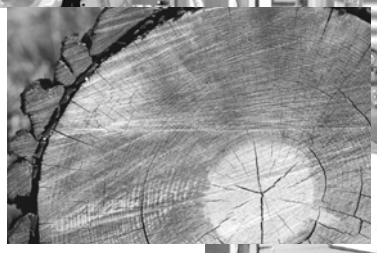
SEW EURODRIVE

DR.71-225, 315 AC Motors

Edition 08/2008
16639219 / EN

Operating Instructions



SEW
EURODRIVE

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1 General Information

1.1 How to use the operating instructions

The operating instructions are an integral part of the product and contain important information on operation and service. The operating instructions are written for all employees who assemble, install, startup, and service this product.

The operating instructions must be accessible and legible. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. Consult SEW-EURODRIVE if you have any questions or if you require further information.

1.2 Structure of the safety notes

The safety notes in these operating instructions are structured as follows:

Symbol	SIGNAL WORD!
	Nature and source of hazard. Possible consequence(s) if disregarded. • Measure(s) to avoid the hazard.

Symbol	Signal word	Meaning	Consequences if disregarded
Example:  General hazard  Specific hazard, e.g. electric shock	**HAZARD!**	Imminent hazard	Severe or fatal injuries
	WARNING!	Possible hazardous situation	Severe or fatal injuries
	CAUTION!	Possible hazardous situation	Minor injuries
	**STOP!**	Possible damage to property	Damage to the drive system or its environment
	**NOTE**	Useful information or tip. Simplifies handling of the drive system.	

1.3 Rights to claim under warranty

Adhering to the operating instructions is a prerequisite for fault-free operation and the fulfillment of any right to claim under warranty. Read the operating instructions before you start working with the unit.

1.4 Exclusion of liability

You must comply with the information contained in these operating instructions to ensure safe operation of the electric motors and to achieve the specified product characteristics and performance features. SEW-EURODRIVE does not assume liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

1.5 Copyright notice

2 Safety Notes

The following basic safety notes are intended to prevent injury to persons and damage to property. The operator must ensure that the basic safety notes are read and observed. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation, please contact SEW-EURODRIVE.

2.1 Preface

The following safety notes relate primarily to the use of motors. If using gearmotors, please also refer to the safety notes for gear units in the corresponding operating instructions.

Also observe the supplementary safety notes in the individual sections of these operating instructions.

2.2 General information

⚠ HAZARD!

During operation, the motors and gearmotors can have live, bare and movable or rotating parts as well as hot surfaces, depending on their enclosure.

Severe or fatal injuries.

- All work related to transportation, storage, setup/mounting, connection, startup, maintenance and repair may only be carried out by qualified personnel, in strict observation of:
  - The relevant detailed operating instructions
  - The warning and safety signs on the motor/gearmotor
  - All other project planning documents, operating instructions and wiring diagrams belonging to the drive
  - The specific regulations and requirements for the system
  - The national/regional regulations governing safety and the prevention of accidents
- Never install damaged products
- Immediately report any damage to the shipping company

Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to machinery.

Refer to the documentation for additional information.

2.3 Designated use

The electric motors are intended for industrial systems. Use in potentially explosive atmospheres is prohibited, unless measures are expressly taken to make it possible.

Air-cooled designs are dimensioned for ambient temperatures of -20 °C to +40 °C and installation altitudes ≤ 1000 above sea level. Note that information on the nameplate may differ. It is essential that the operating conditions for the unit comply with the nameplate information.

2.4 Transport

Inspect the shipment immediately upon receipt for any damage that may have occurred during transportation. Inform the shipping company immediately. It may be necessary to preclude startup.

Tighten the eyebolts securely. They are only intended for the weight of the motor/gearmotor; do not attach any additional loads.

The built-in lifting eyebolts comply with DIN 580. Always observe the loads and regulations listed in this standard. If the gearmotor is equipped with two eyebolts, then both of these should be used for transportation. In this case, the tension force vector of the slings must not exceed a 45° angle according to DIN 580.

Use suitable, sufficiently rated handling equipment when necessary. Remove any transportation fixtures prior to startup. Reattach these in the case of further transportation.

2.5 Installation

Make sure that the supports are even, the foot and flange mounting is correct and if there is direct coupling, align with precision. Resonances between the rotational frequency and the double network frequency caused by the structure are to be avoided. Turn the rotor manually and listen for unusual noises. Check the direction of rotation in decoupled status.

Only install or remove belt pulleys and couplings using suitable devices (heat up) and cover with a touch guard. Avoid improper belt tension.

Make the pipe connections that may eventually be required. Mounting positions with shaft ends pointing upwards should be equipped with a cover to prevent foreign objects from falling into the fan. Ensure that ventilation openings are not obstructed and that used air, including air from adjacent units, cannot be drawn in again straight away.

Observe the notes in the "Mechanical Installation" section.

2.6 Electrical connection

All work may only be carried out by qualified personnel. During work, the low-voltage machine must be on standstill, enabled, and safeguarded against an accidental restart. This also applies to auxiliary circuits (e.g. anti-condensation heating).

Check that the motor is de-energized!

Exceeding the tolerances in EN 60034-1 (VDE 0530, part 1) – voltage + 5%, frequency + 2%, curve shape, symmetry – increases the heating and influences electromagnetic compatibility. Observe nameplate data and the wiring diagram in the terminal box.

Pay attention to the wiring information and different data on the nameplate, as well as observing the wiring diagram.

The connection should be a continuous secure electrical connection (no protruding wire ends); use the cable end equipment intended for this purpose. Establish a secure 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 national regulations. With low voltage, the distances should be no shorter than the following values, in compliance with IEC 60664:

Rated voltage V_N	Distance
≤ 500 V	3 mm
≤ 690 V	5.5 mm

The terminal box must be free of foreign objects, dirt and humidity. Unused cable entry openings and the box itself must be closed so that they are dust and water proof. Secure keys for test mode without output elements. When operating low-voltage machines with brakes, check that the break is functioning correctly before startup.

Observe the notes in the "Electrical Installation" section!

2.7 Operation

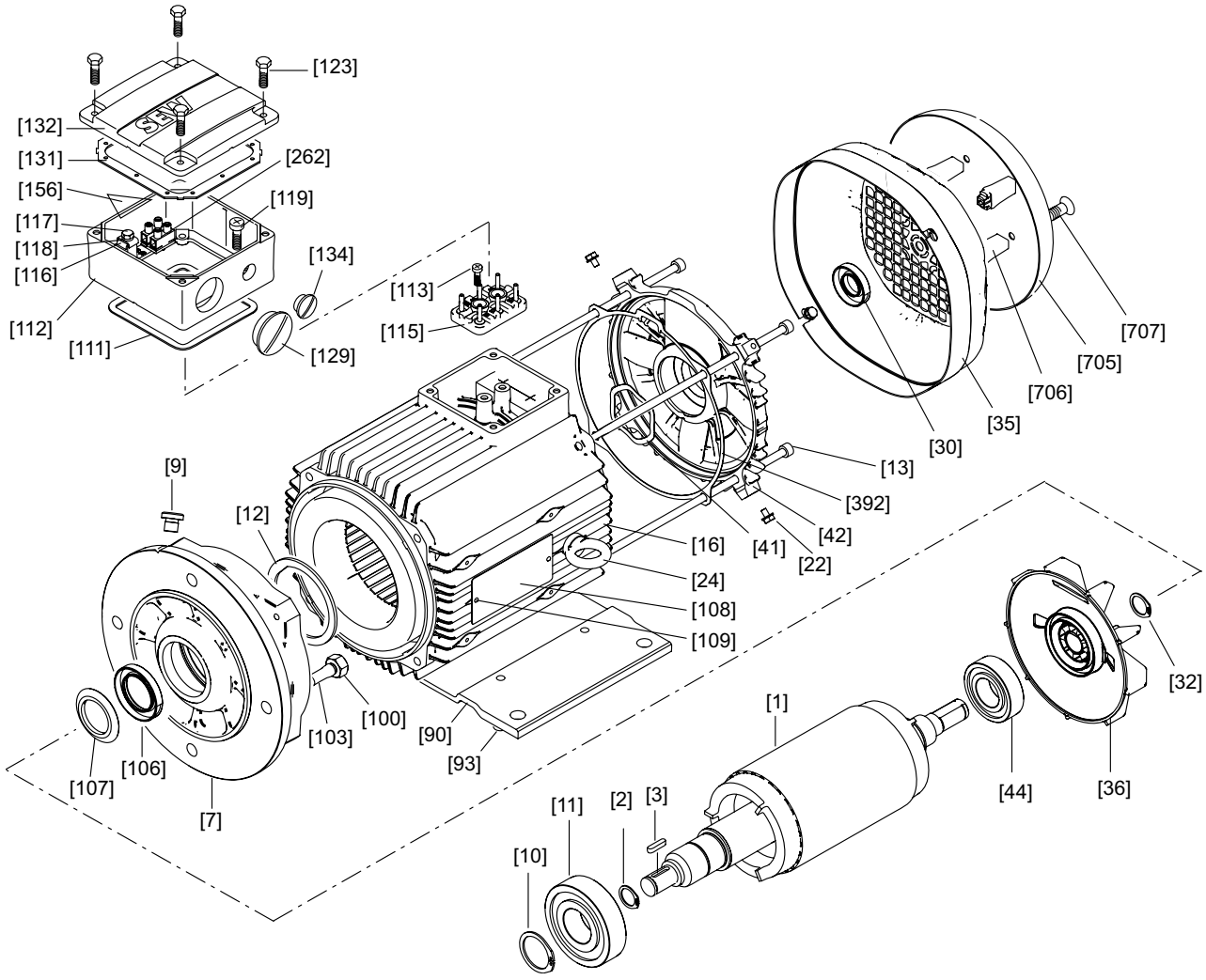
Whenever changes to normal operation occur, such as increased temperatures, noise, vibrations, etc., you should determine the cause. Consult the manufacturer if required. Never deactivate protection devices, even in test mode. Switch off the motor if you are not sure.

Regularly clean air ducts in dusty or dirty environments.

3 Motor Structure

	NOTE
	The following figure illustrates the general structure. Its only purpose is to facilitate the assignment of components to the spare parts lists. Deviations are possible depending on the motor size and version!

3.1 DR.71 - DR.132 – basic structure



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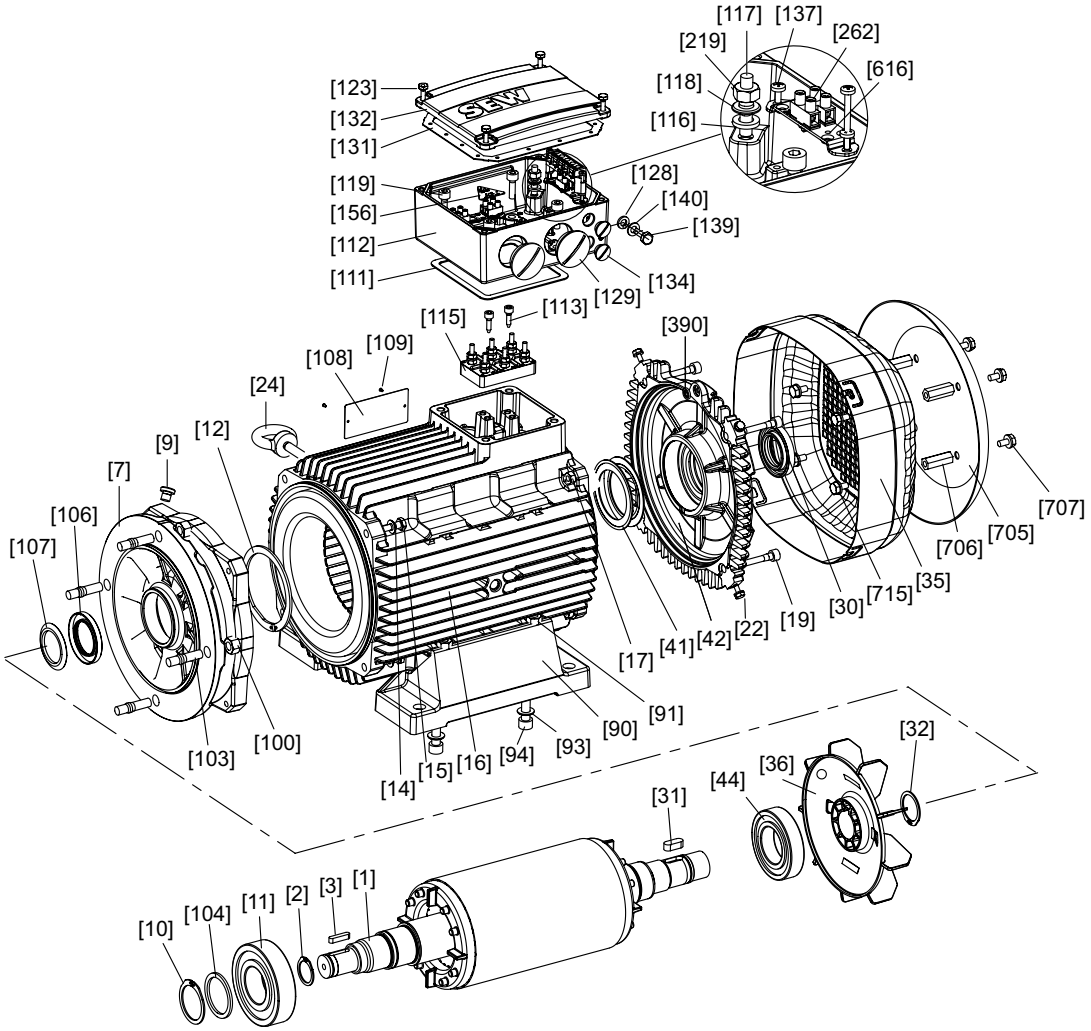
[1] Rotor
[2] Circlip
[3] Key
[7] Flanged end shield
[9] Screw plug
[10] Circlip
[11] Grooved ball bearing
[12] Circlip
[13] Machine screw
[16] Stator
[22] Hex head screw
[24] Lifting eyebolt
[30] Oil seal
[32] Circlip
[35] Fan guard
[36] Fan
[41] Shim washer
[42] B-side endshield
[44] Grooved ball bearing
[90[Base plate
[93] Pan head screw
[100] Hex nut
[103] Stud
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Pan head screw
[115] Terminal board
[116] Terminal clip
[117] Hex head screw
[118] Lock washer
[119] Pan head screw
[123] Hex head screw
[129] Screw plug with O-ring
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug with O-ring
[156] Label
[262] Terminal clip, complete
[392] Sealing
[705] Protective cowl
[706] Spacer
[707] Pan head screw

3.2 DR.160 - DR.180 – basic structure



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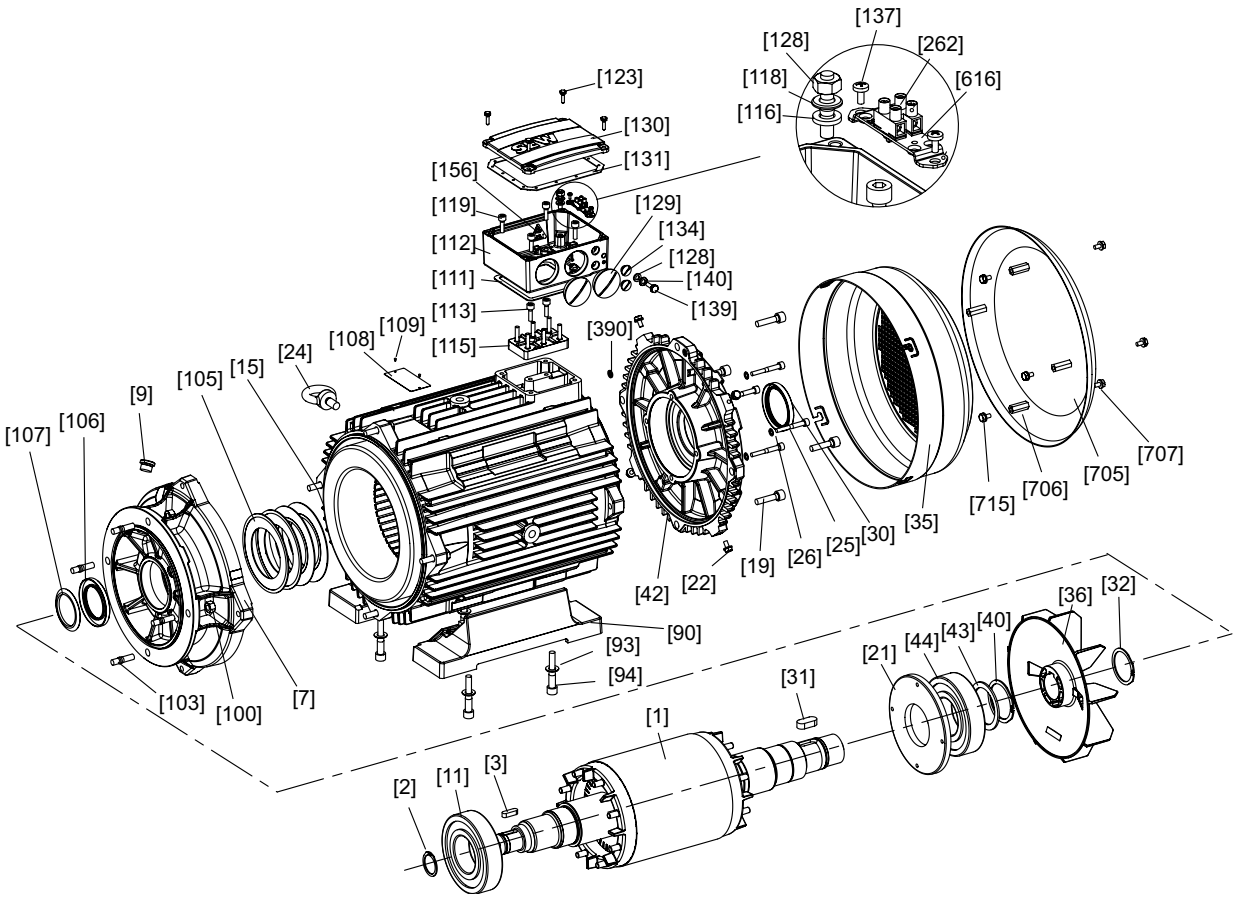
[1] Rotor
[2] Circlip
[3] Key
[7] Flange
[9] Screw plug
[10] Circlip
[11] Grooved ball bearing
[12] Circlip
[14] Washer
[15] Hex head screw
[16] Stator
[17] Hex nut
[19] Machine screw
[22] Hex head screw
[24] Lifting eyebolt
[30] Sealing ring
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[41] Cup spring
[42] B-side endshield
[44] Grooved ball bearing
[90] Foot
[91] Hex nut
[93] Washer
[94] Machine screw
[100] Hex nut
[103] Stud
[104] Supporting ring
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Screw
[115] Terminal board
[116] Serrated lock washer
[117] Stud
[118] Washer
[119] Machine screw
[121] Grooved pin
[123] Hex head screw
[128] Serrated lock washer
[129] Screw plug withO-ring
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug with O-ring
[137] Screw
[139] Hex head screw
[140] Washer
[153] Terminal strip
[156] Label
[219] Hex nut
[262] Terminal clip
[390] O-ring
[616] Retaining plate
[705] Protective cowl
[706] Spacer
[707] Hex head screw
[715] Hex head screw

3.3 DR.200 - DR.225 – basic structure



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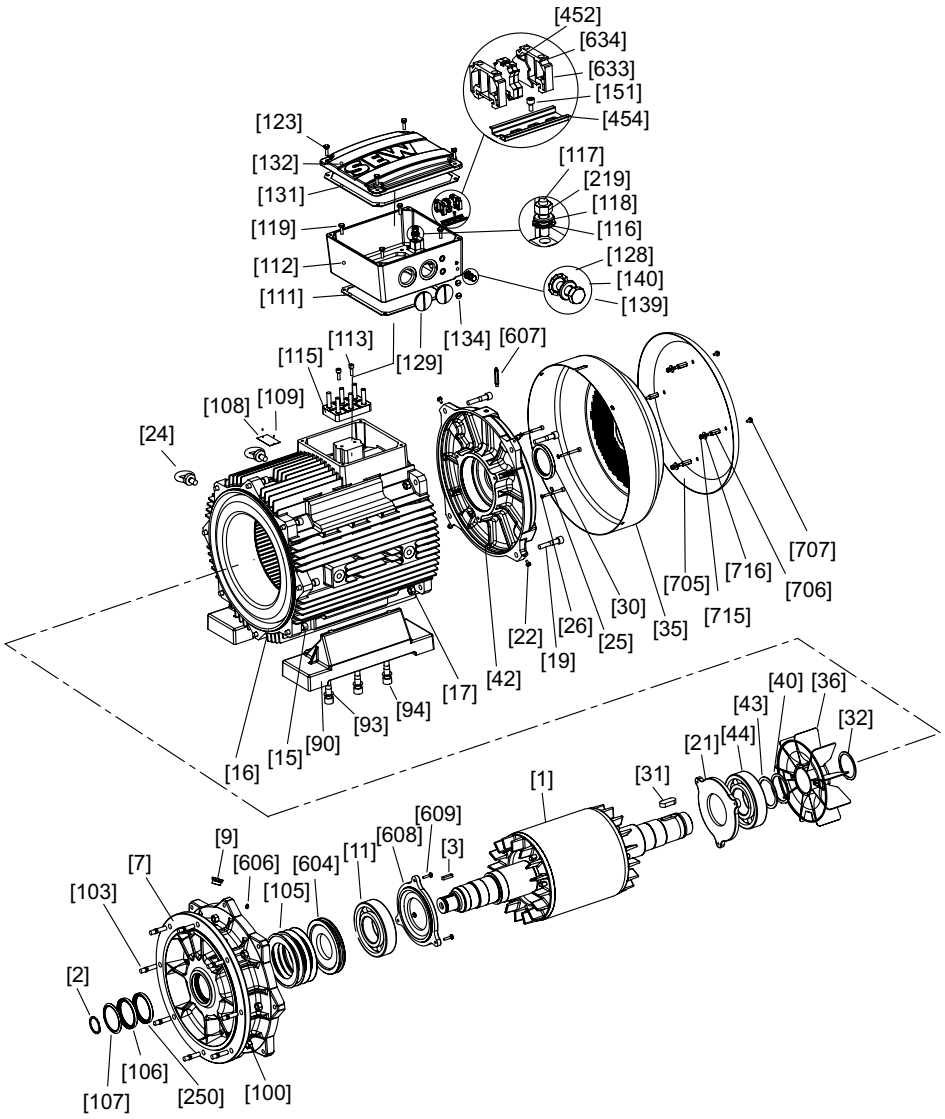
[1] Rotor
[2] Circlip
[3] Key
[7] Flange
[9] Screw plug
[11] Grooved ball bearing
[15] Hex head screw
[16] Stator
[19] Machine screw
[21] Oil seal flange
[22] Hex head screw
[24] Lifting eyebolt
[25] Machine screw
[26] Sealing washer
[30] Oil seal
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[40] Circlip
[42] B-side endshield
[43] Supporting ring
[44] Grooved ball bearing
[90] Foot
[93] Washer
[94] Machine screw
[100] Hex nut
[103] Stud
[105] Cup spring
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Machine screw
[115] Terminal board
[116] Serrated lock washer
[117] Stud
[118] Washer
[119] Machine screw
[123] Hex head screw
[128] Serrated lock washer
[129] Screw plug
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug
[137] Screw
[139] Hex head screw
[140] Washer
[156] Label
[219] Hex nut
[262] Terminal clip
[390] O-ring
[616] Retaining plate
[705] Protective cowl
[706] Spacer bolt
[707] Hex head screw
[715] Hex head screw

3.4 DR.315 – basic structure



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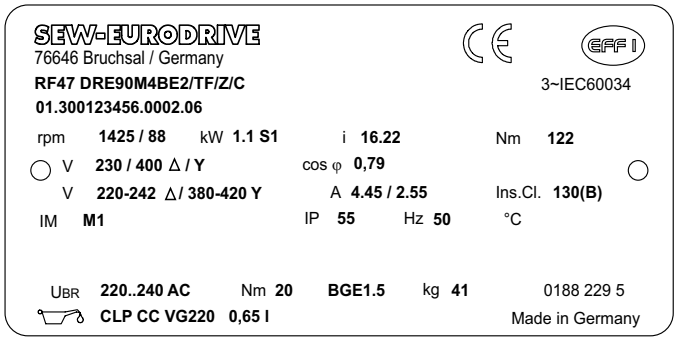
[1] Rotor
[2] Circlip
[3] Key
[7] Flange
[9] Screw plug
[11] Rolling bearing
[15] Machine screw
[16] Stator
[17] Hex nut
[19] Machine screw
[21] Oil seal flange
[22] Hex head screw
[24] Lifting eyebolt
[25] Machine screw
[26] Sealing washer
[30] Oil seal
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[40] Circlip
[42] B-side endshield
[43] Supporting ring
[44] Rolling bearing
[90] Foot
[93] Washer
[94] Machine screw
[100] Hex nut
[103] Stud
[105] Cup spring
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Machine screw
[115] Terminal board
[116] Serrated lock washer
[117] Stud
[118] Washer
[119] Hex head screw
[123] Hex head screw
[128] Serrated lock washer
[129] Screw plug
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug
[139] Hex head screw
[140] Washer
[151] Machine screw
[219] Hex nut
[250] Oil seal
[452] Terminal strip
[454] Top hat rail
[604] Lubrication ring
[606] Greasing nipple
[607] Greasing nipple
[608] Oil seal flange
[609] Hex head screw
[633] End bracket
[634] End plate
[705] Protective cowl
[706] Spacer bolt
[707] Hex head screw
[715] Hex nut
[716] Washer

3.5 Nameplate, unit designation

3.5.1 Nameplate

Example: DRE gearmotor with brake



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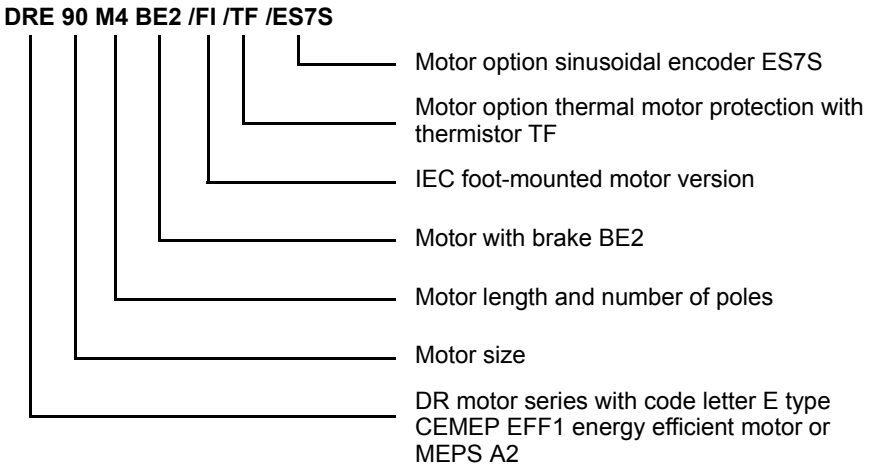
3.5.2 Unit designation

Example: Foot-mounted AC motor with brake



4 Mechanical Installation

	NOTE
	Observe the safety notes in section 2 during installation!

4.1 Before you start

Do only install the drive if the following conditions are met:

- The specifications on the nameplate of the drive correspond to the supply system or the output voltage of the frequency inverter
- The drive is undamaged (no damage caused by transportation or storage)
- You are certain that the following requirements have been met:
  - Ambient temperature between -20 °C and +40 °C.

    Note that the temperature range of the gear unit may also be restricted (see gear unit operating instructions)
  - No oil, acid, gas, vapors, radiation, etc.
  - Installation altitude max. 1000 m above sea level

    Observe section "Installation altitude" (see page 22).
  - Note the restrictions for encoders
  - Special design: Drive configured in accordance with the ambient conditions

STOP	**STOP**
	The mounting position for installation must correspond to the specifications on the nameplate.

4.2 Mechanical installation

4.2.1 Preliminary work

Motor shaft ends must be thoroughly cleaned of anti-corrosion agents, contamination or similar (use a commercially available solvent). Do not allow the solvent to penetrate the bearings or shaft seals – this could damage the material.

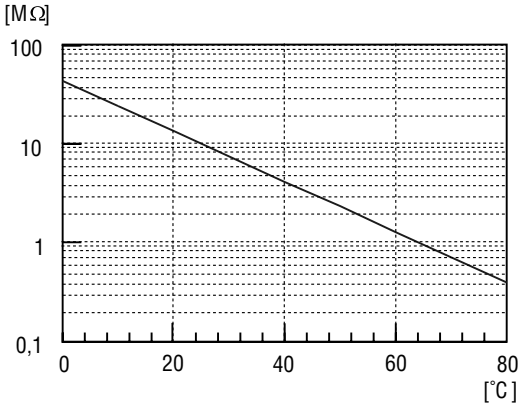
Motors with reinforced bearing

STOP	**STOP**
	Motors with a reinforced bearing must not be operated without an overhung load. Otherwise you risk damaging the bearings.

Extended storage of motors

- Note that the service life of the lubricant in the ball bearings is reduced by 10% per year after the first year of storage.
- You should re-lubricate the lubrication devices on motors that have been in storage for longer than 5 years before startup. Observe the information on the motor lubricant plate.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance for this purpose (measuring voltage 500 V).

The insulation resistance (see following figure) varies greatly depending on the temperature. The motor must be dried if the insulation resistance is not adequate.



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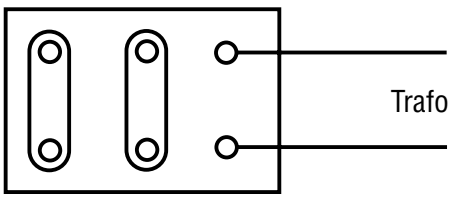
Drying the motor

Heat the motor:

- with hot air or
- via isolation transformer
  - Connect the windings in series (see following figure)
  - Auxiliary AC voltage supply max. 10% of the rated voltage with max. 20% of the rated current



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The drying process is finished when the minimum insulation resistance has been exceeded.

In the terminal box check that:

- the inside is clean and dry
- the connections and fixing parts are free from corrosion
- the gasket and sealing surfaces are functioning
- the cable glands are tight, otherwise clean or replace them

4.2.2 Installing the motor

- Do only install the gearmotor in the specified mounting position on a level, vibration-free and torsionally rigid support structure.
- Align the motor and the driven machine carefully in order to prevent the output shaft from being exposed to unacceptable strain. Observe the permitted overhung and axial forces.
- Do not jolt or hammer the shaft end.
- Use an appropriate cover, e.g. motor option /C "Protective cowl", to prevent objects or fluids entering motors in vertical mounting positions (M4).
- Check that there is sufficient clearance around the motor to provide for adequate cooling, and that the motor does not suck in warm air from other devices.
- Balance components for subsequent mounting on the shaft with a half key (motor shafts are balanced with a half key).
- **Existing condensation drain holes are sealed with closing plugs. You must not remove these plugs as this would suspend the higher degree of protection of the motor.**
- If using brakemotors with manual brake release, screw in either the hand lever (with self-re-engaging manual brake release) or the setscrew (with lockable manual brake release).

