



SEW
EURODRIVE

Operating instructions



PxG[®] integrated series precision planetary gearmotors

PxG[®] CM3G.. series



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1 General information

1.1 Structure of the safety notes

1.1.1 Meaning of signal words

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

Signal word	Meaning	Consequences if not observed
▲ DANGER	Imminent danger	Death or severe injuries
▲ WARNING	Possibly dangerous situation	Death or severe injuries
▲ CAUTION	Possibly dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment

1.1.2 Structure of section-related safety notes

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

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



SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

1.1.3 Meaning of the hazard symbols

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

Hazard symbol	Meaning
	General hazard
	No access for persons with pacemakers or implanted defibrillators.
	Warning of hot surfaces
	Warning of automatic startup

1.1.4 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

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

1.2 Decimal separator in numerical values

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

Example: 30.5 kg

1.3 Rights to claim under limited warranty

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

1.4 Recycling, reprocessing, reuse

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

1.5 Product names and trademarks

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

1.6 Copyright notice

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1.7 Further documentation

Also refer to the following documents:

- Addendum to the operating instructions "Safety encoders and safety brakes – CMP.., CMPZ.., CM3C.., ECM3C.., CM3P.., CM3G.. – Functional safety"
- "CM3.., ECM3C.., CMP(Z).., CMSB.., CFM.., DRC.. synchronous servomotors - project planning for BK.., BKB.., BP.., BR.., BY.., BZ.. brakes" product manual

2 Safety notes

2.1 Preliminary information

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

2.2 Duties of the user

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

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

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

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

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

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

2.3 Target group

Specialist for mechanical work	Any mechanical work may be performed only by adequately qualified specialists. Specialists in the context of this documentation are persons who are familiar with the design, mechanical installation, troubleshooting, and maintenance of the product, and who possess the following qualifications: • Qualifications in the field of mechanics in accordance with the national regulations • Familiarity with this documentation
Specialist for electrotechnical work	Any electrotechnical work may be performed only by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons who are familiar with electrical installation, startup, troubleshooting, and maintenance of the product, and who possess the following qualifications: • Qualifications in the field of electrical engineering in accordance with the national regulations • Familiarity with this documentation
Additional qualifications	In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation. The persons must have the express authorization of the company to operate, program, parameterize, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.
Instructed persons	All work in the areas of transport, storage, installation, operation and waste disposal may only be carried out by persons who are trained and instructed appropriately. These instructions must enable the persons to carry out the required activities and work steps safely and in accordance with regulations.

2.4 Designated use

The product is intended for use in industrial and commercial systems.

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

Gearmotors of this series are designated to be installed in electrical systems or machines.

In the 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).

For the technical data, refer to the nameplate and 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.

2.4.1 Restrictions of use

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

- Use in potentially explosive areas
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation

For installation altitudes over 1000 m above sea level, please contact the SEW-EURODRIVE Service.

Synchronous servomotors in design without encoder and with the **ELSM®** control mode **must not be used in lifting applications**. This control mode is permitted only for applications of horizontal materials handling.

2.5 Functional safety technology

The product is not permitted to perform any safety function without higher-level safety systems.

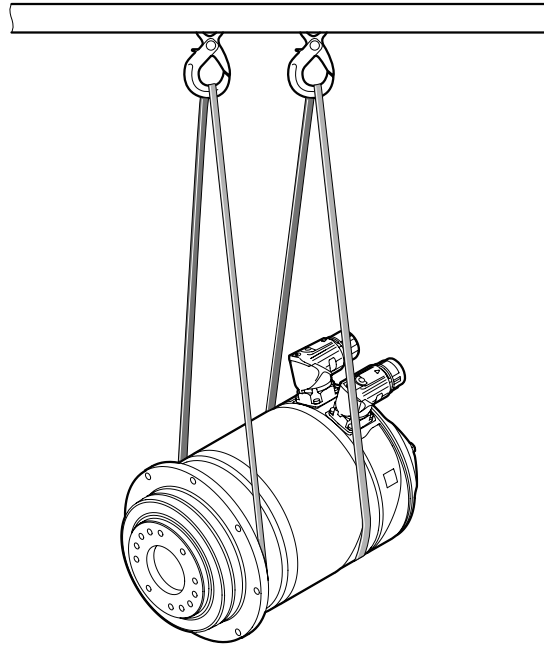
Functionally safe motor options that enable the implementation of safety sub-functions can optionally be installed on the product.

When using the safety subfunctions, refer to the relevant documentation.

2.6 Transportation/storage

Observe the following notes when transporting the device:

- 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.
- In case the product is not installed right away, store it horizontally, dry, dust-free and indoors at a storage temperature between -10 °C and +40 °C. The product can be stored for up to 24 months without requiring any special measures before startup. In case of storage period longer than 24 months, contact SEW-EURODRIVE.
- Note that retaining straps attached to the products might be under tension. To avoid cutting injuries, remove the retaining straps carefully from the product and wear suitable protective clothing, if necessary.
- If the product weighs more than 20 kg, use lifting equipment for transporting, e.g. straps. You can find the mass on the nameplate of the product.



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- Note the hazard from suspended loads. Do not stand under suspended loads. Secure the area where suspended loads can fall down. Secure loads using suitable holding fixtures (e.g. belts) before lifting them.
- Sudden impacts, e.g. due to falling or sudden lowering of the product can cause damages to the product. Only use lifting equipment and load handling devices with a sufficient load capacity. Adhere to the permitted load of the lifting equipment. Lower the product carefully.
- Adhere to DIN 580 for using lifting devices. The tension force vector of the slings must not exceed a 45° angle.
- If necessary, use suitable, adequately dimensioned transport aids.
- Do not transport or store the product resting on the encoder cover or on the connectors.
- Do not use the connectors to hang up the product.
- The open keyway has sharp edges. Insert the key in the keyway and pull a protective tubing over the shaft.

2.7 Creating a safe working environment

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

2.7.1 Performing work on the product safely

Defective or damaged product

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

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

Use of hazardous substances, lubricants, adhesives

Observe the following information to avoid poisoning or fire hazards:

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

Hot surfaces

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

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

Falling load

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

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

Rotating parts

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

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

Sharp edges

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

- Wear safety gloves.

Missing protective equipment

To avoid injuries, wear the appropriate protective equipment during all work on the product:

- Wear safety gloves.
- Wear safety shoes.
- Wear protective goggles.

2.7.2 Performing electrical work safely

Observe the following information to perform electrical work safely:

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

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

Live parts

Always adhere to the 5 safety rules for all work on electrical components:

1. Disconnect.
2. Secure the device against a restart.
3. Check that no voltage is applied.
4. Ground and short-circuit.
5. Cover or isolate neighboring live parts.

Depending on the situation, it is possible to deviate from rules 4 and 5. Observe standard EN 50110-1.

Dangerous voltage

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

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

Danger due to electric arc

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

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

Dangerous voltage due to charged energy storage units

Products with a connected energy storage unit are not de-energized even when they have been disconnected from the supply system. Observe the following information:

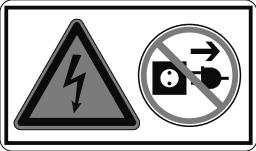
- Before performing any electrical work, and after disconnecting the supply voltage, energy storage units must be discharged using a discharge unit.
- Observe the following waiting period after disconnecting the supply voltage and before performing any electrical work: **10 minutes**.
- Ensure that the unit is de-energized.
- Also observe the labels and hazard symbols on the product.

2.8 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.
- If you remove mechanical strained or heavy components, secure the construction to prevent injuries.

2.9 Warning notes on the planetary gearmotor

Observe the warning notes attached to the device. The following warning notes can be found on the device:

Safety note	Meaning
	Risk of electric shock – connect or disconnect the connector only in de-energized state and with the motor at a standstill.
	It is essential that you observe the correct polarity of the brake supply. Check the polarity when replacing the brake.
	Warning of hot surfaces.

The attached safety notes can become dirty or illegible over time. Always make sure that safety and operating notes are legible. Replace damaged labels.

2.10 Electrical installation

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

2.10.1 Electrical connection

The connection must be a permanently secure electrical connection (no protruding wire ends). Use the corresponding cable end equipment. Establish a safe protective earth connection. When the motor is connected, the distances to non-insulated and live parts must not be shorter than the minimum values according to IEC 60664 and to national regulations. With low voltage, the distances should be no shorter than the following values, in compliance with IEC 60664:

Nominal voltage V_N	Distance
$\leq 500 \text{ V}$	3 mm
$\leq 690 \text{ V}$	5.5 mm

2.10.2 Regenerative operation

The movement of the output element (e.g. coasting) generates a voltage at the live product parts of the motor connection. Observe the following information to avoid an electric shock:

- Do not touch open live components (e.g. male contacts of the connector).
- Secure all open live components with a touch guard.
- Secure the output shaft against rotation when working without touch guard.

2.11 Startup/operation

Do not deactivate monitoring and protection devices even for a test run.

In the event of deviations from normal operation, switch off the product. Possible deviations are increased temperatures, noise, or vibration, for example. Determine the cause. Contact SEW-EURODRIVE if necessary.

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

Observe the safety notes in chapters "Startup" (→  54) and "Operation" (→  56) in this documentation.

2.12 Magnetic fields

The rotor of the motor is equipped with permanent magnets. The magnets emit strong magnetic fields, even when no current is supplied. If permanent magnets are exposed, e.g. in case of removed rotor, health hazards may arise. This especially applies to persons with active medical implants.

In addition, exposed permanent magnets exert strong attraction forces on magnetizable materials such as other motor components or tools. The attraction of other objects can cause severe injuries by crushing.

During operation, additional electromagnetic fields are generated.

Observe DGUV (German Social Accident Insurance) regulation 15 – "Electromagnetic fields" for use in industrial workplaces. The relevant national and local provisions and regulations apply in other countries.

3 Device structure

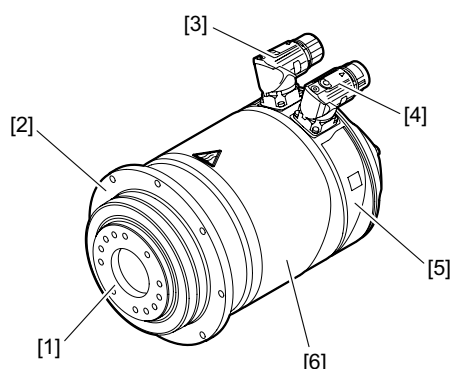
3.1 Basic structure

The PxG® integrated planetary gearmotor consists of a planetary gear unit and a synchronous motor with 1 or 2 connectors.

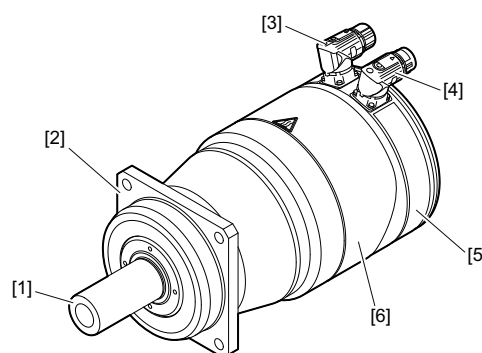
The gear units are single- or multi-stage precision planetary gear units with low backlash. They can be used in all mounting positions. The gear units are lubricated for life, which makes them low-maintenance.

The following figures show examples of the PxG® integrated planetary gearmotor:

PxG® integrated
with flange block shaft



PxG® integrated
with solid shaft



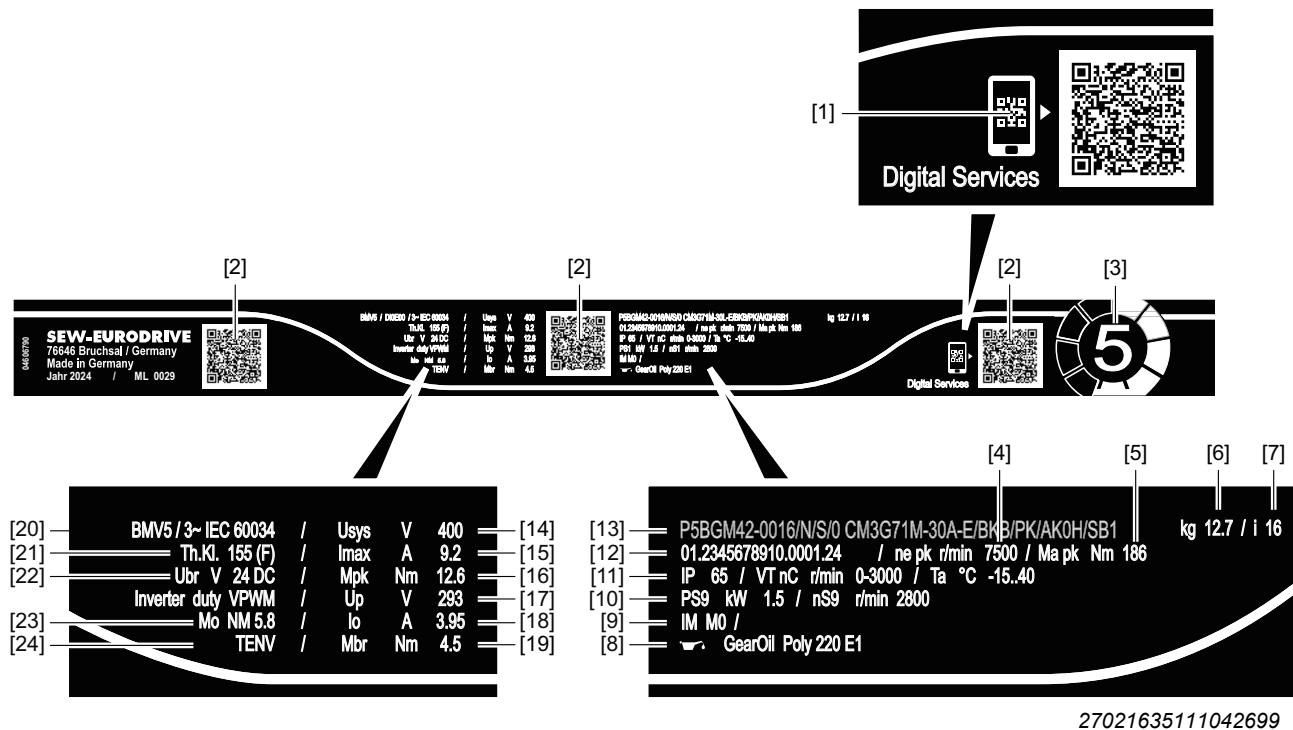
- | | |
|--|----------------------|
| [1] Output shaft (flange block shaft, solid shaft) | [4] Power connector |
| [2] Gear unit flange | [5] Nameplate (tape) |
| [3] Signal connector | [6] Motor housing |

The dots in product designations are placeholders for letters and/or numbers. One dot represents one letter or one number, two dots represent two or more letters or numbers.

