

B 1050 – en

Industrial gear units

Manual with installation instructions





Read this manual with installation instructions

Read this *manual with installation instructions* carefully prior to performing any work on or putting the gear unit into operation. Always observe the instructions in this document.

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

Please also note the following documents:

- Gear unit catalogues,
- Documentation for the electric motor,
- Documentation for equipment which is attached or provided.

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

Documentation

Designation: **B 1050**
 Part No.: **6052902**
 Series: Gear units and geared motors
 Type series: SK 5207 to SK 15507,
 SK 5217 to SK 11217 and SK xx319
 Gear unit types: **Industrial gear units**

Version list

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Table 1: Version list B 1050

Copyright notice

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Publisher

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1 Safety information

1.1 Intended use

These gear units are used to transmit rotary movements. They convert velocity and torque. They are intended for use as part of a drive system in commercially used plant and machinery. The gear units must not be operated until it has been established that the plant or machinery can be safely operated with the gear unit. Suitable protective measures must be provided if failure of a gear unit or a geared motor could result in a risk to persons. The 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 may not be used in environments in which an explosive atmosphere can occur.

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 Do not make any modifications.

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

1.3 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.

1.4 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.

1.5 Safety for particular activities

1.5.1 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.

1.5.2 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.

1.6 Hazards

1.6.1 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.
- Gear units may only be transported with shackles and lifting straps/chains at an angle of 90° to 70° to the horizontal. Do not use the eye bolts on the motor for lifting if a motor is fitted to the gear unit. The eye bolts are not designed for lifting the motor with heavy attachments. Pay attention to the section 3.1 "Transporting the gear unit".

1.6.2 Hazards due to rotating parts

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

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

1.6.3 Danger on entry

Persons may fall and be seriously injured when standing on the gear unit.

- Only stand on the gear unit for maintenance and repair work and only when the gear unit is at a standstill.
- Never stand on shaft journals, protective covers, attachments and piping.

1.6.4 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.

1.6.5 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.

1.6.6 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.

1.6.7 Hazards due to pressurised coolants

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

2 Description of gear units

2.1 Type designations and gear unit types

Gear unit types/ Type designations			
Parallel gear units			
2-stage		3-stage	
SK 5207		SK 5307	
SK 6207		SK 6307	
SK 7207		SK 7307	
SK 8207		SK 8307	
SK 9207		SK 9307	
SK 10207		SK 10307	
SK 11207		SK 11307	
SK 12207		SK 12307	
SK 13207		SK 13307	
SK 14207		SK 14307	
SK 15207		SK 15307	
Helical bevel gear unit			
2-stage		3-stage	4-stage
SK 5217		SK 5407	SK 5507
SK 6217		SK 6407	SK 6507
SK 7217		SK 7407	SK 7507
SK 8217		SK 8407	SK 8507
SK 9217		SK 9407	SK 9507
SK 10217		SK 10407	SK 10507
SK 11217		SK 11407	SK 11507
		SK 12407	SK 12507
		SK 13407	SK 13507
		SK 14407	SK 14507
		SK 15407	SK 15507

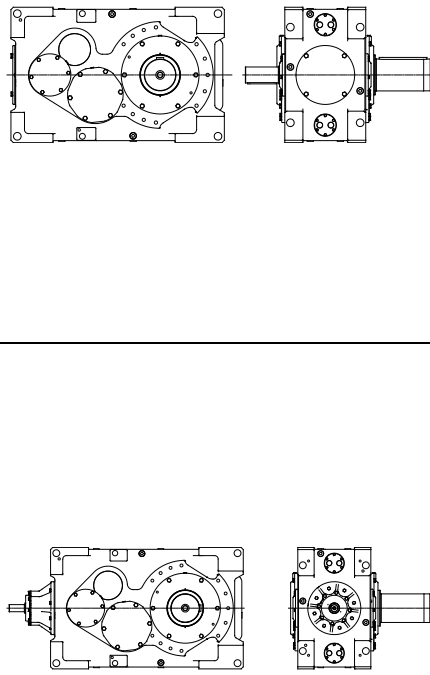


Table 2: Type designations and gear unit types

Double gear units consist of two single gear units. The type designation of the SK 13307/7282 double gear unit, for example, means that the double gear unit consists of the single gear units SK 13307 and SK 7282. For the attached gear units, note the documentation B 1000.

SK 5418 gear units are 3-stage gear units with an angled stage.

SK xx319 gear units are 3-stage gear units with extended axle spacing.



Figure 1: MAXXDRIVE® XT 2-stage helical bevel gear unit

Abbreviation	Description
A	Hollow output shaft
B	Fastening element
CC	Cooling coil
CS1-X	Cooling system oil/water
CS2-X	Cooling system oil/air
D	Torque support
DB	Drying agent filter
DRY	Additional measures against oil leak for mounting position M5 (True Drywell) with standard bearings
EA	Splined hollow output shaft
ED	Elastic torque arm (details on name plate D)
EF	Cellulose filter
EV	Splined solid output shaft
EW	Splined drive shaft
F	B14 output flange
FAN-A	Axial fan
FAN-R	Radial fan
FK	B5 output flange
FV	Ventilation filter
F1	Drive flange
H	Cover cap
H66	IP66 cover
IEC	Standard IEC motor mounting
KL2	Agitator version - Standard bearings
KL3	Agitator version - Standard bearings - Drywell
KL4	Agitator version - Standard bearings - True Drywell
KL6	Agitator version - Standard bearings - True Drywell - Foot mounting
L	Solid output shaft on both sides
LC	Lubricant circulation with oil injection for roller bearings, oil level reduced
LCX	Lubricant circulation with oil injection for roller bearings and gearing, oil level greatly reduced
M	GRIPMAXX™
MC	Motor bracket
MF...	Motor base frame
MFB	Motor base frame with brake
MFK	Motor base frame with elastic coupling
MFT	Motor base frame with hydrodynamic coupling
MO	Measuring devices and sensors
MS...	Motor swing base
MSB	Motor swing base with brake
MSK	Motor swing base with elastic coupling
MST	Motor swing base with hydrodynamic coupling
MT	Motor mount
NEMA	Standard NEMA motor attachment
OH	Oil heater
Oil sight glass	Oil inspection glass

Abbreviation	Description
Oil gauge	Oil level indicator
OT	Oil level tank
PT100	Temperature sensor
R	Back stop
S	Shrink disc
V	Solid output shaft
VL	Reinforced bearings
VL2	Agitator version - Reinforced bearings
VL3	Agitator version - Reinforced bearings - Drywell
VL4	Agitator version - Reinforced bearings - True Drywell
VL5	Extruder flange version
VL6	Agitator version - Reinforced bearings - Drywell - Foot mounting
W	Free drive shaft
W2	Two free drive shaft journals
W3	Three free drive shaft journals
WG	First stage gear unit
WX	Auxiliary drive unit

Table 3: Versions and options

2.2 Name plate

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

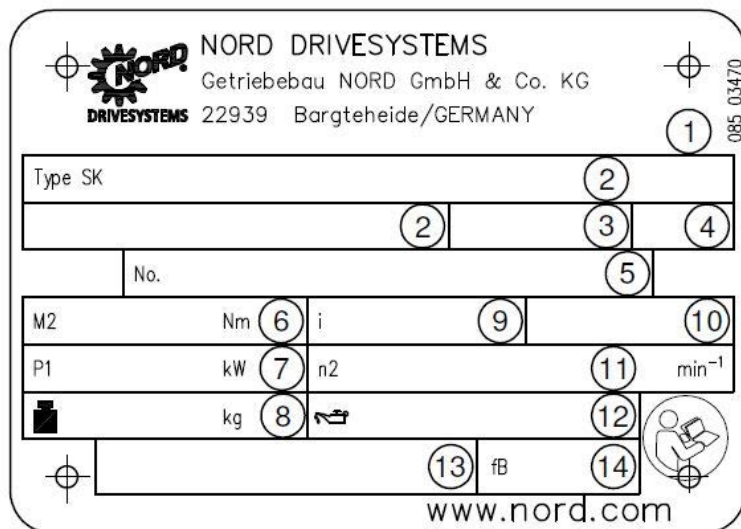


Figure 2: Name plate

Explanation

1	DataMatrix code	8	Weight
2	NORD gear unit type	9	Overall gear unit ratio
3	Modes of operation	10	Installation position
4	Year of manufacture	11	Rated speed of gear unit output shaft
5	Serial number	12	Lubricant type, viscosity and quantity
6	Rated torque of gear unit output shaft	13	Customer part number
7	Drive power	14	Operating factor

3 Transport, storage, assembly

3.1 Transporting the gear unit

WARNING

Hazard due to falling loads

- Do not use the eye bolts on a mounted motor to lift the unit.
- Note the centre of gravity of the gear unit.

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

No additional loads must be attached to the gear unit.

Use suitable aids such as cross-beams or similar to facilitate transportation of the gear unit. Gear units may only be transported with shackles and lifting strapschains at an angle of 90° to 70° to the horizontal.

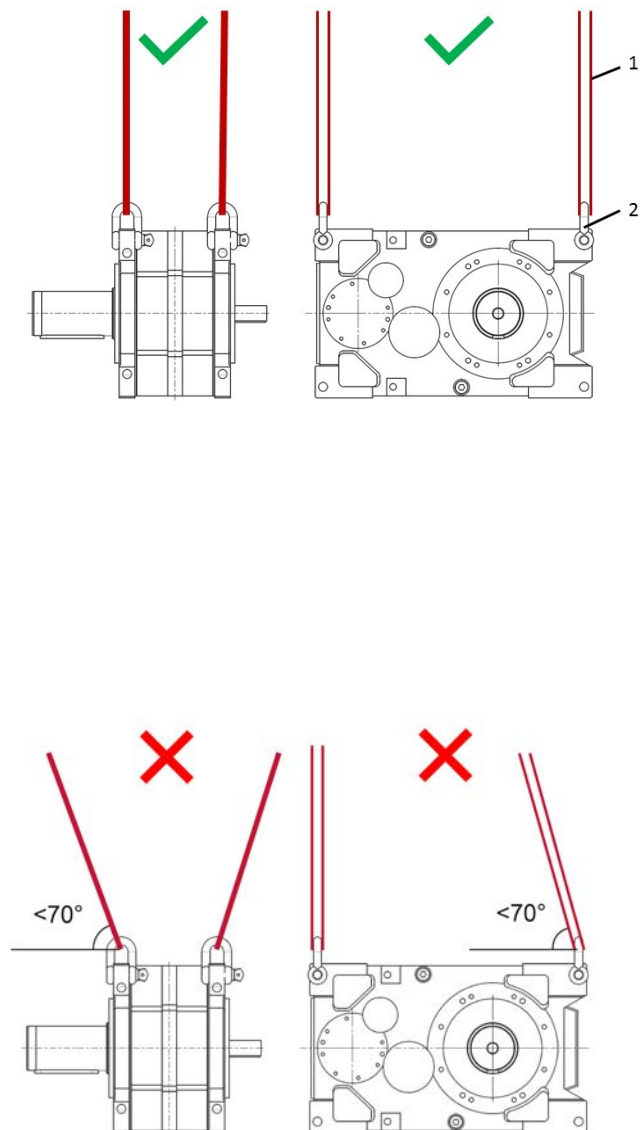
Only transport gear units which are filled with oil in their installation position.

Attachment to the ring bolts must not result in diagonal pulling. If necessary, use suitable attachment swivels.

Check the lifting gear before use.

The illustrations in the following sub-sections show examples for transporting the gear unit.

3.1.1 Transport of standard gear units



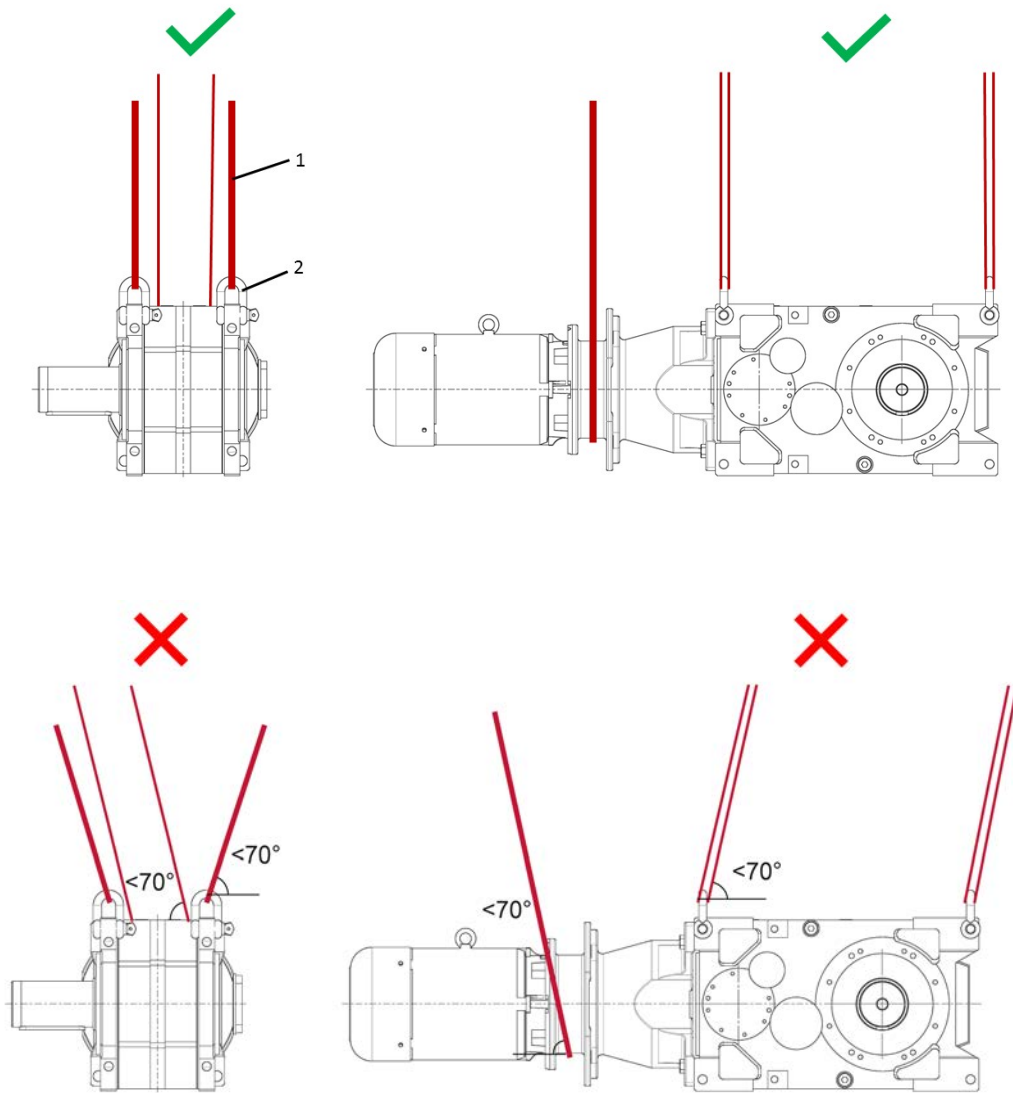
Legend

- 1: Lifting strap
- 2: Shackle
- ✗: Not permissible
- ✓: Permissible

Figure 3: Transport of standard gear unit

3.1.2 Transport of gear units with motor adapter

The ring bolts on the motor must **not** be used for transportation.



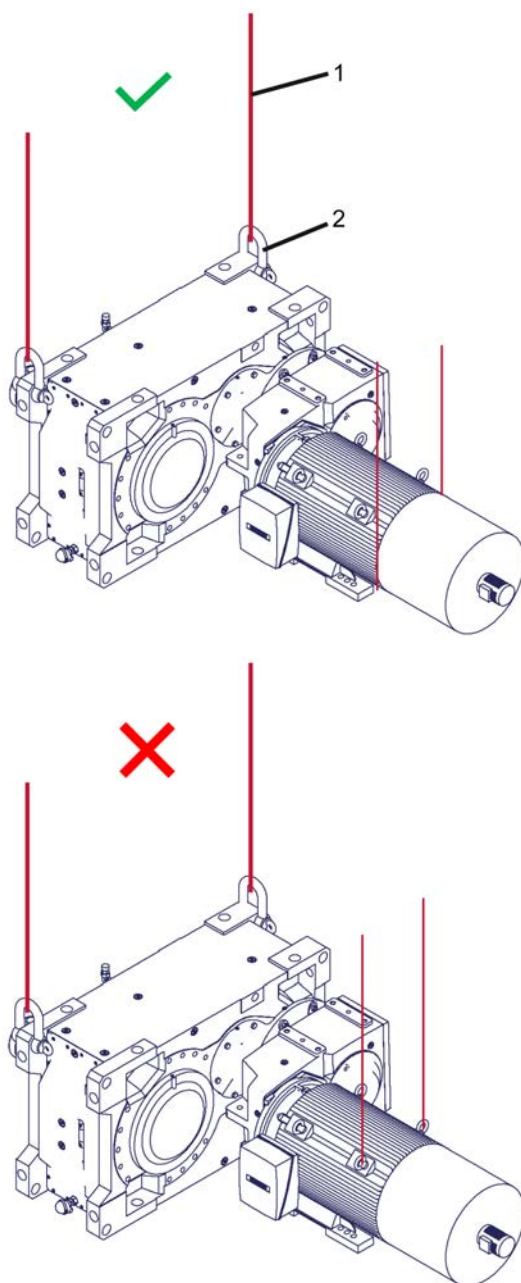
Legend

- 1: Lifting strap
- 2: Shackle
- ✗: Not permissible
- ✓: Permissible

Figure 4: Transport of gear units with motor adapter

3.1.3 Transport of gear units with auxiliary drives or first stage gear units (Option: WG, WX)

The eyebolts on the auxiliary drive, on the first stage gear unit or on the motor must **not** be used for transportation.



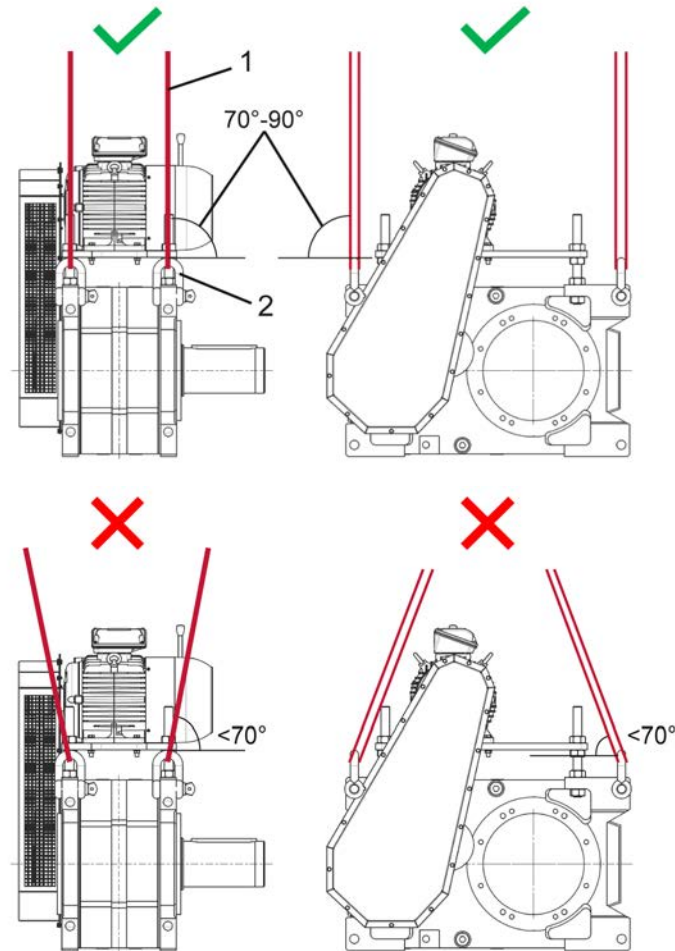
Legend

- 1: Lifting strap
- 2: Shackle
- ✗: Not permissible
- ✓: Permissible

Figure 5: Transport of gear units with auxiliary drives or first stage gear units

3.1.4 Transport of gear units with V-belt drives

The ring bolts on the motor and the motor bracket must **not** be used for transportation.



Legend

- 1: Lifting strap
- 2: Shackle
- ✗: Not permissible
- ✓: Permissible

Figure 6: Transport of gear units with V-belt drives

3.1.5 Transport of agitator version gear units

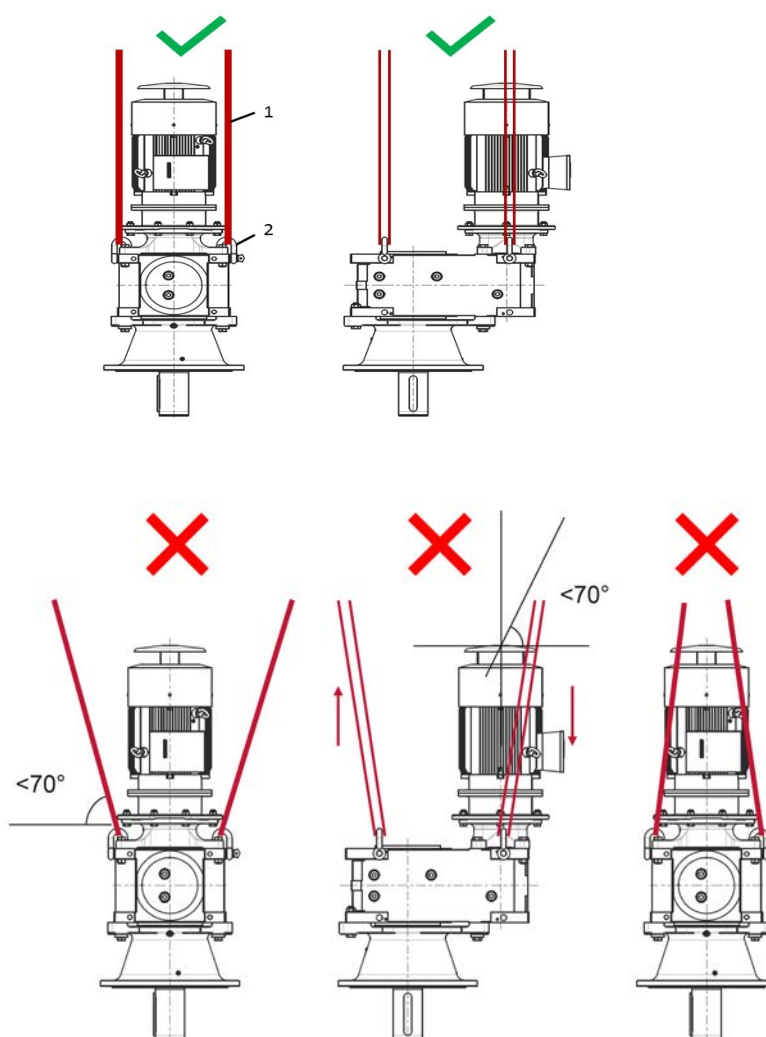
The ring bolts on the motor must **not** be used for transportation.

Special lifting gear must be used to ensure correct transport if the shackle holes cannot be used due to the IEC attachment. DIN 580 and DIN 582 ring bolts may not be used.

WARNING

Danger of injury due to the gear unit tipping or falling over

- Pay attention to the centre of gravity of the gear unit.
- Transport the motor in a position which is as vertical as possible.