Installation in damp locations or in the open

- If possible, arrange the terminal box so that the cable entries are pointing downwards.
- Coat the threads of the cable glands and filler plugs with sealing compound, tighten the glands properly, and coat again.
- Seal the cable entry properly.
- Clean the sealing surfaces of the terminal box and the terminal box cover carefully before re-assembly; gaskets have to be glued in on one side. Replace any brittle seals!
- If required, touch up the corrosion protection (especially at the eyebolts).
- Check the degree of protection.

4.2.3 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to EN 50347 • ISO j6 with ∅ ≤ 28 mm • ISO k6 with ∅ ≥ 38 mm up to ≤ 48 mm • ISO m6 for ∅ ≥ 55 mm • Center bore in accordance with DIN 332, shape DR..	Centering shoulder tolerance in accordance with EN 50347 • ISO j6 with ∅ ≤ 250 mm • ISO h6 for ∅ ≥ 300 mm

5 Electrical Installation

	NOTES
	• Observe the safety notes in section 2 during installation! • Use switch contacts in utilization category AC-3 according to EN 60947-4-1 for switching the motor and the brake.

5.1 Compulsory use of the wiring diagrams

Connect the motor only as shown in the wiring diagram(s) included with the motor. **You must not connect or start up the motor if the wiring diagram is missing.** You can obtain the valid wiring diagrams from SEW-EURODRIVE free of charge.

5.2 Wiring notes

Comply with the safety notes during installation.

5.2.1 Protecting the brake control system against interference

Unless they are shielded, brake cables must always be routed separately from other power cables with phased currents to protect brake controls against interference. Power cables with phased currents are in particular

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

5.2.2 Protecting the motor protection devices against interference

To protect against interference by SEW motor protection devices (temperature sensors TF, winding thermostats TH):

- You may route separately shielded supply cables together with switched-mode power lines in one cable.
- You must not route unshielded supply cables together with switched-mode power lines in one cable.

5.3 Special aspects for operation with a frequency inverter

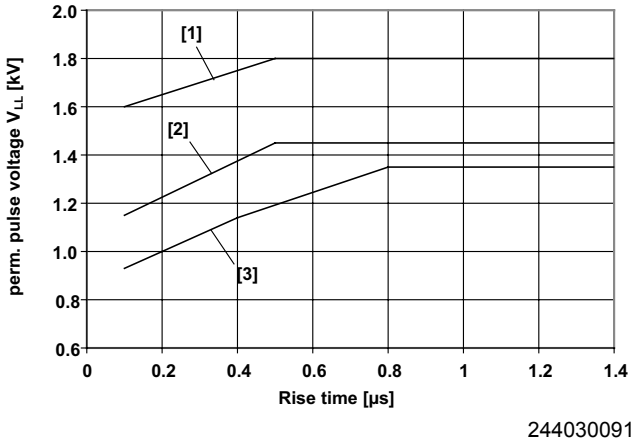
When motors are powered from inverters, you must adhere to the wiring instructions issued by the inverter manufacturer. You must also observe the operating instructions for the frequency inverter.

5.3.1 Motor on SEW inverter

SEW-EURODRIVE has tested operation of the motor on SEW frequency inverters. The required dielectric strength values of the motors were confirmed and the startup routines adjusted to the motor data. You can operate the DR motor with any frequency inverter from SEW-EURODRIVE. To do this, start up the motor as described in the operating instructions for the frequency inverter.

5.3.2 Motor on a non-SEW inverter

Operating SEW motors on non-SEW frequency inverters is permitted if the pulse voltages at the motor terminals indicated in the following figure are not exceeded.



[1] Permitted pulse voltage for DR motors with reinforced insulation (../RI)
[2] Permitted pulse voltage for DR standard
[3] Permitted pulse voltage according to IEC60034-17

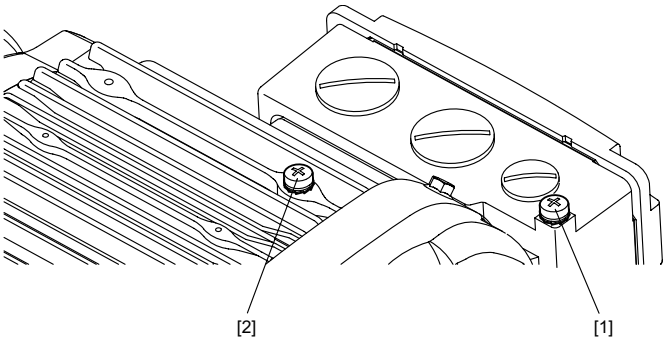
	NOTE
	The diagram applies to motor operation of the motor. If the permitted pulse voltage is exceeded, you must install limiting measures, such as filters, chokes or special motor cables. You should also consult the manufacturer of the frequency inverter.

5.4 Improving the grounding (EMC)

For improved, low-impedance grounding at high frequencies, we recommend using the following connections:

5.4.1 Size DR.71-DR.132:

Size DR.71-DR132
• 1 x self-tapping screw DIN 7500 M5 x 12 • 1 x washer ISO 7090 • 1 x serrated lock washer DIN 6798



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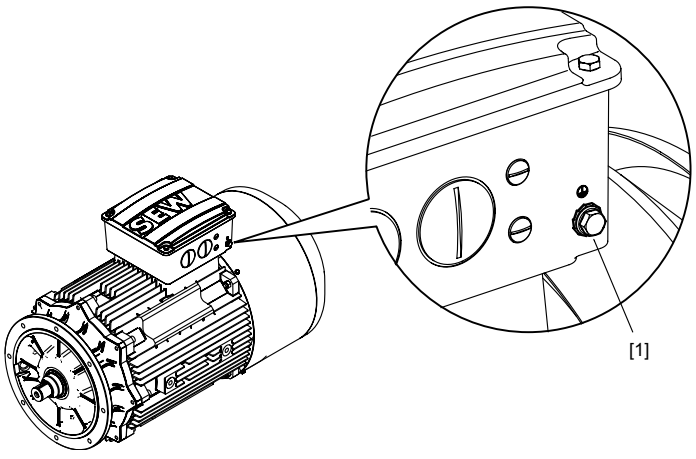
[1] Use the pre-cast bore at the terminal box (brake motor)
[2] Creating a bore in the stator housing with ∅ =4.6 and t_{max}= 11.5

5.4.2 Size DR.160-DR.315:

Size DR.160-DR.225	Size DR.315
• 1 x hex head screw ISO 4017 M8 x 20 • 1 x washer ISO 7090 • 1 x serrated lock washer DIN 6798	• 1 x hex head bolt ISO 4017 M12 x 30 • 1 x washer ISO 7090 • 1 x serrated lock washer DIN 6798



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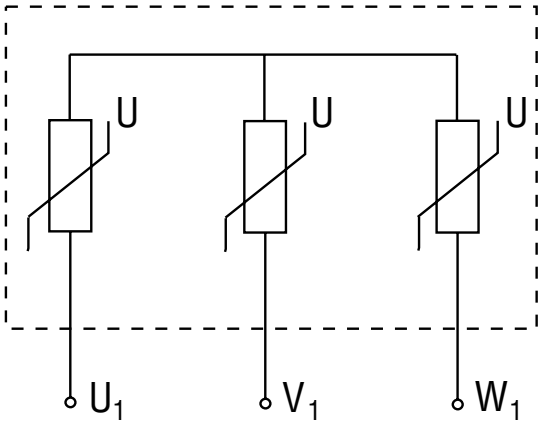
[1] Use the grounding screw at the terminal box

5.5 Special aspects in switching operation

When the motors are used in switching operation, possible interference of the switchgear must be excluded by ensuring suitable wiring. According to EN 60204 (electrical equipment of machines), motor windings must have interference suppression to protect the numerical or programmable logic controllers. As it is primarily switching operations that cause interference, SEW-EURODRIVE recommends installing protective circuitry in the switching devices.

5.6 Special aspects of torque motors and low-speed motors

Due to the design of torque motors and low-speed motors, very high induction voltages may be generated when they are switched off. Consequently, SEW-EURODRIVE recommends using the varistor circuit shown below for protection. The size of the varistors depends, amongst other factors, on the starting frequency – note for project planning!



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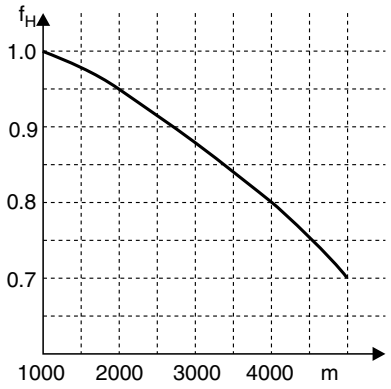
5.7 Ambient conditions during operation

5.7.1 Ambient temperature

Unless otherwise specified on the nameplate, you must observe the temperature range of -20 °C to +40 °C. Motors intended for use in higher or lower ambient temperatures have specific designations on the nameplate.

5.7.2 Installation altitude

The maximum installation altitude of 1000 m above sea level must not be exceeded. Otherwise, power is reduced by the factor f_H according to the diagram below.



The reduction in rated power is calculated according to the following formula:

$$P_{N1} = P_N \times f_H$$

P_{N1} = reduced rated power [kW]
P_N = rated power [kW]
f_H = Factor for reduction due to installation altitude

5.7.3 Hazardous radiation

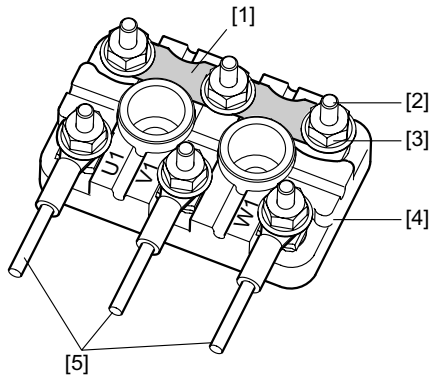
Motors must not be subjected to hazardous radiation (such as ionizing radiation). Contact SEW-EURODRIVE if necessary.

5.8 Connecting the motor

5.8.1 Connecting the motor via the terminal box

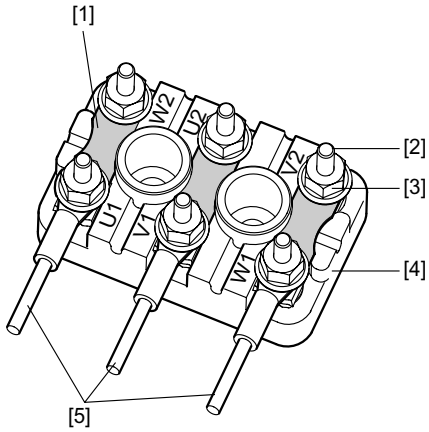
- In accordance with the wiring diagram provided
- Check cable cross section
- Arrange terminal links correctly
- Tighten connections and protective earth
- In the terminal box: Check winding connections and tighten them if necessary

Arrangement of the terminal links for ⅄ connection

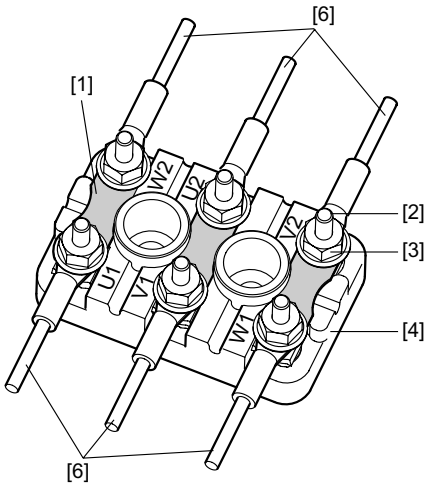


Arrangement of the terminal links for △ connection

Motor size DR.71-DR.225:



Motor size DR.315:



[1] Terminal link
[2] Terminal stud
[3] Flange nut
[4] Terminal board
[5] Customer connection
[6] Customer connection with split connection cable

NOTE

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

5.8.2 Motor connection terminal box

The motors are supplied and connected differently depending on the electrical design. Arrange the cables and terminal links as shown in the wiring diagram and screw them on firmly. Observe the tightening torques specified in the following tables.

Motor size DR.71-DR.100							
Terminal stud ∅	**Tightening torque for the hex nut**	**Customer connection** **Cross section**	**Design**	**Connection type**	**Scope of delivery**	**PE Terminal stud** ∅	**Design**
M4	**1.6 Nm**	**≤ 1.5 mm²**	**1a**	**Solid wire Conductor end sleeve**	**Pre-assembled terminal links**	M5	4
		≤ 6 mm²	**1b**	**Ring cable lug**	**Pre-assembled terminal links**		
		≤ 6 mm²	2	Ring cable lug	Small connection accessories enclosed in bag		
M5	2.0 Nm	≤ 2.5 mm²	1a	Solid wire Conductor end sleeve	Pre-assembled terminal links		
		≤ 16 mm²	1b	Ring cable lug	Pre-assembled terminal links		
		≤ 16 mm²	2	Ring cable lug	Small connection accessories enclosed in bag		
M6	3.0 Nm	≤ 35 mm²	3	Ring cable lug	Small connection accessories enclosed in bag		

Motor size DR.112-DR.132							
Terminal stud ∅	**Tightening torque for the hex nut**	**Customer connection** **Cross section**	**Design**	**Connection type**	**Scope of delivery**	**PE Terminal stud** ∅	**Design**
M5	**2.0 Nm**	**≤ 2.5 mm²**	**1a**	**Solid wire Conductor end sleeve**	**Pre-assembled terminal links**	M5	4
		≤ 16 mm²	**1b**	**Ring cable lug**	**Pre-assembled terminal links**		
		≤ 16 mm²	2	Ring cable lug	Small connection accessories enclosed in bag		
M6	3.0 Nm	≤ 35 mm²	3	Ring cable lug	Small connection accessories enclosed in bag		

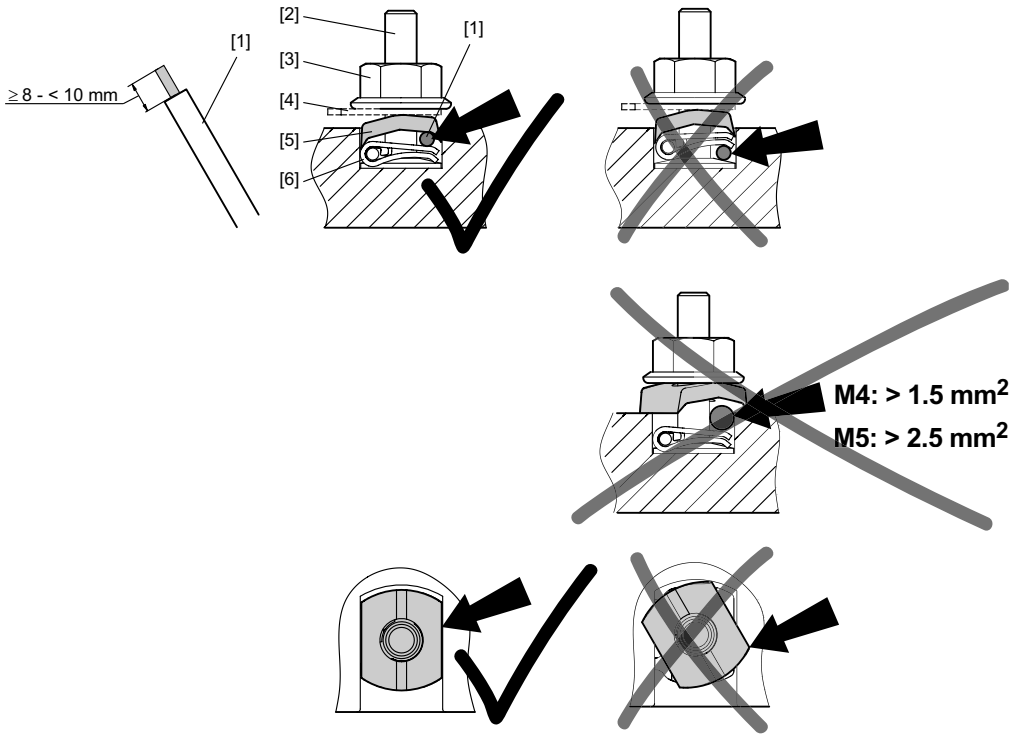
Motor size DR.160							
Terminal stud ∅	**Tightening torque for the hex nut**	**Customer connection** **Cross section**	**Design**	**Connection type**	**Scope of delivery**	**PE Terminal stud** ∅	**Design**
M6	**3.0 Nm**	**≤ 35 mm²**	**3**	**Ring cable lug**	**Small connection accessories enclosed in bag**	M8	5
M8	6.0 Nm	≤ 70 mm²	3	Ring cable lug	Small connection accessories enclosed in bag	M10	5

Motor size DR.180-DR.225							
Terminal stud ∅	**Tightening torque for the hex nut**	**Customer connection** **Cross section**	**Design**	**Connection type**	**Scope of delivery**	**PE Terminal stud** ∅	**Design**
M8	**6.0 Nm**	**≤ 70 mm²**	**3**	**Ring cable lug**	**Small connection accessories enclosed in bag**	M8	5
M10	10 Nm	≤ 95 mm²	3	Ring cable lug	Small connection accessories enclosed in bag	M10	5
M12	15.5 Nm	≤ 95 mm²	3	Ring cable lug	Small connection accessories enclosed in bag	M10	5

Motor size DR.315							
Terminal stud ∅	**Tightening torque for the hex nut**	**Customer connection** **Cross section**	**Design**	**Connection type**	**Scope of delivery**	**PE Terminal stud** ∅	**Design**
M12	**15.5 Nm**	≤ 95 mm²	**3**	**Ring cable lug**	**Connection parts pre-assembled**	M12	5
M16	**30 Nm**	≤ 120 mm²					

The designs in bold print apply to S1 operation for the standard voltages and standard frequencies according to the data in the catalog. Other designs may have different connections, for example different terminal stud diameters and/or a different scope of delivery.

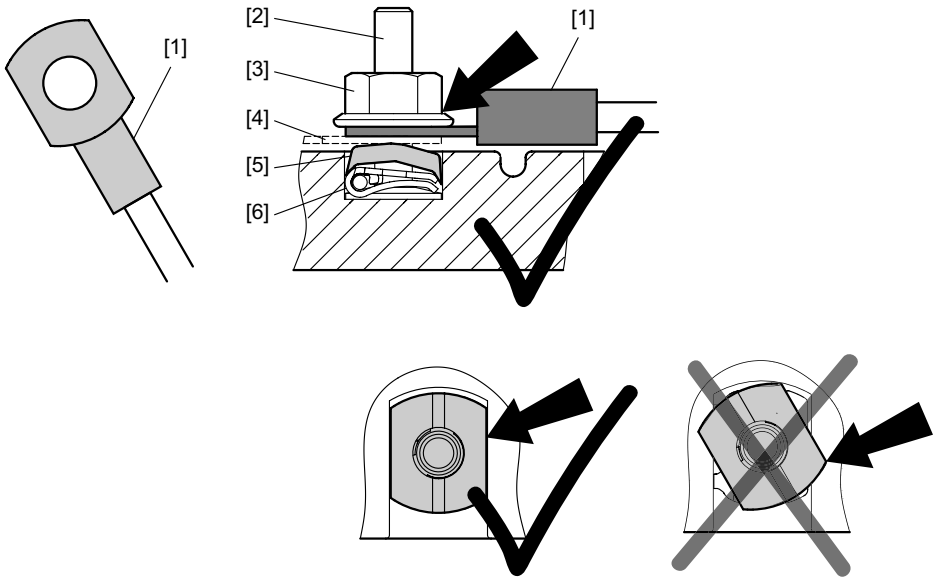
Design 1a:



88866955

[1] External connection
[2] Terminal stud
[3] Flange nut
[4] Terminal link
[5] Terminal washer
[6] Winding connection with Stocko connection terminal

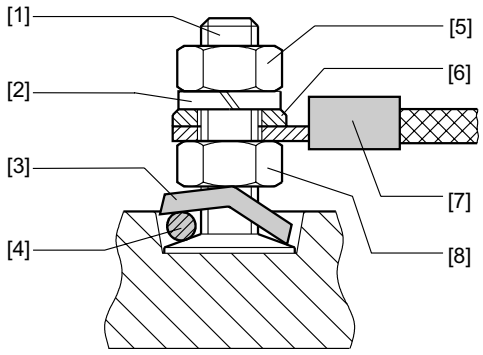
Design 1b:



88864779

[1] External connection with ring cable lug, to DIN 46237 or DIN 46234, for example.
[2] Terminal stud
[3] Flange nut
[4] Terminal link
[5] Terminal washer
[6] Winding connection with Stocko connection terminal

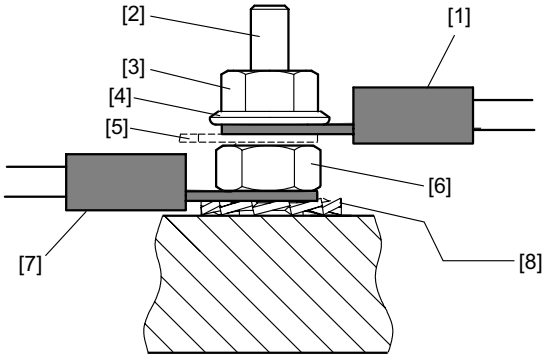
Design 2



185439371

[1] Terminal stud
[2] Lock washer
[3] Terminal washer
[4] Winding connection
[5] Upper nut
[6] Washer
[7] External connection with ring cable lug, to DIN 46237 or DIN 46234, for example.
[8] Lower nut

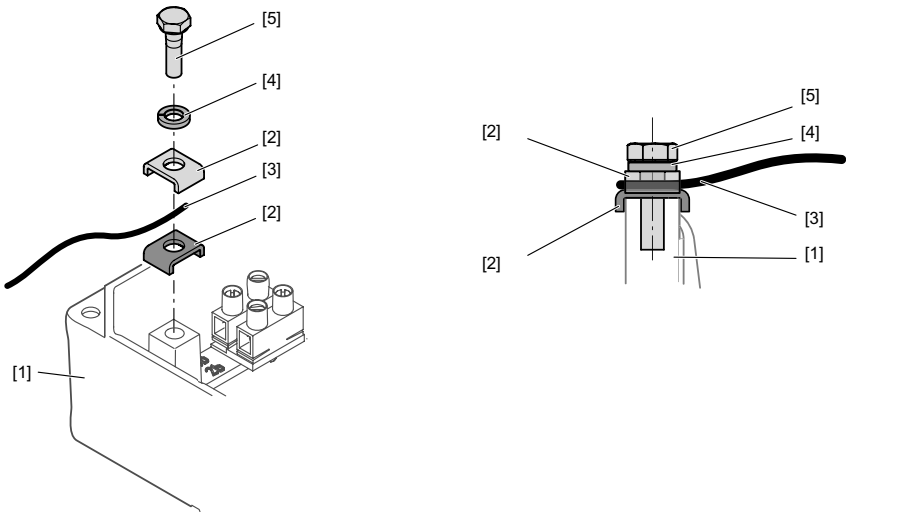
Design 3



199641099

[1] External connection with ring cable lug, to DIN 4637 or DIN 46234, for example.
[2] Terminal stud
[3] Upper nut
[4] Washer
[5] Terminal link
[6] Lower nut
[7] Winding connection with ring cable lug
[8] Serrated lock washer

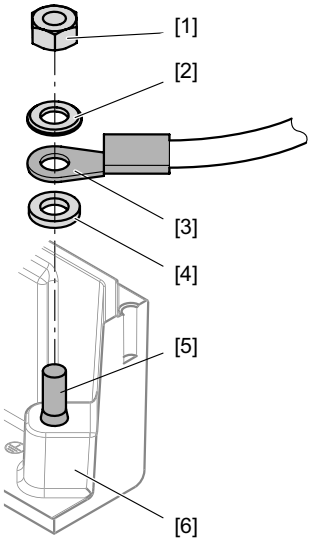
Design 4

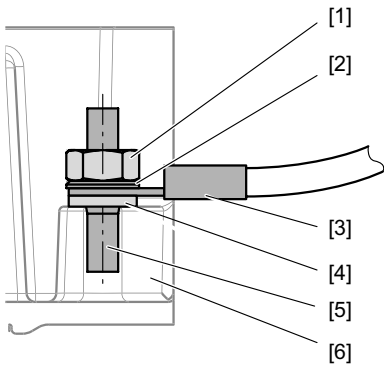


1139606667

[1] Terminal box
[2] Terminal clip
[3] PE conductor
[4] Lock washer
[5] Hex head screw

Design 5

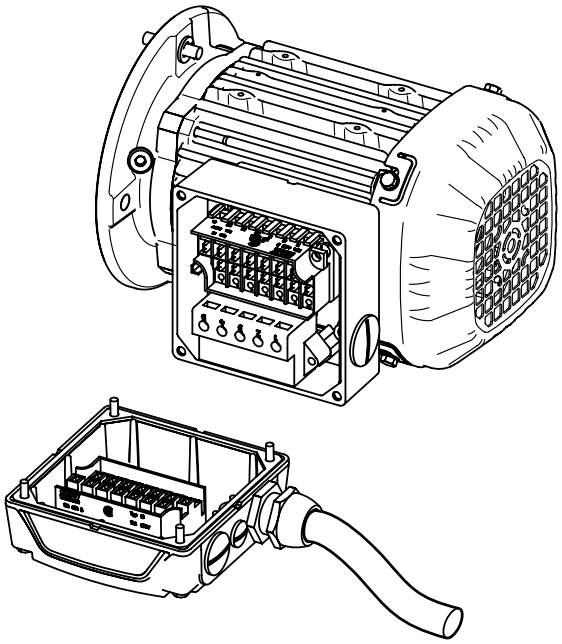




1139608587

[1] Hex nut
[2] Washer
[3] PE conductor with cable lug
[4] Serrated lock washer
[5] Stud
[6] Terminal box

5.8.3 Connecting the motor using the IS plug connector



1009070219

The IS plug connector is supplied from the factory with its base fully wired-up, including additional features such as a brake rectifier. The upper section of the IS connector is included in the scope of delivery and must be connected as shown in the wiring diagram.

The IS plug connector has CSA approval up to 600 V. Note for application according to CSA regulations: Tighten the M3 terminal screws to a torque of 0.5 Nm! See the following table for American Wire Gauge (AWG) cable cross sections.

Cable cross section

Make sure the type of line corresponds to the applicable regulations. The rated currents are specified on the motor nameplate. The cable cross sections that can be used are listed in the following table.

Without variable terminal link	With variable terminal link	Link cable	Double assignment (motor and brake/SR)
0.25 - 4.0 mm^2	0.25 - 2.5 mm^2	max. 1.5 mm^2	max. 1 x 2.5 and 1 x 1.5 mm^2
AWG 23 - 12	AWG 23 - 14	max. AWG 16	max. 1 x AWG 14 and 1 x AWG 16

Wiring the upper section of the plug connector

- Loosen the housing cover screws:
  - Remove the housing cover
- Loosen the screws from the upper section of the plug connection.
  - Remove the upper section of the plug connection from the cover.
- Strip the insulation off the connection lead:
  - Strip about 9 mm insulation off the connecting leads
- Pass the cable through the cable gland

Wiring up as shown in wiring diagram R83

- Connect the lines as shown in the circuit diagram:
  - Tighten the clamping screws carefully!
- Install the plug connector (→ section "Installing the plug connector")

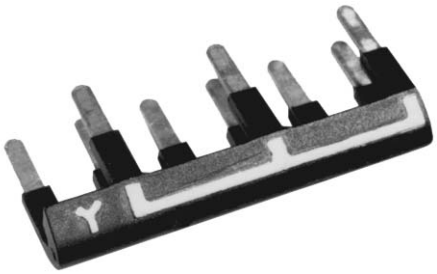
Wiring up as shown in wiring diagram R81

For⅄ / △ startup:

- Connect with 6 lines:
  - Tighten the clamping screws carefully!
  - Motor contactors in the control cabinet
- Install the plug connector (→ section "Installing the plug connector")

For⅄ or△ operation:

- Connect as shown in the wiring diagram
- According to the desired motor operation (⅄ or △) Install the variable terminal link as shown in the following figures.
- Install the plug connector (→ section "Installing the plug connector")



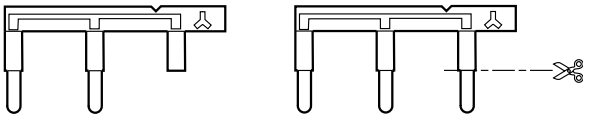
798606859

798608523

Brake control system BSR – preparing the variable terminal link

For⅄ operation:

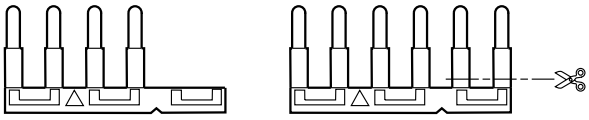
On ⅄ side of the variable terminal link, remove only the bare metal pin of the marked prong horizontally as shown in the following figure – touch guard!



798779147

For△ operation:

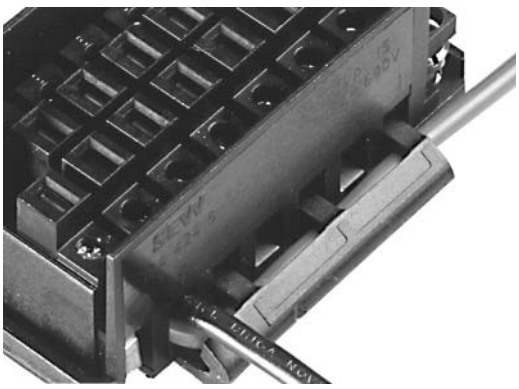
On △ side of the variable terminal link, completely remove 2 prongs horizontally as shown in the following figure.