3.2 Nameplate and type designation

3.2.1 Nameplate

The following figure shows an example of a nameplate:

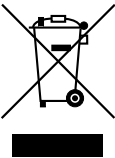


[1]	• Digital Services
[2]	• Data matrix code
[3]	• Performance class
[4]	• Maximum input speed
[5]	• Maximum permitted output torque for continuous duty
[6]	• Mass
[7]	• Gear ratio
[8]	• Lubricant
[9]	• Mounting position
[10]	• Rated power for operation with non-periodic load and speed changes (operating mode S9 according to IEC 60034-1) • Rated speed for operation with non-periodic load and speed changes (operating mode S9 according to IEC 60034-1)
[11]	• Degree of protection according to IEC/EN 60034-5 • Variable torque • Ambient temperature
[12]	• Serial number
[13]	• Type designation
[14]	• System voltage, voltage of the supplying inverter
[15]	• Maximum permitted current

[16]	• Dynamic limit torque of the motor
[17]	• Voltage at the open terminals of the motor at rated speed
[18]	• Standstill current
[19]	• Nominal braking torque
[20]	• Brake control • 3-phase supply
[21]	• Thermal class
[22]	• Brake voltage
[23]	• Standstill torque
[24]	• TENV (Totally Enclosed Non-Ventilated)

Identifier on the nameplate

The following table shows an example of the markings on the nameplate.

	CE marking to state compliance with European directives (see EU declaration of conformity or EU declaration of incorporation).
	UR mark to confirm that UL (Underwriters Laboratory) is informed about the registered components; register number by UL: E189357
	FS logo with 2-digit number for identification of installed functional safety motor options.
	Products and accessories may fall within the scope of the country-specific transposition of the WEEE Directive. Dispose of the product and its accessories in accordance with the national regulations of your country.
	Product label with QR code. The QR code on the product can be scanned. You will be redirected to the digital services of SEW-EURODRIVE. There, you have access to product-specific data, documents, and further services. Additional information is available in the "Documentation" > "Data and documents" area.

3.2.2 Type designation

The following table shows an example of a type designation:

P5BGM42-0016/N/S/0 CM3G71M-30A-E/BKB/PK/AK0H/SB1	
P	Gear unit type
5	Performance class
B	Shaft design
GM	Gear unit design
4	Gear unit size
2	Number of stages
0016	Gear ratio
N	Rotational clearance
S	Lubricant
0	Standard design
CM3G	Motor series
71	Motor size
M	Motor length
30	Speed class
A	System voltage
E	Shaft with push-in pinion
BKB	Brake
PK	Temperature sensor
AK0H	Encoder
SB1	Connection variant

3.2.3 Serial number

The following table shows the structure of a serial number:

Example: 01.0123456789.0001.25	
01.	Sales organization
01234567	Order number (8 digits)
89.	Order item (2 digits)
0001	Quantity (4-digit)
25	End digits of the year of manufacture (2 digits)

3.3 Designs and options

3.3.1 Gear units

Designation	
P	Precision planetary gear unit
5, 6, 7	Performance class: 5 = For high dynamics 6 = For high average speeds 7 = For high torques
N, B, C, K, V	Shaft design: N = Smooth solid shaft B = Flange block (without index bore) C = Flange block (with index bore) K = Solid shaft with keyway V = Splined solid shaft
GM	Planetary gearmotor
2, 3, 4, 5	Size
1, 2, 3	Number of stages
0004 ... 0220	Gear ratio: 0004: i = 4 0005: i = 5 ... 027x: i = 27.5 ... 0220: i = 220 0000: i = Special gear ratio
N, R, X	Rotational clearance: N = Standard R = Reduced X = Special rotational clearance
S, F, G, H, X	Lubricants: S = Synthetic oil – GearOil by SEW-EURODRIVE Poly E1 F = Food-grade lubricant oil – GearOil by SEW-EURODRIVE Poly H1 G = Synthetic grease H = Food-grade lubricant (grease) X = Special lubricant
0, X	Customer-specific: 0 = Standard X = Special design

3.3.2 Synchronous servomotors

Designation	Description
CM3G..	CM3G.. series (Dynamics, direct mounting)
63, 71, 80, 100	Sizes
S, M	Lengths
-30, -60	Speed classes: -30 = 3000 min ⁻¹ -60 = 6000 min ⁻¹
A, L	System voltage: A = AC 400 V L = DC 48 V
-E	Shaft design: -E = Shaft with push-in pinion

3.3.3 Brakes

Designation	Description
/BKB	Permanent-magnet holding brake

3.3.4 Temperature sensor/temperature detection

Designation	Description
/PK	Temperature sensor Pt1000 in winding

3.3.5 Encoder

Designation	Description	Capability class
–	Without encoder	–
/RH1M	Single-turn encoder, resolver (standard)	Medium Class
/EZ2Z	Single-turn encoder, MOVILINK® DDI	Medium Class
/AZ2Z	Multi-turn encoder, MOVILINK® DDI	Medium Class
/EZ4Z	Single-turn encoder, MOVILINK® DDI	High Class
/AZ4Z	Multi-turn encoder, MOVILINK® DDI	High Class
/EK0Z ¹⁾	Single-turn encoder, MOVILINK® DDI	High class
/AK0Z ¹⁾	Multi-turn encoder, MOVILINK® DDI	High class
/EK0H ²⁾	Single-turn encoder, HIPERFACE®	High class
/AK0H ²⁾	Multi-turn encoder, HIPERFACE®	High class
/EK0J ³⁾	Single-turn encoder, HIPERFACE DSL®	High class
/AK0J ³⁾	Multi-turn encoder, HIPERFACE DSL®	High class
/EH1E ²⁾	Single-turn encoder, EnDat 2.2	High class
/AH1E ²⁾	Multi-turn encoder, EnDat 2.2	High class
/EH4F ²⁾	Single-turn encoder, EnDat 3	High class
/AH4F ²⁾	Multi-turn encoder, EnDat 3	High class
/AH1Q ²⁾	Multi-turn encoder, DRIVE-CLiQ	High class

1) Always designed as a safety encoder.

2) Optionally available as a safety encoder.

3) On request (optionally as a safety encoder).

3.3.6 Connection variants

Designation	Description
/SH1	Hybrid connector for M23 motor/brakemotor for encoderless design Connector on the motor side
/SD1	M23 motor/brakemotor hybrid connector (motor, brake, communication) for MOVILINK® DDI Connector on the motor side
/SJ1	M23 motor/brakemotor hybrid connector (power and data) for HIPERFACE® DSL Connector on the motor side
/SE1	M23 motor/brakemotor hybrid connector (power and data) for EnDat 2.2 Connector on the motor side
/SF1	M23 hybrid connector motor/brakemotor (power and data) for EnDat 3, for DC 24 V brakes using two-wire technology Connector on the motor side
/SF4	M23 hybrid connector motor/brakemotor (power and data) for EnDat 2.2 Connector on the motor side
/SM1	Connector for M23 motor Connector on the motor side, plug-in motor and encoder cable
/SB1	Connector for M23 brakemotor Connector on the motor side, plug-in motor and encoder cable
/SQ1	M23 motor/brakemotor connector and M23 DRIVE-CLiQ signal connector Connector on the motor side, plug-in motor and encoder cable

4 Mechanical installation

4.1 Before you start



⚠ WARNING

Magnetic fields can have an impact on the function of pacemakers and other active medical implants.

Health risk.

- ✓ The product has permanent magnets that generate a magnetic field, even when no current is supplied. During operation, additional electromagnetic fields are generated.
- If you have a pacemaker or any other active medical implant, keep a distance > 500 mm between the body part with the active medical implant and the motor.
- Inform people with active medical implants about the dangers.

Observe the following points before installing the device:

- The information on the nameplate must match the requirements (of the application).
- The information on the drive's nameplate must match the output voltage of the inverter.
- The drive is undamaged (no damage caused by transportation or storage).
- All transport protection has been removed.
- You have ensured that there are no oils, acids, gases, vapors, radiation, etc. present.
- Make sure that no foreign objects impair the function of the device.
- Make sure that the nameplate is legible after assembly.
- Ambient temperature is as specified on the nameplate.

Note that the temperature range of the mounted gear unit might also be restricted (see operating instructions of the gear unit).

- Ensure that work is carried out by trained specialists only.
- When the drive is installed in abrasive ambient conditions, protect the output end oil seals against wear.
- Protect the components from mechanical damage.
- For flange mounting, use the screws and tightening torques specified under "Screw sizes and tightening torques for flange mounting".
- Thoroughly clean the output shafts and the flange surfaces and make sure that they are free from anti-corrosion agent, dirt or the like. Do not use compressed air. Use a mild commercially available solvent. Do not expose the sealing lips of the oil seals to the solvent.
- Align the device and driven machine carefully so that the output shaft is not subjected to impermissible load. Observe the permitted overhung and axial loads.
- Do not jolt or hammer the shaft end.
- Only install or remove belt pulleys and couplings using suitable devices and cover them with a touch guard. Avoid impermissible belt tension. Observe the admitted overhung loads due to the belt tension.
- Make sure that the customer's counter-bearing is unobstructed and can move freely.

- Protect the device against icing.
- Avoid condensation due to cold air. Condensed water in the gear unit can cause damage.
- Ensure that the cooling air supply to the gearmotor is unobstructed.
- Make sure that no warm exhaust air from other devices is drawn in.
- If parts need to be mounted subsequently on the shaft, balance them only with a half key.
- Check that the direction of rotation is correct in decoupled state.
- Cover the moving drive and output elements with a touch guard.

The specifications listed above refer to the standard designs. The requirements for special designs might vary from the standard. Refer to the order confirmation for deviating conditions. Make sure that the drive is designed according to the ambient conditions.

4.2 Required tools and aids

You require the following tools and resources for mechanical installation:

- Set of wrenches
- Set of Allen wrenches
- Torque wrench
- Mounting device (recommended)
- Compensation elements (washers, spacing rings), if necessary
- Fasteners for input and output elements
- Sealant (e.g. Loctite® 573 or 574)
- Thread locking compound (e.g. Loctite® 243)

4.3 Tolerances during assembly work

Shaft ends – geometric tolerances

Solid shaft	ISO k6
Flange block	ISO h7/H7

Centering shoulder of the flanges – geometric tolerances

Solid shaft	ISO g7
Flange block	ISO h7

4.4 Centering bores

Ø	> 13 – 16 mm	M5	Ø	> 30 – 38 mm	M12
Ø	> 16 – 21 mm	M6	Ø	> 38 – 50 mm	M16
Ø	> 21 – 24 mm	M8	Ø	> 50 – 85 mm	M20

Ø	> 24 – 30 mm	M10	
Ø	Shaft diameter for solid shaft option		

4.5 Installation in damp locations or in the open

Observe the following points when operating the unit in damp rooms or outdoors:

- If possible, arrange the motor and encoder connection in such a way that the connector cables are not pointing upwards.
- Clean the sealing surfaces of the connectors (motor or encoder connection) before reassembly.
- Replace embrittled seals.
- Check the required degree of protection.
- To prevent additional heat from entering the product due to direct sunlight, install a corresponding protection device, such as a cover or canopy.

The protection device must not cause heat build-up.

4.6 Mounting the gearmotor on or in the machine

4.6.1 Requirements for mounting

Gear unit/motor combination

Depending on the gear unit ratio and the size combination of motor and gear unit, the motor could damage the gear unit at high speeds or torques. Observe the permitted data on the nameplate.

