

INTELLIGENT DRIVESYSTEMS, WORLDWIDE SERVICES



B 2000 – en

Explosion-protected gear units

Operating and Assembly Instructions





Read the operating and installation instructions

Read this operating and installation manual carefully prior to performing any work on or putting the gear unit into operation. Always observe the instructions in this operating and assembly manual.

Keep this operating and installation manual in the vicinity of the gear unit so that it is available if required.

Please also note the following documents:

- Gear unit catalogues (G1000, G1012, G1014, G1035, G1050, G2000),
- Operating and maintenance instructions for the electric motor,
- Operating instructions for equipment which is attached or provided.

Please contact Getriebebau NORD GmbH & Co. KG if you require further information.

Documentation

Designation: B 2000

Material No.: 6051402

Series: Gear units and geared motors

Type series:

Gear unit types: **Helical gear units**
NORDBLOC helical gear units
Standard helical gear units
Parallel shaft gear units
Bevel gear units
Helical worm gear units
MINIBLOC worm gear units
UNIVERSAL worm gear units

Version list

Title, Date	Order number	Remarks
B 2000, January 2013	6051402 / 0413	-
B 2000 , September 2014	6051402 / 3814	• General corrections
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B 2000, April 2017	6051402 / 1417	• General corrections • New helical gear units SK 071.1, SK 171.1, SK 371.1, SK 571.1, SK 771.1;

Title, Date	Order number	Remarks
B 2000, October 2017	6051402 / 4217	<ul style="list-style-type: none"> • General corrections • New parallel shaft gear units SK 0182.1; SK 0282.1; SK 1282.1; SK 1382.1 • New worm gear unit SK 02040.1 • New declarations of conformity 2D + 2G; 3D + 3G
B 2000, April 2019	6051402 / 1419	<ul style="list-style-type: none"> • General corrections • Revision of safety and warning information • Change of labelling according to DIN EN 13463-1 to DIN EN ISO 80079-36 • New declarations of conformity 2D + 2G; 3D + 3G
B 2000, October 2019	6051402 / 4419	<ul style="list-style-type: none"> • General corrections • Structural modifications to the document • Supplementation of gear unit types SK 871.1; SK 971.1; SK 1071.1 • Removal of the Declaration of Conformity according to DIN EN ISO 13463-1.

Table 1: Version list B 2000

Copyright notice

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1 Safety information

1.1 Intended use

These gear units are used to transmit and transform rotary movements. 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 machine or system must comply with local legislation and directives. All applicable health and safety requirements must be met. In particular, the Machinery Directive 2006/42/EC, TR CU 010/2011 and the TR CU 020/2011 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 type plate. They satisfy the explosion protection requirements of Directive 2014/34/EU and TR CU 012/2011 for the category indicated on the type plate. The gear units may only be operated with components which are intended for use in explosion hazard areas. Atmospheres with gases, vapours and aerosols (CE: Zone 1 or 2, labelling G; EAC: Category IIG) and dusts (CE: Zone 21 or 22, labelling IID; EAC: Category IIID) must not be present during operation. The approval of the gear unit is void in case of a hybrid mixture.

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 assembly manual. This may also result in personal injury.

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

Some gear units are equipped with a cooling coil. 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.

Observe the special documentation stated in field "S" of the type 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.

1.2.2 Attachments and equipment

- For use with gear units with device category 2D the motor must have at least protection class IP6x.
- Getriebebau NORD GmbH & Co KG can calculate the required cooling power if lubricant cooling is necessary. Gear units with a cooling coil must not be commissioned without lubricant cooling. The function of the lubricant cooling must be monitored with a resistance thermometer (PT100). The drive must be shut down if the permissible temperature is exceeded. Check for leaks at regular intervals.
- Equipment attached to the gear unit such as couplings, 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.

1.2.3 Lubricants

- Oil mist may ignite inside the gear unit if unsuitable oils are used. The function of the back stop may be impaired, resulting in increased temperatures and sparks. Therefore only use oils which correspond with the details on the type 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. 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 type 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 label. The dot in the middle of the temperature label turns black if the surface temperature is too high. Take the gear unit out of service immediately if the dot has turned black.

1.2.5 Radial and axial forces

Drive and driven elements may only be subjected to the maximum permitted radial and lateral forces F_{R1} and F_{R2} and axial forces F_{A1} and F_{A2} indicated on the rating plate (see Section (please see chapter 2.2 "Type plate" on page 24)).

- Observe the correct tension, particularly for belts and chains.
- Additional loads due to unbalanced hubs are not permitted.

1.2.6 Assembly and installation

- 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 Inspection and maintenance

- Perform all of the inspections 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 expansion tanks may only be located in areas with maximum gas group IIB.
- Gear units with a coating thickness in excess of 0.2 mm may only be used in areas in which processes that cause charging are not to be expected.
- The painting of the gear unit is designed for Category 2G Group IIB (Zone 1 Group IIB). For use in Category 2G Group IIC (Zone 1 Group IIC) the gear unit must not be used or installed in areas in which processes which cause electrostatic charging are to be expected.
- In case of subsequent painting it must be ensured that the paint has the same characteristics as the original paint.
- To prevent electrostatic charging, surfaces may only be cleaned with a damp cloth.

1.3 ATEX ignition hazards according to DIN EN ISO 80079-36

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 type plate,
 - Statement of lubricant fill levels.
- Measures to ensure monitoring of sources of ignition "b"
 - Use of temperature monitoring as ignition protection system b1.

1.4 Do not make any modifications.

Do not make any modifications to the gear unit. Do not remove any protective devices.

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.

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 units by the eye bolts which are provided. The eye bolts must be fully screwed in. Only pull on the eye bolts vertically, never cross-wise or at an angle. Only use the eye bolts to lift the gear unit without other components. The eye bolts are not designed for lifting the gear unit with attachments. Use the eye bolts on both the gear unit and the motor to lift a geared motor.

1.8.2 Hazards due to rotating parts

Rotating parts cause a risk of entanglement. Therefore provide a contact guard. In addition to shafts, this also applies to fans as well as drives and drive elements such as belt drives, chain drives, shrink discs and couplings.

For test operation do not switch on the drive without an installed drive element or secure the parallel key.

Take possible run-on of the machine into consideration for the design of protective guards.

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.

1.9 Explanation of markings

 **DANGER**

Indicates an immediate danger, which may result in death or very serious injury if it is not avoided.

 **DANGER**



Indicates an immediate danger, which may result in death or very serious injury if it is not avoided. Contains important information regarding explosion protection.

 **WARNING**

Indicates a dangerous situation, which may result in death or very serious injury if it is not avoided.

 **CAUTION**

Indicates a dangerous situation, which may result in minor injuries if it is not avoided.

NOTICE!

Indicates a situation, which may result in damage to the product or its environment if it is not avoided.

 **Information**

Indicates hints for use and especially important information to ensure reliability of operation.

2 Description of gear units

2.1 Type designation and type of gear unit

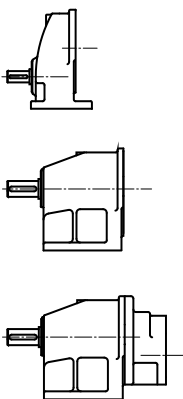
Gear unit types / Type designations	
Helical gear units SK 11E, SK 21E, SK 51E (1-stage) SK 02, SK 12, SK 52, SK 62N (2-stage) SK 03, SK 13, SK 23, SK 33N, SK 43, SK 53 (3-stage)	
	
Versions / Options	
-	Foot-mounted version
F	Output flange B5
XZ	Base and output flange B14
XF	Base and output flange B5
VL	Reinforced bearings
AL	Solid shaft, reinforced axial bearings
IEC	Standard IEC motor mounting
NEMA	Standard NEMA motor attachment
W	Free input shaft
VI	Viton radial seals
OA	Oil expansion tank
SO1	Synthetic oil ISO VG 220

Table 2: Helical gear units - Type designation and gear unit types

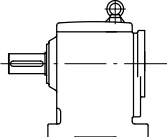
Gear unit types / Type designations	
Helical gear units SK 62, SK 72, SK 82, SK 92, SK 102 (2-stage) SK 63, SK 73, SK 83, SK 93, SK 103 (3-stage)	
	
Versions / Options	
-	Foot-mounted version
F	Output flange B5
XZ	Base and output flange B14
XF	Base and output flange B5
VL	Reinforced bearings
IEC	Standard IEC motor mounting
NEMA	Standard NEMA motor attachment
W	Free input shaft
VI	Viton radial seals
OA	Oil expansion tank
SO1	Synthetic oil ISO VG 220

Table 3: Large helical gear units - Type designation and gear unit types

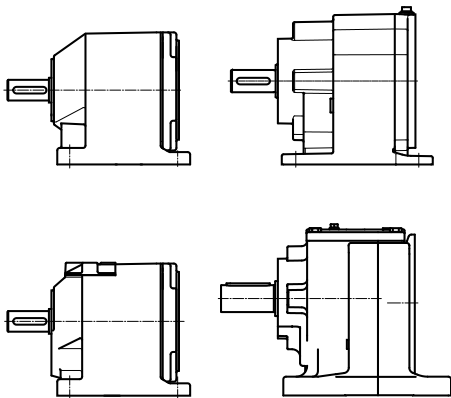
Gear unit types / Type designations			
NORDBLOC helical gear units			
SK 320, SK 172, SK 272, SK 972 (2-stage)			
SK 273, SK 373, SK 973 (3-stage)			
SK 071.1, SK 171.1, SK 371.1, SK 571.1, SK 771.1, SK 871.1, SK 971.1, SK 1071.1 (single stage)			
SK 072.1, SK 172.1 (2-stage)			
SK 372.1, SK 672.1 (2-stage)			
SK 373.1, SK 673.1 (3-stage)			
SK 772.1, SK 872.1, SK 972.1 (2-stage)			
SK 773.1, SK 873.1, SK 973.1 (3-stage)			
			
Versions / Options			
-	Foot-mounted version	NEMA	Standard NEMA motor attachment
F	Output flange B5	W	Free input shaft
XZ	Base and output flange B14	VI	Viton radial seals
XF	Base and output flange B5	OA	Oil expansion tank
VL	Reinforced bearings	SO1	Synthetic oil ISO VG 220
IEC	Standard IEC motor mounting		

Table 4: NORDBLOC helical gear units - Type designation and gear unit types

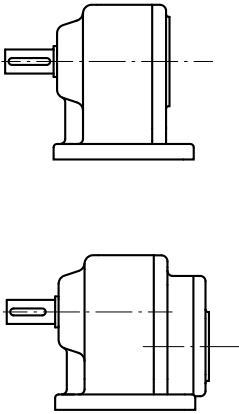
Gear unit types / Type designations			
Standard helical gear units			
SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 (2-stage)			
SK 000, SK 010, SK 200, SK 250, SK 300, SK 330 (3-stage)			
			
Versions / Options			
-	Foot-mounted version	AL	Solid shaft, reinforced axial bearings
Z	Output flange B14	IEC	Standard IEC motor mounting
XZ	Base and output flange B14	NEMA	Standard NEMA motor attachment
XF	Base and output flange B5	W	Free input shaft
F	Output flange B5	VI	Viton radial seals
5	Reinforced output shaft	SO1	Synthetic oil ISO VG 220
V	Reinforced drive		

Table 5: NORDBLOC helical gear units - Type designation and gear unit types

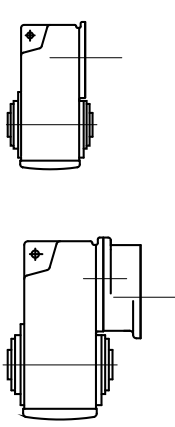
Gear unit types / Type designations																																																			
<p>Parallel shaft gear units</p> <p>SK 0182NB, SK 0182.1, SK 0282NB, SK 0282.1, SK 1282, SK 1282.1, SK 9282, SK 10282, SK 11282 (2-stage)</p> <p>SK 0182.1, SK 0282.1, SK 1382NB, SK 1382.1, SK 2382, SK 9382, SK 10382, SK 11382, SK 12382, SK 10382.1, SK 11382.1 (3-stage)</p>																																																			
																																																			
Versions / Options																																																			
<table border="0"> <tr><td>A</td><td>Hollow shaft version</td></tr> <tr><td>V</td><td>Solid shaft version</td></tr> <tr><td>Z</td><td>Output flange B14</td></tr> <tr><td>F</td><td>Output flange B5</td></tr> <tr><td>X</td><td>Foot mounting</td></tr> <tr><td>S</td><td>Shrink disc</td></tr> <tr><td>VS</td><td>Reinforced shrink disc</td></tr> <tr><td>EA</td><td>Hollow shaft with internal spline</td></tr> <tr><td>G</td><td>Rubber buffer</td></tr> <tr><td>VG</td><td>Reinforced rubber buffer</td></tr> <tr><td>B</td><td>Fastening element</td></tr> <tr><td>H</td><td>Covering cap as contact guard</td></tr> <tr><td>H66</td><td>Covering cap IP66</td></tr> </table>	A	Hollow shaft version	V	Solid shaft version	Z	Output flange B14	F	Output flange B5	X	Foot mounting	S	Shrink disc	VS	Reinforced shrink disc	EA	Hollow shaft with internal spline	G	Rubber buffer	VG	Reinforced rubber buffer	B	Fastening element	H	Covering cap as contact guard	H66	Covering cap IP66	<table border="0"> <tr><td>VL</td><td>Reinforced bearings</td></tr> <tr><td>VLII</td><td>Agitator version</td></tr> <tr><td>VLIII</td><td>Drywell agitator version</td></tr> <tr><td>SCX</td><td>Screw Conveyor Flange</td></tr> <tr><td>IEC</td><td>Standard IEC motor mounting</td></tr> <tr><td>NEMA</td><td>Standard NEMA motor attachment</td></tr> <tr><td>W</td><td>Free input shaft</td></tr> <tr><td>VI</td><td>Viton radial seals</td></tr> <tr><td>OA</td><td>Oil expansion tank</td></tr> <tr><td>SO1</td><td>Synthetic oil ISO VG 220</td></tr> <tr><td>CC</td><td>Casing cover with cooling spiral</td></tr> <tr><td>OT</td><td>Oil level tank</td></tr> </table>	VL	Reinforced bearings	VLII	Agitator version	VLIII	Drywell agitator version	SCX	Screw Conveyor Flange	IEC	Standard IEC motor mounting	NEMA	Standard NEMA motor attachment	W	Free input shaft	VI	Viton radial seals	OA	Oil expansion tank	SO1	Synthetic oil ISO VG 220	CC	Casing cover with cooling spiral	OT	Oil level tank
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Table 6: Parallel shaft gear units - Type designation and gear unit types

Double gear units consist of two single gear units. They are to be treated as per the instructions in this Manual, i.e. as two individual gear units.

Type designation for double gear units: e. g. SK 73 /22 (consisting of single gear units SK 73 and SK 22).

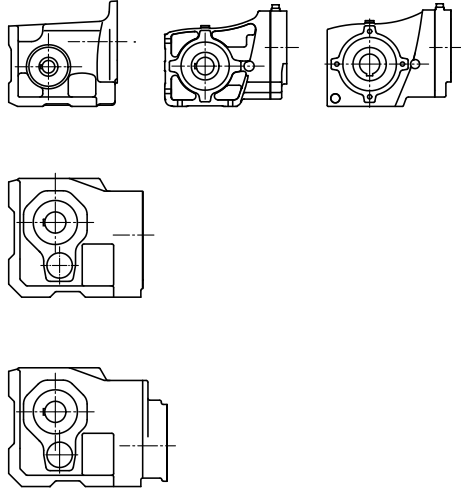
Gear unit types / Type designations	
<p>Bevel gear units</p> <p>SK 92072, SK 92172, SK 92372, SK 92672, SK 92772, SK 920072.1, SK 92072.1, SK 92172.1, SK 92372.1, SK 92672.1, SK 92772.1, SK 930072.1, SK 93072.1, SK 93172.1, SK 93372.1, SK 93672.1, SK 93772.1 (2-stage) SK 9012.1, SK 9016.1, SK 9022.1, 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 (3-stage) SK 9013.1, SK 9017.1, SK 9023.1, SK 9033.1, SK 9043.1, SK 9053.1 (4-stage)</p>	
	
Versions / Options	
<ul style="list-style-type: none"> - Foot-mounted version A Hollow shaft version V Solid shaft version L Solid shaft both sides Z Output flange B14 F Output flange B5 X Foot mounting D Torque arm K Torque bracket S Shrink disc VS Reinforced shrink disc EA Hollow shaft with internal spline R Back stop B Fastening element 	<ul style="list-style-type: none"> H Covering cap as contact guard H66 Covering cap IP66 VL Reinforced bearings VLII Agitator version VLIII Drywell agitator version SCX Screw Conveyor Flange IEC Standard IEC motor mounting NEMA Standard NEMA motor attachment W Free input shaft VI Viton radial seals OA Oil expansion tank SO1 Synthetic oil ISO VG 220 CC Casing cover with cooling spiral

Table 7: Bevel gear units - Type designation and gear unit types

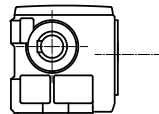
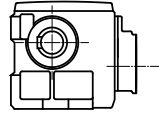
Gear unit types / Type designations			
<p>Helical worm gear units SK 02040, SK 02040.1, SK 02050, SK 12063, SK 12080, SK 32100, SK 42125 (2-stage) SK 13050, SK 13063, SK 13080, SK 33100, SK 43125 (3-stage)</p>			
 			
Versions / Options			
-	Foot mounting with solid shaft	B	Fastening element
A	Hollow shaft version	H	Covering cap as contact guard
V	Solid shaft version	H66	Covering cap IP66
L	Solid shaft both sides	VL	Reinforced bearings
X	Foot mounting	IEC	Standard IEC motor mounting
Z	Output flange B14	NEMA	Standard NEMA motor attachment
F	Output flange B5	W	With free drive shaft
D	Torque support	VI	Viton radial seals
S	Shrink disc	OA	Oil expansion tank

Table 8: Helical worm gear units - Type designation and gear unit types

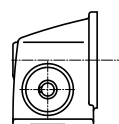
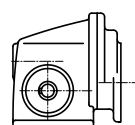
Gear unit types / Type designations			
<p>MINIBLOC worm gear units SK 1S 32, SK 1S 40, SK 1S 50, SK 1S 63, SK 1SU... , SK 1SM 31, SK 1SM 40, SK 1SM 50, SK 1SM 63, (single stage) SK 2S32NB, SK 2S40NB, SK 2S50NB, SK 2S63NB, SK 2SU...., SK 2SM40, SK 2SM50, SK 2SM63 (2-stage)</p>			
 			
Versions / Options			
-	Foot mounting with solid shaft	X	Foot mounting
A	Hollow shaft version	B	Fastening element
V	Solid shaft version	IEC	Standard IEC motor mounting
L	Solid shaft both sides	NEMA	Standard NEMA motor attachment
Z	Output flange B14	W	With free drive shaft
F	Output flange B5	VI	Viton radial seals
D	Torque support		

Table 9: MINIBLOC - Type designation and gear unit types

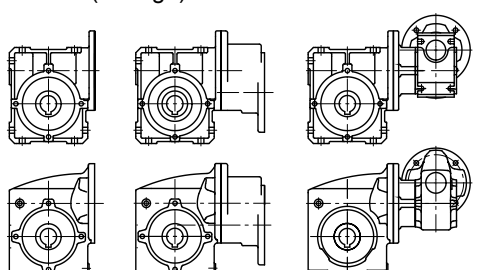
Gear unit types / Type designations			
UNIVERSAL worm gear units			
SK 1SI31, SK 1SI40, SK 1SI50, SK 1SI63, SK 1SI75, SK 1SID31, SK 1SID40, SK 1SID50, SK 1SID63, SK 1SID75 SK 1SIS31,...., SK 1SIS75, SK 1SD31, SK 1SD40, SK 1SD50, SK 1SD63, SK 1SIS-D31,...., SK 1SIS-D63 SK 1SMI31, SK 1SMI40, SK 1SMI50, SK 1SMI63, SK 1SMI75 SK 1SMID31,...., SK 1SMID63 (1-stage) SK 2SD40, SK 2SD50, SK 2SD63, SK 1SI.../31, SK 1SI.../H10, SK 2SID40,...., SK 2SID63 SK 2SIS-D40,...., SK 2SIS-D63 SK 2SMI40, SK 2SMI50, SK 2SMI63 SK 2SMID40, SK 2SMID50, SK 2SMID 63 (2-stage)			
			
Versions / Options			
V	Solid shaft or plug-in shaft	H10	Modular contrate pre-stage
A	Hollow shaft version	/31	Worm pre-stage
L	Solid shaft both sides	/40	Worm pre-stage
X	Feet on three sides	IEC	Standard IEC motor mounting
Z	Output flange B14	NEMA	Standard NEMA motor attachment
F	Output flange B5	W	With free drive shaft
D	Torque support	VI	Viton radial seals
H	Covering cap		

Table 10: UNIVERSAL worm gear units - Type designation and gear unit types

2.2 Type plate

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





		Getriebebau NORD GmbH & Co. KG 22939 Bargteheide/GERMANY			
Typ SK 12 – IEC 63 /2G /2D					
No. 201234567					
n_2 18		$\text{min}^{-1} n_1$ 1345		i_{ges} 72.63	
M_2 96		$\text{Nm } P_1$ 0.18		$\text{min}^{-1} \text{IM}$ M1	
F_{R2} 3.35		$\text{kN } F_{R1}$		$\text{kW } B_j$ 01/16	
F_{A2} 4.00		$\text{kN } \blacksquare$ 15		$\text{kN } T_u$ -10/+40 °C	
Oil CLP 220 / 0,25l				$\text{kg } x_{R2}$ 50 mm	
		II 2G Ex h IIC T4 Gb		MI 24000 h	
		II 2D Ex h IIIC T125°C Db		S	

Figure 1: Type plate (example)

Explanation of the type plate			
Abbreviation	Unit	Designation	See Section
Type	-	NORD gear unit type	
No.	-	Serial number	
i_{tot}	-	Total gear unit ratio	
n_2	rpm	Rated speed of gear unit output shaft *	
n_1	rpm	Rated speed of the gear unit drive shaft or drive motor *	
IM	-	Version (installation orientation)	7.1
M_2	Nm	Max. permissible torque at the gear unit output shaft	
P_1	kW	Max. permissible drive power or motor power	
B_j	-	Year of manufacture	
F_{R2}	kN	Max. permissible transverse force on the gear unit output shaft	3.7
F_{R1}	kN	Max. permissible transverse force on the gear unit drive shaft for option W	3.7
T_u	°C	Permissible ambient temperature range for the gear unit	
F_{A2}	kN	Max. permissible axial force on the gear unit outputshaft	3.7
\blacksquare	kg	Total weight	3.7
MI	h	Interval for general overhaul of the gear unit in operating hours or according to the specification of the dimensionless maintenance class CM	5.2
x_{R2}	mm	Max. dimension for the point of application of the transverse force F_{R2}	3.7
Oil	-/l	Type of gear oil (standard designation) and gear oil volume	7.2

Explanation of the type plate			
Abbreviation	Unit	Designation	See Section
Last line 	-	ATEX labelling, as per DIN EN 80079-36: 1. Group (always II, not for mines) 2. Category (2G, 3G for gas or 2D, 3D for dust) 3. Labelling of non-electrical devices (Ex h) or ignition protection type if fitted (c) 4. Explosion group if present (Gas: IIC, IIB; Dust: IIIC, IIIB) 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 indication of the temperature range on the type plate or in the special documentation 6. EPL (equipment protection level) Gb, Db, Gc, Dc 7. Note the special documentation and/or temperature measurement during commissioning (X)	4.3
S	-	Number of the special documentation, consisting of serial no. / year	
* The maximum permissible speeds are 10 % above the rated speed if the maximum permissible drive power P1 is not exceeded.			
If the fields F_{R1} , F_{R2} , F_{A1} and F_{A2} are empty, the forces are zero. If the field x_{R2} is empty, the point of application of force F_{R2} is central on the driven shaft journal (See Section 3.7).			

