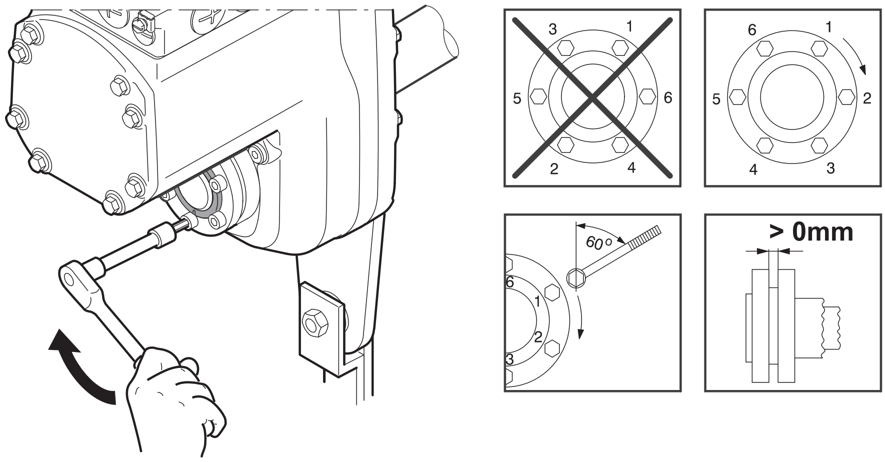
21. Tighten the locking screws by working round several times from one screw to the next (not in diametrically opposite sequence):

   ⇨ The exact values for the tightening torques are shown on the shrink disk.



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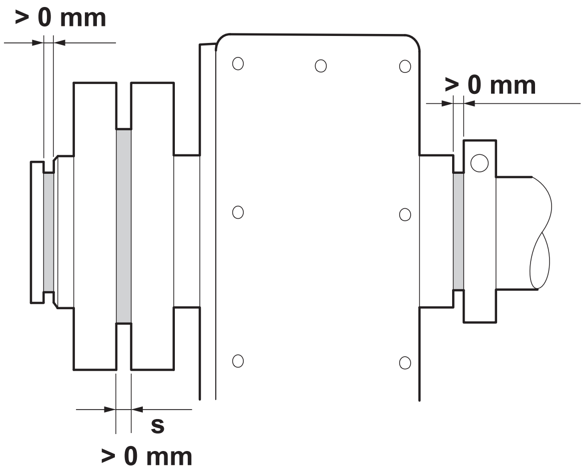
22. After installation, make sure the remaining gap s between the outer rings of the shrink disks is > 0 mm.
    - ⇨ The remaining gap between counter bushing and hollow shaft end as well as bushing and stop ring must be > 0 mm.



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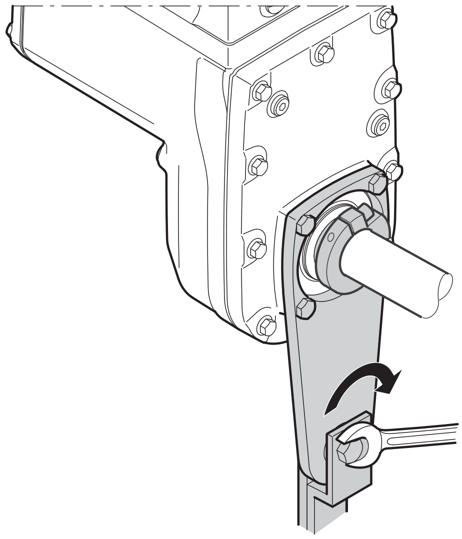
23. Securely tighten the torque arm; observe chapter "Torque arm".



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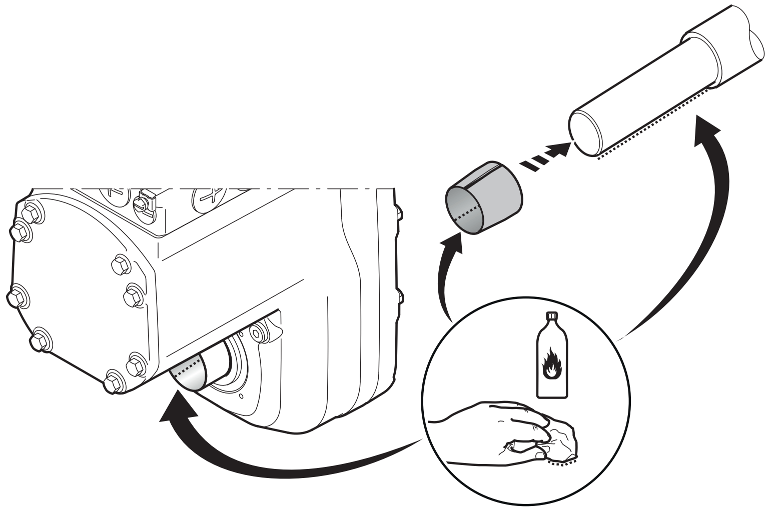
4.7 Shaft-mounted gear unit with TorqLOC® (customer shaft with contact shoulder)

1. Clean the customer shaft and the inside of the hollow shaft. Ensure that all traces of grease or oil are removed.



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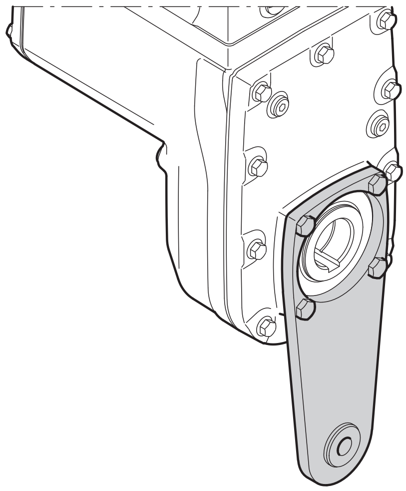
2. Fasten the torque arm on the drive unit; observe chapter "Torque arm".



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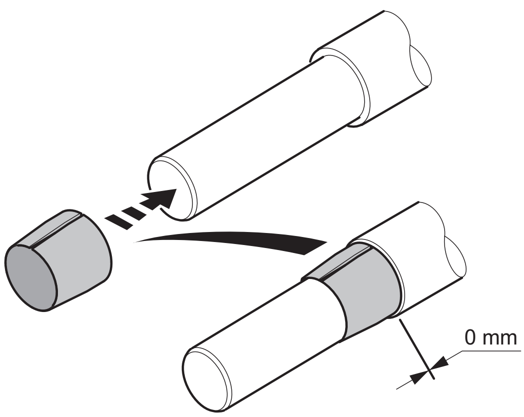
3. Slide the bushing onto the customer shaft.



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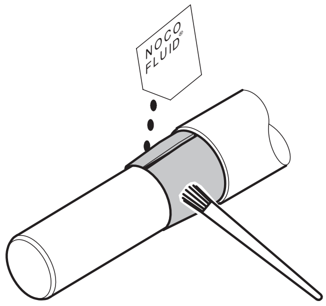
4. Apply NOCO® fluid on the bushing and spread thoroughly.



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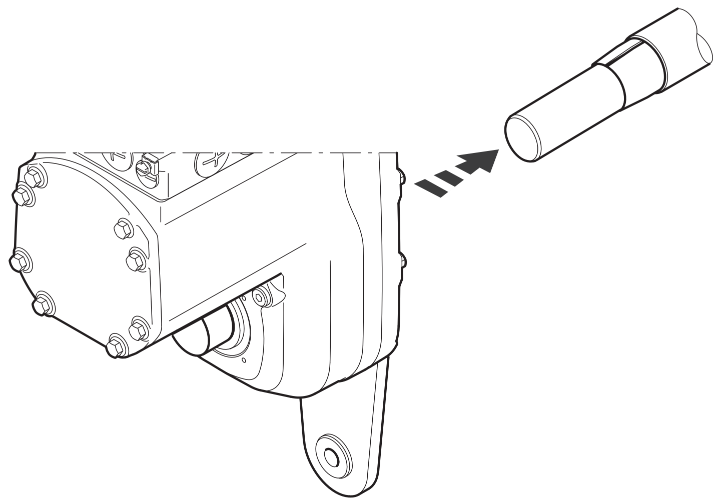
5. Push the gear unit onto the customer shaft.



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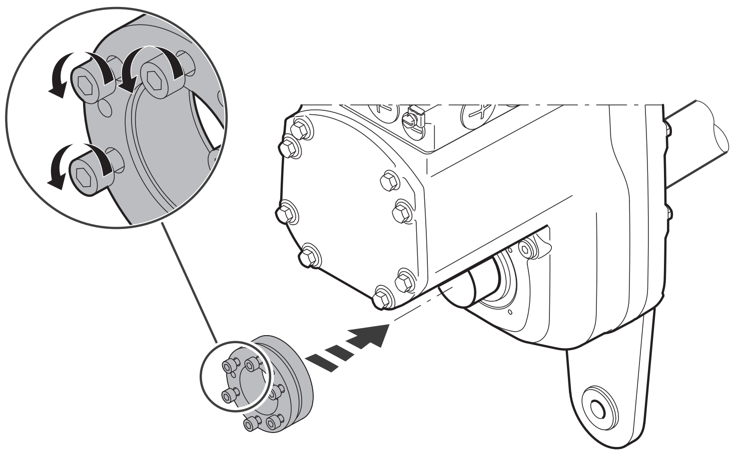
6. Make sure that all screws are loosened and slide the shrink disk onto the hollow shaft.



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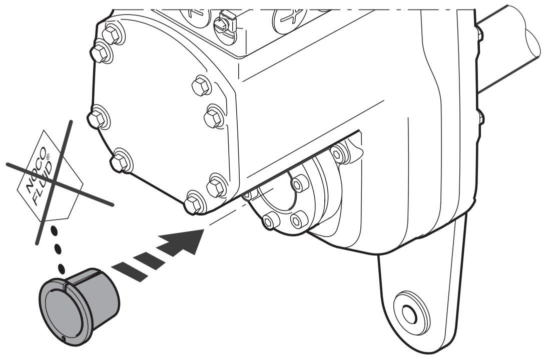
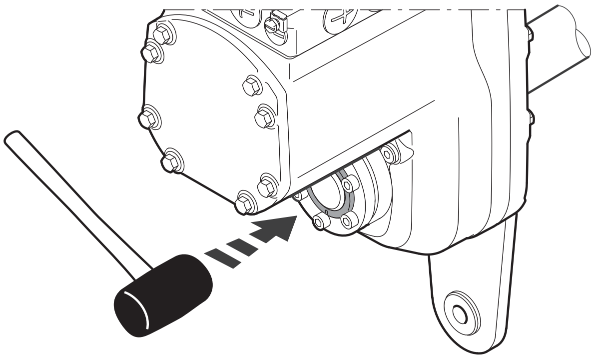
7. Slide the counter bushing onto the customer shaft and into the hollow shaft.



18014420038485643

8. 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.
9. Tap lightly on the flange of the counter bushing to ensure that the bushing is fitted securely in the hollow shaft.



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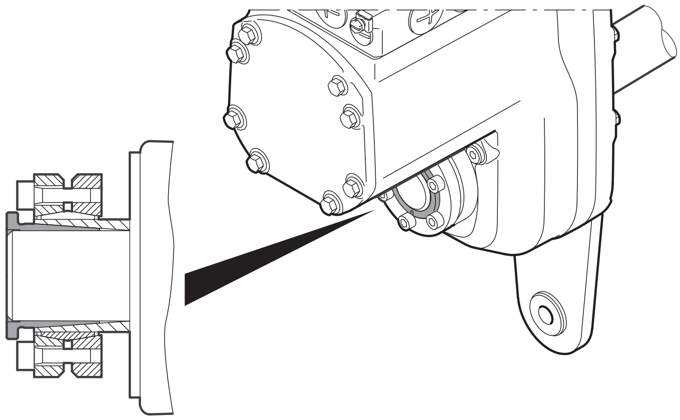
10. Make sure that the customer shaft is seated in the counter bushing.



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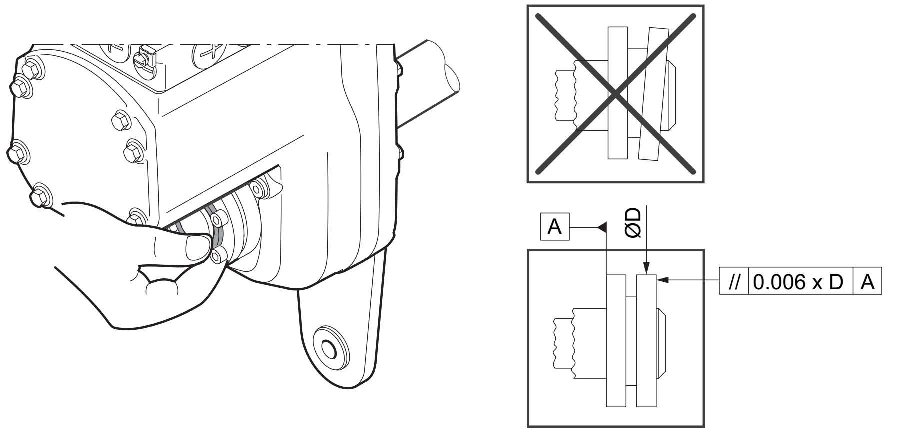
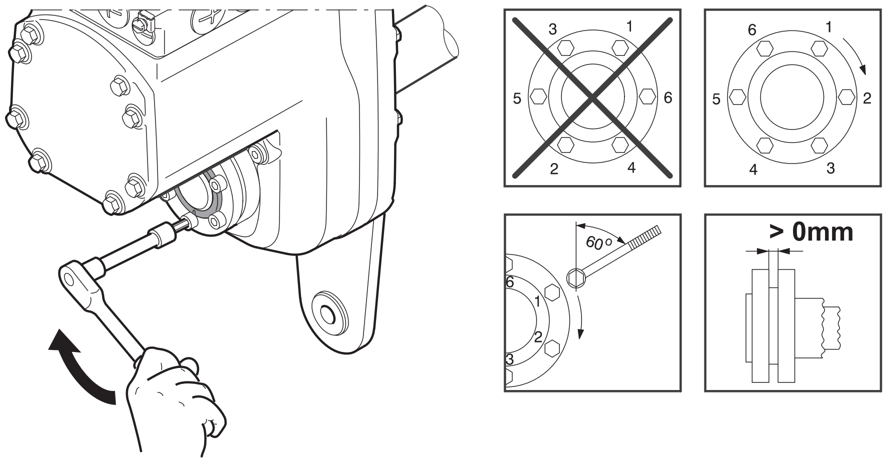
11. Tighten the screws of the shrink disk only hand-tight and ensure that the outer rings of the shrink disk are parallel.



18014420038463755

12. 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 shown on the shrink disk.



18014420038466187

13. After installation, make sure the remaining gap s between the outer rings of the shrink disks is > 0 mm.

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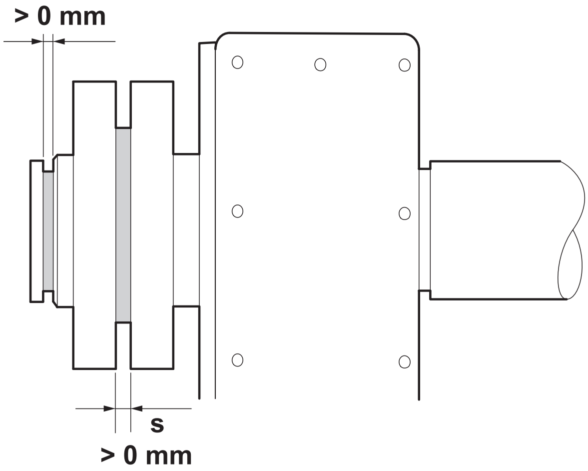
14. The remaining gap between counter bushing and hollow shaft end must be > 0 mm.



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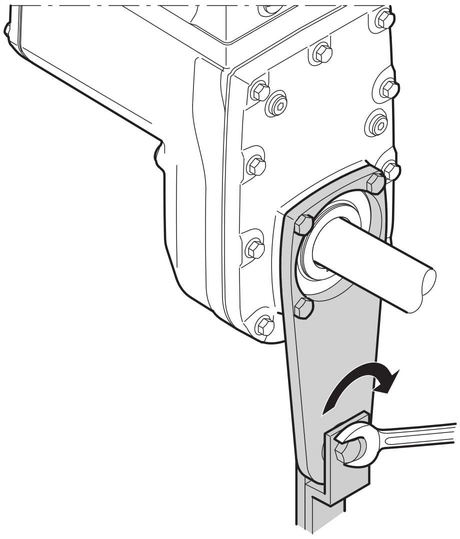
15. Mount the torque arm and tighten it securely; observe chapter "Torque arm".



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4.8 Shaft-mounted gear unit with TorqLOC® – disassembly, cleaning, lubrication

4.8.1 Removal notes

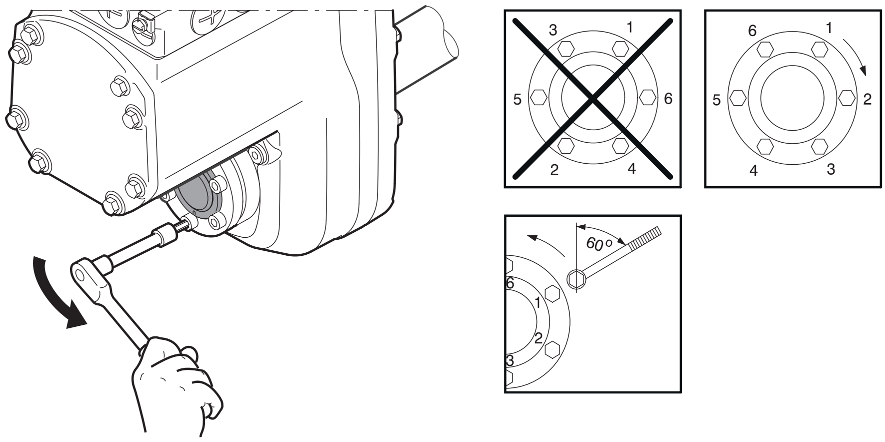
⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

- Let the devices cool down before touching them.

1. Loosen the locking screws one after the other by a quarter rotation each to avoid tilting the outer rings.



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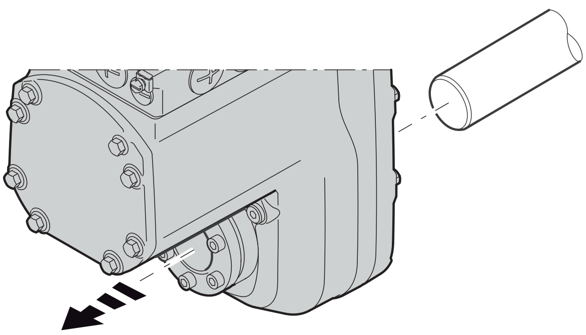
2. Unscrew the locking screws evenly one after the other. Do not remove the locking screws completely.
3. Dismantle the conical steel bushing. If required, use the outer rings as pullers as follows:
   - ⇨ Remove all the locking screws.
   - ⇨ Screw the respective number of screws in the tapped holes of the shrink disk.
   - ⇨ Support the inner ring against the gear unit housing.
   - ⇨ Pull off the conical steel bushing by tightening the screws.
4. Remove the gear unit from the shaft.



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5. Remove the shrink disk from the hub.

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4.8.2 Cleaning and lubrication

There is no need to dismantle removed shrink disks before they are reinstalled.

Clean and lubricate the shrink disk if it is dirty.

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 paste
Aemasol MO 19P	Spray or paste
Aemasol DIO-sétral 57 N (lube coat)	Spray

Grease the locking screws with a multipurpose grease such as Molykote BR 2 or similar.

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4.9 Installing the protective cover

⚠ WARNING

Risk of injury caused by rapidly moving output elements.

Serious injuries.

- Disconnect the drive unit from the power supply and safeguard it against unintentional power up before you start working on it.
- Equip the input and output elements (e.g. customer shaft with contact shoulder or clamping ring, shrink disk) with a touch guard.

NOTICE

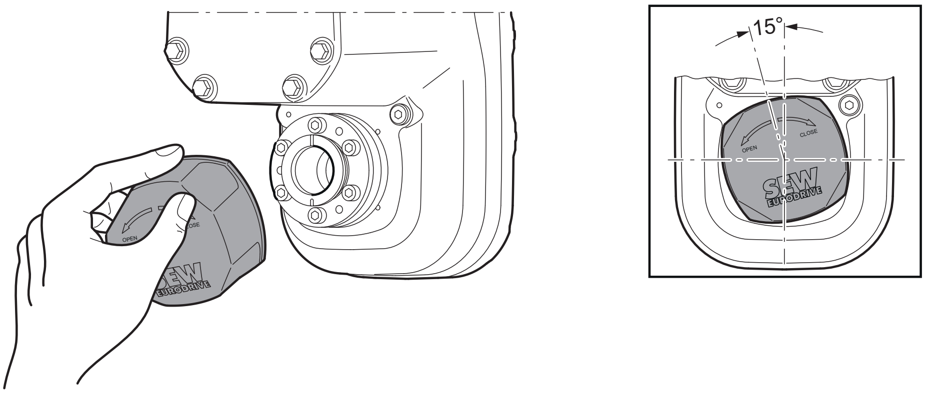
Impermissible use of the threads.

Damage to the drive unit.

- The threads may only be used for other applications after consultation with SEW-EURODRIVE.
- SEW-EURODRIVE assumes no guarantee or liability for resulting product damages.

4.9.1 Installing the fixed cover

1. Place the safety cover offset by 15° counterclockwise.



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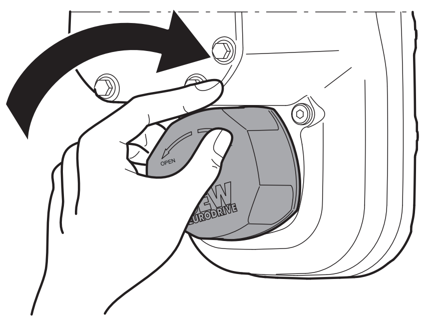
2. Turn the safety cover clockwise until it locks in position.



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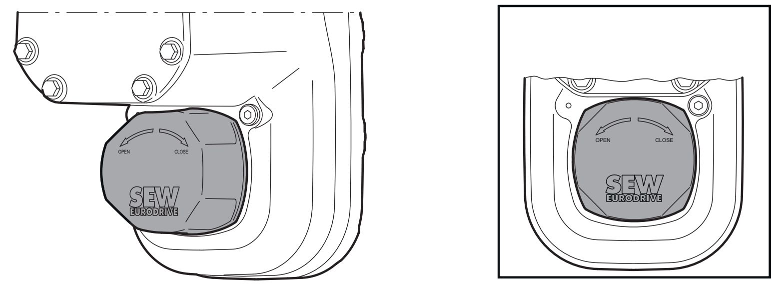
3. The following figure shows the installed safety cover.



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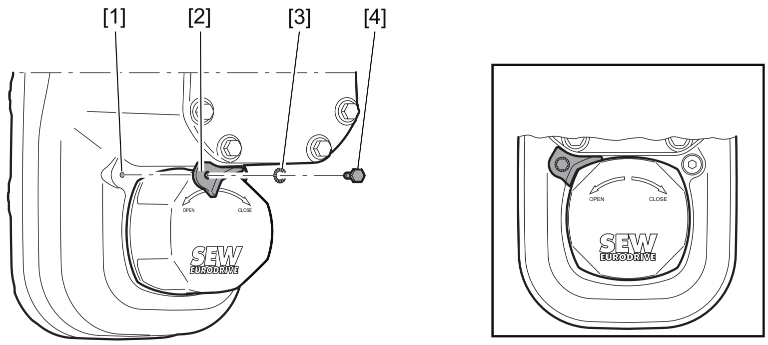
4. Fasten the locking device in the bore provided for this purpose using the enclosed screw and serrated lock washer. The permitted tightening torque for the screw M4x10 is 3.3 Nm.



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[1] Bore for the locking device
[2] Locking device
[3] Serrated lock washer
[4] M4x10 screw

4.9.2 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.

4.10 Torque arm

NOTICE

Improper assembly may damage the drive unit.

Possible damage to property.

- Do not place torque arms under strain during installation.
- Always use bolts of quality 8.8 to fasten torque arms.

INFORMATION

As an option, the necessary bolts can be included in the delivery.

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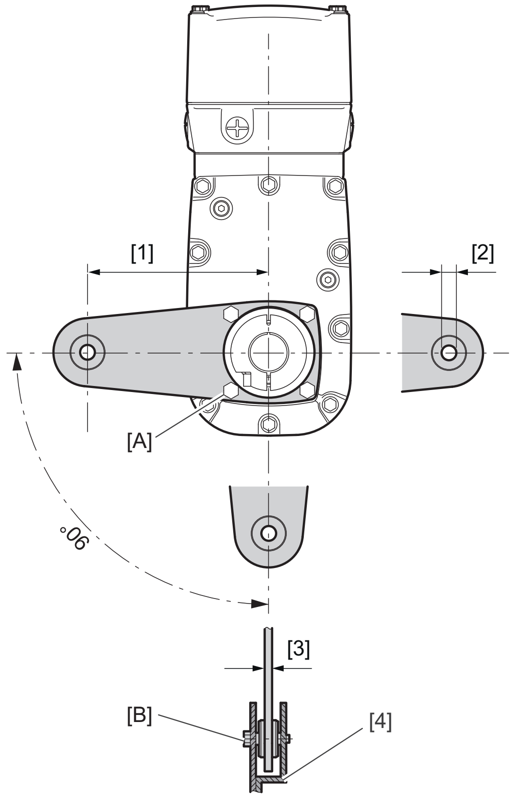
4.10.1 Installation options

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

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4.11 Tightening torques

⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

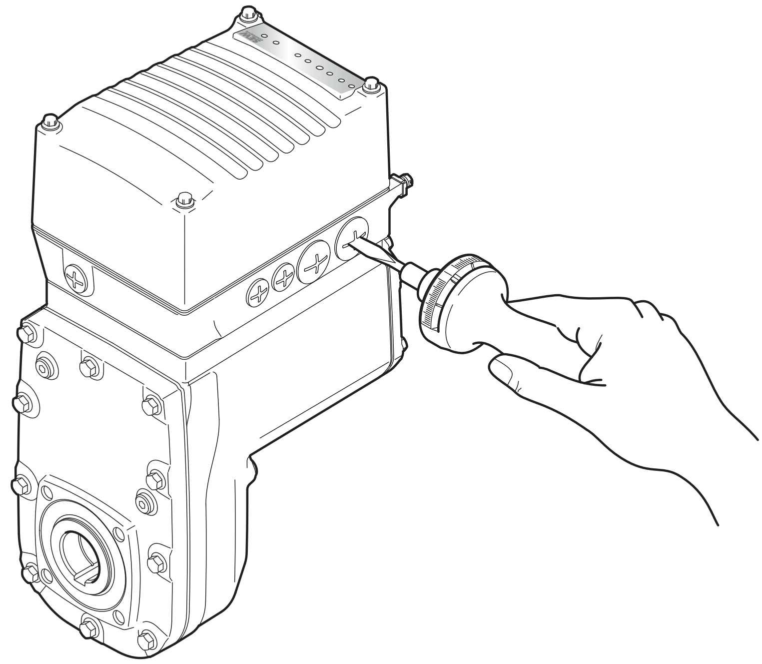
- Let the devices cool down before touching them.

4.11.1 Blanking plugs

Tighten the plastic blanking plugs **included in the delivery** by SEW-EURODRIVE with 2.5 Nm:

Example

The following figure shows an example. The number and position of the cable entries depends on the ordered variant.



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4.11.2 Cable glands

Tightening torques

Tighten the EMC cable glands **optionally** supplied by SEW-EURODRIVE to the following torques:

Screw fitting	Part number	Content	Size	Outer cable diameter	Tightening torque
EMC cable glands (nickel-plated brass)	18204783	10 pcs	M16 x 1.5	5 to 9 mm	4.0 Nm
	18204805	10 pcs	M25 x 1.5	11 to 16 mm	7.0 Nm

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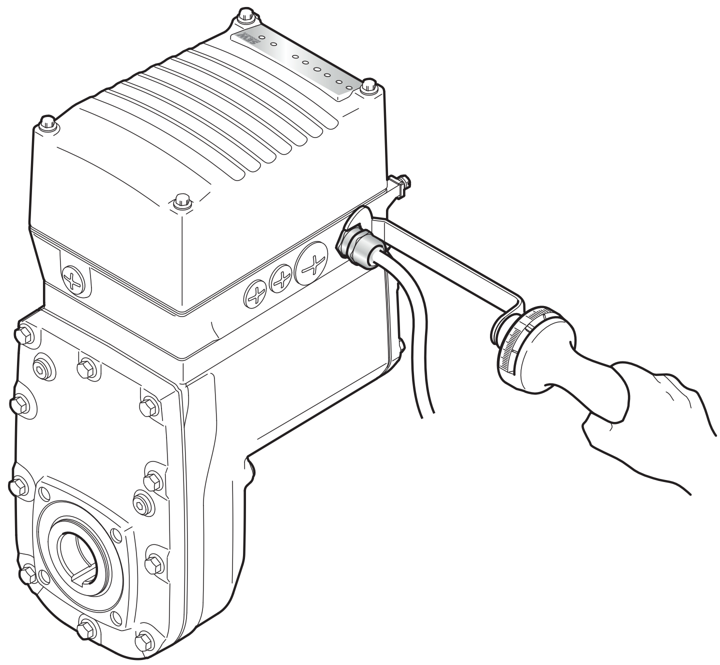
Screw fitting	Part number	Content	Size	Outer cable diameter	Tightening torque
EMC cable glands (stainless steel)	18216366	10 pcs	M16 x 1.5	5 to 9 mm	4.0 Nm
	18216382	10 pcs	M25 x 1.5	11 to 16 mm	7.0 Nm

The cable retention in the cable gland must withstand the following removal force of the cable from the cable gland:

- Cable with outer diameter > 10 mm: ≥ 160 N
- Cable with outer diameter < 10 mm: = 100 N

Example

The following figure shows an example. The number and position of the cable entries depends on the ordered variant.



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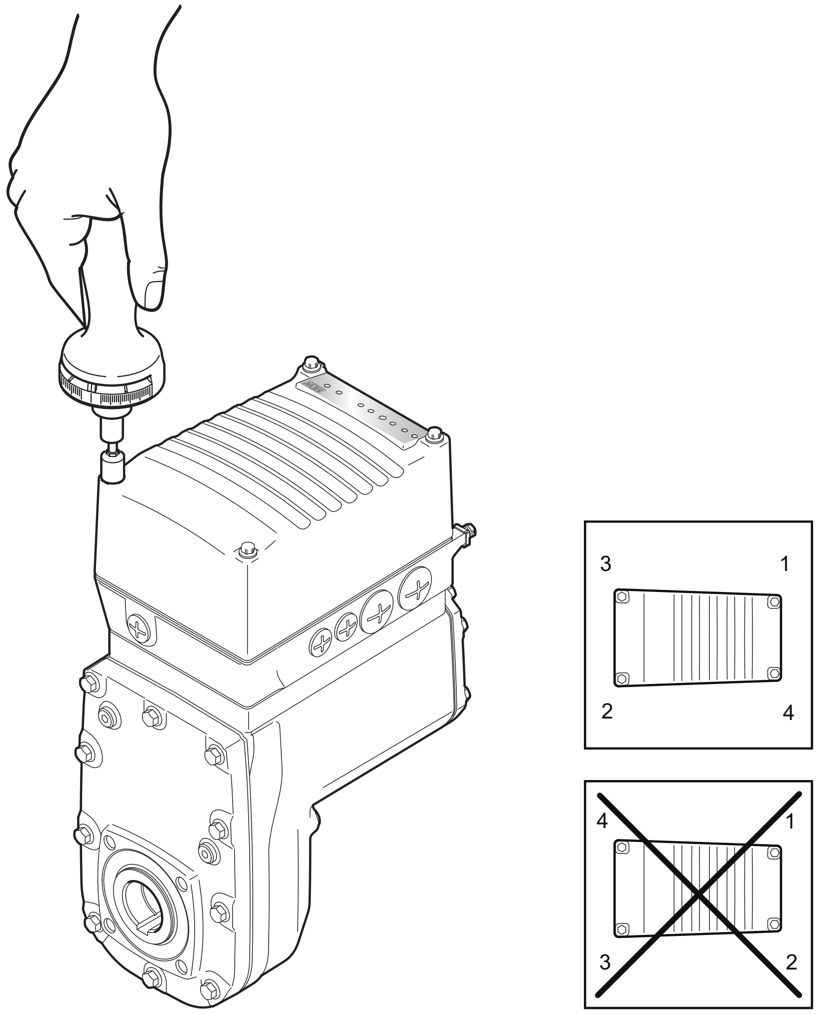
4.11.3 MOVIGEAR® electronics cover

Proceed as follows when installing the electronics cover: Insert the screws and tighten them in diametrically opposite sequence **step by step** with a tightening torque of 6.0 Nm.



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5 Electrical installation

INFORMATION

Adhere to the safety notes during installation.

5.1 Installation planning taking EMC aspects into account

5.1.1 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.

5.1.2 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.

5.1.3 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.

For more information on cable selection, routing and shielding, refer to chapter "Cable routing and shielding".

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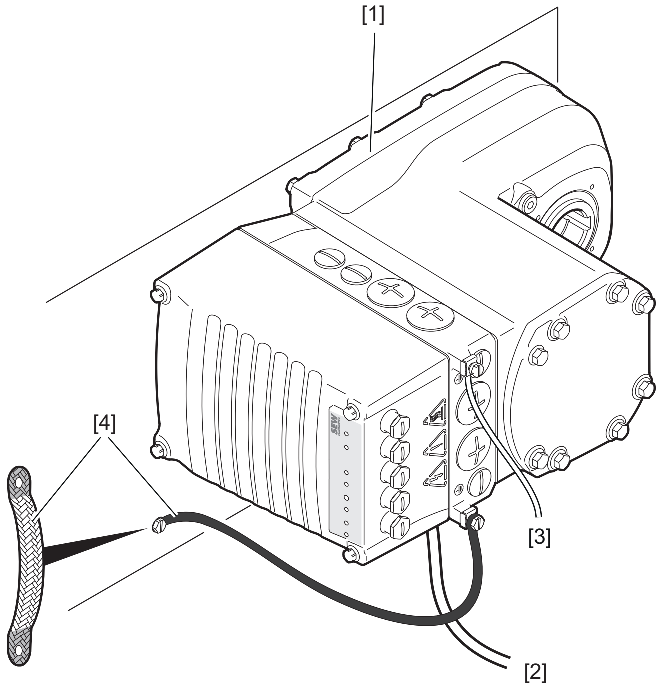
5.1.4 Equipotential bonding

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 rail.
- To do so, use a ground strap (HF litz wire), for example, to connect the device and the grounding point of the system.

Example



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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.
[2] PE conductor in the supply system cable
[3] 2. PE conductor via separate terminals
[4] EMC-compliant equipotential bonding, for example using a ground strap (HF litz wire)
The contact surfaces must be conductive (free of paint).

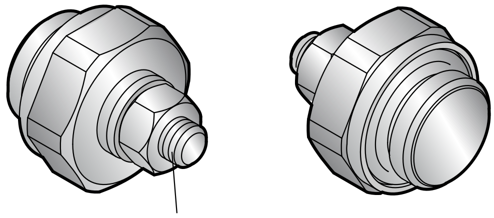
- Do not use the cable shields of data lines for equipotential bonding.

INFORMATION

For detailed information on equipotential bonding for decentralized inverters and drive units, refer to the publication "Equipotential Bonding of Decentralized Inverters" by SEW-EURODRIVE.

5.2 Equipotential bonding at the connection box

Another option for HF-capable equipotential bonding at a connection box is the following cable gland with M6 stud bolt:



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	Tightening torque of the cable gland	Tightening torque of the M6 nut for stud bolt	Part number
M16 cable gland with M6 stud bolt	4.0 Nm	3.0 Nm	08189234
M25 cable gland with M6 stud bolt	7.0 Nm	3.0 Nm	08192685

You can install this cable gland at a connection box that still has a free cable entry of size M16 or M25.

Screw the cable gland into the free cable entry and install the grounding cable (with ring cable lug) or the HF litz wire at the M6 stud bolt.

5.3 Installation instructions

5.3.1 Permitted voltage systems

Information on voltage 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	Use is only permitted with electronics cover in IT system design (...-513-....). • 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. • No EMC limits are specified for interference emission in IT systems. The EMC limits for interference emission specified in the chapter "Technical data" do not apply to IT system designs.
Voltage systems with grounded outer conductor	Not permitted.

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5.3.2 Connecting 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 nominal power (see chapter "Technical data and dimension sheets").
- Install safety equipment F11/F12/F13 for line fuses at the beginning of the power supply cable behind the supply bus junction, see chapter "Connection diagram".

  Dimension the safety features according to the cable cross section.
- Use only copper conductors with a minimum temperature range of 90 °C as connection cable.

5.3.3 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 (mm^2)	0.5 mm^2 – 6 mm^2	0.5 mm^2 – 6 mm^2
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 mm^2 – 4.0 mm^2	0.25 mm^2 – 2.5 mm^2
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 mm^2 – 2.5 mm^2	0.25 mm^2 – 2.5 mm^2	0.25 mm^2 – 1.5 mm^2
Stripping length	5 mm – 6 mm		

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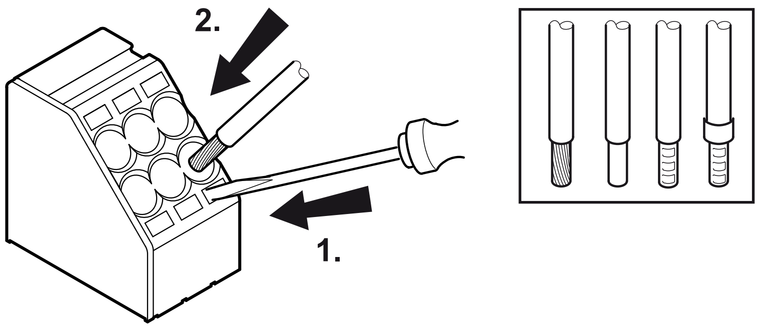
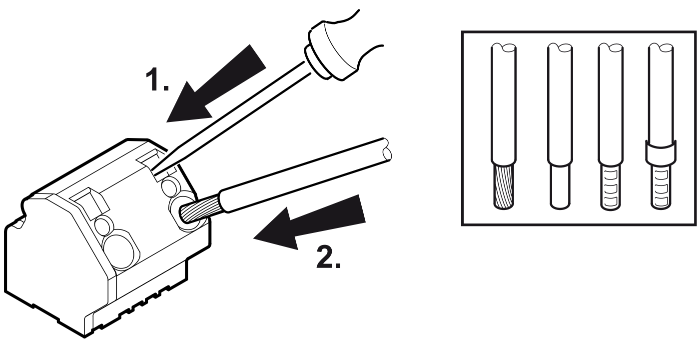
5.3.4 Activating line terminals X1

Adhere to the following sequence when actuating the line terminals X1:

Line terminals X1 (the following figure shows a schematic illustration)
 25649924107

5.3.5 Activating terminals X3 for the braking resistor

Adhere to the following sequence when you activate the terminals X3 for the braking resistor:

Terminals X3 for the braking resistor (the following figure shows a schematic illustration)
 25650172171

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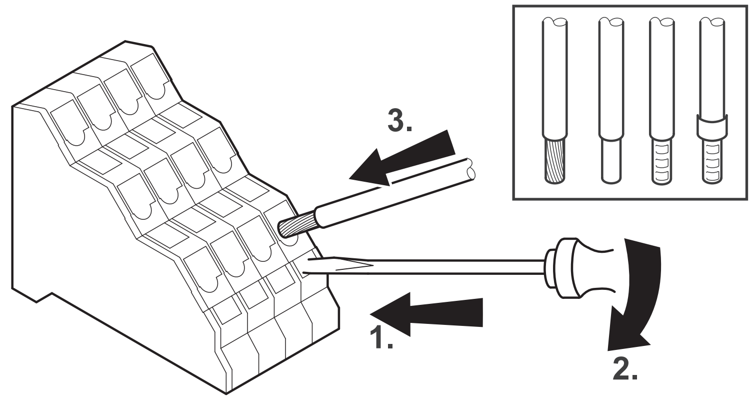
5.3.6 Activating control terminals X9

Adhere to the following sequence when actuating the X9 control terminals:

X9 control terminals (the following figure shows a schematic illustration)



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5.3.7 Residual current device

⚠ WARNING

No protection against electric shock if an incorrect type of residual current device is used.

Severe or fatal injuries.

- The product can cause direct current in the PE conductor. If a residual current device (RCD) or a residual current monitoring device (RCM) is used for protection in the event of a direct or indirect contact, only a type B RCD or RCM is permitted on the supply end of the product.

- If the use of a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not to use a residual current device.

5.3.8 Line contactor

NOTICE

Non-compliance with the minimum switch-on/switch-off times.

Damage to the device.

- Keep the supply system switched off for 10 s before switching the power back on.
- Do not switch the supply system off and on more than once per minute.

- Use only a contactor of utilization category AC3 (EN 60947-4-1) as a line contactor.

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5.3.9 Notes on PE connection

⚠ WARNING

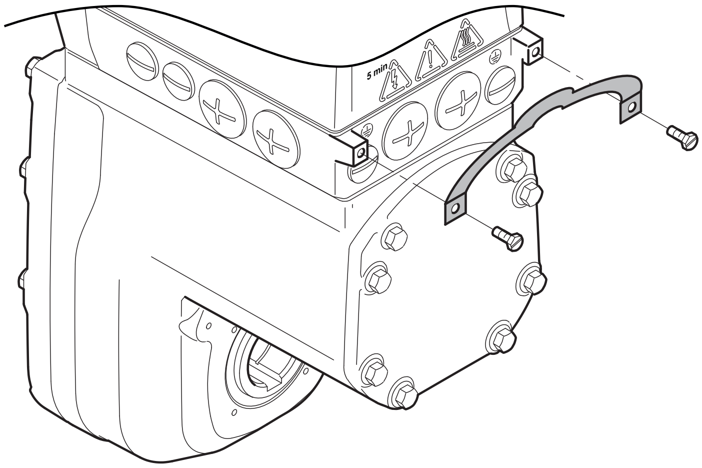
Electric shock due to incorrect connection of PE.

Severe or fatal injuries.

- The permitted tightening torque for the screw is 2.0 to 2.4 Nm.
- Observe the following notes regarding PE connection.

Make sure the handle has been removed before you connect the PE cable.

Store the handle for future service work.



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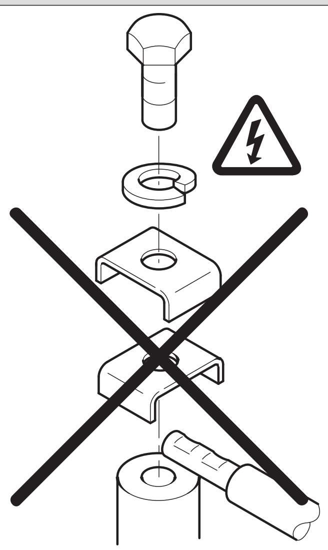
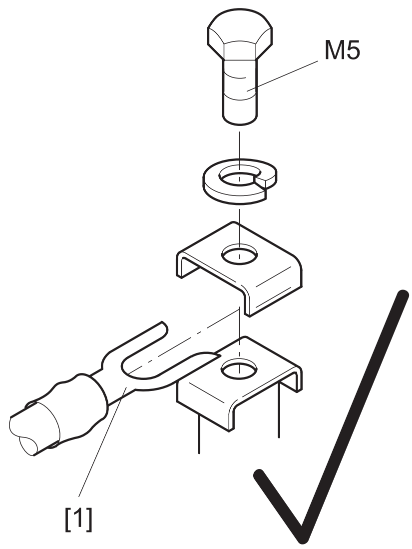
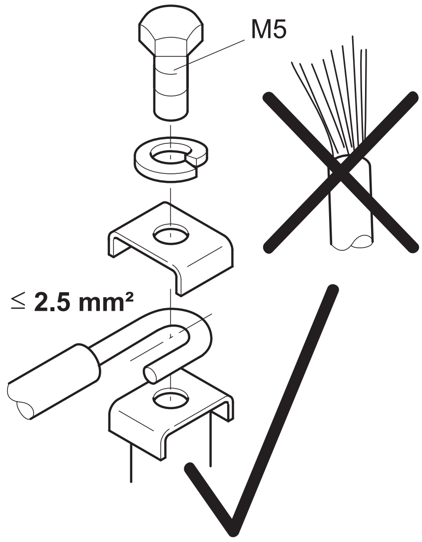
Impermissible assembly	Recommendation: Assembly with cable lug[1)] Permitted for all cross sections	Assembly with solid connecting wire[1)] Permitted for cross sections up to max. 2.5 mm²
	 M5 [1] *9007201632429067*	 M5 ≤ 2.5 mm² *9007201632413579*

1) Use the specified material for the assembly that is included in the accessory bag.

[1] Forked cable lug suitable for M5 PE screws

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Leakage currents

Earth-leakage currents ≥ 3.5 mA can occur during normal operation. In order to fulfill EN 61800-5-1, observe the following notes:

- The protective earth (PE) connection must meet the requirements for systems with high earth-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 with the original PE connection.

    The second PE connection is not required according to DIN EN 61800-5-1, if the line connection is equipped with a plug connector for industrial applications (according to IEC 60309) and if the supply system cable has a diameter of ≥ 2.5 mm^2.

INFORMATION

The round M23 plug connector of the 723 series by TE Connectivity - Intercontec products meet the requirements according to IEC 60309 "Plug connectors for industrial applications".

5.3.10 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.

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5.3.11 Installation above 1000 m amsl

You can install the drive units at altitudes from 1000 m to a maximum of 3800 m above sea level provided the following conditions are met.[1)]

- The nominal motor current I_N is reduced due to the reduced cooling above 1000 m (see chapter "Technical data and dimension sheets").
- Above 2000 m above sea level, the air and creeping 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 unit for altitudes of 2000 m above sea level and higher (safe electrical disconnection in accordance with EN 61800-5-1).
- At installation altitudes between 2000 m and 3800 m above sea level, the permitted rated power supply voltages are reduced as follows:
  – By 6 V per 100 m

1) The maximum altitude is limited by the reduced electric strength due to the lower air density.

5.3.12 Protection devices

- The following units come equipped with integrated protection devices against overload.
- Cable protection for the power cable must be implemented using external overload devices.
- Observe the relevant standards concerning the cable cross section, voltage drop and installation type.

5.3.13 UL-compliant installation (in preparation)

UL and cUL approval for the MOVIGEAR® performance series is in preparation.

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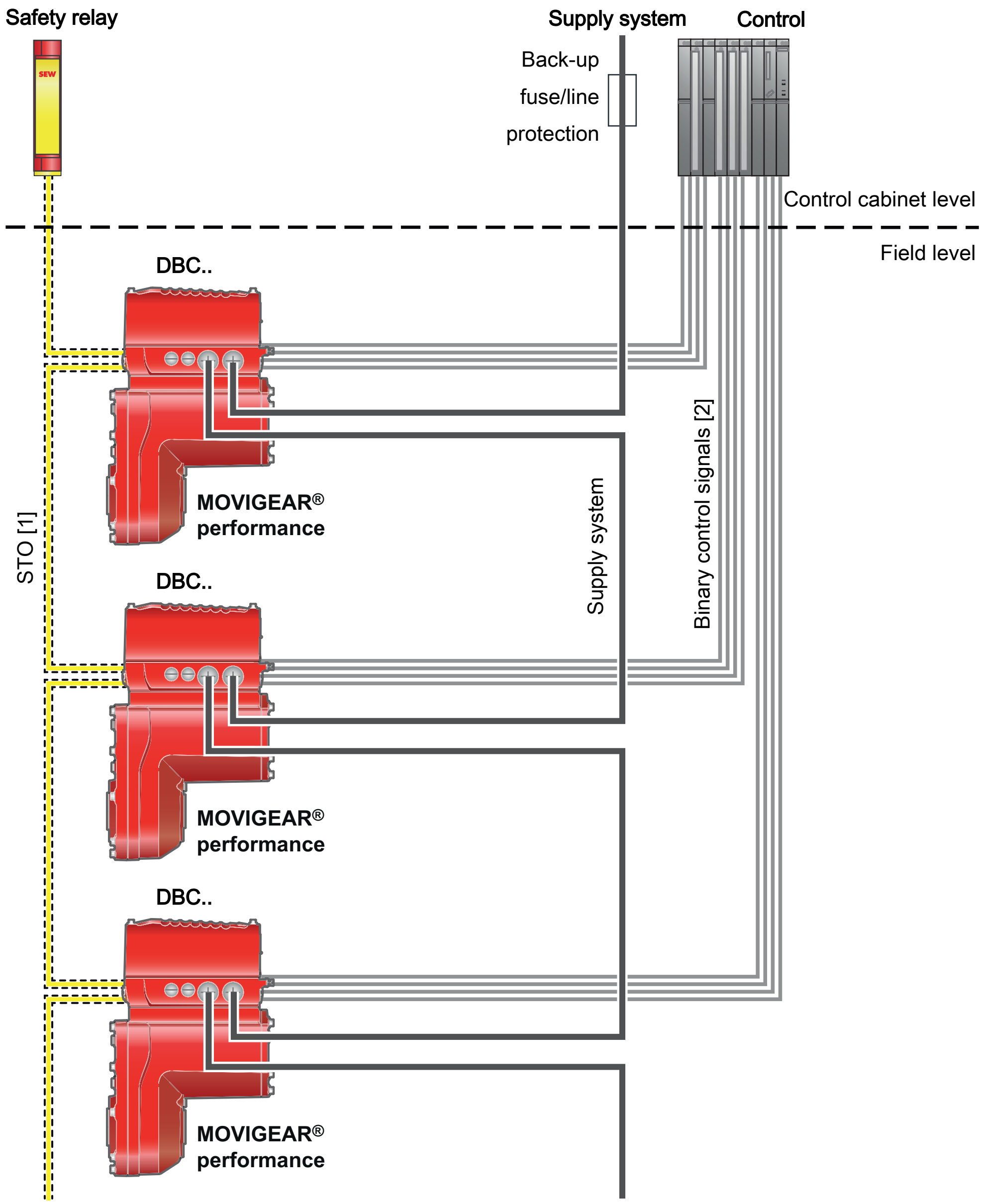
5.4 Installation topology (example: standard installation)

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] Control using up to 4 binary signals and 1 analog signal.

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5.5 Terminal assignment

⚠ WARNING

Electric shock due to regenerative operation when the shaft is turning.

Severe or fatal injuries.

- Secure the output shaft against rotation when the electronics cover is removed.

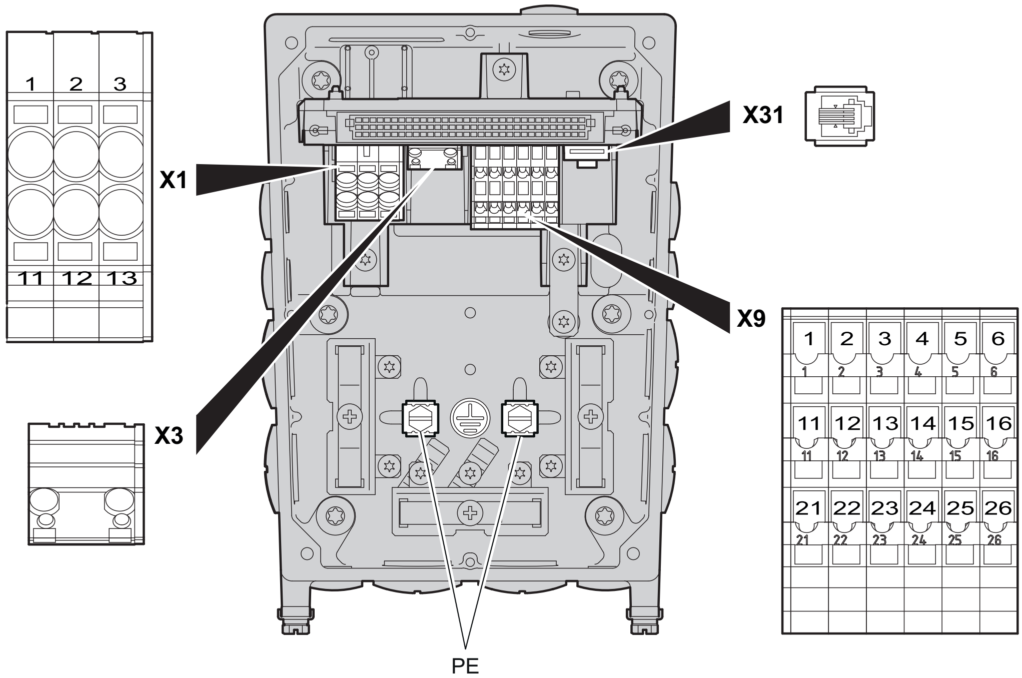
INFORMATION

The terminals X3 for connecting the braking resistor can be connected to an optional, internal braking resistor. As an alternative, you an connect an external braking resistor if the power rating of this braking resistor is not sufficient.

Proceed as follows to do so:

- Loosen the connections of the internal braking resistor.
- Insulate and fasten the connections of the internal braking resistor. Make sure all connections leading to other components are electrically insulated.
- Connect the external braking resistor again. Observe the installation instructions of the device and of the external braking resistor.