Customer's construction

The customer construction must have the following characteristics:

- Evenness
- Vibration damping
- Torsionally rigid

The maximum permitted flatness defect applies for flange mounting (guide values with reference to DIN ISO 1101):

- Gear unit size P..GM2 – 5: Max. 0.2 mm

Corrosion protection

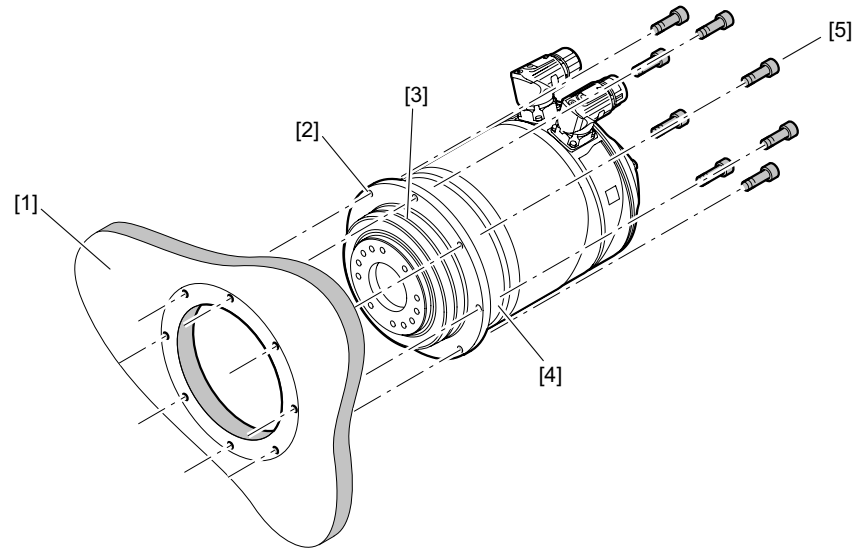
Electrochemical corrosion occurs between various metals, for example, cast iron and stainless steel. If there is a risk of electrochemical corrosion, use 2 to 3 mm thick plastic inserts between the gear unit and the driven machine. The material used must have an electrical leakage resistance $< 10^9 \Omega$. If necessary, insert the screws with plastic washers.

Threadlocker

Coat the retaining screws with a thread locking compound, e.g. Loctite® 243. Observe the safety and processing notes of the used thread locking compound.

4.6.2 Mounting on the output side

Mount the gearmotor to the machine as shown in the following figure:



18014436622200843

- [1] Output design flange block shaft
Customer's construction with threaded bores or through bores
- [2] Mounting bores
- [3] Centering collar at the output end
- [4] Gear unit housing
- [5] Retaining screws

✓ Observe the information in "Requirements for mounting" (→ 26).

✓ **⚠ WARNING!**

Risk of injury if the drive starts up unintentionally. Severe or fatal injuries. Disconnect the drive from the power supply before starting work. Prevent the drive from starting up unintentionally, for example by locking the key switch or removing the fuses from the current supply. Set up a sign to indicate that the drive must not be switched on.

1. **⚠ CAUTION!** Overload of the gear unit due to insufficient centering in the customer construction. Destruction of the gear unit.
Center the gear unit with as little play as possible in the customer construction.
2. Coat the retaining screws [5] with a thread locking compound, e.g. Loctite® 243.
3. Mount the gear unit to the customer's construction [1] using the mounting bores [2]. Using through bores and nuts is also permitted as an alternative to direct screw connections with tapped holes.
4. Tighten the retaining screws [5] evenly with increasing torque in several steps using a suitable tool. Suitable tools are signal-generating torque wrenches or motorized screwdrivers with dynamic torque detection. Use screws with strength class 12.9 and tightening torques in accordance with the information in "Screw sizes and tightening torques for flange mounting" (→ 27).

4.6.3 Screw sizes and tightening torques for flange mounting

Use the screw sizes and tightening torques specified in the table for flange mounting the gearmotor.

Type designation	Size	Mounting bore Number of screws × Ø mm	Screw ¹⁾ DIN EN ISO 4762	Tightening torque Nm
P5NG.., P6NG.. P5KG.., P6KG.. P5VG.., P6VG..	2	4 × 5.5	M5	8.3
	3	4 × 6.6	M6	14
	4	4 × 9	M8	35
	5	4 × 11	M10	68
P5BG.., P6BG.. P5CG.., P6CG..	2	8 × 4.5	M4	4.2
	3	8 × 5.5	M5	8.3
	4	8 × 5.5	M5	8.3
	5	12 × 6.6	M6	14
P7BG..	2	16 × 4.5	M4	4.2
	3	16 × 5.5	M5	8.3
	4	16 × 5.5	M5	8.3
	5	24 × 6.6	M6	14

1) Strength class 12.9

The information refers to standard designs. The requirements for special designs might vary from the standard. Refer to the order confirmation for deviating conditions.

All values are calculated in accordance with VDI2230 and based on the following conditions:

The friction coefficient for threads of strength class 12.9 is $\mu = 0.09$ (in accordance with VDI 235-101). The capacity utilization is 90% of the elastic limit, and signal-generating torque wrenches or motorized screwdrivers with dynamic torque measurement are used as tools.

4.7 Mounting the output elements on the solid shaft

4.7.1 Maximum permitted static axial forces at the output shaft

The following table lists the maximum permitted static axial forces $F_{A_stat_max}$ (axial forces at standstill), that may not be exceeded when a mount-on component is pushed or shrunk onto the output shaft. The values apply to a shaft unaffected by any radial loads ($F_R = 0$).

For the respective bearing type, refer to the order documents.

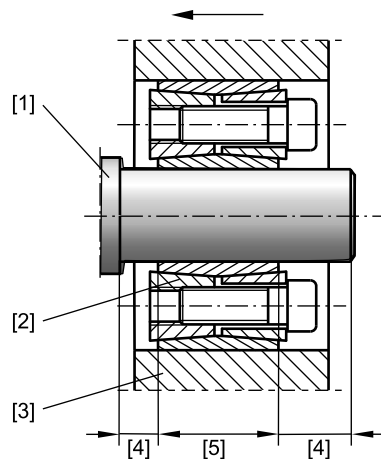
Type designation	Size	$F_{A_stat_max}$ in N	
		Bearing type 1	Bearing type 2
P.NG., P.KG., P.VG..	2	9250	1450
	3	12000	2000
	4	20250	3550
	5	34500	6250

4.7.2 Mounting the output elements on the smooth solid shaft

Observe the following points before installing the device:

- Use a mounting device for installing input and output elements if possible. Use the centering bore and the thread on the shaft end for positioning.
- Push all mount-on components (belt pulleys, couplings, pinions etc.) onto the shaft end without force.
- When installing the belt pulleys, make sure the belt is tensioned correctly in accordance with the manufacturer's instructions.
- The clamping area must be clean and free of grease, otherwise the shaft-hub connection will not function properly.
- The shaft collar [1] can be used as defined stop for mounting output elements onto the solid shaft.

Mount the output elements on the smooth solid shaft with clamping set according to the following figure:



1839232907

- [1] Shaft shoulder
- [2] Clamping set
- [3] Output element, e.g. gear wheel or sprocket
- [4] Greased shaft area
- [5] Ungreased clamping area

1. Clean the clamping area [5] so that it is clean and free of grease.
2. Grease accessible surfaces [4] of the shaft after mounting.

4.7.3 Mounting the output elements on the solid shaft with key or splining

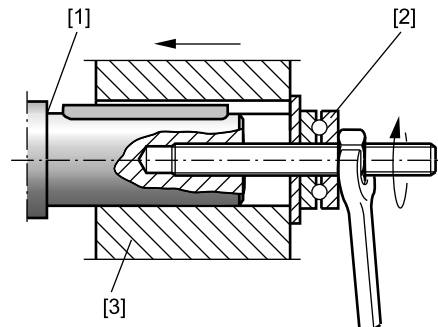
Observe the following points before installing the device:

- Use a mounting device for installing input and output elements if possible. Use the centering bore and the thread on the shaft end for positioning.
- Push all mount-on components (belt pulleys, couplings, pinions etc.) onto the shaft end without force.
- When installing the belt pulleys, make sure the belt is tensioned correctly in accordance with the manufacturer's instructions.
- If you deviate from the described assembly examples, observe the information on the maximum permitted static axial load under "Maximum permitted static axial forces at the output shaft".
- For reversing operation, also observe the notes on required output elements in the applicable project planning documents and dimension sheets.

When mounting output elements by the customer, it is recommended to use a narrower hub fit and/or adhesive securing (e.g. Loctite® 243).

- The shaft collar [1] can be used as defined stop for mounting output elements onto the solid shaft.
- Assembly will be easier if you apply lubricants (e.g. NOCO-Paste) to the output elements and heat them up (80 – 100 °C).

Mount the gearmotor onto the solid shaft with key or splining using a mounting device according to the following figure:



1839217419

- [1] Shaft shoulder
- [2] Thrust bearing (optional)
- [3] Hub

4.8 Mounting the output elements on the flange block shaft

Mount the output elements to the flange block shaft.

1. Clean and degrease the flange surfaces.
2. Evenly tighten the retaining screws in several turns with increasing torque using a suitable tool (→ 24).
 - ⇒ Use screws with strength class 12.9 in accordance with the information in "Screw-in depth, tightening torque" (→ 32).
 - ⇒ Observe the maximum screw-in depths and the tightening torques under "Screw-in depth, tightening torque" (→ 32).

4.8.1 Screw-in depth, tightening torque

Use the screws specified in the following table and the corresponding screw-in depths and tightening torques for mounting the output elements.

Type designation	Size	Number of screws × screw size ¹⁾	Maximum screw-in depth mm	Tightening torque Nm
P5BG.., P6BG..	2	8 × M5	7	8.3
	3	8 × M6	10	14
	4	12 × M6	12	14
	5	12 × M8	15	35
P5CG.., P6CG..	2	7 × M5	7	8.3
	3	7 × M6	10	14
	4	11 × M6	12	14
	5	11 × M8	15	35
P7BG..	2	10 × M5	7	8.3
	3	12 × M6	10	14
	4	12 × M8	12	35
	5	12 × M10	15	68

1) Strength class 12.9

The information in the table refers to standard designs. The requirements for special designs might vary from the standard. Refer to the order confirmation for deviating conditions.

All values are calculated in accordance with VDI2230 and based on the following conditions:

The friction coefficient for threads of strength class 12.9 is $\mu = 0.09$ (in accordance with VDI 235-101). The capacity utilization is 90% of the elastic limit, and signal-generating torque wrenches or motorized screwdrivers with dynamic torque measurement are used as tools.

5 Electrical installation

5.1 Before you start



⚠ WARNING

Magnetic fields can have an impact on the function of pacemakers and other active medical implants.

Health risk.

- ✓ The product has permanent magnets that generate a magnetic field, even when no current is supplied. During operation, additional electromagnetic fields are generated.
- If you have a pacemaker or any other active medical implant, keep a distance > 500 mm between the body part with the active medical implant and the motor.
- Inform people with active medical implants about the dangers.

Observe the following points before electrical installation:

- Switch off the electrical system before working on the main switch and prevent it from being switched on accidentally.
- Observe the 5 safety rules before commencing the work: Disconnect. Secure the device against a restart. Check that no voltage is applied. Ground and short-circuit it. Cover or cordon off neighboring live parts.
- Observe the information on the nameplate.
- Observe the information on the wiring diagram enclosed with the device. You can find the relevant wiring diagrams on the SEW-EURODRIVE website.
- Do not touch the male contacts in the power connector.
- Install a touch guard at the power connector if no mating connector is plugged in.
- Secure each product with a ground connection.
- To prevent interference with the motor protection devices and/or the brake controls, unshielded cables must not be routed alongside pulsed power cables in the same cable duct or close to each other.
- Make sure that there is adequate ventilation in the work environment.
- With brakemotors, check for proper function of the brakes.
- Operate the product only with correctly connected protective earth, even for short-time measuring or test purposes.
- Only operate the gearmotor with attached customer output element, or with a suitably secured key.
- Operate the gearmotors only in conjunction with a frequency inverter.
- For drives supplied by inverters, observe the operating instructions for the frequency inverter.
- Observe the voltage drop due to the cable length of the supply cable. Especially with the DC 48 V design, a voltage drop has a significantly greater influence on the dynamic limit characteristic curve and can lead to a reduction in the dynamic power limit. For more information, refer to the SEW-Workbench planning and configuration tool.

5.2 Additional regulations

The generally applicable installation regulations for low-voltage electric equipment (such as DIN IEC 60364, DIN EN 50110) must be complied with when setting up electrical machinery.

5.3 Connecting the motor and the encoder system via connector

In the basic design, SEW-EURODRIVE delivers the motors with a connector on the motor side and without a mating connector.

With two-cable technology, the encoder system is connected via a separate 12-pin circular connector (M23). The mating connectors can be ordered separately or together with the motor.

Motors in encoderless design and motors with encoders with MOVILINK® DDI, EnDat 2.2, EnDat 3, or HIPERFACE® DSL interface are designed in single-cable technology.

INFORMATION



Using an inverter with suitable control mode is mandatory for operating a motor in encoderless design.

The following control modes by SEW-EURODRIVE are available:

- ELSM® (Encoderless Synchronous Machine) control mode
- PMVC control mode (Permanent Magnet Vector Control)

All servomotors are equipped with quick-lock right-angle or radial connectors as standard (SpeedTec).

Note that hybrid cables for motors with encoders with EnDat 2.2 (AC 400 V), EnDat 3, and HIPERFACE® DSL interface are not available from SEW-EURODRIVE.

5.3.1 Notes on connection via plug connectors

The cables are connected to adjustable right-angle connectors or to connectors on the terminal box.