Please note that for geared motors (gear units with attached electric motors) the electric motor has its own type plate and separate ATEX labelling. The motor labelling must also comply with data for the planning of the plant or the machine.

The lowest explosion protection level on the gear unit and the motor labelling applies for the geared motor unit.

If the electric motor is driven with a frequency inverter, the motor requires ATEX approval for inverter operation. If the motor is operated with an inverter, significant differences between the nominal speeds on the type plates of the motor and the gearbox are normal and permissible. For operation of the motor with the mains supply, differences of the nominal speeds on the motor and the gear unit of up to ± 60 rpm are permissible.

2.3 Additional type plate for EAWU



		
Directive	TR CU 012/2011	2014/34/EU – DIN EN ISO 80079-36
Labelling	II Gb c T4 X	II2G Ex h IIC T4 Gb
	II Gb c T3 X	II2G Ex h IIC T3 Gb
	II Gb c IIB T4 X	II2G Ex h IIB T4 Gb
	II Gb c IIB T3 X	II2G Ex h IIB T3 Gb
	III Db c T125°C X	II2D Ex h IIIC T125°C Db
	III Db c T140°C X	II2D Ex h IIIC T140°C Db
	II Gc T4 X	II3G Ex h IIC T4 Gc
	II Gc T3 X	II3G Ex h IIC T3 Gc
	III Dc T125°C X	II3D Ex h IIIC T125°C Dc
	III Dc T140°C X	II3D Ex h IIIC T140°C Dc

Table 11: EAC Ex / CE Ex labelling

Explosion protected gear units which are intended for use in the region of the Eurasian Economic Union have an additional type plate which indicates use in explosion hazard areas with EAC labelling according to EAC Ex.

In the further course of these operating and installation instructions, the EAC Ex logo will not be indicated together with the CE Ex logo. The EAC Ex logo is equivalent to the CE Ex logo. If "ATEX" is stated in these operating and installation instructions, this also applies accordingly for EAC Ex gear units.

With servicing as specified, gear units may have a service life of 30 years. The gear unit should be taken out of service at the latest 30 years after delivery by Getriebebau NORD. The year of delivery corresponds to the year of manufacture which is stated on the ATEX type plate.

EAC Ex gear units have two type plates. One type plate complies with ATEX Directive 2014/34 EU and the relevant standards; the second type plate contains the additional specifications according to Directive TP TC 012/2011



Figure 2: Additional type plates for EAC Ex

3 Assembly instructions, storage, preparation, installation

Please note all safety information (please see chapter 1 "Safety information") and warning information in the relevant sections.

3.1 Transporting the gear unit

WARNING

Hazard due to falling loads

- The thread of the eye bolt must be fully screwed in.
- Do not pull on the eye bolt at an angle.
- Note the centre of gravity of the gear unit.

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

Transport the gear unit with care. Use suitable aids such as cross-beams or similar to facilitate transportation of the gear unit. Impacts to the free ends of shafts may cause internal damage to the gear unit.

3.2 Storage

For short-term storage before commissioning, please observe the following:

- Store gear units in the fitting position ((please see chapter 7.1 "Versions and maintenance")) and secure them against falling,
- Lightly oil bare metal housing surfaces and shafts
- Store in a dry place,
- Temperature in the range from – 5 °C to + 50 °C without large fluctuations,
- Relative humidity less than 60 %,
- No direct exposure to sunlight or UV light,
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity,
- No vibration or oscillation

3.3 Long-term storage

For storage or standstill periods in excess of 9 months, Getriebebau NORD recommends the long-term storage option. With the use of the measures listed below, storage for up to 2 years is possible. As the actual influences on the unit greatly depend on the local conditions, these times should only be regarded as guide values.

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

- Store in the fitting position (please see chapter 7.1 "Versions and maintenance") and secure them against falling.
- Transportation damage to the external paint must be repaired. Check that a suitable rust inhibitor is applied to the flange bearing surfaces. If necessary apply a suitable rust inhibitor to the surfaces.
- Gear units with the long-term storage option are completely filled with lubricant or have VCI corrosion protection agent mixed with the gear oil (see adhesive label on the gear unit, or are not filled with oil, but rather with small quantities of VCI concentrate.
- The sealing band in the vent plug must not be removed during storage. The gear unit must remain sealed tight.
- Store in a dry place.
- In tropical regions the drive unit must be protected against damage by insects.
- Temperature in the range from – 5 °C to + 40 °C without large fluctuations.
- Relative humidity less than 60 %.
- No direct exposure to sunlight or UV light.
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity.
- No vibration or oscillation

Measures during storage or standstill periods

- If the relative humidity is < 50 % the gear unit can be stored for up to 3 years.

Measures before commissioning

- Inspect the gear unit before commissioning.
- If the storage or standstill period exceeds 2 years or the temperature during short-term storage has greatly deviated from the standard range, the lubricant in the gear unit must be replaced before commissioning.
- If the gear unit is completely filled, the oil level must be reduced before commissioning.
- For gear units without oil filling, the oil level for the version must be filled before commissioning. The VCI concentrate may remain in the gear unit. Lubricant quantities and types must be filled according to the details on the type plate.

3.4 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 type plate. Gear units with the abbreviation UN in field IM of the type plate are version-independent. Section 7.1 "Versions and maintenance" 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.

It must be checked and ensured that the version as stated on the type plate complies with the installation orientation and that the installation orientation does not change during operation.

Please heed the Operating Instructions for the motor, in particular with regard to the chosen version.

3.5 Preparing for installation

Inspect the delivery for transport and packaging damage immediately on receipt. The drive unit must be examined and may only be installed if no damage is apparent. In particular the shaft sealing rings and sealing caps must be inspected for damage. Report any damage to the carrier immediately. Gear units with transport damage must not be commissioned.

All bare metal surfaces and shafts of the gear units are protected against corrosion with oil/grease or corrosion protection agents before shipping.

Thoroughly remove all oil / grease or corrosion protection agents and any dirt from the shafts and flange surfaces before assembly.

In applications where an incorrect rotational direction may result in damage or potential risk, the correct rotational direction of the output shaft must be established by test running the drive when uncoupled and ensured for subsequent operation.

For gear units with an integrated back stop, switching the drive motor to the blocked direction of rotation, i.e. incorrect 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, it must be ensured that the gear unit can only operate in the direction of rotation. (For further explanations refer to Catalogue G1000 and WN-0000 40)

It must be ensured that no aggressive or corrosive substances which attack metal, lubricants or elastomers are present in the area surrounding the installation site or are subsequently expected during operation. In case of doubt, please contact Getriebebau NORD and take the recommended action.

Oil expansion tanks (Option OA) must be fitted in accordance with works standard WN 0-530 04. For M10 x 1 screw fittings, the enclosed factory standard WN 0-521 35 must also be observed.

Oil level tanks (Option OT) must be fitted in accordance with Works Standard 0-521 30. Screw the enclosed M12x1.5 pressure relief screw into the tank.

The pressure vent must be activated prior to commissioning. To activate, remove the transport securing devices.

Double gear units consist of two separate gear units (please see chapter 7.1 "Versions and maintenance").

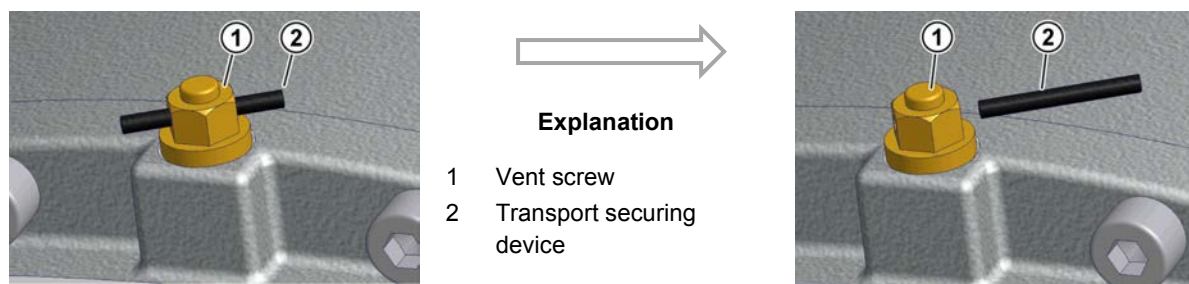


Figure 3: Activation of the pressure vent

3.6 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.

The eye bolts which are screwed into the gear unit must be used for installing the gear unit. No additional loads must be attached to the gear unit. If geared motors have an additional eye bolt attached to the motor, this must also be used. Avoid pulling on the eye bolts at an angle. Observe the safety information (please see chapter 1 "Safety information").

The base and/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. All contamination of the bolting surfaces of gear unit and base or flange must be thoroughly removed.

The gear housing must always be earthed. With geared motors, earthing via the motor connection must be ensured.

The gear unit must be precisely aligned with the drive shaft of the machine in order to prevent additional forces from being imposed on the gear unit due to distortion.

Welding of the gear unit is prohibited. The gear unit must not be used as the earth connection for welding work, as this may cause damage to the bearings and gear wheels.

The gear unit must be installed in the correct orientation (please see chapter 7.1 "Versions and maintenance").

All gear unit feet or all flange bolts on each side must be used. Bolts must have a minimum quality of 10.9. The bolts must be tightened to the correct torques (please see chapter 7.3 "Screw tightening torques"). Tension-free bolting must be ensured, especially with foot and flange-mounted gear units.

Oil checking and oil drain screws must be accessible.



Information

Gear units with option XZ or XF

The foot mount is used to install and fasten the gear unit. It is designed to absorb the reaction forces from the torque, permissible radial or axial forces and weight.

B5- or B14- flanges are not designed for mounting the gear unit and absorbing reaction forces. For this, use the foot mount or contact Getriebekonstruktion NORD for investigation of the particular case.

3.7 Fitting hubs on the gear shafts

! DANGER



Danger of explosion due to increased temperature

The gear unit may heat up to an impermissible extent if transverse forces are applied unfavourably.

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

NOTICE!

The gear unit may be damaged by axial forces.

- Do not allow any harmful axial forces to act on the gear unit. Do not strike the hub with a hammer.

During assembly take care that the shaft axes are precisely aligned with each other and comply with the permissible tolerances as stated by the manufacturer. Drive and driven elements, e.g. coupling and chain-wheel hubs must be mounted onto the drive and driven shaft of the gear unit using suitable pullers that will not apply damaging axial forces to the gear unit. In particular, do not hit the hubs with a hammer.

i 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 coupling must be positioned according to the assembly instructions for the coupling. If no details are stated, the coupling must be aligned flush with the end of the motor shaft.

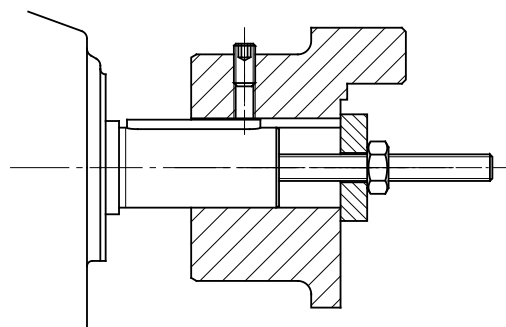
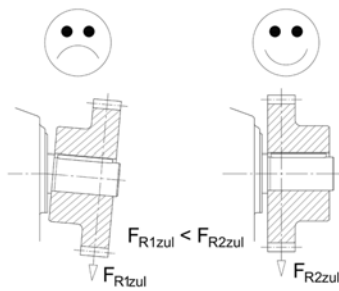


Figure 4: Example of a simple pulling device

The maximum radial forces F_{R1} and F_{R2} and axial forces F_{A1} and F_{A2} as stated in the catalogue, which are imposed on the gear unit by driving and driven elements, must not be exceeded (refer to the type plate). Observe the correct tension, particularly on 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} for the output shaft is stated on the rating plate, but no dimension x_{R2} is stated, the application of the force is assumed to be to the centre of the shaft journal.

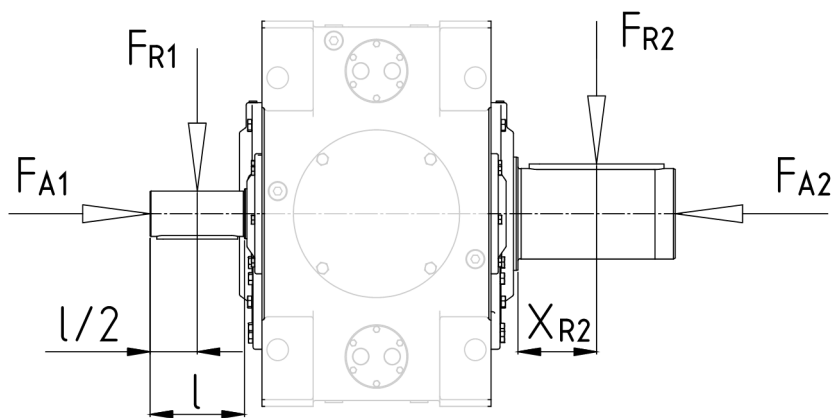


Figure 5: Permissible application of force to drive and driven shafts

3.8 Fitting push-on gear units

WARNING

When the screw fastenings of the torque arm are removed, 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, gear wheels, shafts and housings may be damaged by incorrect assembly.

- Use suitable pulling devices.
- 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 grease or anti-corrosion agent may escape after assembly and may drip off. Thoroughly clean these points on the output shaft after a running-in time of approx. 24 hours. This escape of grease is not due to a leak in the gear unit.

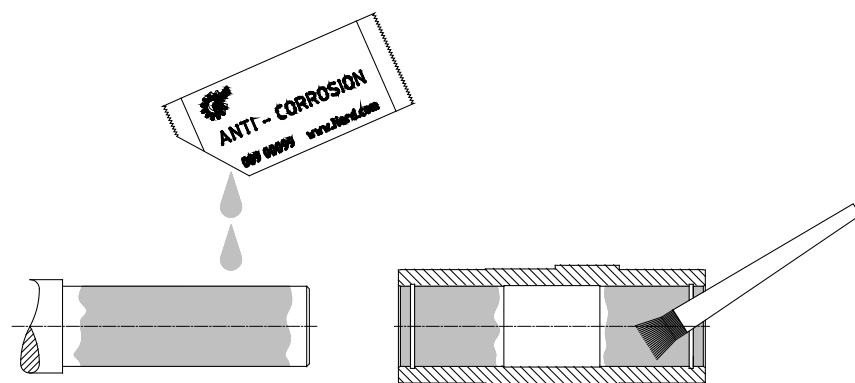


Figure 6: Applying lubricant to the shaft and the hub

i Information

The gear unit can be fitted to shafts with and without a shoulder using the fastening element (Option B). Tighten the screw of the fastening element with the appropriate torque (please see chapter 7.3 "Screw tightening torques") For gear units with option H66, the closing cap fitted at the factory must be removed before assembly.

For push-on gear units with 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. As standard, a 2nd closing cap is supplied as a loose spare part. After installing the gear unit, fit the new closing cap as described in Section 3.11 "Fitting the covers".

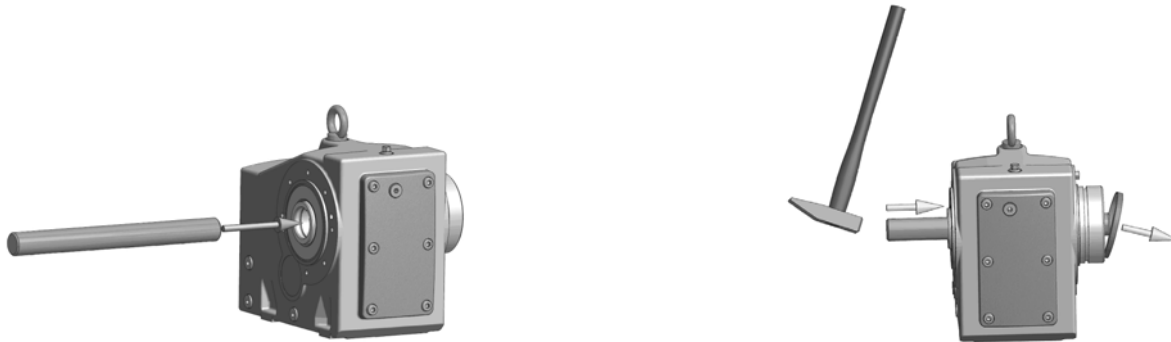


Figure 7: Removing the factory-fitted closing cap

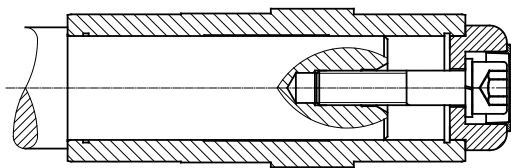


Figure 8: Gear unit mounted on shaft with a shoulder using the fastening element

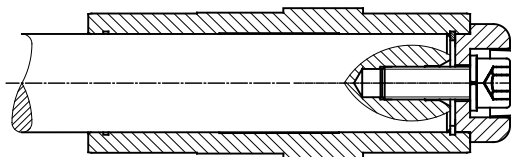


Figure 9: Gear unit mounted on shaft without a shoulder using the fastening element

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

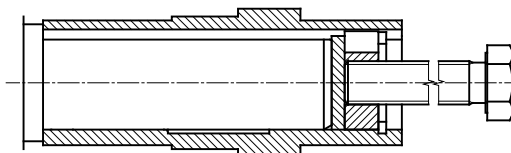


Figure 10: Removal using dismantling device

When assembling push-on gears with torque supports, the support must not be distorted. Tension-free mounting is aided by the rubber buffer (Option G or VG).

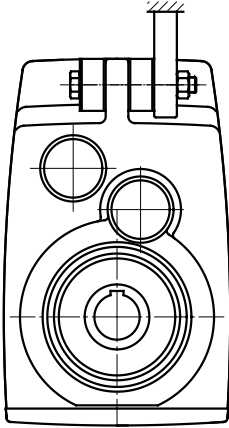
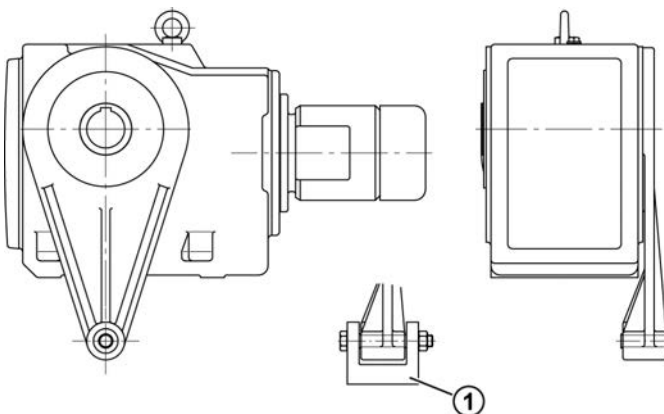


Figure 11: Mounting the rubber buffer (Option G and/or VG) on parallel shaft gear units

To fit the rubber buffer, tighten the screw fastening until there is no play between the contact surfaces when there is no load.

