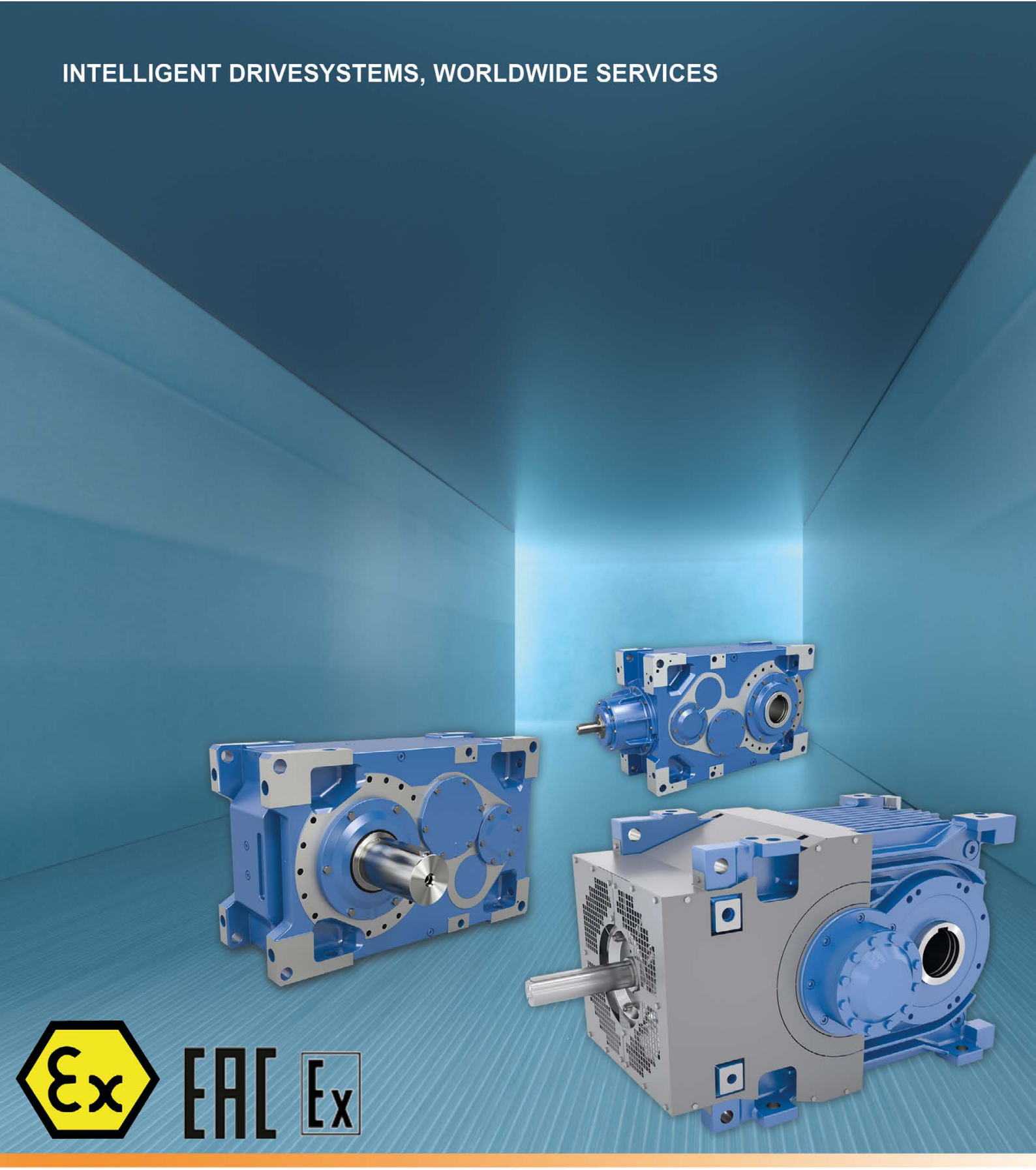
INTELLIGENT DRIVESYSTEMS, WORLDWIDE SERVICES



B 2050 – en

Explosion-protected industrial gear units

Operating and Assembly Instructions

NORD® DRIVESYSTEMS

Read the operating and installation instructions

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

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

Please also note the following documents:

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

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

Documentation

Designation:	**B 2050**
Part No.:	**6053002**
Series:	Gear units and geared motors
Type series:	SK 5207 – SK 15507, SK 5217 – SK 11217 and SK 5217 – SK 11217
Gear unit types:	**Industrial gear units**

Version list

Title, Date	Order number	Remarks
B 2050, February 2013	**6053002** / 0613	-
B 2050, September 2014	**6053002** / 3814	• General corrections
B 2050, April 2015	**6053002** / 1915	• General corrections
B 2050, March 2016	**6053002** / 0916	• Revision of ATEX documentation / extension of options, • Extension of the series, • New Declarations of Conformity, • General corrections
B 2050, May 2017	**6053002** / 1817	• Revision
B 2050, May 2019	**6053002** / 1819	• Revision of ATEX documentation, • Extension of the MAXXDRIVE® XT series, • New Declarations of Conformity, • General corrections
B 2050, October 2019	**6053002** / 4419	• Extensive revision of the safety and warning information, • Removal of the Declaration of Conformity according to DIN EN 13463-1. • Revision of the description for options MS and MF • Option SAFOMI added • SK 5217 to 11217 added • Sound Emission chapter added • Supplements to Service and Maintenance Intervals chapter • General corrections
B 2050, November 2020	**6053002** / 4620	• Descriptions for options DB and VL/KL 2/3/4/6 added • Option OH added • Revision of tables for lubricants and minimum starting temperatures • General corrections and amendments

Table 1: Version list B 2050

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Member of the NORD DRIVESYSTEMS Group

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1 Safety information

1.1 Intended use

These gear units are used to transmit and transform rotary movements. They are intended for use as part of a drive system in commercially used plant and machinery. The gear units must not be operated until it has been established that the plant or machinery can be safely operated with the gear unit. Suitable protective measures must be provided if failure of a gear unit or a geared motor could result in a risk to persons. The machine or system must comply with local legislation and directives. All applicable health and safety requirements must be met. In particular, the Machinery Directive 2006/42/EC, TR CU 010/2011 and the TR CU 020/2011 must be especially observed in the relevant areas of application.

The gear units are suitable for use in explosion hazard areas according to the category stated on the type plate. They satisfy the explosion protection requirements of Directive 2014/34/EU and TR CU 012/2011 for the category indicated on the type plate. The gear units may only be operated with components which are intended for use in explosion hazard areas. Atmospheres with gases, vapours and aerosols (CE: Zone 1 or 2, labelling G; EAC: Category IIG) and dusts (CE: Zone 21 or 22, labelling IID; EAC: Category IIID) must not be present during operation. The approval of the gear unit is void in case of a hybrid mixture.

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

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

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

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

1.2 Safety information for explosion protection

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

Observe the special documentation stated in field "S" of the type plate as well as instructions for equipment and attachments.

1.2.1 Field of use

- Gear units must be properly designed. Overloads may result in breakage of components. This may cause sparks. Carefully fill in the enquiry form. Getriebebau NORD GmbH & Co KG designs gear units according to the details in the enquiry form. Please note the information for gear unit selection in the enquiry form and in the catalogue.
- Explosion protection only applies for areas which correspond to the device category and the type of explosive atmosphere according to the labelling on the type plate. The type of gear unit and all technical data must comply with the planning details for the plant or machinery. If there are several operating points, the maximum drive power, torque or speed must not be exceeded in any operating point. The gear unit may only be operated in the installation position which complies with the version. Carefully check all details on the type plate before installing the gear unit.

- All work, e.g. transportation, storage, installation, electrical connection, commissioning, servicing and maintenance must be performed in a non-explosive atmosphere.

1.2.2 Attachments and equipment

- For use with gear units with device category 2D the motor must have at least protection class IP6x.
- Getriebebau NORD GmbH & Co KG can calculate the required cooling power if lubricant cooling is necessary. Gear units with a cooling coil must not be commissioned without lubricant cooling. The function of the lubricant cooling must be monitored with a resistance thermometer (PT100). The drive must be shut down if the permissible temperature is exceeded. Check for leaks at regular intervals.
- Equipment attached to the gear unit such as couplings, pulleys, cooling systems, pumps, sensors etc., as well as drive motors must also be suitable for use in the zone with an explosive atmosphere. The ATEX labelling must conform to the details of the system and/or machine design.

1.2.3 Lubricants

- Oil mist may ignite inside the gear unit if unsuitable oils are used. The function of the back stop may be impaired, resulting in increased temperatures and sparks. Therefore only use oils which correspond with the details on the type plate. Recommended lubricants can be found in the appendix to these operating and installation instructions.

1.2.4 Operating conditions

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

1.2.5 Radial and axial forces

Drive and driven elements may only be subjected to the maximum permitted radial and lateral forces F_{R1} and F_{R2} and axial forces F_{A1} and F_{A2} indicated on the rating plate (see Section (please see chapter 2.2 "Name plate" on page 22)).

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

1.2.6 Assembly and installation

- Incorrect installation results in stresses and impermissibly high loads. This causes increased surface temperatures. Note the installation and assembly instructions in these operating and installation instructions.
- Before commissioning, carry out all of the checks which are prescribed in these operating and maintenance instructions in order to detect faults which could increase the risk of explosion in good time. Do not commission the gear unit if abnormalities are found during the checks. Contact Getriebebau NORD.

- For gear units with temperature class T4 or with a maximum surface temperature of less than 200 °C, carry out a measurement of the surface temperature of the gear unit before commissioning. Take the gear unit out of service if the measured surface temperature is too high.
- The gear unit housing must be earthed in order to prevent electrostatic charging.
- Defective lubrication causes temperature increases and sparks. Check the oil level before commissioning.

1.2.7 Inspection and maintenance

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

1.2.8 Protection against electrostatic charging

- Non-conducting coatings, or low pressure hoses may become electrostatically charged. Sparks may be produced on discharge. Such components must not be used in areas in which processes that cause charging are to be expected. Oil expansion tanks may only be located in areas with maximum gas group IIB.
- Gear units with a coating thickness in excess of 0.2 mm may only be used in areas in which processes that cause charging are not to be expected.
- The painting of the gear unit is designed for Category 2G Group IIB (Zone 1 Group IIB). For use in Category 2G Group IIC (Zone 1 Group IIC) the gear unit must not be used or installed in areas in which processes which cause electrostatic charging are to be expected.
- In case of subsequent painting it must be ensured that the paint has the same characteristics as the original paint.
- To prevent electrostatic charging, surfaces may only be cleaned with a damp cloth.

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

The following ignition protection types are used:

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

1.4 Do not make any modifications.

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

1.5 Performing inspection and maintenance work

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

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

1.6 Personnel qualification

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

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

1.7 Safety for particular activities

1.7.1 Check for transport damage

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

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

1.7.2 Safety information for installation and maintenance

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

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

1.8 Hazards

1.8.1 Hazards when lifting

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

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

1.8.2 Hazards due to rotating parts

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

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

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

1.8.3 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.

1.8.4 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.

1.8.5 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.

1.8.6 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.

1.8.7 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.

1.9 Explanation of markings

DANGER

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE!

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

Information

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

2 Description of gear units

2.1 Type designations and gear unit types

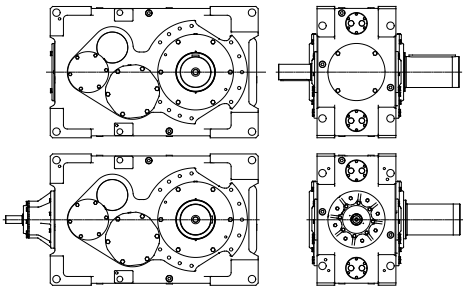
Gear unit types / Type designations					
Helical in-line gear units		Helical bevel gear units			
2-stage	3-stage	2-stage	3-stage	4-stage	
SK 5207	SK 5307	SK 5217	SK 5407	SK 5507	
SK 6207	SK 6307	SK 6217	SK 6407	SK 6507	
SK 7207	SK 7307	SK 7217	SK 7407	SK 7507	
SK 8207	SK 8307	SK 8217	SK 8407	SK 8507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

Table 2: Type designations and gear unit types

Double gear units consist of two single gear units.

SK 5207 - SK 15507 and SK 5217 – SK 11217 gear units should be treated according to these instructions. The operating and assembly manual B 2000 should be used for attached gear units.

Type designation for double gear units: e. g. SK 13307 /7282 (consisting of single gear units SK 13307 and SK 7282).