Observe the following points when working on the device:

- Align the right-angle connector only while the mating connector is plugged in.
If no mating connector is available, use pliers to align the right-angle connector. Avoid damage to the connection part and the insulation insert.
- Comply with the permitted bending radii of the cables.
With low-capacity trailing cables, the bending radii are larger than for standard cables.
- Use cables with a permitted temperature of minimum 80 °C.
- Avoid frequent alignment of the right-angle connectors.

The connector should be rotated to install and connect the motor. Do not turn the angular plug connector regularly once it has been installed.

- To prevent interference with the motor protection devices and/or the brake controls, unshielded cables must not be routed alongside pulsed power cables in the same cable duct or close to each other.
- Make sure not to turn the connector regularly once it has been installed.

5.3.2 Connector type designation

The following table shows an example of a type designation:

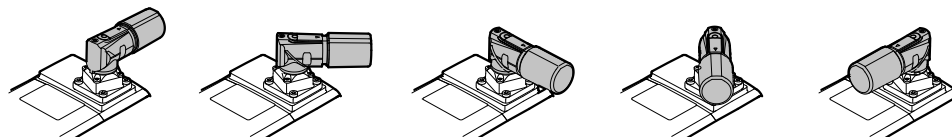
Example: SM1	
S	S Connector

Example: SM1	
M	M Motor B Brakemotor H Hybrid version for an encoderless motor D Motor with digital motor integration with MOVILINK® DDI E Motor with encoder with EnDat 2.2 interface F Motor with encoder with EnDat 3 interface J Motor with encoder with HIPERFACE® DSL interface Q Motor with encoder with DRIVE-CLiQ interface
1	1 Connector size M23 (1.5 – 4 mm ²)

5.4 Single-cable technology connection

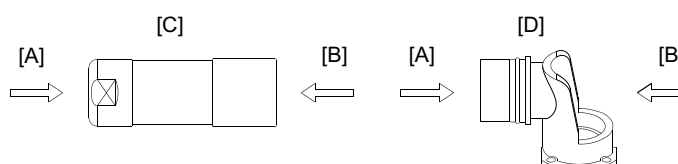
Using the interface allows the servomotors to be connected using single-cable technology. With this technology, all data of the motor, such as encoder data, temperature data, startup data, and data from other sensors, is digitally transferred via a hybrid cable.

The right-angle connector can be rotated to achieve all required positions:



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5.4.1 Key

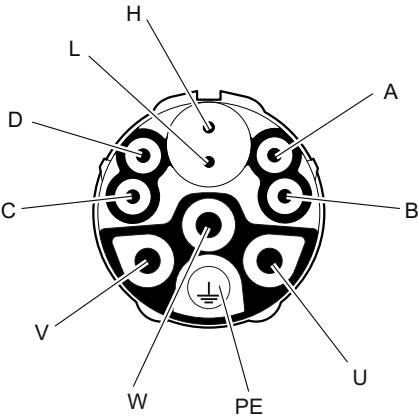


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- [A] Viewing direction A
- [B] Viewing direction B
- [C] Customer-supplied connector with socket contacts
- [D] Flange socket with pin contacts installed at the factory

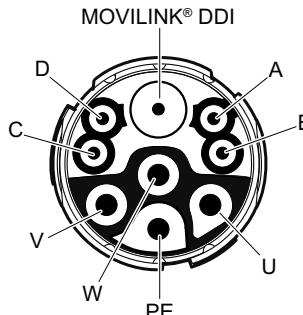
5.4.2 Connection SH1 power connectors (M23)

The connection diagram of the connector depicts the contact end of the connections.

Function			
Motor connection for motors in encoderless design			
Connection type			
M23, male, male thread, TE Connectivity – Intercontec products, series 723, used by SEW-EURODRIVE, SpeedTec equipment, coding ring: none, protected against contact			
Connection diagram			
 34609095051			
Motor assignment			
Contact	Signal	Without brake	With BKB.. brake
U	U	Motor phase U	Motor phase U
V	V	Motor phase V	Motor phase V
W	W	Motor phase W	Motor phase W
A	Reserved	Do not connect	Do not connect
B	Reserved	Do not connect	Do not connect
C	Depending on the option	Do not connect	Brake +
D	Depending on the option	Do not connect	Brake -
PE	PE	Protective earth	Protective earth
H	H	Motor protection	Motor protection
L	L	Motor protection	Motor protection

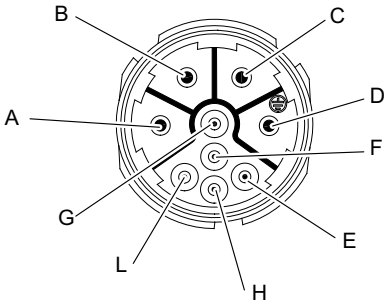
5.4.3 Connection with SD1 hybrid connector (M23)

The connection diagram of the connector depicts the contact end of the connections.

Function			
Motor connection for motors with MOVILINK® DDI interface			
Connection type			
M23, male, male thread, TE Connectivity – Intercontec products, series 723, used by SEW-EURODRIVE, SpeedTec equipment, coding ring: none, protected against contact			
Connection diagram			
			
Motor assignment			
Contact	Signal	Without brake	With BKB.. brake
U	U	Motor phase U	Motor phase U
V	V	Motor phase V	Motor phase V
W	W	Motor phase W	Motor phase W
A	Depending on the option	Do not connect	Brake -
B	Reserved	Do not connect	Do not connect
C	Reserved	Do not connect	Do not connect
D	Depending on the option	Do not connect	Brake +
PE	PE	Protective earth	Protective earth
DDI	MOVILINK® DDI	MOVILINK® DDI	MOVILINK® DDI

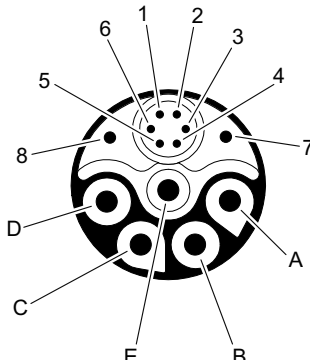
5.4.4 Connection with SJ1 hybrid connector (M23)

The connection diagram of the connector depicts the contact end of the connections.

Function			
Hybrid connection for motor, brakemotor, and signal for motors with HIPERFACE® DSL interface			
Connection type			
M23, male, external thread, TE Connectivity – Intercontec products, 923 series, SpeedTec equipment TE series 923, uncoded, 4+5-pin, codes: 22-0173-031-000, 40-A293-000-000, 40-A253-000-000			
Connection diagram			
 18014430803706123			
Motor assignment			
Contact	Signal	Without brake	With BK../BKB../BZ..D brake
A	U	Motor phase U	Motor phase U
B	V	Motor phase V	Motor phase V
C	W	Motor phase W	Motor phase W
D	PE	Protective earth	Protective earth
E	D -	Data - (serial data transmission)	Data - (serial data transmission)
F	PE	Protective earth (encoder)	Protective earth (encoder)
G	Depending on the option	Do not connect	Brake +
H	D +	Data + (serial data transmission)	Data + (serial data transmission)
L	Depending on the option	Do not connect	Brake -

5.4.5 Connection SE1 hybrid connectors (M23)

The connection diagram of the connector depicts the contact end of the connections.

Function
Hybrid motor, brakemotor and signal connection for motors with EnDat 2.2 interface
Connection type
M23, male, male thread, TE Connectivity – Intercontec products, 723 htec series, SpeedTec equipment, coded. Insulator code SE1: TE series 723, code 13, 5+2+6-pin - 40-A756-000-000, 40-A484-000-000, 40-A721-000-000
Connection diagram
 9007231548959371

Motor assignment			
Contact	Signal	Without brake	With BKB.. brake
A	U	Motor phase U	Motor phase U
B	V	Motor phase V	Motor phase V
C	W	Motor phase W	Motor phase W
D	Reserved	Do not connect	Do not connect
E	PE	Protective earth	Protective earth
1	Up	Voltage supply	Voltage supply
2	0 V	Voltage supply	Voltage supply
3	D +	Data + (serial data transmission)	Data + (serial data transmission)
4	D -	Data - (serial data transmission)	Data - (serial data transmission)
5	CLK +	Clock + (serial data transmission)	Clock + (serial data transmission)
6	CLK -	Clock - (serial data transmission)	Clock - (serial data transmission)
7	Depending on the option	Do not connect	Brake -
8	Depending on the option	Do not connect	Brake +

5.4.6 Connection with SF1 hybrid connector (M23)

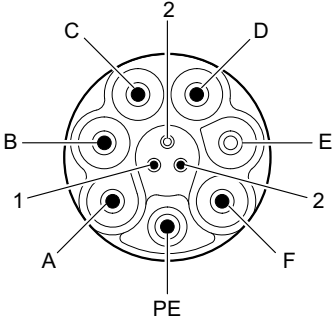
The connection diagram of the connector depicts the contact end of the connections.

Function
Hybrid motor, brakemotor and signal connection for motors with EnDat 3 interface
Connection type
M23, male, male thread, TE Connectivity – Intercontec products, 923 series, SpeedTec equipment TE series 923, uncoded, 4+5-pin, codes: 22-0173-031-000, 40-A293-000-000, 40-A253-000-000
Connection diagram
18014430803706123

Motor assignment				
Contact	Signal	Without brake	With BK../BKB../BZ..D brake	With BZ.. brake
A	U	Motor phase U	Motor phase U	Motor phase U
B	V	Motor phase V	Motor phase V	Motor phase V
C	W	Motor phase W	Motor phase W	Motor phase W
D	PE	Protective earth	Protective earth	Protective earth
E	P_SD -	Data - (serial data transmission)	Data - (serial data transmission)	Data - (serial data transmission)
F	Depending on the option	Do not connect	Do not connect	Brake 14
G	Depending on the option	Do not connect	Brake +	Brake 13
H	P_SD +	Data + (serial data transmission)	Data + (serial data transmission)	Data + (serial data transmission)
L	Depending on the option	Do not connect	Brake -	Brake 15

5.4.7 Connection with SF4 hybrid connector (M23)

The connection diagram of the connector depicts the contact end of the connections.

Function
Hybrid motor, brakemotor and signal connection for motors with EnDat 3 interface
Connection type
M23, male, male thread, TE Connectivity – Intercontec products, 723 htec series, SpeedTec equipment, coded Code 4, 7+3-pin – 40-B094-00, 40-A567-00, 40-A570-00
Connection diagram


Motor assignment				
Contact	Signal	Without brake	With BK../BKB../BZ..D brake	With BZ.. brake
A	U	Motor phase U	Motor phase U	Motor phase U
B	V	Motor phase V	Motor phase V	Motor phase V
C	W	Motor phase W	Motor phase W	Motor phase W
D	Depending on the option	Do not connect	Brake +	Brake 13
E	Depending on the option	Do not connect	Do not connect	Brake 14
F	Depending on the option	Do not connect	Brake -	Brake 15
PE	PE	Protective earth	Protective earth	Protective earth
1	P_SD +	Data + (serial data transmission)	Data + (serial data transmission)	Data + (serial data transmission)
2	Reserved	Do not connect	Do not connect	Do not connect
3	P_SD -	Data - (serial data transmission)	Data - (serial data transmission)	Data - (serial data transmission)

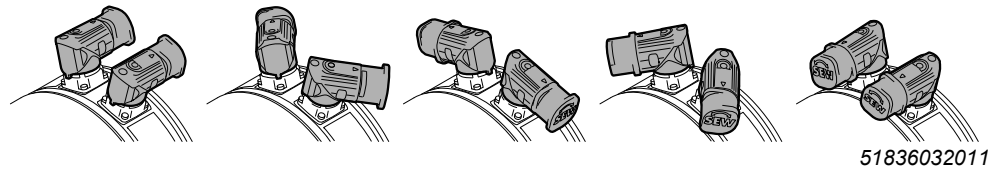
5.5 Two-cable technology connection

As standard, the power supply with or without brake supply is connected to the motor via the quick-lock (SpeedTec) SM./SB. connector system.

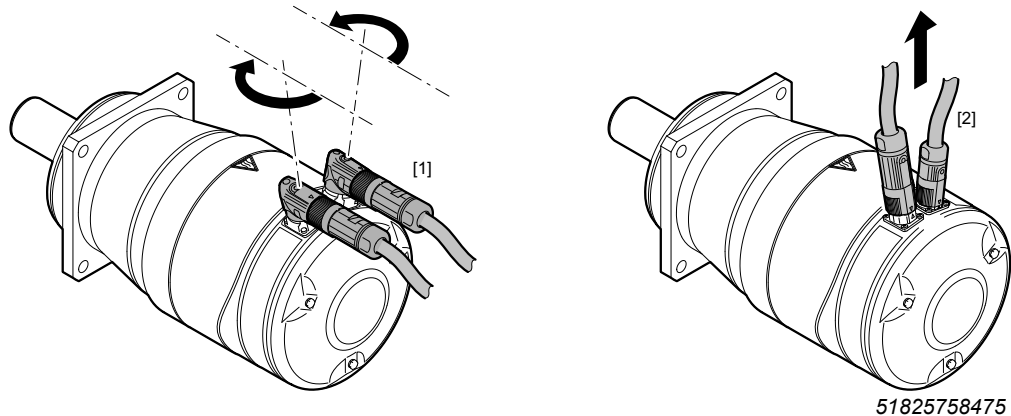
In the basic design, SEW-EURODRIVE delivers the motors with a connector on the motor side and without a mating connector. The encoder system is connected using a separate 12-pin round circular connector (M23).