Then turn the fastening nut half a turn in order to pre-tension the rubber buffer (only applies for screw fastenings with adjusting threads). Greater pre-tension is not permissible.



Explanation

- 1 Always support torque support on both sides

Figure 12: Attaching the torque support on bevel gear and worm gear units

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

3.9 Fitting shrink discs

NOTICE!

Damage to the hollow shaft

- Do not tighten the clamping bolts if the solid shaft is not inserted.

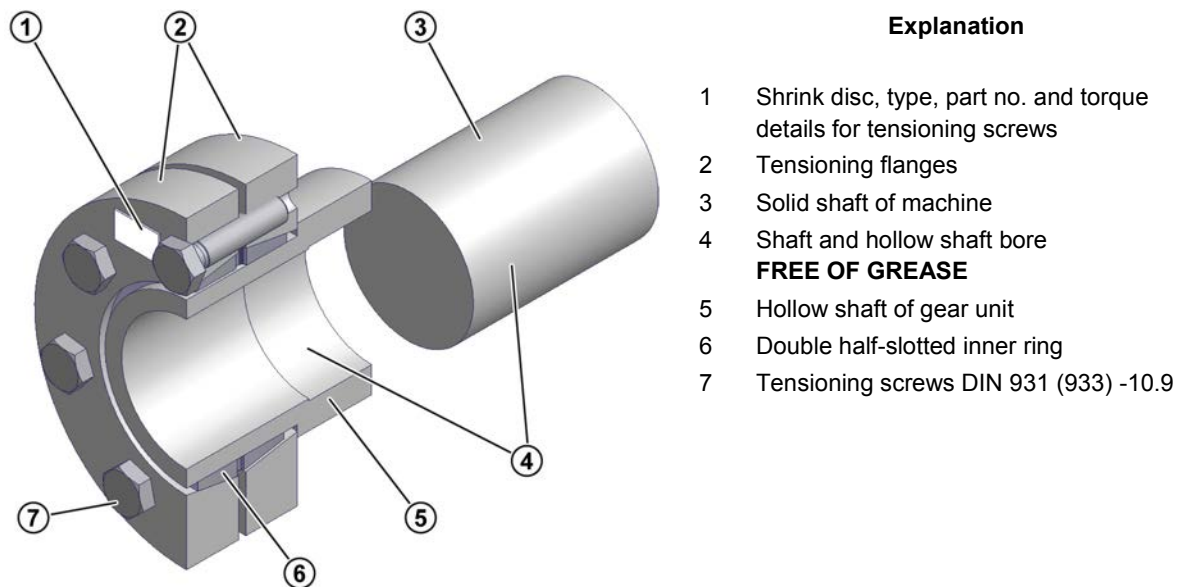


Figure 13: Hollow shaft with shrink disc

The shrink discs are supplied by the manufacturer ready for fitting. They must not be dismantled prior to fitting.

The solid shaft of the machine runs **free of grease** in the hollow shaft of the gear unit.

Assembly sequence

1. Remove any transport securing devices.
2. Loosen but do not remove tightening bolt and tighten gently by hand until there is no play between the flanges and the inner ring.
3. Push the shrink disc onto the hollow shaft until the outer clamping flange is flush with the hollow shaft. The shrink disc is easier to slide on if the bore of the inner ring is lightly greased.
4. Prior to mounting, grease the solid shaft only in the area which will later come into contact with the bronze bush in the hollow shaft of the gear unit. Do not grease the bronze bush, in order to prevent grease penetrating the area around the shrink connection.
5. The hollow shaft of the gear unit must be completely de-greased and **completely free of grease**.
6. In the area of the shrink connection the solid shaft of the machine must be degreased and **completely free** of grease.
7. Insert the solid shaft of the machine into the hollow shaft so as to completely fill the area around the shrink connection.
8. Position the clamping flange by gently tightening the bolts.
9. Tighten the tensioning bolts successively in a clockwise direction by several turns – not crosswise – with approx. $\frac{1}{4}$ rotation per turn. Tighten the bolts with a torque wrench to the torque indicated on the shrink disc.

3 Assembly instructions, storage, preparation, installation

10. When the tensioning bolts have been tightened, there must be an even gap between the clamping flanges. If this is not the case, the gear unit must be dismantled and the shrink disc connection checked for correct fit.

11. The hollow shaft of the gear unit and the solid shaft of the machine should be marked with a line (felt-tip pen) in order to detect any slippage under load.

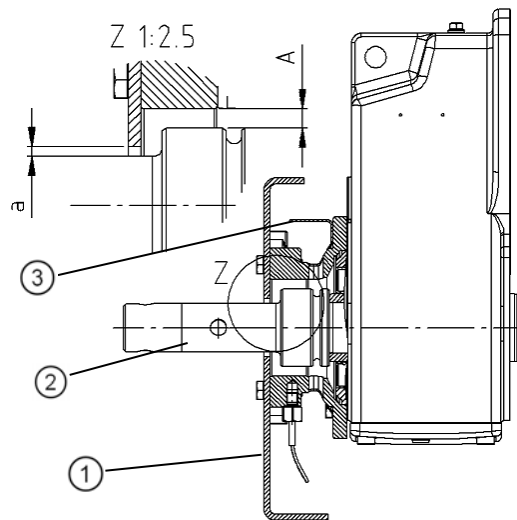
Dismantling sequence:

1. Loosen the tensioning bolts successively in a clockwise direction by several turns with approx. $\frac{1}{4}$ rotation per turn. 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 disk has been in use for a long period or is dirty, it must be dismantled, cleaned and the conical surfaces coated with Molykote G Rapid Plus or a similar lubricant before it is refitted. The threads and head surfaces of the screws must be treated with grease without Molykote. Any damaged or corroded elements must be replaced.

3.10 Installation example for an SCX flange

Note that the maximum gap (dimension a) between the push-in shaft and the rear wall of the conveyor channel or the fastening plate must not exceed $a = 8 \text{ mm}$.



Explanations

- 1 Rear wall of conveyor trough
- 2 Plug-in shaft
- 3 Protective bracket

Figure 14: Installation example for an SCX flange

Check the position of the protective bracket. The protective bracket must always cover the vertical open hole in the flange. The SCX flange may only be used in installation positions M1, M2, M3 and M4. A temperature sensor can be fitted as an option. The sensor must trigger at a temperature of 120°C and shut down the drive unit. Visual inspection is not required if a temperature sensor is used (please see chapter 5.1 "Service and Maintenance Intervals")

3.11 Fitting the covers

⚠ 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.

All fixing screws must be used and coated with a securing lubricant e.g. Loctite 242, Loxeal 54-03 prior to use and tightened to the correct torque (please 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 15: Fitting the covers, Option SH, Option H, and Option H66

3.12 Fitting the covers

Many versions of the universal worm gear unit are supplied with plastic cover caps as standard. These cover caps protect the shaft sealing ring against the entry of dust and other possible contamination. The cover caps can be removed by hand without the use of tools and pushed onto the A or B side.

The cover cap must be removed before installing the universal worm gear unit. After installation is complete, the cover cap must be pushed into the threaded holes on the output flange on the corresponding side. Care must be taken that the cover cap is removed and pushed on vertically, in order not to damage the expansion elements of the cover cap.



Figure 16: Removal and fitting of the cover cap

3.13 Fitting a standard motor

The maximum permitted motor weights indicated in the table below must not be exceeded:

Maximum permitted motor weights														
IEC motor size	63	71	80	90	100	112	132	160	180	200	225	250	280	315
NEMA motor size		56C		140TC		180TC	210TC	250TC	280TC	320TC		360TC /400TC		
Max. motor weight [kg]	25	30	40	50	60	80	100	200	250	350	500	700	1000	1500

Gear units with IEC / NEMA adapters must be operated with self-ventilated motors which comply with IC411 (TEFC) or IC416 (TEBC) externally ventilated motors compliant with EN 600346, which generate a continuous airflow towards the gear unit. Please contact NORD if the use of IC410 (TENV) motors without fans is intended.

Assembly procedure to attach a standard motor to the IEC adapter (Option IEC/NEMA adapter)

1. Clean the motor shaft and flange surfaces of the motor and adapter and check for damage. The mounting dimensions and tolerances of the motor must conform to DIN EN 50347 / NEMA MG1 Part 4.
2. Push the coupling sleeve onto the motor shaft so that the motor parallel key engages into the groove in the sleeve on mounting.
3. Tighten the coupling hub on the motor shaft in accordance with the motor manufacturer's instructions until it touches the collar. With motor sizes 90, 160, 180 and 225, any spacer bushes may need to be positioned between the coupling sleeve and the collar. With standard helical gear units, dimension B between the coupling sleeve and the collar must be observed (see "Figure 17"). Certain **NEMA adapters** require adjustment of the coupling in accordance with the specifications indicated on the adhesive plate.
4. If the coupling half contains a threaded pin, the coupling must be secured axially on the shaft. The threaded pin must be coated with a securing lubricant, e. g. Loctite 242, Loxeal 54-03 prior to use and tightened to the correct torque (please see chapter 7.3 "Screw tightening torques").
5. For Category 2D gear units (refer to the ATEX labelling in the last line of the gear unit type plate) **the flange surfaces** of the motor and adapter must be completely coated with **surface sealant** e.g. Loctite 574 or Loxeal 58-14 before mounting the motor, so that the flange seals after mounting. Sealing of the flange surfaces is recommended for installation outdoors or in a humid environment.
6. Mount the motor on the adapter. Do not forget to fit the ring gear or the gear sleeve (see Figure unterhalb).
7. Tighten the adapter bolts to the correct torque (please see chapter 7.3 "Screw tightening torques").

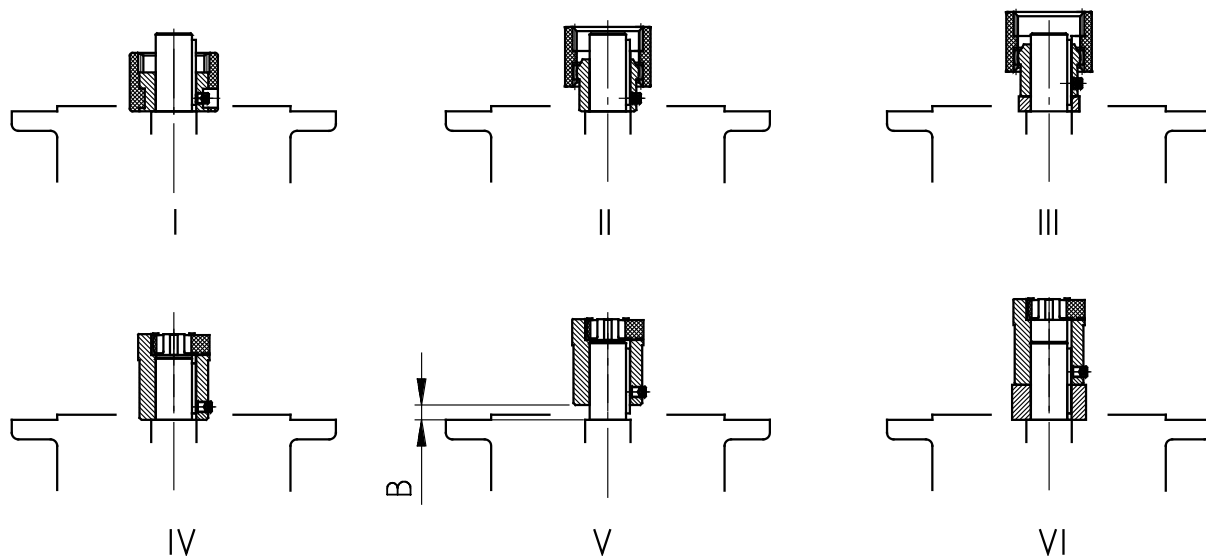


Figure 17: Fitting the coupling onto the motor shaft - various types of coupling

- 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

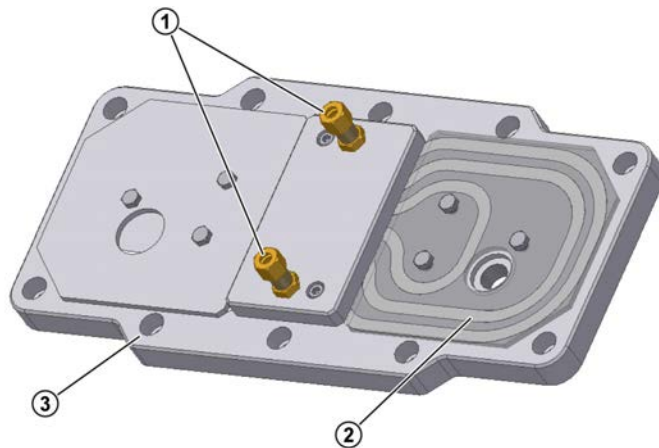
- VI Claw coupling (ROTEX®), two-piece with spacer bush

3.14 Fitting the cooling coil to the cooling system

The cooling coil is installed in the housing cover. Cutting ring screw threads according to DIN 2353 are located at the casing cover for the connection of a pipe with an external diameter of 10 mm.

Remove the closing cap from the screw neck prior to assembly to avoid any contamination of the cooling system. The screw necks should be connected with the coolant circuit, which must be provided by the operator. The flow direction of the coolant is irrelevant.

Make sure not to twist the screw necks during or after assembly as the cooling coil may be damaged. It must be ensured that no external forces act on the cooling coil.



Explanation

- 1 Cutting ring screw threads
- 2 Cooling coil
- 3 Housing cover

Figure 18: Cooling cover

3.15 Installation of an oil expansion tank, Option OA

The expansion tank must be installed vertically with the hose connection facing downwards and the vent plug upwards. If the tank is not fitted, observe the following steps for fitting:

- After installing the gear unit (motor), remove the vent screw on the gear unit.
- For modules 0.7 l, 2.7 l and 5.4 l the reduction / extension is screwed in with the existing sealing ring.
- Now fit the expansion tank (see below for suggested position).
Note: If the necessary screw insertion depth of 1.5d 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.
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.
- The tank should be fitted as high as possible. - Note the length of the hoses!! -
- After this, fit the vent hose with the enclosed hollow screws and seals.

Finally, screw the enclosed M12x1.5 vent screw and sealing ring into the tank.

Notice: For ATEX gear units, screw the enclosed M12x1.5 vent screw into the tank.

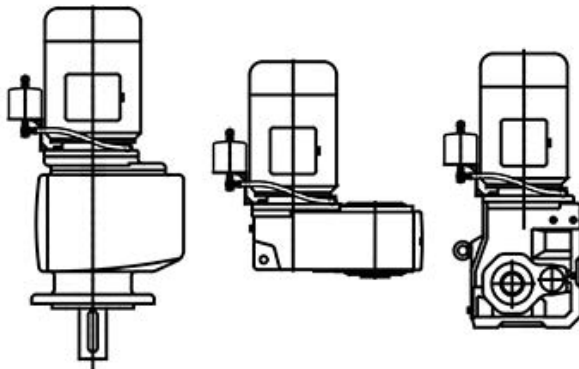


Figure 19: Installing the expansion tank

3.16 Temperature sticker

For temperature class T4 gear units or gear units with a maximum surface temperature of less than 135 °C the supplied self-adhesive 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 type plate.

Examples:

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

The temperature sticker must be affixed next to the oil level screw (please see chapter 7.1 "Versions and maintenance") towards the motor. For gear units with an oil level tank, the temperature sticker must be affixed in the same position as for gear units without an oil level tank. For gear units which are lubricated for life without oil maintenance, the temperature sticker should be affixed next to the type plate.

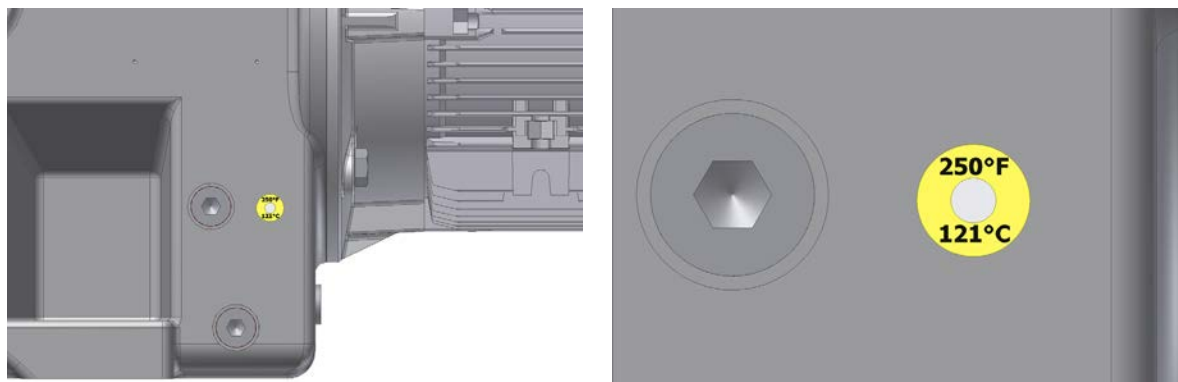


Figure 20: Position of the temperature sticker

3.17 Subsequent painting

DANGER



Explosion hazard due to electrostatic charge

- Subsequent painting must have the same characteristics 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 Check the oil level

The installation position must comply with the version on the type plate. Section 7.1 "Versions and maintenance" 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 maintenance".

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

Gear unit types that are not supplied with an oil filling must be filled before the oil level is checked. (please see chapter 5.2 "Service and Maintenance Work").

Check the oil level with an oil temperature of between 20 °C to 40 °C.

Checking the oil level:

1. The oil level may only be checked when the gear unit is at a standstill and has cooled down. The gear unit must be secured to prevent accidental activation.
2. Gear units with oil level screw:
 - Standard version M4 (V1 and V5) helical gear units have an angled pipe for checking the oil level as shown in Figure 21 (right-hand illustration). This must point vertically upwards. Before checking the oil level, the pressure vent must be unscrewed.
 - The oil level screw corresponding to the version must be screwed out (please see chapter 7.1 "Versions and maintenance").
 - Check the oil level in the gear unit with the dipstick supplied (Part No.: 283 0050), as shown in Figure 21 (left and right illustration). To do this, the part of the dipstick which is submerged in the oil must be held vertically.
 - The maximum oil level is the lower edge of the oil level hole.
 - 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.
 - If the oil level is not correct, it must be adjusted by draining off oil or topping up with the type of oil stated on the type plate.
 - If the integrated seal of the oil level screw is damaged, a new oil level screw must be used or the thread cleaned and coated with securing adhesive, e. g. Loctite 242, Loxeal 54-03 prior to insertion.
 - Fit the oil level screw together with the sealing ring and tighten to the correct torque (please see chapter 7.3 "Screw tightening torques").
 - If the pressure vent has been unscrewed, reinsert it together with the sealing ring and tighten to the correct torque (please see chapter 7.3 "Screw tightening torques").
 - Mount all removed attachments again.
3. Gear units with an oil level tank:
 - The oil level in the oil level tank must be checked with the aid of the dipstick plug (thread G1¼). The oil level must be between the upper and lower marking when the dipstick is fully screwed in; see Figure 21 (centre illustration). These gear units may only be operated in the mounting position stated in Section 7.1 "Versions and maintenance".
4. Gear units with oil inspection glass:
 - The oil level can be seen directly in the window
 - The correct oil level is: the middle of the oil inspection glass.

- If the oil level is not correct, it must be adjusted by draining off oil or topping up with the type of oil stated on the type plate.
5. Final check:
- All previously removed screws must be screwed back in correctly.

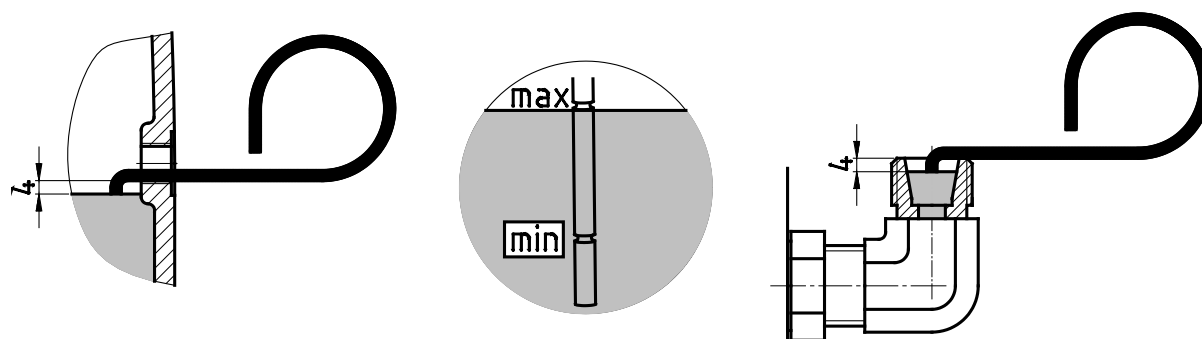


Figure 21: Checking the oil level with a dipstick

4.2 Activating the automatic lubricant dispenser

Some gear unit types with standard motor (Option IEC / NEMA) have an automatic lubricant dispenser for the roller bearings. This must be activated prior to commissioning. 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.

