

**B 2000 – en**

**Explosion-protected gear units**

Operating and Assembly Instructions

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### **Read document and keep for future reference**

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Read this document carefully prior to performing any work on or putting the device into operation. It is essential to read and observe the instructions in this document. They serve as the prerequisite for smooth and safe operation and the fulfilment of any warranty claims.

Contact Getriebebau NORD GmbH & Co. KG if your questions regarding the handling of the device are not answered in this document or if you require further information.

The German version of this document is the original. The German document is always decisive. If this document is available in other languages, this will be a translation of the original document.

Keep this document in the vicinity of the device so that it is available if required.

Use the version of this documentation that is valid for your device at the time of delivery. You can find the currently valid version of the documentation under [www.nord.com](http://www.nord.com).

Please also note the following documents:

- Gear unit catalogues,
- Documentation for the electric motor,
- Documentation for equipment which is attached or provided,
- Special documentation according to details on the name plate.

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## Documentation

Designation:	B 2000
Part no.:	6051402
Series:	Gear units and geared motors
Type series:	
Gear unit types:	<b>Helical gear units</b> <b>NORDBLOC.1® helical in-line gear unit</b> <b>Standard helical gear unit</b> <b>Parallel shaft gear units</b> <b>Bevel gear units</b> <b>Helical worm gear units</b> <b>MINIBLOC worm gear units</b> <b>UNIVERSAL worm gear units</b>

## Version list

Title, Date	Order number / Version	Remarks
	Internal code	
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<b>B 2000</b> , September 2014	<b>6051402</b> / 3814	<ul style="list-style-type: none"> <li>• General corrections</li> </ul>
<b>B 2000</b> , April 2015	<b>6051402</b> / 1915	<ul style="list-style-type: none"> <li>• New gear unit types SK 10382.1 + SK 11382.1</li> </ul>
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Title, Date	Order number / Version	Remarks
	Internal code	
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Table 1: Version list B 2000

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## Publisher

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## **1 Safety information**

### **1.1 Intended use**

These gear units are used to transmit rotary movements. They convert velocity and torque. They are intended for use as part of a drive system in commercially used plant and machinery. The gear units must not be operated until it has been established that the plant or machinery can be safely operated with the gear unit. Suitable protective measures must be provided if failure of a gear unit or a geared motor could result in a risk to persons. The plant or machinery must comply with local legislation and directives. All applicable health and safety requirements must be met. In particular, the Machinery Directive 2006/42/EC and UKCA "Supply of Machinery (Safety) Regulations 2008" must be especially observed in the relevant areas of application.

The gear units are suitable for use in explosion hazard areas according to the category stated on the name plate. For the category stated on the name plate, they comply with the explosion protection requirements of the 2014/34/EU and the "Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016: Great Britain" directives. The gear units may only be operated with components which are intended for use in explosion hazard areas. During operation, no mixture of atmospheres with gases, vapours and aerosols (Zone 1 or 2, IIG labelling), and dusts (Zone 21 or 22, IID labelling) may be present. In case of a hybrid mixture, the approval of the gear unit is void.

Structural modifications to the gear units are not permitted and result in the approval for the gear unit becoming void.

The gear units may only be used according to the information in the technical documentation from Getriebebau NORD GmbH & Co. KG. Damage to the gear unit may result if the gear unit is not used as intended and according to the information in the operating and installation manual. This may also result in personal injury.

The base or the gear unit mount must be appropriately dimensioned for the weight and torque. All of the fastenings provided must be used.

Some gear units are equipped with a cooling coil/cooling system. These gear units may only be operated if the cooling circuit is connected and in operation.

### **1.2 Safety information for explosion protection**

The gear units are suitable for use in explosion hazard areas. The following information must be observed in order to ensure adequate explosion protection.

Note all technical data stated on the name plate and comply with them. Observe the special documentation stated in field "S" of the name plate as well as instructions for equipment and attachments.

### 1.2.1 Field of use

- Gear units must be properly designed. Overloads may result in breakage of components. This may cause sparks. Carefully fill in the enquiry form. Getriebebau NORD GmbH & Co KG designs gear units according to the details in the enquiry form. Please note the information for gear unit selection in the enquiry form and in the catalogue.
- Explosion protection only applies for areas which correspond to the device category and the type of explosive atmosphere according to the labelling on the type plate. The type of gear unit and all technical data must comply with the planning details for the plant or machinery. If there are several operating points, the maximum drive power, torque or speed must not be exceeded in any operating point. The gear unit may only be operated in the installation position which complies with the version. Carefully check all details on the type plate before installing the gear unit.
- All work, e.g. transportation, storage, installation, electrical connection, commissioning, servicing and maintenance must be performed in a non-explosive atmosphere.
- The atmospheric conditions, in which the drive is commissioned, must be within an ambient pressure range from 80 kPa to 110 kPa and an oxygen content of approx. 21 % according to DIN EN ISO 80079-36.

### 1.2.2 Attachments and equipment

- Gear units with a cooling system for oil cooling must not be commissioned without lubricant cooling. The function of the lubricant cooling must be monitored. If the permissible temperature is exceeded, the drive must be shut down. Check for leaks at regular intervals.
- Equipment attached to the gear unit such as couplings (that can be mounted on input and output shafts), pulleys, cooling systems, pumps, sensors, etc., as well as drive motors must also be suitable for use in the zone with an explosive atmosphere. The ATEX labelling must conform to the details of the system and/or machine design.
- Couplings for the IEC or NEMA adapters described in this manual have no separate ATEX labelling.

### 1.2.3 Lubricants

- Unsuitable oils can cause an explosion risk. Therefore only use oils which correspond with the details on the name plate. Recommended lubricants can be found in the appendix to these operating and installation instructions.

### 1.2.4 Operating conditions

- If the gear unit is equipped with a back stop, note the minimum speed for releasing the back stop as well as the maximum speed. Gear units with a back stop on the drive shaft may only be operated with a minimum speed of the drive shaft of 900 min<sup>-1</sup>. Speeds which are too low cause increased wear and temperature increases. Excess speeds will damage the back stop.
- If the gear unit is exposed to direct sunlight or comparable radiation, the ambient temperature or the temperature of the cooling air must always be at least 10 K below the maximum permissible ambient temperature range "Tu" as stated on the name plate.
- Even small changes to the installation conditions can have a significant effect on the temperature of the gear unit. Gear units with temperature class T4 or with a maximum surface temperature of 135 °C or less must be provided with a temperature sticker. The dot in the middle of the temperature sticker turns black if the surface temperature is too high. Take the gear unit out of service immediately if the dot has turned black.

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### 1.2.5 Radial and axial forces

- Drive and driven elements may only be subjected to the maximum permitted radial forces  $F_{R1}$  and  $F_{R2}$  and axial forces  $F_{A2}$  indicated on the name plate (see Section 2.2 "Name plate").
- Observe the correct tension, particularly for belts and chains.
- Additional loads due to unbalanced hubs are not permitted.

### 1.2.6 Assembly, installation and commissioning

- Incorrect installation results in stresses and impermissibly high loads. This causes increased surface temperatures. Note the installation and assembly instructions in these operating and installation instructions.
- Before commissioning, carry out all of the checks which are prescribed in these operating and maintenance instructions in order to detect faults which could increase the risk of explosion in good time. Do not commission the gear unit if abnormalities are found during the checks. Contact Getriebebau NORD.
- For gear units with temperature class T4 or with a maximum surface temperature of less than 200 °C, carry out a measurement of the surface temperature of the gear unit before commissioning. Take the gear unit out of service if the measured surface temperature is too high.
- The gear unit housing must be earthed in order to prevent electrostatic charging.
- Defective lubrication causes temperature increases and sparks. Check the oil level before commissioning.

### 1.2.7 Service and maintenance

- Perform all of the inspection and maintenance work specified in these operating and installation instructions with great care, in order not to increase the risk of explosion due to functional faults and damage. The drive must be shut down if any abnormalities are detected. Contact Getriebebau NORD.
- Defective lubrication causes temperature increases and sparks. Check the oil level at regular intervals according to the details in these operating and installation instructions.
- Dust and dirt deposits cause temperature increases. Dust may also be deposited inside covers which are not dust-proof. Remove deposits at regular intervals according to the details in these operating and installation instructions.

### 1.2.8 Protection against electrostatic charging

- Non-conducting coatings, or low pressure hoses may become electrostatically charged. Sparks may be produced on discharge. Such components must not be used in areas in which processes that cause charging are to be expected. Oil reservoir tanks may only be located in areas with the gas group IIB.
- Having a suitable, electrostatically tested paint finish, the gear units are designed for Categories 2G Group IIC (Zone 1 Group IIC) and 2D Group IIIC (Zone 21 Group IIIC).
- In case of subsequent painting, it must be ensured that the paint used cannot become electrostatically charged.
- To prevent electrostatic charging, surfaces may only be cleaned with a damp cloth.

### 1.3 Applied ignition protection classes according to DIN EN ISO 80079-37

The following ignition protection types are used:

- Measures to ensure constructional safety "c"
  - Strength and thermal calculations for all applications,
  - Selection of suitable materials and components,
  - Calculation of a recommended interval for general overhaul,
  - Inspection interval for lubricant level, therefore ensuring lubrication of bearings, seals and gears,
  - Requirement for thermal check during commissioning.
- Measures to ensure encapsulation with liquid "k"
  - The gears are lubricated with a suitable lubricant,
  - Statement of approved lubricants on the name plate,
  - Statement of lubricant fill levels.
- Measures to ensure monitoring of sources of ignition "b"
  - Use of temperature monitoring for oil cooling systems as ignition protection system b1.

### 1.4 Do not make any modifications.

Do not make any structural modifications to the gear unit. Do not remove any protective guards. Do not change the original coating / paint or apply additional coatings / paints.

### 1.5 Performing inspection and maintenance work

Due to lack of maintenance and damage, malfunctions may occur which can result in personal injury.

- Carry out all servicing and maintenance work at the specified intervals.
- Also note that servicing is necessary after long storage periods prior to commissioning.
- Do not operate damaged gear units. The gear unit must not have any leaks.

### 1.6 Personnel qualification

All transport, storage, installation, commissioning and maintenance work must be carried out by qualified specialist personnel.

Qualified specialist personnel are persons who have the training and experience to recognise and avoid any possible risks.

Repairs may only be done by Getriebebau NORD GmbH & Co. KG or by a person authorised in accordance with the statutory regulations of explosion protection.

### 1.7 Safety for particular activities

#### 1.7.1 Check for transport damage

Transport damage may cause malfunctions of the gear unit, which may cause personal injury. Oil which escapes due to leaks may cause a slipping hazard.

- Check the packaging and the gear unit for transport damage.
- Do not operate damaged gear units.

#### 1.7.2 Safety information for installation and maintenance

Before starting work on the gear unit disconnect the drive from the power supply and secure it against accidental switch-on. Allow the gear unit to cool down. Depressurise the cooling circuit lines.

Damaged or defective components, attachment adapters, flanges and covers may have sharp edges. Wear work gloves and work clothing.

### 1.8 Hazards

#### 1.8.1 Hazards when lifting

Persons may be injured by falling or swinging gear units. Therefore also observe the following information:

- Cordon off a wide area around the hazard area. Take care that there is adequate space to avoid swinging loads.
- Never stand under suspended loads.
- Use adequately dimensioned means of transport which are suitable for the purpose. The weight of the gear unit can be obtained from the type plate.
- Only lift the gear unit by the factory-mounted eyebolts.

If there are no eyebolts available, screw one eyebolt according to DIN 580 into each provided threaded hole. The eyebolts must be fully screwed in.

Tighten the eyebolts only according to Chapter 3.1 "Transporting the gear unit". Only use the eyebolts to lift the gear unit without other components. The eye bolts are not designed for lifting the gear unit with attachments. Use the eyebolts on both the gear unit and the motor to lift a geared motor (observe the manufacturer's instructions for the motor).

#### 1.8.2 Hazards due to rotating parts

Rotating parts cause a risk of entanglement. This may lead to severe injuries such as crushing or strangling.

- Provide contact protection. In addition to shafts, this also applies to fans as well as drives and driven elements such as belt drives, chain drives, shrink discs and couplings. Take possible run-on of the machine into consideration for the design of protective devices.
- Do not operate the drive without covers or hoods.
- Secure the drive to prevent activation during installation and maintenance work.
- For test operation do not switch on the drive without an installed driven element or secure the motor shaft key.
- Also observe the safety information in the operating and installation instructions provided by manufacturers of components supplied.

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### 1.8.3 Hazards due to high or low temperatures

The gear unit may heat up to 90 °C during operation. Touching hot surfaces or contact with hot oil may result in burns. At very low ambient temperatures freezing may occur on contact.

- Only touch the gear unit when wearing gloves after operation or at very low ambient temperatures.
- Before starting maintenance work, allow the gear unit to cool down sufficiently after operation.
- Provide a contact guard if there is a risk that persons may touch the gear unit when it is in operation.
- Bursts of hot oil mist may be emitted from the pressure vent screw during operation. Provide a suitable guard so that persons cannot be injured by this.
- Do not place any flammable materials on the gear unit.

### 1.8.4 Hazards due to lubricants and other substances

Chemical substances which are used with the gear unit may be toxic. Eye injuries may result if these substances enter the eyes. Lubricants and adhesives may cause skin irritation.

Oil mist may escape when vent screws are opened.

Due to lubricants and conservation materials, gear units may be slippery and slip out of the hands. There is a slipping hazard from spilled lubricants.

- When working with chemical substances wear chemical-resistant gloves and work clothing. Wash your hands after working.
- Wear protective goggles if there is a possibility of splashed chemicals, for example when filling oil or during cleaning work.
- If chemicals enter the eyes, rinse with large amounts of cold water immediately. Consult a physician in case of symptoms.
- Observe the safety data sheets for the chemicals. Keep the safety data sheets in the vicinity of the gear unit.
- Collect spilled lubricants immediately with a binding agent.

### 1.8.5 Hazards due to noise

Some gear units or attached components may cause hazardous noise levels during operation. Wear hearing protection if work has to be carried out close to such gear units.

### 1.8.6 Hazards due to pressurised coolants

The cooling system is under high pressure. Damage or opening a cooling line which is under pressure may result in injury. Depressurise the cooling circuit before working on the gear unit.



## 2 Description of gear units

### 2.1 Gear unit types and type designations

Gear unit types/ Type designations
<b>UNICASE helical gear units</b> <b>2-stage:</b> SK 02, SK 12, SK 22 SK 32, SK 42, SK 52, SK 62N, SK 62, SK 72, SK 82, SK 92, SK 102 <b>3-stage:</b> SK 03, SK 13, SK 23, SK 33N, SK 43, SK 53, SK 63, SK 73, SK 83, SK 93, SK 103
<b>NORDBLOC.1@ helical gear unit</b> <b>1-stage:</b> SK 071.1, SK 171.1, SK 371.1, SK 571.1, SK 771.1, SK 871.1, SK 971.1, SK 1071.1 <b>2-stage:</b> SK 072.1, SK 172.1, SK 372.1, SK 572.1, SK 672.1, SK 772.1, SK 872.1, SK 972.1 <b>3-stage:</b> SK 373.1, SK 573.1, SK 673.1, SK 773.1, SK 873.1, SK 973.1
<b>STANDARD helical gear units</b> <b>2-stage:</b> SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 <b>3-stage:</b> SK 010, SK 200, SK 250, SK 300, SK 330
<b>UNICASE parallel gear units</b> <b>2-stage:</b> SK 0182NB, SK 0182.1, SK 0282NB, SK 0282.1, SK 1282, SK 1282.1, SK 2282, SK 3282, SK 4282, SK 5282, SK 6282, SK 7282, SK 8282, SK 9282 <b>3-stage:</b> SK 2382, SK 3382, SK 4382, SK 5382, SK 6382, SK 7382, SK 8382, SK 9382, SK 10382, SK 10382.1, SK 11382
<b>UNICASE bevel gear units</b> <b>3-stage:</b> SK 9012.1, SK 9016.1, SK 9022.1, SK 9032.1, SK 9042.1, SK 9052.1, SK 9062.1, SK 9072.1, SK 9082.1, SK 9086.1, SK 9092.1, SK 9096.1 <b>4-stage:</b> SK 9013.1, SK 9017.1, SK 9023.1, SK 9033.1, SK 9043.1, SK 9053.1
<b>NORDBLOC.1@ bevel gear unit</b> <b>2-stage:</b> SK 920072.1, SK 92072.1, SK 92172.1, SK 92372.1, SK 92672.1, SK 92772.1, SK 930072.1, SK 93072.1, SK 93172.1, SK 93372.1, SK 93672.1, SK 93772.1
<b>UNICASE worm gear units</b> <b>2-stage:</b> SK 02040, SK 02040.1, SK 02050, SK 12063, SK 12080, SK 32100, SK 42125 <b>3-stage:</b> SK 13050, SK 13063, SK 13080, SK 33100, SK 43125
<b>UNIVERSAL SI worm gear units</b> <b>1-stage:</b> SK 1SI31, SK 1SID31, SK 1SI40, SK 1SID40, SK 1SI50, SK 1SID50, SK 1SI63, SK 1SID63, SK 1SI75 <b>2-stage (Helical worm gear unit):</b> SK 2SID40, SK 2SID50, SK 2SID63
<b>UNIVERSAL SMI worm gear units</b> <b>1-stage:</b> SK 1SMI31, SK 1SMID31, SK 1SMI40, SK 1SMID40, SK 1SMI50, SK 1SMID50, SK 1SMI63, SK 1SMID63, SK 1SMI75 <b>2-stage (Helical worm gear unit):</b> SK 2SMID40, SK 2SMID50, SK 2SMID63

**Table 2: Gear unit types and type designations**

Double gear units consist of two single gear units. The type designation of the SK 73/22 double gear unit, for example, means that the double gear unit consists of the single gear units SK 73 and SK 22.

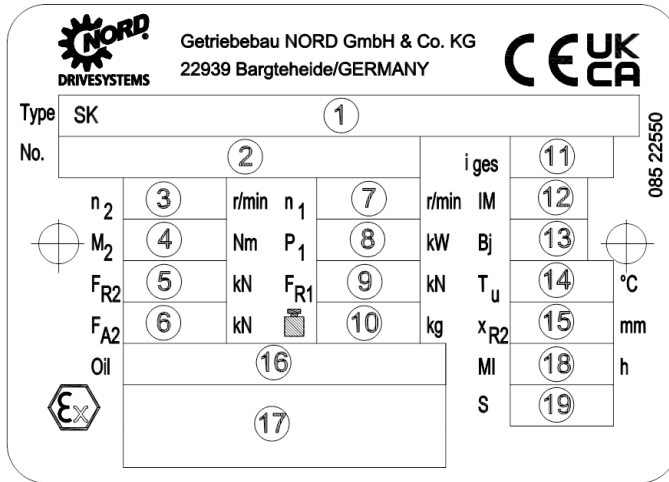
Abbreviation	Description
(without)	Foot mounting with solid shaft
/31	Worm gear first stage
/40	Worm gear first stage
5	Reinforced output shaft
A	Hollow shaft
AI	Standard IEC motor attachment
AI...BRG1	Standard IEC motor attachment with manual re-lubrication
AI...RLS	Standard IEC motor attachment with integrated back stop
AL	Reinforced axial bearing
AN	Standard NEMA motor attachment
AN...BRG1	Standard NEMA motor attachment with manual re-lubrication
AN...RLS	Standard NEMA motor attachment with integrated back stop
B	Fastening element
CC	Cooling coil
D	Torque arm
EA	Splined hollow shaft
F	B5 flange
G	Rubber buffer for torque arm
H	Cover cap
/H10	Modular helical pre-stage for universal worm gear units
H66	IP66 cover
IEC	Standard IEC motor attachment
K	Torque bracket
L	Solid shaft both sides
NEMA	Standard NEMA motor attachment
OA	Oil expansion chamber
OT	Oil level tank
R	Back stop
S	Shrink disc
SCX	Screw conveyor flange ATEX
SO1	Synthetic oil ISO VG 220
V	Solid shaft (for standard helical gear units: reinforced drive)
VG	Reinforced rubber buffer
VI	Viton radial shaft seals
VL	Reinforced output bearings
VL2	Agitator version - Reinforced bearings
VL3	Agitator version - Reinforced bearings - Drywell
VS	Reinforced shrink disc
W	Free drive shaft
X	Housing foot mounting
Z	B14 flange

Table 3: Versions and options

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### 2.2 Name plate

The name plate must be permanently attached to the gear unit and must not be exposed to permanent soiling. Please contact the NORD service department if the name plate is illegible or damaged.



Type SK		①													
No.		②				i ges		⑪							
n <sub>2</sub>		③		r/min n <sub>1</sub>		⑦		r/min IM		⑫					
M <sub>2</sub>		④		Nm P <sub>1</sub>		⑧		kW Bj		⑬					
F <sub>R2</sub>		⑤		kN F <sub>R1</sub>		⑨		kN T <sub>u</sub>		⑭		°C			
F <sub>A2</sub>		⑥		kN		⑩		kg x <sub>R2</sub>		⑮		mm			
Oil		⑯						MI		⑰		h			
Ex		⑰						S		⑱					

Figure 1: Name plate

#### Explanation

- |    |   |    |   |
|----|---|----|---|
| 1  | NORD gear unit type   | 16 | Lubricant type, viscosity and quantity  |
| 2  | Serial number   | 17 | Labelling according to DIN EN ISO 80079-36:   |
| 3  | Nominal speed of gear unit output shaft <sup>1)</sup>                               | 1. | Group (always II, not for mines)  |
| 4  | Rated torque of gear unit output shaft  | 2. | Category (2G, 3G for gas, or 2D, 3D for dust)   |
| 5  | Max. permissible transverse force on the gear unit output shaft                     | 3. | Labelling of non-electrical devices (Ex h) or ignition protection type, if present (c)  |
| 6  | Max. permissible axial force on the gear unit output shaft                          | 4. | Explosion group, if present (Gas: IIC, IIB; Dust: IIIC, IIIB)   |
| 7  | Nominal speed of the gear unit input shaft or drive motor <sup>1)</sup>             | 5. | Temperature class (T1–T3 or T4 for gas) or max. surface temperature (e.g. 125 °C for dust) or special max. surface temperature, see special documentation |
| 8  | Max. permissible drive power  | 6. | EPL (equipment protection level) Gb, Db, Gc, Dc   |
| 9  | Max. permissible transverse force on the gear unit input shaft for option W         | 7. | Note the special documentation and/or temperature measurement during commissioning (x)  |
| 10 | Weight  | 18 | Interval for general overhaul in operating hours or according to the specification of the dimensionless maintenance class CM                              |
| 11 | Overall gear unit ratio   | 19 | Number of the special documentation   |
| 12 | Installation position   |    |   |
| 13 | Year of manufacture   |    |   |
| 14 | Permissible ambient temperature range   |    |   |
| 15 | Max. dimension for the point of application of the transverse force F <sub>R2</sub> |    |   |

<sup>1)</sup> The maximum permissible speeds are 10% above the nominal speed if the maximum permissible drive power P<sub>1</sub> is not exceeded.

If the fields F<sub>R1</sub>, F<sub>R2</sub>, and F<sub>A2</sub> are empty, the forces are zero. If the field x<sub>R2</sub> is empty, the point of application of force F<sub>R2</sub> is central on the output shaft journal.

For geared motors (gear units with attached electric motor), the electric motor has its own name plate with separate labelling according to Directive 2014/34/EU (ATEX). The motor labelling must also comply with the data for the system and machine planning.

**The lower explosion protection on the gear unit and electric motor labelling applies for the geared motor unit.**

If the electric motor is driven with a frequency inverter, the motor requires approval for inverter operation according to Directive 2014/34/ EU. If the motor is operated with an inverter, significant differences between the nominal speeds on the name plates of motor and the gear unit are normal and permissible. For operation of the motor with mains supply, differences of the nominal speeds on the name plates of motor and gear unit of up to  $\pm 60$  rpm are permissible.

### 2.3 UKCA certification

The explosion-proof gear units intended for use in Great Britain and Northern Ireland comply with the following British directive:

“The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016”

The gear units also have the UKCA labelling on the name plate.

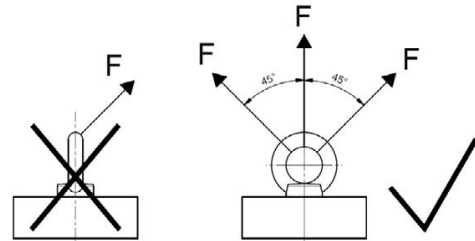
### 3 Transport, storage, assembly

#### 3.1 Transporting the gear unit

#### WARNING

##### Hazard due to falling loads

- The thread of the eyebolt must be fully screwed in.
- As shown in the illustration to the right, only lift on the eyebolts vertically to the female thread and not more oblique than 45° to the vertical.
- Note the centre of gravity of the gear unit.



Only use the eyebolts attached to the gear unit for transport. If geared motors have an additional eyebolt attached to the motor, this must also be used.

Transport the gear unit with care. Impacts to the free ends of shafts may cause internal damage to the gear unit.

No additional loads must be attached to the gear unit.

Use suitable aids such as cross-beams or similar to facilitate the attachment or transportation of the gear unit. Gear units without eyebolts may only be transported with shackles and lifting straps or chains at an angle of 90° to 70° to the horizontal.

#### 3.2 Storage and downtimes

##### 3.2.1 General measures

- Store the gear unit in a dry space, relative humidity less than 60%.
- Store the gear unit at a temperature in the range of – 5 °C to + 50 °C without severe temperature fluctuations.
- Do not expose the gear unit to direct sunlight or UV light.
- There must be no aggressive or corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity.
- The gear unit must not be exposed to vibration or oscillation.
- Store the gear unit in the mounting position (see chapter 7.1 "Versions and mounting position"). Secure it against falling.

### 3.2.2 Storage and downtimes in excess of 3 months

Note the following measures in addition to Section 3.2.1 "General measures".

- Repair damages to the coating. Check if a corrosion protection agent has been applied to the flange bearing surfaces, the shaft ends and the unpainted surfaces. If required, apply a suitable corrosion protection agent to the surfaces.
- Seal all openings on the gear unit.
- The output shaft must be rotated by at least one revolution every 3 months so that the contact position of the gear teeth and the roller bearings are changed.

### 3.2.3 Storage and downtimes of more than 9 months

Under certain conditions, storage of 2 to 3 years is possible. The specified storage duration is only approximate. The actual storage duration depends on the local conditions. Note the following measures in addition to Sections 3.2.1 "General measures" and 3.2.2 "Storage and downtimes in excess of 3 months".