Legend



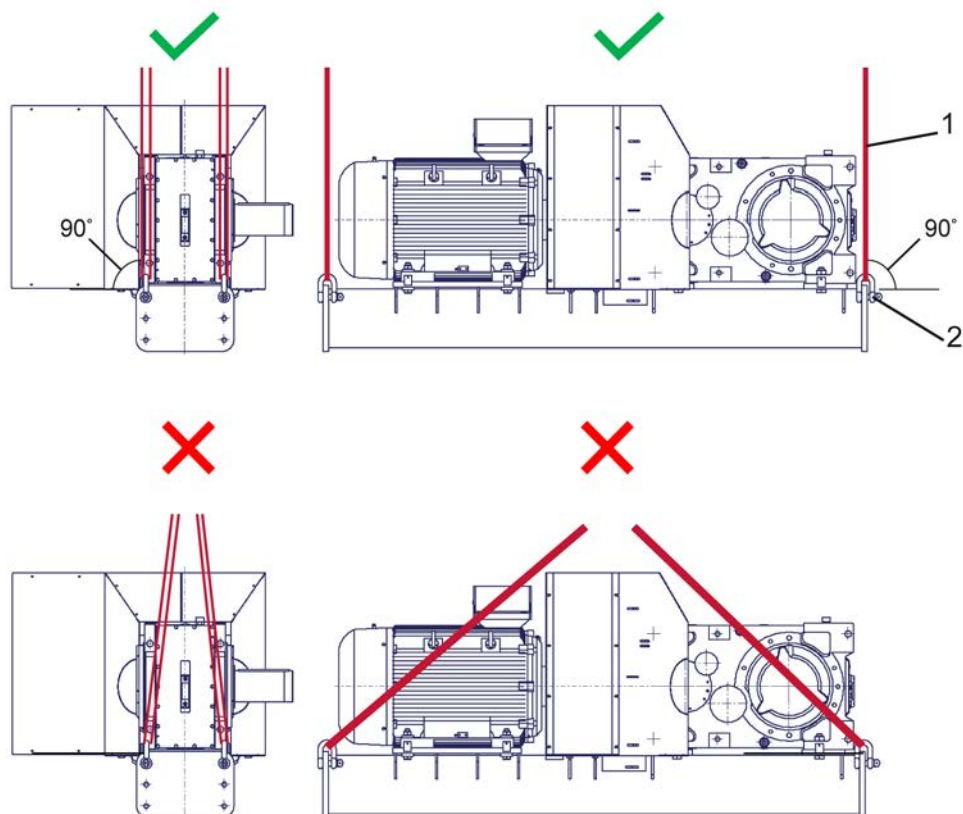
- 1: Lifting strap
- 2: Shackle
- : Not permissible
- : Permissible

Figure 7: Transport of agitator version gear units

3.1.6 Transport of gear unit with motor swing base or base frame

Motors with a motor swing base or base frame may only be transported with shackles and lifting straps which are vertically aligned. Only use the attachment points on the motor swing base or on the base frame.



Legend

- 1: Lifting strap
- 2: Shackle
- ✗: Not permissible
- ✓: Permissible

Figure 8: Transport of gear unit with motor swing base or base frame

3.2 Storage and downtimes

3.2.1 General measures

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

3.2.2 Storage and downtimes in excess of 3 months

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

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

For this, the gear unit should not be operated DOL (direct online) to avoid sliding of the roller bearings.

- For gear units with circulation lubrication (Option: LC, LCX), the motor pump must be started every 3 months. For this, the gear unit or the pump should not be operated DOL (direct online). The speed should be gradually increased from 50 % of the speed which is stated on the name plate to prevent excessive pressures in the pump and the lubricant lines during cold starting.
- Check the interior conservation regularly. The components must be wetted with oil.

3.2.3 Storage and downtimes in excess of 9 months

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

Gear units can be supplied prepared for long-term storage. The gear units are completely filled with lubricant, have VCI corrosion protection agent mixed with the gear oil or are filled with small quantities of VCI concentrate. The adhesive label on the housing shows the respective information.

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

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

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

- Check the gear unit for external damage.
- After storage of more than 2 years, or with storage temperatures outside of the permissible range from -5 °C to +40 °C, replace the lubricant in the gear unit before commissioning.
- If the gear unit is completely filled, the oil level must be reduced according to the mounting position. For the lubricant quantity and lubricant type, refer to the information on the name plate.
- For gear units without oil filling, the oil level must be refilled and checked according to chapter 5.2.5 "Oil level" before commissioning. The VCI concentrate may remain in the gear unit. The VCI concentrate is not mixable with polyglycol-based lubricants (PG oils). If PG oils are used, the VCI concentrate must be removed from the gear unit. When using VCI additive, only use the oil types which are specified on the name plate and are approved by Getriebebau NORD (see chapter 7.3.2 "Gear oils").
- For Option VL/KL2 to VL6/KL6, replace the bearing grease after a storage time of more than 2 years. The service life of the grease is reduced after a storage time or gearbox shutdown of more than 9 months (see chapter 5.2.15 "Re-lubricating the bearing in the output flange (Option: VL2/3/4/6, KL2/3/4/6)").
- Gear units filled with VCI concentrate for long-term storage are fully closed. Take care that the vent is fitted and released as necessary prior to commissioning. The installation position can be obtained from the specific dimension sheet for the order.

3.3 Preparing for installation

3.3.1 Check for damages

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

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

3.3.2 Remove corrosion protection agents

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

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

3.3.3 Check rotational direction

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

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

3.3.4 Check ambient conditions

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

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

3.3.5 Installing the oil reservoir tank (Option OT)

The oil level tank (Option: OT) is fitted as standard prior to delivery of the gear unit. If this is not the case, the intended position can be obtained from the order-related dimension sheet.

3.4 Installing the gear unit

NOTICE

Damage of bearing and gear wheel

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

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

- Air must be able to flow freely past all sides of the gear unit.
- A free space of 30° must be ensured around the fan intake.
- The gear unit must not be enclosed or encased.
- The gear unit must not be exposed to highly energetic radiation.
- Do not direct warm exhaust air from other units onto the gear unit.
- The base or flange to which the gear unit is attached must not input any heat into the gear unit during operation.
- Do not allow dust to accumulate in the area of the gear unit

Please contact NORD if the conditions stated above cannot be met.

The base on which the gear unit is fitted must be vibration-free, torsionally rigid and flat. The flatness of the bolting surface on the base must be of the requested precision (see chapter 7.5 "Tolerances for bolting surfaces"). The base must be designed according to the weight and torque, taking into account the forces acting on the gear unit. Bases which are insufficiently rigid may lead to radial and axial displacement during operation, which is not measurable when the unit is stopped. When attaching the gear unit to a concrete base using masonry bolts or base blocks, provide appropriate recesses in the base. Tensioning bars must be cast into the concrete base in their aligned state.

Precisely align the gear unit with the drive shaft of the machine in order to prevent additional forces from being imposed on the gear unit due to distortion. The service life of shafts, bearings and couplings depends on the precision of alignment of the shaft. Therefore, zero deviation should always be aimed for in alignment. For the tolerances of the shaft journals and the flange connection dimensions, refer to the order-related dimension sheet. Also note the requirements in the operating instructions of the used coupling.

Fasten the gear unit with all screws. Use screws with a minimum quality of 8.8. Tighten the bolts with correct torques (see chapter 7.4 "Screw tightening torques").

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

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

For solid shaft version (Option: V, L) the drive shaft and the output shaft are each equipped with a closed key groove according to DIN 6885 and a centring hole according to DIN 332.

The corresponding 6885-A key is included in the scope of delivery.

NOTICE

The gear unit may be damaged by axial forces.

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

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

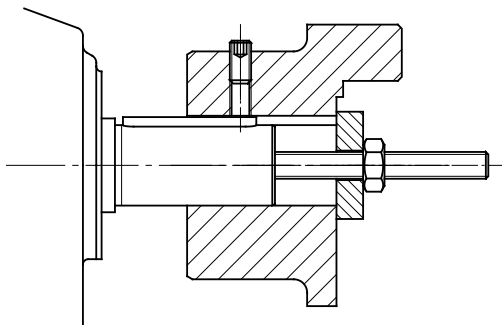


Figure 9: Example of a simple pulling device

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

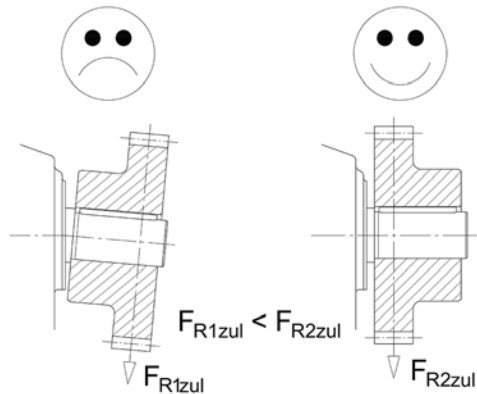
i Information

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.

Position the coupling according to the coupling installation instructions on the specific drawing for the order. If no position details are stated on the drawing, align the coupling flush with the end of the motor shaft.

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

Additional loads due to unbalanced hubs are not permitted.



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

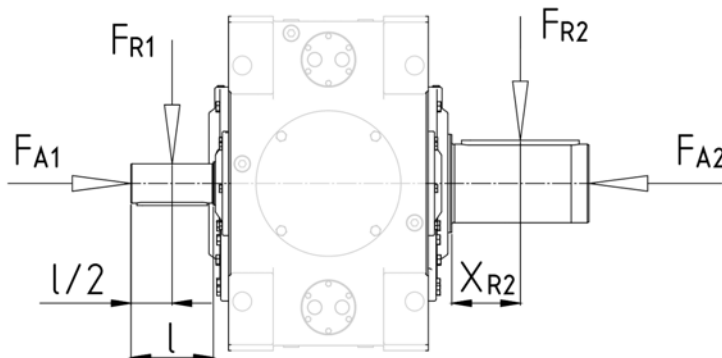


Figure 10: Permissible application of force to drive and driven shafts

3.6 Assembly of gear unit with hollow shaft (Option: A, EA)

NOTICE

The gear unit may be damaged by axial forces.

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

- Check the hollow shaft and the machine shaft for damaged seats and edges and fix all possible damage before assembly.
- Use a suitable pulling device.
- Do not hit the hub with a hammer.
- Before and after pulling, align the hollow shaft precisely with the machine shaft. The hollow shaft must not be tilted.

The required length of the key of the machine solid shaft must be sufficiently designed in order to ensure safe transmission of forces. If splines are used (Option EA), the splines on the solid shaft of the machine must be of correct size and tolerances.

Assembly and subsequent dismantling is facilitated by applying an anti-corrosive lubricant to the shaft before fitting (e.g. NORD Anti-Corrosion Part No. 089 00099). Excess lubricant may escape after fitting and may drip off. Thoroughly clean these points on the output shaft after a running-in time of approx. 24 hours.

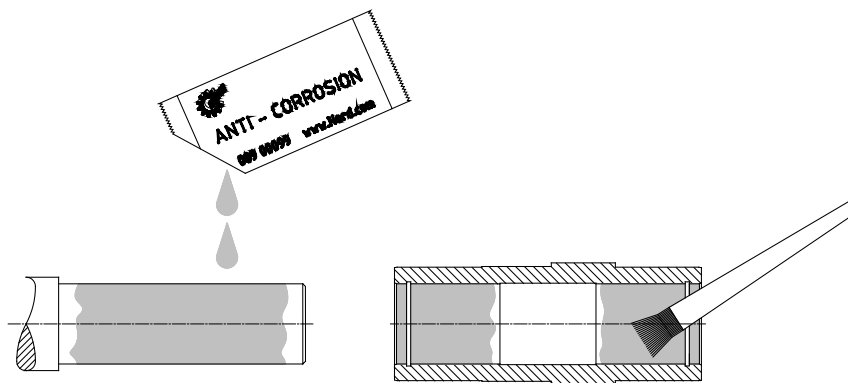


Figure 11: Applying lubricant to the shaft and the hub

3.6.1 Fitting a hollow shaft with fastening element (Option: B)

The gear unit can be fitted to shafts with and without a shoulder using the fastening element (Option B). Tighten the fastening element bolt with the correct torque (see chapter 7.4 "Screw tightening torques").

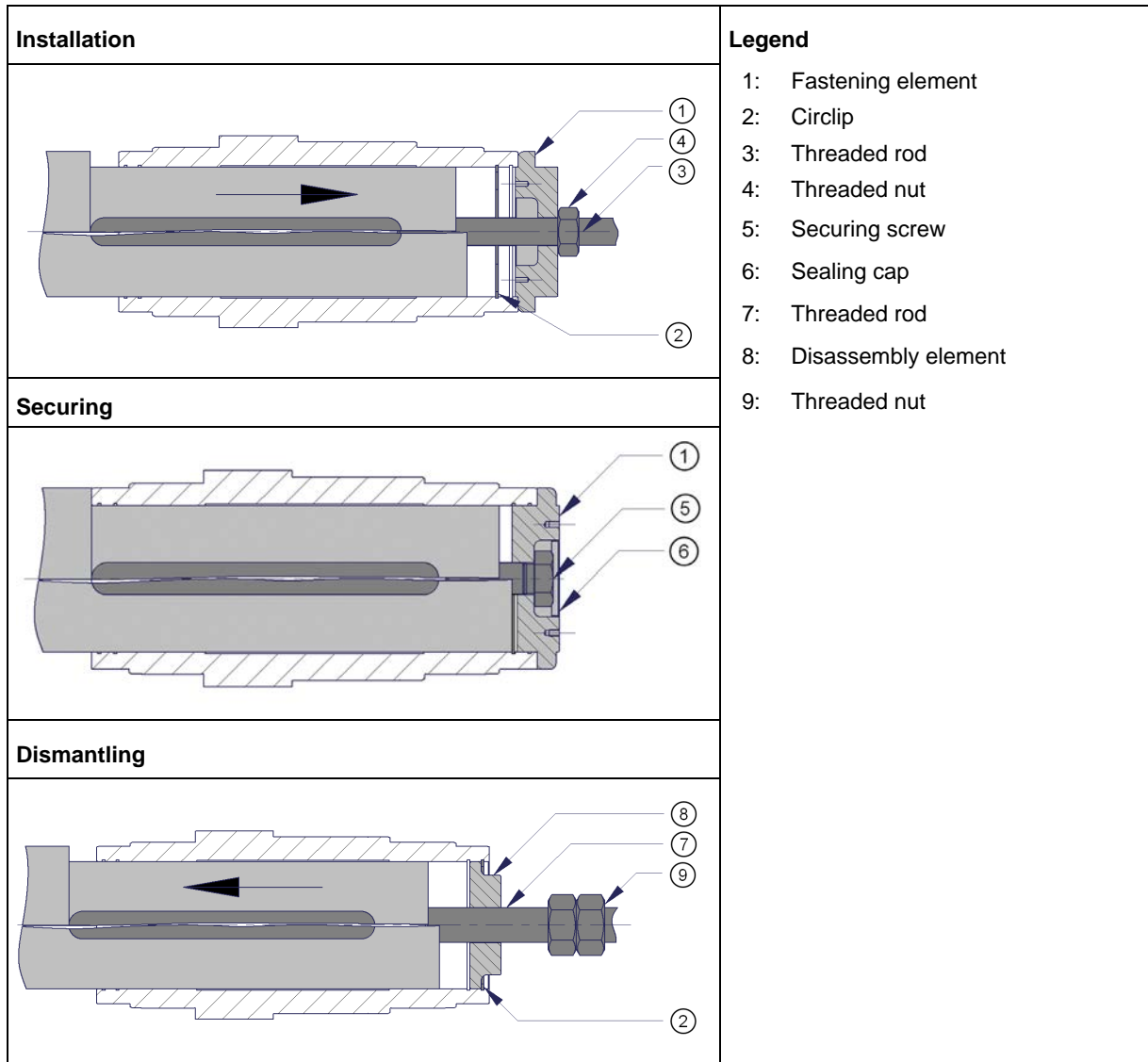


Figure 12: Assembly and disassembly of the fastening element (schematic diagram)

Attachment of the hollow shaft to the machine shaft is performed with the attachment kit provided. The attachment depends on the shaft version.

Installation

For versions with shoulders:

1. With the aid of the fastening element (1), the threaded rod (3) and the threaded nut (4), push the hollow shaft up to the stop in the shoulder of the shaft.

For versions without shoulders:

1. Insert the correct circlip (2) into the inner locking groove of the shaft.
2. With the aid of the fastening element (1), the threaded rod (3) and the threaded nut (4), push the hollow shaft until it is stopped by the circlip (2)

Securing

For versions with shoulders:

1. Place the fastening element (1) with the long centring diameter into the shaft and secure it with the locking screw (5).

For versions without shoulders:

1. Place the fastening element (1) with the long centring diameter into the shaft and secure it with the locking screw (5). The fastening element (1) must be fully adjacent to the front side of the hollow shaft.

Dismantling

1. Place the dismantling element (8) on the face end of the shaft.
2. Insert the correct circlip (2) into the outer locking groove of the hollow shaft and position the dismantling element with the circlip.
3. Screw the threaded rod (7) into the dismantling element (8) to remove the gear unit from the machine shaft.

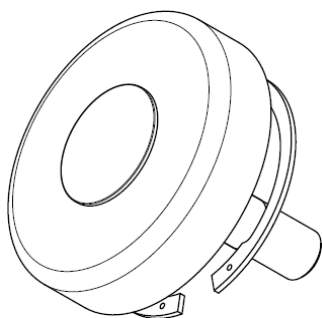


Figure 13: Fastening element (example)

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

NOTICE

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

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

Hollow shafts with shrink discs must be protected from dust, dirt and moisture. NORD recommends option H/H66 (see chapter 3.14 "Installing the cover cap, air baffle (Option: H, H66, FAN, MF., MS...)").

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

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

Always observe the documentation from the manufacturer of the shrink disc.

Prerequisites

- The hollow shaft must be completely free of grease.
- The standard solid shaft of the machine must be completely free of grease.
- Unless otherwise stated in the specific dimension sheet for the order, the external diameter of the solid shaft must be within the tolerance h6 if the diameter is up to and including 160 mm or g6 for larger diameters. The fit must be according to DIN EN ISO 286-2.

Fitting procedure for 2-part shrink disc

1. Remove the cover, if any.
2. Loosen the tensioning bolts of the shrink disc, but do not unscrew them completely. Tighten the tensioning bolts gently by hand until there is no play between the flanges and the inner ring.
3. Push the shrink disc up to the specified position on the hollow shaft. For the position, refer to the order-related dimension sheet.
4. For a special hollow shaft with bronze bushing, grease the solid shaft of the machine in the area which will later come into contact with the bushing in the hollow shaft (Figure 14). Do not grease the bronze bushing. It is essential that the tensioning seat of the hollow shaft is free of grease.

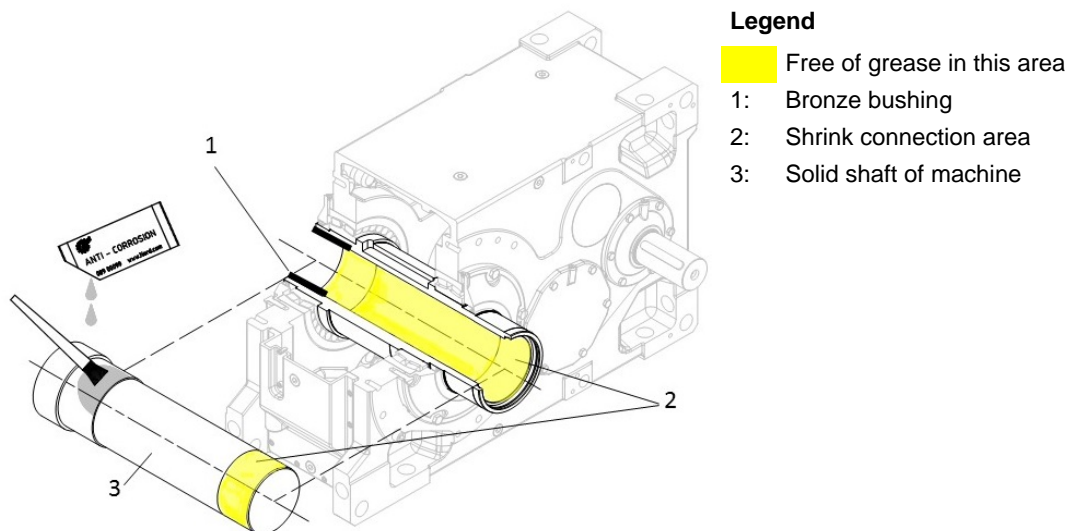


Figure 14: Machine shaft assembly for special hollow shafts with shrink discs

For a standard hollow shaft, do not apply grease to the solid shaft of the machine.

5. Insert the solid shaft of the machine into the hollow shaft so that the area around the shrink connection is completely filled.
6. Tighten the tensioning bolts of the shrink disc **in sequence** with approx. $\frac{1}{4}$ rotation of the bolt per turn in clockwise direction by several turns. Use a torque wrench to tighten tensioning bolts to the tightening torque specified on the shrink disc.

7. After tightening the tensioning bolts the face of the inner ring on the screw side must be flush with the face of the outer ring. The shrink disc must be checked visually for distortion (Figure 15).

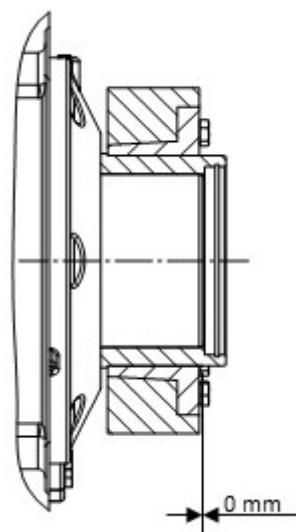


Figure 15: Fitted shrink disc

8. Mark the hollow shaft of the gear unit and the solid shaft of the machine with a label in order to detect any slippage under load.

Standard disassembly procedure:

1. Loosen the tensioning bolts of the shrink disc with approx. $\frac{1}{4}$ rotation of the bolt per turn **in sequence** in a clockwise direction by several turns. Do not remove the tensioning bolts from their thread.
2. If the external ring does not detach from the inner ring after approx. one turn of all screws, the external ring can be released with the aid of the push-off thread. Screw as many tensioning bolts as are necessary into the push-off threads evenly until the external ring separates from the internal ring.
3. Press the gear unit off the hollow shaft from the solid shaft of the machine.

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

For maintenance measures, see the operating instructions from the manufacturer of the shrink disc.

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

NOTICE

Damage to the gear unit due to incorrect installation

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

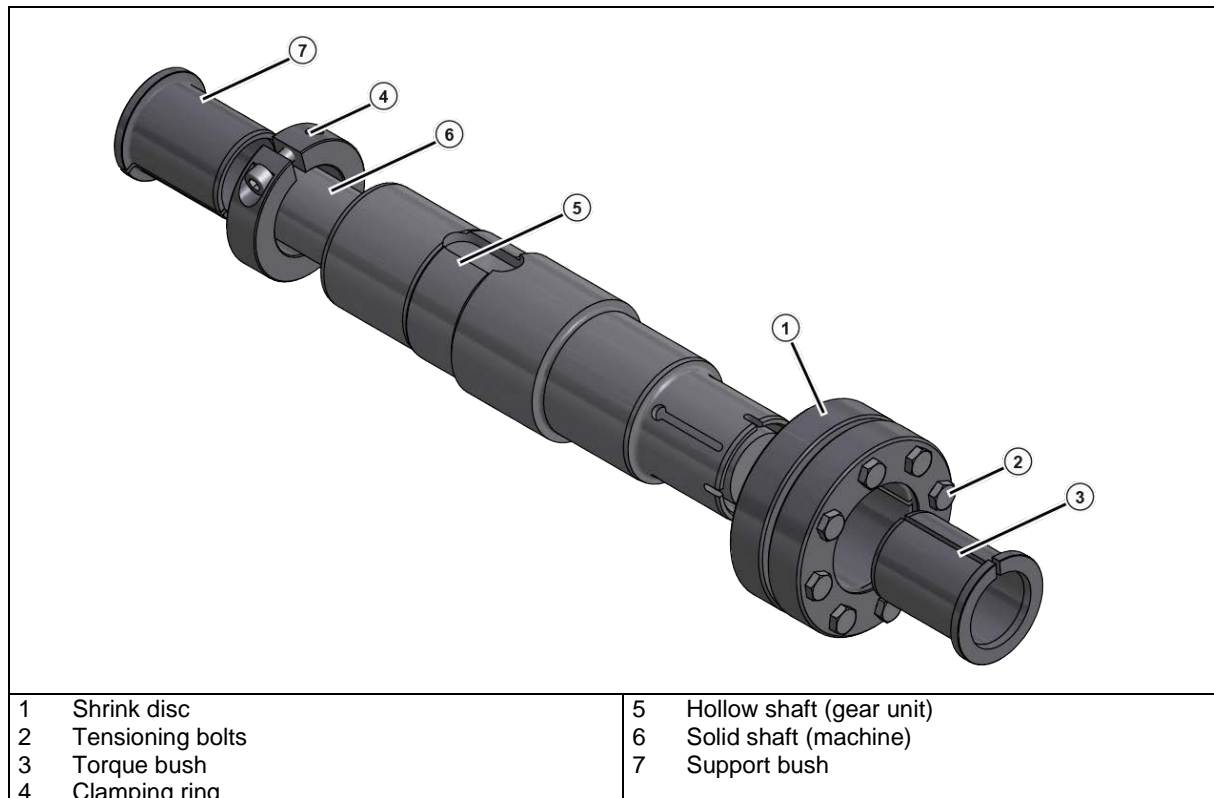


Figure 16: GRIPMAXX™, exploded diagram

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

The solid shaft material must have a minimum yield strength of 360 N/mm². This ensures that no permanent deformation occurs due to the clamping force.