798777483

Wiring up as shown in wiring diagram R81 for ⅄ or △ operation with double terminal assignment

- At terminal point for double assignment:
  - Connect the link cable
- When operation is as required:
  - Insert the link cable in the variable terminal link
- Install the variable terminal link.
- At terminal point for double assignment:
  - Connect the motor lead above the variable terminal link
- Connect the other lines as shown in the wiring diagram
- Install the plug connector (→ section "Installing the plug connector")

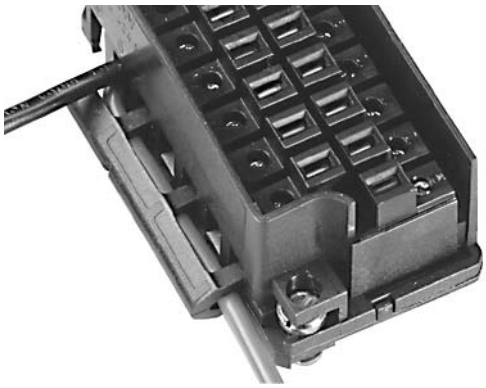


798780811

Installing the plug connector

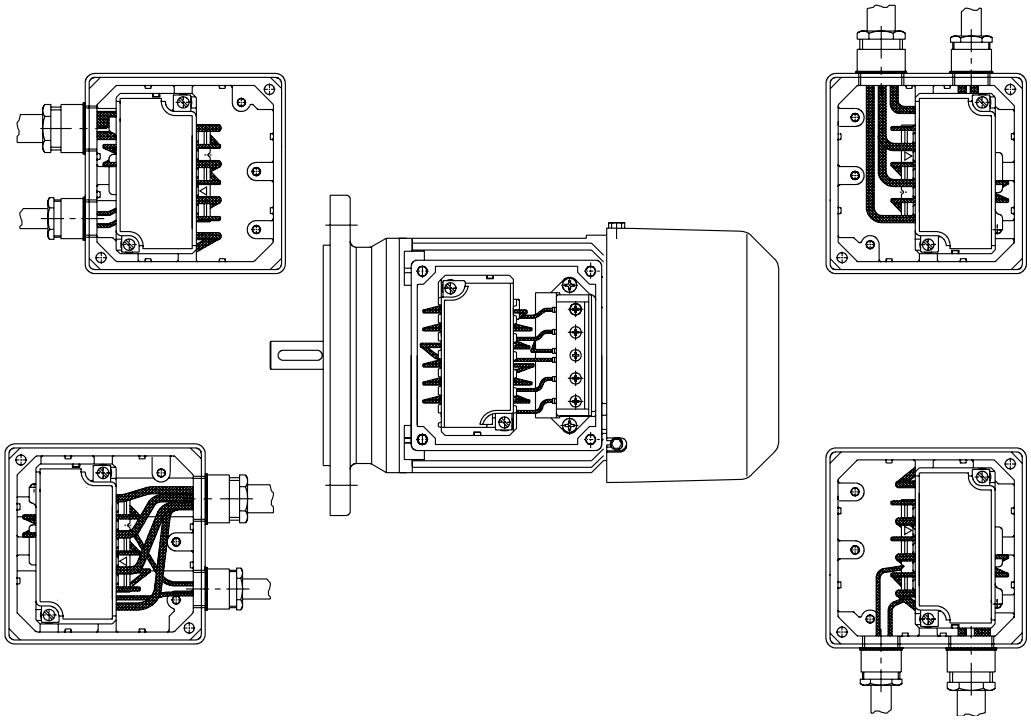
The housing cover of the IS plug connector can be screwed onto the lower section of the plug connector depending on the required position of the cable lead. The upper section of the plug connector shown in the following figure must first be installed in the housing cover so it will match the position of the lower section of the plug connector:

- Define the required mounting position
- Install the upper section of the plug connector into the housing cover in accordance with the mounting position
- Close the plug connector
- Tighten the cable gland



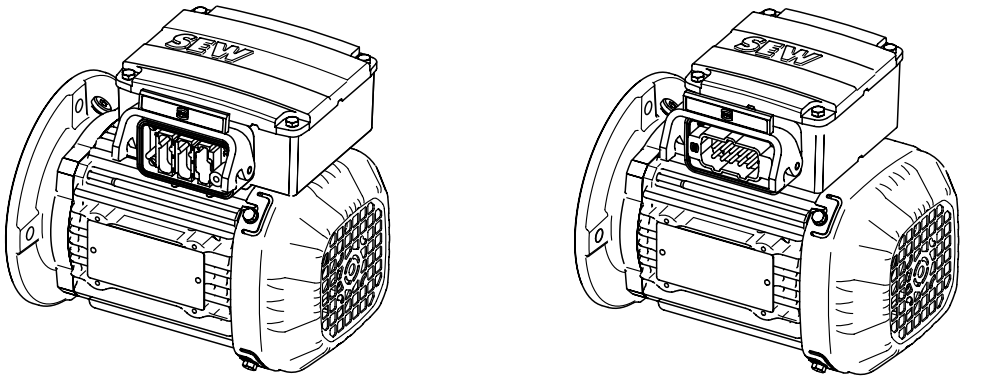
798978827

Mounting position of the upper section of the plug connector in the housing cover



798785163

5.8.4 Connect the motor using plug connectors AB.., AD.., AM.., AK.., AC.., AS



798984587

The installed AB.., AD.., AM.., AK.., AC.. and AS connector systems are based on the connector systems made by Harting.

- AB.., AD.., AM.., AK.. Han Modular®
- AC.., AS.. Han 10E / 10ES

The plug connectors are located at the side of the terminal box. They are locked either using two clamps or one clamp on the terminal box.

UL approval has been granted for the plug connectors.

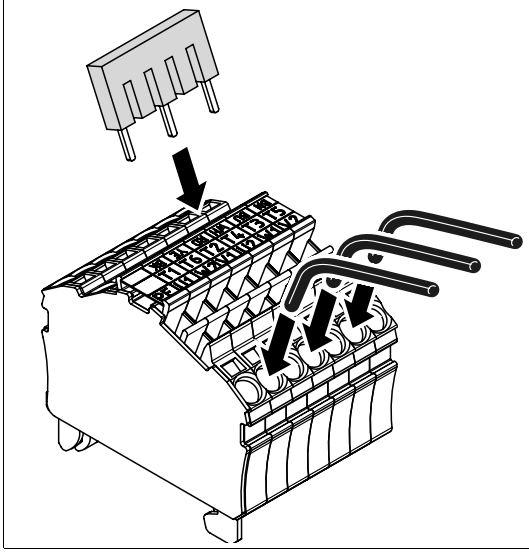
The mating connector (sleeve housing) with socket contacts is not included in the scope of delivery.

The enclosure is only applied when the mating connector is mounted and locked.

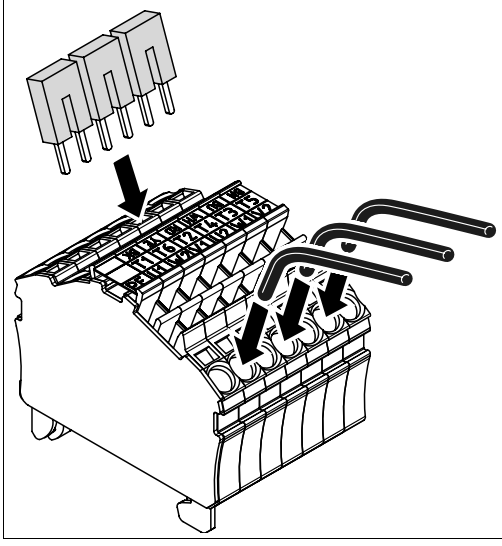
5.8.5 Connecting the motor via the KCC terminal strip

- In accordance with the wiring diagram provided
- Check the max cable cross section:
  - 4 mm² rigid
  - 4 mm² flexible
  - 2.5 mm² with conductor end sleeve
- In the terminal box: Check winding connections and tighten them if necessary
- Stripping length 10-12 mm

Arrangement of the terminal links for ⅄ connection



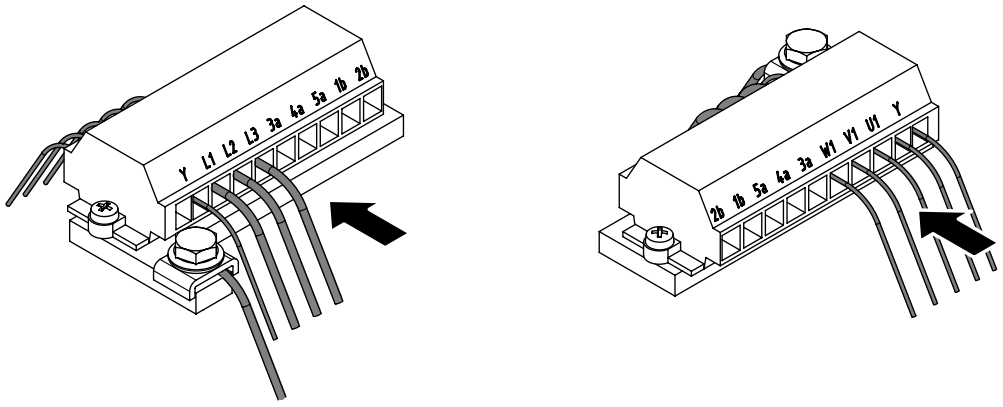
Arrangement of the terminal links for △ connection



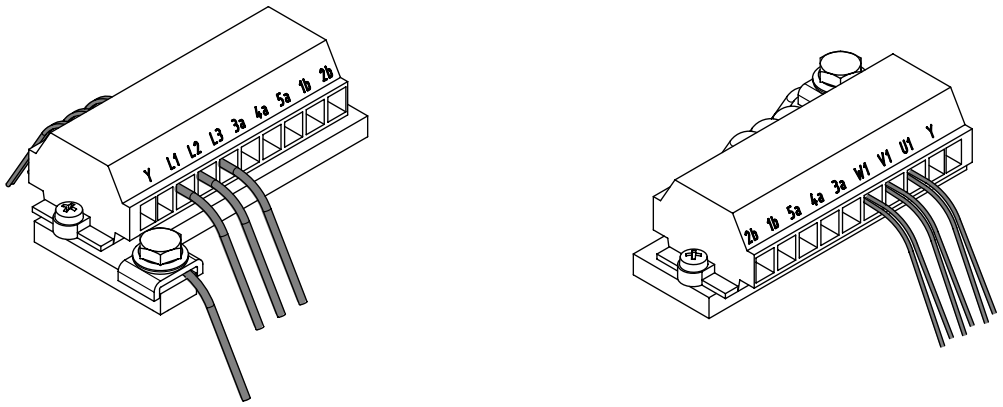
5.8.6 Connecting the motor via the KC1 terminal strip

- In accordance with the wiring diagram provided
- Check the max cable cross section:
  - 2.5 mm² rigid
  - 1.5 mm² flexible with cable end sleeve (flexible without cable end sleeve is not permitted)
- Stripping length 8-9 mm

Arrangement of terminal links with ⅄ connection



Arrangement of the terminal links for △ connection



5.9 Connecting the brake

The brake is released electrically. The brake is applied mechanically when the voltage is switched off.

	**STOP** • Comply with the applicable regulations issued by the relevant employer's liability insurance association regarding phase failure protection and the associated circuit/ circuit modification! • Connect the brake according to the provided wiring diagram. • In view of the DC voltage to be switched and the high level of current load, it is essential to use either special brake contactors or AC contactors with contacts in utilization category AC-3 according to EN 60947-4-1.

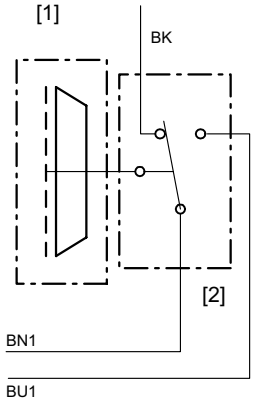
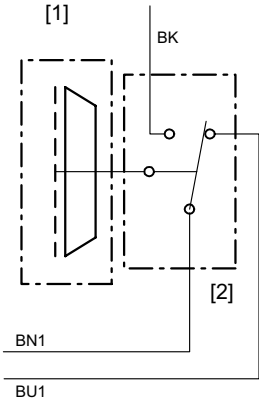
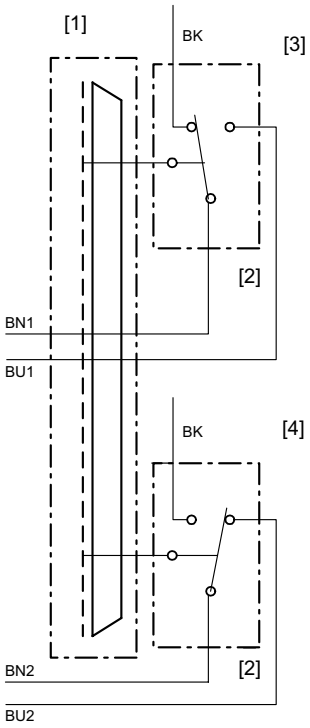
5.9.1 Connecting the brake control

The DC disk brake is powered from a brake control system with protection circuit. It is located in the terminal box/IS lower part or must be installed in the control cabinet.

- **Check the cable cross sections - braking currents (see Section "Technical Data")**
- Connect the brake control according to the provided wiring diagram
- For motors in thermal class 180 (H), install the brake rectifier in the control cabinet.

5.9.2 Connecting the DUB diagnostics unit

Connect the diagnostics unit as shown in the wiring connection diagram(s) provided with the motor. The maximum permitted connection voltage is AC 250 V with a maximum current of 6 A. With low voltage the maximum voltage is AC 24 V or DC 24 V with max. 0.1 A. A subsequent change to low voltage is not permitted.

Function monitoring	Wear monitoring	Function and wear monitoring
		
[1] Brake [2] MP321-1MS microswitch	[1] Brake [2] MP321-1MS microswitch	[1] Brake [2] MP321-1MS microswitch [3] Function monitoring [4] Wear monitoring
1145889675	1145887755	1145885835

5.10 Accessory equipment

Connect accessory equipment as shown in the wiring connection diagram(s) provided with the motor. **Do not connect or start up the accessory equipment if the wiring diagram is missing.** You can obtain the valid wiring diagrams from SEW-EURODRIVE free of charge.

5.10.1 TF temperature sensor

STOP	**STOP**
	The temperature sensor TF may not be subjected to voltages > 30 V.

The PTC thermistors comply with DIN 44082.

Resistance measurement (measuring instrument with $V \leq 2.5$ V or I < 1 mA):

- Standard measured values: 20...500 Ω, thermal resistance > 4000 Ω

When using the temperature sensor for thermal monitoring, the evaluation function must be activated to maintain reliable isolation of the temperature sensor circuit. If the temperature reaches an excessive level, the thermal protection function must be activated immediately.

5.10.2 TH winding thermostats

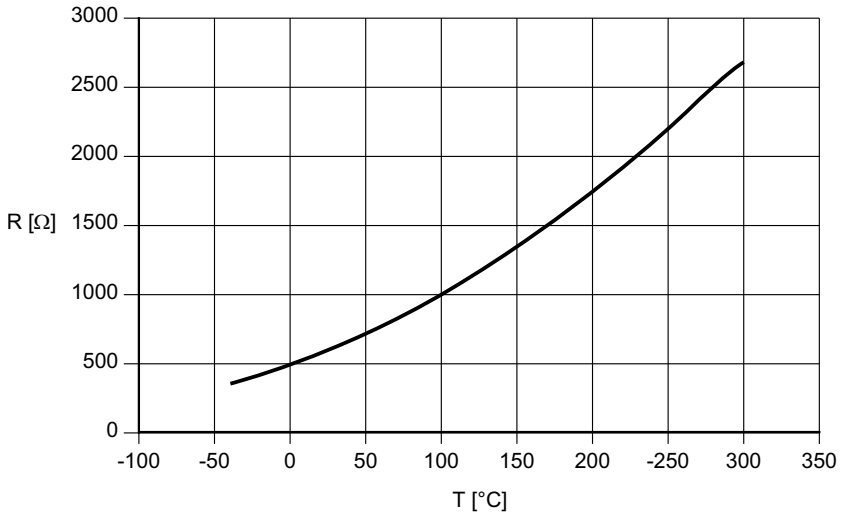
The thermostats are connected in series and open when the permitted winding temperature is exceeded. They can be integrated in the drive monitoring circuit.

	AC V	DC V	
Voltage U [V]	250	60	24
Current (cos φ = 1.0) [A]	2.5	1.0	1.6
Current (cos φ = 0.6) [A]	1.6		
Contact resistance max. 1 ohm at DC 5 V / 1 mA			

5.10.3 KTY84-130 temperature sensor

STOP	**STOP**
	Incorrect connection may cause damage to the temperature sensor and the motor winding! Avoid currents > 4 mA in the circuit of the KTY since high self-heating of the temperature sensor can damage its insulation and the motor winding. It is essential to observe the correct connection of the KTY to ensure correct evaluation of the temperature sensor. Check the polarity.

The characteristic curve in the following figure shows the resistance curve subject to the motor temperature with a measuring current of 2 mA and correct pole connection.

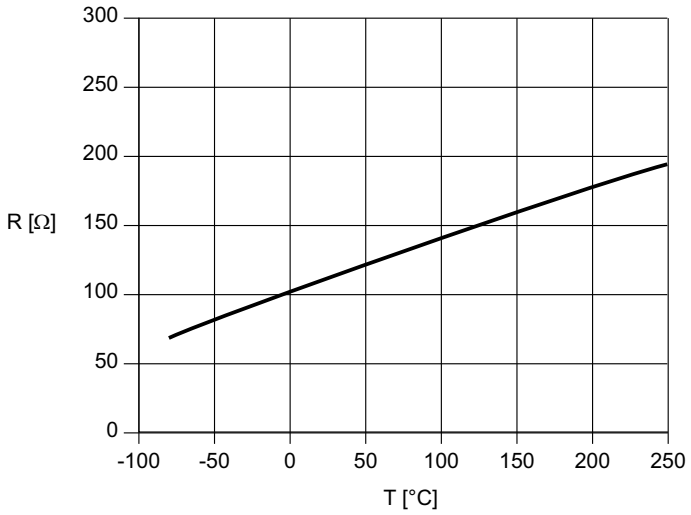


Technical Data	KTY84 - 130
Connection	Red (+) Blue (-)
Total resistance at 20 - 25 °C	540 Ω < R < 640 Ω
Test current	< 3 mA

5.10.4 PT100 temperature detection

STOP	**STOP**
	Incorrect connection may cause damage to the temperature sensor and the motor winding! Avoid currents > 4 mA in the circuit of the PT100 since high self-heating of the temperature sensor can damage its insulation and the motor winding. Observe the correct connection of the PT100 to ensure correct evaluation of the temperature sensor.

The characteristic curve in the following figure shows the resistance curve subject to the motor temperature.



Technical data	PT100
Connection	Red/white
Resistance at 20 - 25 °C per PT100	107 Ω < R < 110 Ω
Test current	< 3 mA

5.10.5 V forced cooling fan

- Connection in separate terminal box
- Max. connection cross section 3 × 1.5 mm^2
- Cable gland M16 × 1.5

Motor size	Operating mode/connection	Frequency in Hz	Voltage V
DR.71-DR.132	1 ~ AC ⊥[1] (△)	50	100 - 127
DR.71-DR.132	1 ~ AC ⊥[1] (△)	60	100 - 135
DR.71-DR.132	3 ~ AC 人	50	175 - 220
DR.71-DR.132	3 ~ AC 人	60	175 - 230
DR.71-DR.132	3 ~ AC △	50	100 - 127
DR.71-DR.132	3 ~ AC △	60	100 - 135
DR.71-DR.180	1 ~ AC ⊥[1] (△)	50	230 - 277
DR.71-DR.180	1 ~ AC ⊥[1] (△)	60	230 - 277
DR.71-DR.315	3 ~ AC 人	50	346 - 500
DR.71-DR.315	3 ~ AC 人	60	380 - 575
DR.71-DR.315	3 ~ AC △	50	200 - 290
DR.71-DR.315	3 ~ AC △	60	220 - 330

1) Steinmetz circuit

NOTE

For information on how to connect the V forced cooling fan, refer to the wiring diagram (see page 116).

5.10.6 Mount-on Encoders – overview

Refer to the wiring connection diagrams on information on how to connect incremental encoders:

Encoder	Motor size	Encoder type	Mounting type	Power supply	Signal	Wiring diagram
ES7S	DR.71-132	Encoder	Shaft-centered	DC 7..30V	1Vss sin/cos	68 180 xx 08
ES7R	DR.71-132	Encoder	Shaft-centered	DC 7..30V	TTL (RS422)	68 179 xx 08
ES7C	DR.71-132	Encoder	Shaft-centered	DC 4.5..30V	HTL / TTL (RS 422)	68 179 xx 08
AS7W	DR.71-132	Encoder	Shaft-centered	DC 7..30V	1Vss sin/cos	68 181 xx 08
EG7S	DR.160-225	Encoder	Shaft-centered	DC 7..30V	1Vss sin/cos	68 180 xx 08
EG7R	DR.160-225	Encoder	Shaft-centered	DC 7..30V	TTL (RS422)	68 179 xx 08
EG7C	DR.160-225	Encoder	Shaft-centered	DC 4.5..30V	HTL / TTL (RS 422)	68 179 xx 08
AG7W	DR.160-225	Encoder	Shaft-centered	DC 7..30V	1Vss sin/cos	68 181 xx 08
EH7S	DR.315	Encoder	Shaft-centered	DC 10..30V	1Vss sin/cos	08 259 xx 07
AS7Y	DR.71-132	Encoder	Shaft-centered	DC 7..30V	1Vss sin/cos + SSI	68 182 xx 07
AG7Y	DR.160-225	Encoder	Shaft-centered	DC 7..30V	1Vss sin/cos + SSI	68 182 xx 07
AH7Y	DR.315	Encoder	Shaft-centered	DC 9..30V	TTL+SSI (RS 422)	08 259 xx 07

NOTES

- Maximum oscillation load for encoders ≤ 10 g ≈ 100 m/s^2 (10 Hz ... 2 kHz)
- Shock resistance ≤ 100 g ≈ 1000 m/s^2 for the DR.71-DR.225
- Shock resistance ≤ 200 g ≈ 2000 m/s^2 for the DR.315

5.10.7 Built-in encoders – overview

Encoder	Motor size	Power supply	Signals
EI71	DR71-132	DC 9..30V	HTL 1 period/revolution
EI72			HTL 2 periods/revolution
EI76			HTL 6 periods/revolution
EI7C			HTL 24 periods/revolution

The LED display provides an optical feedback according to the following table:

LED color	Track A	Track B	Track /A	Track /B
Orange (red and green)	0	0	1	1
Red	0	1	1	0
Green	1	0	0	1
Off	1	1	0	0

NOTE

For information on how to connect the built-in encoder, refer to the wiring diagram.

- Observe the "Wiring diagrams" (see page 111) chapter for a connection via terminal strip.
- Observe the enclosed wiring diagram for a connection via M12 connectors.

5.10.8 Encoder connection

When connecting encoders to inverters, always follow the operating instructions for the respective inverter!

- Maximum cable length (inverter - encoder):
  - 100 m with a capacitance per unit length ≤ 120 nF/km
- Core cross section: 0.20 ... 0.5 mm^2
- Use shielded cables with twisted pair conductors and apply the shield over large area on both ends:
  - to the connection cover of the encoder, in the cable gland, or in the encoder plug
  - to the inverter on the electronics shield clamp or to the housing of the sub D plug
- Install the encoder cables separately from the power cables, maintaining a distance of at least 200 mm.

5.10.9 Anti-condensation heating

Observe the permitted voltage according to the nameplate.

6 Startup

6.1 Prerequisites for startup

	NOTE
	• It is essential to observe the safety notes in section 2 (see page 7) during installation. • In case of problems, refer to section "Malfunctions" (see page 117)!

6.1.1 Before startup, make sure that

- the drive is undamaged and not blocked,
- the measures stipulated in section "Preliminary work" (see page 15) are performed after extended storage periods.
- all connections have been made properly
- the direction of rotation of the motor/gearmotor is correct
  - (motor rotating clockwise: U, V, W to L1, L2, L3)
- all protective covers have been installed correctly
- all motor protection equipment is active and set for the rated motor current
- there are no other sources of danger present

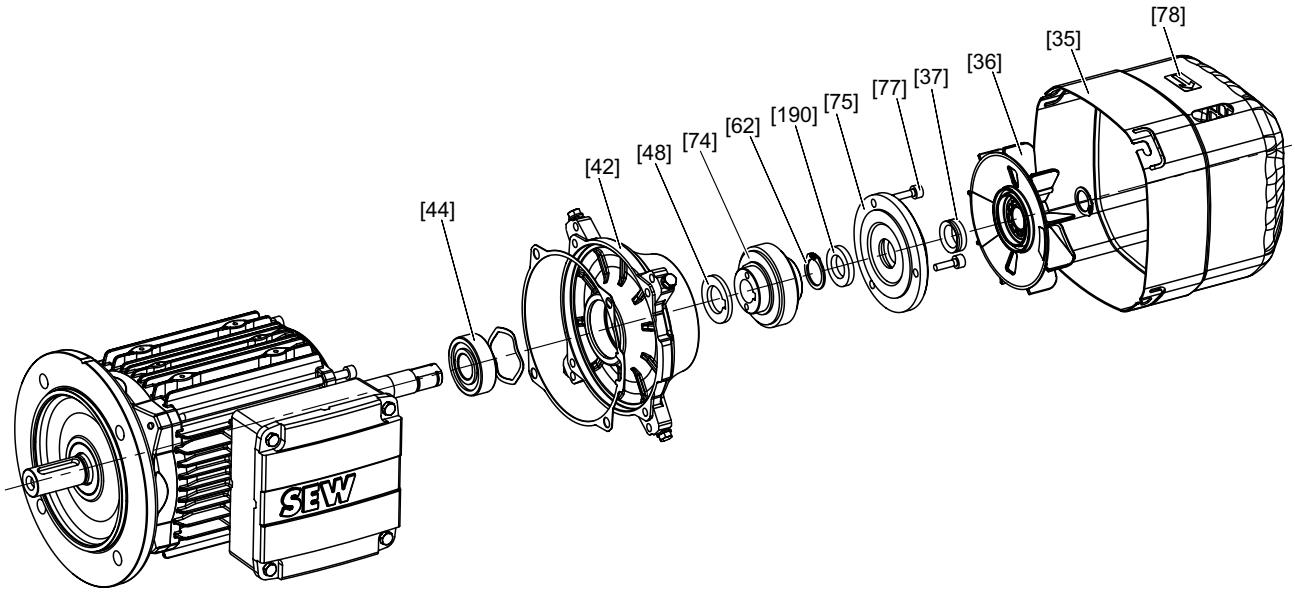
6.1.2 During startup, make sure that

- the motor is running correctly (no overload, no speed fluctuation, no loud noises, etc.)
- the braking torque corresponds to the respective application. Observe chapter "Technical Data" (see page 95) and the nameplate.

	STOP
	On brake motors with a self-re-engaging manual brake release, the hand lever must be removed after startup! A bracket is provided for storing the lever on the outside of the motor housing.

6.2 Altering the blocking direction on motors with a backstop

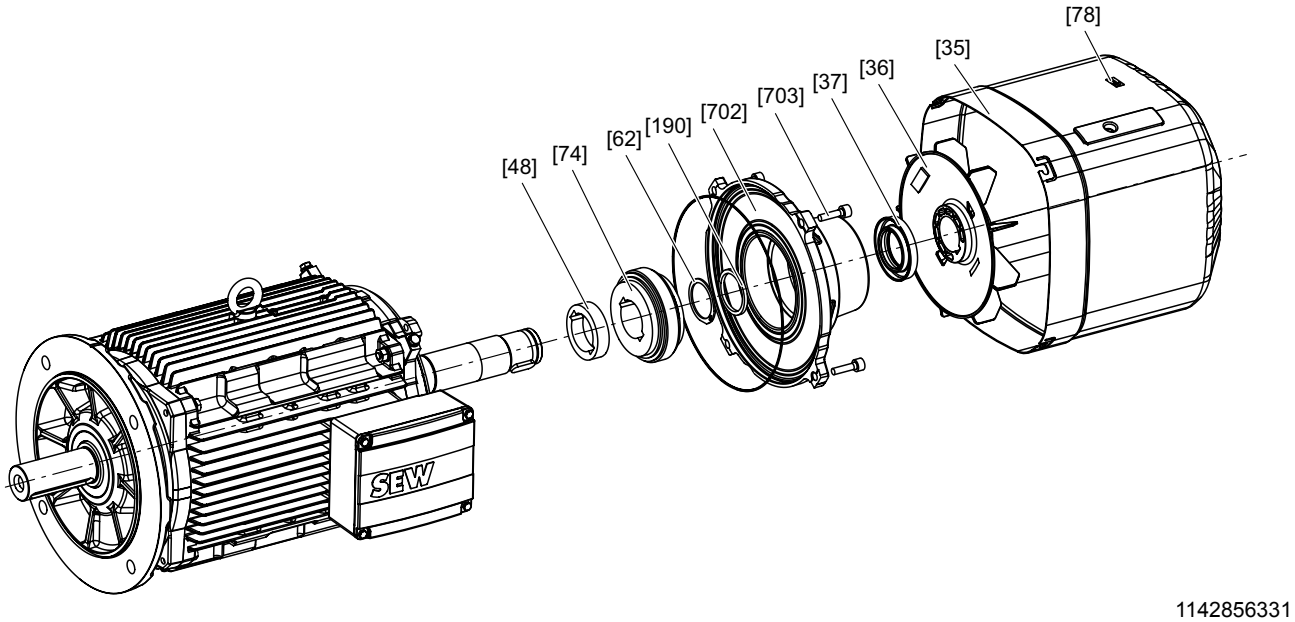
6.2.1 DR.71-DR.80 with backstop – basic structure



1142858251

[35] Fan guard
[36] Fan
[37] Sealing ring
[42] Backstop endshield
[44] Grooved ball bearing
[48] Spacing ring
[62] Circlip
[74] Wedge element ring, complete
[75] Sealing flange
[77] Screw
[78] Label
[190] Felt ring

6.2.2 DR.90-DR.315 with backstop – basic structure



1142856331

[35] Fan guard
[36] Fan
[37] Sealing ring
[48] Spacing ring
[62] Circlip
[74] Wedge element ring, complete
[78] Label
[190] Felt ring
[702] Backstop housing, complete
[703] Machine screw

6.2.3 Changing the blocking direction

The backstop is used to block a direction of rotation of the motor. The direction of rotation is indicated by an arrow on the fan guard of the motor or on the gearmotor housing.

Proceed as follows to change the blocking direction:

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the motor from the power supply and safeguard it against accidental startup before starting work!
- Carefully observe the following steps!

1. Remove forced cooling fan and incremental encoder (if installed).

   See section "Motor and brake maintenance – preliminary work" (see page 51).

2. Remove flange cover or fan guard [35]
3. For the DR.71-80: Remove the sealing flange [75].

   For the DR.90-315: Completely remove the backstop housing [702]
4. Loosen the circlip [62]
5. Remove the wedge element ring [74] via screws in the forcing threads or using a puller
6. Spacing ring [48] – if there is one – remains installed
7. Turn over the wedge element [74] and press it back on
8. Install circlip [62]
9. For the DR.71-80: Cover sealing flange [75] with Hylomar and install it. Replace felt ring [190] and sealing ring [37] if required

   For the DR.90-315: Replace sealing [901], felt ring [190] and sealing ring [37] if required, and install the backstop housing [702].
10. Reinstall the removed parts.
11. Replace the label indicating the direction of rotation

7 Inspection/Maintenance

⚠ HAZARD!

Risk of crushing if the hoist falls.

Severe or fatal injuries.

- Secure or lower hoist drives (danger of falling)
- Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional re-start!
- Only use genuine spare parts in accordance with the valid parts list.
- Always install a new brake controller at the same time as replacing the brake coil!

⚠ CAUTION!

The surface temperatures on the drive can be very high during operation.

Danger of burns.

- Let the motor cool down before you start your work.

STOP

For assembly, the ambient temperature and the oil seals themselves may not be colder than 0 °C, since the oil seals could be damaged otherwise.