The following figure shows the terminal assignment of MOVIGEAR®..-DBC-C:



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Assignment				
Terminal	**No.**	**Name**	**Marking**	**Function**
X1 line terminals	1	L1	Brown	Line connection, phase L1 – IN
	2	L2	Black	Line connection, phase L2 – IN
	3	L3	Gray	Line connection, phase L3 – IN
	11	L1	Brown	Line connection, phase L1 – OUT
	12	L2	Black	Line connection, phase L2 – OUT
	13	L3	Gray	Line connection, phase L3 – OUT
⏚	–	PE	–	PE connection
X3 braking resistor terminals	1	BR	–	Braking resistor connection
	2	BR	–	Braking resistor connection
X9 control terminals	1	F_STO_P1	Yellow	Input STO+
	2	F_STO_P1	Yellow	Input STO+ (to loop through)
	3	0V24_OUT	–	0V24 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	F_STO_M	Yellow	Input STO_ground
	12	F_STO_M	Yellow	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	F_STO_P2	Yellow	Input STO+
	22	F_STO_P2	Yellow	Input STO+ (to loop through)
	23	0V24_IN	–	0V24 reference potential for DC 24 V supply
	24	DOR-NO	–	Relay output DO R, NO contact
	25	0V24_OUT	–	0V24 reference potential for DC 24 V output
	26	24V_OUT	–	DC 24 V output

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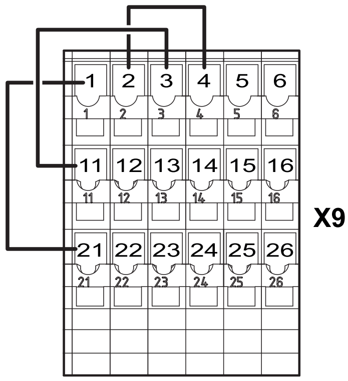
Assignment				
Terminal	**No.**	**Name**	**Marking**	**Function**
X31 engineering interface	1	0V24_OUT	–	0V24 reference potential for DC 24 V auxiliary output
	2	CAN_L	–	CAN Low connection
	3	CAN_H	–	CAN High connection
	4	24V_OUT	–	DC 24 V auxiliary output

The following figure shows the factory-installed jumpers at the X9 terminals:



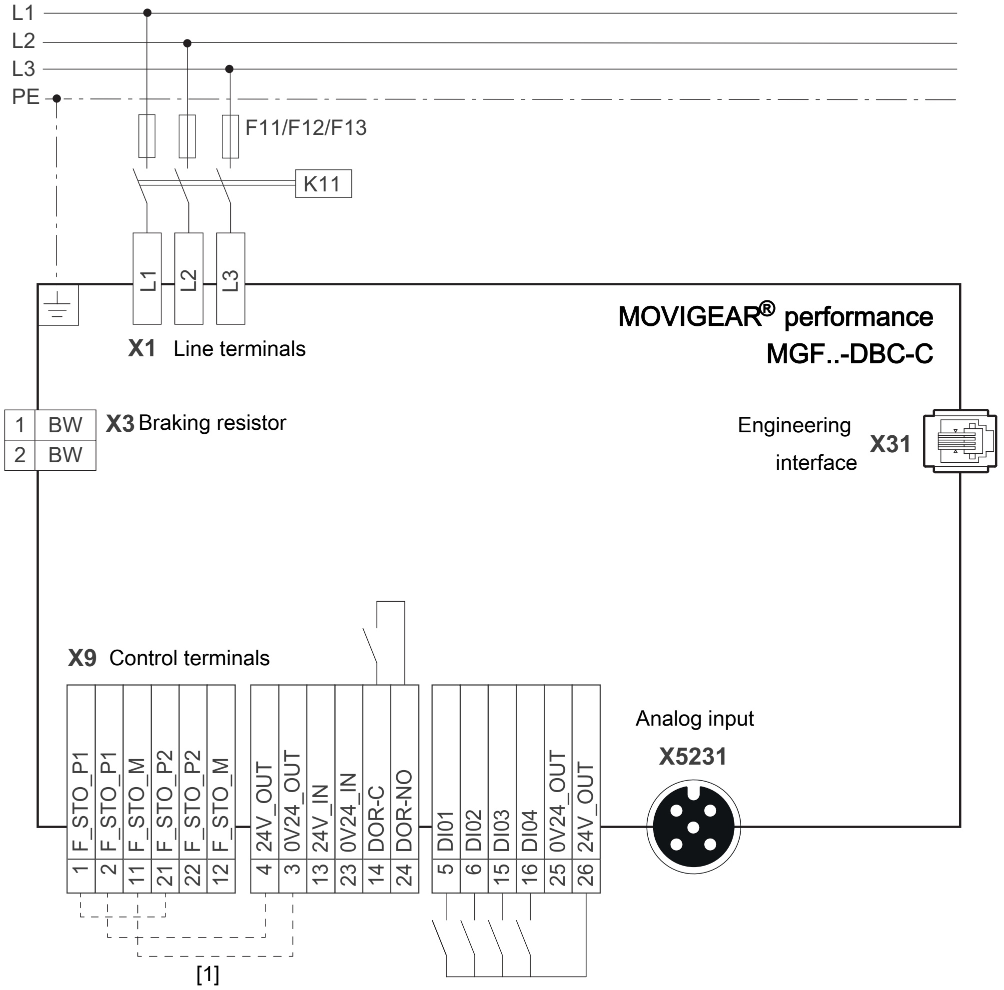
29006177419

These jumpers are not present in the following designs:

- Designs with plug connectors with STO function.

For additional information, refer to chapter "Functional safety".

5.6 Connection diagram



9007228244504587

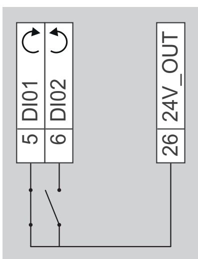
[1] Jumpers installed at the factory (only applicable to designs without plug connectors with STO function). For additional information, refer to chapter "Functional safety".

For terminal assignment, refer to chapter "Terminal assignment".

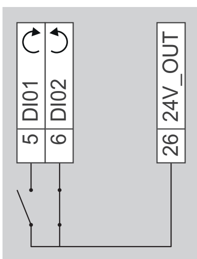
For plug connector assignment, refer to chapter "Plug connectors".

5.6.1 Terminal functions in Easy mode (delivery state)

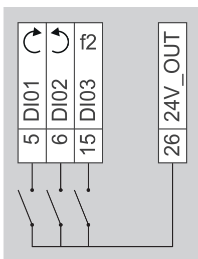
Positive direction of rotation active (CW)



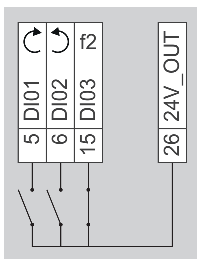
Negative direction of rotation active (CCW)



Setpoint f1 active



Setpoint f2 active



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5.7 Cable routing and cable shielding

5.7.1 Accessory bag with installation equipment (part number 18241395)

INFORMATION

For some installation variants, you do not need all the parts of the accessory kit.

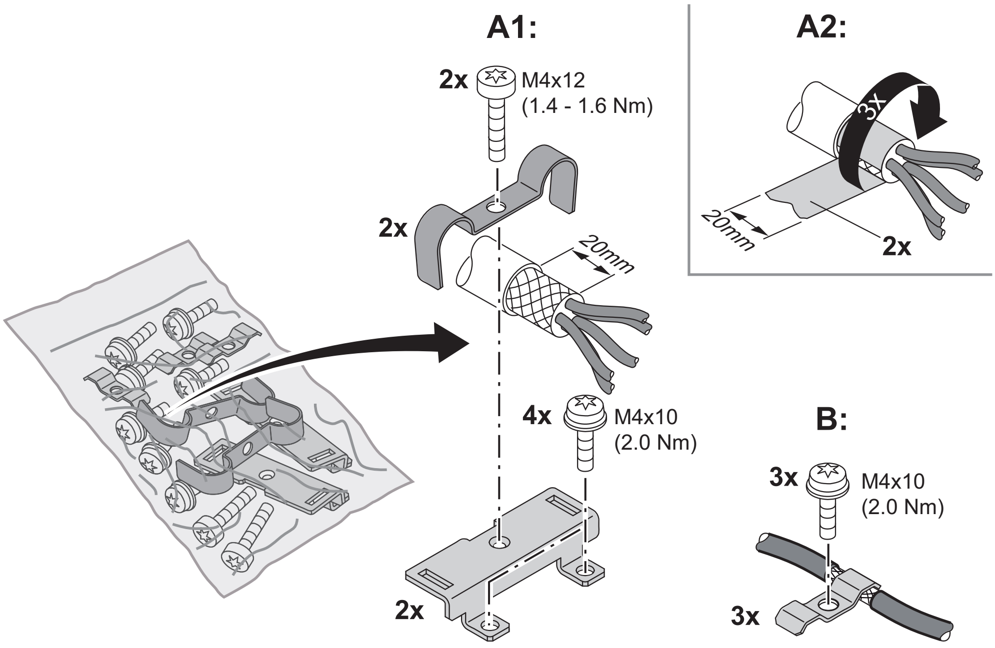
The delivery of each drive unit includes the following accessory bag with installation materials for cable shielding (exception: Does not apply when all possible connections were ordered in plug connector design):

- **A1: Installation material for line and hybrid cables:**

  2 x shield clamps with shield plate and screws to connect the shield of line cables or hybrid cables (outer shield).
- **A2: Conductive film:**

  2 x pieces of conductive film to wind around the braid shield. Use the conductive film if required.
- **B: Installation equipment for signal lines:**

  3 x shield clamps with screw to connect the shield of line cables (e.g. STO).



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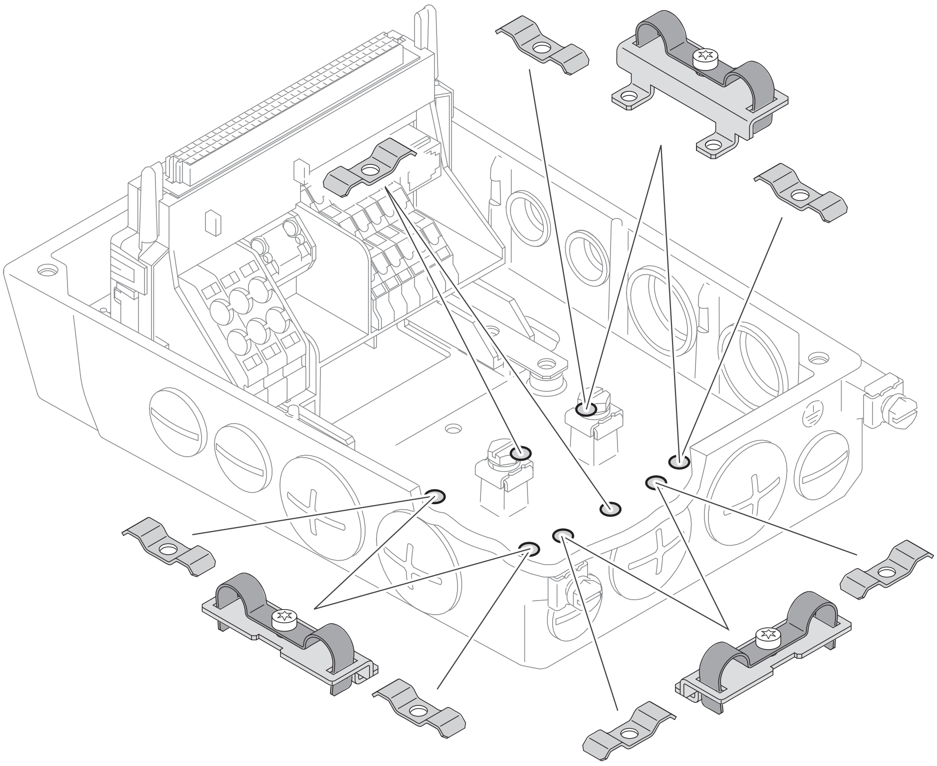
5.7.2 General installation options

The following figure shows the general installation options. The following chapters show common examples and contain important notes on cable selection and cable routing.



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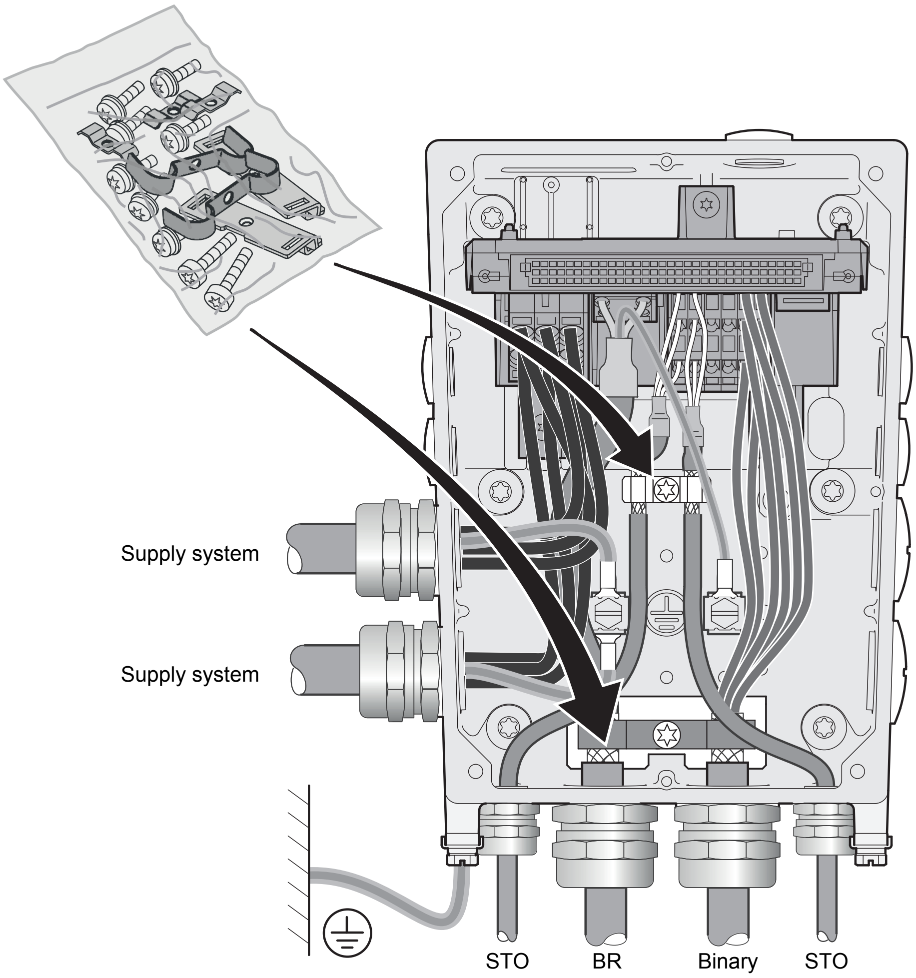
5.7.3 Installation with separately routed binary signal cable

Notes on cable routing and shielding – Recommended cable routing

Note the following when routing and shielding the cables:

- Cable selection
  - For cable selection, observe chapter "Technical data and dimension sheets / connection cables" in the operating instructions.
  - You can use unshielded cables for the supply system connection.
- Cable shielding
  - Connect the shields of the cables to the metal housing of the unit using the shield clamps of the installation equipment kit. To do so, strip off the cable sheath around the shield connection surface.
  - As an alternative, you can use optionally available EMC cable glands to connect the shield of cables, see chapter "Cable glands".
- External braking resistor
  - Also observe the notes in chapter "Terminal assignment".
- Observe the permitted bending radii of the installed cables for cable routing.



18014427790689419

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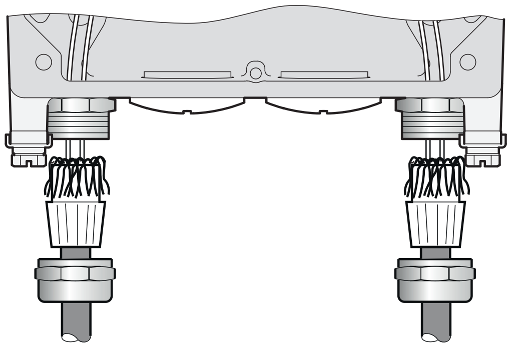
5.8 EMC cable glands

5.8.1 Cable shielding (alternative)

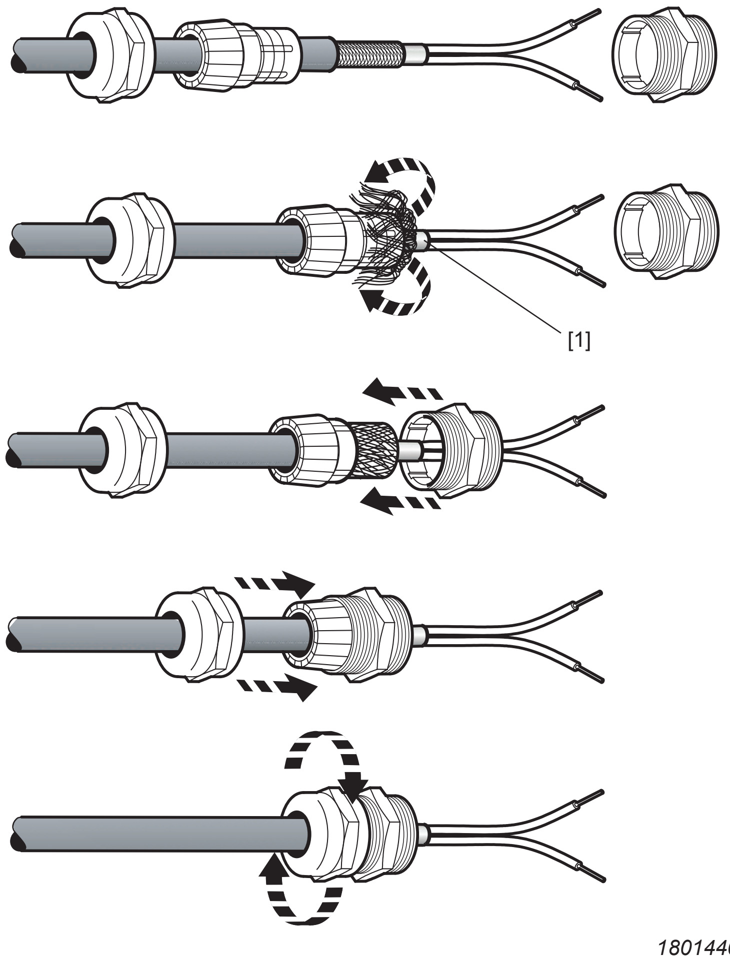
As an alternative to using shield clamps for shielded cables (e.g. control cables, STO cables, power cables), you can use EMC cable glands, which are available as an option, to connect the shield.



25216680843

5.8.2 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.

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5.9 Plug connectors

5.9.1 Representation of connections

The wiring diagrams of the plug connectors depict the contact end of the connections.

5.9.2 Designation key

The designation of plug connectors is specified according to the following key:

X	**Terminal**
2	**Group** 1 = Power input 2 = Power output 3 = Encoder 4 = Bus 5 = Inputs and outputs
01	**Function** Function of the plug connector within a group
2	**Type** Wiring diagram of the plug connector within a function
–	
	Group number (optional) for several plug connectors with the same function
	Sequence number (optional) In case of several plug connectors in one group

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5.9.3 Connection cables

INFORMATION

For more information on cable types, refer to the chapter "Technical data".

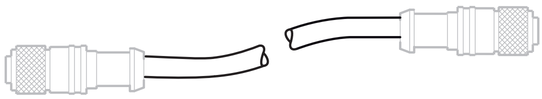
Connection cables are not included in the scope of delivery.

Prefabricated cables for connecting SEW-EURODRIVE components can be ordered. For each connection, the available prefabricated cables are listed. Specify the part number and length of the required cable in your order.

The number and design of the required connection cables depend on the type of the device and the components to be connected. This is why you do not need all listed cables.

Cable types

The table below shows the depiction and what they mean:

Representation	Meaning
	Fixed length
	Variable length
	Suitable for cable carriers
	Not suitable for cable carriers

Cable routing

Observe the permitted bending radii of the installed cables for cable routing. For detailed information, refer to chapter "Technical data" > "Dimension sheets" > "Plug connectors including mating connectors".

Using prefabricated cables with plug connectors

SEW-EURODRIVE uses prefabricated cables for certifications, type tests and approval of the units. The cables available from SEW-EURODRIVE meet all the requirements necessary for the functions of the unit and the connected components. The devices under consideration are always the basic devices including all connected components and corresponding connection cables.

This is why SEW-EURODRIVE recommends to use only the prefabricated cables specified in the documentation.

When using units 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 units concerning functional safety.

Using third-party cables with plug connectors

If third-party cables are used – even if these cables are technically adequate – SEW-EURODRIVE does not accept any liability and cannot guarantee unit properties or functions.

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If you use third-party cables for connecting the device and connected components, ensure their compliance with applicable national regulations. Note that the technical features of the device or unit network might be affected inadvertently when using third-party cables. This concerns in particular the following properties:

- Mechanical properties (e.g. IP degree of protection, 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 (such as interference emission limit values, compliance with interference immunity values stipulated in standards)
- Functional safety (approvals according to EN ISO 13849-1)

Third-party cables not explicitly recommended by SEW-EURODRIVE must meet at least the requirements of the following standards and have been permitted according to these plug connector standards:

- IEC 60309
- IEC 61984

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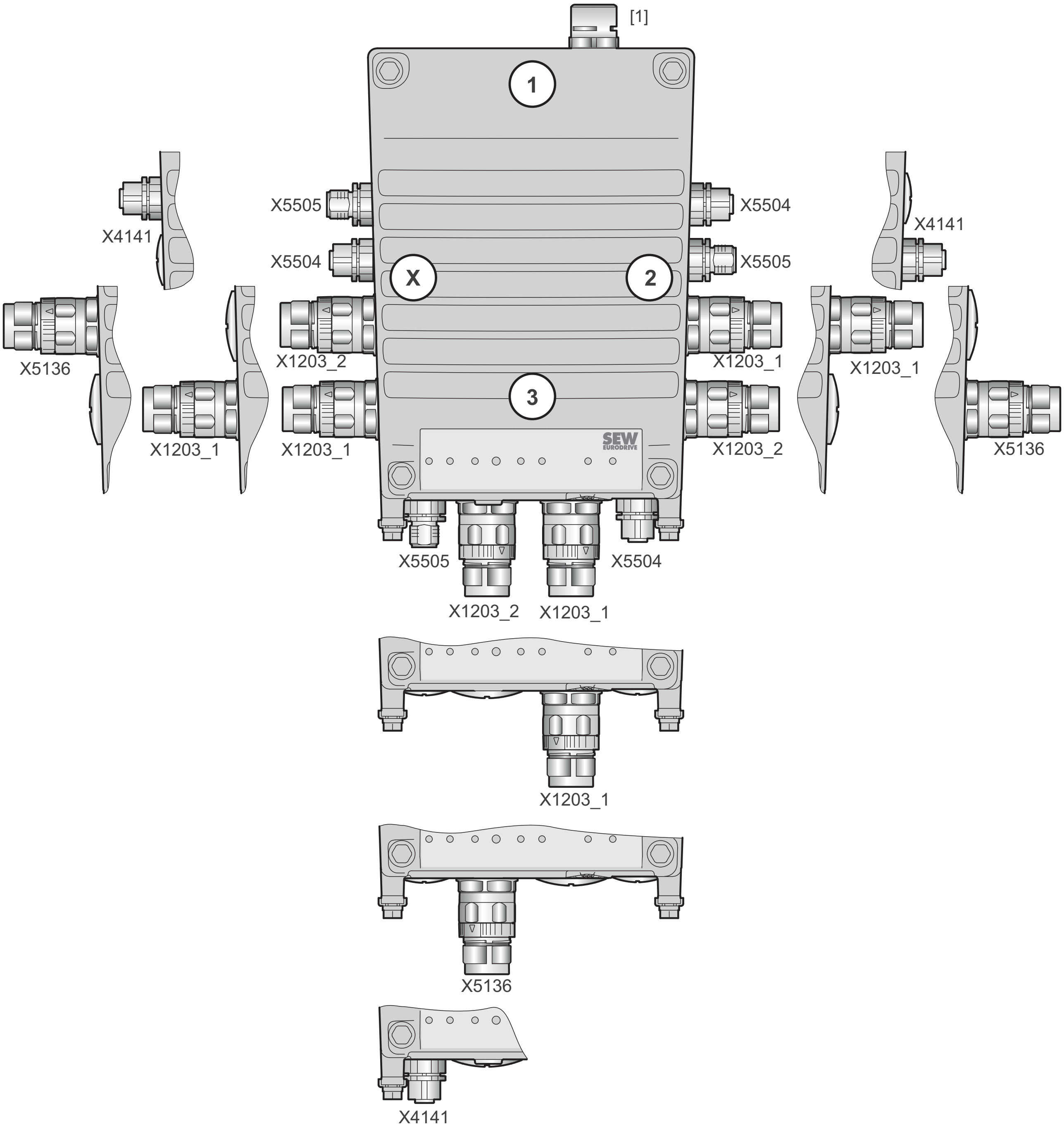
5.9.4 Plug connector positions of the drive unit

The following figure shows possible plug connector positions:



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Plug connector				Not together at a position with the plug connector:
Designation	Coding ring/ color	Function	Position	
X1203_1	Black	AC 400 V connection[1)]	X, 2 or 3	–
X1203_2	Black	AC 400 V connection	X, 2 or 3	• X5136
X5504	Yellow	STO (3-core connection)[2)]	X, 2 or 3	–
X5505	Yellow	STO (3-core connection)[2)]	X, 2 or 3	• X4141

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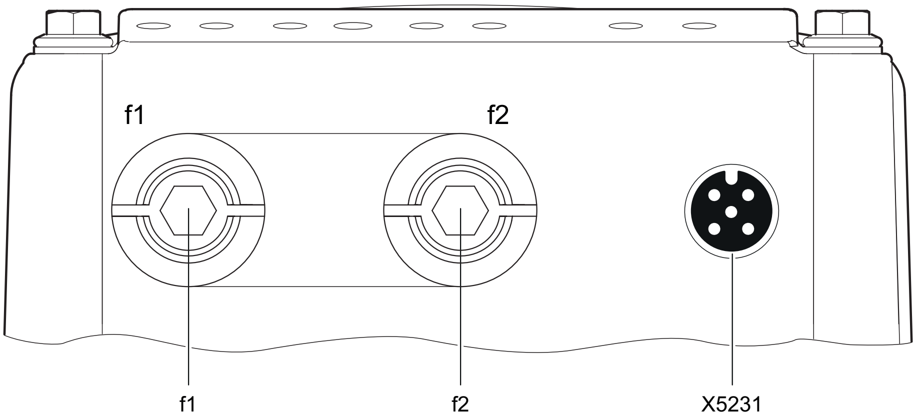
Plug connector				Not together at a position with the plug connector:
Designation	Coding ring/ color	Function	Position	
X5136	Black	Digital inputs/outputs	X, 2 or 3	• X1203_2
X4141	Black	Engineering interface	X, 2 or 3	• X5505
–	–	[1] Optional pressure compensation	1	–

1) Plug connector X1203_1 can also be ordered individually (i.e. without plug connector X1203_2).

2) Plug connectors X5504 and X5505 can only be ordered together.

5.9.5 Plug connector positions at the electronics cover

The following figure shows the positions of the potentiometers and plug connectors:



9007228262316171

Designation	Function
f1	Potentiometer f1 (underneath the screw plug)
f2	Potentiometer f2 (underneath the screw plug)
X5231	Analog input

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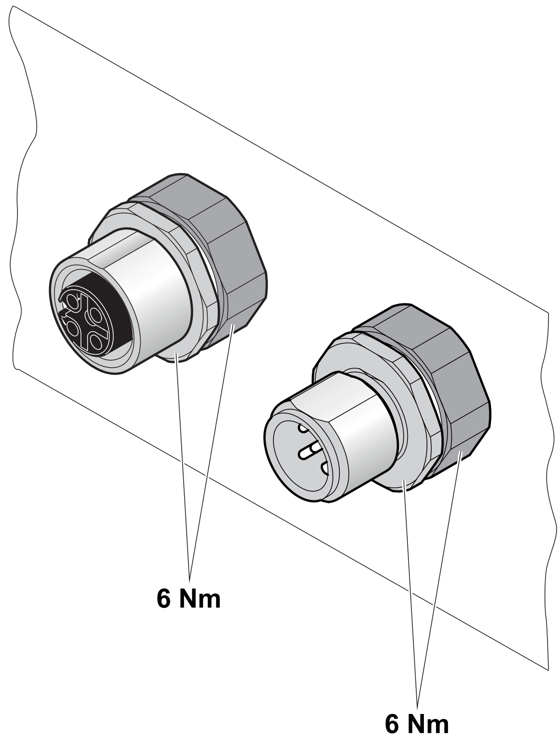
5.9.6 Plug connector variants

M12 plug connector at the connection box

M12 plug connectors at the connection box are pre-installed so they match the connection cables provided by SEW-EURODRIVE. Customers can adjust the orientation of plug connectors if required.

The following figure shows a schematic illustration with the permitted tightening torques:



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M23 plug connector

⚠ CAUTION

Possible damage of the right-angle connector when rotated without mating connector.

Irreparable damage to the thread, damage to the sealing surface.

- Do not use pliers to adjust the right-angle connector before connecting it.

⚠ CAUTION

Loss of the guaranteed degree of protection.

Potential damage to property.

- Remove the union nut from the M23 plug connector using 3 Nm.
- Between plug connector and bushing is a gap of 2 mm.

⚠ CAUTION

Adjusting the right-angle connector too often can damage it.

Potential damage to property.

- Adjust the plug connector only when installing and connecting the drive unit.
- Do not turn the plug connector regularly once it has been installed.

The M23 plug connectors are available in the following variants:

- [1] "Straight" plug connector
- [2] "Right-angle" plug connector

Once the mating connector has been plugged in, the "right-angle" connector can be adjusted without using additional tools.

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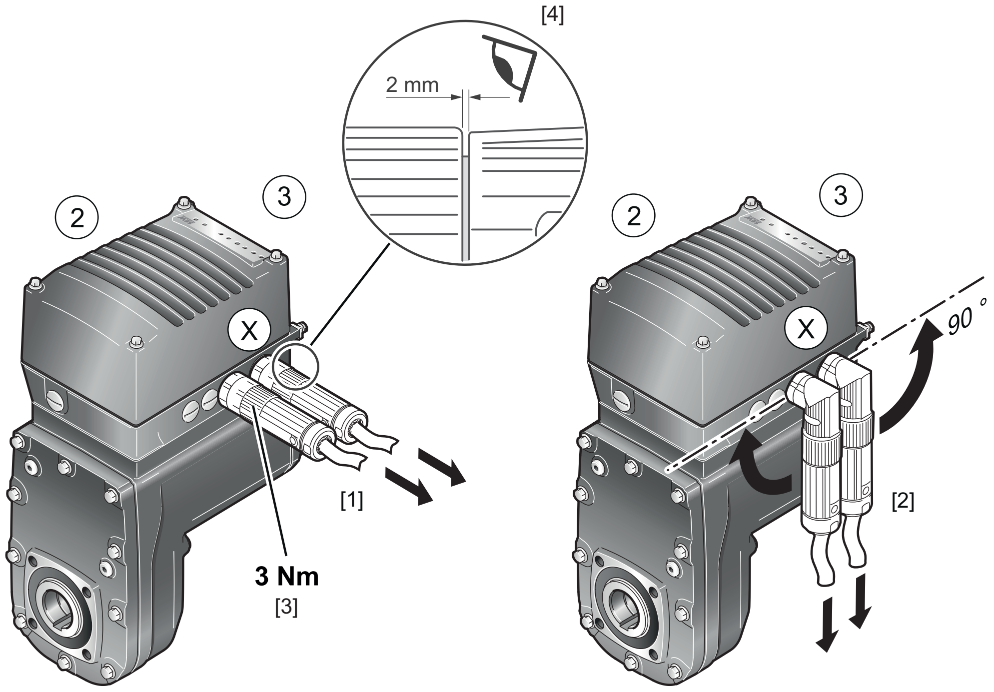
Example of MOVIGEAR® performance



9007224476469899

[1] "Straight" design
[2] "Angled" design
[3] The tightening torque for the union nut is 3 Mn.
You can order suitable tools from TE Connectivity - Intercontec products using the following order number:
• Socket wrench 3 Nm, 1/4" external square driver: C1.020.00
• Hook wrench 1/4" square socket, suitable to the 923/723 series with SpeedTec equipment: C6.216.00
[4] Between plug connector and bushing is a gap of 2 mm.

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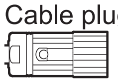
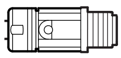
5.9.7 Using plug connectors assembled by yourself

The power plug 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:

Plug connector type		**Designation for order from the supplier TE Connectivity - Intercontec products**
Coding ring: Black	Cable plug (male) 	H 51 A 019 MR 02 59 0102 000
	Cable socket (female) 	H 52 A 013 FR 02 59 0102 000

5.10 Optional plug connector assignment

⚠ WARNING

Electric shock when disconnecting or connecting voltage-carrying plug connectors.

Severe or fatal injuries

- Switch off the line voltage.
- Never plug or unplug plug connectors while they are energized.

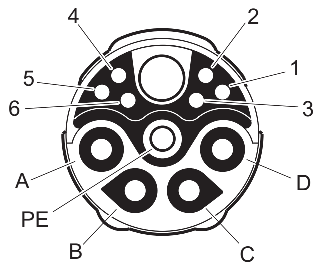
5.10.1 X1203_1 and X1203_2: AC 400 V connection

The following table shows information about this connection:

Function
AC 400 V connection for supplying the device/for looping through

Connection type
M23, SEW insert, 723 series, SpeedTec-capable, company: TE/Intercontec, female, coding ring: black, protected against contact

Connection diagram



Assignment		
Contact	**Signal**	**Description**
A	L1	Line connection, phase L1
B	L2	Line connection, phase L2
C	L3	Line connection, phase L3
D	Res.	Reserved
PE	PE	PE connection
1	Res.	Reserved
2	Res.	Reserved
3	Res.	Reserved
4	Res.	Reserved
5	Res.	Reserved
6	Res.	Reserved

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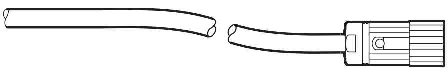
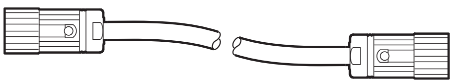
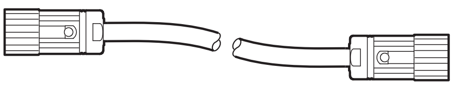
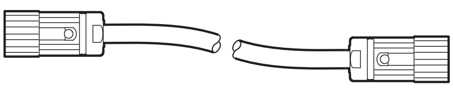
Connection cables

The following tables list the cables available for this connection:

Cable cross section 1.5 mm²

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open — M23, coding ring: black, male	CE: 18180094	HELUKABEL® JZ-600	Variable	1.5 mm² / AC 500 V

Cable cross section 2.5 mm²

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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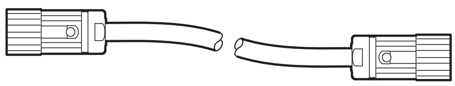
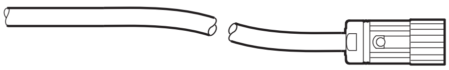
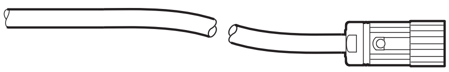
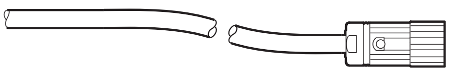
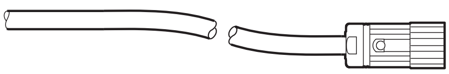
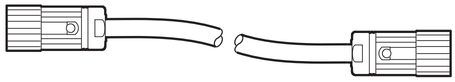
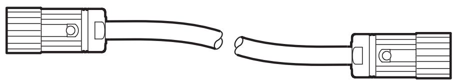
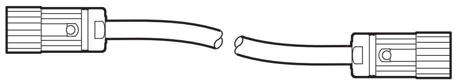
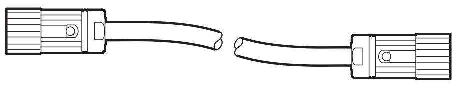
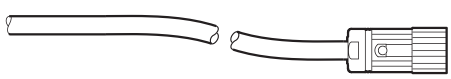
Connection cable		Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male	M23, coding ring: black, male	UL: 18153275	HELUKABEL® MULTIFLEX® – 512	Variable 	2.5 mm² / AC 500 V
 Open	M23, coding ring: black, male	CE: 18127479	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	2.5 mm² / AC 500 V
 Open	M23, coding ring: black, male	CE: 18133967	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable 	2.5 mm² / AC 500 V
 Open	M23, coding ring: black, male	UL: 18153283	HELUKABEL® – JZ-602	Variable 	2.5 mm² / AC 500 V
 Open	M23, coding ring: black, male	UL: 18153291	HELUKABEL® MULTIFLEX® – 512	Variable 	2.5 mm² / AC 500 V

Cable cross section 4.0 mm²

Connection cables	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 CE: 18133975	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	4 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18133975	HELUKABEL® TOPFLEX® – 611-PUR (Halogen-free)	Variable 	4 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153305	HELUKABEL® – JZ-602	Variable 	4 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153313	HELUKABEL® MULTIFLEX® – 512	Variable 	4 mm² / AC 500 V
 Open — M23, coding ring: black, male	CE: 18127495	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	4 mm² / AC 500 V

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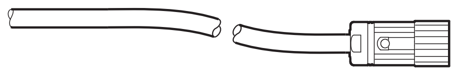
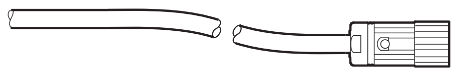
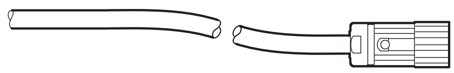
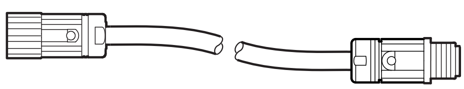
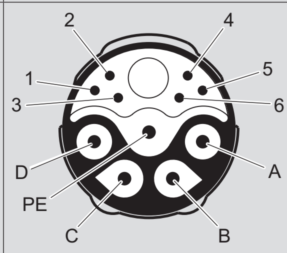
Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross-section/operating voltage
 Open — M23, coding ring: black, male	CE: 18133983	HELUKABEL® TOPFLEX® – 611-PUR (Halogen-free)	Variable 	4 mm² / AC 500 V
 Open — M23, coding ring: black, male	UL: 18153321	HELUKABEL® – JZ-602	Variable 	4 mm² / AC 500 V
 Open — M23, coding ring: black, male	UL: 18153348	HELUKABEL® MULTIFLEX® – 512	Variable 	4 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, female	UL: 18166318	HELUKABEL® MULTIFLEX® – 512	Variable 	4 mm² / AC 500 V

Connection of cables with open end

The following table shows the conductor assignment of the cables with the following part numbers:

Part numbers
18180094, 18127479, 18133967, 18153283, 18153291, 18127495, 18133983, 18153321, 18153348

Assembly					
Open cable end				**Prefabricated plug connectors**	
					
Core color/ core cross section	**Identi-fication**	**Assembly**	**Description**	**Signal**	**Contact**
Black 1.5 mm^2 2.5 mm^2	1	Not pre-fabricated	Line connection, phase L1	L1	A
Black 1.5 mm^2 2.5 mm^2	2	Not pre-fabricated	Line connection, phase L2	L2	B
Black 1.5 mm^2 2.5 mm^2	3	Not pre-fabricated	Line connection, phase L3	L3	C
Green/yel-low 1.5 mm^2 2.5 mm^2	-	Not pre-fabricated	PE connection	PE	PE

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5.10.2 X5504: STO (3 cores)

⚠ WARNING

No safe disconnection of the device.

Severe or fatal injuries.

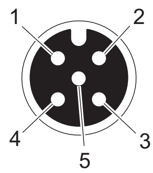
- Do not use the 24 V output (pins 1 and 3) for safety-related applications.
- Only jumper the STO connection with 24 V if the device does not have to fulfill any safety function.

The following table shows information about this connection:

Function
Connection for safe torque off (STO, 3 cores)

Connection type
M12, 5-pin, female, A-coded, color: yellow

Connection diagram



Assignment		
Contact	**Signal**	**Description**
1	24V_OUT	DC 24 V auxiliary output
2	F_STO_P2	F_STO_P2 connection
3	0V24_OUT	0V24 reference potential for DC 24 V auxiliary output
4	F_STO_P1	F_STO_P1 connection
5	F_STO_M	F_STO_M connection

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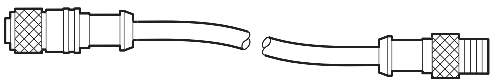
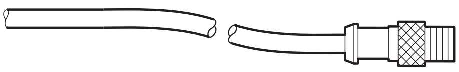
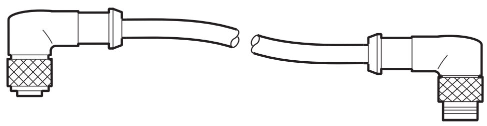
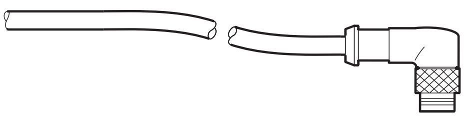
Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

The following table provides an overview of 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	Variable	3 x 0.75 mm^2 / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28110943	HELUKABEL LiYCY	Variable	3 x 0.75 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110951	HELUKABEL LiYCY	Variable	3 x 0.75 mm^2 / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28110978	HELUKABEL LiYCY	Variable	3 x 0.75 mm^2 / DC 60 V

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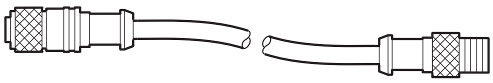
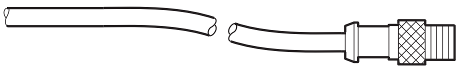
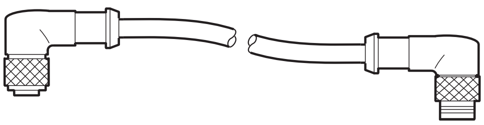
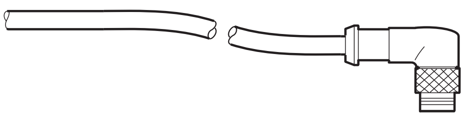
Connection cable		Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female	M12, 5-pin, A-coded, male	CE/UL: 28110994	igus chainflex CF78.UL	Variable	4 x 0.5 mm^2 / DC 60 V
 Open	M12, 5-pin, A-coded, male	CE/UL: 28111001	igus chainflex CF78.UL	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	Variable	4 x 0.5 mm^2 / DC 60 V
 Open	M12, 5-pin, A-coded, male	CE/UL: 28111036	igus chainflex CF78.UL	Variable	4 x 0.5 mm^2 / DC 60 V

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Connection of cables with open end

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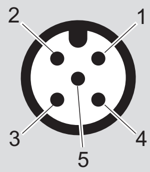
The following table shows the conductor assignment of the cables with the following part numbers:

Part numbers
28110978, 28110943

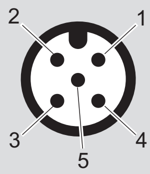
Assembly					
Open cable end				**Prefabricated plug connectors**	
					
Core color/ core cross section	**Identi- fication**	**Assembly**	**Description**	**Signal**	**Contact**
1)	–	Not pre-fabricated	DC 24 V auxiliary output	24V_OUT	1
White 0.75 mm²	–	Not pre-fabricated	F_STO_P2 connection	F_STO_P2	2
1)	–	Not pre-fabricated	0 V 24 reference potential for DC 24 V auxiliary output	0V24_OUT	3
Brown 0.75 mm²	–	Not pre-fabricated	F_STO_P1 connection	F_STO_P1	4
Green 0.75 mm²	–	Not pre-fabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these cores in the plug connector.

igus chainflex

The following table shows the conductor assignment of the cables with the following part numbers:

Part numbers
28111001, 28111036

Assembly					
Open cable end				Prefabricated plug connectors	
					
Core color/ core cross section	Identi-fication	Assembly	Description	Signal	Contact
1)	–	Not pre-fabricated	DC 24 V auxiliary output	24V_OUT	1
Black 0.75 mm^2	1	Not pre-fabricated	F_STO_P2 connection	F_STO_P2	2
1)	–	Not pre-fabricated	0 V 24 reference potential for DC 24 V auxiliary output	0V24_OUT	3
Black 0.75 mm^2	2	Not pre-fabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.75 mm^2	3	Not pre-fabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these cores in the plug connector.

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5.10.3 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.

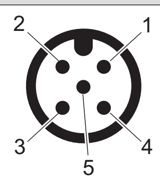
- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

The following table shows information about this connection:

Function
Connection for safe torque off (STO, 3 cores)

Connection type
M12, 5-pin, male, A-coded, color: yellow

Connection diagram



Assignment		
Contact	**Signal**	**Description**
1	Res.	Reserved
2	F_STO_P2	F_STO_P2 connection
3	Res.	Reserved
4	F_STO_P1	F_STO_P1 connection
5	F_STO_M	F_STO_M connection

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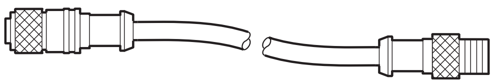
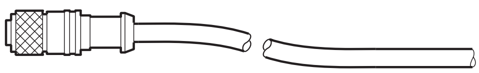
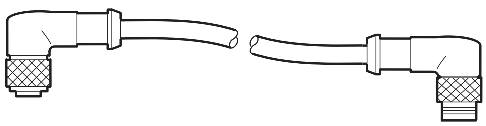
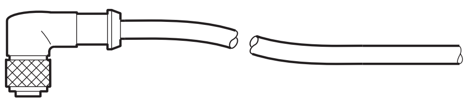
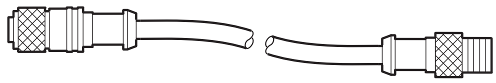
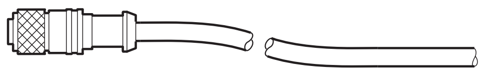
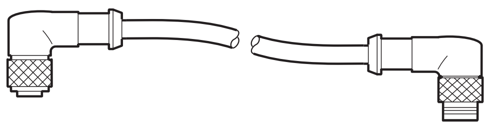
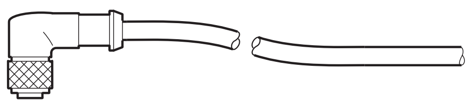
Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

The following table provides an overview of 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	Variable 	3 x 0.75 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28117808	HELUKABEL LiYCY	Variable 	3 x 0.75 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110951	HELUKABEL LiYCY	Variable 	3 x 0.75 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28110986	HELUKABEL LiYCY	Variable 	3 x 0.75 mm^2 / DC 60 V

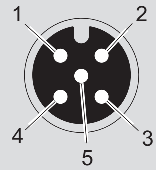
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female / M12, 5-pin, A-coded, male	CE/UL: 28110994	igus chainflex CF78.UL	Variable 	4 x 0.5 mm² / DC 60 V
 M12, 5-pin, A-coded, female / Open	CE/UL: 28117816	igus chainflex CF78.UL	Variable 	4 x 0.5 mm² / DC 60 V
 M12, 5-pin, A-coded, female / M12, 5-pin, A-coded, male	CE/UL: 28111028	igus chainflex CF78.UL	Variable 	4 x 0.5 mm² / DC 60 V
 M12, 5-pin, A-coded, female / Open	CE/UL: 28111044	igus chainflex CF78.UL	Variable 	4 x 0.5 mm² / DC 60 V

Connection of cables with open end

HELUKABEL

The following tables show the conductor assignment of cables with the following part numbers:

Part numbers
28117808, 28110986

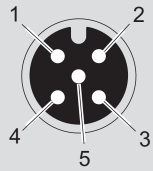
Assembly					
Open cable end				**Prefabricated plug connectors**	
					
Core color/ core cross section	**Identi-fication**	**Assembly**	**Description**	**Signal**	**Contact**
1)	–	Not pre-fabricated	DC 24 V auxiliary output	24V_OUT	1
White 0.75 mm^2	–	Not pre-fabricated	F_STO_P2 connection	F_STO_P2	2
1)	–	Not pre-fabricated	0 V 24 reference potential for DC 24 V auxiliary output	0V24_OUT	3
Brown 0.75 mm^2	–	Not pre-fabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.75 mm^2	–	Not pre-fabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these cores in the plug connector.

igus chainflex

The following tables show the conductor assignment of cables with the following part numbers:

Part numbers
28117816, 28111044

Assembly					
Open cable end				Prefabricated plug connectors	
					
Core color/ core cross section	Identi-fication	Assembly	Description	Signal	Contact
1)	–	Not pre-fabricated	DC 24 V auxiliary output	24V_OUT	1
Black 0.75 mm^2	1	Not pre-fabricated	F_STO_P2 connection	F_STO_P2	2
1)	–	Not pre-fabricated	0 V 24 reference potential for DC 24 V auxiliary output	0V24_OUT	3
Black 0.75 mm^2	2	Not pre-fabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.75 mm^2	3	Not pre-fabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these cores in the plug connector.

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5.10.4 STO jumper plug (3-core)

⚠ WARNING

Safe disconnection of the device is not possible when using the STO jumper plug.

Severe or fatal injuries.

- Only use use the STO jumper plug if the device is not used to fulfill any safety function.

⚠ WARNING

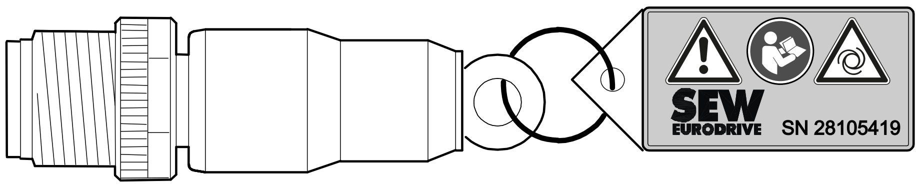
Disabling of the safety-related disconnection of further devices due to parasitic voltages when using an STO jumper plug.

Severe or fatal injuries.

- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

The STO jumper plug can be connected to the STO plug 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

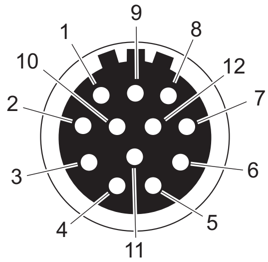
5.10.5 X5136: Digital inputs, relay output

The following table shows information about this connection:

Function
Digital inputs, relay output

Connection type
M23, female, male thread, TE Connectivity-Intercontec products, P insert, SpeedTec equipment, 12-pole, 0°-coded

Connection diagram



Assignment		
Contact	**Signal**	**Description**
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

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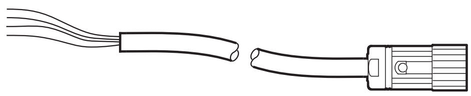
Connection cable

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

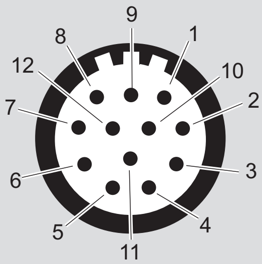
The following table provides an overview of the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open; M23, 12-pin, 0°-coded	CE/UL: 11741457	HELUKABEL Li9Y91YC11Y -HF	Variable 	6 x 2 x 0.25 mm^2 / DC 60 V

Connection of cables with open end

The following table shows the conductor assignment of the cables with the following part numbers:

Part numbers
11741457

Assembly					
Open cable end				Prefabricated plug connectors	
					
Core color/ core cross section	**Identi-fication**	**Assembly**	**Description**	**Signal**	**Contact**
Pink 0.25 mm²	-	Not pre-fabricated	Digital input DI01	DI01	1
Gray 0.25 mm²	-	Not pre-fabricated	Digital input DI02	DI02	2
Red 0.25 mm²	-	Not pre-fabricated	Digital input DI03	DI03	3
Blue 0.25 mm²	-	Not pre-fabricated	Digital input DI04	DI04	4
Yellow 0.25 mm²	-	Not pre-fabricated	Reserved	Res.	5
Green 0.25 mm²	-	Not pre-fabricated	Relay output DO R, common contact	DOR-C	6
Purple 0.25 mm²	-	Not pre-fabricated	Relay output DO R, NO contact	DOR-NO	7
Black 0.25 mm²	-	Not pre-fabricated	DC 24 V output	+24V_O	8
Brown 0.25 mm²	-	Not pre-fabricated	0V24 reference potential	0V24_O	9
White 0.25 mm²	-	Not pre-fabricated	Reserved	Res.	10
Gray/pink 0.25 mm²	-	Not pre-fabricated	DC 24 V output	+24V_O	11
Green/yel-low 0.25 mm²	-	Not pre-fabricated	Functional earth	FE	12

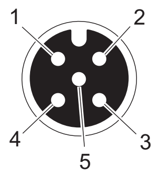
5.10.6 X4141: Engineering interface

The following table shows information about this connection:

Function
Engineering interface (CAN)

Connection type
M12, 5-pin, female, A-coded, color: black

Connection diagram



Assignment		
Contact	**Signal**	**Description**
1	Res.	Reserved
2	24V_OUT	DC 24 V auxiliary output[1)]
3	0V24_OUT	0V24 reference potential[1)]
4	CAN_H	CAN High connection
5	CAN_L	CAN Low connection

1) Only use this output to supply components by SEW-EURODRIVE.

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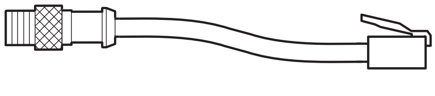
Connection cables

The following table provides an overview of the cables available for this connection:

Connection cable	Conformity/ part num-ber	Length/in-stallation type	Operating voltage
Connection to interface adapter USM21A:  M12, 5-pin, A-coded, male — RJ10	CE: 28111680	3.0 m 	DC 60 V
Connection to CBG.. keypad :  M12, 5-pin, A-coded, male — D-sub, 9-pin, male, angled	CE: 28117840	3.0 m 	DC 60 V

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5.11 Plug connector assignment at the electronics cover

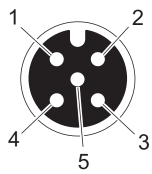
5.11.1 X5231: Analog input

The following table shows information about this connection:

Function
Analog input

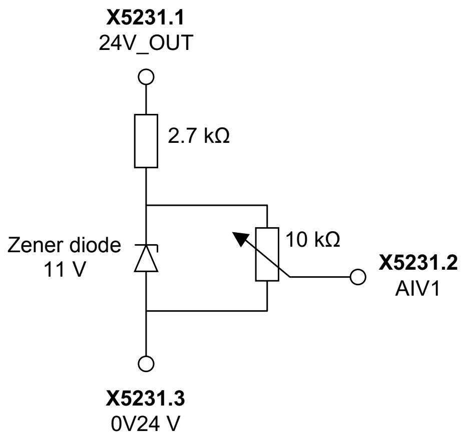
Connection type
M12, 5-pin, female, A-coded, color: black

Connection diagram



Assignment		
Contact	**Signal**	**Description**
1	24V_OUT	DC 24 V output
2	AIV1	Analog voltage input AI1
3	0V24	0V24 reference potential / Reference potential of the analog input
4	AIC1	Analog current input AI1
5	FE	Functional earth

SEWEURODRIVE recommends using the following connection type for connecting a potentiometer to the voltage input AIV1:



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5.12 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.

5.12.1 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 engineering interface X31 – With 2 RJ10 plug connectors – Length: 3 m	28231449
Connection cable RJ10/M12 For connection to the engineering interface X4141 • With RJ10 plug connector • With M12 plug connector, 5-pin, male, A-coded • Length: 3 m	28111680
Retrofit set M12 engineering interface X4141	28258185

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Connection to X4141 (M12 at the connection box)

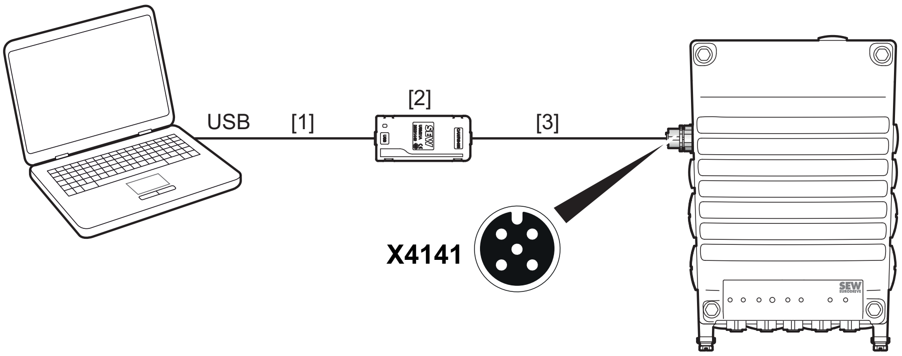
NOTICE

Unauthorized insertion of the STO jumper plug into the engineering interface.

