



Operating Instructions



Synchronous Servomotors

CM3C63 – 100 / CM3P71 – 100

Medium Inertia / High Dynamic



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1 General information

1.1 About this documentation

The documentation at hand is the original.

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

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

1.2 Other applicable documentation

Observe the corresponding documentation for all additional components.

1.2.1 Additional information

This documentation contains additional information on the product or optional components:

- Wiring diagrams provided with the motor
- Addendum to the operating instructions "Safety Encoder and Safety Brake"

1.3 Structure of the safety notes

1.3.1 Meaning of signal words

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

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

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.

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
	No access for persons with pacemakers or implanted defibrillators
	Warning of hot surfaces
	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 step.

This is the formal structure of an embedded safety note:

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

1.4 Decimal separator in numerical values

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

Example: 30.5 kg

1.5 Rights to claim under limited warranty

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

1.6 Product names and trademarks

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

1.7 Copyright notice

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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 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.

In the case of installation in electrical systems or machines, it is prohibited to start the proper operation of the product until it is determined that the machine meets the requirements stipulated in the local laws and directives.

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

2.5 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.

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.

2.6 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.

2.7 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.
- 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.
- The open keyway has sharp edges. Insert the key in the keyway and pull a protective tubing over the shaft.
- If the product weighs more than 40 kg, use suitable lifting equipment such as belts.
- Always use lifting eyebolts and lifting eyes if available.
- Tighten lifting eyebolts.
- The lifting eyes/bolts are designed to carry only the weight of the product without mount-on components. Mount-on units have separate suspension attachments, if necessary. Additionally use these attachments as described in the relevant operating instructions. Do not mount any additional loads.
- Adhere to DIN 580 for using lifting devices. The tension force vector of the slings must not exceed a 45° angle.
- 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.
- If necessary, use suitable, sufficiently dimensioned handling equipment.
- Store the product in a dry, dust-free room if you do not install it right away.
- If you store the product for a longer time (independent of packaging and ambient conditions), observe the chapter "Startup after storage" (→ 55).
- Ensure that the product is not subject to mechanical impact.
- Do not transport or store the product on the fan guard.

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 Electric work

2.9.1 Carrying out electric work safely

Observe the following information to carry out electrical work safely during installation and maintenance:

- Electrical work may only be carried out by electrically skilled persons.
- Always adhere to the 5 safety rules for working on electrical components:
 - Disconnect
 - Secure the drive against restart
 - Check that no voltage is applied
 - Ground and short-circuit it
 - Cover or safeguard neighboring live parts
- When the device is switched on, dangerous voltages are present on all power connections as well as on any connected cables and terminals. This is also the case even if the motor is at standstill.
- Ensure that the connection boxes are closed and screwed down before applying the supply voltage.
- Ensure that all required covers are mounted before applying the supply voltage.

2.9.2 Regenerative operation of drives

Moving the output element (e.g. coasting) generates a voltage at the live components of the motor connection. Observe the following information to avoid electric shock:

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

2.9.3 Disconnecting and connecting plug-in connections while voltage is applied

An electric arc may occur when plug-in connections are disconnected or connected while voltage is applied (e.g. connection between drive and control). Observe the following to avoid risk of injury, risk of electric shock and damage to property:

- Ensure that the product is de-energized before disconnecting and connecting the plug-in connections.

2.9.4 Electrical connection

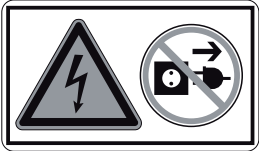
The connection must be a permanently secure electrical connection (no protruding wire ends). Use the corresponding cable end equipment. Establish a safe protective earth connection. When the motor is connected, the distances to non-insulated and live parts must not be shorter than the minimum values 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

The terminal box must be free from foreign objects, dirt and humidity. Unused cable entry openings and the connection box itself must be sealed so that they are dust- and water-proof.

2.10 Warning notes on the motor

Observe the warning safety notes specified on the motor. The following safety notes can be found on the motor:

Safety note	Meaning
	Do not connect or disconnect the plug-in connection when voltage is applied.
	For motors with BK.. brake: Adhere to the specified polarity of the power supply of the BK.. brake. 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.

2.11 Startup/operation

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 on all power connections as well as on any connected cables and terminals. This can also be the case if the motor is at standstill.

Risk of burns due to arcing: Do not disconnect power connections during operation. Do not connect power connections during operation.

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

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

2.12 Inspection/maintenance

Use only genuine spare parts in accordance with the valid spare parts list.

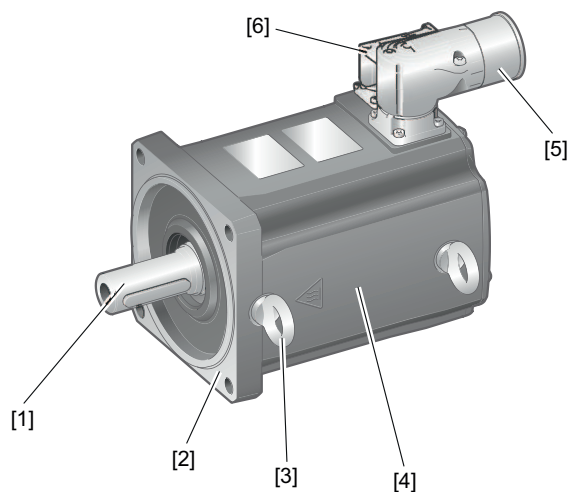
3 Motor structure

3.1 Basic structure

The following figures are schematic representations. Motor size and design may cause deviations.

3.1.1 Structure of the motor without brake

The following figure shows an overview of the motor components:



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- [1] Output shaft with key
- [2] Flange
- [3] Eyebolt

- [4] Housing
- [5] Power plug connector
- [6] Signal plug connector

3.2 Nameplate and type designation

3.2.1 Nameplate on the motor

The following figure shows the 1st nameplate of a CM3C.. motor:

	SEW-EURODRIVE 76646 Bruchsal / Germany	DI0E00 Jahr 2020	[1]	
[2]	CM3C71S-20A-P/BZ/DI/PK/AZ2Z/SD1		[2]	
[3]	01.7825733307.0001.20		[3]	
[4]	Mo 6,5 Nm	VTnC 0-2000 r/min	IM B5	[4]
[5]	Mpk 19,5 Nm	n max 7200 r/min	IP 65	[5]
[6]	Io 3,5 A	Up 257 V	kg 13,876	[6]
[7]	Imax 12,2 A	Ta -20..40 °C	Th.Kl. 155(F)	[7]
[8]	U _{sys} 400 V	Mbr 17 Nm	TENV ML 03	[8]
[9]	PS1 1,28 Kw	Ubr 218-243 AC V	nS1 2000r/min	[9]
3~IEC60034 22935908 Made in Germany				

Line	Specifications (from left to right)
[1]	Type code of the MOVILINK® DDI interface
[2]	Type designation
[3]	Serial number
[4]	- Standstill torque - Variable torque - Speed class - Mounting position
[5]	- Dynamic limit torque of the motor - Maximum permitted speed - Degree of protection according to IEC 60034-5
[6]	- Standstill current - Voltage at the open terminals of the motor at rated speed - Mass
[7]	- Maximum permitted current - Permitted ambient temperature range - Thermal class
[8]	- System voltage, voltage of the supplying inverter - Nominal braking torque - TENV (Totally Enclosed Non-Ventilated) - Mounting location (plant code)

3 Motor structure

Nameplate and type designation

Line	Specifications (from left to right)
[9]	- Rated power continuous duty - Brake voltage - Rated speed continuous duty

The following figure shows the 2nd nameplate of a CM3C.. motor:



Line	Information
[1]	• Type designation
[2]	• Serial number

The following table lists all the markings that can be provided on a nameplate, and an explanation of what they mean:

	CE marking to state compliance with European Directives, (see EU declaration of conformity or EU declaration of incorporation).
	CEL mark to represent the energy efficiency in the Chinese grade classification.
	CMIM logo to confirm compliance with the technical regulations of Morocco.
	FS logo with 2-digit number for identification of installed functional safety motor options.
	UR mark to confirm that UL (Underwriters Laboratory) is informed about the registered components; register number by UL: E337323
	CSA mark to confirm the market conformity of the Canadian Standard Association (CSA).

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	EAC mark (EurAsian Conformity) Confirms compliance with the technical regulations of the economic and customs union of Russia, Belarus, Kazakhstan, Armenia.
	The UA.TR mark declares conformity with the technical regulations of Ukraine.
	The UKCA mark indicates compliance with British guidelines.
	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. In the "Documentation" > "Data and documents" area, the product manual of the device with further information is available.

3.2.2 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)

3.2.3 Type designation

The following example shows the structure of the type designation:

CM3C80L-60A-K/PK/RH1M/SMB	
CM3C	Motor series
80	Motor size
L	Motor length
60	Speed class
A	System voltage
K	Shaft design
PK	Temperature sensor
RH1M	Encoder
SMB	Connection variant

3.3 Drive designs and options

3.3.1 Synchronous servomotors

Designation	
CM3C..	CM3C.. series (medium inertia)
CM3P..	CM3P.. series (high dynamics)
63, 71, 80, 100	Sizes
S, M, L	Lengths
-20, -30, -45, -60	Speed classes: -20 = 2000 min ⁻¹ -30 = 3000 min ⁻¹ -45 = 4500 min ⁻¹ -60 = 6000 min ⁻¹
A	System voltage: A = 400 V
-N, -K, -P, -D	Shaft design: -N = Shaft without key -K = Shaft with key -P = Shaft with pinion shaft end -D = Shaft for compact mounting

3.3.2 Brakes and brake control

Designation	Description
/BK	Permanent-magnet holding brake
/BZ ¹⁾	Spring-loaded holding brake with increased working capacity
/BZ..D ¹⁾	Spring-loaded holding brake with increased working capacity for operation on direct DC voltage supply.
/BZ..Z	Spring-loaded holding brake with increased working capacity for operation with the integrated BS1Z brake control
/HR	Manual brake release of BZ..., BZ..D, and BZ..Z brake Automatic re-engaging
BG1Z ²⁾	Integrated brake control for MOVILINK® DDI, motor-external brake supply AC 200 – 500 V with installed 230 V brake, condition monitoring of the brake, brake diagnostics, wear detection.
BS1Z ²⁾	Integrated brake control for MOVILINK® DDI For DC 24 V brakes with condition monitoring of the brake Brake diagnostics, brake wear detection

- 1) Optionally available as safety brake.
2) Not compatible for controlling a safety brake.

3.3.3 Temperature sensor/temperature detection

Designation	Option
/PK	Pt1000 temperature sensor

3.3.4 Encoder

Designation	Description	Capability class
–	Without encoder	–
/RH1M	Single-turn encoder, resolver (standard)	Medium Class
/AK0H ¹⁾	Multi-turn encoder, HIPERFACE®	High class
/AK1H ²⁾	Multi-turn encoder, HIPERFACE®	High class
/EK1H	Single-turn encoder, HIPERFACE®	High 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
/EH1E ²⁾	Single-turn encoder, EnDat2.2	High class
/AH1E ²⁾	Multi-turn encoder, EnDat2.2	High class
/EK0J ³⁾	Single-turn encoder, HIPERFACE®	High class
/AK0J ³⁾	Multi-turn encoder, HIPERFACE®	High class
/AH1Q ³⁾	Multi-turn encoder, DRIVE-CLiQ	High class

- 1) Optionally available as safety encoder (in preparation).
2) Optionally available as safety encoder.
3) Optionally available as safety encoder upon request.

3.3.5 Fan

Designation	Option
/VR	Forced cooling fan

3.4 Functional safety

Motors from SEW-EURODRIVE are optionally available with functionally safe motor options. These are designed for implementing safety functions.

SEW-EURODRIVE labels a functionally safe motor option on the drive with an FS logo and a 2-digit number on the motor nameplate. The number is a code that indicates which components in the drive are safety-related. This makes it possible to uniquely identify an available functional safety motor option via the motor nameplate.

Make sure you observe any present FS logo on the nameplate and its meaning according to the following table:

FS logo	Available functionally safe motor option		
	Decentralized inverters	Safety brake	Safety encoders
	✓	–	–
	–	✓	–
	–	–	✓
	✓	–	✓
	–	✓	✓

✓ The motor option is functionally safe.

– The motor option is not available.

If the FS logo is present on the motor nameplate, e.g. with the code "FS 11", the motor includes a combination of safety encoder and safety brake. Drives can also be equipped with 2 encoders, e.g. a built-in encoder and an add-on encoder. In such cases, the FS logo for the safety encoder always relates to the add-on encoder. If an FS logo is available, adhere to the information specified in the corresponding documentation.

If the drive bears the FS logo on the nameplate, adhere to the information in the following documentation:

- Addendum to the operating instructions "Safety Encoders and Safety Brakes for Synchronous Servomotors CMP..., CMPZ..., CM3C..., CM3P..."

The characteristic safety value used to determine the safety level for systems and machines yourself, refer to chapter "Characteristic safety values" in the operating instructions.

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.

Only install the device if the following conditions are met:

- Observe the information on the nameplate.
- 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.
- The information on the nameplate of the drive corresponds to the voltage supply system or to the output voltage of the inverter.
- Ambient temperature is as specified on the nameplate.

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

- Ensure that work is carried out by trained specialists only.
- Insert the key into the keyway.
- Pull a protective tubing over the shaft.
- Take account of derating at an installation altitude > 1000 m above sea level.
- Protect the components from mechanical damage.
- Only install the device in the specified mounting position on a level and torsionally rigid support structure.
- For flange mounting, use the screws and tightening torques specified in chapter "Screw sizes and tightening torques for flange mounting".
- 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.
- 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.
- Make sure that the customer's counter-bearing is unobstructed and can move freely.

- Ensure that the cooling air supply to the motor is unobstructed.
- Make sure that no warm exhaust air from other devices is drawn in.
- Balance parts to be subsequently mounted on the shaft only with half a key (motor shafts are balanced with half a key).
- Screw in the hand lever for brakemotors with manual brake release (with re-engaging manual brake release HR).
- Turn the rotor by hand and pay attention to unusual grinding noises.
- Check that the direction of rotation is correct in decoupled state.
- If the product is equipped with functionally safe options, please note the indications in the corresponding operating instructions.