7.1 Inspection and maintenance intervals

Unit/unit part	Time interval	What do I do?
BE brake	• **If used as a working brake:** at least every 3000 hours of operation[1)] • **If used as a holding brake:** Every 2 to 4 years, depending on operating conditions [1)]	Inspect the brake • measure the brake disk thickness • brake disk, lining • Measure and adjust working air gap • Pressure plate • Carrier/gearing • Pressure rings • Suck off any abrasion • Inspect the switch contacts and replace them if necessary (e.g. in case of burn-out)
Motor	• **Every 10,000 operating hours**[2)]	Inspect the motor: • Check rolling bearing and change if necessary • Replace the oil seal • Clean the cooling air passages
Drive	• Varies (depending on external factors)	• Touch up or renew the surfaces/ anticorrosion coating • Check and clean the air filter.

1) The amount of wear depends on many factors and may be high. The machine designer must calculate the required inspection/maintenance intervals individually in accordance with the project planning documents (e.g. "Project Planning for Drives").

2) For the DR.315 with re-lubrication device, please note the shortened re-lubrication periods in sec. "Bearing lubrication DR.315".

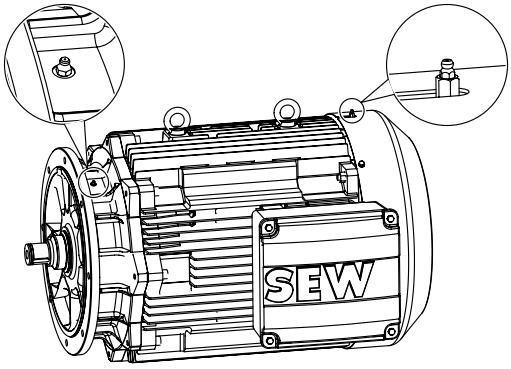
7.2 Bearing lubrication

7.2.1 Bearing lubrication for DR.71- DR.225

The motor bearings generally come with lubrication for life.

7.2.2 Bearing lubrication for DR.315

Size 315 motors may be equipped with a lubrication device. The following figure shows the positions of the lubrication devices.



375353099

[1] Lubrication device in type A in accordance with DIN 71412

Under normal operating conditions and at an ambient temperature between -20 °C C to +40 °C, SEW-EURODRIVE uses ESSO Polyrex EM (K2P-20 DIN 51825), a polyurea-based mineral high-performance, high temperature grease for the initial lubrication.

For motors in the low temperature range up to -40 °C SEW uses SKF GXN, which is also a polyurea-based mineral grease.

Re-lubrication

You can purchase the lubricants in 400 g cartridges from SEW-EURODRIVE. For order information, refer to the section, "Lubricant tables for rolling bearings of SEW motors" .

	NOTE
	Only mix lubricants of the same thickness type, the same base oil and the same consistency (NLGI class)!

Grease the motor bearings in accordance with the information on the lubricant plate. The used grease collects inside the motor and should be removed every 6-8 re-lubrication cycles during an inspection. Each time you re-lubricate, ensure that the bearing is two-thirds full.

After re-lubricating the motors, you should startup slowly, if possible, so that the grease is distributed evenly.

Re-lubrication period

The re-lubrication intervals for the bearing correspond to the following table for the following conditions:

- -20 °C...+40 °C Ambient temperature
- 4-pole speed
- and normal load

At greater speeds, higher loads or higher ambient temperatures, the re-lubrication intervals are shorter. Use 1.5 times the quantity for the initial filling.

	Horizontal mounting position		Vertical mounting position	
Motor type	**Duration**	**Quantity**	**Duration**	**Quantity**
DR.315 /NS	5000 h	50 g	3000 h	70 g
DR.315 /ERF /NS	3000 h	50 g	2000 h	70 g

7.3 Reinforced bearing

	**STOP**
	In the /ERF (reinforced bearing) option, cylindrical rolling bearing are installed on the A side. These must not be operated without an overhung load, otherwise you risk damaging the bearings.

The reinforced bearing is only offered with the /NS (re-lubrication) option so as to facilitate optimal lubrication of the bearing. Please observe the notes on bearing lubrication in section "Bearing lubrication of the DR.315" (see page 49).

7.4 Motor and brake maintenance – preliminary work

⚠ HAZARD!

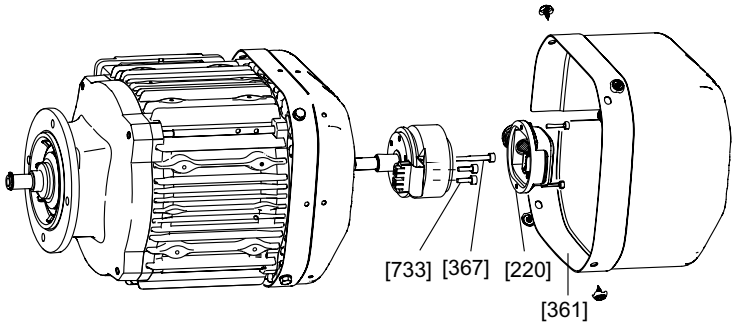
Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Before starting work, isolate the motor and brake from the power supply.
- Safeguard against accidental startup.

7.4.1 Remove the incremental encoder from DR.71-DR.132

The following figure shows how to remove an encoder using the ES7 incremental encoder as an example.



179980299

[220] Connection cover
[361] Protection cover
[367] Retaining screw
[733] Screws

Removing ES7./ AS7.

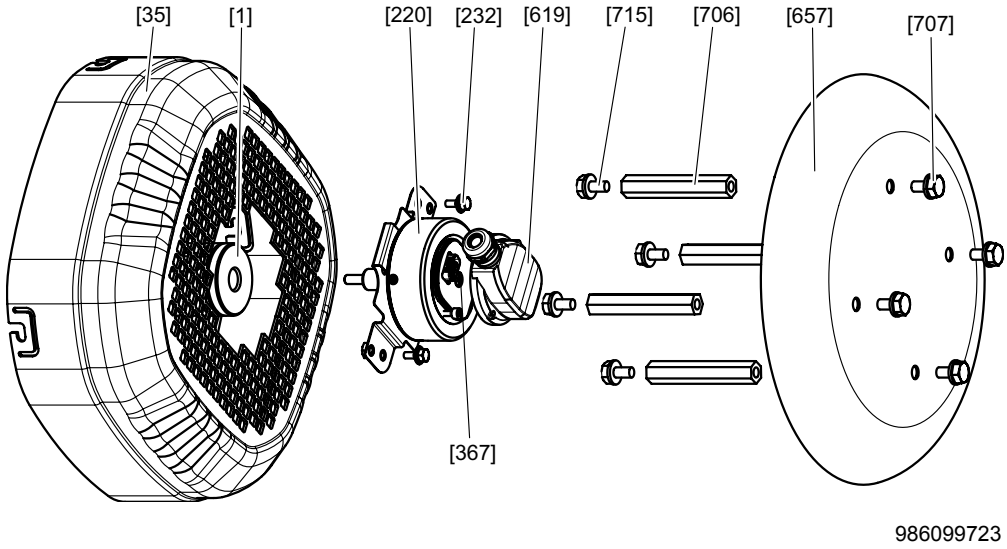
- Remove the protection cover [361].
- Unscrew the connection cover [220] and remove it. Do not disconnect the encoder connection cable!
- Unfasten the expansion anchor by unscrewing the screws [733] from the cover grid.
- Unscrew the central retaining screw [367] by about two to three turns and unfasten the spread shaft cone by tapping lightly on the head of the screw.
- Remove the incremental encoder from the bore of the rotor [1]

Re-assembly

For re-assembly, please note:

- Apply NOCO® Fluid to the encoder spigot.
- Tighten the central retaining screw [367] with a tightening torque of 2.9 Nm.
- Tighten the screw [733] in the expansion anchor with a tightening torque of max. 1.0 Nm.

7.4.2 Removing the incremental encoder from 160-DR.225



[1] Rotor
[35] Fan guard
[220] Connection cover
[232] Screws
[367] Retaining screw
[619] Encoder
[657] Cover
[706] Spacer bolt
[707] Screws
[715] Screws

Removing EG7./ AG7.

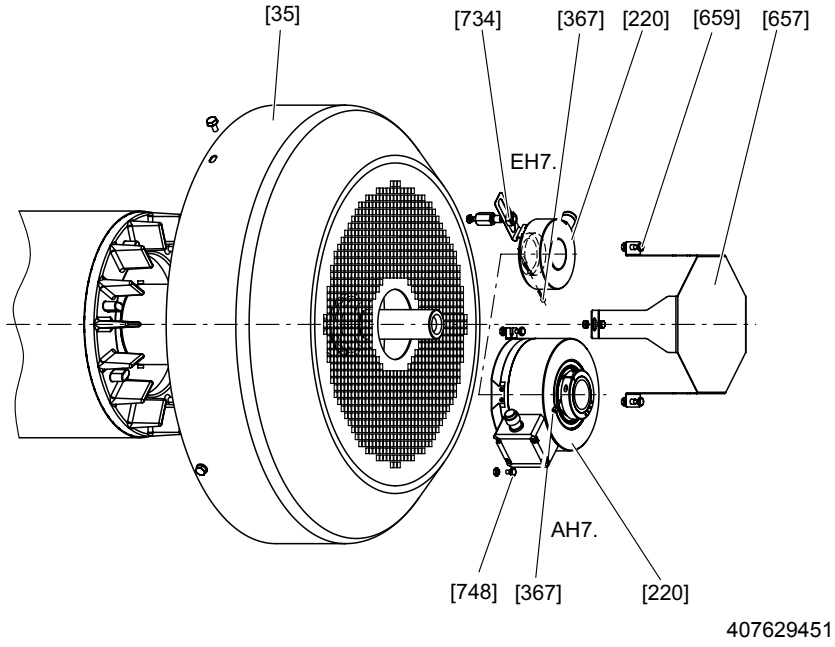
- Loosen the screws [707] and the remove cover [657]. Use SW13 spacer bolts [706] to counterhold.
- Unscrew the connection cover [619] and remove it.
- Remove the screws [232]
- Remove the fan guard [35]
- Force off the encoder by loosening the central retaining screw [367]
- If the encoder is hard to loosen, you can loosen or counterhold the encoder shaft at the installed SW17 spanner flat.

Re-assembly

- Apply NOCO® Fluid to the encoder shaft.
- Place the encoder in the rotor bore and tighten the central retaining screw [367] (max. 6 Nm)
- Install the fan guard
- Attach the torque plate of the encoder to the air outlet using the 2 screws [232]
- Install connection cover [619]
- Install the cover [657] with the screws [707].

7.4.3 Removing the incremental encoder from DR.315

The following figure shows the disassembly of the incremental encoder on the DR.315



[35] Fan guard
[220] Encoder
[367] Retaining screw
[657] Protection cover
[659] Screw
[734] Nut
[748] Screw

Removing EH7

- Remove the protection cover [657] by loosening the screws [659].
- Separate the encoder from the fan guard by loosening the nut [734].
- Loosen the retaining screw [367] on the encoder and remove the encoder [220] from the shaft.

Removing AH7.

- Remove the protection cover [657] by loosening the screws [659].
- Separate the encoder from the fan guard by loosening the screws [748].
- Loosen the retaining screw [367] on the encoder and remove the encoder [220] from the shaft.

Re-assembly

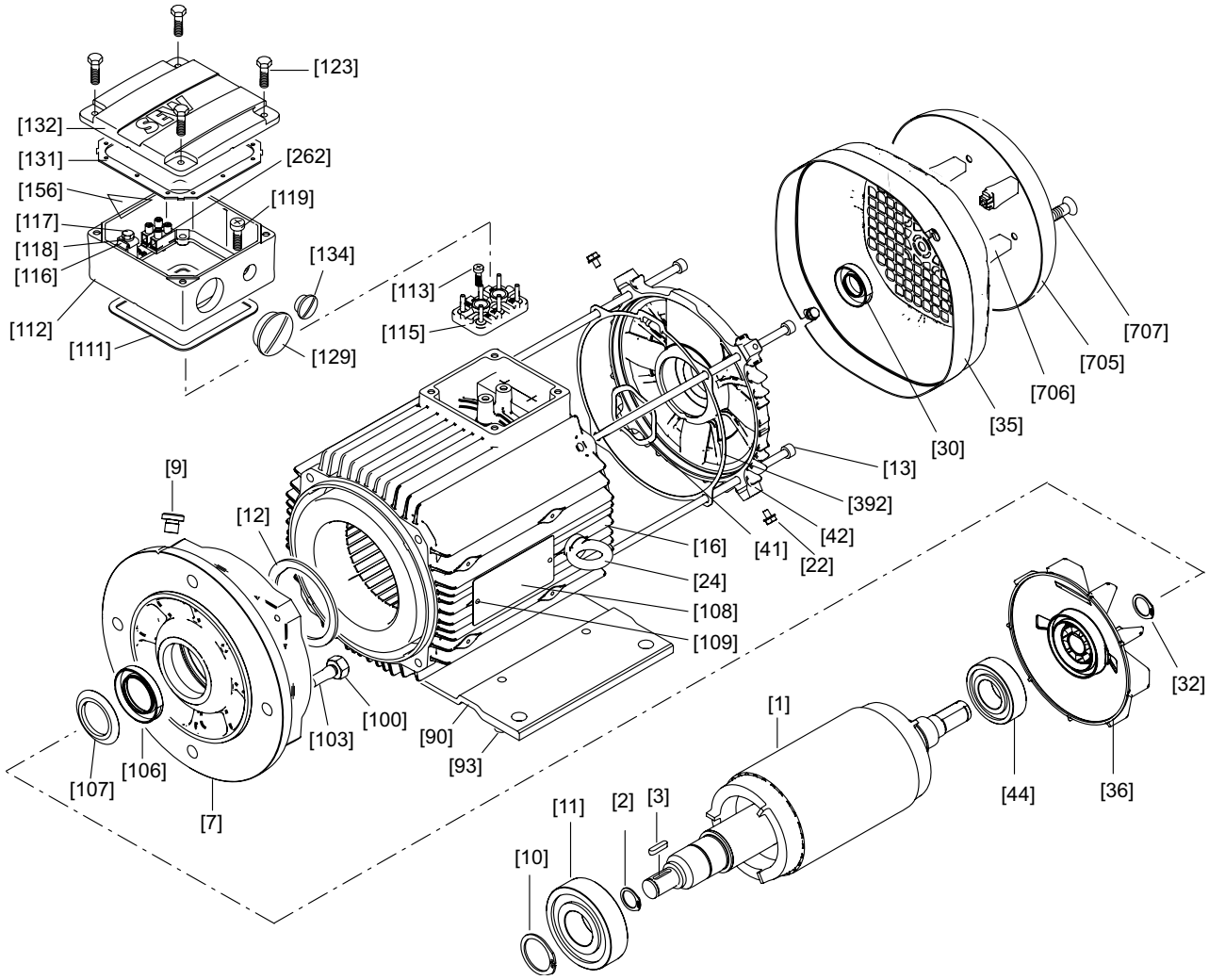
For re-assembly, please note:

- Apply NOCO® Fluid to the encoder spigot.
- Tighten the retaining screw with the following tightening torques:

Encoder	Tightening torque
EH7.	0.7 Nm
AH7.	3.0 Nm

7.5 Inspection/maintenance for DR.71-DR.225 motors

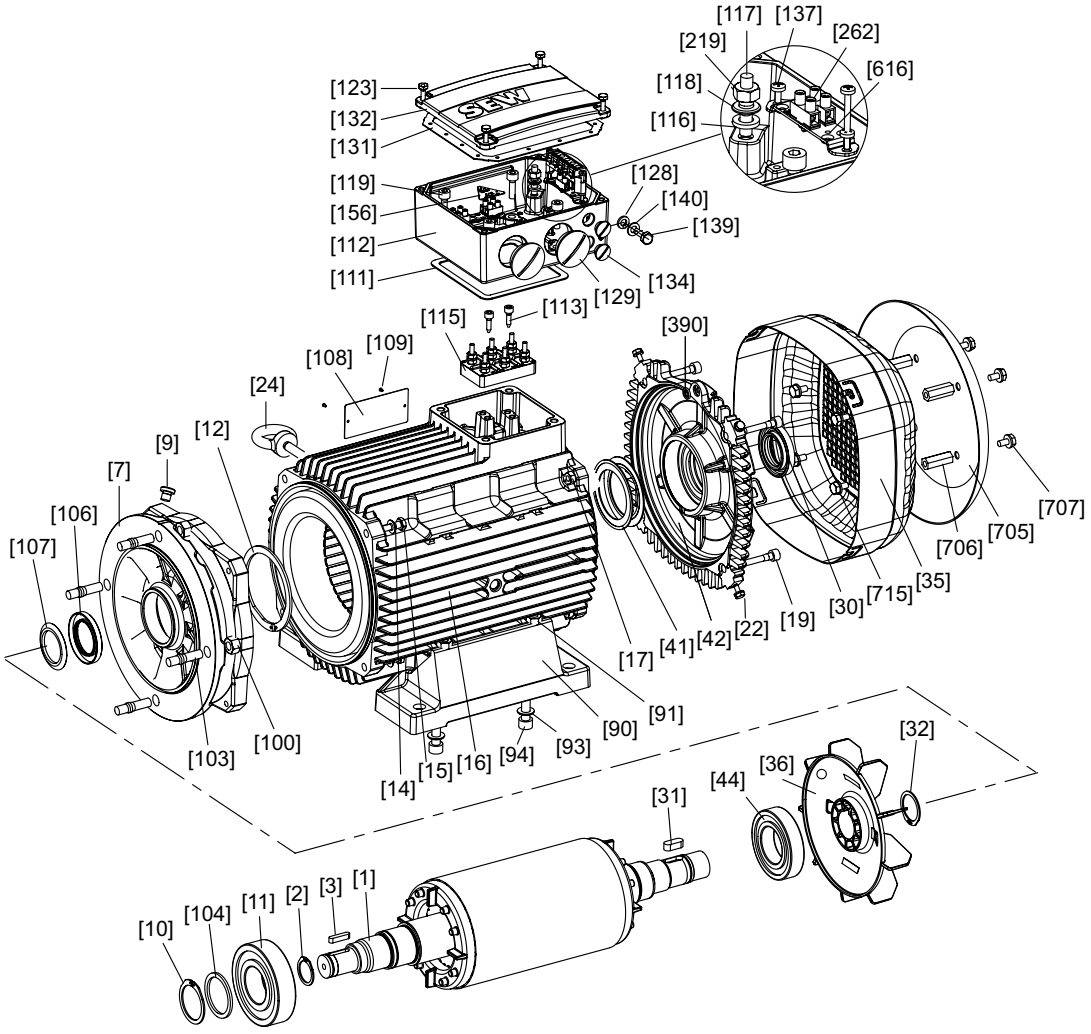
7.5.1 DR.71 - DR.132 – basic structure



173332747

[1] Rotor
[2] Circlip
[3] Key
[7] Flanged end shield
[9] Screw plug
[10] Circlip
[11] Grooved ball bearing
[12] Circlip
[13] Machine screw
[16] Stator
[22] Hex head screw
[24] Lifting eyebolt
[30] Oil seal
[32] Circlip
[35] Fan guard
[36] Fan
[41] Shim washer
[42] B-side endshield
[44] Grooved ball bearing
[90[Base plate
[93] Pan head screw
[100] Hex nut
[103] Stud
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Pan head screw
[115] Terminal board
[116] Terminal clip
[117] Hex head screw
[118] Lock washer
[119] Pan head screw
[123] Hex head screw
[129] Screw plug with O-ring
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug with O-ring
[156] Label
[262] Terminal clip, complete
[392] Sealing
[705] Protective cowl
[706] Spacer
[707] Pan head screw

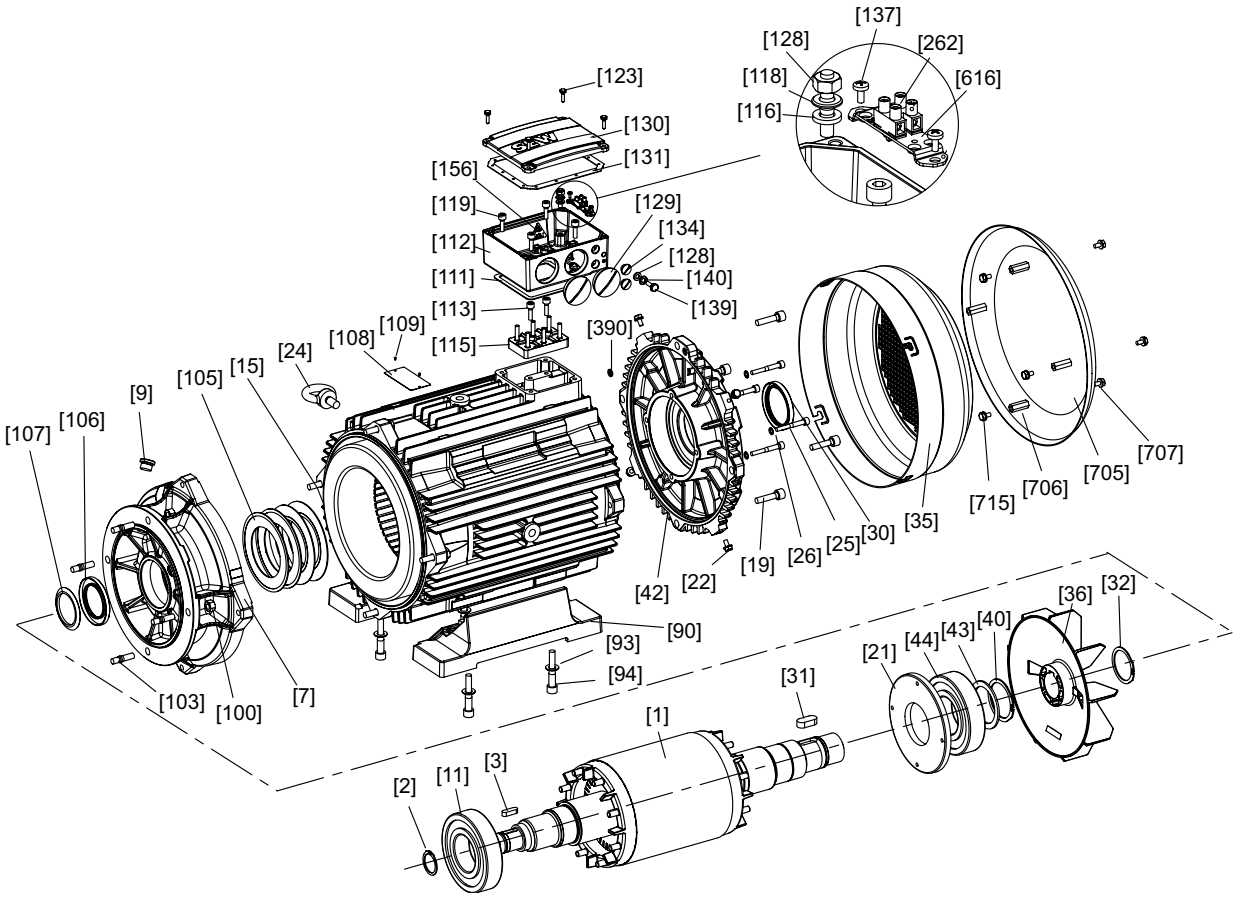
7.5.2 DR.160 - DR.180 – basic structure



527322635

[1] Rotor
[2] Circlip
[3] Key
[7] Flange
[9] Screw plug
[10] Circlip
[11] Grooved ball bearing
[12] Circlip
[14] Washer
[15] Hex head screw
[16] Stator
[17] Hex nut
[19] Machine screw
[22] Hex head screw
[24] Lifting eyebolt
[30] Sealing ring
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[41] Cup spring
[42] B-side endshield
[44] Grooved ball bearing
[90] Foot
[91] Hex nut
[93] Washer
[94] Machine screw
[100] Hex nut
[103] Stud
[104] Supporting ring
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Screw
[115] Terminal board
[116] Serrated lock washer
[117] Stud
[118] Washer
[119] Machine screw
[121] Grooved pin
[123] Hex head screw
[128] Serrated lock washer
[129] Screw plug withO-ring
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug with O-ring
[137] Screw
[139] Hex head screw
[140] Washer
[153] Terminal strip
[156] Label
[219] Hex nut
[262] Terminal clip
[390] O-ring
[616] Retaining plate
[705] Protective cowl
[706] Spacer
[707] Hex head screw
[715] Hex head screw

7.5.3 DR.200 - DR.225 – basic structure



1077856395

[1] Rotor
[2] Circlip
[3] Key
[7] Flange
[9] Screw plug
[11] Grooved ball bearing
[15] Hex head screw
[16] Stator
[19] Machine screw
[21] Oil seal flange
[22] Hex head screw
[24] Lifting eyebolt
[25] Machine screw
[26] Sealing washer
[30] Oil seal
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[40] Circlip
[42] B-side endshield
[43] Supporting ring
[44] Grooved ball bearing
[90] Foot
[93] Washer
[94] Machine screw
[100] Hex nut
[103] Stud
[105] Cup spring
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Machine screw
[115] Terminal board
[116] Serrated lock washer
[117] Stud
[118] Washer
[119] Machine screw
[123] Hex head screw
[128] Serrated lock washer
[129] Screw plug
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug
[137] Screw
[139] Hex head screw
[140] Washer
[156] Label
[219] Hex nut
[262] Terminal clip
[390] O-ring
[616] Retaining plate
[705] Protective cowl
[706] Spacer bolt
[707] Hex head screw
[715] Hex head screw

7.5.4 DR.71-DR.225 – inspection steps

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the motor from the power supply and safeguard it against accidental startup before starting work!
- Carefully observe the following steps!

1. Remove forced cooling fan and incremental encoder (if installed).

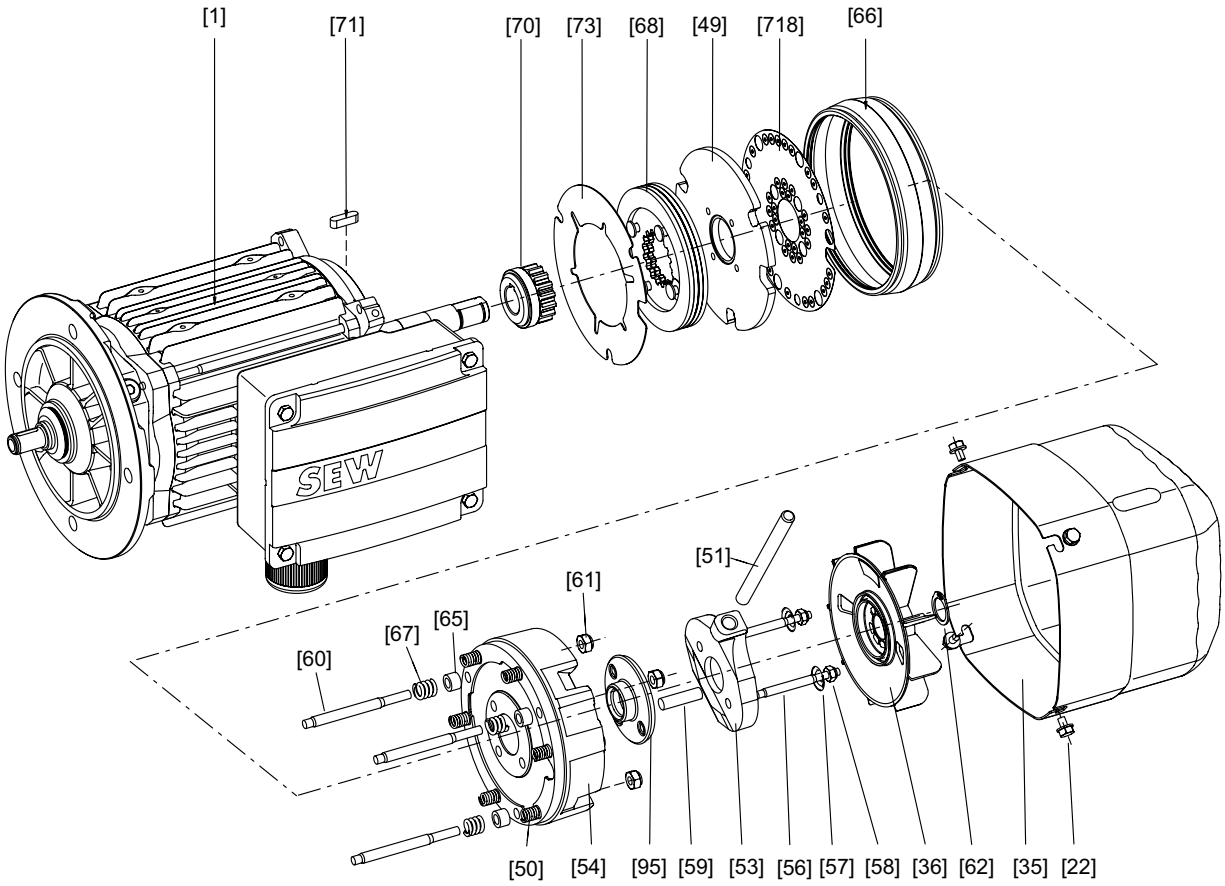
   See section "Motor and brake maintenance – preliminary work" (see page 51).

2. Remove fan guard [35] and fan [36].
3. Remove stator:
   - **Size DR.71-DR.132:** Remove machine screws [13] from flanged endshield [7] and B-side endshield [42]. Remove stator [16] from flanged endshield [7].
   - **Size DR.160-DR.180:** Loosen hex head screw [19] and remove B-side endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
   - **Size DR.200-DR.225:**
     - Loosen hex head screw [15] and remove the flanged endshield [7] from the stator.
     - With gearmotors: Remove oil flinger [107]
     - Loosen hex head screw [19] and remove the complete rotor [1] together with the B-side endshield [42].
     - Loosen hex head screw [25] and remove the complete rotor [1] from the B-side endshield [42].
4. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, proceed to step 7
   - If there is condensation, proceed to step 5
   - If there is gear oil, have the motor repaired by a specialist workshop
5. If there is moisture inside the stator:
   - With gearmotors: Remove the motor from the gear unit
   - With motors without a gear unit: Remove the A-flange
   - Remove the rotor [1]
6. Clean the winding, dry it and check it electrically (see section "Preliminary work" see page 15).

7. Replace the grooved ball bearings [11] [44] with permitted ball bearings.
   See section"Permitted rolling bearing types" (see page 106).
8. Reseal the shaft:
   – A-side: Replace oil seal [106]
   – B-side: Replace oil seal [30]
     Coat the sealing lip with grease (Klüber Petamo GHY 133).
9. Reseal the stator seat:
   – Seal the sealing surface with duroplastic sealing compound
     (operating temperature -40 °C...+180 °C) e.g. "Hylomar L Spezial".
   – For size DR.71-DR.132: Replace sealing [392].
10. Install the motor and accessory equipment.