Damage to the device.

- **Never** insert the STO jumper plug into the engineering interface.

The engineering interface X31 in the connection box of the drive unit is assigned to the internal wiring of plug connector X4141.



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[1] USB 2.0 connection cable (commercial, included of the USM21A delivery)
[2] USM21A interface adapter
[3] Connection cable RJ10/M12 (available for delivery from SEW-EURODRIVE, part number: 28111680)

Installing the included engineering plug connector X4141

In some cases, the X4141 engineering plug connector is provided in an accessory bag (part number: 28258185) included in the drive unit delivery from SEW-EURODRIVE. In this case, install the engineering plug connector X4141 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 plug connector RJ10 from outside through one of the permitted cable entry bores (for the permitted positions, see chapter "Plug connector positions"). Push the cable completely into the connection box.
5. Screw plug connector M12 into the cable entry bore. Fasten the nuts of the M12 plug connector (tightening torque: 6 Nm).

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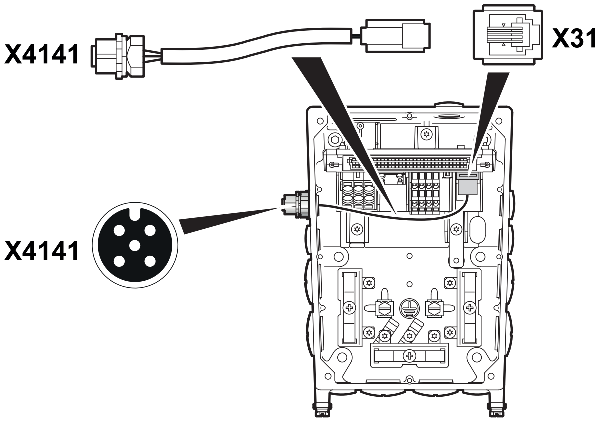
6. Insert the RJ10 plug connector into plug connector X31 in the connection box. The following figure shows an example of the cable routing:



9007225044813707

7. Plug the electronics cover onto the connection box. Screw on the electronics cover with 4 screws (tightening torque: 6 Nm).

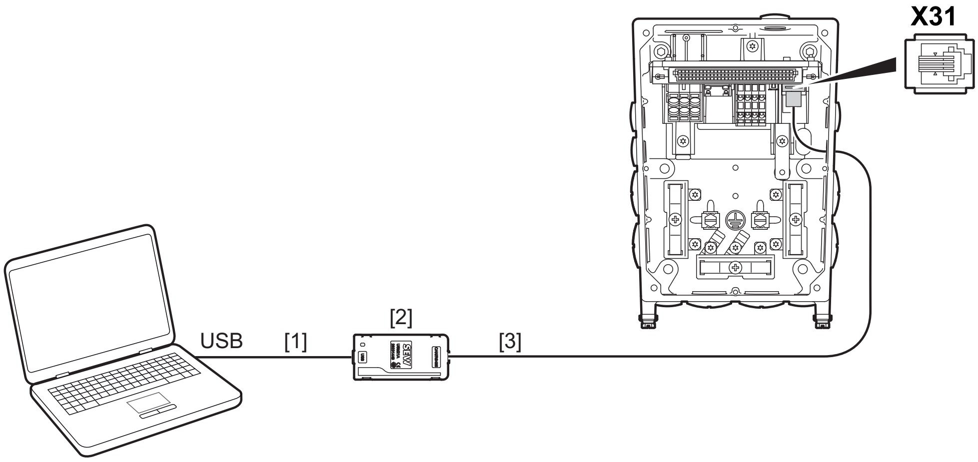
Connection to X31 (RJ10 in the connection box)

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.. keypad
- Do **not** connect the following options with 5 V nominal voltage to the X31 connector:
  - Interface adapters USB11A, UWS11A, UWS21A
  - Keypads DBG.., GBG21A.



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[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)

5.12.2 Connection via CBG21A or CBG11A keypad

Use the CBG21A or CBG11A keypad 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
CBG21A keypad	28238133
CBG11A keypad	28233646
CBG.. connection cable D-sub/M12 For connecting the X4141 engineering interface to the 24 V supply voltage • With D-sub plug connector 9-pin, male • With M12 plug connector, 5-pin, male, A-coded • Length: 3 m	28117840
CBG.. connection cable D-sub/RJ10 For connecting the X31 engineering interface to the 24 V supply voltage • With D-sub plug connector 9-pin, male • With RJ10 plug 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 plug connector • with USB 2.0 Mini B plug connector • Length: 3 m	25643517

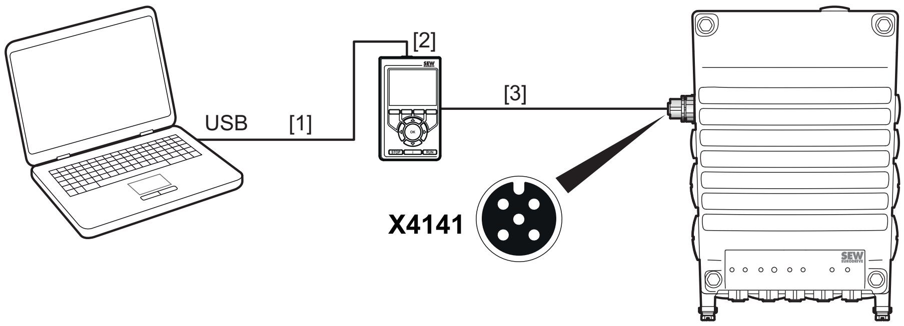
Connection to X4141 (M12 at the connection box)

NOTICE

Unauthorized insertion of the STO jumper plug into the engineering interface.

Damage to the device.

- **Never** insert the STO jumper plug into the engineering interface.



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[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] CBG21A or CBG11A keypad
[3] D-sub/M12 connection cable
(available for delivery from SEW-EURODRIVE, part number: 28117840)

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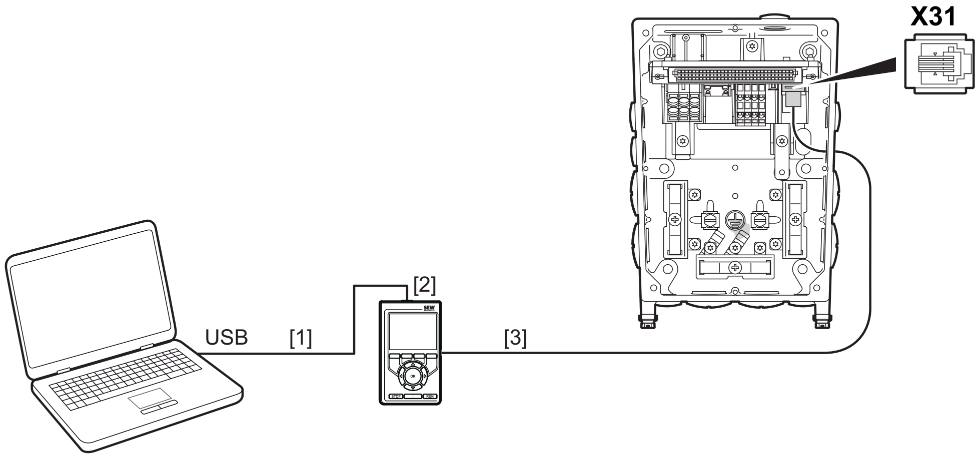
Connection to X31 (RJ10 in the connection box)

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.. keypad
- Do **not** connect the following options with 5 V nominal voltage to the X31 connector:
  - Interface adapters USB11A, UWS11A, UWS21A
  - Keypads DBG.., GBG21A.



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[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] CBG21A or CBG11A keypad
[3] D-sub/RJ10 connection cable
(available for delivery from SEW-EURODRIVE, part number: 28117832)

6 Startup

6.1 Startup notes

INFORMATION

It is essential to comply with the safety notes during startup.

⚠ WARNING

Risk of injury due to missing or defective protective covers.

Severe or fatal injuries.

- Install the protective covers of the system according to the instructions.
- Never start the device if the protection covers are not installed.

⚠ 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**

⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

- Let the devices cool down before touching them.

⚠ WARNING

Device malfunction due to incorrect device setting.

Severe or fatal injuries.

- Observe the startup instructions.
- Always have the installation carried out by trained specialists.
- Only use settings that are correct for the function.

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NOTICE

Undercutting the minimum switch-off time of the line contactor.

Irreparable damage to the inverter or unforeseen malfunctions.

- You must observe a minimum switch-off time of 10 s after switching off the voltage supply.
- Do not switch the voltage supply on or off **more often than once per minute**.

INFORMATION

- Before startup, remove the paint protection cap from the LED displays.
- Before startup, remove the paint protection film from the nameplates.

INFORMATION

- To ensure fault-free operation, do not disconnect or connect signal cables during operation.

6.1.1 Lifting applications

⚠ WARNING

Danger of fatal injury if the hoist falls.

Severe or fatal injuries.

- In case of products used in lifting applications, additional monitoring systems or mechanical protection devices must be used.

NOTICE

Application in ELSM® control mode

When the inverter is operated in ELSM® control mode, using it in lifting applications is not permitted. In this control mode only applications of horizontal materials handling are permitted.

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6.2 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.
- Adjust the current limit and torque limit accordingly.

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 persons or machines.

Required hardware components:

- PC or laptop as specified in chapter "PC connection".

Required software:

- Engineering software MOVISUITE® standard by SEW-EURODRIVE.

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6.3 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.

Exception:

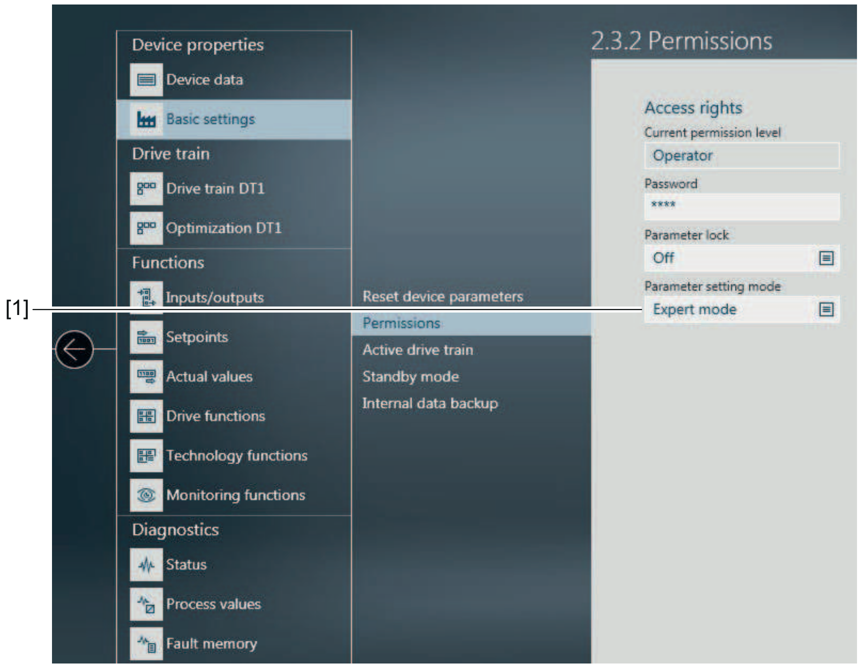
- You can only change the parameter *Startup mode* in Expert mode.

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. Doing so, you will activate the (parameterizable) replacement values of the mechanical setting elements.
- You can set the device parameters.

The parameterization mode can be set via the MOVISUITE® engineering software or the CBG.. keypad.



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[1] Basic settings > authorizations > parameterization mode > Expert mode

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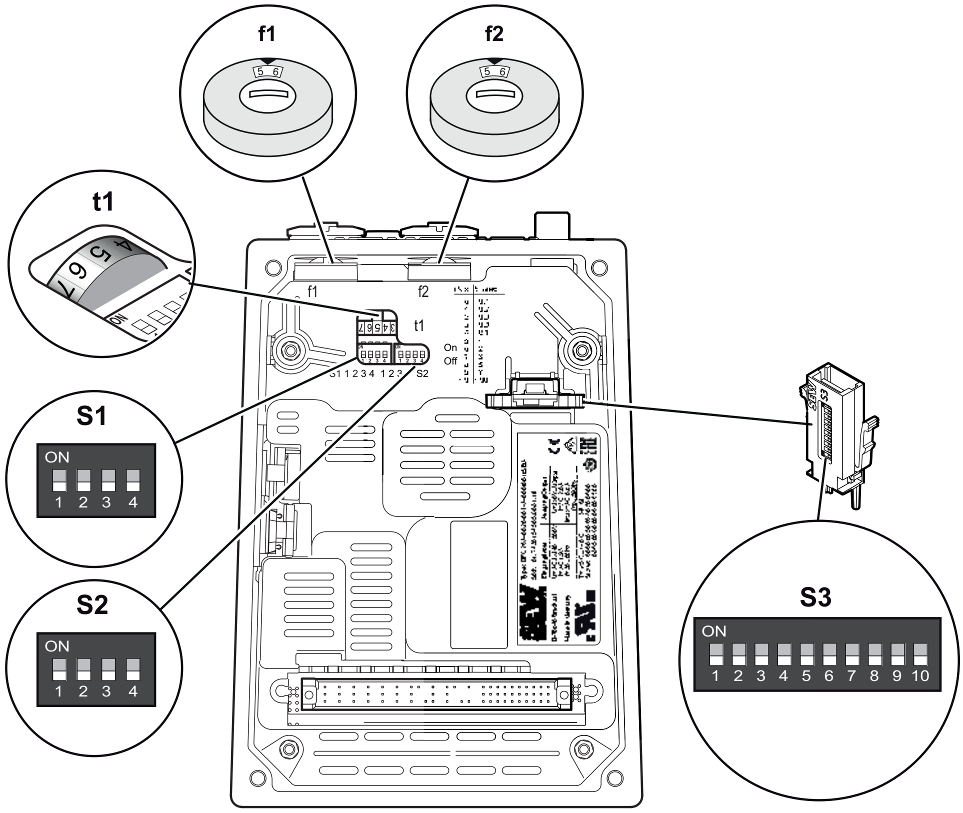
6.4 Control elements

6.4.1 Overview

The following figure gives an overview of the control elements at the electronics cover:



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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

6.4.2 Potentiometer f1

NOTICE

Loss of the ensured degree of protection if the screw plug of the potentiometer is not installed or not installed correctly.

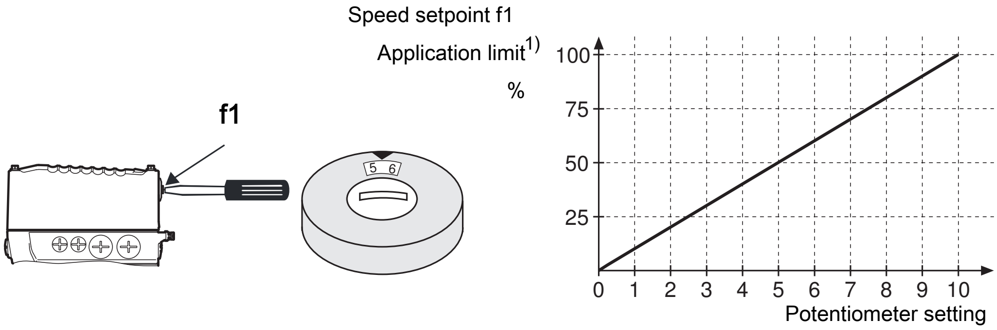
Damage to the device.

- 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 Expert mode, the predefined setpoint is always active at the potentiometer f1.
- 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:



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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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6.4.3 Potentiometer f2

NOTICE

Loss of the ensured degree of protection if the screw plug of the potentiometer is not installed or not installed correctly.

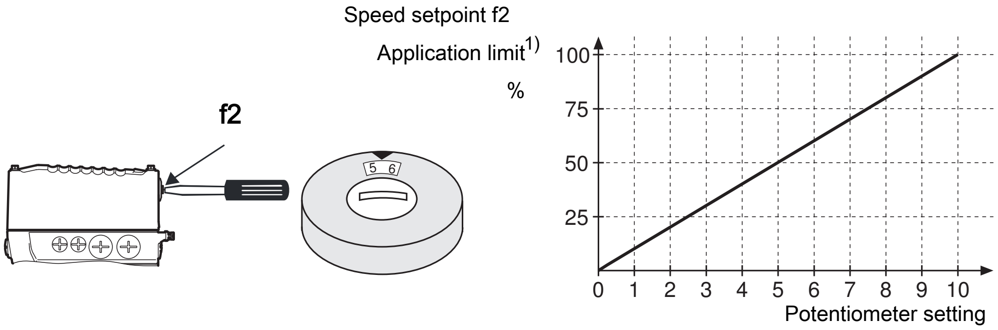
Damage to the device.

- 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.
- 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:



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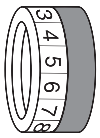
1) Depending on the selected direction of rotation, the parameter *Application limit positive* or the parameter *Application limit negative* are used to scale the speed setpoint f2.
For the application limit, refer to the MOVISUITE® parameter tree in the following menu: *Functions* > *Monitoring functions* > *Limit values* > *Application limit*.

6.4.4 Potentiometer t1

Use the potentiometer t1 to set the acceleration/deceleration setpoint t1.

- When the device is set to Expert mode, the predefined setpoint is always active at the potentiometer t1.
- 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 setting	**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.

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6.5 DIP switches

6.5.1 Overview

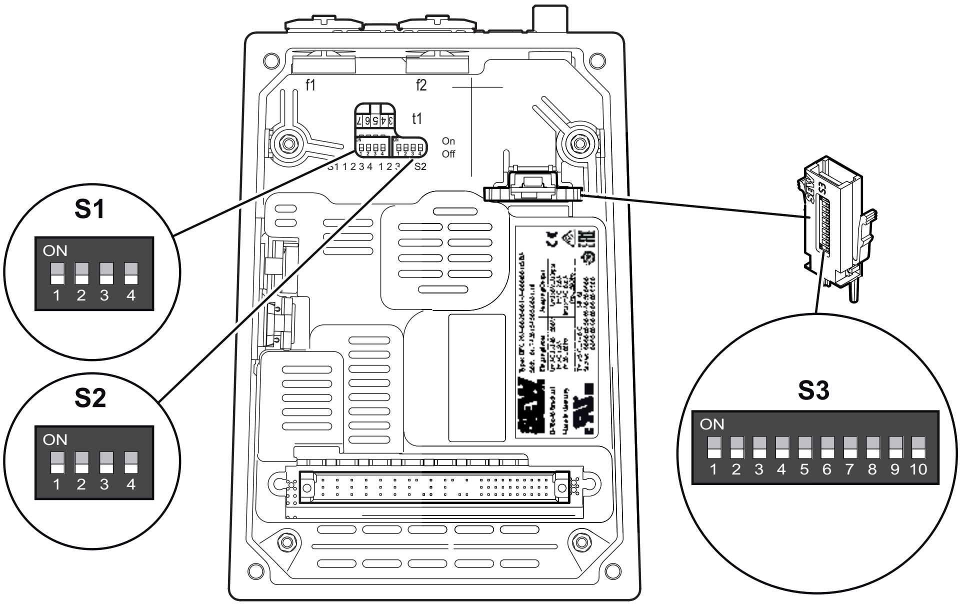
NOTICE

Damage to the DIP switches caused by unsuitable tools.

Possible damage to property.

- To set the DIP switches, use only suitable tools, such as a slotted screwdriver with a blade width of no more than 3 mm.
- The force used for setting the DIP switches must not exceed 5 N.

The following figure shows the DIP switches of the drive unit:



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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**	**Releasing the brake / deactivating DynaStop® with FCB 01 – enable**	**Speed monitoring deactivation**	**Reserved**
ON	On	On	Speed monitoring Off	On
OFF	**Off**[1)]	**Off**[1)]	**Speed monitoring On**[1)]	**Off**[1)]

1) The factory settings are shown in boldface.

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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**
Meaning	**Reserved**	**Source setpoint f1**	**Reserved**	**Reserved**
ON	–	Analog input AI1	–	–
OFF	–	**Potentiometer f1**	**–**	**–**

Do not alter the factory setting of DIP switches S2/1, S2/3 and S2/4 = 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.

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6.5.2 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 settings of the relevant parameter are 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 FC B01" is inhibited.
- ON (S1/2 = ON): The function "Releasing the brake / deactivating DynaStop® with FC B01" is enabled.

  When the function block FC B01 is active, you can release the brake or deactivate DynaStop® using a digital input or an actuated process data bit.

INFORMATION

For more information about disabling DynaStop® without drive enable, refer to chapter "Operation".

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DIP switch S1/3: Deactivating the speed monitoring

INFORMATION

If the function of this DIP switch is deactivated via parameter access, the last active settings of the relevant parameter are 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 switch S2/2: Source of setpoint f1

Use this DIP switch to select the source of the speed setpoint f1.

- Potentiometer f1 (S2/2 = OFF): The settings of potentiometer f1 define the speed of the drive unit when setpoint f1 is active (see chapter "Startup" > "Control elements" > "Potentiometer f1").
- Analog input AI1 (S2/2 = ON): The value of analog input AI1 determined the speed of the drive unit when setpoint f1 is active. (See chapter "Operation" > "Setpoint scaling of the analog input".

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6.6 Startup procedure

6.6.1 Startup in Easy mode

In Easy mode (delivery state), startup is performed without a PC or keypad.

The device functions are predefined in Easy mode.

The setpoint is only set using mechanical setting elements (potentiometer, DIP switch).

The electronics cover controls the drive unit using the drive function FCB 05 Speed control.

6.6.2 Startup in Easy mode

In Expert mode, perform startup of the devices using the MOVISUITE® engineering software of SEW-EURODRIVE.

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The startup procedure is divided into segments. The following steps illustrate the startup procedure for a device by way of an example.

Drive train segment

Drive train		Configuring drive trains.

Interfaces segment

Standard interfaces		Basic settings of the standard interfaces • Standard I/O • Encoder 1

Functions segment

I/O configuration		• Standard I/O • I/O card DI/DO
Drive functions		• FCB 05 Speed control

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Advanced drive functions		• FCB 01 Output stage inhibit • FCB 02 Stop default • FCB 26 Stop at user limit
Monitoring functions		• Limit values 1 • Monitoring functions 1 • Energy-saving function

Information on the drive unit

Device data is available via the project nodes.

Device data		• Device identification • Main component • Subcomponent • Production label
Fault responses Overview		• Axis module • Power supply monitoring • Functions
Setup		• Access rights • Resetting device parameters.

Checklist for startup

The following checklist lists the necessary steps for complete startup.

Step	Startup step	Finished
1	Install the drive unit.	
2	Install the MOVI-C® component.	
3	Start MOVISUITE®.	
4	Start up the drive train.	
5	Parameterize the setpoints.	
6	Parameterize the function blocks (FCBs).	
7	Configure digital inputs and outputs.	
8	Configure the process data (PD).[1)]	
9	Configure the software modules (MOVIKIT®).	
10	Test the drive unit/application.	

1) Not available with DBC designs.

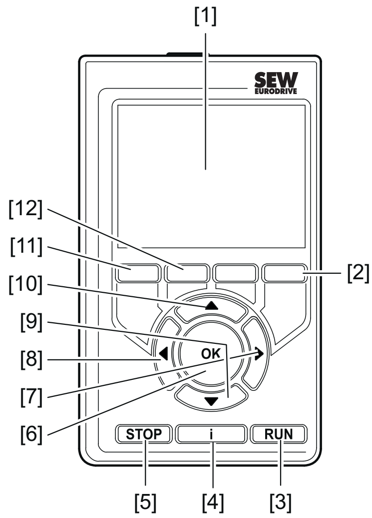
6.7 Startup with the CBG21A keypad

Using the CBG21A keypad, startup can be performed intuitively guided by the symbols and functions of the color display.

6.7.1 CBG21A keypad

The following figure shows the CBG21A keypad:

[1]	Color display	
[2]	Function keys (Function according to bottom line on color display)	
[3]	<RUN> key	(Start)
[4]	<I> key	(Information)
[5]	<STOP> key	(Stop)
[6]	<OK> key	(Acknowledgment)
[7]	<►> key	(Left)
[8]	<◄> key	(Right)
[9]	<▼> key	(Down)
[10]	<▲> key	(Up)
[11]	Function key <⇦>	(Back)
[12]	Function key <⇨>	(Next)



Operation

Activating a field	Select a field using the arrow keys <◄>/<►>/<▲>/<▼>. Use the <OK> key to activate the field.
Entering numbers	Use the arrow keys <◄>/<►> to change the digit within the number. The editable digit is highlighted. Change the value of the number using the arrow keys <▲>/<▼>. Confirm the number with the <OK> key.

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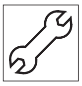
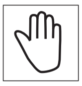
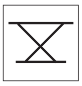
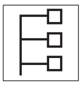
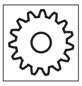
Symbols used

The available functions are shown with pictograms in the keypad display.

	Startup
	Manual mode
	Optimization of the control mode
	Application
	Diagnostics
	Parameter
	Data management
	Settings
	Back
	Next

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6.8 Startup with the CBG11A keypad

Using the CBG11A keypad, startup can be performed intuitively guided by the symbols and functions of the color display.

INFORMATION

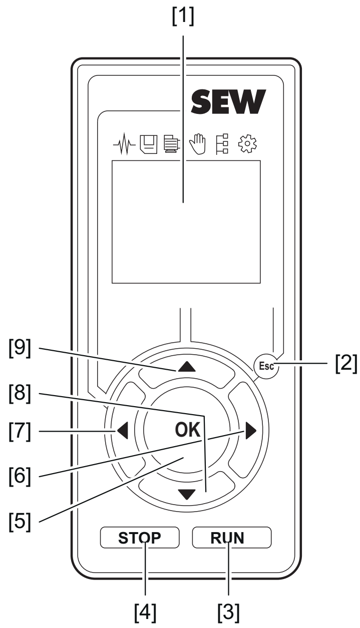
You cannot start up a motor with encoder using the CBG11A keypad.

You can carry out this particular startup with a CBG21A keypad or with the MOVISUITE® engineering software.

6.8.1 CBG11A keypad

The following figure shows the CBG11A keypad:

[1]	Color display	
[2]	<Esc> key	
[3]	<RUN> key	(Start)
[4]	<STOP> key	(Stop)
[5]	<OK> key	(Acknowledgment)
[6]	<►> key	(Left)
[7]	<◄> key	(Right)
[8]	<▼> key	(Down)
[9]	<▲> key	(Up)



All text on the color display is only available in English.

Operation

Select functions.	Use the <Esc> key to return to the main menu.
	Select a function using the arrow keys <◄>/<►>/<▲>/<▼>.
	Confirm your selection with the <OK> key.
Entering numbers	Use the arrow keys <◄>/<►> to change the digit within the number. The editable digit is underlined.
	Change the value of the number using the arrow keys <▲>/<▼>.
	Confirm the number with the <OK> key.

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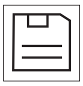
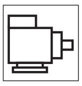
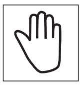
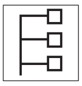
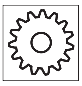
Symbols used

The available functions are shown with pictograms in the keypad display.

	Diagnostics
	Data management
	Startup
	Manual mode
	Parameter tree
	Keypad settings

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6.9 Configuring the digital inputs/outputs

Easy mode (delivery state)

In Easy mode, the following configuration of the digital inputs is active:

Digital inputs	
Function **(Configuration of the digital inputs)**	**Setting** **(CW/CCW/setpoint changeover)**
• DI01	Fixed setpoints, positive rotation direction
• DI02	Fixed setpoints, negative rotation direction
• DI03	Potentiometer f2
• DI04	Fault reset

Digital outputs	
Function	**Setting**
DOR (relay output)	Ready for operation

Expert mode

In Expert mode, you can assign other functions to the digital inputs and to the relay output, either individually or using predefined configurations of the digital inputs.

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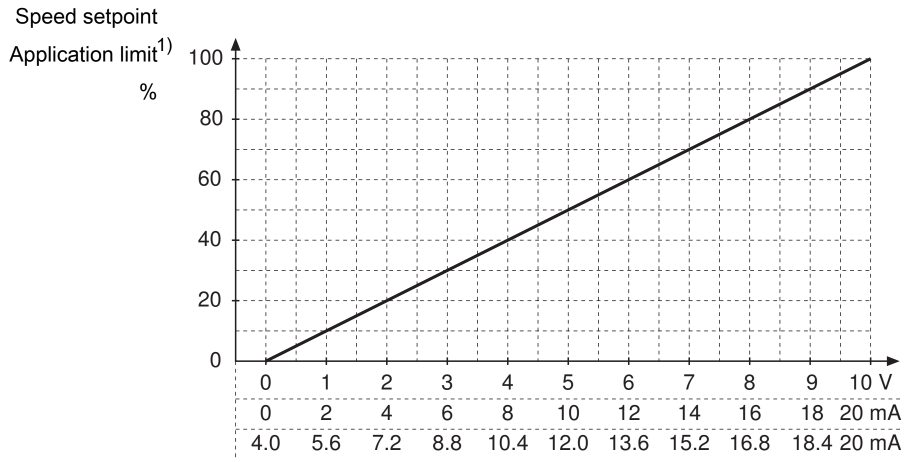
6.10 Setpoint scaling of the analog input

The setpoint scaling of analog input AI1 depends on the operating mode of the fixed setpoint processing.

Operating mode "Mechanical setting elements"

Setpoint scaling on the operating mode: "Mechanical setting elements":

The following figure shows the setpoint scaling of the analog input AI1:



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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*.

Additional operating modes

Setpoint scaling on the operating modes:

- "Unipolar/fixed setpoint"
- "Bipolar/fixed setpoint"
- "Fixed setpoint + analog setpoint"
- "Fixed setpoint × analog setpoint"

INFORMATION

In these operating modes, the setpoint scaling is only possible in Expert mode and with a free configuration of the digital inputs (configuration of the digital inputs = "0").

In these operating modes, the setpoints of the analog input can be adjusted using the following scaling parameters of the analog input:

- *Voltage offset scaling*
- *Current offset scaling*
- *Numerator scaling*
- *Denominator scaling*

6.11 Disabling DynaStop® for startup purposes

6.11.1 Important notes on disabling DynaStop® (/DSP option)

⚠ WARNING

Removing the electronics cover will disable DynaStop®.

Severe or fatal injuries.

- If it is not permitted to deactivate the system, additional measures are required (e.g. mechanical stake-out)

⚠ WARNING

Electric shock due to regenerative energy created by moving system or machine. The regenerative energy can cause dangerous voltages at the terminals or plug connectors, even when the supply voltage is disconnected.

Severe or fatal injuries.

- Never touch the wiring space with wiring board and plug connector.
- If you cannot rule out that the wiring space is touched, provide for suitable protection covers.

NOTICE

Damage to the connector plug between drive unit and electronics cover due to regenerative energy created by movement of the system or machine.

Potential damage to property.

- To disable DynaStop®, you have to remove the electronics cover completely to prevent damage to the plug connector (destroyed contacts).

6.11.2 Steps for disabling DynaStop®

Note:

INFORMATION

For more information about the DynaStop® function, refer to chapters "Operation" and "Technical data and dimension sheets".

Disabling DynaStop® by removing the electronics cover

Disable the DynaStop® function as follows:

1. Observe chapter "Startup notes"
2. Observe chapter "Important notes on disabling DynaStop®".
3. Disconnect all components from the voltage supply and use an external disconnecting device to avoid an unintentional re-connection.
4. Completely remove the electronics cover.

The DynaStop® function is disabled. The system/machine can now be moved mechanically observing the notes in chapter "Important notes on disabling DynaStop®".

Disabling DynaStop® using the control signal

As an alternative, you can disable the DynaStop® function using a control signal (process data or digital input). Observe the instructions in chapter "Operation" > "Disabling DynaStop® without drive enable. (FCB 01)".

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6.12 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 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.

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7 Operation

7.1 Binary controller

The behavior of the drive unit depends on the following factors:

- Selected configuration of the digital inputs.
- Status of digital inputs.

The following table describes the control functions in conjunction with the predefined configurations of the digital inputs.

The following configurations of the digital inputs are available:

No.	Configuration of the digital inputs	Description
0	User-defined configuration	• The individual digital inputs can be configured separately.
		• The operating mode of the fixed setpoint processing can be freely configured.
1	**CW, CCW, setpoint changeover**	• Direction of rotation positive, negative • 2 Speed setpoints • Fault reset
		Fixed setpoint processing mode: • Mechanical setting elements
2	Enable, fixed setpoints	• Enable • 4 Speed setpoints The direction of rotation is prescribed by the sign of the setpoint. • Fault reset
		Fixed setpoint processing mode: • Mechanical setting elements
3	Enable, external fault, setpoint changeover	• Positive direction of rotation (clockwise rotation) • 2 Speed setpoints • External error input • Fault reset
		Fixed setpoint processing mode: • Mechanical setting elements
4	Motor potentiometer right	• Positive direction of rotation (clockwise rotation) • Speed setpoint via the motor potentiometer function • Fault reset
		Fixed setpoint processing mode: • Mechanical setting elements

No.	Configuration of the digital inputs	Description
5	Motor potentiometer left	• Negative direction of rotation (counterclockwise rotation) • Speed setpoint via the motor potentiometer function • Fault reset
		Fixed setpoint processing mode: • Mechanical setting elements
6	CW, CCW, primary frequency	• Direction of rotation positive, negative • Speed setpoint via the primary frequency input • Fault reset
		Fixed setpoint processing mode: • Mechanical setting elements

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7.1.1 Configuration 0: User-defined configuration

Function of the digital inputs

- The digital inputs can be configured freely.
- In contrast to the predefined terminal configurations 1 – 6, the drive unit remains in the status "FCB 02 Stop default" once the enable signal is revoked. If you require the status "FCB 01 Output stage inhibit", you must assign this function to a digital input.

Configuring the fixed setpoint processing modes

- The fixed setpoint processing modes can be configured freely.

Fixed setpoint processing mode	Functions of the setpoint sources
• Unipolar fixed setpoint • Bipolar fixed setpoint • Fixed setpoint + analog setpoint • Fixed setpoint × analog setpoint	No function: • Potentiometer f1 • Potentiometer f2 • DIP switch S2/2
	Scaling of analog input AI1: • Scale the speed setpoint by setting the scaling factor of analog input AI1
• Primary frequency • Motor potentiometer	No function: • Potentiometer f1 • Potentiometer f2 • DIP switch S2/2
	Function of analog input AI1: • You cannot use analog input AI1 for the speed setpoint.
	Scaling of analog input AI1: • Scale the speed setpoint by setting the scaling factor of analog input AI1
• Mechanical setting elements	No function: • Scale the speed setpoint using the scaling parameter of analog input AI1
	Scaling of analog input AI1: • Set permanently to 0 – 100% of parameter *Application limit – positive/negative speed setpoint*

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7.1.2 Configuration 1: CW, CCW, setpoint changeover

Fixed setpoint processing mode: Mechanical setting elements (cannot be changed)

Configuration 1 is active in Easy mode and in the delivery state.

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Right	Left	Potentiometer f2	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	0	x	x	Lights up yellow
The drive unit operates in positive direction of rotation (clockwise rotation) with speed setpoint f1.[2)] The acceleration setpoint t1 is active.[1)]	1	0	0	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the speed setpoint f1. The acceleration setpoint t1 is active.[1)]	0	1	0	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with speed setpoint f2. The acceleration setpoint t1 is active.[1)]	1	0	1	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the speed setpoint f2. The acceleration setpoint t1 is active.[1)]	0	1	1	x	Illuminated in green
The drive unit stops with deceleration setpoint t1.[1)] After that, FCB 02 Stop default is activated.	1	1	x	x	Flashing green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) If DIP switch S2/2 (Analog setpoint selection) is set to "ON", the speed setpoint of analog input AI1 is used instead of speed setpoint f1.

0 = No voltage 1 = 24 V x = Any

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7.1.3 Configuration 2: Enable, fixed setpoints

Fixed setpoint processing mode: Mechanical setting elements (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Enable	Fixed setpoint 2^0	Fixed setpoint 2^1	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	x	x	x	Lights up yellow
The drive unit is running with the fixed speed setpoint 1. The direction of rotation is specified by the sign of the fixed setpoint. The acceleration setpoint t1 is active.[1)]	1	1	0	x	Illuminated in green
The drive unit is running with the fixed speed setpoint 2. The direction of rotation is specified by the sign of the fixed setpoint. The acceleration setpoint t1 is active.[1)]	1	0	1	x	Illuminated in green
The drive unit is running with the fixed speed setpoint 3. The direction of rotation is specified by the sign of the fixed setpoint. The acceleration setpoint t1 is active.[1)]	1	1	1	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with the analog speed setpoint f1.[2)] The acceleration setpoint t1 is active.[1)]	1	0	0	x	Illuminated in green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) If DIP switch S2/2 (Analog setpoint selection) is set to "ON", the speed setpoint of analog input AI1 is used instead of speed setpoint f1.

0 = No voltage 1 = 24 V x = Any

7.1.4 Configuration 3: Enable, external fault, setpoint changeover

Fixed setpoint processing mode: Mechanical setting elements (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Enable	External fault	Potentiometer f2	Reset	
The drive unit stops with deceleration setpoint t1.[1] FCB 01 Output stage inhibit is activated afterwards.	0	1	x	x	Lights up yellow
The drive unit is running in positive direction of rotation (clockwise rotation) with speed setpoint f1.[2] The acceleration setpoint t1 is active.[1]	1	1	0	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with speed setpoint f2. The acceleration setpoint t1 is active.[1]	1	1	1	x	Illuminated in green
The drive unit is in state "External terminal fault".	1	0	x	x	Flashing red
The fault state has been reset.	0	1	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) If DIP switch S2/2 (Analog setpoint selection) is set to "ON", the speed setpoint of analog input AI1 is used instead of speed setpoint f1.

0 = No voltage 1 = 24 V x = Any

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7.1.5 Configuration 4: Motor potentiometer right

Fixed setpoint processing mode: Motor potentiometer (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Right	Motor poten-tiometer up	Motor poten-tiometer down	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	x	x	x	Lights up yellow
The drive unit is running in positive direction of rotation (clockwise rotation) with speed setpoint "Motor potentiometer". The acceleration setpoint t1 is active.[1)]	1	0	0	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with **increasing** speed setpoint "Motor potentiometer".[2)] The change in speed is defined by the parameter *Acceleration* of the motor potentiometer function.	1	1	0	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with **decreasing** speed setpoint "Motor potentiometer".[2)] The change in speed is defined by the parameter *Deceleration* of the motor potentiometer function.	1	0	1	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with **constant** speed setpoint "Motor potentiometer". The acceleration setpoint t1 is active.[1)]	1	1	1	x	Illuminated in green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) The speed setpoint of the motor potentiometer can only be changed when the drive unit is enabled.

0 = No voltage 1 = 24 V x = Any

7.1.6 Configuration 5: Motor potentiometer left

Fixed setpoint processing mode: Motor potentiometer (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Left	Motor potentiometer up	Motor potentiometer down	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	x	x	x	Lights up yellow
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the speed setpoint "Motor potentiometer". The acceleration setpoint t1 is active.[1)]	1	0	0	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the **increasing** speed setpoint "Motor potentiometer".[2)] The change in speed is defined by the parameter *Acceleration* of the motor potentiometer function.	1	1	0	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the **decreasing** speed setpoint "Motor potentiometer".[2)] The change in speed is defined by the parameter *Deceleration* of the motor potentiometer function.	1	0	1	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the **constant** speed setpoint "Motor potentiometer".[1)] The acceleration setpoint t1 is active.[1)]	1	1	1	x	Illuminated in green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) The speed setpoint of the motor potentiometer can only be changed when the drive unit is enabled.

0 = No voltage 1 = 24 V x = Any

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7.1.7 Configuration 6: CW, CCW, primary frequency

Fixed setpoint processing mode: Primary frequency setpoint (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Right	Left	Input fre-quency	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	0	x	x	Lights up yellow
The drive unit is running in positive direction of rotation (clockwise rotation) with the speed setpoint defined in the primary frequency function. The acceleration setpoint t1 is active.[1)]	1	0	0 – 120 kHz	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the speed setpoint defined in the primary frequency function. The acceleration setpoint t1 is active.[1)]	0	1	0 – 120 kHz	x	Illuminated in green
The drive unit stops with deceleration setpoint t1.[1)] After that, FCB 02 Stop default is activated.	1	1	x	x	Flashing green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.

0 = No voltage 1 = 24 V x = Any

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7.2 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" [2] choice box. Select the "Manual mode" [1] menu item.

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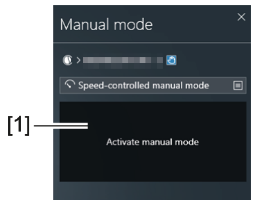
⇨ MOVITSUITE® opens the "Manual mode” window.

7.2.1 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].



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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.

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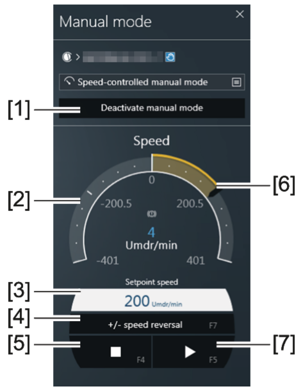
Manual mode is deactivated:

- When you click on the [Deactivate manual mode] button
- or when you close the "Manual mode" window.

7.2.2 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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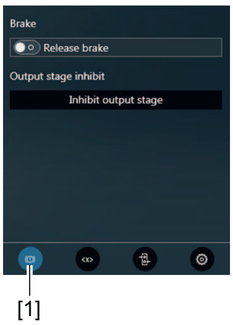
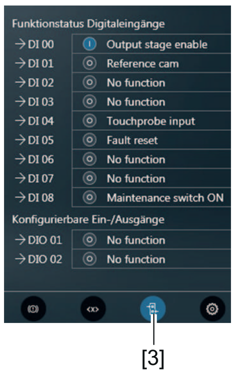
Controller

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 Disable output stages	Actual values	Digital inputs and outputs	Acceleration Reference travel Timeout
			
Key [1]	Key [2]	Key [3]	Key [4]

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7.3 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 used 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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7.4 DynaStop®

7.4.1 Functional description

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

This can result in severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When DynaStop® is used on inclining/downward slopes or for vertical conveyors without free hanging loads, adhere to the basic safety and health requirements (e.g. the EG Machinery Directive 2006/42/EG).
- 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.

Possible damage to property

- Activate the FCB01 Output stage inhibit only when the speed is "0".

The DynaStop® function allows for generating a speed-dependent torque 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).

7.4.2 DynaStop® torques

INFORMATION

For possible DynaStop® torques, refer to chapter "Technical data and dimension sheets" > "DynaStop® torques".

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7.5 Function "Releasing the brake / deactivating DynaStop® with FCB 01"

7.5.1 Note:

INFORMATION

For information on how to disable the DynaStop® function for startup and assembly purposes, refer to chapter "Startup".

7.5.2 Activating the function

⚠ WARNING

Risk from falling loads.

This can result in severe or fatal injuries.

- Do **not** use the function "Releasing the brake / deactivating DynaStop® with FCB 01" for hoist applications and applications with potentially falling loads.
- Inhibit the function via the following steps:
  – Deactivate the function of the DIP switch S1/2 using the parameter *Deactivation* = **"1"** (path: *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Releasing the brake / deactivating DynaStop® with FCB 01 – enable*)
  – Inhibit the functions using the parameter *Releasing the brake / deactivating DynaStop ®with FCB 01 – enable* = **"0"** (path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit*).

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 "Releasing the brake / deactivating DynaStop® with FCB 01". 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**

     Set the DIP switch S1/2 "Releasing the brake / deactivating DynaStop® with FCB 01 – enable" = ON.
   - **Via parameter settings**

     Deactivate the DIP switch S1/2 by setting the parameter *Deactivation* = **"1".**

     (Path: *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Releasing the brake / deactivating DynaStop® with FCB 01 – enable)*

     Enable the function "Releasing the brake / deactivating DynaStop® with FCB 01 – enable" by setting the parameter *Releasing the brake / deactivating DynaStop® with FCB 01 – enable* to **"1"** [1].

     (Path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit*)

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2. **Configuring the control signal**:

- **Control via the digital input**

  Assign the function "Releasing the brake / deactivating DynaStop® with FCB 01" [2] to a digital input.

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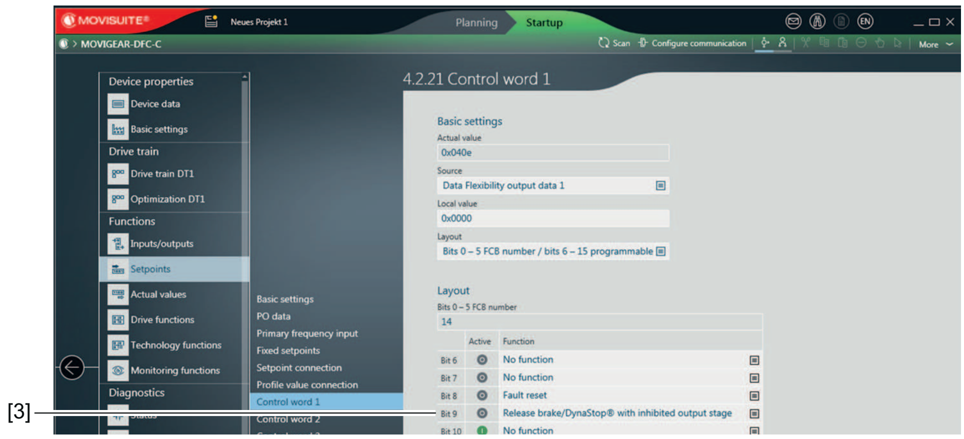
- **Control via process data bit** (not available with DBC designs)

  Assign the function "Releasing the brake / deactivating DynaStop® with FCB 01" [3] to a process output bit.



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The set control signal can be used to deactivate DynaStop® when the function block FCB 01 is active.

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7.6 DynaStop® in conjunction with STO

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

This can result in severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When DynaStop® is used on inclining/downward slopes or for vertical conveyors without free hanging loads, adhere to the basic safety and health requirements (e.g. the EG Machinery Directive 2006/42/EG).
- 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

Observe chapter "Functional safety" for using the STO function.

The optional DynaStop® function is not safety-related. It is not part of the safety functions described in chapter "Functional safety".

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7.6.1 Using DynaStop® in connection with the STO function

To use the DynaStop® function in connection with the STO function, SEW-EURODRIVE recommends control using the safety function SS1(c).

To do so, the parameter *Behavior at standstill* must be set to "Brake applied/drive not energized" (path: *Functions* > *Drive functions* > *FCB 02 Stop default*).

The following table shows the behavior of the DynaStop® function depending on the parameter setting:

Index	Parameter	Setting	Meaning
8563.1	*Behavior at standstill* (Path: *Functions > Drive functions > FCB 02 Stop default)*	Drive energized (brake released / DynaStop® deactivated)	If the enable signals are revoked, the drive decelerates according to the active deceleration setpoint. When the drive reaches speed "0", DynaStop® is **not** activated. Motor position control is active.
		Drive not energized (brake applied / DynaStop® activated)	If the enable signals are revoked, the drive decelerates according to the active deceleration setpoint. When the speed reaches "0", DynaStop® is activated. The motor is de-energized.
8501.3	*Apply brake/activate DynaStop® in STO state* (Path: *Functions > Drive functions > FCB 01 Output stage inhibit > Brake/DynaStop®*)	**0 (No)**	The DynaStop® status remains unchanged when STO is activated.
		1 (yes)	DynaStop® is activated (not safety-related) when STO is enabled. **Note:** Observe the permitted operating range of the DynaStop® function.

(dark grey)	Required settings
(light grey)	Recommended setting

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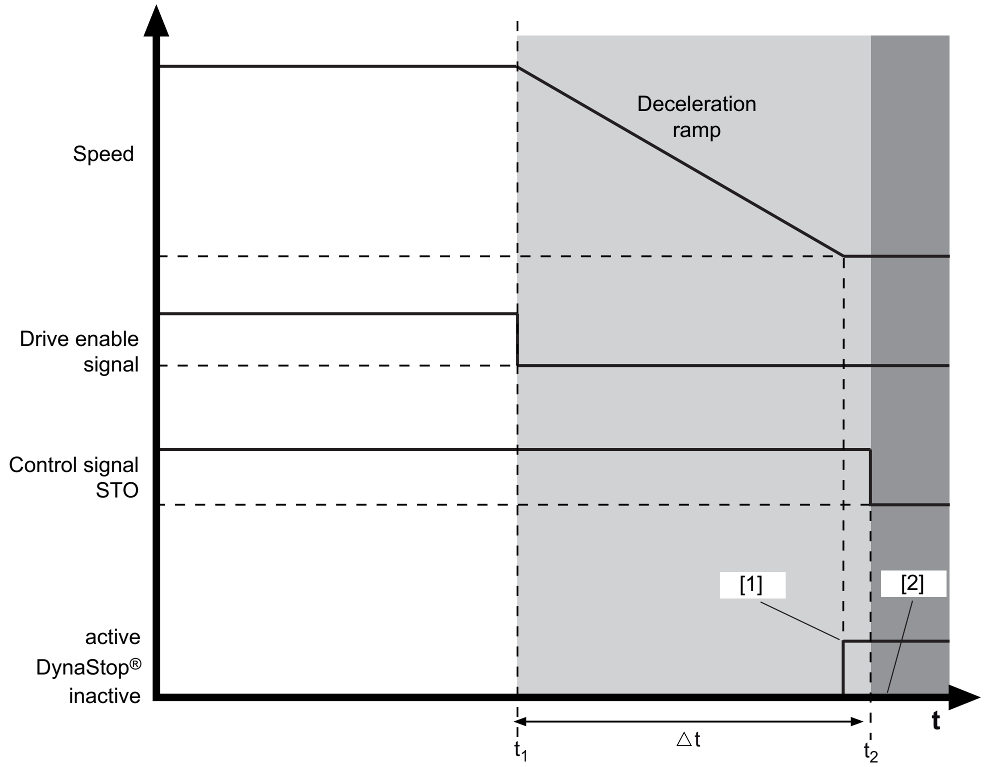
The following figure shows how to use the DynaStop® function in conjunction with the STO function and controller according to SS1(c):



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[1] Parameter:
Behavior at standstill = **"Drive not energized (brake applied / DynaStop® activated)"**
(factory setting)

[2] Parameter:
Behavior at standstill = **"Drive energized (brake released / DynaStop® deactivated)"**
(Path: *Functions* > *Drive functions* > *FCB 02 Stop default)*

t Time

t_1 Point of time when deceleration ramp is initiated

t_2 Point of time when STO is triggered

Δt Time span between initiating the deceleration ramp and STO

Safe time delay range

Range with active STO function

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7.6.2 Drive behavior when STO is activated before standstill (rotational speed = "0")

NOTICE

Danger due to incorrect parameter settings

If the parameter *Apply brake/activate DynaStop®in STO state* is set to **"1"**, (path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit* > *Brake/DynaStop®*), the DynaStop® function can be activated outside of 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 the factory settings or recommended settings.

If STO is activated before the motor has come to standstill (rotational speed = 0), the DynaStop® function behaves as set in parameter Parameter *Apply brake/DynaStop® in STO state* (Path: *Functions* > *Drive functions* > FCB 01 *Output stage inhibit* > *Brake/DynaStop®*):

Index	Parameter	Setting	Meaning
8501.3	*Apply brake/activate DynaStop® in STO state* (Path: *Functions > Drive functions > FCB 01 Output stage inhibit > Brake/DynaStop®*)	**0 (No)**	The DynaStop® status remains unchanged when STO is activated. • Depending on the application, the motor coasts to a halt or even accelerates. • The stopping distance is not defined.
		1 (yes)	DynaStop® is activated (not safety-related) when STO is enabled. • In case DynaStop® is activated before the rotational speed has reached "0", high torques/motor currents can occur that may damage the drive and the application. • Evaluate the possible consequences. • The stopping distance is not defined.

Recommended setting/factory setting

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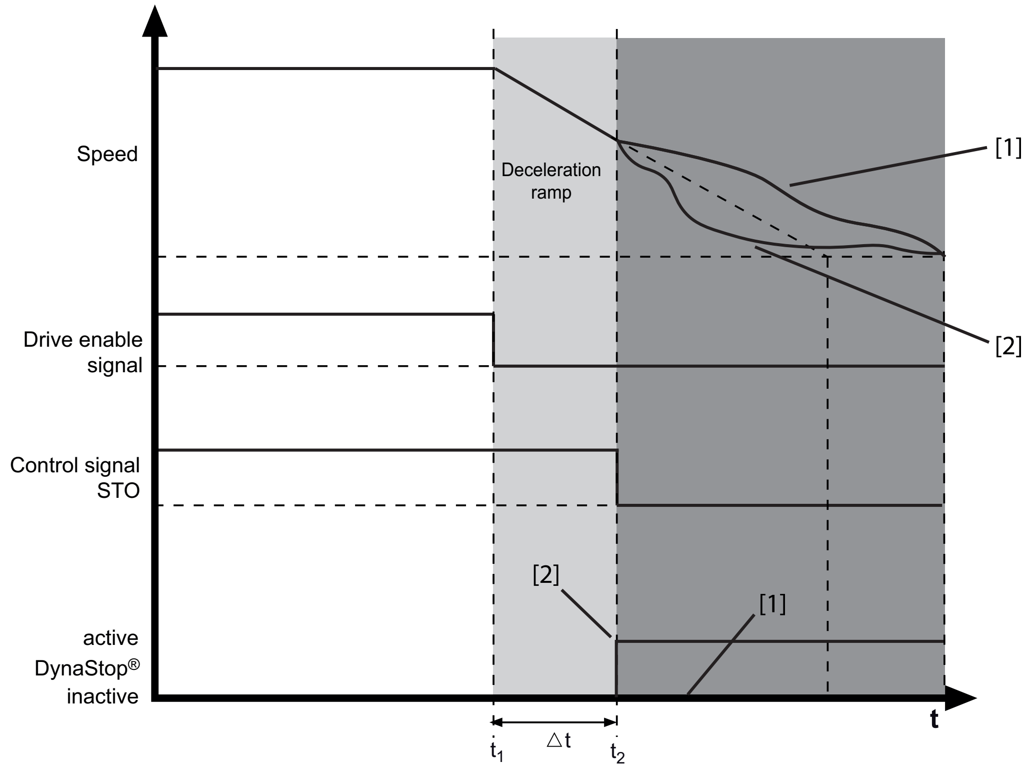
The following figure shows the behavior when STO is activated before motor standstill (rotational speed = 0):



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[1]	Parameter: *Apply brake/activate DynaStop® in STO state* = **"0"** (no) factory settings
[2]	Parameter: *Apply brake/activate DynaStop® in STO state* = **"1"** (yes) (Path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit* > *Brake/ DynaStop®*)
t	Time
t_1	Point of time when deceleration ramp is initiated
t_2	Point of time when STO is triggered
Δt	Time span between initiating the deceleration ramp and STO
	Safe time delay range
	Range with active, safety-related STO function

Activating the STO function during the execution of the deceleration ramp aborts the controlled ramp-down:

Possible reasons for premature activation of STO:

- Deceleration time Δt too short
- Extension of the deceleration ramp when the current limit is reached, e.g. due to too high load

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8 Service

NOTICE

Improper work on the drive units can lead to damage.