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

Versions / Options									
Abbreviation	**Description**	Details on type plate	See Chapter 3.	See Chapter 4.	**Abbreviation**	**Description**	Details on type plate	See Chapter 3.	See Chapter 4.
A	Hollow shaft version	x	x		**…T**	with hydrodynamic coupling		x	
B	Fastening element	x	x		**MS…**	Motor swing base	x	x	
CC	Cooling coil	x	x	x	**…K**	with elastic coupling		x	
CS1 X	Cooling system oil / water	x	x	x	**…T**	with hydrodynamic coupling		x	
CS2 X	Cooling system oil / air	x	x	x	**MT**	Motor mount	x	x	
D	Torque support	x	x		**NEMA**	Standard NEMA motor attachment		x	
EA	Splined hollow output shaft	x	x		**OH**	Oil heater**3)**		x	
ED2)	Elastic torque arm		x		**OT**	Oil level tank		x	
EV	Splined solid output shaft	x			**PT100**	Temperature sensor			x
EW	Splined drive shaft				**R**	Backstop	x		x
F	Block flange	x	x		**S**	Shrink disc	x	x	
FAN	Fan			x	**V**	Solid output shaft	x		
FK	Collar flange		x		**VL**	Reinforced bearings	x		
F1	Drive flange	x			**VL2**	Agitator version - Reinforced bearings	x	x	
H/H66	Cover cap as contact guard	x	x		**VL3**	Agitator version - Reinforced bearings - Drywell	x	x	
IEC	Standard IEC motor mounting	x			**VL43)**	Agitator version - Reinforced bearings - True Drywell	x	x	
KL2	Agitator version - Standard bearings	x	x		**VL63)**	Agitator version - Reinforced bearings - True Drywell - Foot mounting	x	x	
KL3	Agitator version - Standard bearings - Drywell	x	x		**VL53)**	Extruder flange version	x	x	
KL43)	Agitator version - Standard bearings - True Drywell	x	x		**W**	One free drive shaft journal			
KL63)	Agitator version - Standard bearings - True Drywell - Foot mounting	x	x	x	**W2**	Two free drive shaft journals			
L	Solid output shaft on both sides	x			**W3**	Three free drive shaft journals			
LC/ LCX1) 3)	Lubricant circulation	x	x	x	**WX3)**	Auxiliary drive unit		x	
MF…	Motor base frame	x	x		**DRY3)**				
…K	with elastic coupling		x						

[1] With pressure monitor | [2] Also only stated with D on the type plate | [3] Only for ATEX 3G/3D

Table 3: Versions and options

Certain versions / options can only be used for particular gear unit sizes or configurations.

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

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.

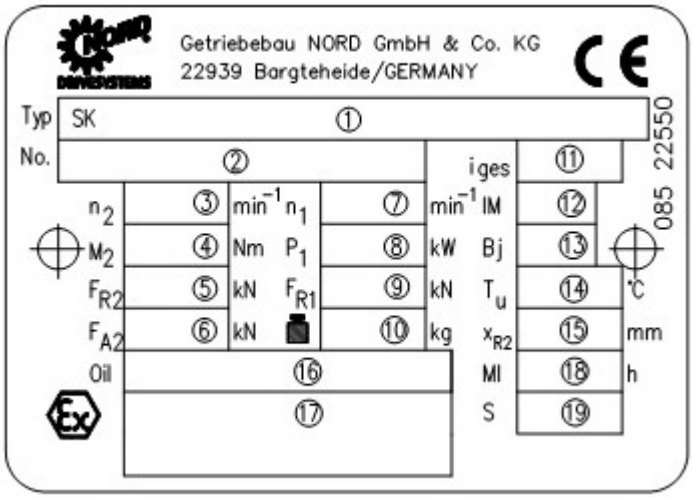


Figure 2: Name plate (example)

Explanation of the name plate				
No.	**Abbreviation**	**Unit**	**Designation**	**See section**
1	Type SK	-	NORD gear unit type	2.1 "Type designations and gear unit types"
2	No.	-	Serial number	
3	n_2	rpm	Rated speed of gear unit output shaft*	
4	M_2	Nm	Max. permissible gear unit output shaft torque	
5	FR2	kN	Max. permissible transverse force on the gear unit output shaft	1.2.5 "Radial and axial forces"
6	FA2	kN	Max. permissible axial force on the gear unit output shaft	1.2.5 "Radial and axial forces"
7	n_1	rpm	Rated speed of the gear unit drive shaft or drive motor *	
8	P_1	kW	Max. permissible drive power or motor power	
9	FR1	kN	Max. permissible transverse force on the gear unit drive shaft for option W	1.2.5 "Radial and axial forces"
10		kg	Total weight	1.2.5 "Radial and axial forces"
11	i_{ges}	-	Overall gear unit ratio	
12	IM	-	Version (installation orientation)	7.2 "Installation orientation"
13	Bj	-	Year of manufacture	
14	Tu	°C	Permissible ambient temperature range for the gear unit	
15	xR2	mm	Max. dimension for the point of application of the transverse force FR2	1.2.5 "Radial and axial forces"
16	Oil	-	Type of gear oil (standard designation) and gear oil volume	7.3 "Lubricants"

Explanation of the name plate				
No.	**Abbreviation**	**Unit**	**Designation**	**See section**
17		-	Ex labelling, suffix "X" indicates special documentation Labelling as per ATEX (DIN EN ISO 80079-36): 1. Group (always II, not for mines) 2. Category (2G, 3G for gas or 2D, 3D for dust) 2. Labelling of non-electrical devices (Ex h) or ignition protection type if fitted (c) 4. Explosion group if present (Gas: IIC, IIB; Dust: IIIC, IIIB) 5. Temperature class (T1-T3 or T4 for gas) or max. surface temperature (e.g. 125 °C for dust) or special max. surface temperature, see indication of the temperature range on the name plate or in the special documentation 6. EPL (equipment protection level) Gb, Db, Gc, Dc 7. Note the special documentation and/or temperature measurement during commissioning (X)	
18	MI	h	Interval between general overhauls in operating hours. This corresponds to 90 % of the nominal service life	5.2.16 "General overhaul "
19	S	-	Number of the special documentation, consisting of serial no. / year	
* The maximum permissible speeds are 10% above the rated speed if the maximum permissible drive power P1 is not exceeded.				
The forces are zero if the fields FR1, FR2 and FA2 are empty. If the field xR2 is empty, the point of application of force FR2 is central on the driven shaft journal.				

Table 4: Explanation of name plate

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

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

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

2.3 Additional type plate for EAWU

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

Table 5: EAC Ex / CE Ex labelling

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

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

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

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

Figure 3: Additional type plates for EAC Ex

3 Assembly instructions, storage, preparation, installation

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

3.1 Transporting the gear unit

⚠ WARNING

Hazard due to falling loads

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

Check the lifting gear before use.

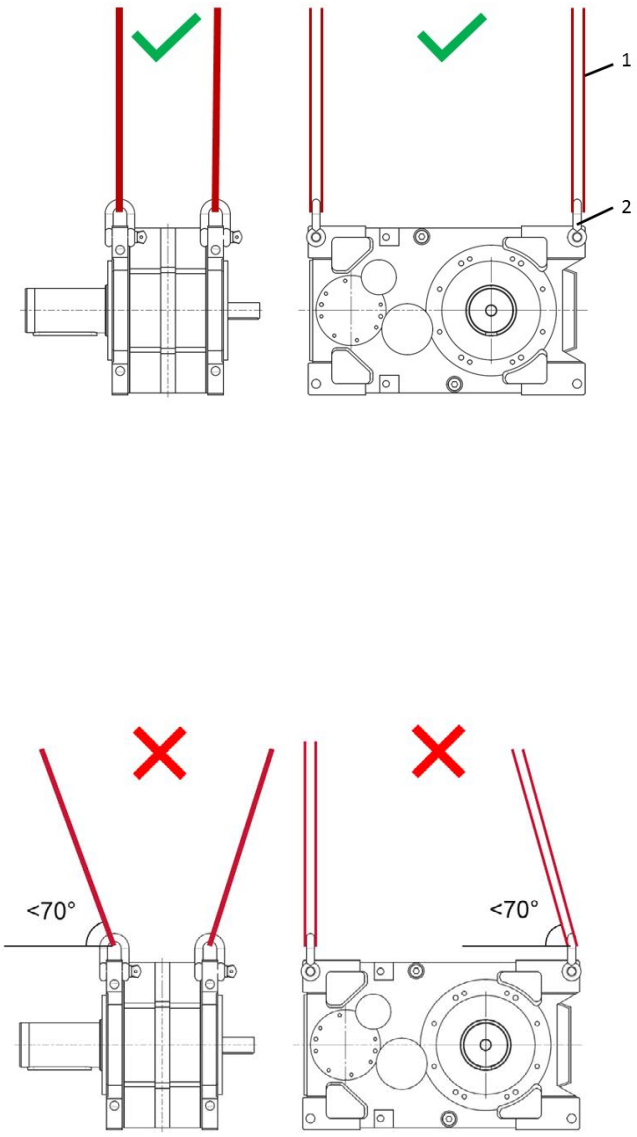
If possible, transport the gear unit in the installation orientation. Diagonal pulling is not permissible.

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

Gear units may only be transported with shackles, lifting straps or chains at an angle of **90° to 70°** to the horizontal.

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

3.1.1 Transport of standard gear units



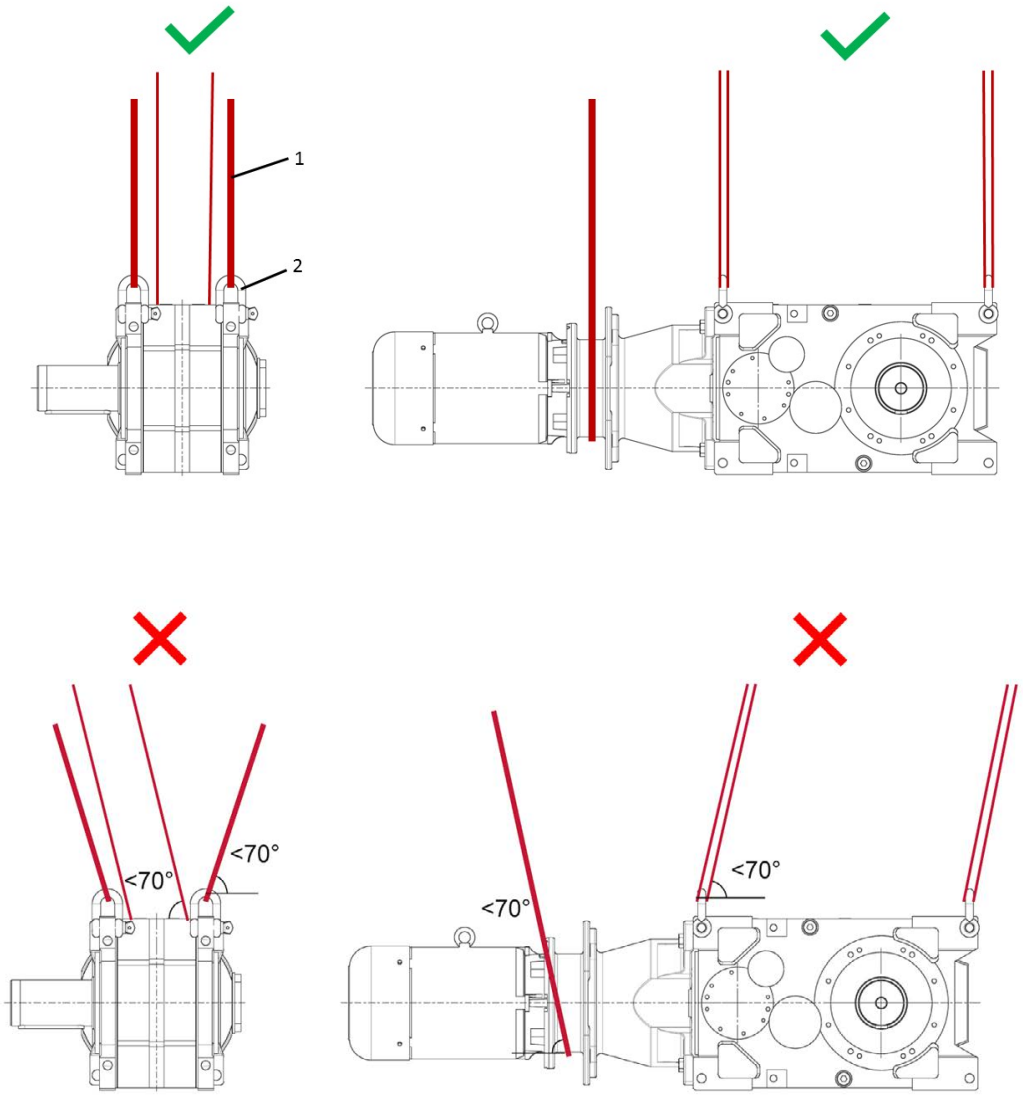
Legend

1: Lifting strap
2: Shackle
✕: Not permissible
✓: Permissible

Figure 4: 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.