You can recognize a product with functional safety by the FS logo on the nameplate.

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 Installation in damp locations or in the open

- 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 plug connectors (motor or encoder connection) before reassembly.
- Replace embrittled seals.
- Touch up the anti-corrosion protection if necessary.
- Check the required degree of protection.
- Install covers (canopy) if necessary.
- Install a suitable protective cover against direct sunlight during outdoor operation.

The protection device must not cause heat build-up.

4.3 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to EN 50347	Centering shoulder tolerance according to EN 50347
• ISO k6 • Center hole according to DIN 332, shape DR	• ISO j6

4.4 Screw sizes and tightening torques for flange mounting

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

Motor	Ø bore mm	Screw 8.8 DIN EN ISO 4762	Tightening torque ¹⁾ Nm
CM3C63	6.5	M6 × 20 ²⁾	10.1
CM3C71 CM3P71	9	M8 × 35	24.6
CM3C80 CM3P80	11	M10 × 40	48
CM3C100 CM3P100	11	M10 × 40	48

1) The friction coefficient of the threads is 0.12.

2) Due to the flange geometry with this size, longer screws cannot be used.

4.5 Motor mounting to MD adapter

The following note only applies to motors in compact mounting with the MD adapter. These motors have the identification letter "D" for the shaft design in their type designation (e.g. CM3C71M-30A-D/PK/RH1M/SMB).

NOTICE

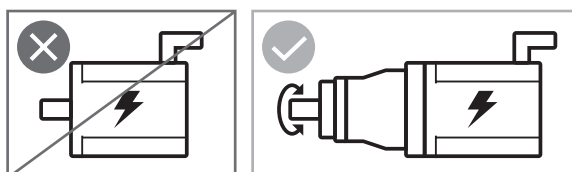


Motor operation without gear unit and adapter

Motor damage

- Never operate the motor prepared for mounting to the MD.. adapter without a gear unit or a suitable and intended test device.
- Gear units with the MD.. adapter may only be operated with CM3C.. or CM3P.. servomotors with shaft design D.

On the servomotors, a label is attached that indicates that servomotors with MD.. adapter must never be operated without a gear unit.



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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 information when working on the motor and with the motor:

- 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.
- Ensure that work is carried out by trained specialists only.
- Secure the motor against unintended power-up.
- Observe the information on the nameplate.
- Observe the information on the motor wiring diagram.
- With brakemotors, check for proper function of the brakes.
- Operate the motors only with a frequency inverter.
- Observe the operating instructions of the frequency inverter.
- Operate the product only with correctly connected protective earth, even for short-time measuring or test purposes.
- Secure each product with a ground connection.
- Never connect or disconnect plug connectors while they are energized.
- Do not touch the male contacts in the power plug connector.
- Install a touch guard at the power plug connector if no mating connector is plugged in.
- Only operate the motor with attached customer output element (e.g. gear unit), or with a suitably secured key.
- It is essential that you observe the correct polarity of the brake supply.
Check the polarity when replacing the brake.
- Repairs or modifications to the product may only be performed by trained specialists. Contact SEW-EURODRIVE Service when performing work on the unit.

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 Wiring notes

5.3.1 Protecting the brake control system against interference

To protect the brake control system against interference, do not route unshielded brake cables together with switched-mode power cables.

Switched-mode power cables include in particular:

- Output cables from servo inverters, converters, soft start units and brake units
- Supply cables for braking resistors and similar options

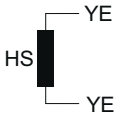
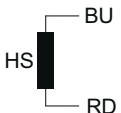
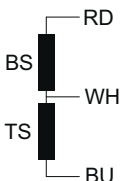
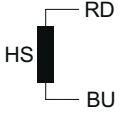
5.3.2 Protecting the motor protection devices against interference

Adhere to the following points to protect motor protection devices by SEW-EURODRIVE against interference:

- Route separately shielded feeder cables together with switched-mode power lines in one cable
- Do not route unshielded feeder cables together with switched-mode power lines in one cable.

5.4 Brake connection

5.4.1 Brake connection

Brake	Description
	The BP.. spring-loaded brake is designed as a two-wire brake and is equipped with a holding coil with two connections of the same color.
	The BK..permanent magnet brake is designed as a two-wire brake and is equipped with a holding coil with two differently colored connections. The polarity of the supply is relevant to the function.
	The BY.. and BZ.. spring-loaded brakes are designed as three-wire brakes and have a split brake coil with three differently colored connections. The connections are used for connecting to brake controls from SEW-EURODRIVE.
	The BY..D and BZ..D spring-loaded brakes are designed as two-wire brakes and have two differently colored connections. The polarity of the supply is not relevant to the function.

Key			
BU	Blue	HS	Holding coil
WH	White	BS	Accelerator coil
RD	Red	TS	Coil section
YE	Yellow		



⚠ WARNING

Delayed brake application or unintentional brake release due to incorrect control or connection.

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

- Observe the specifications of this documentation for connecting the brake.
- If you are uncertain about brake control, voltage supply type and design, or over-voltage and short circuit protection, contact the plant manufacturer or SEW-EURODRIVE.

5.4.2 Delivery state

The connection leads of the brakes are installed ready for connection in the motor upon delivery. Depending on the design, the cables in the terminal box are routed to auxiliary terminals or in the connector on the motor side.

The brake is internally connected to the motor ground wires. An additional connection for the brake is not necessary.

For the connector assignment, refer to chapter "Connecting the two-cable technology", for the assignment in the terminal box, refer to chapter "Connection with terminal box".

▲ WARNING



Severe or fatal injuries

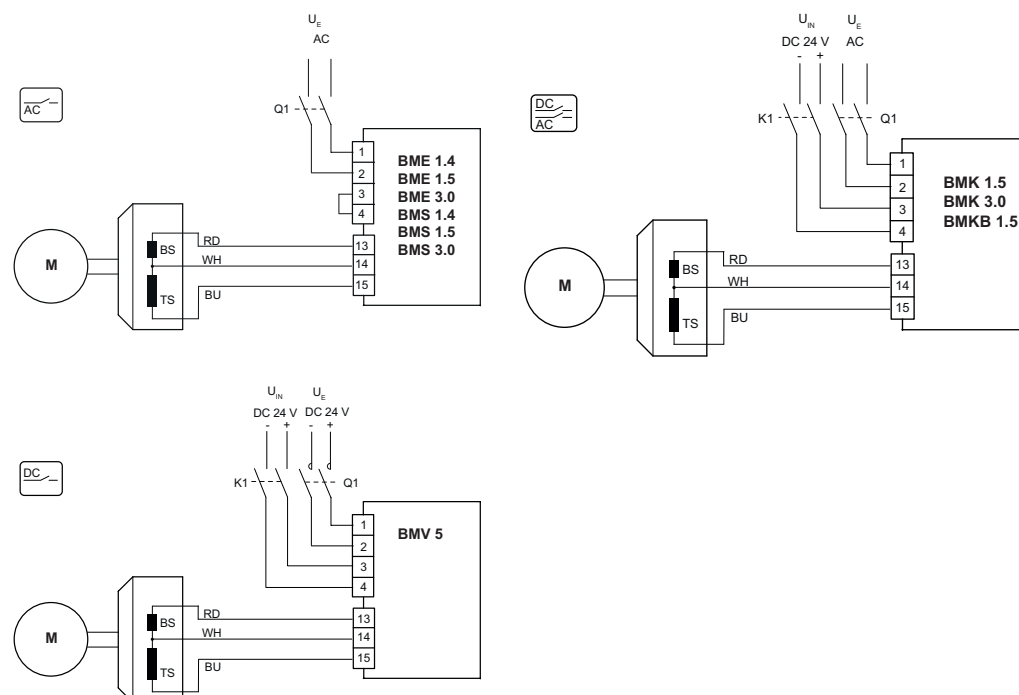
Great and unexpected elongation of the stopping distance.

- Operate each brake with a separate brake control.
- Observe the notes on dimensioning in the catalog, or contact SEW-EURODRIVE.

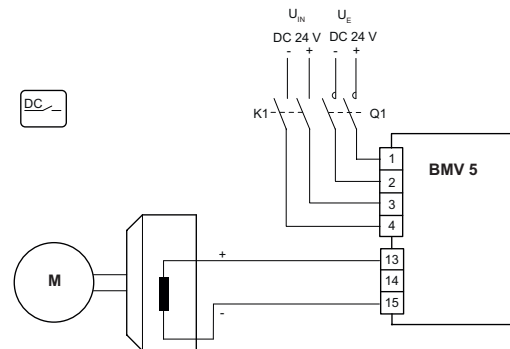
5.4.3 Permitted brake control

The brake is designed for operation with AC voltage or DC voltage, depending on the design. The following table shows the different connection combinations:

Brake	Coil connection	AC supply system With control	DC supply system with control	DC supply system with control
		BME, BMK(B), BMP, BMH, SBM, BST	BMV	BSG
BZ..	RD	13	13	3
	WH	14	14	1
	BU	15	15	5



Brake	Coil connection	DC supply system with control	DC system without control	DC supply system with control	MOVIAXIS® (MXA) MOVIDRIVE® modular (MDA, MDD)
		BMV		BS24	
BK..	RD	13	+	3	DB00
	BU	15	–	5	DGND
BZ..D	RD	13	+	3	DB00
	BU	15	–	5	DGND



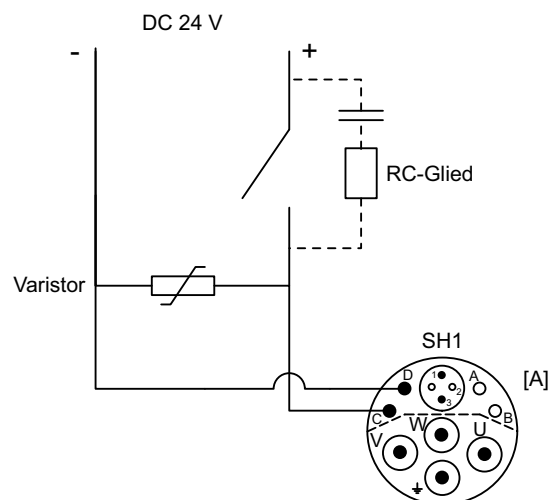
For the terminal assignment in the terminal box, refer to chapter "Connection with terminal box".

5.4.4 Wiring diagram of the brake control with /BK.. or /BZ..D brake

Direct 24 V brake supply with non-SEW inverters

If the brake is not controlled via BMV brake control unit, a contactor must be used that is suitable for switching inductive DC loads. In this case 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.



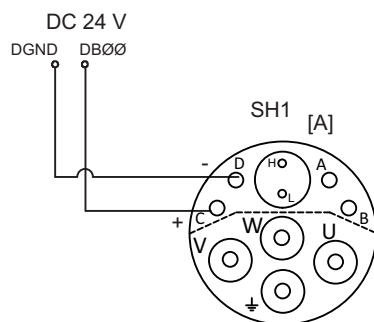
- [1] Varistor
- [2] RC element

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Direct 24 V brake supply

With MOVIDRIVE®
modular



NOTICE

Damage to the BK.. brake.

Possible damage to property.

- It is essential that you observe the correct polarity of the BK.. brake supply. Check the polarity when replacing the brake.

5.4.5 Optional separation of DC and AC circuits

In the case of brakes operated with AC voltage, make sure the connection type designated by the manufacturer is applied correctly during the brake connection. The following types are distinguished:

- Cut-off in the AC circuit (AC cut-off) with normal application time
- Cut-off in the AC circuit and the DC circuit (AC/DC cut-off) with shortened application time

The correct switch-off type must be ensured through appropriate wiring. Certain brake controls by SEW-EURODRIVE implement the cut-off in the DC or AC circuit via integrated switching relays (e.g. BMP1.5).

The connection type is specified on the included wiring diagrams by a pictogram.

⚠ WARNING



Delayed brake application or unintentional ongoing brake release due to incorrect cut-off.

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

- During project planning, consider the required cut-off type and the effects on the expected stopping distance in particular.
- Only use the faster cut-off in the DC and AC circuit for hoists and hoist-like applications.
- If it is unclear whether the application is a hoist-like application, contact SEW-EURODRIVE.
- Make sure that the configured connection type (AC or AC/DC) is implemented correctly during startup, irrespective of the type of application.

5.4.6 Brake voltage supply

The brake voltage supply must match the values specified on the nameplate of the motor. The brake must be supplied via the designated brake control.

The specifications on the nameplate have a tolerance of +/-5% of the upper/lower limit value of the stated connection range. Observe order-specific deviations.

Make sure the voltage supply is sufficiently stable by using cable cross sections and voltage sources that are dimensioned accordingly. Make sure the supply voltage does not drop below 90% of the nominal value during starting. This can be caused by an increased inrush current and an increased cable length, especially at DC 24 V.

5.4.7 Switching equipment

The high electrical load during switching of the brake (inductive load) requires suitable contactors/switch contacts to have the brake function properly.

Depending on the brake type and design, the switch contacts must meet the specifications in the following utilization categories:

- Switch contacts for the supply voltage for operation with AC voltage: AC-3 according to IEC 60947-4-1 or AC-15 according to IEC 60947-5-1.
- Switch contact for the supply voltage for operation with DC voltage: Preferably AC-3 or DC-3 according to IEC 60947-4-1. As an alternative, contacts in utilization category DC-13 according to IEC 60947-5-1 are also permitted.
- Switch contacts for optional cut-off in the DC circuit: AC-3 according to IEC 60947-4-1.

Observe the specifications on the provided wiring diagram.

Using a semi-conductor relay is not permitted.

5.4.8 Fusing the voltage supply

To obtain protection against overcurrents damage (e.g. due to short circuit or incorrect connection), a sufficiently dimensioned fusing must be used at the supply cables.

Observe the project planning notes in the catalog or contact SEW-EURODRIVE.

5.5 Connecting the motor and the encoder system via plug connector SM./SB./SH.

As standard, the electric motors are supplied with the SM./SB. plug connector system in two-cable technology.