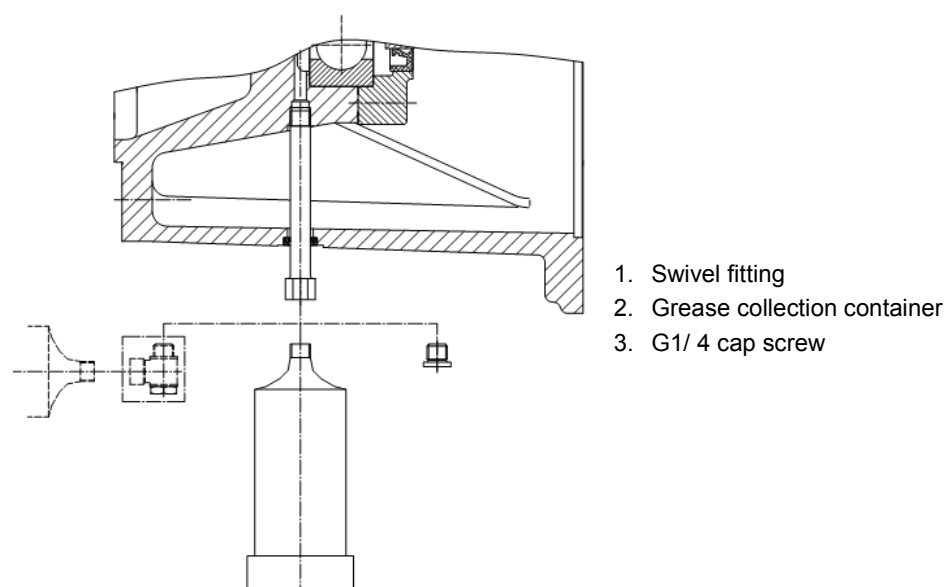
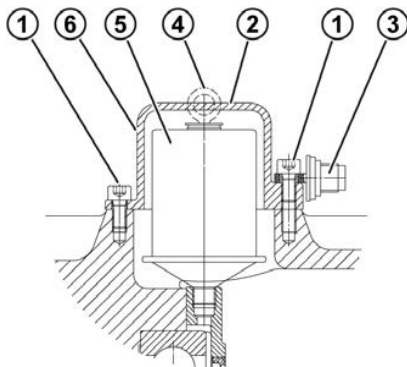


Figure 22: Fitting the grease collection container

Activating the lubricant dispenser:

1. Loosen and remove the cylindrical 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. The **flange surfaces** of the cartridge cover must be completely coated with **surface sealant**, e. g. Loctite 574 or Loxeal 58-14 prior to assembly, so that the cover seals after it has been fitted. (Only necessary for category 2D gear units – see ATEX labelling, last line of the type plate.)
5. Re-fit the cartridge cover and fasten it with the cylindrical screw (please see chapter 7.3 "Screw tightening torques").
6. Mark activation date on the adhesive label indicating the month/year.



Explanation

- | | |
|---|----------------------------|
| 1 | Cylindrical screws M8 x 16 |
| 2 | Cartridge cover |
| 3 | Activation screw |
| 4 | Lug |
| 5 | Lubricant dispenser |
| 6 | Position of adhesive label |

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

Adhesive label



Figure 24: Adhesive label

4.3 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 ± 4 °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 (please see chapter 3.16 "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.:

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_{max} Db / II 3D Ex h IIIC T_{max} .Dc: $T_{gm} + T_u - T_{um} < T_{max} - 15 \text{ °C}$
T_{gm} : Measured temperature of the surface of the gear unit housing in °C
T_{um} : Measured air temperature in °C
T_{max} : Maximum surface temperature according to gear unit type plate (ATEX labelling) in °C
T_u : 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

4.4 Operation with lubricant cooling

The coolant must have a similar thermal capacity to water (specific thermal capacity at 20 °C $c=4.18 \text{ kJ/kgK}$). 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**. The required **quantity of coolant** is **10 litres/minute**, and the **coolant inlet temperature** must not exceed 40 °C; we recommend **10 °C**.

We also recommend fitting a pressure reducer or similar at the coolant inlet to avoid damage due to excessive pressure.

If there is a danger of frost the operator should add a suitable anti-freeze solution to the cooling water.

The **temperature of the cooling water** and the **cooling water flow rate** must be supervised and ensured by the operator. The drive must be shut down if the permissible temperature is exceeded.

4.5 Checking the gear unit

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 disks. To do this, remove the cover and check whether the marking specified in Section 3.9 "Fitting shrink discs" 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".

Information

Shaft sealing rings 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.

4.6 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.

4.7 Checklist

Checklist		
Subject of check	Date checked:	Information see Section
Is any transportation damage or damage apparent?		3.5
Does the labelling on the type plate conform to the specifications?		2.2
Does the configuration on the type plate conform to the actual installation?		3.4
Is the pressure vent screwed in?		3.5
Do all drive and driven elements have ATEX approval?		3.7
Are the external gear shaft forces within permitted limits (chain tension)?		3.7
Are contact guards fitted to rotating components?		3.11
Does the motor also have a relevant ATEX approval?		3.13
Is the temperature sticker affixed?		3.16
Has the correct oil level for the configuration been checked?		5.2
Is the automatic lubricant dispenser activated?		4.2
Has the temperature measurement been carried out?		4.3
Has the centre of the temperature sticker turned black?		4.3
Is the cooling cover connected to the cooling circuit?		3.14 4.4
Has the gear unit been checked with a test run?		4.5
Has the shrink disk connection been checked for slippage?		4.5

5 Service and maintenance

5.1 Service and Maintenance Intervals

Service and Maintenance Intervals	Service and maintenance work	Information see Section
Weekly or every 100 operating hours	<ul style="list-style-type: none"> • Visual inspection for leaks • Check the gear unit for unusual running noises and/or vibrations • Only for gear units with cooling cover: Visual inspection of the temperature sticker 	5.2
Every 2500 operating hours, at least every six months	<ul style="list-style-type: none"> • Check the oil level 	5.2
	<ul style="list-style-type: none"> • Visual inspection of the rubber buffer • Visual inspection of hose • Visual inspection of shaft sealing ring • Visual inspection of Option SCX 	5.2
	<ul style="list-style-type: none"> • Visual inspection of the temperature sticker 	5.2
	<ul style="list-style-type: none"> • Remove dust (only for category 2D) • Check the coupling (only for category 2G and standard IEC / NEMA motor attachment) • Re-grease / remove excess grease (only applicable for free drive shaft / Option W and for agitator bearings / Option VLII / VLIII) • Clean or replace the pressure vent screw 	5.2

Service and Maintenance Intervals	Service and maintenance work	Information see Section
Every 5000 operating hours, at least every year (only for standard IEC / NEMA motor attachment)	<ul style="list-style-type: none"> Replace the automatic lubricant dispenser / remove excess grease, empty or replace the grease collection container at each second replacement of the lubricant dispenser 	5.2 4.2
For operating temperatures up to 80 °C, every 10000 operating hours, at least every 2 years	<ul style="list-style-type: none"> Change the oil (if filled with synthetic products, the interval is doubled, with the use of SmartOilChange the interval is specified by SmartOilChange) Check the cooling coil for deposits (fouling) Replace the shaft sealing rings at every oil change Clean or replace the vent screw as necessary 	5.2
Every 20000 operating hours, at least every 4 years	<ul style="list-style-type: none"> Re-lubricate the bearings in the gear unit Replace the hoses Check the function of the resistance thermometer (only II2GD) 	5.2
Interval as stated in field MI of the type plate (only for Category 2G and 2D) or at least every 10 years	<ul style="list-style-type: none"> General overhaul 	5.2

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 conditions (operating temperatures higher than 80 °C, high humidity, aggressive environment and frequent fluctuations in the operating temperature).

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.

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 shaft sealing rings, cover caps, screw fittings, hoses and housing joints should be checked.

Information

Shaft sealing rings are components with a limited life and are subject to wear and ageing. The service life of shaft sealing rings depends on various ambient conditions. Temperature, light (especially UV light), ozone and other gases and liquids affect the ageing process of shaft sealing rings. Some of these influences may change the physical or chemical properties of the shaft sealing rings and result in a significant reduction of their service life. Foreign substances (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 (please see chapter 7.5 "Leakage and leak-tightness").

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.

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.

Check the oil level

Section 7.1 "Versions and maintenance" describes the mounting positions 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 maintenance".

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

Gear unit types that are not supplied full of oil must be filled before the oil level is checked.

Check the oil level with an oil temperature of between 20 °C to 40 °C.

1. The oil level may only be checked when the gear unit is at a standstill and has cooled down. The gear unit must be secured to prevent accidental activation.
2. The oil level screw corresponding to the actual mounting position must be screwed out (please see chapter 7.1 "Versions and maintenance").

Information

At the first oil level check a small amount of oil may escape, as the oil level may be above the lower edge of the oil level hole.

3. **Gear units with oil level screw:** The correct oil level is at the bottom edge of the oil level hole. If the oil level is too low, this must be corrected with the appropriate type of oil. Optionally, an oil level glass is also possible instead of the oil level screw.
4. **Gear units with oil tank:** Der The oil level must be checked with the aid of the cap screw with dipstick (G1¼ thread) in the oil tank. The oil level must be between the top and bottom marking when the dipstick is fully screwed in (see Figure 27). Top up the oil level with the relevant type of oil as necessary. These gearboxes may only be operated in the mounting position stated in Section 7.1 "Versions and maintenance".
5. The oil level screw or the cap screw with dipstick and all other loosened screws must be correctly re-tightened.

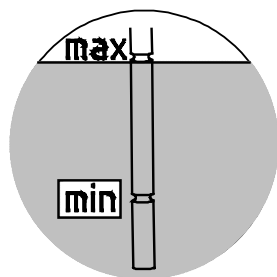


Figure 27: Checking the oil level with a dipstick

Visual inspection of the rubber buffers

Gear units with rubber buffers (Option G or VG) and gear units with torque supports are equipped with rubber elements. If these show damage such as tears to the rubber surface, the elements must be replaced. Please contact the NORD service department.

Visual inspection of hose

Gear units with an oil tank (Option OT) and external cooling units have rubber hoses. Check the connections for leaks. After assembling the oil lines, fill the gear unit housing with the gear oil type and quantity that is printed on the type plate. Please contact the NORD service department.

Visual inspection of shaft sealing ring

Information

Shaft sealing rings 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.

Visual inspection of Option SCX

Check the dirt outlet holes on the 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 shaft sealing ring on the gear unit for damage. Damaged shaft sealing rings must be replaced with new rings. Mount the gear unit on the cleaned flange.

Visual inspection of the temperature sticker

(only necessary for temperature class T4 or max. 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 immediately. The drive unit must not resume operation before the cause of overheating has been remedied and renewed overheating can be ruled out.

Before putting into operation again, a new temperature-sensitive adhesive label must be attached to the gear unit.

Remove dust

(only necessary for category 2D)

Dust deposits on the gear unit housing must be removed if they are more than 5 mm thick. With gear units fitted with a cover (Option H) the cover must be removed. Dust deposits in the cover, on the driven shaft and on the shrink disk must be removed. Then the covering cap must be fitted.

Information

Some covers can be completely sealed with liquid sealing agent. In such cases, there is no need for regular cleaning of the cover if it is completely sealed with a liquid sealing agent such as Loctite 574 or Loxeal 58-14.

Checking the coupling

(only necessary for category 2G and IEC / NEMA standard motor attachments)

The motor must be removed. Plastic or elastomer coupling components must be examined for traces of wear. The plastic or elastomer coupling components must be replaced if the limiting values listed below for the particular coupling versions and sizes are exceeded (see the following table), .

These coupling components have a specific colour depending on the permissible temperature range and the torque which can be transmitted. Only use replacement parts which have the same colour as the original parts. Otherwise there is an increased risk of material fatigue.

With claw couplings (ROTEX®), the tooth thickness of the elastomer gear rim must be measured as shown in the illustration. B_{min} is the minimum permitted tooth thickness.

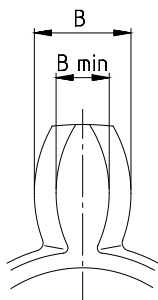


Figure 28: Measurement of gear rim wear on the ROTEX claw coupling®

Limiting wear values for coupling gear rims							
Type	R14	R24	R38	R42	R48	R65	R90
B [mm]	9.7	8.6	13.3	15.7	17.7	22.2	32.3
B min [mm]	7.7	5.6	10.3	11.7	13.7	17.2	24.3

Table 12: Limiting wear values for coupling gear rims

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

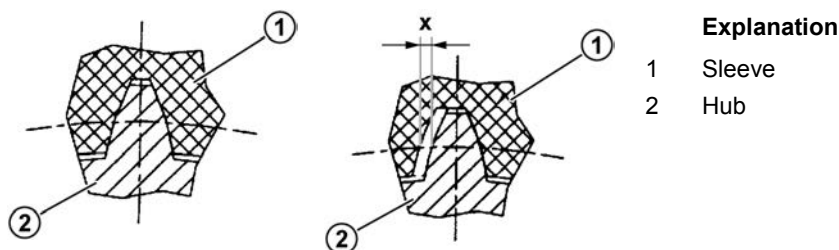


Figure 29: Measurement of gear sleeve wear for curved tooth BoWex® couplings

i Information

If the examination only shows slight wear (25 % of the limiting value), it is permissible to extend the interval for examination of the coupling to twice the normal period, i.e. 5000 operating hours and at least every year.

Re-greasing

Some gear unit designs (free drive shaft, Option W, agitator designs VL2 and VL3) are equipped with a re-greasing device.

For agitator versions VL2 and VL3, the vent screw located opposite to the grease nipple must be unscrewed before re-greasing. Grease should be injected until a quantity of 20 - 25 g escapes from the vent hole. After this, the vent plug must be reinserted and tightened.

For Option W and some IEC adapters, the outer roller bearing must be re-greased with approx. 20 - 25 g of grease via the grease nipple provided. Remove any excess grease from the adapter.

Recommended grease: Petamo GHY 133N (please see chapter 7.2 "Lubricants")(Klüber Lubrication), a food compatible grease is possible as an option.

Replacing the automatic lubricant dispenser

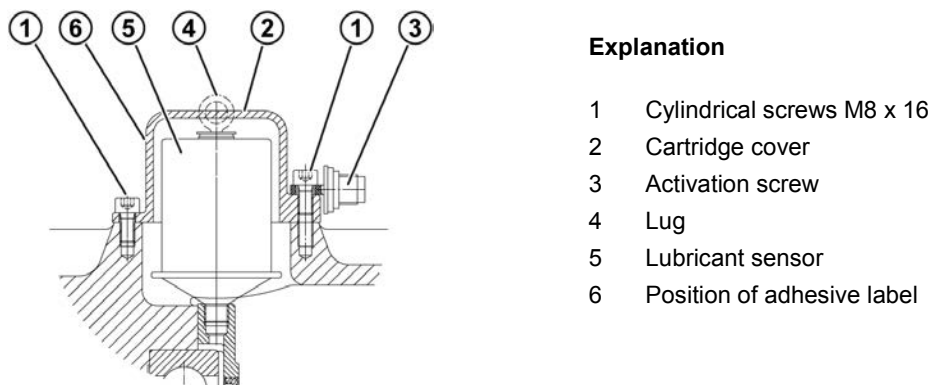


Figure 30: Replacing the automatic lubricant dispenser with standard motor mounting

The cartridge cover must be unscrewed. The lubrication dispenser is screwed out and replaced with a new component (Part No. 28301000 or for food-compatible grease Part No.: 28301010). Remove any excess grease from the adapter. Then activate (please see chapter 4.2 "Activating the automatic lubricant dispenser").

Empty or replace the grease collection container (Part No. 28301210) with every second replacement of the lubricant container. To empty the container, unscrew it from the screw fitting. The container has an internal piston, which can be pressed back with a rod with a maximum diameter of 10 mm. Collect the grease which is pressed out and dispose of it correctly. Due to the shape of the container, a residual quantity of grease remains in the container. After emptying and cleaning the container, it can be screwed back into the drain hole in the IEC adapter. Replace the container with a new one if it is damaged.

Checking the cooling coil for deposits

To check the cooling coil, the coolant feed must be shut off and the pipes disconnected from the cooling coil. If deposits are apparent on the inner wall of the cooling coil, the deposits and the coolant must be analysed.

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 yellow brass fittings).

Please contact the NORD Service department.

Cleaning or replacing the vent plug

Unscrew the vent screw and thoroughly clean it (e.g. with compressed air) and fit the vent screw in the same place, If necessary, use a new vent screw with a new sealing ring.

Replace 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 shaft sealing ring 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 shaft sealing ring does not run in the old wear track.

Re-lubricating bearings

For bearings which are not oil-lubricated and whose holes are completely above the oil level, replace the roller bearing grease (recommended grease: PETAMO GHY 133N). Please contact the NORD service department.

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.

For this, the gear unit must be fully disassembled and the following work must be carried out:

1. Clean all components of the gear unit
2. Examine all gear unit components for damage
3. All damaged components must be replaced

4. Replace all roller bearings
5. Replace all seals, shaft sealing rings and Nilos rings
6. Optional: Replace the backstop
7. Optional: Replace the elastomers in the coupling

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 type plate in field MI.

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

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.

$$N_A = C_M \cdot f_L \cdot k_A$$

C_M : Maintenance class according to field MI of the type 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 $k_A = 1$)

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

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

P_1 Max. permissible drive power or motor power in kW according to the type plate

P_{tat} : 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_{tat1} , P_{tat2} , P_{tat3} , ... with known percentage times q_1 , q_2 , q_3 , ..., the following equivalent average drive power applies:

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

6 Disposal

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

Gear unit components	Material
Gear wheels, shafts, rolling bearings, parallel keys, locking rings, ...	Steel
Gear unit housing, housing components, ...	Grey cast iron
Light alloy gear unit housing, light alloy gear unit housing components, ...	Aluminium
Worm gears, bushes, ...	Bronze
Shaft sealing rings, 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 spiral, embedding material of the cooling spiral, screw fittings	Copper, epoxy, yellow brass

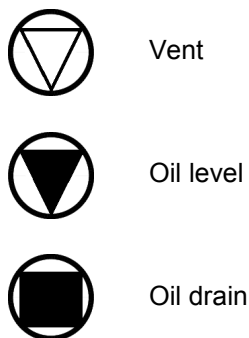
Table 13: Disposal of materials

7 Appendix

7.1 Versions and maintenance

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

Explanation of symbols for the following mounting position illustrations:



Standard helical gear units

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

NORDBLOC helical gear units SK 072.1 and SK 172.1

1. Bring the gear unit from the M4 orientation into the M2 installation orientation and remove the oil level screw for the M2 orientation.

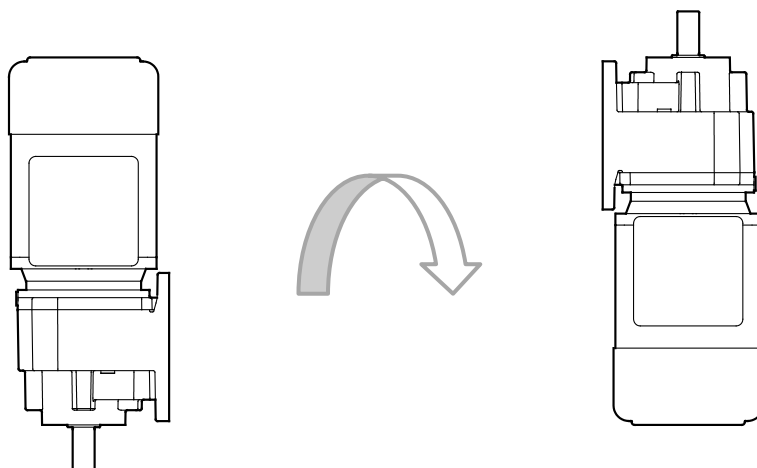


Figure 31: Oil level measurement SK 072.1 – SK 172.1

2. Determine the measurement X between the upper edge of the gear unit housing and the oil level. If necessary, modify the dipstick (see Figure 32 below).

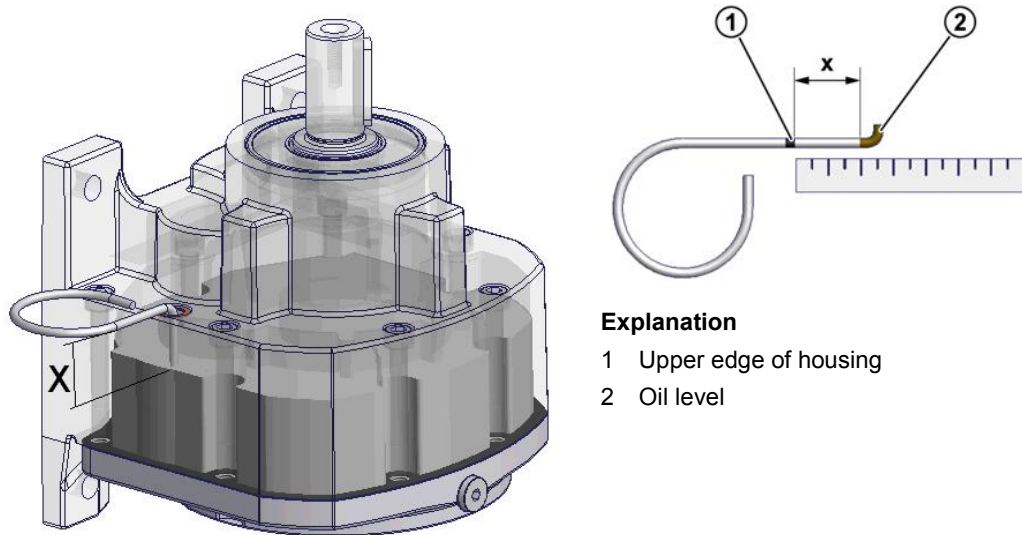


Figure 32: Measuring the oil level

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 type 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 in and tighten the oil level screw in the installation orientation M2 as per Section (please see chapter 0 "Check the oil level").
5. Bring the gear unit back into the installation orientation M4.