Do not use corrosion protection, assembly paste or other coatings on the fitting surfaces of the shaft, the bushes, the clamping rings or the shrink disc.

Prerequisites

- The solid shaft [6] must be free from burrs, corrosion, lubricants or other foreign bodies.
- The hollow shaft [5], the bushes [3], [7], the clamping ring [4] and the shrink disc [1] must be free from dirt, grease and oil.
- The solid shaft diameter must be within the following tolerances:

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

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

Table 4: Permissible machine shaft tolerances

Fitting procedure

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

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

Dismantling procedure

WARNING

Danger of injury due to sudden mechanical release

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

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

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

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

3.8 Installing a flange version gear unit (Option: F, FK, VL2/3/4/5, KL2/3/4)

NOTICE

Risk of gear unit damage from distortion

- Flange version gear units must only be bolted to the flange of the driven machine.

The bolting surface of the driven machine must comply with the tolerances in Section 7.5 "Tolerances for bolting surfaces". The flange of the driven machine must be free of vibration and torsionally rigid.

The diameter of the hole circle and the size of the threaded holes on the flange of the gear unit can be obtained from the order-related dimension sheet.

The bolting surfaces of both flanges must be clean.

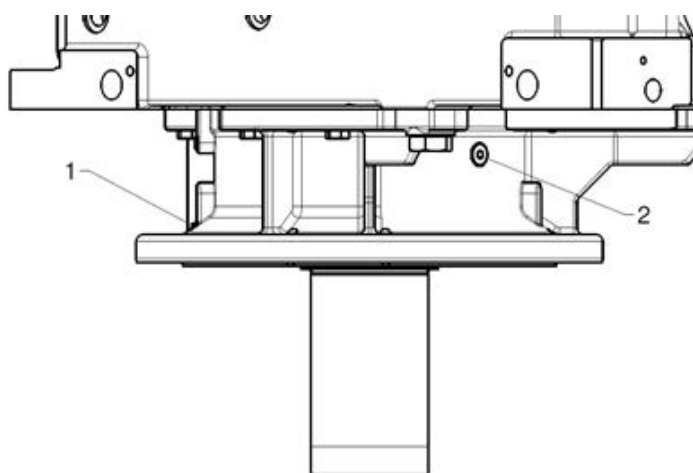
3.8.1 Agitator version (Option: VL2, KL2)

These options provide reinforced drive shaft bearings with a greater bearing spacing. These can absorb high radial and axial forces for a longer service life.

For Option VL2, the bottom bearing is an oversized, double-row spherical roller bearing.

For Option KL2, the bottom bearing is a conical roller bearing.

On the flange, there is a grease nipple for the bottom bearing as well as a screw plug, through which excess grease can escape from the grease chamber.



Legend

- 1: Grease nipple
- 2: Closing cap for grease escape

Figure 17: VL2 Option

3.8.2 Agitator version with Drywell (Option: VL3, KL3)

NOTICE

Check the leak indicator regularly (see chapter 5.2.5.5 "Checking the leak indicator (Option: VL3, KL3 with Drywell)").

These options have the same dimensions and load limits as Option VL2/KL2 (see 3.8.1 Agitator version (Option: VL2, KL2)).

The difference is that in the area of the lower roller bearing an oil-free space is created by sealing with two radial shaft sealing rings.

There is also an additional seal to the atmosphere below the bottom bearing. This design is known as Drywell. It enables detection of leaks before oil escapes outside of the gear unit. For leak indication, there is an oil inspection glass on the flange.

The bottom bearing is grease-lubricated. It is sufficiently filled with grease as delivered, however, it must be re-lubricated regularly (see chapter 5.1 "Inspection and maintenance intervals").

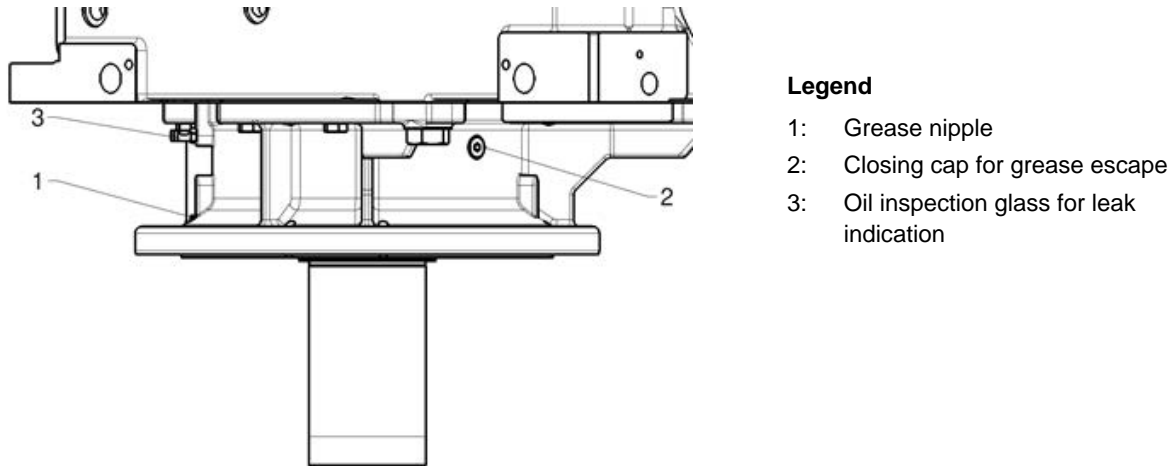


Figure 18: Option VL3/KL3 and VL4/KL4

3.8.3 Agitator version with True Drywell (Option: VL4, KL4)

Compared to Options VL3 and KL3 (see 3.8.2 Agitator version with Drywell (Option: VL3, KL3)), these options are equipped with additional protection against leakage (see chapter 3.9 "True Drywell version gear units (Option: VL4, KL4, VL6, KL6, DRY)"). The risk of leakage is reduced by means of an oil level tube with an additional V-ring seal and several O-rings. In addition, reduction of the oil fill level minimises losses due to splashing.

3.8.4 Extruder flange version (Option: VL5)

The extruder flange version combines customised flange and hollow shaft dimensions as well as radial and axial tolerances with two or three different standardised axial floating roller bearings per gear unit size.

3.8.5 Agitator version with True Drywell and foot mounting (Option: VL6, KL6)

These options include the entire internal elements of Option VL4 or KL4 (see 3.8.3 Agitator version with True Drywell (Option: VL4, KL4)). The elements are installed in a bolt-on housing without a flange.

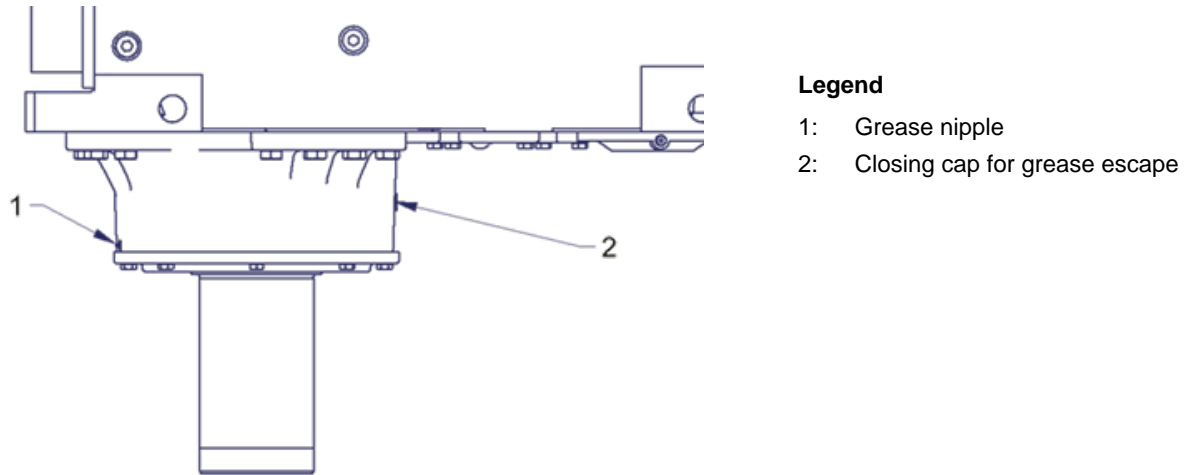


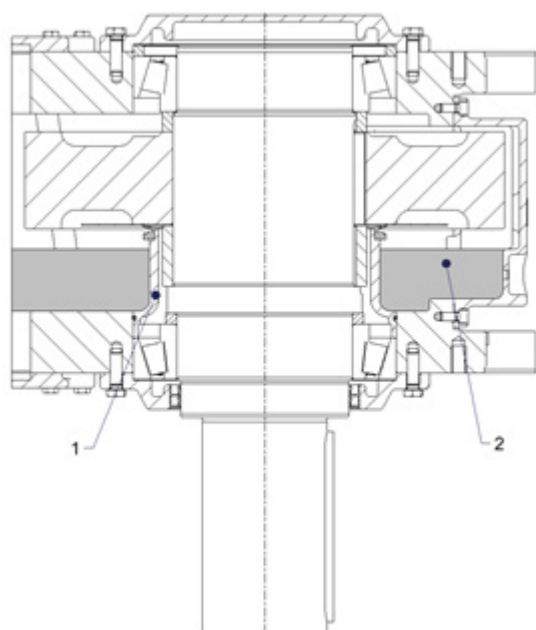
Figure 19: Option VL6/KL6

3.9 True Drywell version gear units (Option: VL4, KL4, VL6, KL6, DRY)

NOTICE

The grease-lubricated drive bearing is protected against oil by the oil level tube. Too much oil may flood the oil level tube.

To prevent an oil leak on the bottom output bearing, the oil level in the gear unit is reduced. The lower output shaft bearing is separated from the oil bath by an oil level tube. This bearing is grease-lubricated. It is sufficiently filled with grease as delivered, however, it must be re-lubricated regularly (see chapter 5.1 "Inspection and maintenance intervals"). The remaining roller bearings and gears are lubricated with pressurised circulating lubrication a motor or flange pump.



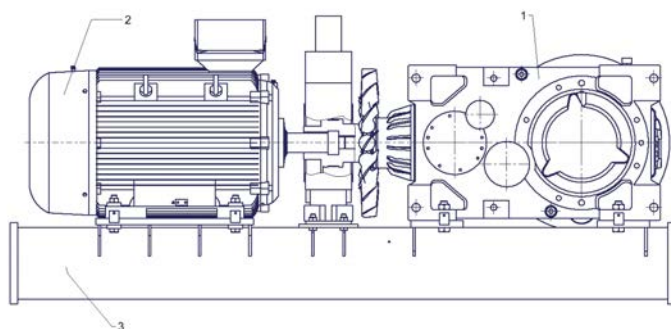
Legend

- 1: Oil level tube
- 2: Oil level

Figure 20: Schematic diagram (Option: DRY)

3.10 Motor base frame (Option: MF)

A motor base frame is a steel structure for pre-assembled drive packages in a horizontal position. This is used to mount the gear unit, (hydro) coupling, motor, and where applicable, a mechanical brake. It also includes the necessary protective devices (e.g. cover cap, Option H). The steel structure is supported by several fastening feet.



Legend

- 1: Gear units
- 2: Motor
- 3: Foundation frame

Installation and assembly

Impermissible tension, distortion and poor stability can damage the gear unit and attached components. They significantly affect the wear pattern of gear wheels, the load on the bearings, and consequently the service life of the gear unit.

Components between the motor and the gear unit, e.g. turbo couplings or brakes are pre-adjusted prior to delivery. Check and adjust the alignment and settings of these components according to the corresponding manufacturer's documentation prior to commissioning the gear unit. Incorrect alignment will result in premature failure of the attached components and the gear unit.

Install the drive package on a horizontal and level surface. Ensure that foundation and torque arm are dimensioned adequately. The maximum permissible distortion is 0.1 mm at a distance of 1 m.

Ensure a non-distorted alignment to the shaft of the connected machine.

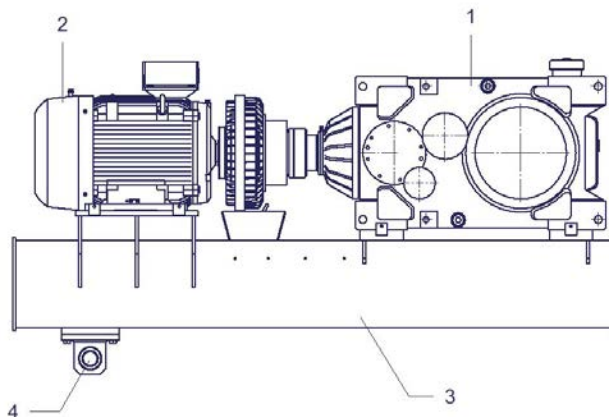
Pay attention to the job-specific information of brake and coupling components contained in the dimension sheet or the order confirmation, as well as all notes on installation and assembly contained in the separate operating and installation instructions of all installed components.

Additional notes on the installation of the motor base frame

- Solid shaft with elastic output coupling, see section 3.5 "Installation of a hub on solid shaft (option: V, L)"

3.11 Motor swing base (Option: MS)

A motor swing base is a steel structure for pre-assembled drive packages in a horizontal position. This is used to mount the gear unit, (hydro) coupling, motor, and where applicable, a mechanical brake. It also comes with the necessary protective devices (e.g. cover cap, Option H). The steel structure is supported by the drive shaft and a torque arm.



Legend

- 1: Gear units
- 2: Motor
- 3: Gear unit swing base
- 4: Elastic element (retainer bush)

Installation and assembly

Impermissible tension, distortion and poor stability can damage the gear unit and attached components. They significantly affect the wear pattern of gear wheels, the load on the bearings, and consequently the service life of the gear unit.

Components between the motor and the gear unit, e.g. turbo couplings or brakes are pre-adjusted prior to delivery. Check and adjust the alignment and settings of these components according to the corresponding manufacturer's documentation prior to commissioning the gear unit. Incorrect alignment will result in premature failure of the attached components and the gear unit.

Install the drive package on a horizontal and level surface. Ensure that foundation and torque arm are dimensioned adequately. The maximum permissible distortion is 0.1 mm at a distance of 1 m.

Ensure a non-distorted alignment to the shaft of the connected machine.

Pay attention to the job-specific information of brake and coupling components contained in the dimension sheet or the order confirmation, as well as all notes on installation and assembly contained in the separate operating and installation instructions of all installed components.

Additional notes on the installation of the motor swing base

- Push-on gear unit via hollow shaft (option A, EA), see section 3.6 "Assembly of gear unit with hollow shaft (Option: A, EA)"
- Solid shaft with flange coupling, see section 3.5 "Installation of a hub on solid shaft (option: V, L)"
- Hollow shaft with fastening element (option B), see section 3.6 "Assembly of gear unit with hollow shaft (Option: A, EA)"
- Hollow shaft with shrink disc (option S), see section 3.6.2 "Fitting a hollow shaft with shrink disc (Option: S)"

NORD recommends a g6 fit for the bolt supporting the elastic element.

To facilitate installation and to protect against corrosion, a suitable lubricant may be applied to the inner diameter of the elastic element.

The elastic element is made of an elastomer that can be used up to a temperature of +40°C. Depending on the component, the elastic element is capable of compensating for a small assembly-related offset. For specifications, refer to the manufacturer's documentation.

3.12 Motor mount (Option: MT)

Gear units with motor mounts and belt drives are pre-adjusted prior to delivery. Check the alignment of the motor and the belt tension prior to commissioning the gear unit.

3.13 Installing the belt drive

WARNING

Risk of belt damage from incorrect installation

A damaged belt may break during operation. This can result in severe injuries.

- Reduce the axle spacing before installation so that the belt can be inserted into the grooves without the use of force.
- Forcible mounting belts by means of tyre levers, screwdrivers etc. is completely impermissible, as this often causes invisible damage to the stretch-resistant tension cord or the surrounding fabric.

Information

In the standard version, V-belt drives cannot be combined with a mounting flange or fan, as these options would conflict with each other.

To ensure the correct function, the pre-tension of the belt must be checked and corrected as necessary. Excessive, or too little contact pressure increases losses due to friction and may result in an interruption of torque transfer.

The belt tension can be checked with the aid of various measuring devices. NORD recommends that the check is made with the aid of a non-contact frequency measuring device, which enables quick, simple and reliable testing even in inaccessible areas.

Initial installation and the general inspection procedure with a frequency measuring device are described below:

1. Ensure the axis-parallel and horizontal alignment of the shaft and the V-belt pulleys. Maximum angular deviation and displacement values can be provided on request.
2. Clean and de-grease all bare metal surfaces such as holes and the surface of the tapered bushing of the pulley.
3. Insert the tapered bushing into the hub. Bring all connecting holes into alignment. Half-threaded holes must be opposite half-smooth holes.
4. Lightly grease the studs or cap screws and screw them in. Do not tighten the screws yet.
5. Clean and de-grease the shaft.
6. Push the pulley with the taper bushing to the required position on the shaft.
7. If a key is used, place it in the groove on the shaft. There must be play between the key and the groove in the hole.

8. Evenly tighten the studs or cap screws with an Allen key. Tightening torques can be provided on request.
9. Place on the belts in sequence. Roughly pre-adjust the tension by increasing the gap between the axles.
10. Make a belt vibrate by plucking or hitting it with a finger.
11. Point the sensor of the measuring device at the vibrating power drum and read the measurement.
12. Correct the axle spacing as necessary and measure again.
13. To prevent the entry of foreign bodies, fill empty connection holes with grease.

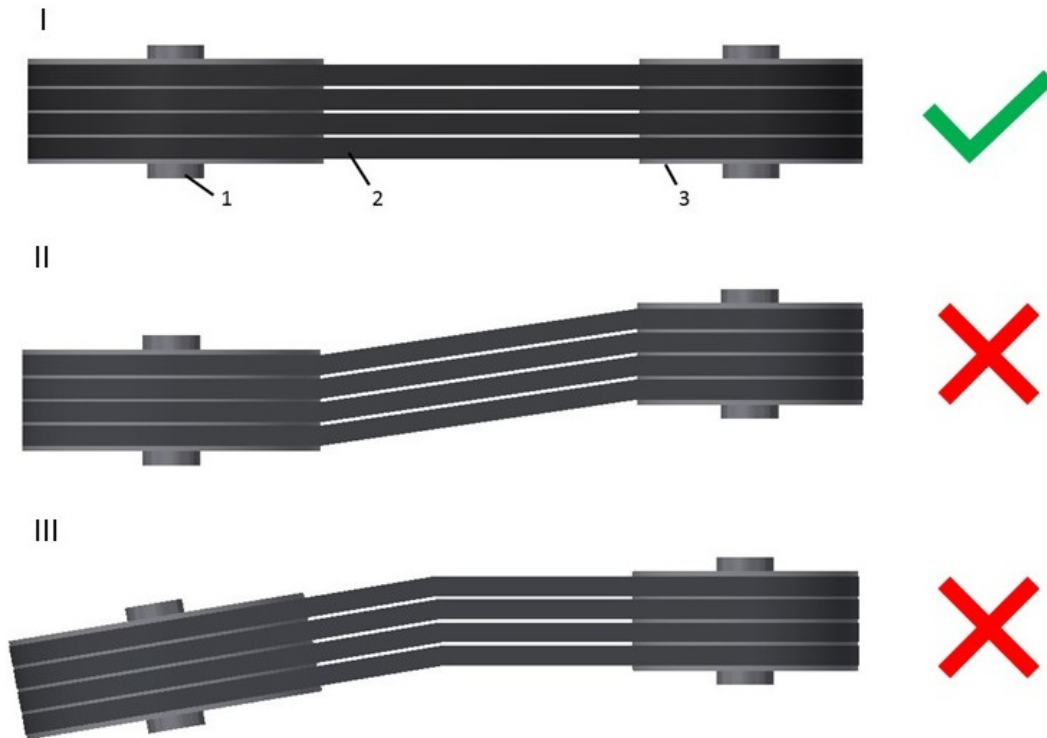
After a running time of 0.5 to 4 hours, check the belt tension again and correct as necessary.



Legend

- 1: Studs or cylindrical screws
- 2: Tapered bushing
- 3: V-belt pulley

Figure 21: V-belt pulley (disassembled/assembled)



Legend

- 1: Axle (shaft)
- 2: Belt
- 3: Belt pulley
- I: Aligned pulleys on axially parallel shafts
- II: Axial displacement of the pulleys
- III: Horizontal angular displacement of axles
- ✗: Not permissible
- ✓: Permissible

Figure 22: Axle alignment (belt drives)

3.14 Installing the cover cap, air baffle (Option: H, H66, FAN, MF..., MS...)

NOTICE

Do not use damaged covers.

Depending on the field of use, covers are used for the following reasons:

- Personal protection (Protection from rotating machine components) (Option: H)
- Protection of gear unit components (e.g. seals) with high dust concentrations (Option: H66)

NORD fan covers and air baffles ensure a correct supply of air for the gear unit (Option FAN)

NOTICE

Risk of gear unit damage due to incorrect installation

- The fan must not make contact with the fan cover.



Information

- Keep the fan cover and air baffle free of dust.
- Remove dirt on the fan wheel, fan cover and protective grill with a hard brush.
- Never use a pressure washer to clean the fan cover, baffles and protective grill.

Use all fastening screws. Secure the fastening screws by coating them with securing lubricant, e.g. Loctite 242, Loxeal 54-03. Tighten the fastening screws with the correct torque (see chapter 7.4 "Screw tightening torques").

3.15 Fitting a standard motor (Option: IEC, NEMA)

The motor weights as well as the dimension "X max" indicated in the table below must not be exceeded:

Maximum permitted IEC and NEMA motor weights								
IEC	132	160	180	200	225	250	280	315
NEMA	210 T	250 T	280 T	324 T	326 T	365 T		
Centre of gravity X max ¹⁾ [mm]	200	259	300	330	370	408	465	615
Weight [kg]	100	200	250	350	500	700	1000	1500

¹⁾ see Figure 23 for dimension X max

Table 5: IEC and NEMA motor weights

Maximum permitted Transnorm motor weights								
Transnorm	315	355						
Centre of gravity X max ¹⁾ [mm]	615	615						
Weight [kg]	1500	1500						

¹⁾ see Figure 23 for dimension X max

Table 6: Transnorm motor weights

Getriebebau NORD must be consulted if the values stated in the table are exceeded.

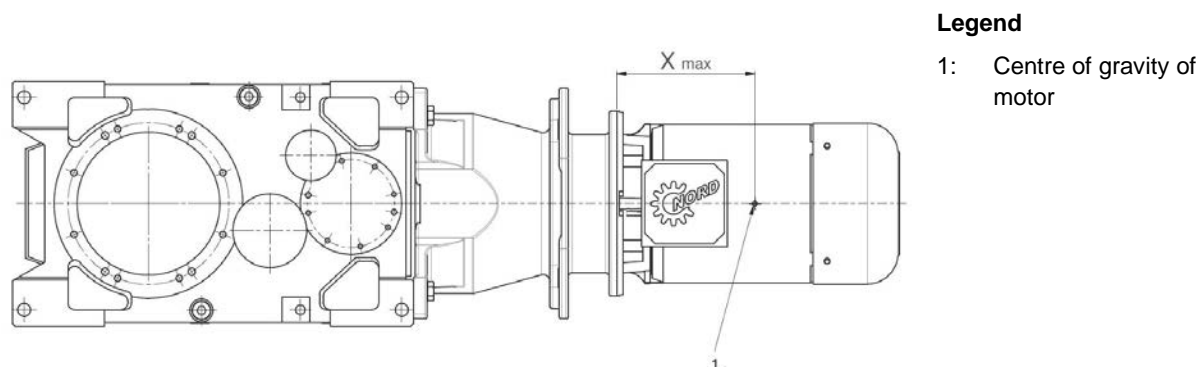


Figure 23: Centre of gravity of motor

Fitting a motor with standard dog couplings (Rotex®)

Also pay attention to the separate documentation for the coupling.