Possible damage to property.

- Note that only qualified personnel is permitted to repair drives from SEW-EURODRIVE.
- Consult SEW-EURODRIVE Service department.

8.1 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 output-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
Drive shaft does not turn although the motor is running (see chapter "Meaning of LEDs")	Shaft-hub connection in the gear unit interrupted	Send in the drive unit for repair

8.2 Evaluating fault messages

8.2.1 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 [6], select the "Status" node.
   - ⇨ The **current fault messages** can be found in the "Fault status" [5] group.
   - ⇨ **Additional information** on the causes for the "Not ready" status can be found in the "Device status" [4] group.
   - ⇨ Information on the **history of the fault messages** can be found in the "Fault memory" [7] node.

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[1] Fault status of the main component
[2] Fault status of the subcomponent
[3] Display of the status bits

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8.3 Switch-off responses

Fault response	Description
No response	The inverter ignores the event.
Warning with self reset	The inverter sends a warning message with self-reset.
Warning	The inverter issues a warning message.
Application stop (with output stage inhibit)	The inverter stops with the deceleration set for the application limit. For 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.
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 acknowledges the fault. The inverter automatically resumes the operation performed before the fault. The drive restarts automatically.

8.4 Fault messages with parameterizable response

Fault	Description	Index no.	Possible fault 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 (values below threshold defined by the user, index 8351.5).	8622.4	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage

Fault	Description	Index no.	Possible fault response
External fault	Here you can set the device response to an external fault (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 one can set how the device is to respond to a timeout on the EtherCAT®/SBus^{PLUS} (timeout period, Index 8455.3).	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
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

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Fault	Description	Index no.	Possible fault response
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
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 – fault	Here you can set the device response to an encoder fault.	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

8.5 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.

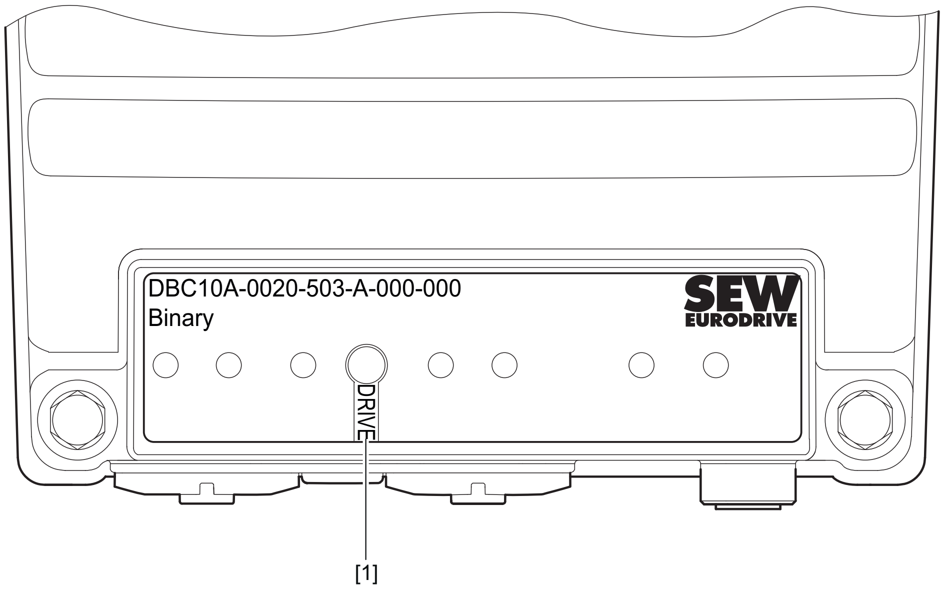
Acknowledge fault message by:

- Switch the supply system off and on again.
- Via the controller/PLC: Send "reset command".

8.6 Description of status and operating displays

8.6.1 LED displays of the binary control

The following figure shows the LEDs of the binary design:



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[1] "DRIVE" status LED

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8.6.2 General LEDs

"DRIVE" status LED

LED	Operating status/ Fault code	Operating status/ Subfault code	Meaning	Measure
– **Off**	Not ready for operation		Line voltage absent.	Switch on the line voltage.
Yellow **Flashes very rapidly, 4 Hz**	Not ready for operation		Initialization phase	Wait for the initialization to be completed.
Yellow **Flashes 1 Hz**	Ready but unit inhibited		The "STO" signal is active.	Deactivate the "STO" signal.
Yellow **Flashes slowly, 0.5 Hz**	Ready for operation, but manual mode/local mode, device inhibited		Line voltage is OK.	–
Yellow **Flashes rapidly, 2 Hz**	Ready		Deactivation of DynaStop® without drive enable is active.	–
Yellow **Steady light**	Ready but unit inhibited		Line voltage is OK. The output stage is locked.	–
Green **Flashes slowly, 0.5 Hz**	Unit enabled, but condition manual mode/local mode		The output stage is enabled. The motor is in operation.	–
Green **Flashes very rapidly, 4 Hz**	Unit enabled, but current limit active.		The drive is at the current limit.	Reduce the load.
Green **Steady light**	Unit enabled.		The output stage is enabled. The motor is in operation.	–
Yellow/red **Flashes with changing colors, 1 Hz** **(2 x yellow, 2 x red)**	Ready		A displaying fault is present. The output stage is locked.	Consult the "Fault table" chapter for possible measures to be taken.
Green/red **Flashes with changing colors, 1 Hz** **(2 × green, 2 × red)**	Ready		A displaying fault is present. The output stage is enabled. The motor is in operation.	Consult the "Fault table" chapter for possible measures to be taken.

LED	Operating status/ Fault code	Subfault code	Meaning	Measure
Red **Flashes 1 Hz**	3	1	Ground fault	Consult the “Fault table” chapter for possible measures to be taken.
	4	1	Brake chopper fault	
	6	1	Line fault	
	7	1	DC link fault	
	8	1, 2, 3	Speed monitoring fault	
	9	1, 2, 5, 6, 9, 10	Control mode fault	
	10	1, 3 – 11	Data Flexibility fault	
	11	1 – 6	Temperature monitoring fault	
	12	1, 2	Brake fault	
	13	5, 24	Encoder 1 fault	
	16	5 – 8, 10, 20 – 27	Startup fault	
	19	1 – 9	Process data fault	
	20	2, 11	Device monitoring fault	
	23	4	Power section fault	
	25	2 – 7, 20, 21, 30, 31, 61, 70	Parameter memory monitoring	
	26	1, 3	External fault	
	28	1 – 12, 14	FCB drive function fault	
	29	1 – 4	Hardware limit switch fault	
	30	1 – 3	Software limit switch fault	
	31	1 – 4, 7, 9	Thermal motor protection fault	
	32	2 – 6, 12	Communication fault	
	33	11, 12, 13	System initialization fault	
	34	1	Process data configuration fault	
	35	1 – 5	Function activation fault	
	42	1 – 3	Lag fault	
	44	2, 3, 4	Fault overcurrent phase U, V, W	
	46	2, 3, 50, 51, 52	Safety card fault	
	51	1	Analog processing fault	

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LED	Operating status/		Meaning	Measure
	Fault code	Subfault code		
Red **Steady light**	1	1, 2	Output stage monitoring fault	Contact SEW-EURODRIVE Service.
	4	2	Brake chopper fault	
	7	2	DC link fault	
	9	3, 4, 8	Control mode fault	
	10	2, 99	Data Flexibility fault	
	11	7, 8	Temperature monitoring fault	
	13	1, 3, 6, 7, 8, 9, 11, 13, 15, 22, 23	Encoder 1 fault	
	16	2, 11, 12. 30	Startup fault	
	17	7	Internal processor fault	
	18	1, 3,4, 7, 8, 9, 10, 12, 13	Software error	
	20	1.7	Device monitoring fault	
	21	1	S-Drive 1 fault	
	23	5, 6, 7, 8	Power section fault	
	25	10, 12 – 19, 50, 51, 81	Parameter memory monitoring	
	28	13	FCB drive function fault	
	33	1, 2, 6, 7, 8, 10	System initialization fault	
	46	1	Safety card fault	

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8.7 Fault table

8.7.1 Fault 1 Output stage monitoring

Subfault: 1.1 **Description: Short circuit in motor output terminals**		
	Response: Output stage inhibit	
	Cause	Measure
	Overcurrent in output stage or faulty output stage control detected, and output stage inhibited by hardware.	Possible causes for overcurrent are short circuit at the output, excessive motor current, or a defective power output stage.

Subfault: 1.2 **Description: Overcurrent in output stage**		
	Response: Output stage inhibit	
	Cause	Measure
	Motor current too high.	Connect a smaller motor.
	Current supply.	Check the current supply.
	Current transformer	Check the current transformer.
	Ramp limit deactivated and set ramp time too short.	Increase the ramp time.
	Phase module defective.	Check the phase module.
	DC 24 V supply voltage unstable.	Check the DC 24 V supply voltage.
	Interruption or short circuit on signal lines of phase modules.	Check the signal lines.

8.7.2 Fault 3 Ground fault

Subfault: 3.1 **Description: Ground fault**		
	Response: Output stage inhibit	
	Cause	Measure
	Ground fault in the motor lead.	Eliminate ground fault in motor lead.
	Ground fault in the inverter.	Eliminate ground fault in inverter.
	Ground fault in the motor.	Eliminate ground fault in motor.
	Ground fault in line components.	Eliminate ground fault in line components.

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8.7.3 Fault 4 Brake chopper

Subfault: 4.1 Description: Brake chopper overcurrent		
	Response: Output stage inhibit	
	Cause	Measure
	Excessive regenerative power.	Extend the deceleration ramps.
	Short circuit detected in braking resistor circuit.	Check the supply cable to the braking resistor.
	Braking resistance too high.	Check the technical data of the braking resistor.

Subfault: 4.2 Description: Brake chopper defective		
	Response: Output stage inhibit	
	Cause	Measure
	Output stage of brake chopper defective.	Replace the defective brake chopper.

8.7.4 Fault 6 Line fault

Subfault: 6.1 Description: Line phase failure		
	Response: Line phase failure	
	Cause	Measure
	Missing line phase detected.	Check the supply system cable.
	DC link voltage periodically too low.	Check the configuration of the supply system.
	Inadequate line voltage quality.	Check supply (fuses, contactor).

8.7.5 Fault 7 DC link

Subfault: 7.1 Description: DC link overvoltage		
	Response: Output stage inhibit	
	Cause	Measure
	Maximum permitted DC link voltage limit exceeded and output stage inhibited by hardware.	– Extend the deceleration ramps. – Check supply cable to the braking resistor. – Check the technical data of the braking resistor.

8.7.6 Fault 8 Speed monitoring

Subfault: 8.1

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 the delay time set for speed monitoring, or reduce the load.
Encoder not connected correctly.	Check the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the acceleration values.
Encoder has incorrect direction of rotation.	– Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce acceleration values. – Check motor lead and motor, check line phases.

Subfault: 8.2

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 the delay time set for speed monitoring, or reduce the regenerative load.
Encoder not connected correctly.	Check the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the deceleration values.
Encoder has incorrect direction of rotation.	– Check the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the deceleration values. – Check motor cable and motor. Check the line phases.

Subfault: 8.3

Description: Maximum speed at motor shaft

Response: Output stage inhibit

Cause	Measure
Actual speed exceeded "Maximum speed at motor shaft" limit value (index 8360.9 / 8361.9). This limit value is set at startup matching the motor and gear unit.	Reduce the maximum speed.

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8.7.7 Fault 9 Control mode

Subfault: 9.1 **Description: Magnetization of motor not possible**	
Response: Output stage inhibit	
Cause	Measure
The user-defined current limit or output stage monitoring have reduced the possible maximum current to such a degree that the required magnetizing current cannot be set.	– Reduce the output stage utilization, e.g. by reducing the PWM frequency or reducing the load. – Increase the user-defined current limit.

Subfault: 9.2 **Description: Requested operating mode not possible with active control mode**	
Response: Output stage inhibit	
Cause	Measure
The current FCB activated an operating mode. The active control mode does not support this operating mode, for example "position control" or "torque control" with U/f control mode.	– Use a control mode that supports the required operating mode. Connect an encoder if necessary. – Select an operating mode that is supported by the current control mode.

Subfault: 9.3 **Description: Absolute rotor position not available**	
Response: Output stage inhibit	
Cause	Measure
The current control mode requires an absolute rotor position. The encoder selected for "Source of actual speed" does not provide an absolute rotor position.	Use an absolute encoder, or identify the rotor position using FCB 18.

Subfault: 9.4 **Description: Correct current supply of motor not possible**	
Response: Output stage inhibit	
Cause	Measure
Failed to set required current during premagnetization.	Check the cabling, or disable the function "Current monitoring during premagnetization".

Subfault: 9.5 **Description: Maximum output frequency exceeded**	
Response: Output stage inhibit	
Cause	Measure
Maximum output frequency exceeded.	Reduce the maximum speed.

Subfault: 9.6

Description: Maximum model speed exceeded

Response: Output stage inhibit

Cause	Measure
Speed of drive calculated in ELSM® control mode too high for motor control.	If possible, minimize the "Speed/position controller sampling cycle", or reduce the speed.

Subfault: 9.8

Description: Flux model error

Response: Output stage inhibit

Cause	Measure
Rotor flux calculated by motor model not plausible, or calculated internal voltage too small.	– Check configuration data. – Check motor data. – Check machine: Idle state or speed too low. – Check the connection cable between inverter and motor. – Contact SEW-EURODRIVE Service.

Subfault: 9.9

Description: Parameter measurement not possible with active motor type

Response: Output stage inhibit

Cause	Measure
Parameter measurement is possible only with "asynchronous" and "synchronous" motor types. No magnetic reluctance motors and LSPM motors.	Select the correct motor type.

Subfault: 9.10

Description: Rotor stall monitoring

Response: Output stage inhibit

Cause	Measure
The current control cannot hold the load torque. The deviation between stationary setpoint voltage and actual voltage is too large.	Reduce the load torque (hoist) in the controlled system.

Subfault: 9.11

Description: Standstill current function

Response: Output stage inhibit

Cause	Measure
With the ELSM® method, the standstill current function is possible only in combination with rotor position measurement.	– Enable rotor position measurement. – Check motor data.

8.7.8 Fault 10 Data Flexibility

Subfault: 10.1 **Description: Initialization**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Init task error.	The init task has issued a return code ! = 0. Check the program.

Subfault: 10.2 **Description: Illegal operation code**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Illegal opcode in Data Flexibility program.	Contact the SEW-EURODRIVE Service.

Subfault: 10.3 **Description: Memory access**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Memory area violated while accessing array.	For example, an array access results in writing beyond the permitted memory range. Check the program.

Subfault: 10.4 **Description: Stack**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Overflow of Data Flexibility stack detected.	Check the program.

Subfault: 10.5 **Description: Division by 0**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Division by 0.	Check the program.

Subfault: 10.6 **Description: Runtime**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Runtime error/watchdog.	Check the program. The program execution time exceeds the permitted time.
	PDI or PDO tasks.	Check the program. The execution time of the PDI or PDO task exceeds the permitted time.

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Subfault: 10.7		
Description: Calculation result of multiplication/division command too large		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Calculation result of multiplication/division command exceeds 32 bits.	Check the program.
	Failed to write calculation result of multiplication/ division command into result variable.	Check the program.

Subfault: 10.8		
Description: Illegal connection		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Index used in connect not allowed.	Check the program. The index used either does not exist or is not permitted for access via process data – see parameter list.

Subfault: 10.9		
Description: CRC code		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Wrong CRC checksum of code.	Load the program again. The program memory is corrupt. Unauthorized write access to the program memory.

Subfault: 10.10		
Description: Setpoint cycle time not supported		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Non-supported setpoint cycle time parameterized.	Set the setpoint cycle time to the default value 1 ms.

Subfault: 10.11		
Description: No application program loaded		
	Response: Output stage inhibit	
	Cause	Measure
	No Data Flexibility application program loaded.	Load the program or disable Data Flexibility.

Subfault: 10.99		
Description: Unknown error		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Unknown Data Flexibility error.	Contact the SEW-EURODRIVE Service.

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8.7.9 Fault 11 Temperature monitoring

Subfault: 11.1
Description: Heat sink overtemperature

Response: Output stage inhibit

Cause	Measure
Maximum permitted heat sink temperature exceeded. The capacity utilization is possibly too high.	– Reduce the load. – Reduce the rms value of the current. – Reduce the PWM frequency. – Ensure sufficient cooling. – Reduce the ambient temperature.

Subfault: 11.2
Description: Heat sink utilization – prewarning

Response: Heat sink utilization – prewarning

Cause	Measure
High thermal load on heat sink of device, and prewarning threshold reached.	– Reduce the load. – Reduce the rms value of the output current. – Reduce the PWM frequency. – Ensure sufficient cooling. – Reduce the ambient temperature.

Subfault: 11.3
Description: Device utilization

Response: Output stage inhibit

Cause	Measure
The temperature has reached or exceeded the switch-off threshold. Possible causes: Mean output current too high.	Reduce the load.
PWM frequency too high.	Reduce the PWM frequency.
Ambient temperature too high.	Ensure sufficient cooling.
Unfavorable air convection.	Check air convection.
Fan defective.	Check the fan and replace if necessary.

Subfault: 11.5
Description: Electromechanical utilization

Response: Output stage inhibit

Cause	Measure
Electromechanical components of device overloaded by excessive continuous current.	Reduce the load. If necessary, reduce the rms value of the current.

Subfault: 11.6		
Description: Electromechanical utilization – prewarning		
	Response: Electromechanical utilization – prewarning	
	Cause	Measure
	High load on electromechanical components of device due to high continuous current. Prewarning threshold reached.	– Reduce the load. – Reduce the PWM frequency. – Reduce the rms value of the current. – Reduce the ambient temperature.

Subfault: 11.7		
Description: Wire break at temperature sensor of heat sink		
	Response: Output stage inhibit	
	Cause	Measure
	Wire break at temperature sensor of heat sink.	Contact the SEW-EURODRIVE Service.

Subfault: 11.8		
Description: Short circuit at temperature sensor of heat sink		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit at temperature sensor of heat sink.	Contact the SEW-EURODRIVE Service.

8.7.10 Fault 12 Brake

Subfault: 12.1		
Description: Brake output		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	No brake connected.	Check the connection of the brake.
	Brake cable disconnected in switched-on state.	Check the connection of the brake.
	Overload due to overcurrent > 2 A	Check the sequential profile of brake control.
	Overload due to excessive connection (> 0.5 Hz)	Check the sequential profile of brake control.
	Monitoring works only with parameter setting "Brake installed" and "Brake applied".	Make sure that the connected brake is permitted.

Subfault: 12.2		
Description: DC 24 V brake voltage		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	DC 24 V supply voltage not within permitted tolerance of ± 10%.	Check the DC 24 V supply voltage.
	Monitoring is only active with parameter settings “Brake installed” and “Brake applied”.	Check the parameter setting.

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Subfault: 12.3 Description: Temperature		
	Response: Output stage inhibit	
	Cause	Measure
	Brake temperature outside permitted range (too high or too low).	Check the ambient conditions and the application.
	Brake temperature too high. When using decentralized devices, DC link overvoltage is reduced by the brake.	Check the application for how often generator mode occurs.

Subfault: 12.4 Description: Brake control module missing		
	Response: Output stage inhibit	
	Cause	Measure
	Brake control has been activated although the hardware is not equipped with the matching module.	Select another brake type or brake connection.

Subfault: 12.5 Description: Short circuit		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit in the brake detected.	Check the brake connection.

Subfault: 12.6 Description: Wear limit reached		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Brake worn	Replace the brake or readjust it.

Subfault: 12.10 Description: Digital motor integration fault – critical		
	Response: Output stage inhibit	
	Cause	Measure
	The intelligent brake rectifier of "digital motor integration" signaled a critical component fault.	See subcomponent fault.

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8.7.11 Error 13 encoder 1 fault

Subfault: 13.1 **Description: Position comparison check**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Faulty comparison between raw position and track counter of absolute encoders.	– Check the track signal wiring. – Check interference sources (e.g. from the area of EMC). – Replace encoder. – Replace the card. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.2 **Description: Unknown encoder type**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder type not known and not supported by inverter.	– Check the encoder type. – Contact SEW-EURODRIVE Service. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.3 **Description: Invalid data**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn).	– Check the startup parameters. – Replace encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.4 Description: Track measurement error	
Response: Encoder 1 – latest critical fault	
Cause	**Measure**
Error during track measurement.	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Replace if necessary. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.5 Description: Internal warning	
Response: Encoder – warning	
Cause	**Measure**
Encoder signaled warning.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Clean the sensor.

Subfault: 13.6 Description: Signal level too low	
Response: Encoder 1 – latest critical fault	
Cause	**Measure**
Vector below permitted limit during signal level monitoring.	– Check the wiring. – Check interference sources (e.g. from the area of EMC). – Check the encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.7 Description: Signal level too high	
Response: Encoder 1 – latest critical fault	
Cause	**Measure**
Vector exceeds permitted limit during signal level monitoring.	Check the gear ratio of the resolver in use. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.8		
Description: Signal level monitoring		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Vector exceeds permitted limit during signal level monitoring.	Check the resolver mounting position. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.9		
Description: Quadrant check		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Error checking quadrants (sine encoder).	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from the area of EMC). – Check the encoder. Replace if necessary. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.10		
Description: Position tolerance range monitoring		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Position outside tolerance range.	– Check the startup parameters. – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.11 **Description: Data timeout**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder process data timeout.	– Check interference sources (e.g. from the area of EMC). – Check the startup parameters. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.12 **Description: Emergency**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder signaled emergency.	– Check interference sources (e.g. from the area of EMC). – Check the startup parameters. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.13 **Description: Error during initialization**		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Communication error during initialization.	– Check parameterization. – Check baud rate. – Ensure that the CANopen interface on the encoder (Node ID) is correctly adjusted. – Check the wiring. Note: 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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Subfault: 13.14 Description: Communication		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Faulty communication with encoder.	– Check the voltage supply. – Check interference sources (e.g. from the area of EMC). – Check the wiring. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.15 Description: System error		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	System error while evaluating encoder.	– Ensure that the multi-turn encoder is within the configured path range. – Check the limits. – Check for correct settings of encoder numerator/denominator factors. – Check interference sources (e.g. from the area of EMC). – Check the startup parameters. – Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.16 Description: Permanent high level in data line – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Permanent high level of data signal.	– Check the wiring. – Check the encoder. Note: 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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Subfault: 13.17 Description: Permanent high level in data line		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Permanent high level of data signal.	– Check the wiring. – Check the encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.18 Description: Permanent low level in data line – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Permanent low level of data signal.	– Check the wiring. – Check the encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.19 Description: Permanent low level in data line		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Permanent low level of data signal.	– Check the wiring. – Check the encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.20 Description: SSI error bit – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Error bit set in SSI protocol.	– Check the startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "Emergency mode" manual mode, you can move the drive even with a fault in an external position encoder.

Subfault: 13.21		
Description: SSI error bit		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Error bit set in SSI protocol.	– Check the startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "Emergency mode" manual mode, you can move the drive even with a fault in an external position encoder.

Subfault: 13.22		
Description: Internal fault – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder signaled internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.23		
Description: Internal fault		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Encoder signaled internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: 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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Subfault: 13.24 Description: Travel range exceeded		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Current position mode (index 8381.10) does not allow for larger travel range.	Check the travel range. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.25 Description: Error during encoder startup		
	Response: Output stage inhibit	
	Cause	Measure
	Fatal error during encoder startup.	Switch the device off and on again. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.26 Description: Digital motor integration fault – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder of "Digital motor integration" signaled a component fault.	– Check interference sources. – Replace encoder.

Subfault: 13.27 Description: Digital motor integration fault		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Encoder of "Digital motor integration" signaled a component fault.	– Check interference sources. – Replace encoder.

Subfault: 13.28 Description: Digital motor integration warning		
	Response: Encoder – warning	
	Cause	Measure
	Encoder of "Digital motor integration" signaled a warning.	– Check interference sources.

8.7.12 Fault 16 Startup

Subfault: 16.1
Description: Motor not started up

Response: Output stage inhibit

Cause	Measure
Motor not started up or not started up completely.	Perform complete motor startup.

Subfault: 16.2
Description: Cannot calculate controller parameters

Response: Output stage inhibit

Cause	Measure
Delay of encoder in use too long to calculate required filter coefficients.	Use an encoder with a shorter delay, or contact SEW-EURODRIVE Service.

Subfault: 16.3
Description: Thermal motor model not possible

Response: Output stage inhibit

Cause	Measure
Invalid parameters for thermal motor model or for drive enable although starting up thermal model not yet completed.	Check the parameters of the thermal motor model, and perform startup.

Subfault: 16.5
Description: Current limit smaller than magnetizing current of the motor

Response: Output stage inhibit

Cause	Measure
Current limit smaller than magnetizing current of the motor calculated by active control mode.	Increase the current limit. Required magnetizing current: See diagnostics parameters of control mode.

Subfault: 16.6
Description: Control mode not possible

Response: Output stage inhibit

Cause	Measure
Wrong control mode selected for the motor.	Choose a control mode that matches the selected motor.

Subfault: 16.7
Description: PWM frequency not possible

Response: Output stage inhibit

Cause	Measure
Specified PWM frequency not allowed for this power output stage.	Choose another PWM frequency. For possible PWM frequencies, refer to the device configuration data.

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Subfault: 16.8 Description: Temperature sensor motor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty startup of temperature sensor of motor 1.	Perform startup again.

Subfault: 16.9 Description: Temperature sensor motor 2		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty startup of temperature sensor of motor 2.	Perform startup again.

Subfault: 16.10 Description: Actual position source not assigned		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Active control mode requires an encoder for position mode.	– Assign actual position source in encoder assignment of the active drive train (Index 8565.3 or 8566.3). – If no encoder is installed, activate the FCBs only using "torque control" or "speed control" operating mode.

Subfault: 16.11 Description: Motor data calculation error		
	Response: Output stage inhibit	
	Cause	Measure
	Motor startup not possible because of inconsistent motor data or wrong device configuration data.	Check the motor data for plausibility, or contact SEW-EURODRIVE Service.

Subfault: 16.12 Description: Motor data write sequence		
	Response: Output stage inhibit	
	Cause	Measure
	Subindex 1 not written to zero before writing electrical startup parameters (index 8357, 8360, 8394, 8420 or 8358, 8361, 8395, 8421).	Reset the fault. Set parameters 8360/1 or 8361/1 to "0" before writing additional parameters.

Subfault: 16.20	
Description: Nominal speed too high or nominal frequency too low	
Response: Output stage inhibit	
Cause	Measure
During startup using nameplate data: Nominal speed too high or nominal frequency too low. The resulting number of pole pairs is 0.	Enter plausible motor data (nominal speed and nominal frequency).

Subfault: 16.21	
Description: Nominal slip negative	
Response: Output stage inhibit	
Cause	Measure
During startup using nameplate data, the calculated nominal slip is negative: Nominal frequency too low, or nominal speed too high, or number of pole pairs too high.	Enter plausible motor data (nominal frequency, nominal speed, number of pole pairs).

Subfault: 16.22	
Description: Specify the number of pole pairs	
Response: Output stage inhibit	
Cause	Measure
During startup using nameplate data: It is not possible to calculate the number of pole pairs accurately from nominal frequency and nominal speed.	Enter the number of pole pairs.

Subfault: 16.23	
Description: Plausibility check failed	
Response: Output stage inhibit	
Cause	Measure
During startup using nameplate data: The estimated nominal power does not match the entered nominal power.	Check entered nameplate data for plausibility.

Subfault: 16.24	
Description: Speed controller sampling cycle not possible with current PWM frequency or current control mode	
Response: Application stop + output stage inhibit	
Cause	Measure
At a PWM frequency of "2.5 kHz", only the speed controller sampling cycle of 2 ms is permitted. For the ELSM® control mode, the only permitted speed controller sampling cycles are 1 ms and 2 ms.	Increase PWM frequency or increase sampling cycle of speed controller to 2 ms. Set the sampling cycle to 1 ms or 2 ms for ELSM® control mode.

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Subfault: 16.25 Description: User-defined current limit too low for standstill current		
	Response: Output stage inhibit	
	Cause	Measure
	User-defined current limit value too small for minimum standstill current.	Increase the user-defined current limit, or disable the standstill current function.

Subfault: 16.26 Description: Nominal values incomplete or implausible		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: Nominal voltage, nominal current, nominal speed or nominal torque are not entered or are not plausible.	Enter or check nominal voltage, nominal current, nominal speed, and nominal torque.

Subfault: 16.27 Description: Maximum current or maximum torque not plausible		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: Maximum current or maximum torque not entered, or maximum current and maximum torque not plausible.	Check the maximum current and maximum torque.

Subfault: 16.30 Description: Faulty EtherCAT® EEPROM configuration state		
	Response: Warning	
	Cause	Measure
	Faulty EtherCAT®/SBus^{PLUS} EEPROM configuration status. EEPROM not loaded; binary file not loaded.	Contact the SEW-EURODRIVE Service.
	Faulty EEPROM loading procedure.	Contact the SEW-EURODRIVE Service.
	Faulty EEPROM checksum.	Contact the SEW-EURODRIVE Service.

Subfault: 16.40 Description: Data of selected motor not valid		
	Response: Output stage inhibit	
	Cause	Measure
	Startup data set on replaceable memory module not valid for this motor.	Replace the memory module.

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Subfault: 16.41		
Description: Data of selected motor does not exist		
	Response: Output stage inhibit	
	Cause	Measure
	No startup data set found on the replaceable memory module for the selected motor.	Check the selection and, if necessary, start up another motor or replace the memory module.

Subfault: 16.50		
Description: Brake parameters not initialized		
	Response: Output stage inhibit	
	Cause	Measure
	No brake data present	Check startup.

8.7.13 Fault 17 Internal processor fault

Subfault: 17.7		
Description: Exception error		
	Response: Output stage inhibit	
	Cause	Measure
	Exception trap in CPU.	Contact the SEW-EURODRIVE Service.

8.7.14 Fault 18 Software error

Subfault: 18.1		
Description: Motor management		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Error detected at motor management interface.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.

Subfault: 18.3		
Description: Task system warning		
	Response: Warning	
	Cause	Measure
	Error while processing internal task system. This may be a timeout for cyclical tasks, for example.	– Acknowledge the warning. – Contact SEW-EURODRIVE Service if the warning occurs regularly.

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Subfault: 18.4	
Description: Task system	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
A fault was detected during the processing of the internal task system. This may be a timeout for cyclical tasks, for example.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.

Subfault: 18.7	
Description: Fatal error	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
Fatal software error.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.

Subfault: 18.8	
Description: Invalid fault code	
Response: Output stage inhibit	
Cause	Measure
Invalid fault code requested.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.

Subfault: 18.9	
Description: Internal software error	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
The software reports an unexpected event.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.

Subfault: 18.10		
Description: Watchdog		
	Response: Output stage inhibit	
	Cause	Measure
	Software no longer operates within intended cycle time.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.

Subfault: 18.12		
Description: Configuration data		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Configuration data not plausible or cannot be interpreted by active firmware version.	Update the firmware or load valid configuration data.

Subfault: 18.13		
Description: Calibration data		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Calibration data not plausible.	Load valid calibration data.

8.7.15 Fault 19 Process data

Subfault: 19.1		
Description: Torque setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Implausible values specified as torque setpoints.	Adjust torque setpoints.

Subfault: 19.2		
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 range.	Check the position setpoint.
	Position in user unit generates number overflow in the system unit.	Check the position in user unit.

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Subfault: 19.3		
Description: Speed setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Specified rotational speed setpoints not plausible.	Adjust rotational speed setpoints.

Subfault: 19.4		
Description: Acceleration setpoint violation		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The specified acceleration setpoints are not plausible. Only a value range of >= 0 is permitted.	Adjust acceleration setpoints.

Subfault: 19.5		
Description: Drive function does not exist		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Non-existing drive function (FCB) selected via process data.	Specify an existing FCB number for FCB activation via process data.

Subfault: 19.6		
Description: Mass moment of inertia setpoint violation		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Implausible values specified as mass moment of inertia setpoints. Only a value range of >= 0 is permitted.	Adjust the setpoints for the mass moment of inertia.

Subfault: 19.7		
Description: Referencing missing		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Activated function permitted only with referenced encoder.	Reference the encoder first, then activate the function.

Subfault: 19.8		
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.

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Subfault: 19.9 Description: Jerk setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Jerk values not plausible.	Adjust jerk setpoints.

8.7.16 Fault 20 Device monitoring

Subfault: 20.1 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 standby supply voltage outside permitted voltage range.	Check the voltage level of the external DC 24 V standby supply voltage and check for correct port. If required, correct. – Acknowledge the fault. – If the fault occurs repeatedly, replace the device. For further support, contact SEW-EURODRIVE Service.

Subfault: 20.2 Description: Supply voltage overload		
	Response: Output stage inhibit	
	Cause	Measure
	For MOVIDRIVE® system, the current load of the current paths of the DC 24 V standby supply voltage inside the device is too high. The device signal output of the device was de-energized because of the fault message.	Identify the consumer that is overloading the internal supply voltage: 1. Remove all external consumers: – At the digital outputs of the basic device. – At options that may be present. – At all encoder connections. – At other consumers at the DC 24 V output voltage terminals. 2. Acknowledge the fault. 3. Reconnect the consumers with the device, one after the other, until the fault message appears once again. 4. To eliminate the fault, connect a consumer with a lower current consumption or eliminate the short circuit.

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Subfault: 20.7 Description: Internal hardware fault		
	Response: Output stage inhibit	
	Cause	Measure
	Fault in the device hardware.	– Acknowledge the fault. – If the fault occurs repeatedly, replace the device. For further support, contact SEW-EURODRIVE Service.

Subfault: 20.8 Description: Fan warning		
	Response: Warning with self-reset	
	Cause	Measure
	Fan function impaired.	Check the fan for proper functioning.

Subfault: 20.9 Description: Fan fault		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Fan defective.	Contact the SEWEURODRIVE Service.

Subfault: 20.10 Description: Fan supply voltage fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Supply voltage of fan missing.	Check the connection or establish a connection.

Subfault: 20.11 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. – Check the STO wiring before acknowledging the fault, and make sure that both STO signals are switched to low level.

8.7.17 Fault 21 Digital motor integration 1

Subfault: 21.1 Description: Communication error		
	Response: Output stage inhibit	
	Cause	Measure
	Communication error detected on the interface of the "digital motor integration".	Check the cabling.

Subfault: 21.2 Description: Slave required		
	Response: Output stage inhibit	
	Cause	Measure
	Device started up with a drive with "digital motor integration" but no drive with "Digital motor integration" is connected.	Connect a drive with "digital motor integration" matching startup, or perform a new startup.

Subfault: 21.3 Description: Incompatible drive motor		
	Response: Output stage inhibit	
	Cause	Measure
	Connected drive not compatible with started-up drive.	Connect a drive that matches startup, or perform a new startup.

Subfault: 21.4 Description: Invalid label		
	Response: Output stage inhibit	
	Cause	Measure
	The connected drive contains invalid data.	Replace the drive.

Subfault: 21.5 Description: Incompatible slave		
	Response: Output stage inhibit	
	Cause	Measure
	The connected slave of "digital motor integration" cannot be used with this inverter firmware.	Update inverter or slave.

Subfault: 21.6 Description: Overload/short circuit on the interface		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit in the cabling of components of "Digital motor integration".	Check the cabling of the component of "digital motor integration".
	Voltage of "Digital motor integration" component too low.	Check the voltage supply of the component.

8.7.18 Fault 23 Power section

Subfault: 23.1 Description: Warning	
Response: Warning with self-reset	
Cause	Measure
Power section fault with fault response of the type "Warning".	See also "Power section subcomponent" fault status.

Subfault: 23.2 Description: Fault	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Power section fault with fault response of the type "Standard".	See also "Power section subcomponent" fault status.

Subfault: 23.3 Description: Critical fault	
Response: Output stage inhibit	
Cause	Measure
Power section fault with fault response of the type "Critical fault".	See also "Power section subcomponent" fault status.

Subfault: 23.4 Description: Hardware fault	
Response: Output stage inhibit	
Cause	Measure
A fault occurred in a hardware component of the power section, e.g.: Overcurrent hardware comparator.	– Check the current supply. – Increase the ramp time. – Check for correct motor size (the motor current is too high). – Contact SEWEURODRIVE Service.
Switched-mode power supply fault, hardware fault.	– Check the current supply. – Check the DC 24 V supply voltage.
Fault at the gate driver of an IGBT.	Defect in the power output stage. Contact the SEWEURODRIVE Service.
Invalid process data configuration. Status of control section and power section are not compatible.	Contact the SEWEURODRIVE Service.

Subfault: 23.5 Description: Invalid process data configuration	
Response: Output stage inhibit	
Cause	Measure
Invalid process data configuration.	Contact the SEWEURODRIVE Service.

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Subfault: 23.6		
Description: Process data timeout		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Power section communication interface detected process data timeout.	If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Subfault: 23.7		
Description: Parameter communication timeout		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Power section communication interface detected timeout in parameter communication.	If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Subfault: 23.8		
Description: Parameter communication error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Power section communication interface detected error in parameter communication.	If the error occurs repeatedly, contact SEW-EURODRIVE Service.

Subfault: 23.9		
Description: Firmware of power section corrupt		
	Response: Output stage inhibit	
	Cause	Measure
	Failed to update firmware on power section.	Update the firmware again.

8.7.19 Fault 25 Parameter memory monitoring

Subfault: 25.2		
Description: NV memory – runtime error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error of non-volatile memory system.	– Reset the device. – If this occurs repeatedly, replace device. Contact the SEW-EURODRIVE Service.

Subfault: 25.6 Description: Incompatible device configuration		
	Response: Output stage inhibit	
	Cause	Measure
	The data set in the device was copied from another device, which differs from the current device in the device family, power, or voltage.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
	Replaceable memory module used by another device. Power rating, device family, or voltage differs from the current device.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
	The power section was replaced and differs in its power rating or voltage from the original power section.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".

Subfault: 25.7 Description: NV memory initialization – error		
	Response: Output stage inhibit	
	Cause	Measure
	Error initializing non-volatile memory system.	– Reset the device. – If this occurs repeatedly, replace device. Contact the SEW-EURODRIVE Service.

Subfault: 25.10 Description: Power section configuration data – version conflict		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of configuration data of power section.	Contact the SEW-EURODRIVE Service.

Subfault: 25.12 Description: Power section configuration data – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty configuration data of power section.	Contact the SEW-EURODRIVE Service.

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Subfault: 25.13		
Description: Control electronics configuration data – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty configuration data of control electronics.	Contact the SEW-EURODRIVE Service.

Subfault: 25.14		
Description: Calibration data of power section – version conflict		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of calibration data of power section.	Contact the SEW-EURODRIVE Service.

Subfault: 25.15		
Description: Calibration data of control electronics – version conflict		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of calibration data of control electronics.	Contact the SEW-EURODRIVE Service.

Subfault: 25.16		
Description: Power section calibration data – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty calibration data of power section.	Contact the SEW-EURODRIVE Service.

Subfault: 25.17		
Description: Control electronics calibration data – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty calibration data of control electronics.	Contact the SEW-EURODRIVE Service.

Subfault: 25.18		
Description: Power section QA data – CRC error		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of power section.	Contact the SEW-EURODRIVE Service.

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Subfault: 25.19		
Description: Control electronics QA data – CRC error		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of control electronics.	Contact the SEW-EURODRIVE Service.

Subfault: 25.20		
Description: Initialization error – basic device memory		
	Response: Output stage inhibit	
	Cause	Measure
	Initialization error of the basic device memory.	Contact the SEW-EURODRIVE Service.

Subfault: 25.21		
Description: Runtime error – basic device memory		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error in memory of basic device.	Contact the SEW-EURODRIVE Service.

Subfault: 25.30		
Description: Initialization error – replaceable memory module		
	Response: Output stage inhibit	
	Cause	Measure
	The formatting of the replaceable memory module does not match.	Restore delivery state. NOTICE: All the data on the replaceable memory module will be reset to default.
	Initialization error of replaceable memory module after delivery state.	Contact the SEW-EURODRIVE Service.

Subfault: 25.31		
Description: Runtime error – replaceable memory module		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error of replaceable memory module.	Contact the SEW-EURODRIVE Service.

Subfault: 25.32		
Description: Replaceable memory module not compatible		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The inserted replaceable memory module cannot be used.	Replace the memory module.

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Subfault: 25.50		
Description: Runtime error – replaceable safety memory module		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Runtime error of the replaceable safety memory module.	Contact the SEW-EURODRIVE Service.

Subfault: 25.51		
Description: Initialization error – replaceable safety memory module		
	Response: Warning	
	Cause	Measure
	Initialization error of the replaceable safety memory module.	Contact the SEW-EURODRIVE Service.

Subfault: 25.61		
Description: Error – restore point		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Failed to create restore point.	Delete restore point.

Subfault: 25.70		
Description: Incompatible card configuration		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The current configuration of the cards does not match the state of the stored startup. For example, a card was removed that was still present during startup.	– Restore the original configuration of the cards. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".

8.7.20 Fault 26 External fault

Subfault: 26.1		
Description: Terminal		
	Response: External fault	
	Cause	Measure
	Error message about external error source.	Programmable via 8622.5 (default: application stop (with output stage inhibit)).

Subfault: 26.3		
Description: Power section emergency shutdown		
	Response: Output stage inhibit	
	Cause	Measure
	Power section requested external emergency shutdown because it detected critical fault.	Contact SEW-EURODRIVE Service.

Subfault: 26.4		
Description: External braking resistor fault		
	Response: Response to external braking resistor fault	
	Cause	Measure
	External braking resistor's temperature switch connected to terminal tripped.	– Check the resistor mounting position. – Clean the resistor. – Check the configuration of the resistor. – Install a larger resistor. – Check the trip switch settings. – Optimize the travel cycle so that less regenerative operation energy arises.

8.7.21 Fault 28 FCB drive functions

Subfault: 28.1		
Description: FCB 11/12 – Timeout while searching zero pulse		
	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.

Subfault: 28.2		
Description: FCB 11/12 – Hardware limit switch upstream of 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 downstream of the hardware limit switch.

Subfault: 28.3		
Description: FCB 11/12 – Hardware limit switch and reference cam not flush		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Hardware limit switch and reference cam not mounted flush.	Make sure that the reference cam and the hardware limit switch are mounted flush.

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Subfault: 28.4		
Description: FCB 11/12 – Reference offset error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Error when determining reference offset.	– Make sure that the reference offset is not set to a larger value than the "Modulo maximum" limit value. When using a single-turn absolute encoder, make sure that the reference offset is not set to a larger value than one encoder revolution.

Subfault: 28.5		
Description: FCB 11/12 – Referencing not possible		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	In the active drive train, the "Actual position source" parameter is set to "No encoder".	Assign "Actual position source", or do not perform any referencing.

Subfault: 28.6		
Description: FCB 11/12 – Limit switch/reference cam not flush/overlapping with fixed stop		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Hardware limit switch or reference cam that has not been selected was approached during reference travel to fixed stop.	Check whether the parameters set for reference travel are correct.
	During reference travel to fixed stop with selected hardware limit switch or reference cam, the fixed stop was reached without approaching the hardware limit switch or reference cam.	Check whether the parameters set for reference travel are correct.

Subfault: 28.7		
Description: FCB 21 – Test torque greater than maximum torque at motor shaft		
	Response: Output stage inhibit	
	Cause	Measure
	The required test torque for the brake test is higher than the maximum torque. It cannot be generated by the motor/inverter combination.	Reduce the test torque.

Subfault: 28.8		
Description: FCB 21 – Test torque not reached		
	Response: Output stage inhibit	
	Cause	Measure
	Test torque required for brake test exceeds valid limit values.	– Reduce the test torque. – Check limit values.

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Subfault: 28.9 **Description: FCB 18 – Rotor position identification not possible**	
Response: Output stage inhibit	
Cause	Measure
Rotor position identification started with incremental encoder but aborted prematurely.	– Restart the rotor position identification. – Check whether the encoder is connected correctly. – Check whether the encoder is defective.
Result of rotor position identification cannot be stored in encoder.	Select "Inverter" as storage location.
Combination of "Automatic" mode and "Encoder" storage location not permitted.	Set the operating mode to "Manual" or the storage location to "Inverter".

Subfault: 28.10 **Description: FCB 25 – Unbalanced motor phases**	
Response: Output stage inhibit	
Cause	Measure
Significantly different values determined in the three 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.

Subfault: 28.11 **Description: FCB 25 – At least one phase with high resistance**	
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.

Subfault: 28.12 **Description: FCB 25 – Timeout during stator resistance measurement**	
Response: Output stage inhibit	
Cause	Measure
Motor parameter measurement activated while motor is turning.	– Stop the motor. – Start motor parameter measurement when the motor is at standstill.

Subfault: 28.13		
Description: FCB 25 – Characteristic curve identification not possible		
	Response: Output stage inhibit	
	Cause	Measure
	Motor parameter measurement does not allow for unique identification of the characteristic curve.	Contact the SEW-EURODRIVE Service.

Subfault: 28.14		
Description: Modulo min. and max. swapped		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	In the active data set, the value for "Modulo minimum" is greater than the value for "Modulo maximum"; see Monitoring functions\Limit values 1 or Monitoring functions\Limit values 2.	Swap the values for modulo minimum and modulo maximum.

Subfault: 28.15		
Description: FCB 25 – Timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Measuring rotor resistance, LSigma, or stator inductance not completed.	Contact the SEW-EURODRIVE Service.

8.7.22 Fault 29 HW limit switches

Subfault: 29.1		
Description: Positive limit switch approached		
	Response: HW limit switch – current drive train	
	Cause	Measure
	Positive hardware limit switch approached.	– Check hardware limit switch wiring. – Check target position. – Move clear of the hardware limit switch at negative speed.

Subfault: 29.2		
Description: Negative limit switch approached		
	Response: HW limit switch – current drive train	
	Cause	Measure
	Negative hardware limit switch approached.	– Check hardware limit switch wiring. – Check target position. – Move clear of the hardware limit switch at positive speed.

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Subfault: 29.3 **Description: Limit switch missing**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Both positive and negative hardware limit switches approached at the same time.	– Check hardware limit switch wiring. – Check the parameter setting of digital inputs. – Check the parameter setting of process output data.

Subfault: 29.4 **Description: Limit switches swapped**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Positive hardware limit switch approached at negative speed, or negative hardware limit switch approached at positive speed.	Check whether hardware limit switch connections are swapped.

8.7.23 Fault 30 Software limit switches

Subfault: 30.1 **Description: Positive limit switch approached**		
	Response: SW limit switches – current drive train	
	Cause	Measure
	Positive software limit switch approached.	– Check software limit switch position. – Check target position. – Move clear of software limit switch at negative speed.

Subfault: 30.2 **Description: Negative limit switch approached**		
	Response: SW limit switches – current drive train	
	Cause	Measure
	Negative software limit switch approached.	– Check software limit switch position. – Check target position. – Move clear of software limit switch at positive speed.

Subfault: 30.3 **Description: Limit switches swapped**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Position value of negative software limit switch greater than position value of positive software limit switch.	Check software limit switch positions.

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8.7.24 Fault 31 Thermal motor protection

Subfault: 31.1		
Description: Temperature sensor wire break – motor 1		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Connection to temperature sensor of motor 1 interrupted.	Check the temperature sensor wiring.

Subfault: 31.2		
Description: Temperature sensor short circuit – motor 1		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit in connection with temperature sensor of motor 1.	Check the temperature sensor wiring.

Subfault: 31.3		
Description: Temperature sensor overtemperature – motor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature sensor of motor 1 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. – Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (Pt1000).

Subfault: 31.4		
Description: Temperature model overtemperature – motor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature model of motor 1 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. – Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (Pt1000).

Subfault: 31.5		
Description: Temperature sensor prewarning – motor 1		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 1 exceeds prewarning threshold.	Check for motor overload.

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Subfault: 31.6 **Description: Temperature model prewarning – motor 1**		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 1 exceeds prewarning threshold.	Check for motor overload.

Subfault: 31.7 **Description: UL temperature monitoring**		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature model of active motor signals overtemperature.	Check for motor overload.

Subfault: 31.8 **Description: Communication timeout temperature sensor – motor 1**		
	Response: Output stage inhibit	
	Cause	Measure
	Communication with temperature sensor is disrupted, e.g. via MOVILINK® DDI.	Check the cabling.

Subfault: 31.9 **Description: Temperature too low – temperature sensor – motor 1**		
	Response: Warning with self-reset	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 1 below -50 °C.	– Check if a KTY temperature sensor is installed in the motor but the parameterization has been carried out for a Pt1000 temperature sensor. – Heat the motor.

Subfault: 31.11 **Description: Temperature sensor wire break – motor 2**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Connection to temperature sensor of motor 2 interrupted.	Check the temperature sensor wiring.

Subfault: 31.12 **Description: Temperature sensor short circuit – motor 2**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit in connection with temperature sensor of motor 2.	Check the temperature sensor wiring.

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Subfault: 31.13 Description: Temperature sensor overtemperature – motor 2	
Response: Output stage inhibit	
Cause	Measure
Temperature sensor of motor 2 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. – Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (Pt1000).

Subfault: 31.14 Description: Temperature model overtemperature – motor 2	
Response: Output stage inhibit	
Cause	Measure
Temperature model of motor 2 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. – Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (Pt1000).

Subfault: 31.15 Description: Temperature sensor prewarning – motor 2	
Response: No response	
Cause	Measure
Temperature signaled by temperature sensor of motor 2 exceeds prewarning threshold.	Check for motor overload.

Subfault: 31.16 Description: Temperature model prewarning – motor 2	
Response: No response	
Cause	Measure
Temperature signaled by temperature sensor of motor 2 exceeds prewarning threshold.	Check for motor overload.

Subfault: 31.19 Description: Temperature too low – temperature sensor – motor 2	
Response: Warning with self-reset	
Cause	Measure
Temperature signaled by temperature sensor of motor 2 below -50 °C.	– Check if a KTY temperature sensor is installed in the motor but the parameterization has been carried out for a Pt1000 temperature sensor. – Heat the motor.

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8.7.25 Fault 32 Communication

Subfault: 32.2 Description: EtherCAT®/SBus^{PLUS} process data timeout	
Response: Fieldbus – timeout response	
Cause	Measure
Process data timeout during EtherCAT®/SBus^{PLUS} communication.	– Check the wiring of the system bus and module bus. – Check that the EtherCAT®/SBus^{PLUS} configuration is correctly set in the MOVI-C® CONTROLLER. – Check EtherCAT®/SBus^{PLUS} timeout configuration in the device.

Subfault: 32.3 Description: Faulty synchronization signal	
Response: External synchronization	
Cause	Measure
Faulty synchronization signal period.	Check for correct setting of the EtherCAT®/ SBus^{PLUS} configuration in the MOVI-C® CONTROLLER.

Subfault: 32.4 Description: No synchronization signal	
Response: External synchronization	
Cause	Measure
No synchronization signal present.	Check for correct setting of the EtherCAT®/ SBus^{PLUS} configuration in the MOVI-C® CONTROLLER.

Subfault: 32.5 Description: Synchronization timeout	
Response: External synchronization	
Cause	Measure
Timeout while synchronizing to synchronization signal.	Check for correct setting of the EtherCAT®/ SBus^{PLUS} configuration in the MOVI-C® CONTROLLER.

Subfault: 32.6 Description: Copy parameter set	
Response: Output stage inhibit	
Cause	Measure
Error while downloading parameter set to device.	– Check the wiring of the system bus and module bus. – Restart download.

Subfault: 32.8 Description: User-timeout timeout		
	Response: User timeout timeout response	
	Cause	Measure
	The timeout time of the user timeout function elapsed.	Write the parameter for triggering the user timeout function cyclically before the timeout time elapses.

Subfault: 32.11 Description: Local mode timeout		
	Response: Local mode – timeout response	
	Cause	Measure
	Communication connection to device interrupted in local mode.	– Increase the timeout setting in local mode.
	New Scope project created.	– Reset the fault. – Restart local operation.
	Scope measurement loaded from device.	– Reset the fault. – Restart local operation.

Subfault: 32.12 Description: Manual mode timeout		
	Response: Manual mode – timeout response	
	Cause	Measure
	Communication connection to device interrupted in manual mode.	– Check whether too many programs are open on the operator PC. – Increase the timeout time in manual mode.
	New Scope project created.	– Reset the fault. – Restart manual mode.
	Scope measurement loaded from device.	– Reset the fault. – Restart manual mode.

8.7.26 Fault 33 System initialization

Subfault: 33.1 Description: Motor current measurement		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Motor current measurement detected an error.	Contact the SEW-EURODRIVE Service.

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Subfault: 33.2 Description: Firmware CRC check		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Error checking firmware.	Contact the SEW-EURODRIVE Service.

Subfault: 33.6 Description: FPGA configuration		
	Response: Output stage inhibit	
	Cause	Measure
	Error checking FPGA configuration.	Contact the SEW-EURODRIVE Service.

Subfault: 33.7 Description: Function block compatibility error		
	Response: Output stage inhibit	
	Cause	Measure
	Error checking compatibility of function block.	Contact the SEW-EURODRIVE Service.

Subfault: 33.8 Description: SW function block configuration		
	Response: Output stage inhibit	
	Cause	Measure
	Error detected while checking configuration of software function block.	Contact the SEW-EURODRIVE Service.

Subfault: 33.9 Description: Power section hardware compatibility fault		
	Response: Output stage inhibit	
	Cause	Measure
	Firmware does not match hardware of power section.	Contact the SEW-EURODRIVE Service.