NORDBLOC helical 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. The following steps must be observed.

SK 071.1, SK 171.1, SK 371.1, SK 571.1

1. Bring the gear unit into the installation orientation M4.

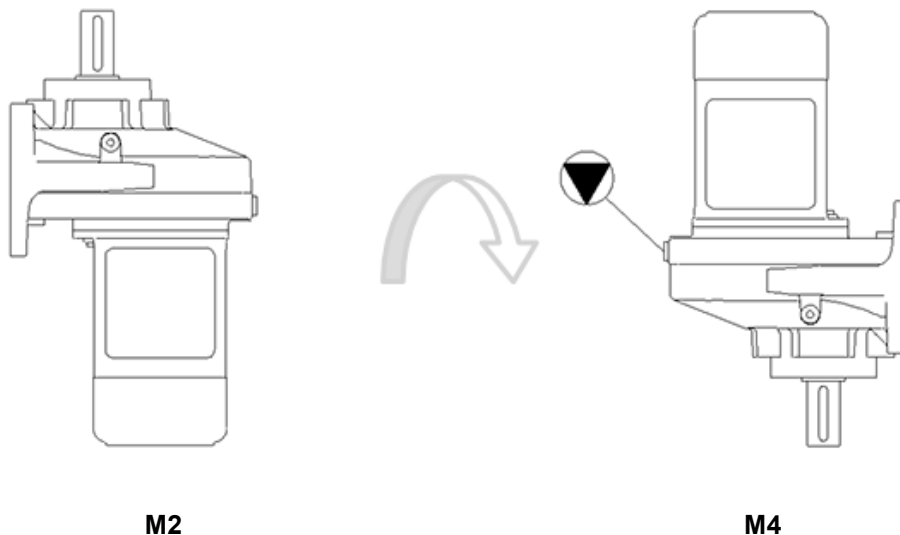
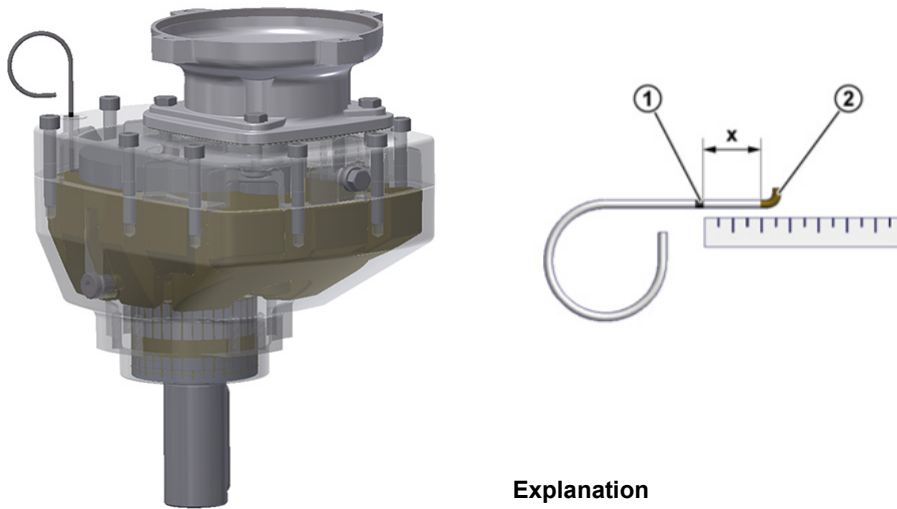


Figure 33: Oil level measurement SK 071.1 – SK 371.1

2. Unscrew the oil level screw for installation position M4 and check the oil level as described in Section 0 "Check the oil level". If necessary, adjust the oil level with the type of oil shown on the type plate.
3. Screw in the M4 oil level screw and tighten with the correct torque (please see chapter 7.3 "Screw tightening torques").
4. Bring the gear unit back into the installation orientation M2 and install it.

SK 771.1 ... SK 1071.1

1. Bring the gear unit into the installation orientation M4 (see above)
2. Determine the dimension X between the top edge of the gear unit cover and the oil level.



Explanation

- 1 Upper edge of housing
- 2 Oil level

Figure 34: Oil level SK 771.1

3. Compare the determined measurement X with the dimension in the following table. If necessary, adjust the oil level with the type of oil shown on the type 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 M4 oil level screw and tighten with the correct torque see Section (please see chapter 7.3 "Screw tightening torques").
5. Bring the gear unit back into the installation orientation M2 and install it.

UNIVERSAL worm gear units

SK 1SI 31 – SK 1SI 75

SK 1SIS 31 – SK 1SIS 75

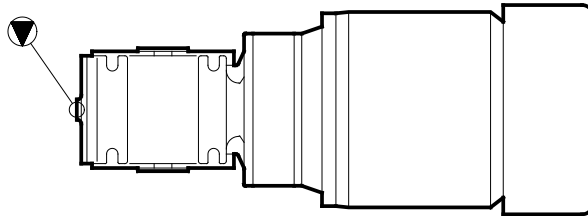


Figure 35: Orientation for oil level check

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

Information

An adequate settling time of the warm gear unit or geared motor in the position shown in Figure 35 must be observed, in order to allow the oil to settle evenly.

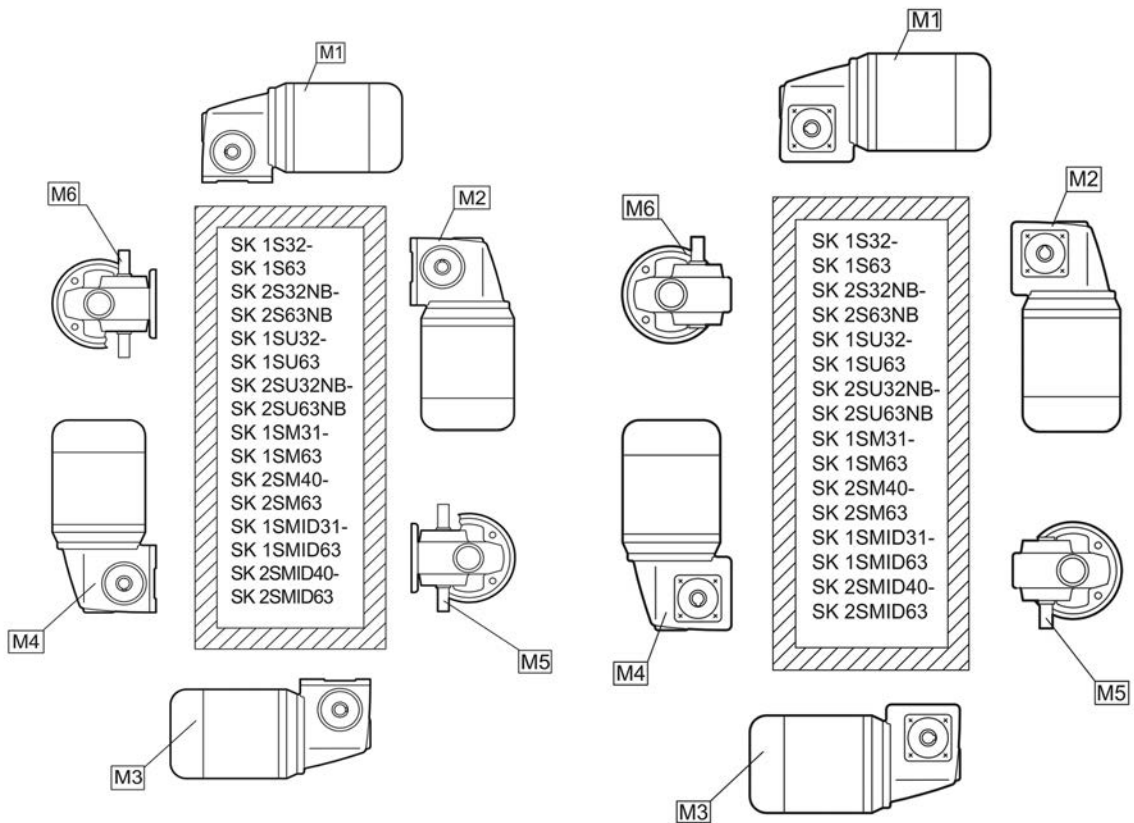
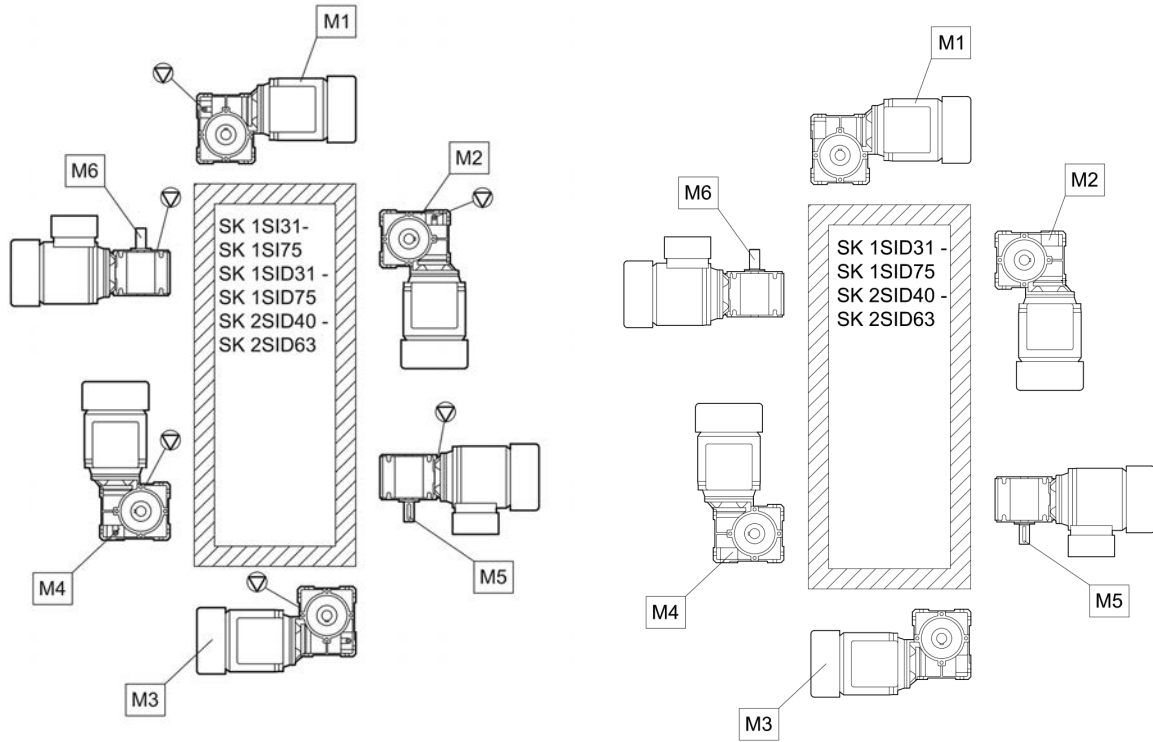
The oil level can then be checked as described in Section 0 "Check the oil level".

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 (please see chapter 0 "Check the oil level" on page 55). 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 vent screw.



Parallel shaft gear units

The following illustration applies for the M4 / H5 configuration of gear unit types SK 9282, SK 9382, SK 10282, SK 10382, SK 11282, SK 11382, SK 12382, SK 10382.1, SK 11382.1 with oil level tank.

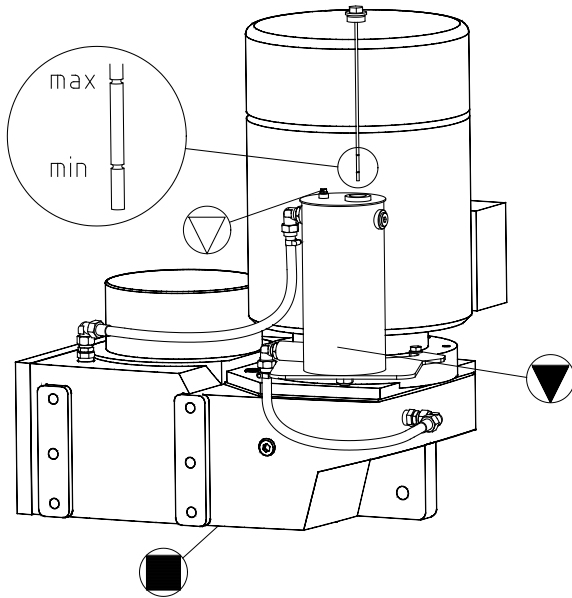


Figure 36: Parallel shaft gear units with oil level tank

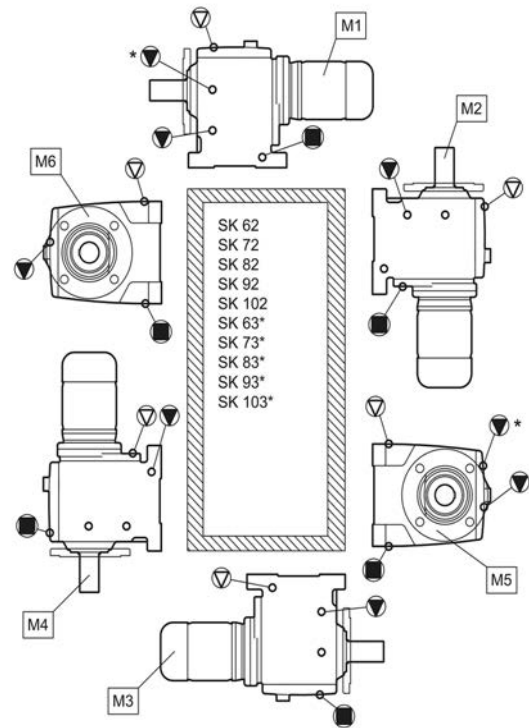
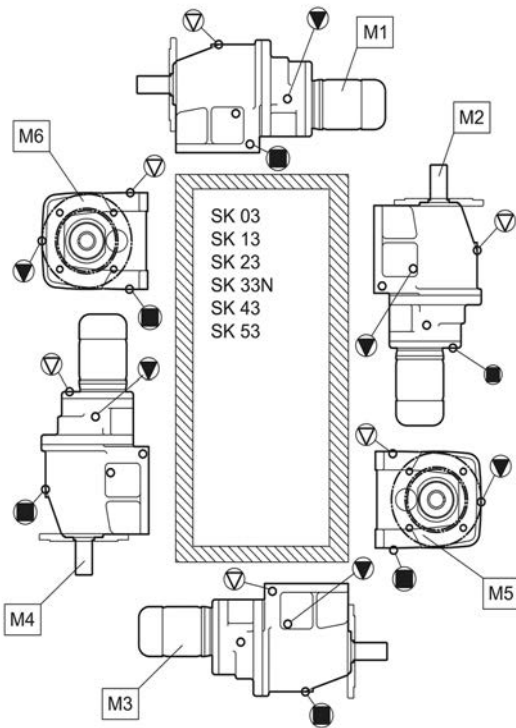
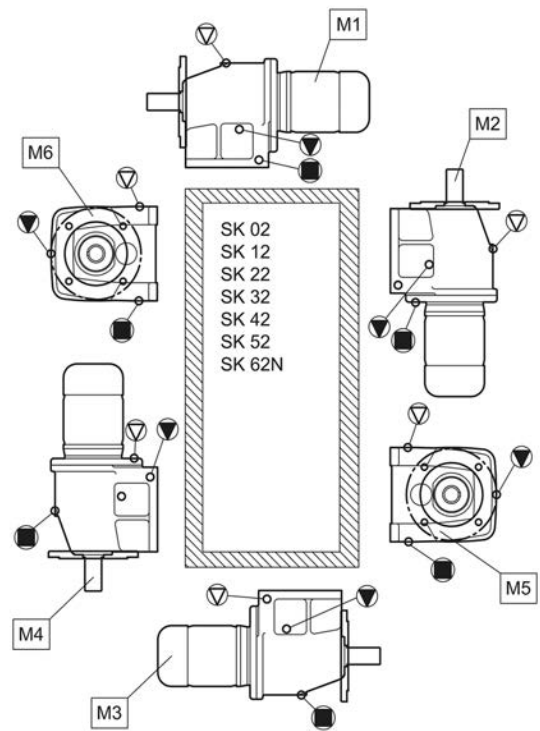
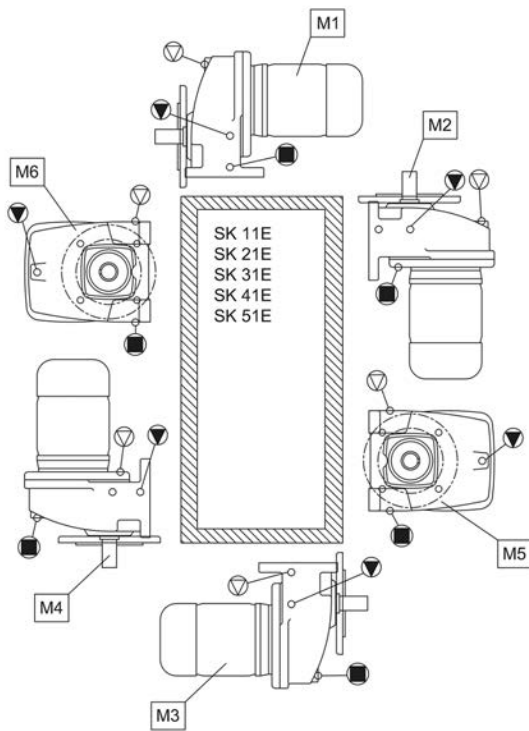
Oil level screws are not fitted to gear unit types SK 0182 NB, SK 0282 NB and SK 1382 NB in the ATEX categories 3G and 3D (please see chapter 2.2 "Type plate").