7.6 Inspection/maintenance for DR71-DR.225 brakemotors

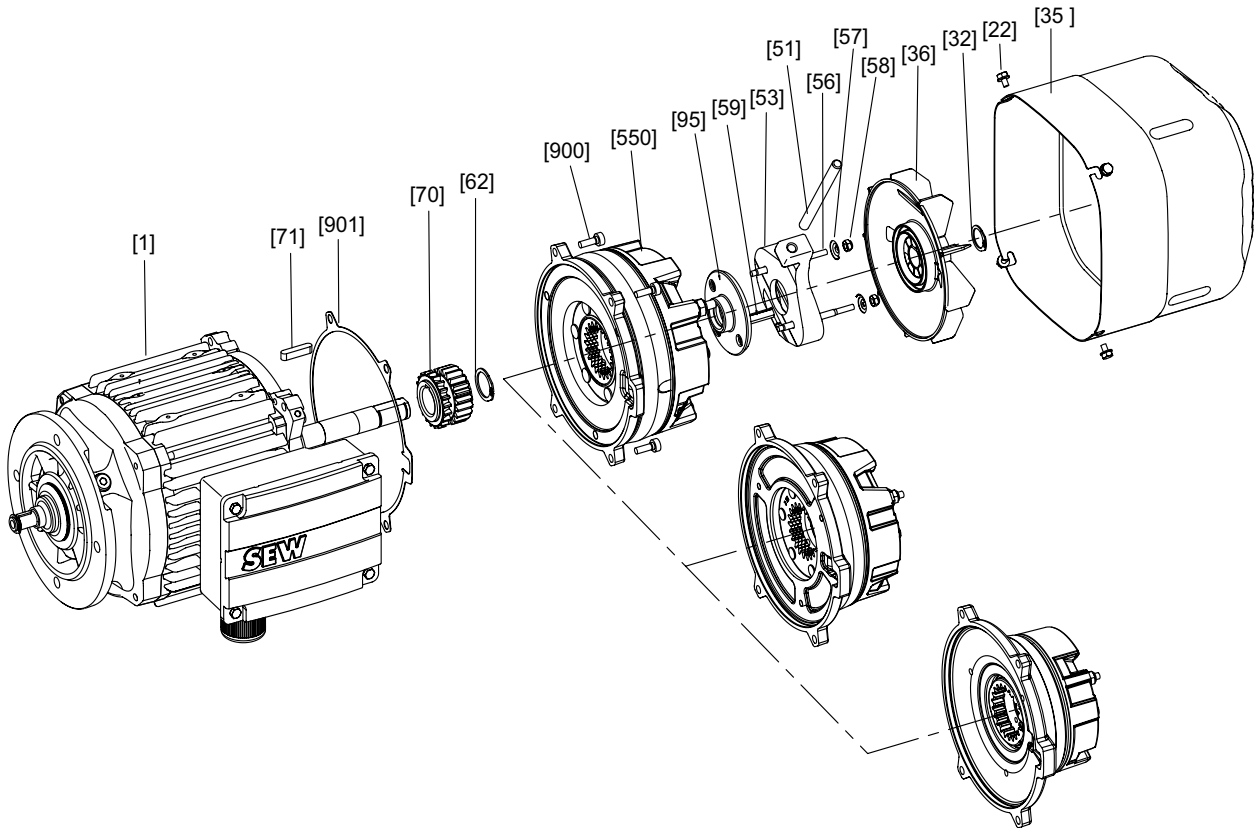
7.6.1 DR.71-DR.80 brakemotor – basic structure



174200971

[1] Motor with brake endshield
[22] Hex head screw
[35] Fan guard
[36] Fan
[49] Pressure plate
[50] Brake spring
[11] Magnet, complete
[51] Hand lever
[53] Releasing lever
[54] Magnet, complete
[56] Stud
[57] Conical coil spring
[58] Setting nut
[59] Parallel pin
[60] Stud 3x
[61] Hex nut
[65] Pressure ring
[66] Rubber sealing collar
[67] Counter spring
[68] Brake disk
[62] Circlip
[70] Carrier
[71] Key
[73] Terminal disk
[95] Sealing ring
[718] Damping plate

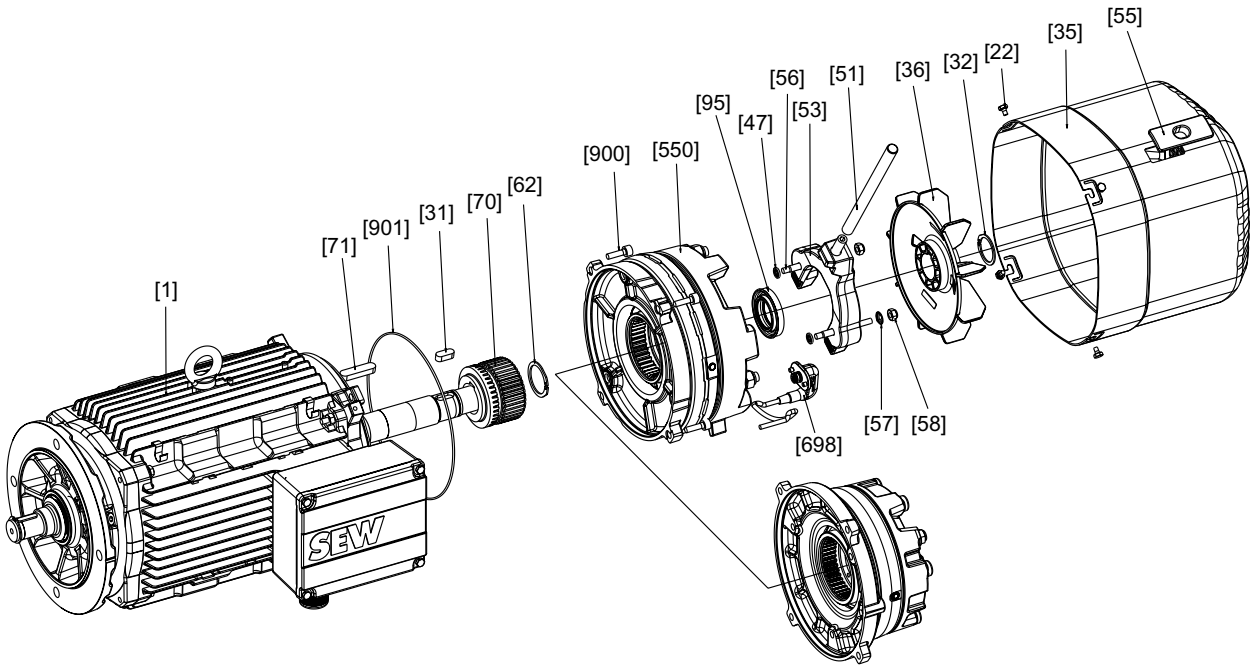
7.6.2 DR.90-DR.132 brakemotor – basic structure



179981963

[1] Motor with brake endshield
[22] Hex head screw
[32] Circlip
[35] Fan guard
[36] Fan
[51] Hand lever
[53] Releasing lever
[56] Stud
[57] Conical coil spring
[58] Setting nut
[59] Parallel pin
[62] Circlip
[70] Carrier
[71] Key
[95] Sealing ring
[550] Pre-assembled brake
[900] Screw
[901] Sealing

7.6.3 DR.160-DR.225 brakemotor – basic structure



527223691

[1] Motor with brake endshield
[22] Hex head screw
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[47] O-ring
[51] Hand lever
[53] Releasing lever
[55] Closing piece
[56] Stud
[57] Conical coil spring
[58] Setting nut
[62] Circlip
[70] Carrier
[71] Key
[95] Sealing ring
[550] Pre-assembled brake
[698] Plug connector cpl. (only BE20-BE32)
[900] Screw
[901] O-ring

7.6.4 DR.71-DR.225 brakemotor – inspection steps

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove forced cooling fan and incremental encoder (if installed).

   See section "Motor and brake maintenance – preliminary work" (see page 51).

2. Remove fan guard [35] and fan [36].
3. Remove stator:
   - **Size DR.71-DR.132:**Remove machine screws [13] from flanged endshield [7] and brake endshield [42]. Remove stator [16] from flanged endshield [7].
   - **Size DR.160-DR.180:**Loosen hex head screw [19] and remove brake endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
   - **Size DR.200-DR.225:**
     - Loosen hex head screw [15] and remove the flanged endshield [7] from the stator.
     - With gearmotors: Remove oil flinger [107]
     - Loosen hex head screw [19] and remove the complete rotor [1] together with the brake endshield [42].
     - Loosen hex head screw [25] and remove the complete rotor [1] from the brake endshield [42].
4. Remove the brake cable:
   - **BE05-BE11:** Remove the terminal box cover and unfasten the brake cable from the rectifier.
   - **BE20-BE32:** Loosen safety screws of the brake plug connector [698] and remove plug connector.
5. Push the brake off the stator and carefully lift it off.
6. Pull the stator back by about. 3 to 4 cm.
7. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, proceed to step 10
   - If there is condensation, proceed to step 8
   - If there is gear oil, have the motor repaired by a specialist workshop
8. If there is moisture inside the stator:
   - With gearmotors: Remove the motor from the gear unit
   - With motors without a gear unit: Remove the A-flange
   - Remove the rotor [1]
9. Clean the winding, dry it and check it electrically (see section "Preliminary work" see page 15).

10. Replace the grooved ball bearings [11] [44] with permitted ball bearings.

    See section "Permitted rolling bearing types" (see page 106).

11. Reseal the shaft:

    – A-side: Replace oil seal [106]

    – B-side: Replace oil seal [30]

      Coat the sealing lip with grease (Klüber Petamo GHY 133).

12. Reseal the stator seat:

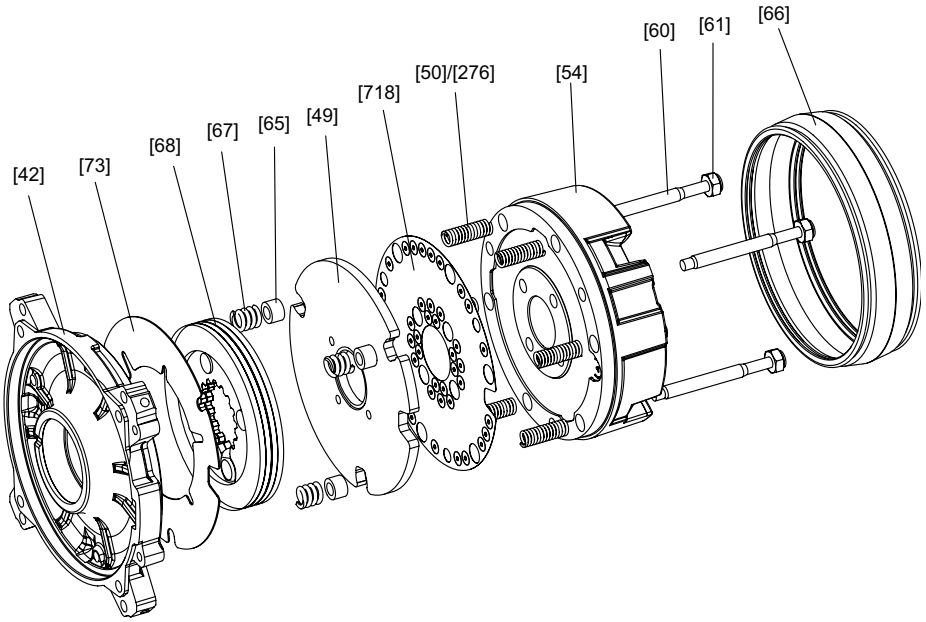
    – Seal the sealing surface with duroplastic sealing compound (operating temperature: -40 °C...+180 °C) e.g. "Hylomar L Spezial".

    – For size DR.71-DR.132: Replace sealing [392].

13. **Size DR-160-DR.225:** Replace the O-ring [901] between the brake endshield [42] and the pre-assembled brake [550]. Install the pre-assembled brake [550]

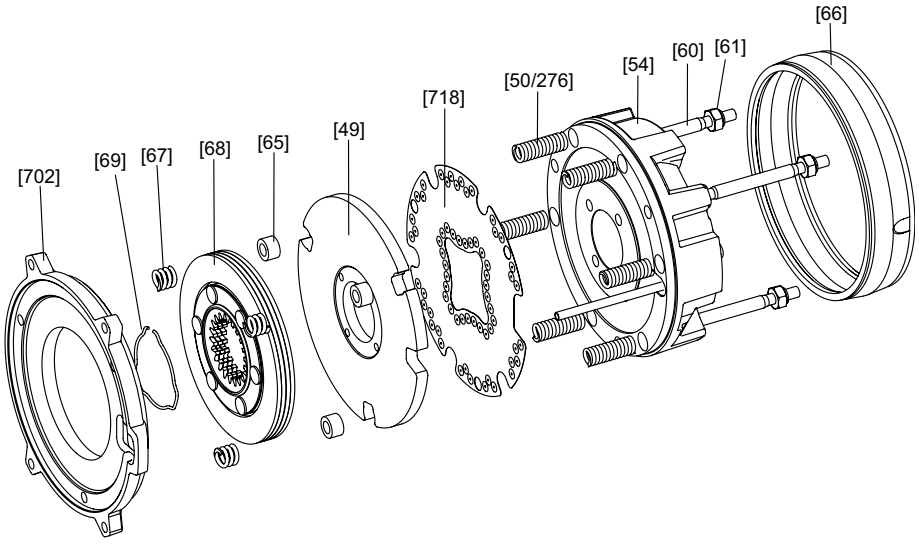
14. Install the motor, the brake and accessory equipment.

7.6.5 BE05-BE2 brakes (DR.71-DR.80) – basic structure



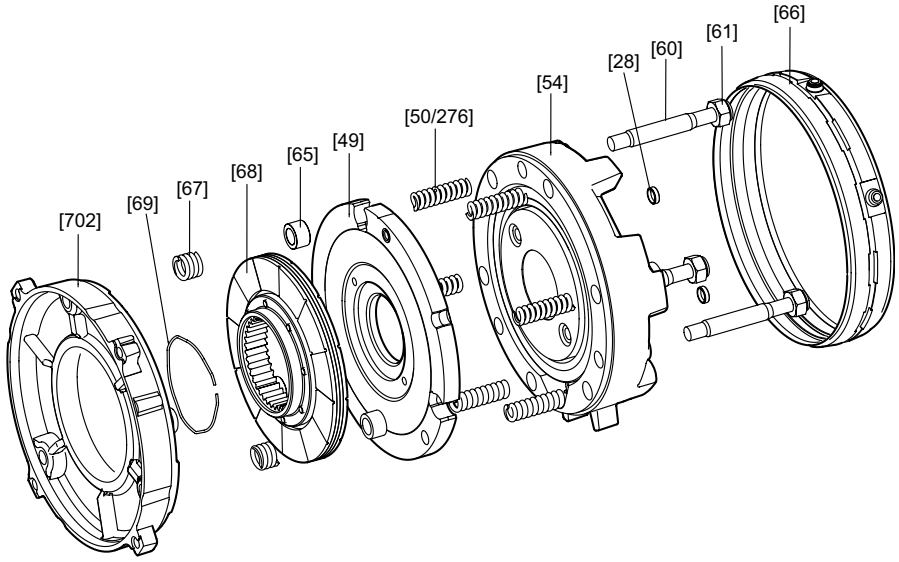
[42] Brake bearing end shield
[49] Pressure plate
[50] Brake spring (normal)
[54] Magnet, complete
[60] Stud 3x
[61] Hex nut
[65] Pressure ring
[66] Rubber sealing collar
[67] Counter spring
[68] Brake disk
[73] Terminal disk
[276] Brake spring (blue)
[718] Dampening plate

7.6.6 BE1-BE11 brake (DR.90-DR.160) – basic structure



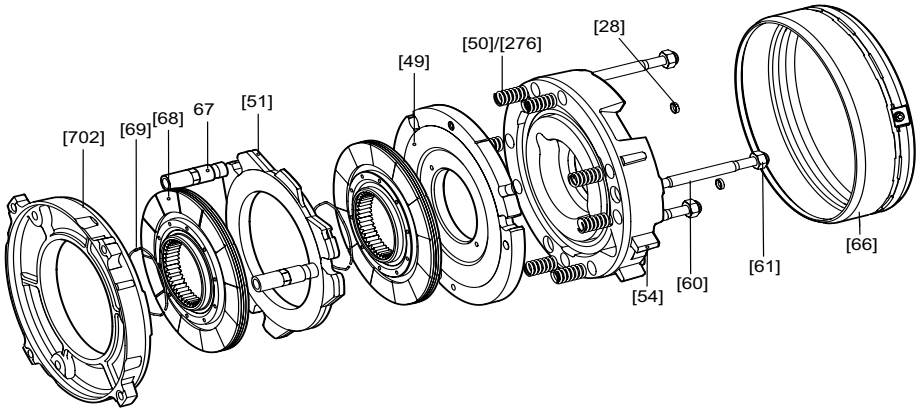
[49] Pressure plate
[50] Brake spring (normal)
[54] Magnet, complete
[60] Stud 3x
[61] Hex nut
[65] Pressure ring
[66] Rubber sealing collar
[67] Counter spring
[68] Brake disk
[69] Circular spring
[276] Brake spring (blue)
[702] Friction disk
[718] Dampening plate

7.6.7 BE20 brake (DR.160-DR.180) – basic structure



[28] Closing cap
[49] Pressure plate, complete
[50] Brake spring (normal)
[54] Magnet, complete
[60] Stud 3x
[61] Hex nut
[65] Pressure ring
[66] Rubber sealing collar
[67] Counter spring
[68] Brake disk
[69] Circular spring
[276] Brake spring (blue)
[702] Friction disk

7.6.8 BE30-BE32 brake (DR.180-DR.225) – basic structure



[28] Closing cap
[49] Pressure plate, complete
[50] Brake spring (normal)
[51] Brake lining
[54] Magnet, complete
[60] Stud 3x
[61] Hex nut
[66] Rubber sealing collar
[67] Setting sleeve
[68] Brake disk
[69] Circular spring
[276] Brake spring (blue)
[702] Friction disk

7.6.9 Setting the working air gap of BE05-BE32 brakes

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

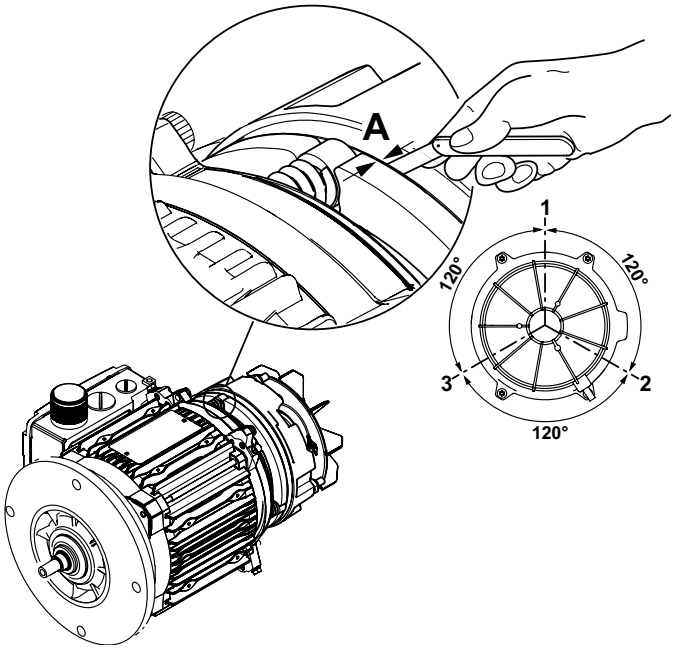
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove the following:
   - forced cooling fan and incremental encoder (if installed)

     See section "Motor and brake maintenance – preliminary work" (see page 51).
   - Flange cover or fan guard [35]
2. Push the rubber sealing collar [66] aside,
   - release the clamping strap, if necessary
   - Suck off any abrasion
3. Measure the brake disk [68]:
   - Minimum brake disk thickness see section "Technical Data" (see page 95).
   - Replace brake disk if necessary, see section "Replacing the brake disk of BE05-BE32 brakes" (see page 68).
4. **BE30-BE32:** Unfasten the setting sleeves [67] by turning it towards the brake endshield.
5. Measure the working air gap A (see following figure)

   (use a feeler gauge and measure at three points offset by 120°):
   - between the pressure plate [49] and damping plate [718]



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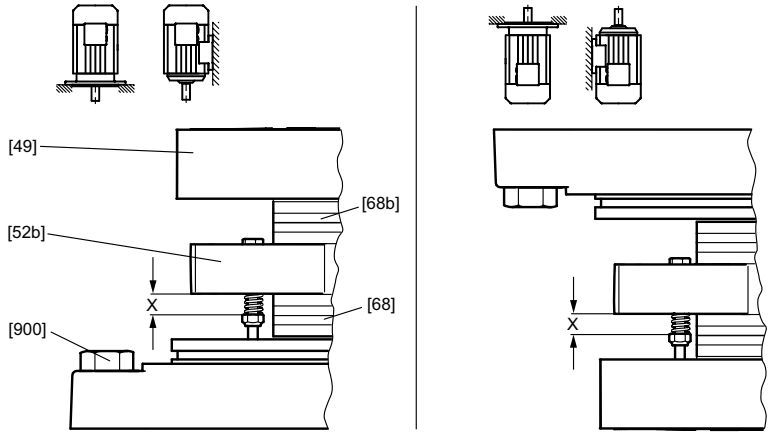
6. **BE05-BE20:** Tighten the hex nuts [61] until the working air gap is set correctly, see section "Technical Data" (see page 95)

   BE30-BE32: Tighten the hex nuts [61] until the working air gap is 25 mm.

7. If you are mounting the BE32 in a vertical position, set the 3 springs on the brake stationary disk to the following measurement:

Mounting position	X in [mm]
Brake at the top	7.3
Brake at the bottom	6.5



[49] Pressure plate
[52b] Brake lining (BE32 only)
[68] Brake disk
[68b] Brake disk (BE32 only)
[900] Hex nut

8. **BE30-BE32:** Tighten the setting sleeves [67]
   - towards the magnet
   - until the working air gap is set correctly, see section "Technical Data" (see page 95).
9. Put the rubber sealing collar back in place and re-install the dismantled parts.

7.6.10 Replacing the brake disk of BE05-BE32 brakes

When replacing the brake disk, check the other removed parts as well, and replace them if need be.

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

NOTES

- The brake of DR.71-DR.80 motor sizes cannot be removed from the motor because the BE brake is directly installed on the brake endshield of the motor.
- The brake of DR.90-DR.225 motor sizes cannot be removed from the motor for replacing the brake disk because the BE brake is pre-installed on the brake endshield of the motor with a friction disk .

1. Remove the following:
   - forced cooling fan and incremental encoder (if installed)

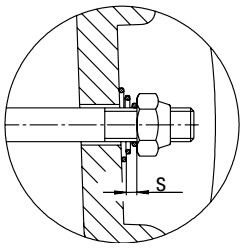
     See section "Motor and brake maintenance – preliminary work" (see page 51).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Remove the brake cable
   - **BE05-BE11:** Remove the terminal box cover and unfasten the brake cable from the rectifier.
   - **BE20-BE32:** Loosen safety screws of the brake plug connector [698] and remove plug connector.
3. Remove the rubber sealing collar [66]
4. Loosen hex nuts [61], carefully pull off the magnet [54] (brake cable!) and take out the brake springs [50].
5. **BE05-BE11:** Remove the damping plate [718], pressure plate [49] and brake disc [68]

   BE20-BE30: Remove pressure plate [49] and brake disk [68]

   BE32: Remove pressure plate [49], brake disk [68] and [68b]
6. Clean the brake components
7. Install a new brake disk(s).
8. Re-install the brake components,
   - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE32 brakes" (see page 66).

9. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance "s" [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20; BE30; BE32	2

10. Put the rubber sealing collar back in place and re-install the dismantled parts.

NOTES

- The lockable manual brake release (type HF) is already released if a resistance is encountered when operating the setscrew.
- The self-re-engaging manual brake release (type HR) can be operated with normal hand pressure.
- In brake motors with self-re-engaging manual brake release, the manual brake release lever must be removed after startup/maintenance! A bracket is provided for storing the lever on the outside of the motor.

NOTES

Important: After replacing the brake disk, the maximum braking torque is reached only after several cycles.

7.6.11 Changing the braking torque of BE05-BE32 brakes

The braking torque can be altered in stages,

- by changing the type and number of brake springs
- by changing the complete magnet (only possible for BE05 and BE1)
- by changing the brake (from motor size DR.90).
- by changing to a two-disk brake (BE30 only)

For the possible braking torque steps, please refer to section "Technical Data" (see page 95).

7.6.12 Changing the brake spring of BE05-BE32 brakes

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

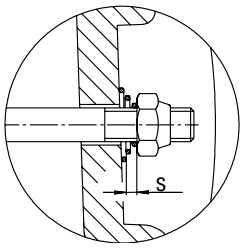
- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove the following:
   - forced cooling fan and incremental encoder (if installed)

     See section "Motor and brake maintenance – preliminary work" (see page 51).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Remove the brake cable
   - **BE05-BE11:** Remove the terminal box cover and unfasten the brake cable from the rectifier.
   - **BE20-BE32:** Loosen safety screws of the brake plug connector [698] and remove plug connector.
3. Remove the rubber sealing collar [66] and the manual brake release:
   - setting nuts [58], conical coil springs [57], studs [56], releasing lever [53], spiral dowel pin [59]
4. Unfasten hex nuts [61] and pull off the magnet [54]
   - By about. 50 mm (caution: brake cable!!)
5. Change or add brake springs [50/276]
   - Arrange brake springs symmetrically
6. Re-install the brake components
   - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE32 brakes" (see page 66).

7. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance "s" [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20, BE30, BE32	2

8. Put the rubber sealing collar back in place and re-install the dismantled parts.

	NOTE
	Replace setting nuts [58] and hex nuts [61] if the removal procedure is repeated.

7.6.13 Changing the magnet of BE05-BE32 brakes

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

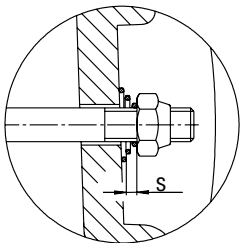
- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove the following:
   - forced cooling fan and incremental encoder (if installed)

     See section "Motor and brake maintenance – preliminary work" (see page 51).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Remove the rubber sealing collar [66] and the manual brake release:
   - setting nuts [58], conical coil springs [57], studs [56], releasing lever [53], spiral dowel pin [59]
3. Remove the brake cable
   - **BE05-BE11:** Remove the terminal box cover and unfasten the brake cable from the rectifier.
   - **BE20-BE32:** Loosen safety screws of the brake plug connector [698] and remove plug connector.
4. Unfasten hex nuts [61], remove complete magnet [54], remove brake springs [50/276].
5. Install new magnet with brake springs. For the possible braking torque steps, please refer to section "Technical Data" (see page 95).
6. Re-install the brake components
   - Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE05-BE20 brakes" (see page 66).

7. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance "s" [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20, BE30, BE32	2

8. Put the rubber sealing collar back in place and re-install the dismantled parts.
9. Replace brake controller in the event of an interturn short circuit or a short circuit to frame.

	NOTE
	Replace setting nuts [58] and hex nuts [61] if the removal procedure is repeated.

7.6.14 Replacing the brake of DR.71-DR.80

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

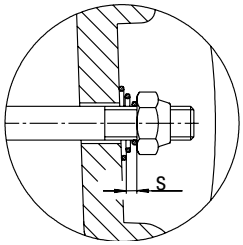
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove the following:
   - forced cooling fan and incremental encoder (if installed)

     See section "Motor and brake maintenance – preliminary work" (see page 51).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Remove the terminal box cover and loosen the brake cable from the rectifier. If necessary, attach trailing wire to brake cables.
3. Loosen machine screws [13] and remove brake endshield with brake from stator.
4. Guide the brake cable into the terminal box.
5. Align the cam of the brake endshield.
6. Mount oil seal [95].
7. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance "s" [mm]
BE05; BE1; BE2	1.5

7.6.15 Replacing the brake of DR.90-DR.225

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

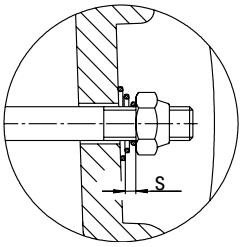
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove the following:
   - forced cooling fan and incremental encoder (if installed)

     See section "Motor and brake maintenance – preliminary work" (see page 51).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Remove the brake cable
   - **BE05-BE11:** Remove the terminal box cover and unfasten the brake cable from the rectifier.
   - **BE20-BE32:** Loosen safety screws of the brake plug connector [698] and remove plug connector.
3. Unfasten screws [900] and remove brake from brake endshield.
4. **DR.90- DR.132:** Observe the alignment of the sealing [901].
5. Connect brake cable.
6. Align the cam of the friction disk.
7. Mount oil seal [95].
8. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance "s" [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20, BE30, BE32	2

7.6.16 Retrofitting HR/HF manual brake release

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

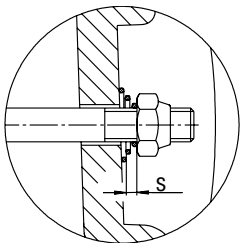
Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove the following:
   - forced cooling fan and incremental encoder (if installed)

     See section "Motor and brake maintenance – preliminary work" (see page 51).
   - Flange cover or fan guard [35], circlip [32/62] and fan [36]
2. Installing manual brake release:
   - **for BE05-BE11:**
     - Remove the sealing ring [95]
     - Screw in studs [56], insert sealing ring for manual brake release [95] and hammer in parallel pin [59].
     - Mount release lever [53], conical coil springs [57] and setting nuts [58].
   - **for BE20-BE32:**
     - Screw in studs [56].
     - Mount release lever [53], conical coil springs [57] and setting nuts [58].
3. Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see the following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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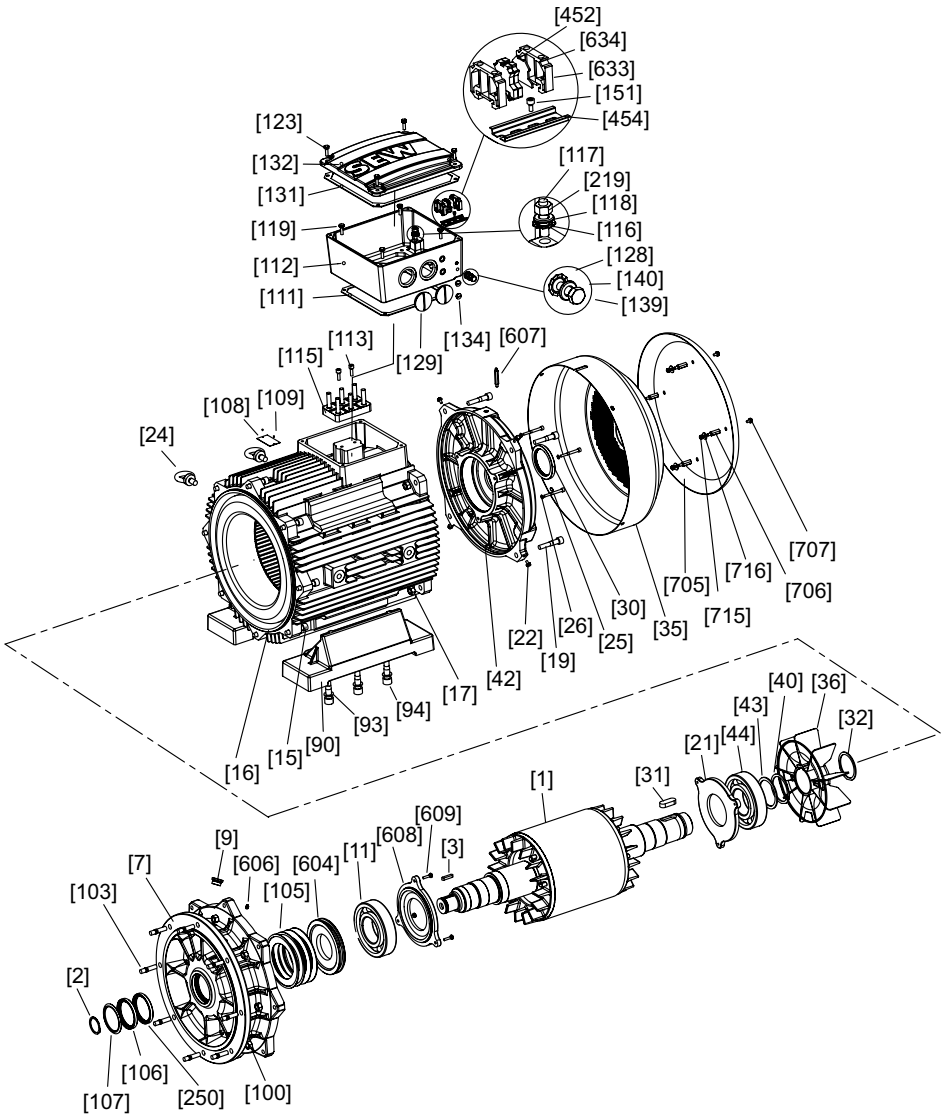
Brake	Floating clearance "s" [mm]
BE05; BE1; BE2	1.5
BE5; BE11, BE20, BE30, BE32	2

4. Reinstall the removed parts.

7.7 Inspection/maintenance for DR.315 motors

7.7.1 DR.315 – basic structure



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[1] Rotor
[2] Circlip
[3] Key
[7] Flange
[9] Screw plug
[11] Rolling bearing
[15] Machine screw
[16] Stator
[17] Hex nut
[19] Machine screw
[21] Oil seal flange
[22] Hex head screw
[24] Lifting eyebolt
[25] Machine screw
[26] Sealing washer
[30] Oil seal
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[40] Circlip
[42] B-side endshield
[43] Supporting ring
[44] Rolling bearing
[90] Foot
[93] Washer
[94] Machine screw
[100] Hex nut
[103] Stud
[105] Cup spring
[106] Oil seal
[107] Oil flinger
[108] Nameplate
[109] Grooved pin
[111] Gasket for lower part
[112] Terminal box lower part
[113] Machine screw
[115] Terminal board
[116] Serrated lock washer
[117] Stud
[118] Washer
[119] Hex head screw
[123] Hex head screw
[128] Serrated lock washer
[129] Screw plug
[131] Gasket for cover
[132] Terminal box cover
[134] Screw plug
[139] Hex head screw
[140] Washer
[151] Machine screw
[219] Hex nut
[250] Oil seal
[452] Terminal strip
[454] Top hat rail
[604] Lubrication ring
[606] Greasing nipple
[607] Greasing nipple
[608] Oil seal flange
[609] Hex head screw
[633] End bracket
[634] End plate
[705] Protective cowl
[706] Spacer bolt
[707] Hex head screw
[715] Hex nut
[716] Washer

7.7.2 DR.315 – inspection steps

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the motor from the power supply and safeguard it against accidental startup before starting work!
- Carefully observe the following steps!