Subfault: 33.10 Description: Run-up timeout		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Timeout during system run-up.	Contact the SEW-EURODRIVE Service.

Subfault: 33.11 Description: Hardware compatibility error		
	Response: Output stage inhibit	
	Cause	Measure
	Firmware does not match device.	Contact the SEW-EURODRIVE Service.

Subfault: 33.12 Description: Memory module plugged in		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A plugged-in memory module was detected during device start. The setting for the device parameter source is set to "Internal memory".	– Switch off the device. Remove the memory module and restart the device. – Change the parameter "Non-volatile memory source" to "Arbitrary" or "Replaceable memory module". Switch the device off and on again.

Subfault: 33.13 Description: Memory module removed		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The device was started without a memory module. The setting for the device parameter source is set to "Replaceable memory module".	Switch off the device. Insert the memory module and restart the device.
	Replaceable memory module removed during ongoing operation.	Change the parameter "Non-volatile memory source" to "Internal memory". Switch the device off and on again.

Subfault: 33.14 Description: EtherCAT® slave controller cannot be accessed		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	EtherCAT® slave controller cannot be accessed.	Contact the SEW-EURODRIVE Service.

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Subfault: 33.15 Description: Firmware configuration		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The Device Update Manager detected a modified version of the application firmware.	Acknowledge the fault. Doing so will update the configuration data of the Device Update Manager.
	The error occurs repeatedly several times. The Device Update Manager is outdated and cannot save the configuration.	Update the Device Update Manager.

8.7.27 Fault 34 Process data configuration

Subfault: 34.1 Description: Changed process data configuration		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Process data configuration changed during active process data operation.	– Stop the process data and make your changes. Then start the process data again. – Perform a reset. Doing so will stop the process data, apply the changes, and restart the process data.

8.7.28 Fault 35 Function activation

Subfault: 35.1 Description: Activation key – application level invalid		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The activation key was entered incorrectly.	Enter the activation key again.
	The activation key was not created for this device.	Check the activation key.
	When using a double axis, the activation key for the wrong instance was entered in the device.	Enter the activation key for the allocated instance.
	An activation key for a technology level was entered in the parameter "Application level – Activation key".	Enter the activation key in the correct parameter.

Subfault: 35.2		
Description: Application level too low		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The activated software module requires a higher application level.	Enter an activation key for the required application level. You can find the required level in the parameter 8438.3 "Application level – Required level".

Subfault: 35.3		
Description: Technology level too low		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	An activated technology function requires a higher technology level.	Enter an activation key for the required technology level. You can find the required level in the parameter 8438.13 "Technology level – Required level".

Subfault: 35.4		
Description: Activation key – technology level invalid		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The activation key was entered incorrectly.	Enter the activation key again.
	The activation key was not created for this device.	Check the activation key.
	When using a double axis, the activation key for the wrong instance was entered in the device.	Enter the activation key for the allocated instance.
	An activation key for an application level was entered in the parameter "Technology level – Activation key".	Enter the activation key in the correct parameter.

8.7.29 Fault 42 Lag error

Subfault: 42.1 Description: Positioning lag error		
	Response: Positioning lag error	
	Cause	Measure
	A lag error occurred during positioning. Incorrect encoder connection.	Check the connection of the encoder.
	Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
	Wiring faulty.	Check the wiring of encoder, motor, and line phases.
	Acceleration ramps too short.	Extend the acceleration ramps.
	P component of the position controller too small.	Set P component of the position controller to a larger value.
	Speed controller parameters set incorrectly.	Check controller parameters.
	Value of lag error tolerance too small.	Increase the lag error tolerance.
	Mechanical components cannot move freely or are blocked.	Make sure mechanical parts can move freely, and check whether they are blocked.

Subfault: 42.2 Description: Jog mode lag error		
	Response: Output stage inhibit	
	Cause	Measure
	A lag error occurred in jog mode (FCB 20). Incorrect encoder connection.	Check the connection of the encoder.
	Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
	Wiring faulty.	Check the wiring of encoder, motor, and line phases.
	Acceleration ramps too short.	Extend the acceleration ramps.
	P component of the position controller too small.	Set P component of the position controller to a larger value.
	Speed controller parameters set incorrectly.	Check controller parameters.
	Value of lag error tolerance too small.	Increase the lag error tolerance.
	Mechanical components cannot move freely or are blocked.	Make sure mechanical parts can move freely, and check whether they are blocked.

Subfault: 42.3 Description: Standard lag error		
	Response: Output stage inhibit	
	Cause	Measure
	A lag error has occurred outside a positioning process. Incorrect encoder connection.	Check the connection of the encoder.
	Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
	Wiring faulty.	Check the wiring of encoder, motor, and line phases.
	Acceleration ramps too short.	Extend the acceleration ramps.
	P component of the position controller too small.	Set P component of the position controller to a larger value.
	Speed controller parameters set incorrectly.	Check controller parameters.
	Value of lag error tolerance too small.	Increase the lag error tolerance.

8.7.30 Fault 44 Subcomponent power section

Subfault: 44.2 Description: Overcurrent phase U		
	Response: Remote – critical fault	
	Cause	Measure
	Overcurrent phase U.	– Rectify the short circuit. – Connect a smaller motor. – Increase the ramp time. – In the event of a defective output stage, contact SEW-EURODRIVE Service.

Subfault: 44.3 Description: Overcurrent phase V		
	Response: Remote – critical fault	
	Cause	Measure
	Overcurrent phase V.	– Rectify the short circuit. – Connect a smaller motor. – Increase the ramp time. – In the event of a defective output stage, contact SEW-EURODRIVE Service.

Subfault: 44.4 Description: Overcurrent phase W		
	Response: Remote – critical fault	
	Cause	Measure
	Overcurrent phase W.	– Rectify the short circuit. – Connect a smaller motor. – Increase the ramp time. – In the event of a defective output stage, contact SEW-EURODRIVE Service.

8.7.31 Fault 45 Fieldbus interface

Subfault: 45.1 Description: No response		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Basic device detects a plugged fieldbus interface. However, it is not starting properly and so cannot be addressed.	– Switch the power off and on again/perform a reset. – If the fault occurs repeatedly, replace the fieldbus interface and send it to SEW-EURODRIVE together with the fault number. For further support, contact SEW-EURODRIVE Service.

Subfault: 45.2 Description: Option interface		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Basic device detects fault on internal interface for fieldbus connection.	– Switch the power off and on again/perform a reset. – If the fault occurs repeatedly, replace the fieldbus interface and send it to SEW-EURODRIVE together with the fault number. For further support, contact SEW-EURODRIVE Service.

Subfault: 45.3 Description: Process output data timeout		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface detected timeout of process output data on fieldbus interface.	– Check master communication routine. – Check the communication connection between process data producer (master) and fieldbus interface. The data line might be interrupted. – Extend the fieldbus timeout time. – Switch off monitoring.

Subfault: 45.5 Description: Engineering interface		
	Response: Warning	
	Cause	Measure
	Engineering interface no longer works, or works only to a limited extent.	– Switch the power off and on again/perform a reset. – If the fault occurs repeatedly, replace the fieldbus interface and send it to SEW-EURODRIVE together with the fault number. For further support, contact SEW-EURODRIVE Service.

Subfault: 45.7 Description: Invalid process output data		
	Response: Fieldbus – timeout response	
	Cause	Measure
	– The producer of the process output data reports that the data is invalid. – Process data is exchanged via the fieldbus but the data is invalid.	– Check whether the PLC is in "Stop" state. – Restart the PLC.

Subfault: 45.9 Description: Fieldbus interface – warning		
	Response: Warning	
	Cause	Measure
	Basic device detects non-critical fault on internal interface for fieldbus connection.	– Reset the fault. – If the fault occurs repeatedly, replace the fieldbus interface and send it to SEW-EURODRIVE together with the fault number. For further support, contact SEW-EURODRIVE Service.

Subfault: 45.50 Description: Fieldbus interface – warning		
	Response: Warning with self-reset	
	Cause	Measure
	Fieldbus interface signals subcomponent fault of the type "Warning".	Refer to the subcomponent fault of the fieldbus interface and perform the action required for eliminating the fault.

Subfault: 45.51 Description: Fieldbus interface – fault		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface signals subcomponent fault of the type "Standard".	Refer to the subcomponent fault of the fieldbus interface and perform the action required for eliminating the fault.

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Subfault: 45.52		
Description: Fieldbus interface – critical fault		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface signals subcomponent fault of the type "Critical fault".	Refer to the subcomponent fault of the fieldbus interface and perform the action required for eliminating the fault.

8.7.32 Fault 46 Safety card

Subfault: 46.1		
Description: No response		
	Response: Output stage inhibit	
	Cause	Measure
	Failed to synchronize with subcomponent.	– Check device assignment of basic device and option. – Check card slot and installation and correct if necessary. – Restart the device. – Contact SEW-EURODRIVE Service.

Subfault: 46.2		
Description: Invalid variant		
	Response: Output stage inhibit	
	Cause	Measure
	Plugged safety card design does not match inverter type.	– Remove the safety card. – Use the correct safety card design.
	For double axes, only designs without encoder interface can be used.	– Remove option. – Use the design without encoder interface.
	For double axes, no encoder option must be plugged in.	Remove the option.

Subfault: 46.3		
Description: Internal communication timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Communication interrupted between inverter and safety card.	Check card slot and installation and correct if necessary. Contact SEW-EURODRIVE Service if the error is still present.
	Safety card signals subcomponent fault of the type "Warning".	Check card slot and installation and correct if necessary. Contact SEW-EURODRIVE Service if the error is still present.

Subfault: 46.50 Description: Warning		
	Response: Warning with self-reset	
	Cause	Measure
	Safety card signals subcomponent fault of the type "Warning".	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

Subfault: 46.51 Description: Fault		
	Response: Emergency stop + output stage inhibit with self-reset	
	Cause	Measure
	Safety card signals subcomponent fault of the type "Standard fault".	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

Subfault: 46.52 Description: Critical fault		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	Safety card signals subcomponent fault of the type "Critical fault".	– For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3). – If the jumper plug is plugged at terminal "X6", remove the jumper plug.

8.7.33 Fault 51 Analog processing

Subfault: 51.1 Description: Analog current input 4 mA limit		
	Response: Warning with self-reset	
	Cause	Measure
	Input current below 4 mA.	Check the input current.

8.7.34 Fault 52 Explosion protection function category 2

Subfault: 52.1 Description: Startup error		
	Response: Output stage inhibit	
	Cause	Measure
	No valid startup available.	Perform startup.

Subfault: 52.2 **Description: Impermissible system function**	
Response: Output stage inhibit	
Cause	Measure
Impermissible system function activated.	Disable impermissible functions when Ex protection function is active, such as "Activate standstill current" = "On" in the active control mode.

Subfault: 52.3 **Description: Inverter too large**	
Response: Output stage inhibit	
Cause	Measure
Ratio of inverter current to nominal motor current too large.	Check the assignment of motor and inverter, and check the dimensioning of the system.

Subfault: 52.4 **Description: Parameterization of current limit characteristic**	
Response: Output stage inhibit	
Cause	Measure
Error while setting parameters for current limit characteristic.	– Parameterize the current limit characteristic. – Perform startup again.

Subfault: 52.5 **Description: Time duration exceeded f < 5 Hz**	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Duration of 60 s for f < 5 Hz exceeded.	Check the dimensioning of the system: If speed control = FCB 05, increase the speed. If speed = 0, inhibit output stage / with stop FCBs, activate the brake function if a brake is installed.

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8.8 Device replacement

▲ WARNING

Removing the electronics cover will disable DynaStop®.

Severe or fatal injuries.

- If it is not permitted to deactivate the system, additional measures are required (e.g. mechanical stake-out)

▲ 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**

▲ WARNING

Improper installation/disassembly of drive units and mount-on components.

Risk of injury.

- Adhere to the notes about installation and disassembly.
- Before releasing shaft connections, make sure that there are no active torsional moments present (tensions within the system).

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8.8.1 Replacing the electronics cover

1. Observe the safety notes.
2. Loosen the screws and take off the electronics cover from the connection box.
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.

But it is permitted to use an electronics cover with a nominal output current that is up to 3 times higher or lower than what the old electronics cover had.

- 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 that 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.

4. Set all the controls (e.g. DIP switches, see "Startup" chapter) on the new electronics cover in the same way as the controls of the previous electronics cover.
5. Remove the replaceable memory module from the old electronics cover. Insert the replaceable memory module in the new electronics cover.
6. Place the new electronics cover onto the connection box and screw it on.
7. Supply the device with voltage.
8. Check the new electronics cover for proper functioning.

8.8.2 Replacing the memory module

1. Observe the safety notes.
2. Loosen the screws and take off the electronics cover from the connection box.
3. Remove the memory module from the old electronics cover.
4. Compare the type designation of the memory module.

INFORMATION

The new memory module must have the same type designation as the old memory module.

5. Insert the new memory module in the new electronics cover.
6. Place the electronics cover onto the connection box and screw it on.
7. Supply the device with voltage.
8. Check the startup of the device.
   - ⇨ If required, perform startup again or load the saved startup to the device.
   - ⇨ For devices with safety card, check the startup of the safety card. For more information, refer to the "MOVISAFE® CSB51A Safety Option" manual.
9. Check the new electronics cover for proper functioning.

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8.8.3 Replacing the drive unit

1. Observe the safety notes.
2. Install the lifting eyes to the drive unit, see chapter "Service" > "Device replacement" > "Installing the lifting eyes".
3. Disassemble the drive unit. Observe the notes in chapter "Mechanical Installation".
4. Compare the data on the nameplates of the old drive unit to the data on the nameplates of the new drive unit.

INFORMATION

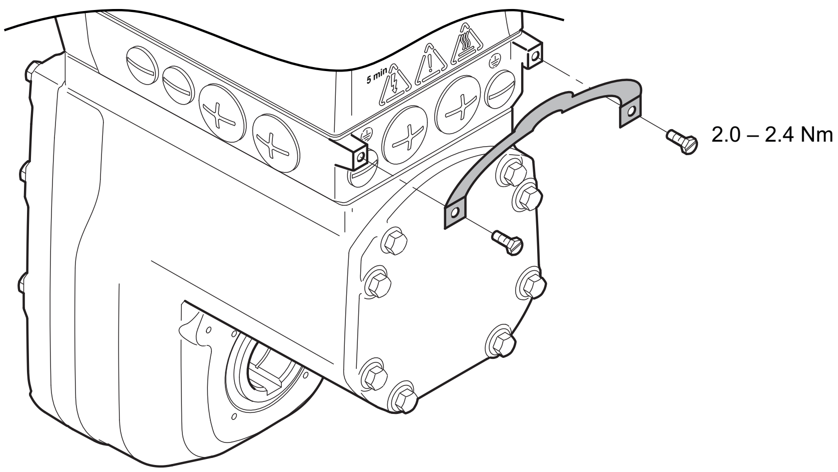
Always replace the drive unit with a drive unit that has the same properties.

In safety-related applications, replace a drive unit only with a drive unit with the same FS logo.

5. Mount the drive unit. Observe the "Mechanical installation" chapter.
6. Remove the lifting eyes from the new drive unit. Store the lifting eyes for future service work.
7. Perform the installation according to the "Electrical Installation" chapter.
8. Set all the controls (e.g. DIP switches, see "Startup" chapter) on the new electronics cover in the same way as the controls of the previous electronics cover.
9. Remove the memory module from the old electronics cover. Insert this memory module in the new electronics cover.
10. Place the electronics cover onto the connection box and screw it on.
11. Supply voltage to the drive.
12. Check the new drive unit for proper functioning.

8.8.4 Installing the lifting eyes

1. Remove the PE connection cable.
2. Install the lifting eye for transportation as depicted in the following image:



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8.9 SEW-EURODRIVE Service

8.9.1 Sending in a unit for repair

If a fault cannot be repaired, please contact SEW-EURODRIVE Service (see "Address list").

Please always specify the digits of the status label when you contact the SEW electronics service so our Service personnel can 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.)
- Nature of the fault
- Accompanying circumstances
- Your own presumptions as to what has happened
- Any unusual events preceding the problem, etc.

8.10 Shutdown

⚠ 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 unit, de-energize the unit using appropriate measures.

8.11 Storage

Observe the following instructions when shutting down or storing the device:

- If you shut down and store the device for a longer period, close open cable bushings and cover ports with protective caps.
- Make sure that the unit is not subject to mechanical impact during storage.

Observe the notes on storage temperature in chapter "Technical data".

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8.12 Extended storage

8.12.1 Drive

NOTICE

Volatilization of the VCI anti-corrosion agent

Possible 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). Please 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".

8.12.2 Storage conditions

Observe the storage conditions specified in the following table for extended storage:

Climate zone	Packaging[1)]	Storage location[2)]	Storage duration
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones)	Packed in containers, with desiccant and moisture indicator sealed in plastic wrap.	Under roof, protected against rain and snow, no shock loads.	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. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors, no shocks.	2 years or more with regular inspections. Check for cleanness and mechanical damage during the inspection. Check corrosion protection.

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Climate zone	Packaging[1]	Storage location[2]	Storage duration
Tropical (Asia, Africa, Central and South America, Australia, New Zealand excluding temperate zones)	Packed in containers, with desiccant and moisture indicator sealed in plastic wrap. Protected against insect damage and mildew by chemical treatment.	Under roof, protected against rain and shocks.	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. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors, no shocks. Protected against insect damage.	2 years or more with regular inspections. Check for cleanness and mechanical damage during the inspection. Check corrosion protection.

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.

8.12.3 Electronics

INFORMATION

For electronics components, adhere to the following notes in addition to the notes in chapters "Extended storage" > "Drive" and "Extended storage" > "Storage conditions".

If the device is in extended storage, connect it to the supply voltage for at least 5 minutes every 2 years. Otherwise, the device's service life may be reduced.

Procedure in case maintenance has been neglected

Electrolytic capacitors are used in the inverters. They are subject to aging effects when de-energized. This effect can damage the capacitors if the device is connected directly to the nominal voltage after a longer period of storage. If you have not performed maintenance regularly, SEW-EURODRIVE recommends that you increase the line voltage slowly up to the maximum voltage. This can be done, for example, by using a variable transformer for which the output voltage has been set according to the following overview. After you have completed the regeneration process, the device can be used immediately or stored again for an extended period with maintenance.

The following graduations are recommended:

AC 400/500 V units:

- Stage 1: AC 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 500 V for 1 hour

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8.13 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:

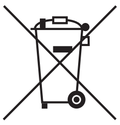
- Iron, steel or cast iron
- Stainless steel
- Magnets
- Aluminum
- Copper
- Electronic parts
- Plastics

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 of it's 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.

9 Inspection and maintenance

9.1 Determining the operating hours

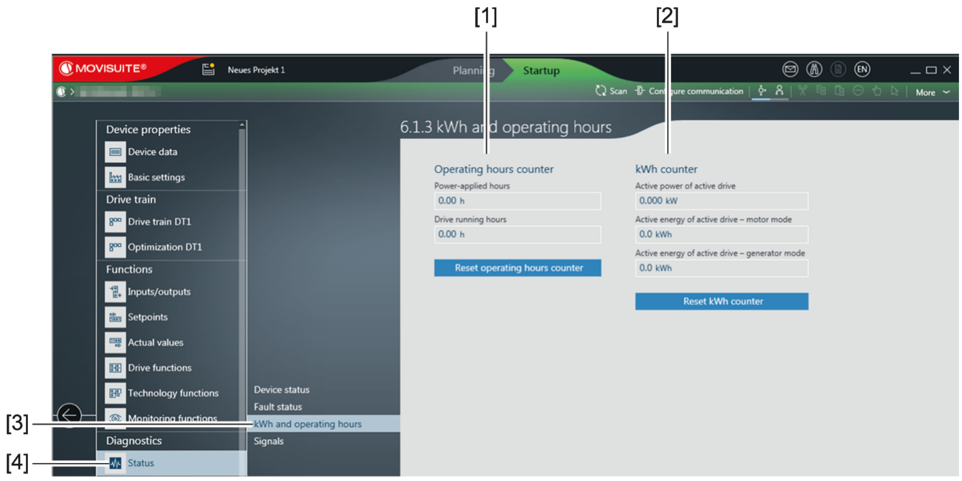
9.1.1 About MOVISUITE®

The device allows for reading the operating hours performed in order to assist with inspection and maintenance work.

To determine the operating hours performed, proceed as follows:

1. In MOVISUITE®, open the parameter tree of the device.
2. In the parameter tree [4], select the "Status" node.

⇨ The **operating hours** performed can be found in the "kWh and operating hours" [3] group.



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[1] Display of operating and drive running hours performed
[2] Display of active power and active energy

9.2 Inspection and maintenance intervals

The following table shows the inspection and replacement intervals for the drive units:

Time interval	What to 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 a bearing damage: Have the bearing replaced by SEW-EURODRIVE Service or qualified personnel trained by SEW-EURODRIVE.	SEW-EURODRIVE Service
		Qualified personnel trained by SEW-EURODRIVE
	Visual inspection of the seals for leakage:	Specialists at customer site
	• In the event of a leakage at the output oil seal: Change the oil seal	Specialists at customer site
	• In the event of any other leakage:	
	– Replace the drive unit	Specialists at customer site
	– Recommendation: Contact SEW-EURODRIVE Service.	SEW-EURODRIVE Service
	For gear units with a torque arm: Check rubber buffers and replace them if necessary	Specialists at customer site
Every 20 000 operating hours[1)]	Have the motor inspected by SEW-EURODRIVE Service or qualified personnel trained by SEW-EURODRIVE.	SEW-EURODRIVE Service
		Qualified personnel trained by SEW-EURODRIVE
The drive units are equipped with long-term lubrication. Depending on the operating conditions and the oil temperature, the oil must be changed at least every 5 years (see chapter "Lubricant change intervals").	Change synthetic oil	Specialists at customer site
	Replace oil seal on output end (do not install it in the same track)	Specialists at customer site

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Time interval	What to do?	Who is permitted to perform the work?
When the cover / electronics cover is removed 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 fluctuations.	Specialists at customer site
Each time the cover / electronics cover is removed	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
Varying (depending on external factors)	Touch up or renew the surface/ anti-corrosion coating	Specialists at customer site
	To prevent permanent water accumulation in the B-side safety cover, you must clean it at regular intervals.	Specialists at customer site

1) Wear times are influenced by many factors. The system manufacturer must calculate the required inspection/maintenance intervals individually in accordance with the project planning documents.

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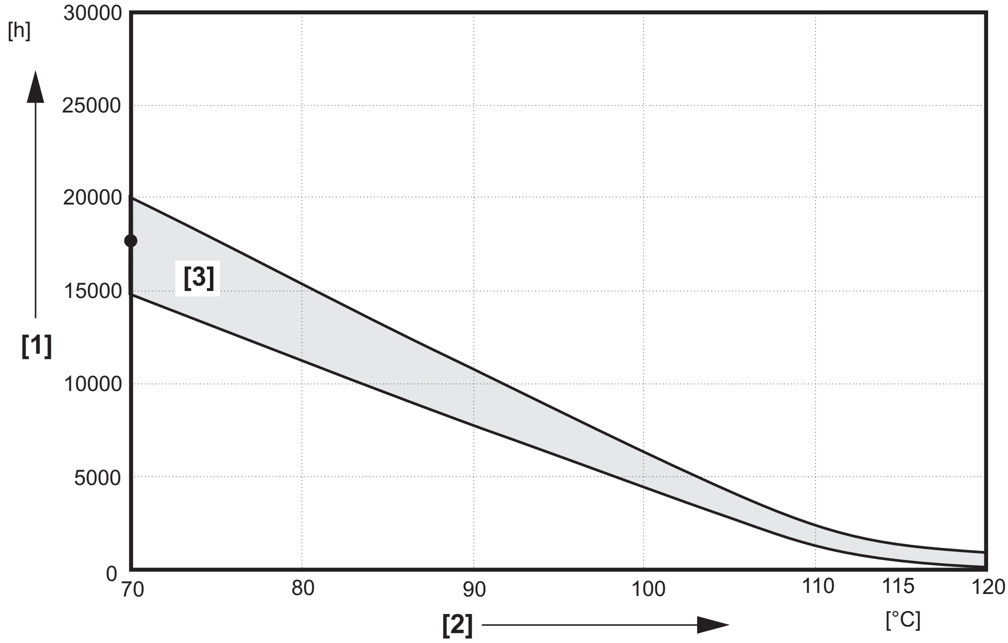
9.3 Lubricant change intervals

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

9.4 Inspection and maintenance work

9.4.1 Preliminary work regarding inspection and maintenance

Observe the following notes before you start with inspection/maintenance work on the MOVIGEAR® performance:

⚠ WARNING

Risk of injury if the device starts up unintentionally, and danger of electrical voltage.

Dangerous voltages may still be present for up to 5 minutes after disconnection from the line voltage.

- Disconnect the device from the power supply with suitable external measures before you start working on the device and secure it against unintentional reconnection to the voltage supply.
- Secure the output shaft against rotation.
- Before removing the electronics cover, wait for at least the following time: **5 minutes.**

⚠ WARNING

Risk of burns due to hot surfaces and hot gear unit oil.

Serious injuries.

- Let the devices cool down before touching them.
- Remove the screw plugs and the breather valve carefully.
- The gear unit must still be warm, otherwise the high viscosity of excessively cold oil will make it more difficult to drain the oil correctly.

NOTICE

Damage to the drive unit.

Potential damage to property.

- Make sure that only the SEW-EURODRIVE Service or qualified personnel trained by SEW-EURODRIVE opens the gear unit cover.

NOTICE

Filling in the wrong oil may result in significantly different lubricant characteristics.

Potential damage to property.

- Do not mix different synthetic lubricants and do not mix synthetic and mineral lubricants.
- Synthetic oil is used as the standard lubricant.

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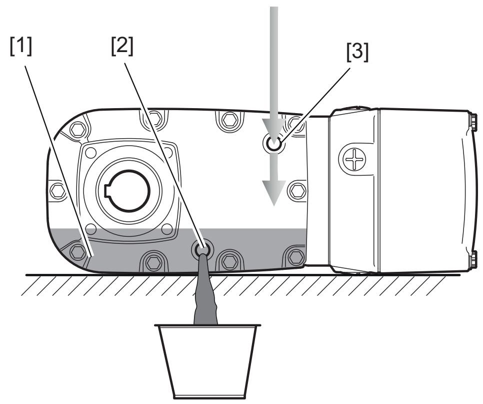
9.4.2 Changing the oil

Draining the oil

1. Observe the notes in chapter "Preliminary work for inspection and maintenance".
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Serious injuries. Let the devices cool down before touching them.
   Remove the drive unit from the system, otherwise it is not possible to change the oil.
3. SEW-EURODRIVE recommends that you drain the oil in the position depicted in the figure below:
4. Place an adequate container underneath the oil drain plug [2].
5. ⚠ **WARNING!** Risk of burns due to hot gear oil. Serious injuries. Let the devices cool down before touching them.
   Remove the lowest screw plug [2] or the breather valve installed there (depends on the mounting position used according to the mounting position sheet).
6. It is easier to drain the oil when you also remove the upper screw plug [3] or breather valve installed there (flowing in of air).
7. Drain the oil. Completely remove the residual oil [1] in the drive with a suitable device.

Recommended position

The following figure shows the position recommended for draining the oil:



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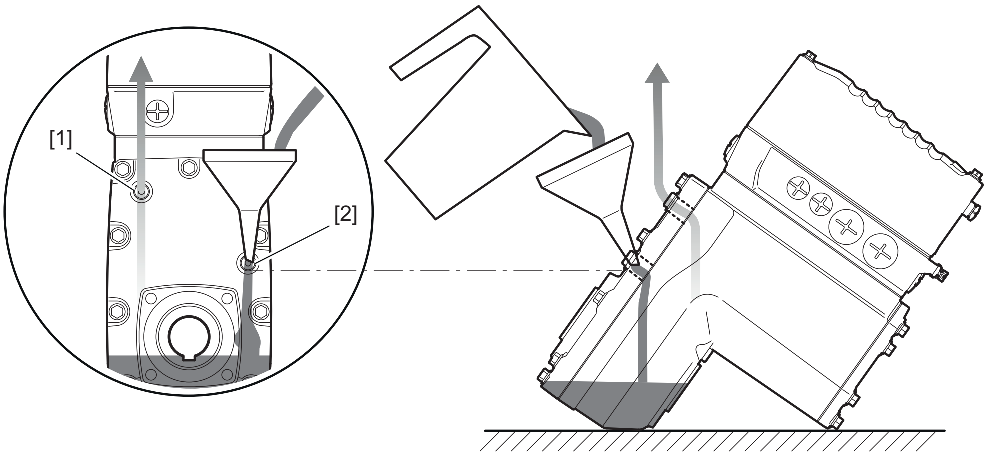
Filling in the oil

1. Observe the notes in chapter "Preliminary work for inspection and maintenance".
2. SEW-EURODRIVE recommends that you fill in the new oil in the position depicted in the figure below.
3. **NOTICE!** Filling in the wrong oil may result in significantly different lubricant characteristics. Potential damage to property. Do not mix different synthetic lubricants and do not mix synthetic and mineral lubricants. Synthetic oil is used as the standard lubricant.
   Fill in new oil of the same type via the lower bore hole [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 nameplate or the chapter "Technical data and dimension sheets / Lubricants" depending on the mounting position.
4. Re-insert the screw plug and the breather valve. Depending on the mounting position used, observe the mounting position sheet.
5. Touch up or renew the surfaces / anti-corrosion coating.

Recommended position

The following figure shows the position recommended for filling in the new oil:



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9.4.3 Replacing the output oil seal

1. Observe the notes in chapter "Preliminary work for inspection and maintenance".
2. Remove the drive unit from the system.
3. **NOTICE!** Oil seals with a temperature below 0 °C may get damaged during installation. Potential damage to property. Store oil seals at ambient temperatures over 0 °C. Warm up the oil seals before you install them, if necessary.
   When changing the oil seal, ensure that there is a sufficient grease reservoir between the dust lip and sealing lip, depending on the type of gear unit.
   ⇨ If you use double oil seals, fill one-third of the gap with grease.
   ⇨ Do not install the oil seal on the same track.
4. Touch up or renew the surfaces / anti-corrosion coating.

9.4.4 Painting the drive unit

1. Observe the notes in chapter "Preliminary work for inspection and maintenance".
2. **NOTICE!** Breather valves and oil seals may be damaged during painting or repainting. Potential damage to property. Thoroughly cover the breather valves and sealing lip of the oil seals with strips prior to painting.
   Clean the surface of the drive unit and make sure it is free from grease.
3. Remove the strips after painting.

9.4.5 Cleaning the drive unit

Observe the notes in chapter "Preliminary work for inspection and maintenance".

Excessive dirt, dust or shavings can have a negative impact on the function of drive units; in some cases, these factors can cause the motor to break down.

For this reason, you must clean the drives at regular intervals (after one year at the latest) to ensure a sufficiently large area for heat dissipation.

Insufficient heat dissipation can have unwanted consequences. The bearing service life is reduced through operation at impermissibly high temperatures (bearing grease degrades).

9.4.6 Connection cables

Observe the notes in chapter "Preliminary work for inspection and maintenance".

Check the connection cables for damage at regular intervals and replace if necessary.

9.4.7 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
1 piece	18187765
10 piece	28266161
50 piece	28266188

Steps

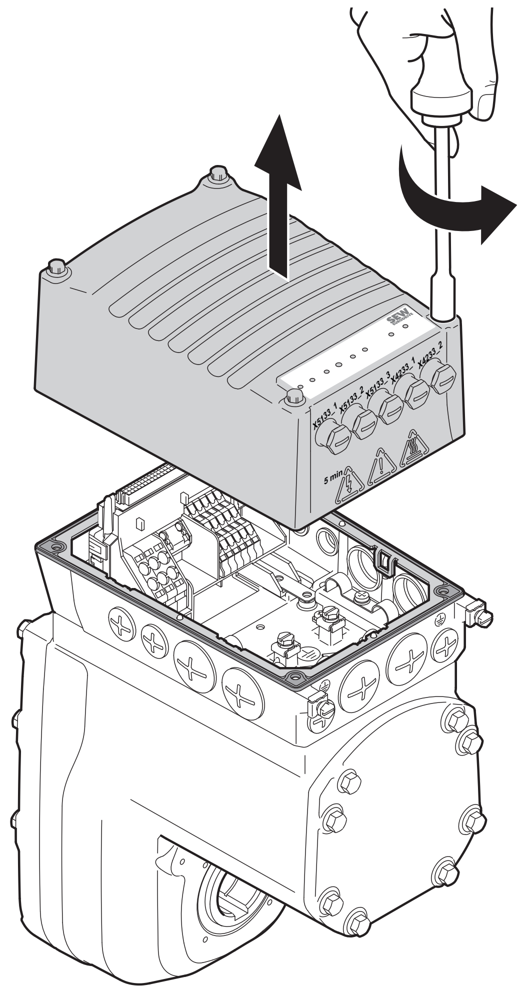
NOTICE

Loss of the guaranteed degree of protection.

Possible damage to property.

- When the cover is removed from the connection box, you have to protect the cover and the wiring space from humidity, dust or foreign particles.
- Make sure that the cover is mounted properly.

1. Observe the notes in chapter "Preliminary work for inspection and maintenance".
2. Loosen the screws of the electronics cover and remove it.



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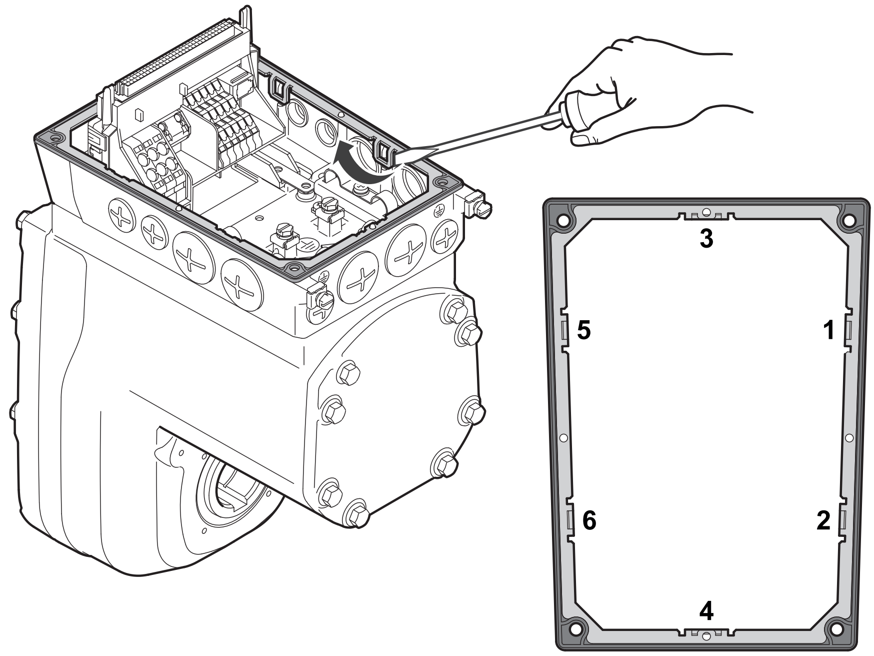
3. **NOTICE!** Loss of the guaranteed degree of protection. Possible damage to property. Make sure not to damage the sealing surfaces when removing the gasket. Loosen the used gasket by levering it off the retaining cams.
   ⇨ This becomes easier when you keep to the sequence shown in the figure below.



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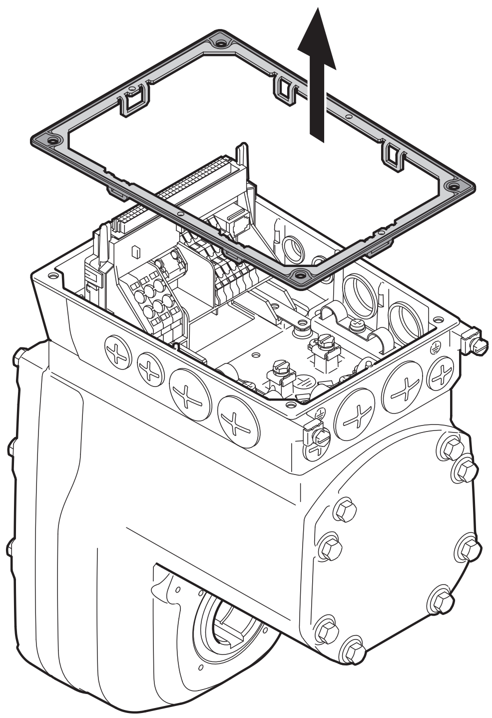
4. Remove the old gasket completely from the connection box.



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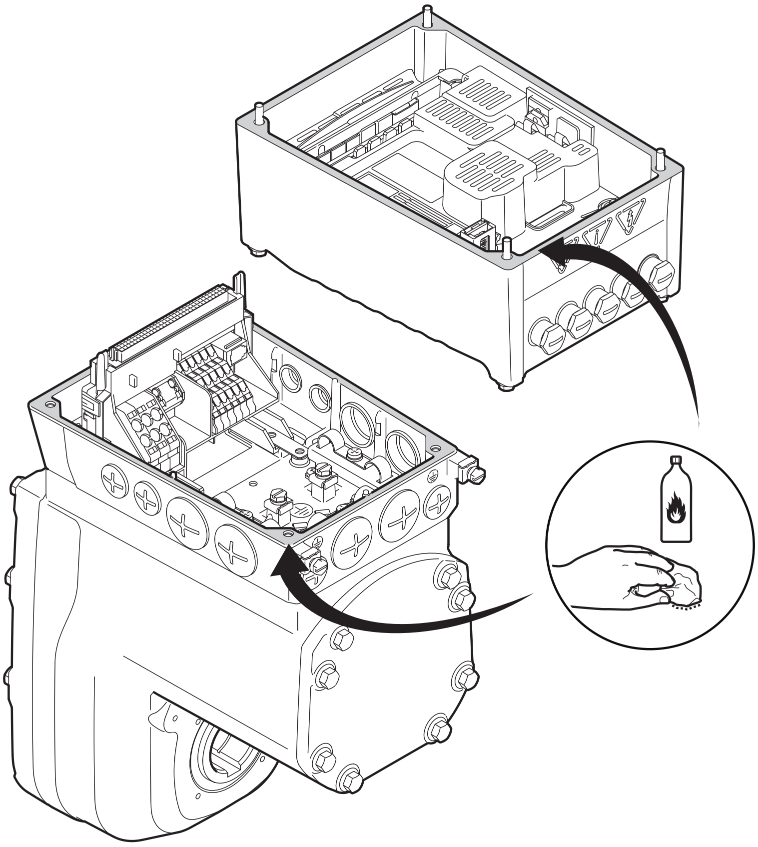
5. ⚠ **CAUTION!** Risk of injury due to sharp edges. Cuts. Use protective gloves for cleaning. Work may only be carried out by qualified personnel.
   Clean the sealing surfaces of the connection box and the electronics cover carefully.



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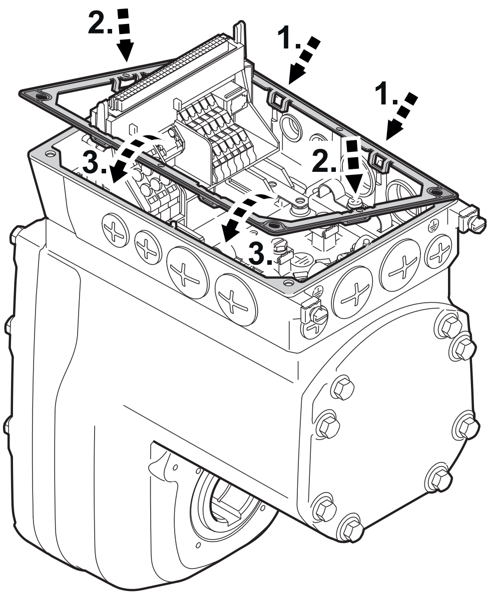
6. Place the new gasket on the connection box and fix it in position with the retaining cams. This becomes easier when you keep to the sequence shown in the figure below.



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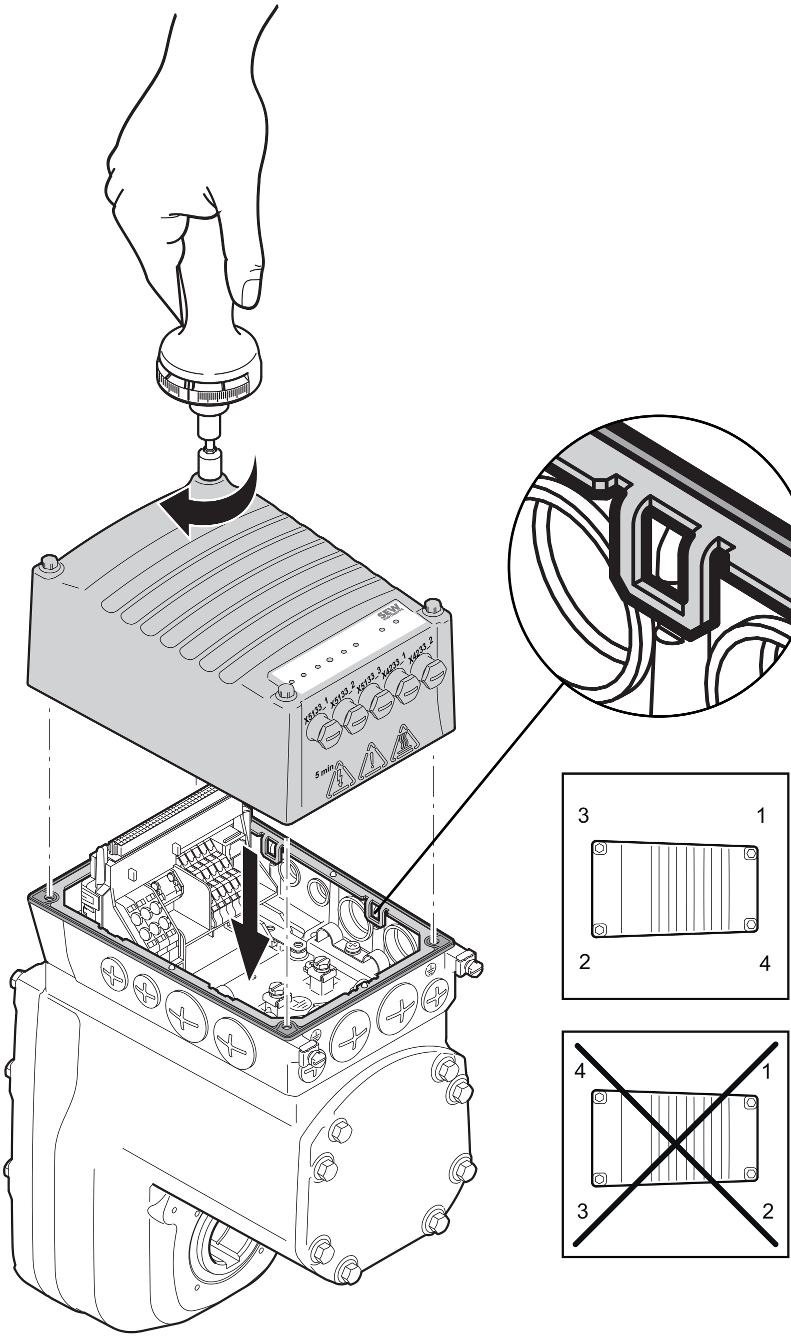
7. Check the installation and startup of the drive unit using the applicable operating instructions.
8. Place the electronics cover on the connection box again and fasten it.
   ⇨ Proceed as follows when screwing on MOVIGEAR® the electronics cover: Insert the screws and tighten them in diametrically opposite sequence **step by step** with a tightening torque of 6.0 Nm.



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10 Configuration

10.1 Preliminary information

INFORMATION

Data may differ due to continuous product development.

10.1.1 Abbreviation key

The following table provides a description of abbreviations used in this chapter:

Abbreviation	Description
M_a	MOVIGEAR® continuous output torque
M_{apk}	Maximum permitted torque for short-time duty
M_{a_eso}	Maximum permitted torque for non-cyclical special loads, max. 1000 cycles
M_{DSP}	Maximum torque DynaStop®
M_{ar}	Retrodriving application torque
n_a	Output speed
n_e	Motor speed
n_{G_min}	Minimum output speed
n_{G_max}	Maximum output speed
n_{DSP}	Gear shaft speed
W	Mean braking work
η_{load}	Efficiency of the application

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10.2 Drive selection data

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

Drive selection data			Your entry
n_{G_min}	Minimum output speed	min^{-1}	
n_{G_max}	Maximum output speed	min^{-1}	
n_{max}	Highest application speed	min^{-1}	
n_{min}	Lowest application speed	min^{-1}	
M_{max}	Maximum application torque	Nm	
M_a at n_{amin}	Output torque at minimum output speed	Nm	
M_a at n_{amax}	Output torque at maximum output speed	Nm	
M_{ar}	Retrodriving torque at input shaft	Nm	
S.., ..% cdf	Duty type and cyclic duration factor (cdf) or exact load cycle can be entered.		
Z	Starting frequency; alternatively, exact load cycle can be specified	1/h	
M4, M1..M6	Mounting position		
IP..	Required degree of protection		
ϑ_{amb}	Ambient temperature	°C	
H	Installation altitude	m	

10.2.1 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.

10.2.2 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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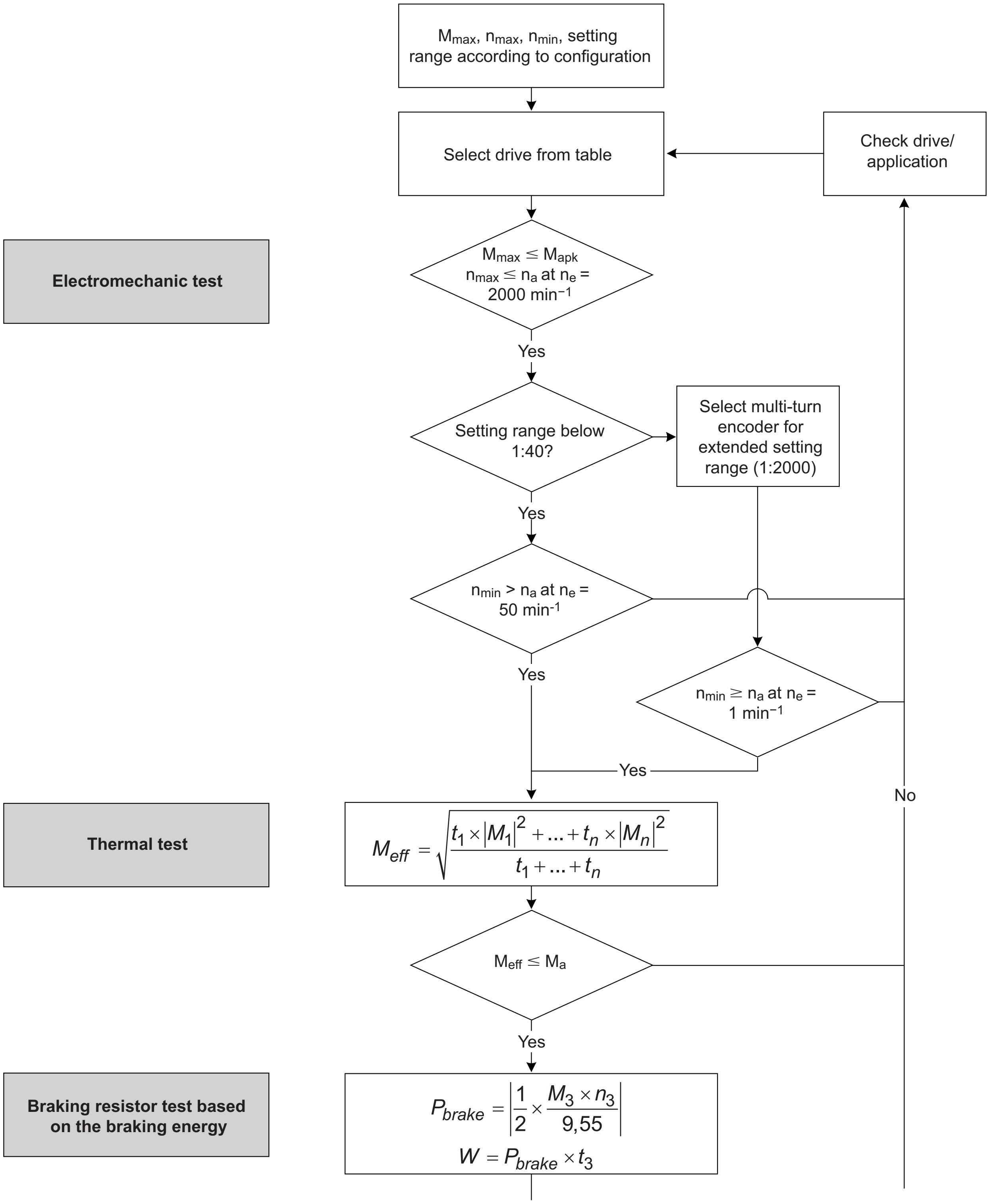
10.3 MOVIGEAR® performance

10.3.1 Project planning procedure

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



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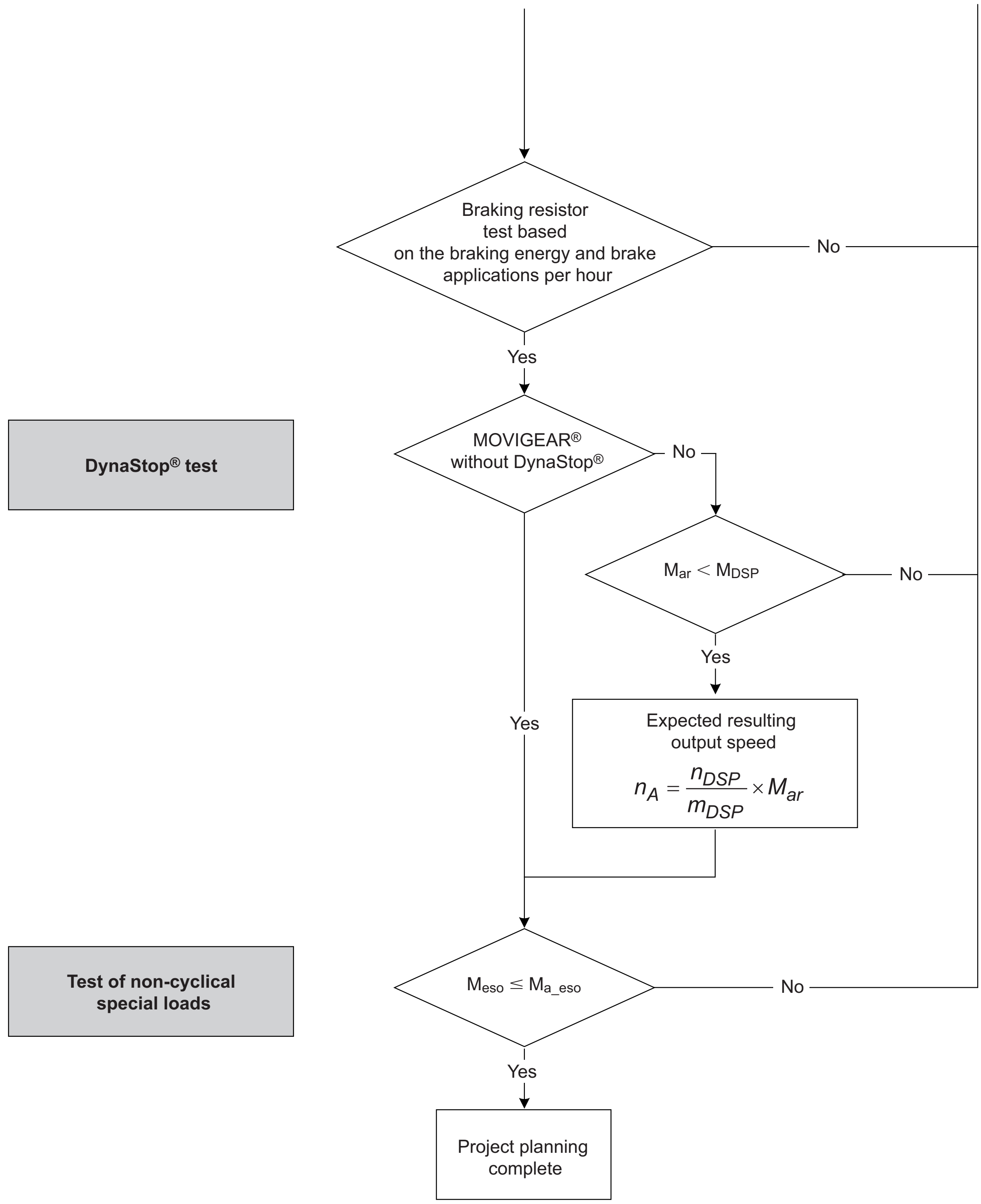

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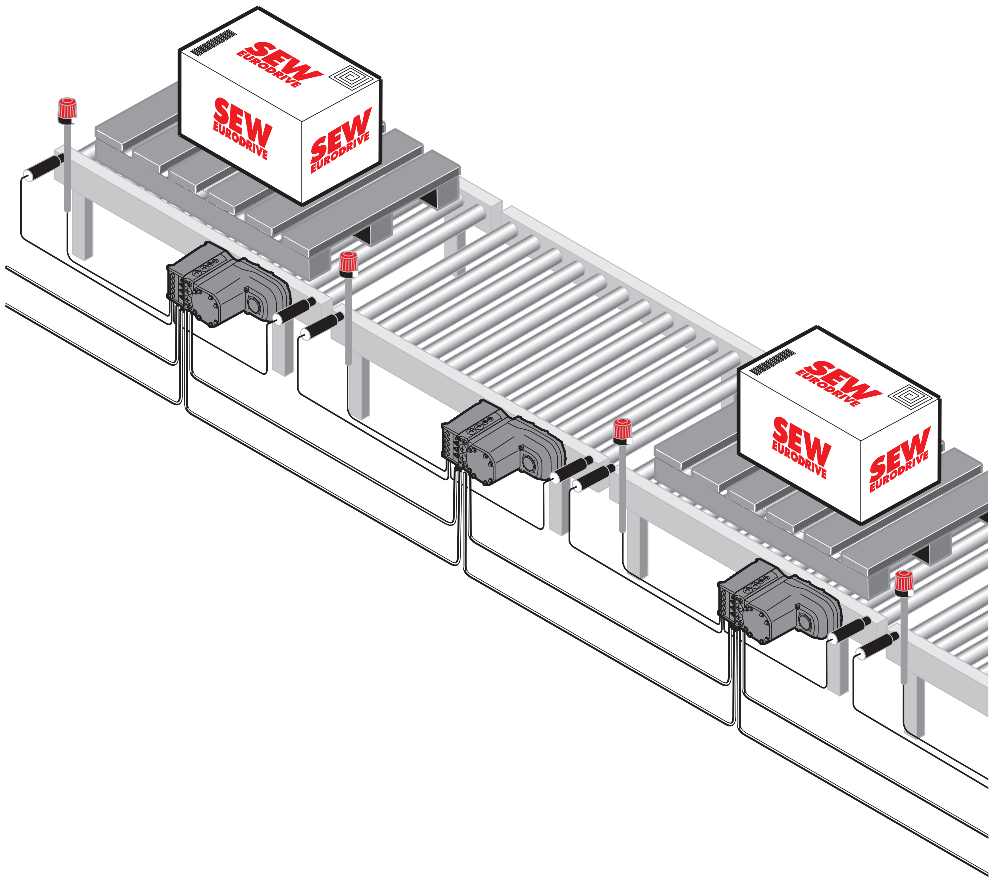
10.3.2 Drive selection using the example of a roller conveyor

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	2.500 kg
Conveying speed	v	22 m/min
Positioning speed		5 m/min
Acceleration	a	0.4 m/s^2
Number of rollers		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		6 times/hour
Maximum external force at standstill	F_{ext}	800 N

The following figure shows a schematic illustration:



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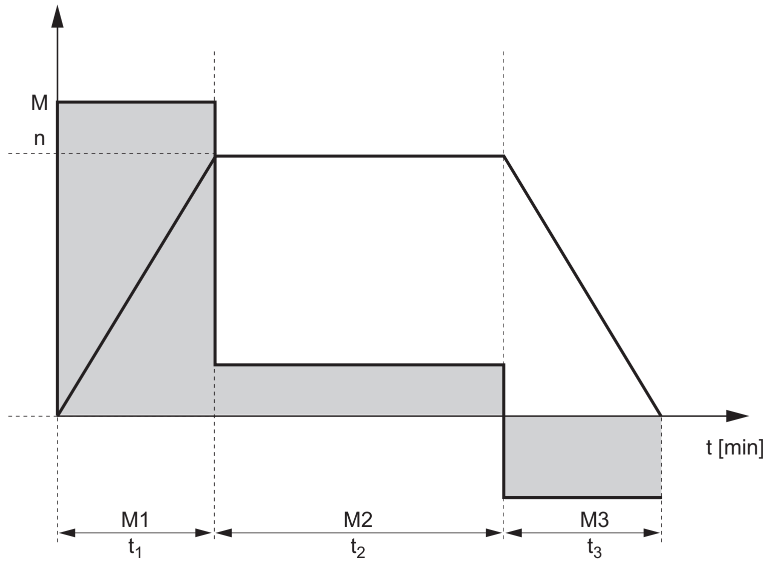
Calculating the application

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 in order to determine the MOVIGEAR® drive units:

Calculation	
Static travel resistance	$F_R = \mu \times m \times g$ $\mu = \left[\frac{2}{D} x \left(\mu_{bearing} \times \frac{d}{2} + f\right) + c\right]$ $\mu = \left[\frac{2}{140mm} x \left(0.005 \times \frac{28mm}{2} + 1.2\right) + 0\right]$ $\mu = 0.01814$ $F_R = 0.01814 \times 2500kg \times 9.81$ $F_R = 445N$ 25222496907
Dynamic travel resistance	$F_{Dyn} = m \times a$ $F_{Dyn} = 2500kg \times 0.4\, m/s^2$ $F_{Dyn} = 1000N$
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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Calculation	
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	$n_{amin} = \frac{v_{min}}{\pi \times D} = \frac{5\,m/\min}{\pi \times 0.14m} = 11.4\min^{-1}$ $n_{amax} = \frac{v_{max}}{\pi \times D} = \frac{22\,m/\min}{\pi \times 0.14m} = 50.0\min^{-1}$

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Selecting the MOVIGEAR® performance drive unit

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

1. Which torque class (size) is required?

   Requirement: The maximum possible startup torque of the MOVIGEAR® performance drive unit must be higher than the maximum application torque: $M_{max} \leq M_{apk}$

   Due to the application calculations, the maximum application torque is M_{max} = 145 Nm

   MGF..2-..-C drive units with i > 10.37 meet these requirements.