In the basic version, SEW-EURODRIVE delivers electric motors with a connector on the motor end and without mating connector. The encoder system is connected using a separate 12-pin round plug connector (M23). The mating connectors can be ordered separately or together with the motor.

Electric motors in the optional "encoderless design" are equipped with single-cable technology with SH. plug connector system upon delivery.

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).

5.5.1 Notes regarding the connection of the power and signal cables via the connector system

Power cables and signal cables are connected with adjustable right-angle connectors as standard.

Observe the following information when working on the motor and with the motor:

- 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.

- 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 protect the motor protection devices and/or the brake control from damage, you must not route unshielded supply cables alongside pulsed power cables.
- Make sure not to turn the connector regularly once it has been installed.

5.5.2 Type designation of plug connectors at the cable side

The following table shows an example of a type designation:

Example: SM12	
S	S Plug connector
	K Terminal box

Example: SM12		
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	
	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)	
	B Connector size M40 (6 – 16 mm ²)	
	C Connector size M58 (16 – 35 mm ²)	
	D Signal connector with MOVILINK® DDI in case of separate connection of motor power and signal interface	
2	Cross section	
	1 1.5 mm ²	10 10 mm ²
	2 2.5 mm ²	16 16 mm ²
	4 4 mm ²	25 25 mm ²
	6 6 mm ²	35 35 mm ²

5.5.3 Assembling the cable yourself

Prefabricated cables are available from SEW-EURODRIVE to connect the SM./SB. plug connector system. For information on the prefabricated cables and part numbers, refer to the catalog for the respective motor.

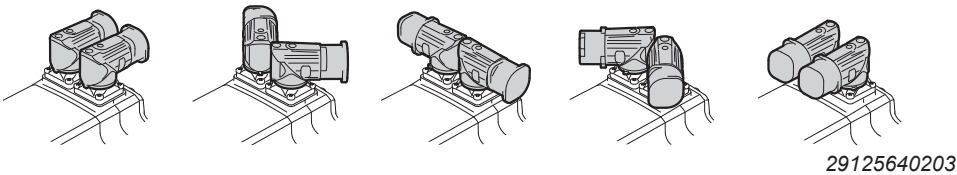
5.6 Connecting the two-cable technology

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

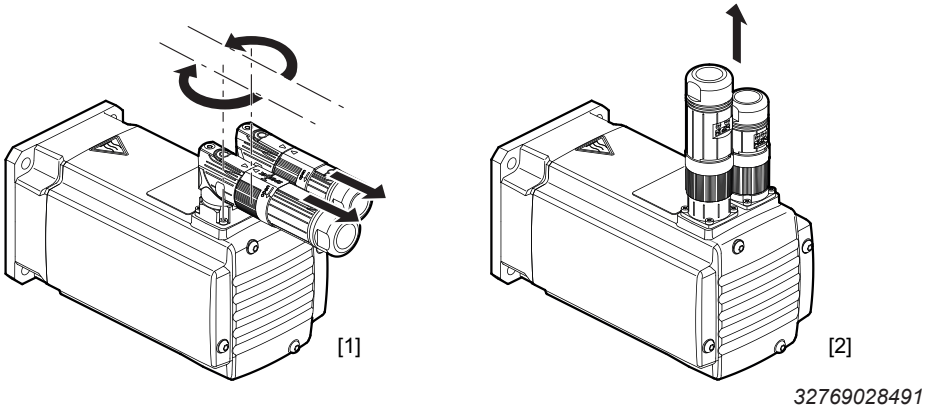
In the basic design, SEW-EURODRIVE delivers the electric motors with a connector on the motor side and without a mating connector. The encoder system is connected using a separate 12-pin round circular connector (M23).

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

The SM1/SB1, SMB/SBB right-angle connectors can be aligned to achieve all desired positions. The following figure illustrates examples of different positions of SM1/SB1, SMB/SBB plug connectors:



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

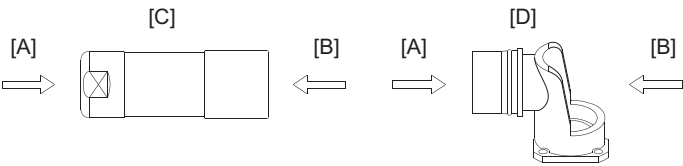


- [1] "Directional" connector position
- [2] "Radial" connector position

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

Connector position		Plug connectors	
		SM1/SB1	SMB/SBB
Radial		✓	✓
Adjustable	Steplessly adjustable positions	✓	✓

5.6.1 Key



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

5.6.2 Connecting SM1/SB1 power plug connectors (M23)

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

Function

Motor connection for motors with resolver/HIPERFACE® interface

Connection type

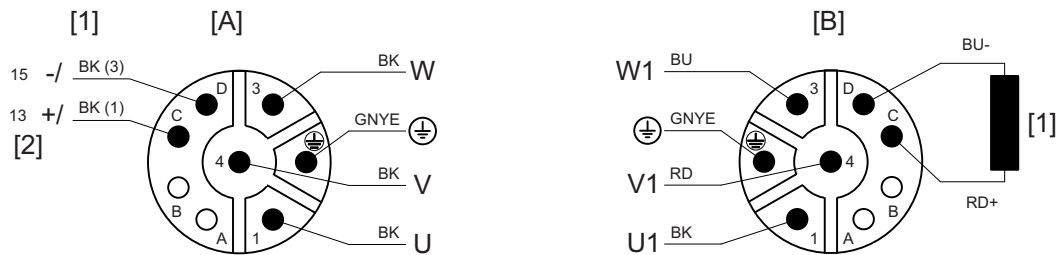
M23, TE Connectivity - Intercontec Products, series 923, SEW insert, SpeedTec equipment, coding ring: without, male

Connection diagram

Motor assignment				
Contact	Signal	Without brake	With BK../BZ..D brake	With BZ.. brake
A	Reserved	Do not connect	Do not connect	Do not connect
B	Reserved	Do not connect	Do not connect	Brake 14
C	Reserved	Do not connect	Brake +	Brake 13
D	Reserved	Do not connect	Brake -	Brake 15
PE	PE	Protective earth	Protective earth	Protective earth
1	U	Motor phase U	Motor phase U	Motor phase U
3	W	Motor phase W	Motor phase W	Motor phase W
4	V	Motor phase V	Motor phase V	Motor phase V

Wiring diagram of SM1./SB1. with/without BK.. brake

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

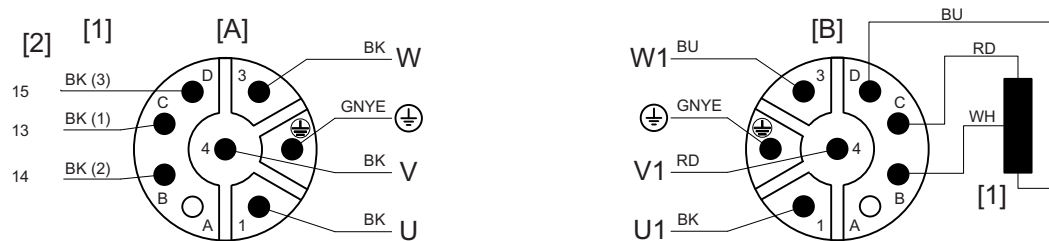


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- [1] BK.. brake (optional)
- [2] Connection to rectifier from SEW-EURODRIVE according to operating instructions.

Wiring diagram of SM1./SB1. with/without BZ../BZ..D brake

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

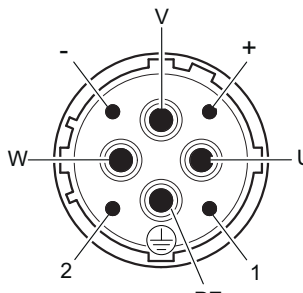


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- [1] BZ../BZ..D brake (optional)
- [2] Connection to rectifier from SEW-EURODRIVE in accordance with operating instructions. For BZ..D, there is no port 14 (contact B).

5.6.3 Connection SMB/SBB power plug connector (M40)

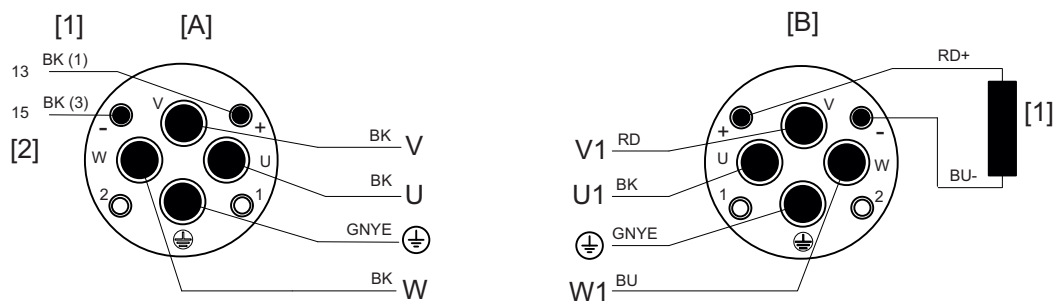
The connection diagram of the plug connector depicts the contact end of the connections.

Function
Motor connection for motors with resolver/HIPERFACE® interface
Connection type
M40, TE Connectivity - Intercontec products, series 940, SEW insert, SpeedTec equipment, coding ring: without, male
Connection diagram


Motor assignment				
Contact	Signal	Without brake	With BK../BZ..D brake	With BZ.. brake
+	Reserved	Do not connect	Brake +	Brake 13
-	Reserved	Do not connect	Brake -	Brake 15
1	Reserved	Do not connect	Do not connect	Brake 14
2	Reserved	Do not connect	Do not connect	Do not connect
PE	PE	Protective earth	Protective earth	Protective earth
U	U	Motor phase U	Motor phase U	Motor phase U
V	V	Motor phase V	Motor phase V	Motor phase V
W	W	Motor phase W	Motor phase W	Motor phase W

Wiring diagram of SMB./SBB. with/without BK.. brake

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

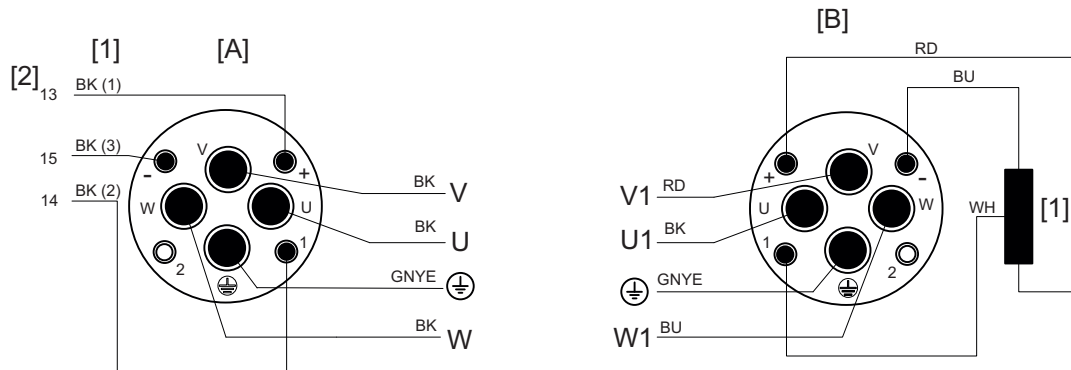


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- [1] BK.. brake (optional)
 [2] Connection to SEW rectifier according to operating instructions.

Wiring diagram of SMB./SBB. with/without BZ../BZ..D brake

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

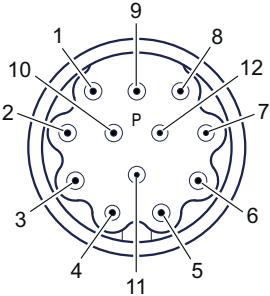


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- [1] BZ../BZ..D brake (optional)
- [2] Connection to rectifier from SEW-EURODRIVE according to operating instructions. For BZ..D, there is no port 14 (contact 1).

5.6.4 Connection of SM./SB. signal plug connector

The connection diagram of the plug 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, SEW insert, SpeedTec equipment, coding ring: without, male			
Connection diagram			
			
Motor assignment			
Contact	Signal	with AK0H/AK1H/EK1H encoder	With RH1M resolver
1	Reserved	Do not connect	Reference +
2	Reserved	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	Protective earth	Do not connect
12	V _s	Voltage supply	Do not connect

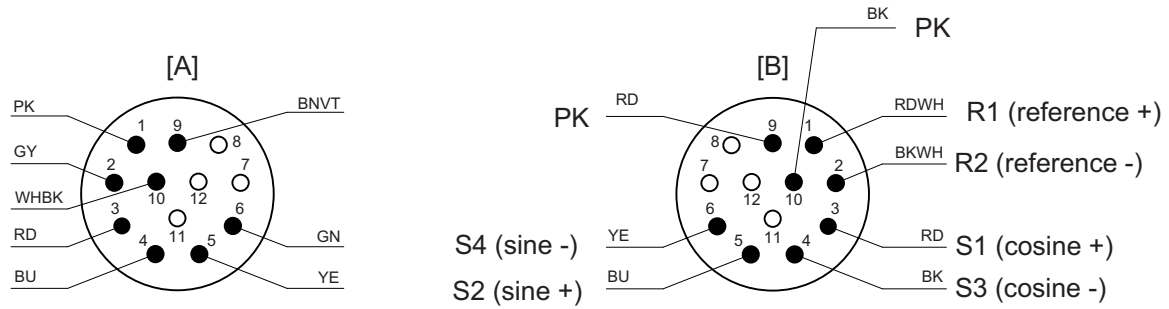
Wiring diagram of signal plug connectors RH1M resolver

INFORMATION



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

Wiring diagram

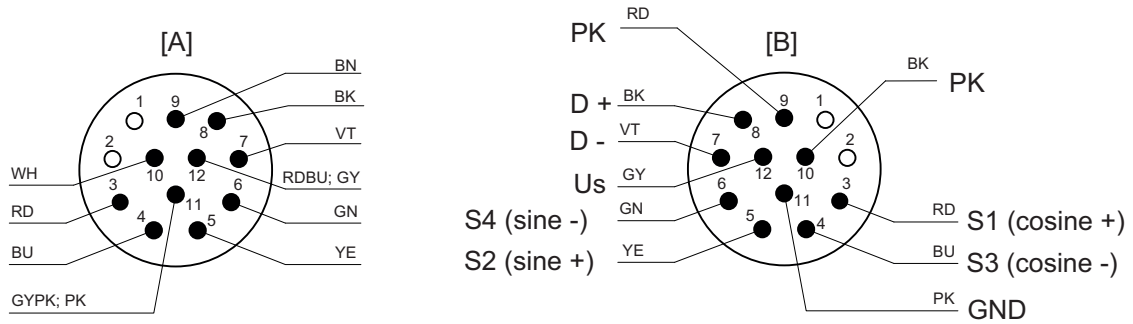


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Connect the shield to the metal housing in the plug connector. The color code corresponds to the cables from SEW-EURODRIVE.