1. Remove forced cooling fan and incremental encoder (if installed).

   See section "Motor and brake maintenance – preliminary work" (see page 51).

   With gearmotors: Remove the motor from the gear unit.
2. Remove fan guard [35] and fan [36].
3. Unfasten machine screws [25] and [19], and remove B-side endshield [42].
4. Unfasten machine screws [15] from the flange [7] and remove the complete rotor [1] together with the flange. With gearmotors, pull off the oil flinger [107].
5. Loosen screws [609] and separate the rotor from the flange [7]. Before disassembly, protect the oil seal seat from damage using adhesive tape or a protective sleeve.
6. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, proceed to step 8
   - If there is condensation, proceed to step 7
   - If there is gear oil, have the motor repaired by a specialist workshop
7. If there is moisture inside the stator:

   Clean the winding, dry it and check it electrically (see section "Preliminary work" see page 15).
8. Replace the rolling bearing [11] [44] with permitted rolling bearing types.

   See section "Permitted rolling bearing types" (see page 106).

   Fill the bearing with grease until it is two-thirds full.

   See section "DR.315 – bearing lubrication". (see page 49)

   Important: place the oil seal flange [608] and [21] onto the rotor shaft before installing the bearings.
9. Starting on the A-side, mount the motor vertically.
10. Place the cup springs [105] and lubrication ring [604] into the bearing bore of the flange [7].

    Hang the rotor [1] onto the B-side thread, and guide into the flange [7].

    Fasten the oil seal flange [608] to the flange [7] using the hex head bolts [609].

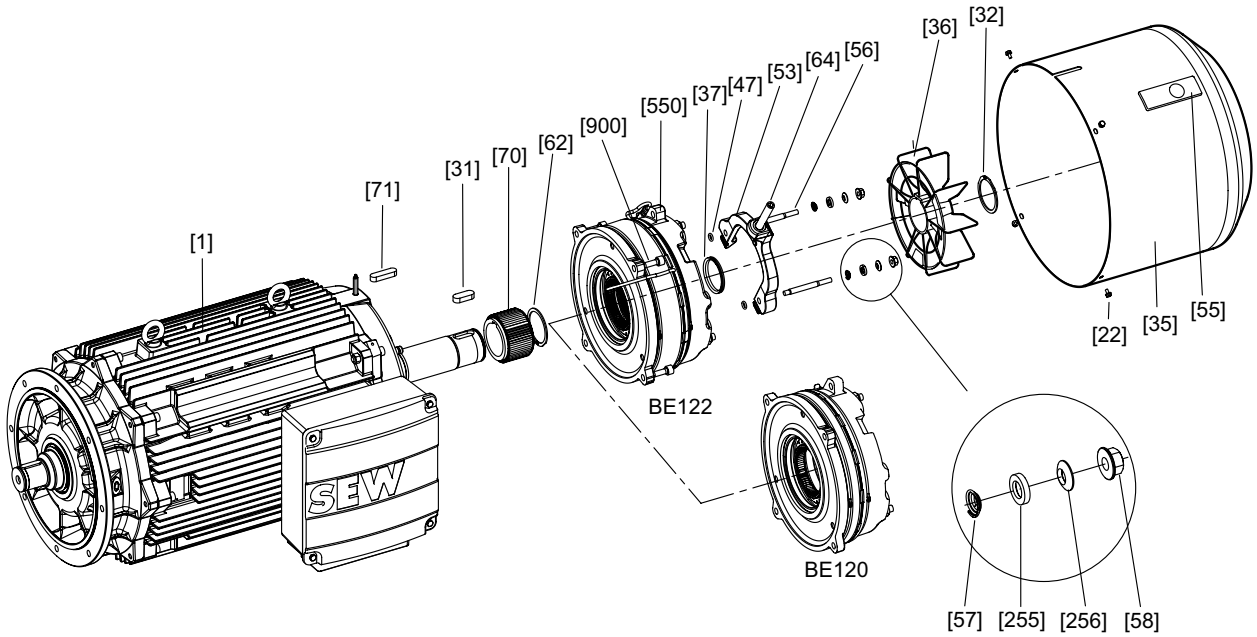
11. Mount the stator [16].
    - Reseal the stator seat: Seal the sealing surface with duroplastic sealing compound (operating temperature: -40 °C...+180 °C) e.g. "Hylomar L Spezial".

      Important: Protect the winding overhead from damage.
    - Screw in the stator [16] and flange [7] with screws [15].
12. Before mounting the B-side endshield [42], screw in the M8 setscrew approximately 200 mm into the oil seal flange [21].
13. Before mounting the B-side endshield [42], feed the setscrew in through a bore for the screw [25]. Screw in the B-side endshield [42] and stator [16] using machine screws [19] and hex nuts [17]. Lift the oil seal flange [21] with the setscrew, and fasten using 2 screws [25]. Remove the setscrew and screw in the remaining screws [25].
14. Renew oil seals
    - A-side: insert the oil seal [106] and – for gearmotors – the oil seal [250], and replace the oil flinger [107].

      With gearmotors, fill about two-thirds of the space between the two oil seals with grease (Klüber Petamo GHY133).
    - B-side: insert the oil seal [30], and coat the sealing lip with the same grease.
15. Install the fan [36] and fan guard [35].

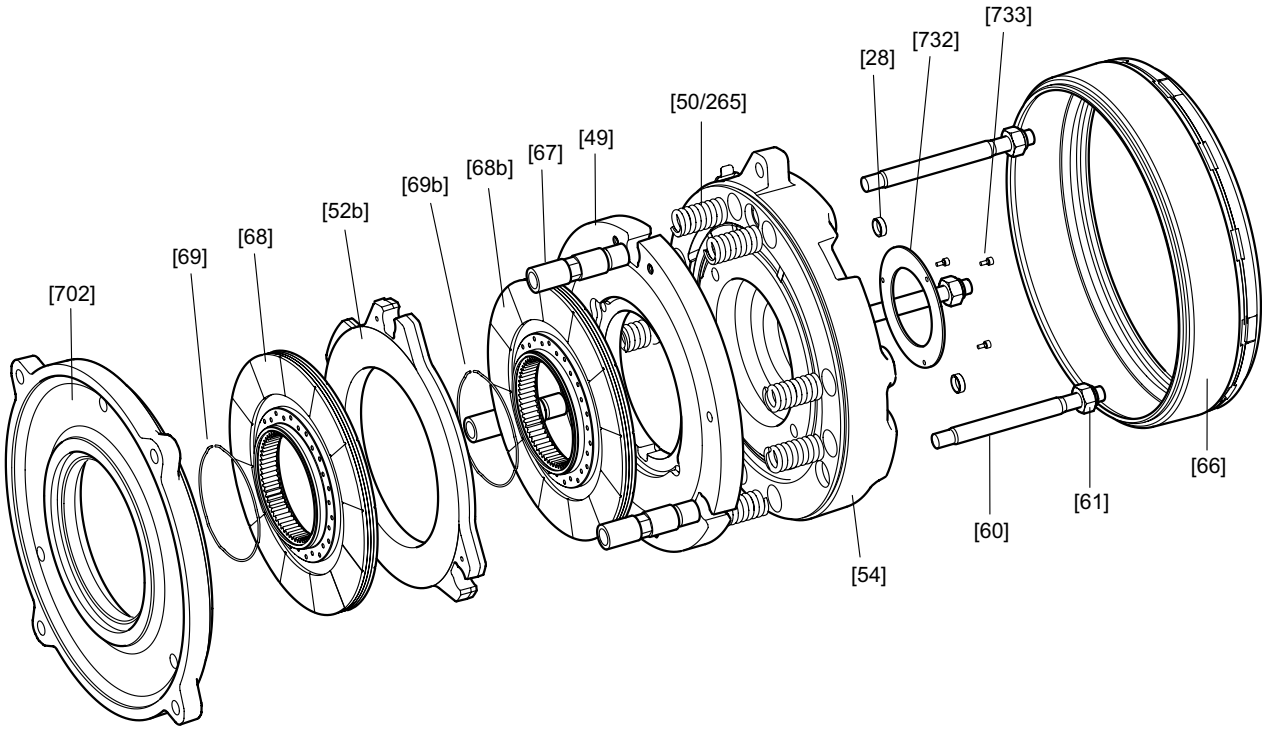
7.8 Inspection/maintenance for DR.315 brakemotors

7.8.1 DR.315 brakemotor – basic structure



[1] Motor with brake endshield
[22] Hex head screw
[31] Key
[32] Circlip
[35] Fan guard
[36] Fan
[37] V-ring
[47] O-ring
[53] Releasing lever
[55] Closing piece
[56] Stud
[57] Conical coil spring
[58] Setting nut
[62] Circlip
[64] Setscrew
[70] Carrier
[71] Key
[255] Conical seat
[256] Spherical washer
[550] Pre-assembled brake
[900] Screw
[901] Sealing

7.8.2 BE120-BE122 brake – basic structure



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[28]	Closing cap	[66]	Rubber sealing collar	[702]	Friction disk
[49]	Pressure plate	[67]	Setting sleeve	[732]	Cover disk
[50]	Brake spring	[68]	Brake disk	[733]	Screw
[52b]	Brake lining (BE122 only)	[68b]	Brake disk (BE122 only)		
[54]	Magnet, complete	[69]	Circular spring		
[60]	Stud 3x	[69b]	Circular spring (BE122 only)		
[61]	Hex nut	[256]	Brake spring		

7.8.3 DR.315 brakemotor – inspection steps

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove forced cooling fan and incremental encoder (if installed)

   See section "Motor and brake maintenance – preliminary work" (see page 51).

2. Remove fan guard [35] and fan [36]
3. Unfasten brake connector
4. Loosen screws [900] and remove pre-assembled brake [550] from brake endshield.
5. Unfasten machine screws [25] and [19], and remove B-side endshield [42].
6. Unfasten machine screws [15] from the flange [7] and remove the complete rotor [1] together with the flange. With gearmotors, pull off the oil flinger [107].
7. Loosen screws [609] and separate the rotor from the flange [7]. Before disassembly, protect the oil seal seat from damage using adhesive tape or a protective sleeve.
8. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, proceed to step 8
   - If there is condensation, proceed to step 7
   - If there is gear oil, have the motor repaired by a specialist workshop
9. If there is moisture inside the stator:

   Clean the winding, dry it and check it electrically (see section "Preliminary work" (see page 51)).

10. Replace the rolling bearing [11] [44] with permitted rolling bearing types.

    See section "Permitted rolling bearing types" (see page 106).

    Fill two-thirds of the bearing with grease.

    See section "DR.315 – bearing lubrication" (see page 49)

    Important: place the oil seal flange [608] and [21] onto the rotor shaft before installing the bearings.

11. Starting on the A-side, mount the motor vertically.
12. Place the cup springs [105] and lubrication ring [604] into the bearing bore of the flange [7].

    Hang the rotor [1] onto the B-side thread, and guide into the flange [7].

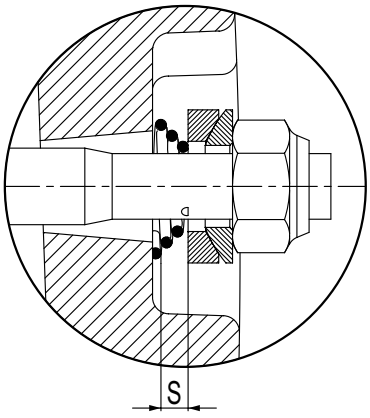
    Fasten the oil seal flange [608] to the flange [7] using the hex head bolts [609].

13. Mount the stator [16].
    - Reseal the stator seat: Seal the sealing surface with duroplastic sealing compound (operating temperature: -40 °C...+180 °C) e.g. "Hylomar L Spezial".

      Important: Protect the winding overhead from damage.
    - Screw in the stator [16] and flange [7] with screws [15].
14. Before mounting the brake endshield, screw in the M8 setscrew approximately 200 mm into the oil seal flange [21].
15. Before mounting the brake endshield [42], feed the setscrew in through a bore for the screw [25]. Screw in the brake endshield and stator [16] using machine screws [19] and hex nuts [17]. Lift the oil seal flange [21] with the setscrew, and fasten using 2 screws [25]. Remove the setscrew and screw in the remaining screws [25].
16. Renew oil seals
    - A-side: insert the oil seals [106], the oil flinger [107], and the oil seal [250] for gearmotors.

      Fill about two-thirds of the space between the two oil seals with grease (Klüber Petamo GHY133).
    - B-side: insert the oil seal [30], and coat the sealing lip with the same grease. This applies to gearmotors only
17. Align the cam of the friction disk, and mount the brake onto the brake endshield using a screw [900].
18. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

    This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance "s" [mm]
BE120; BE122	2

19. Install the fan [36] and fan guard [35].
20. Install the motor and accessory equipment.

7.8.4 Setting the working air gap for BE120-BE122 brakes

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

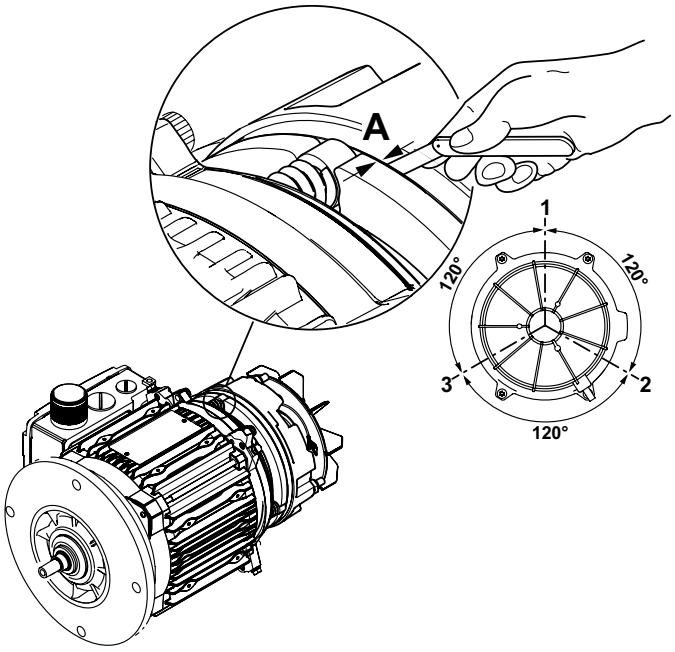
1. Remove forced cooling fan and incremental encoder (if installed)

   See section "Motor and brake maintenance – preliminary work" (see page 51)
2. Remove fan guard [35] and fan [36]
3. Push the rubber sealing collar [66] aside,
   - release the clamping strap, if necessary
   - Suck off any abrasion
4. Measure the brake disk [68, 68b]:

   Replace brake disk if ≤ 12 mm.

   See section "Replacing the brake disk of BE120-BE122 brakes" (see page 86)
5. Unfasten the setting sleeves [67] by turning it towards the endshield
6. Measure the working air gap A (see following figure)

   (use a feeler gauge and measure at three points offset by 120°):



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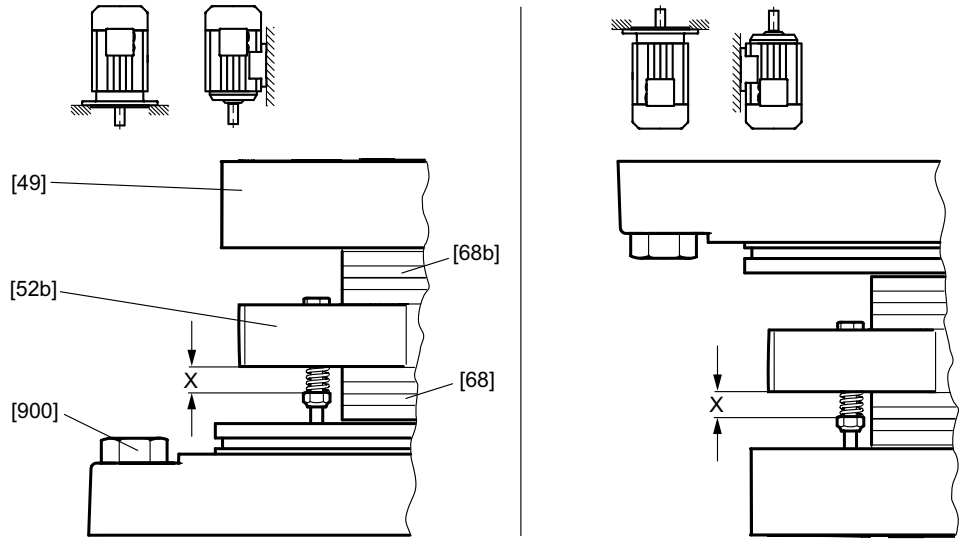
7. Tighten the hex nuts [61]
8. If you are mounting the BE122 in a vertical position, set the 3 springs on the brake stationary disc to the following measurement:

Mounting position	X in [mm]
Brake at the top	10.0
Brake at the bottom	10.5



[49] Pressure plate
[52b] Brake lining (BE122 only)
[68] Brake disk
[68b] Brake disk (BE122 only)
[900] Hex nut

9. Tighten the setting sleeves
   - towards the magnet
   - Until the working air gap is set correctly, see section "Technical Data" (see page 95)
10. Put the rubber sealing collar back in place and re-install the dismantled parts.

7.8.5 Replacing the brake disk of BE120-BE122 brakes

When fitting a new brake disk (thickness ≤ 12 mm), also check the other removed parts replace them if need be..

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

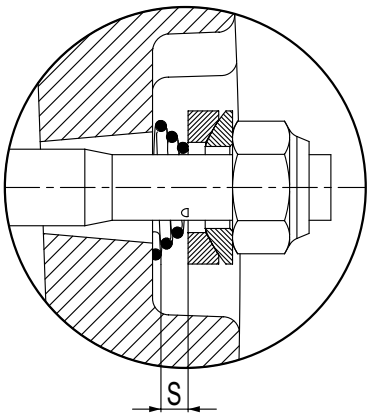
1. Remove forced cooling fan and incremental encoder (if installed)

   See section "Motor and brake maintenance – preliminary work" (see page 51)

2. Remove the fan guard [35], circlip [32] and fan [36]
3. Loosen the plug connector on the magnet
4. Remove the rubber sealing collar [66] and the manual brake release:
   – setting nuts [58], conical seat [255], spherical washer [256], conical coil springs [57], studs [56], releasing lever [53]
5. Unfasten hex nuts [61], carefully remove complete magnet [54] and remove brake springs [50/265].
6. Remove the pressure plate [49] and brake disk [68b], and clean the brake components.
7. Install a new brake disk.
8. Re-install the brake components,
   – Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE120-BE122 brakes" (see page 84).

9. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance "s" [mm]
BE120; BE122	2

10. Put the rubber sealing collar back in place and re-install the dismantled parts.

	NOTES
	• The lockable manual brake release (type HF) is already released if a resistance is encountered when operating the setscrew. • After replacing the brake disk, the maximum braking torque is reached only after several cycles.

7.8.6 Changing the braking torque of BE120-BE120 brakes

The braking torque can be altered in stages,

- by changing the type and number of brake springs
- by changing the brake

For the possible braking torque steps, please refer to section "Technical Data" (see page 95).

7.8.7 Changing the brake spring of BE120-BE122l brakes

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

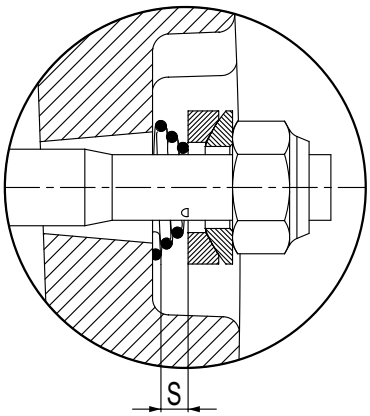
- Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup!
- Carefully observe the following steps!

1. Remove forced cooling fan and incremental encoder (if installed)

   See section "Motor and brake maintenance – preliminary work" (see page 51)
2. Remove the flange cover or fan guard [35], circlip [32] and fan [36]
3. Unfasten the plug connector on the magnet [54] and protect it from getting dirty
4. Remove the rubber sealing collar [66] and the manual brake release:
   – setting nuts [58], conical seat [255], spherical washer [256], conical coil springs [57], studs [56], releasing lever [53]
5. Unfasten hex nuts [61] and pull off the magnet [54]
   – by about 50 mm
6. Change or add brake springs [50/265]
   – Arrange brake springs symmetrically
7. Re-install the brake components
   – Except for the fan and the fan guard, because the working air gap has to be set first, see section "Setting the working air gap of the BE120-BE122 brakes" (see page 84).

8. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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Brake	Floating clearance "s" [mm]
BE120; BE122	2

9. Put the rubber sealing collar back in place and re-install the dismantled parts.

	NOTE
	Replace setting nuts [58] and hex nuts [61] if the removal procedure is repeated.

7.8.8 Replacing the brake of DR.315

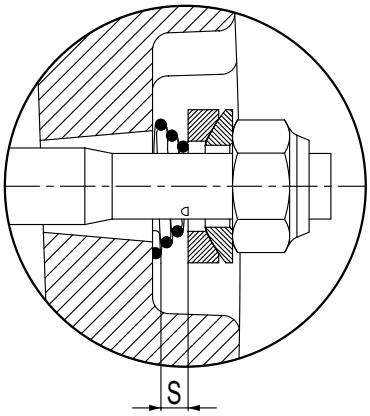
STOP	**STOP** The mounting position for installation should correspond to the specifications on the nameplate; make sure that the intended mounting position is permitted.

	**⚠ HAZARD!** Risk of crushing if the drive starts up unintentionally. Severe or fatal injuries. • Isolate the motor and brake from the power supply before starting work, safeguarding them against accidental startup! • Carefully observe the following steps!

1. Remove forced cooling fan and incremental encoder (if installed)

   See section "Motor and brake maintenance – preliminary work" (see page 51)
2. Remove the flange cover or fan guard [35], circlip [32] and fan [36]
3. Unfasten brake connector
4. Unfasten screws [900] and remove brake from brake endshield.
5. Align the cam of the friction disk, and mount the brake onto the brake endshield using a screw [900].
6. With manual brake release: Use setting nuts to set the floating clearance "s" between the conical coil springs (pressed flat) and the setting nuts (see following figure).

   This floating clearance "s" is necessary so that the pressure plate can move up as the brake lining wears. Otherwise, reliable braking is not guaranteed.



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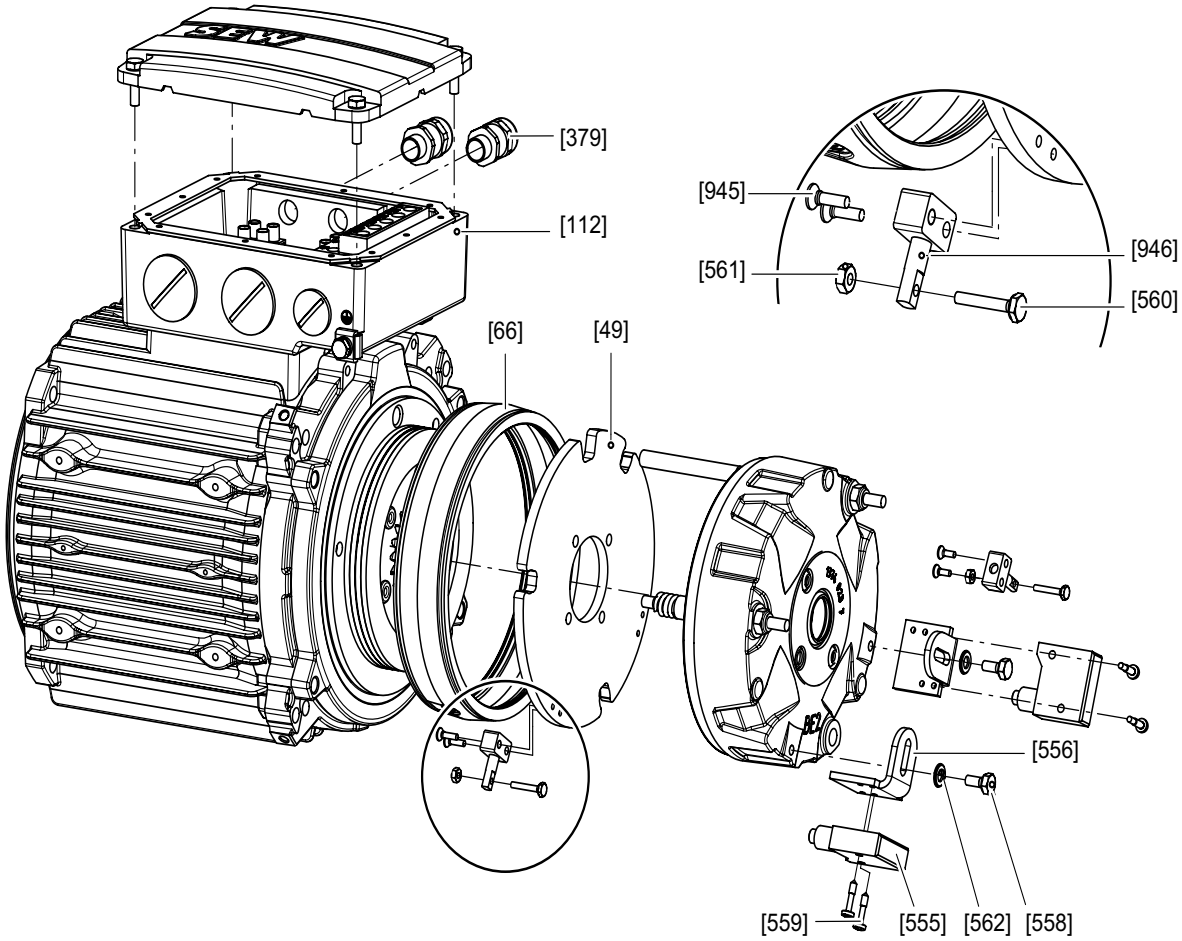
Brake	Floating clearance "s" [mm]
BE120; BE122	2

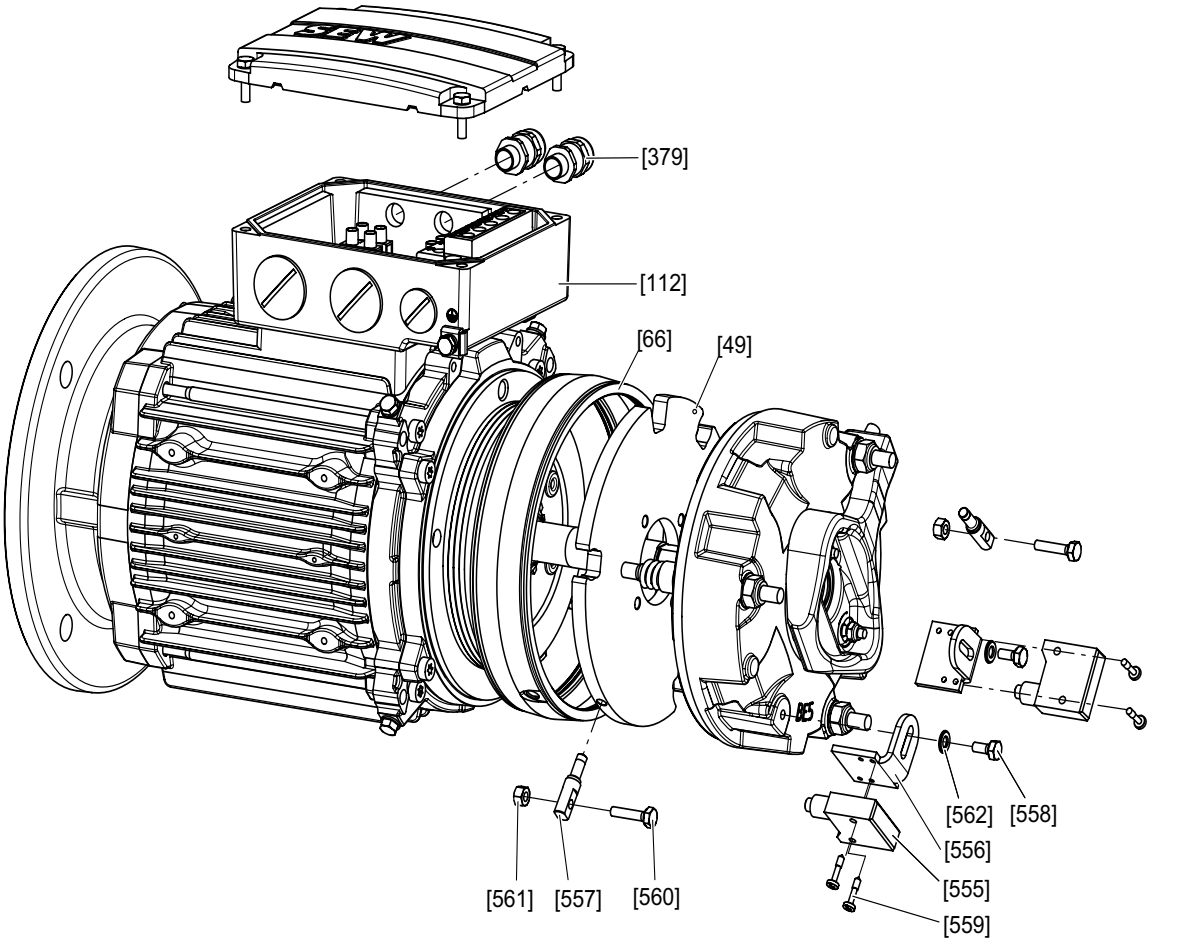
7.9 Inspection/maintenance – DUB

7.9.1 DUB connected to DR.90-100 with BE2 – basic structure



[49] Pressure plate for DUB
[66] Rubber sealing for DUB
[112] Terminal box lower part
[379] Cable gland
[555] Microswitch
[556] Angle bracket
[557] Bolts
[558] Hex head screw
[559] Pan head screw
[560] Hex head screw
[561] Stud
[562] Washer
[945] Countersunk screw
[946] Mounting plate, complete

7.9.2 DUB connected to DR.90-315 with BE5-BE122 – basic structure



[49] Pressure plate for DUB
[66] Rubber sealing for DUB
[112] Terminal box lower part
[379] Cable gland
[555] Microswitch
[556] Angle bracket
[557] Bolts
[558] Hex head screw
[559] Pan head screw
[560] Hex head screw
[561] Stud
[562] Washer

7.9.3 Inspection/maintenance – DUB1 for function monitoring

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the motor from the power supply and safeguard it against accidental startup before starting work!
- Carefully observe the following steps!