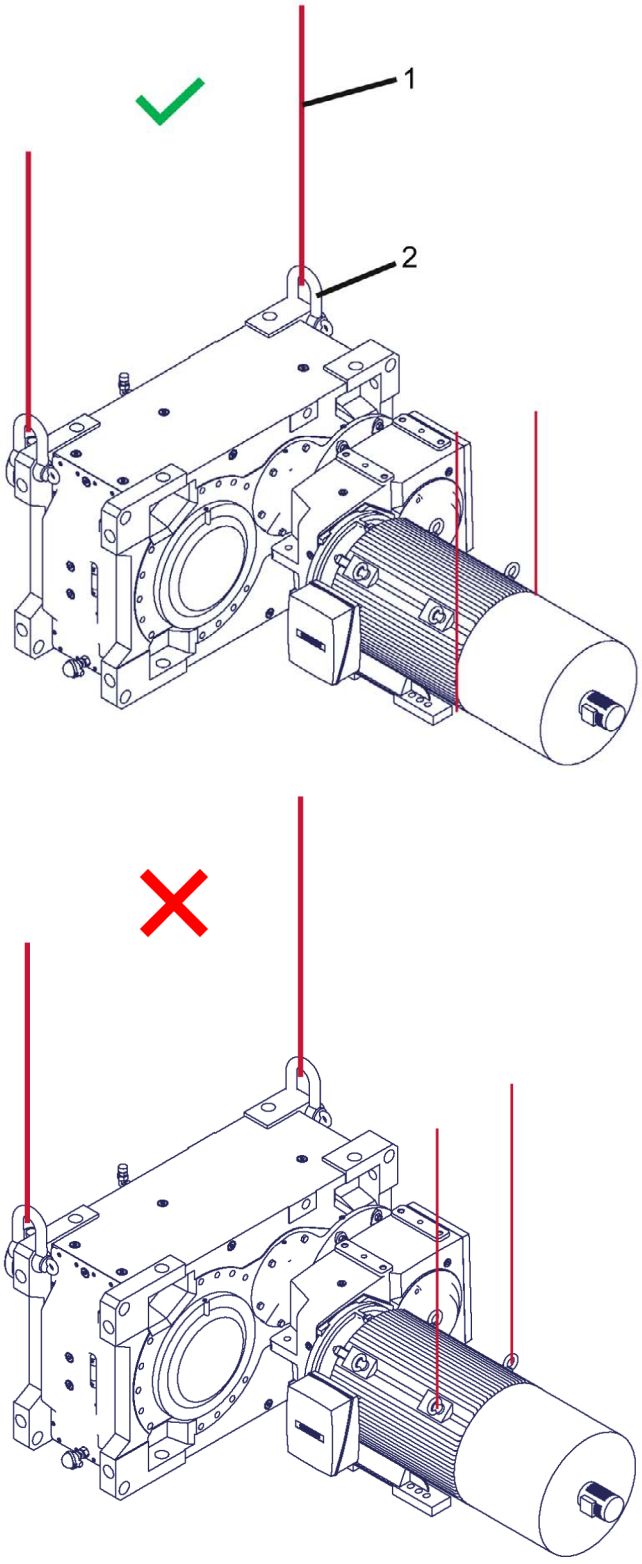
Legend

1: Lifting strap
2: Shackle
✕: Not permissible
✓: Permissible

Figure 5: 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 ring bolts on the auxiliary drive or first stage gear unit must **not** be used for transportation.



Legend

1: Lifting strap
2: Shackle
✕: Not permissible
✓: Permissible

Figure 6: Transport of gear units with auxiliary drives or first stage gear units

3.1.4 Transport of agitator version gear units

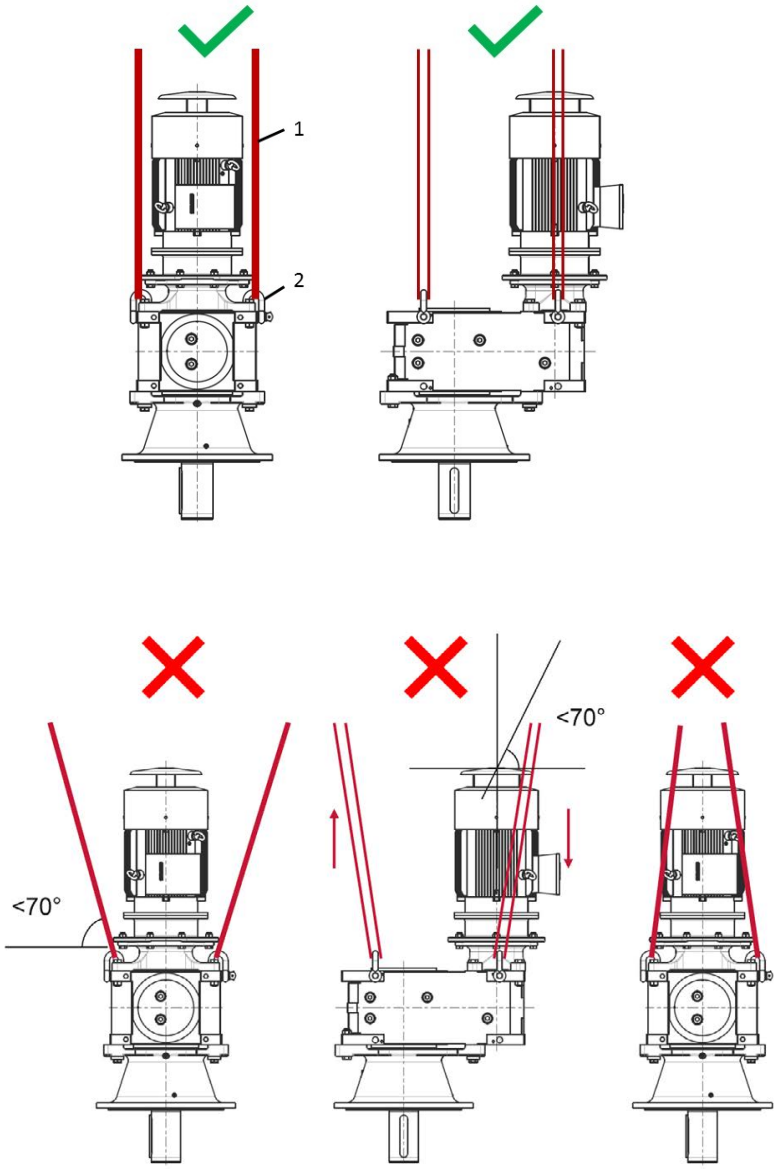
The ring bolts on the motor must **not** be used for transportation.

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.



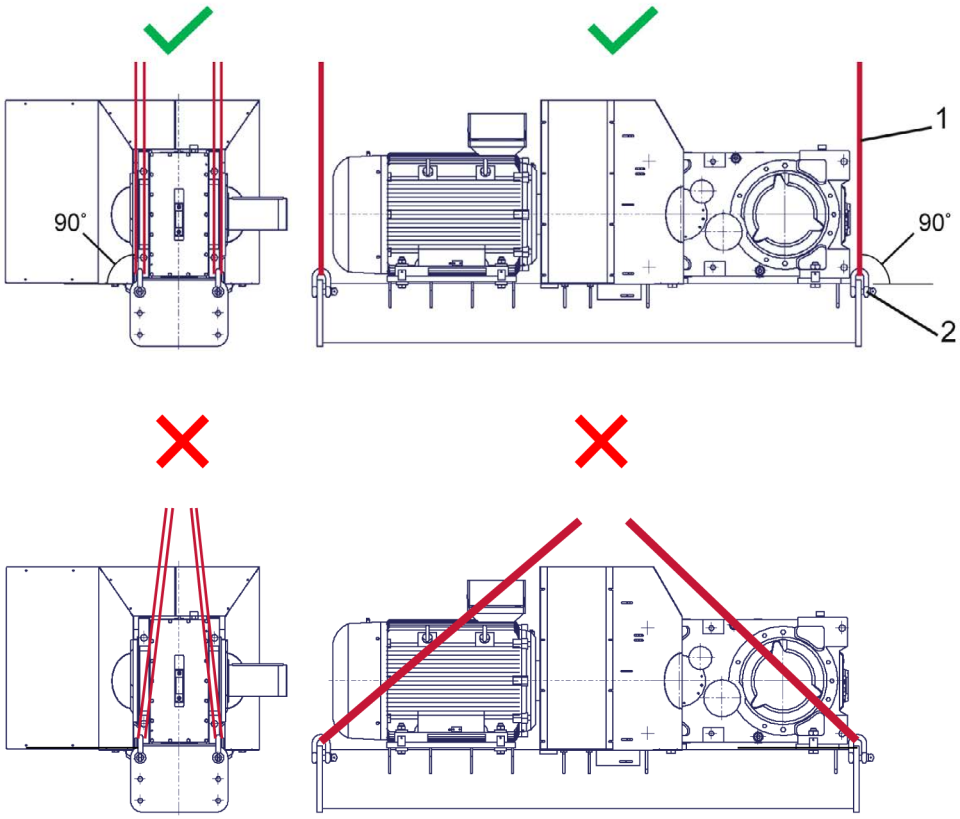
Legend

1: Lifting strap
2: Shackle
✕: Not permissible
✓: Permissible

Figure 7: Transport of agitator version gear units

3.1.5 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 or chains which are vertically aligned. Only use the attachment points on the motor swing base or 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

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

- Store gear units in the fitting position ((please see chapter 7.2 "Installation orientation")) and secure them against falling,
- Lightly oil bare metal housing surfaces and shafts
- Store in a dry place,
- Temperature in the range from – 5 °C to + 50 °C without large fluctuations,
- Relative humidity less than 60 %,
- No direct exposure to sunlight or UV light,
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity,
- No vibration or oscillation

3.3 Long-term storage

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

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

- Store in the installation position (please see chapter 7.2 "Installation orientation")and secure the gear unit against falling.
- Transportation damage to the external paint must be repaired. Check that a suitable rust inhibitor is applied to the flange bearing surfaces. If necessary apply a suitable rust inhibitor to the surfaces.
- Gear units with the long-term storage option are completely filled with lubricant or have VCI corrosion protection agent mixed with the gear oil (see adhesive label on the gear unit, or are not filled with oil, but rather with small quantities of VCI concentrate. Getriebebau NORD recommends that the VCI concentrate is renewed after 2 years and that the oil is distributed by rotating the drive shaft.
- The sealing cord in the vent screw must not be removed during storage and the gear unit must be tightly sealed.
- Store in a dry place.
- In tropical regions the drive unit must be protected against damage by insects.
- Temperature in the range from - 5 °C to + 40 °C without large fluctuations.
- Relative humidity less than 60 %.
- No direct exposure to sunlight or UV light.
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity.
- No vibration or oscillation

Measures during storage or standstill periods

- 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).
- For gear units with circulation lubrication (Option: LC, LCX) the pump must be started every 3 months if possible. 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 type plate.
- If the relative humidity is < 50 % the gear unit can be stored for up to 3 years.

Measures before commissioning

- Inspect the gear unit before commissioning.

- If the storage or standstill period exceeds 2 years or the temperature during short-term storage has greatly deviated from the standard range, the lubricant in the gear unit must be replaced before commissioning.
- The bearing grease (Option: VL/KL2 bis VL6/KL6) must be renewed or replaced after a storage time of more than 2 years. The operating life of the grease reduces for storage periods of less than one year.
- If the gear unit is completely filled, the oil level must be reduced before commissioning.
- For gear units without oil filling, the oil level for the version must be filled before commissioning. The VCI concentrate may remain in the gear unit. Lubricant quantities and types must be filled according to the details on the type plate.

3.4 Checking the version

The gear unit may only be operated in the stated version. The permissible version is stated in the field IM on the type plate. Gear units with the abbreviation UN in field IM of the type plate are version-independent. Section 7.2 "Installation orientation" shows the versions of the individual gear unit types. If an X is present in the field IM, the special documentation, whose number is stated in field S, must be observed.

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

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

3.5 Preparing for installation

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

All bare metal surfaces and shafts of the geared motor are protected against corrosion with oil, grease or corrosion protection agents before shipping.

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

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

Gears with integrated back stops are marked with arrows on the drive/driven sides. The arrows point in the rotation direction of the gear unit. When connecting the motor and during motor control, it must be ensured that the gear unit can only operate in the direction of rotation.

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

Oil level tanks (Option: OT) are 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.

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.

If possible, the shaft sealing rings or the gear unit should be protected from exposure to direct sunlight.

3.6 Installing the gear unit

DANGER

Explosion hazard

- No explosive atmosphere must be present when installing the gear unit.

No additional loads must be attached to the gear unit. If a motor is mounted, an eye bolt on the motor must not be used for lifting (please see chapter 1 "Safety information").

All bolts must be used to fasten the gear unit.