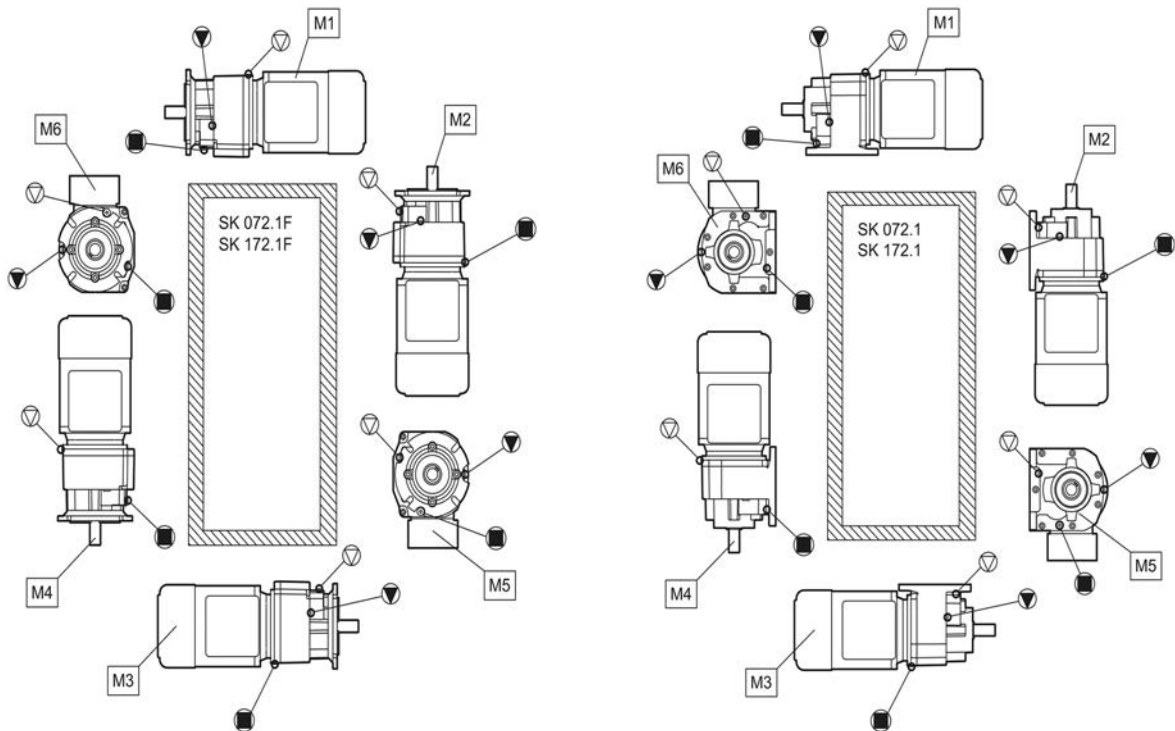
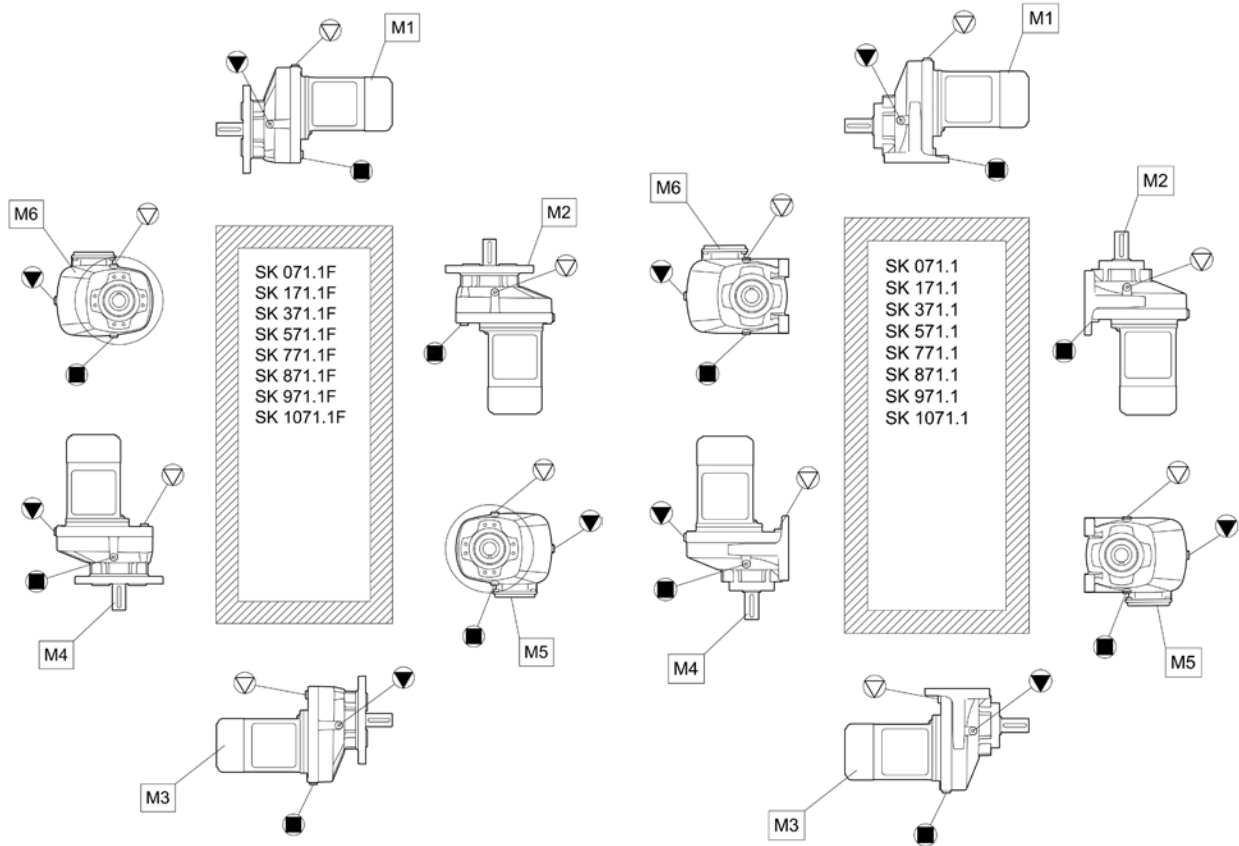
In category 2G and 2D, types SK 0182 NB, SK 0282 NB and SK 1382 NB only have one oil level screw. These gear unit types have checkable life-long lubrication.

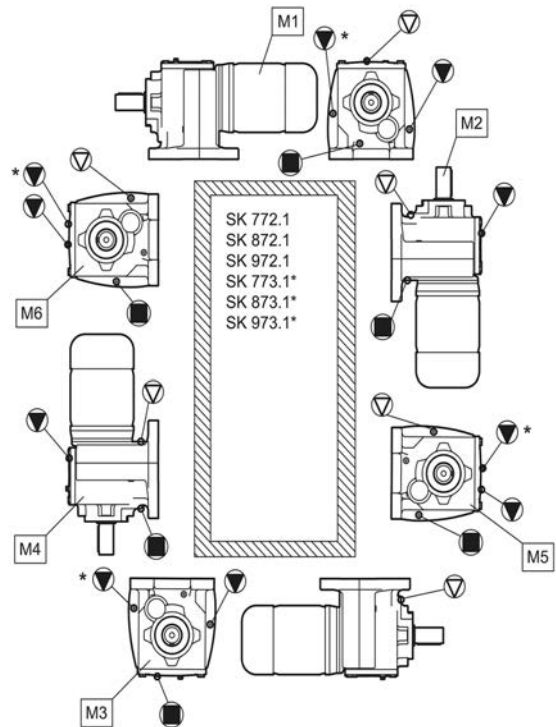
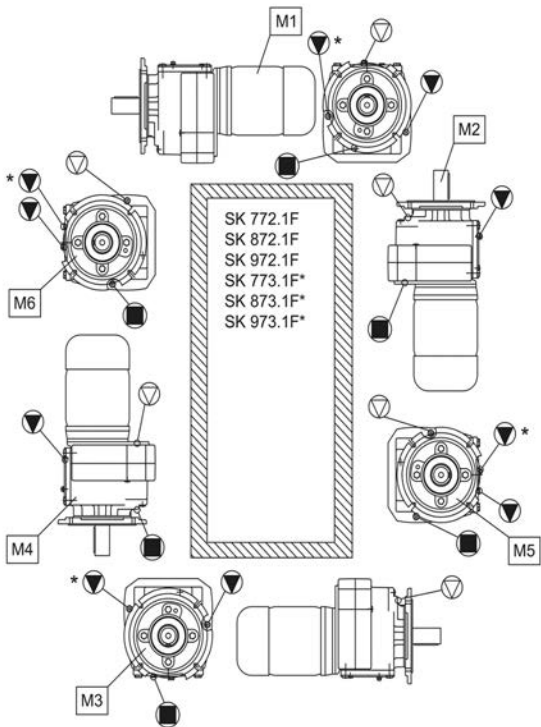
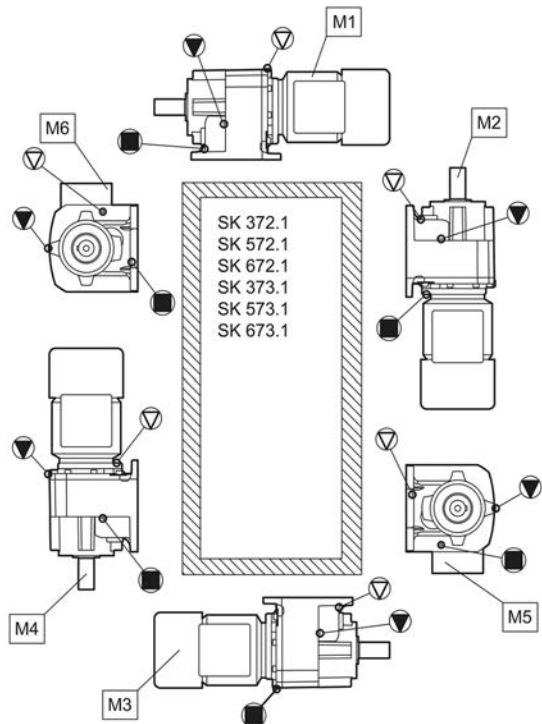
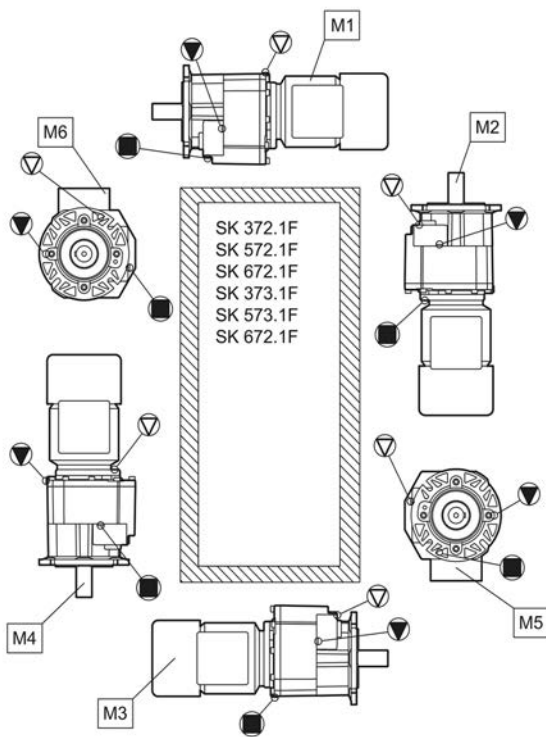
NORDBLOC helical gear units

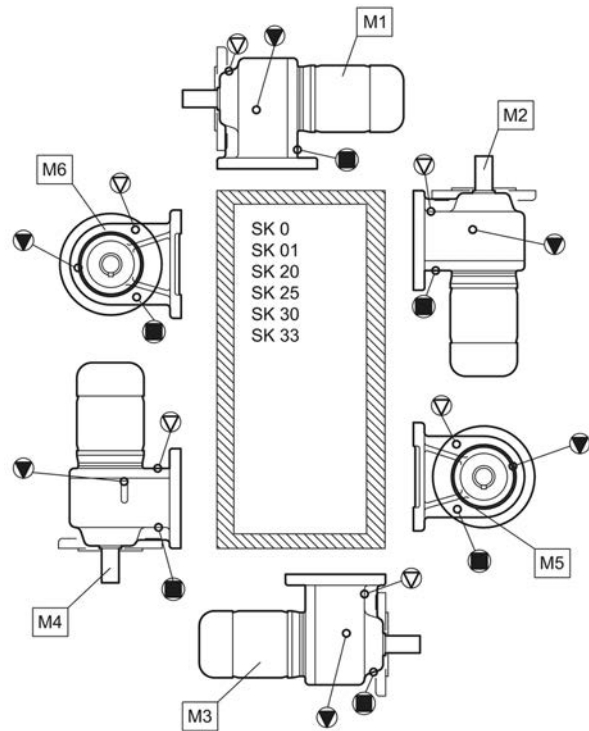
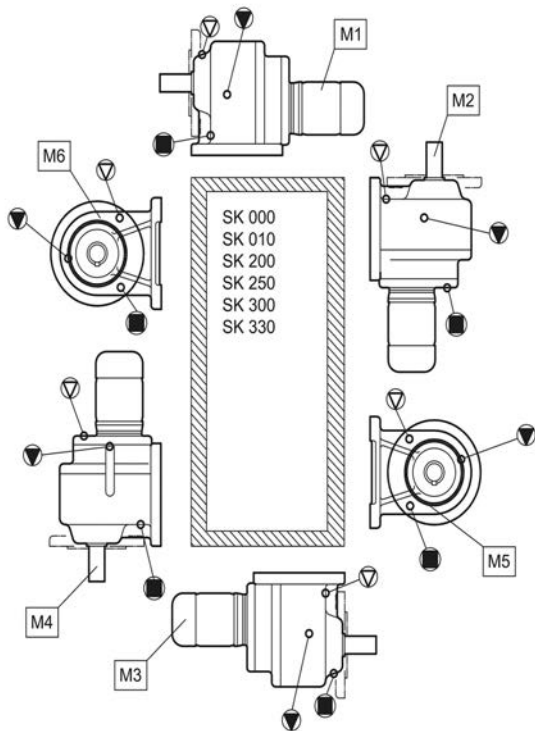
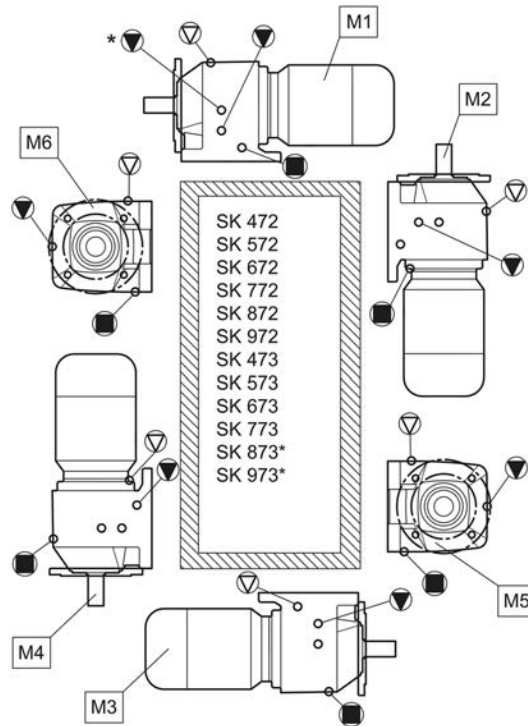
Gear unit types SK 320, SK 172, SK 272, SK 372 and SK 273 and SK 373 are not fitted with oil level screws for ATEX categories 3G and 3D (please see chapter 2.2 "Type plate").

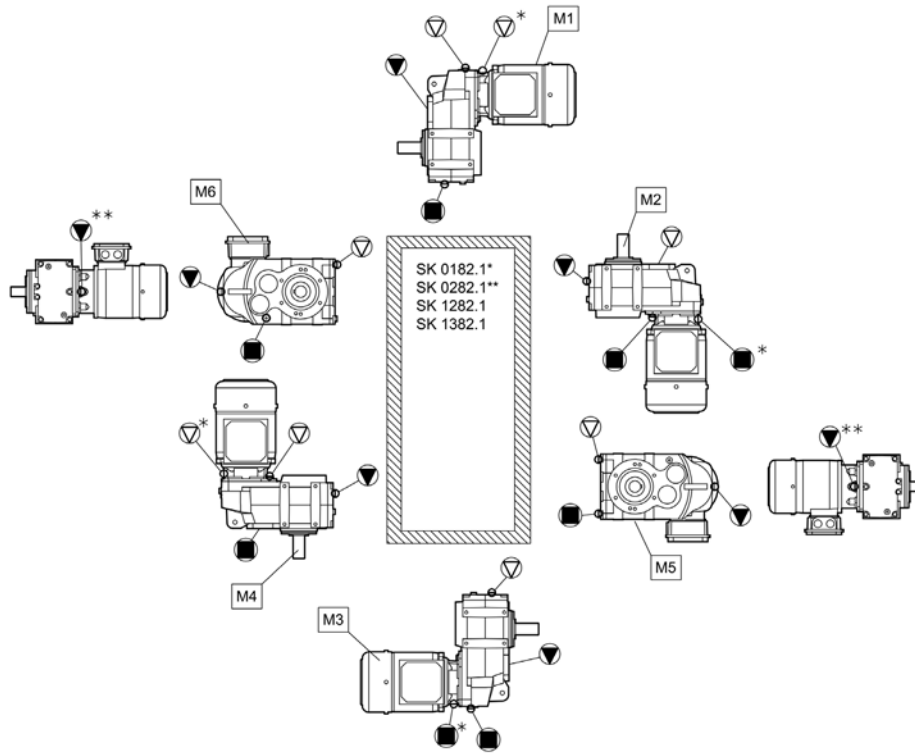
In category 2G and 2D, types SK 320, SK 172, SK 272, SK 372 and SK 273 and SK 373 only have one oil level screw. These gear unit types have checkable life-long lubrication.

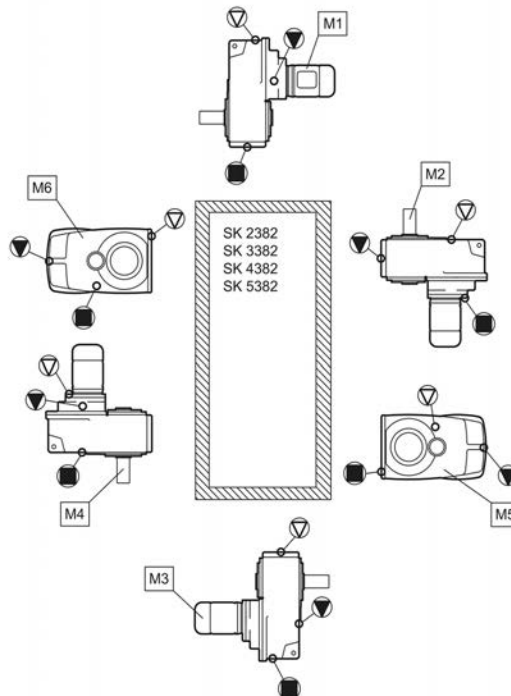
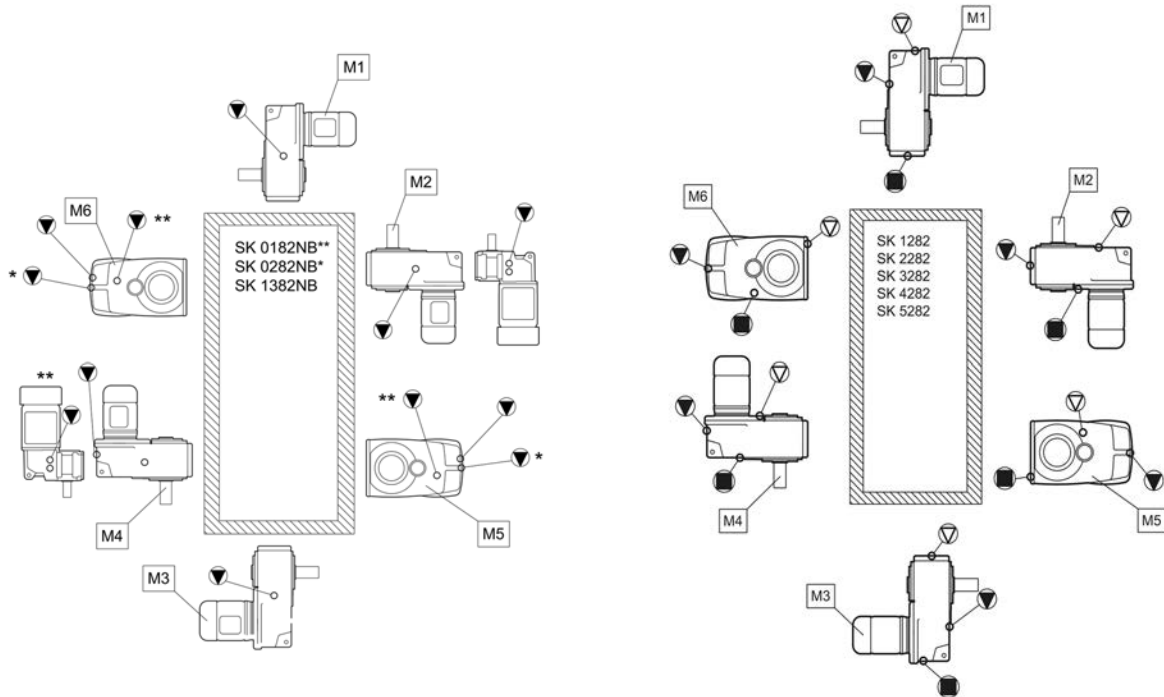


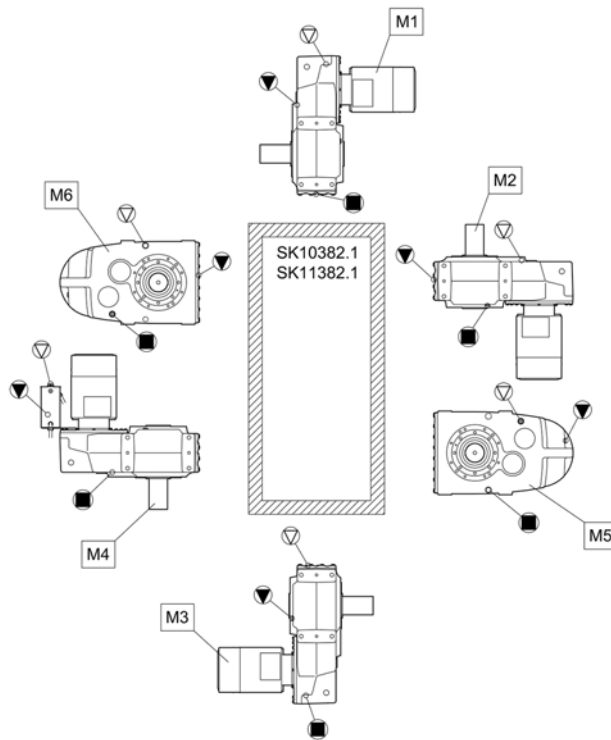
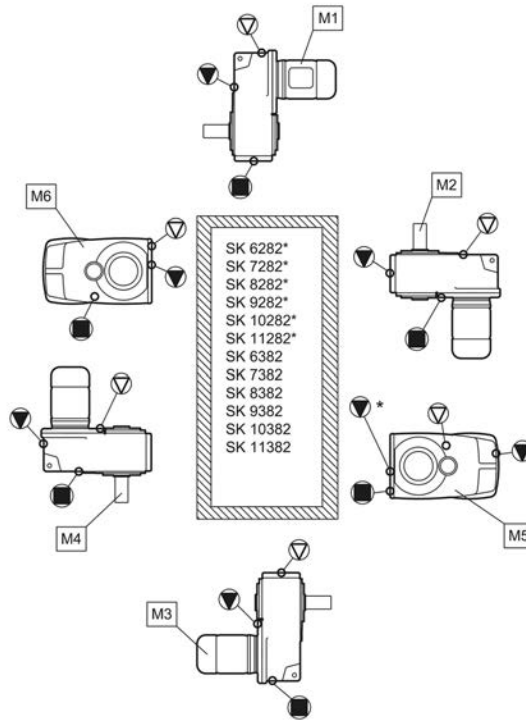