If a different type of coupling is used, observe the documentation from the manufacturer for the assembly sequence.

1. Clean the motor shaft as well as the flange surfaces of the motor and adapter. Check them for damage. Check the attachment dimensions and tolerances of the motor and the adapter.
2. Push the half-coupling onto the motor shaft so that the parallel key of the motor engages into the groove in the half-coupling on mounting.
3. Pull the half-coupling onto the motor shaft according to the instructions of the motor manufacturer. Position the half-coupling according to the order-specific drawing of the coupling. If there are no instructions on the drawing, align the half-coupling flush with the end of the motor shaft.

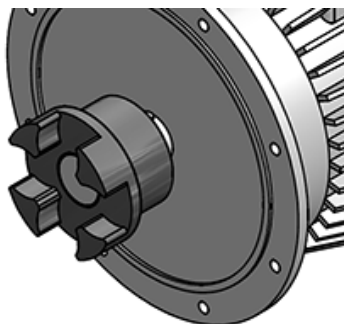


Figure 24: Fitting the coupling to the motor shaft

4. Coat the setscrew with securing adhesive (e.g. Loctite 242 or Loxeal 54-03) and secure the half-coupling with the setscrew. Tighten the setscrew with the correct tightening torque (see chapter 7.4 "Screw tightening torques").
5. The flange surfaces of the motor and the adapter should be sealed if the motor is installed outdoors or in a humid environment. Completely coat the flange surfaces prior to the motor mounting with surface sealant (e.g. Loctite 574 or Loxeal 58-14).
6. Mount the motor together with the enclosed ring gear onto the adapter. Tighten the adapter bolts with the correct tightening torque (see chapter 7.4 "Screw tightening torques").

3.16 Installing the drive coupling

Check the alignment of the coupling prior to commissioning.

Always verify the coupling specifications if the operating conditions (power, speed, changes to the drive or the driven machine) change.

3.16.1 Dog coupling

Normally, the gear unit is connected to the motor with a dog coupling. For gear units without an IEC/NEMA adapter, the alignment between the gear unit and the motor must be ensured by the operator and the coupling installed according to the manufacturer's instructions.

For gear units with IEC/NEMA adapters, see section 3.15 "Fitting a standard motor (Option: IEC, NEMA)".

3.16.2 Turbo coupling

WARNING

Risk of oil being expelled in case of an overload

The oil being expelled from the coupling is hot. Danger of burns.

- The coupling must be encased as a protection against oil being expelled.

As standard, turbo couplings are usually supplied filled with oil.

Turbo couplings are usually supplied with a fusible plug. In case of overload the oil temperature in the coupling increases. As soon as the temperature limit (usually 140 °C) is reached, the fusible plug melts and the oil flows out of the coupling in order to separate the motor and the gear unit before both components are damaged. An oil tray for the escaping oil should be provided.

The quantity of oil in the coupling can be obtained from the manufacturer's documentation. An oil tray is installed as standard for gear units on a motor swing base or base frame which are combined with a turbo coupling.

Optionally, turbo couplings can be equipped with a fusible plug and a separate mechanical switch.

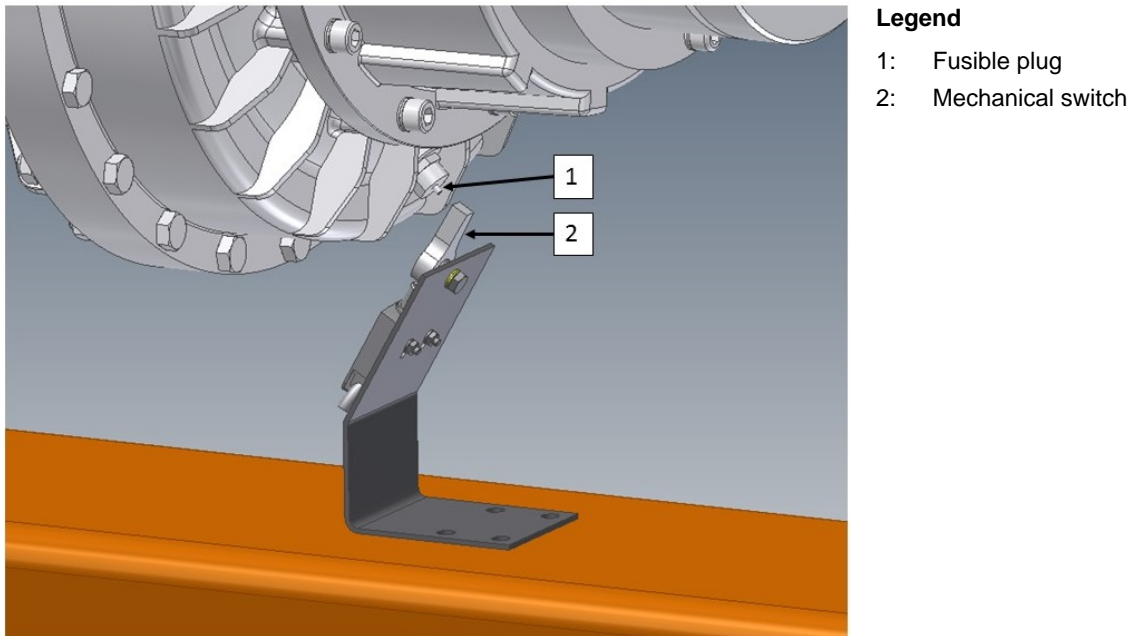


Figure 25: Fusible plug with separate mechanical switch

The triggering temperature of the fusible plug is usually 120 °C. This ensures that the system is shut down before the temperature for the fusible plug is reached.

The alignment of the mechanical switch must be checked with the aid of the manufacturer's documentation prior to commissioning. The switch must be connected to evaluation electronics.

Position the half-coupling according to the order-specific drawing. If no details regarding the position are stated, align the coupling flush with the end of the motor shaft.

3.16.3 Dog coupling

For the correct alignment, refer to the manufacturer's manual. Dog couplings require lubrication to ensure wear-free function. Lubricate the dog coupling according to the manufacturer's manual prior to commissioning.

3.17 Installing the output coupling

Always verify the coupling specifications if the operating conditions (power, speed, changes to the drive or the driven machine) change.

Install a separately supplied output coupling and align it. Follow the enclosed manufacturer's documentation.

Check the alignment of the coupling prior to commissioning.

3.18 Installation of the internal cooling system (Option: CC)

WARNING

Risk of injury due to pressure discharge

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

NOTICE

Damage to the cooling coil

- Do not twist the connection pieces during installation.
- Even after the installation, no external forces must be able to act on the cooling coil via the connection pieces.
- Prevent vibrations from reaching the cooling coil during operation.

NOTICE

Damage to the cooling coil

- In case of risk of freezing and before long standstill periods, drain the cooling water and blow out the remaining water with compressed air.

Information

Use of two cooling coils (Option: 2CC)

Make sure when using **two cooling coils** to **connect** them **in parallel** and not in series. This is the only way to ensure that sufficient cooling power is available.

For the inlet and outlet of cooling fluid, connections with pipe threads are provided on the gear unit or the casing cover for fitting pipes or hoses. The exact size of the pipe threads can be obtained from the specific dimension sheet for the order.

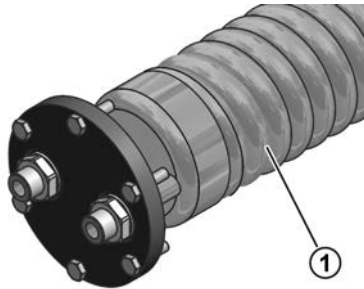
The cooling coil must be completely submerged, as otherwise condensation may occur.

If a volume regulator is fitted upstream of the cooling coil, the connection is extended accordingly. The coolant must be supplied via the volume regulator. Pay attention to the operating instructions of the volume regulator.

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

The required quantity of coolant depends on the size of the cooling coil. Depending on the housing connection, the following flow rates apply:

- Cable cross section G3/8": 5 l/min
- Cable cross section G1/2": 10 l/min.



Legend

1: Cooling coil

Figure 26: Cooling cover with cooling coil fitted (schematic diagram)

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

3.19 Installation of an external cooling system (Option: CS1-X, CS2-X)

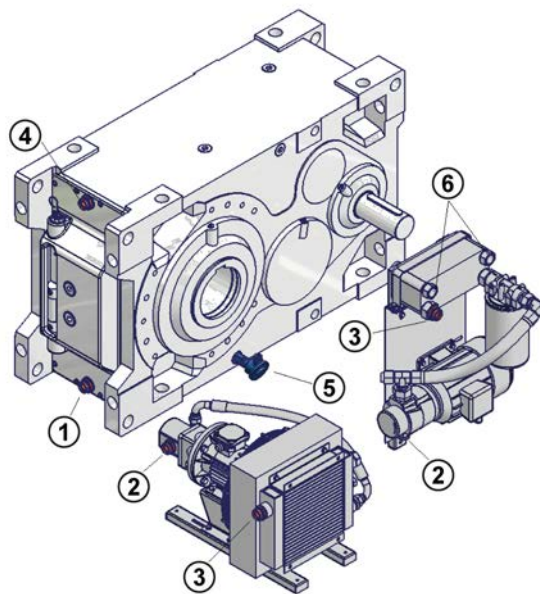
External cooling systems are only used to cool the gear unit lubricant and are not used to lubricate the gear unit.

Information

Other connection positions may also be arranged. In the case of the combination of lubricant circulation with an external cooling system, the pressure and intake lines between the lubricant circulation and the cooling unit must be connected. The connection points can be obtained from the order-related dimension sheet.

Connect the cooling system as shown in Figure 27. Do not modify any of the pre-assembled hoses without having consulted NORD beforehand.

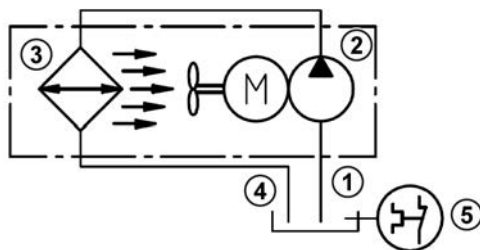
Further information about the cooling system and control information should be obtained from the manufacturer's instructions for the cooling system. The technical limit values in the manufacturer's documentation have priority.



Legend

- 1: Gear unit intake connection
- 2: Pump/cooling system intake connection
- 3: Cooling system pressure connection
- 4: Gear unit pressure connection
- 5: PT100 temperature monitoring (optional/recommended)
- 6: Cooling water connection

Figure 27: Industrial gear unit with CS1-X and CS2-X cooling systems



Legend

- 1: Intake connection
- 2: Pump
- 3: Heat exchanger
- 4: Cooling system pressure connection
- 5: Temperature monitor (PT100)
- 6: Cooling water connection

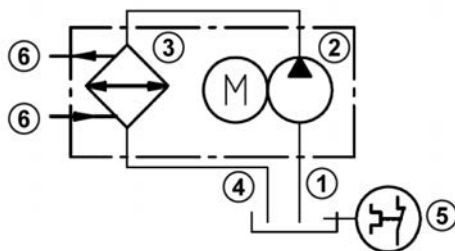


Figure 28: Hydraulic plan of industrial gear units with CS1-X and CS2-X cooling systems

3.20 Installing a fan (Option: FAN-A, FAN-R)

The fan wheel of a radial and axial fan is arranged on the high-speed shaft of the gear unit and protected against accidental contact by a fan cover. The fan takes in air through the protective grill of the fan cover. The lateral air baffles of the fan cover guide the air past the gear unit housing. Through this, the air dissipates a specific amount of the housing heat.

An electrical external fan, which is driven by an external three-phase motor, is available as a special option. For the correct installation and the electrical connection, refer to the manufacturer's manual.

3.21 Installation of the lubricant circulation (Option: LC, LCX)

For gear units with lubricant circulation, either a flange-pump or a motor pump is used. A flange pump is driven by the drive shaft of the gear unit. The motor pump has a separate drive.

The pump is already installed on the gear unit on delivery. All oil lines are connected correctly.

The lubricant circulation is normally equipped with pressure switches. Ensure the connection as well as the evaluation of the pressure switch.



Information

In the case of combination of lubricant circulation with external cooling units, the pressure and intake lines between the lubricant circulation and the cooling unit must be connected. The connection points can be obtained from the order-related dimension sheet.

3.22 Gear unit monitoring sensors (option: MO)

For the position of the sensors, refer to the order-related dimension sheet.

Pay attention to the manufacturer's documentation.

3.23 Installing the torque arm (Option: D, ED, MS)

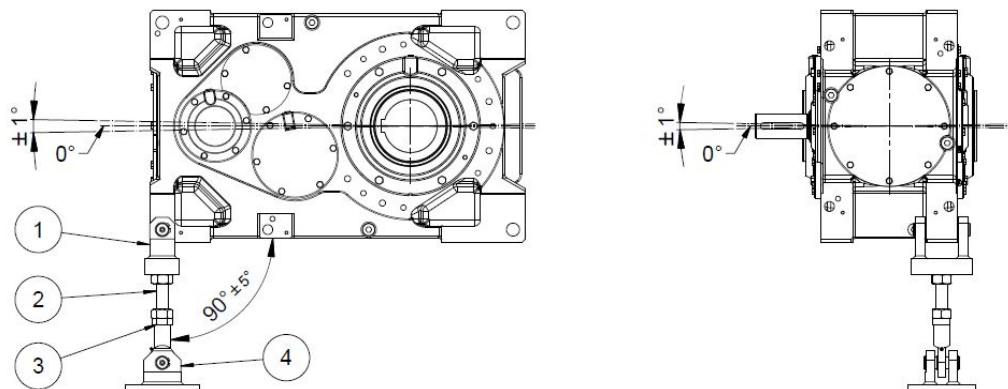
NOTICE

Reduced service life of the output shaft bearings due to incorrect installation of the torque arm

- Ensure that the torque arm is not distorted during the installation or operation.
 - The torque arm is not suitable for transferring transverse forces.
-

The torque arm should be mounted on the side of the machine in order to reduce the bending moment on the machine shaft. For helical gear units with motor adapters, the torque support is located opposite to the motor adapter.

Tension and pressure loads are permissible for installation upwards or downwards.



Legend

- 1: Fork head with bolt
- 2: Threaded bolt
- 3: Maintenance-free joint head
- 4: Fork plate with bolt

Figure 29: Permissible installation tolerances of the torque arm (Option D and ED) (schematic diagram)

The length of the torque support (Option: D) can be adjusted within a certain range.

1. Align the gear unit horizontally with the threaded bolts and nuts of the torque arm. Afterwards, secure the setting with the lock nuts.
2. Secure the screw connectors of the torque arm, e.g. with Loctite 242 or Loxeal 54-03. Tighten the screw connectors with the correct torque (see chapter 7.4 "Screw tightening torques").

The Option ED torque support has an integrated elastic element and cannot be adjusted in length.

3.24 Connecting the oil heater (Option: OH)

WARNING

Risk of fire due to exposed heater bars

- Ensure that the heater bars are fully immersed in the oil bath before switching them on and during heating operation.

The oil heater is already installed prior to delivery. Observe the manufacturer's instructions for connecting the oil heater.

Information

Prevent excessive heat dissipation

The gear unit heat loss is particularly high in installation locations where there are extremely low ambient temperatures or strong air movements. In such cases, it may be necessary to provide protective devices against excessive gear unit heat losses if the oil heater cannot sufficiently compensate for the heat loss.

3.25 Adjusting the brake

WARNING

Risk of brake malfunction from faulty adjustment

A brake malfunction may cause serious injury.

- Adjust the brake correctly as described in the operating instructions before commissioning.
- Use additional monitoring functions (e.g. Option SLW).

Read and observe the instructions of the brake prior to assembly, commissioning and adjusting work. For details on the options described below, please refer to the dimension sheet or order confirmation.

The brake is delivered in a pre-adjusted state only. Check the settings and correct them as necessary.

The brake is delivered in an applied state.

The brake specifications must always be verified if the operating conditions (power, speed, changes to the drive or the driven machine) change.

3.25.1 Automatic lining wear correction (option: LWC)

While being operated, the brake lining of a mechanical brake is subject to wear. The option LWC compensates for this wear by automatically adjusting the brake lining. But the adjusting range is limited. To maintain an even braking effect, you must check and if necessary correct the adjustment (residual stroke) in line with the manufacturer's specifications and during or briefly after commissioning in particular.

Information

Decreasing braking effect

The braking effect will decrease if the mechanical wear of the brake lining exceeds the adjusting range of the LWC option. This has a negative effect on the brake response time and the braking distance.

3.25.2 Limit switch to indicate the brake lining wear (option SLW)

While being operated, the brake lining of a mechanical brake is subject to wear. The option SLW indicates when the wear limit is reached and the brake lining must be replaced.

3.25.3 Connecting the NC/NO contacts (Option: SO/SC)

The Option SO/SC comprises limit switches that make it possible to report the switching state of the mechanical brake (open/closed).

The switching state of the limit switches is evaluated by a higher-level control. The correct connection and the processing of the switching states must be ensured by the operator.

With proper evaluation, the Option SO/SC prevents e. g. the drive from starting while the brake is applied.

3.25.4 Manual release and manual release with limit switch (option: MR, Option: MRS)

WARNING

Unexpected movement

Operating the manual release will disengage the brake. This can result in unexpected drive movements even if the drive is switched off electrically.

- Safeguard the hazard zone.
 - Secure the drive against impermissible movement before actuating the manual release.
 - Disengage the machine.
 - Do not lock the manual release.
-

Options MR and MRS comprise a manual release of the brake. With these options, the contact pressure and thus the brake torque can be reduced or cancelled entirely.

The option MRS features an additional limit switch. This limit switch reports the switching state of the manual release and can be accordingly evaluated by a higher level control unit.

Information

You must check and if necessary correct the function of the limit switch after the brake linings are replaced.

3.26 Subsequent painting

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

4 Commissioning

4.1 Checking the oil level

Check the oil level before commissioning (see chapter 5.2 "Service and maintenance work").

The following table shows the usual oil filling state of oil spaces on delivery:

Oil space	Oil filling	
	with	without
Industrial gear units		X
Primary gear unit (Option: WG)	X	
Auxiliary gear unit (Option: WX)	X	
Connecting flange (Option: WX)		X
Turbo coupling	X	
Oil tank (Option: OT)		X

Table 7: Oil spaces as delivered

Information

Incorrect oil level indication due to trapped air for Option WX with installation position M5/M6

During commissioning and after changing the oil, air (air pockets) may become trapped in the gear unit oil bath. These disappear during operation. The resulting space fills with lubricant. Because of this the oil level may deviate in comparison with the initial filling. This process may take several days. During this period an incorrect display of the oil level cannot be ruled out.

- Check the oil level at regular intervals, especially after commissioning or changing the oil.

4.2 Activating the vent

- The vent must be fitted after installation if the gear unit comes with an initial filling.

Remove the screw plug which is used for the transport. This screw plug is marked red. Install the vents in the same position.

The position of the vents can be obtained from the specific dimension sheet for the order or from Section 7.2 "Standard positions of the oil drain, vent and oil level". Detailed information about the venting option which is used (e.g.: FV, EF, DB) can be found in Section 5.2.12 "Cleaning or replacing the vent".

Information

Auxiliary gear unit (Option: WX) and first stage gear units (Option: WG) can be equipped with pressure venting (Option: DR). The pressure vent must be unlocked prior to commissioning. Refer to the operating and installation instructions B 1000.

The sealing plug which is used to close the vent hole for transport is marked with red paint.

The connecting flange between the industrial gear unit and the auxiliary gear unit is always equipped with a pressure venting device. This device, as well as the pressure venting device on the industrial gear unit (only for ATEX-certified gear units) must be unlocked as shown in Figure 30.

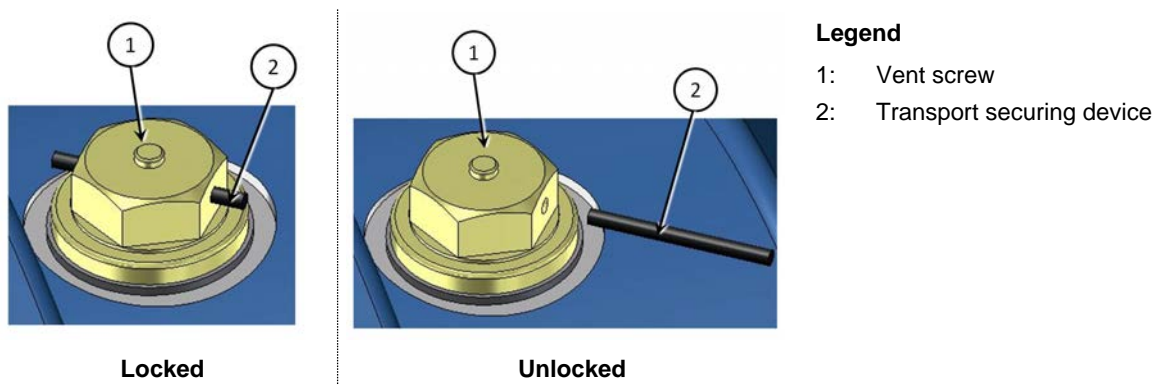


Figure 30: Activation of the pressure vent

4.3 Taconite seal/Labyrinth seal

This sealing combination consists of a radial shaft sealing ring and a grease-filled dust seal (labyrinth seal). This type of seal is recommended for especially dusty environments.

If Taconite seals are installed, check there is a grease-filled gap between the bearing cover plates. Re-greasing is carried out via the conical grease nipple. Observe the re-greasing intervals (see maintenance table).

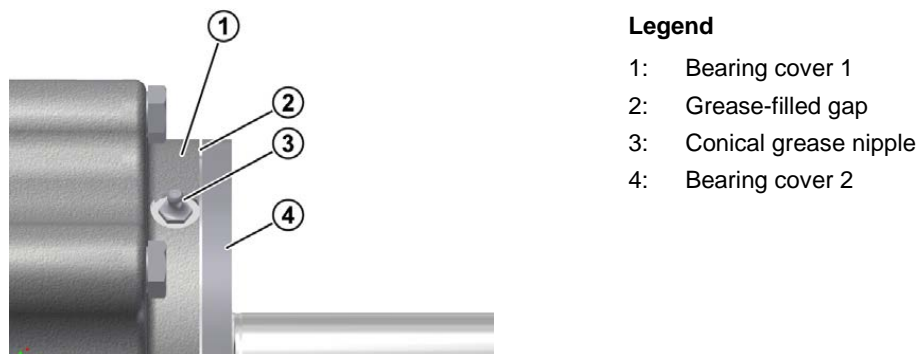


Figure 31: Checking a Taconite seal

As standard, the grease nipple is located directly on the bearing cover.

In the case of covers or IEC cylinders, lubrication lines are installed on the gear unit to enable easy re-lubrication. In this case, obtain the lubrication positions from the specific dimension sheet for the order.

Information

For reliable operation, labyrinth seals require a stationary, horizontal installation position without dirty water or high levels of dust.

Overfilling the gear unit and/or a large amount of foam may result in leakage.

4.4 Heated output hollow shaft

The hot medium may only flow through the hollow shaft after commissioning, when the roller bearings at the output have reached their operating temperature. Otherwise, the roller bearings may be damaged.

This type of operation is a special case and must be taken into account by Getriebebau NORD during the gear unit planning. In case of changes to process parameters or a subsequent conversion to this application case, verification must be made by Getriebebau NORD.

4.5 Lubricant circulation (Option: LC, LCX)

NOTICE

Gear unit damage due to overheating

- The drive unit may only be commissioned after the pump and the pressure monitor for the pressure circulation lubrication have been connected and commissioned.
- During operation, the function of the lubricant circulation must be ensured by means of a monitoring system.
- The gear unit must be shut down immediately in case of failure of the lubrication circulation.

NOTICE

Damage due to high line pressure

- In case of cold starting, ensure that the maximum permissible viscosity of the lubricant is not exceeded, in order to prevent excess pressure in the pump and the lubricant lines.

During start-up, the viscosity of the gear oil must not be higher than 1800 cSt. For ISO-VG220 this corresponds to a temperature of at least 10 °C for mineral oil, and a temperature of at least 0 °C for synthetic oil.

Gear units equipped with lubricant circulation are usually equipped with a pressure monitor to monitor the pump function. Connect the pressure monitor so that operation is only possible if the oil pump has built up pressure. If the pressure falls below the pre-set value, the electric signal is interrupted by the pressure switch.