Wiring diagram of signal plug connector AAK0H, AK1H, EK1H encoder

Wiring diagram



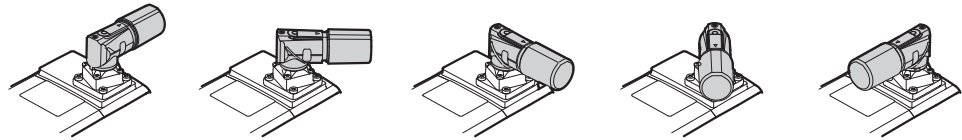
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Connect the shield to the metal housing in the plug connector. The color code corresponds to the cables from SEW-EURODRIVE.

5.7 Connecting single-cable technology

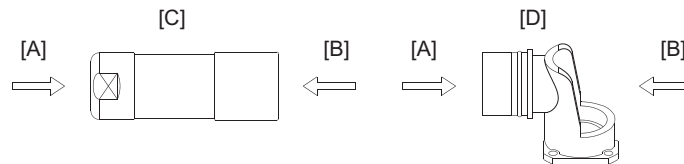
Using the fully digital MOVILINK® DDI interface by SEW-EURODRIVE allows for connecting servomotors using single-cable technology. With this technology, all data of the motor, such as encoder data, temperature data, startup data, and data of further sensors is digitally transferred via a hybrid cable.

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



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5.7.1 Key

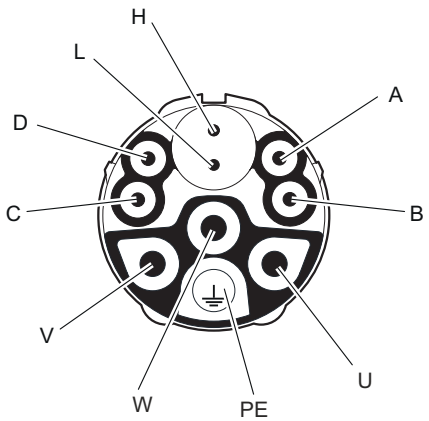


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- [A] Viewing direction A
- [B] Viewing direction B
- [C] Customer-supplied plug connector with socket contacts
- [D] Flange socket with pin contacts installed at the factory

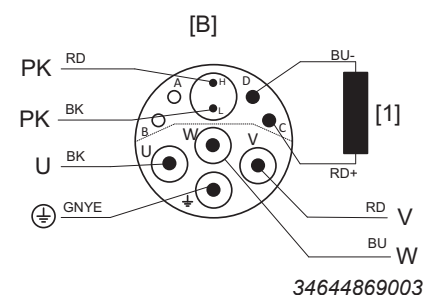
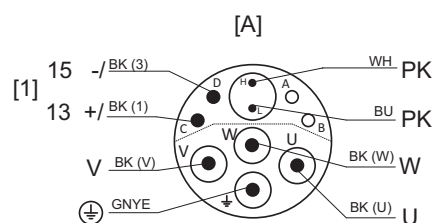
5.7.2 Connection of SH1 power plug connector (M23)

The connection diagram of the plug 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, SEW-EURODRIVE insert, SpeedTec equipment, coding ring: without, protected against contact
Connection diagram
 34609095051

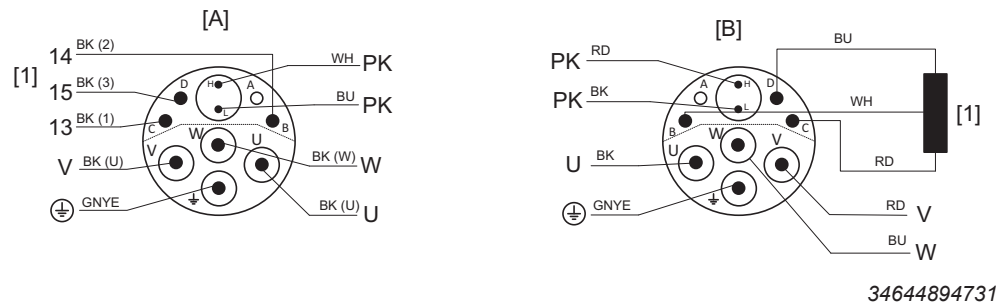
Motor assignment				
Contact	Signal	Without brake	With BK../BZ..D brake	With BZ.. brake
U	U	Motor phase U	Motor phase U	Motor phase U
V	V	Motor phase V	Motor phase V	Motor phase V
W	W	Motor phase W	Motor phase W	Motor phase W
A	Reserved	Do not connect	Do not connect	Do not connect
B	Reserved	Do not connect	Do not connect	Brake 14
C	Reserved	Do not connect	Brake +	Brake 13
D	Reserved	Do not connect	Brake -	Brake 15
PE	PE	Protective earth	Protective earth	Protective earth
H	H	Motor protection	Motor protection	Motor protection
L	L	Motor protection	Motor protection	Motor protection

Wiring diagram for SH1 without brake / with BZ..D/BK.. brake



[1] BZ..D/BK.. brake (optional)

Wiring diagram for SH1 without brake / with BZ.. brake



[1] BZ.. brake (optional)

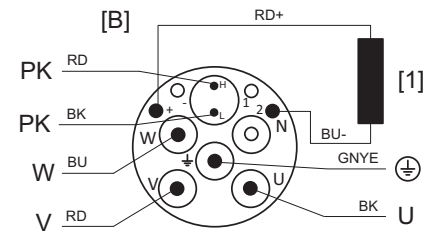
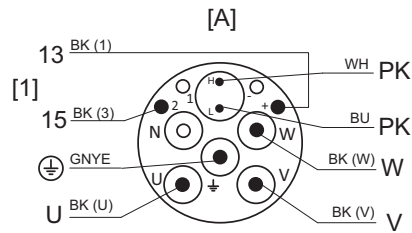
5.7.3 Connection of SHB (M40) power plug connectors

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

Function	
Motor connection for motors in encoderless design	
Connection type	
M40, male, male thread, TE Connectivity – Intercontec products, series 740, SEW-EURODRIVE insert, SpeedTec equipment, coding ring: without, protected against contact	
Connection diagram	

Motor assignment				
Contact	Signal	Without brake	With BK../BZ..D brake	With BZ.. brake
U	U	Motor phase U	Motor phase U	Motor phase U
V	V	Motor phase V	Motor phase V	Motor phase V
W	W	Motor phase W	Motor phase W	Motor phase W
1	Reserved	Do not connect	Do not connect	Do not connect
2	Reserved	Do not connect	Brake -	Brake 15
+	Reserved	Do not connect	Brake +	Brake 13
-	Reserved	Do not connect	Do not connect	Do not connect
N	Reserved	Do not connect	Do not connect	Brake 14
PE	PE	Protective earth	Protective earth	Protective earth
H	H	Motor protection	Motor protection	Motor protection
L	L	Motor protection	Motor protection	Motor protection

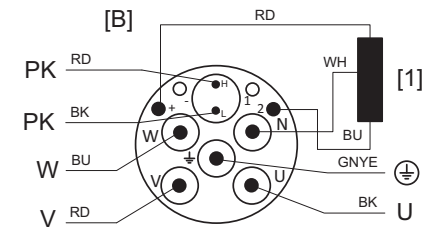
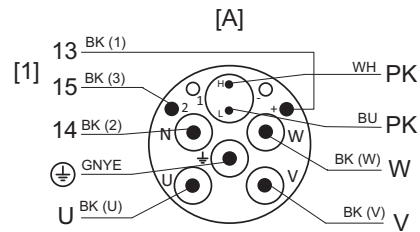
Wiring diagram for SHB without brake / with BZ..D/BK.. brake



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[1] BZ..D/BK.. brake (optional)

Wiring diagram for SHB without brake / with BZ.. brake



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[1] BZ.. brake (optional)

5.8 Connection with terminal box

Optionally, you can connect the power and signal cables with conductor end sleeves via a terminal box.

INFORMATION



To protect the motor protection devices or the brake control from damage, you must not route unshielded supply cables alongside switched-mode power cables.

Shielded supply cables may be routed together with switched-mode power lines in one cable.

Switched-mode power cables are:

- Output cables from servo inverters, converters, and brake units
 - Supply cables for braking resistors and similar options
-
- Check the cross section of the cables.
 - Screw on the connections and the PE. Check for correct connection.
 - An EMC screw fitting must be used for the cable entry of the signal cable to ensure a perfect shield connection.

⚠ WARNING



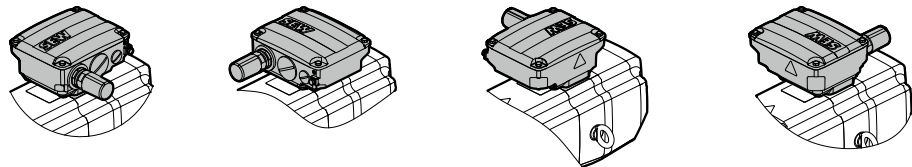
Risk of electric shock if signal cables or signal wires come into contact with power connections.

Fatal or serious injuries.

- The single conductors of signal cables (e.g. of encoders or temperature sensors) of the encoder cable must have minimum clearance of 4 mm from all bare and live parts of the terminal board and the eyelets.
- All single conductors of signal cables (e.g. of encoders or temperature sensors) or individual signal cables (e.g. with MOVILINK® DDI) must be insulated by the cable jacket or insulating tubing up to the connection to the terminal strip. Please ensure that the insulation cannot slip.

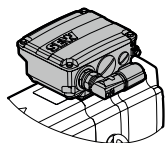
You can align the terminal box with hybrid plug connector KD1/KDB and the signal plug connector KDD in all desired positions.

To rotate the terminal box, contact SEW-EURODRIVE.



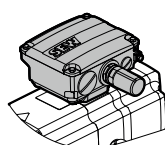
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The KD1 hybrid plug connectors are also optionally available in angled positions. You can align the KD1 right-angle plug connector in a similar way to the SD1 plug connectors.



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The KDD terminal box design is available for motors with high motor power and currents. The signal plug connector is used to connect the MOVILINK® DDI interface. The motor and brake power supply is ensured via a cable gland in the terminal box.



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5.8.1 Position of terminal box and cable entry

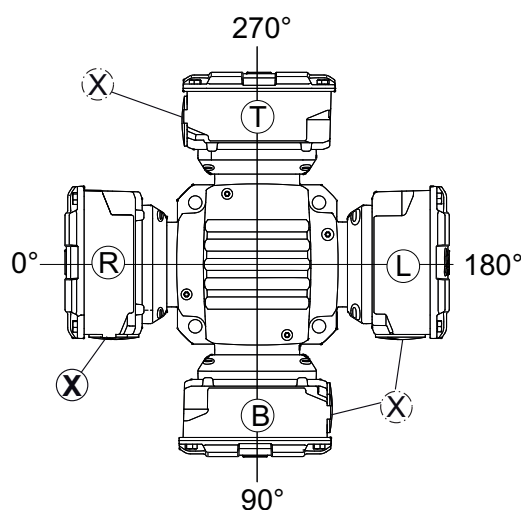
Product standard EN 60034 prescribes the following designations for terminal boxes positioned facing towards the output shaft (A-side):

- R (right)
- B (bottom)
- L (left)
- T (top)

This designation applies to motors without a gear unit in mounting position B3 (= M1).

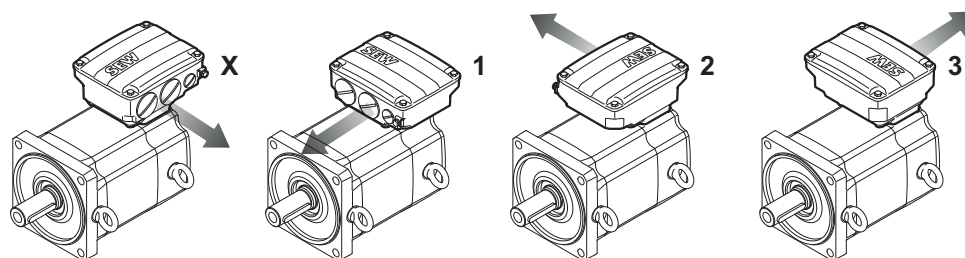
The position of the motor terminal box has so far been indicated with 0°, 90°, 180° or 270° as viewed onto the fan guard (B-side). For gearmotors, the previous designation is retained.

The following figure shows both designations. Where the mounting position of the motor changes, R, B, L and T are rotated accordingly.



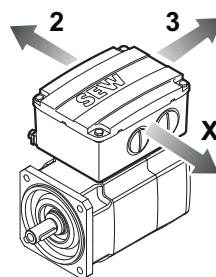
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The cable entry position is specified with X, 1, 2, 3. As standard, the terminal box is delivered in 270° design with cable entry "X".



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The following figure shows that only terminal box position "X" is available for motor size 63. Cable entry is possible from 3 sides.