1. Check and, if need be, adjust the working air gap according to section "Setting the working air gap for BE.. brake".
2. Screw hex head screw [560] against the actuator of microswitch [555] until it switches over (brown-blue contacts closed).

   While screwing, apply hex nut [561] to eliminate the longitudinal play from the thread.
3. Turn hex head screw [560] back until microswitch [555] switches back (contacts brown-blue open).
4. To ensure operational reliability, turn hex head screw [560] further back by one-sixth of a revolution (0.1 mm)
5. Tighten hex nut [561], while doing so, hold hex head screw [560] to keep it in the correct position.
6. Switch the brake on and off several times. Check whether the microswitch opens and closes reliably in any motor shaft position. Therefore, change the position of the motor shaft manually several times.

7.9.4 Inspection/maintenance – DUB2 for wear monitoring

⚠ HAZARD!

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the motor from the power supply and safeguard it against accidental startup before starting work!
- Carefully observe the following steps!

1. Check and, if need be, adjust the working air gap according to section "Setting the working air gap for BE.. brake".
2. Screw hex head screw [560] against the actuator of microswitch [555] until it switches over (brown-blue contacts closed).

   While screwing, apply hex nut [561] to eliminate the longitudinal play from the thread.
3. For BE2-BE5:

   – Loosen hex head screw [560] towards the microswitch [555] by three quarters of a revolution

   (with BE2 by about 0.375 mm / with BE5 by about 0.6 mm)

   With BE11-BE122

   – Loosen hex head screw [560] towards the microswitch [555] by a whole revolution (about 0.8 mm).
4. Tighten hex nut [561], while doing so, hold hex head screw [560] to keep it in the correct position.
5. If the brake lining reaches the wear limit, the microswitch automatically switches back (contacts brown-blue open) and activates a relay or a signal.

7.9.5 Inspection/maintenance – DUB3 for function and wear monitoring

If two DUB are connected to one brake, both monitoring statuses can be realized. In this case, set the DUB2 for wear monitoring before you set the DUB1 for function monitoring.

8 Technical Data

8.1 Work done, working air gap, braking torques

Brake Type	Work done until maintenance [10^6 J]	Working air gap [mm] min.[1]	Working air gap [mm] max.	Brake disk [mm] min.	Braking torque settings: Braking torque [Nm]	Type and number of brake springs: normal	Type and number of brake springs: blue	Order number of brake springs: normal	Order number of brake springs: blue
BE05	120	0.25	0.6	9.0	5.0 3.5 2.5 1.8	2 2 - -	4 2 6 3	0135 017 X	1374 137 3
BE1	120	0.25	0.6	9.0	10 7.0 5.0	6 4 2	- 2 4	0135 017 X	1374 137 3
BE2	165	0.25	0.6	9.0	20 14 10 7.0	6 2 2 -	- 4 2 4	1374 024 5	1374 052 0
BE5	260	0.25	0.9	9.0	55 40 28 20 14	6 2 2 - -	- 4 2 4 3	1374 070 9	1374 071 7
BE11	640	0.3	1.2	10.0	110 80 55 40	6 2 2 -	- 4 2 4	1374 183 7	1374 184 5
BE20	1000	0.3	1.2	12.0	200 150 110 80	6 4 3 3	- 2 3 -	1374 322 8	1374 248 5
BE30	1500	0.3	1.2	10.0	300 200 150	8 4 4	- 4 -	0187 455 1	1374 435 6
BE32	1500	0.4	1.2	10.0	600 500 400 300 200	8 6 4 4 -	- 2 4 - 8	0187 455 1	1374 435 6
BE120	520	0.4	1.2	12.0	1000 800 600 400	8 6 4 4	- 2 4 -	1360 877 0	1360 831 2
BE122	520	0.5	1.2	12.0	2000 1600 1200 800	8 6 4 4	- 2 4 -	1360 877 0	1360 831 2

1) Note when checking the working air gap: Parallelism tolerances on the brake disk may cause deviations of ±0,15 mm after a test run.

8.2 Braking torque assignment

8.2.1 Motor size DR.71-DR.100

Motor type	Brake type	Braking torque gradation in Nm										
DR.71	BE05	1.8	2.5	3.5	5.0							
	BE1				5.0	7.0	10					
DR.80	BE05	1.8	2.5	3.5	5.0							
	BE1				5.0	7.0	10					
	BE2					7.0	10	14	20			
DR.90	BE1				5.0	7.0	10					
	BE2					7.0	10	14	20			
	BE5							14	20	28	40	55
DR.100	BE2					7.0	10	14	20			
	BE5							14	20	28	40	55

8.2.2 Motor size DR.112-DR.225

Motor type	Brake type	Braking torque gradation in Nm											
DR.112	BE5	14	28	40	55								
	BE11			40	55								
DR.132	BE5		28	40	55								
	BE11			40	55	80	110						
DR.160	BE11			40	55	80	110						
	BE20					80	110	150	200				
DR.180	BE20					80	110	150	200				
	BE30							150	200	300			
	BE32								200	300	400		
DR.200/225	BE30							150	200	300			
	BE32								200	300	400	500	600

8.2.3 Motor size DR.315

Motor type	Brake type	Braking torque gradation in Nm						
DR.315	BE120	400	600	800	1000			
	BE122			800		1200	1600	2000

8.3 Operating currents

8.3.1 Brake BE05/1, BE2

The current values I_H (holding current) listed in the tables are r.m.s. values. Use appropriate instruments for measuring r.m.s. values. The inrush current (accelerator current) I_B only flows for a short time (ca. 160 ms) when the brake is released. There is no increased inrush current if a BG or BMS brake rectifier is used or if there is a direct DC voltage supply – only possible with brakes up to size BE2.

	BE05/1	BE2
Max. braking torque [Nm]	5/10	20
Braking power [W]	32	43
Inrush current ratio I_B/I_H	4	4

Rated voltage V_N		BE05/1		BE2	
V_{AC}	V_{DC}	I_H [A_{AC}]	I_G [A_{DC}]	I_H [A_{AC}]	I_G [A_{DC}]
24 (23-26)	**10**	2,10	2.80	2.75	3.75
60 (57-63)	**24**	0.88	1.17	1.57	1.46
120 (111-123)	**48**	0.45	0.58	0.59	0.78
184 (174-193)	**80**	0.29	0.35	0.38	0.47
208 (194-217)	**90**	0.26	0.31	0.34	0.42
230 (218-243)	**96**	0.23	0.29	0.30	0.39
254 (244-273)	**110**	0.20	0.26	0.27	0.34
290 (274-306)	**125**	0.18	0.26	0.24	0.30
330 (307-343)	**140**	0.16	0.20	0.21	0.27
360 (344-379)	**160**	0.14	0.18	0.19	0.24
400 (380-431)	**180**	0.13	0.16	0.17	0.21
460 (432-484)	**200**	0.11	0.14	0.15	0.19
500 (485-542)	**220**	0.10	0.13	0.13	0.17
575 (543-600)	**250**	0.09	0.11	0.12	0.15

Key

I_B Acceleration current – brief inrush current
I_H Holding current r.m.s. value in the connecting harness to the SEW brake rectifier
I_G Direct current with direct DC voltage supply
V_N Rated voltage (rated voltage range)

8.3.2 Brakes: BE5, BE11, BE20, BE 30, BE32

The current values I_H (holding current) listed in the tables are r.m.s. values. Use appropriate instruments for measuring r.m.s. values. The inrush current (accelerator current) I_B only flows for a short time (ca. 160 ms) when the brake is released. You may not use a direct voltage supply is not required.

	BE5	BE11	BE20	BE30/32
Max. braking torque [Nm]	55	110	200	300/600
Braking power [W]	49	77	100	130
Inrush current ratio I_B/I_H	5.7	6.6	7	10

Rated voltage V_N		BE5	BE11	BE20	BE30/32
V_{AC}	V_{DC}	I_H [A_{AC}]	I_H [A_{AC}]	I_H [A_{AC}]	I_H [A_{AC}]
60 (57-63)	**24**	1.25	2.08	2.49	-
120 (111-123)	**48**	0.64	1.04	1.25	1.81
184 (174-193)	**80**	0.40	0.66	0.79	1.15
208 (194-217)	**90**	0.36	0.59	0.70	1.02
230 (218-243)	**96**	0.33	0.52	0.63	0.91
254 (244-273)	**110**	0.29	0.47	0.56	0.81
290 (274-306)	**125**	0.26	0.42	0.50	0.72
330 (307-343)	**140**	0.23	0.37	0.44	0.64
360 (344-379)	**160**	0.21	0.33	0.40	0.57
400 (380-431)	**180**	0.18	0.29	0.35	0.51
460 (432-484)	**200**	0.16	0.26	0.32	0.46
500 (485-542)	**220**	0.15	0.23	0.28	0.41
575 (543-600)	**250**	0.13	0.21	0.25	0.36

Key

I_B Acceleration current – brief inrush current
I_H Holding current r.m.s. value in the connecting harness to the SEW brake rectifier
I_G Direct current with direct DC voltage supply
V_N Rated voltage (rated voltage range)

8.3.3 Brake BE120, BE122

The current values I_H (holding current) listed in the tables are r.m.s. values. Use appropriate instruments for measuring r.m.s. values. The inrush current (accelerator current) I_B only flows for a short time (ca. 400 ms) when the brake is released. You may not use a direct voltage supply is not required.

	BE120	BE122
Max. braking torque [Nm]	1000	2000
Braking power [W]	250	250
Inrush current ratio I_B/I_H	4.9	4.9

Rated voltage V_N		BE120	BE122
V_{AC}	V_{DC}	I_H [A_{AC}]	I_H [A_{AC}]
230 (218-243)	**-**	1.80	1.80
254 (244-273)	**-**	1.60	1.60
290 (274-306)	**-**	1.43	1.43
360 (344-379)	**-**	1.14	1.14
400 (380-431)	**-**	1.02	1.02
460 (432-484)	**-**	0.91	0.91
500 (485-542)	**-**	0.81	0.81
575 (543-600)	**-**	0.72	0.72

Key

I_B Acceleration current – brief inrush current
I_H Holding current r.m.s. value in the connecting harness to the SEW brake rectifier
I_G Direct current with direct DC voltage supply
V_N Rated voltage (rated voltage range)

8.4 Resistors

8.4.1 Brake BE05/1, BE2, BE5

	BE05/1	BE2	BE5
Max. braking torque [Nm]	5/10	20	55
Braking power [W]	32	43	49
Inrush current ratio I_B/I_H	4	4	5.7

Rated voltage V_N		**BE05/1**		**BE2**		**BE5**	
V_{AC}	**V_{DC}**	**R_B**	**R_T**	**R_B**	**R_T**	**R_B**	**R_T**
24 (23-26)	**10**	0.77	2.35	0.57	1.74	-	-
60 (57-63)	**24**	4.85	14.8	3.60	11.0	2.20	10.5
120 (111-123)	**48**	19.4	59.0	14.4	44.0	8.70	42.0
184 (174-193)	**80**	48.5	148	36.0	111	22.0	105
208 (194-217)	**90**	61.0	187	45.5	139	27.5	132
230 (218-243)	**96**	77.0	125	58.0	174	34.5	166
254 (244-273)	**110**	97.0	295	72.0	220	43.5	210
290 (274-306)	**125**	122	370	91	275	55.0	265
330 (307-343)	**140**	154	470	115	350	69.0	330
360 (344-379)	**160**	194	590	144	440	87.0	420
400 (380-431)	**180**	245	740	182	550	110	530
460 (432-484)	**200**	310	940	230	690	138	660
500 (485-542)	**220**	385	1180	290	870	174	830
575 (543-600)	**250**	490	1480	365	1100	220	1050

8.4.2 Brakes: BE5, BE11, BE20, BE30/32

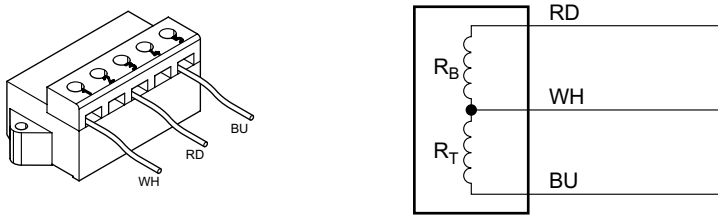
	BE11	BE20	BE30/32
Max. braking torque [Nm]	110	200	600
Braking power [W]	77	100	130
Inrush current ratio I_B/I_H	6.6	7	10

Rated voltage V_N		**BE11**		**BE20**		**BE30/32**	
V_{AC}	**V_{DC}**	**R_B**	**R_T**	**R_B**	**R_T**	**R_B**	**R_T**
60 (57-63)	**24**	1.20	7.6	1.1	7.1	-	-
120 (111-123)	**48**	4.75	30.5	3.3	28.6	2.1	15.8
184 (174-193)	**80**	12.0	76.0	8.4	57	5.3	39.8
208 (194-217)	**90**	15.1	96	10.6	71.7	6.7	50
230 (218-243)	**96**	19.0	121	13.3	90.3	8.4	63
254 (244-273)	**110**	24.0	152	16.7	134	10.6	79.3
290 (274-306)	**125**	30.0	191	21.1	143	13.3	100
330 (307-343)	**140**	38.0	240	26.5	180	16.8	126
360 (344-379)	**160**	47.5	305	33.4	227	21.1	158
400 (380-431)	**180**	60	380	42.1	286	26.6	199
460 (432-484)	**200**	76	480	52.9	360	33.4	251
500 (485-542)	**220**	95	600	66.7	453	42.1	316
575 (543-600)	**250**	120	760	83.9	570	53.0	398

8.4.3 Resistance measurement BE05-BE32

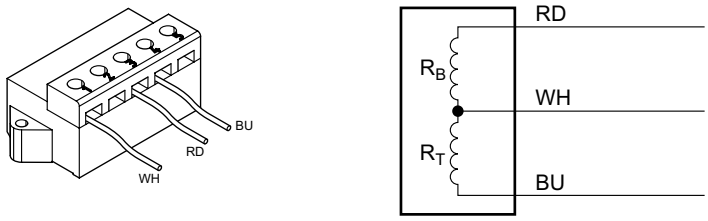
Cutoff in the AC circuit

The following illustration shows how to measure resistance with cutoff in the AC circuit.



Cut-off in the DC and AC circuits

The following illustration shows how to measure resistance with cutoff in the DC and AC circuits.



BS Accelerator coil
TS coil section
R_B Accelerator coil resistance at 20 °C [Ω]
R_T Coil section resistance at 20 °C [Ω]
U_N Rated voltage (rated voltage range)

RD red
WH White
BU blue

	NOTE
	When measuring the resistance of the coil section (R_{Sec}) or the acceleration coil (R_{Acc}), remove the white conductor from the brake rectifier; if it remains connected, the internal resistance of the brake rectifier will cause erroneous results.

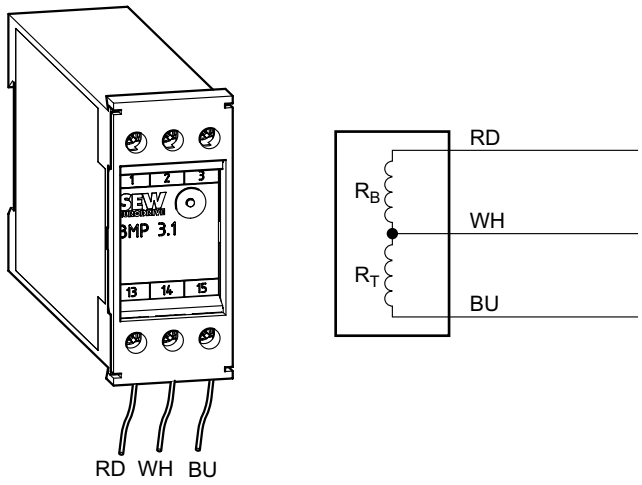
8.4.4 Brake BE120, BE122

	BE120	BE122
Max. braking torque [Nm]	1000	2000
Braking power [W]	250	250
Inrush current ratio I_B/I_H	4.9	4.9

Rated voltage V_N		BE120		BE122	
V_{AC}	V_{DC}	R_B	R_T	R_B	R_T
230 (218-243)	-	7.6	29.5	7.6	29.5
254 (244-273)	-	9.5	37.0	9.5	37.0
290 (274-306)	-	12.0	46.5	12.0	46.5
360 (344-379)	-	19.1	74.0	19.1	74.0
400 (380-431)	-	24.0	93.0	24.0	93.0
460 (432-484)	-	30.0	117.0	30.0	117.0
500 (485-542)	-	38.0	147.0	38.0	147.0
575 (543-600)	-	48.0	185.0	48.0	185.0

Resistance measurement BE120, BE122

The following illustration shows how to measure resistance with BMP 3.1.



BS Accelerator coil
TS coil section
R_B Accelerator coil resistance at 20 °C [Ω]
R_T Coil section resistance at 20 °C [Ω]
U_N Rated voltage (rated voltage range)

NOTE

When measuring the resistance of the coil section (R_{Sec}) or the acceleration coil (R_{Acc}), remove the white conductor from the brake rectifier; if it remains connected, the internal resistance of the brake rectifier will cause erroneous results.

8.5 Brake rectifier combinations

8.5.1 Brakes: BE05/1, BE2, BE5, BE11, BE20, BE30/32

The table below shows the standard and optional combinations of brakes and brake rectifiers.

		BE05	BE1	BE2	BE5	BE11	BE20	BE30/32
BG	BG 1.5	X^1	X^1	X^1	–	–	–	–
	BG 3	X^2	X^2	X^2	–	–	–	–
BGE	BGE 1.5	•	•	•	X^1	X^1	X^1	X^1
	BGE 3	•	•	•	X^2	X^2	X^2	X^2
BS	BS 24	X	X	X	–	–	–	–
BMS	BMS 1.5	•	•	•	–	–	–	–
	BMS 3	•	•	•	–	–	–	–
BME	BME 1.5	•	•	•	•	•	•	•
	BME 3	•	•	•	•	•	•	•
BMH	BMH 1.5	•	•	•	•	•	•	•
	BMH 3	•	•	•	•	•	•	•
BMK	BMK 1.5	•	•	•	•	•	•	•
	BMK 3	•	•	•	•	•	•	•
BMP	BMP 1.5	•	•	•	•	•	•	•
	BMP 3	•	•	•	•	•	•	•
BMV	BMV 5	•	•	•	•	•	•	–
BSG	BSG	•	•	•	X	X	X	–
BSR	BGE 3 + SR 11	•	•	•	•	•	–	–
	BGE 3 + SR 15	•	•	•	•	•	•	•
	BGE 1.5 + SR 11	•	•	•	•	•	–	–
	BGE 1.5 + SR 15	•	•	•	•	•	•	•
BUR	BGE 3 + UR 11	•	•	•	•	–	–	–
	BGE 1.5 + UR 15	•	•	•	•	•	•	•

X standard design
X^1 Standard design with brake rated voltage of AC 150 - 500 V
X^2 Standard design with brake rated voltage of AC 24/42 - 150 V
• optional
– not permitted

8.5.2 Brake BE120, BE122

The table below shows the standard and optional combinations of brakes and brake rectifiers.

	BE120	BE122
BMP 3.1	X	X

8.6 Brake control system

8.6.1 Wiring space of the motor

The following tables list the technical data of brake control systems for installation in the motor wiring space and the assignments with regard to motor size and connection technology. The different housings have different colors (= color code) to make them easier to distinguish.

Motor size DR.71-DR.225

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BG	One-way rectifier	AC 150...500 V	1.5	BG 1.5	825 384 6	Black
		AC 24...500 V	3.0	BG 3	825 386 2	Brown
BGE	One-way rectifier with electronic switching	AC 150...500 V	1.5	BGE 1.5	825 385 4	Red
		AC 42...150 V	3.0	BGE 3	825 387 0	Blue
BSR	One-way rectifier + current relay for cut-off in the DC circuit	AC 150...500 V	1.0	BGE 1.5 + SR 11	825 385 4 826 761 8	
			1.0	BGE 1.5 + SR 15	825 385 4 826 762 6	
		AC 42...150 V	1.0	BGE 3 + SR11	825 387 0 826 761 8	
			1.0	BGE 3 + SR15	825 387 0 826 762 6	
BUR	One-way rectifier + voltage relay for cut-off in the DC circuit	AC 150...500 V	1.0	BGE 1.5 + UR 15	825 385 4 826 759 6	
		AC 42...150 V	1.0	BGE 3 + UR 11	825 387 0 826 758 8	
BS	Varistor protection circuit	DC 24 V	5.0	BS24	826 763 4	Water blue
BSG	Electronic switching	DC 24 V	5.0	BSG	825 459 1	White

Motor size DR.315

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit.	AC 230...575 V	2.8	BMP 3.1	829 507 7	

8.6.2 Control cabinet

The following tables list the technical data of brake control systems for installation in the control cabinet, and the assignment regarding the motor size and connection technology. The different housings have different colors (= color code) to make them easier to distinguish.

Motor size DR.71-DR.225

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMS	One-way rectifier like BG	AC 150...500 V	1.5	BMS 1.5	825 802 3	Black
		AC 42...150 V	3.0	BMS 3	825 803 1	Brown
BME	One-way rectifier with electronic switching like BGE	AC 150...500 V	1.5	BME 1.5	825 722 1	Red
		AC 42...150 V	3.0	BME 3	825 723 X	Blue
BMH	One-way rectifier with electronic switching and heating function	AC 150...500 V	1.5	BMH 1.5	825 818 X	Green
		AC 42...150 V	3	BMH 3	825 819 8	Yellow
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit	AC 150...500 V	1.5	BMP 1.5	825 685 3	White
		AC 42...150 V	3.0	BMP 3	826 566 6	Light blue
BMK	One-way rectifier with electronic switch mode, DC 24 V control input and separation in the DC circuit	AC 150...500 V	1.5	BMK 1.5	826 463 5	Water blue
		AC 42...150 V	3.0	BMK 3	826 567 4	Bright red
BMV	Brake control unit with electronic switching, DC 24 V control input and fast cut-off	DC 24 V	5.0	BMV 5	1 300 006 3	White

Motor size DR.315

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit.	AC 230...575 V	2.8	BMP 3.1	829 507 7	

8.7 Permitted rolling bearing types

8.7.1 Rolling bearing types for motor sizes DR.71-DR.225

Motor type	A-side bearing		B-side bearing	
	IEC motor	Gearmotor	AC motor	Brakemotor
DR.71	6204-2Z-J-C3	6303-2Z-J-C3	6203-2Z-J-C3	6203-2RS-J-C3
DR.80	6205-2Z-J-C3	6304-2Z-J-C3	6304-2Z-J-C3	6304-2RS-J-C3
DR.90-DR.100	6306-2Z-J-C3		6205-2Z-J-C3	6205-2RS-J-C3
DR.112-DR.132	6308-2Z-J-C3		6207-2Z-J-C3	6207-2RS-J-C3
DR.160	6309-2Z-J-C3		6209-2Z-J-C3	6209-2RS-J-C3
DR.180	6312-2Z-J-C3		6213-2Z-J-C3	6213-2RS-J-C3
DR.200-DR.225	6314-2Z-J-C3		6314-2Z-J-C3	6314-2RS-J-C3

8.7.2 Rolling bearing types for motor size DR.315

Motor type	A-side bearing		B-side bearing	
	IEC motor	Gearmotor	IEC motor	Gearmotor
DR.315K	6319-J-C3	6319-J-C3	6319-J-C3	6319-J-C3
DR.315S				
DR.315M		6322-J-C3		6322-J-C3
DR.315L				

Motor with reinforced bearing / ERF

Motor type	A-side bearing	B-side bearing	
		IEC motor	Gearmotor
DR.315K	NU319E	6319-J-C3	6319-J-C3
DR.315S			
DR.315M			6322-J-C3
DR.315L			

8.8 Lubricant tables

8.8.1 Lubricant table for rolling bearings

Motor size DR.71-DR.225

The bearings are 2Z or 2RS closed bearings and cannot be re-lubricated.

	Ambient temperature	Manufacturer	Type	DIN designation
Motor rolling bearings	-20 °C ... +80 °C	Esso	Polyrex EM[1)]	K2P-20
	+20 °C ... +100 °C	Klüber	Barrierta L55/2[2)]	KX2U
	-40 °C ... +60 °C	Kyodo Yushi	Multemp SRL[2)]	K2N-40

1) mineral lubricant (= mineral-based rolling bearing grease)

2) synthetic lubricant (= synthetic-based rolling bearing grease)

Motor size DR.315

Motors of size DR.315 can be equipped with a re-lubrication device.

	Ambient temperature	Manufacturer	Type	DIN designation
Motor rolling bearings	-20 °C ... +80 °C	Esso	Polyrex EM[1)]	K2P-20
	-40 °C ... +60 °C	SKF	GXN[1)]	K2N-40

1) mineral lubricant (= mineral-based rolling bearing grease)

8.9 Order information for lubricants and anti-corrosion agents

Lubricants and anti-corrosion agents may be obtained directly from SEW-EURODRIVE using the following order numbers.

Usage	Manufacturer	Type	Quantity	Order number
Lubricant for rolling bearings	Esso	Polyrex EM	400 g	09101470
	SKF	GXN	400 g	09101276
Lubricant for sealing rings	Klüber	Petamo GHY 133	10 g	04963458
Anti-corrosion agent and lubricant	SEW-EURODRIVE	NOCO® FLUID	5.5 g	09107819

9 Appendix

9.1 Wiring diagrams

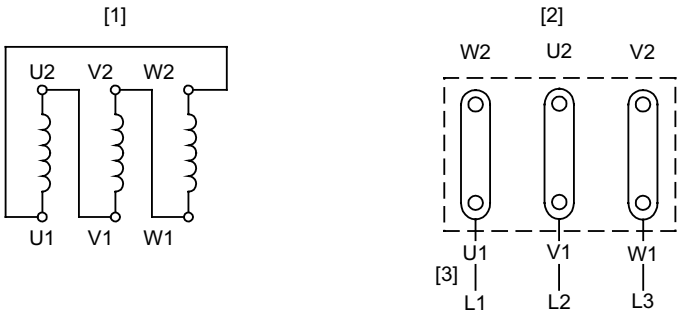
	NOTE
	Connect the motor as shown in the wiring diagram or the assignment diagram included with the motor. The following section only gives an overview of the most common connection options. You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

9.1.1 Delta and star connection

AC motor

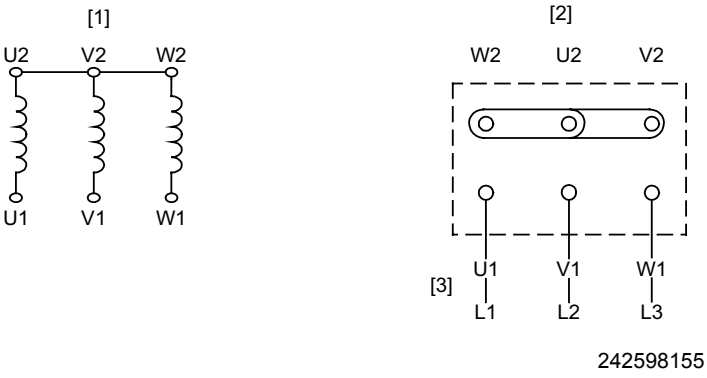
For all motors with one speed, direct on-line or ⅄- △ startup.

△ *connection* The following figure depicts the △ connection for low voltage.



[1] Motor winding
[2] Motor terminal board
[3] Incoming cables

⅄ *connection* The following figure depicts the ⅄ connection for high voltage.



[1] Motor winding
[2] Motor terminal board
[3] Incoming cables

Change in direction of rotation: Replacing two incoming cables (L1 - L2).

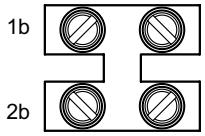
9.1.2 Motor protection with TF or TH for DR.71-DR.225

TF/TH

The following illustrations show the connection of the motor protection with TF PTC thermistor sensors or TH bimetallic thermostats.

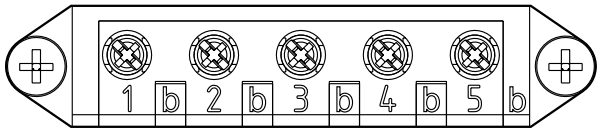
Either a two-pole terminal clip or a five-pole terminal strip is available for connecting to the trip switch.