You can order the mating connectors separately or together with the motor.

The SM1/SB1/SQ1 right-angle connectors can be aligned to achieve all desired positions. The following figure shows examples of different positions of SM1/SB1/SQ1 connectors:



The defined alignment for straight connectors is "radial". The radial connectors [2] are optional:



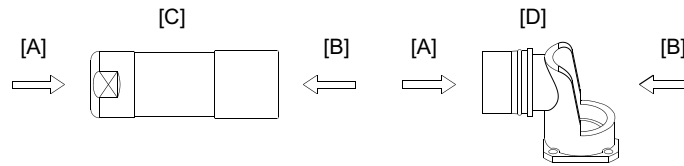
[1] "Directional" connector position

[2] "Radial" connector position

The different connectors for the individual motor sizes are available in the following designs:

Connector position		Connector	
		SM1/SB1	SQ1
Radial		✓	—
Adjustable	Infinitely variable positions	✓	✓

5.5.1 Key



8790995467

- [A] Viewing direction A
- [B] Viewing direction B
- [C] Customer-supplied connector with socket contacts
- [D] Flange socket with pin contacts installed at the factory

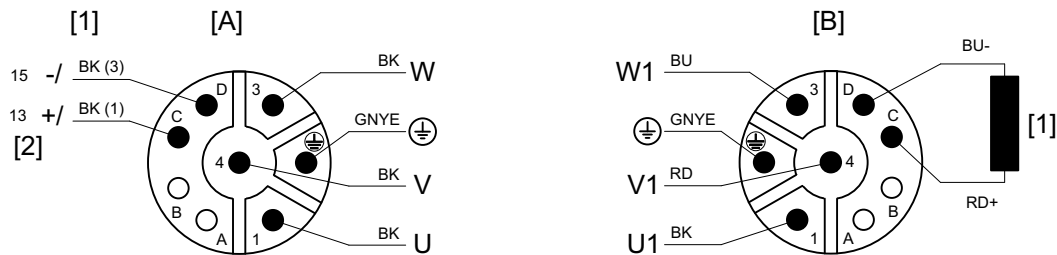
5.5.2 Connecting SM1/SB1 power connectors (M23)

The connection diagram of the connector depicts the contact end of the connections.

Function	
Motor connection for motors with resolver/HIPERFACE® interface	
Connection type	
M23, TE Connectivity - Intercontec products, series 923, used at SEW-EURODRIVE, SpeedTec equipment, coding ring: without, male	
Connection diagram	

Motor assignment			
Contact	Signal	Without brake	With BKB.. brake
A	Reserved	Do not connect	Do not connect
B	Reserved	Do not connect	Do not connect
C	Depending on the option	Do not connect	Brake +
D	Depending on the option	Do not connect	Brake -
PE	PE	Protective earth	Protective earth
1	U	Motor phase U	Motor phase U
3	W	Motor phase W	Motor phase W
4	V	Motor phase V	Motor phase V

Connection diagram for SM1/SB1 without/with BKB.. brake



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- [1] BKB.. brake (optional)
- [2] Connection to the brake control from SEW-EURODRIVE in accordance with the operating instructions

Connect the shield to the metal housing in the connector. The color code corresponds to the cables from SEW-EURODRIVE.

5.5.3 Connecting SM./SB. signal connectors

The connection diagram of the connector depicts the contact end of the connections.

Function
 Signal connection for motors with resolver/HIPERFACE® interface

Connection type
 M23, TE Connectivity – Intercontec products, series 623, used by SEW-EURODRIVE, SpeedTec equipment (SpeedTec-ready optional), coding ring: none, male

Connection diagram

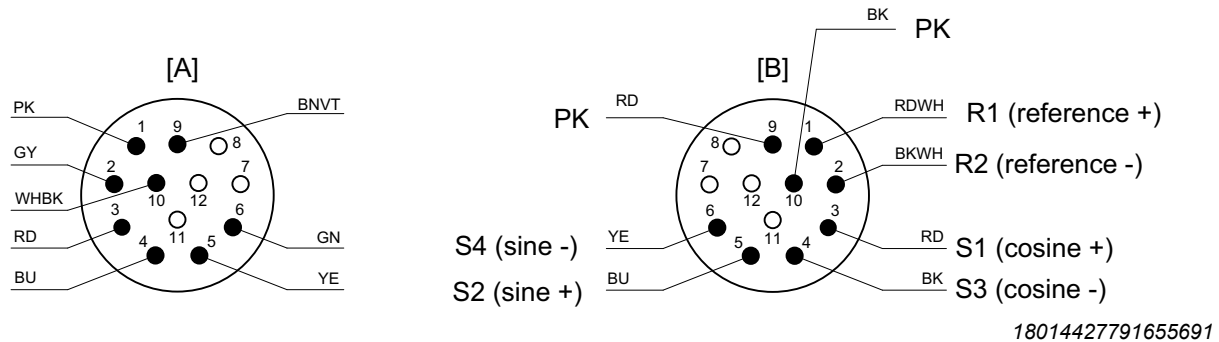
Motor assignment			
Contact	Signal	With HIPERFACE®	With resolver
1	Depending on the option	Do not connect	Reference +
2	Depending on the option	Do not connect	Reference -
3	S1 cos +	Cosine +	Cosine +
4	S3 cos -	Cosine -	Cosine -
5	S2 sin +	Sine +	Sine +
6	S4 sin -	Sine -	Sine -
7	D -	Data -	Do not connect
8	D +	Data +	Do not connect
9	PK	Motor protection	Motor protection
10	PK	Motor protection	Motor protection
11	GND	Reference potential	Do not connect
12	U _s	Voltage supply	Do not connect

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Wiring diagram of signal plug connectors RH1M resolver

The connection diagram and signal logics of the RH1M resolver are identical for CMP.., CM3C.., ECM3C.., and CM3G.. motors. Due to the installation design, the color coding of the cores might vary.

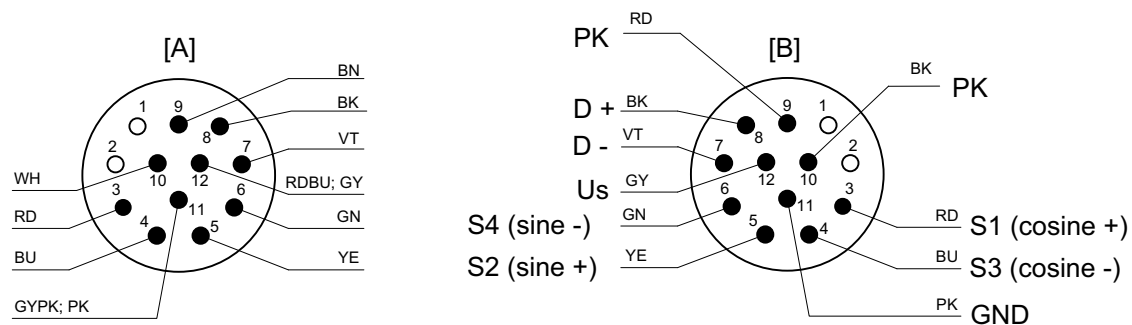
Connection diagram



Connect the shield to the metal housing in the connector. The color code corresponds to the cables from SEW-EURODRIVE.

Connection diagram for the signal connector for AK0H, EK0H encoder

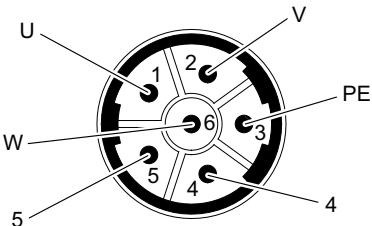
Connection diagram



Connect the shield to the metal housing in the connector. The color code corresponds to the cables from SEW-EURODRIVE.

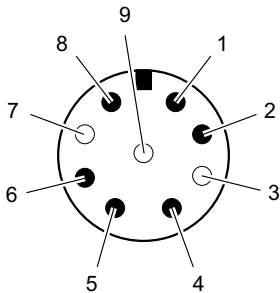
5.5.4 Connecting SQ1 power plug connectors (M23)

The connection diagram of the connector depicts the contact end of the connections.

Function			
Motor connection for motors with DRIVE-CLiQ interface			
Connection type			
M23, male, male thread, TE Connectivity – Intercontec products, 923 series, SpeedTec equipment TE series 923, uncoded, 6-pin, codes: 22-0093-031-P00, 40-A080-000-000, 40-A079-000-000			
Connection diagram			
			
Motor assignment			
Contact	Signal	Without brake	With BK..., BKB..., BZ...D brake
1	U	Motor phase U	Motor phase U
2	V	Motor phase V	Motor phase V
3	PE	Protective earth	Protective earth
4	Depending on the option	Do not connect	Brake +
5	Depending on the option	Do not connect	Brake -
6	W	Motor phase W	Motor phase W

5.5.5 Connecting SQ1 signal connectors (M23)

The connection diagram of the connector depicts the contact end of the connections.

Function		
Signal connection for motors with DRIVE-CLiQ interface		
Connection type		
M23, male, male thread, TE Connectivity – Intercontec products, SpeedTec equipment TE series 623, uncoded, 9-pin		
Connection diagram		
		
Motor assignment		
Contact	Signal	with DRIVE-CLiQ
1	TXP	Serial data transmission (transmit)
2	TXN	Serial data transmission (transmit)
3	Reserved	Do not connect
4	0 V	Reference potential
5	RXP	Serial data transmission (receive)
6	RXN	Serial data transmission (receive)
7	Reserved	Do not connect
8	Up	Voltage supply
9	Reserved	Do not connect

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5.6 BMV.. brake control with BKB.. brake

In every application, the BKB.. holding brake can be controlled via the BMV brake control or a customer relay with varistor overvoltage protection.

5.6.1 Brake control with digital input

In addition to the voltage supply, the BMV brake control offers a digital input for a DC 24 V signal with which the brakes can be switched, for example via an inverter.

It is a purely functional input that is not "functionally safe" with respect to safety technology.

Due to their operating principle, fault states can occur in these devices that lead to unintentional ongoing brake release, even if the control voltage has been switched off.



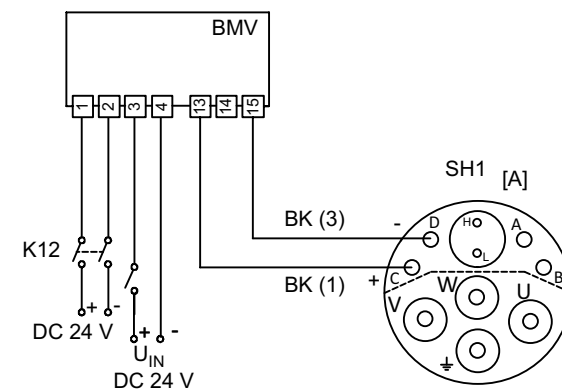
▲ WARNING

Unintentional ongoing brake release due to unrecognized malfunction of the brake control.

Severe or fatal injuries, e.g. due to falling hoist or extended coasting.

- In emergency-stop, emergency-off, hoist, and hoist-like applications, always switch off the supply voltage and the control voltage together and disconnect them on all poles.
- To meet increased safety and reliability requirements, ensure that a malfunction of the brake control can be detected through additional, suitable diagnostic measures, e.g. by monitoring the braking current.
- If you have any questions regarding the handling of the control input, contact SEW-EURODRIVE.

5.6.2 BMV.. brake control – connection with SH1



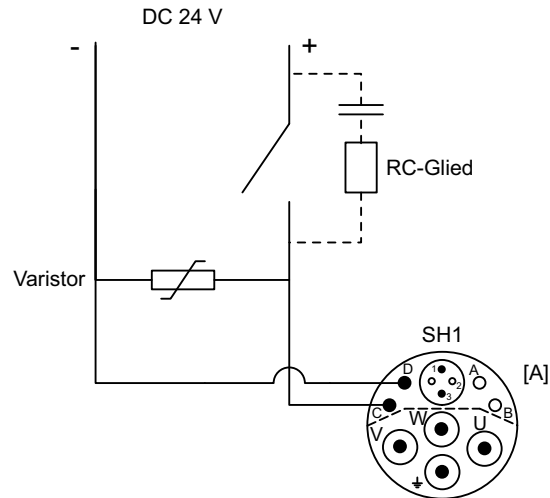
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Connection 1, 2 Power supply
Connection 3, 4 Signal (inverter)

Direct 24 V brake supply with non-SEW inverters

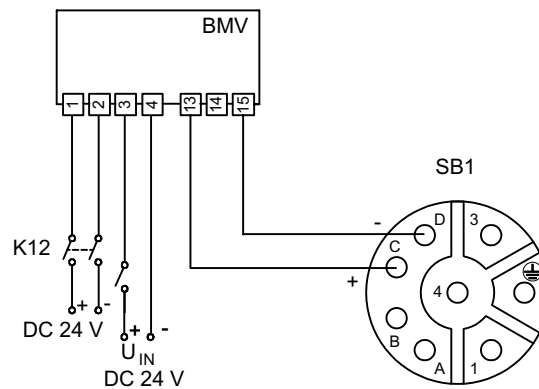
If the brake is not controlled via the BMV.. brake control, a contactor must be used that is suitable for switching inductive DC loads. In this context, a varistor circuit in parallel to the brake coil is required as overvoltage protection and EMC interference suppression of the 24 V supply.