Gear units can be supplied prepared for long-term storage. The gear units are completely filled with lubricant, or a VCI corrosion protection agent is added to the gear oil. The adhesive label on the housing shows the respective information.

#### **Conditions of the gear unit and storage area for long-term storage prior to commissioning:**

- Store the gear unit at a temperature in the range of -5 °C to +40 °C without severe temperature fluctuations.
- Check if the sealing cord in the vent screw is in place. It must not be removed during storage.
- Store the gear unit in a dry space. With a relative humidity less than 60%, the gear unit can be stored for up to 2 years; with a relative humidity less than 50%, storage of up to 3 years is possible.
- In tropical regions, protect the gear unit against damage by insects.
- Gear unit components such as motors, brakes, couplings, belt drive, and cooling units must be protected for a long-term storage in accordance to their operating instructions.

In addition to the preparations listed in 4 "Commissioning", the following measures are necessary before commissioning:

- Check the gear unit for external damage.
- After storage of more than 2 years, or with storage temperatures outside the permissible range from -5 °C to +40 °C, change the lubricant in the gear unit before commissioning.
- If the gear unit is completely filled, the oil level must be reduced according to the mounting position. For the lubricant quantity and lubricant type, refer to the information on the name plate.
- For the option with manual re-lubrication, change the bearing grease after a storage period of more than two years. The service life of the grease is reduced after a storage time or gear unit shutdown of more than 9 months (see chapter 5.2.11 "Re-greasing (Option: VL2, VL3, W, AI, AN)").

### 3.3 Checking the version

The gear unit may only be operated in the stated version. The permissible version is stated in the field IM on the name plate. Gear units with the abbreviation UN in field IM of the name plate are version-independent. Section 7.1 "Versions and mounting position" shows the versions of the individual gear unit types. If an X is present in the field IM, the special documentation, whose number is stated in field S, must be observed.

Ensure that the version as stated on the name plate complies with the installation position and that the installation position does not change during operation.

For geared motors, also pay attention to the operating instructions of the motor.

## 3.4 Preparing for installation

### 3.4.1 Check for damages

Please examine the delivery for transport and packaging damage immediately on receipt. Pay particular attention to radial shaft seals and sealing caps. Report any damage to the carrier immediately.

Do not put the drive into operation if damage such as leaks are visible.

### 3.4.2 Remove corrosion protection agents

All bare metal surfaces and shafts of the drive are protected with corrosion protection agents before shipping.

Thoroughly remove corrosion protection agents and any dirt (e.g. colour residues) from all shafts, flange surfaces and gear unit attachment surfaces before assembly.

### 3.4.3 Check rotational direction

If an incorrect rotational direction may result in damage or potential risk, check for the correct rotational direction of the output shaft during a test run before attaching it to the machine. Ensure the correct rotational direction during operation.

For gear units with an integrated back stop, switching the drive motor to the blocked direction of rotation, may result in damage to the gear unit. Gears with integrated back stops are marked with arrows on the drive/driven sides. The arrows point in the rotation direction of the gear unit. When connecting the motor and during motor control, ensure, e.g. by testing the field of rotation, that the gear unit can only operate in the direction of rotation.

### 3.4.4 Check ambient conditions

Make sure that no aggressive or corrosive substances which attack metal, lubricants or elastomers are present at the installation site or are subsequently expected during operation. If such substances are to be expected, contact Getriebebau NORD.

The gear unit, especially its radial shaft seals should be protected from exposure to direct sunlight.

### 3.4.5 Installing the oil expansion chamber (Option: OA)

Mount the oil expansion chamber (Option OA) according to Chapter 3.15 "Installation of an oil expansion chamber (Option: OA)".

### 3.4.6 Installing the oil reservoir tank (Option: OT)

Mount the oil reservoir tank (Option OT) according to document WN 0-521 30.

For explosion-protected gear units, pressure venting is mandatory. Screw the enclosed M12x1.5 pressure relief vent into the oil reservoir tank.



### 3.5 Installing the gear unit

#### DANGER



#### Explosion hazard

- No explosive atmosphere must be present when installing the gear unit
- For geared motors, check that the cooling air from the motor fan can circulate around the gear unit without obstruction.

#### NOTICE

#### Damage of bearing and gear wheel

- Do not carry out any welding work on the gear unit.
- Do not use the gear unit as earth connection for welding work.

The following conditions must be met at the installation site in order to prevent overheating during operation:

- There must be adequate space around the gear unit.
- Air must be able to flow freely past all sides of the gear unit.
- For geared motors, the cooling air from the motor fan must be able to circulate around the gear unit without obstruction.
- The gear unit must not be enclosed or encased.
- The gear unit must not be exposed to high energy radiation.
- Do not direct warm exhaust air from other units onto the gear unit.
- The base or flange to which the gear unit is attached must not input any heat into the gear unit during operation.
- Do not allow dust to accumulate in the area of the gear unit

**Install the gear unit in the correct mounting position** (see chapter 7.1 "Versions and mounting position"). **Oil checking and oil drain screws must be accessible.**

The base or flange to which the gear unit is fitted should be vibration-free, torsionally rigid and flat. The flatness of the bolting surface on the base or flange must comply with DIN ISO 2768-2 tolerance class K.

Precisely align the gear unit with the drive shaft of the machine in order to prevent additional forces from being imposed on the gear unit due to distortion.

Fasten the gear unit to all gear unit feet of one side or to all flange holes. Use bolts with a minimum quality of 8.8. Tighten the bolts with correct torques (see chapter 7.3 "Screw tightening torques").

For foot and flange-mounted gear units (Option XZ or XF), ensure tension-free bolting. The foot mounting is used to fasten the gear unit. It is designed to absorb the reaction forces from the torque, radial and axial forces as well as the weight. B5 or B14 flanges are basically not designed to absorb the reaction forces. In case of doubt, contact Getriebbau NORD for investigation of the particular case.

Earth the gear unit housing. For geared motors, ensure the earthing via the motor connection.

### 3.6 Installation of a hub on solid shaft (option: V, L)

#### DANGER



#### Explosion hazard due to increased temperature or sparks

The gear unit may heat up to an impermissible extent if transverse forces are applied unfavourably. Bearing, gearing and housing may be damaged and cause sparks.

- The transverse force must be applied as closely as possible to the gear unit.

#### NOTICE

#### The gear unit may be damaged by axial forces.

Bearings, gearwheels, shafts and housings may be damaged by incorrect fitting.

- Use a suitable pulling device.
- Do not hit the hub with a hammer.

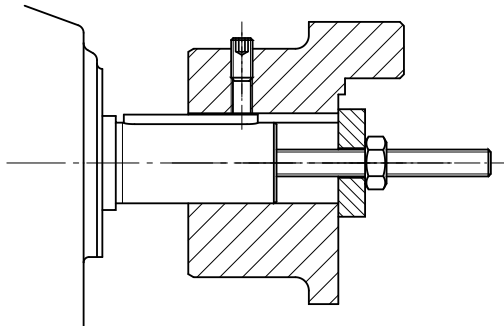


Figure 2: Example of a simple pulling device

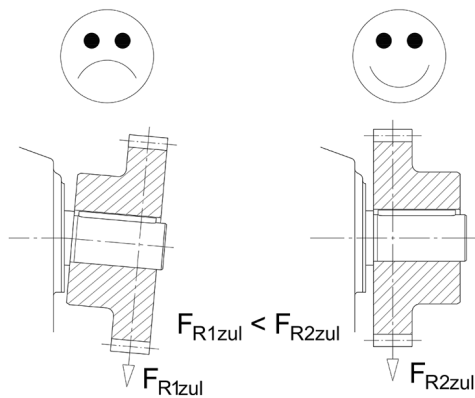
During fitting, ensure that the shaft axes are precisely aligned with each other. Comply with the permissible tolerance details provided by the manufacturer.

#### Information

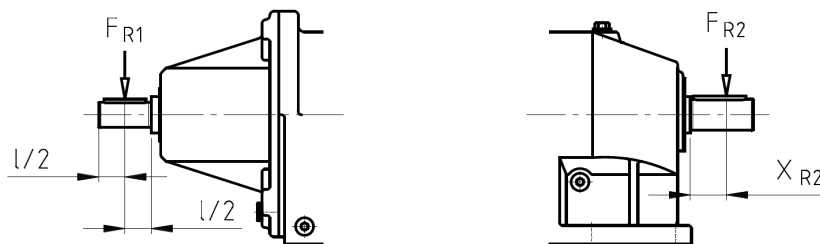
Use the end thread of the shafts for pulling. Fitting can be facilitated by coating the hub with lubricant or heating it up to approx. 100 °C beforehand.

**The maximum radial forces FR1 and FR2 and axial forces FA2 which are imposed on the driving and driven elements of the gear unit must not be exceeded** (refer to the name plate). Pay particular attention to the correct tension of belts and chains.

Additional loads due to unbalanced hubs are not permitted.



The transverse force must be applied as closely as possible to the gear unit. For drive shafts with free shaft ends (Option W), the maximum permissible transverse force  $F_{R1}$  applies for the application of the transverse force to the centre of the free shaft journal. For output shafts, the application of the transverse force  $F_{R2}$  must not exceed the dimension  $x_{R2}$ . If the radial force  $F_{R2}$  is stated on the name plate, but no dimension  $x_{R2}$  is stated, application of force is assumed to be to the centre of the shaft journal.



**Figure 3: Permissible application of force to drive and driven shafts**

### 3.7 Fitting push-on gear units with fastening element (option: B)

#### **⚠ WARNING**

##### **Risk of severe injuries**

If the screw fastenings of the torque arm are removed during operation, the gear unit will rotate around the output shaft.

- Secure the screw fastening against loosening, e.g. with Loctite 242 or a second nut.

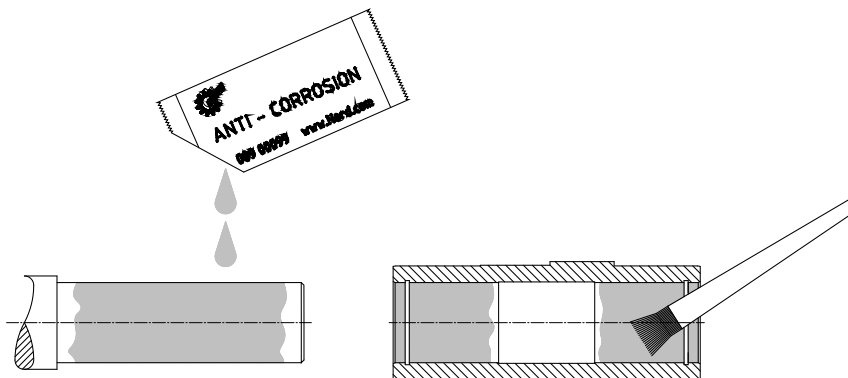
#### **NOTICE**

##### **The gear unit may be damaged by axial forces.**

Bearings, gearwheels, shafts and housings may be damaged by incorrect fitting.

- Use a suitable pulling device.
- Do not strike the gear unit with a hammer.

Assembly and subsequent dismantling is facilitated by applying an anti-corrosive lubricant to the shaft before fitting (e.g. NORD Anti-Corrosion Part No. 089 00099). Excess lubricant may escape after fitting and may drip off. This escape of grease is not due to a leak in the gear unit. Thoroughly clean these points on the output shaft after a running-in time of approx. 24 hours.



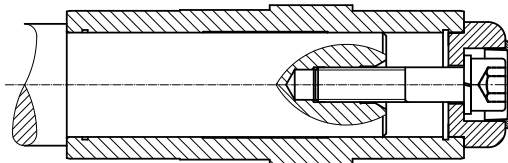
**Figure 4: Applying lubricant to the shaft and the hub**

For push-on gear units with cover cap IP66 (Option H66) and fastening element (Option B) the pressed-in closing cap must be pushed out before installing the gear unit. The pressed-in closing cap may be destroyed during dismantling. A 2nd closing cap is supplied as a spare part. Fit the closing cap after installation of the gear unit as described in Section 3.11 "Fitting the covers (option: H, H66)".

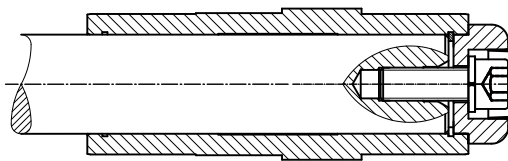


**Figure 5: Removing the factory-fitted closing cap**

The gear unit can be fitted to solid shafts with and without a shoulder using the fixing element (Option B). Tighten the fastening element bolt with correct torque (see chapter 7.3 "Screw tightening torques"). When fastening without a contact shoulder, a circlip is used in the hollow shaft for axial fastening.

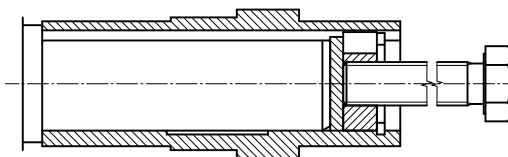


**Figure 6: Gear unit mounted on shaft with a shoulder using the fastening element**



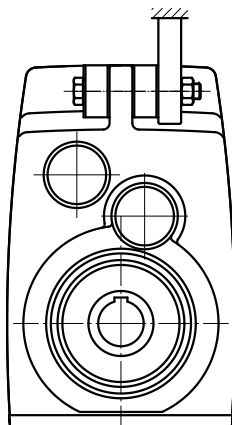
**Figure 7: Gear unit mounted on shaft without a shoulder using the fastening element**

A gear unit can be removed from a shaft with a shoulder e.g. using the following device.



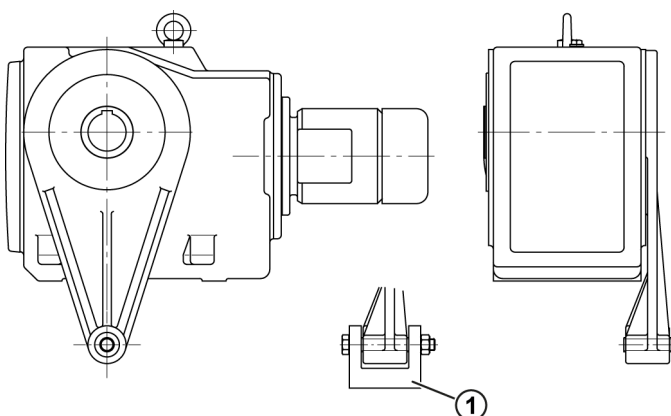
**Figure 8: Removal using dismantling device**

Do not distort the support when installing push-on gear units with a torque support. Tension-free mounting is aided by the rubber buffer (Option G or VG).



**Figure 9: Mounting the rubber buffer (Option G and/or VG) on parallel shaft gear units**

To fit the rubber buffer, tighten the screw fastening until there is no play between the contact surfaces when there is no load. For screw fastenings with standard thread, then rotate the fastening nut half a turn in order to pre-tension the rubber buffer. Greater pre-tension is not permissible.



**Explanation**

- 1 Always support torque support on both sides

**Figure 10: Attaching the torque support on bevel gear and worm gear units**

Tighten the fastenings of the torque support with the correct torque (see chapter 7.3 "Screw tightening torques") and secure them against loosening, e.g. with Loctite 242 or Loxeal 54-03.

#### 3.8 Fitting a hollow shaft with shrink disc (Option: S)

#### NOTICE

##### Risk of damage to the gear unit if the shrink disc is installed incorrectly

- Do not tighten the tensioning bolts if the solid shaft is not installed. This would permanently deform the hollow shaft.

Hollow shafts with shrink discs must be protected from dust, dirt and moisture. NORD recommends option H/H66 (see chapter 3.11 "Fitting the covers (option: H, H66)").

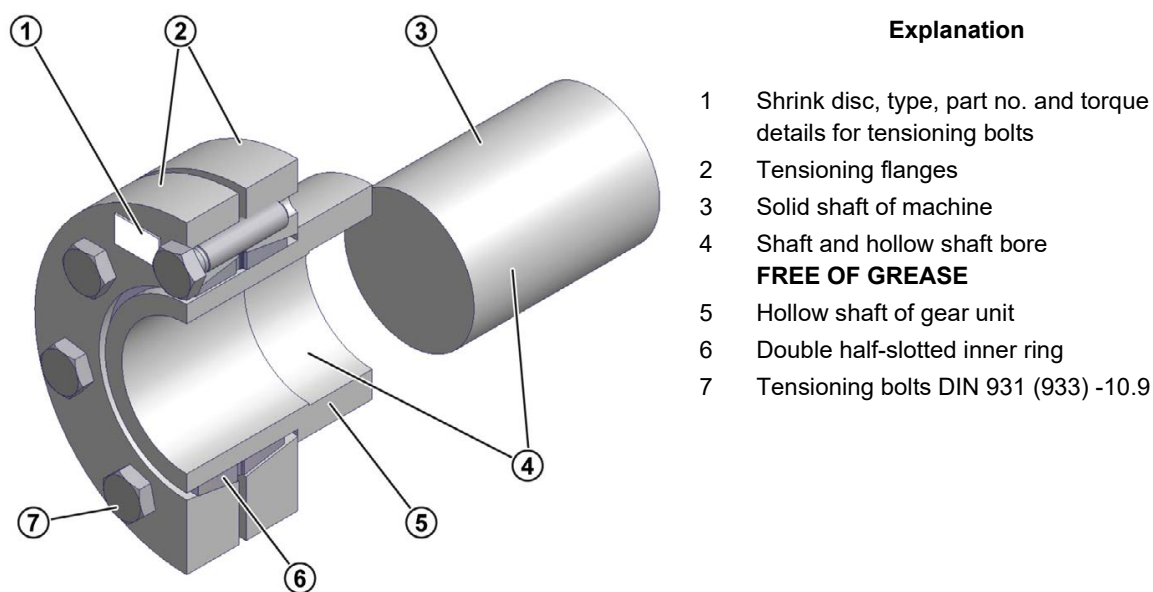


Figure 11: Hollow shaft with shrink disc

The shrink disc is supplied ready for fitting. It must not be dismantled prior to fitting.

The solid shaft material must have a minimum yield strength of 360 N/mm<sup>2</sup>. This ensures that no permanent deformation occurs due to the clamping force.

If necessary, also observe the documentation from the manufacturer of the shrink disc.

##### Prerequisites

- The hollow shaft must be completely free of grease.
- The solid shaft of the machine must be completely free of grease.
- The external diameter of the solid shaft must be within the tolerance h6 or k6 for highly irregular operation, unless otherwise specified in the order-related dimension sheet. The fit must be according to DIN EN ISO 286-2.

##### Fitting procedure

1. Remove the cover, if any.

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2. Loosen the tensioning bolts of the shrink disc, but do not unscrew them completely. Tighten the tensioning bolts gently by hand until there is no play between the flanges and the inner ring.
3. Lightly grease the bore of the inner ring. Push the shrink disc onto the hollow shaft until the outer clamping flange is flush with the hollow shaft.
4. Grease the solid shaft of the machine in the area which will later come into contact with the bushing in the hollow shaft. Do not grease the bronze bushing. It is essential that the tensioning seat of the hollow shaft is free of grease.
5. Insert the solid shaft of the machine into the hollow shaft so that the area around the shrink connection is completely filled.
6. Tighten the tensioning bolts of the shrink disc with approx.  $\frac{1}{4}$  rotation of the bolt per turn **in sequence** in a clockwise direction by several turns.  
Use a torque wrench to tighten the tensioning bolts to the tightening torque specified on the shrink disc.
7. Check if there is an even gap between the clamping flanges. If this is not the case, the shrink disc connection must be dismantled and checked for correct fit.
8. Mark the hollow shaft of the gear unit and the solid shaft of the machine with a label in order to detect any slippage under load.

**Standard disassembly procedure:**

 **WARNING**

**Danger of injury due to sudden mechanical release**

The elements of the shrink disc are under great mechanical tension. Sudden release of the outer rings produces high separating forces and can result in uncontrolled detachment of shrink disc components.

- Do not remove any tensioning bolts if you have not ensured that the external outer rings of the shrink disc have been released from the inner ring.

1. Loosen the tensioning bolts of the shrink disc with approx.  $\frac{1}{4}$  rotation of the bolt per turn **in sequence** in a clockwise direction by several turns. Do not remove the tensioning bolts from their thread.
2. Loosen the clamping flanges from the cone of the inner ring.
3. Remove the gear unit from the solid shaft of the machine.

If a shrink disc has been in use for a long period or is dirty, dismantle it and clean it before refitting. Check the shrink disc for damage or corrosion. Replace the damaged elements if they are not in perfect condition.

Coat the conical surfaces with MOLYKOTE® G-Rapid Plus or a similar lubricant. Place some multi-purpose grease on the screw thread and the contact surfaces of the screw heads.

**3.9 Fitting a hollow shaft with GRIPMAXX™ (Option: M)**



## ⚠ DANGER



#### Explosion hazard

Using option M (GRIPMAXX™) under non-approved ambient conditions may lead to the ignition of an explosive environment.

- Only use option M (GRIPMAXX™) in categories II3D and II3G (EPL Gc and Dc).

The screw on the clamping ring must be tightened with the appropriate torque (see chapter 7.3 "Screw tightening torques").

## NOTICE

#### Damage to the gear unit due to incorrect installation

- Do not tighten the tensioning bolts of the shrink disc until the solid shaft and the torque bush are in the correct position.

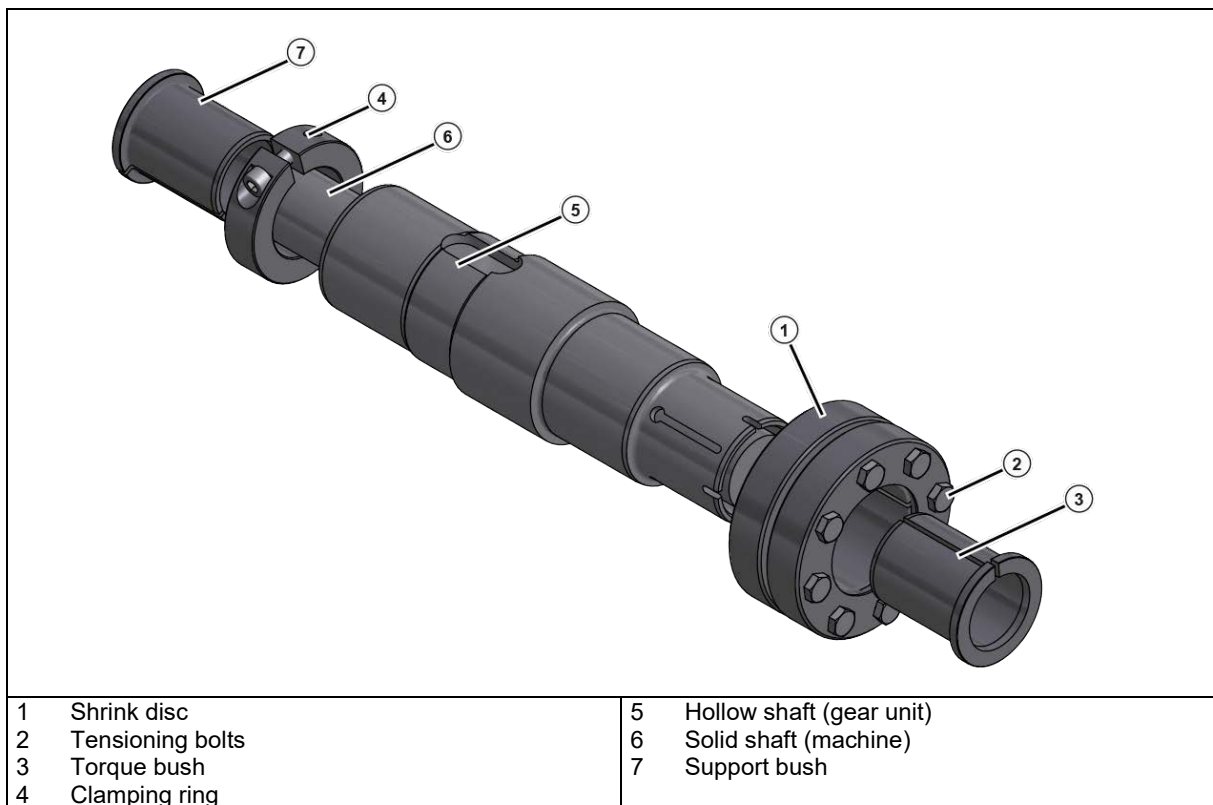


Figure 12: GRIPMAXX™, exploded diagram

Take all expected peak loads into account when dimensioning the solid shaft or the machine shaft.

The solid shaft material must have a minimum yield strength of 360N/mm<sup>2</sup>. This ensures that no permanent deformation occurs due to the clamping force.

**Do not use any lubricants, corrosion protection agents, assembly paste or other coatings** on the mating surfaces of the shaft, the bushes, the clamping rings or the shrink disc.

#### Prerequisites

- The solid shaft [6] must be free from burrs, corrosion, lubricants or other foreign bodies.

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- The hollow shaft [5], the bushes [3], [7], the clamping ring [4] and the shrink disc [1] must be free from dirt, grease or oil.
- The solid shaft diameter must be within the following tolerances:

Metric machine shafts		
From	To	ISO 286-2 Tolerance h11(-)
Ø [mm]	Ø [mm]	[mm]
10	18	-0.11
18	30	-0.13
30	50	-0.16
50	80	-0.19
80	120	-0.22
120	180	-0.25

Imperial machine shafts		
From	To	ISO 286-2 Tolerance h11(-)
Ø [in]	Ø [in]	[in]
0.4375	0.6875	-0.004
0.7500	1.0625	-0.005
1.1250	1.9375	-0.006
2.0000	3.1250	-0.007
3.1875	4.6875	-0.008
4.7500	7.0625	-0.009

Table 4: Permissible machine shaft tolerances

### Fitting procedure

1. Determine the correct installation position of the shrink disc [1] on the gear unit. Ensure that the position of the hollow shaft [5] corresponds to the details in the order.
2. Slide the support bush [7] and the clamping ring [4] onto the solid shaft [6]. Ensure that the support bush is correctly positioned. Secure the support bush [7] with the clamping ring [4] by tightening the clamping ring bolt with the appropriate torque (see chapter 7.3 "Screw tightening torques").
3. Push the gear unit onto the secured support bush [7], up to the stop against the clamping ring.
4. Slightly loosen the tensioning bolts [2] and push the shrink disc [1] onto the solid shaft.
5. Push the torque bush [3] onto the solid shaft.
6. Tighten the 3 or 4 tensioning bolts [2] until finger-tight and ensure that the outer rings of the shrink disc are pulled together parallel. Then tighten the remaining bolts.
7. Tighten the tensioning bolts successively in a clockwise direction by several turns – **not crosswise** – with approx. ¼ rotation of the bolt per turn. Use a torque wrench to achieve the tightening torque specified on the shrink disc.