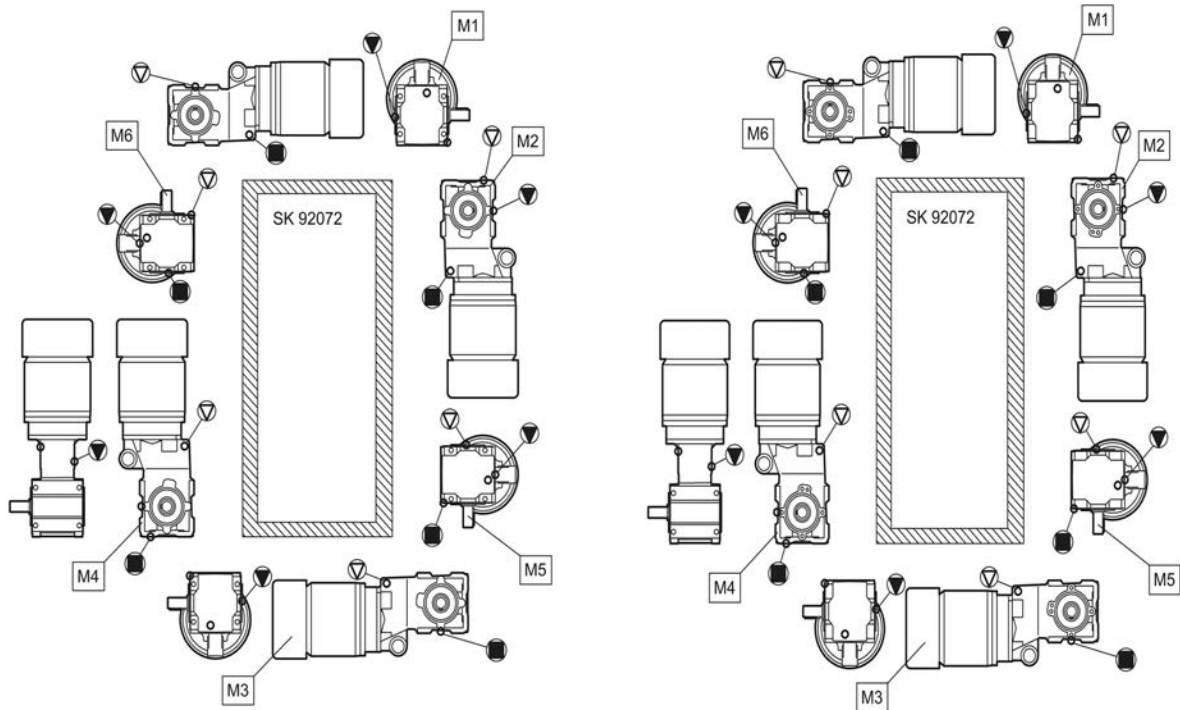
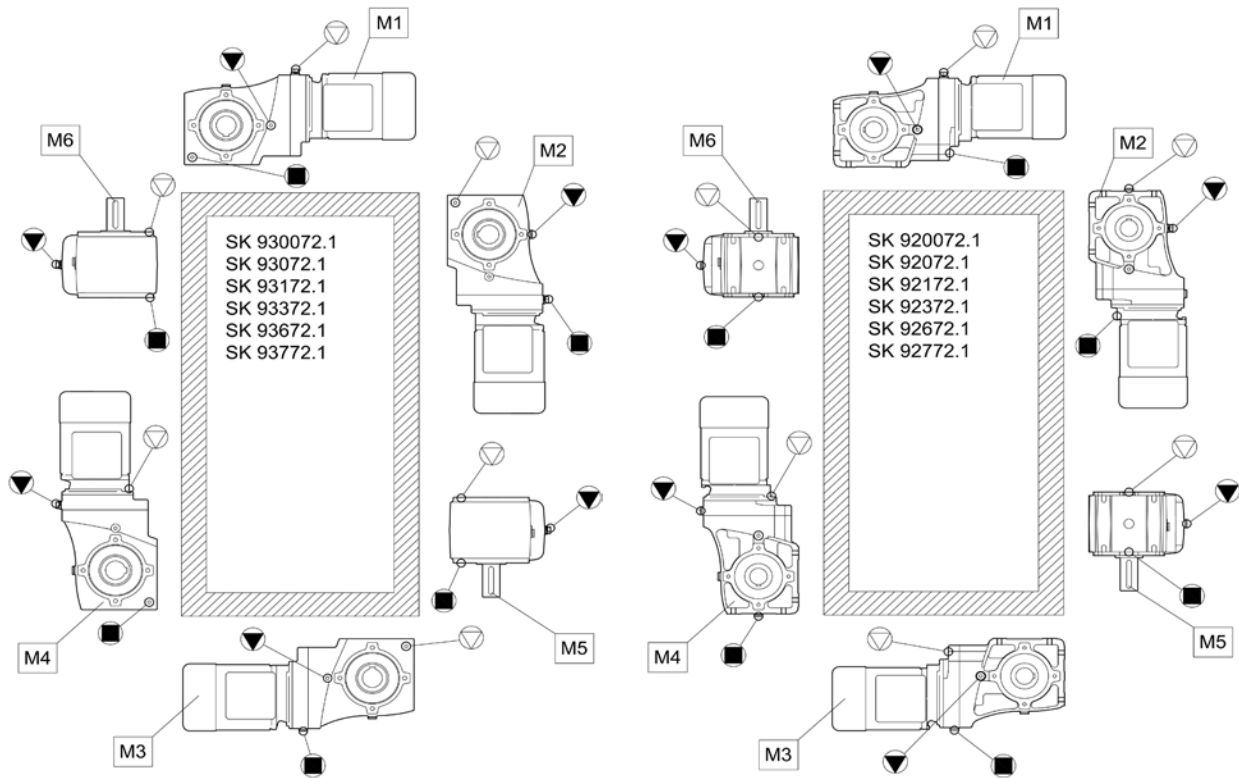


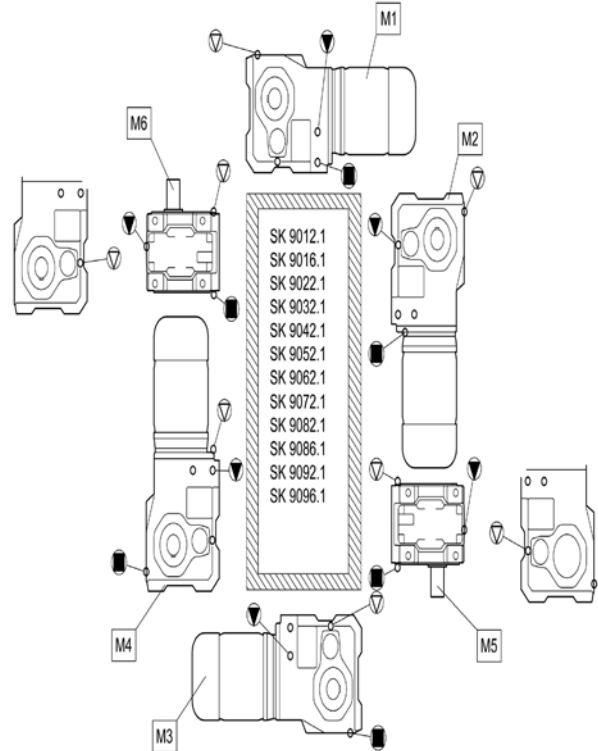
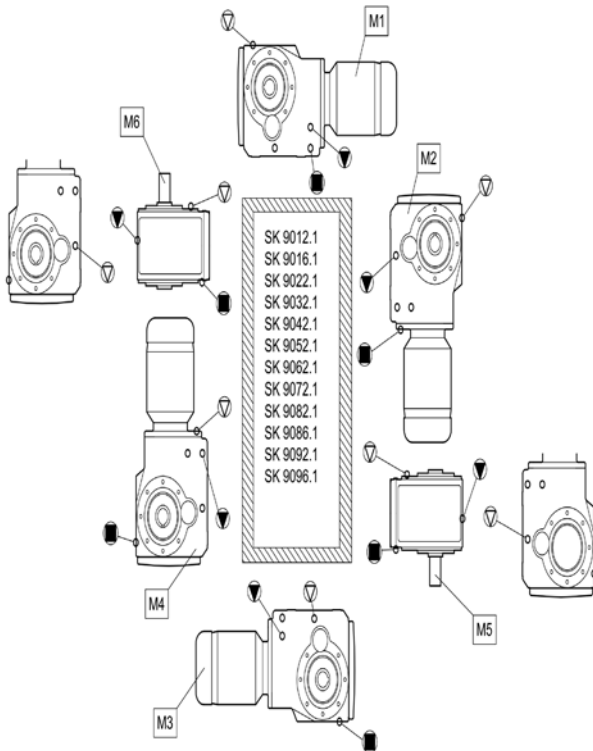
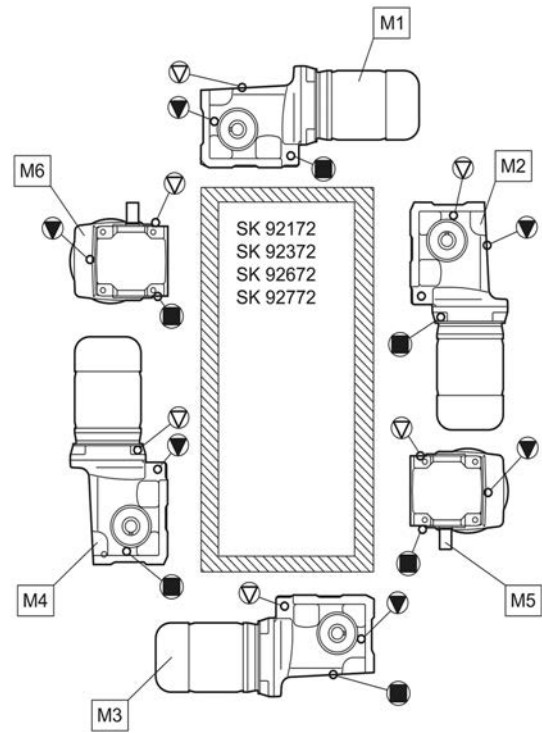
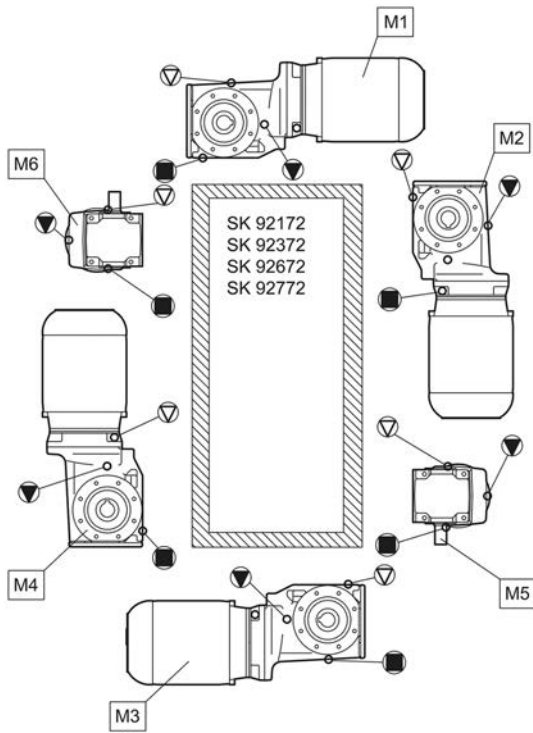


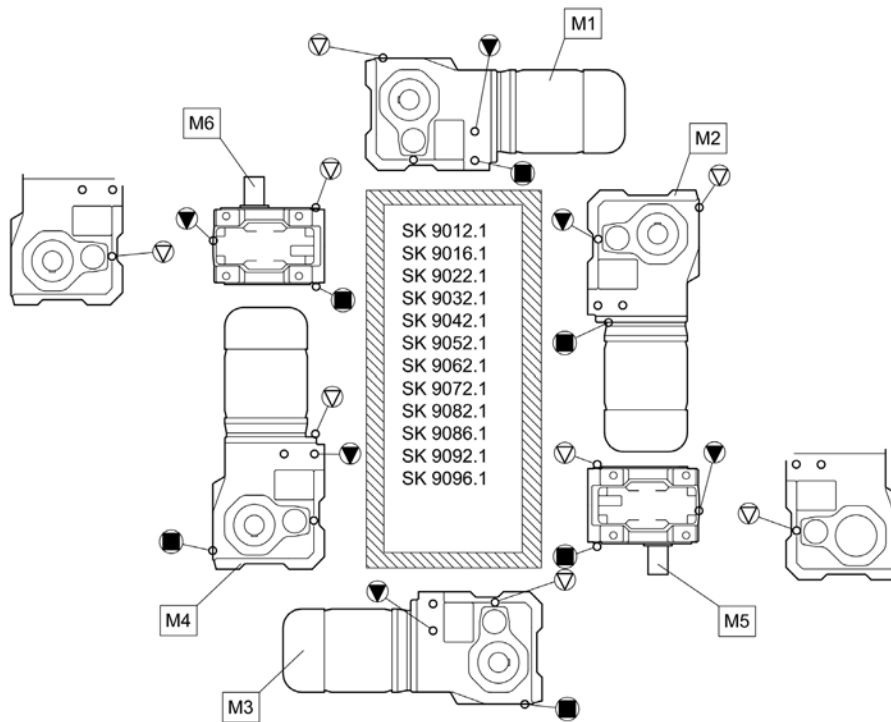
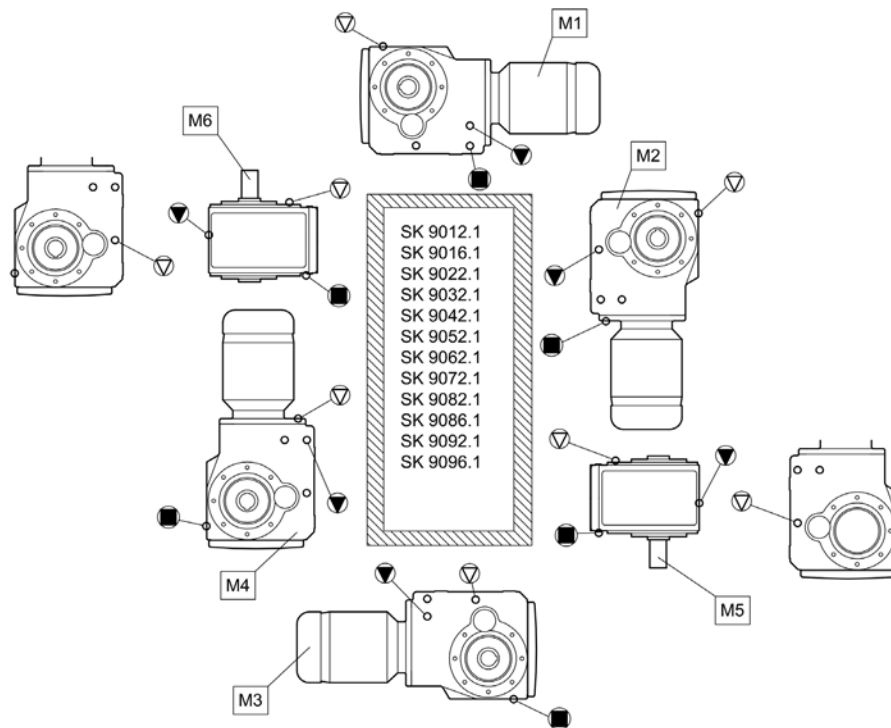


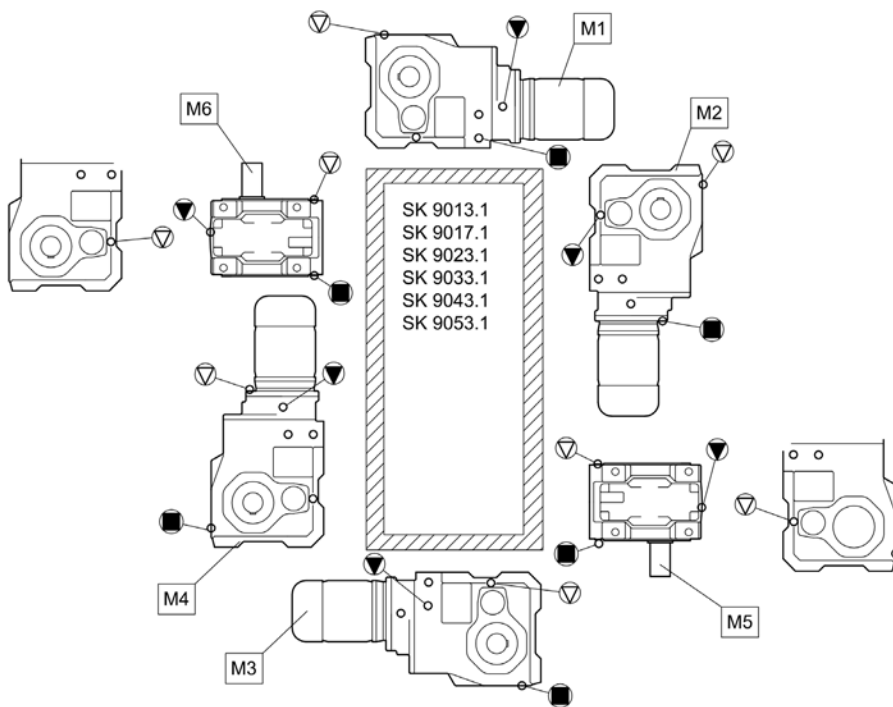
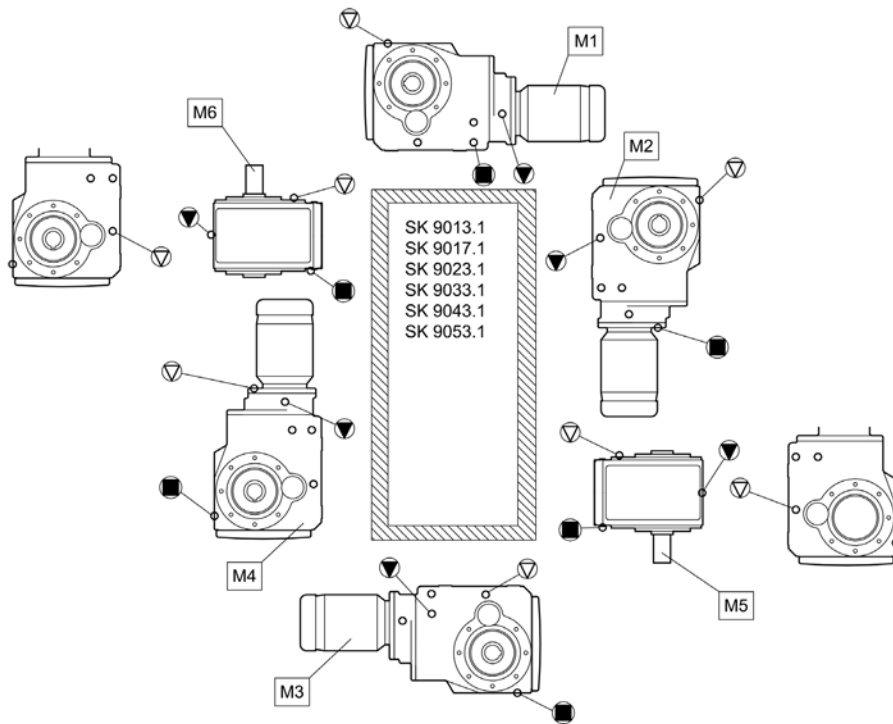