Pay attention to the following items in order to prevent overheating:

- Ensure a free flow of air to all sides of the gear unit.
- Ensure that there is a free space of 30° around fan intakes.
- With geared motors, the cooling air of the motor fan must be able to flow against the gear unit without obstruction.
- Do not enclose or encase the gear unit.
- Do not subject the gear unit 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 gear unit must be precisely aligned with the drive shaft of the machine in order to prevent additional forces from being imposed on the gear unit due to distortion.

Information

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. In this context, refer to the special Operating Manuals regarding the requirements for the coupling, for example.

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 appropriate precision (please 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, appropriate recesses must be provided in the base. Tensioning bars must be cast into the concrete base in their aligned state.

Bolts with a minimum quality of 8.8 must be used to fasten the gear unit. The bolts must be tightened to the correct torques (please see chapter 7.4 "Screw tightening torques").

The tolerances of the shaft ends and the flange connections should be obtained from the specific dimension sheet for the order.

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

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

3.7 Hub installation on solid shafts (Option: V, L)

DANGER

Danger of explosion due to increased temperature

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

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

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

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

NOTICE

The gear unit may be damaged by axial forces.

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

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

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 (specific drawing for the order). If no details are stated, align the coupling flush with the end of the motor shaft.

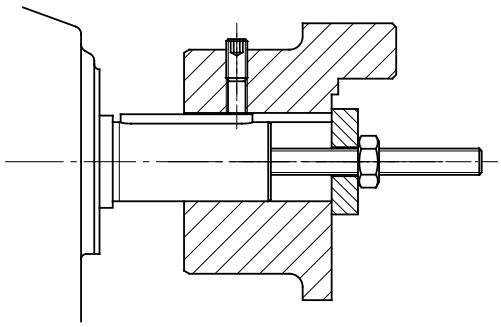
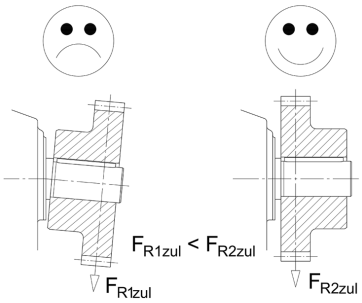


Figure 9: Example of a simple pulling device

The maximum radial forces F_{R1} and F_{R2} and axial forces F_{A1} and F_{A2} which are imposed on the driving and driven elements of the gear unit must not be exceeded (refer to the type plate). Observe the correct tension, particularly on belts and chains.

Additional loads due to unbalanced hubs are not permitted.



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

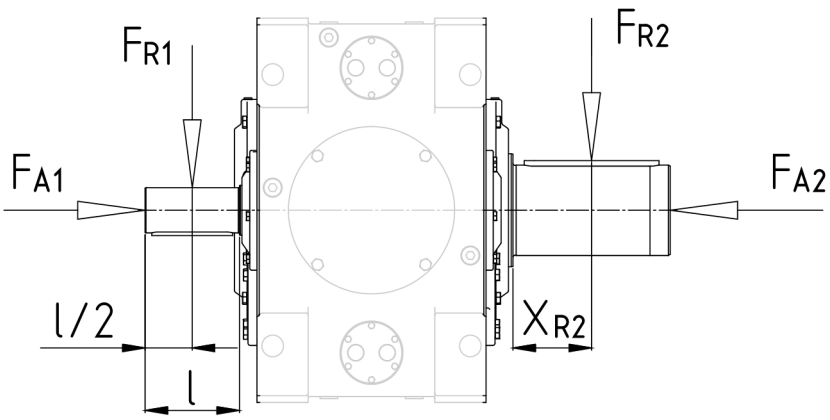


Figure 10: Permissible application of force to drive and driven shafts

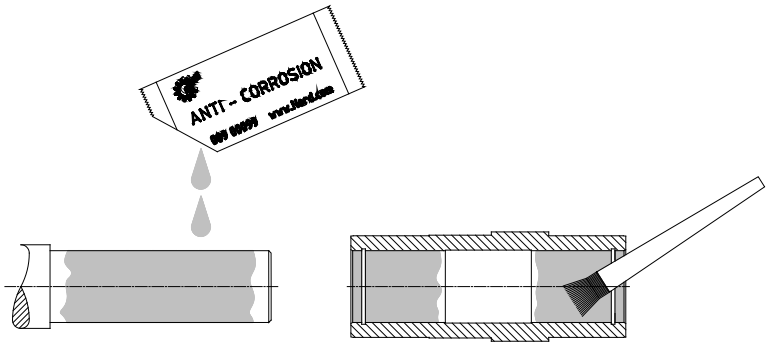
3.8 Gear unit with hollow shaft (Option: A, EA)

NOTICE

Risk of damage to bearings, gear wheels, shafts or housing

- The hollow shaft of the gear unit unit must be fitted onto the solid shaft of the machine using a suitable puller which will not exert damaging axial forces on the gear unit. In particular, do not hit the gear unit with a hammer.
- Before installation, check the hollow shaft and the machine shaft for damaged seats and edges. Damage of any kind is impermissible and must be remedied before starting installation.
- Before and during pulling, the hollow shaft must be precisely aligned with the machine shaft and must not be tilted.

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



Please note:

Not for gear units with shrink discs (please see chapter 3.8.2 "Hollow shaft with shrink disc element (Option: S)")**!**

Figure 11: Applying lubricant to the shaft and the hub

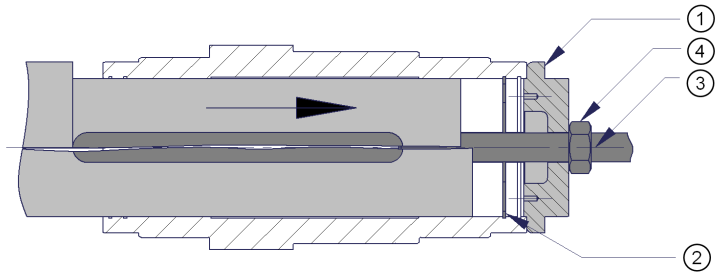
The required length of the parallel key of the solid shaft of the machine must be appropriately designed by the customer in order to ensure safe transmission of forces.

If splines are used (Option: EA) to transmit the forces, it must be ensured that the splines on the solid shaft of the machine are of the correct size and tolerances.

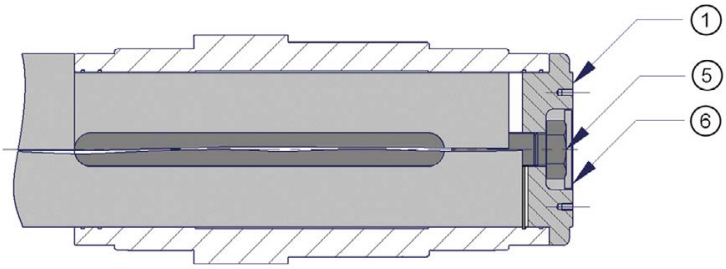
3.8.1 Hollow shaft with fastening element (Option: B)

The gear unit can be fitted to solid shafts with and without a shoulder using the fastening element. The screw of the fastening element must be tightened with the appropriate torque (please see chapter 7.4 "Screw tightening torques").

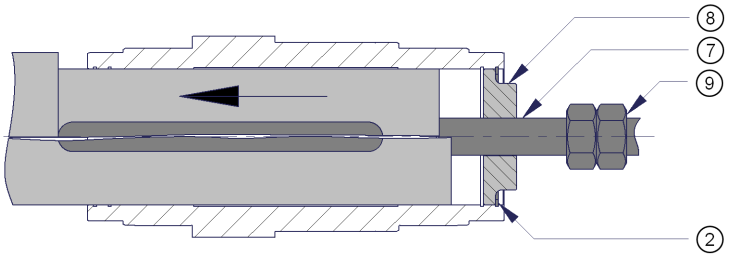
Installation



Securing



Dismantling



Legend

1: Fastening element
2: Circlip
3: Threaded rod
4: Threaded nut
5: Securing screw
6: Sealing cap
7: Threaded rod
8: Disassembly element
9: Threaded nut

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, 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, 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 in contact with the circlip (2).

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 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.

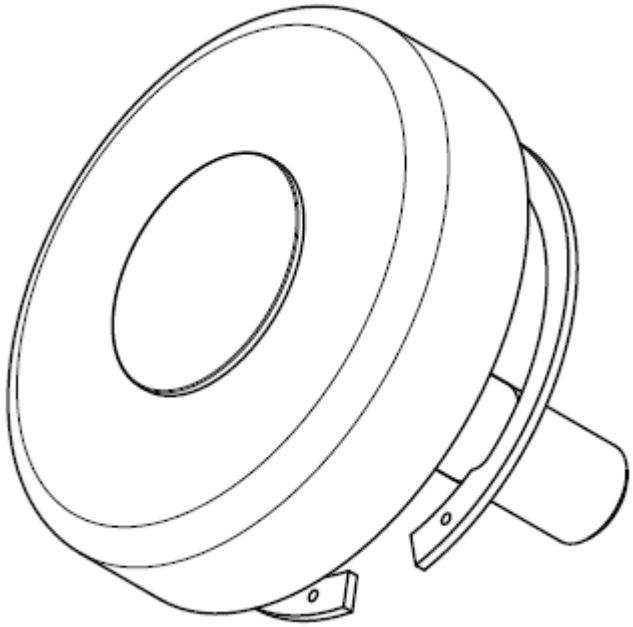


Figure 13: Fastening element (example)

3.8.2 Hollow shaft with shrink disc element (Option: S)

NOTICE

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

- To avoid tension or rubbing between the hollow shaft and the shoulder, hollow shafts with shrink discs must not be mounted on solid machine shafts with shoulders.
- If the tensioning bolts of the shrink disc are tightened without the solid shaft inserted, the hollow shaft may be permanently deformed. Do not tighten the bolts if the solid shaft is not inserted!
- When re-assembling the shrink disc, the thread and head surfaces of the tensioning bolts must be treated with grease which does not contain Molycote.
- The separate manufacturer’s documentation for the shrink disc must be observed for installation.

Unless otherwise stated in the specific dimension sheet for the order, the external diameter of the customer's shaft must have a fit of 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.

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

Information

Protect hollow shafts with shrink discs from dust, dirt and moisture. Option H/H66 (please see chapter 3.13 "Cover cap air baffle (Option: H, H66, FAN, MF.., MS…)")is recommended.

Standard fitting procedure for 2-part shrink discs:

1. Remove the cover if present

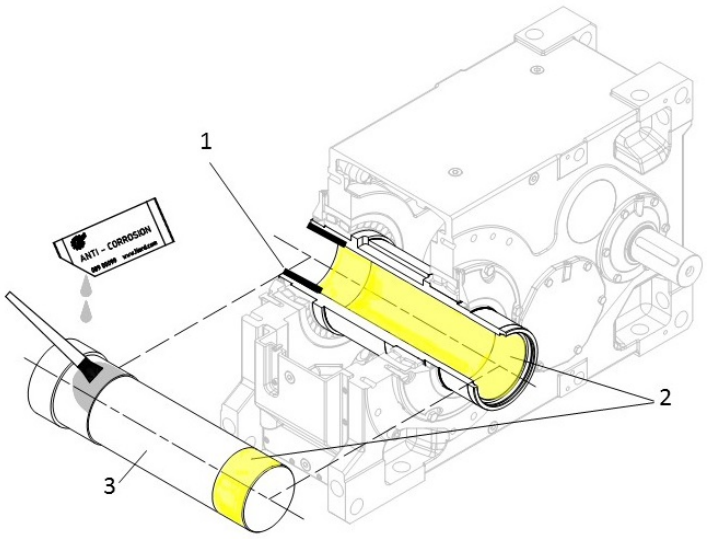
2. Loosen the tensioning bolts of the shrink disc but do not remove them. Tighten them gently by hand until there is no play between the flanges and the inner ring.

3. Push on the shrink disc up to the specified position (refer to the specific dimension sheet for the order).

4. The solid shaft of the machine must be completely de-greased prior to assembly.

   a. Do not apply grease to standard hollow machine shafts.

   b. In the case of special hollow shafts with a bronze bushing, the solid shaft of the machine must be greased in the area which will later come into contact with the bushing in the hollow shaft of the gear unit (Figure 14). It is essential that the tensioning seat of the hollow shaft is free of grease.



Legend

Free of grease in this area
1: Bronze bushing
2: Shrink connection area
3: Solid shaft of machine

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

5. The hollow shaft of the gear unit and its bushing must be completely de-greased in order to avoid accidental greasing in the area of the shrink connection.

6. Insert the solid shaft of the machine into the hollow shaft so that the area around the shrink connection is completely filled.

7. Evenly tighten the tensioning bolts of the shrink disc **in sequence** in the clockwise direction in several stages.

8. 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).