After tightening the tensioning bolts, there must be an even gap between the clamping flanges. If this is not the case, dismantle the shrink disc connection and check the fit.

### Dismantling procedure



#### Danger of injury due to sudden mechanical release

The elements of the shrink disc are under great mechanical tension. Sudden release of the outer rings produces high separating forces and can result in uncontrolled detachment of shrink disc components.

- Do not remove any tensioning bolts if you have not ensured that the external outer rings of the shrink disc have been released from the inner ring.

1. Unscrew the tensioning bolts [2] of the shrink disc in sequence, with approximately half a turn (180°), until the inner ring of the shrink disc can be moved.
2. Pull the shrink disc [1] with the torque bush [3] off from the shaft.
3. Remove the outer rings of the shrink disc from the conical inner ring. For this it may be necessary to lightly tap the bolts with a soft-face hammer or to lightly lever the outer rings apart.
4. Pull the gear unit off the machine shaft.

Clean all individual components before refitting. Check the bushes and the shrink disc for damage or corrosion. Replace the bushes and the shrink disc if they are not in perfect condition. Coat the conical seat of the outer rings and the outside of the clamping ring with MOLYKOTE® G-Rapid Plus or a similar product. Place some multi-purpose grease on the screw thread and the contact surfaces of the screw heads.

#### 3.10 Installation of an SCX flange (option: SCX)

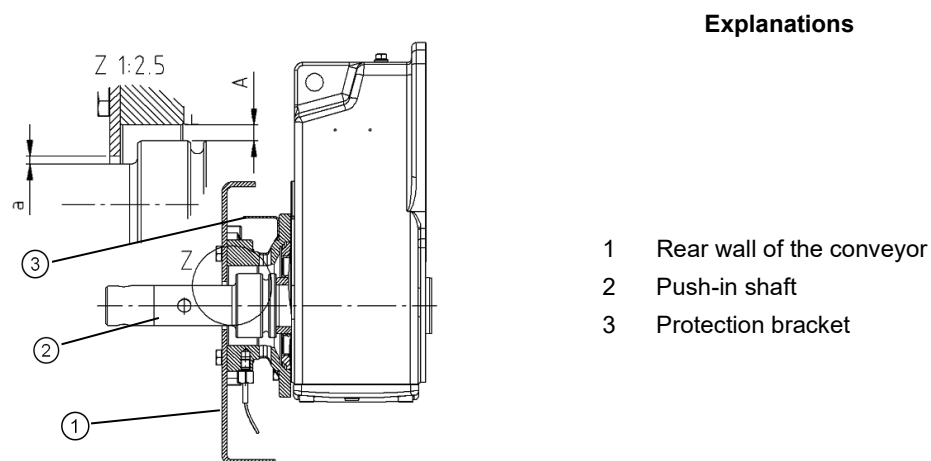


Figure 13: Installation example of an SCX flange

The SCX flange may only be operated in the mounting positions M1, M2, M3 and M4.

A temperature sensor can be optionally installed. The sensor must trip at a temperature of 120 °C and stop the drive. Visual inspection may be omitted upon usage of a temperature sensor (see chapter 5.1 "Inspection and maintenance intervals").

The gap (dimension A) between the push-in shaft (2) and the rear wall of the conveyor (1) or the fastening plate must not be larger than 8 mm.

The protection bracket (3) must cover the open hole running vertically upwards in the SCX flange.

#### 3.11 Fitting the covers (option: H, H66)

**! DANGER**



##### Explosion hazard due to damaged and rubbing covers

- Inspect covers for transportation damage, e.g. dents and warping before fitting.
- Do not use damaged covers.

Use all fastening screws. Secure the fastening screws by coating them with securing lubricant, e.g. Loctite 242, Loxeal 54-03. Tighten the fastening screws with the correct torque (see chapter 7.3 "Screw tightening torques").

For covers with Option H66, press in the new condition closing cap by tapping it lightly with a hammer.

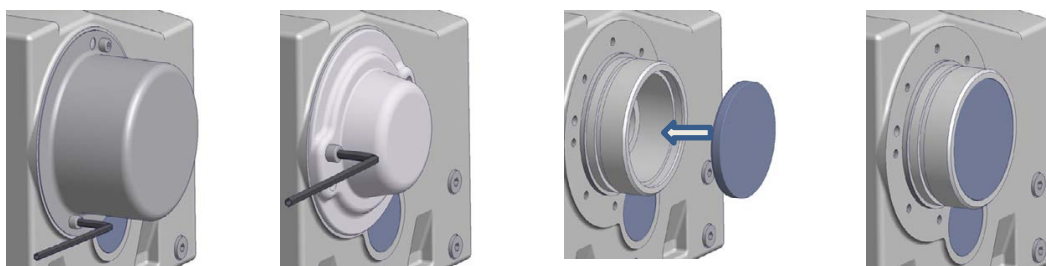


Figure 14: Fitting the covers, Option SH, Option H, and Option H66

### 3.12 Fitting the covers

Some versions of universal worm gear units are delivered as standard with a plastic cover cap. The cover cap protects the radial shaft seals against the entry of dust and other contamination. The cover cap can be attached on the A side or the B side. It can be removed by hand without tools.

#### NOTICE

##### Damage to the expansion elements of the cover cap

- Do not jam the cover cap when pulling it off or attaching it.

Pull the cover cap off vertically prior to the installation of the universal worm gear unit. After completing the fitting, attach the cover cap onto the right side by attaching the expanding elements into the threaded holes on the output flange.



Figure 15: Disassembly and assembly of the cover cap

#### 3.13 Fitting a standard motor (Option: IEC, NEMA, AI, AN)

Depending on the gear unit type, exceptions are permissible with the maximum motor weights. These are indicated in the tables below and must not be exceeded.



#### Explosion hazard



- Only standard motors with an adequate ATEX Zone category according to the type plate may be used.
- For ATEX category 2D gear units (see the ATEX labelling on the last line of the gear unit type plate), the motor must have at least protection class IP6x.

Maximum permitted motor weights														
Motor size	63	71	80	90	100	112	132	160	180	200	225	250	280	315
Max. motor weight [kg]	25	30	50	50	80	80	100	250	250	350	500	1000	1000	1500
SK 32, SK 3282, SK 9032.1, SK 32100, SK 772.1, SK 773.1					100	100								
SK 42, SK 4282, SK 9042.1, SK 42125					100	100	130	200						
SK 52, SK 63, SK 5282, SK 6382, SK 9052.1, SK 872.1, SK 873.1, SK 972.1, SK 973.1					100	100	130							
SK 62, SK 73, SK 83, SK 6282, SK 7382, SK 8382, SK 9072.1					100	100	130							
SK 72, SK 82, SK 93, SK 103, SK 7282, SK 8282, SK 9382, SK 10382.1, SK 9082.1, SK 9086.1, SK 9092.1, SK 9096.1							130							
SK 920072.1, SK 92072.1, SK 0, SK 071.1, SK 0182.1, SK 930072.1, SK 93072.1, SK 93372.1			40											
SK 1382NB, SK 1382.1, SK 92372, SK 92372.1, SK 12063, SK 372.1, SK 371.1, SK 1382.1 GJL					60									

Table 5: Motor weights IEC motors

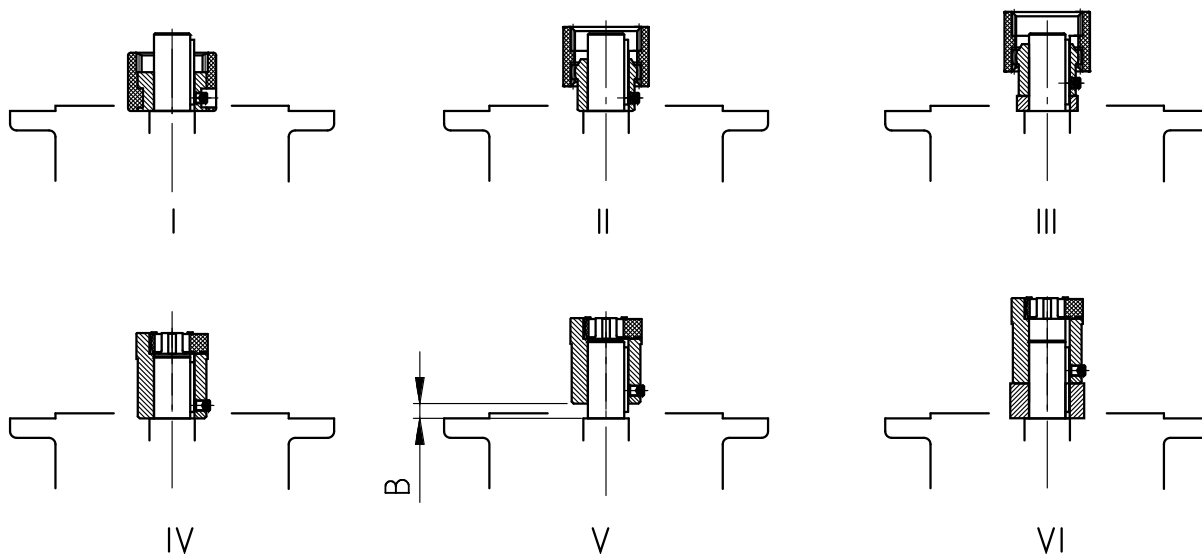
Maximum permitted motor weights														
Motor size		56C		140TC		180TC	210TC	250TC	280TC	320TC	360TC	400TC		
Max. motor weight [kg]		30		50		80	100	200	250	350	700	700		
SK 62, SK 72, SK 73, SK 83, SK 93, SK 9072.1, SK 6282, SK 7282, SK 7382, SK 8382, SK 9382											500	500		

**Table 6: Motor weights NEMA motors**

Gear units with IEC or NEMA adapter must be operated with self-ventilated motors (IC411, TEFC) or externally ventilated motors (IC416, TEBC) according to EN 60034-6. The gear unit must be exposed to a continuous airflow. Please contact Getriebbau NORD if the use of motors without fans (IC410, TENV) is intended.

#### Fitting a standard motor to the IEC adapter (Option IEC) or NEMA adapter (Option NEMA)

1. Clean the motor shaft and the flange surfaces of the motor and motor adapter, and check them for damage. Check the motor dimensions. The dimensions must be within the tolerances according to DIN EN 50347 or NEMA MG1 Part 4.
2. For motor sizes 90, 160, 180 and 225, position the spacer bushes that may be provided onto the motor shaft.
3. Position the half-coupling onto the motor shaft so that the motor parallel key engages into the groove of the half-coupling. Tighten the half-coupling in accordance with the motor manufacturer's instructions. With standard helical gear units, observe dimension B between the half-coupling and the collar (see "Figure 16"). Adjust the coupling in accordance with the specifications indicated on the adhesive plate for certain **NEMA adapters**.
4. If the half-coupling contains a setscrew, secure the coupling axially on the shaft. Coat the setscrew with securing adhesive before screwing it in, e.g. Loctite 242 or Loxeal 54-03, and tighten it with the correct torque (see chapter 7.3 "Screw tightening torques").
5. For category 2D gear units (see ATEX labelling in the last line of the gear unit name plate), the flange surfaces of the motor and motor adapter must be sealed. For other gear units, sealing of the flange surfaces is recommended if the motor is installed outside or in a humid environment. Completely coat the flange surfaces with surface sealant, e.g. Loctite 574 or Loxeal 58-14.
6. Attach the motor to the adapter. Also attach the enclosed ring gear or the enclosed gear sleeve (see figure below).
7. Tighten the adapter bolts with the correct torque (see chapter 7.3 "Screw tightening torques").



**Figure 16: Fitting the coupling onto the motor shaft - various types of coupling**

- I Curved tooth coupling (BoWex®), one-piece
- II Curved tooth coupling (BoWex®), two-piece
- III Curved tooth coupling (BoWex®), two-part with spacer bush
- IV Claw coupling (ROTEX®), two-piece
- V Claw coupling (ROTEX®), two-piece, observe dimension B:

Standard helical gear units:		
	SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 (2-stage)	
	SK 010, SK 200, SK 250, SK 300, SK 330 (3-stage)	
	IEC size 63	IEC size 71
Dimension B (Fig. V)	B = 4.5 mm	B = 11.5 mm

- VI Claw coupling (ROTEX®), two-piece with spacer bush

#### Fitting a standard motor to the IEC adapters AI160–AI315 (Option AI) or NEMA adapters AN250TC–AN400TC (Option AN)

1. Clean the motor shaft and the flange surfaces of the motor and motor adapter, and check them for damage. Check the motor dimensions. The dimensions must be within the tolerances according to DIN EN 50347 or NEMA MG1 Part 4.
2. Remove the motor shaft's key.
 

**Note:** For adapter AI315, the key does not have to be dismantled. Continue with Step 5. of this description.
3. With the adapters AI160, AI180 and AI225, attach the spacer bush supplied with the product.
4. Attach the key supplied with the product (see "Table7: Motor parallel keys").
5. For the attachment of the half-coupling, heat up the half-coupling to approx. 100 °C. Position the half-coupling as follows:
  - Push AI160, AI180 and AI225 on to the spacer bush.
  - Push AI200, AI250, AI280 and AI315 on to the motor shaft collar.
  - AN250TC–AN400TC until dimension A has been attained (see "Table 8: Position of the half-coupling on the NEMA motor shaft")

6. If the half-coupling contains a setscrew, secure the coupling axially on the shaft. Coat the setscrew with securing adhesive before screwing it in, e.g. Loctite 242 or Loxeal 54-03, and tighten it with the correct torque (see chapter 7.3 "Screw tightening torques").
7. For category 2D gear units (see ATEX labelling in the last line of the gear unit name plate), the flange surfaces of the motor and motor adapter must be sealed. For other gear units, sealing of the flange surfaces is recommended if the motor is installed outside or in a humid environment. Completely coat the flange surfaces with surface sealant, e.g. Loctite 574 or Loxeal 58-14.
8. Attach the motor to the adapter. Also attach the enclosed ring gear or the enclosed gear sleeve (see **Figure 16: Fitting the coupling onto the motor shaft - various types of coupling**). For the AN360TC and AN400TC adapters, attach the adapter flange to the motor first, and screw the motor onto the adapter.
9. Tighten the adapter bolts with the correct torque (see chapter 7.3 "Screw tightening torques").

IEC/NEMA type	Coupling	Shaft $\varnothing$	Motor shaft's key
AI 160	R42	42	AB12x8x45
AI 180	R48	48	AB14x9x45
AN 250	R42	41.275	B3/8x3/8x1 1/2
AN 280	R48	47.625	B1/2x1/2x1 1/2
AI 200	R55	55	B16x10x50x
AN 320	R55	53.976	B1/2x1/2x1 1/2
AI 225	R65	60	B18x11x70
AN 360 R350	R65	60.325	B5/8x5/8x2 1/4
AI 250	R75	65	B18x11x70
AI 280	R75	75	B20x12x70
AN 360 R450	R75	60.325	B5/8x5/8x3 1/8
AN 400	R75	73.025	B3/4x3/4x3 1/4

Table7: Motor parallel keys

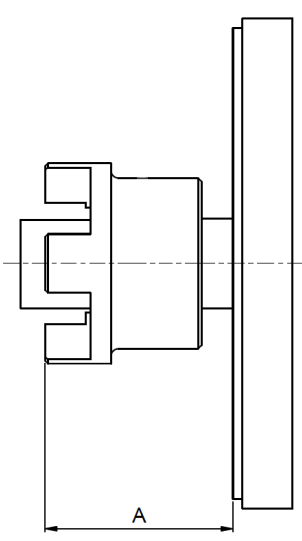
	NEMA type	Coupling size	A [mm]
	N250TC R350	R42	83
	N250TC 300S	R42	86
	N280TC R350	R48	87.5
	N280TC 300S	R48	102.5
	N320TC	R55	91
	N360TC/350	R65	126.5
	N360TC/450	R75	150.5
	N400TC	R75	164.5

Table 8: Position of the half-coupling on the NEMA motor shaft



#### 3.14 Mounting of the cooling coil onto the cooling system

#### **⚠ WARNING**

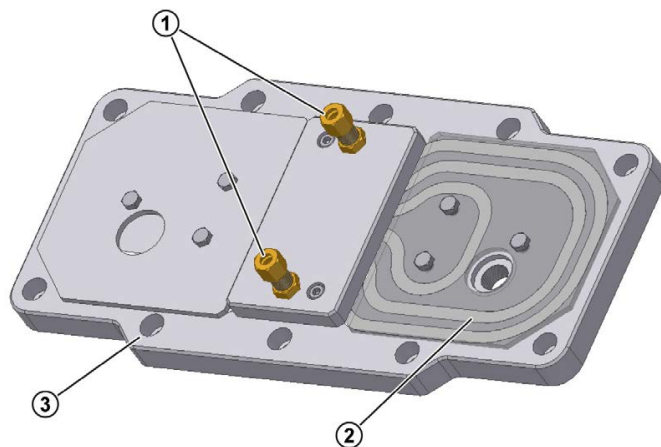
##### **Risk of injury due to pressure discharge**

- Ensure that the pressure is released from the cooling circuit before carrying out any work on the gear unit.

#### **NOTICE**

##### **Damage to the cooling coil**

- Do not twist the connection pieces during installation.
- Ensure load-free assembly of the connection pipes or hoses.
- Even after the installation, no external forces must be able to act on the cooling coil via the connection pieces.
- Prevent vibrations from reaching the cooling coil during operation.



##### **Explanation**

- |   |   |
|---|---|
| 1 | Connection pieces with cutting ring screw connections |
| 2 | Cooling coil  |
| 3 | Housing cover   |

**Figure 17: Cooling cover**

The cooling coil is installed in the housing cover. For the inlet and outlet of cooling fluid, connection pieces with cutting ring screw connections according to DIN 2553 are provided on the housing cover for a connection of a pipe with an external diameter of 10 mm.

Remove the sealing plug from the screw necks prior to assembly and flush the cooling coil to prevent any contamination of the cooling system. Then, connect the connection pieces with the coolant circuit. The flow direction of the coolant is irrelevant.

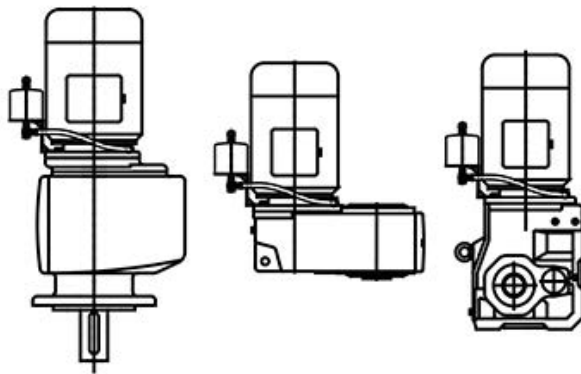
### 3.15 Installation of an oil expansion chamber (Option: OA)

#### 3.15.1 Installation of the sizes I, II and III

The oil expansion chamber is available in 3 sizes with different capacities:

- 0.7 l (Size I)
- 2.7 l (Size II)
- 5.4 l (Size III)

The oil expansion chamber must be mounted vertically with the hose connection facing downwards and the vent screw facing upwards. Taking the hose length into account, the container should be fitted as high as possible. For suggestions for the position of the oil expansion chamber, see the following illustration.



**Figure 18: Position of the oil expansion chamber**

1. After installing the gear unit, remove the vent screw.
2. Screw in the reduction or extension with the existing sealing ring.

For gear units having an oil maintenance bore with an M10x1 thread, also consider document WN 0-521 35.

3. If the fastening screw is screwed into a through hole, seal the thread with a medium-strength screw securing material such as LOXEAL 54-03 or Loctite 242.
4. Screw on the expansion tank. If the necessary screw insertion depth of  $1.5 \times d$  can no longer be achieved, use a 5 mm longer screw. If a longer screw cannot be fitted, use a stud and a nut with appropriate dimensions.
5. Attach the vent hose with the enclosed hollow screws and seals.
6. Screw the enclosed M12 x 1.5 pressure vent into the oil expansion chamber.

#### 3.15.2 Installation of sizes 0A and 0B

The oil expansion chamber must be mounted vertically with the hose connection facing downwards and the vent screw facing upwards. Taking the hose length into account, the container should be fitted as high as possible. Suggestions for the position of the oil expansion chamber see Figure 18. Note that with the M4 configuration with terminal box position in position 2, it is not possible to install the oil expansion chamber.

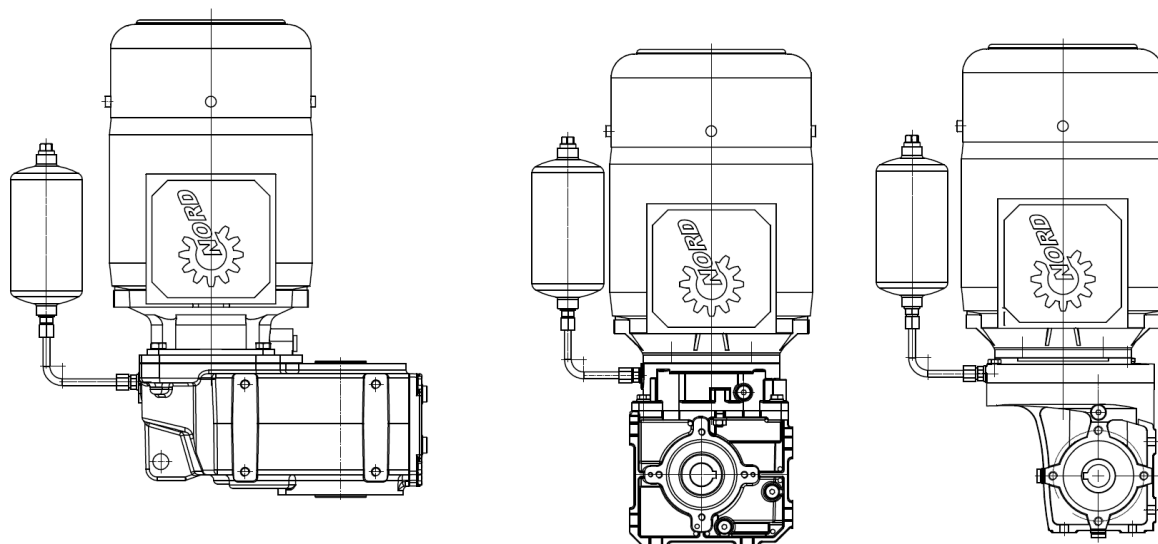


Figure 19: Position of the oil expansion chamber

1. After installing the gear unit, remove the oil level or vent screw.
2. Install the oil expansion chamber according to Figure 18. Align it parallel to the motor shaft.
3. Maintain the maximum tightening torque of 12 Nm for screwing the oil expansion chamber onto the gear unit housing.
4. Screw the enclosed M10 x 1.0 pressure vent into the oil expansion chamber.

#### 3.16 Attaching the temperature sticker

For temperature class T4 gear units or gear units with a maximum surface temperature of less than 135 °C the supplied temperature sticker (printed with value 121 °C) must be affixed to the gear unit housing.  
Part No.: 2839050.

The temperature class or the maximum surface temperature can be obtained from the ATEX labelling in the last line of the gear unit name plate.

Examples:

II 2G Ex h IIC **T4** Gb or. II 3D Ex h IIIC **T125°C** Dc

Affix the temperature sticker next to the oil level screw (see chapter 7.1 "Versions and mounting position") towards the motor. For gear units with an oil reservoir tank, affix the temperature sticker in the same position as for gear units without oil reservoir tanks. For gear units which are lubricated for life, affix the temperature sticker next to the name plate.

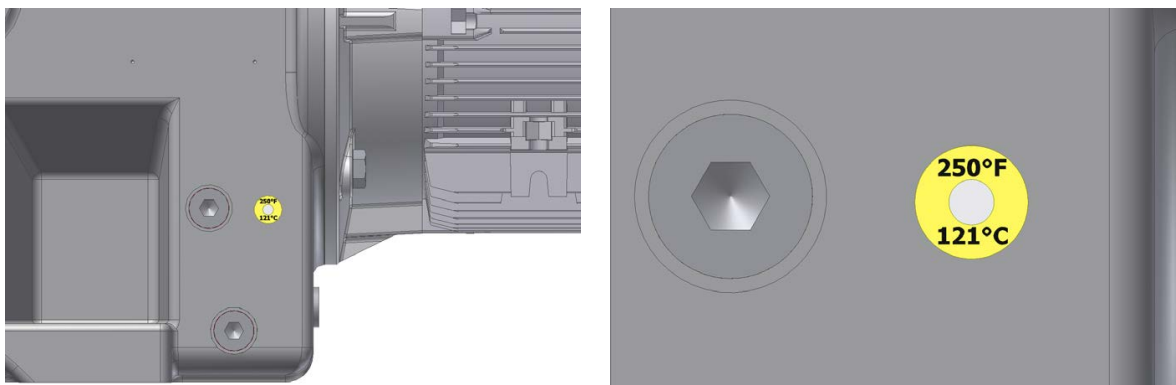


Figure 20: Position of the temperature sticker

### 3.17 Subsequent painting

 **DANGER**



#### Explosion hazard due to electrostatic charge

- Subsequent painting must have the same characteristics and layer thickness as the original painting.

For retrospective painting of the gear unit, the shaft sealing rings, rubber elements, pressure vent screws, hoses, type plates, adhesive labels and motor coupling components must not come into contact with paints, lacquers or solvents, as otherwise the components may be damaged or made illegible.

### 4 Commissioning

#### 4.1 Checking the oil level

**! DANGER**



#### Explosion hazard in case of inadequate lubrication

- Check the oil level before commissioning (see chapter 5.2.3 "Checking the oil level").

#### 4.2 Activating the vent

If venting of the gear unit is provided, the pressure vent must be activated before commissioning. Double gear units consist of two single units, are equipped with 2 oil chambers and possibly 2 vents.

To activate, remove the sealing cord in the pressure relief vent. For the position of the pressure relief vent, see Section 7.1 "Versions and mounting position".