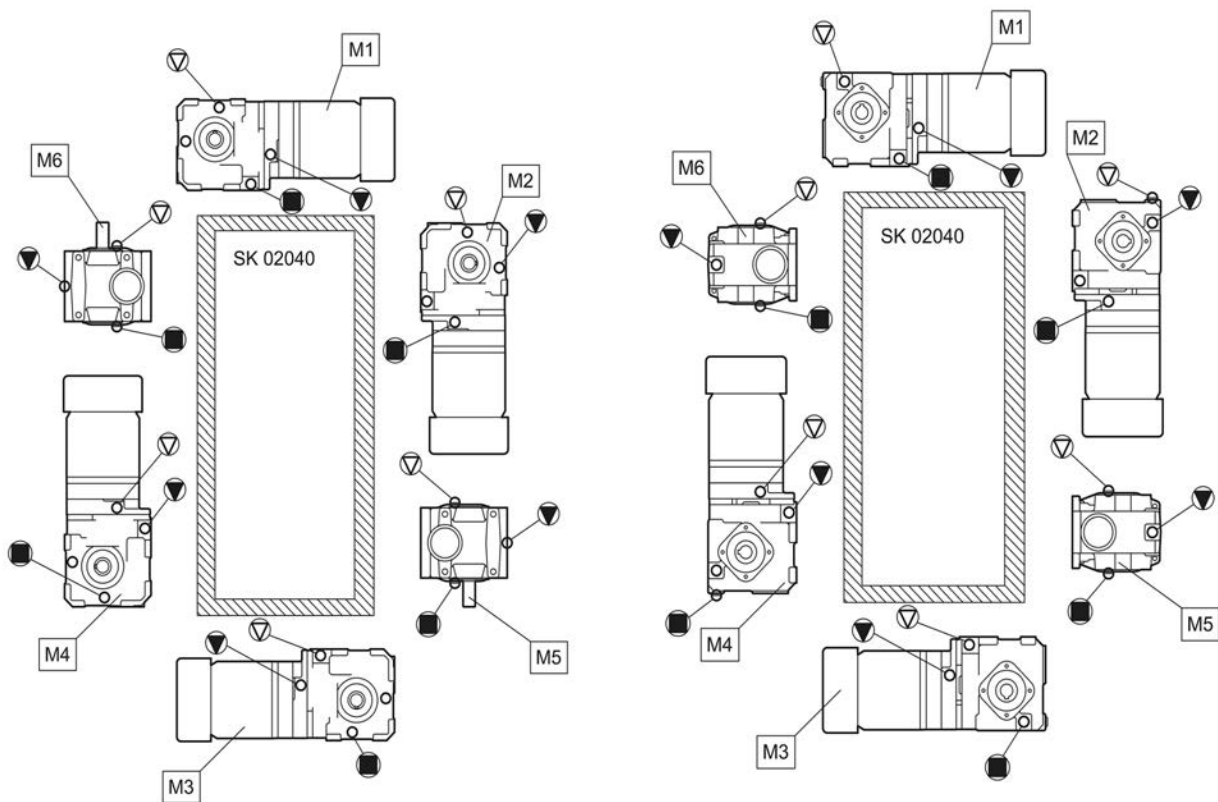
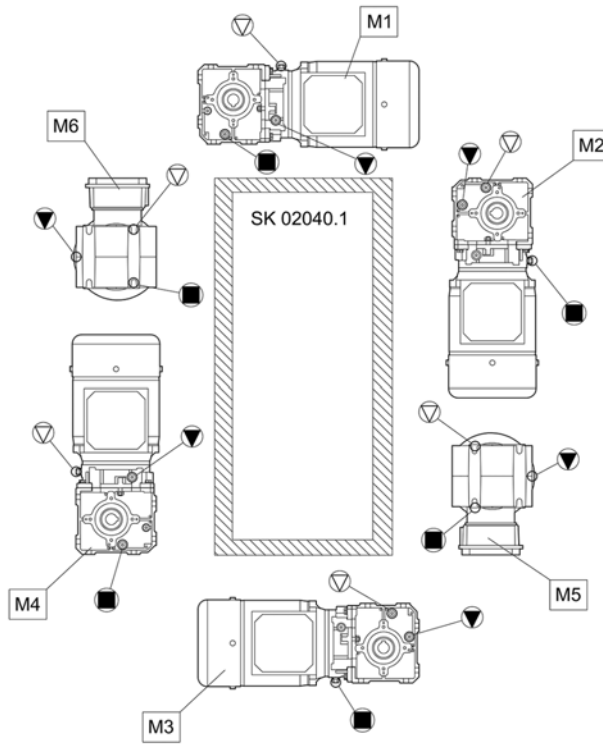


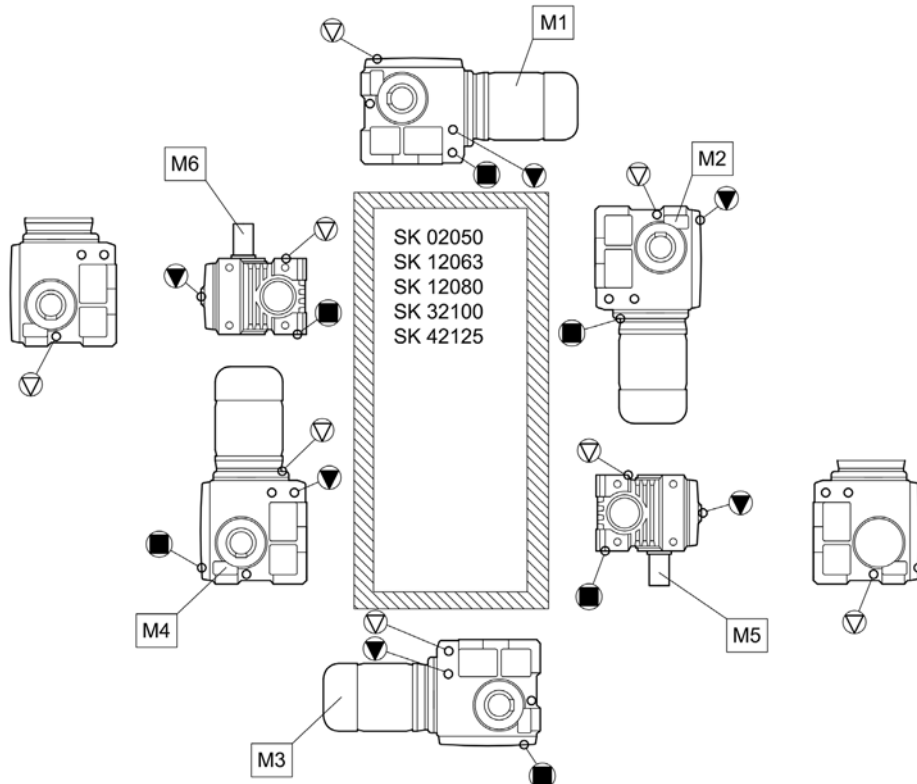
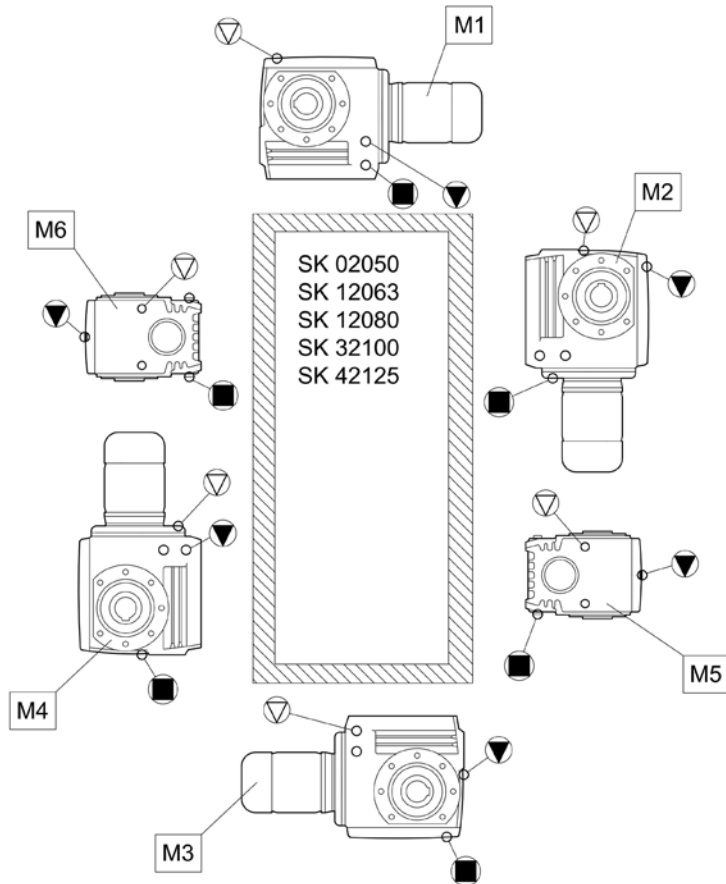


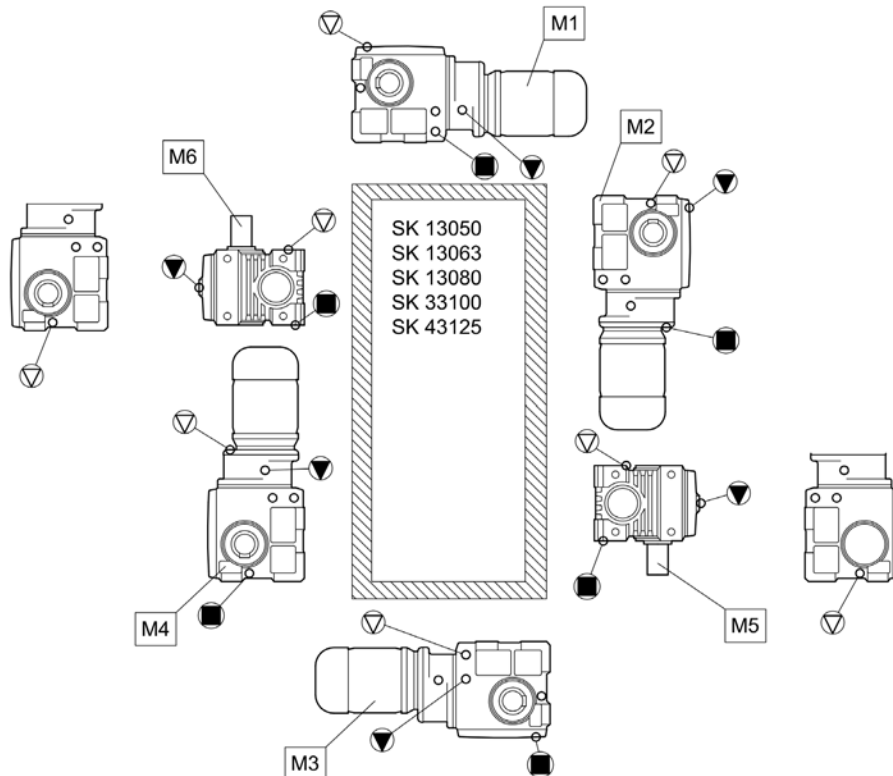
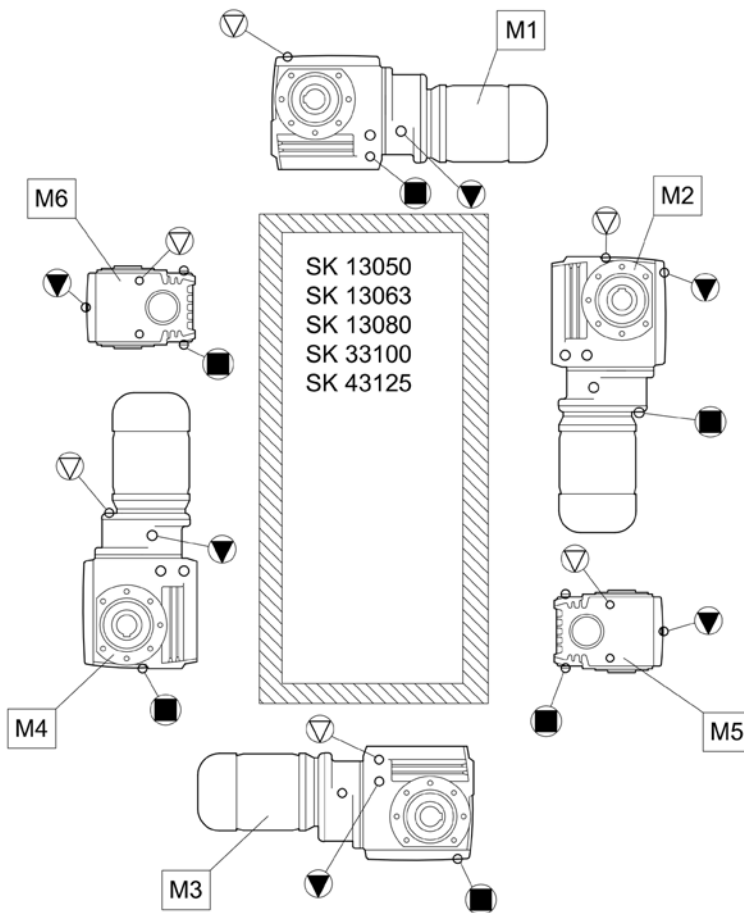












7.2 Lubricants

⚠ DANGER



Explosion hazard due to unsuitable oil

Use of the gear oil type which is stated on the type plate is essential.

The following table shows the proprietary brands or product names according to the gear oil types stated on the gear unit type plate (please see chapter 2.2 "Type plate"). This means that a product corresponding to the type of oil shown on the type plate must be used. In special cases, the designation of the specified product is stated on the type plate of the gear unit.







Lubricant type	Details on type plate						
Mineral oil	CLP 220	Alpha EP 220 Alpha SP 220 Optigear BM 220 Optigear 1100/220	Renolin CLP 220 Renolin CLP 220 Plus Renolin Gear 220 VCI	Klüberoil GEM 1-220 N	Mobilgear 600 XP 220	Omala S2 G 220	Carter EP 220 Carter XEP 220
	CLP 100	Alpha EP 100 Alpha SP 100 Optigear BM 100 Optigear 1100/100	Renolin CLP 100 Renolin CLP 100 Plus	Klüberoil GEM 1-100 N	Mobilgear 600 XP 100	Omala S2 G 100	Carter EP 100
Synthetic oil (Polyglycol)	CLP PG 680	Alphasyn GS 680 Optigear Synthetic 800/680	Renolin PG 680	Klübersynth GH 6-680	Mobil Glygoyle 680	Omala S4 WE 680	Carter SY 680 Carter SG 680
	CLP PG 220	Alphasyn GS 220 Alphasyn PG 220 Optigear Synthetic 800/220	Renolin PG 220	Klübersynth GH 6-220	Mobil Glygoyle 220	Omala S4 WE 220	-
Synthetic oil (hydrocarbon)	CLP HC 220	Alphasyn EP 220	Renolin Unisyn CLP 220 Renolin Unisyn Gear 220 VCI	Klübersynth GEM 4-220 N	Mobil SHC 630	Omala S4 GX 220	Carter SH 220
Bio-degradable oil	CLP E 680	-	Plantogear 680 S	-	-	-	-
	CLP E 220	Performance Bio GE 220 ESS	Plantogear 220 S	Klübersynth GEM 2-220	-	Naturelle Gear Fluid EP 220	-
Food grade oil as per FDA 178.3570	CLP PG H1 680	Optileb GT 1800/680	Cassida Fluid WG 680	Klübersynth UH1 6-680	Mobil Glygoyle 680	-	-
	CLP PG H1 220	Optileb GT 1800/220	Cassida Fluid WG 220	Klübersynth UH1 6-220	Mobil Glygoyle 220	-	Nevastane SY 220
	CLP HC H1 680	Optileb GT 680	Cassida Fluid GL 680	Klüberoil 4 UH1-680 N	-	-	-
	CLP PG H1 220	Optileb GT 220	Cassida Fluid GL 220	Klüberoil 4 UH1-220 N	Mobil SHC Cibus 220	-	Nevastane XSH 220

Table 14: Lubricant table

7.3 Screw tightening torques

Screw tightening torques [Nm]							
Dimensions	Screw fastenings in strength classes				Cap screws	Threaded pin on coupling	Screw fastenings on protective 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 15: 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

WARNING

Danger of slipping in case of leaks

- Clean the soiled floor before starting troubleshooting.

NOTICE!

Gear unit damage

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

Gear unit malfunctions		
Fault	Possible cause	Remedy
Unusual running noises, vibrations	Oil too low or bearing damage or gear wheel damage	Consult NORD Service
Oil escaping from gear unit or motor	Defective seal	Consult NORD Service
Oil escaping from pressure vent	Incorrect oil level or incorrect, contaminated oil or unfavourable operating conditions	Oil change, use oil expansion tank (Option OA)
Gear unit becomes too hot	Unfavourable installation conditions or gear unit damage	Consult NORD Service
Shock when switching on, vibrations	Defective motor coupling or loose gear unit mounting or defective rubber element	Replace elastomer gear rim, tighten motor and gear unit fastening bolts, replace rubber element
Output shaft does not rotate although motor is running	Fracture in gear unit or defective motor coupling or shrink disc slippage	Consult NORD Service

Table 16: 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. A complete seal is technically not possible, as a certain film of moisture, for example on the radial shaft sealing rings is normal and advantageous for a long-term seal. In the region of vents, moisture due to oil may be visible due to the escape of oil mist because of the function. In the case of grease-lubricated labyrinth seals, e.g. Taconite sealing systems, used grease emerges from the sealing gap due to the principle of operation. This apparent leak is not a fault.

According to the test conditions as per DIN 3761, the leak is determined by the medium which is to be sealed, which in test bench tests exceeds the function-related moisture in a defined test period and which results in dripping of the medium which is 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 leak			
		Radial shaft seal	In IEC adapter	Housing joint	Venting
Sealed	No moisture apparent	No reason for complaint	No reason for complaint	No reason for complaint	No reason for complaint
Damp	Moisture film locally restricted (not an area)	No reason for complaint	No reason for complaint	No reason for complaint	No reason for complaint
Wet	Moisture film beyond the extent of the component	No reason for complaint	No reason for complaint	Repair if necessary	No reason for complaint
Measurable leakage	Recognisable stream, dripping	Repair recommended	Repair recommended	Repair recommended	Repair recommended
Temporary leakage	Temporary malfunction of the sealing system or oil leak due to transport *)	No reason for complaint	No reason for complaint	Repair if necessary	No reason for complaint
Apparent leakage	Apparent leakage, e.g. due to soiling, sealing systems which can be re-lubricated	No reason for complaint	No reason for complaint	No reason for complaint	No reason for complaint

Table 17: Definition of leaks according to DIN 3761

*) Previous experience has shown that moist or wet radial shaft sealing rings stop leaking later. 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






 GETRIEBEBAU NORD Member of the NORD DRIVESYSTEMS Group	
Getriebebau NORD GmbH & Co. KG <small>Getriebebau-Nord-Str. 1 . 22941 Bargteheide, Germany . Tel.: +49(0)4532 289 - 0 . Fax: +49(0)4532 289 - 2253 . info@nord.com</small>	
EU Declaration of Conformity According to EU directive 2014/34/EU Annex VIII	
Getriebebau NORD GmbH & Co. KG hereby declares, Page 1 of 1 that the gear units and geared motors from the following product series	
<ul style="list-style-type: none"> • Helical gear units Type SK ... • Parallel shaft gear units Type SK ...82, SK ...82.1, SK ...82NB 	<ul style="list-style-type: none"> • Worm gear units Type SK 02..., SK 1Sl...,SK 12..., SK 13..., SK 3..., SK 4.... • Bevel gear units Type SK 9.....
with ATEX labelling  II 2D / 2G	
are compliant with the following directive: ATEX directive for products 2014/34/EU	
Applied standards:	
	EN 1127-1: 2011 DIN EN ISO 80079-36: 2016 DIN EN ISO 80079-37: 2016 DIN EN 60079-0: 2014
Getriebebau NORD has submitted the documents required as per 2014/34/EU Annex VIII to the notified body:	
	DEKRA EXAM GmbH Dinnendahlstraße 9 44809 Bochum ID number:0158 Certificate: BVS 04 ATEX H/B 196
Bargteheide, 28/02/2019  U. Küchenmeister Manager	 Dr. O. Sadi Technical Manager

Figure 37: Declaration of Conformity for Category 2G / 2D, labelling according to DIN EN ISO 80079-36

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



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EU Declaration of Conformity


According to EU directive 2014/34/EU Annex VIII

Getriebebau NORD GmbH & Co. KG hereby declares,
that the gear units and geared motors from the following product series

Page 1 of 1

- **Helical gear units**
Type SK ...
- **Parallel shaft gear units**
Type SK ...82, SK ...82.1,
SK ..82NB

- **Worm gear units**
Type SK 02..., SK 1SI...,SK 12..., SK 13...,
SK 3..., SK 4....
- **Bevel gear units**
Type SK 9....


with ATEX labelling  II 3D / 3G

are compliant with the following directive:
ATEX directive for products **2014/34/EU**


Applied standards:

DIN EN 1127-1:	2011
DIN EN ISO 80079-36:	2016
DIN EN ISO 80079-37:	2016
DIN EN 60079-0:	2014

Bargteheide, 28/02/2019



U. Küchenmeister
Manager



Dr. O. Sadi
Technical Manager

Figure 38: Declaration of Conformity for Category 3G / 3D, labelling according to DIN EN ISO 80079-36

7.7 Repair information

For enquiries to our technical and mechanical service departments, please have the precise gear unit type (type plate) and if necessary the order number (type plate) to hand.

7.7.1 Repairs

The device must be sent to the following address if it needs repairing:

Getriebebau NORD GmbH & Co. KG
Service Department
 Getriebebau-Nord-Straße 1
 22941 Bargteheide

No guarantee can be given for any attachments, such as encoders or external fans, if a gear unit or geared motor is sent for repair.

Please remove all non-original parts from the gear unit or geared motor.

Information

If possible, the reason for returning the component/device should be stated. If necessary, at least one contact for queries should be stated.

This is important in order to keep repair times as short and efficient as possible.

7.7.2 Internet information

In addition, the country-specific operating and installation instructions in the available languages can be found on our Internet site: 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

2D	Dust explosion protected gear units, Zone 21	F_A	Axial force
2G	Gas explosion protected gear units, Zone 1	IE1	Standard efficiency motors
3D	Dust explosion protected gear units, Zone 22	IE2	High efficiency motors
ATEX:	AT mosphères EX plosible	IEC	International Electrotechnical Commission
B5	Flange fastening with through holes	NEMA	National Electrical Manufacturers Association
B14	Flange fastening with threaded holes	IP55	International Protection
CW	Clockwise, right rotation	ISO	International standardisation organisation
CCW	Counter-clockwise, left rotation	pH	pH value
°dH	Water hardness in German hardness degrees 1 dH = 0.1783 mmol/l	PPE	Personal Protective Equipment
DIN	Deutsches Institut für Normung [<i>German Standards Institute</i>]	DIR	Directive
EC	European Community	VCI	Volatile Corrosion Inhibitor
EN	European standard	WN	Document from Getriebebau NORD
F_R	Radial force		

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