The pressure monitor can only be evaluated after the pump has been put into operation, as a pressure must first be built up. During commissioning, a lower pressure is permissible for a short period. The pressure monitor is usually set to 0.5 bar.

4.6 Gear unit cooling with fan (Option: FAN-A, FAN-R)

WARNING

Severe injuries due to lack or incorrect installation of the fan cover

- Do not commission the fan or the gear unit without the fan cover.
- Ensure correct fastening of the fan cover. The fan must not make contact with the fan cover.

WARNING

Risk of eye injury from suspended particles

- Use goggles when switching on the fan.

NOTICE**Risk of gear unit overheating from insufficient air flow**

- Check the contact guard for warping and damage. Repair possible damage prior to commissioning.
 - An adequate supply of air must be ensured by means of a minimum free space of 30° ahead of the air intakes. Keep the air inlet grille and the fan blades clean.
-

The main direction of rotation of an axial fan (Option FAN-A) has been specified during the planning phase. For the main direction of rotation, refer to the order-related dimension sheet. For opposite direction of rotation, the axial fan has no cooling power. The calculated thermal limit power of the gear unit cannot be maintained then.

4.7 Cooling coil (Option: CC)

NOTICE

Gear unit damage due to overheating

- The drive may only be commissioned after the cooling spiral has been connected to the cooling circuit, and the cooling circuit has been put into operation.

If there is a danger of frost, a suitable anti-freeze solution must be added to the cooling water in due time.

The coolant must have a thermal capacity similar to water.

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

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

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

The required quantity of coolant depends on the size of the cooling coil. Depending on the housing connection, the following flow rates apply:

- Cable cross section G3/8": 5 l/min
- Cable cross section G1/2": 10 l/min.

The **coolant inlet temperature** must not exceed 20 °C. The coolant inlet temperature may only be higher in individual cases according to the order documentation. In case of other coolant inlet temperatures, observe the special documentation provided by Getriebebau NORD or contact Getriebebau NORD.

The temperature and the flow rate of the cooling fluid must be monitored and ensured. The drive must be shut down if the permissible temperature is exceeded.



Information

With a thermostat in the cooling water inlet, the volume of cooling water can be adjusted to the actual requirements.

4.8 External cooling system (Option: CS1-X, CS2-X)

NOTICE

Gear unit overheating

- Only start commissioning the drive after the cooling unit has been connected and commissioned.
- The standard painting / coating is only suitable for the range C1/C2 according to DIN EN ISO 12944.

NOTICE

Damage due to high line pressure

- In case of cold starting, ensure that the maximum permissible viscosity of the lubricant is not exceeded, in order to prevent excess pressure in the pump and the lubricant lines.

The main components of the external cooling system are the motor pump, filter and heat exchanger. Usually, the cooling system is equipped with a pressure switch to monitor the pump and therefore the cooling.

Unless otherwise stated by the manufacturer, the following applies for external cooling systems:

- A value of -0.4 bar must not be undershot on the suction side.
- The viscosity must not exceed 1000 - 1500 cSt at 1500 rpm.

Information about the cooling system and control information should be obtained from the operating instructions of the cooling system. The manufacturer's specifications are definitive.



Information

Temperature regulation is provided by means of a resistance thermometer (PT100), which is installed in the oil sump of the gear unit.

It is recommended that the cooling unit is only switched on above an oil temperature of 60 °C and switched off below an oil temperature of 45 °C.

4.8.1 Oil / water cooler (Option: CS1-X)

For oil/water coolers, the temperature and flow volume of the cooling water must be monitored and ensured. The maximum permissible cooling water inlet temperature is defined during the planning phase and can be found in the order data. The maximum ambient temperature is 40 °C. If higher ambient temperatures may occur, verification must be made by Getriebebau NORD prior to commissioning.

The permissible lubricant temperature range is 10 °C to 80 °C.

If there is a danger of frost, a suitable anti-freeze solution must be added to the cooling water in due time.

The permissible contamination for oil/water coolers is a suspended particle quantity of less than 10 mg/l and a particle size of less than 0.6 mm (spherical). Fibrous substances result in a large increase in pressure losses.

4.8.2 Oil / air coolers (Option: CS2-X)

The maximum ambient temperature is 40 °C. If higher ambient temperatures may occur, verification must be made by Getriebebau NORD prior to commissioning.

The permissible lubricant temperature range depends on the lubricant type.

Maximum permitted oil temperatures:

- For mineral oil, the maximum permissible oil temperature is 10 °C to 80 °C.
- For synthetic oil, the maximum permissible oil temperature is 10 °C to 100 °C.

An adequate supply of air must be ensured for oil/air coolers. A free space of at least 30° must be provided for the air intake. The protective grills and the fan blades must be kept clean.

4.9 Oil heater (Option: OH)

WARNING

Risk of fire due to exposed heater elements

- Ensure that the heater bars are fully immersed in the oil bath before switching them on and during heating operation.
- The oil heater must be switched off for operation of gear units with a reduced oil fill level (Option: LCX, VL4, KL4, VL6, KL6, DRY).

The oil heater is equipped with a temperature sensor and a thermostat. The heater is pre-set to a switch-off temperature of 20 °C. This means that the heater is in operation as long as an oil temperature of 20 °C has not been reached. Please contact Getriebebau NORD for other switch-off temperatures.

The oil heater must remain functional when the gear unit is shut down in order to ensure that the oil temperature does not drop too much.

Information

If an oil heater is used, it is recommended that the gear unit is also equipped with a PT 100 to monitor the oil temperature.

4.10 Temperature monitoring (Option: PT100)

NOTICE!

Gear unit damage through overheating

- The customer must connect the resistance thermometer to an evaluation device. The operator is responsible for implementing this interlock

The PT100 is a temperature measuring resistance with which the oil temperature can be monitored. The PT100 must be connected to a suitable evaluation device and the signal must be evaluated.

The triggering device must be set so that the drive unit shuts down when the maximum permissible oil temperature is reached.

For mineral oil, the maximum permissible oil temperature is 85 °C.

For synthetic oil, the maximum permissible oil temperature is 105 °C.

4.11 Backstop/Auxiliary drive (Option: R, WX)

NOTICE!

Gear unit damage through overheating

- The auxiliary drive must be secured or monitored to prevent it from idling.
- Operation below the lift-off speed according to the following tables results in a considerable reduction of the service life of the back stop bearing.

A back stop prevents running in a particular direction of rotation.

An auxiliary drive enables the gear unit to be run at a low speed, e.g. for maintenance work. In normal operation a freewheeling coupling disconnects the auxiliary drive from the gear unit.

The back stop and the freewheeling coupling are lubricated by the gear unit oil.

The back stop or the freewheeling coupling lift off due to centrifugal force above a certain lift-off speed n_1 (see Table 8 and Table 9). For this, the auxiliary drive must be at a standstill. The freewheeling coupling is monitored by a speed sensor. There is increased wear if the necessary lift-off speed is not reached. The service life of the back stop or freewheeling coupling is reduced. To minimise wear and generation of heat, back stops or freewheeling couplings in continuous operation should only be operated above the lift-off speed.

Information

Before commissioning, note the information and specifications of the back stop or freewheeling coupling in the specific documentation for the order.

Adhesive labels on the gear unit indicate the direction of rotation of the back stop and the freewheeling coupling. The direction of rotation can be obtained from the specific dimension sheet for the order.

Information

Incorrect oil level indication due to trapped air for Option WX with installation position M5/M6

During commissioning and after changing the oil, air (air pockets) may become trapped in the gear unit oil bath. These disappear during operation. The resulting space fills with lubricant. Because of this the oil level may deviate in comparison with the initial filling. Trapped air can escape via the gear unit venting. This process may take several days. During this period an incorrect display of the oil level cannot be ruled out.

- Check the oil level at regular intervals, especially after changing the oil or commissioning.

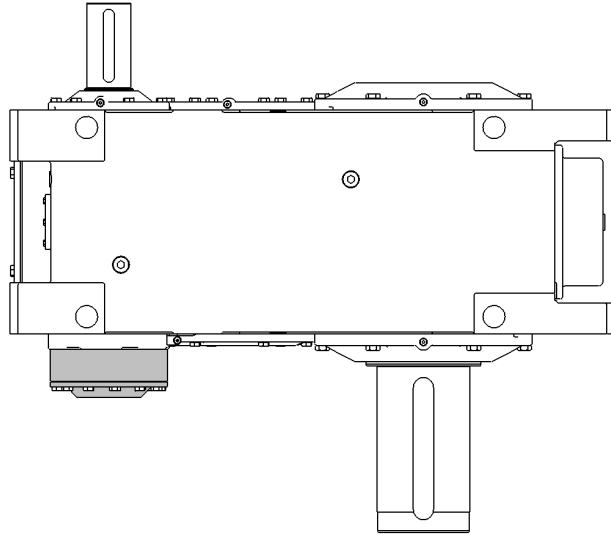


Figure 32: Industrial gear unit with back stop (schematic diagram)

Gear unit	Stages	Nominal gear ratio i_N		Lift-off speed n_1 [rpm]
		From	to	
SK 5207	2	7.1	25	430
SK 5307	3	28	315	670
SK 5407	3	18	25	671
		28	50	1088
		56	100	1759
SK 5507	4	112	400	2740
SK 6207	2	8.0	28	430
SK 6307	3	31.5	355	670
SK 6407	3	20	25	671
		28	50	1088
		56	112	1759
SK 6507	4	125	445	2740
SK 7207	2	7.1	25	400
SK 7307	2	28	315	430
SK 7407	3	15	25	624
		28	50	1012
		56	100	1636
SK 7507	4	112	400	1759
SK 8207	2	8	28	400
SK 8307	3	32.5	355	430
SK 8407	3	20	28	624
		31.5	56	1012
		63	112	1636
SK 8507	4	125	450	1759

Gear unit	Stages	Nominal gear ratio i_N		Lift-off speed n_1 [rpm]
		From	to	
SK 9207	2	7.1	25	320
SK 9307	3	28	355	400
SK 9407	3	18	25	499
		28	50	810
		56	100	1309
SK 9507	4	112	400	1636
SK 10207	2	8	28	320
SK 10307	3	31.5	400	400
SK 10407	3	20	28	499
		31.5	56	810
		63	112	1309
SK 10507	4	125	450	1636

Table 8: Back stop lift-off speeds SK 5..07 – SK 10..07

Gear unit	Stages	Nominal gear ratio i_N		Lift-off speed n_1 [rpm]
		From	to	
SK 11207	2	5.6	20	320
SK 11307	3	22.4	28	320
		31.5	112	400
SK 11407	3	12.6	28	448
		31.5	45	698
		50	71	1136
SK 11507	4	80	100	1136
		112	400	1420
SK 12207	2	5.6	20	250
SK 12307	3	22.4	112	320
SK 12407	3	12.5	28	352
		31.5	45	544
		50	71	888
SK 12507	4	80	400	1136
SK 13207	2	5.6	20	250
SK 13307	2	22.4	112	320
SK 13407	3	12.5	28	352
		31.5	45	544
		50	71	886
SK 13507	4	80	400	1136
SK 14207	2	7.1	25	240
SK 14307	3	28	140	250
SK 14407	3	14	40	373
		45	56	522
		63	90	851
SK 14507	4	100	400	886

Gear unit	Stages	Nominal gear ratio i_N		Lift-off speed n_1 [rpm]
		From	to	
SK 15207	2	5.6	20	220
SK 15307	3	22.4	112	250
SK 15407	3	12.5	28	310
		31.5	45	479
		50	71	781
SK 15507	4	80	400	886

Table 9: Back stop lift-off speeds SK 11..07 – SK 15..07

Gear unit	Stages	Nominal gear ratio i_N		Lift-off speed n_1 [rpm]
		From	to	
SK 5217 / SK 6217	2	6	8	499
SK 5217 / SK 6217	2	10	14	809
SK 5217 / SK 6217	2	16	22	1308
SK 7217 / SK 8217	2	6	8	451
SK 7217 / SK 8217	2	9	13	697
SK 7217 / SK 8217	2	16	20	1136
SK 9217 / SK 11217	2	6	8	352
SK 9217 / SK 11217	2	9	13	545
SK 9217 / SK 11217	2	16	21	887

Table 10: Back stop lift-off speeds SK 5..17 – SK 11..17

4.12 Test run

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

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

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

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

- Leaks
- Slippage of the shrink discs. To do this, remove the cover and check whether the marking specified in Section 3.6.2 "Fitting a hollow shaft with shrink disc (Option: S)" indicates a movement of the gear unit hollow shaft relative to the machine shaft. Then remount the cover as described in Section 3.14 "Installing the cover cap, air baffle (Option: H, H66, FAN, MF..., MS...)".

Information

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

Information

Taconite seals have a grease filling to seal the gear unit against dirt and other contaminants. During continuous operation of the gear unit and the associated heating, grease may drip from the area of the Taconite seal. This is normal and is not due to a leak.

4.13 Checklist

4.13.1 Obligatory

Checklist		
Item to be checked	Date of check:	Information see Section
Can transport damage or other damage be found?		3.3.1
Does the version on the name plate comply with the specifications?		2.2
Does the required mounting position comply with the actual position?		7.1
Has the correct oil level for the version been checked?		5.2.5
Has the vent been fitted and activated?		4.2
Has the gear unit been earthed?		3.4
Has the gear unit been aligned properly?		3.4
Has the gear unit been installed free of tension?		3.4
Are the external gear shaft forces within the permitted limits?		3.5
Is the coupling between the gear unit and the motor correctly installed?		3.16
Was the gear unit checked in a test run?		4.12

Table 11: Obligatory checklist for commissioning

4.13.2 Optional

Checklist		
Item to be checked	Date of check:	Information see Section
Option R, WX, FAN: Is the direction of rotation specified and checked?		4.11, 4.6
Option D and ED: Is the torque arm installed correctly?		3.23
Option S, FAN: Are rotating parts covered with a contact guard?		3.14
Option FAN, CS2-X: Is an adequate supply of air ensured?		4.6, 4.8
Option CS1-X, CC: Is the cooling water connected to the cooling unit or the cooling coil and open?		3.18, 3.19
Option CS1-X, CS2-X: Is the cooling unit connected to the gear unit?		3.19
Option LC, LCX: Is the pressure monitor connected and functioning?		4.5
Option PT100: Is the temperature monitor connected and functioning?		4.10
Option S: Was the shrink disc connection tested for slippage?		3.6.2
Brake option: Is the brake correctly adjusted?		3.25
Option MT: Is the belt correctly tensioned?		3.12
Option WX: Has the speed monitor been functionally connected?		4.11

Table 12: Optional checklist for commissioning

5 Service and maintenance

5.1 Inspection and maintenance intervals

Inspection and maintenance intervals	Inspection and maintenance work	Information see Section
According to manufacturer's details	<ul style="list-style-type: none"> • Option PT100: Check the function and measurement accuracy; recalibrate as necessary • Option LC/LCX: Check the function and measurement accuracy of the pressure monitor, recalibrate as necessary • Option CS1-X: Service the oil / water cooler • Option CS2-X: Service the oil / air cooler • Option DB: Replace drying agent filter • Brakes: check for wear • Couplings: Service the drive and output couplings 	Manufacturer's documentation
Standstill/storage > 3 months	<ul style="list-style-type: none"> • Regularly check the protective coating on unpainted and painted surfaces • Check the condition of the oil • Check the seals 	3.2.2
Daily	<ul style="list-style-type: none"> • Visual inspection of the contamination indicator • Check oil temperature • Check oil pressure • Check if the operating noise has changed 	5.2.8 4.10 4.5 5.2.2
Every 100 operating hours, but at least weekly	<ul style="list-style-type: none"> • Visual inspection for leaks • Check the gear unit for unusual running noises and vibrations • Option VL3/KL3: Check the oil leak indicator 	5.2.1 5.2.2 5.2.5.5
After 500 operating hours	<ul style="list-style-type: none"> • Check the brake <ul style="list-style-type: none"> – Inspect the wear pattern of the brake – Check the lining wear correction • Check the coupling <ul style="list-style-type: none"> – Check the gearing wear of the coupling 	3.25 3.16, 3.17
At least once per month	<ul style="list-style-type: none"> • Option FAN-A, FAN-R: Check the air cooler / gear unit for dirt and dirt deposits • Option CS2-X: Check the heat exchanger for dirt • Check the covers and the attachment adapters for dirt and dirt deposits 	5.2.9 5.2.9 5.2.9
At least once within 3 months	<ul style="list-style-type: none"> • Belt drive option: <ul style="list-style-type: none"> – Inspect the pulleys and belts for wear and condition (profile gauges) – Check the belt tension 	5.2.17

Inspection and maintenance intervals	Inspection and maintenance work	Information see Section
Every 2500 operating hours, at least every six months	• Visual inspection of shaft sealing ring	5.2.1
	• Check the oil level and oil condition	5.2.5
	• Clean or replace the vent	5.2.12
	• Option ED: Visual inspection of the rubber buffers	5.2.6
	• Option LC, LCX, CS1-X, CS2-X, OT: Visual inspection of hoses and pipes	5.2.7
	• Option CS1-X, CS2-X, LC, LCX: Check the oil filter	5.2.8
	• Option VL2/3/4/6 KL2/3/4/6: Re-lubricate the bearings in the output flange and remove excess grease	5.2.15
	• Taconite option: Re-grease	5.2.16
	• Check the brake <ul style="list-style-type: none"> – Inspect the wear pattern of the brake – Check the lining wear correction 	3.25
	• Check dog coupling <ul style="list-style-type: none"> – Check the gearing wear of the coupling – Replace grease 	3.16.3, 3.17
For operating temperatures up to 80 °C: Every 10000 operating hours, but at least every 2 years Higher temperatures reduce the oil change intervals	• Replace shaft sealing rings if worn	5.2.13
	• Change the oil (if filled with synthetic oil, this period is doubled) Reduction of lubricant replacement interval under extreme operating conditions (high humidity, aggressive environment, high temperatures and large temperature fluctuations)	5.2.10
	• Option CC: Check the cooling coil for deposits (fouling)	5.2.11
Every 20000 operating hours, but at least every 4 years	• Re-grease the bearings in the gear unit (only for SK5..07 to SK6..07 and installation position M5/M6)	5.2.14
	• Option LC, LCX, CS1-X, CS2-X, OT: Replace hose lines	5.2.7
At least every 10 years	• General overhaul	5.2.19

Table 13: Inspection and maintenance intervals

5.2 Service and maintenance work

5.2.1 Visual inspection for leaks

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

Information

Radial shaft seals are components with a limited life and are subject to wear and ageing. The service life of radial shaft seals depends on various ambient conditions. Temperature, light (especially UV light), ozone and other gases and liquids affect the ageing process of radial shaft seals. Some of these influences may change the physical or chemical properties of the radial shaft seals and result in a significant reduction of their service life. Foreign matter (e.g. dust, sludge, sand, metallic particles) and excess temperature (excessive speed or external heating) accelerate the wear of the sealing lip. These sealing lips are made of an elastomer material and are lubricated with a special grease at the factory. This reduces the wear due to their function and ensures a long service life. An oil film in the region of the rubbing sealing lip is therefore normal and is not due to leakage (see chapter 7.7 "Leakage and leak-tightness").

NOTICE

Damage to the radial shaft seals through unsuitable cleaning agents

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

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

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

5.2.2 Check for running noises

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

5.2.3 Check fan and spaces between the ribs (Maxxdrie XT) (Option: FAN-A, FAN-R)

Keep the inlet and outlet on the fan cover and the fan wheel free from dirt.

Fan operation increases the probability of dirt and dust deposits in the spaces between the cooling webs of a ribbed gear unit housing (Maxxdrie XT). This will reduce the thermal dissipation performance of the housing. As a consequence, the gear unit is no longer cooled sufficiently. Clean the spaces between the ribs.

Pay attention to the information from Section 4.6 "Gear unit cooling with fan (Option: FAN-A, FAN-R)" prior to commissioning again.

5.2.4 Cleaning the heat exchanger (Option: CS2-X)

Clean the heat exchanger of the oil/air cooler (Option: CS2-X) regularly in order to maintain the efficiency. Pay attention to the operating instructions of the oil/air cooler.

5.2.5 Oil level

The installation position must comply with the version on the name plate.

WARNING

Risk of burns and injuries

- Switch off the drive before checking the oil level.
- Secure the drive against inadvertent switching on, for example with a padlock.
- Allow the gear unit to cool down. The oil temperature should be between 20 °C and 40 °C.

Checking the oil level

Information

The SAFOMI option requires a different procedure for checking and adjusting the oil level than that which is described here (see chapter 5.2.5.6 "No-seal adapter for agitators (Option: SAFOMI)").

1. Shut down the drive.
2. Make sure to wait for 5 to 10 minutes.
3. Check the oil level only if the gear unit is at a standstill and if the oil is free from foaming.
 - An oil level above the "Max" marking is impermissible and may indicate the ingress of foreign liquids (e.g. water). → Check the water content of the oil.
 - An oil level below the "Min" marking is impermissible and may indicate a leak.

An impermissible oil level may damage the gear unit.

- Find and correct the reason for the incorrect oil level.
- If applicable, correct the oil level or change the oil (see section 5.2.10 "Oil change").

Use the gear oil type stated on the type plate.

- If possible, filling should be carried out via the vent position.

Other filling positions are possible. The specific dimension sheet for the order is definitive.

For the positions of the oil level measuring device, the vent and the oil drain, please refer to the specific dimension sheet for the order.

For double gear units (Option: WG) and gear units with auxiliary drive (Option: WX) the oil level must be checked on both gear units. For auxiliary drives with freewheeling couplings the oil level in the attachment cylinder must also be checked.

Oil level checks and top-ups may be necessary for attached couplings. In this case, the manufacturer's documentation must be observed.

5.2.5.1 Oil level screw

1. The corresponding oil level screw must be removed.
2. Check the oil level in the gear unit with the dipstick supplied (Part No.: 28300500), as shown in Figure 33. 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.
3. 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.
4. Fit the oil level screw together with the sealing ring and tighten to the correct torque (see chapter 7.4 "Screw tightening torques").

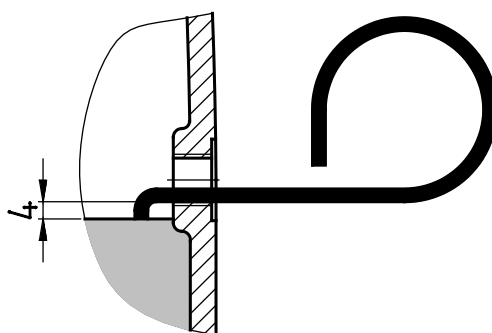


Figure 33: Checking the oil level with a dipstick

5.2.5.2 Oil inspection glass/oil level glass (Option: OSG), Oil level indicator (Option: OST)

The oil level can be seen directly in the window. The correct oil level is the middle of the inspection glass. For the oil level indicator version, the oil level must be in the middle.

5.2.5.3 Oil dipstick (Option: PS)

1. Unscrew the dipstick from the gear unit and wipe it with a clean cloth.
2. Fully insert the dipstick into the gear unit and unscrew it again.
3. The oil level must be between the upper and lower marking.

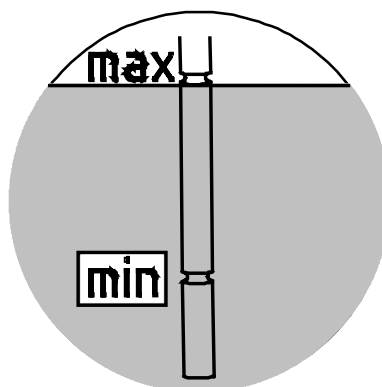


Figure 34: Checking the oil level with an oil dip-stick

5.2.5.4 Oil level tanks (Option: OT)

NOTICE

Damage to the gear unit due to low oil level

An oil level below the Min marking may indicate a leak. This may result in damage to the gear unit.

- Clarify and remedy the reason for the incorrect oil level.

NOTICE

Damage to the gear unit due to high oil level

If the gear unit is delivered with oil and installation position M5 the oil reservoir tank vessel is completely filled by NORD. High oil levels may result in damage to the gear unit.

- Ensure the correct oil level prior to commissioning.

Check the oil level prior to commissioning. A gear unit which is in operation must be shut down at least 20 to 30 minutes before checking the oil level.

The oil level must be checked with the gear unit at a standstill and with foam-free oil in the installation position stated on the name plate.