   Result: A MOVIGEAR® performance of torque class MGF..2 is selected.

2. Selecting the 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 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 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 table in chapter "Technical data" > "Selection tables":

MGF..2-..-C									
	n_a	n_a	M_a	M_{apk}			M_{a_eso}	i_{tot}	Weight
	at n_e= 50 min^{-1}	at n_e= 2000 min^{-1}	at n_e= 500 to 2000 min^{-1}	at n_e= 200 to 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
	...	...	...	...	...	...	...	...	
	...	...	...	...	...	...	...	...	
	...	...	...	...	...	...	...	...	
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	

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3. Checking the setting range and minimum speed

   Setting range 5 m/min: 22 m/min ≈ 1:4.4.

   This means the standard setting range of 1:50 is sufficient. The option /AZ1Z (multi- multi-turn encoder with MOVILINK® DDI connection) need 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 MOVIGEAR®:

   Requirement: In order to avoid thermal problems, the effective torque of the application must be smaller than the continuous output torque of the MOVIGEAR® drive unit: $M_{eff} < M_a$

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

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

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

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

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   The application calculation results in an effective torque of M_{eff} = 45.1 Nm. The continuous output torque of the selected MOVIGEAR® drive unit is M_a at n_e 2000 min^{-1} = 149 Nm.

   If applicable, observe derating factors (derating for installation altitude and ambient temperature).

   Result: The requirements are met.

5. Checking the braking resistance

   Calculating the regenerative braking power during deceleration:

$$P_{brake} = \left| \frac{1}{2} \times \frac{M_3 \times n_3}{9.55} \right|$$

$$P_{brake} = \left| \frac{1}{2} \times \frac{4.5 Nm \times 50 \frac{1}{\min}}{9.55} \right| = 11.8 W$$

   Proceed according to chapter "Regenerative load capacity – integrated braking resistor".

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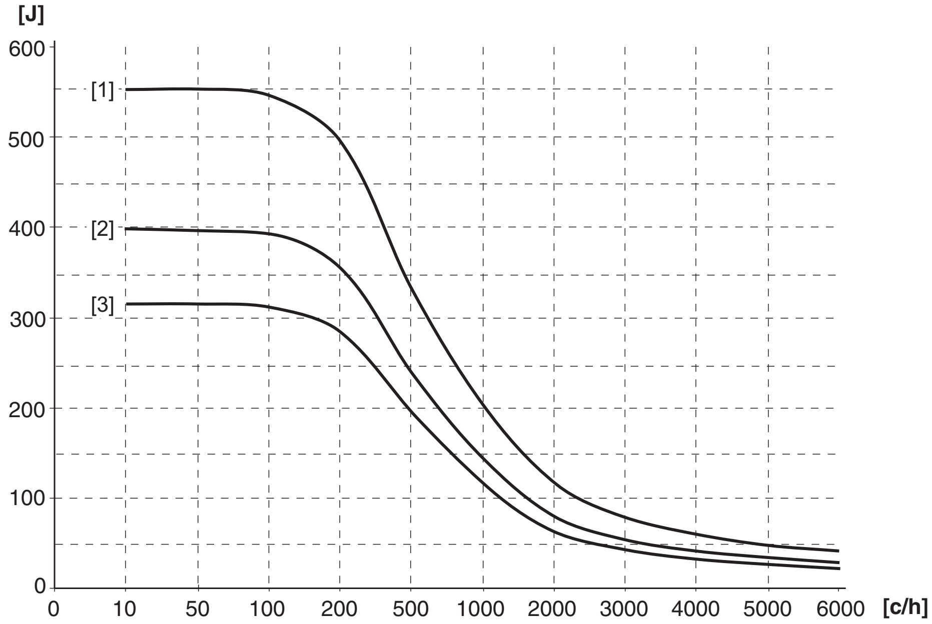
10.3.3 Regenerative load capacity of the integrated braking resistor

The following diagram shows the load capacity per braking operation of the BW1 braking resistor integrated in MOVIGEAR® as standard:



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[1] Brake ramp 10 s
[2] Brake ramp 4 s
[3] Brake 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}.

Calculation of the deceleration ramp for MOVIGEAR®: a_{down} = 3000 min^{-1} x 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. Use the characteristic curve with the shorter deceleration ramp because a shorter deceleration ramp means more braking energy.

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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10.4 DynaStop® – The electrodynamic retarding function

10.4.1 Functional description

INFORMATION

For a functional description of DynaStop® refer to chapter "Operation" > "DynaStop®"

10.4.2 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 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 chapter "Technical data and dimension drawings" > "Deceleration torques DynaStop®":

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 velocity:

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

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

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

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Result:

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

11 Technical data and dimension sheets

11.1 Conformity

11.1.1 CE marking

- Low voltage directive:

  The documented device series fulfills the regulations of the low voltage directive 2014/35/EU.
- Electromagnetic compatibility (EMC):

  The devices are designed for use as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 "Variable-speed electrical drives". Provided that the installation notes are followed, the requirements for CE marking of the entire machine/system equipped with these units on the basis of the EMC Directive 2014/30/EU are met. For detailed information about EMC-compliant installation, refer to the publication "Electromagnetic Compatibility in Drive Technology" from SEW-EURODRIVE.

The CE mark on the nameplate represents conformity with the low voltage directive 2014/35/EU and the EMC directive 2014/30/EU.

11.1.2 UL approval (in preparation)

The certification mark UL Listed on the nameplate confirms the UL and cUL approval (USA). cUL is equal to the approval according to CSA.

11.1.3 EAC

The documented device series fulfills the requirements of the technical regulations of the Customs Union of Russia, Kazakhstan, and Belarus.

The EAC marking on the nameplate certifies the conformity with the safety requirements of the Custom Union.

11.1.4 UkrSEPRO (Ukrainian Certification of Products)

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The UkrSEPRO mark on the nameplate certifies adherence to the technical regulations of Ukraine for the documented unit series.

11.1.5 RCM approval

The RCM approval has been granted for the documented unit series.

The RCM mark on the nameplate certifies the conformity with ACMA (Australian Communication and Media Authority).

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11.2 General information

11.2.1 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.

11.2.2 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.

11.2.3 Paint

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

11.2.4 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.

11.2.5 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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11.3 Technical data

11.3.1 General technical data for MOVIGEAR® performance

Input

Type MOVIGEAR® performance		**MGF..2-..-C**	**MGF..4-..-C**	**MGF..4-..-C/XT**
Torque class		**200 Nm**	**400 Nm**	
Nominal supply voltage (to EN 50160)	U_{line}	3 x AC 380 – 500 V		3 x 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 ±10%		

Electronics cover (inverter)

Type MOVIGEAR® performance		**MGF..2-..-C**	**MGF..4-..-C**	**MGF..4-..-C/XT**
Torque class		**200 Nm**	**400 Nm**	
Type of electronics cover		**..0020-5.3-A-..**	**...0032-5.3-A-...**	**...0040-5.3-A-...**
Nominal output current at f_{PWM} = 4 kHz	$I_{N\_inverter}$	2.0 A	3.2 A	4.0 A
Apparent output power	S_N	1.9 kVA	2.9 kVA	5.0 kVA
Overload capacity of $I_{N\_inverter}$ at F_{PWM} = 4 kHz		300%1)		< 3 Hz: 220%1) ≥ 3 Hz: 300%1)
		The overload capacity may be limited depending on the gear unit ratio. For the maximum torque values (M_{apk}), refer to chapter "Torque characteristics".		
PWM frequency	f_{PWM}	4, 8, 16 kHz (adjustable)		
Max. output frequency	$f_{max\_inverter}$	CFC: ELSM®:	500 Hz 500 Hz	
Speed control range		CFC: ELSM®:	1 : 2000 1 : 40	

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

Motor

Type MOVIGEAR® performance		**MGF..2-..-C**	**MGF..4-..-C**	**MGF..4-..-C/XT**
Torque class		**200 Nm**	**400 Nm**	
Nominal motor current	I_N	1.85 A	2.9 A	3.9 A
Nominal motor speed	n_N	2000 min^{-1}		
Rated motor frequency	f_N	133.3 Hz		
Motor efficiency	eff	89.0% ≙ IE5	92.4% ≙ IE5	93.9% ≙ IE5
Motor's mass moment of inertia	J_{mot}	7.64 $kgm^2 \times 10^{-4}$	23.30 $kgm^2 \times 10^{-4}$	30.40 $kgm^2 \times 10^{-4}$

Brake chopper and braking resistor

Type MOVIGEAR® performance		MGF..2-..-C	MGF..4-..-C	MGF..4-..-C/XT
Torque class		**200 Nm**	**400 Nm**	
Minimum braking resistor value	R_{BWmin}	100 Ω		
Brake chopper continuous power		550 W	900 W	900 W
Brake chopper peak power		300% of the apparent output power S_N × 0.9		225% S_N x 0.9

Installation location

Type MOVIGEAR® performance		MGF..2-..-C	MGF..4-..-C	MGF..4-..-C/XT
Torque class		**200 Nm**	**400 Nm**	
Ambient temperature		See chapter "Environmental conditions"		
Degree of protection	IP	Standard: IP65 according to EN 60529 (housing closed and all cable bushings sealed)		
Pollution class		2 in accordance with IEC 60664-1		
Overvoltage category		III in accordance with IEC 60664-1		
Installation altitude	h	Up to h ≤ 1000 m without restrictions. 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 to comply with 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		Class 3M5, 5M1 according to DIN EN 60721-3-3/-5		

General

Type MOVIGEAR® performance		MGF..2-..-C	MGF..4-..-C	MGF..4-..-C/XT
Torque class		**200 Nm**	**400 Nm**	
Power section nominal power loss	P_V	16 W	27 W	45 W
No. of times power may be switched on/off		1 × per minute		
Minimum switch-off time for Power off		10 s		
Operating mode		S1, DB (EN 60034-1)		
Type of cooling		Natural cooling to DIN 41751 and EN 61800-5-1		
Signaling functions		Display elements to indicate the device state		
Required preventive measure		Grounding the device		

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Type MOVIGEAR® performance		MGF..2-..-C	MGF..4-..-C	MGF..4-..-C/XT
Torque class		**200 Nm**	**400 Nm**	
Current carrying capacity of terminals		See chapter: • See chapter "Technical data and dimension sheets" > "Technical data" > "Current carrying capacity of the terminals" in the operating instructions. • "Electrical Installation" > "Installation instructions" > "Permitted cable cross section of terminals"		
Interference immunity		EN 61800-3, 2. Environment (industrial environment)		
Interference emission		EN 61800-3 category C3 With IT systems, **no** EMC category is specified.		
Mass		See chapter "Technical data and dimension sheets" > "Torque characteristics"		

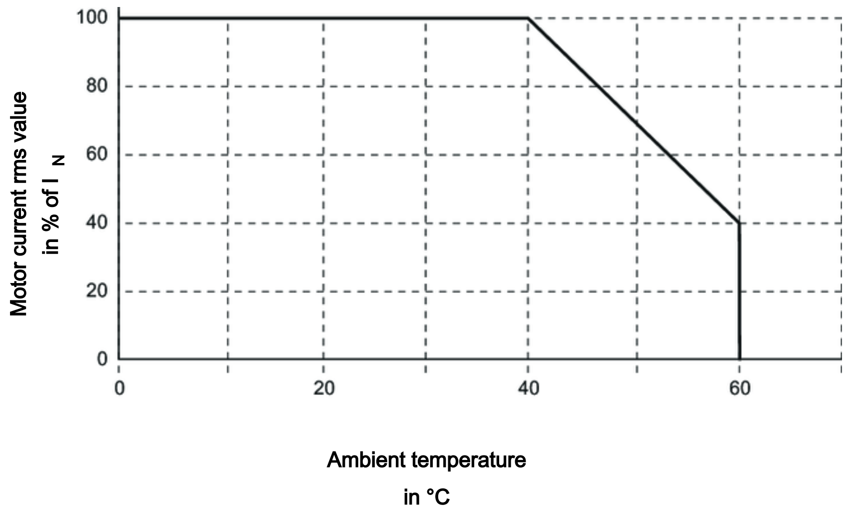
11.3.2 Environmental conditions

Ambient conditions	
Climatic conditions	• Long-term storage (weatherproof): EN 60721-3-1 class 1K2, ambient temperature -25 °C to +70 °C (deviating to the standard), non-condensing, no moisture condensation • Transport (weatherproof): EN 60721-3-2 class 2K3, ambient temperature -25 °C to +70 °C, non-condensing, no moisture condensation • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3K3, ambient temperature -25 °C to +60 °C (deviating to the standard), non-condensing, no moisture condensation • $I_{N\ motor}$ reduction: 3 % I_N per K at 40 °C to 60 °C
Chemically active substances	• Long-term storage (weatherproof): EN 60721-3-1 class 1C2, no corrosive gases, no salt mist (in contrast to the standard) • Transport (weatherproof): EN 60721-3-2 class 2C2, no corrosive gases, no salt mist, no sea water (in contrast to the standard) • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3C2, no corrosive gases, no salt mist
Mechanically active substances	• Long-term storage (weatherproof): EN 60721-3-3 class 1S1, no conductive dust • Transport (weatherproof): EN 60721-3-2 class 2S1 • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3S1, no conductive dust

11.3.3 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

Derating depending on the installation altitude

Observe the derating according to chapter "Mechanical installation" > "Setting up the drive unit" > "Derating depending on the installation altitude".

Notes

INFORMATION

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

11.3.4 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)

11.3.5 DC 24 V supply

Input for the independent backup voltage supply of the electronics		
DC 24 V input	24V_IN	U_{IN} = DC 24 V -10%/+20% according to EN 61131-2
	0V24_IN	Current consumption: I_E ≤ 500 mA, typically 100 mA for electronics • Plus up to 100 mA, for sensor supply

11.3.6 DC 24 V output

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

11.3.7 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 ≈ 4.5 kΩ, sampling cycle ≤ 2 ms Signal level DC +11 to +30 V = "1" = Contact closed DC -3 to +5 V = "0" = Contact open
Sensor/actuator supply	DC 24 V to EN 61131-2, External-voltage-proof and short-circuit proof
Maximum line 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)

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11.3.8 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)

11.3.9 Analog input

Analog input	
Number of inputs	1
Input type	Single-ended input (0V24)
Voltage input	V_{in} = DC 0 to +10 V Resolution 11 bit Internal resistance R_i >10 kΩ
Current input	I_{in} = DC 0 – 20 mA or DC 4 – 20 mA (selectable) Resolution 10 bit Internal resistance R_i = 250 Ω
24 V output (24V_OUT)	Can be used to supply the analog input. Permitted output current: 100 mA

11.3.10 Electronics data – Drive safety functions

The table below shows the technical data for the drive unit relating to the integrated safety technology.

The safe digital inputs comply with 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 designation	General electronics data		
Safety contact STO		X9			
Electrical data of inputs F_STO_P1, F_STO_P2			**Minimum**	**Typical**	**Maximum**
Input voltage range		X9:1 and X9:21	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 status (STO)			DC 11 V	–	–
Input voltage for OFF status (STO)			–	–	DC 5 V
Permitted leakage current of the external safety controller			–	–	1 mA
Technical data					
Time from disconnecting the safety voltage until deactivation of the rotating field			–	1.5 ms	10 ms 2 ms[2)]
Time from connecting the safety voltage until activation of the rotating field			–	–	110 ms

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

2) Only when a safety card by SEW-EURODRIVE is used

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11.3.11 Technical data of encoder options /AZ1Z

Encoder option	Single-turn resolution (Position resolution per motor revolution)		Multi-turn resolution (Max. counter for complete motor revolutions)		Interface connection:
/AZ1Z Multiturn absolute encoder	12 bits	4096 inc.	16 bits	32 767 -32 768	MOVILINK® DDI, coaxial

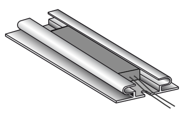
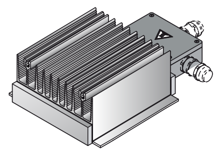
11.3.12 Technical data of the CBG.. keypads

Keypad	**CBG11A**	**CBG21A**
Part number	28232646	28238133
Interfaces	D-sub, 9-pin, female (CAN interface)	
	USB 2.0 mini B, female (PC connection)	
Operating temperature	0 to 60 °C	
Degree of protection	IP40 according to EN 60529	
Dimensions H x W x D	100 × 45 × 20 mm	110 × 65 × 20 mm
Display size H x W	23 x 28.5 mm	37 x 49 mm
Screen diagonal	1.5" (38 mm)	2.4" (61 mm)
Display resolution H x W	64 x 78 pixels	240 x 320 pixels

11.4 Braking resistors

11.4.1 Overview

MOVIGEAR® performance is equipped with a brake chopper. The following table shows their possible use in regenerative mode:

Application	Drive unit	Dissipation of regenerative energy
		Brake chopper
Small amount of regenerative energy	MOVIGEAR® performance	Integrated braking resistor 
Medium/large amount of regenerative energy	MOVIGEAR® performance	External braking resistor 

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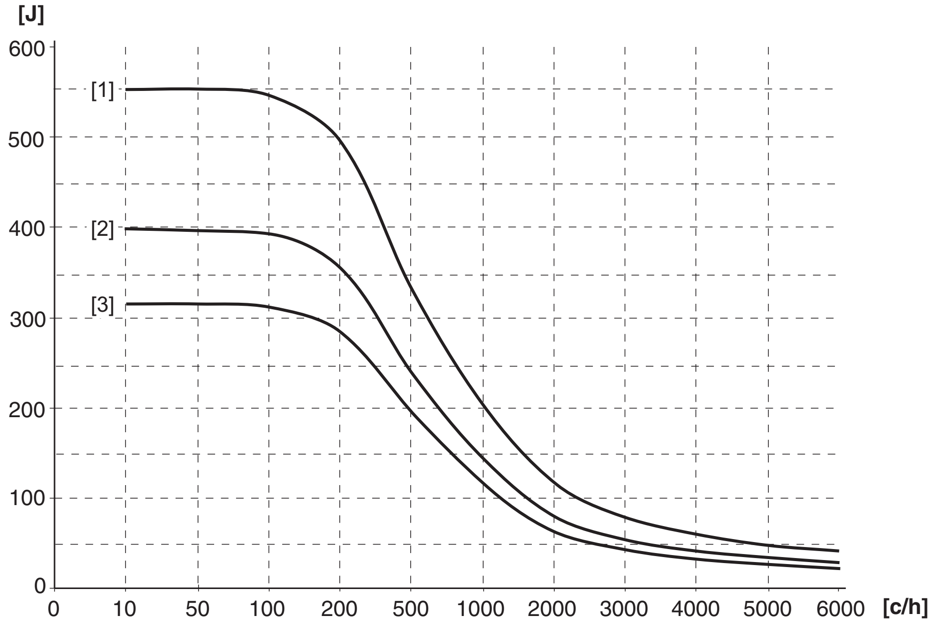
11.4.2 Integrated BW1 braking resistor

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:

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

25296909835

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.

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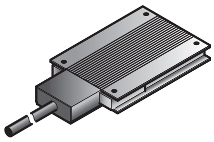
11.4.3 External braking resistor

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

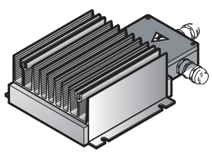
The following table shows the external braking resistors.

BW...-.../K-1.5



Type	BW100-005/K-1.5	BW150-003/K-1.5
Part number	08282862	08282927
Function	Dissipating the regenerative energy	
Degree of protection	IP65	IP65
Resistance	100 Ω	150 Ω
Power rating in S1, 100% cdf	200 W	100 W
Dimensions W x H x D	252 x 15 x 80 mm	146 x 15 x 80 mm
Cable length	1.5 m	1.5 m
Assigned grids	BS-005 (part number: 0813152X)	

BW...-...-T



Type	BW150-006-T	BW100-009-T
Part number	17969565	17969573
Function	Dissipating the regenerative energy	
Degree of protection	IP66	IP66
Resistance	150 Ω	100 Ω
Power rating in S1, 100% cdf	600 W	900 W
Dimensions W x H x D	285 × 75 × 174 mm	435 × 75 × 174 mm
Prescribed connection cables	Shielded cables with a temperature resistance of T_{amb} ≥ 90 °C (194 °F)	
Maximum permitted cable length	15 m	15 m

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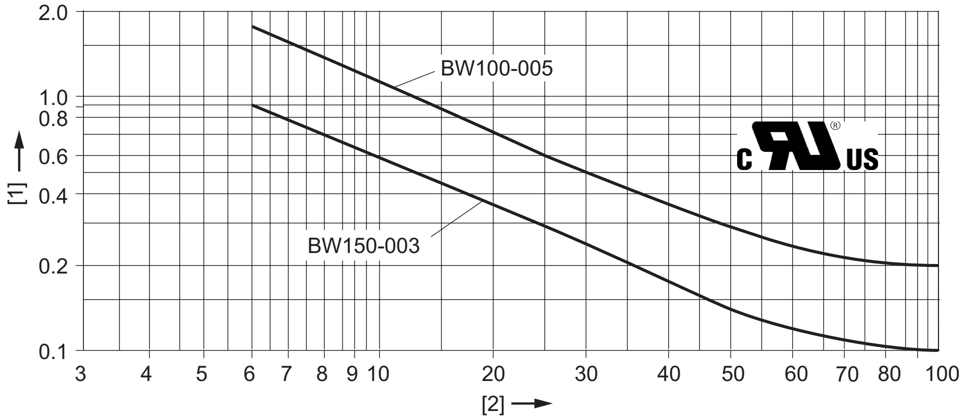
11.4.4 Technical data of BW100-005/K-1.5 and BW150-003/K-1.5

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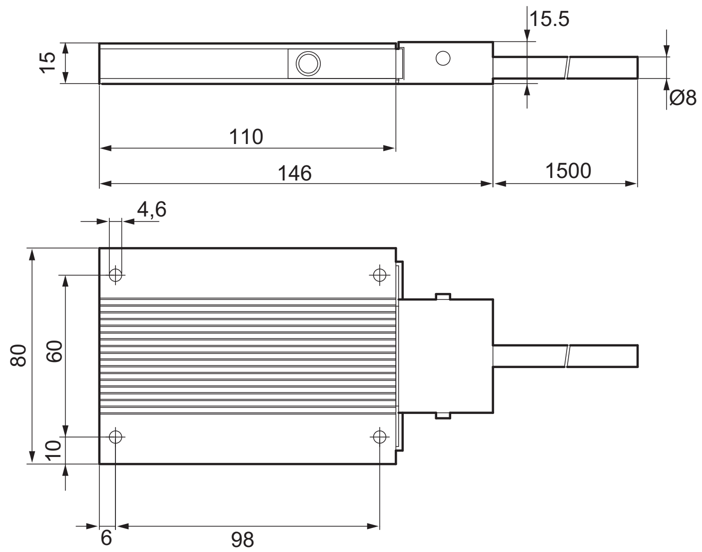
[1] Power in KW
[2] Cyclic duration factor cdf in %

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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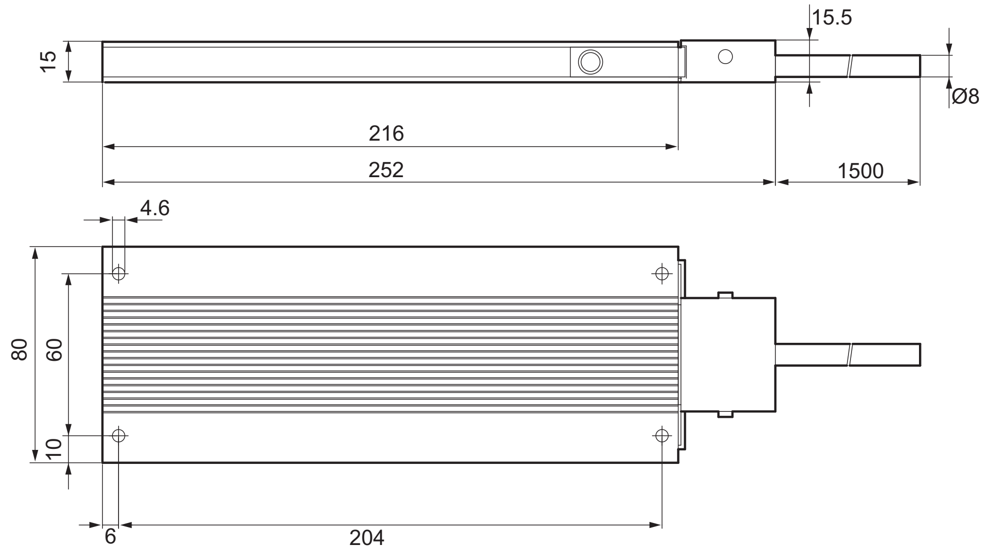
Dimension drawing of BW100-005/K-1.5

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



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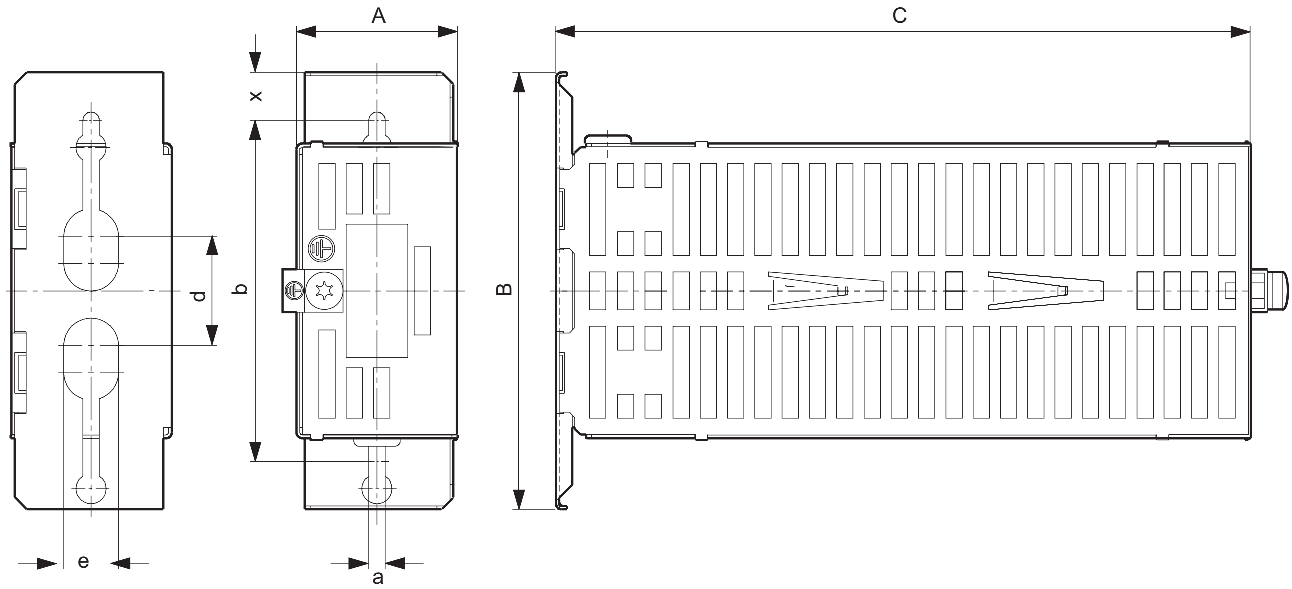
Dimension drawing for the BS-005 protective grid

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

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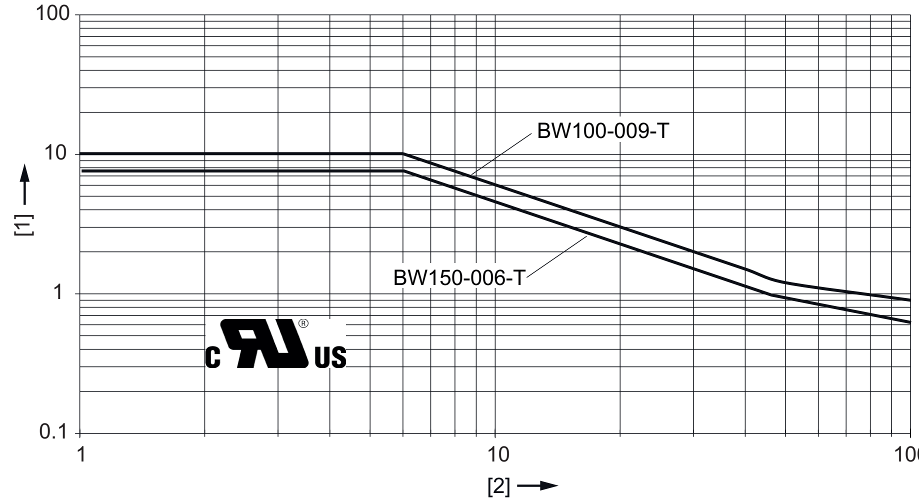
11.4.5 Technical data of BW150-006-T and BW100-009-T

Power diagrams

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



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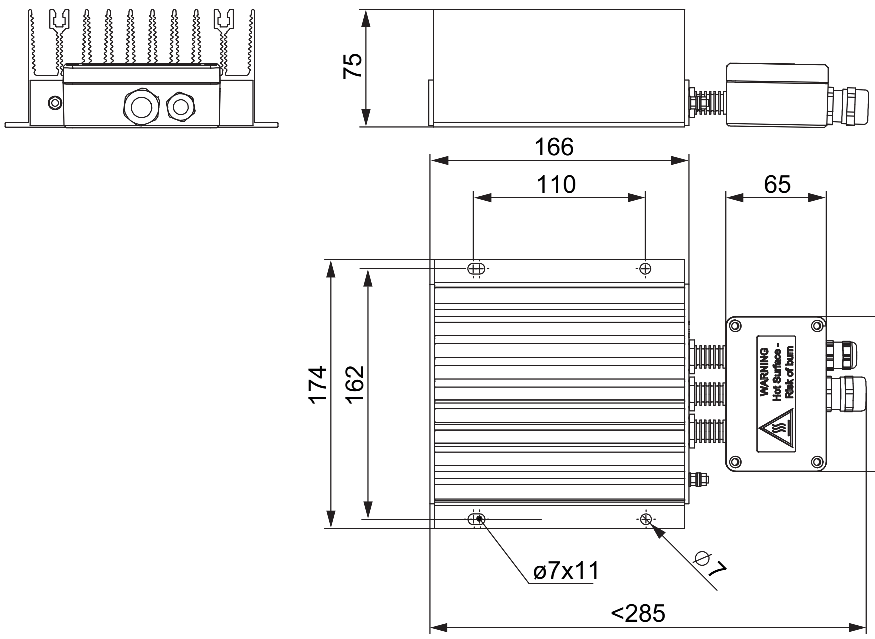
[1] Power in KW
[2] Cyclic duration factor cdf in %
ED Cyclic duration factor of the braking resistor, based on a cycle time of 120 s.

Dimension drawing of BW150-006-T

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



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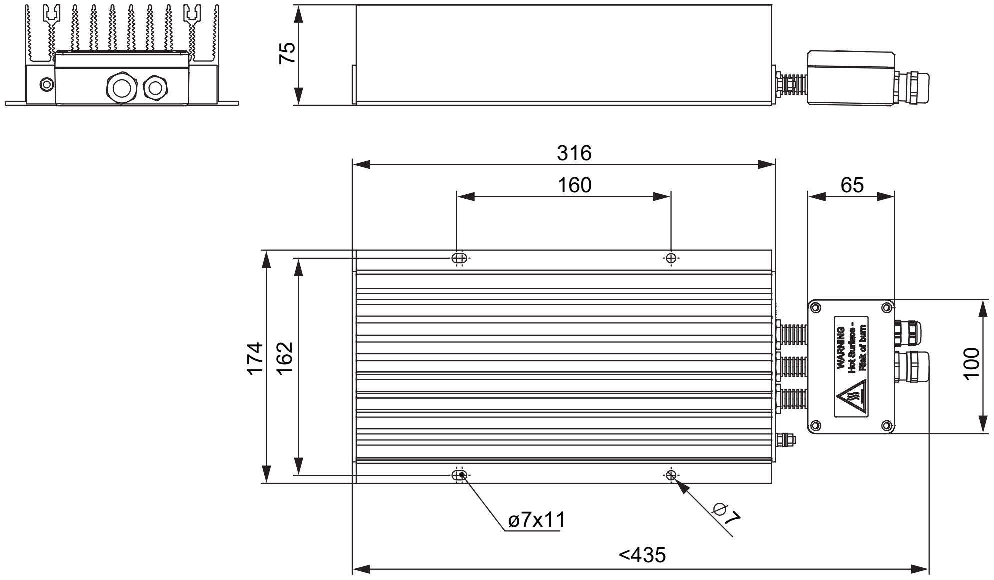
Dimension drawing of BW100-009-T

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



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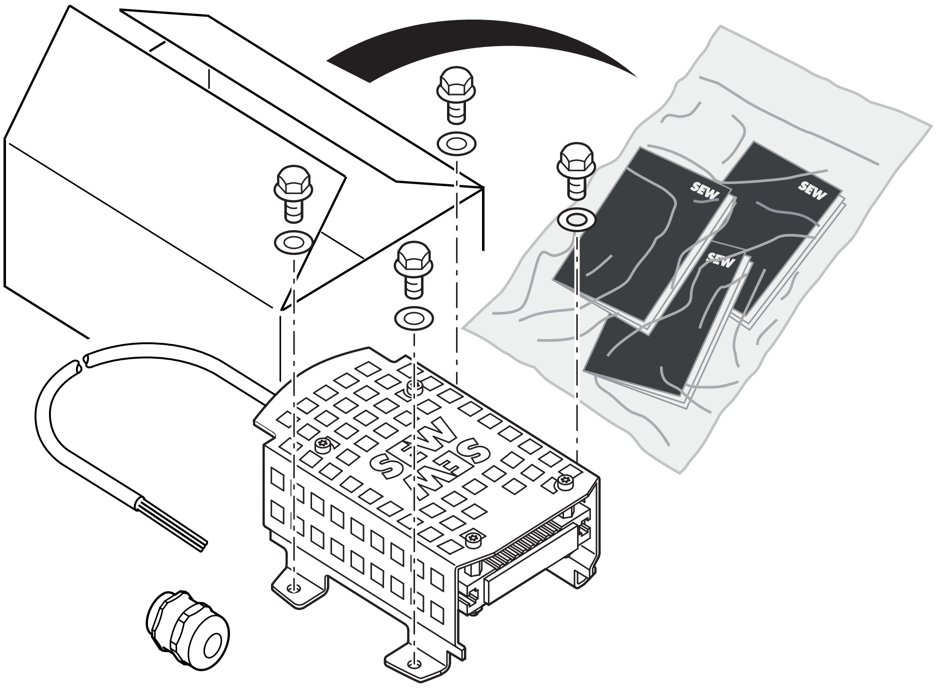
11.5 Mounting kit for braking resistor BW...-.../..C

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:



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11.5.1 Assignment

Drive unit	Mounting kit	
	Part number	Type
MGF..2.-C	18272886	BW100-001/K-1.5/M2C
	18272908	BW100-002/K-1.5/M2C
MGF..4.-C	18272894	BW100-001/K-1.5/M4C
MGF..4.-C/XT	18272916	BW100-002/K-1.5/M4C

11.5.2 Technical data

Type	BW100-001/.../...	BW100-002/.../...
Nominal continuous power at T_{amb}~40 °C	100 W	200 W
Resistance value R_{BW}	100 Ω ±10%	100 Ω ±10%
Design	Flat design	
Connections	3 x AWG 20 l = 150 cm	
Degree of protection (EN 60529)	IP66	
Operating temperature range	-25 °C to +40 °C	
Type of cooling	Natural convection	
Housing temperature at nominal continuous power at T_{amb}~40 °C	< 300 °C	
Conformity	CE/UL/CSA	
Derating at T_U> 40 °C	5% per 10 K to 60 °C	

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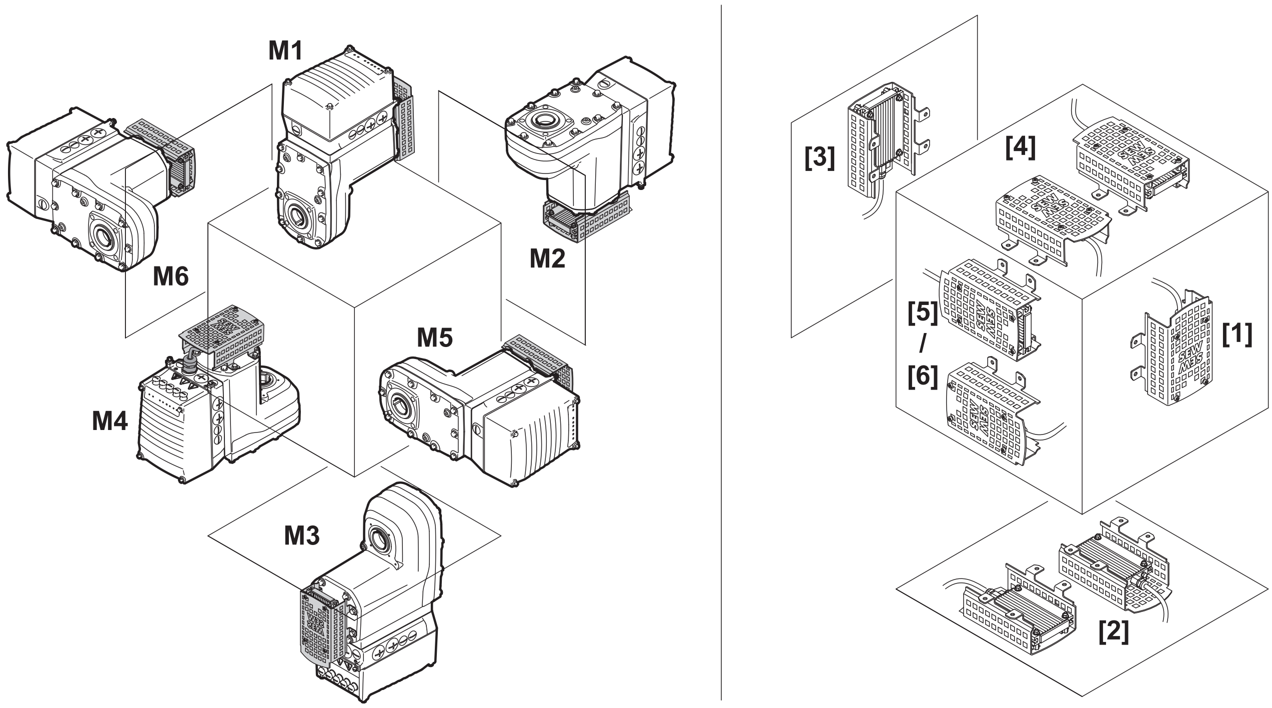
11.5.3 Current-carrying capacity



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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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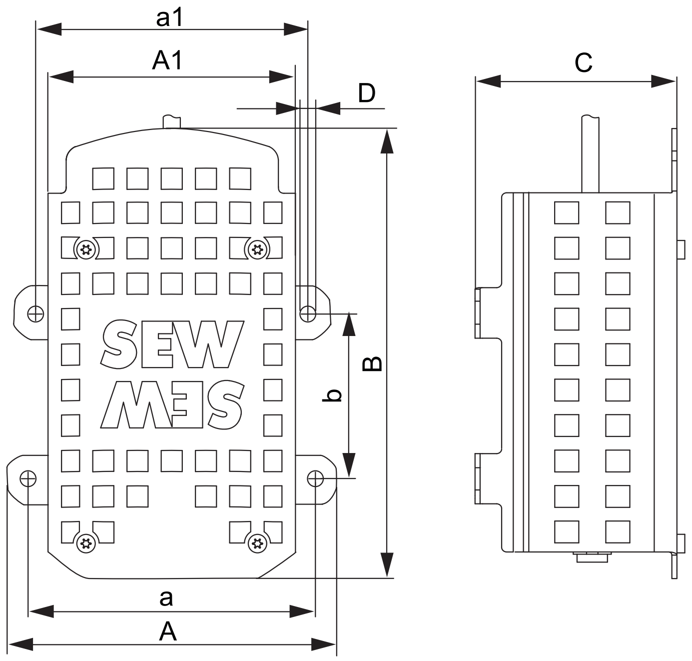
11.5.4 Dimension drawing



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	A	A1	B	C	D	a	a1	b
	mm	mm	mm	mm	mm	mm	mm	mm
18272886 (BW100-001/K-1.5/M2C)	126.0	89.0	148.2	61.8	7	111.0	106.0	54.7
18272908 (BW100-002/K-1.5/M2C)								
18272894 (BW100-001/K-1.5/M4C)	158.0	94.0	149.0	61.8	7	144.0	142.0	82.0
18272916 (BW100-002/K-1.5/M4C)								

11.6 DynaStop® torques

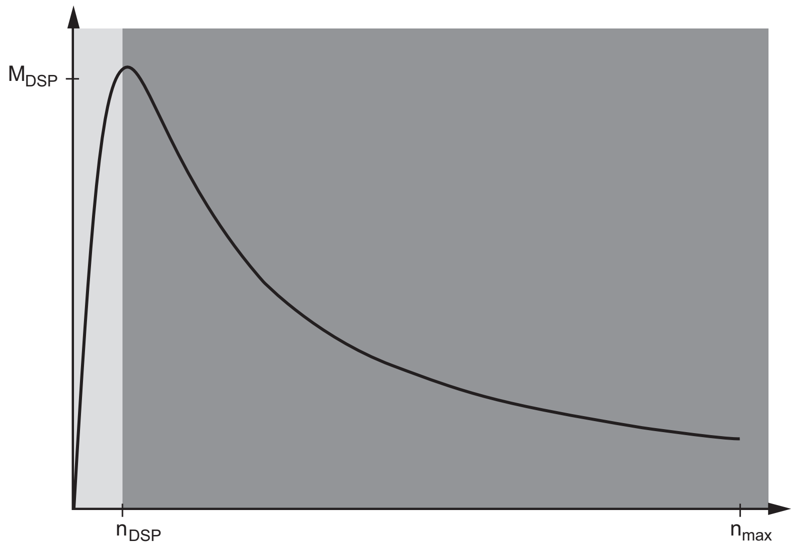
11.6.1 Notes

INFORMATION

For a functional description of DynaStop® refer to chapter "Operation" > "DynaStop®"

11.6.2 Operating range

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



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= Continuously permitted range of DynaStop®
= Impermissible operating range of DynaStop®

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11.6.3 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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11.6.4 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

(grey shading) = Preferred gear ratio

* = Ultimate gear unit ratio

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11.6.5 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 shading)	=	Preferred gear ratio
*	=	Ultimate gear unit ratio

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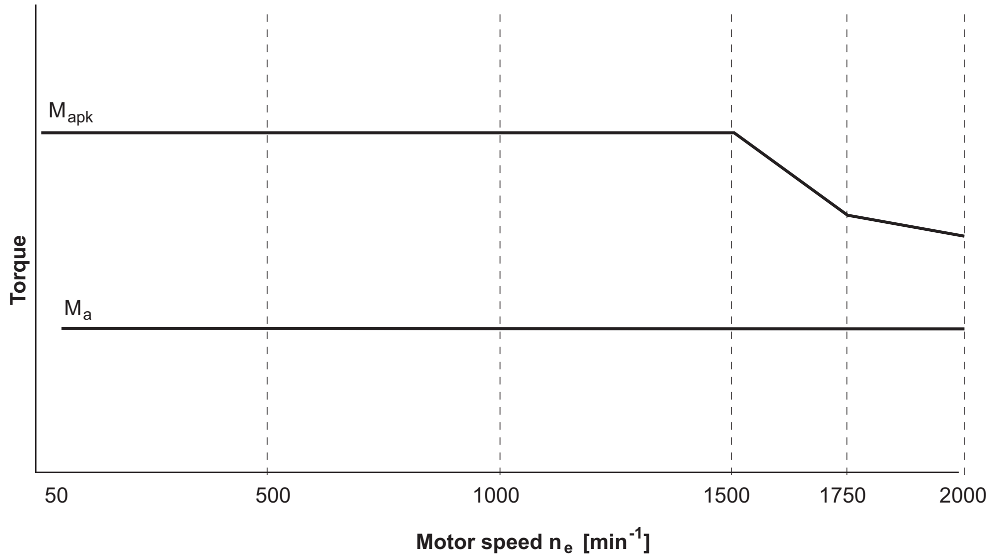
11.7 Torque curves

11.7.1 Control range 1:40

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



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Key

	=	Preferred gear ratio
*	=	Ultimate gear unit ratio
M_{apk}	=	Maximum permitted torque for 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_{a_eso}	=	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..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 to 2000 min^{-1}	at n_e= 5 to 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	

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MOVIGEAR® performance 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 to 2000 min^{-1}	at n_e= 5 to 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	

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MOVIGEAR® performance 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 to 2000 min^{-1}	at n_e= 5 to 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	

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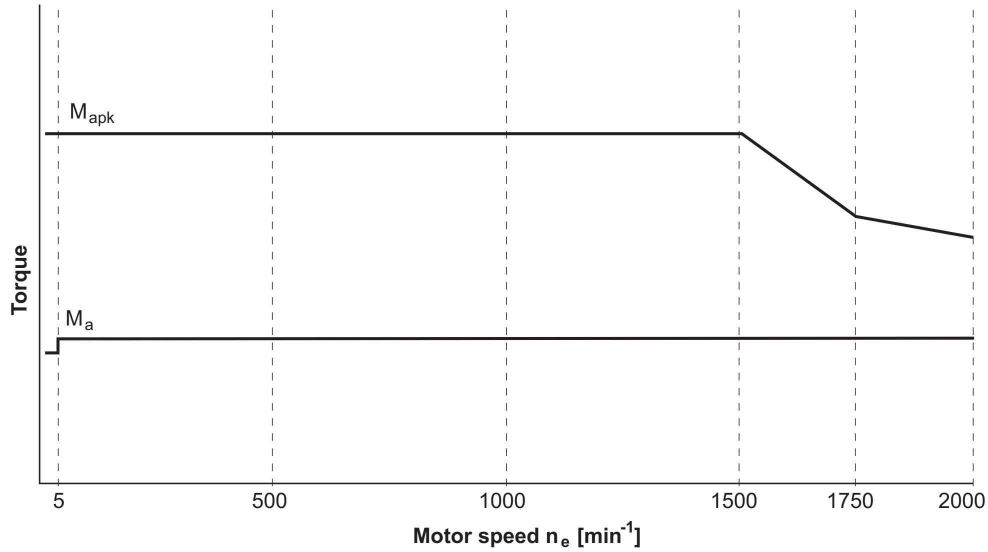
11.7.2 Extended control range 1:2000 (/AZ1Z option)

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



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Key

	=	Preferred gear ratio
*	=	Ultimate gear unit ratio
M_{apk}	=	Maximum permitted torque for 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_{a_eso}	=	Maximum permitted torque for non-cyclical special loads, maximum 1000 cycles
M_a	=	Continuous output torque of MOVIGEAR® For motor speeds n_e < 5 rpm, you have to reduce the output torque M_a to 90%.
n_a	=	Output speed
n_e	=	Motor speed

MOVIGEAR® performance 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 to 2000 min^{-1}	at n_e= 5 to 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	

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MOVIGEAR® performance 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 to 2000 min^{-1}	at n_e= 5 to 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	

MOVIGEAR® performance 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 to 2000 min^{-1}	at n_e= 5 to 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	

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11.8 Surface protection

11.8.1 General information

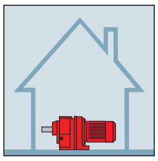
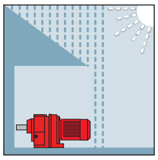
SEW-EURODRIVE offers the following optional protective measure for operating drive units under special environmental conditions.

- OS surface protection

In addition, special optional protective measures for the output shafts are also available.

11.8.2 Surface protection

Instead of the standard surface protection, the drive units are optionally available with the OS1 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

1) According to DIN EN ISO 12 944-2

11.8.3 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

11.8.4 NOCO® fluid

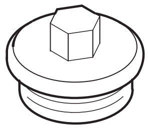
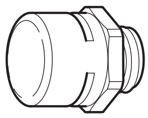
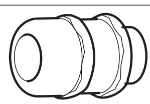
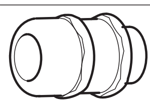
As standard, SEW-EURODRIVE supplies NOCO® fluid corrosion protection and lubricant with every drive unit with hollow shaft. Use NOCO® fluid when installing gear units with hollow shafts. Using this fluid can help prevent contact corrosion and makes it easier to disassemble the drive at a later time. NOCO® fluid is also suitable for protecting machined metal surfaces that do not have corrosion protection, such as parts of shaft ends or flanges. You can also order NOCO® fluid in larger quantities from SEW-EURODRIVE.

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

11.9 Screw fittings

The following tables show the screw connections available from SEW-EURODRIVE.

11.9.1 Cable glands / screw plugs / pressure compensation

Type of screw fitting	Figure	Content	Size	Tightening torque[1)]	Outer cable diameter	Part number
Screw plugs external hexagon (made of stainless steel)		10 pcs	M16 x 1.5	6.8 Nm	–	18247342
		10 pcs	M25 x 1.5	6.8 Nm	–	18247350
Pressure compensation screw fittings (made of stainless steel)		1 piece	M16 x 1.5	4 Nm	–	28214617
EMC cable gland (brass, nickel-plated)		10 pcs	M16 x 1.5	4 Nm	5 to 9 mm	18204783
		10 pcs	M25 x 1.5	7 Nm	11 to 16 mm	18204805
EMC cable gland (made of stainless steel)		10 pcs	M16 x 1.5	4 Nm	5 to 9 mm	18216366
		10 pcs	M25 x 1.5	7 Nm	11 to 16 mm	18216382

1) The specified torques must be adhered to with a tolerance of +/- 10%.

The cable retention in the cable gland must withstand the following removal force of the cable from the cable gland:

- Cable with outer diameter > 10 mm: ≥ 160 N
- Cable with outer diameter < 10 mm: = 100 N

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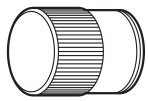
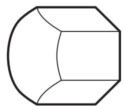
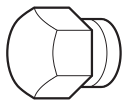
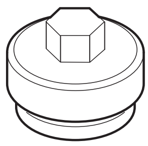
11.9.2 Screw fittings: Plug connectors

Type of screw fitting	Figure	Content	Size	Tightening torque[1)]	Part number
M23 plug (made of stainless steel)		1 piece	M23 x 1.5	Tighten fully	19094558
M12 plug for plug connector with male thread (made of stainless steel)		10 pcs	M12 x 1.0	2.3 Nm	18202799
M12 plug for plug connector with female thread (made of stainless steel)		10 pcs	M12 x 1.0	2.3 Nm	18202276

1) The specified torques must be adhered to with a tolerance of +/- 10%.