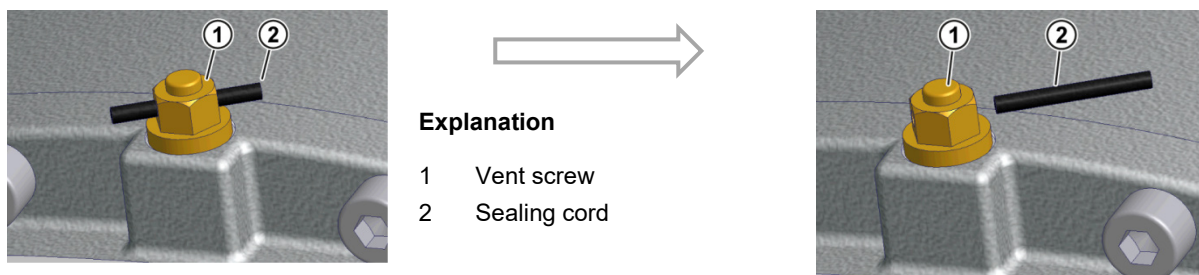


Figure 21: Activating the pressure vent screw

#### 4.3 Activating the automatic lubricant dispenser

Some gear unit types with standard motor (Option IEC/NEMA, not AI/AN) have an automatic lubricant dispenser for the roller bearings. The lubricant sensor must be activated prior to commissioning the gear unit. The cartridge case cover of the adapter for attaching an IEC/NEMA standard motor has a red information sign for activation of the lubricant dispenser. Opposite to the lubricant dispenser there is a grease escape hole which is closed with a G1/4 cap screw. After activation of the lubricant dispenser, the cap screw can be removed and replaced with the grease collection container (Part No. 28301210) which is supplied separately with the delivery.

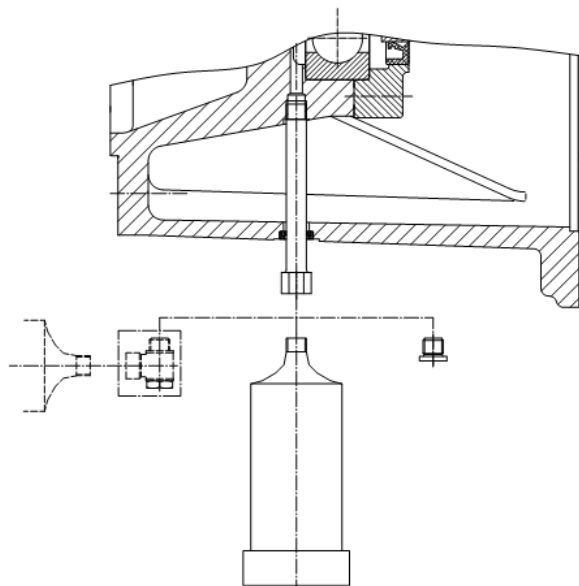
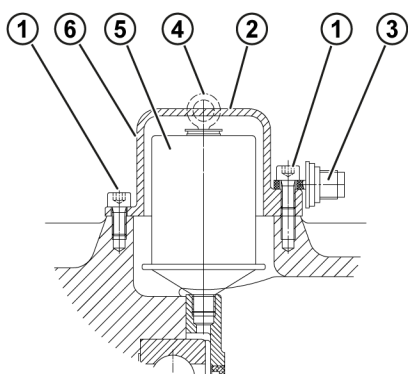


Figure 22: Fitting the grease collection container

**Procedure:**

1. Loosen and remove the cap screws.
2. Remove the cartridge cover.
3. Screw the activation screw into the lubricant dispenser until the lug breaks off at the defined fracture point.
4. For category 2D gear units (see ATEX labelling, last line of the gear unit name plate): Completely coat **the flange surfaces** of the cartridge cover with **surface sealant**, e.g. Loctite 574 or Loxeal 58-14.
5. Re-fit the cartridge cover. Attach the cartridge cover with the cap screws (see chapter 7.3 "Screw tightening torques").
6. Mark month and year of activation on the adhesive label.



**Explanation**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1</li> <li>2</li> <li>3</li> <li>4</li> <li>5</li> <li>6</li> </ol> | <p>Cap screws M8 x 16</p> <p>Cartridge cover</p> <p>Activation screw</p> <p>Lug</p> <p>Lubricant sensor</p> <p>Position of adhesive label</p> |
|--|---|

Figure 23: Activating the automatic lubricant sensor with standard motor mounting

Adhesive label

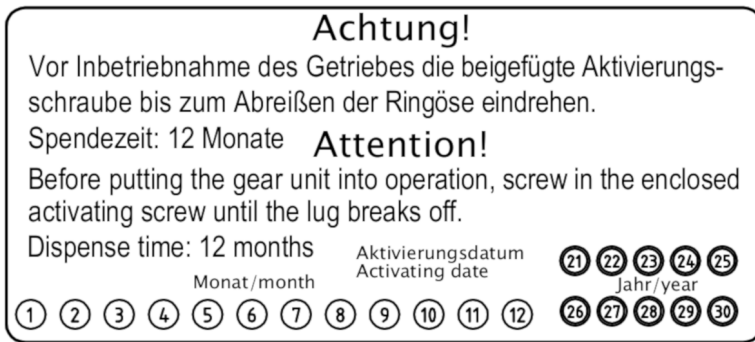


Figure 24: Adhesive label

#### 4.4 Cooling coil (Option: CC)

### DANGER

#### Explosion hazard due to insufficient cooling



- Only put the drive into operation after the cooling coil was connected to the cooling circuit, and the cooling circuit was put into operation.
- Check the temperature and flow rate of the cooling water, and ensure compliance with the permissible limit values.
- If there is a danger of frost, add a suitable anti-freeze solution to the cooling water.
- Observe the special ATEX documentation provided by NORD.

The coolant must have a thermal capacity similar to water.

- Specific thermal capacity of water at 20 °C:  $c = 4.18 \text{ kJ/kgK}$

Clean, industrial water without any air bubbles or sediments is recommended as a coolant. The hardness of the water must be between 1 dH and 15 dH; the pH value must be between pH 7.4 and pH 9.5. No aggressive liquids may be added to the coolant!

The **coolant pressure** must not exceed **8 bar**. We also recommend fitting a pressure reducer at the coolant inlet to avoid damage due to excessive pressure.

The **coolant inlet temperature** must not exceed 40 °C. **10 °C** are recommended.

The required **coolant flow rate** is **10 l/min**.

#### 4.5 Temperature measurement

The details of the ATEX temperature class or the maximum surface temperature are based on normal installation conditions. Even small changes to the installation conditions can have a significant effect on the temperature of the gear unit.

During commissioning, a surface temperature measurement of the gear unit must be made under maximum load. This does not apply to gear units which are labelled as temperature class T1 – T3 or a maximum surface temperature of 200 °C in the last line of the rating plate.

For the temperature measurement, a normal temperature measuring device is required, which covers a measurement range from 0 °C to 130 °C and a precision of at least  $\pm 4 \text{ °C}$  and which enables the measurement of the surface temperature and the temperature of the air.

Temperature measurement procedure:

1. Allow the gear unit to run at maximum speed under maximum load for approx. 4 hours.
2. Following warm-up, the temperature of the gear unit housing surface  $T_{gm}$  is to be measured close to the temperature sticker (see chapter 3.16 "Attaching the temperature sticker").
3. Measure the temperature of the air  $T_{um}$  in the immediate vicinity of the gear unit.

Shut down the drive and contact Getriebebau NORD if one of the following criteria is not fulfilled:

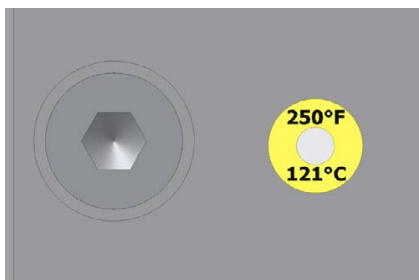
- The measured air temperature  $T_{um}$  is within the permissible range stated on the type plate.
- The measured air temperature on the surface of the gear unit housing  $T_{gm}$  is less than 121 °C.
- The temperature sticker has not turned black (see Figure 26).
- The measured temperature of the surface of the gear unit housing plus the difference between the highest permissible air temperature  $T_u$  stated on the type plate and the measured air temperature must be at least 15 °C lower than the maximum permissible surface temperature, i.e.:

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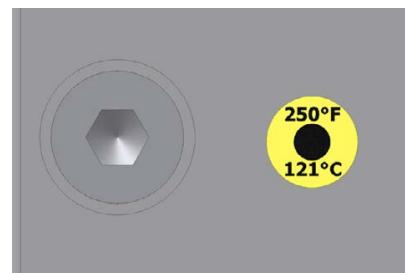


ATEX labelling: II 2G Ex h IIC T4 Gb/ II 3G Ex h IICT4 Gc: $T_{gm} + T_u - T_{um} < 135\text{ °C} - 15\text{ °C}$
ATEX labelling: II 2D Ex h IIIC T <sub>max</sub> Db / II 3D Ex h IIIC T <sub>max</sub> :Dc: $T_{gm} + T_u - T_{um} < T_{max} - 15\text{ °C}$
T <sub>gm</sub> : Measured temperature of the surface of the gear unit housing in °C
T <sub>um</sub> :: Measured air temperature in °C
T <sub>max</sub> : Maximum surface temperature according to gear unit type plate (ATEX labelling) in °C
T <sub>u</sub> : Upper value of the permissible ambient temperature range in °C according to the type plate

Figure 25: ATEX labelling



Centre dot is **white**: OK



Centre dot is **black**: Temperature was too high.

Figure 26: Temperature sticker

### 4.6 Test run

#### DANGER

##### Explosion hazard during operation of a defective gear unit

Any abnormal operation of the gear unit may directly or indirectly lead to the ignition of an explosive environment.



- Perform a test run as described below, and pay attention to the mentioned irregularities.
- In case of irregularities, shut down the drive immediately.
- Contact the NORD service department.

During commissioning of the gear unit a test run should be carried out in order to detect any problems prior to continuous operation.

During a test run under full load, the gear unit should be checked for:

- Unusual noises, such as grinding, knocking or rubbing noises
- Unusual vibrations, oscillations or other movements
- Production of steam or smoke

After the test run, the gear unit should be checked for:

- Leaks
- Slippage of the shrink discs. To do this, remove the cover and check whether the marking specified in Section 3.8 "Fitting a hollow shaft with shrink disc (Option: S)" indicates a movement of the gear unit hollow shaft relative to the machine shaft. Then remount the cover as described in Section 3.11 "Fitting the covers (option: H; H66)".

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## Information

Radial shaft seals are rubbing seals and have sealing lips made from an elastomer material. These sealing lips are lubricated with a special grease at the factory. This reduces the wear due to their function and ensures a long service life. An oil film in the region of the rubbing sealing lip is therefore normal and is not due to leakage.

### 4.7 Running-in time for the worm gear unit

In order to achieve maximum efficiency of the worm gear unit, the gear unit must be subjected to a running-in period of approx. 25 h – 48 h under maximum load.

There may be a reduction in efficiency before the running-in period is complete.

### 4.8 AI/AN adapter operation with option BRG1

In connection with option BRG1 (manual re-lubrication), the IEC adapters (Option: AI) or the NEMA adapters (Option: AN) may be operated at a maximum input speed of 1800 rpm. Higher speeds would lead to premature failure of the seals and coupling spider.

### 4.9 Checklist

Checklist		
Item to be checked	Date of check:	Information see Section
Are there any transport damages or other damages visible?		3.4.1
Does the labelling on the name plate comply with the specifications?		2.2
Does the version on the name plate conform to the actual installation?		3.3
Is the pressure vent activated?		4.2
Do all drive and driven elements have ATEX approval?		1.2.2
Are the external gear shaft forces within permitted limits (chain tension)?		3.6
Are rotating parts covered with the contact guard?		3.11
Does the motor also have appropriate ATEX approval?		3.13
Has the temperature sticker been affixed?		3.16
Has the correct oil level for the version been checked?		5.2.3
Is the automatic lubricant sensor activated?		4.3
Has the temperature been measured?		4.5
Does the centre of the temperature sticker have a white colour?		4.5
Is the cooling system connected?		3.14 4.4
Was the gear unit checked in a test run?		4.6
Was the shrink disc connection tested for slippage?		4.6

Table 9: Checklist for commissioning

## 5 Service and maintenance

### 5.1 Inspection and maintenance intervals

Inspection and maintenance intervals	Inspection and maintenance work	Information, see Section
Weekly or every 100 operating hours	<ul style="list-style-type: none"> <li>• Visual inspection for leaks</li> <li>• Check the gear unit for unusual running noises and/or vibrations</li> <li>• Only for <b>gear units with cooling cover</b>: Visual inspection of the temperature sticker</li> </ul>	5.2.1 5.2.2 5.2.8
Every 2,500 operating hours, at least every six months	<ul style="list-style-type: none"> <li>• Oil level check</li> <li>• Visual inspection of the rubber buffer</li> <li>• Visual inspection of hose</li> <li>• Visual inspection of radial shaft seal</li> <li>• Visual inspection of Option SCX</li> <li>• Visual inspection of the temperature sticker</li> </ul>	5.2.3 5.2.4 5.2.5 5.2.6 5.2.7 5.2.8
	<ul style="list-style-type: none"> <li>• Remove dust (only for category 2D)</li> <li>• Check coupling (only for category 2G and standard IEC/NEMA motor attachment)</li> <li>• Re-grease/remove excess grease (only applicable for free input shaft/option W, for agitator bearings/option VL2/VL3 and for AI.../AN... adapter with option BRG1)</li> <li>• Clean or replace the pressure relief vent</li> </ul>	5.2.9 5.2.10 5.2.11 5.2.15
Every 5000 operating hours, at least every year (only for standard IEC / NEMA motor attachment)	<ul style="list-style-type: none"> <li>• Replace the automatic lubricant sensor, remove excess grease, empty or replace the grease collection container at each second replacement of the lubricant sensor</li> </ul>	5.2.12
For operating temperatures up to 80 °C, every 10,000 operating hours, at least every 2 years	<ul style="list-style-type: none"> <li>• Change the oil (if filled with synthetic products, the interval is doubled; with the use of <b>SmartOilChange</b>, the interval is specified by <b>SmartOilChange</b>)</li> </ul>	5.2.3
	<ul style="list-style-type: none"> <li>• Check the cooling coil for deposits (fouling)</li> </ul>	5.2.14
	<ul style="list-style-type: none"> <li>• Replace the radial shaft seals at every oil change, at least every 10,000 operating hours</li> <li>• Clean or replace the vent screw as necessary</li> </ul>	5.2.16 5.2.15
Every 20,000 operating hours, at least every 4 years	<ul style="list-style-type: none"> <li>• Re-lubricate the bearings in the gear unit</li> <li>• Replace the hoses</li> <li>• Check the function of the resistance thermometer (only I12GD)</li> </ul>	5.2.17
Interval as stated in field MI of the name plate (only for Categories 2G and 2D) or at least every 10 years	<ul style="list-style-type: none"> <li>• General overhaul</li> </ul>	5.2.18

Table 10: Inspection and maintenance intervals

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**i Information**

The oil change intervals apply for normal operating conditions and operating temperatures up to 80 °C. The oil change intervals are reduced in the case of extreme operating conditions (operating temperatures higher than 80 °C, high humidity, aggressive environment and frequent fluctuations in the operating temperature).

---

**i Information**

**SmartOilChange** determines the optimum time for an oil change based on a continuous determination of the oil temperature. With **SmartOilChange** from Getriebebau NORD, this is achieved entirely on the basis of product-specific key data, the specified ambient temperature and internal measurement values of the power electronics such as the current consumption. Additional hardware is therefore not required for the Getriebebau NORD solution.

The measurement results are processed and interpreted by the integrated software and result in the display of the calculated residual time until the next oil change.

---

## 5.2 Service and maintenance work

### DANGER

#### Explosion hazard



- No explosive atmosphere must be present during repair work.
- When cleaning the gear unit, do not use procedures or materials which may cause electrostatic charging of the gear unit or adjacent non-conducting components.

### 5.2.1 Visual inspection for leaks

The gear unit must be checked for leaks. Attention should be paid to escaping gear oil and traces of oil on the exterior or underneath the gear unit. In particular, the radial shaft seals, cover caps, screw fittings, hoses and housing joints should be checked.

### Information

Radial shaft seals are components with a limited life and are subject to wear and ageing. The service life of radial shaft seals depends on various ambient conditions. Temperature, light (especially UV light), ozone and other gases and liquids affect the ageing process of radial shaft seals. Some of these influences may change the physical or chemical properties of the radial shaft seals and result in a significant reduction of their service life. Foreign matter (e.g. dust, sludge, sand, metallic particles) and excess temperature (excessive speed or external heating) accelerate the wear of the sealing lip. These sealing lips are made of an elastomer material and are lubricated with a special grease at the factory. This reduces the wear due to their function and ensures a long service life. An oil film in the region of the rubbing sealing lip is therefore normal and is not due to leakage (see chapter 7.5 "Leakage and leak-tightness").

### NOTICE

#### Damage to the radial shaft seals through unsuitable cleaning agents

Unsuitable cleaning agents may damage the radial shaft seals, which may then cause an increased risk of leaks.

- Do not clean the gear unit with cleaning agents which contain acetone or benzol.
- Avoid contact with hydraulic oils.

If leaks are suspected, the gear unit should be cleaned, the oil level checked and checked again for leaks after approx. 24 hours. If a leak is confirmed (dripped oil), the gear unit must be repaired immediately. Please contact the NORD service department.

If the gear unit is equipped with a cooling coil in the housing cover, the connections and the cooling coil must be checked for leaks. If there are any leaks, these must be repaired immediately. Please contact the NORD service department.

### 5.2.2 Check for running noises

If the gear unit produces unusual running noises or vibrations, this could indicate damage to the gear unit. In this case the gear unit must be repaired immediately. Please contact the NORD Service department.

### 5.2.3 Checking the oil level

Section 7.1 "Versions and mounting position" describes the versions and the corresponding oil level screws. With double gear units, the oil level must be checked on both units. The pressure vent must be at the position marked in Section 7.1 "Versions and mounting position".

The oil level does not need to be checked on gear units without oil level screw (see chapter 7.1 "Versions and mounting position").

The oil level must only be carried out when the gear unit is at a standstill and has cooled down. Provide protection against accidental activation. Check the oil level with an oil temperature of between 10 °C to 40 °C.

#### **Gear units with oil level screw**

1. Standard version M4 (V1 and V5) helical gear units have an angled pipe for checking the oil level as shown in Figure 27 (right-hand illustration). This must point vertically upwards. Before checking the oil level, unscrew the pressure vent.
2. Unscrew the oil level screw corresponding to the mounting position (see chapter 7.1 "Versions and mounting position").
3. Check the oil level in the gear unit with the dipstick supplied (Part No.: 283 0050) as shown in Figure 27 (left and right illustration). To do this, hold the part of the dipstick which is submerged in the oil vertically.
4. The maximum oil level is the lower edge of the oil level hole.
5. The minimum oil level is approx. 4 mm below the lower edge of the oil level hole. The dipstick then just dips into the oil.
6. If the oil level is not correct, adjust the oil level by draining off oil or topping up with the type of oil stated on the name plate.
7. If the integrated seal of the oil level screw is damaged, use a new oil level screw or clean the thread and coat it with securing adhesive before screwing it in, e.g. Loctite 242 or Loxeal 54-03.
8. Attach the oil level screw together with the sealing ring and tighten with the correct torque (see chapter 7.3 "Screw tightening torques").
9. If the pressure vent has been unscrewed, screw it back in again together with the sealing ring and tighten with the correct torque (see chapter 7.3 "Screw tightening torques").
10. Mount all removed attachments again.

#### **Gear units with an oil level tank**

The oil level must be checked with the aid of the dipstick plug (thread G1¼) in the oil reservoir tank. The oil level must be between the upper and lower marking when the dipstick is fully screwed in; see Figure 27 (centre illustration). These gear units may only be operated in the mounting position stated in Section 7.1 "Versions and mounting position".

#### **Gear units with oil inspection glass**

1. The oil level can be seen directly in the window.
2. The correct oil level is:
  - Maximum: the middle of the oil inspection glass,
  - Minimum: Lower edge of the oil inspection glass.
3. If the oil level is not correct, adjust the oil level by draining off oil or topping up with the type of oil stated on the name plate.

#### **Final check**

All previously removed screws must be screwed back in correctly.

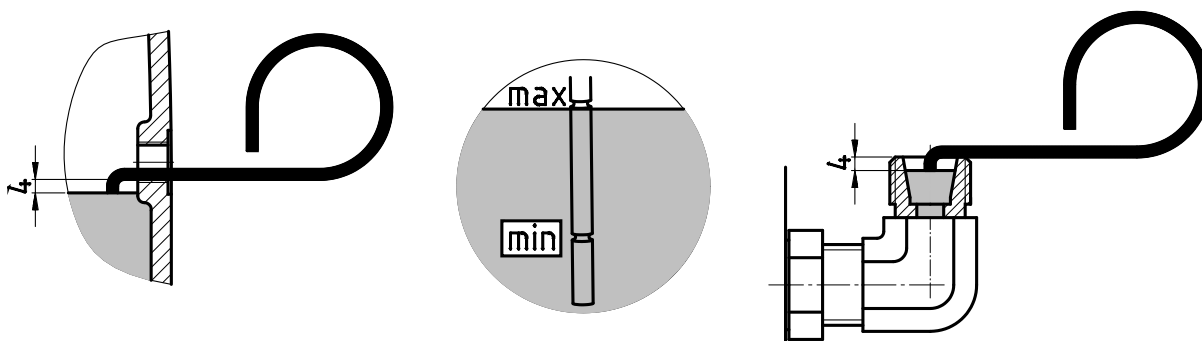


Figure 27: Checking the oil level with a dipstick

### 5.2.4 Visual inspection of the rubber buffers (Option: G, VG)

If these show damage such as tears to the surface, the rubber elements must be replaced. In this case, please contact NORD Service.

### 5.2.5 Visual inspection of the hoses (Option: OT)

Gear units with an oil reservoir tank have rubber hoses.

Check the hoses and screw connectors for leaks, cuts, tears, porous areas and chafing. In case of damage, the hoses must be replaced. Please contact the NORD service department.

### 5.2.6 Visual inspection of the radial shaft seals

#### **i** Information

Radial shaft seals are rubbing seals and have sealing lips made from an elastomer material. These sealing lips are lubricated with a special grease at the factory. This reduces the wear due to their function and ensures a long service life. An oil film in the region of the rubbing sealing lip is therefore normal and is not due to leakage.

### 5.2.7 Visual inspection of the SCX flange (option: SCX)

Check the dirt outlet holes on the SCX flange for dirt.

The gap between the shaft and the fastening plate must be free from dirt. If severe soiling is apparent, pull the gear unit off the push-in shaft and clean the push-in shaft and the inside of the flange.

Check the radial shaft seals on the gear unit for damage. Damaged radial shaft seals must be replaced with new radial shaft seals.

Mount the gear unit on the cleaned SCX flange.

### 5.2.8 Visual inspection of the temperature sticker

(only necessary for temperature class T4 or maximum surface temperature < 135 °C)

Check the temperature sticker for black colouration. If the temperature sticker has turned black, the gear unit has become too hot. The cause of overheating must be determined. Please contact the NORD service department. Do not resume operation of the drive before the cause of overheating has been remedied and renewed overheating can be ruled out.

Before putting into operation again, affix a new temperature sticker on the gear unit.

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### 5.2.9 Remove dust

(only necessary for category 2D)

Remove dust deposits on the gear unit housing if they are more than 5 mm thick.

For gear units fitted with a cover (Option H), remove the cover. Remove dust deposits in the cover, on the output shaft and on the shrink disc. Remount the cover cap afterwards.

#### **i** Information

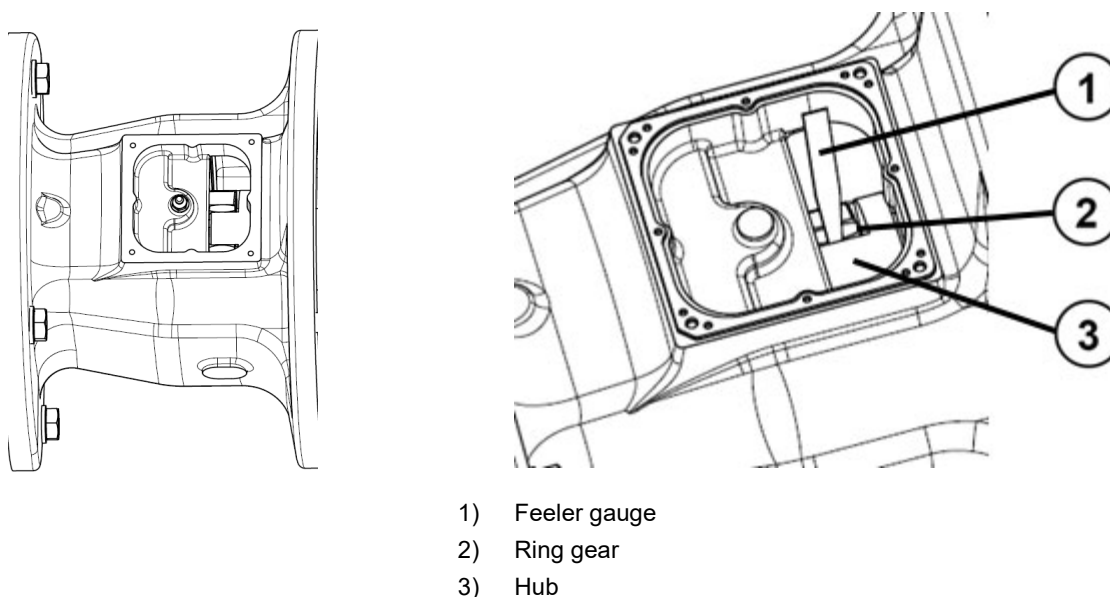
If the cover cap is completely sealed with a liquid sealing agent such as Loctite 574 or Loxeal 58-14, there is no need for regular cleaning of the cover cap

### 5.2.10 Check coupling (Option: IEC, NEMA, AI, AN)

(only necessary for category 2G)

For option AN or AI, it is possible to check the coupling through the inspection hole. Remove the inspection cover and check the claw coupling's play. If the wear limit  $X_{max}$  has been exceeded, the ring gear must be replaced.

For the IEC or NEMA option, remove the motor.



**Figure 28: For option AI, AN, check coupling through the inspection hole**

Examine the plastic and elastomer coupling components for traces of wear. Permissible wear limits can be found in Table 11. If the limit values are undershot, the coupling components must be replaced. Only use replacement parts which have the same colour as the original parts. The colour corresponds to a permissible temperature range and the torque transmission. Otherwise there is an increased risk of material fatigue.

With claw couplings (ROTEX®), measure the tooth thickness of the elastomer ring gear as shown in Figure 29.  $B_{min}$  is the minimum permitted tooth thickness.