If the oil level is below the minimum level (lower edge of the inspection window), the oil level must be corrected by topping up with lubricant.

- a. Oil reservoir tank and dipstick (standard configuration) (characteristic: cylindrical container): The oil level must be checked with the aid of the dipstick plug (thread G1¼) in the oil tank. The sequence is as described in the previous section.
- b. Oil reservoir tank and oil level indicator (standard configuration) (characteristic: rectangular container): The oil level can be seen directly in the window. The correct oil level is the middle of the oil level indicator.

After correction of the oil level, oil level screws, dipsticks, vents and oil drain screws which have been unscrewed must be screwed in again and tightened with the correct torques (see Section 7.4 "Screw tightening torques").

5.2.5.5 Checking the leak indicator (Option: VL3, KL3 with Drywell)

The leak indicator enables detection of leaks before oil escapes from the gear unit. The leak indicator must be checked at the intervals which are stated in the service schedule.

1. Check whether oil can be seen inside or outside of the leak indicator. If no oil is visible, no further measures are necessary.
2. If oil is visible in the leak indicator, remove the leak indicator cover cap and catch the escaping oil in a suitable container.
 - Often there is only a temporary fault in the sealing system, e.g. due to small particles of dirt underneath the sealing lip, which can be removed during further operation. In this case, the quantity of oil which has escaped by the next interval is smaller or no oil has escaped. A repair is not necessary at this time.
 - If a larger quantity of oil has escaped by the next interval, there is a permanent malfunction of the sealing system, which must be repaired. In this case, please contact NORD Service.

5.2.5.6 No-seal adapter for agitators (Option: SAFOMI)

NOTICE

Damage to the gear unit due to insufficient lubricant

Oil foam formation may indicate contamination of the oil, e.g. due to the entry of foreign liquids. Contamination impairs the lubricant properties of the gear oil and may result in damage to the gear unit.

- Check the gear oil for water and other contaminants.
- Change the oil.
- Clarify and remedy the cause of oil contamination.

With this option, the gear unit housing is equipped with a 3D oil inspection glass and an oil inspection glass in the SAFOMI motor adapter. If the gear unit is subsequently equipped with a SAFOMI motor adapter, the gear unit housing does not include a 3D oil inspection glass. Check the oil level with a dipstick.

- Check the oil level in the gear unit housing with the 3D oil inspection glass. The 3D oil inspection glass must always be completely filled with oil.
- The oil inspection glass in the SAFOMI-IEC adapter is used to check the gear oil with regard to foam formation. No oil foam must be visible neither at a standstill nor during operation.

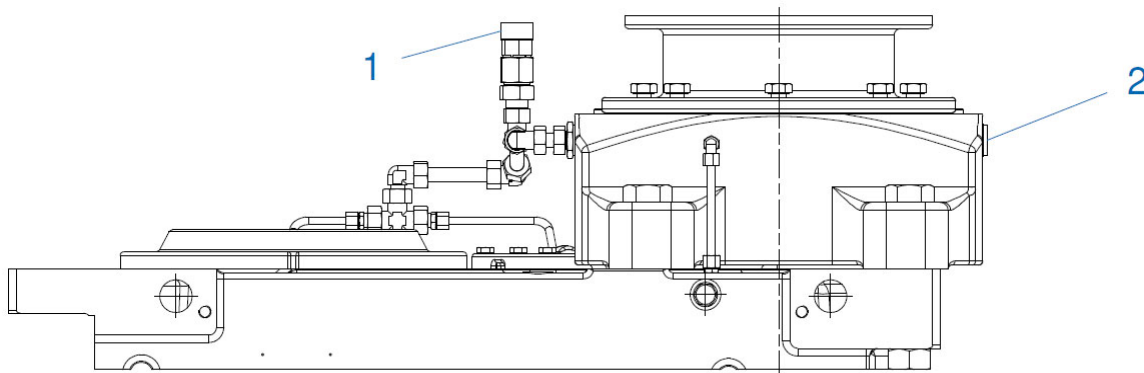


Figure 35: Illustration air space

Before topping up the oil, unscrew the (pressure) vent (1) or the screw plug (2) in the air space so that air can escape from the gear unit.

i Information

Incorrect oil level indication due to trapped air

During commissioning and after changing the oil, air (air pockets) may become trapped in the gear unit oil bath. These disappear during operation. The resulting space fills with lubricant. Because of this the oil level may deviate in comparison with the initial filling. Trapped air can escape via the gear unit venting. This process may take several days. During this period an incorrect display of the oil level in the 3D inspection glass cannot be ruled out.

- Check the oil level at regular intervals, especially after changing the oil or commissioning.

Information

Incorrect oil level indication due to formation of vacuum with the version without a vent pipe for the air space

When draining the oil, or in case of leaks, a vacuum may form above the oil bath in the gear unit. This may cause incorrect indication of the oil fill level in the 3D oil inspection glass. By loosening the plug in the air space, air can flow in and remove the vacuum.

- Check the oil level and loosen the closing plug in the air space at regular intervals, especially after changing the oil or commissioning.
-

5.2.6 Visual inspection of the rubber elements of the elastic torque arm (Option: ED)

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

5.2.7 Visual inspection of cables

5.2.7.1 Piping (Option: LC, LCX, OT)

The piping of lubrication circulation systems or vent lines for full oil level in combination with oil level tanks must be checked for leaks.

The affected pipes must be replaced in case of leaks. In this case, please contact NORD Service.

5.2.7.2 Hose lines (Option: LC, LCX, CS1-X, CS2-X, OT)

Hose lines are used as intake and pressure lines for lubricant circulation and for cooling units. An oil reservoir tank can also be connected to the gear unit via hoses.

Hoses are subjected to a natural ageing process due to external influences, e. g. due to UV radiation.

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

5.2.8 Oil filter (Option: CS1-X, CS2-X, LC/LCX)

As standard, the oil filter is equipped with a visual contamination indicator. It is recommended that the filter element is replaced at the latest after an operating period of one year.

The filter element must be replaced immediately if the contamination indicator triggers. Refer to the relevant manufacturer's documentation for further information.

5.2.9 Remove dust

Dust layers on the gear unit housing and on the fan blades degrade the cooling performance and lead to overheating. Remove dust deposits. For ribbed gear unit housings, special care must be taken that the spaces between the ribs are cleaned at regular intervals.

5.2.10 Oil change

WARNING

Risk of burns and injuries

- Allow the hot gear unit to cool down before touching it. However, the gear unit should still be warm so that the oil can drain out faster.
 - Wear protective gloves and goggles when changing the oil.
-

Information

Getriebebau NORD recommends regular analysis of the gear oil to optimise the oil change interval.

The position of the oil drain screw or the optional drain tap, the vents and devices for checking the oil level should be obtained from the order-related dimension sheet.

For gear units with circulation lubrication and cooling system, replace the oil according to the maintenance instruction for the circulation lubrication and the cooling system.

Procedure:

1. Choose a collection vessel according to the oil quantity stated on the name plate. Place the collection vessel under the oil drain screw or the oil drain tap.
2. Unscrew the vents from the gear unit.
3. Unscrew the oil drain screw from the gear unit. With a drain tap, unscrew the closing cap from the drain tap and open the drain tap.
4. Completely drain the oil from the gear unit. If present, also empty filters and piping.
5. In order to remove oil sludge particles, due to wear and old residues, flush the oil space. For this, use the same type of oil which is used during operation.
6. Clean the thread of the oil drain screw or the screw plug of the oil drain tap. Coat the screw with securing adhesive, e. g. Loctite 242 or Loxeal 54-03. Tighten the screws with the correct torque ((see chapter 7.4 "Screw tightening torques")).
7. Fill the gear unit with the specified quantity of fresh oil according to the name plate through the vent hole. If the gear unit is equipped with a dipstick, the oil may be filled through this hole.
8. Check the oil level according to Section 5.2.5 "Oil level" after 15 minutes, for a gear unit with oil reservoir tank, after 30 minutes. Correct the oil level as necessary.

5.2.11 Checking the cooling coil for deposits (Option: CC)

The cooling water flow rate must be controlled. For this, pay attention to the information in Section 4.7 "Cooling coil (Option: CC)".

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

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

Please contact the NORD Service department.

5.2.12 Cleaning or replacing the vent

5.2.12.1 Vent filter (Option: FV)

The ventilation filter uses a wire mesh as the filter material and enables an equalisation of pressure between the interior of the gear unit and the environment. Visually check the ventilation filter for soiling. A soiled filter is no longer capable of fulfilling its function and must be replaced.

1. Unscrew the old ventilation filter.
2. Screw in the new ventilation filter with a new sealing ring (see chapter 7.4 "Screw tightening torques").



Figure 36: Vent filter (Option FV)

5.2.12.2 Cellulose filter (Option: EF)

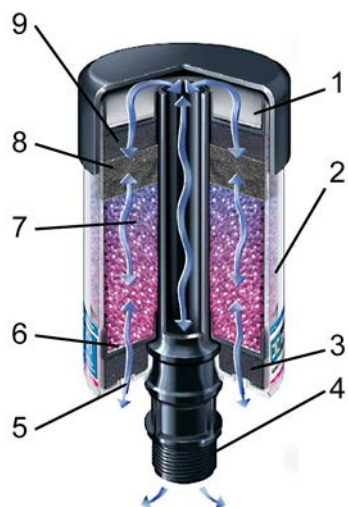
This filter uses cellulose as the filter material. The filter insert is replaceable.

1. Unscrew the cap of the filter insert
2. Remove and check the filter element
3. Optional: Replace the filter element in case of contamination
4. Insert the filter insert
5. Put on the cover and tighten finger-tight



Figure 37: Cellulose filter (Option EF)

5.2.12.3 Drying agent filter / Wet air filter (Option: DB)



Legend

- 1: Second filter element
- 2: Polycarbonate housing
- 3: Foam pad
- 4: Connecting thread
- 5: Air inlet
- 6: Filter element
- 7: Silica gel
- 8: Active carbon pad (optional)
- 9: Foam pad

Figure 38: Drying agent filter, example version

Drying agent filters are intended to prevent damp oil, condensation and rust in the system, as well as to increase the service life of the oil and the machine filters.

Drying agent filters use silica gel as the filter material. The degree of contamination of the filter is visible from the outside. With increasing contamination the colour of the filter material changes from blue to pink. The colour change starts in the lower area and spreads to the upper area. The filter should be replaced when three quarters of the filter have changed colour.

1. Check the degree of contamination.
2. If replacement is necessary, unscrew the old drying agent filter.

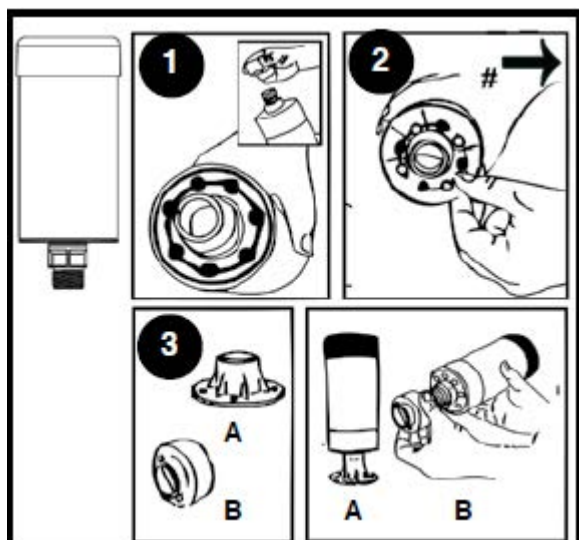


Figure 39: Installing the drying agent filter

3. Remove the blue plug on the underside of the central pipe (1) of the new drying agent filter.
4. Remove the two opposing red plugs (2) on the underside of the filter.
5. Screw in the new drying agent filter finger tight (3).

i Information

The moisture separation performance is better if all of the plugs are removed. The period of use before saturation is then slightly shorter.

5.2.13 Replacing the shaft sealing ring

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

i Information

Special installation rules must be observed when replacing **MSS7 seals** in order to achieve a normal operating life. MSS7 seals are two-part seals which consist of a liner with an axial dust lip and a radial shaft sealing ring with a radial dust lip (Figure 40: MSS7 seal). Please contact the NORD Service department in case of any queries.

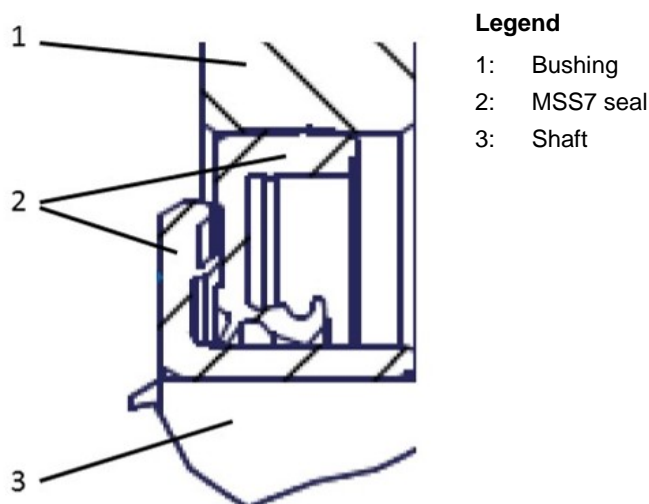


Figure 40: MSS7 seal

5.2.14 Re-lubrication of bearings in the gear unit

NOTICE

Damage to the gear unit due to insufficient lubricant

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

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

As standard, all bearings in the gear units are lubricated with an oil bath. Lubricant circulation is used for installation positions where this is not possible, or in case of reduced oil levels.

Exceptions to this are gear units SK 5..07 to SK 6..07 in installation position M5/M6. In this installation position, the upper bearings are lubricated with grease.

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

Recommended grease: Petamo GHY 133N - Klüber Lubrication. (see chapter 7.3.1 "Roller bearing greases")

5.2.15 Re-lubricating the bearing in the output flange (Option: VL2/3/4/6, KL2/3/4/6)

WARNING

Risk of injury and burns from the gear unit

There is a risk of injury, as re-lubrication must be carried out while the gear unit is running.

- Observe the safety information in the safety section.

NOTICE

Damage to the gear unit due to insufficient lubricant

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

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

NOTICE

Bearing damage through incorrect re-greasing

- Avoid high pressures when re-greasing, to avoid damage to the surrounding seals.
- The gear unit must be in operation during re-greasing.

For agitator version gear units re-lubrication of the lower grease-lubricated bearing in the output flange is necessary. The flanges are equipped with DIN 71412 conical grease nipples in the area of the bearings.

The roller bearings are sufficiently filled with grease as delivered, however they must be re-lubricated at regular intervals (see chapter 5.1 "Inspection and maintenance intervals").

1. Clean any dirt from the grease nipple so that no foreign matter is pressed into the bearing with the grease.
2. Unscrew the closing cap which is approximately opposite to the grease nipple, so that excess old grease can escape.
3. Press grease into the grease nipple in the area of the bearing according to the quantities stated in the following table.

The recommended grease type is Petamo GHY 133N - Klüber Lubrication (see chapter 7.3.1 "Roller bearing greases").

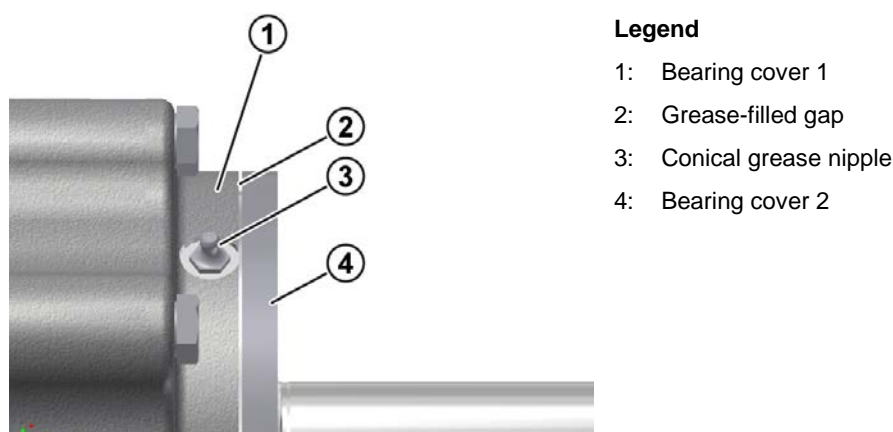
4. Catch the grease which escapes from the closing cap opening.
5. Remove the residual grease in the area of the closing cap.
6. Close the closing cap

Quantity	Grease quantity VL [g]	Grease quantity KL [g]
SK5.07	110	60
SK6.07	110	60
SK7.07	200	130
SK8.07	200	130
SK9.07	210	170
SK10.07	210	170
SK11.07	220	180
SK12.07	220	180
SK13.07	340	230
SK14.07	340	230
SK15.07	380	240

Table 14: Grease quantities for re-greasing the lower output shaft bearing

5.2.16 Re-greasing the Taconite seal

Input and/or output shafts may be equipped with Taconite seals, depending on the version. Re-lubricate the Taconite seals with the associated grease nipples on the bearing cover or via the lubrication line.



Legend

- 1: Bearing cover 1
- 2: Grease-filled gap
- 3: Conical grease nipple
- 4: Bearing cover 2

Figure 41: Re-grease Taconite seal

The exact lubrication points can be obtained from the order-related dimension sheet. Fill the seal with grease until clean grease emerges from the grease gap. Remove excess grease.

Recommended grease: Petamo GHY 133N - Klüber Lubrication (see chapter 7.3.1 "Roller bearing greases")

Information

Optimal re-lubrication is achieved by rotating the gear unit shaft in 45° steps when lubricating and pressing in grease, until clean grease emerges from the shaft.

5.2.17 Checking v-belts (belt drives)

WARNING

Entanglement hazard

- The protective cover must be correctly installed before re-commissioning.

V-belt pulleys should be visually inspected at regular intervals. In case of severe signs of wear, a V-groove and profile gauge should be used as an aid to determine the degree of wear. Dirt on the belt pulley or the belts causes friction losses. Therefore, always keep these components clean and dry.

Check the condition of the V-belts. Replace cracked or brittle V-belts. If one or more V-belts fail in a multiple groove drive, a new V-belt must be fitted. V-belts from different manufacturers must not be combined to form a set of belts. Before installing new V-belts, check the condition of the V-belt pulleys.

After a running time of approx. 4-5 hours with the drive under full load, check the tension of the V-belts with a frequency measuring device. Correct the tension of the v-belts as necessary.

5.2.18 Inspection cover

WARNING

Risk of injury due to rotating parts and danger of burns

- Switch off the drive before opening the inspection cover.
- Secure the drive against inadvertent switching on, for example with a padlock.
- Allow the gear unit to cool down. The oil temperature should be less than 40 °C.

CAUTION

Risk of chemical burns and skin irritation

Chemical substances which are used with the gear unit may be toxic. If these substances get into the eyes, eye injury can be caused. Lubricants and adhesives can cause skin irritation.

- Wear protective gloves and goggles.

NOTICE

Risk of damage to bearings, gear wheels, shafts

Foreign bodies in the gear unit can damage bearings, gear wheels and shafts.

- Prevent the entry of foreign bodies into the gear unit.

Opening an inspection cover enables the visual inspection of parts of the gear unit interior (gear wheels, shafts, bearings).

Depending on the version, inspection covers are designed with different sealing systems (e.g. flat seals, liquid seal, O-ring seal).

Only use the provided seal type!

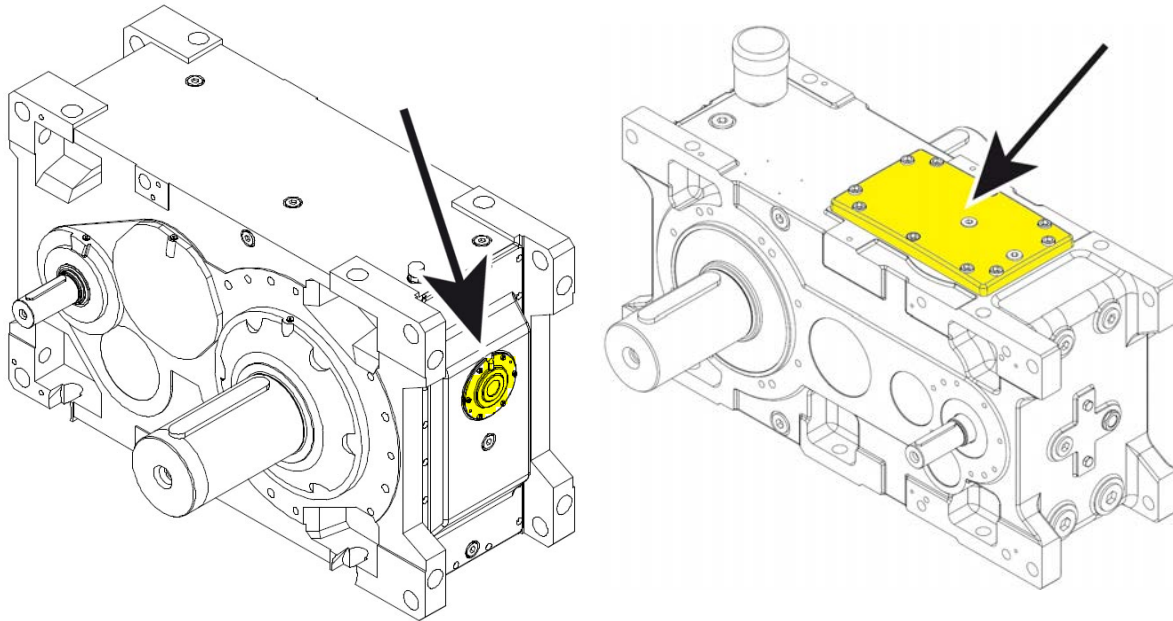


Figure 42: Examples of inspection covers

Checking inspection covers

1. Check fastening screws for firm fit.
2. Check sealing of the cover.

If sealings or screws are damaged or not usable, replace them. Proceed as described below.

Disassembly of the inspection cover

1. Loosen the cover.
2. Remove the cover with seal.

Make sure that no foreign bodies fall into the gear unit interior.

Assembly of the inspection cover

1. Clean the seal surfaces on the gear unit housing and on the inspection cover.
2. Replace screws that have become unusable with screws of the same design and strength class.
3. Replace seals that have become unusable.
4. Screw the cover tightly with the provided tightening torques.

(see chapter 7.4 "Screw tightening torques")

5.2.19 General overhaul

The general overhaul must be carried out by a specialist workshop with suitable equipment and be qualified personnel with appropriate equipment in observance of national regulations and laws. We recommend that the general overhaul is carried out by the NORD Service Department.

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

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

6 Disposal

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

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

Table 15: Materials

7 Appendix

7.1 Versions and mounting position

7.1.1 Parallel gear units

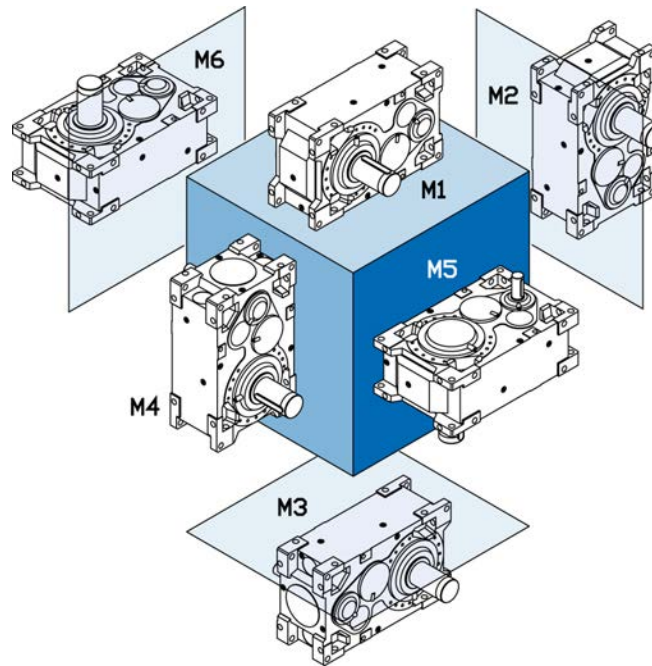


Figure 43: Helical gear unit installation positions with standard mounting surface

7.1.2 Helical bevel gear unit

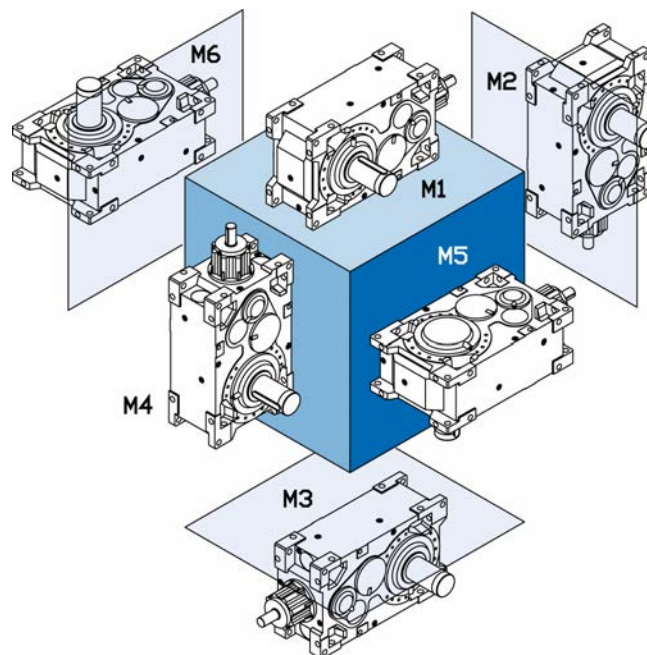


Figure 44: Bevel gear unit installation positions with standard mounting surface

7.2 Standard positions of the oil drain, vent and oil level

The configuration and the position of the oil drain, vent and oil level should be primarily obtained from the dimension sheet for the order. If this does not contain any details, the following details can be used.