11.9.3 Screw fittings of the potentiometer

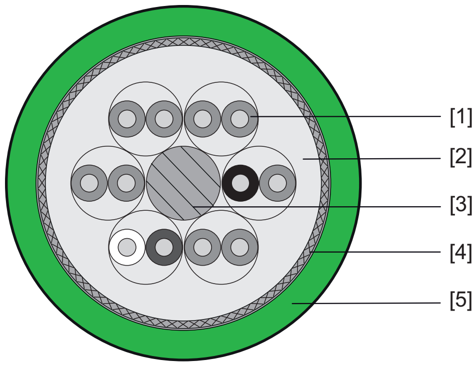
Type of screw fitting	Image	Content	Size	Tightening torque[1)]	Part number
Hexagon head screw plug for potentiometer (stainless steel)		10 piece	M24 x 1.5	6.8 Nm	18241077

1) The specified torques must be adhered to with a tolerance of +/- 10%.

11.10 Connection cable

11.10.1 Specification of signal cables for digital inputs and relay output

Mechanical design

		HELUKABEL Li9Y91YC11Y-HF
Mechanical design		 *29747895691*
[1]	**Cores**	6 conductor pairs, 2 × 0.25 mm^2 Copper
	Insulation	Polypropylene, 0.24 mm
	Colors	DIN 47100 yellow/green, pink/gray, blue/red, black/purple, pink and gray/ red and blue, brown/white
[2]	**Inner sheath-ing**	TPE-O, halogen-free
	Color	Nature
[3]	**Filler**	-
[4]	**Shield**	Braided copper wires, tinned optical coverage min. 85%
[5]	**Outer cable jacket**	TPU, halogen-free
	Color	Green, similar to RAL 2018
	Label	SEW-EURODRIVE 150665 Li9Y91YC11Y-HF 6x 2 x 0.25QMM E170315 AWM STYLE 20233 AWM I/II A/B 80 °C 300 V FT1 - DESINA - *week/year of production*
	Diameter	**15.6 mm**

Technical data

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

Characteristics	Type: HELUKABEL Li9Y91YC11Y-HF SEW-EURODRIVE 150665
UL properties	UL758 (AWM) UL Style 20223 (sheath) UL Style 10493 (insulation)
RoHS conformity	Yes
Test voltage core/ core	AC 1.5 kV 50 Hz/1 min.
Test voltage core/ 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 radiuses	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 properties	• Oil resistance according to DIN 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 • Silicon-free

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11.11 Mounting positions

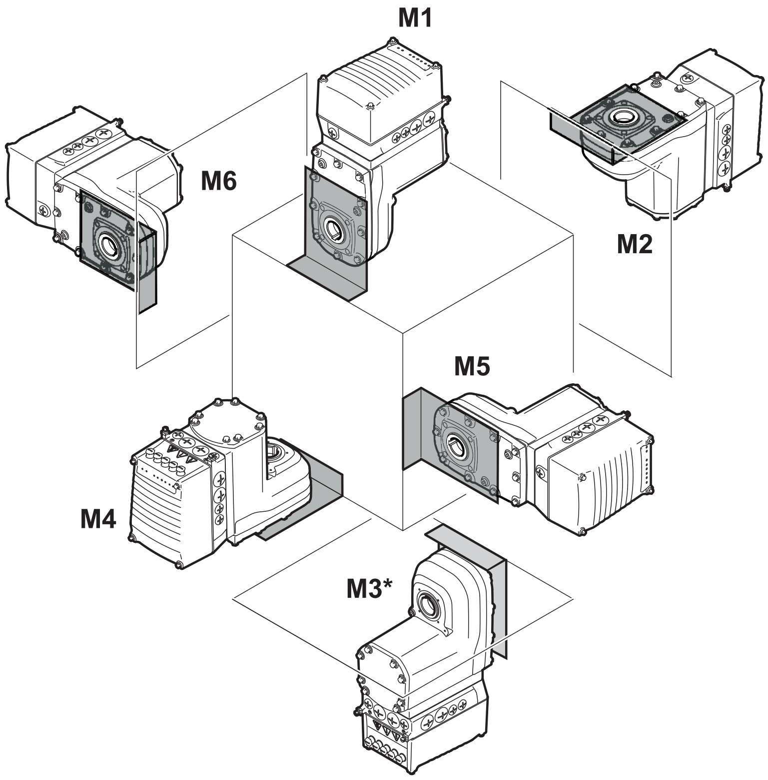
11.11.1 Description of mounting positions

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 documentation "Integrated Pressure Compensation (Option /PG)".

Mounting positions M1 to M6

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



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* Mounting position M3 is only possible with the option "integrated pressure compensation /PG". Observe the documentation "Integrated Pressure Compensation (Option /PG)".

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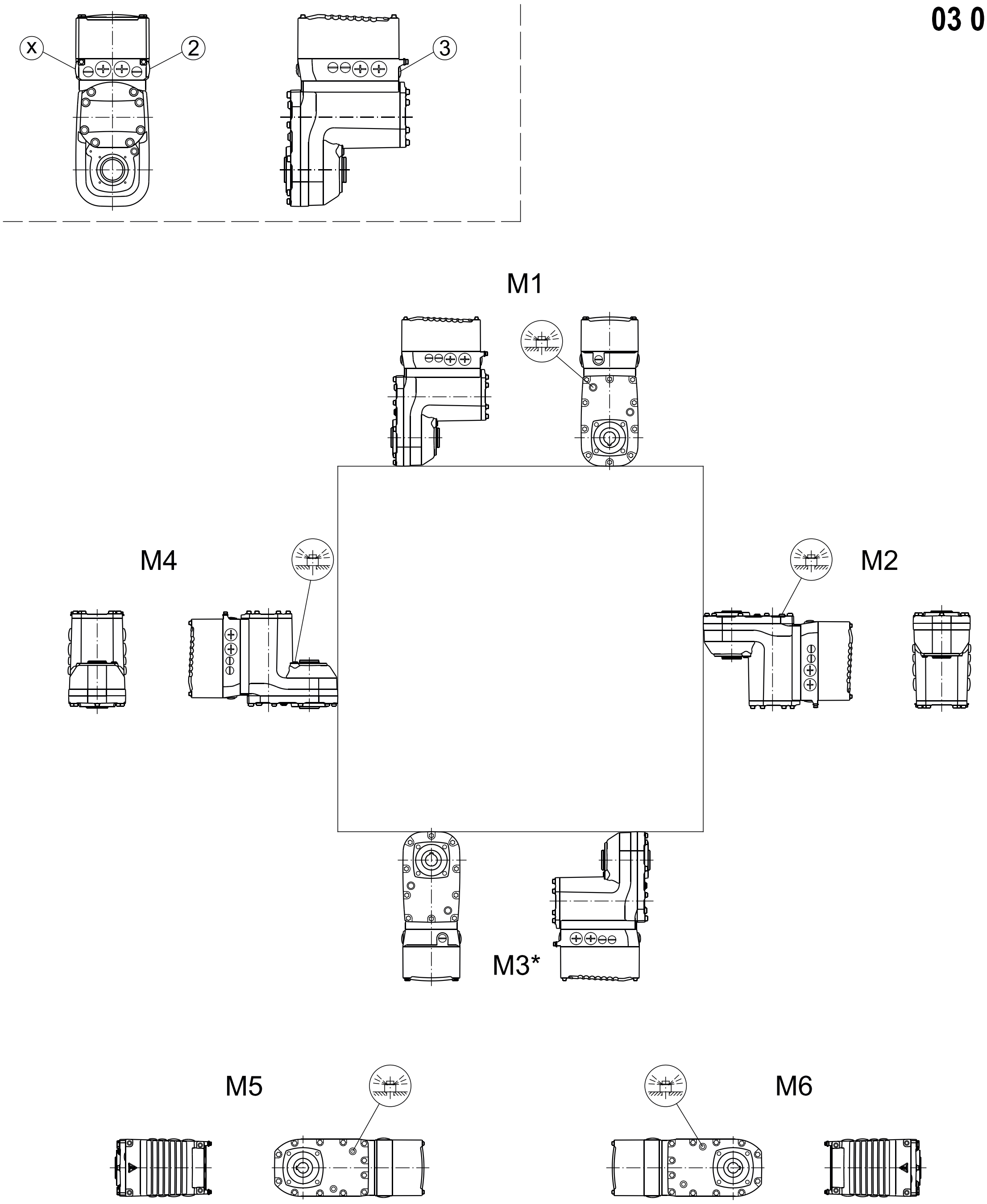
11.11.2 Mounting position sheet

03 015 00 18



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* Mounting position M3 is only possible with the option "integrated pressure compensation /PG". Observe the documentation "Integrated Pressure Compensation (Option /PG)".

 = Breather valve

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11.12 Lubricants

11.12.1 Roller bearing greases

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

Area of operation	Ambient temperature	Manufacturer	Type
Standard	-40 °C to +80 °C	Fuchs	Renolit CX-TOM 15
	-40 °C to +80 °C	Klüber	Petamo GHY 133 N
	-40 °C to +40 °C	Bremer & Leguil	Cassida Grease GTS 2

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11.12.2 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 documentation "Integrated Pressure Compensation (Option /PG)".
(grey shading)	=	Preferred gear ratio

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11.12.3 Lubricant table

NOTICE

Selecting improper lubricants may damage the gear unit.

Possible damage to property.

- Observe the following information.

Notes

- 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.

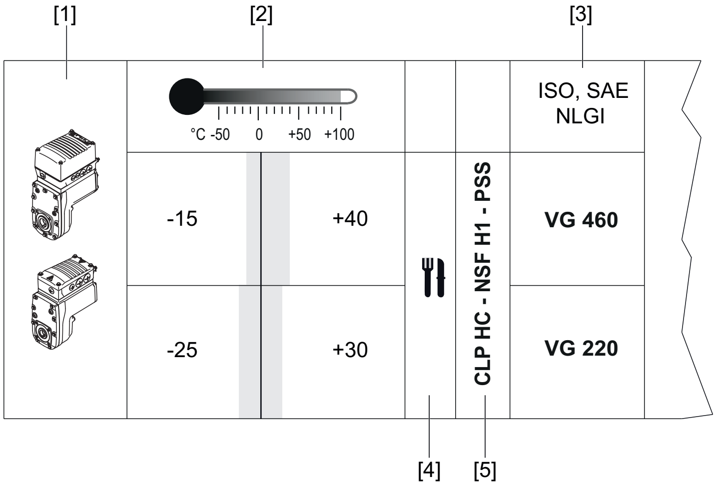
  If you use other lubricants for the gear units and/or use the lubricants at temperatures outside the recommended temperature range, SEW-EURODRIVE does not assume liability.

  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 is 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.



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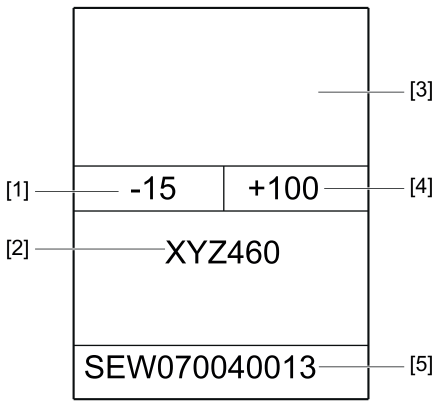
[1] Device type
[2] Ambient temperature range
[3] Viscosity class
[4] Note on special approvals
[5] Lubricant type

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 concerning 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	

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 – polyalphaolefin (PAO)
	Lubricant for the food processing industry – NSF-H1-compliant
Oil seal	Oil seal
PSS	"Premium Sine Seal" oil seal. The addendum "PSS" for the lubricant type indicates compatibility with the sealing system.

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Lubricant table

The lubricant table is valid as of the time of printing of this document. Refer to **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".

MGF..-..C	[1] °C -50 0 +50 +100	[2]	[3]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil	KLÜBER LUBRICATION	Shell	TOTAL
	[4] -25 … +60		CLP HC (-PSS)	VG 220					-25 … +110 Mobil SHC 630			
	-30 … +50		CLP HC (-PSS)	VG 150					-30 … +100 Mobil SHC 629			
	[4] -15 … +40		CLP HC - NSF H1 (-PSS)	VG 460			-15 … +100 Optilieb GT 460 SEW070040313					
	-25 … +30		CLP HC - NSF H1 (-PSS)	VG 220			-25 … +80 Optilieb GT 220 SEW070040313					

9007224704496523

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

11.13 Design notes for gear units with hollow shaft and key

INFORMATION

Always use the supplied NOCO® fluid for assembly. The fluid prevents contact corrosion and makes disassembly at a later time easier.

INFORMATION

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 [A] and without [B] contact shoulder".

INFORMATION

For dimensioning the keyed connection, observe 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.

11.13.1 Installation

SEW-EURODRIVE recommends **2 variants for installing** the hollow shaft and key on 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.

The following sections describe the two options.

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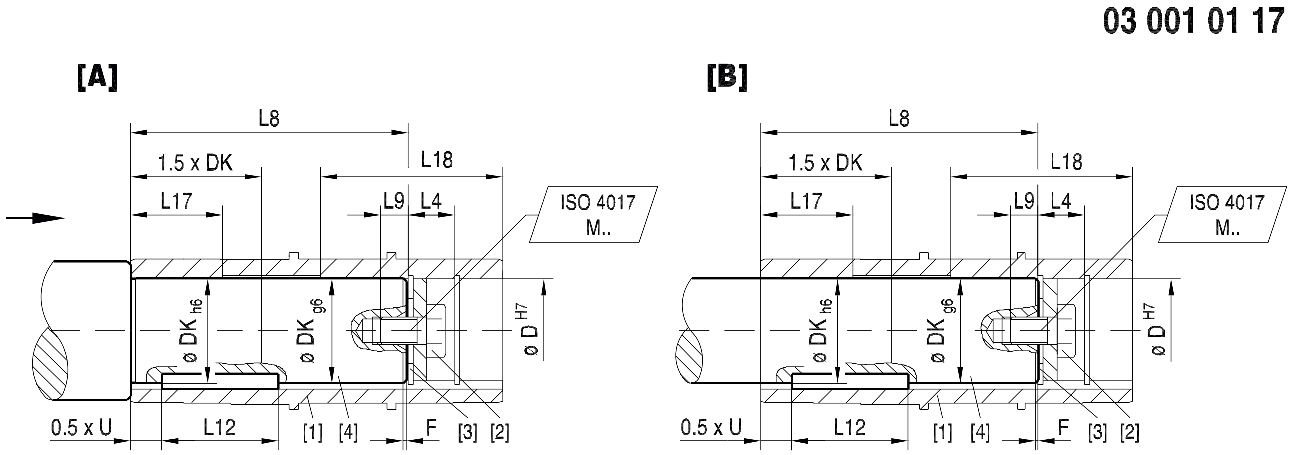
11.13.2 Mounting using supplied fastening parts

The following fastening parts are provided as standard:

- Retaining screw with washer [2]
- Retaining ring [3]

Customer shaft



[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

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Dimensions and tightening torque 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 [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	M12x30-8.8	20
	40	40	89	12.85	35	55	1	12[5]	30	M16x40-8.8	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	M12x30-8.8	20
	40	40	105.5	17.65	40	60	1	12[4]	29	M16x40-8.8	40

Key

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)

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

You can also 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:

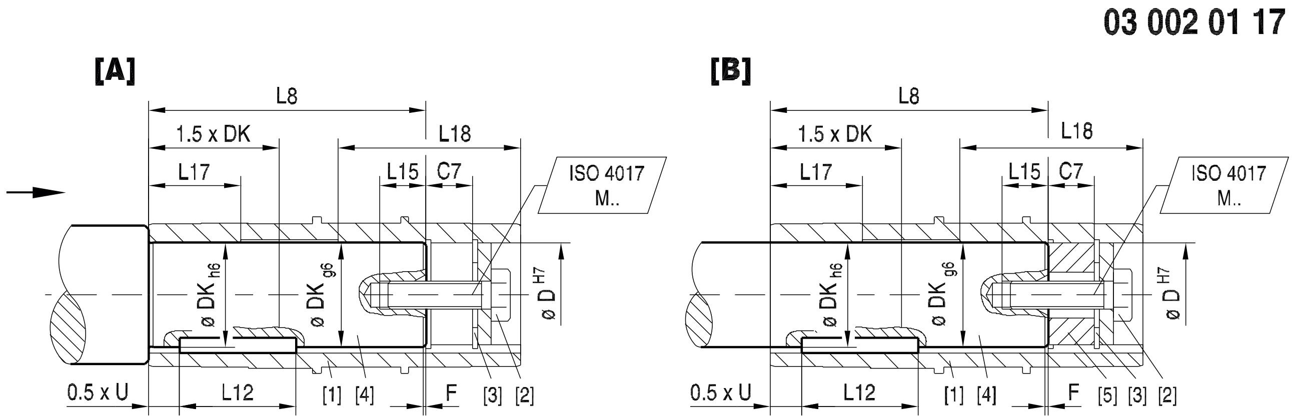
- Spacer tube for installation without contact shoulder [5]
- Retaining screw for assembly [2]
- Forcing washer for disassembly [7]
- Fixed nut for disassembly [8]

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].



[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 the included ejector plate and fixed nut.
L17/L18	Cylinder section length with dimension H7

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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	$L15^{+2}$	Retaining screw [2] from the assembly/ disassembly kit	MS	Installation/removal 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

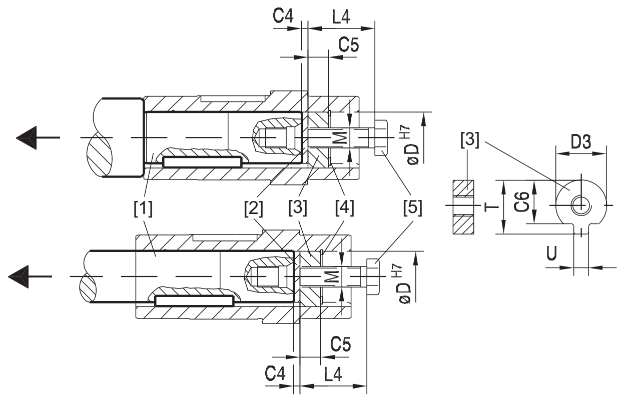
Disassembly

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	M1)	Installation/ removal kit
	mm	mm	mm	mm	mm	mm	mm	mm		Part number
MGFA.1-..-C2)	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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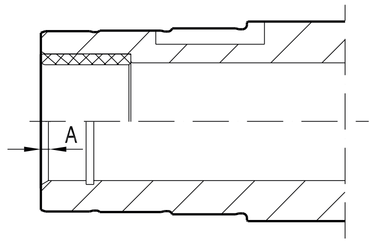
11.14 Drive unit with hollow shafts

11.14.1 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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11.15 Dimension drawings of the drive unit

11.15.1 Dimension sheet notes

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...13 mm	→ M4
Ø	> 13...16 mm	→ M5
Ø	> 16...21 mm	→ M6
Ø	> 21...24 mm	→ M8
Ø	> 24...30 mm	→ M10
Ø	> 30...38 mm	→ M12
Ø	> 38...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, plug connectors or pressure compensation fittings (in conjunction with the design for wet areas).

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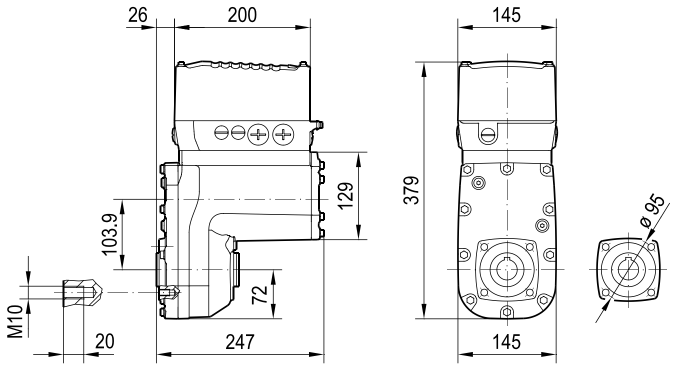
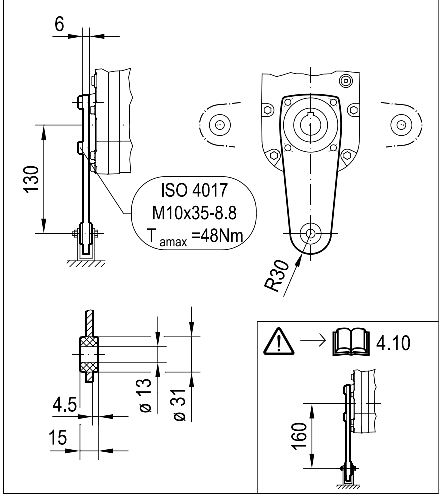
11.15.2 MGF..2-..-C

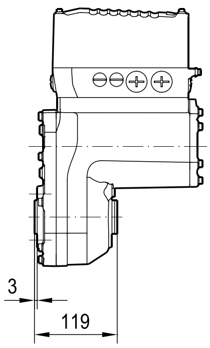
03 002 01 18

MGFAS2..-C

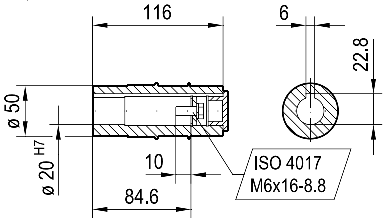


MGF.T2..-C

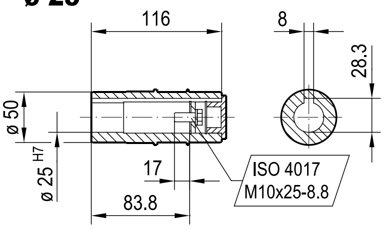




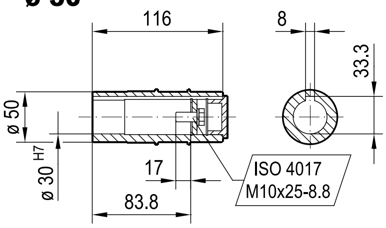
ø 20 H7



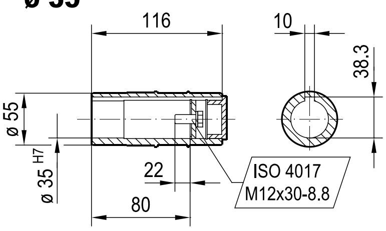
ø 25 H7



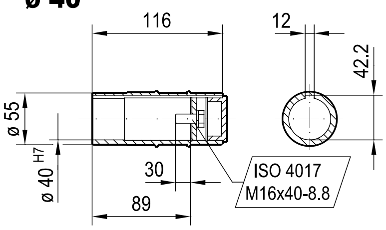
ø 30 H7



ø 35 H7



ø 40 H7



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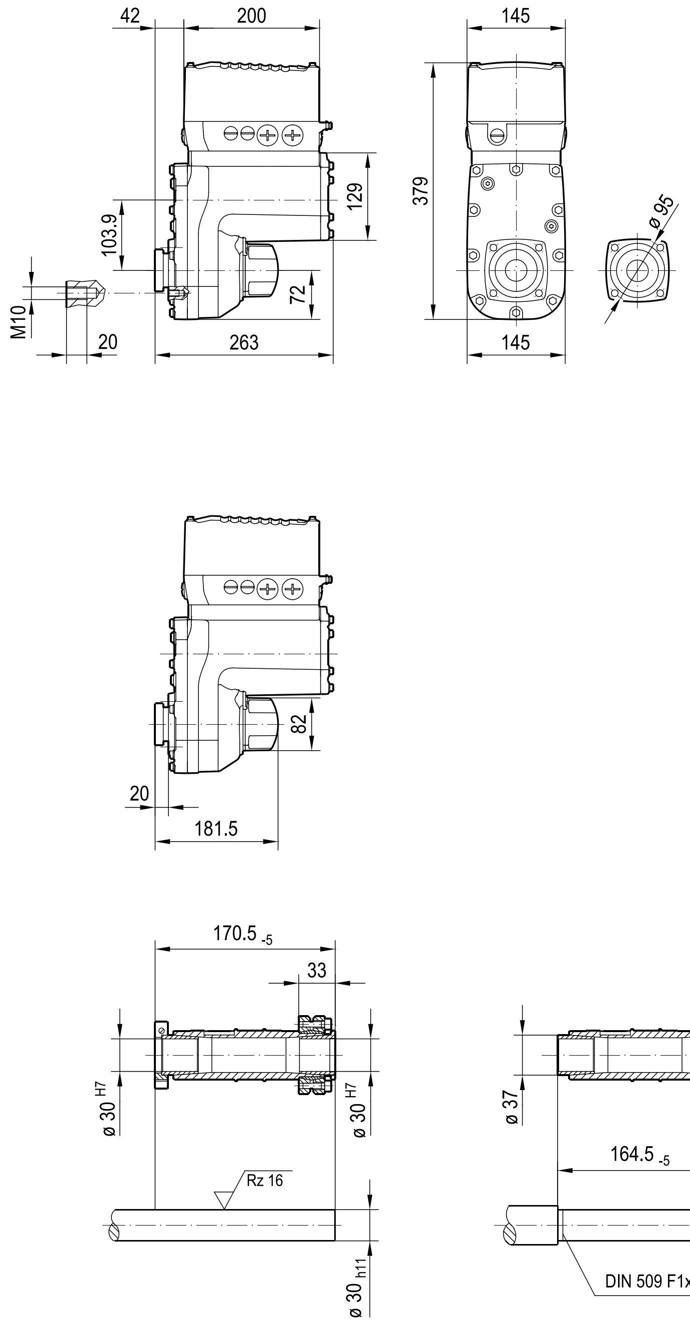
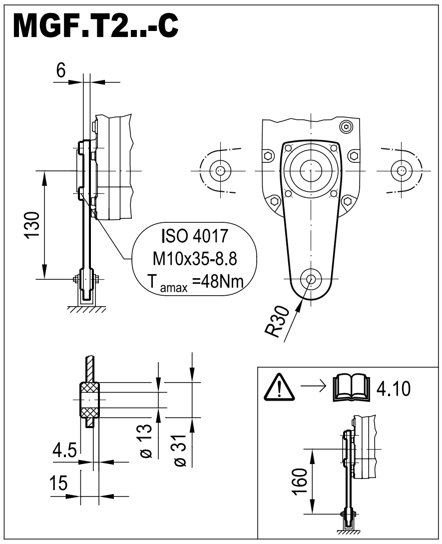
03 004 01 18

MGFTS2..-C





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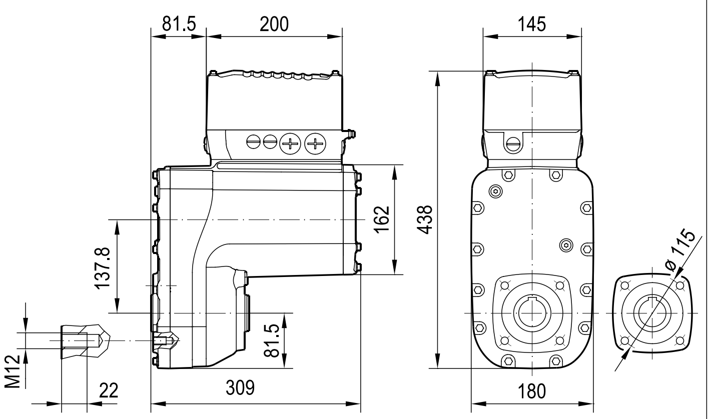
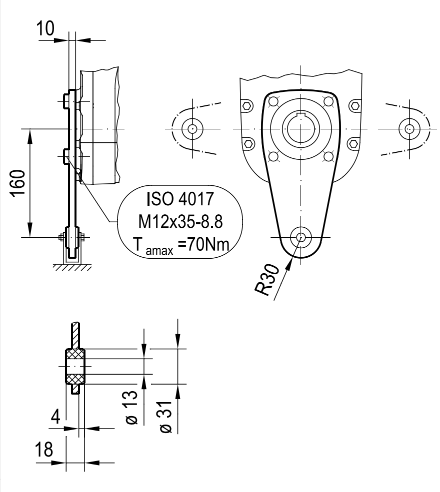
11.15.3 MGF..4-..-C

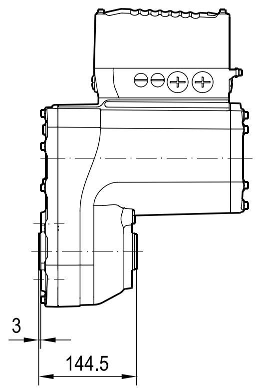
03 006 00 18

MGFAS4..-C

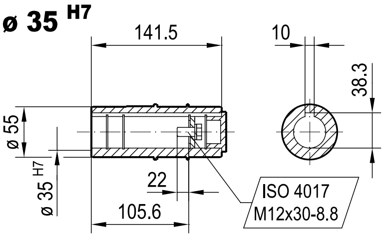


MGF.T4..-C





ø 35 H7



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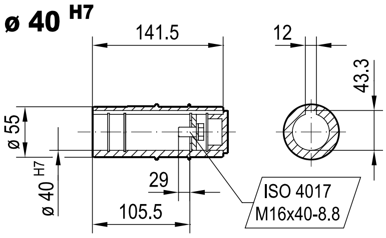
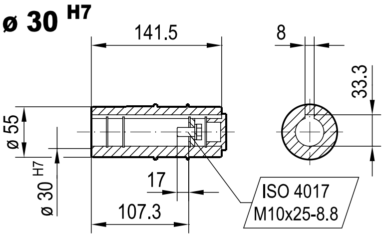


ø 30 H7



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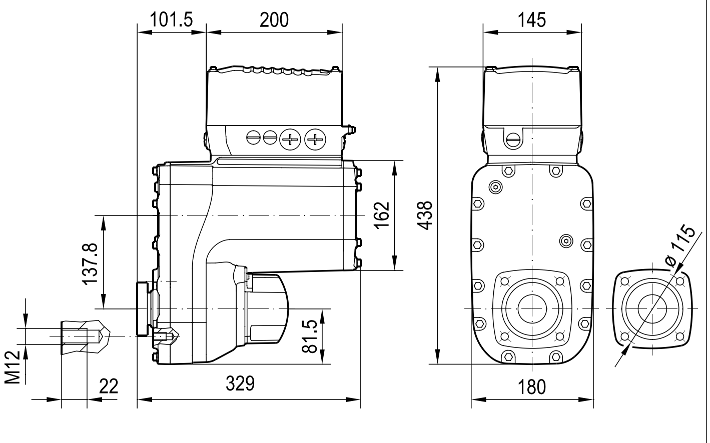
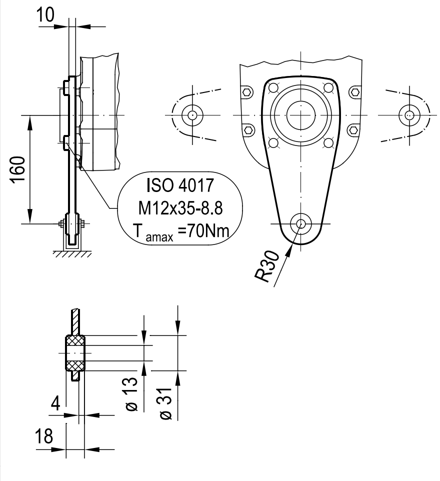
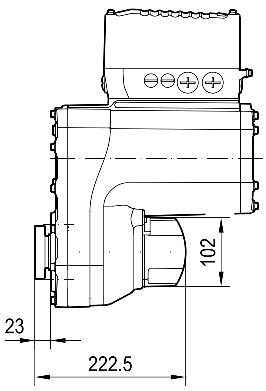
03 007 00 18

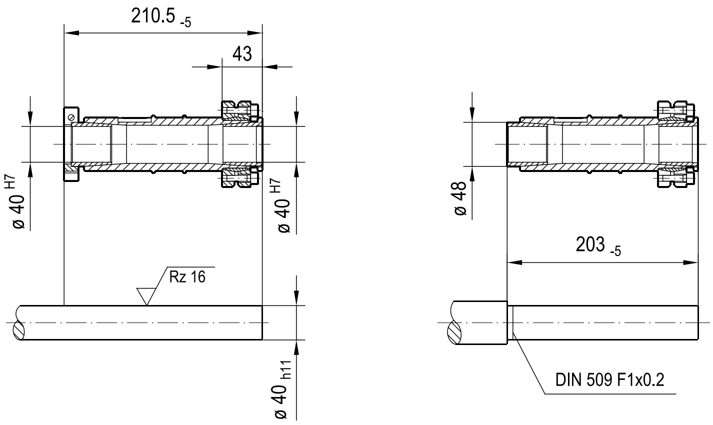
MGFTS4..-C



MGF.T4..-C







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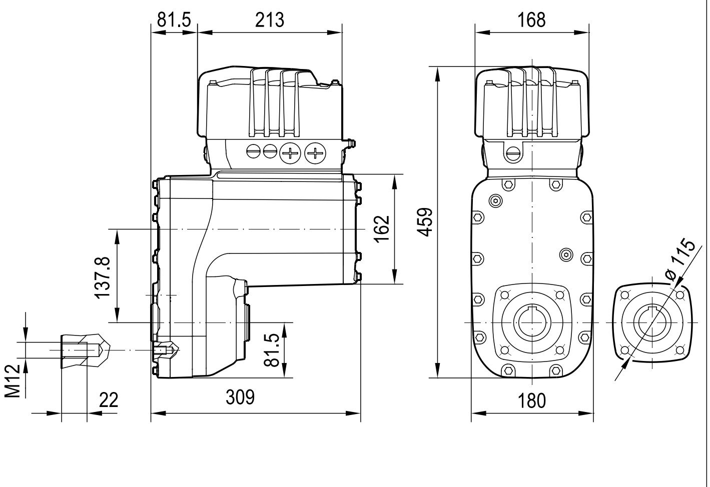
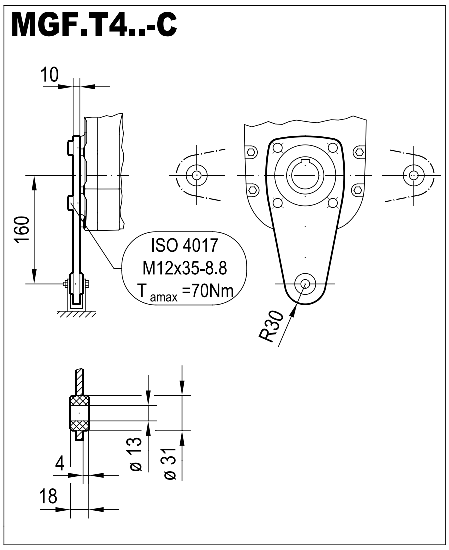
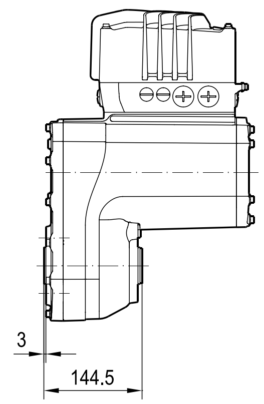
11.15.4 MGF..4-..-C/XT with increased torque

03 008 00 18

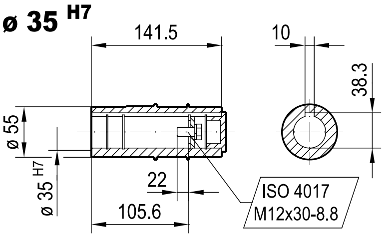
MGFAS4..-C/XT



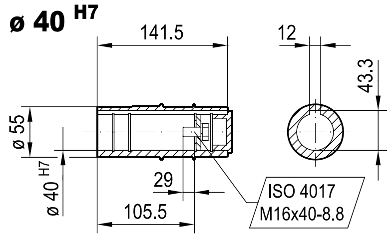




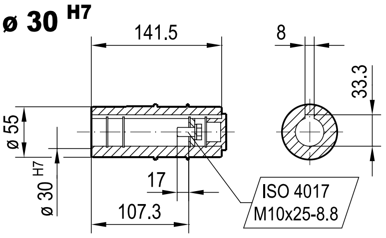
ø 35 H7



ø 40 H7



ø 30 H7



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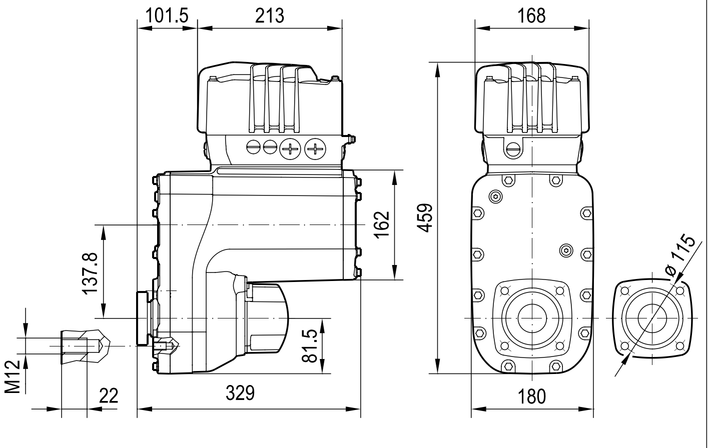
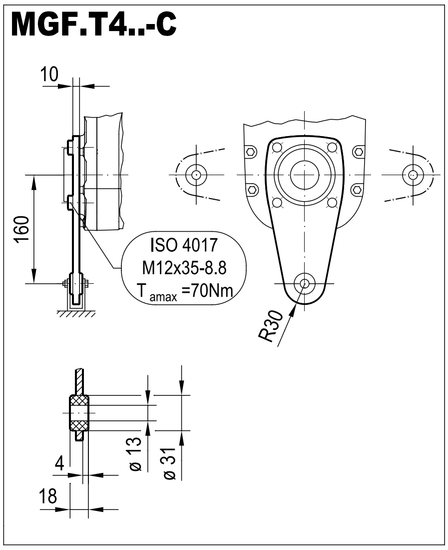
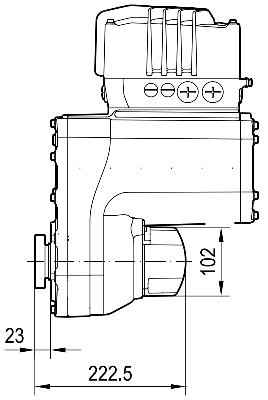
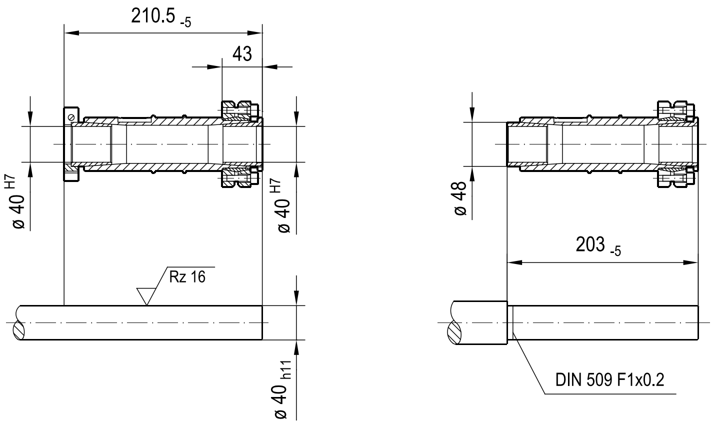
03 009 00 18

MGFTS4..-C/XT









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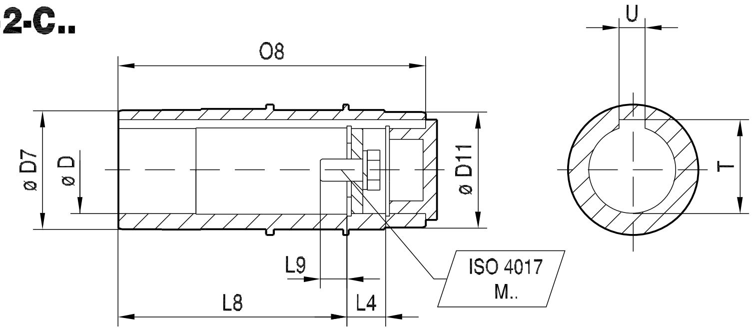
11.15.5 Shaft designs

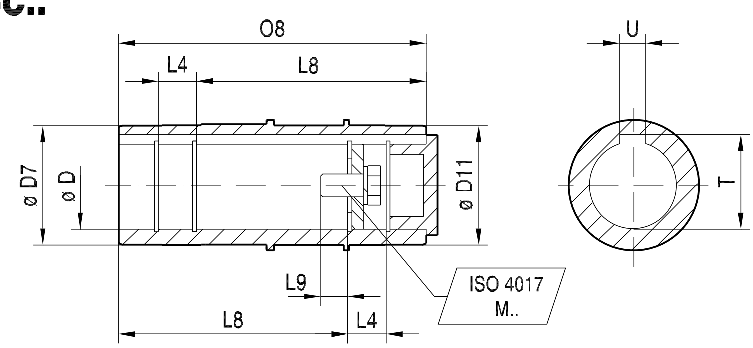
MGFAS..C/mm (MGFAS1..C only with MOVIGEAR® classic)

03 016 02 17

MGF.1-2-C..



MGF.4-C..



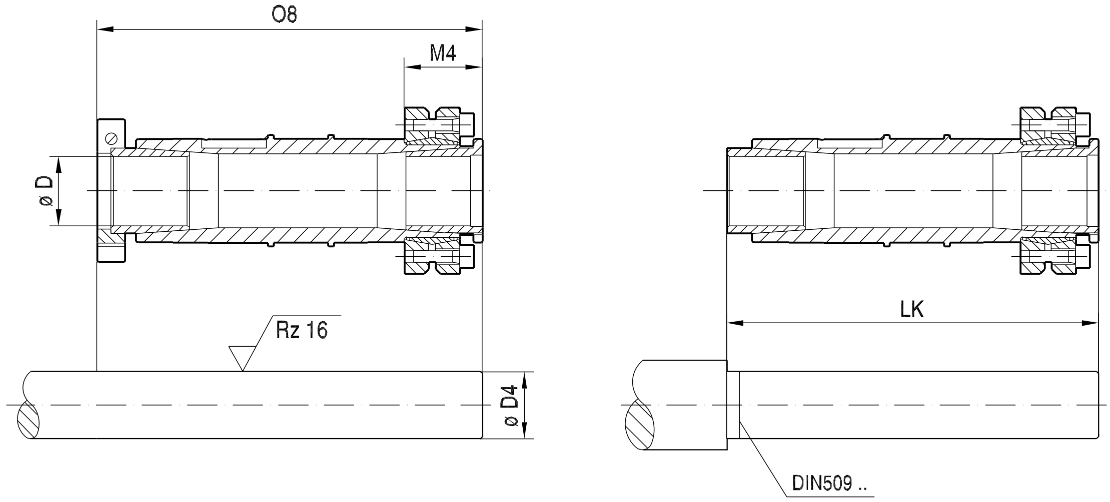
	ø D H7	ø D7	ø D11	L4	L8	L9	O8	T	U	ISO 4017
MGFAS1..C	20	35	38	16.4	73.6	10	106	22.8	6	M6x16-8.8
MGFAS1..C	25	35	38	16.2	73.8	17	106	27	8	M10x25-8.8

	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

MGFTS..C/mm (MGFTS1..C only with MOVIGEAR® classic)

03 017 00 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	35	35.03	43	210.5	203	F1x0.2
MGFTS4..C	40	40.1	43	210.5	203	F1x0.2

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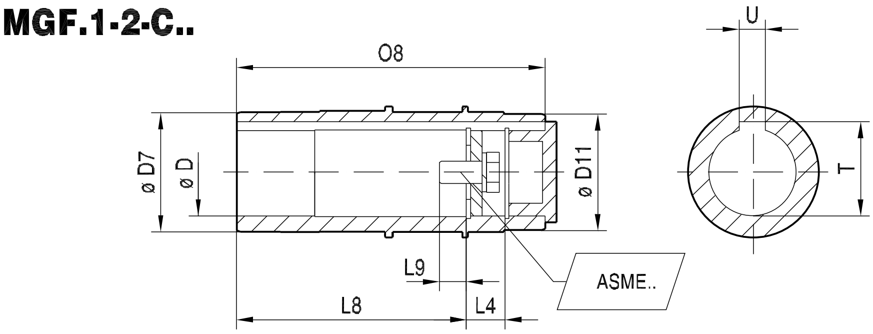
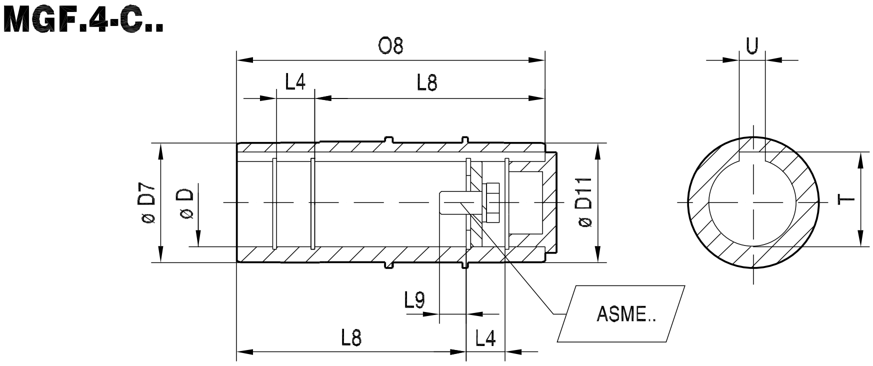
MGFAS..C/inch (MGFAS1..C only with MOVIGEAR® classic)

03 016 00 18





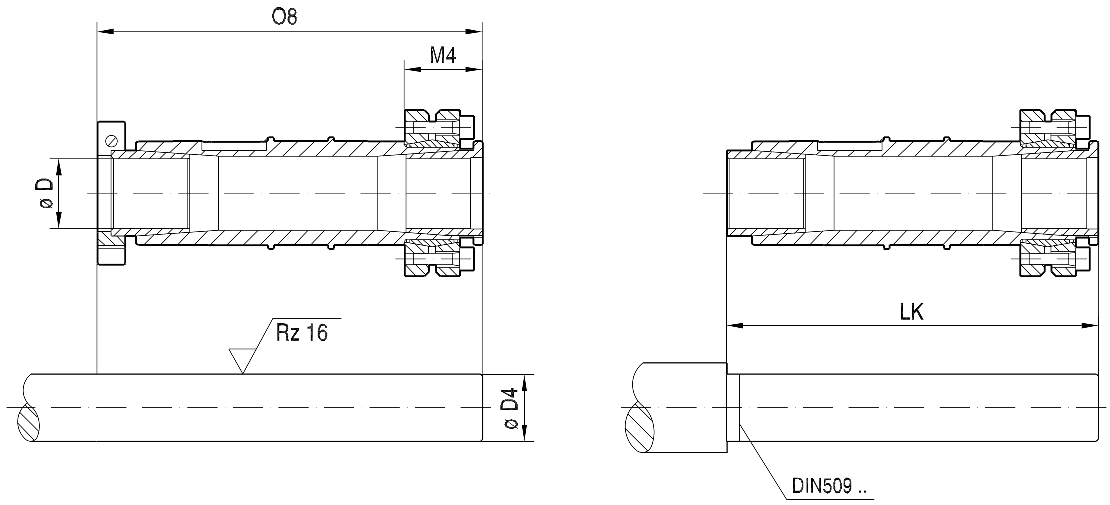
	ø D H7	ø D7	ø D11	L4	L8	L9	O8	T	U	ASME
MGFAS1..C	0.750	1.378	1.496	0.646	2.898	0.347	4.173	0.846	0.187	1/4-20x0.625
MGFAS1..C	0.875	1.378	1.496	0.646	2.937	0.347	4.173	0.965	0.187	1/4-20x0.625
MGFAS1..C	1.000	1.378	1.496	0.638	2.906	0.695	4.173	1.122	0.250	3/8-16x1.00

	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

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

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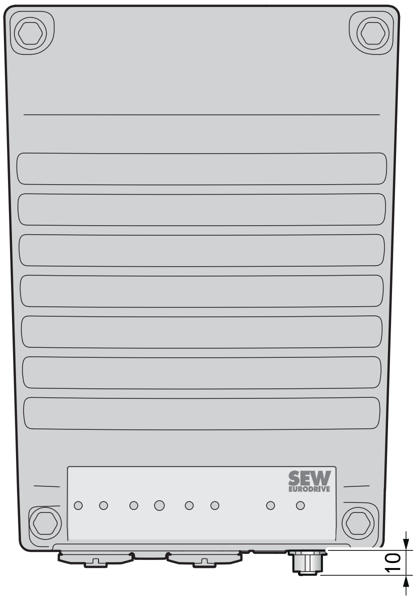
11.16 Dimension drawings of plug connectors in the electronics cover

The following figure shows the additional dimensions of the plug connector.



30622557067

[1] M12 plug connector, female

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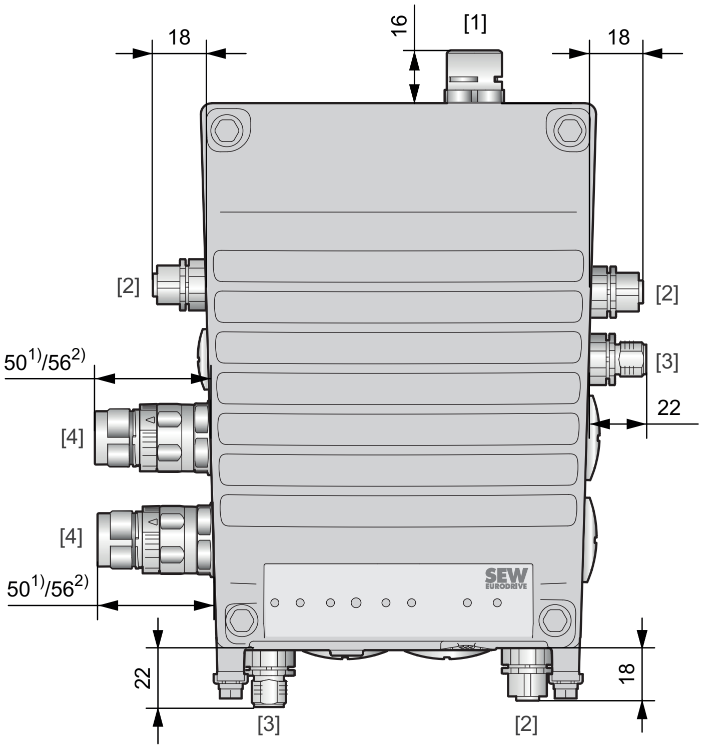
11.17 Dimension drawings of plug connectors in the connection box

11.17.1 MOVIGEAR® performance MGF..-...-C/IV

Plug connectors

INFORMATION

- The following figure shows an example of the additional dimensions of the optional plug connectors for a possible plug connector configuration.
- For more information, refer to the chapter "Plug connector positions".



9007224554389771

1) "Straight" plug connector variant
2) "Right-angle" plug connector variant
[1] Optional pressure compensation
[2] M12 plug connector, female
[3] M12 plug connector, male
[4] M23 plug connector, female

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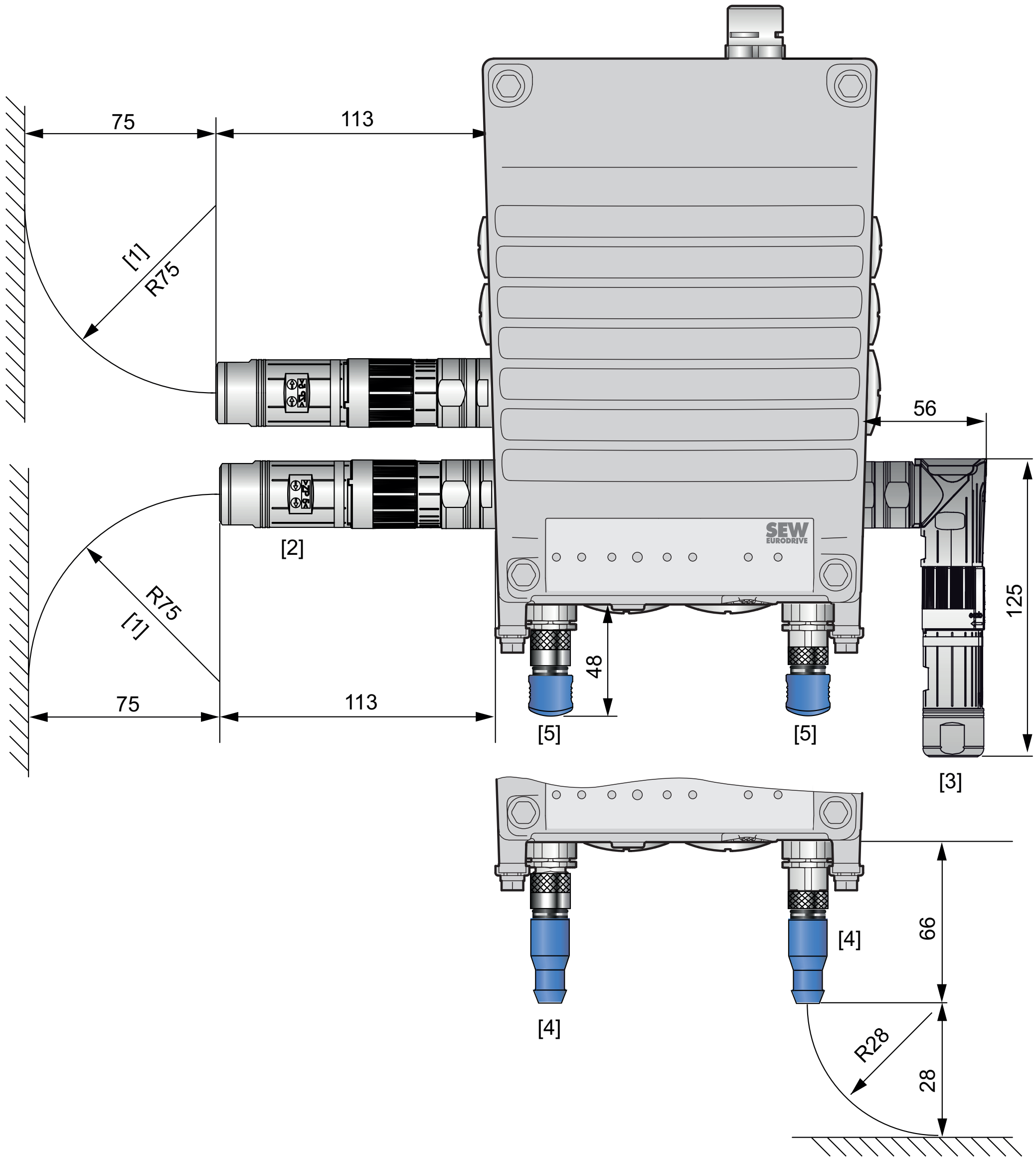
Plug connector including mating connector

INFORMATION

- The following figure shows the additional dimensions/bending radii of the optional plug connectors including mating connector in connection with prefabricated cables from SEW-EURODRIVE.
- For more information, refer to the chapter "Plug connector positions".