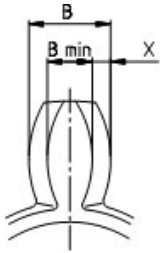


Figure 29: Measuring the tooth thickness on the ROTEX® claw coupling

Limiting wear values for coupling ring gears								
Type	R14	R24	R38	R42	R48	R55	R65	R90
B [mm]	9.7	8.6	13.3	15.7	17.7	19.6	22.2	32.3
B <sub>min</sub> [mm]	7.7	5.6	10.3	11.7	13.7	14.6	17.2	24.3
X <sub>max</sub> [mm]	2.0	3.0	3.0	4.0	4.0	5.0	5.0	8.0

Table 11: Limiting wear values of the coupling ring gears

For curved tooth gear couplings, the limiting wear value is X = 0.8 mm, as shown in the following illustration.

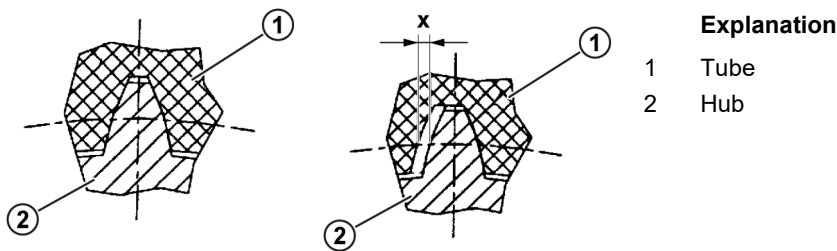


Figure 30: Measurement of gear sleeve wear for curved-tooth BoWex® couplings

**i Information**

If the examination of the coupling only shows wear below 25% of the limiting value, it is permissible to duplicate the interval for examination of the coupling, i.e. to 5,000 operating hours, at least one year.

### 5.2.11 Re-greasing (Option: VL2, VL3, W, AI, AN)

Some gear unit designs are equipped with a re-greasing device.

For the agitator versions VL2 and VL3, unscrew the vent screw opposite the grease nipple prior to re-greasing. Inject grease until a quantity of 20 - 25g escapes from the vent hole. Screw the vent screw back in.

For option W and the IEC/NEMA adapters AI and AN with option BRG1, grease the outer roller bearing with approx. 20–25 g of grease at the grease nipple. With the IEC/NEMA adapters AI and AN, the grease nipple is located under a bolt-on inspection cover. Before re-greasing, unscrew the grease drain screw so that the excess grease can drain off. Remove the excess grease on the motor adapter.

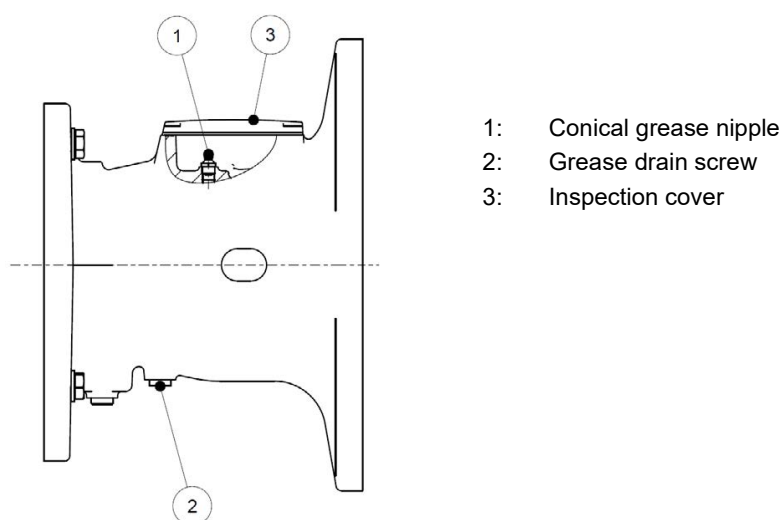


Figure 31: Re-grease IEC/NEMA adapters AI and AN with option BRG1

Recommended grease:

- Petamo GHY 133N (Klüber Lubrication)

### 5.2.12 Replacing the automatic lubricant dispenser

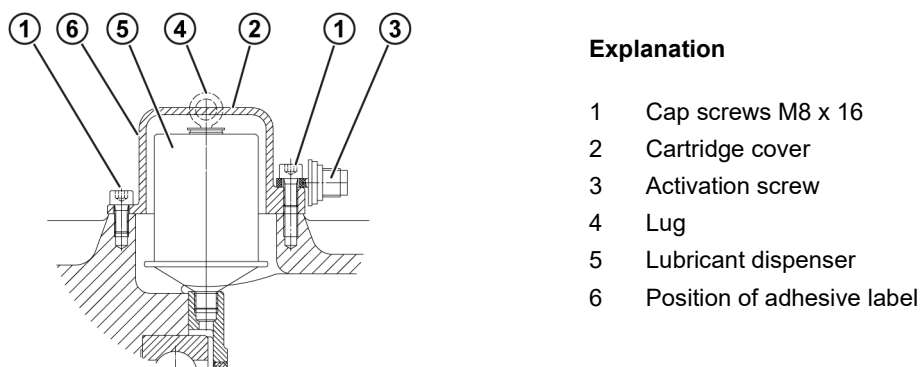


Figure 32: Switching the automatic lubricant sensor with standard motor mounting

(Lubricant sensor: Part No.: 28301000 or for food-compatible grease Part No.: 28301010)

1. Unscrew the cartridge cover
2. Unscrew the lubricant sensor.
3. Screw in the new lubricant sensor.

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4. Remove excess grease from the adapter.
5. Activate the full lubricant sensor (see chapter 4.3 "Activating the automatic lubricant dispenser").

The grease collection container (Part No. 28301210) must be replaced or drained with every second replacement of the lubricant sensor. Due to the form of the container, a residual amount of grease remains in the container.

1. Unscrew the grease collection container from the screw connector.
2. Press grease out of the grease collection container. To do this, push the internal piston back with a rod. The rod may have a maximum diameter of 10 mm. Collect the extracted grease and dispose it properly.
3. Check the collecting vessel. If the collecting vessel is damaged, replace it with a new one.
4. Screw the collecting vessel back into the drain hole on the motor adapter.

### 5.2.13 Change the oil

On the figures in Section 7.1 "Versions and mounting position" the positions of the oil drain screw, the oil level screw and the vent screw, if present, are shown depending on the mounting position.

#### **WARNING**

##### **Danger of burns**

The oil may be very hot. Use protective equipment.

Procedure:

1. Place a collection vessel under the oil drain screw or the oil drain tap.
2. Screw out the oil level screw (if present) and the oil drain screw. When using an oil reservoir tank, screw out the screw plug with dipstick.
3. Completely drain the oil from the gear unit.
4. Check the sealing rings of the oil drain screw and the oil level screw. If a sealing ring is damaged, replace the corresponding screw. You can also clean the threads and coat them with securing adhesive e.g. Loctite 242 54-03 before screwing them in.
5. Screw the oil drain screw into the hole and tighten to the correct torque (see chapter 7.3 "Screw tightening torques").
6. Using a suitable filling device, refill with oil of the same type through the oil level hole until oil emerges from the oil level hole. The oil can also be filled through the hole of the pressure vent screw or of a screw plug located higher than the oil level. If an oil reservoir tank is used, fill the oil through the upper inlet (thread G1¼) until the oil level is set as described in Section 5.2.3 "Checking the oil level".
7. Check the oil level after at least 15 min, if using an oil level container after at least 30 min.

#### **Information**

The oil does not need to be replaced for gear units without oil drain screws (see chapter 7.1 "Versions and mounting position"). The gear unit are lubricated for life.

Standard helical gear units in ATEX categories 3G and 3D (see chapter 2.2 "Name plate") do not have an oil level screw. Here, new oil is injected through the threaded hole of the pressure vent, with the oil quantity according to the following table.

For all other gear unit types, the information on the name plate shall apply.

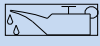
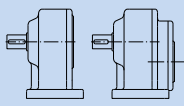

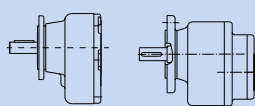
Oil quantities													
													
	M1	M2	M3	M4	M5	M6		M1	M2	M3	M4	M5	M6
Gear unit type	Quantity [l]						Gear unit type	Quantity [l]					
<b>SK 0</b>	0.13	0.22	0.13	0.22	0.13	0.13	<b>SK 0 F</b>	0.13	0.22	0.13	0.22	0.13	0.13
<b>SK 01</b>	0.22	0.38	0.22	0.38	0.22	0.22	<b>SK 01 F</b>	0.22	0.38	0.22	0.38	0.22	0.22
<b>SK 20</b>	0.55	1.00	0.55	1.00	0.55	0.55	<b>SK 20 F</b>	0.35	0.60	0.35	0.60	0.35	0.35
<b>SK 25</b>	0.50	1.00	0.50	1.00	0.50	0.50	<b>SK 25 F</b>	0.50	1.00	0.50	1.00	0.50	0.50
<b>SK 30</b>	0.90	1.30	0.90	1.30	0.90	0.90	<b>SK 30 F</b>	0.70	1.10	0.70	1.10	0.70	0.70
<b>SK 33</b>	1.00	1.60	1.00	1.60	1.00	1.00	<b>SK 33 F</b>	1.00	1.50	1.00	1.50	1.00	1.00
<b>SK 000</b>	0.24	0.40	0.24	0.41	0.24	0.24	<b>SK 000 F</b>	0.24	0.41	0.24	0.41	0.24	0.24
<b>SK 010</b>	0.38	0.60	0.38	0.60	0.38	0.38	<b>SK 010 F</b>	0.35	0.65	0.40	0.74	0.50	0.30
<b>SK 200</b>	0.80	1.30	0.80	1.30	0.80	0.80	<b>SK 200 F</b>	0.65	0.95	0.70	1.10	0.80	0.50
<b>SK 250</b>	1.20	1.50	1.20	1.50	1.20	1.20	<b>SK 250 F</b>	0.90	1.40	1.00	1.60	1.30	0.80
<b>SK 300</b>	1.20	2.00	1.20	2.00	1.20	1.20	<b>SK 300 F</b>	1.25	1.50	1.20	1.80	1.30	0.95
<b>SK 330</b>	1.80	2.80	1.80	2.80	1.80	1.80	<b>SK 330 F</b>	1.60	2.50	1.60	2.90	1.90	1.40

Table 12: Oil quantities for standard helical gear units for ATEX categories 3G and 3D

### 5.2.14 Checking the cooling coil for deposits (Option: CC)

The cooling water flow rate must be controlled. For this, pay attention to the information in Section 4.4 "Cooling coil (Option: CC)".

If a chemical cleaner is used, it must be ensured that the cleaning agent does not attack the material of the cooling coil (copper pipe and brass fittings).

Check the cooling coil and the cover for leaks if strong corrosion is found on the connections.

Please contact the NORD Service department.

### 5.2.15 Clean and check vent screw

1. Unscrew the vent screw.
2. Thoroughly clean the vent screw, e.g. with compressed air.
3. Check the vent screw and the sealing ring. If the sealing ring is damaged, use a new vent screw.
4. Screw the vent screw back in.

### 5.2.16 Replacing the shaft sealing ring

Once the shaft sealing ring has reached the end of its service life, the oil film in the region of the sealing lip increases and a measurable leakage with dripping oil occurs. **The radial shaft seal must then be replaced.** The space between the sealing lip and the protective lip must be filled approximately 50 % with grease on fitting (recommended grease: PETAMO GHY 133N). Take care that after fitting, the new radial shaft seal does not run in the old wear track.

5.2.17 Re-lubrication of bearings in the gear unit

**NOTICE**

**Damage to the gear unit due to insufficient lubricant**

There is a risk of bearing failure in the event of inadequate lubrication.

- It is essential to comply with the recommended intervals.
- Only use greases which are approved by Getriebebau NORD.
- Never mix different greases. If different greases are mixed, the gear unit may be damaged due to inadequate lubrication caused by incompatibility between the different greases.
- Avoid contamination of the grease with foreign substances and washing out of the grease by lubricating oil.

Please contact the NORD Service department for replacement of the grease in the roller bearings.

Recommended grease: Petamo GHY 133N - Klüber Lubrication. (see chapter 7.2.1 "Roller bearing greases")

5.2.18 General overhaul

**DANGER**

**Explosion hazard**



- The general overhaul must be carried out by qualified personnel in a specialist workshop with appropriate equipment.
- We urgently recommend that the general overhaul is carried out by the NORD Service Department.

With Category 2G and 2D gear units, a general overhaul is necessary after a specified period of operation.

The approved period of operation is usually stated on the name plate in field MI.

Alternatively, the maintenance class CM may be stated in field MI (e.g.: MI CM = 5.).

In this case, the time for general overhaul in years after commissioning ( $N_A$ ) is calculated according to the following formula: The maximum permissible duration of operation after commissioning is 10 years. This also applies to higher calculated values.

$$N_A = CM \cdot f_L \cdot k_A$$

CM Maintenance class according to field MI of the name plate

$f_L$ : Running time factor

$f_L = 10$  Maximum running time 2 hours per day

$f_L = 6$  Running time 2 to 4 hours per day

$f_L = 3$  Running time 4 to 8 hours per day

$f_L = 1.5$  Running time 8 to 16 hours per day

$f_L = 1$  Running time 16 to 24 hours per day

$k_A$ : Utilisation factor (usually  $k_A = 1$ )

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Longer maintenance intervals often result if the actual power required by the application is known. The utilisation factor may be calculated as follows.

$$k_A = \left( \frac{P_1}{P_{tat}} \right)^3$$

P1 Max. permissible drive power or motor power in kW according to the name plate

P<sub>tat</sub>: Actual drive power or motor power in kW which is required by the application at the rated speed., determined e.g. by measurements

For variable loads with differing actual drive powers with nominal speeds P<sub>tat1</sub>, P<sub>tat2</sub>, P<sub>tat3</sub>, ... with known percentage times q<sub>1</sub>, q<sub>2</sub>, q<sub>3</sub>, ..., the following equivalent average drive power applies:

$$P_{tat} = \sqrt[3]{P_{tat1}^3 \cdot \frac{q_1}{100} + P_{tat2}^3 \cdot \frac{q_2}{100} + P_{tat3}^3 \cdot \frac{q_3}{100} + \dots}$$

During general overhaul, the gear unit is completely dismantled. The following work steps are carried out:

- All gear unit components are cleaned.
- All gear unit components are checked for damage.
- Damaged parts are replaced.
- All roller bearings are replaced.
- Replace all seals, radial shaft seals and Nilos rings.
- Optional: The back stop will be renewed.
- Optional: Replace the elastomers in the coupling.

## 6 Disposal

Observe the current local regulations. In particular, lubricants must be collected and disposed of correctly.

<b>Gear unit components</b>	<b>Material</b>
Gearwheels, shafts, roller bearings, keys, circlips, ...	Steel
Gear unit housing, housing components, ...	Grey cast iron
Light alloy gear unit housing, light alloy housing components, ...	Aluminium
Worm gears, sockets, ...	Bronze
Radial shaft seals, sealing caps, rubber components, ...	Elastomers with steel
Coupling components	Plastic and steel
Flat seals	Asbestos-free sealing material
Gear oil	Additive mineral oil
Synthetic gear oil (adhesive label: CLP PG)	Polyglycol-based lubricants
Synthetic gear oil (adhesive label CLP PG)	Poly-alpha-olefin based lubricants
Cooling coil, embedding material of the cooling coil, screw fittings	Copper, epoxy, yellow brass

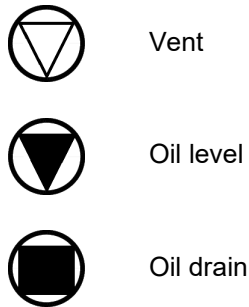
**Table 13: Materials**

## 7 Appendix

### 7.1 Versions and mounting position

For versions which are not listed, please refer to the special documentation drawing (see chapter 2.2 "Name plate").

#### 7.1.1 Explanation of symbols



#### 7.1.2 Standard helical gear units

Standard ATEX category 3G and 3D helical gear units do not have oil filling screws (see chapter 2.2 "Name plate").

#### 7.1.3 NORDBLOC.1® helical in-line gear units SK 072.1 and SK 172.1

1. Bring the gear unit from the M4 installation position into the M2 installation position. Remove the oil level screw for the M2 installation position.

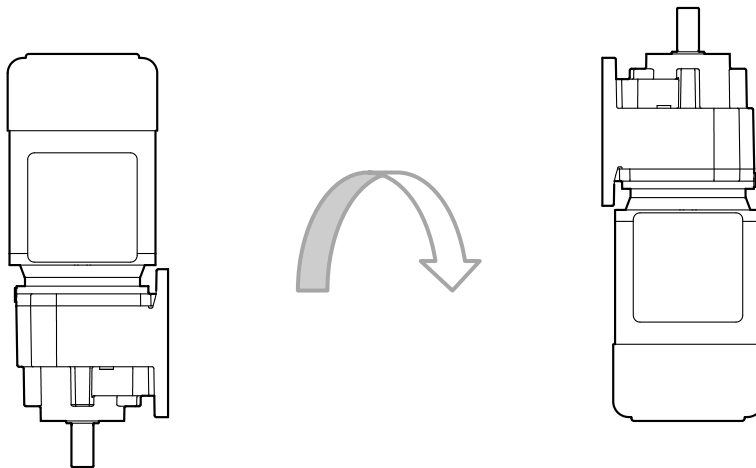
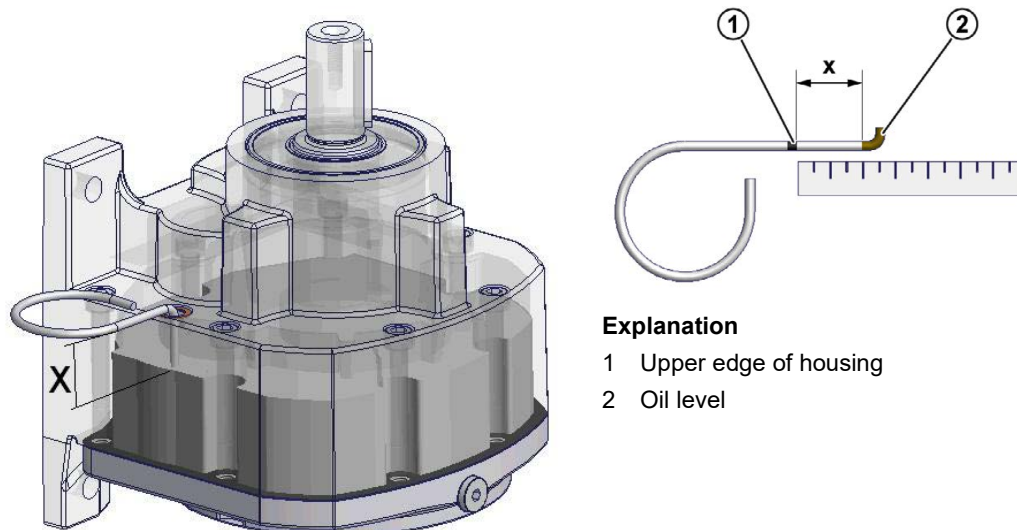


Figure 33: Oil level measurement SK 072.1 – SK 172.1

2. Determine the measurement X between the upper edge of the gear unit housing and the oil level. If necessary, adjust the dipstick accordingly (see Figure 34).





**Explanation**

- 1 Upper edge of housing
- 2 Oil level

Figure 34: Measuring the oil level

3. Compare the determined measurement X with the corresponding measurement in the following table. If necessary, adjust the oil level with the type of oil shown on the name plate.

Gear unit type	Thread size	Measurement X [mm]
SK 072.1	M8 x 1	22 ± 1
SK 172.1	M8 x 1	20 ± 1

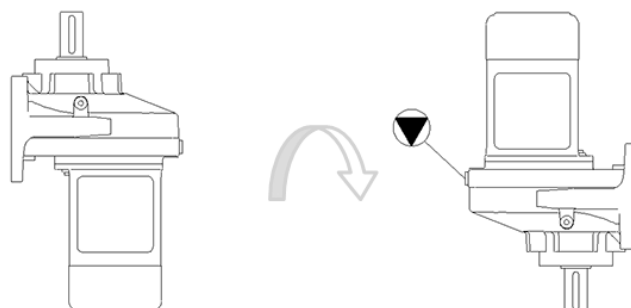
- 4. Screw the oil level screw of the M2 installation position back in and tighten it.
- 5. Bring the gear unit back into the M4 installation position.

**7.1.4 NORDBLOC.1® helical in-line gear units SK 071.1, SK 171.1, SK 371.1, SK 571.1, SK 771.1 ... SK 1071.1**

The gear units do not have oil level screws in the installation position M2. The oil level must be measured in installation position M4. Proceed as follows.

**SK 071.1, SK 171.1, SK 371.1, SK 571.1**

- 1. Bring the gear unit into the M4 installation position.



M2

M4

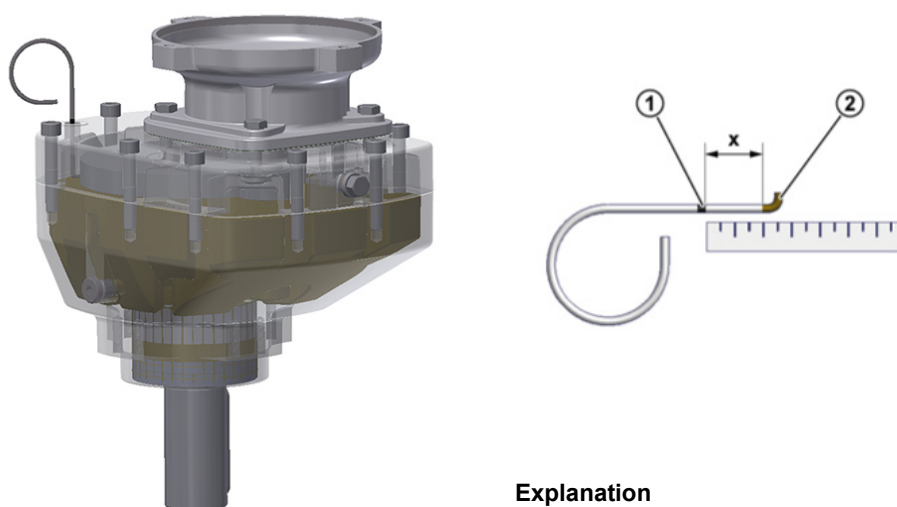
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Figure 35: Oil level measurement SK 071.1 – SK 371.1

2. Remove the oil level screw for the M4 installation position. Check the oil level according to Section 5.2.3 "Checking the oil level". If necessary, adjust the oil level with the type of oil shown on the name plate.
3. Screw the oil level screw of the M4 installation position back in and tighten with the correct torque (see chapter 7.3 "Screw tightening torques").
4. Bring the gear unit back into the M2 installation position and remount it.

### SK 771.1 ... 1071.1

1. Bring the gear unit into the M4 installation position (see Figure 35)
2. Determine the measurement X between the upper edge of the gear unit cover and the oil level.



#### Explanation

- 1 Upper edge of housing
- 2 Oil level

Figure 36: Oil level SK 771.1 ... 1071.1

3. Compare the determined measurement X with the measurement in the following table. If necessary, adjust the oil level with the type of oil shown on the name plate.

Gear unit type	Thread size	Measurement X [mm]
SK 771.1	M12 x 1.5	28 ± 1
SK 871.1	M12 x 1.5	14 ± 1
SK 971.1	M12 x 1.5	26 ± 1
SK 1071.1	M12 x 1.5	10 ± 1

4. Screw in the oil level screw of the M4 installation position and tighten with the correct torque (see chapter 7.3 "Screw tightening torques").
5. Bring the gear unit back into the M2 installation position and remount it.

### 7.1.5 NORDBLOC.1® helical in-line gear units

In category 2G and 2D, the gear unit types SK 320, SK 172, SK 272, SK 372 as well as SK 273 and SK 373 have only one oil level screw. These gear unit types have a checkable life-long lubrication. These gear unit types in ATEX categories 3G and 3D do not have oil level screws (see chapter 2.2 "Name plate").

### 7.1.6 Parallel shaft gear units

The following illustration applies to the M4 / H5 version of gear unit types SK 9282, SK 9382, SK 10282, SK 10382, SK 11282, SK 11382, SK 12382, SK10382.1, SK11382.1 with oil reservoir tank.

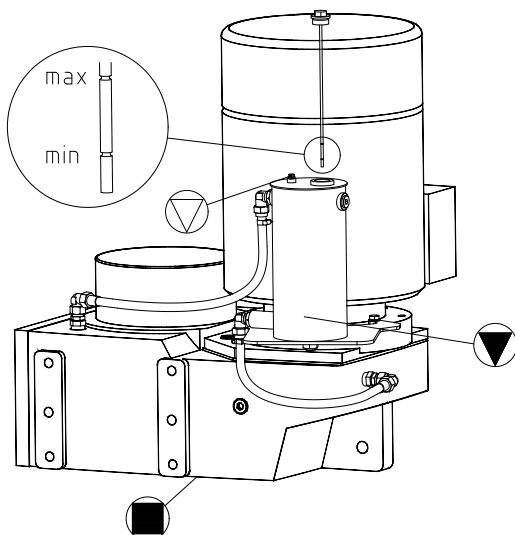


Figure 37: Parallel shaft gear units with oil level tank

In category 2G and 2D, types SK 0182 NB, SK 0282 NB and SK 1382 NB have a checkable life-long lubrication. In this category, the gear unit types have only one oil level screw. These gear unit types in ATEX categories 3G and 3D do not have oil level screws (see chapter 2.2 "Name plate").

### 7.1.7 UNIVERSAL worm gear units

SK 1SI 31 – SK 1SI 75

SK 1SIS 31 – SK 1SIS 75

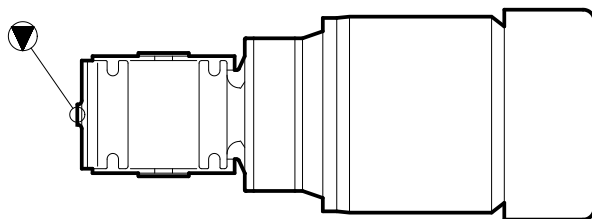


Figure 38: Orientation for oil level check

For the **oil level check**, bring the gear unit into the position shown above. To do this, it may be necessary to remove the gear unit or the geared motor.

#### Information

The warm gear unit must be adequately settled in the position shown in Figure 38, in order to allow the oil to settle evenly.