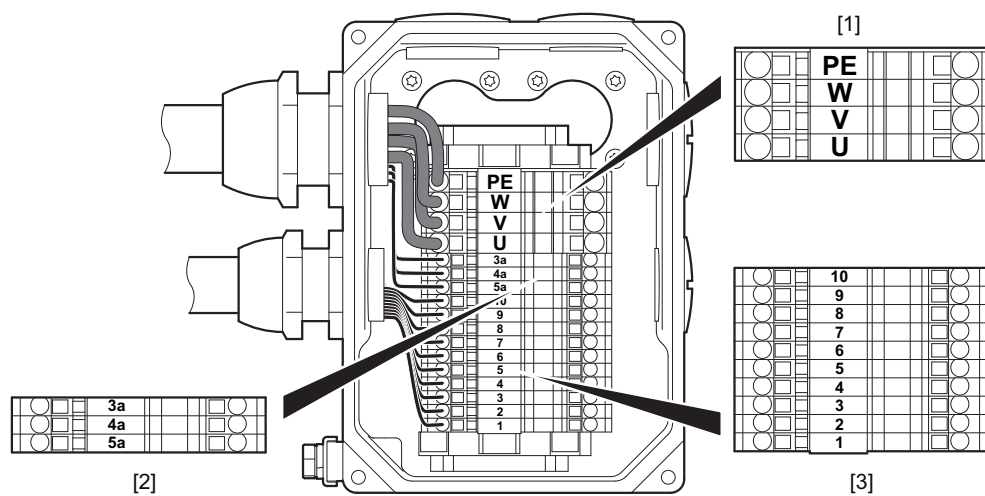
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Observe that the terminal box position is defined when ordering the motor. The terminal box must not be turned afterwards. Contact SEW-EURODRIVE if necessary.

5.8.2 Connection cross section

Motor	Power rating		Brake		Encoder/resolver/ thermal motor protection		Cable entry
	Connection	Maximum Connection cross section	Connection	Maximum Connection cross section	Connection	Maximum Connection cross section	Diameter
CM3C63	Spring terminals	4 mm ²	Spring terminals	1.5 mm ²	Spring terminals	1.5 mm ²	M25 × 1.5 (3×) M20 × 1.5 (3×)
CM3C71, CM3C80, CM3C100 CM3P71, CM3P80, CM3P100	M6 bolt	10 mm ²	Spring terminals	2.5 mm ²	Spring terminals	2.5 mm ²	M32 × 1.5 (2×) M16 × 1.5 (1×)

5.8.3 Terminal assignment of terminal box KK CM3C63



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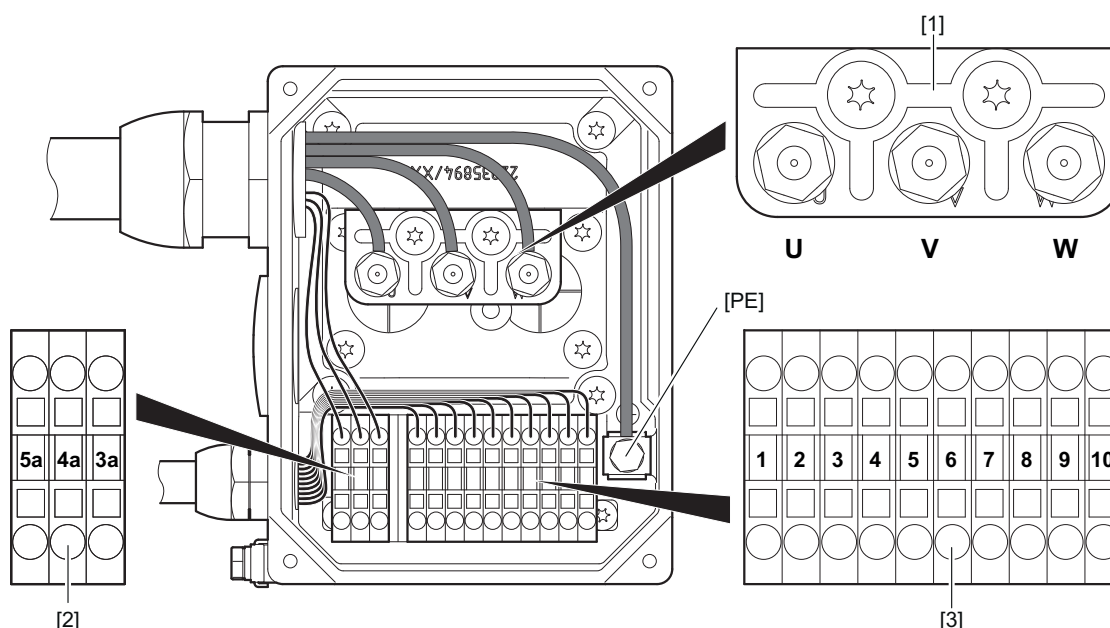
Terminal [1]	No.	Connection
Supply system	U	Line phase U
	V	Line phase V
	W	Line phase W
	PE	Protective earth

Terminal [2]	No.	Brake control connection			
		BMV..	BS24	BME.., BMP.., BMH.., BMK.., BST.., SBM..	BSG..
BK.. brake BZ..D brake	3a	–	–	–	1
	4a	13	3	–	–
	5a	15	5	–	–
BZ.. brake	3a	–	–	14	1
	4a	–	–	13	5
	5a	–	–	15	3

Terminal [3]	No.	RH1M resolver		AK1H, EK1H, AK0H encoders	
		Connection	Comment	Connection	Comment
Signal	1	R1 ref +	Reference +	cos +	Cosine +
	2	R2 ref -	Reference -	ref cos	Reference
	3	S1 cos +	Cosine +	sin +	Sine
	4	S3 cos-	Cosine -	ref sin -	Reference
	5	S2 sin+	Sine +	D -	DATA
	6	S4 sin-	Sine -	D +	DATA
	7	–	–	GND	Mass
	8	–	–	Vs	Voltage
	9	PK	Motor protection	PK	Motor protection
	10	PK	Motor protection	PK	Motor protection

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

5.8.4 Terminal assignment of terminal box KK CM3C71 – 100/CM3P71 – 100



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Terminal [1]	No.	Connection
Supply system	U	Line phase U
	V	Line phase V
	W	Line phase W
	PE	Protective earth

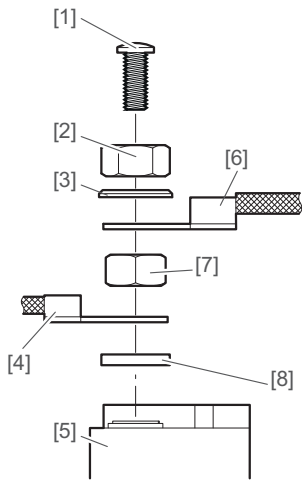
Terminal [2]	No.	BMV..	BS24	Brake control connection BME.., BMP.., BMH.., BMK.., BST.., SBM..	BSG..
BK.. brake BZ..D brake	3a	–	–	–	–
	4a	13	3	–	–
	5a	15	5	–	–
BZ.. brake	3a	–	–	14	1
	4a	–	–	13	5
	5a	–	–	15	3

Terminal [3]	No.	RH1M resolver		AK1H, EK1H, AK0H encoders	
		Connection	Comment	Connection	Comment
Signal	1	R1 ref +	Reference +	S1 cos +	Cosine +
	2	R2 ref -	Reference -	S3 cos-	Cosine -
	3	S1 cos +	Cosine +	S4 sin+	Sine +
	4	S3 cos-	Cosine -	S2 sin-	Sine -
	5	S2 sin+	Sine +	D -	Data -
	6	S4 sin-	Sine -	D +	Data +
	7	–	–	GND	Mass
	8	–	–	Vs	Voltage
	9	PK	Motor protection	PK	Motor protection
	10	PK	Motor protection	PK	Motor protection

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

5.8.5 Power connection on terminal box

The following figure shows the power connection on the terminal box:



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- | | |
|-------------------|--------------------|
| [1] Terminal stud | [5] terminal board |
| [2] Upper nut | [6] Customer cable |
| [3] Washer | [7] Lower nut |
| [4] Motor cable | [8] Lock washer |

Positions 4, 6 and 7 are considered live for the dimensioning of the terminal box.

Diameter of the terminal stud	Tightening torque of the hex nut	Customer connection Cross section	Design	Connection type	Scope of delivery
M4	1.6 Nm	≤ 6 mm ²	Design 1b	Ring cable lug	Terminal links Pre-assembled
		≤ 6 mm ²	Design 2	Ring cable lug	Connection accessories Enclosed in the bag
M5	2.0 Nm	≤ 10 mm ²	Design 2	Ring cable lug	Connection accessories Enclosed in the bag
M6	3.0 Nm	≤ 10 mm ²	Design 3	Ring cable lug	Connection accessories Enclosed in the bag

5.9 Assembling the cables

Observe the following when you assemble the cables yourself:

- The socket contacts for the motor connection are implemented as crimping contacts. Only use suitable tools for crimping.
- Insulate the connecting wires. Cover the connections with heat shrink tubings.
- Incorrectly installed socket contacts can be removed without removal tools.

5.9.1 Assembling mating connectors power cable

Mating connector type SM1/ SB1 SpeedTec	Crimping area U, V, W, PE mm ²	Crimping area Brake mm ²	Cables Crimping diameter mm
13354698	0.35 – 2.5	0.35 – 2.5	9 – 14
13354256	0.35 – 2.5		14 – 17
13354264	2.5 – 4		14 – 17

Mating connector type SMB/ SBB SpeedTec	Crimping area U, V, W, PE mm ²	Crimping area Brake mm ²	Cables Crimping diameter mm
13421778	1.5 – 10	0.35 – 2.5	9 – 16
13421751	1.5 – 10		16.5 – 25
13421670	6 – 16		16.5 – 25

The connector service packs also contain the brake pins, so that no difference needs to be made between motor and brakemotor.

5.9.2 Assembling mating connector encoder cable

Part number SpeedTec signal mating con- nector	Crimping area mm ²	Cable crimping diameter mm
16447115	0.14 – 1	6 – 10

The complete connector service pack always includes the following parts:

- Feedback connector
- Insulation inserts
- Socket contacts

5.10 Options

5.10.1 Pt1000 thermal motor protection

Type designation

/PK

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.

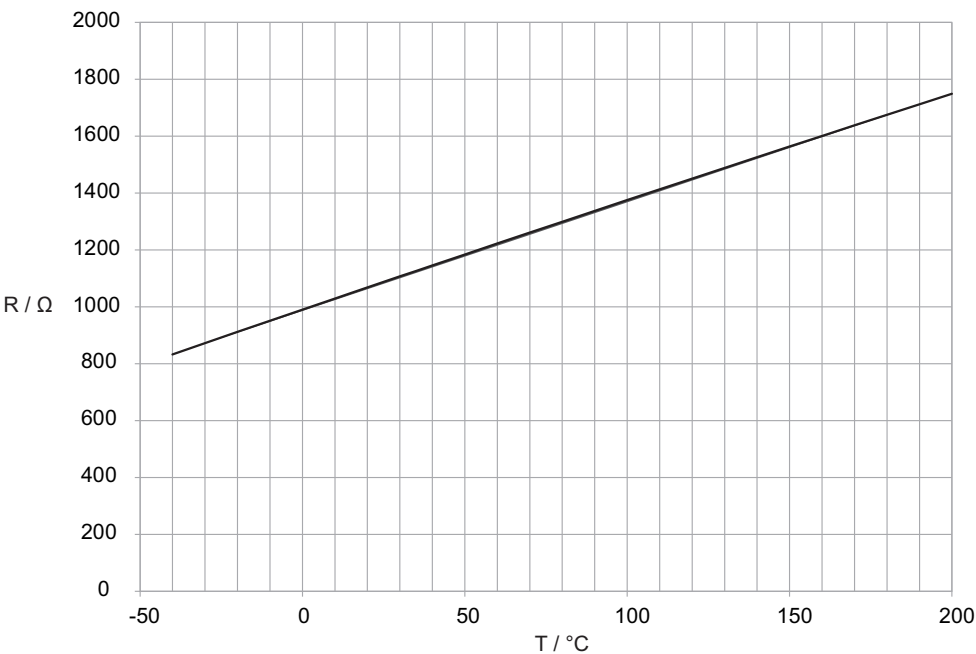
Technical data

The Pt1000 temperature sensor continuously detects the motor temperature.

	Pt1000
Connection	red – black
Total resistance at 20 – 25 °C	1050 Ω < R < 1150 Ω
Test 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 Pt1000



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5.10.2 VR forced cooling fan

The synchronous servomotors of size 71 – 100 can be equipped with a VR forced cooling fan as an option.

Adhere to the minimum clearance of 100 mm to the machine environment – even with motors with forced air cooling – so that the flow of hot air is not obstructed.

If required, remove any deposits or dirt from the motor. Dirt on the motor surface causes reduced heat dissipation and can therefore cause thermal motor overload.

INFORMATION



The forced cooling fan can only be used up to a maximum oscillation and shock load of 1 g.

Electrical connection



CAUTION

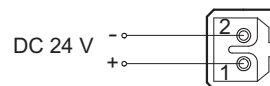
Starting up the fan when it is not installed.

Risk of injury due to rotating parts.

- The fan may only be taken into operation after installation.

The VR forced cooling fan is only available for DC 24 V voltage.

- DC 24 V $\pm$ 20%
- Plug connector connection
- Maximum connection cross section $2 \times 1 \text{ mm}^2$
- Cable gland Pg7 with inner diameter 7 mm



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Connector contact	Connection
1	24 V +
2	0 V

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.

Ensure the following before startup:

- 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.
- Ensure that work is carried out by trained specialists only.
- The drive must be undamaged and not blocked.
- All connections, especially the PE, have been made correctly.
- There are no other sources of danger.
- All motor protection devices are activated.
- Never connect or disconnect plug connectors while they are energized.
- Do not touch the male contacts in the power plug connector.
- Install a touch guard at the power plug connector if no mating connector is plugged in.
- Operate the motors only with a frequency inverter.
- The frequency inverter must be suitable for controlling a synchronous permanent magnet motor.
- Prior to startup, configure the SEW-EURODRIVE frequency inverter using the suitable engineering software.
- Only operate the motor with attached customer output element (e.g. gear unit), or with a suitably secured key.
- The motor surface must not be covered by heat-sensitive or insulating materials.
- All protection covers are installed correctly.
- Let the unit cool down sufficiently before you start working on it.
- For brakemotors with manual brake release, remove the hand lever immediately after startup.
- First, 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 BK.. And BZ.. brakes 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.
- After an extended storage period (independent of the ambient conditions), observe the information in chapter "Startup after storage" (→ 55).