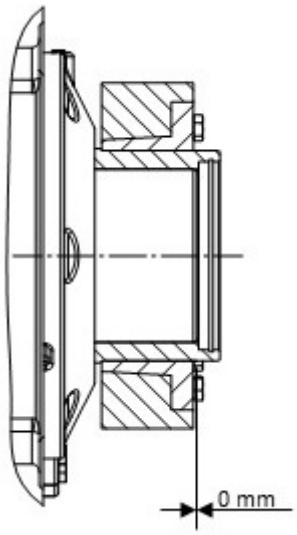


Figure 15: Fitted shrink disc

9. The hollow shaft of the gear unit and the solid shaft of the machine should be marked in order to detect any slippage under load.

Standard disassembly procedure:

1. Evenly loosen the tensioning bolts of the shrink disc **in sequence** in the clockwise direction in several stages. 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. For this, screw as many tensioning bolts as are necessary into the push-off threads evenly until the external ring separates from the internal ring.

3. The gear unit is removed from the solid shaft of the machine by pushing against the hollow shaft.

If a shrink disk has been in use for a long period or is dirty, it must be dismantled, cleaned and the conical surfaces coated with Molykote G Rapid Plus or a similar lubricant before it is refitted. The threads and head surfaces of the screws must be treated with grease without Molykote. Any damaged or corroded elements must be replaced.

3.9 Flange version gear units (option: F, FK, VL2/3/4/5, KL2/3/4)

NOTICE!

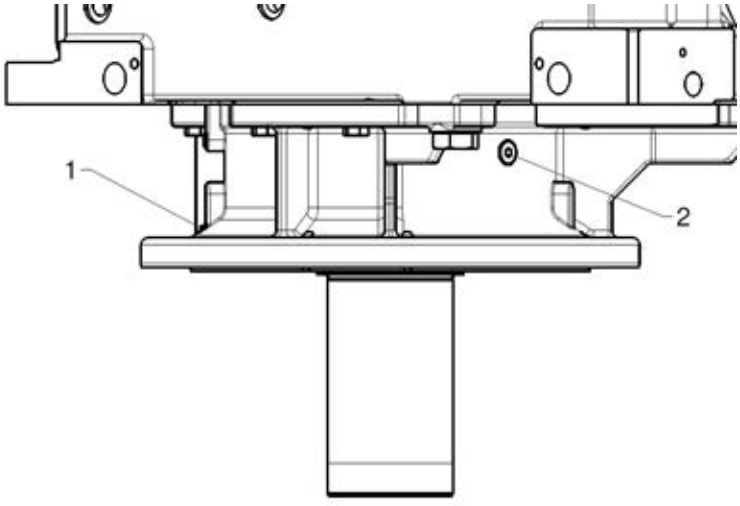
Risk of gear unit damage from distortion

- 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 bolting surfaces of both flanges must be clean.

The diameter of the hole circle and the size of the threaded holes on the flange of the gear unit must be obtained from the specific dimension sheet for the order.

3.9.1 Option VL2/KL2

This option provides reinforced drive shaft bearings with a greater bearing spacing. The bottom bearing is an oversized, double-row floating roller bearing (Option VL2) or a conical roller bearing (Option KL2) which can withstand high radial and axial forces for a longer operating life. Option VL2/KL2 includes a lubricating nipple for the bottom bearing as well as a closing cap, through which excess grease can escape from the grease chamber.



Legend

1: Grease nipple
2: Closing cap for grease escape

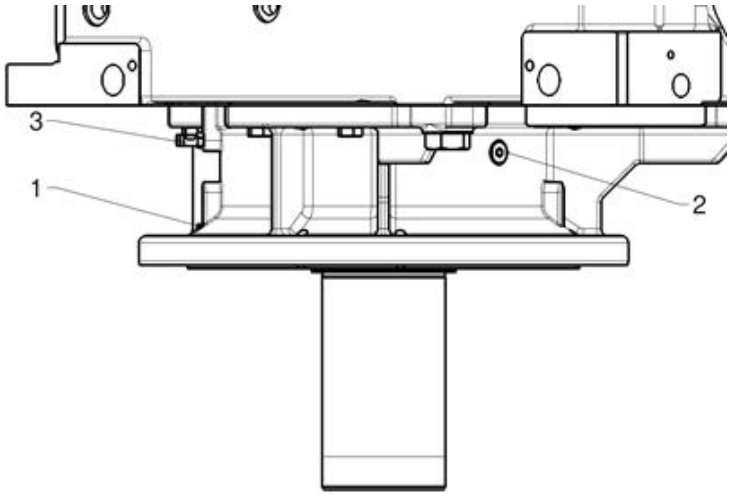
Figure 16: VL2 option

3.9.2 Option VL3/KL3 (with Drywell)

This option has the same dimensions and load limits as 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 and additional seal to the atmosphere below the bottom bearing. This design is known as Drywell and enables detection of leaks before oil escapes from the gear unit.

Because of this, the bottom bearing is lubricated with grease. A small “leak indicator” oil level glass is installed in this area to detect any possible leakage.



Legend

1: Grease nipple
2: Closing cap for grease escape
3: Leak indicator

Figure 17: Option VL3/KL3 and VL4/KL4

NOTICE

The output bearings in the Drywell flange are sufficiently filled with grease as delivered, however, they must be re-lubricated at regular intervals (see maintenance table).

NOTICE

Check the oil level glass for leaks at regular intervals (see maintenance table). Contact NORD Service if there is any oil in the oil level glass.

3.9.3 Option VL4/KL4 (with True Drywell)

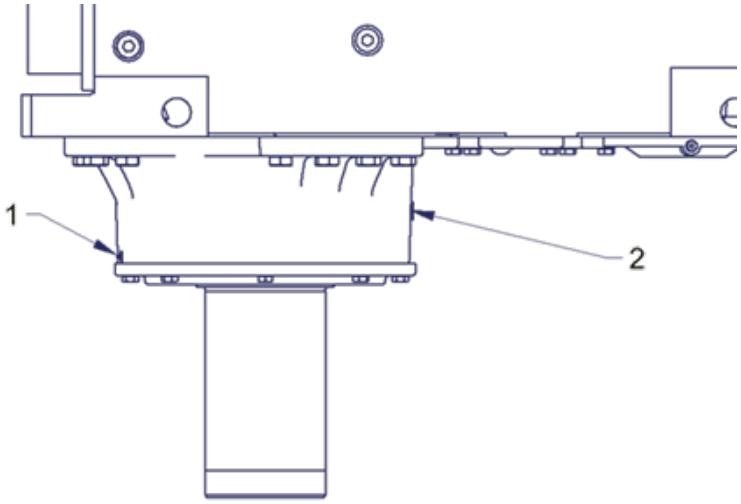
In contrast to Option VL3, Option VL4 with True Drywell (please see chapter 3.10 "True Drywell version gear units (Option: VL4, KL4, VL6, KL6, DRY)") is equipped with additional protection against leaks. The risk of leakage is reduced by means of an oil level tube with an additional V-ring seal and several O-rings. In addition, the necessary reduction of the oil fill level minimises losses due to splashing.

3.9.4 VL5 option

The extruder flange version (Option VL5) 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.

3.9.5 Option VL6/KL6

This option includes the entire internal elements of Option VL4/KL4, but is installed in a bolt-on housing without a flange.



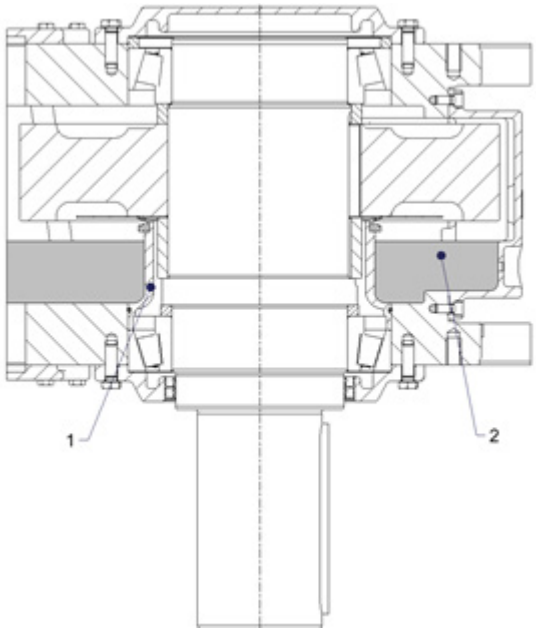
Legend

1: Grease nipple
2: Closing cap for grease escape

Figure 18: Option VL6/KL6

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

With the True Drywell or DRY versions the oil level in the gear unit is reduced and the output shaft bearing is separated from the oil bath by an oil level tube. This output shaft bearing is lubricated with grease. The remaining roller bearings and gears are lubricated with pressurised circulating lubrication (motor or flange pump).



Legend

1: Oil level tube
2: Oil level

Figure 19: Schematic diagram (Option: DRY)

NOTICE

The grease-lubricated drive bearing is sufficiently filled with grease as delivered, however, it must be re-lubricated at regular intervals (see maintenance table).

NOTICE

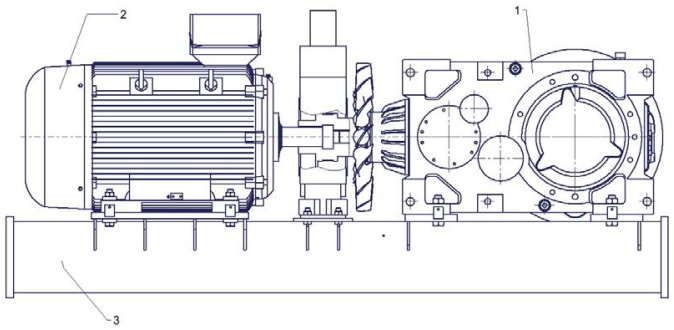
The grease-lubricated drive bearings are protected against oil by the oil level tube. Too much oil may flood the oil level tube.

Information

Before performing installation, commissioning and modification work, the manufacturer's documentation must be read, understood and observed. Verification by NORD is urgently required for changes to the operating conditions (power, speed, changes to the drive or the driven machine).

3.11 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, also a mechanical brake, and includes the necessary protective devices (e.g. cover, Option H). The steel structure is supported by several fastening feet.



Legend

1: Gear unit
2: Motor
3: Foundation frame

Installation and assembly

⚠ WARNING

Hazards from rotating parts

There are moving parts (e.g. shafts) on the individual components of the drive package. These can rotate quickly and lead to injuries (e.g. crushing, strangling, etc.).

- Do not operate the drive without covers or hoods.
- Secure the drive against inadvertent switching on during installation work.
- Pay attention to the additional information contained in the operating and assembly instructions for third-party components.
- Pay attention to the job-specific information on brake and coupling components contained in the dimension sheet or the order confirmation.

NOTICE!

Risk of gear unit damage from faulty installation

Impermissible tension, distortion and poor stability can damage the gear unit and attached components.

- Use the right lashing points.
- Install the drive package on a horizontal and level surface.
- Ensure that foundation and torque arm are dimensioned adequately.
- Do not exceed the maximum permissible distortion of 0.1 mm at a distance of 1 m.
- Check and correct the alignment of mounted components (Pay attention to the manufacturers' documentation).
- Ensure a non-distorted alignment to the shaft of the connected machine.

Impermissible distortion and poor stability of the gear unit 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: The alignment and adjustment of these components must be checked and corrected 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.

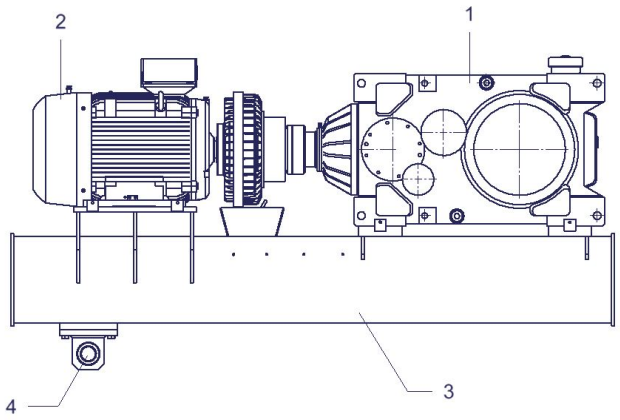
Pay attention to all the notes on installation and assembly contained in the present manual and also the separate operating and assembly instructions of all installed components (e.g. couplings or brakes).

Additional notes on the installation of the motor base frame

- Solid shaft with elastic output coupling, see section 3.7 "Hub installation on solid shafts (Option: V, L)"

3.12 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, also a mechanical brake, and it comes with the necessary protective devices (e.g. Cover, Option H). The steel structure is supported by the drive shaft and a torque arm.



Legend

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

Installation and assembly

⚠ WARNING

Hazards from rotating parts

There are moving parts (e.g. shafts) on the individual components of the drive package. These can rotate quickly and lead to injuries (e.g. crushing, strangling, etc.).