Additional option: If the varistor circuit is not sufficient for EMC interference suppression, an additional RC element can be switched via the contactor.



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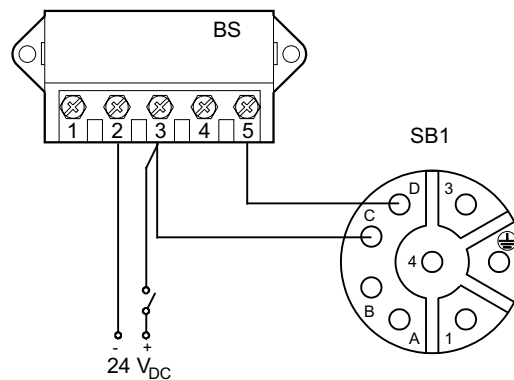
5.6.3 BMV.. brake control – connection with SB1



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Connection 1, 2 Power supply
 Connection 3, 4 Signal (inverter)

External switching device with BS protective circuit



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Direct 24 V brake supply

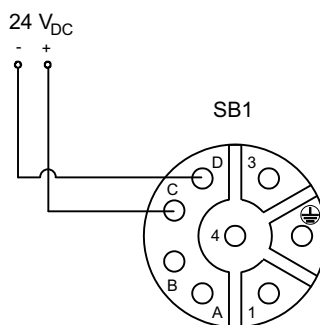
NOTICE

Malfunction and damage to the brake due to reverse polarity.

Damage to brake

- It is essential that you observe the correct polarity of the brake power supply.

With third-party in-
verters



12986696203

The brake must be protected against overvoltages in the following cases, e.g. by means of a varistor protection circuit:

- For operation with third-party inverters
- For brakes that are not supplied directly from inverters from SEW-EURODRIVE.

5.7 Options

5.7.1 /PK thermal motor protection

Description

Thermal motor protection in combination with the corresponding evaluation electronics prevents the motor from overheating and consequently from being damaged. A temperature sensor provides only indirect protection as only one sensor value is determined.

The /PK motor design consists of a Pt1000 installed in one of the three motor windings. The Pt1000 has a nearly linear characteristic curve and a high level of accuracy. In combination with a frequency inverter containing the thermal model of the motor, the frequency inverter can also provide a motor protection function because of the /PK temperature sensor.

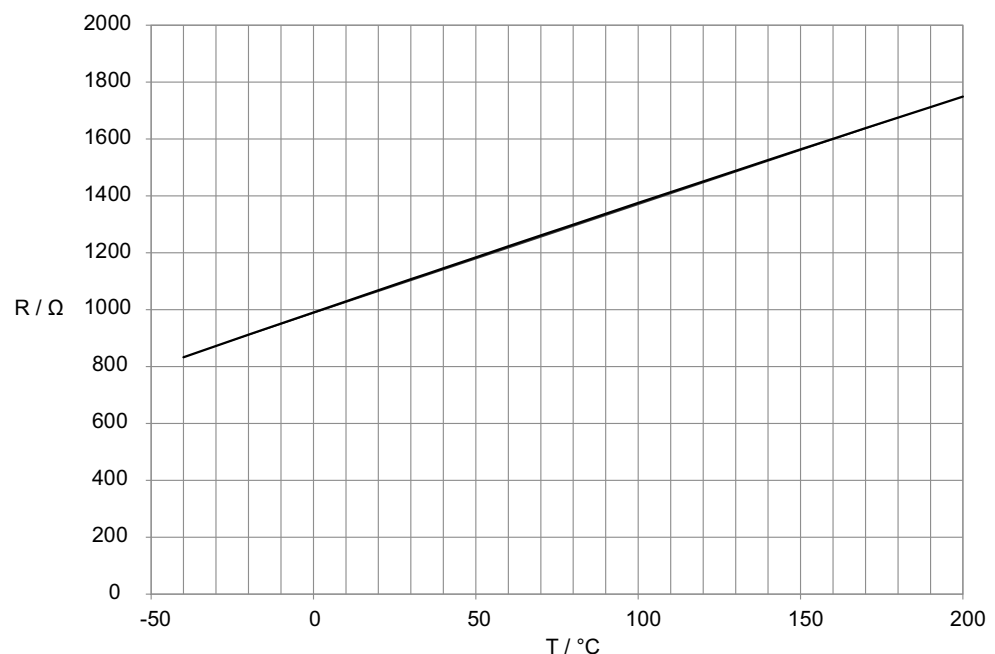
Technical data

The temperature sensor continuously monitors the motor temperature.

	/PK
Designation	Pt1000
Connection	Red – black
Total resistance at 20 – 25 °C	1050 Ω < R < 1150 Ω
Characteristic	According to EN IEC 60751
Typical measuring current	0.3 mA
Maximum measuring current	< 3 mA

The temperature sensor is unipolar which means that interchanging the incoming cables does not change the measurement result.

Typical characteristic curve of the temperature sensor



6 Startup

6.1 Before you start



⚠ WARNING

Magnetic fields can have an impact on the function of pacemakers and other active medical implants.

Health risk.

- ✓ The product has permanent magnets that generate a magnetic field, even when no current is supplied. During operation, additional electromagnetic fields are generated.
- If you have a pacemaker or any other active medical implant, keep a distance > 500 mm between the body part with the active medical implant and the motor.
- Inform people with active medical implants about the dangers.

Observe the following points before startup:

- Use appropriate safety measures to prevent the drives from starting up unintentionally.
- Avoid all hazards to humans and machines by taking appropriate safety precautions.
- The drive must be undamaged and not blocked.
- All connections, especially the PE, have been made correctly.
- The direction of rotation of the gearmotor is correct.
- All protection covers are installed correctly.
- All motor protection devices are activated.
- There are no sources of danger.
- Never connect or disconnect connectors while they are energized.
- Do not touch the male contacts in the power connector.
- Install a touch guard at the power connector if no mating connector is plugged in.
- Prior to startup, configure the SEW-EURODRIVE frequency inverter using the suitable engineering software.
- Operate the gearmotors only in conjunction with a frequency inverter.
- The frequency inverter must be suitable for controlling a synchronous permanent magnet motor.
- For motors or gearmotors supplied by inverters, limit the maximum current at the frequency inverter.
- The motor surface is not covered by heat-sensitive or heat-insulating materials.
- Let the unit cool down sufficiently before you start working on it.
- To prevent the lubricant from overheating, check the surface temperature during startup.
- If the surface temperature exceeds 90 °C, stop the drive and contact the SEW-EURODRIVE Service.
- Determine and eliminate the cause of the fault before acknowledging a motor protection fault at the frequency inverter.
- Do not acknowledge a motor protection fault several times at the frequency inverter.

- With brakemotors, check for proper function of the brakes.
- Operate the BKB.. brake only as holding brake.
- The brake may only be applied when the speed is $\leq 20 \text{ min}^{-1}$. For greater speeds, contact SEW-EURODRIVE.

6.2 Startup

During startup, run in the gearmotor at low speed and without axial or radial shaft load for 10 revolutions in each direction, so that the bearing lubrication is distributed evenly.

6.3 Measuring the surface temperature

It is essential to measure the surface temperature at the maximum loading condition when starting up the gearmotor. Commercially available thermometers can be used to measure the temperature.

Measure the surface temperature at the joint between gear unit and adapter, and at the joint between adapter and motor. The maximum surface temperature is reached after approx. 3 hours. It must not exceed a value of 90 °C.

7 Operation

7.1 General information



⚠ WARNING

Risk of injury if the drive starts up unintentionally.

Severe or fatal injuries.

- Before you start working on the unit, disconnect the motor and all connected options from the power supply.
- Secure the motor against unintended power-up.



⚠ CAUTION

Risk of burns due to hot surfaces.

Injury.

- Let the product cool down before touching it.

NOTICE

Destruction of the motor due to multiple acknowledgements of a motor protection fault.

Damage to property, damage to the motor.

- First, determine the cause of the fault before acknowledging a motor protection fault.
- Do not acknowledge a motor protection fault more than once.

7.2 Gear unit malfunctions

Fault	Possible cause	Measure
Gearmotor does not start	Supply cable interrupted.	Check connections and correct, if necessary.
	Thermal motor protection tripped.	Check the thermal motor protection for correct setting and correct fault, if necessary.
	Inverter defective, overloaded, connected incorrectly, or set incorrectly.	Check inverter, check wiring.
Incorrect direction of rotation	Incorrect setpoint polarity	Check inverter, check setpoints.
Gearmotor hums and has high current consumption	Drive blocked.	Check drive.
	Brake does not release.	See "Brake malfunctions" (→ 58).
	Failure on the encoder cable	Check the encoder cable.
	Inverter set incorrectly.	Check the inverter.

Fault	Possible cause	Measure
Gear unit housing temperature exceeds 90 °C	Overload	Check load for sluggishness; use larger gearmotor or reduce load, if necessary; check the travel profile.
	Ambient temperature too high	Observe permitted temperature range.
	Insufficient cooling	Correct the cooling air supply or clear the cooling air ducts; retrofit the forced cooling fan, if necessary.
	Nominal duty type (S1 to S10, EN 60034) incorrectly selected, e.g. because of excessive effective torque.	Adjust the nominal duty type of the gearmotor to the required operating conditions; consult a specialist, if necessary, to determine the correct drive.
	Inverter not optimized	Check the inverter.
Running noise of the gearmotor	Bearing damage	Contact SEW-EURODRIVE.
		Replacing the gearmotor
	Vibration of rotary parts	Rectify cause, possible imbalance.

7.3 Malfunctions in the motor

Fault	Possible cause	Measure
Increased operating temperature (> 90 °C)	Limited air supply	Ensure unobstructed air supply. Contact SEW-EURODRIVE.
	Speed/torque is too high	Check the configuration. Contact SEW-EURODRIVE.
	The motor heats up the gear unit	Check the configuration. Check gearmotor connection. Cool the gearmotor. Contact SEW-EURODRIVE.
	Ambient temperature too high	Lower the ambient temperature. Check the configuration. Contact SEW-EURODRIVE.
Unusual, increased operating noise.	Evenly meshing/grinding noise: Bearing damage or strain on motor mounting	Contact SEW-EURODRIVE.
	Evenly knocking noise: Damage to gearing	Contact SEW-EURODRIVE.
	Incorrect controller setting	Check controller setting.

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7.4 Brake malfunctions

7.4.1 BKB.. brake

Fault	Possible cause	Measure
Brake does not release	Brake connected incorrectly.	Check the connection of the brake.
	Incorrect voltage at brake control unit, e.g. voltage drop in the supply cable > 10%.	Check voltage at motor connection: Correct connection voltage; check cable cross section.
	Brake coil has interturn fault or short circuit to exposed conductive part.	Contact SEW-EURODRIVE.
Brake does not apply/brake.	Incorrect braking torque.	Contact SEW-EURODRIVE.
		Motor/brake replacement by SEW-EURODRIVE.
Noise/squeaking near the brake	Brake parameters set incorrectly in the inverter.	Check brake release and application times.
Brake does not apply	Maximum permitted working air gap exceeded because brake lining worn down.	Contact SEW-EURODRIVE.
		Motor/brake replacement by SEW-EURODRIVE.

7.5 Encoder malfunctions

Faults on the encoder are output on the inverter with an appropriate error message. For further information, refer to the relevant documentation of the inverter.

8 Service

8.1 SEW-EURODRIVE Service

If you are unable to rectify a fault, contact SEW-EURODRIVE Service. For addresses, refer to www.sew-eurodrive.com.

When contacting SEW-EURODRIVE Service, always specify the following information so that our service personnel can assist you more effectively:

- Information on the nameplate (e.g. type designation, serial number, part number, product key, purchase order number)
- Brief description of the application
- Error message on the status display
- Type of fault
- Accompanying circumstances
- Unusual events preceding the problems

8.2 Waste disposal

Dispose of the product and all parts separately in accordance with their material structure and the national regulations. Put the product through a recycling process or contact a specialist waste disposal company. If possible, divide the product into the following categories:

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

The following materials are hazardous to health and the environment. These materials must be collected and disposed of separately:

- Oil and grease

Collect used oil and grease separately according to type. Ensure that the used oil is not mixed with solvent. Dispose of used oil and grease correctly.

- Screens
- Capacitors

Waste disposal according to WEEE Directive 2012/19/EU

This product and its accessories may fall within the scope of the country-specific application of the WEEE Directive. Dispose of the product and its accessories according to the national regulations of your country.

For further information, contact the responsible SEW-EURODRIVE branch or an authorized partner of SEW-EURODRIVE.



9 Inspection/maintenance

9.1 Before you start



⚠ WARNING

Magnetic fields can have an impact on the function of pacemakers and other active medical implants.

Health risk.

- ✓ The product has permanent magnets that generate a magnetic field, even when no current is supplied. During operation, additional electromagnetic fields are generated.
- If you have a pacemaker or any other active medical implant, keep a distance > 500 mm between the body part with the active medical implant and the motor.
- Inform people with active medical implants about the dangers.