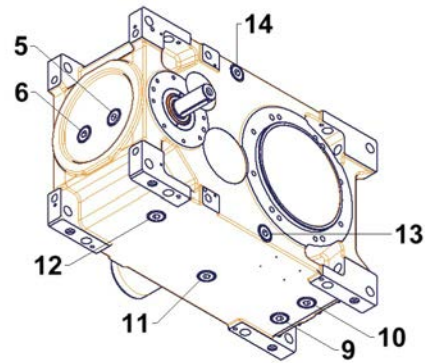
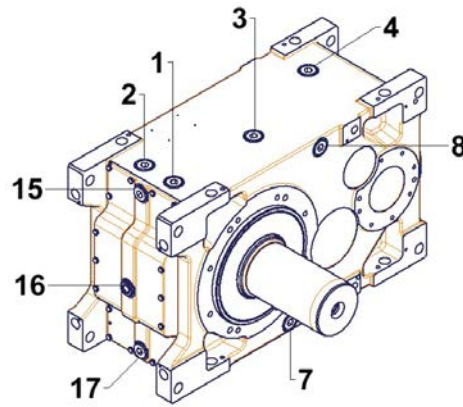
		5x07, 6x07		7x07-10x07		11x07-15x07		5x17 – 11x17
Option	Installation orientation	207 307	407 507	207 307	407 507	207 307	407 507	217
Oil sight glass	M1	6 (D)	16	5/6 (D)	16	5 (D)	17 (G)	5
	M2	7/13	7/13	7/13	7/13	7/13	7/13	---
	M3	5 (D)	16	5/6 (D)	16	6 (D)	16 (G)	---
	M4	4/12	---	4/12	---	4/12	---	---
	M5	---	---	---	---	---	---	---
	M6	---	---	---	---	---	---	---
Oil gauge	M1	/OT	/OT	/OT	/OT	/OT	/OT	/OT
	M2	/OT	/OT	/OT	/OT	/OT	/OT	---
	M3	/OT	/OT	/OT	/OT	/OT	/OT	---
	M4	/OT	/OT	/OT	/OT	/OT	/OT	/OT
	M5	/OT	/OT	/OT	/OT	/OT	/OT	/OT
	M6	/OT	/OT	/OT	/OT	/OT	/OT	/OT
Dipstick	M1	1/2 /OT	1/2 /OT	1/2 /OT	1/2 /OT	1/2 /OT	1/2 /OT	1/2
	M2	15/17 /OT	15/17 /OT	15/17 /OT	15/17 /OT	15/18 /OT	15/18 /OT	---
	M3	9/10 /OT	9/10 /OT	9/10 /OT	9/10 /OT	9/10 /OT	9/10 /OT	---
	M4	5/6 /OT	---	5/6 /OT	---	5/6 /OT	---	/OT
	M5	13/14 /OT	13/14 /OT	---	---	---	---	/OT
	M6	7/8 /OT	7/8 /OT	---	---	---	---	/OT
Drain cock	M1	7/13 (D)	7/13 (D)	7/13 (D)	7/13 (D)	7/13 (D)	7/13 (D)	6
	M2	5/6	---	5/6	---	5/6	5/6	---
	M3	8/14 (D)	8/14 (D)	8/14 (D)	8/14 (D)	8/14 (D)	8/14 (D)	---
	M4	15/17	15/17	15/17	15/17	15/18	15/18	4/5
	M5	7/8	7/8	7/8	7/8	7/8	7/8	7/8
	M6	13/14	13/14	13/14	13/14	13/14	13/14	9/10

		5x07, 6x07		7x07-10x07		11x07-15x07		5x17 – 11x17
Option	Installation orientation	207 307	407 507	207 307	407 507	207 307	407 507	217
Vent	M1	1/2 /OT	1/2 /OT	1/2 /OT	1/2 /OT	1/2 /OT	1/2 /OT	1/2
	M2	16 /OT	16 /OT	16 /OT	16 /OT	16/17 /OT	16/17 /OT	
	M3	9/10 /OT	9/10 /OT	9/10 /OT	9/10 /OT	9/10 /OT	9/10 /OT	
	M4	5/6 /OT		5/6 /OT		5/6 /OT		/OT
	M5	13/14 /OT	13/14 /OT					/OT
	M6	7/8 /OT	7/8 /OT					/OT
Key:								
Housing		Standard position in housing						
Lid		Standard position in lid						
Oil tank		Standard only possible in oil tank						
---		Special, not possible in standard						
/OT		If option OT, then always in the oil tank						
(D)		Optionally in the lid						
(G)		Optionally in the housing						

Table 16: Position of housing options on oil screw holes (standard installation positions)

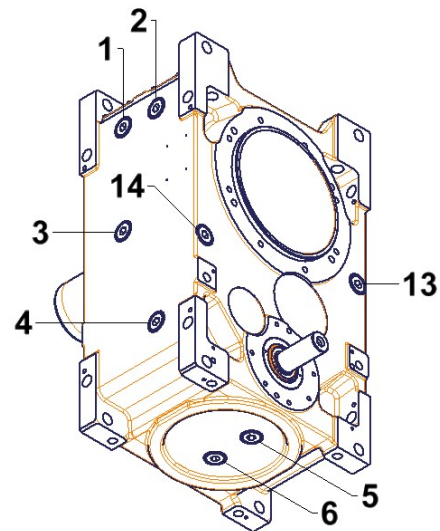
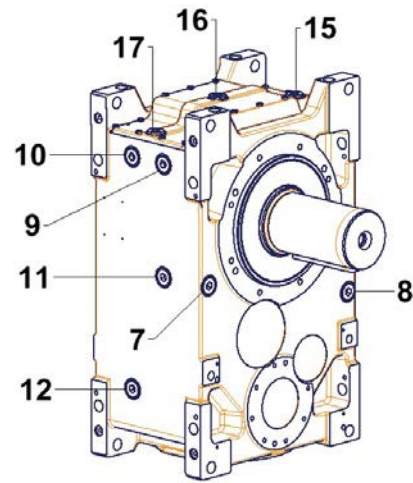
Gear units SK 5207 – SK 10507

M1 oil screw holes



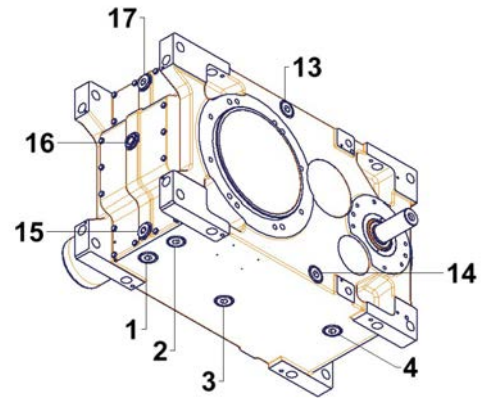
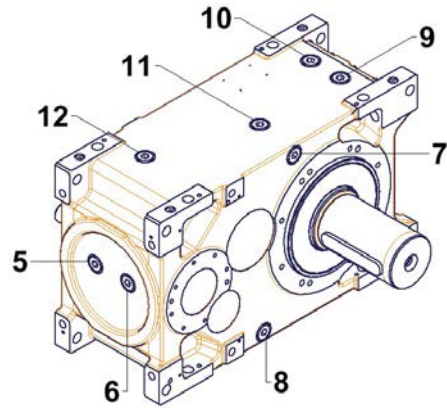
Gear units SK 5207 – SK 10507

M2 oil screw holes



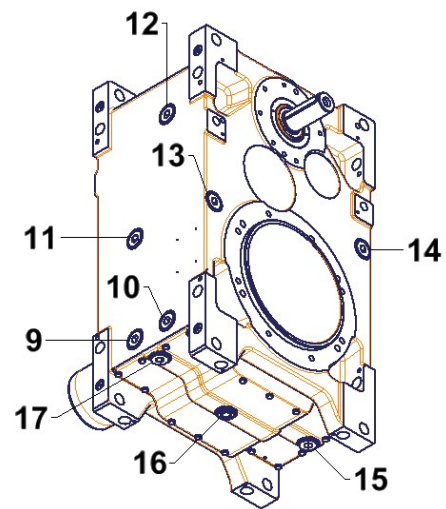
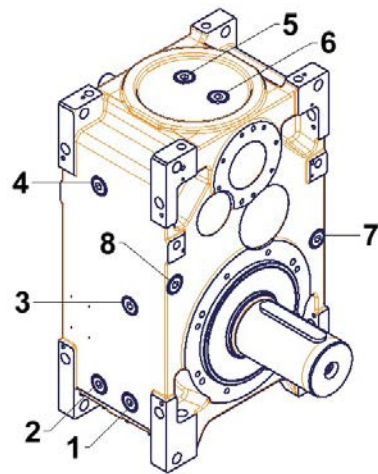
Gear units SK 5207 – SK 10507

M3 oil screw holes



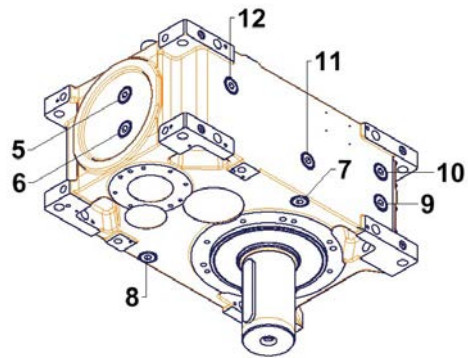
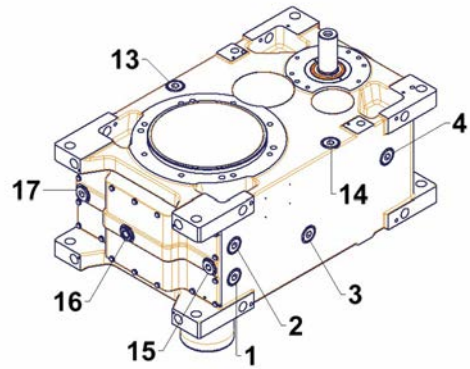
Gear units SK 5207 – SK 10507

M4 / oil screw holes



Gear units SK 5207 – SK 10507

M5 oil screw holes



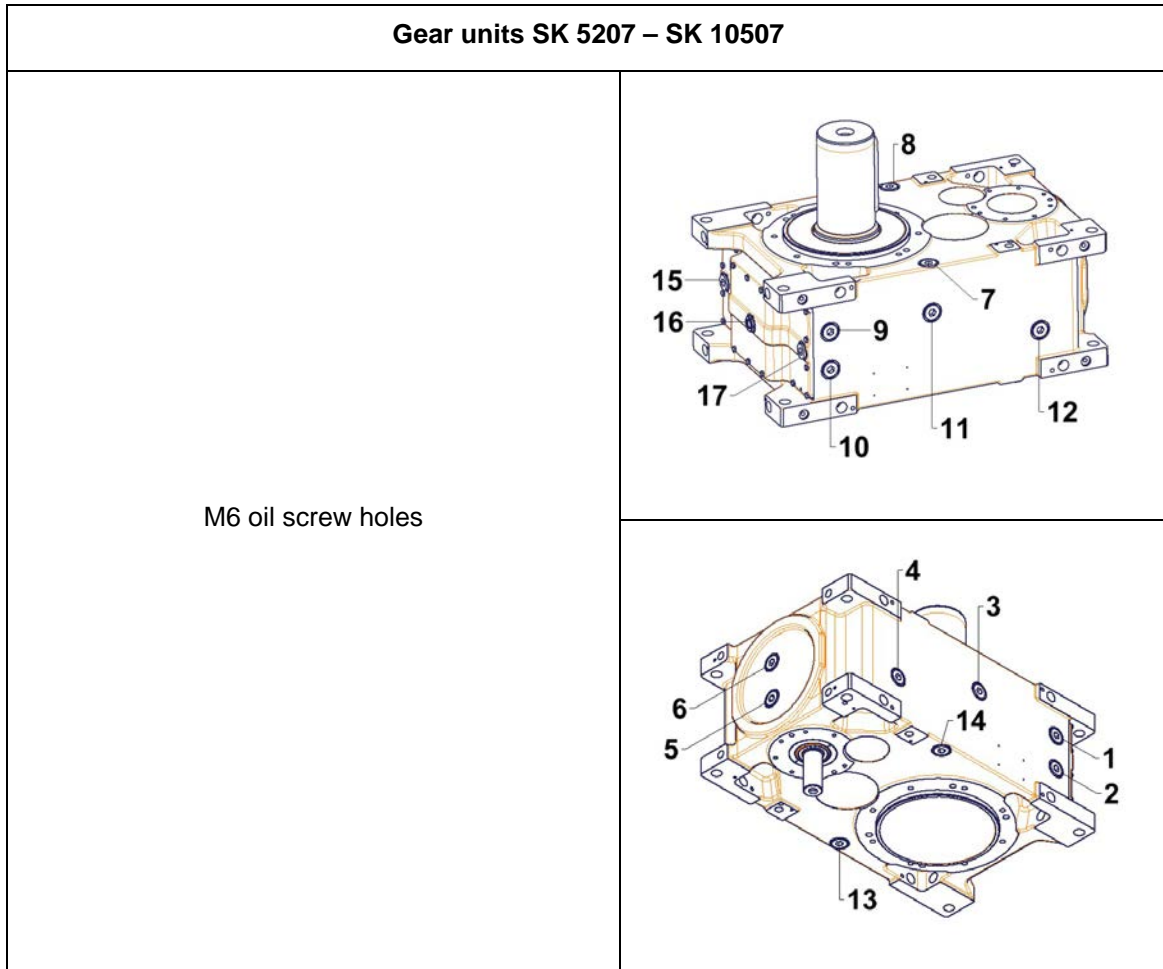
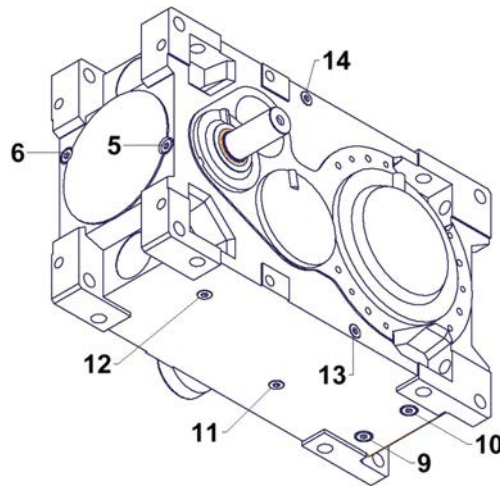
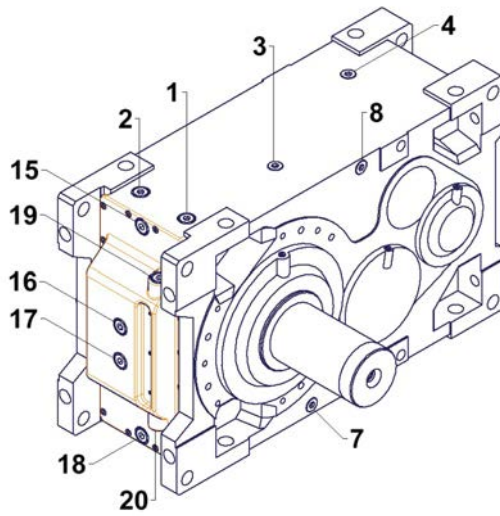


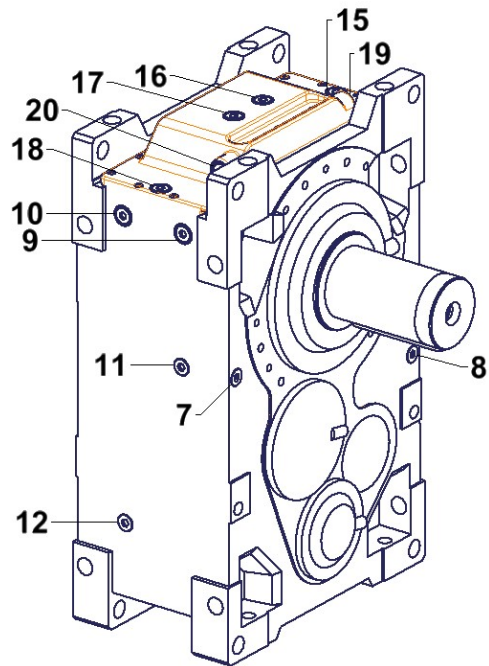
Figure 45: Numbering of oil screw holes on SK 5207 – SK 10507

Gear units SK 11207 – SK 15507

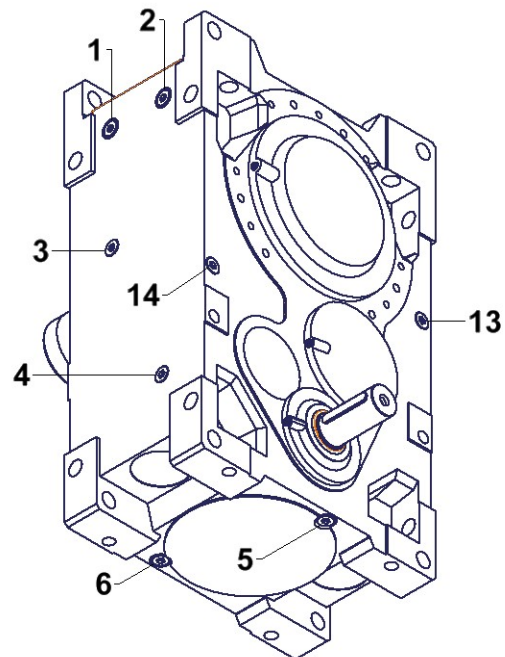
M1 oil screw holes



Gear units SK 11207 – SK 15507

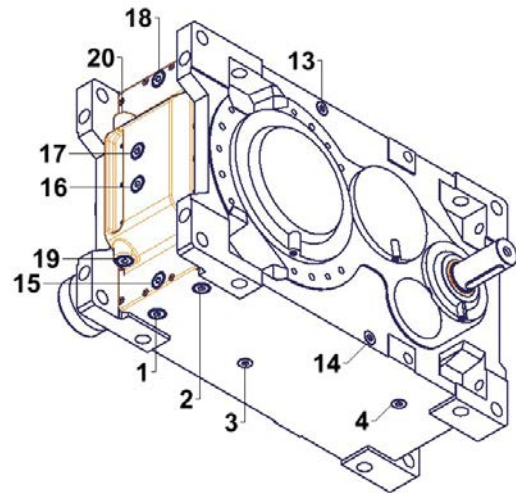
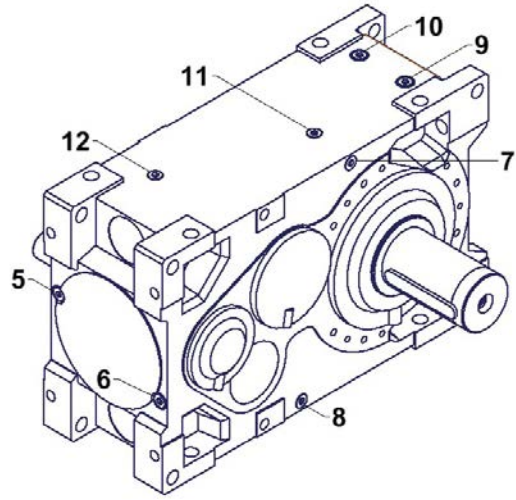


M2 oil screw holes



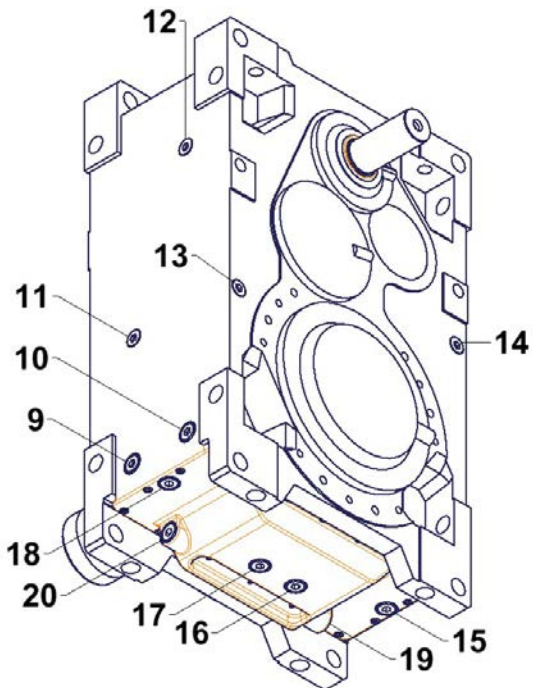
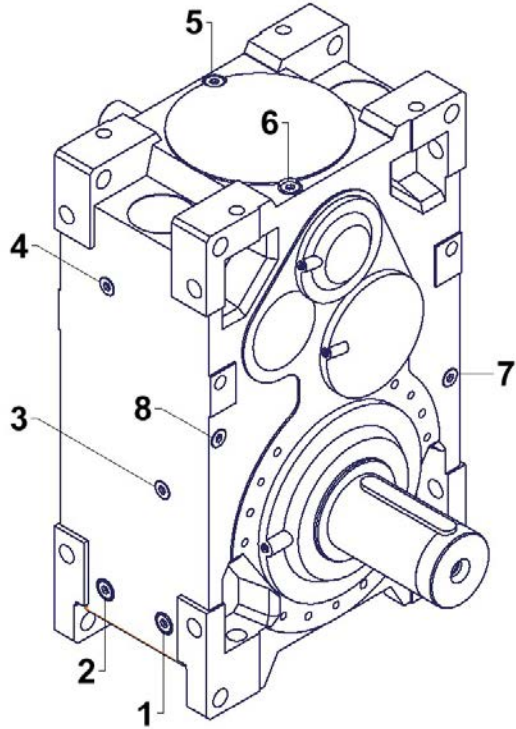
Gear units SK 11207 – SK 15507

M3 oil screw holes



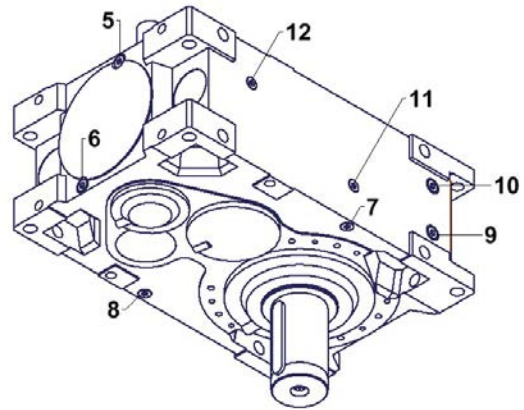
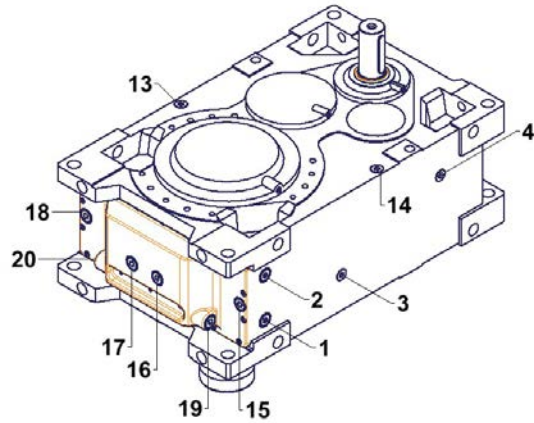
Gear units SK 11207 – SK 15507