6.2 Startup

During startup, run in the motor 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 Startup after storage

If you use a motor that has been stored for a longer period of time (depending on the ambient conditions), observe the following points in addition to chapter "Before start-up":

- Run in the motor at low speed and without axial or radial shaft load for 10 revolutions in each direction so that the bearing lubrication is again distributed evenly.
- For brakemotors with BK.. brake, SEW-EURODRIVE recommends a loop-in routine (3 minutes running at 300 min^{-1} , brake application 1 – 2 times per second).
- The bearing grease service life is reduced after storage periods > 1 year.
- After more than 4 years in storage, have the motor inspected for signs of aging of the ball bearings grease by SEW-EURODRIVE.
- Check whether the motor has absorbed moisture due to the longer storage time. Measure the insulation resistance with a measurement voltage of DC 500 V.

The insulation resistance depends greatly on the temperature. You can measure the insulation resistance between the connection pins and the motor housing using an insulation measuring device. If the insulation resistance is not sufficient, the motor must be dried.

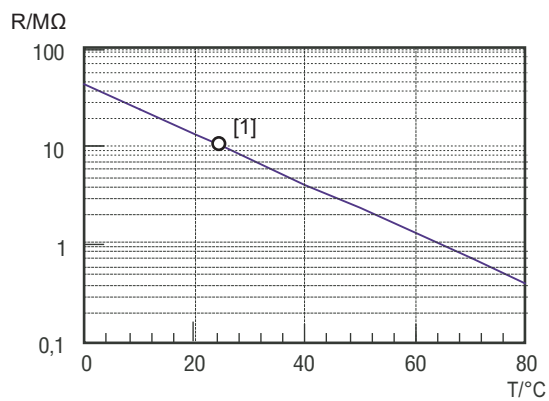
INFORMATION



If the insulation resistance is too low, the motor has absorbed moisture.

SEW-EURODRIVE recommends to send the motor back to SEW-EURODRIVE together with a description of the fault.

The following figure shows the minimum insulation resistance depending on the temperature.



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[1] Resistance temperature point (RT point)

7 Inspection/maintenance

7.1 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.

Ensure the following before inspection/maintenance:

- 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.
- Secure the motor against unintended power-up.
- Secure or lower the hoist drives.
- Only qualified specialists are allowed to carry out work on drives with functionally safe motor options.
- If the product is equipped with functionally safe options, please note the indications in the corresponding operating instructions.

You can recognize a product with functional safety by the FS logo on the nameplate.

- Improperly carried out work on drives with functionally safe motor options can result in loss of the safety functions. This can cause injuries and damage.
- Let the unit cool down sufficiently before you start working on it.
- Wear a respirator of class FFP2 when performing work in the terminal box of brakemotors.
- Avoid swirling of the brake abrasion.
- Remove the brake abrasion with suitable extraction systems or damp cloths that bind dust.
- Brake abrasion must not be blown out.
- Make sure that there is adequate ventilation in the work environment.
- Repairs or modifications to the product may only be performed by trained specialists. Contact SEW-EURODRIVE Service when performing work on the unit.
- Make sure that the regulations are adhered to before restarting the motor.
- Perform a safety and functional check following all maintenance and repair work (thermal protection).

7.2 Maintenance intervals

INFORMATION



The amount of wear depends on many factors and may be high. The system manufacturer must calculate the required inspection/maintenance intervals individually 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?
Servomotor	• Every 10 000 operating hours¹⁾	Inspect the servomotor: • Check ball bearing. • Clean cooling air ducts. • Check PE connection for proper functioning.
Drive	• Depending on external factors	• Touch up or renew the surface protection/anti-corrosion coating.
BK.. brake	• At least after 3 months, depending on the operating conditions • After 2000 braking operations from the rated speed	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, see chapter "Startup after storage" (→ 55). • Contact SEW-EURODRIVE Service when maintenance is required.
BZ.. brake	• Every 0.5 to 2 years, depending on the load conditions	Inspect the brake: • Measure the working air gap. During every maintenance work, when the drive is being opened: • Vacuum any brake abrasion

Unit / part of unit	Time interval	What should I do?
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.

7.3 Information about the BK.. brake

- The brake must be replaced when the permitted total work W_{insp} , determined during project planning, is reached. Contact SEW-EURODRIVE.
- The brake may only be replaced by SEW-EURODRIVE or a qualified workshop.

7.4 Information about the BZ.. brake

The working air gap of the BZ.. brake is increased when the brake lining carrier wears. Therefore regularly (see chapter "Maintenance intervals" (→ 58)) measure the working air gap according to the following chapter.

If the working air gap exceeds the maximum permitted value, the brake lining carrier or the brake must be replaced by SEW-EURODRIVE or another qualified workshop.

7.4.1 Measuring the working air gap of the BZ.. brake

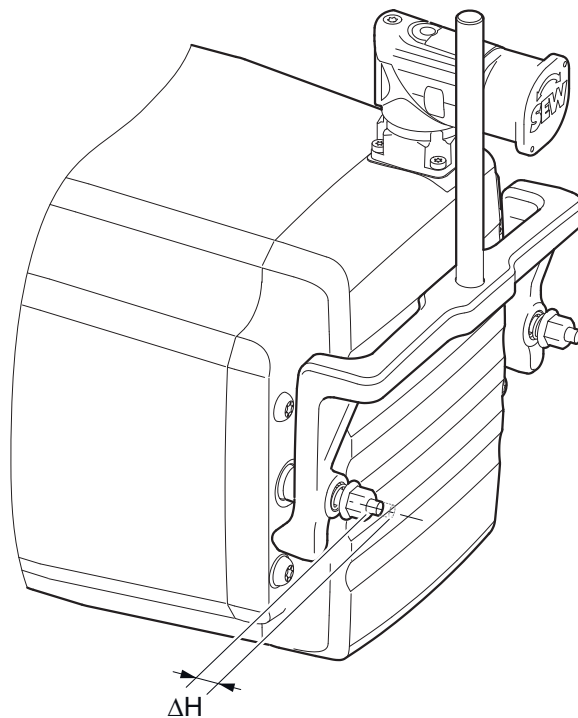
Measure the working air gap indirectly with the motion of the pressure plate while releasing the brake. Depending on the motor design, the procedure varies:

- Brake with manual brake release (→ 59).
- Brake without manual brake release (→ 61).
- Brake without manual brake release with single-cable technology or terminal box (→ 62).

Measuring the working air gap for brakes with manual brake release

- ▲ WARNING!** Risk of injury!
De-energize the motor and brake and safeguard the drive against unintentional power-up.
- If installed, remove the forced cooling fan.
- Connect the brake to the voltage supply.
- Release and apply the brake electrically. Measure the motion ΔH of the pressure plate at the studs. This motion ΔH corresponds to the working air gap.

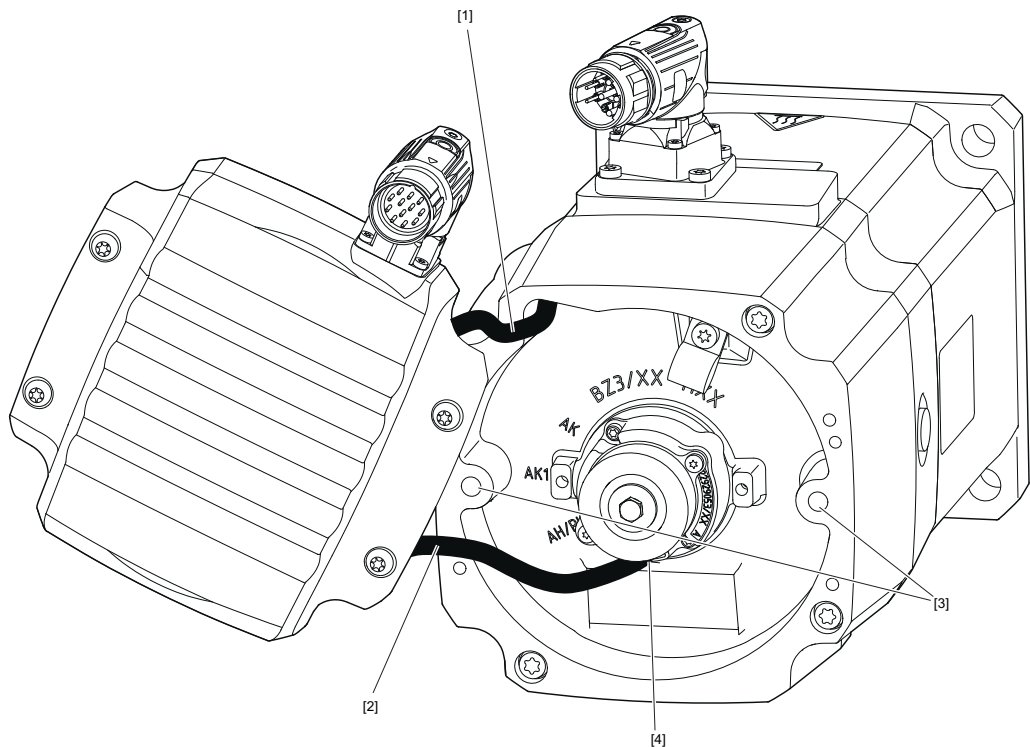
5. If the dimension ΔH is **> 0.6 mm**, the brake lining carrier or the brake must be replaced. The working air gap cannot be adjusted.



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Measuring the working air gap for brakes without manual brake release

1. **⚠ WARNING!** Risk of injury!
De-energize the motor and brake, and prevent the drive against unintentional power-up.
2. If installed, remove the forced cooling fan.
3. Remove the signal connector.
4. **⚠ CAUTION!** The Litz wires [1] [2] for the temperature sensor and the encoder must not be damaged or crushed. The litz wires have only a small excess length. Remove the encoder cover carefully. To reduce the stress on the Litz wires, it is recommended to temporarily attach the encoder cover to the drive (see following figure).



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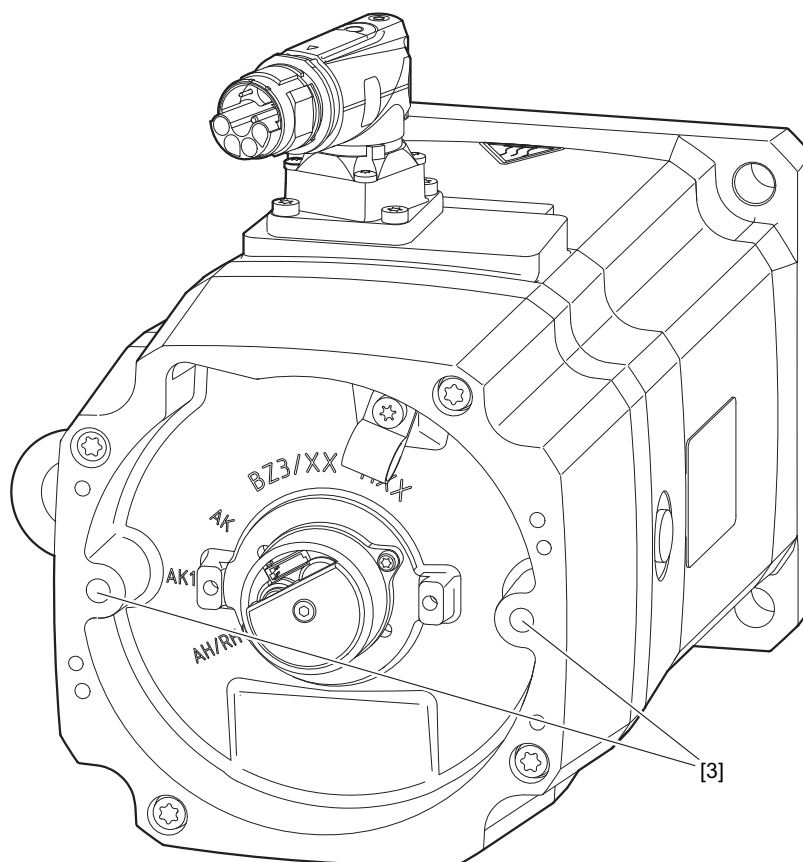
- [1] Litz wires for temperature sensor
- [2] Litz wires for encoder
- [3] Holes of the manual brake release
- [4] Plug-in connection encoder connector / encoder

5. Screw the studs (screw sizes and tightening torques see chapter "Recommendations for studs" (→ 63)) into the holes of the manual brake release [3].
6. Connect the brake to the voltage supply.
7. Release and apply the brake electrically. Measure the stroke ΔH of the pressure plate at the studs. This stroke ΔH corresponds to the working air gap.
8. If the dimension ΔH is **> 0.6 mm**, the brake lining carrier or the brake must be replaced. The working air gap cannot be set.
9. Remove the studs from the holes of the manual brake release [3].
10. **Important!** Check the Litz wires [1] [2] for possible damages.
11. **Important!** Check of the encoder connector is correctly inserted into the encoder [4].

12. Install the encoder cover. Tighten the screws with a tightening torque of 6.8 Nm.

Measuring the working air gap for brakes without manual brake release with single-cable technology or terminal box

1. **▲ WARNING!** Risk of injury!
De-energize the motor and brake and safeguard the drive against unintentional power-up.
2. If installed, remove the forced cooling fan.
3. Remove the encoder cover.
4. Insert the stud (for information on sizes and tightening torques, refer to chapter "Recommendations for studs" (→ 63)) into the holes of the manual brake release [3] of the brake.



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[3] Holes of the manual brake release

5. Connect the brake to the voltage supply.
6. Release and apply the brake electrically. Measure the motion ΔH of the pressure plate at the studs. This motion ΔH corresponds to the working air gap.
7. If the dimension ΔH is **> 0.6 mm**, the brake lining carrier or the brake must be replaced. The working air gap cannot be adjusted.
8. Remove the studs from the holes of the manual brake release [3].
9. Install the encoder cover. Tighten the screws with a tightening torque of 6.8 Nm.