Observe the following points before inspection/maintenance:

- Switch off the electrical system before working on the main switch and prevent it from being switched on accidentally.
- Observe the 5 safety rules before commencing the work: Disconnect. Secure the device against a restart. Check that no voltage is applied. Ground and short-circuit it. Cover or cordon off neighboring live parts.
- Only operate the gearmotor with attached customer output element, or with a suitably secured key.
- Secure or lower the hoist drives.
- Before releasing any shaft connections, make sure there is no active torsional torque present that could lead to tension within the system.
- Let the unit cool down sufficiently before you start working on it.
- Make sure that there is adequate ventilation in the work environment.
- Prevent foreign particles from entering into the gear unit during maintenance and inspection work.
- Use only genuine spare parts in accordance with the valid spare parts list.
- Allow leaking or spilled lubricants to cool down sufficiently before touching the lubricants.
- Absorb any leaked or spilled lubricant with a suitable binding agent. Dispose of the mixture in accordance with the regulations.
- Motor shaft ends, output shafts, and flange surfaces must be thoroughly cleaned of anti-corrosion agents, contamination, or similar. Use a commercially available solvent for this purpose. The solvent must not get into the bearings or sealing rings as this can damage the material.
- Thoroughly clean the output shafts and the flange surfaces and make sure that they are free from anti-corrosion agent, dirt or the like. Do not use compressed air. Use a mild commercially available solvent. Do not expose the sealing lips of the oil seals to the solvent.
- Do not clean the device with a high-pressure cleaning device.
- Only the SEW-EURODRIVE Service or repair workshops that have the necessary expertise may repair or modify the motor.

- Make sure that the regulations are adhered to before restarting the gearmotor.
- Perform a safety and functional check following all maintenance and repair work (thermal protection).

9.2 Maintenance intervals

Wear times are influenced by many factors and can be short. The required intervals for inspection and maintenance must be individually calculated by the system manufacturer in accordance with the project planning documents.

Factors that can shorten inspection and maintenance intervals include:

- Number of real emergency stop braking operations
- Particularly high number of cycles with high motor acceleration
- Especially high cyclic duration factor at high speed
- Changing direction of rotation (reversing operation)
- Vertical mounting positions and pivoted mounting positions
- High mass moments of inertia due to the motion of the drive, e.g. in mobile drives or drives subject to high impact and vibration load
- Application-related generative torques or torsional vibrations
- External environmental factors, such as moisture, high degree of UV exposure, low ambient temperatures, etc.

Unit / part of unit	Time interval	What should I do?
Gear unit	• 500 operating hours or 3 months after startup	• Visual inspection for external damage and leakage at the seals. • Check the tightening torques of the screw connections between the gear unit and the machine and between the output elements and the output shaft.
	• Every 3 months	• Visual inspection for external damage and leakage at the seals.
	• Annually	• Check the tightening torques of the screw connections between the gear unit and the machine and between the output elements and the output shaft.
Servomotor	• Every 10 000 operating hours ¹⁾	Inspect the servomotor: • Clean the cooling air ducts. • Check the proper functioning of the PE connection.
Drive	• Depending on external factors	• Touch up or renew the surface protection/anti-corrosion coating.

Unit / part of unit	Time interval	What should I do?
BKB.. brake	At least after 3 months, depending on the operating conditions	Inspect the brake: - Connect the brake connections to the controlled power supply unit and determine the opening voltage by increasing the voltage from 10 to 24 V (clicking of the brake). Contact SEW-EURODRIVE if necessary. - Check the braking torque. Grind in the brake if necessary. - Contact SEW-EURODRIVE Service when maintenance is required.
Motor surface Cooling air ducts	Depending on external factors	- Clean motor surfaces. - Clean cooling air ducts.

1) The periods of wear are affected by many factors and may be shorter than the recommendation above.

9.3 Lubricants

The gear unit is lubricated for life and filled with the following lubricant from SEW-EURODRIVE at the factory:

- GearOil Poly E1 by SEW-EURODRIVE (synthetic oil)
- GearOil Poly H1 E1 by SEW-EURODRIVE (food grade lubricant (oil))
- Grease HL 2 E1 by SEW-EURODRIVE (synthetic grease)
- Grease HL 2 H1 E1 by SEW-EURODRIVE (food grade lubricant (grease))

9.4 Notes on the BKB.. brake

The BKB.. brake is integrated in the gearmotor. Beyond the "inspection" (→ 60), no further maintenance work is possible on the brake.

- The brake must be replaced when the permitted total braking work W_{Insp} (determined during project planning) is reached. Contact SEW-EURODRIVE.
- The brake must be replaced when the maximum number of emergency stop braking operations permitted up to the end of service life N_{B2max} has been reached.
- The brake may only be replaced by SEW-EURODRIVE or a qualified workshop.

9.5 Cleaning

Dirt, dust or chips on the drive increase the operating temperature as the optimum heat dissipation of the motor is no longer possible.

Clean the servomotor regularly, depending on the operating and ambient conditions.

9.6 Connection cable

Check the connection cable for damage at regular intervals. Replace if necessary.

9.7 Storage

Observe the following points when shutting down or storing:

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

10 Technical data

10.1 Boundary conditions

The technical data applies under the following boundary conditions:

- Maximum ambient temperature 40 °C
- System voltage AC 400 V, DC 48 V
- Pulse width modulation frequency (PWM frequency) at least 8 kHz
- Flange surface made from steel, unpainted, measuring 600 mm × 600 mm × 25 mm
- Gear unit with oil lubrication (lubricant S)
- Maximum housing temperature 90 °C
- Maximum winding temperature 145 °C
- Motor mounting position IM B5 according to IEC/EN 60034-7 or mounting position M1 according to the SEW-EURODRIVE definition for gearmotors

10.2 Technical data of the BKB.. brake

The BKB.. brake is essentially used as a holding brake. However, it is also suitable for emergency braking.

The following table shows the technical data of the brake. The BKB.. brake operates with a fixed braking torque per brake size.

Motors			CM3G63S CM3G63M	CM3G71S CM3G71M	CM3G80S CM3G80M	CM3G100S CM3G100M
Brake			BKB02	BKB05	BKB1	BKB2
Static braking torque	$M_{4, 100^{\circ}\text{C}}$	Nm	1.8	4.5	13	23
Dynamic braking torque	M_1	Nm	1.3	2.8	8	15.4
Nominal brake voltage (rating range)	V_N	DC V	24 (21.6 – 25.4)	24 (21.6 – 25.4)	24 (21.6 – 25.4)	24 (21.6 – 25.4)
Nominal holding current	I_H	DC A	0.46	0.58	0.71	1.0
Response time of the brake without high-speed excitation	$t_{1,II}$	ms	35	80	80	70
Brake application time in case of DC disconnection	$t_{2,I}$	ms	10	20	20	50
Permitted braking work per braking operation in case of emergency stop	$W_{\text{per},N}$	J	102	197	325	645
Permitted braking work until maintenance	W_{insp}	kJ	205	425	650	1290
Permitted mechanical speed	$n_{\text{max},0}$	min ⁻¹	10000	10000	10000	10000
Permitted brake application speed in case of emergency stop	$n_{\text{max},1}$	min ⁻¹	6000	6000	6000	6000
Nominal power of the brake coil	P_B	W	11	14	17	24

Motors			CM3G63S CM3G63M	CM3G71S CM3G71M	CM3G80S CM3G80M	CM3G100S CM3G100M
Brake			BKB02	BKB05	BKB1	BKB2
Brake coil resistance at 120 °C, V_N	R_B	Ω	$72.8 \pm 7\%$	$56.7 \pm 7\%$	$46.8 \pm 7\%$	$33.12 \pm 7\%$

The brake must be replaced after a certain number of emergency stop braking operations. Observe the calculation specifications and limit values in the manual "Project Planning for BK.., BKB.., BP.., BR.., BY.., BZ.. brakes Standard Brake/Safety Brake".

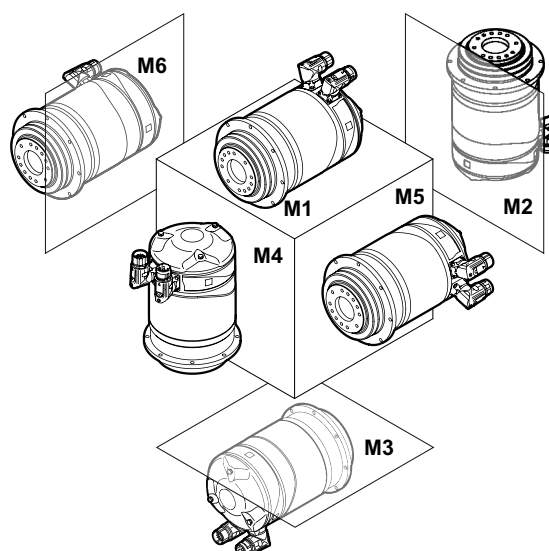
When dimensioning the 24 V supply, it is not necessary to consider a current reserve for releasing the brake, i.e. the ratio of inrush current to operating current is 1.

The specified response and application times are approximate values. Potential response times of switching elements or controllers are not taken into account here.

10.3 Mounting positions

Due to their design, the gear units are completely closed and do not have a ventilation valve. They can be used in any mounting position M1 – M6 without having to make adjustments to the gear unit.

The following figure shows the mounting positions M1 – M6 of SEW-EURODRIVE.



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Mount the gear unit in the mounting position specified in the order documents. If no mounting position is specified, you can select the position freely.

11 Contacting SEW-EURODRIVE

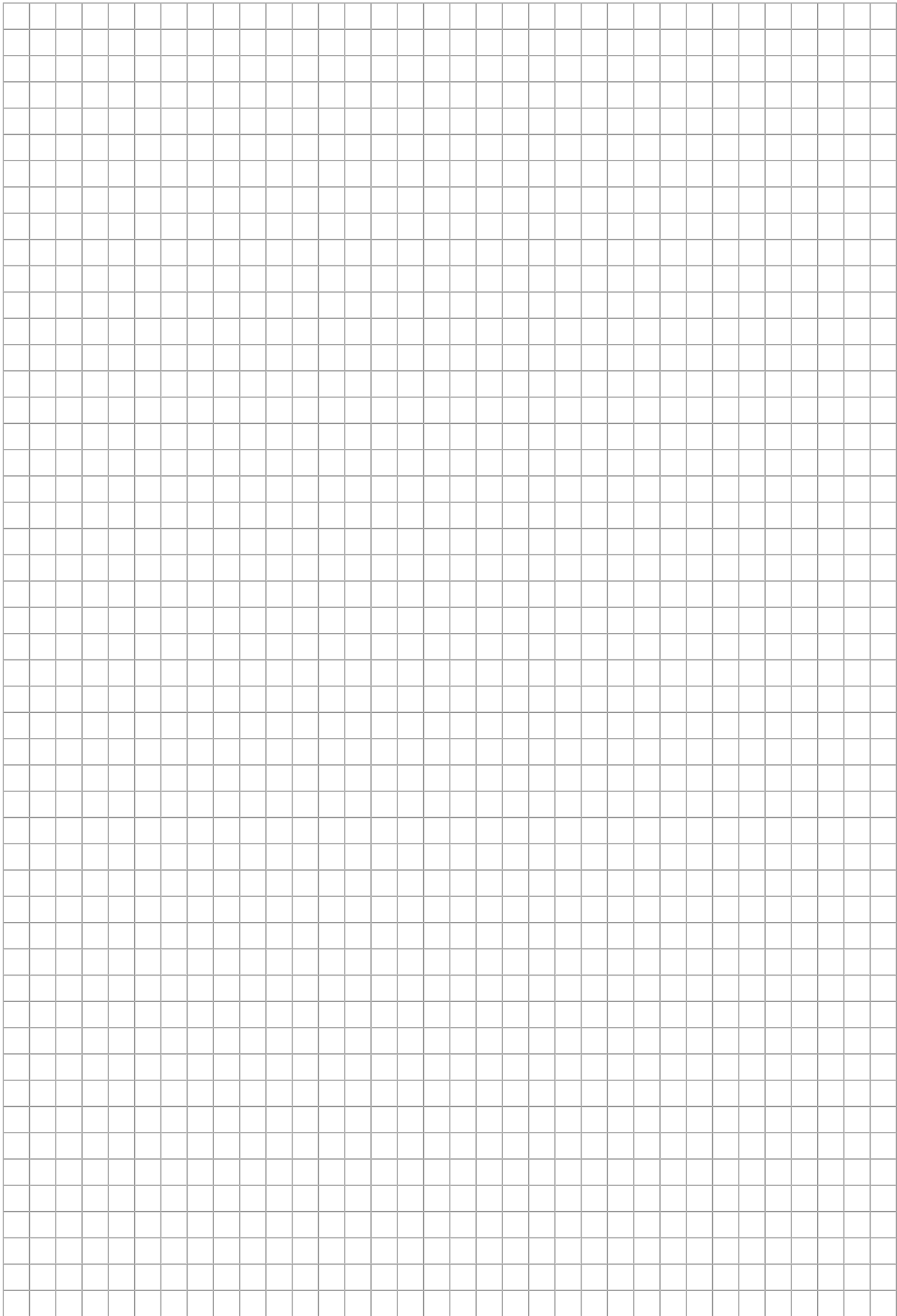
You can find the worldwide contact data and locations on the **SEW-EURODRIVE website** via the following link or the QR code shown below.