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[1] Bending radius
[2] "Straight" plug connector variant M23
[3] "Right-angle" plug connector variant M23
[4] "Straight" plug connector variant M12
[5] "Right-angle" plug connector variant M12

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12 Functional safety

12.1 General information

12.1.1 Underlying standards

The safety assessment of the electronics cover is based on the following standards and safety classes:

Underlying standards	
Safety class/underlying standard	• Performance level (PL) according to EN ISO 13849-1:2015 • Safety Integrity Level (SIL) according to EN 61800-5-2:2017 • Safety Integrity Level Claim Limit (SIL_{CL}) according to EN 62061:2005/A1:2013

12.2 Integrated Safety Technology

12.2.1 MOVIGEAR® performance

The safety technology of the drive unit described below has been developed and tested in accordance with the following safety requirements:

- Safety Integrity Level 3 according to EN 61800-5-2:2017, EN 61508:2010.
- PL e according to EN ISO 13849-1: 2015.

This was certified by TÜV Rheinland. Copies of the TÜV certificate and the corresponding report are available from SEW-EURODRIVE on request.

12.2.2 Safe condition

For safety-related operation of the drive unit, Safe Torque Off is defined as safe state (see STO drive safety function). The safety concept is based on this definition.

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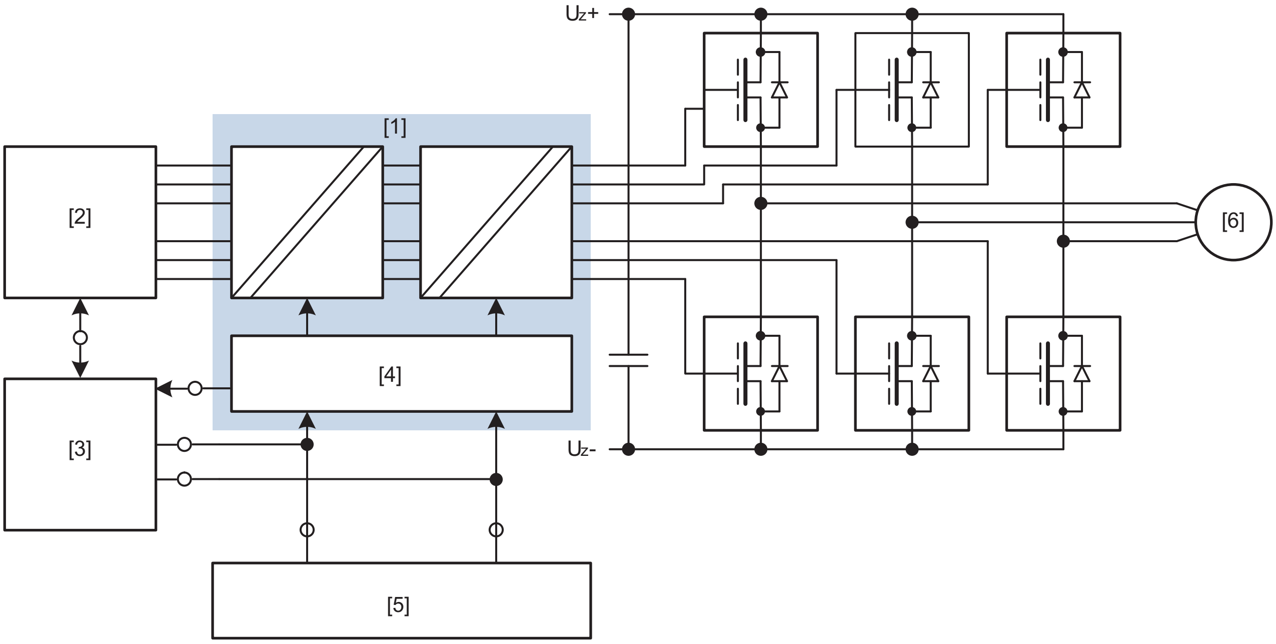
12.2.3 Safety concept

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

- The drive unit can be connected to an external safety controller or safety relay. This external safety controller/safety relay disconnects the safety-related STO input via a 2-pole 24 V switching signal (sourcing/sinking) when a connected command device (e.g. emergency stop button with latching function) is activated. This activates the STO function of the drive unit.
- An internal, dual-channel structure with diagnostics prevents the generation of pulse trains at the power output stage (IGBT).
- Instead of 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 control 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 drive safety function is activated, the PWM signals generated by the drive unit are interrupted and not transmitted to the IGBTs.
- If the STO function detects a discrepancy between both channels, the PWM signals are inhibited. The inhibit can be revoked by a 24 V reset, or by a device reset if F_STO_P1 and F_STO_P2 are not controlled with 24 V.
- The STO drive safety function can be activated externally e.g. via an external safety device via the STO input.

12.2.4 Schematic representation of the safety concept



23543720971

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

12.2.5 Drive safety functions

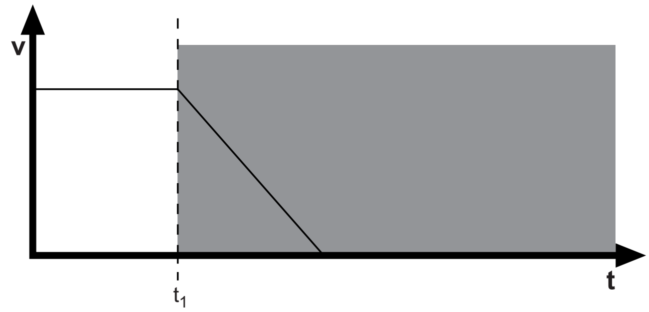
The following drive-related safety functions can be used:

- **STO** (Safe Torque Off according to EN 61800-5-2) by disconnecting the STO input.

  If the STO function is activated, the frequency inverter no longer supplies power to the motor for generating torque. This drive safety function corresponds to a non-controlled stop according to EN 60204-1, stop category 0.

  The STO input must be disabled by a suitable external safety controller/safety relay.

  The following figure shows the STO function:



2463228171

v	Speed
t	Time
t_1	Point of time when STO is triggered
	Disconnection range

- **SS1(c) (SS1-t)** (safe stop 1, with time control according to EN 61800-5-2) by means of suitable external control (e.g. safety relay with delayed disconnection).

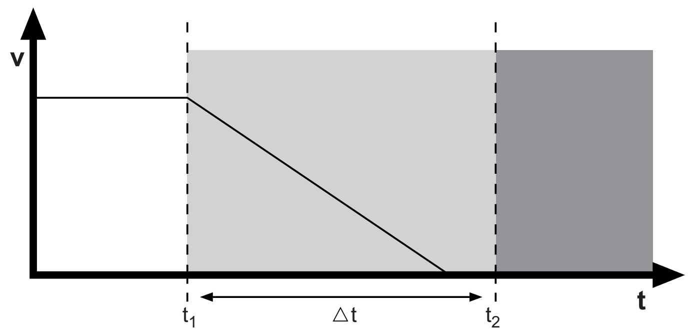
  The following sequence is mandatory:

  – Decelerate the drive using an appropriate deceleration ramp specified via setpoints.

  – Disconnect the STO input (= triggering the STO function) after a specified safety-related time delay.

  This drive safety function corresponds to a controlled stop according to EN 60204-1, stop category 1.

  The following figure illustrates the SS1(c) function (SS1-t):



2463226251

v	Speed

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t	Time
t_1	Point of time when brake ramp is initiated
t_2	Point of time when STO is triggered
Δt	Delay time until STO is triggered
	Safe time delay range
	Disconnection range

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12.2.6 Restrictions

- Note 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 drive safety functions that require active deceleration (braking) of the dangerous movement.
- When using the SS1(c) (SS1-t) function as described in chapter "Functional safety" > "Integrated safety technology" > "Drive safety functions", the brake deceleration ramp of the drive is not monitored with respect to safety. In the event of a fault, deceleration may fail during the delay time or, in the worst-case scenario, there might be an acceleration. In this case, the STO function is only activated after the set time delay has expired. The resulting danger must be taken into account in the risk assessment of the system/machine. Additional safety measures might have to be implemented.
- 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 to 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 happens when the STO function is triggered:

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

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12.3 Safety conditions

The requirement for safe operation is that the drive safety functions of the drive unit are properly integrated into an application-specific higher-level drive safety function. A system/machine-specific risk assessment must be carried out by the system/machine manufacturer and taken into account for the use of the drive system with the drive unit.

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

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

- Approved devices.
- Installation requirements.
- Requirements on external safety controllers and safety relays.
- Startup requirements.
- Operation requirements.

12.3.1 Approved devices

The following device variants are permitted for safety-related applications:

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

12.3.2 Requirements on the installation

- The wiring technology used must comply with the standard EN 60204-1.
- The STO control cables must be routed according to EMC guidelines and as follows:
  - Inside an electrical installation space: Single conductors can be routed.
  - Outside a closed installation space: Shielded cables must be routed permanently (fixed) and protected against external damage, or equivalent measures have to be taken.
  - Adhere to the regulations in force for the application.
  - The sinking and sourcing cables from the external safety device to the axis must be routed right next to each other with a cable length of ≤ 100 m.
  - The sinking and sourcing cables from the external safety device to the axis must have the same cable length. A difference in length ≤ 3% of the two cables is permitted.
  - Using suitable measures. the user must ensure that STO control cable is routed separately from the power lines of the drive. This does not apply to cables approved by SEW-EURODRIVE specifically for this case of application.
- The STO function does not detect short circuits or interference voltage in the supply line. For this reason, one of the following 2 requirements must always be met:
  - 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 lines.
- Observe the values specified for safety components when designing the safety circuits.

- The STO signal (F_STO_P1, F_STO_P2, and F_STO_M) may not be used for feedback.
- For safety controller/safety relays, you must only use grounded voltage sources with protective electrical separation (PELV) according to EN 61131-2 and EN 60204-1.
- If several voltage sources are used, each voltage source must be connected to a PE system.
- When planning the installation, observe the technical data of the electronics cover.
- When the STO control cables are routed to Terminal X9 in the electronics cover, the cable ends must be covered with conductor end sleeves and the cables must be fixed close to the terminal X9 using cable ties. Other the low-voltage signals can be bundled together with the STO signals.
- Do not use the port 24 V_OUT of the electronics cover for safety-related applications. This voltage is only permitted to supply the M12 plug connector X5504 when the STO jumper is plugged in.
- To use the drive unit in safety-related applications, remove the jumpers labeled with "Caution, remove jumper for safety operation" from the STO terminal X9. No labeled jumpers are available for those designs where the STO connection is performed using plug connectors. The installed jumper is relevant to the function.

12.3.3 Requirements on 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 that is required in the overall system for the respective application-related drive safety function.

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

Application	Safety controller requirements
Performance level d according to EN ISO 13849-1, SIL 2 according to EN 62062	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 required safety class (see manufacturer documentation). The STO input of the electronics cover can be switched with 2 poles (sourcing output, sourcing/sinking, or serial sourcing), or with 1 pole (sourcing).
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- Electro-sensitive protective equipment (such as light grid or scanner) according to EN 61496-1 and emergency stop buttons must not be directly connected to the STO input. The connection must be made using safety relays, safety controllers etc.

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- To ensure protection against unintended 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. 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 according to EN ISO 13849-2 or DIN 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:
  – 2-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
  – 2-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)
  – 2-pole serial sourcing:

    Fault exclusion is mandatory
  – 1-pole sourcing output:

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

2-pole sourcing output:

- Test pulses can be used when the device is switched on or off.
  – 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 package before you generate another switch-on test pulse or another switch-on test pulse package.
  – The signal levels must be played back by the safety controller and compared to the expected value.

2-pole sourcing/sinking:

- Test pulses can be used when the device is switched on or off.
  – 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 package before you generate another switch-on test pulse or another switch-on test pulse package.
  – The signal levels must be played back by the safety controller and compared to the expected value.

2-pole serial sourcing:

- Fault exclusion in the connection lead is mandatory if no external test pulses are possible.

1-pole sourcing output:

- Test pulses can be used when the device is switched on or off.
  – The test pulse in the sourcing channel must not exceed 1 ms.

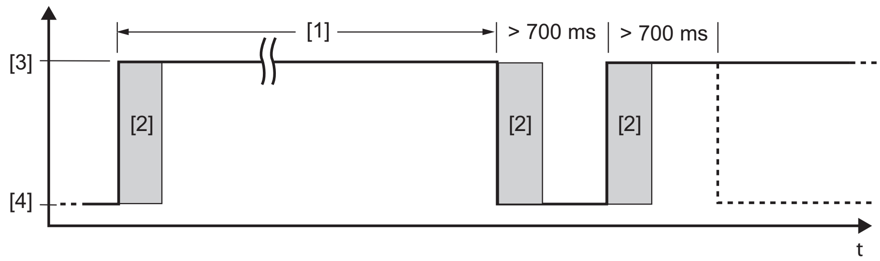
– The next switch-off test pulse may only occur after a time period of 2 ms at the earliest.
– A maximum of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any package before you generate another switch-on test pulse or another switch-on test pulse package.
– The signal levels must be played back by the safety controller and compared to the expected value.

12.3.4 Requirements on startup

- To validate the implemented drive safety functions, they must be documented and checked after successful startup.
- Observe the restrictions for drive safety functions in chapter "Restrictions" for the validation of the safety functions. Non-safety-related parts and components that affect the result of the test (e.g. motor brake) must be deactivated, if necessary.
- For using the drive unit in safety-relevant applications, it is essential that you perform and record startup checks for the disconnecting device and correct wiring.

12.3.5 Requirements on operation

- Operation is only allowed within the limits specified in the data sheets. This principle applies to the external safety controller as well as to the drive unit.
- The built-in diagnostic function is limited in case of a permanently enabled or permanently disabled STO input. Only with a level change of the STO signal, extended diagnostic functions are performed. This is why the drive safety function via STO input must be triggered with connected line voltage at least once every 12 months for PL d according to EN ISO 13849-1 and SIL 2 according to EN 61800-5-2, and at least once every 3 months for PL e according to EN ISO 13849-1 and SIL 3 according to EN 61800-5-2 to achieve a complete test coverage. Adhere to the following test procedure.



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[1] Maximum 12 months with PL d/SIL 2

Maximum 3 months with PL e/SIL 3

[2] Internal diagnostics

[3] High: No STO

[4] Low: STO active

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- To achieve complete test coverage after a device reset (e.g. after connecting the line voltage), the test transition (STO active → not active) can only be started > 700 ms later. The device signals "ready for operation" or "STO – Safe Torque Off" 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 of the drive unit. If the fault is reset (e.g. by switching the line 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 mentions test procedure must be performed. If the fault occurs again, replace the device or contact the SEW-EURODRIVE Service.

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12.4 Connections variants

12.4.1 General information

Generally, all the connection variants listed in this documentation are permitted for safety-relevant applications as long as the basic safety concept is met. This means you have to make sure that the DC 24 V safety inputs are operated by an external safety relay or a safety controller, in this way preventing an automatic restart.

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 are block diagrams whose only purpose is to show the drive safety function(s) with the relevant components. For reasons of clarity, circuit-related measures that usually 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 installation errors.
- Detecting ground faults or short circuits in externally installed lines.
- Guaranteeing the required interference immunity against electromagnetic interference.

12.4.2 Requirements

Using safety relays

The requirements of the manufacturers of safety relays (such as protecting the output contacts against welding) or of other safety components must be strictly observed. For cable routing, the basic requirements apply as described in this documentation.

For connecting the drive unit with the safety relays, observe the installation requirements in chapter "Functional safety" > "Safety conditions" > "Installation requirements".

All instructions by the manufacturer of the safety relay used in the particular application must be observed.

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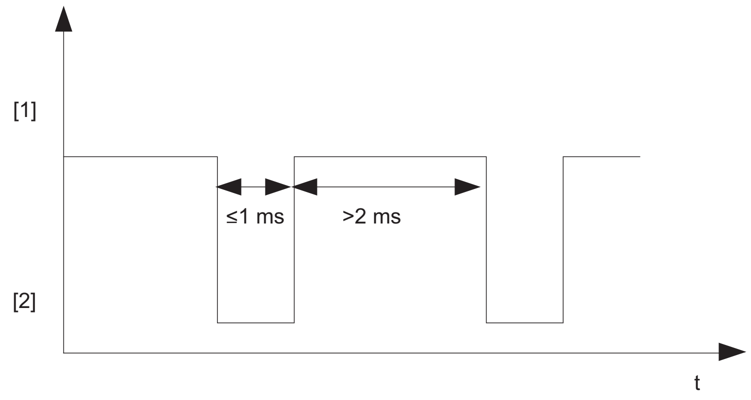
Using safety controllers

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.



15214338827

[1] High

[2] Low

INFORMATION

If the safety-related control voltage plug at the STO input is switched off (STO activated), you must observe chapter "Functional safety" > "Safety conditions" > "Requirements for the external safety controller" with regard to the test pulses.

INFORMATION

If F_STO_P1, F_STO_P2 are connected to DC 24 V, and 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 100 m. 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 electronics cover. 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 cable routing requirements apply.
- A calculation based on the technical data of the electronics cover must be performed separately for each case of STO group disconnection.
- A maximum of 20 drive units must be used in an STO group disconnection.

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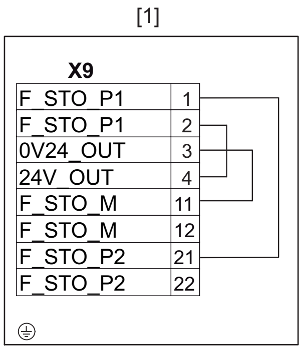
12.4.3 Connection variant 1: Terminal X9 in the connection box

For detailed information on terminal X9, refer to chapter "Electrical Installation" > "Terminal assignment".

Wiring diagrams

Delivery state

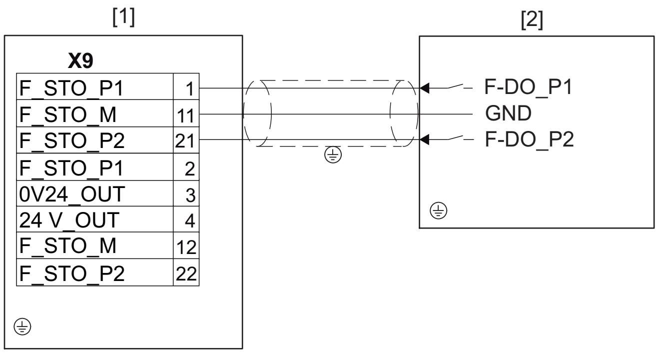
In delivery state, the terminals at the connection for safe disconnection X9 are jumpered. The jumpers are marked with the text "Caution, remove jumper for safety operation". To use the drive unit in safety-related applications, remove the jumpers from the STO terminal X9.



9007222815498379

[1] Drive unit

2-pole sourcing



9007222818851979

[1] Drive unit
[2] External safety device

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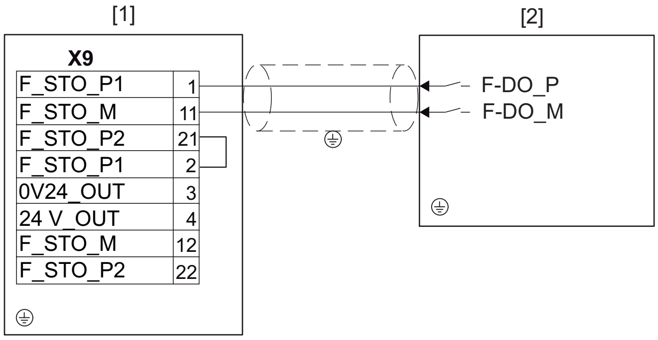
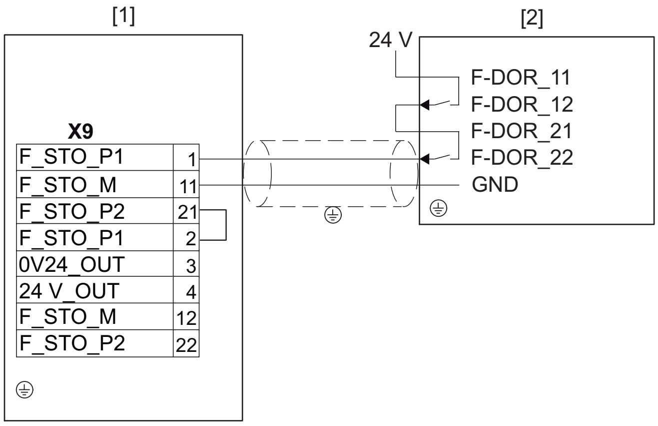
2-pole sourcing/sinking



9007222818872587

[1] Drive unit
[2] External safety device

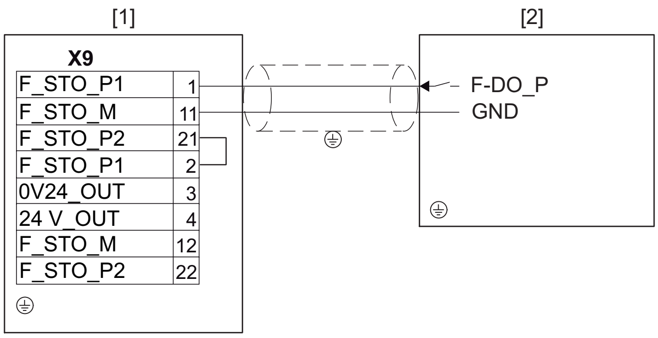
2-pole serial sourcing



9007222818944907

[1] Drive unit
[2] External safety device

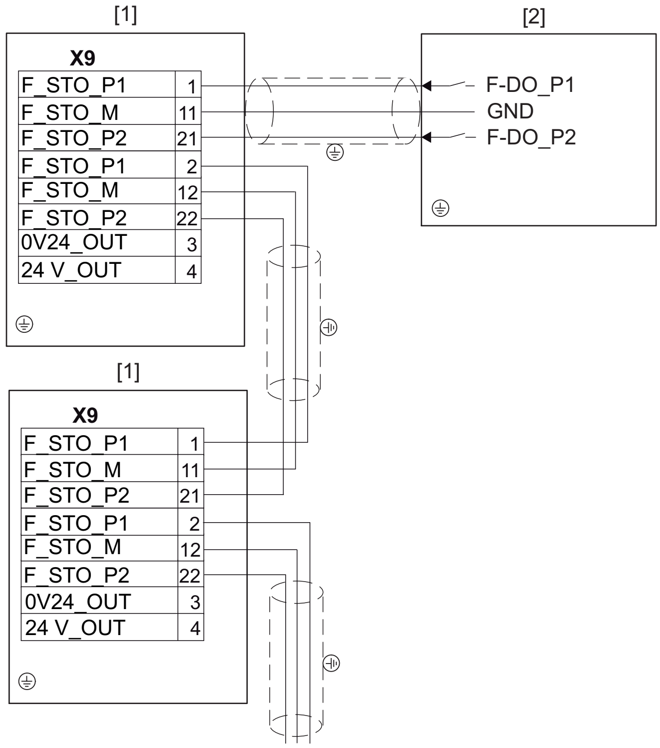
1-pole sourcing



9007222819398155

[1] Drive unit
[2] External safety device

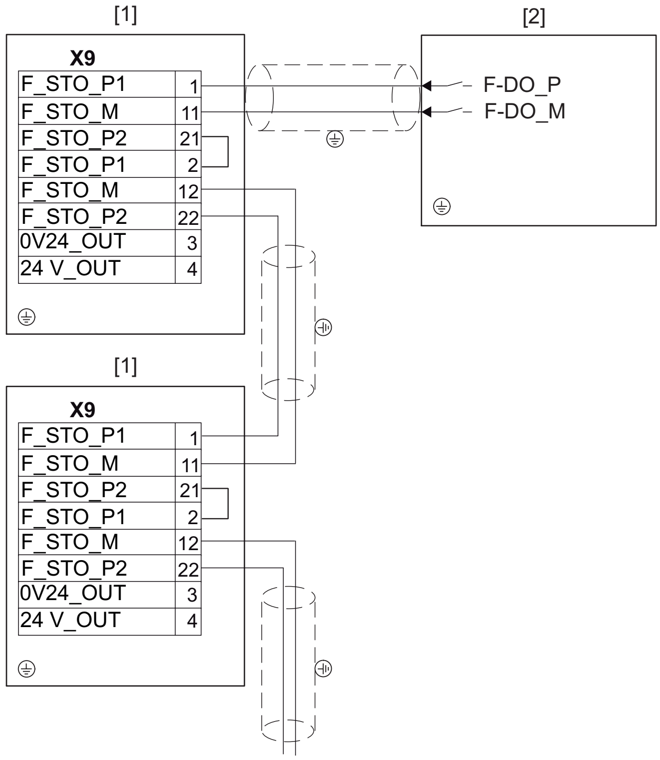
STO group disconnection, 2-pole, sourcing



25228151435

[1] Drive unit
[2] External safety controller

STO group disconnection, 2-pole, sourcing/sinking



25228157067

[1] Drive unit
[2] External safety controller

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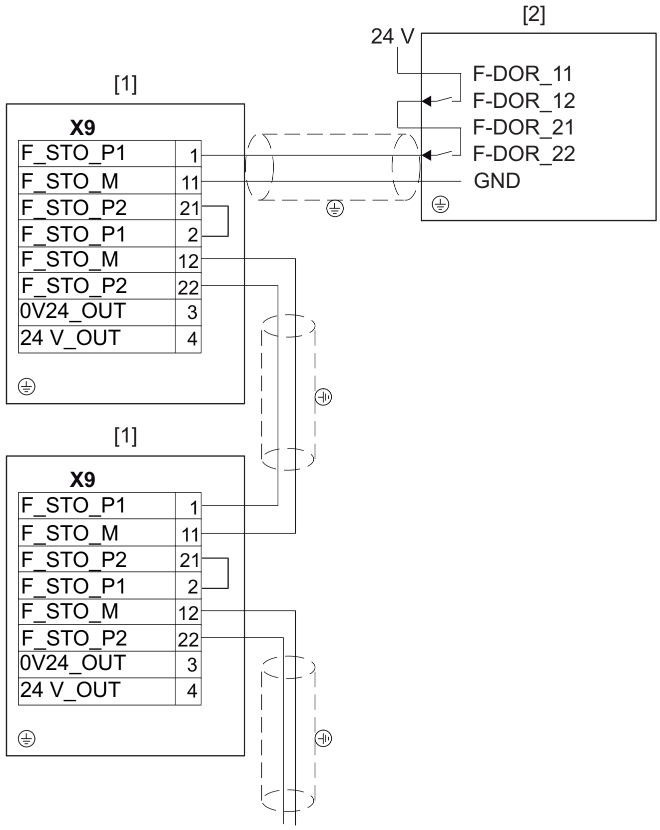
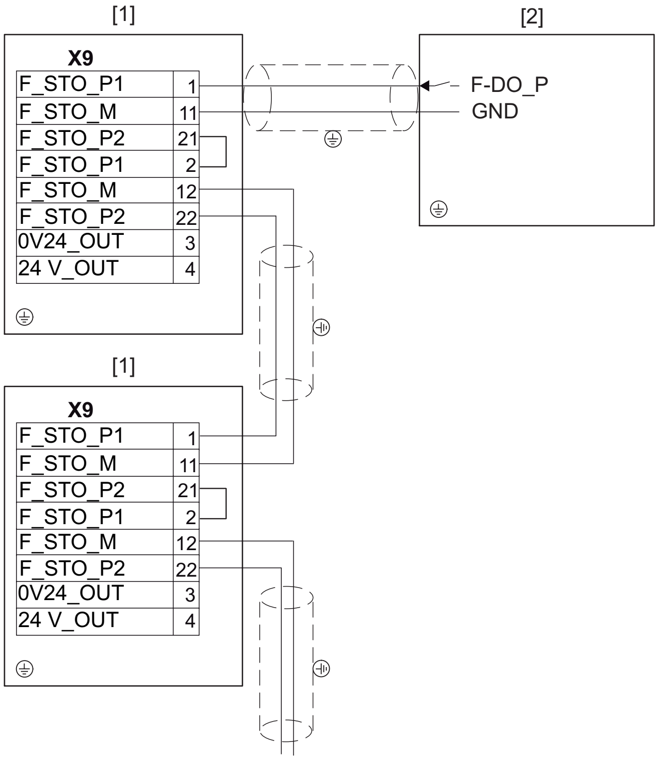
STO group disconnection, 2-pole, serial sourcing



25229441035

[1] Drive unit
[2] External safety controller

STO group disconnection, 1-pole, sourcing



25229445003

[1] Drive unit
[2] External safety controller

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12.4.4 Connection variant 2: M12 plug connector X5504/X5505 at the connection box

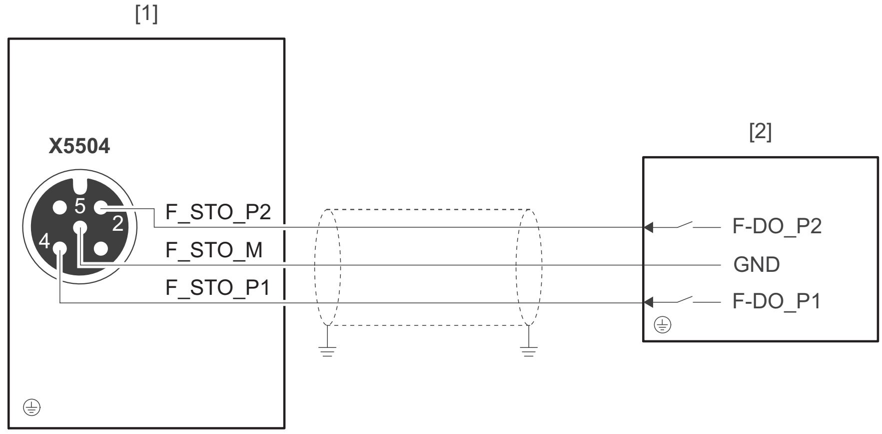
For further information on the connection of X5504/X5505, refer to chapter "Electrical installation" > "Assignment of optional plug connectors".

Wiring diagrams

Delivery state

In the delivery state, plug connector X5504 is not connected, this 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 staring up the unit.

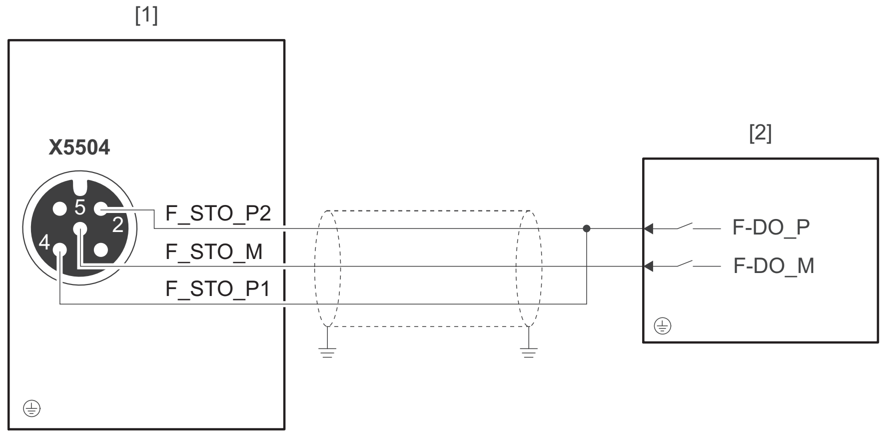
2-pole sourcing



23876274315

[1] Drive unit
[2] External safety device

2-pole sourcing/sinking



23876260491

[1] Drive unit
[2] External safety device

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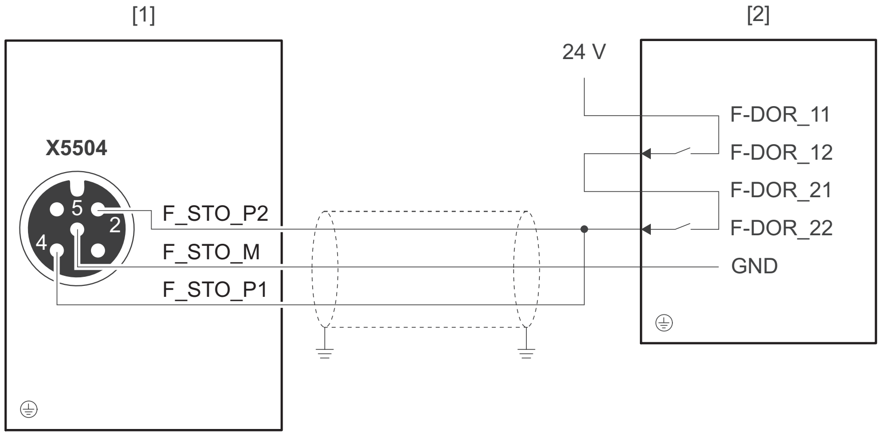
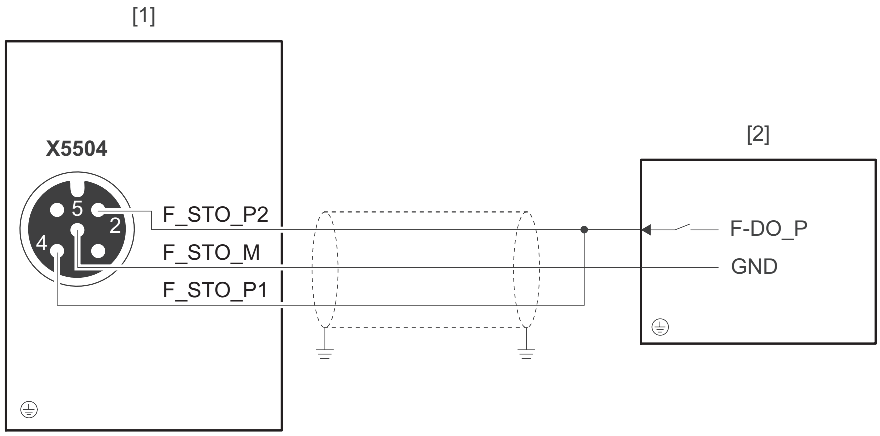
2-pole serial sourcing



23875551243

[1] Drive unit
[2] External safety device

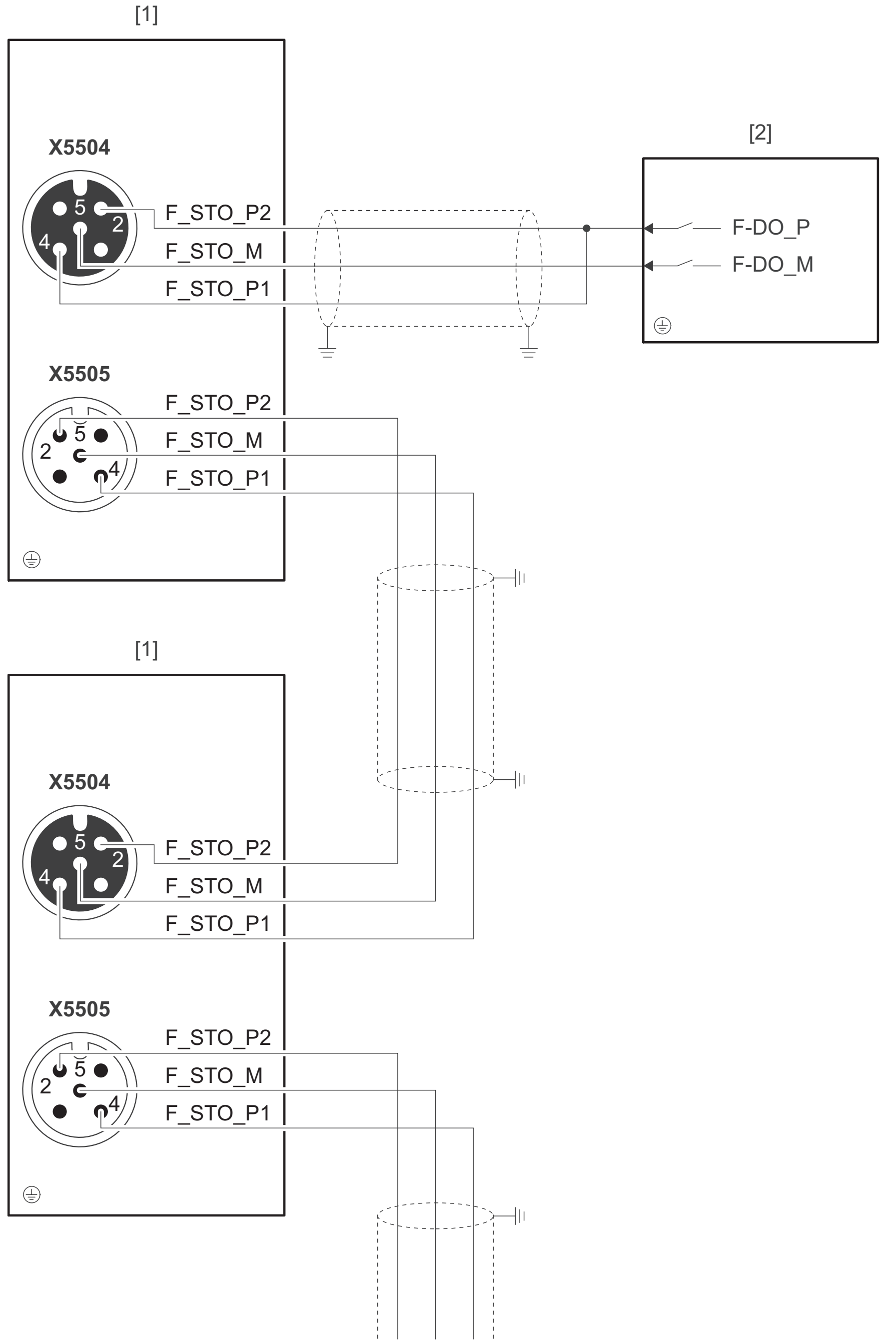
1-pole sourcing



23875545995

[1] Drive unit
[2] External safety device

STO group disconnection, 2-pole, sourcing/sinking



9007223142162187

[1] Drive unit
[2] External safety device

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STO jumper plug

⚠ WARNING

Safe disconnection of the device is not possible when using the STO jumper plug.

Severe or fatal injuries.

- Only use use the STO 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.

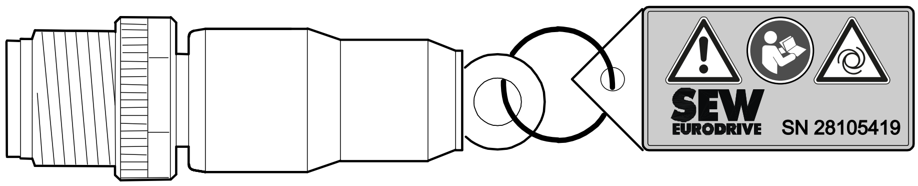
Severe or fatal injuries.

- 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 plug 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

12.5 Safety characteristics

	Characteristic values according to	
	EN 61800-5-2	EN ISO 13849-1
Tested safety class/underlying standards	Safety integrity level 3	Performance level e
Probability of a dangerous failure per hour (PFH 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)	
Drive safety function	STO, SS1[1)] according to EN 61800-5-2	

1) With suitable external control

INFORMATION

With 1-pole wiring, the realizable performance level according to EN ISO 13849 is reduced to PL d. For the wiring between safety relay and STO input, an fault exclusion is necessary.

13 Address list

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Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavík	Tel. +354 585 1070 Fax +354 585)1071 http://www.varmaverk.is vov@vov.is
India			
Registered Office Assembly Sales Service	Vadodara	SEW-EURODRIVE India Private Limited Plot No. 4, GIDC POR Ramangamdi • Vadodara - 391 243 Gujarat	Tel. +91 265 3045200 Fax +91 265 3045300 http://www.seweurodriveindia.com salesvadodara@seweurodriveindia.com
Assembly Sales Service	Chennai	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 saleschennai@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Plant: Plot No. D236/1, Chakan Industrial Area Phase- II, Warale, Tal- Khed, Pune-410501, Maharashtra	Tel. +91 21 35 628700 Fax +91 21 35 628715 salespune@seweurodriveindia.com
Sales Service	Gurgaon	SEW-EURODRIVE India Private Limited Drive Center Gurugram Plot no 395, Phase-IV, UdyogVihar Gurugram , 122016 Haryana	Tel. +91 99588 78855 salesgurgaon@seweurodriveindia.com
Indonesia			
Sales	Medan	PT. Serumpun Indah Lestari Jl.Pulau Solor no. 8, Kawasan Industri Medan II Medan 20252	Tel. +62 61 687 1221 Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041 sil@serumpunindah.com serumpunindah@yahoo.com http://www.serumpunindah.com
	Jakarta	PT. Cahaya Sukses Abadi Komplek Rukan Puri Mutiara Blok A no 99, Sunter Jakarta 14350	Tel. +62 21 65310599 Fax +62 21 65310600 csajkt@cbn.net.id

Indonesia			
	Jakarta	PT. Agrindo Putra Lestari JL.Pantai Indah Selatan, Komplek Sentra Industri Terpadu, Pantai indah Kapuk Tahap III, Blok E No. 27 Jakarta 14470	Tel. +62 21 2921-8899 Fax +62 21 2921-8988 aplindo@indosat.net.id http://www.aplindo.com
	Surabaya	PT. TRIAGRI JAYA ABADI Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11 Surabaya 60111	Tel. +62 31 5990128 Fax +62 31 5962666 sales@triagri.co.id http://www.triagri.co.id
	Surabaya	CV. Multi Mas Jl. Raden Saleh 43A Kav. 18 Surabaya 60174	Tel. +62 31 5458589 Fax +62 31 5317220 sianhwa@sby.centrin.net.id http://www.cvmultimas.com
Ireland			
Sales Service	Dublin	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 http://www.alperton.ie info@alperton.ie
Israel			
Sales	Tel Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly Sales Service	Milan	SEW-EURODRIVE S.a.s. di SEW S.r.l. & Co. Via Bernini,12 20020 Solaro (Milano)	Tel. +39 02 96 980229 Fax +39 02 96 980 999 http://www.sew-eurodrive.it milano@sew-eurodrive.it
Ivory Coast			
Sales	Abidjan	SEW-EURODRIVE SARL Ivory Coast Rue des Pêcheurs, Zone 3 26 BP 916 Abidjan 26	Tel. +225 21 21 81 05 Fax +225 21 25 30 47 info@sew-eurodrive.ci http://www.sew-eurodrive.ci
Japan			
Assembly Sales Service	Iwata	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp
Kazakhstan			
Sales Service	Almaty	SEW-EURODRIVE LLP 291-291A, Tole bi street 050031, Almaty	Tel. +7 (727) 350 5156 Fax +7 (727) 350 5156 http://www.sew-eurodrive.kz sew@sew-eurodrive.kz
	Tashkent	SEW-EURODRIVE LLP Representative office in Uzbekistan 96A, Sharaf Rashidov street, Tashkent, 100084	Tel. +998 71 2359411 Fax +998 71 2359412 http://www.sew-eurodrive.uz sew@sew-eurodrive.uz
	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Fax +976-77109997 imt@imt.mn
Latvia			
Sales	Riga	SIA Alas-Kuul Katlakalna 11C 1073 Riga	Tel. +371 6 7139253 Fax +371 6 7139386 http://www.alas-kuul.lv info@alas-kuul.com
Lebanon			
Sales (Lebanon)	Beirut	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 510 532 Fax +961 1 494 971 ssacar@inco.com.lb

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Lebanon			
Sales (Jordan, Kuwait , Saudi Arabia, Syria)	Beirut	Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 http://www.medrives.com info@medrives.com
Lithuania			
Sales	Alytus	UAB Irseva Statybininku 106C 63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 http://www.irseva.lt irmantas@irseva.lt
Luxembourg			
Representation: Belgium			
Macedonia			
Sales	Skopje	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Malaysia			
Assembly Sales Service	Johor	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Mexico			
Assembly Sales Service	Quéretaro	SEW-EURODRIVE MEXICO S.A. de C.V. SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Quéretaro C.P. 76220 Querétaro, México	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Sales Service	Puebla	SEW-EURODRIVE MEXICO S.A. de C.V. Calzada Zavaleta No. 3922 Piso 2 Local 6 Col. Santa Cruz Buenavista C.P. 72154 Puebla, México	Tel. +52 (222) 221 248 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Mongolia			
Technical Office	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Tel. +976-99070395 Fax +976-77109997 http://imt.mn/ imt@imt.mn
Morocco			
Sales Service Assembly	Bouskoura	SEW-EURODRIVE Morocco SARL Parc Industriel CFCIM, Lot. 55/59 27182 Bouskoura Grand Casablanca	Tel. +212 522 88 85 00 Fax +212 522 88 84 50 http://www.sew-eurodrive.ma sew@sew-eurodrive.ma
Namibia			
Sales	Swakopmund	DB MINING & INDUSTRIAL SUPPLIES CC Einstein Street Strauss Industrial Park Unit1 Swakopmund	Tel. +264 64 462 738 Fax +264 64 462 734 anton@dbminingnam.com
Netherlands			
Assembly Sales Service	Rotterdam	SEW-EURODRIVE B.V. Industrieweg 175 3044 AS Rotterdam Postbus 10085 3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 Service: 0800-SEWHELP http://www.sew-eurodrive.nl info@sew-eurodrive.nl

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New Zealand			
Assembly Sales Service	Auckland	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 30 Lodestar Avenue, Wigram Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Nigeria			
Sales	Lagos	Greenpeg Nig. Ltd Plot 296A, Adeyemo Akapo Str. Omole GRA Ikeja Lagos-Nigeria	Tel. +234-701-821-9200-1 http://www.greenpegltd.com bolaji.adekunle@greenpegltd.com
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	Karachi	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Commercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
Paraguay			
Sales	Fernando de la Mora	SEW-EURODRIVE PARAGUAY S.R.L De la Victoria 112, Esquina nueva Asunción Departamento Central Fernando de la Mora, Barrio Bernardino	Tel. +595 991 519695 Fax +595 21 3285539 sewpy@sew-eurodrive.com.py
Peru			
Assembly Sales Service	Lima	SEW EURODRIVE DEL PERU S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	Makati	P.T. Cerna Corporation 4137 Ponte St., Brgy. Sta. Cruz Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com http://www.ptcerna.com
Poland			
Assembly Sales Service	Łódź	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź	Tel. +48 42 293 00 00 Fax +48 42 293 00 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
	Service	Tel. +48 42 293 0030 Fax +48 42 293 0043	24 Hour Service Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Av. da Fonte Nova, n.º 86 3050-379 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Romania			
Sales Service	Bucharest	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro

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Russia			
Assembly Sales Service	St. Petersburg	ЗАО «СЕВ-ЕВРОДРАЙФ» 188660, Russia, Leningrad Region, Vse-volozhsky District, Korabselki, Aleksandra Nevskogo str. building 4, block 1 P.O. Box 36 195220 St. Petersburg	Tel. +7 812 3332522 / +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru
Senegal			
Sales	Dakar	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 http://www.senemeca.com senemeca@senemeca.sn
Serbia			
Sales	Belgrade	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor 11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.rs
Singapore			
Assembly Sales Service	Singapore	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com
Slovakia			
Sales	Bratislava	SEW-Eurodrive SK s.r.o. Rybničná 40 831 06 Bratislava	Tel.+421 2 33595 202, 217, 201 Fax +421 2 33595 200 http://www.sew-eurodrive.sk sew@sew-eurodrive.sk
	Košice	SEW-Eurodrive SK s.r.o. Slovenská ulica 26 040 01 Košice	Tel. +421 55 671 2245 Fax +421 55 671 2254 Mobile +421 907 671 976 sew@sew-eurodrive.sk
Slovenia			
Sales Service	Celje	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 248-7289 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 bgriffiths@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 48 Prospecton Road Isipingo Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 902 3815 Fax +27 31 902 3826 cdejager@sew.co.za
	Nelspruit	SEW-EURODRIVE (PROPRIETARY) LIMITED 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za

South Korea			
Assembly Sales Service	Ansan	SEW-EURODRIVE KOREA CO., LTD. 7, Dangjaengi-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Zip 425-839	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-eurodrive.kr master.korea@sew-eurodrive.com
	Busan	SEW-EURODRIVE KOREA CO., LTD. 28, Noksansandan 262-ro 50beon-gil, Gangseo-gu, Busan, Zip 618-820	Tel. +82 51 832-0204 Fax +82 51 832-0230
Spain			
Assembly Sales Service	Bilbao	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Sri Lanka			
Sales	Colombo	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
Swaziland			
Sales	Manzini	C G Trading Co. (Pty) Ltd Simunye street Matsapha, Manzini	Tel. +268 7602 0790 Fax +268 2 518 5033 charles@cgtrading.co.sz www.cgtradingswaziland.com
Sweden			
Assembly Sales Service	Jönköping	SEW-EURODRIVE AB Gnejsvägen 6-8 553 03 Jönköping Box 3100 S-550 03 Jönköping	Tel. +46 36 34 42 00 Fax +46 36 34 42 80 http://www.sew-eurodrive.se jonkoping@sew.se
Switzerland			
Assembly Sales Service	Basel	Alfred lmhof A.G. Jurastrasse 10 4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
Taiwan			
Sales	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Huw S. Road Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
	Nan Tou	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 49 255353 Fax +886 49 257878 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
Tanzania			
Sales	Daressalam	SEW-EURODRIVE PTY LIMITED TANZANIA Plot 52, Regent Estate PO Box 106274 Dar Es Salaam	Tel. +255 0 22 277 5780 Fax +255 0 22 277 5788 http://www.sew-eurodrive.co.tz info@sew.co.tz
Thailand			
Assembly Sales Service	Chonburi	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Tunisia			
Sales	Tunis	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn

Turkey			
Assembly Sales Service	Kocaeli-Gebze	SEW-EURODRİVE Hareket Sistemleri San. Ve TIC. Ltd. Sti Gebze Organize Sanayi Böl. 400 Sok No. 401 41480 Gebze Kocaeli	Tel. +90 262 9991000 04 Fax +90 262 9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
Ukraine			
Assembly Sales Service	Dnipropetrovsk	SEW-EURODRIVE, LLC Robochya str., bld. 23-B, office 409 49008 Dnipro	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua
United Arab Emirates			
Drive Technology Center	Dubai	SEW-EURODRIVE FZE PO Box 263835 Jebel Ali Free Zone – South, P.O. Box Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 info@sew-eurodrive.ae
Uruguay			
Assembly Sales	Montevideo	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esqina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-90 sewuy@sew-eurodrive.com.uy
USA			
Production Assembly Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Production +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Wellford	SEW-EURODRIVE INC. 148/150 Finch Rd. Wellford, S.C. 29385	Tel. +1 864 439-7537 Fax +1 864 661 1167 IGOrders@seweurodrive.com
	Additional addresses for service provided on request!		
Vietnam			
Sales	Ho Chi Minh City	SEW-EURODRIVE PTE. LTD. RO at Hochiminh City Floor 8, KV I, Loyal building, 151-151 Bis Vo Thi Sau street, ward 6, District 3, Ho Chi Minh City, Vietnam	Tel. +84 937 299 700 huytam.phan@sew-eurodrive.com
	Hanoi	MICO LTD Quảng Trị - North Vietnam / All sectors except Construction Materials 8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam	Tel. +84 4 39386666 Fax +84 4 3938 6888 nam_ph@micogroup.com.vn http://www.micogroup.com.vn
Zambia			
Representation: South Africa			

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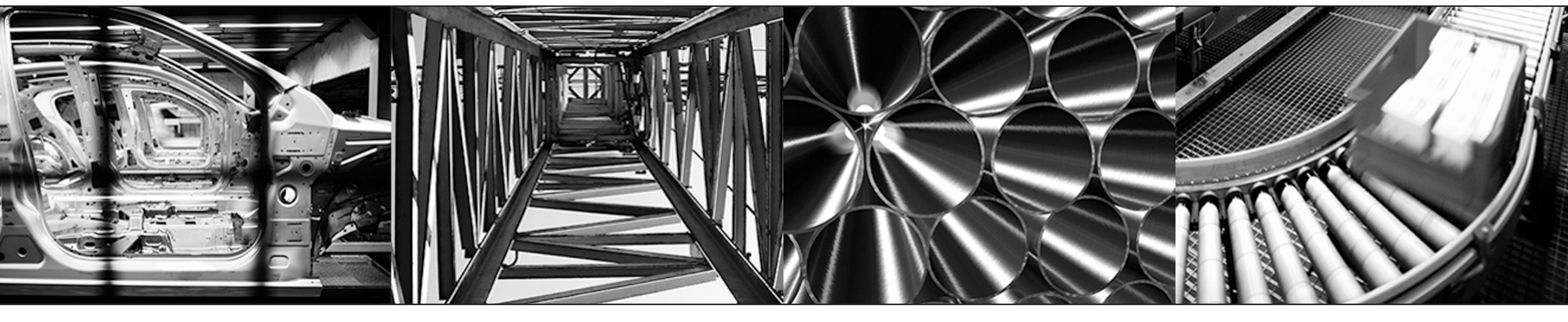

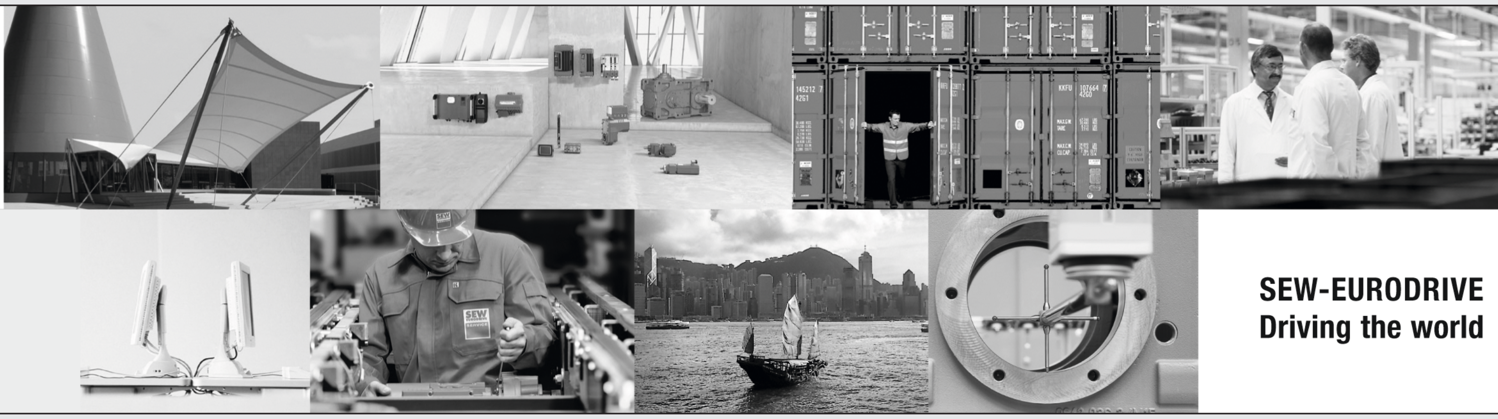

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