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Recommendations for studs

Brake	Screw size	Tightening torque Nm
BZ05, BZ05D, BZ1, BZ1D, BZ3 BZ3D	DIN938 M5 × 110	3.5
BZ5, BZ5D	DIN938 M6 × 110	6.5

7.5 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.

7.6 Connection cable

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

8 Technical data

8.1 Information on the technical data – conditions

The technical data apply under the following boundary conditions:

- Maximum ambient temperature 40 °C
- System voltage 400 V
- Pulse width modulation frequency (PWM frequency) at least 8 kHz
- Aluminum flange surface, painted black, measuring 375 mm × 375 mm × 12 mm
- Housing is painted
- 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

8.2 Technical data of the BK.. brakes

INFORMATION



Response and application times are approximate values.

Potential response times of switching elements or controllers are not taken into account here.

8.2.1 Technical data of the BK.. brake

Brake			CM3C63		CM3C71/CM3P71	
			BK05	BK06	BK08	BK1
Static braking torque	$M_{4,100\text{ °C}}$	Nm	3.8	7.1	7.8	16
Dynamic braking torque	M_1	Nm	2.4	3.9	5	11.6
Nominal brake voltage (rating range)	V_N	V DC	24 (21.6 to 26.4)			
Nominal holding current	I_H	DC A	0.56	0.63	0.63	0.75
Response time of the brake without high-speed excitation	$t_{1,II}$	ms	50	70	90	100
Brake application time in case of DC cut-off	$t_{2,I}$	ms	30	30	25	50
Permitted braking work per braking in case of emergency stop	$W_{per,N}$	kJ	0.37	0.74	0.37	0.55
Permitted braking work until maintenance	W_{insp}	kJ	742	1480	742	1100
Permitted mechanical speed	$n_{max,0}$	min ⁻¹	7200	7200	7200	7200
Permitted brake application speed in case of emergency stop	$n_{max,1}$	min ⁻¹	6000	6000	6000	6000

Brake			CM3C80/CM3P80		CM3C100/CM3P100	
			BK2	BK3	BK4	BK6
Static braking torque	$M_{4,100\text{ °C}}$	Nm	18	30	30	46
Dynamic braking torque	M_1	Nm	10.7	23.8	23.8	33.6
Nominal brake voltage (rating range)	V_N	V DC	24 (21.6 to 26.4)			
Nominal holding current	I_H	DC A	0.80	0.94	0.94	1.0
Response time of the brake without high-speed excitation	$t_{1,II}$	ms	100	200	200	220
Brake application time in case of DC cut-off	$t_{2,I}$	ms	40	60	60	60
Permitted braking work per braking in case of emergency stop	$W_{per,N}$	kJ	0.85	1.2	1.2	2.7
Permitted braking work until maintenance	W_{insp}	kJ	1700	2400	2400	5400
Permitted mechanical speed	$n_{max,0}$	min ⁻¹	7200	7200	5400	5400

			CM3C80/CM3P80		CM3C100/CM3P100	
Brake			BK2	BK3	BK4	BK6
Permitted brake application speed in case of emergency stop	$n_{\max,1}$	min^{-1}	6000	6000	4500	4500

8.2.2 Operating currents for BK.. brakes

	BK05	BK06	BK08	BK1	BK2	BK3	BK4	BK6
Braking torque $M_{4, 100\text{ °C}}$ in Nm	3.8	7.1	7.8	16	18	30	30	46
Nominal power brake coil in W	13.4	15	14.1	18	19.2	22.5	22.5	24
Operating current in A $V_N = 24\text{ (21.6 – 26.4) VDC}$	0.56	0.63	0.59	0.75	0.8	0.94	0.94	1.0

$M_{4, 100\text{ °C}}$ Minimum static braking torque (holding torque) at 100 °C

V_N Nominal voltage (rated voltage range)

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.

8.2.3 Resistance values of BK.. brake coils

	BK05	BK06	BK08	BK1	BK2	BK3	BK4	BK6
Braking torque $M_{4, 100\text{ °C}}$ in Nm	3.8	7.1	7.8	16	18	30	30	46
Nominal power brake coil in W	13.4	15	14.1	18	19.2	22.5	22.5	24
Coil resistance R at 20 °C in Ω $V_N = 24\text{ (21.6 – 26.4) VDC}$	43	38	41	32	30	26	26	24

$M_{4, 100\text{ °C}}$ Minimum static braking torque (holding torque) at 100 °C

R Coil resistance at 20 °C

V_N Nominal voltage (rated voltage range)

8.3 Technical data for the BZ.. and BZ..D brakes

8.3.1 Technical data of the BZ.. brake

			CM3C63				CM3C71/CM3P71			
Brake			BZ05				BZ1			
Static braking torque	$M_{4, 100\text{ °C}}$	Nm	2.5	3.2	4.5	6	5.9	8.4	12	17
Dynamic braking torque	M_1	Nm	2.5	3.2	4.5	6	5.9	8.4	12	17
Response time of the brake with high-speed excitation	$t_{1,II}$	ms	30				40			
Brake application time in case of AC cut-off	$t_{2,I}$	ms	80				80			
Brake application time in case of AC/DC or DC cut-off	$t_{2,II}$	ms	15				15			
Permitted braking work per braking in case of emergency stop	$W_{\text{per},N}$	kJ	2.15				4.82			
Permitted braking work until maintenance	W_{insp}	kJ	17000				39000			
Permitted mechanical speed	$n_{\max,0}$	min^{-1}	7200				7200			
Permitted brake application speed in case of emergency stop	$n_{\max,1}$	min^{-1}	6000				6000			
Inrush current ratio	ICR	1	5.1				5.3			

Nominal DC brake voltage (rating range)			Nominal DC holding current of the brake I_H A	
24 ¹⁾ (21.6 – 26.4)	V_N	V	0.5	0.72

1) The brake voltage DC 24 V requires a high current and is possible only with a limited cable length.

Nominal AC brake voltage (rating range)			Nominal AC holding current of the brake I_H A	
110 (99 – 121)	V_N	V	0.27	0.39
230 (218 – 243)			0.12	0.16
400 (380 – 431)			0.06	0.09
460 (432 – 484)			0.06	0.08
500 (484 – 542)			0.05	0.07

			CM3C80/CM3P80				CM3C100/CM3P100			
Brake			BZ3				BZ5			
Static braking torque	$M_{4,100\text{ °C}}$	Nm	11	16	23	32	22	32	44	63
Dynamic braking torque	M_1	Nm	11	16	23	32	22	32	44	63
Response time of the brake with high-speed excitation	$t_{1,II}$	ms	60				100			
Brake application time in case of AC cut-off	$t_{2,I}$	ms	100				120			
Brake application time in case of AC/DC or DC cut-off	$t_{2,II}$	ms	20				30			
Permitted braking work per braking in case of emergency stop	$W_{per,N}$	kJ	5.35				10.2			
Permitted braking work until maintenance	W_{insp}	kJ	43000				46000			
Permitted mechanical speed	$n_{max,0}$	min ⁻¹	7200				5400			
Permitted brake application speed in case of emergency stop	$n_{max,1}$	min ⁻¹	6000				4500			
Inrush current ratio	ICR	1	5.3				5.2			

Nominal DC brake voltage (rating range)			Nominal DC holding current I_H A	
24 ¹⁾ (21.6 – 26.4)	V_N	V	0.92	1.15

1) The brake voltage DC 24 V requires a high current and is possible only with a limited cable length.

Nominal AC brake voltage (rating range)			Nominal AC holding current I_H A	
110 (99 – 121)	V_N	V	0.49	0.62
230 (218 – 243)			0.21	0.26
400 (380 – 431)			0.12	0.15
460 (432 – 484)			0.11	0.14
500 (484 – 542)			0.09	0.12

8.3.2 Technical data of the BZ..D brake

			CM3C63		CM3C71/CM3P71	
Brake			BZ05D		BZ1D	
Static braking torque	$M_{4,100\text{ °C}}$	Nm	2.5	3.2	5.9	8.4
Dynamic braking torque	M_1	Nm	2.5	3.2	5.9	8.4
Nominal brake voltage (rating range)	V_N	V DC	24 (21.6 to 26.4)			
Nominal holding current	I_H	DC A	0.98		1.11	
Response time of the brake without high-speed excitation	$t_{1,II}$	ms	180		240	
Brake application time in case of DC cut-off	$t_{2,I}$	ms	20		20	
Permitted braking work per braking in case of emergency stop	$W_{per,N}$	kJ	2.15		4.82	
Permitted braking work until maintenance	W_{insp}	kJ	17000		39000	
Permitted mechanical speed	$n_{max,0}$	min ⁻¹	7200		7200	
Permitted brake application speed in case of emergency stop	$n_{max,1}$	min ⁻¹	6000		6000	

			CM3C80/CM3P80		CM3C100/CM3P100	
Brake			BZ3D		BZ5D	
Static braking torque	$M_{4,100\text{ °C}}$	Nm	11	16	22	32
Dynamic braking torque	M_1	Nm	11	16	22	32
Nominal brake voltage (rating range)	V_N	V DC	24 (21.6 to 26.4)			
Nominal holding current	I_H	DC A	1.06		1.35	
Response time of the brake without high-speed excitation	$t_{1,II}$	ms	270		280	
Brake application time in case of DC cut-off	$t_{2,I}$	ms	30		40	
Permitted braking work per braking in case of emergency stop	$W_{per,N}$	kJ	5.35		10.2	
Permitted braking work until maintenance	W_{insp}	kJ	43000		46000	
Permitted mechanical speed	$n_{max,0}$	min ⁻¹	7200		5400	
Permitted brake application speed in case of emergency stop	$n_{max,1}$	min ⁻¹	6000		4500	

8.3.3 Resistance values of BZ.. and BZ..D brake coils

	BZ05	BZ05D	BZ1	BZ1D	BZ3	BZ3D	BZ5	BZ5D
Nominal power brake coil in W	18	22.9	24.2	25.2	30.7	24.5	40	34.1

Nominal voltage V_N		BZ05		BZ05D		BZ1		BZ1D		BZ3		BZ3D		BZ5		BZ5D	
V_{AC}	V_{DC}	R_{BS} Ω	R_{TS} Ω	R_H Ω	R_{BS} Ω	R_{TS} Ω	R_H Ω	R_{BS} Ω	R_{TS} Ω	R_H Ω	R_{BS} Ω	R_{TS} Ω	R_H Ω	R_{BS} Ω	R_{TS} Ω	R_H Ω	R_H Ω
–	24 (21.6 – 26.4)	6.47	28.7	27.6	4.53	20.2	23.6	3.7	15.6	23.8	2.89	12.1	19.3				
110 (99 – 121)	–	20.4	92.5	–	14.5	63.8	–	11.4	50.8	–	9.13	38.3	–				
230 (218 – 243)	–	104	433	–	74.4	323	–	59.2	254	–	46.3	194	–				
400 (380 – 431)	–	327	1481	–	220	1022	–	182	766	–	149	581	–				
460 (432 – 484)	–	431	1865	–	276	1346	–	224	976	–	186	721	–				
500 (484 – 542)	–	546	2844	–	352	1704	–	278	1263	–	234	1171	–				

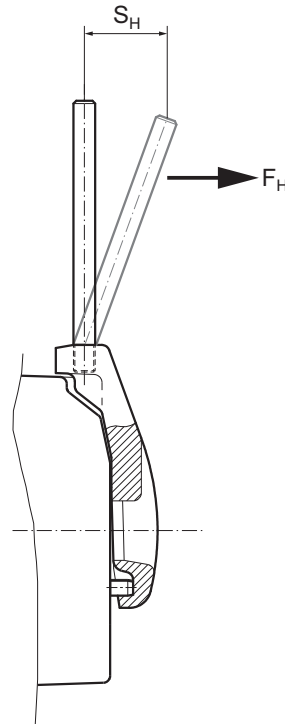
R_{BS} Accelerator coil resistance at 20 °C

R_{TS} Coil section resistance at 20 °C

V_N Nominal voltage (rated voltage range)

8.3.4 Manual brake release

In brakemotors with /HR option “Manual brake release with automatic reengaging function,” you can release the brake manually using the provided lever. The following table shows the required actuating force applied to the lever at maximum braking torque. It is assumed that the lever at the upper end is operated.



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Brake	Motor	Actuating force F_H N	Lever stroke S_H mm
BZ05, BZ05D	CM3C63	100	10.8 ± 5
BZ1, BZ1D	CM3C71 CM3P71	160	18.1 ± 5
BZ3, BZ3D	CM3C80 CM3P80	160	17.1 ± 5
BZ5, BZ5D	CM3C100 CM3P100	250	19 ± 5

8.4 Characteristic safety values of BK.. brakes

The values specified in the following table apply to BK.. brakes in standard applications.

	Characteristic safety values according to EN ISO 13849-1	
Classification	Category B	
System structure	1-channel (Cat. B)	
MTTF_d value	Calculation via B _{10D} value	
B_{10D} value	BK05	10×10^6
	BK06	10×10^6
	BK08	10×10^6
	BK1	10×10^6
	BK2	8×10^6
	BK3	8×10^6
	BK4	6×10^6
	BK6	6×10^6

8.5 Characteristic safety values of BZ.. brakes

The values specified in the following table apply to BZ.. brakes in standard applications.

	Characteristic safety values according to EN ISO 13849-1	
Classification	Category B	
System structure	1-channel (Cat. B)	
MTTF_D value	Calculation via B _{10D} value	
B_{10D} value	BZ05, BZ05D	15×10^6
	BZ1, BZ1D	15×10^6
	BZ3, BZ3D	12×10^6
	BZ5, BZ5D	9×10^6

SEW-EURODRIVE offers BZ.. brakes also as safety brakes. For more information, consult the addendum to the operating instructions "Safety encoders and safety brakes – CM3C.. servomotors – Functional safety".

9 Malfunctions

9.1 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.

9.2 Malfunctions in the motor

Fault	Possible cause	Measure
Motor 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.
Motor is buzzing and has high current consumption	Drive blocked	Check drive.
	Brake does not release	Refer to chapter "Brake malfunctions" (→ 72).
	Failure on the encoder cable	Check the encoder cable.
	Inverter set incorrectly	Check the inverter.