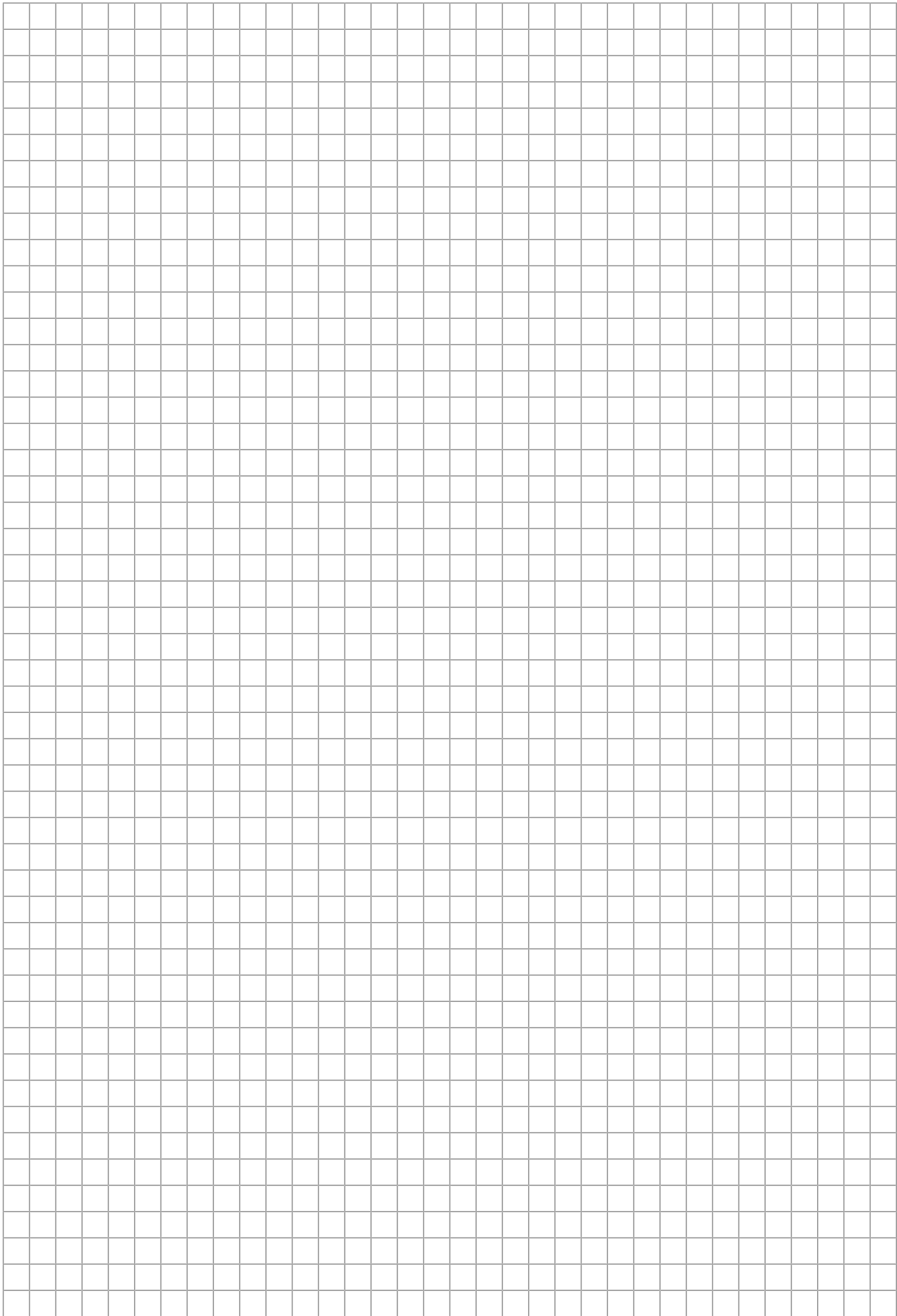
<https://www.sew-eurodrive.de/contacts-worldwide>

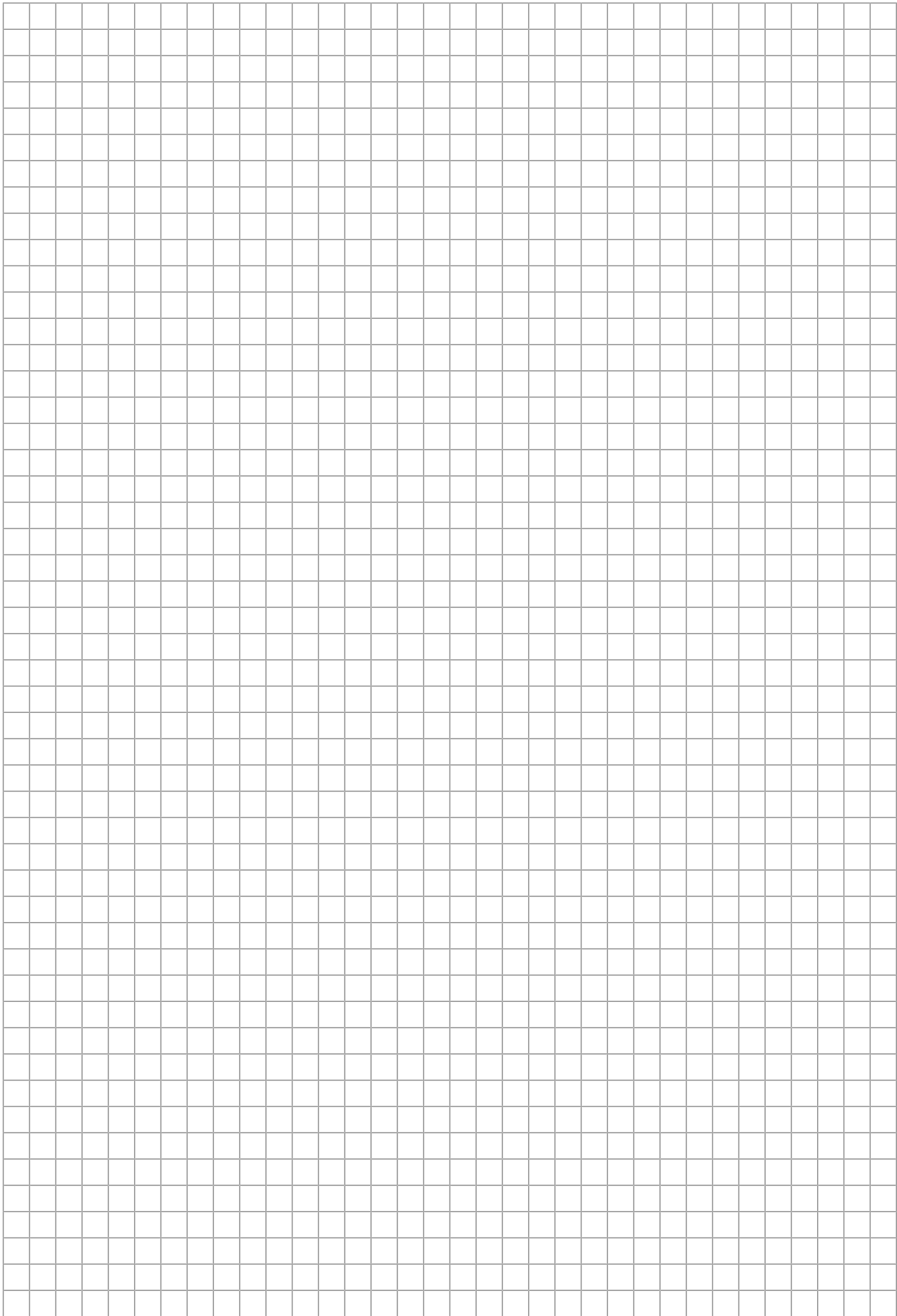


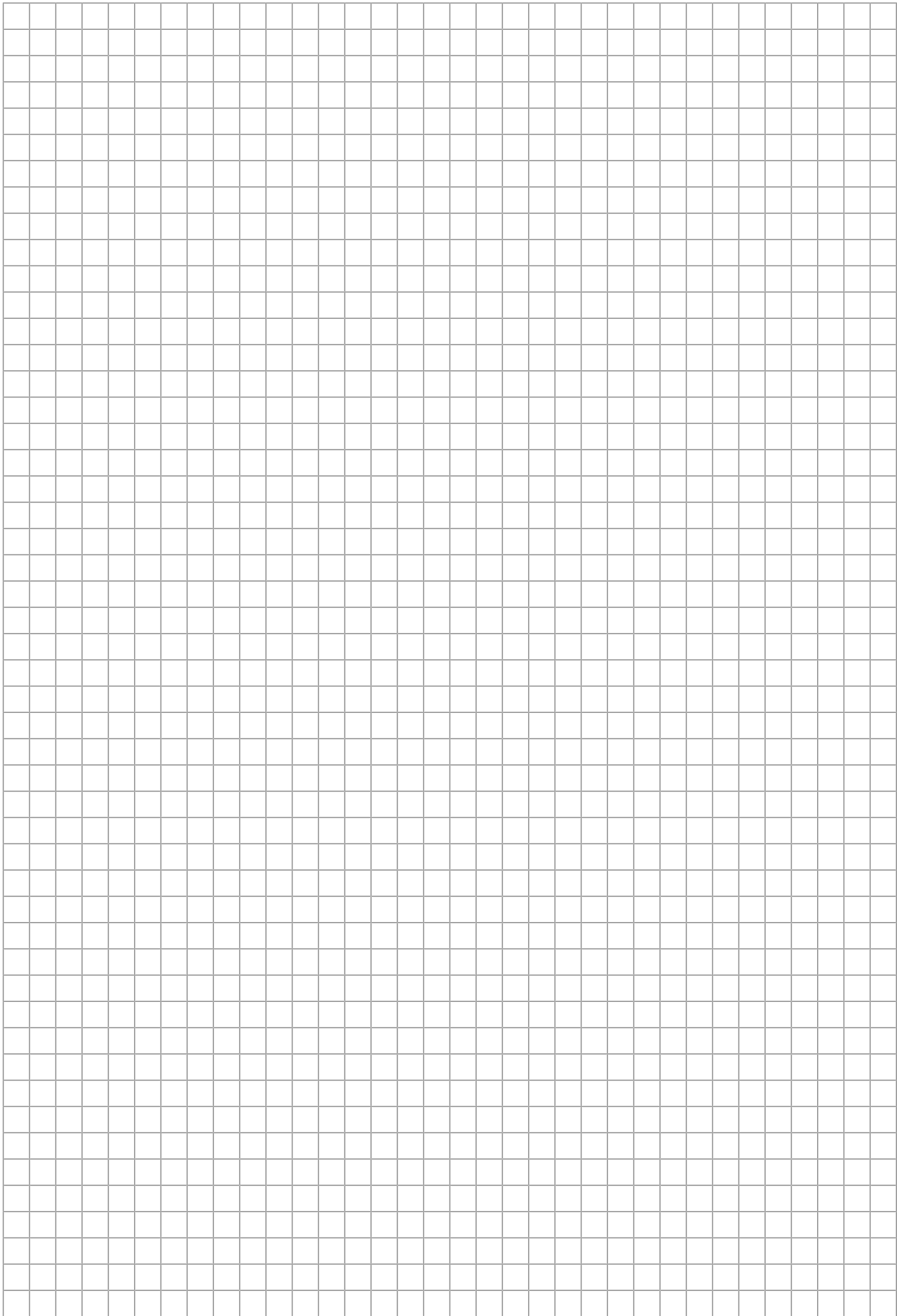
SEW
EURODRIVE

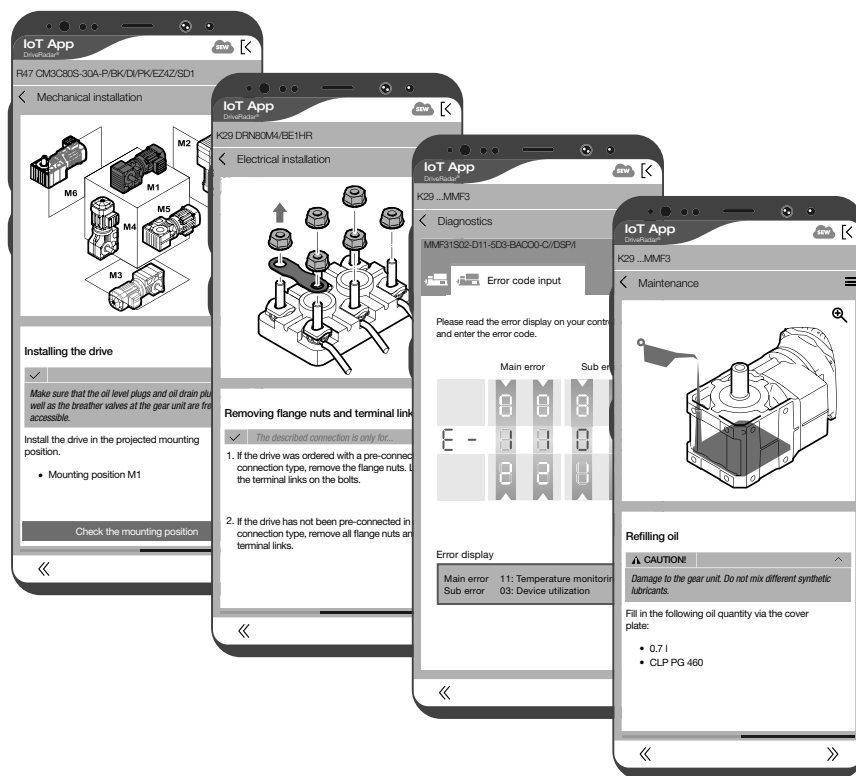












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