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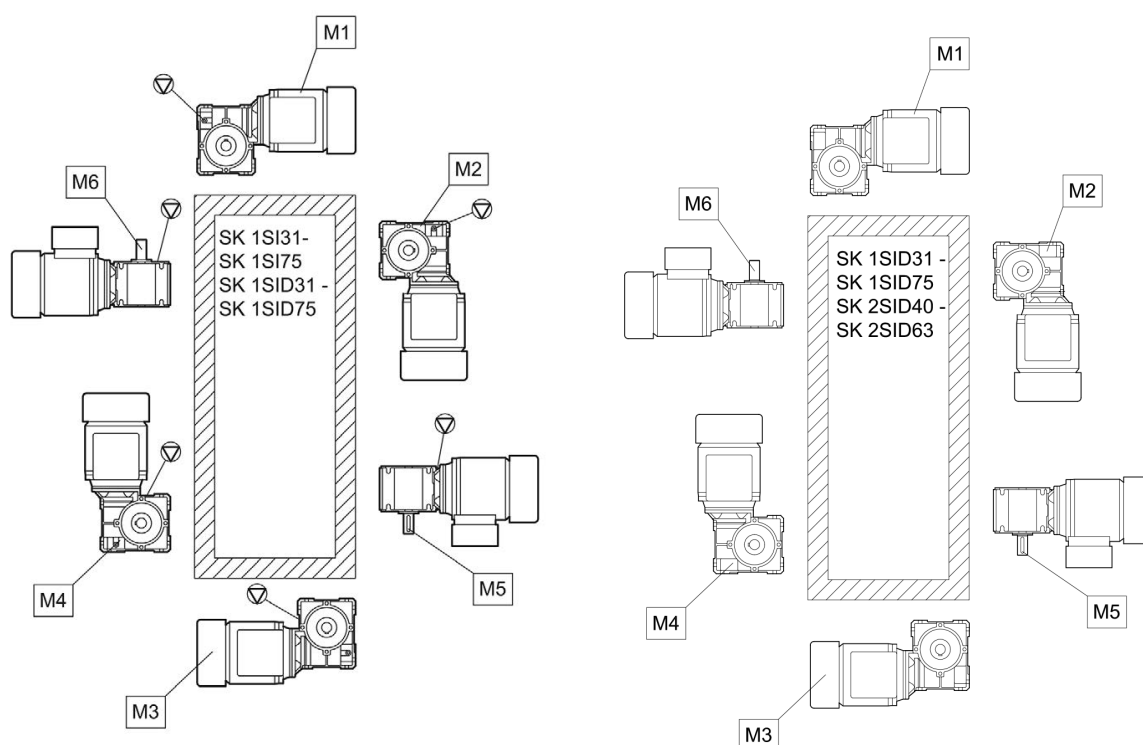
Afterwards, check the oil level as described in Section (see chapter 5.2.3 "Checking the oil level" on page 54).

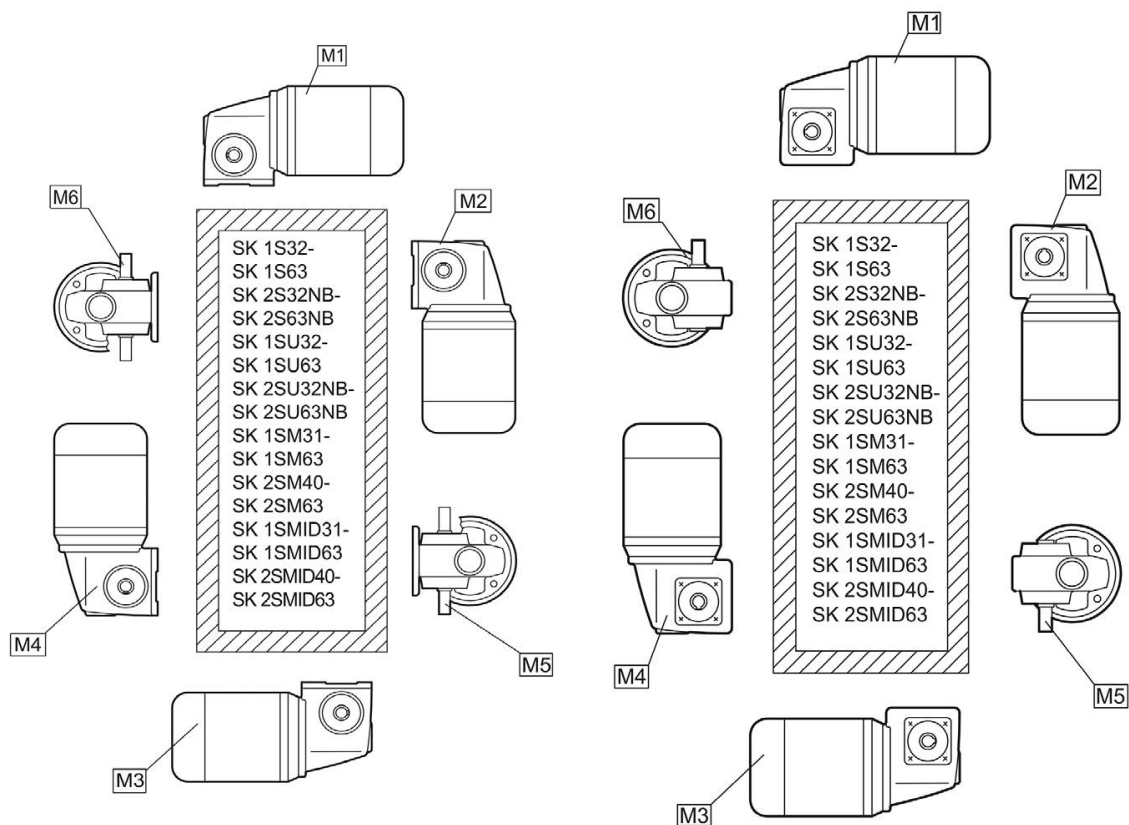
In category 2G and 2D the gear units only have one oil level screw. These gear unit types have a checkable life-long lubrication.

The oil level screws are not used in ATEX categories 3G and 3D. These gear unit types are lubricated for life.

The gear unit types **SK 1S xx**, **SK 2S xx**, **SK 1SU xx**, **SK 2SU xx**, **SK 1SM xx**, **SK 2SM xx**, **SK 1SMI xx**, **SK 2SMI xx** may only be used in category 3G and 3D. These gear units are lubricated for life and do not have an oil level screw.

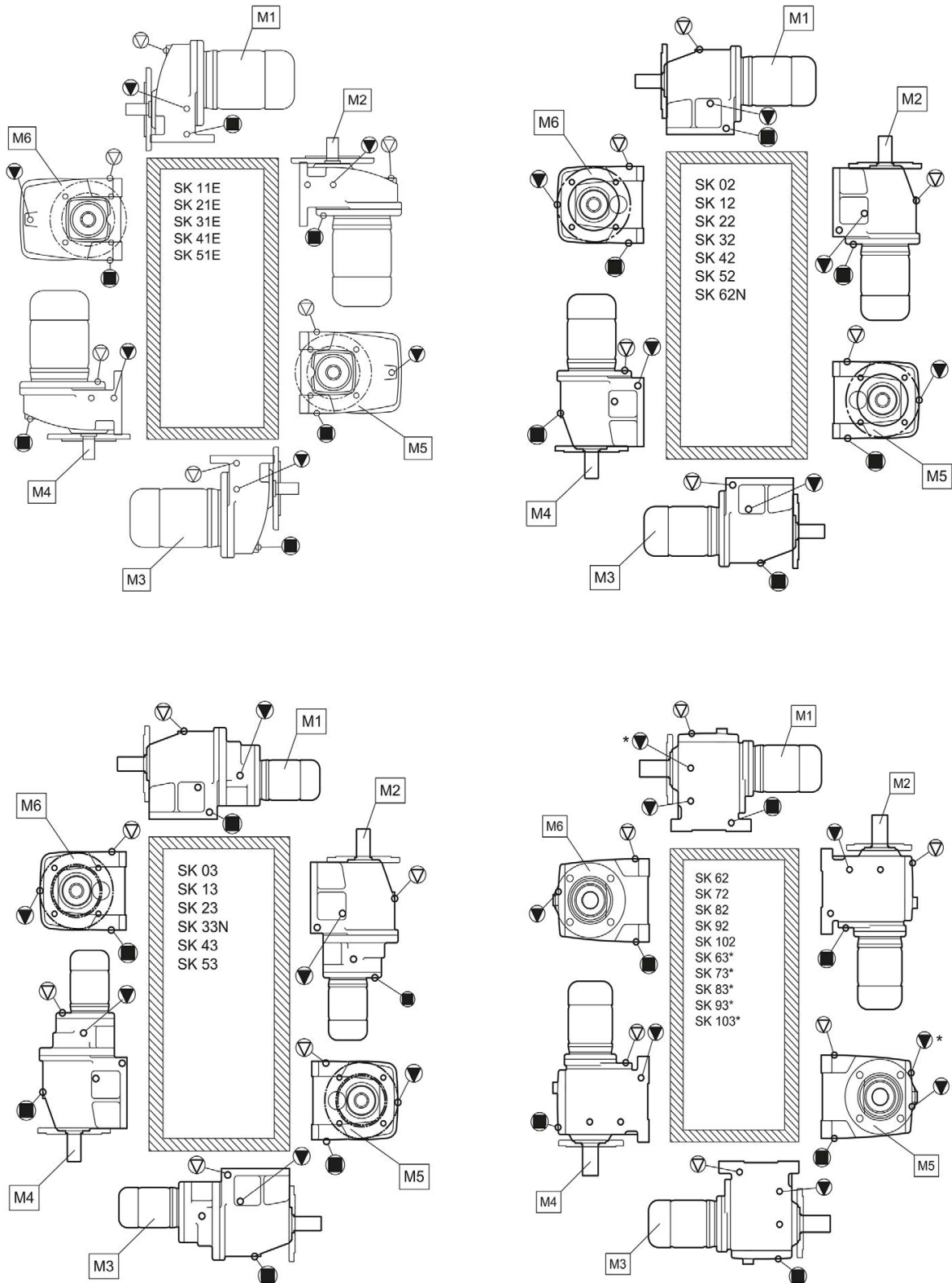
As an option, types SI and SMI can be equipped with a pressure relief vent.



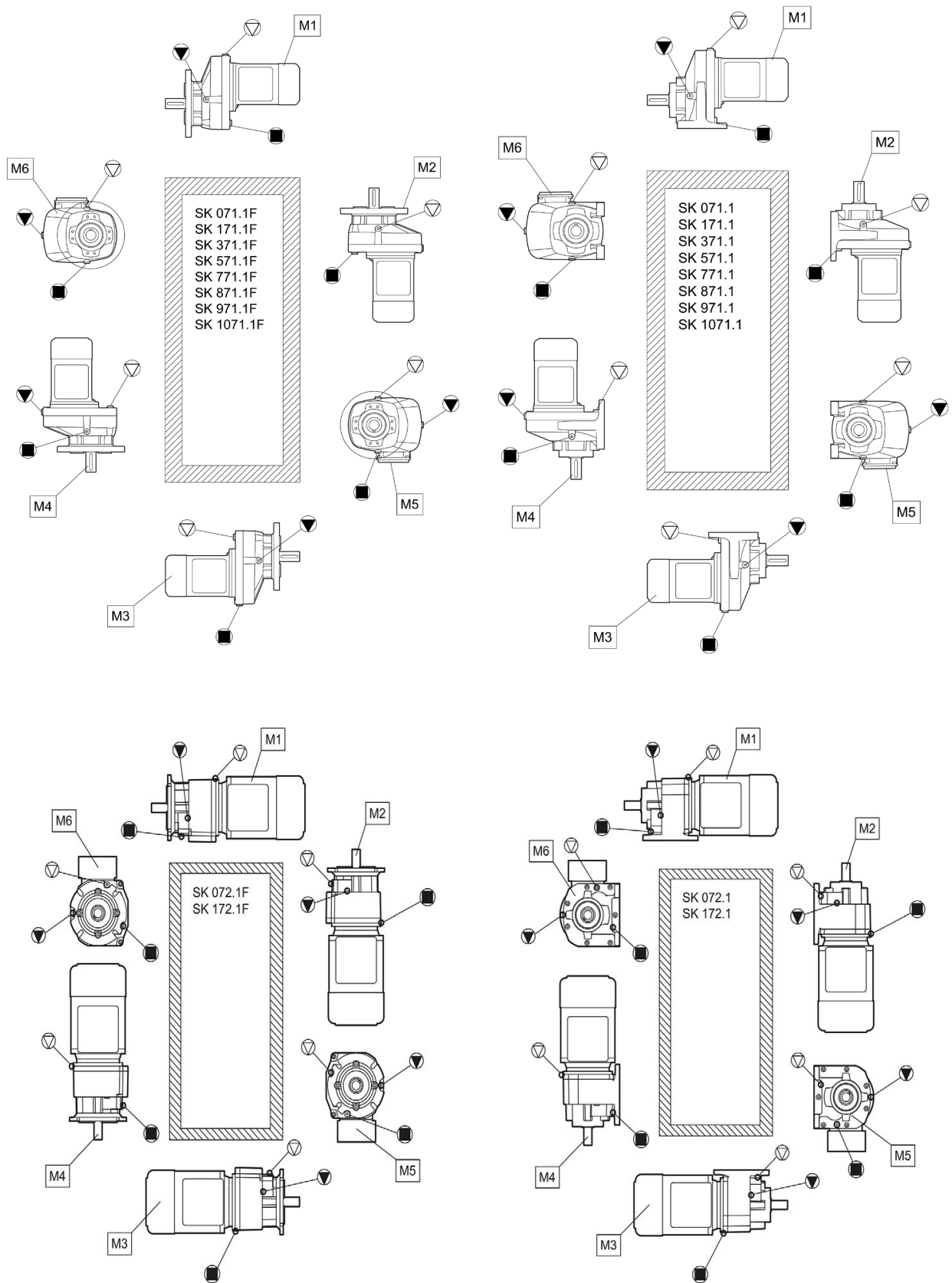


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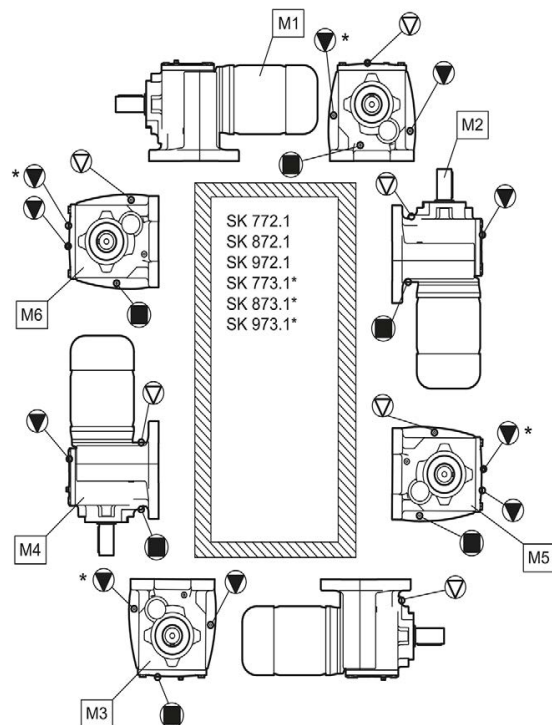
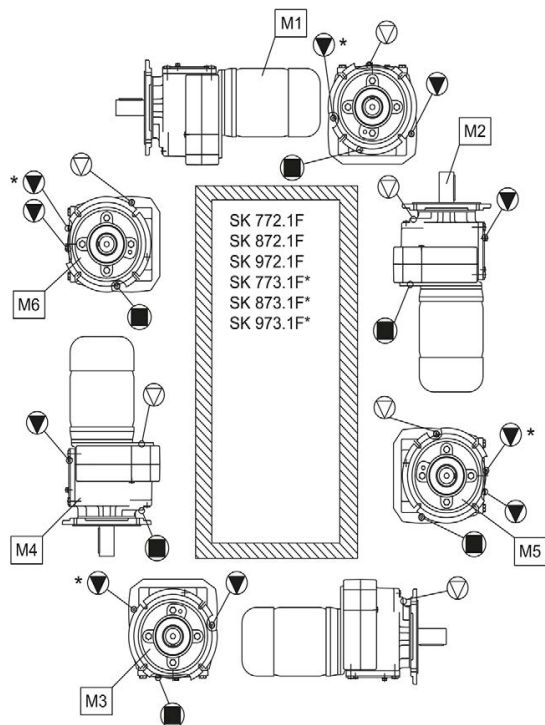
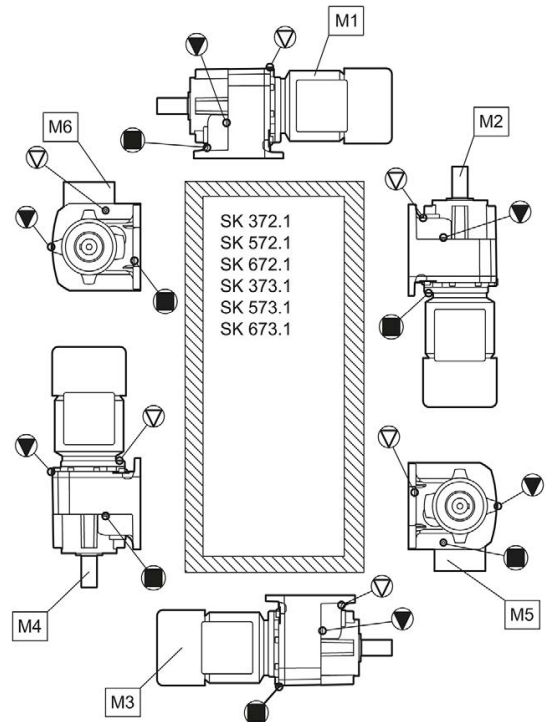
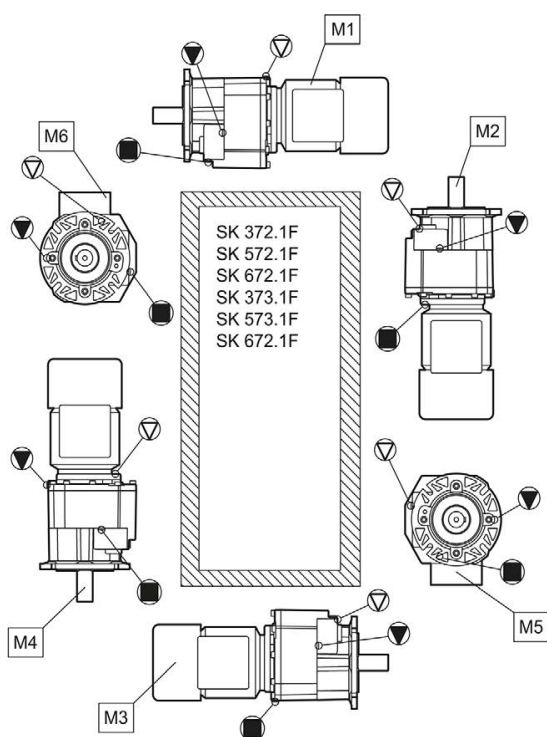
### 7.1.8 Overview of mounting positions



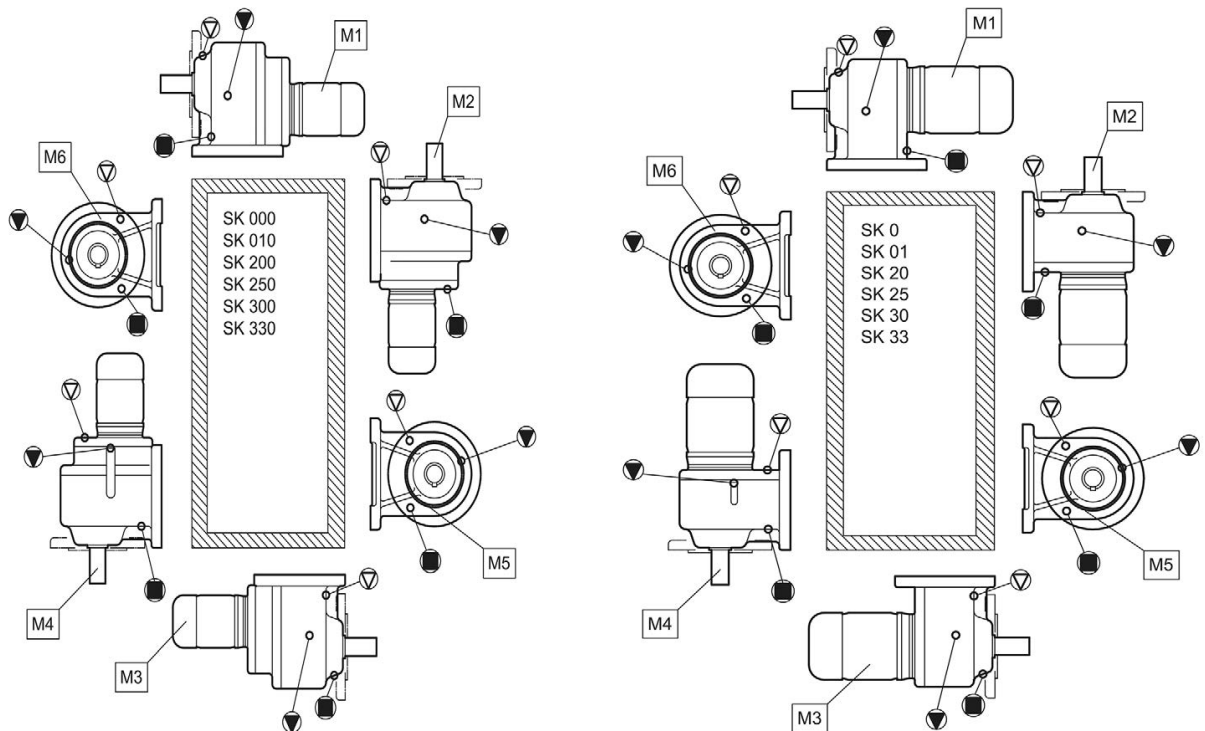
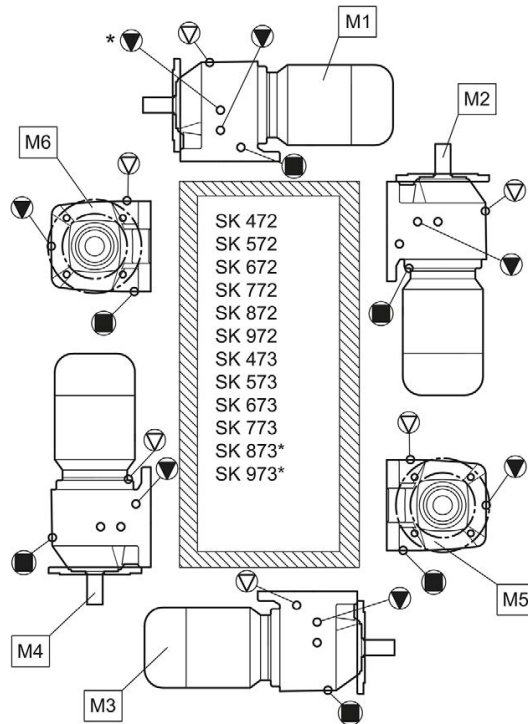
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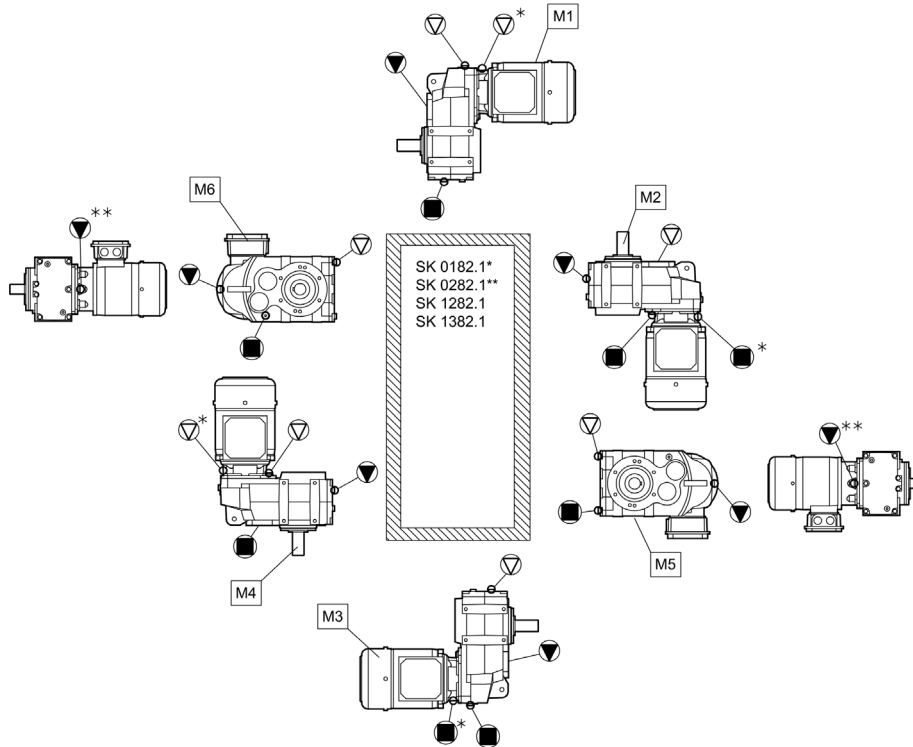
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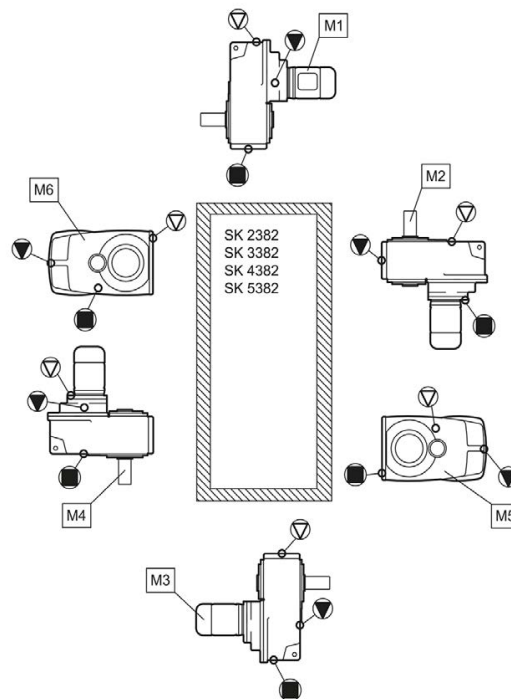
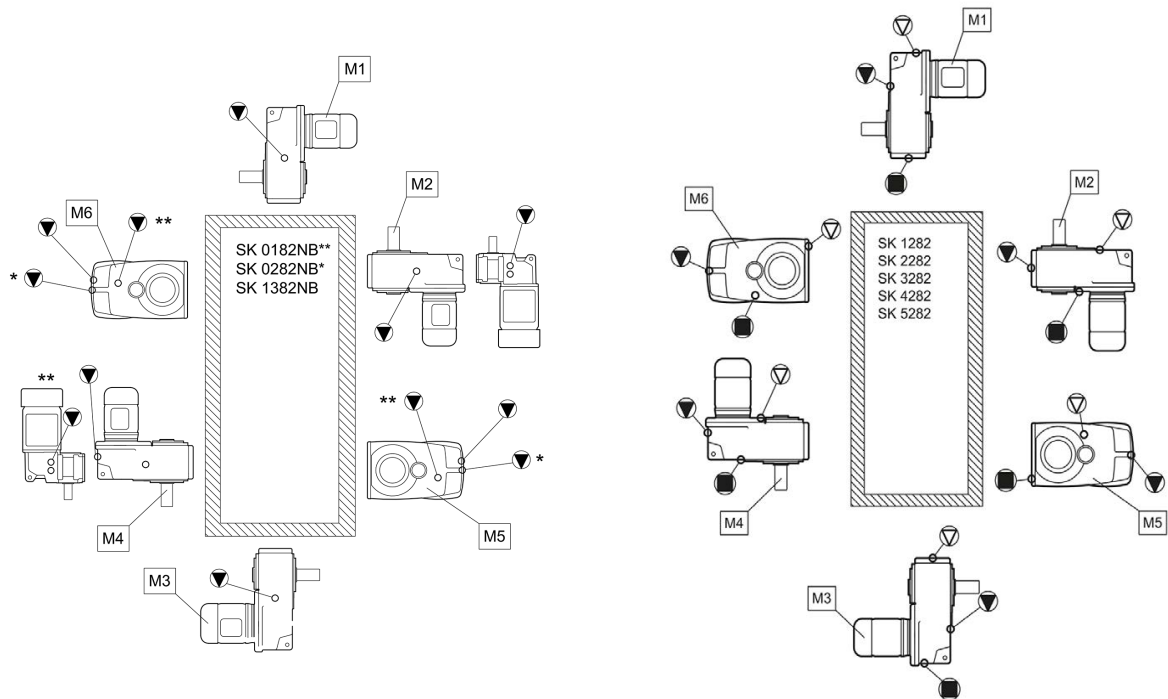