M4 oil screw holes



Gear units SK 11207 – SK 15507

M5 oil screw holes



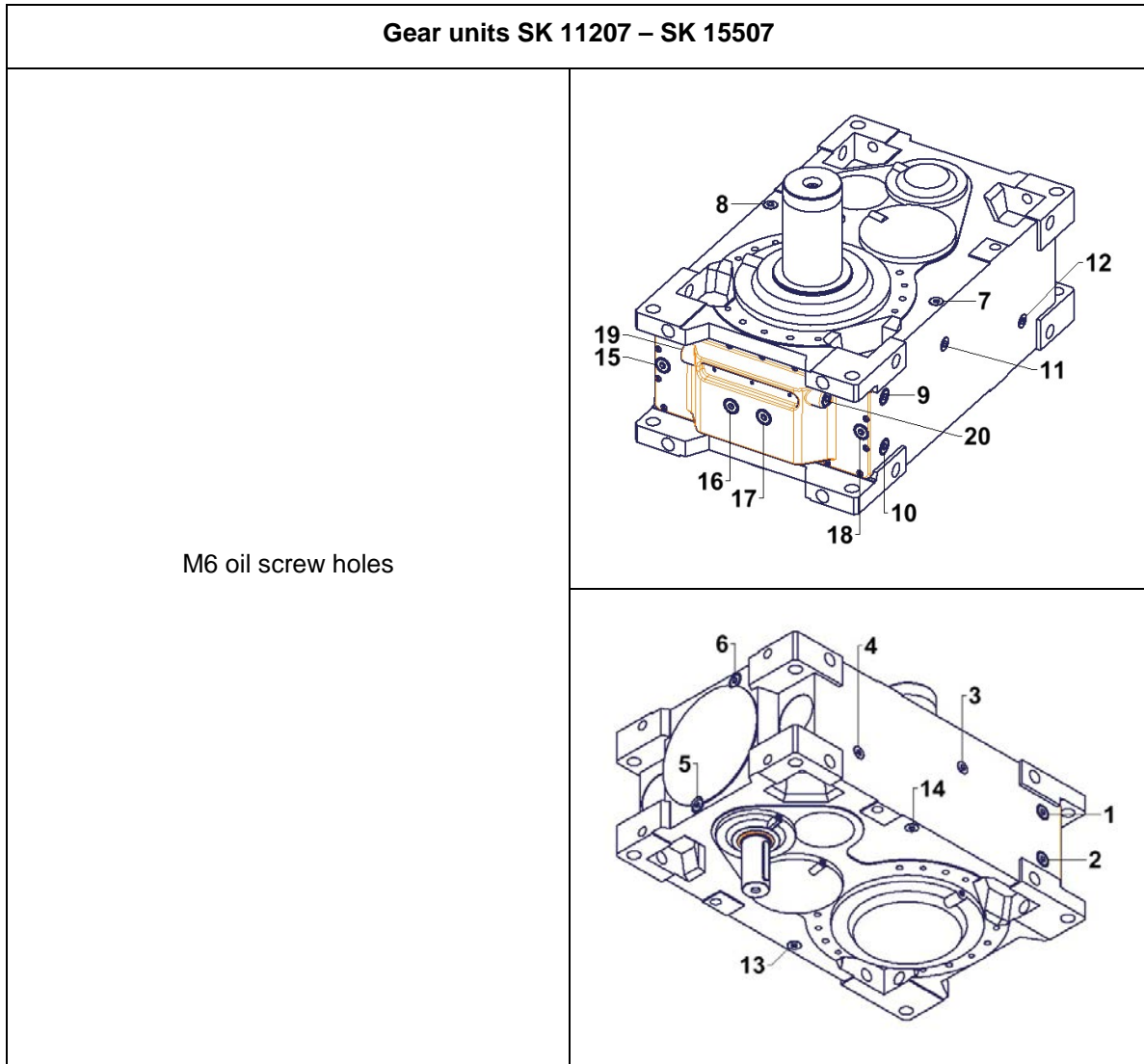
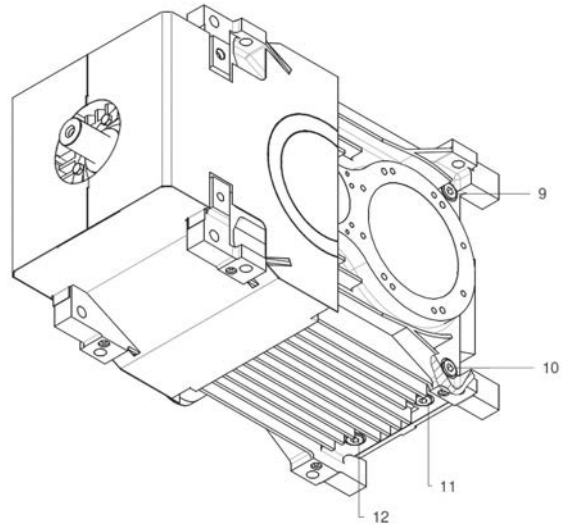
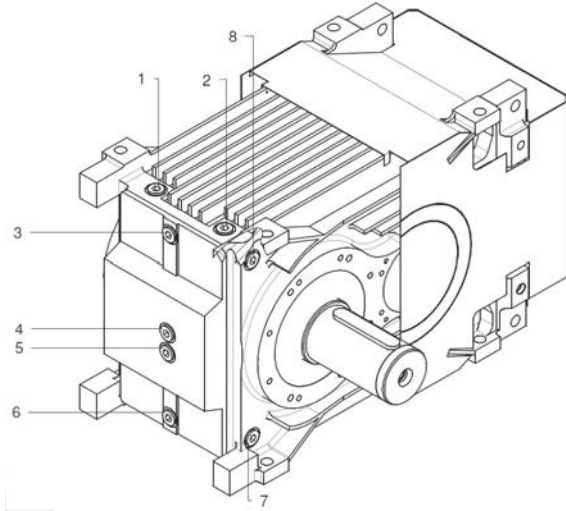


Figure 46: Numbering of oil screw holes on SK 11207 – SK 15507

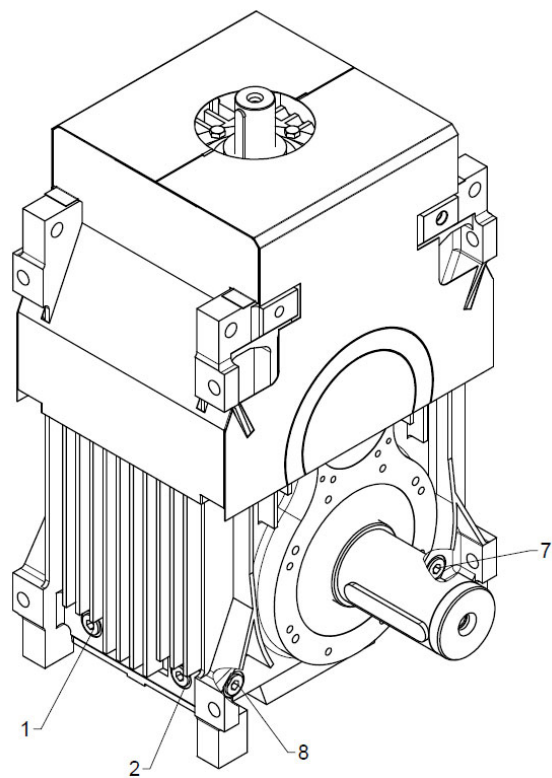
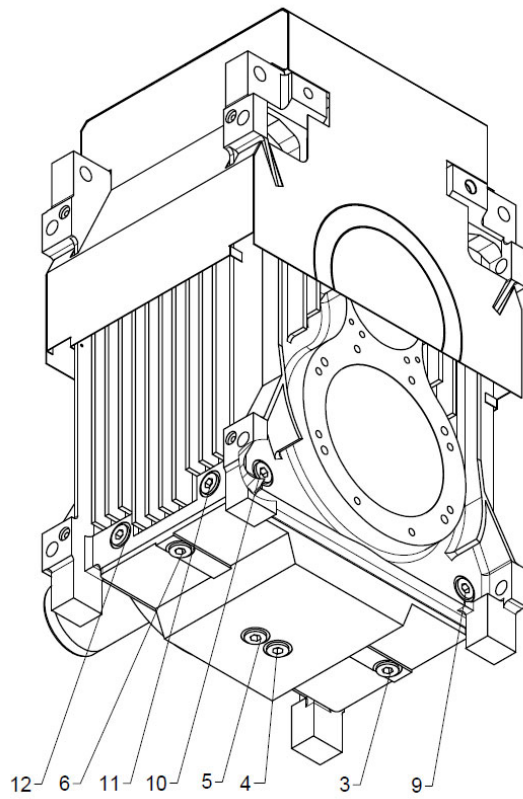
Gear units SK 5217 – SK 11217

M1 oil screw holes



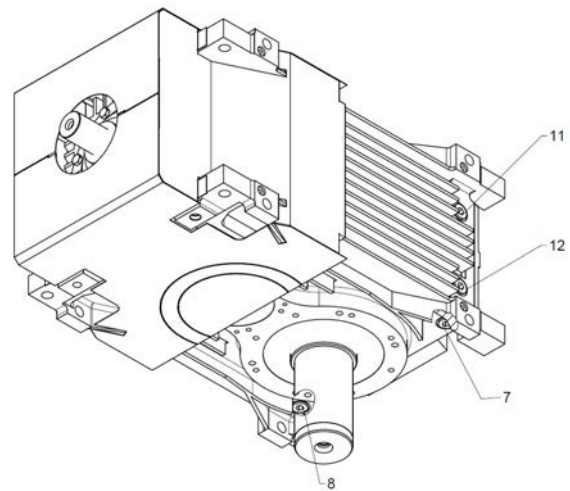
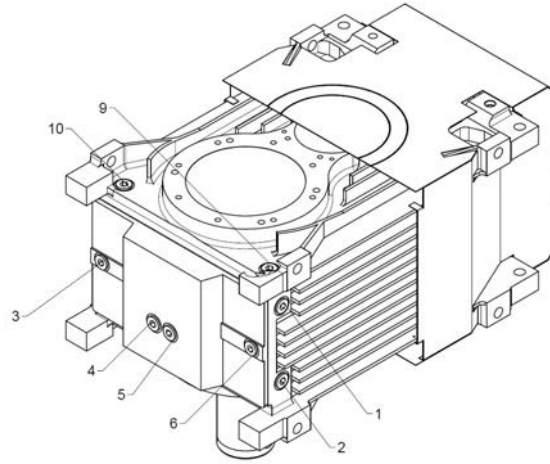
Gear units SK 5217 – SK 11217

M4 oil screw holes



Gear units SK 5217 – SK 11217

M5 oil screw holes



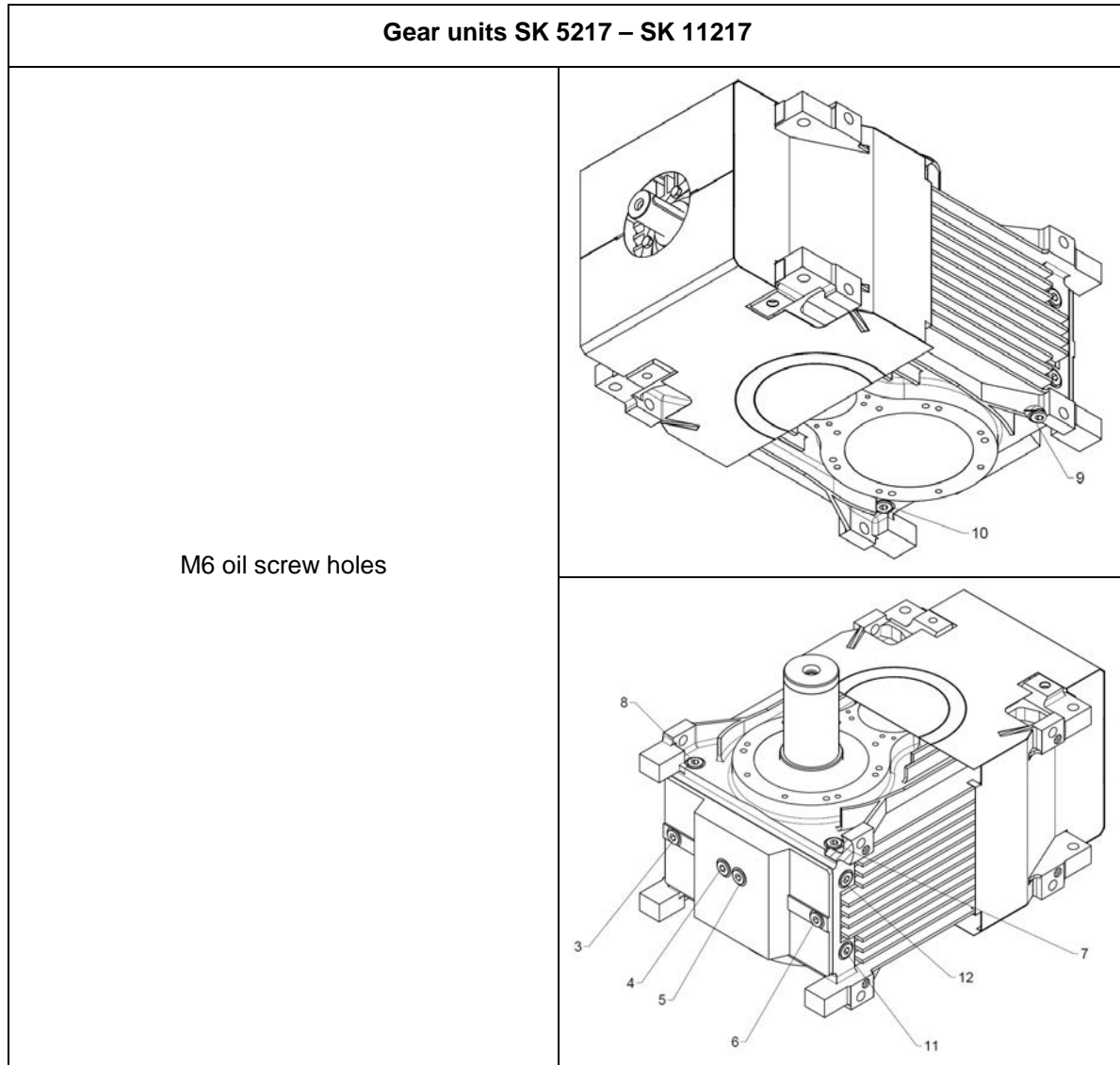


Figure 47: Numbering of oil screw holes on SK 5217 – SK 11217

7.3 Lubricants

7.3.1 Roller bearing greases

This table shows comparable roller bearing greases from various manufacturers. The manufacturer can be changed within a grease type. Only change lubricant type or ambient temperature range after consultation with Getriebebau NORD. Otherwise no guarantee can be accepted for the function of the gear unit.







Roller bearing greases	Ambient temperature [°C]							
	From	to						
Mineral oil-based	-30	60	Energrease LS 2 Energrease LS-EP 2	Longtime PD 2	RENOLIT GP 2 RENOLIT LZR 2 H	-	Mobilux EP 2	Gadus S2 V100 2
	-50	40	-	Optitemp LG 2	RENOLIT JP 1619	-	-	-
Synthetic	-25	80	Energrease SY 2202	Tribol 4747	RENOLIT HLT 2 RENOLIT LST 2	PETAMO GHY 133 N Klüberplex BEM 41-132	Mobiltemp SHC 32	Cassida EPS2
Bio-degradable	-25	40	Biogrease EP 2	-	PLANTOGEL 2 S	Klüberbio M 72-82	Mobil SHC Grease 102 EAL	Naturelle Grease EP2
Food compatible	-25	40	-	Obeen UF 2	RENOLIT G 7 FG 1	Klübersynth UH1 14-151	Mobilgrease FM 222	Cassida RLS2

Table 17: Roller bearing greases

7.3.2 Gear oils

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

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

Prior to the change of oils of different oil types, the gear unit must be thoroughly flushed with the new oil type. It is recommended to use the new product with a lower viscosity for flushing. This is especially valid when switching from a mineral oil (CLP) or synthetic oil CLP HC to to a synthetic oil CLP PG and vice versa.

Viscosity class						
CLP 150	Alpha SP 150	Renolin CLP 150	Klüberoil GEM 1-150 N	Mobilgear 600 XP 150	Omala S2 GX 150	Carter EP 150
	Optigear BM 150	Renolin CLP 150 Plus				Carter XEP 150
CLP 220	Alpha SP 220	Renolin CLP 220	Klüberoil GEM 1-220 N	Mobilgear 600 XP 220	Omala S2 GX 220	Carter EP 220
	Optigear BM 220	Renolin CLP 220 Plus Renolin CLP 220 VCI				Carter XEP 220
CLP 320	Alpha SP 320	Renolin CLP 320 Plus	Klüberoil GEM 1-320 N	Mobilgear 600 XP 320	Omala S2 GX 320	Carter EP 320
	Optigear BM 320	Renolin CLP 320				Carter XEP 320
CLP 460	Alpha SP 460	Renolin CLP 460	Klüberoil GEM 1-460 N	Mobilgear 600 XP 460	Omala S2 GX 460	
	Optigear BM 460	Renolin CLP 460 Plus				
CLP HC 150	Optigear Synthetic PD 150 ES	Renolin Unisyn XT 150	Klübersynth GEM 4-150 N	Mobil SHC 629	Omala S4 GXV 150	Carter SH 150
CLP HC 220	Alphasyn EP 220	Renolin Unisyn Gear 220 VCI	Klübersynth GEM 4-220 N	Mobil SHC 630	Omala S4 GXV 220	Carter SH 220
	Optigear Synthetic PD 220 ES	Renolin Unisyn XT 220				
CLP HC 320	Alphasyn EP 320	Renolin Unisyn XT 320	Klübersynth GEM 4-320 N	Mobil SHC 632	Omala S4 GXV 320	Carter SH 320
	Optigear Synthetic PD 320 ES					
CLP HC 460	Alphasyn EP 460	Renolin Unisyn XT 460	Klübersynth GEM 4-460 N	Mobil SHC 634	Omala S4 GXV 460	Carter SH 460
	Optigear Synthetic PD 460 ES					



Viscosity class						
CLP PG 150		Renolin PG 150	Klübersynth GH 6-150			
CLP PG 220		Renolin PG 220	Klübersynth GH 6-220			
CLP PG 320		Renolin PG 320	Klübersynth GH 6-320			
CLP PG 460		Renolin PG 460	Klübersynth GH 6-460			
CLP PG H1 150			Klübersynth UH 1 6-150			
CLP PG H1 220	Optileb GT 1800/220	Cassida Fluid WG 220	Klübersynth UH 1 6-220			
CLP PG H1 320		Cassida Fluid WG 320	Klübersynth UH 1 6-320			
CLP PG H1 460		Cassida Fluid WG 460	Klübersynth UH 1 6-460			
CLP E 220		Plantogear 220 S				
CLP E 320		Plantogear 320 S				

Table 18: Lubricant oil table

7.3.3 Minimum starting temperatures

Depending on the type of lubrication, the lubricant class, as well as the ambient temperature and additional heating and cooling methods, minimum requirements for the specific oil must be taken into consideration for selection and commissioning.

During start-up, the viscosity of the gear oil must not be higher than 1800 cSt. The following tables show the minimum permissible ambient temperatures (starting temperatures) for the various oil viscosity classes, so that 1800 cSt is not undershot. If the temperatures are lower, the oil must be heated before starting.

Different conditions apply for external cooling systems (Option CS1-X, CS2-X) (see chapter 4.8 "External cooling system (Option: CS1-X, CS2-X)").

Lubrication type	Viscosity class (mineral oils)			
	ISO VG 460	ISO VG 320	ISO VG 220	ISO VG 150
Bath lubrication/immersion lubrication	-10 °C	-12 °C	-15 °C	-20 °C
Lubricant circulation/ Pressure lubrication with motor pump	On request	+15 °C	+10 °C	+5 °C
Lubricant circulation/ Pressure lubrication with flange pump	On request	+5 °C	0 °C	-5 °C
External cooling system	On request	+25 °C	+20 °C	On request

Table 19: Minimum starting temperatures for mineral oils (guideline values for the ambient temperature)

Lubrication type	Viscosity class (synthetic oils)			
	ISO VG 460	ISO VG 320	ISO VG 220	ISO VG 150
Bath lubrication/immersion lubrication	-25 °C	-25 °C	-25 °C	-25 °C
Lubricant circulation/ Pressure lubrication with motor pump	On request	+5 °C	0 °C	-5 °C
Lubricant circulation/ Pressure lubrication with flange pump	On request	-5 °C	-10 °C	-15 °C
External cooling system	On request	+15 °C	+10 °C	On request

Table 20: Minimum starting temperatures for synthetic oils (guideline values for the ambient temperature)

Maximum permitted oil temperatures:

- For mineral oil, the maximum permissible oil temperature is 85 °C.
- For synthetic oil, the maximum permissible oil temperature is 105 °C.

7.3.4 Lubricant quantities

The lubricating oil quantity stated on the type plate is a guideline value. The precise quantity varies depending on the exact gear ratio and any options (e.g. OSG, OST, OT).

Ensure that the oil level is correct. Adjust the oil level as necessary (see Section 5.2.5 "Oil level").

 **Information**

After changing the lubricant, and in particular after the initial filling, the oil level may change during the first few hours of operation, as the oil galleries and hollow spaces only fill gradually during operation. Check and, if necessary, correct the oil level after 2 hours of operation.

7.4 Screw tightening torques

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

Table 21: Screw tightening torques

7.5 Tolerances for bolting surfaces

For installation on motor swing or motor base frame (Option MS, MF) and for flange screw surfaces (Option: F, FK, KL2, KL3, KL4, VL2, VL3, VL4), a maximum permissible distortion of 0.1 mm at a distance of 1 m must not be exceeded.

7.6 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 level too low	Correct oil level, Consult NORD Service
	Bearing damage	Consult NORD Service
	Gear wheel damage	Consult NORD Service
	System defective	Check and correct the alignment of drive components, check operating values of the system
Oil leaks from the gear unit	Defective seal	Consult NORD Service
Oil escaping from pressure vent	Oil level too high	Correct oil level
	Unfavourable operating conditions	Consult NORD Service
Gear unit becomes too hot	Incorrect oil in the gear unit	Change oil, Thoroughly flush the gear unit inside with fresh oil before filling new oil, Consult NORD Service
	Incorrect oil level	Correct oil level
	Dirty oil	Replace oil and filter
	Cooling system dirty	Clean cooling system
	Gear unit dirty	Clean gear unit
	Cooling defective	Consult NORD Service
	Gear unit overloaded	Consult NORD Service
	Impermissible axial or radial forces	Consult NORD Service
	Unfavourable installation situation	Consult NORD Service
Gear unit damage	Consult NORD Service	

Gear unit malfunctions		
Fault	Possible cause	Remedy
Shock when switching on	Motor coupling defective	Replace coupling
	Motor coupling worn	Replace elastomer ring
	Gear unit fastening loose	Check gear unit and motor fastening
	Rubber element worn	Replace rubber element
Output shaft does not rotate although motor is running	Motor coupling defective	Replace coupling
	Shrink disc slip	Check shrink disc
	Breakage in gear unit	Consult NORD Service
Cooling system failure	Cooling system defective	Observe the separate operating manual
Pressure at the pressure safeguard is too low	Pump does not deliver oil	Check pump and replace as necessary
	Leakage	Check piping and replace as necessary

Table 22: Overview of malfunctions

7.7 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 23: 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.

7.8 Noise emissions

The *measuring surface sound level* to be expected for the gear units according to ISO 8579-1 is below the 50% line stated in the standard.

7.9 Repair information

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

7.9.1 Repairs

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

Send the device to the following address:

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



Information

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

7.9.2 Internet information

In addition, you will find the manuals in the available languages on our website: www.nord.com.

7.10 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.

7.11 Abbreviations

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

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