- Do not operate the drive without covers or hoods.
- Secure the drive against inadvertent switching on during installation work.
- Pay attention to the additional information contained in the operating and assembly instructions for third-party components.
- Pay attention to the job-specific information on brake and coupling components contained in the dimension sheet or the order confirmation.

NOTICE!

Risk of gear unit damage from faulty installation

Impermissible tension, distortion and poor stability can damage the gear unit and attached components.

- Use the right lashing points.
- Install the drive package on a horizontal and level surface.
- Ensure that foundation and torque arm are dimensioned adequately.
- Do not exceed the maximum permissible distortion of 0.1 mm at a distance of 1 m.
- Check and correct the alignment of mounted components (Pay attention to the manufacturers' documentation).
- Ensure a non-distorted alignment to the shaft of the connected machine.

Impermissible distortion and poor stability of the gear unit 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: The alignment and adjustment of these components must be checked and corrected 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.

Pay attention to all the notes on installation and assembly contained in the present manual and also the separate operating and assembly instructions of all installed components (e.g. couplings or brakes).

Additional notes on the installation of the motor swing base

- Push-on gear unit via hollow shaft (option A, EA), see section 3.8 "Gear unit with hollow shaft (Option: A, EA)"
- Solid shaft with flange coupling, see section 3.7 "Hub installation on solid shafts (Option: V, L)"
- Hollow shaft with fastening element (option B), see section 3.8.1 "Hollow shaft with fastening element (Option: B)"
- Hollow shaft with shrink disc (option S), see section 3.8.2 "Hollow shaft with shrink disc element (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.

3.13 Cover cap air baffle (Option: H, H66, FAN, MF.., MS…)

DANGER

Explosion hazard due to damaged and rubbing covers

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

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)

NOTICE

Risk of gear unit damage due to incorrect installation

- The fan must not make contact with the air baffle cowling.

Use all fastening screws for installation.

Secure the screws by moistening them with securing adhesive e.g. Loctite 242, Loxeal 54-03 before screwing them in.

Tighten the screws with the correct torque ((please see chapter 7.4 "Screw tightening torques")).

Information

- Keep the cover and air baffle free of dust.
- Remove dirt on the fan wheel, air baffle cowling and protective grill with a hard brush.

Never use a pressure washer to clean the covers, baffles and guide baffle.

3.14 Motor (Option: IEC, NEMA)

DANGER

Explosion hazard

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

WARNING

Risk of severe injuries from rapidly rotating parts

- Secure the drive against accidental start-up.

The maximum permitted motor weights and the dimension “X max" stated in the table below must not be exceeded when attaching the motor to an IEC or NEMA adapter:

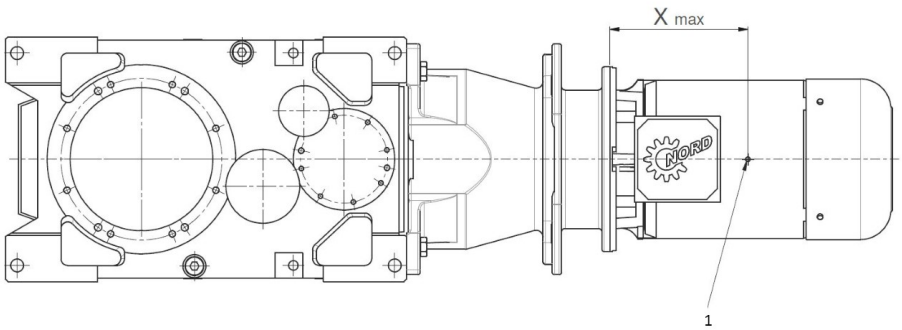
Maximum permitted IEC and NEMA motor weights								
IEC	**132**	**160**	**180**	**200**	**225**	**250**	**280**	**315**
NEMA	210T	250T	280T	324T	326T	365T		
Centre of gravity X max1) [mm]	200	259	300	330	370	408	465	615
Weight [kg]	100	200	250	350	500	700	1000	1500
[1] see Figure 20 for maximum permitted X dimension								

Table 6: IEC and NEMA motor weights

Maximum permitted Transnorm motor weights								
Transnorm	**315**	**355**						
Centre of gravity X max1) [mm]	615	615						
Weight [kg]	1500	1500						
[1)] see Figure 20 for maximum permitted X dimension								

Table 7: Transnorm motor weights

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



Legend

1: Centre of gravity of motor

Figure 20: Centre of gravity of motor

Installation of motors with standard dog couplings (Rotex®)

NOTICE!

Risk of damage to gear unit and motor from poor coupling alignment

- Also pay attention to the separate documentation for the coupling.
- The coupling must be positioned according to the installation instructions (specific drawing for the order). If no details are stated, the coupling must be aligned flush with the end of the motor shaft.

1. Clean the motor shaft and flange surfaces of the motor and adapter and check for damage. Check the attachment dimensions and tolerances of the motor and the adapter.

2. Push the coupling half onto the motor shaft so that the parallel key of the motor engages into the groove in the coupling half on mounting.

3. Pull the coupling halves onto the motor shaft according to the instructions of the motor manufacturer. The shaft end of the motor must be adjusted so that it is flush with the face of the coupling.

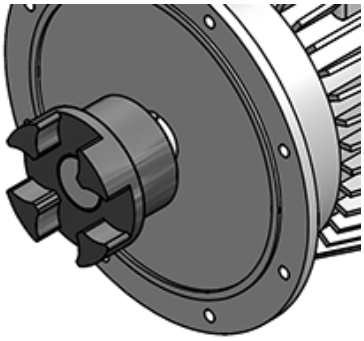


Figure 21: Fitting the coupling to the motor shaft

4. Secure the coupling half with the setscrew. The setscrew must be coated with a threadlocker (e. g. Loctite 242, Loxeal 54-03) and tightened to the correct torque (please see chapter 7.4 "Screw tightening torques").

5. Sealing of the flange surfaces of the motor and the adapter is recommended if the motor is installed outdoors or in a humid environment. Before the motor is installed, the flange surfaces must be completely coated with surface sealant (e.g. Loctite 574 or Loxeal 58-14) so that the flange seals after mounting.

6. Mount the motor on the adapter. Do not forget the ring gear.

7. Tighten the adapter bolts to the correct torque (please see chapter 7.4 "Screw tightening torques").

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

3.15 Drive coupling

NOTICE!

Risk of damage to gear unit and motor from poor coupling alignment

- Check the alignment of the coupling prior to commissioning. The coupling must be positioned according to the installation instructions (specific drawing for the order). If no details are stated, the coupling must be aligned flush with the end of the motor shaft.

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

3.15.1 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 3.14 "Motor (Option: IEC, NEMA)".

3.15.2 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.

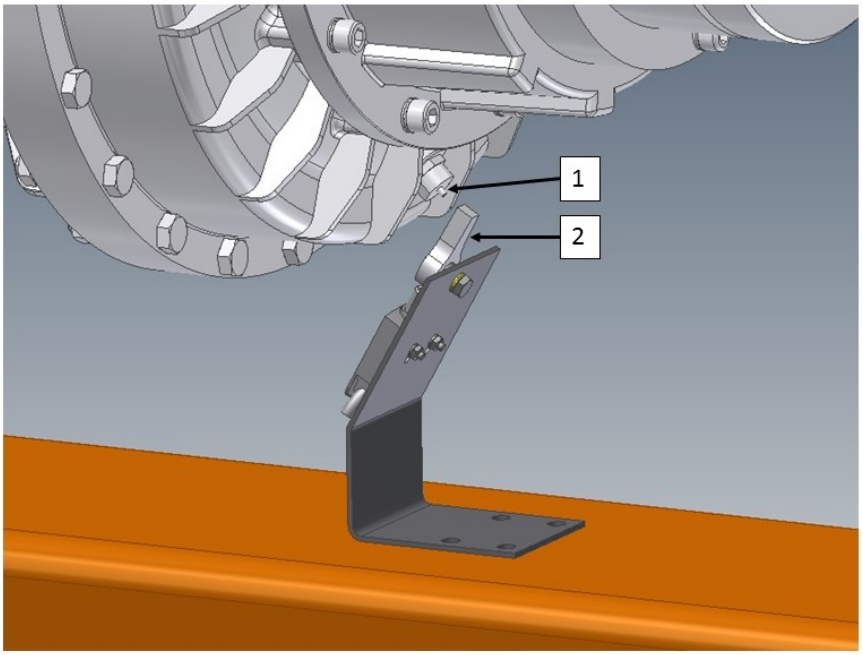
The coupling must be positioned according to the installation instructions (specific drawing for the order). If no details are stated, the coupling must be aligned flush with the end of the motor shaft.

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.

It is recommended that an oil tray is provided for the turbo coupling in order to catch escaping oil. The quantity of oil in the coupling can be obtained from the manufacturer's documentation.

Such 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.



Legend

1: Fusible plug
2: Mechanical switch

Figure 22: 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 the evaluation electronics by the operator.

Information

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

3.15.3 Dog coupling

Dog couplings require lubrication with grease to ensure wear-free function: Dog couplings must be re-greased according to the manufacturer's documentation prior to commissioning.

3.16 Output coupling

NOTICE!

Risk of damage to gear unit and motor from poor coupling alignment

- Check the alignment of the coupling prior to commissioning. The coupling must be positioned according to the installation instructions (specific drawing for the order). If no details are stated, the coupling must be aligned flush with the end of the motor shaft.

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

Output couplings which are supplied separately must be fitted and aligned according to the manufacturer's documentation.

3.17 Internal cooling system (Option: CC)

DANGER

Explosion hazard due to increased temperature

- The cooling system may only be operated in combination with a temperature monitoring device (PT100).
- The special ATEX documentation provided by NORD must be observed.

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

Risk of damage to the cooling coil

- The cooling coil must not be subjected to external forces.
- Do not twist the connections after assembly.
- Prevent vibrations from reaching the cooling coil during operation.
- 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

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

Information

Use of two cooling coils(Option: 2CC)

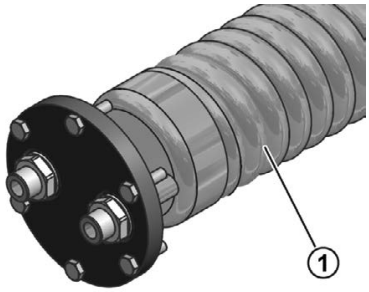
Make sure when using **two cooling coils** to **connect** them **in parallel** and not in series. This is the only way to ensure that sufficient cooling power is available.

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.

Remove the drain plug from the screw neck prior to assembly and flush the cooling coil to prevent any contamination of the cooling system. The screw necks should be connected with the coolant circuit, which must be provided by the operator. The flow direction of the coolant is irrelevant.

If a volume regulator is fitted upstream of the cooling coil, the connection is extended accordingly. The cooling water must be fed in via the volume regulator. Observe the operating instructions of the volume regulator.

Take into account the maximum flow volume of 5 l/min for SK 5..07 to SK 10..07 and 10 l/min for SK 11..07 to SK 15..07.



Legend

1: Cooling coil

Figure 23: Cooling cover with cooling coil fitted (schematic diagram)

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

DANGER

Explosion hazard

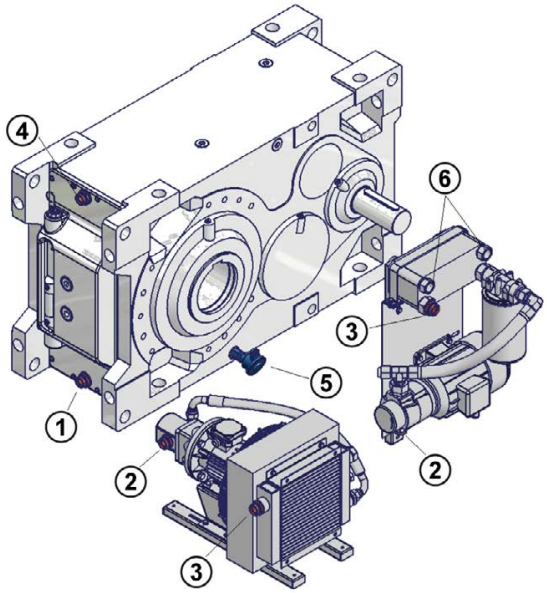
- For operation in explosion hazard atmospheres, only approved and labelled cooling systems may be used. The ATEX labelling must conform to the details of the system and/or machine design.
- The cooling unit may only be operated in combination with a temperature monitoring device (PT100).
- The special ATEX documentation provided by NORD must be observed.

Connect the cooling system as shown in Figure 24. In consultation with NORD, other connection points may be agreed. These must be obtained from the specific dimension sheet for the order.

Do not modify any of the pre-assembled hoses without having consulted NORD beforehand.