Example: TF/TH to a two-pole terminal strip



1b	2b
TF/TH	TF/TH

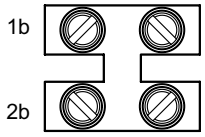
Example: 2 x TF/TH to a five-pole terminal strip



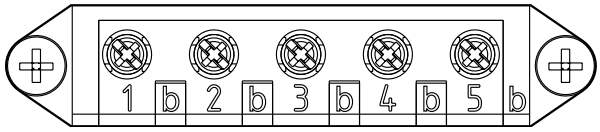
1b	2b	3b	4b	5b
1.TF/TH	1.TF/TH	2.TF/TH	2.TF/TH	-

2xTF/TH / with anti-condensation heating

The following illustration shows the connection of the motor protection with 2 TF PTC thermistor sensors or TH bimetallic thermostats and Hx anti-condensation heating.



1b	2b
Hx	Hx



1b	2b	3b	4b	5b
1.TF/TH	1.TF/TH	2.TF/TH	2.TF/TH	-

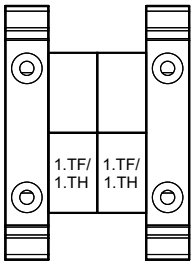
9.1.3 Motor protection using TF or TH with DR315

TF/TH

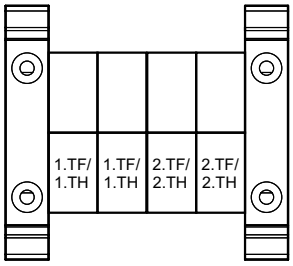
The following figures show the connection of the motor protection with TF PTC thermistor sensors or TH bimetallic thermostats.

Depending on the design an x-pole terminal clip is available for connecting to the trip switch.

Example: TF/TH to terminal strip



Example: 2 x TF/TH to terminal strip

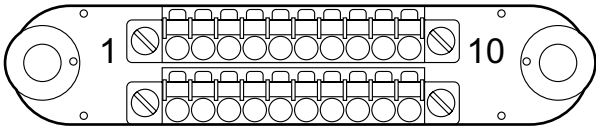


9.1.4 EI7. Built-in encoder

EI7.

The following figure shows the connection of the built-in encoder.

The encoder is equipped with a 10-pole terminal strip.



1e	2e	3e	4e	5e	6e	7e	8e	9e	10e
-	-	-	-	+UB (GY)	GND (PK)	A(cos) (BN)	$\overline{A}$($\overline{cos}$) (WH)	B(sin) (YE)	$\overline{B}$($\overline{sin}$) (GN)

9.1.5 Brake control BGE; BG; BSG; BUR

Brake BE

Brake control BGE; BG; BSG; BUR;

Apply voltage to release the brake (see nameplate).

Contact rating of the brake contactors: AC3 according to EN 60947-4-1

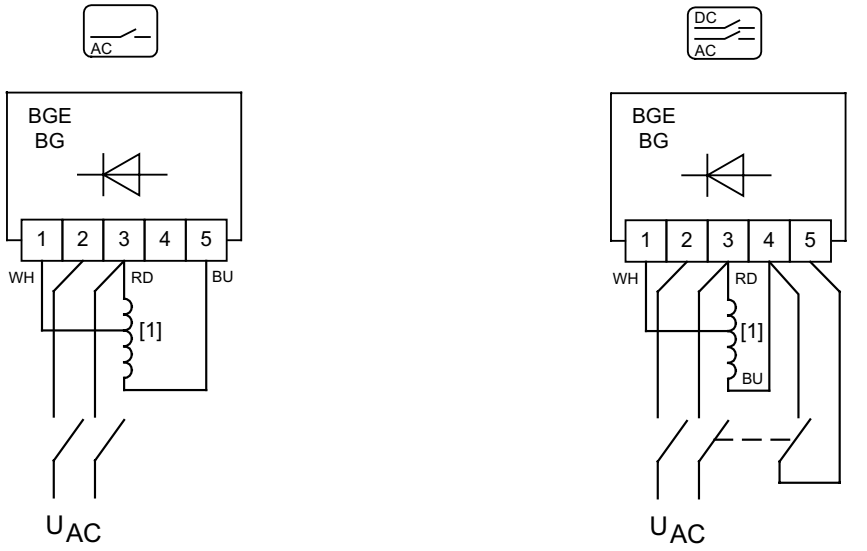
The voltage can be distributed as follows:

- Through a separate supply cable
- From the motor terminal board

This does not apply to multi-speed and frequency-controlled motors.

BG / BGE

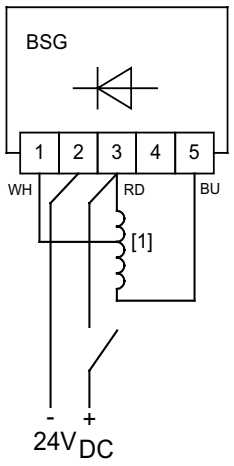
The following figure shows the wiring for BG and BGE brake rectifiers for the AC-side cut-off as well as the DC and AC-side cut-off.



[1] Brake coil

BSG

The following figure shows the DC 24 V connection of the BSG control unit



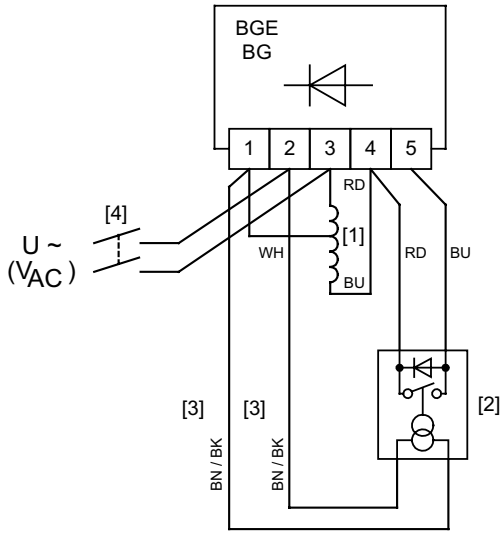
242606475

[1] Brake coil

BUR

STOP	**STOP**
	Connection to motor terminal board not permitted.

The following figure shows the wiring for the BUR brake control



242608139

[1] Brake coil
[2] Voltage relay UR11/UR15
UR 11 (42-150 V) = BN
UR 15 (150-500 V) = BK

9.1.6 BSR brake control

Brake BE

BSR brake control system

Brake voltage = Phase voltage

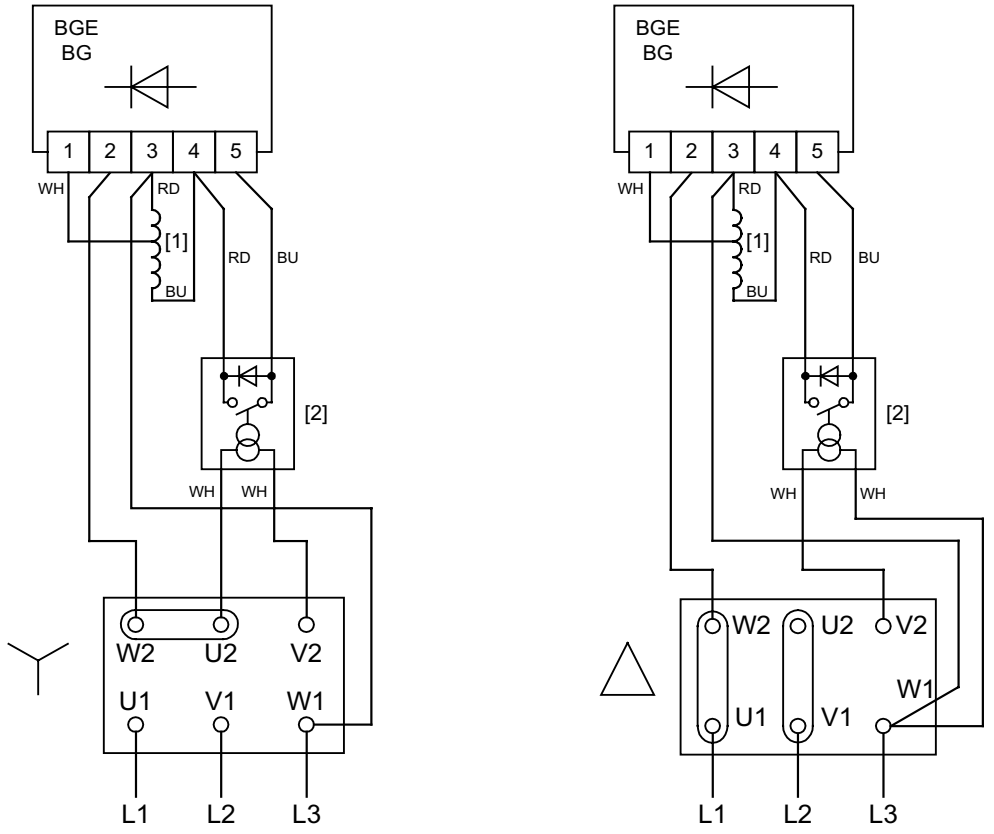
The white connecting leads are the ends of a converter loop and, depending on the motor connection, must be connected to the motor terminal block instead of the △ or 人 bridge.

Factory wiring 人

The following figure shows the factory wiring for the BSR brake control

Example: Motor: AC 230 V / AC 400 V

Brake: AC 230 V



242599819

[1] Brake coil
[2] SR11/15 current relay

9.1.7 BMP3.1 brake control in the terminal box

Brake BE120; BE122

BMP3.1 brake control

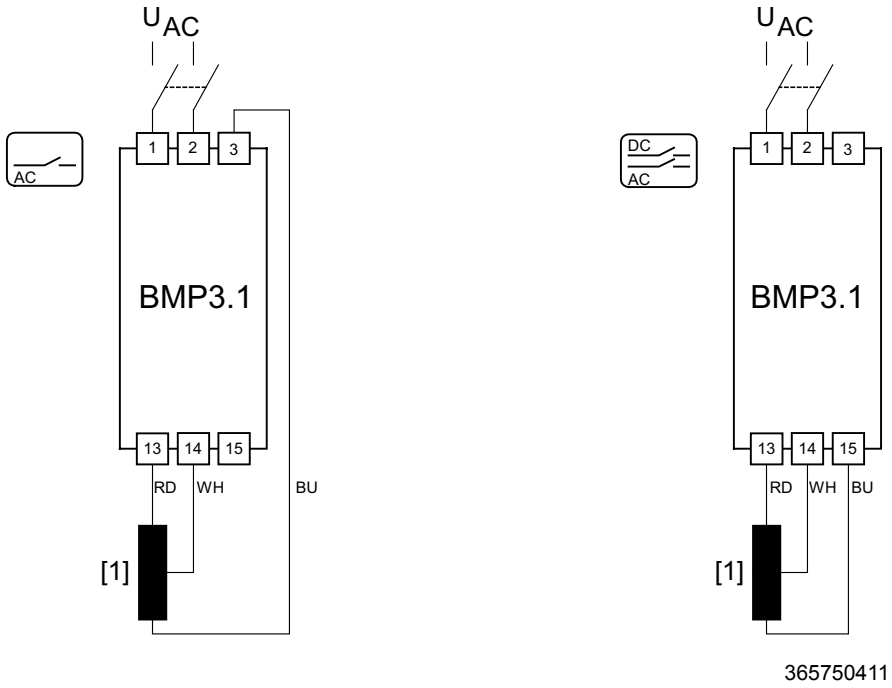
Apply voltage to release the brake (see nameplate).

Contact rating of the brake contactors: AC3 according to EN 60947-4-1

Separate supply cables are required for the voltage supply.

BMP3.1

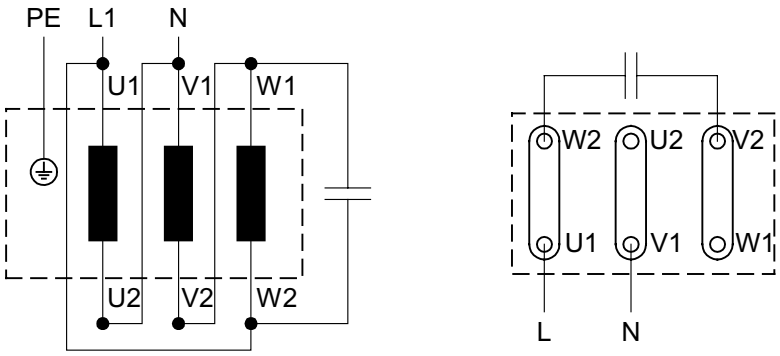
The following figure shows the wiring for the BMP3.1 brake rectifier for the AC-side cut-off as well as the DC and AC-side cut-off.



[1] Brake coil

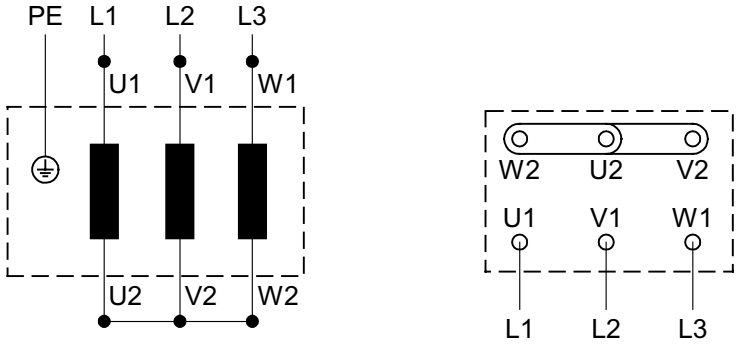
9.1.8 V forced cooling fan

△ - *Steinmetz* The following figure shows the wiring of the V forced cooling fan for delta-Steinmetz connection for 1-phase operation



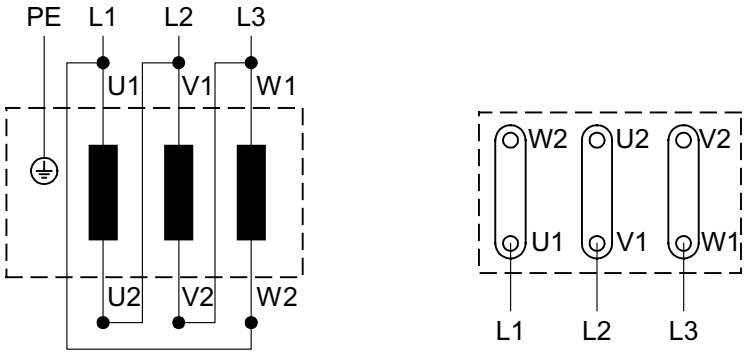
523348491

⅄ *connection* The following figure shows the wiring of the V forced cooling fan for ⅄ connection.



523350155

△ *connection* The following figure shows the wiring of the V forced cooling fan for △ connection.



523351819

10 Malfunctions

10.1 Motor malfunctions

Malfunction	Possible cause	Remedy
Motor does not start up	Supply cable interrupted	Check the connections and (intermediate) terminal points, correct if necessary)
	Brake does not release	See section "Brake malfunctions" (see page 119)
	Supply cable fuse has blown	Replace fuse
	Motor protection (switch) has triggered	Check that the motor protection (switch) is set correctly; current specification is on the nameplate
	Motor protection does not trip	Check motor protection control
	Malfunction in control or in the control process	Observe the switching sequence; correct if necessary
Motor only starts with difficulty or does not start at all	Motor power designed for delta connection but connected in star	Correct the connection from star to delta; follow the wiring diagram
	Motor power designed for star-star connection but only connected in star	Correct the connection from star to star-star; follow the wiring diagram
	Voltage or frequency deviate considerably from setpoint, at least while being switched on.	Provide better power supply system; reduce the power supply load; Check cross section of supply cable, replace with cable of larger cross section if need be.
Motor does not start in star connection, only in delta connection	Star connection does not provide sufficient torque	If the delta inrush current is not too high (observe the regulations of the power supplier), start up directly in delta; Check the project planning and use a larger motor or special version if necessary (consult with SEW-EURODRIVE)
	Contact fault on star/delta switch	Check the switch, replace if necessary; Check the connections
Incorrect direction of rotation	Motor connected incorrectly	Swap two phases of the motor supply cable
Motor hums and has high current consumption	Brake does not release	See section "Brake malfunctions" (see page 119)
	Winding defective	Send motor to specialist workshop for repair
	Rotor rubbing	
Fuses blow or motor protection trips immediately	Short circuit in the motor supply cable	Repair short circuit
	Supply cables connected incorrectly	Correct the wiring, observe the wiring diagram
	Short circuit in motor	Send motor to specialist workshop for repair
	Ground fault on motor	
Severe speed loss under load	Motor overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Voltage drops	Check cross section of supply cable, replace with cable of larger cross section if need be
Motor heats up excessively (measure temperature)	Overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Insufficient cooling	Provide for cooling air supply or clear cooling air passages, retrofit forced cooling fan if necessary. Check the air filter, clean or replace if necessary
	Ambient temperature is too high	Observe the permitted temperature range, reduce the load if necessary
	Motor in delta connection instead of star connection as provided for	Correct the wiring, observe the wiring diagram
	Loose contact in supply cable (one phase missing)	Tighten loose contact, check connections, observe wiring diagram
	Fuse has blown	Look for and rectify cause (see above); replace fuse
	Supply voltage deviates from the rated motor voltage by more than 5% (range A)/ 10% (range B).	Adjust motor to supply voltage.
	Rated operation type (S1 to S10, DIN 57530) exceeded, e.g. through excessive starting frequency	Adjust the rated operating mode of the motor to the required operating conditions; consult a professional to determine the correct drive if necessary

Malfunction	Possible cause	Remedy
Excessively loud operating noise	Ball bearing compressed, dirty or damaged	Re-align motor and the driven machine, inspect rolling bearing and replace if necessary. See section"Permitted rolling bearing types" (see page 106).
	Vibration of rotating parts	Look for the case, possibly an imbalance; correct the cause, observe method for balancing
	Foreign bodies in cooling air passages	Clean the cooling air passages

10.2 Brake malfunctions

Malfunction	Possible cause	Remedy
Brake does not release	Incorrect voltage on brake control unit	Apply the correct voltage; brake voltage specified on the nameplate
	Brake control unit failed	Install a new brake control, check resistors and insulation of the brake coils (see "Resistors" section for resistance values). Check switchgear, replace if need be
	Max. permitted working air gap exceeded because brake lining worn down.	Measure and set working air gap. See the following sections: • "Setting the working air gap of brakes BE05-BE32" (see page 66) "Setting the working air gap of brakes BE120-BE122" (see page 84) If the brake disk is too thin, replace the brake disk. See the following sections: • "Replacing the brake disk of BE05-BE32 brakes" (see page 68) • "Replacing the brake disk of brakes BE120-BE122" (see page 86)
	Voltage drop on supply cable > 10%	Provide correct connection voltage: brake voltage specifications on the nameplate. Check the cross section of the brake supply cable, increase cross section if necessary.
	Inadequate cooling, brake overheats	Provide for cooling air supply or clear cooling air passages, check air filter, clean or replace if necessary. Replace type BG brake rectifier with type BGE.
	Brake coil has interturn short circuit or a short circuit to frame	Check resistors and insulation of the brake coils (see "Resistors" section for resistance values); Replace complete brake and brake control (specialist workshop), Check switchgear, replace if need be
	Rectifier defective	Replace rectifier and brake coil; it may be more economical to replace the complete brake.

Malfunction	Possible cause	Remedy
Brake does not brake	Working air gap not correct	Measure and set working air gap. See the following sections: • "Setting the working air gap of brakes BE05-BE32" (see page 66) • "Setting the working air gap of brakes BE120-BE122" (see page 84) If the brake disk is too thin, replace the brake disk. See the following sections: • "Replacing the brake disk of BE05-BE32 brakes" (see page 68) • "Replacing the brake disk of brakes BE120-BE122" (see page 86)
	Brake lining worn	Replace entire brake disk. See the following sections: • "Replacing the brake disk of BE05-BE32 brakes" (see page 68) • "Replacing the brake disk of brakes BE120-BE122" (see page 86)
	Incorrect braking torque.	Check the project planning and change the braking torque if need be; see section "Work done, working air gap, braking torques" (see page 95) • by changing the type and number of brake springs. See the following sections: – "Changing the braking torque of brakes BE05-BE32" (see page 70) – "Changing the braking torque of brakes BE120-BE122" (see page 88) • by selecting a different brake See section "Braking torque assignment" (see page 96)
	Working air gap so large that setting nuts for the manual release come into contact.	Set the working air gap. See the following sections: • "Setting the working air gap of brakes BE05-BE32" (see page 66) • "Setting the working air gap of brakes BE120-BE122" (see page 84)
	Manual brake release device not set correctly	Set the setting nuts for the manual release correctly See the following sections: • "Changing the braking torque of brakes BE05-BE32" (see page 70) • "Changing the braking torque of brakes BE120-BE122" (see page 88)
	Brake locked by manual brake release HF	Loosen the setscrew, remove if need be
Brake is applied with time lag	Brake is switched only on AC voltage side	Switch both the DC and AC sides (e.g. through retrofitting the current relay from SR to BSR or the voltage relay from UR to BUR); observe wiring diagram
Noises in vicinity of brake	Gearing wear on the brake disk or the carrier caused by jolting startup	Check the project planning, replace the brake disk if need be See the following sections: • "Replacing the brake disk of BE05-BE32 brakes" (see page 68) • "Replacing the brake disk of brakes BE120-BE122" (see page 86) Have a specialist workshop replace the carrier
	Pulsating torques due to incorrectly set frequency inverter	Check correct setting of frequency inverter according to its operating instructions, correct if need be.

10.3 Malfunctions when operated with a frequency inverter

The symptoms described in section "Motor malfunctions" may also occur when the motor is operated with a frequency inverter. Please refer to the frequency inverter operating instructions for the meaning of the problems that occur and to find information about rectifying the problems.

10.4 Customer service

Please have the following information available if you require customer service assistance:

- Nameplate data (complete)
- Type and extent of the problem
- Time the problem occurred and any accompanying circumstances
- Assumed cause
- Ambient conditions such as:
  - Ambient temperature
  - Humidity
  - Installation altitude
  - Dirt
  - etc.

11 Address List

Germany			
Headquarters **Production** **Sales**	**Bruchsal**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal P.O. Box Postfach 3023 • D-76642 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
Service Competence Center	**Central**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 D-76676 Graben-Neudorf	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 sc-mitte@sew-eurodrive.de
	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 40-42 D-30823 Garbsen (near Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 sc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 D-08393 Meerane (near Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-30 sc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 D-85551 Kirchheim (near München)	Tel. +49 89 909552-10 Fax +49 89 909552-50 sc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 D-40764 Langenfeld (near Düsseldorf)	Tel. +49 2173 8507-30 Fax +49 2173 8507-55 sc-west@sew-eurodrive.de
	Electronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 sc-elektronik@sew-eurodrive.de
	Drive Service Hotline / 24 Hour Service		+49 180 5 SEWHELP +49 180 5 7394357
	Additional addresses for service in Germany provided on request!		

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	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
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	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au

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	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Development Area Shenyang, 110141	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
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	Busan	SEW-EURODRIVE KOREA Co., Ltd. No. 1720 - 11, Songjeong - dong Gangseo-ku Busan 618-270	Tel. +82 51 832-0204 Fax +82 51 832-0230 master@sew-korea.co.kr

Latvia			
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Lebanon			
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Lithuania			
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Luxembourg			
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Assembly **Sales** **Service**	**Johore**	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my

Mexico			
Assembly **Sales** **Service**	**Queretaro**	SEW-EURODRIVE MEXIKO SA DE CV SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Queretaro C.P. 76220 Queretaro, Mexico	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx

Morocco			
Sales	**Casablanca**	Afit 5, rue Emir Abdelkader MA 20300 Casablanca	Tel. +212 22618372 Fax +212 22618351 ali.alami@premium.net.ma

Netherlands			
Assembly **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 http://www.vector.nu info@vector.nu

New Zealand			
Assembly **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz

Norway			
Assembly **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no

Peru			
Assembly **Sales** **Service**	**Lima**	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe

Poland			
Assembly **Sales** **Service**	**Lodz**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 PL-92-518 Łódź	Tel. +48 42 67710-90 Fax +48 42 67710-99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
		24 Hour Service	Tel. +48 602 739 739 (+48 602 SEW SEW) sewis@sew-eurodrive.pl

Portugal			
Assembly **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt

Romania			
Sales **Service**	**Bucureşti**	Sialco Trading SRL str. Madrid nr.4 011785 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro

Russia			
Assembly **Sales** **Service**	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 36 195220 St. Petersburg Russia	Tel. +7 812 3332522 +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru

Senegal			
Sales	**Dakar**	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 senemeca@sentoo.sn

Serbia			
Sales	**Beograd**	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor SCG-11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.co.yu

Singapore			
Assembly **Sales** **Service**	**Singapore**	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com

Slovakia			
Sales	**Bratislava**	SEW-Eurodrive SK s.r.o. Rybničná 40 SK-831 06 Bratislava	Tel. +421 2 33595 202 Fax +421 2 33595 200 sew@sew-eurodrive.sk http://www.sew-eurodrive.sk
	Žilina	SEW-Eurodrive SK s.r.o. Industry Park – PChZ ulica M.R.Štefánika 71 SK-010 01 Žilina	Tel. +421 41 700 2513 Fax +421 41 700 2514 sew@sew-eurodrive.sk

Slovakia			
	Banská Bystrica	SEW-Eurodrive SK s.r.o. Rudlovská cesta 85 SK-974 11 Banská Bystrica	Tel. +421 48 414 6564 Fax +421 48 414 6566 sew@sew-eurodrive.sk
	Košice	SEW-Eurodrive SK s.r.o. Slovenská ulica 26 SK-040 01 Košice	Tel. +421 55 671 2245 Fax +421 55 671 2254 sew@sew-eurodrive.sk

Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 SLO - 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net

South Africa			
Assembly **Sales** **Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 494-3104 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442 Cape Town	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 jhainsworth@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 2 Monaceo Place Pinetown Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 700-3451 Fax +27 31 700-3847 hengela@sew.co.za

Spain			
Assembly **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 Fax +34 94 43184-71 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es

Sweden			
Assembly **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Tel. +46 36 3442 00 Fax +46 36 3442 80 http://www.sew-eurodrive.se info@sew-eurodrive.se

Switzerland			
Assembly **Sales** **Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch

Thailand			
Assembly **Sales** **Service**	**Chonburi**	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com

Tunisia			
Sales	**Tunis**	T. M.S. Technic Marketing Service 5, Rue El Houdaibiah 1000 Tunis	Tel. +216 71 4340-64 + 71 4320-29 Fax +216 71 4329-76 tms@tms.com.tn

Turkey			
Assembly **Sales** **Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Bagdat Cad. Koruma Cikmazi No. 3 TR-34846 Maltepe ISTANBUL	Tel. +90 216 4419164, 3838014, 3738015 Fax +90 216 3055867 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr

Ukraine			
Sales **Service**	**Dnepropetrovsk**	SEW-EURODRIVE Str. Rabochaja 23-B, Office 409 49008 Dnepropetrovsk	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua

USA			
Production **Assembly** **Sales** **Service** **Cooporate Offices**	**Southeast Region**	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Manufacturing +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly **Sales** **Service**	**Northeast Region**	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 440-3799 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Additional addresses for service in the USA provided on request!		

Venezuela			
Assembly **Sales** **Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo	Tel. +58 241 832-9804 Fax +58 241 838-6275 http://www.sew-eurodrive.com.ve ventas@sew-eurodrive.com.ve sewfinanzas@cantv.net

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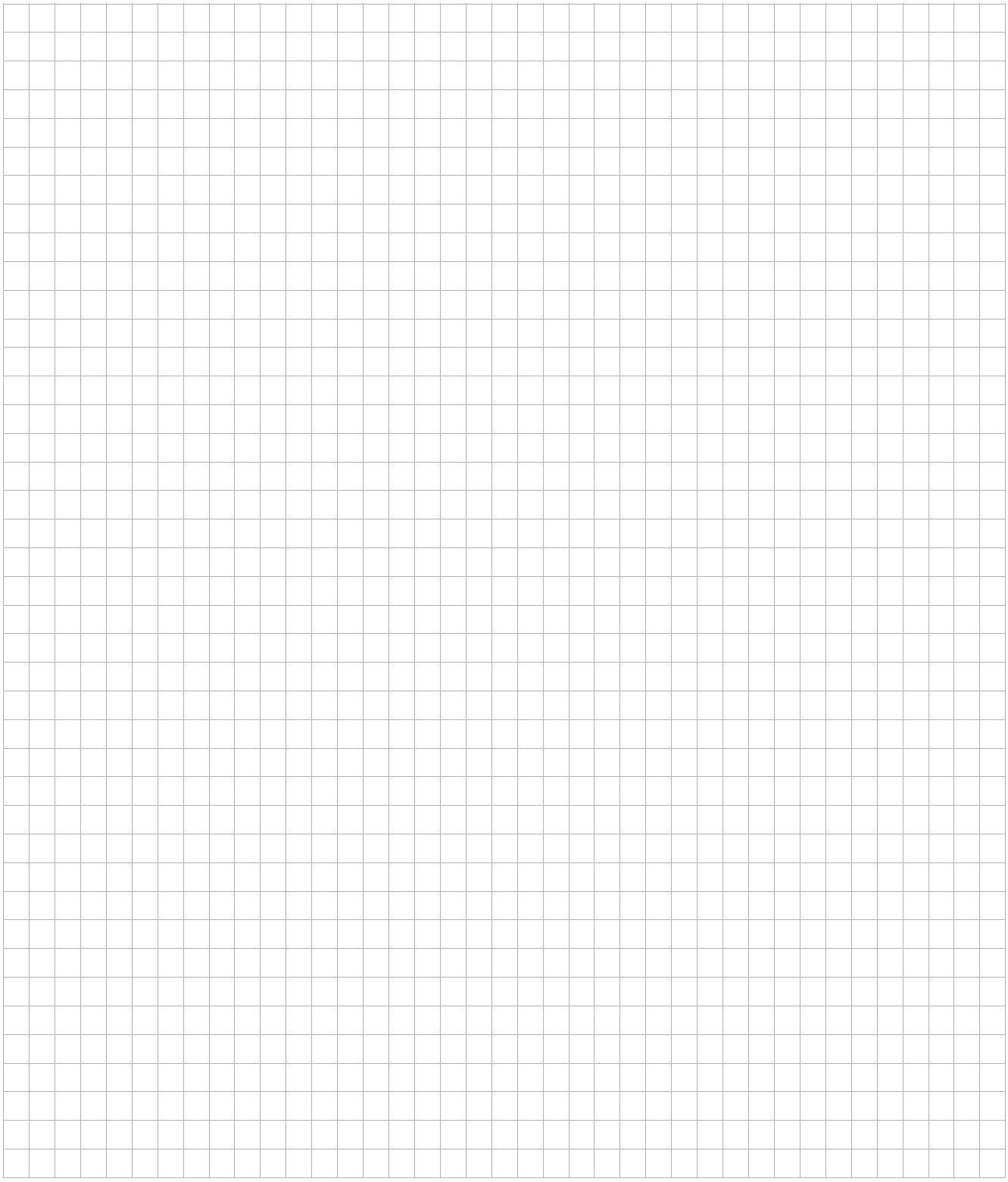

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With people who think fast and develop the future with you.

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With drives and controls that automatically improve your productivity.

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