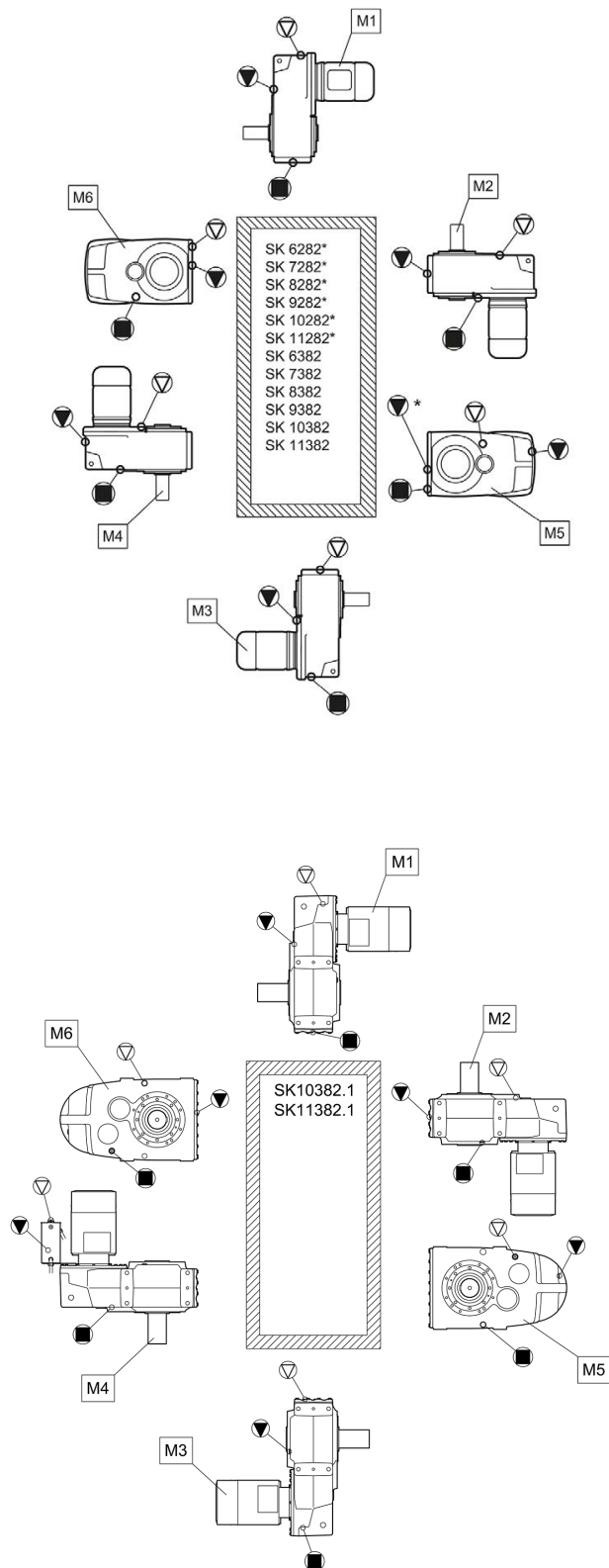
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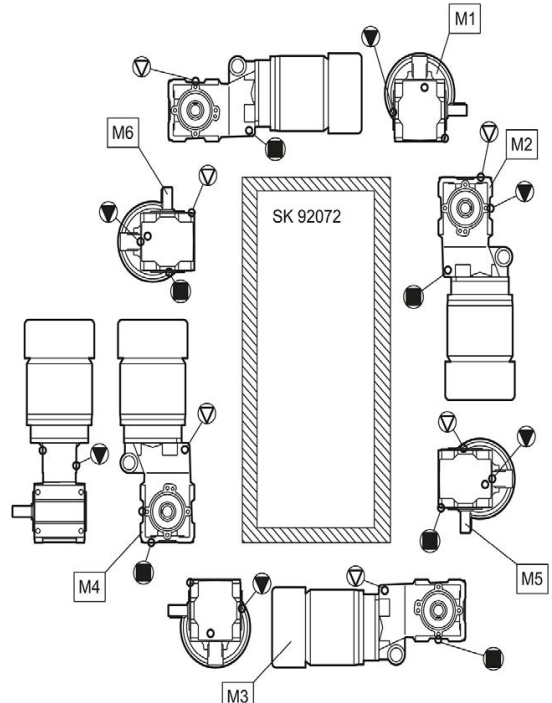
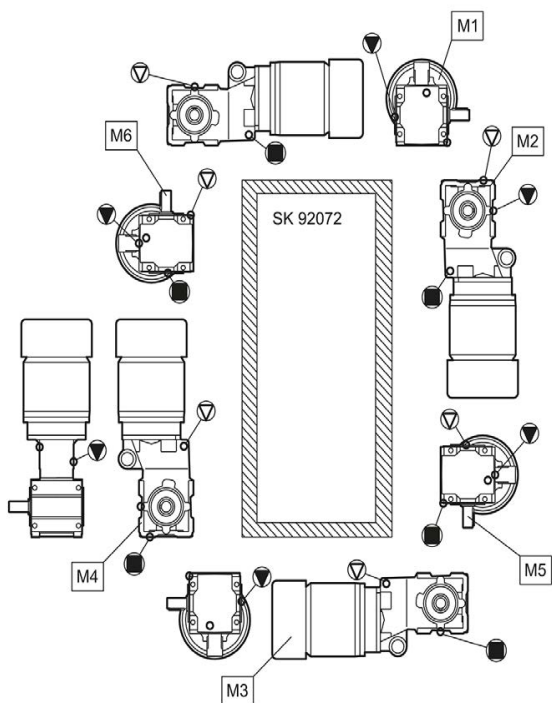
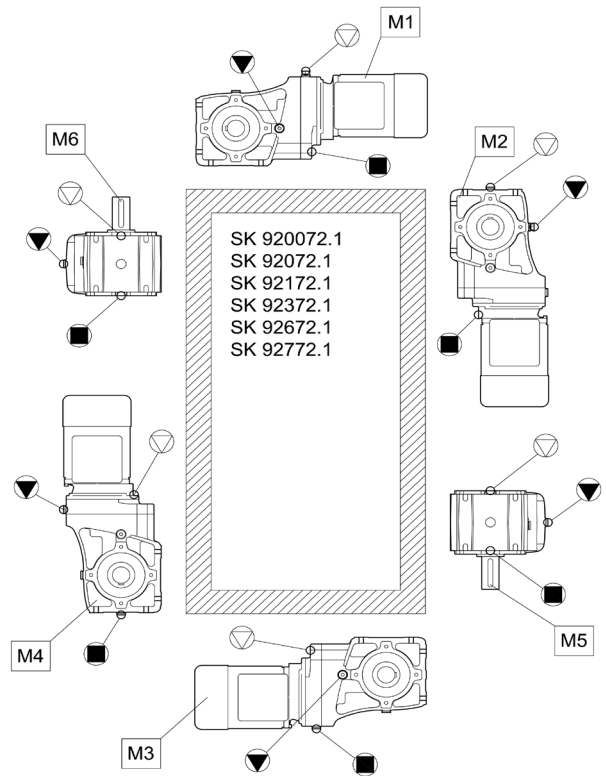
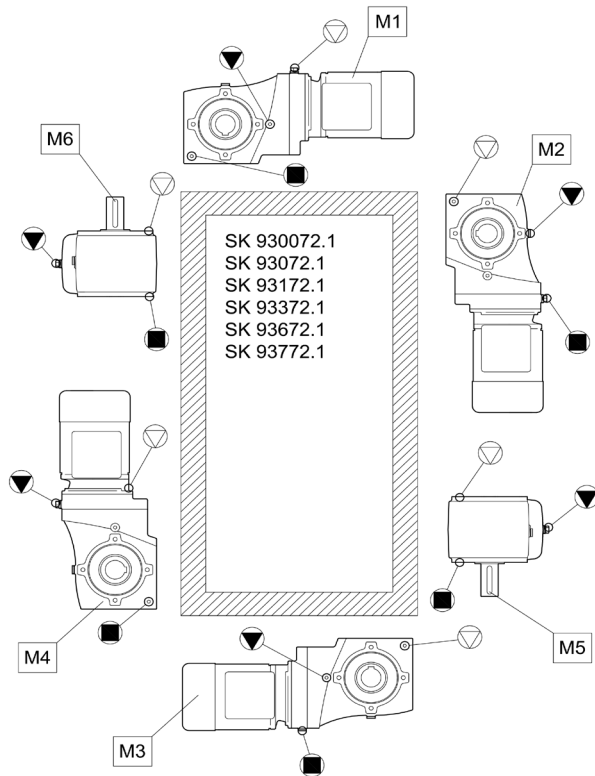
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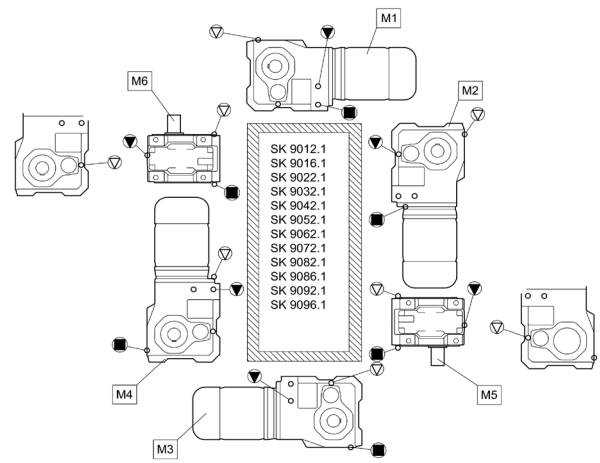
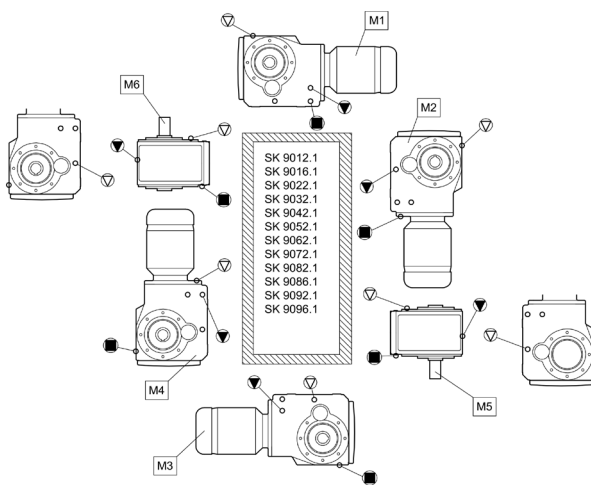
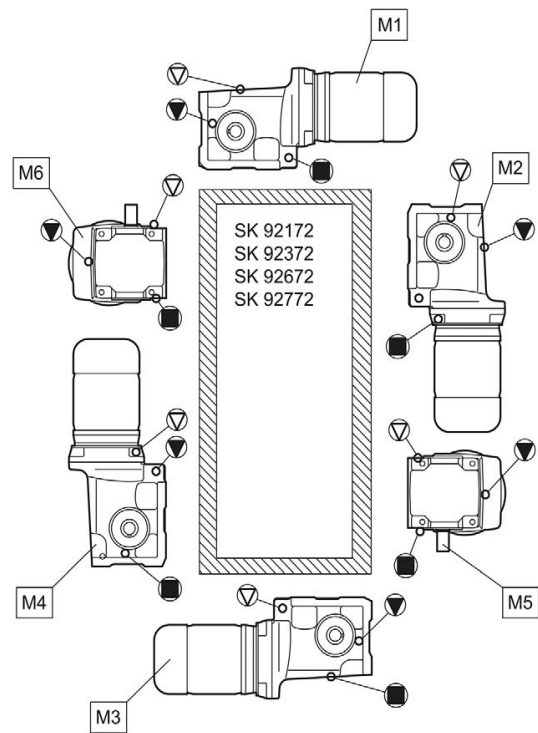
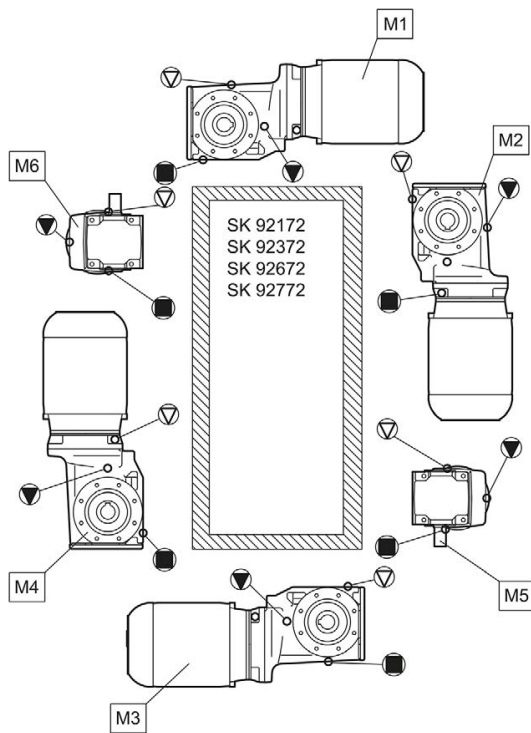
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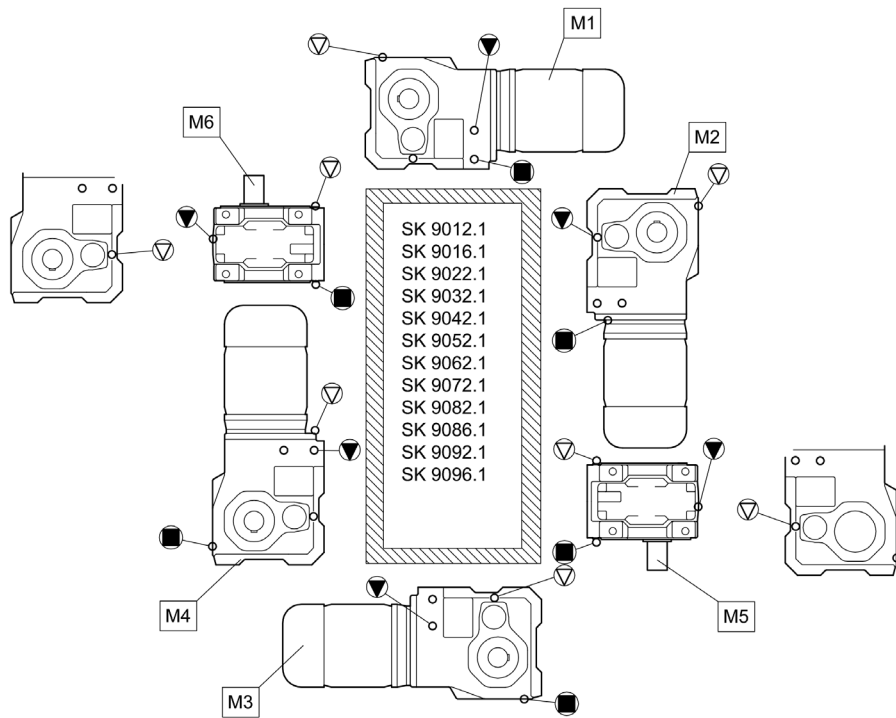
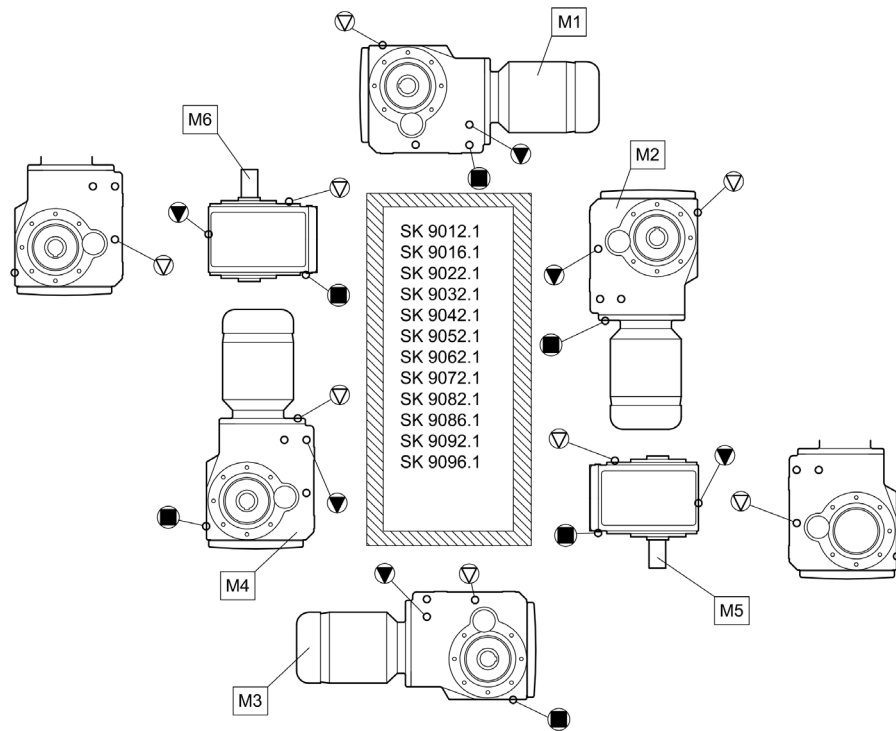
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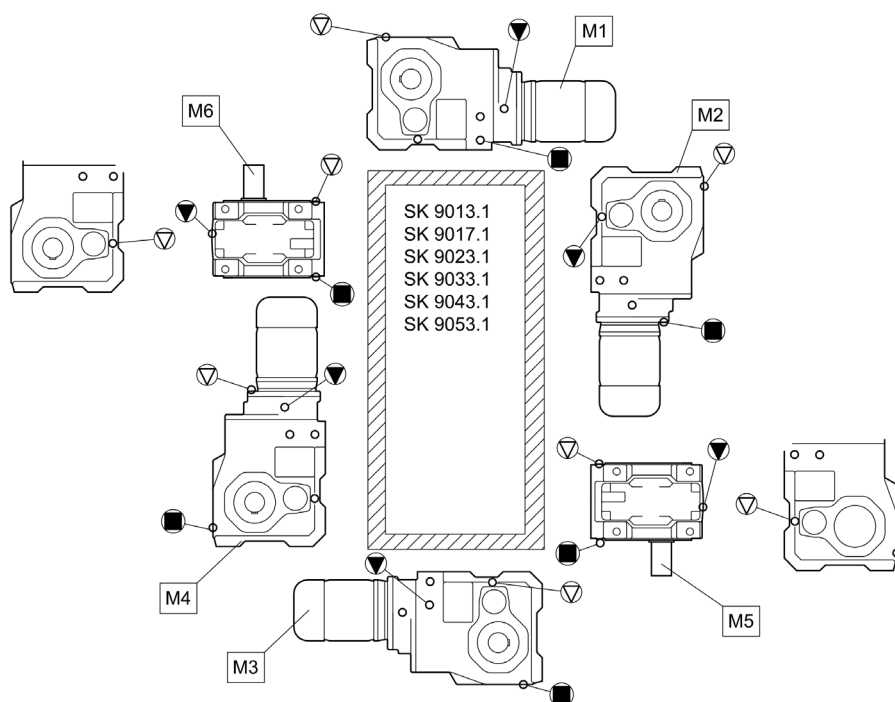
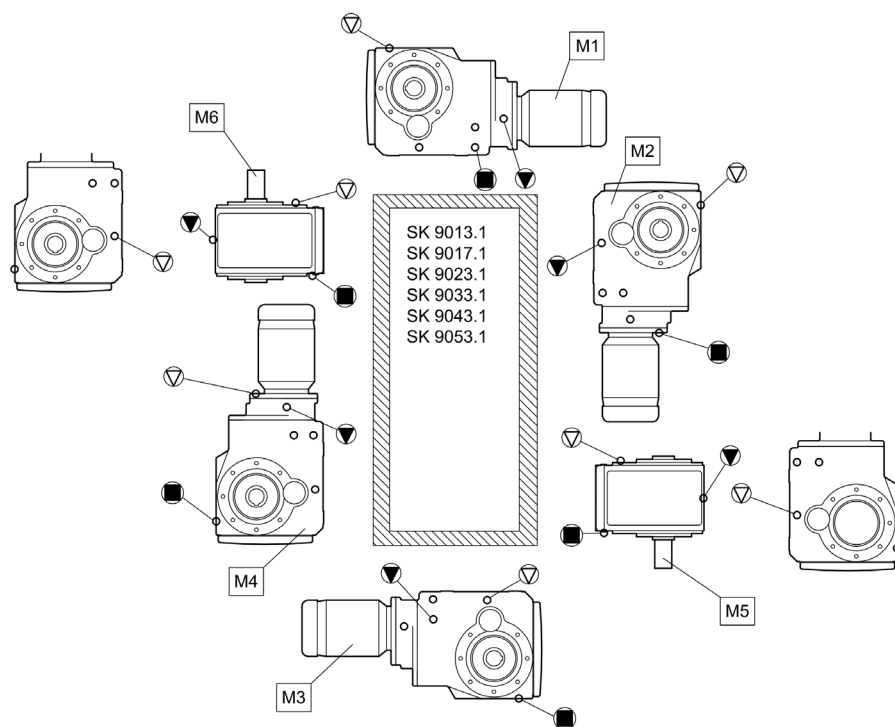
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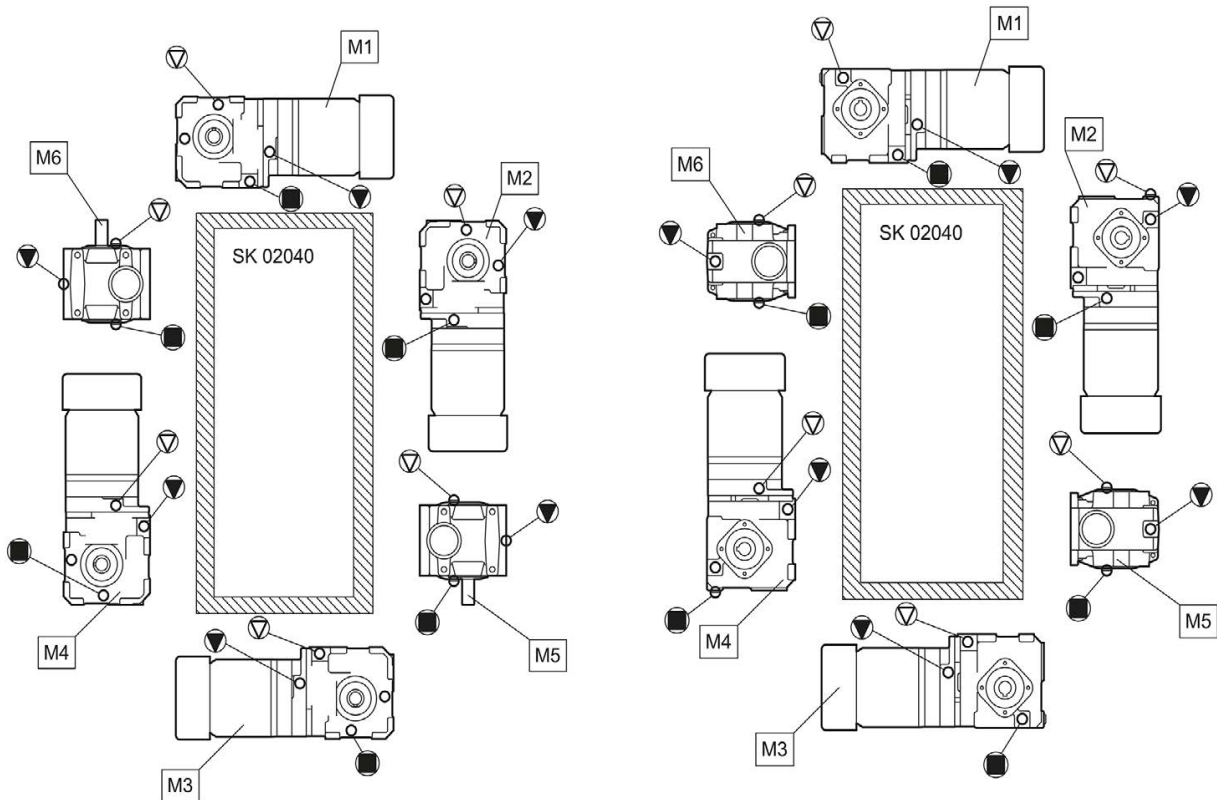
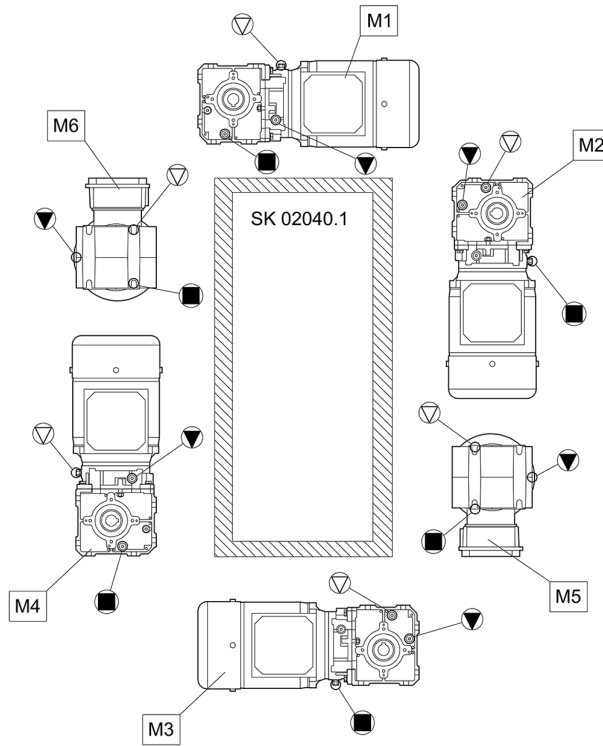