The maximum permissible ambient temperature for the operation of cooling systems is 40 °C. If higher ambient temperatures may occur, verification by NORD must be made before commissioning.

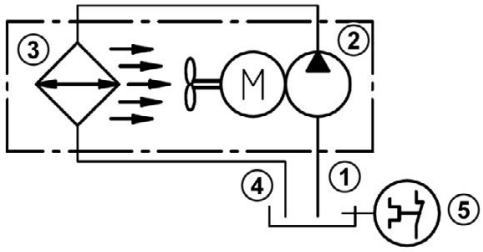
Further information on the oil supply system and control information can be obtained from the operating instructions for the oil supply system (manufacturer's documentation). The technical limit values in the manufacturer's documentation have priority.



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 24: 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

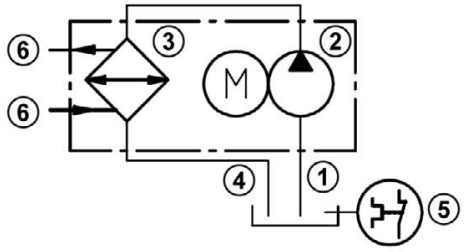


Figure 25: Hydraulic plan of industrial gear units with CS1-X and CS2-X cooling systems

3.19 Lubricant circulation (Option: LC, LCX)

DANGER

Explosion hazard

- For operation in explosion hazard atmospheres, only approved and labelled circulation pumps and sensors may be used.
- The ATEX labelling must conform to the details of the system and/or machine design.

Flanged or motor pumps are used as standard for gear units with lubricant circulation. These are already installed on the gear unit on delivery and all lines are correctly connected.

The flange pump is driven via the gear unit drive shaft. The motor pump has a separate drive.

Lubricant circulation systems are normally equipped with pressure switches. The connection and evaluation of these sensors must be ensured by the operator.

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 during the installation of the gear unit. The connection points should be obtained from the specific dimension sheet for the order.

3.20 Gear unit monitoring sensors (option: MO)

The position of the sensors must be obtained from the specific dimension sheet for the order.

Pay attention to the manufacturer's documentation.

3.21 Temperature sticker

For temperature class T4 gear units or gear units with a maximum surface temperature of less than 135 °C the supplied self-adhesive temperature sticker (printed with value 121 °C) must be affixed to the gear unit housing. Part No.: 8510400). The temperature class or the maximum surface temperature can be obtained from the ATEX labelling in the last line of the gear unit type plate.

Examples:

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

Affix the temperature sticker in the vicinity of the drive bearings. For gear units with an IEC/ NEMA adapter, affix the temperature sticker as for a helical gear unit.

The temperature sticker must be affixed so that it is visible. Depending on the installation orientation, choose a position where the temperature sticker will not be concealed.

The middle of the temperature sticker turns black if the temperature on the surface of the gear unit housing exceeds 121 °C (please see chapter 4.9 "Temperature measurement").

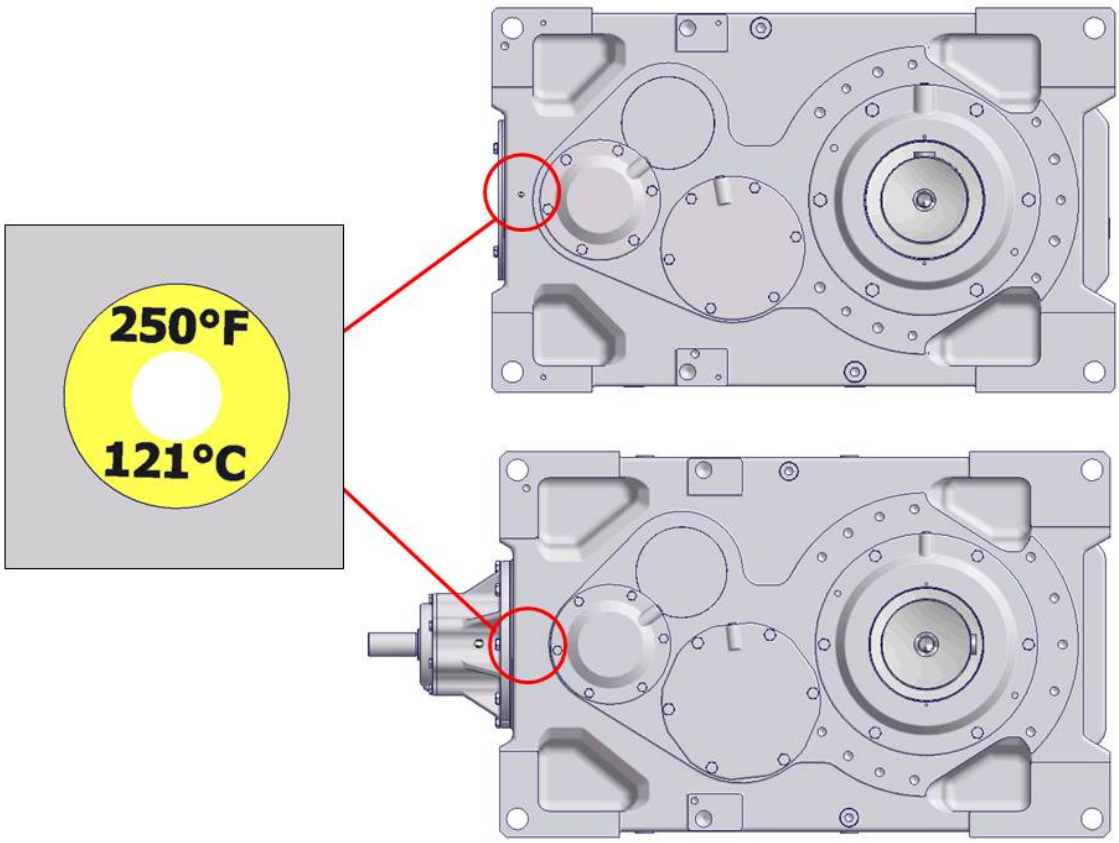


Figure 26: Temperature sticker position for helical and bevel helical gear units

3.22 Torque supports (Option: D, ED, MS)

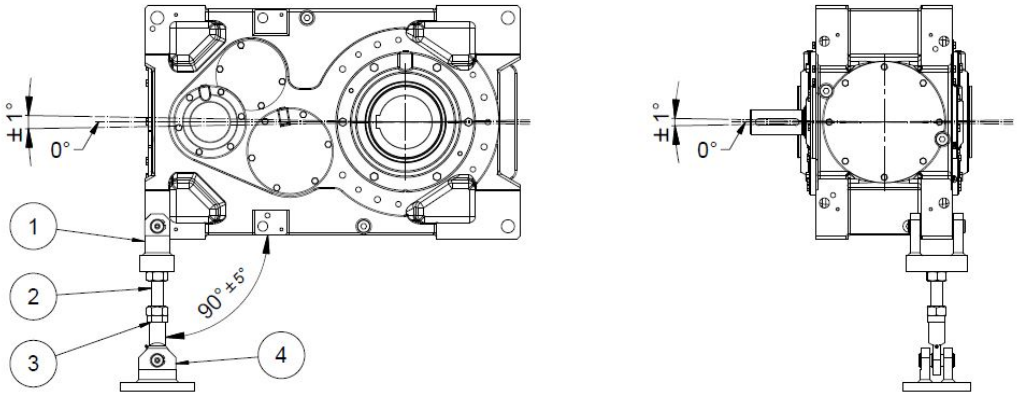
NOTICE!

Risk of gear unit damage if the torque arm is installed incorrectly

- Distortion of the torque support during assembly or operation must be avoided, as otherwise the service life of the output shaft bearings may be reduced.
- The torque arm is not suitable for transferring transverse forces.

Assembly should be carried out from the side of the machine in order to reduce the bending moment on the machine shaft. Tension and pressure and installation upwards or downwards are permissible.

For helical gear units with motor adapters, the torque support is located opposite to the motor adapter.



Legend

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

Figure 27: 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.

The gear unit is aligned horizontally by means of the threaded bolt and the nuts of the torque arm and secured with lock-nuts.

Tighten the fastenings of the torque arm with the correct tightening torques (please see chapter 7.4 "Screw tightening torques")and secure against loosening (e.g. Loctite 242, Loxeal 54-03).

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

3.23 Connecting the oil heater (Option: OH)

DANGER

Explosion hazard

- Oil heaters (Option: OH) are only approved for Category 3D/3G.
- The oil heater may only be operated when at a standstill.
- Before switching on the heater elements, make sure that they are fully immersed in the oil bath.

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.

3.24 Subsequent painting

DANGER

Explosion hazard due to electrostatic charge

- Subsequent painting must have the same characteristics as the original painting.

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

4 Commissioning

4.1 Oil level and venting

DANGER

Risk of explosion in case of poor lubrication

- The oil level must be checked prior to commissioning (please see chapter 5.2.4 "Oil level").
- The vent must be fitted after installation if the gear unit comes with an initial filling. Check the vent before commissioning.

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 8: Oil spaces as delivered

The position of the vents can be obtained from the specific dimension sheet for the order or from Section 7.1 "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 5.2.11 "Venting".

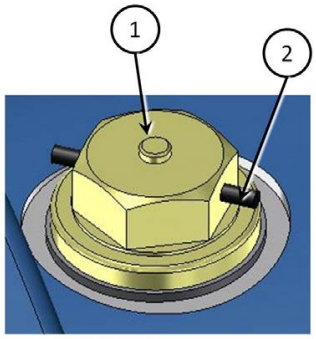
The sealing plug which is used for transport must first be removed and the vent installed in the same position. The sealing plug of gear units that are filled with oil is marked with red paint.

Information

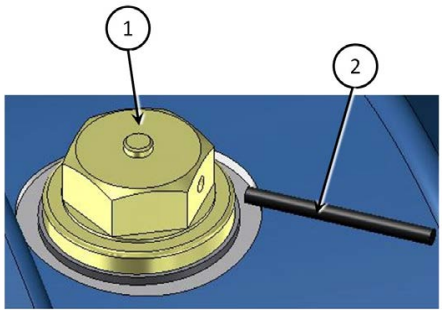
Auxiliary gear unit (Option: WX) and first stage gear units (Option: WG) can be equipped with pressure venting (Option: DR). The pressure vent must be unlocked prior to commissioning. Refer to the operating and installation instructions B 2000.

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 28.



Locked



Unlocked

Legend

1: Vent screw

2: Transport securing device

Figure 28: Activation of the pressure vent

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.

4.2 Lubricant circulation (Option: LC, LCX)

DANGER

Explosion hazard in case of inadequate lubrication

- The drive unit may only be commissioned after the pump and the sensors for the circulation lubrication have been connected and commissioned.
- For cold starting it must be ensured that the highest permissible viscosity of the lubricant is not exceeded in order to prevent excessive pressures in the pump and the lubricant line system.
- 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.

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.

4.3 Gear unit cooling with fan(Option: FAN)

DANGER

Explosion hazard

- Check the contact guard for warping and damage. Repair any damage prior to commissioning.
- Foreign objects must not enter the air intake openings during operation. Sparking may occur if such objects collide with the fan blades.
- An adequate supply of air must be ensured by means of a minimum free space of 30° ahead of the air intakes. The air inlet grille and the fan blades must be kept clean.

WARNING

Risk of eye injury from suspended particles

- Use goggles when switching on the fan.

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

The main direction of rotation was specified in the planning phase and can be obtained from the specific dimension sheet for the order.

The opposite direction of rotation is also permissible. However, in this case the fan does not provide cooling so that the calculated thermal limit power of the gear unit cannot be complied with.

The ATEX approval becomes void if the gear unit is operated in the opposite direction of rotation.

4.4 Internal cooling system (Option: CC)

DANGER

Explosion hazard

- 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.
- The temperature and the flow rate of the cooling fluid must be monitored and ensured.
- If there is a danger of frost the operator should add a suitable anti-freeze solution to the cooling water.
- Use of a resistance thermometer (PT100) is mandatory. The customer must connect the thermometer to an evaluation device which shuts down the drive above 80 °C.
- The special ATEX documentation provided by NORD must be observed.

The **coolant pressure** must not exceed **6 bar (3D/3G) / 2 bar (2D/2G)**.

The maximum **flow volume** is 5 l/min for SK 5..07 to SK 10..07 and 10 l/min for SK 11..07 to SK 15..07.

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.

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

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

DANGER

Explosion hazard

- The drive unit may only be commissioned after the cooling unit has been connected and commissioned.
- For oil / water coolers (option CS1-X), the temperature and the flow rate of the cooling fluid must be monitored and ensured. If there is a danger of frost, a suitable anti-freeze solution must be added to the cooling water in due time.
- Oil / air coolers (Option: are only approved for Category 2G and 3D/3G. A sufficient air intake must be ensured. A free space of at least 30° must be provided for the air intake.
- The standard painting /coating is only suitable for the range C1/C2 according to DIN EN ISO 12944.
- Use of a resistance thermometer (PT100) is mandatory. The thermometer must be connected to an evaluation device which gives a warning signal above 80 °C for temperature class T3 and shuts the drive down with temperature class T4.
- For cold starting it must be ensured that the highest permissible viscosity of the lubricant is not exceeded in order to prevent excessive pressures in the pump and the lubricant line system.
- Observe the special ATEX documentation provided by NORD.