Fault	Possible cause	Measure
Motor housing temperature exceeds 120 °C	Overload	Check load for sluggishness; use larger motor 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.
	Forced cooling fan does not run	Check connection and correct, 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 motor to the required operating conditions; consult a specialist, if necessary, to determine the correct drive.
	Inverter not optimized	Check the inverter.
Running noise on the motor	Bearing damage	Contact SEW-EURODRIVE.
		Replace the motor.
	Vibration of the rotating parts	Rectify cause, possible imbalance.
	With a forced cooling fan: Foreign objects in cooling air ducts	Clean cooling air ducts.

9.3 Brake malfunctions

9.3.1 BK.. 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.

9.3.2 BZ.. brake

Fault	Possible cause	Measure
Brake does not release	Brake control unit failed.	Install a new brake control system, check internal resistance and insulation of brake coil, check switchgear.
	Brake connected incorrectly.	Check brake connection.
	Max. permitted working air gap exceeded because brake lining worn down.	Contact SEW-EURODRIVE.
		Replacement of the brake lining carrier by SEW-EURODRIVE-trained staff.
	Brake coil has interturn fault or short circuit to exposed conductive part.	Check switching devices.
		Replace complete brake and brake control. Contact SEW-EURODRIVE.
	Brake lining worn down.	Contact SEW-EURODRIVE.
		Replacement of the brake lining carrier by SEW-EURODRIVE-trained staff.
	Incorrect voltage at brake control unit.	Apply correct voltage. Specified brake voltage on the nameplate.
Brake does not apply/brake.	Voltage drop along the incoming cable > 10%.	Provide for correct connection voltage. Specified brake voltage on the nameplate.
		Check cable cross section of brake cable. If necessary, increase cross section.
	Rectifier defective.	Replace rectifier and brake coil; it may be more economical to replace the complete brake.
		Contact SEW-EURODRIVE.
Brake is applied with time lag	Brake lining worn down.	Replacement of the brake lining carrier by SEW-EURODRIVE-trained staff.
	Incorrect braking torque.	Check the project planning. If necessary, adjust braking torque by changing the type and number of brake springs.
		Contact SEW-EURODRIVE.
Noise/squeaking near the brake	Manual brake release device not set correctly.	Set the adjusting nuts correctly.
	Brake is switched on AC voltage side.	Switch both, the DC and AC voltage sides; observe wiring diagram.
Noise/squeaking near the brake	Brake parameters set incorrectly in the inverter.	Check brake release and application times.

9.4 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.

10 Service

10.1 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

11 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.

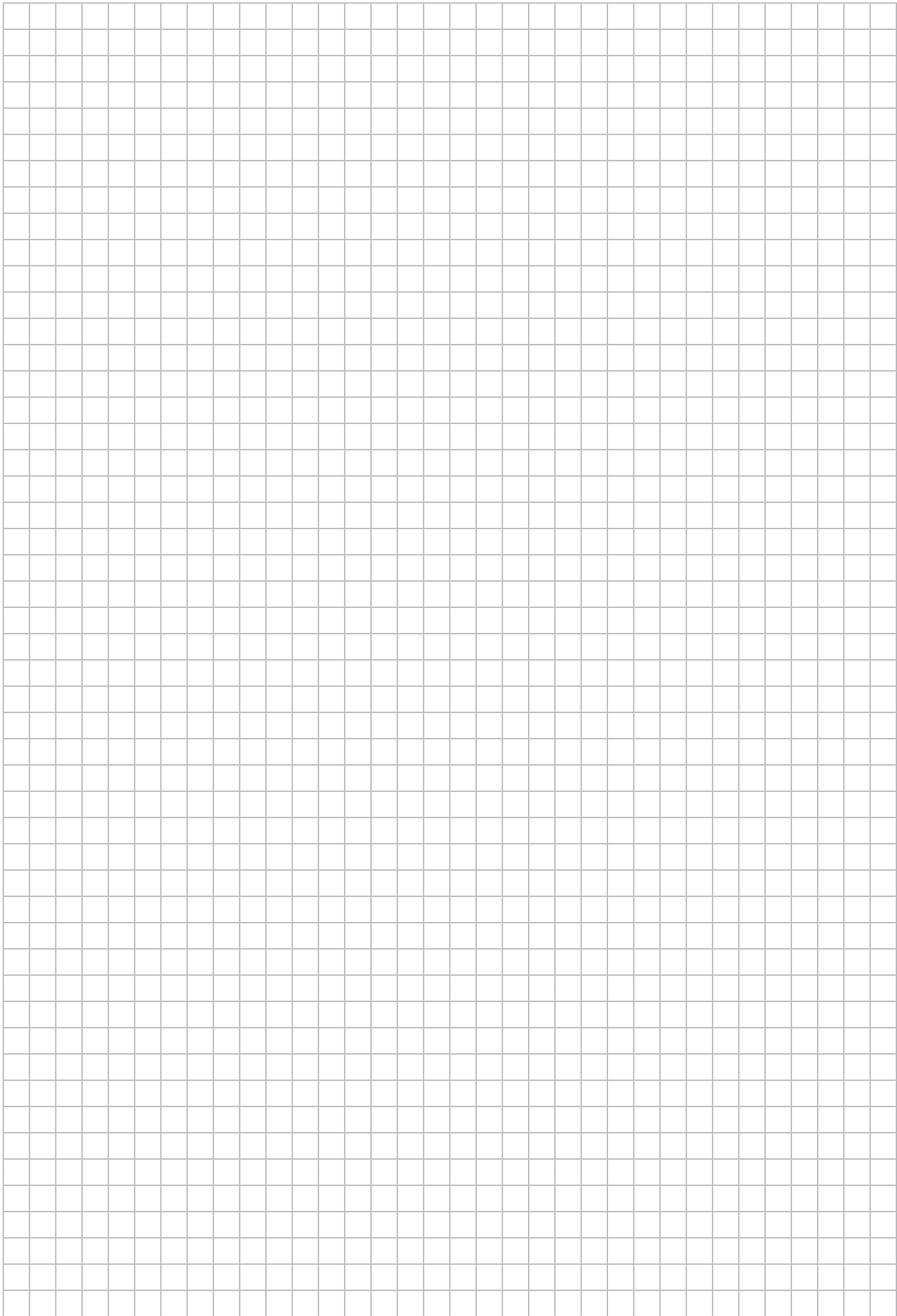
- Screens
- Capacitors

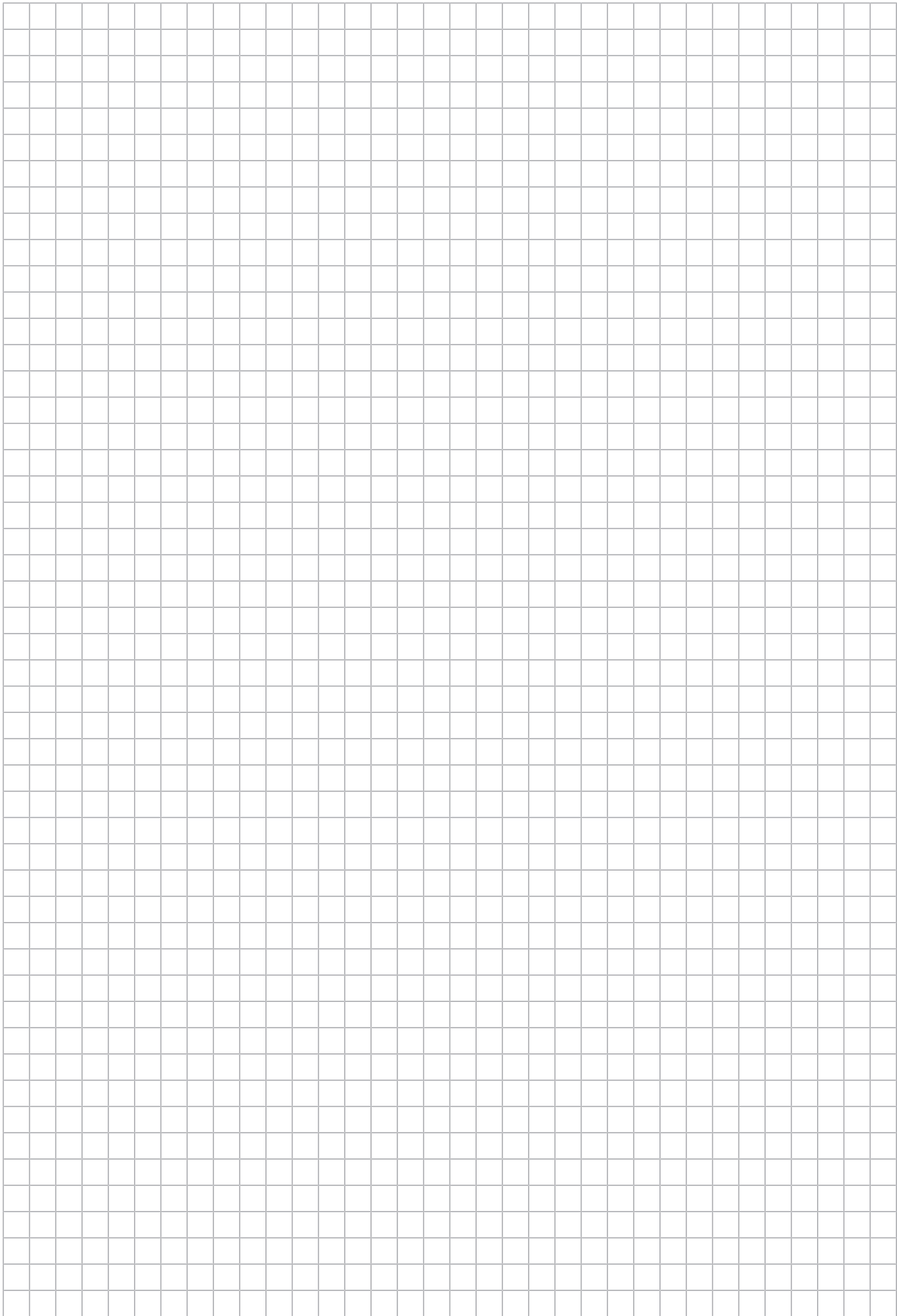


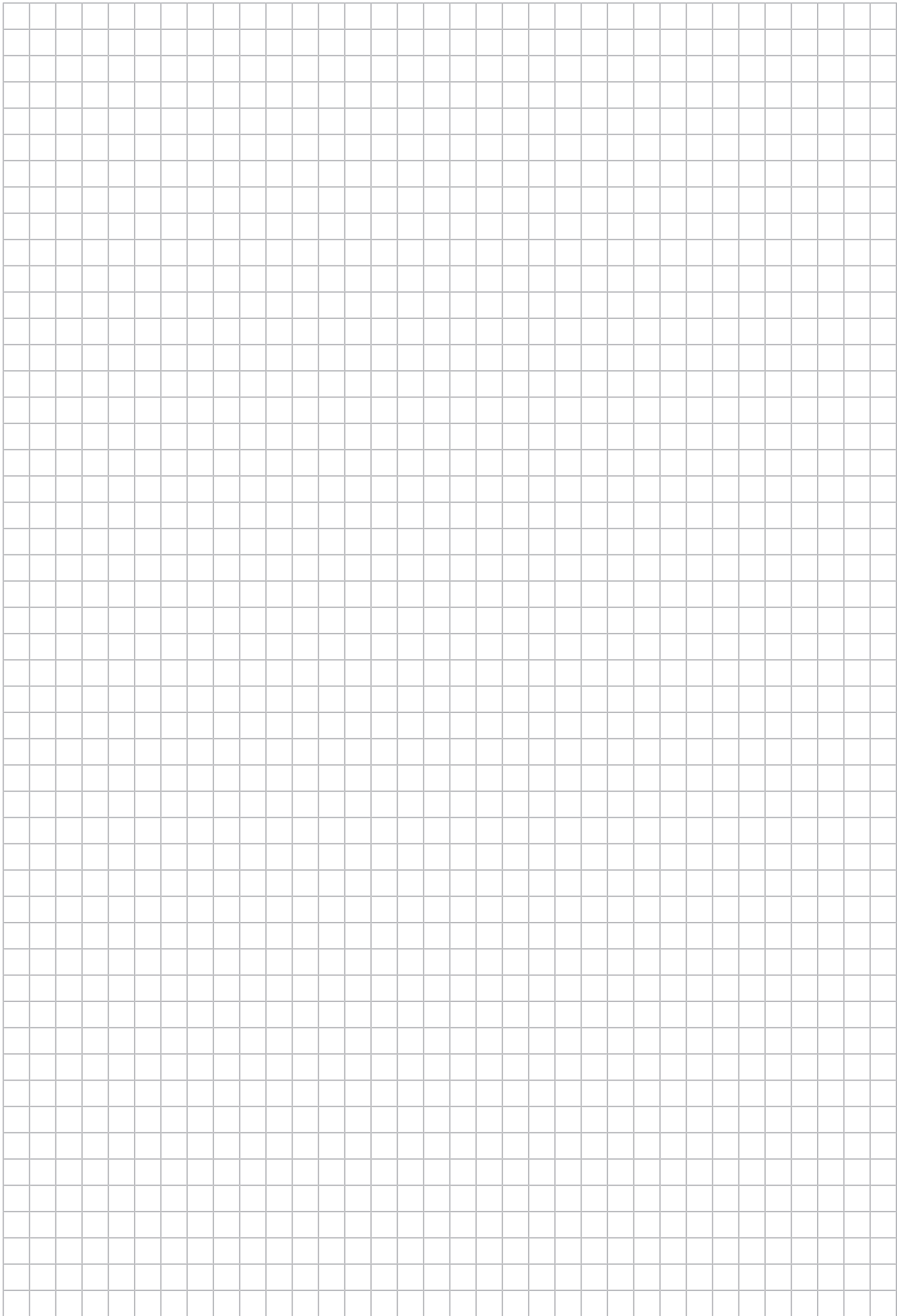
Waste disposal according to WEEE Directive 2012/19/EU

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.











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