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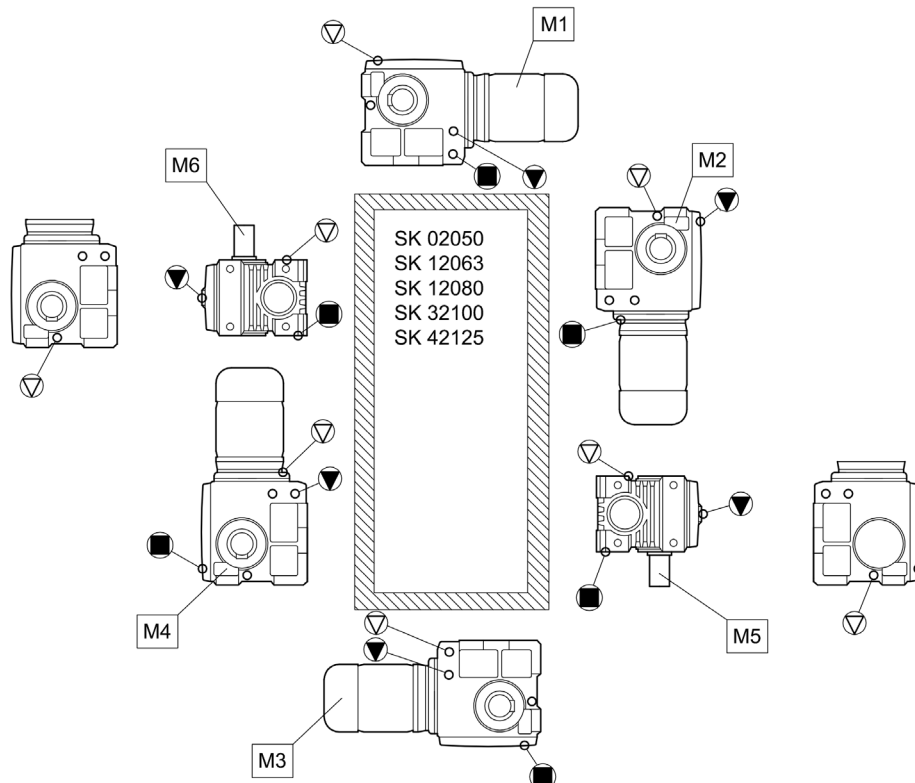
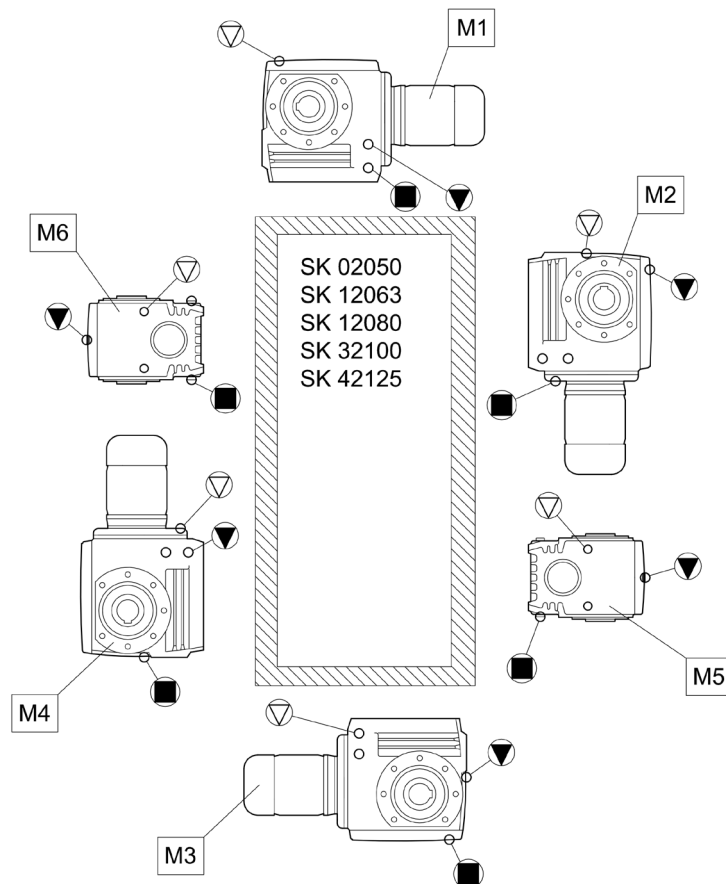


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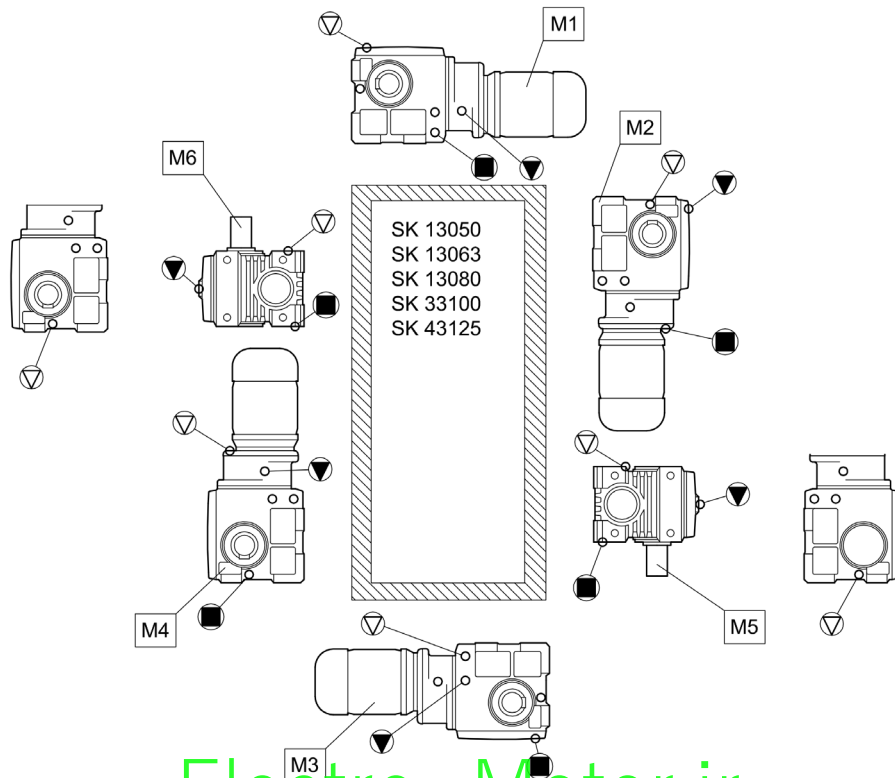
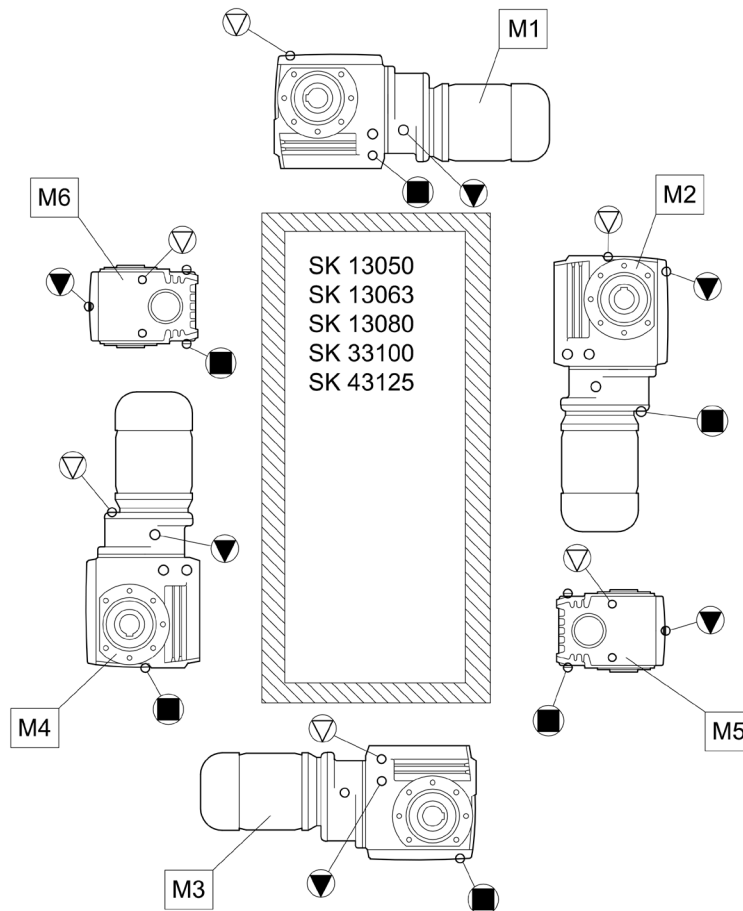




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## 7.2 Lubricants

With the exception of types SK 11382.1, SK 12382 and SK 9096.1, the gear units are filled with lubricant for the required mounting position and are ready for operation as delivered. The initial filling corresponds to a lubricant from the column for the ambient temperatures (standard version) in the lubricant table.

### 7.2.1 Roller bearing greases

This table contains comparable approved roller bearing greases from various manufacturers. The manufacturer can be changed within a lubricant type. Observe the ambient temperature range.

Mixing different greases is not permissible. When changing the grease, different greases of one lubricant type within the relevant ambient temperature range may be mixed in a maximum ratio of 1/20 (5%).

When changing the lubricant type or the ambient temperature range, please consult Getriebebau NORD. Otherwise, no warranty can be accepted for the function of the gear units.





Lubricant type	Ambient temperature				
Grease (mineral oil)	-30...60 °C	Sphereol EPL 2	-	Mobilux EP 2	Gadus S2 V220 2
Grease (PAO)	-25...80 °C	-	PETAMO GHY 133 N	-	-

Table 14: Roller bearing greases

7.2.2 Gear oils



**Explosion hazard due to unsuitable oil**

Ensure the use of the lubricant type stated on the name plate.

Only the gear oils listed in the following table or, in special cases, the products explicitly stated on the name plate are approved for use.

This table shows comparable approved lubricants from various manufacturers. The oil manufacturer can be changed within a viscosity and lubricant type. Only change the lubricant type or the viscosity after consultation with Getriebekonstruktion NORD.

Mixing different oils is not permissible. When changing the gear oil, different oils of one lubricant type with the same viscosity may be mixed in a maximum ratio of 1/20 (5%).






Lubricant type	Details on name plate	DIN (ISO) / Ambient temperature					
Mineral oil	CLP 680	ISO VG 680 0...40 °C	-	-	-	Mobilgear 600 XP 680	Omala S2 GX 680
	CLP 220	ISO VG 220 -10...40 °C	Alpha EP 220 Alpha SP 220	Renolin CLP 220 Renolin CLP 220 VCI	Klüberoil GEM 1-220 N	Mobilgear 600 XP 220	-
	CLP 100	ISO VG 100 -15...25 °C	-	-	Klüberoil GEM 1-100 N	-	-
Synthetic oil (Polyglycol)	CLP PG 680	ISO VG 680 -20...40 °C	-	-	Klübersynth GH 6-680	-	-
	CLP PG 460	ISO VG 460 -25...80 °C	-	-	Klübersynth GH 6-460	-	-
	CLP PG 220	ISO VG 220 -25...80 °C	Optigear Synthetic 1300/220	Renolin PG 220	Klübersynth GH 6-220	-	-
Synthetic oil (hydrocarbons)	CLP HC 460	ISO VG 680 -30...80 °C	-	-	Klübersynth GEM 4-680	Mobil SHC 636	-
	CLP HC 460	ISO VG 460 -30...80 °C	-	-	-	Mobil SHC 634	-
	CLP HC 220	ISO VG 220 -40...80 °C	Alphasyn EP 220	Renolin UNISYSN XT 220 Renolin Unisyn CLP 220 Renolin Unisyn Gear 220 VCI	Klübersynth GEM 4-220 N Klübersynth MEG 4-220	Mobil SHC 630 Mobil SHC Gear 630	Omala S4 GX 220
Bio-degradable oil	CLP E 680	ISO VG 680 -5...40 °C	-	Plantogear 680 S	-	-	-
	CLP E 220	ISO VG 220 -5...40 °C	-	Plantogear 220 S	-	-	-
Food grade oil	CLP PG H1 680	ISO VG 680 -5...40 °C	-	-	Klübersynth UH1 6-680	-	-
	CLP PG H1 220	ISO VG 220 -25...40 °C	-	Cassida Fluid WG 220	Klübersynth UH1 6-220	-	-
	CLP HC H1 220	ISO VG 220 -25...40 °C	-	-	-	Mobil SHC Cibus 220	-

Table 15: Gear oils

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### 7.3 Screw tightening torques

Screw tightening torques [Nm]							
Dimensions	Screw fastenings in strength classes				Cap screws	Threaded pin on coupling	Screw fastenings on covers
	8.8	10.9	12.9	V2A-70 V4A-70			
M4	3.2	5	6	2.8	-	-	-
M5	6.4	9	11	5.8	-	2	-
M6	11	16	19	10	-	-	6.4
M8	27	39	46	24	11	10	11
M10	53	78	91	48	11	17	27
M12	92	135	155	83	27	40	53
M16	230	335	390	207	35	-	92
M20	460	660	770	414	-	-	230
M24	790	1150	1300	711	80	-	460
M30	1600	2250	2650	1400	170	-	-
M36	2780	3910	4710	2500	-	-	1600
M42	4470	6290	7540	4025	-	-	-
M48	6140	8640	16610	5525	-	-	-
M56	9840	13850	24130	8860	-	-	-
G½	-	-	-	-	75	-	-
G¾	-	-	-	-	110	-	-
G1	-	-	-	-	190	-	-
G1¼	-	-	-	-	240	-	-
G1½	-	-	-	-	300	-	-

Table 16: Screw tightening torques

#### Installing hose unions

Oil the thread of the union nut, the cutting ring and the thread of the connecting piece. Tighten the union nut with a spanner until the union nut becomes more difficult to turn. Turn the union nut further by approx. 30° to 60° but only to a maximum of 90° while holding the connecting piece with a spanner. Remove excess oil from the union.

### 7.4 Troubleshooting

**! DANGER**



**Explosion hazard**

- Shut down the gear unit immediately in case of malfunction.

Gear unit malfunctions		
Error	Possible cause	Remedy
Unusual running noises, vibrations	Oil too low or bearing damage or gear wheel damage	Consult NORD Service department
Oil escaping from gear unit or motor	Defective seal	Consult NORD Service department
Oil escaping from pressure vent	Incorrect oil level	Use oil expansion chamber (Option OA)
	Incorrect, dirty oil	Oil change
	Unfavourable operating conditions	Consult NORD Service department
Gear unit becomes too hot	Unfavourable installation conditions or gear unit damage	Consult NORD Service department
Shock when switching on, vibrations	Motor coupling defective	Replace elastomer ring
	Gear unit fastening loose	Tighten motor and gear unit fastening screws
	Defective rubber element	Replace rubber element
Output shaft does not rotate although motor is running	Breakage in gear unit	Consult NORD Service department
	Motor coupling defective	
	Shrink disc slip	

Table 17: Overview of malfunctions

## 7.5 Leakage and leak-tightness

Gear units are filled with oil or grease to lubricate the moving parts. Seals prevent the escape of lubricants. Full leak-tightness is technically not possible, as a certain film of moisture, for example on the radial shaft seals is normal and advantageous for a long-term sealing effect. In the region of vents, oil moisture may be visible due to the escape of function-related oil mist. In the case of grease-lubricated labyrinth seals such as Taconite sealing systems, the used grease emerges from the sealing gap. This apparent leak is not a fault.

According to the test conditions as per DIN 3761, the leak is determined by the medium to be sealed. In bench tests, it exceeds the function-related moisture on the sealing edge in a defined test period and results in dripping of the medium to be sealed. The measured quantity which is then collected is designated as leakage.

Definition of leakage according to DIN 3761 and its appropriate use					
Term	Explanation	Location of leakage			
		Radial shaft seal	In IEC adapter	Housing joint	Vent
Sealed	No moisture apparent	No fault present			
Damp	Moisture film locally restricted (not an area)	No fault present			
Wet	Moisture film beyond the extent of the component	No fault present		Check, if repair is necessary	No fault present
Measurable leakage	Recognisable stream, dripping	Repair recommended			
Temporary leakage	Temporary malfunction of the sealing system or oil leak due to transport *)	No fault present		Check, if repair is necessary	No fault present
Apparent leakage	Apparent leakage, e.g. due to soiling or sealing systems, which can be re-lubricated	No fault present			

Table 18: Definition of leakage according to DIN 3761

\*) Previous experience has shown that moist or wet radial shaft seals stop leaking in the further process. Therefore, under no circumstances can replacement be recommended at this stage. The reason for momentary moisture may be e.g. small particles under the sealing lip.



## 7.6 Declaration of Conformity

### 7.6.1 Explosion protected gear units and geared motors, Category 2G and 2D



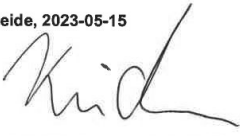
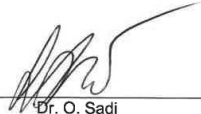
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<b>EU Declaration of Conformity</b> According to EU directive 2014/34/EU Annex VIII	
Getriebebau NORD GmbH & Co. KG declares in sole responsibility, <span style="float: right;">Page 1 of 1</span> that the gear units and geared motors from the following product series	
<ul style="list-style-type: none"> <li>• <b>Helical gear units</b> Type SK ...</li> <li>• <b>Parallel shaft gear units</b> Type SK ...82, SK ...82.1, SK ...82NB</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Worm gear units</b> Type SK 02..., SK 1Sl.,SK 12..., SK 13..., SK 3..., SK 4....</li> <li>• <b>Bevel gear units</b> Type SK 9.....</li> </ul>
with ATEX labelling  <b>II 2D / II 2G</b> (you can find the specific labelling on the nameplate)	
are compliant with the following directive: <b>ATEX directive for products</b> <b>2014/34/EU</b> (source of information: L 96, 29.03.2014, p. 309-356)	
<b>Applied harmonised standards:</b>	
	DIN EN 1127-1:                      2019 DIN EN ISO 80079-36:            2016 DIN EN ISO 80079-37:            2016 DIN EN 60079-0:                   2018
<b>Getriebebau NORD has submitted the documents required as per 2014/34/EU Annex VIII to the notified body:</b>	
	DEKRA EXAM GmbH Dinnendahlstraße 9 44809 Bochum ID number:0158 Certificate: BVS 04 ATEX H/B 196
Bargteheide, 2023-05-15	
 <hr/> U. Küchenmeister Manager	 <hr/> Dr. O. Sadi Technical Manager

Figure 39: Declaration of Conformity for Category 2G / 2D, labelling according to DIN EN ISO 80079-36

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## 7.6.2 Explosion protected gear units and geared motors, Category 3G and 3D



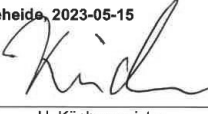
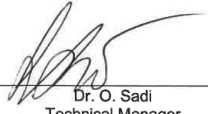
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Bargteheide, 2023-05-15  _____ U. Küchenmeister Manager	 _____ Dr. O. Sadi Technical Manager

Figure 40: Declaration of Conformity for Category 3G / 3D, labelling according to DIN EN ISO 80079-36

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7.6.3 Explosion-proof gear units and geared motors, UKCA 2G and 2D



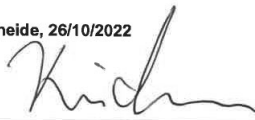

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<b>UK Declaration of Conformity</b> According to UK Statutory Instruments listed below															
<p>Getriebebau NORD GmbH &amp; Co. KG declares in sole responsibility, that the gear units and geared motors from the following product series <span style="float: right;">Page 1 of 1</span></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>• <b>Helical gear units</b> Type SK ...</li> <li>• <b>Parallel shaft gear units</b> Type SK ...82, SK ...82.1, SK ...82NB</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>• <b>Worm gear units</b> Type SK 02..., SK 1Sl.,SK 12..., SK 13..., SK 3..., SK 4...</li> <li>• <b>Bevel gear units</b> Type SK 9.....</li> </ul> </td> </tr> </table> <p>with labelling  II 2D / II 2G (you can find the specific labelling on the nameplate)</p> <p>comply with the following, as amended, UK Statutory Instruments:</p> <table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: left;">Title</th> <th style="text-align: left;">Years and Numbers</th> </tr> </thead> <tbody> <tr> <td>Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016</td> <td>2016 No. 1107</td> </tr> </tbody> </table> <p><b>Applied standards:</b></p> <table style="width: 100%; border: none;"> <tr> <td>BS EN 1127-1:</td> <td>2019</td> </tr> <tr> <td>BS EN ISO 80079-36:</td> <td>2016</td> </tr> <tr> <td>BS EN ISO 80079-37:</td> <td>2016</td> </tr> <tr> <td>BS EN 60079-0:</td> <td>2018</td> </tr> </table> <p><b>Getriebebau NORD has submitted the documents required as per 2016 No. 1107 to the notified body:</b></p> <p style="text-align: center;">DEKRA Certification UK Ltd Body number: 8505</p>		<ul style="list-style-type: none"> <li>• <b>Helical gear units</b> Type SK ...</li> <li>• <b>Parallel shaft gear units</b> Type SK ...82, SK ...82.1, SK ...82NB</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Worm gear units</b> Type SK 02..., SK 1Sl.,SK 12..., SK 13..., SK 3..., SK 4...</li> <li>• <b>Bevel gear units</b> Type SK 9.....</li> </ul>	Title	Years and Numbers	Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016	2016 No. 1107	BS EN 1127-1:	2019	BS EN ISO 80079-36:	2016	BS EN ISO 80079-37:	2016	BS EN 60079-0:	2018
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Bargteheide, 26/10/2022  <hr style="width: 100%;"/> U. Küchenmeister Manager	 <hr style="width: 100%;"/> Dr. O. Sadi Technical Manager														

Figure 41: Declaration of conformity Category 2G/2D, labelling according to UKCA

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7.6.4 Explosion-proof gear units and geared motors, UKCA 3G and 3D



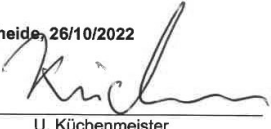
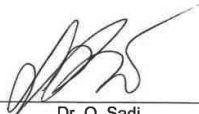
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<b>Applied standards:</b>		
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	BS EN ISO 80079-36:	2016
	BS EN ISO 80079-37:	2016
	BS EN 60079-0:	2018
Bargteheide, 26/10/2022  U. Küchenmeister Manager	 Dr. O. Sadi Technical Manager	

Figure 42: Declaration of conformity Category 3G/3D, labelling according to UKCA

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## 7.7 Repair information

For enquiries to our technical and mechanical service department, please have the exact gear unit type and, if applicable, the order number to hand. You can find this information on the name plate.

### 7.7.1 Repairs

In case of repair, remove all non-original parts from the gear unit or geared motor. No guarantee can be given for any attached parts, such as rotary encoders or external fans.

Send the device to the following address:

**Getriebebau NORD GmbH & Co. KG**  
**Serviceabteilung**  
 Getriebebau-Nord-Straße 1  
 22941 Bargteheide

### Information

If possible, state the reason for returning the component/device. Specify a contact person for queries. This is important in order to keep repair times as short as possible.

### 7.7.2 Internet information

In addition, you will find the manuals in the available languages on our website: [www.nord.com](http://www.nord.com).

## 7.8 Warranty

NORD GmbH & Co. KG accepts no liability for damage to persons, materials or assets as a result of failure to observe this operating manual, operating errors or incorrect use. General wearing parts, e.g. radial seals are excluded from the warranty.

## 7.9 Abbreviations

<b>2D</b>	Dust explosion-proof gear units, Zone 21	<b>F<sub>R</sub></b>	Radial force
<b>2G</b>	Gas explosion-proof gear units, Zone 1	<b>F<sub>A</sub></b>	Axial force
<b>3D</b>	Dust explosion-proof gear units, Zone 22	<b>H1</b>	Lubricant for the food industry
<b>ATEX</b>	<b>AT</b> mosphères <b>EX</b> plosible	<b>IE1</b>	Standard efficiency motors
<b>B5</b>	Flange fastening with through holes	<b>IE2</b>	High efficiency motors
<b>B14</b>	Flange fastening with threaded holes	<b>IEC</b>	International Electrotechnical Commission
<b>CLP</b>	Mineral oil	<b>NEMA</b>	National Electrical Manufacturers Association
<b>CLP HC</b>	Synthetic polyalphaolefin oil	<b>IP55</b>	International protection
<b>CLP PG</b>	Synthetic polyglycol oil	<b>ISO</b>	International standardisation organisation
<b>cSt</b>	Centistokes	<b>pH</b>	pH value
<b>CW</b>	Clockwise, right rotation	<b>PPE</b>	Personal Protective Equipment
<b>CCW</b>	Counter-clockwise, left rotation	<b>DIR</b>	Directive
<b>°dH</b>	Water hardness in German hardness degrees 1 dH = 0.1783 mmol/l	<b>UKCA</b>	UK Conformity Assessed
<b>DIN</b>	Deutsches Institut für Normung [ <i>German Institute for Standardisation</i> ]	<b>VCI</b>	Volatile Corrosion Inhibitor
<b>E</b>	Ester oil	<b>VG</b>	Viscosity group
<b>EC</b>	European Community	<b>WN</b>	Document from Getriebebau NORD
<b>EN</b>	European standard		

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