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

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

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.
- The temperature of the medium to be cooled must not exceed 80 °C.
- The maximum permissible ambient temperature for the operation of cooling systems is 40 °C. If higher ambient temperatures may occur, verification must be made by NORD prior to commissioning.

Further information about the oil supply system and control information can be obtained from the operating instructions for the oil supply system (manufacturer's documentation). The manufacturer's specifications are definitive.

Information

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

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.

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.

4.6 Oil heater (Option: OH)

DANGER

Explosion hazard

- Oil heaters (Option: OH) are only approved for Category 3D/3G.
- The oil heater may only be operated when at a standstill.
- Before switching on the heating elements and during heating, ensure that the heating elements are fully immersed in the oil bath.
- The oil heater may only be used in combination with a temperature monitoring system (PT100).
- Observe the special ATEX documentation provided by NORD.

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.

4.7 Temperature monitoring (Option: PT100)

DANGER

Explosion hazard

- The oil temperature must be monitored with a resistance thermometer (option PT100) if an internal or external cooling system is used. The resistance thermometer must be connected to an evaluation device. The operator is responsible for implementing this interlock.
- A warning signal must be issued if the temperature exceeds 80 °C. The drive must be switched off at temperatures above 80 °C if a cooling system is used.

The PT100 is an electrical resistor with which the oil temperature can be monitored. The electrical resistance depends on the oil temperature. The PT100 must be connected to a suitable evaluation device and the signal must be evaluated. The gear unit must be shut down if the permissible oil temperature is exceeded.

The triggering device must be set so that the drive unit is shut 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.

4.8 Backstop / freewheeling coupling (Option: R, WX)

DANGER

Explosion hazard

- The auxiliary drive must be secured or monitored to prevent it from idling.
- Note the minimum speed for release of the back stop as well as the maximum speed. Too low a speed will increase the temperature. Excess speeds will damage the back stop.

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 9 and Table 10). 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.

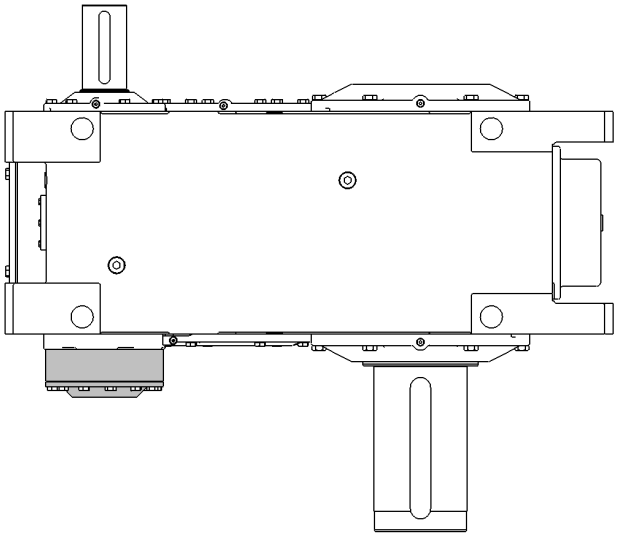


Figure 29: Industrial gear unit with back stop (schematic diagram)

Gear unit	Stages	Nominal gear ratio i_N		Lift-off speed
		From	to	n_1 [rpm]
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
		From	to	n_1 [rpm]
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 9: Back stop lift-off speeds SK 5..07 – SK 10..07

Gear unit	Stages	Nominal gear ratio i_N		Lift-off speed
		From	to	n_1 [rpm]
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
		From	to	n_1 [rpm]
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 10: Back stop lift-off speeds SK 11..07 – SK 15..07

Gear unit	Stages	Nominal gear ratio i_N		Lift-off speed
		From	to	n_1 [rpm]
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 11: Back stop lift-off speeds SK 5..17 – SK 11..17

4.9 Temperature measurement

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

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

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

Temperature measurement procedure:

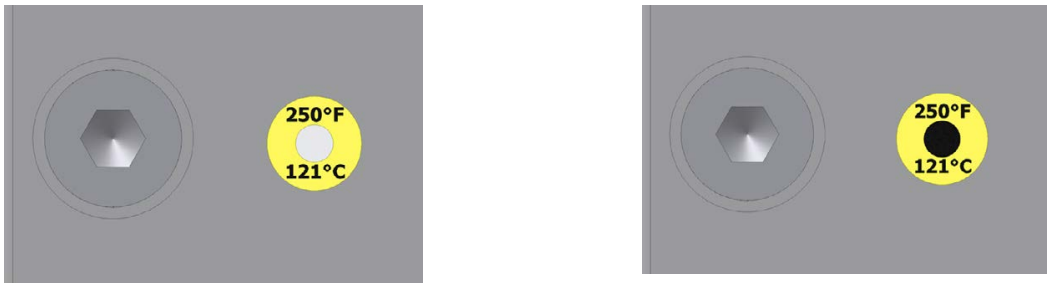
1. Allow the gear unit to run at maximum speed under maximum load for approx. 4 hours.
2. Following warm-up, the temperature of the gear unit housing surface T_{gm} is to be measured close to the temperature sticker (please see chapter 3.21 "Temperature sticker").
3. Measure the temperature of the air T_{um} in the immediate vicinity of the gear unit.

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

- The measured air temperature T_{um} is within the permissible range stated on the type plate.
- The measured air temperature on the surface of the gear unit housing T_{gm} is less than 121 °C.
- The temperature sticker has not turned black (see Figure 31).
- The measured temperature of the surface of the gear unit housing plus the difference between the highest permissible air temperature T_u stated on the type plate and the measured air temperature must be at least 15 °C lower than the maximum permissible surface temperature, i.e.:

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

Figure 30: ATEX labelling



Centre dot is **white:** OK

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

Figure 31: Temperature sticker

4.10 Checking the gear unit

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

NOTICE

Damage to the radial shaft sealing rings through unsuitable cleaning agents

Unsuitable cleaning agents may damage the radial shaft sealing rings, which may then cause and increased risk of leaks.

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

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

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

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

- Leaks
- Slippage of the shrink disks. To do this, remove the cover and check whether the marking specified in Section 3.8.2 "Hollow shaft with shrink disc element (Option: S)"indicates a movement of the gear unit hollow shaft relative to the machine shaft. Then remount the cover as described in Section 3.13 "Cover cap air baffle (Option: H, H66, FAN, MF.., MS…)".

Information

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

4.11 Checklist

4.11.1 Obligatory

Checklist		
Item to be checked	**Date of check:**	**Information see Section**
Can transport damage or other damages be found?		3.1
Does the version on the name plate comply with the specifications?		2.2
Does the required orientation comply with the actual installation position?		7.2
Has the correct oil level for the version been checked?		5.2.4
Has the vent been fitted and activated?		4.1
Has the gear unit been grounded?		3.6
Has the gear unit been aligned properly?		3.6
Has the gear unit been installed free of tension?		3.22
Are the external gear shaft forces within the permitted limits?		3.7
Is the coupling between the gear unit and the motor correctly installed?		3.15
Was the gear unit checked in a test run?		4.10
Does the motor also have appropriate ATEX approval?		3.14, 1.2.2
Do all drive and driven elements have appropriate ATEX approval?		1.2.2
Do all electrical components have appropriate ATEX approval?		1.2.2

4.11.2 Optional

Checklist		
Item to be checked	**Date of check:**	**Information see Section**
Option R, WX, FAN: Is the direction of rotation specified and checked?		4.8, 4.3
Option D and ED: Is the torque arm installed correctly?		3.22
Option AS, FAN: Are rotating parts covered with a contact guard?		3.13
Option FAN, CS2: Is an adequate supply of air ensured?		4.3, 4.5
Option CS1, CC: Is the cooling water connected to the cooling unit or the cooling coil and open?		3.17, 3.18
Option CS1, CS2: Is the cooling unit connected to the gear unit?		3.18
Option: LC: Is the pressure monitor connected and functioning?		4.2
Option PT100: Is the temperature monitor connected and functioning?		4.7
Option AS: Was the shrink disk connection tested for slippage?		3.8.2
Option WX: Has the speed monitor been functionally connected?		4.8
ATEX T4 or T < 135 °C: Is the temperature sticker affixed and has not turned black?		3.21
ATEX T4 or T < 135 °C: Has the temperature been measured?		4.9

5 Service and maintenance

5.1 Service and Maintenance Intervals

Service and Maintenance Intervals	Service and maintenance work	Information see Section
According to manufacturer's details	• Option PT100: Check the function and measurement accuracy; recalibrate as necessary	Manufacturer's documentation
	• Option LC: Check the function and measurement accuracy of the pressure monitor, recalibrate as necessary	
	• Option CS1: Service the oil / water cooler	
	• Option CS2: Service the oil / air cooler	
	• Option DB: Change dry filter medium	
	• Couplings: Service the drive and output couplings	
Standstill/storage > 6 months	• Regularly check the protective coating on unpainted and painted surfaces • Check the condition of the oil • Check the seals	3.3
Daily	• Visual inspection of the contamination indicator	5.2.7
	• Check oil temperature	4.7
	• Check oil pressure	4.2
	• Check if the operating noise has changed	5.2
Every 100 operating hours, but at least weekly	• Visual inspection for leaks	5.2
	• Check the gear unit for unusual running noises and vibrations	5.2
	• Option VL3/KL3: Check the oil leak indicator	5.2.4.5
After 500 operating hours	• Check the coupling – Check the wear of dog couplings	3.15, 3.16
At least once per month	• Option FAN: Check the air cooler for dirt and dirt deposits	5.2.8
	• Option CS2: Check the air heat exchanger unit for dirt and dirt deposits	5.2.8
	• Check the covers and the attachment adapters for dirt and dirt deposits	5.2.8

Service and Maintenance Intervals	Service and maintenance work	Information see Section
Every 2500 operating hours, at least every six months	• Visual inspection of shaft sealing ring	5.2
	• Check the oil level and oil condition	5.2.4
	• Clean or replace the vent	5.2.11
	• Option D, ED: Visual inspection of the rubber buffers	5.2.5
	• Option LC, LCX, CS1, CS2, OT: Visual inspection of hoses and pipes	5.2.6
	• Option CS1, CS2, LC/LCX: Check the oil filter	5.2.7
	• Option VL2/3/4/6 KL2/3/4/6: Re-lubricate the bearings in the output flange and remove excess grease	5.2.14
	• Check the coupling – Check the wear of dog couplings	3.15, 3.16
	• ATEX T4 or T < 135 °C: Visual inspection of the temperature sticker	3.21
	• ATEX 2D/3D: Remove dust	5.2.8
For operating temperatures up to 80 °C: Every 10000 operating hours, but at least every 2 years	• Replace shaft sealing rings if worn	5.2.12
	• 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)	5.2.9
Higher temperatures reduce the oil change intervals	• Option CC: Check the cooling coil for deposits (fouling)	5.2.10
Every 20000 operating hours, but at least every 4 years	• Re-grease the bearings in the gear unit (only for SK5..07 – SK6..07 and installation position M5/M6)	5.2.13
	• Option LC/LCX, CS1, CS2, OT: Replace hose lines	5.2.6
	• ATEX 2D/2G: Check the function of the resistance thermometer	4.7
	• ATEX 2D/2G: Function test of pressure monitor	4.2
According to the interval specified in field MI of the type plate (Only for Category 2G and 2D) or At least every 10 years	• General overhaul	5.2.16

Table 12: Service and Maintenance Intervals

5.2 Service and Maintenance Work

DANGER

Explosion hazard

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

Visual inspection for leaks

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

Information

Shaft sealing rings are components with a limited life and are subject to wear and ageing. The service life of shaft sealing rings depends on various ambient conditions. Temperature, light (especially UV light), ozone and other gases and liquids affect the ageing process of shaft sealing rings. Some of these influences may change the physical or chemical properties of the shaft sealing rings and result in a significant reduction of their service life. Foreign 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 (please see chapter 7.7 "Leakage and leak-tightness").

NOTICE

Damage to the radial shaft sealing rings through unsuitable cleaning agents

Unsuitable cleaning agents may damage the radial shaft sealing rings, 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.

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.

5.2.1 Gear unit cooling with fan (Option: FAN)

The inlet and outlet openings on the fan cover and the fan wheel must be kept clean.

Before re-commissioning, observe the information in Section 4.3 "Gear unit cooling with fan(Option: FAN)".

5.2.2 Heat exchanger (option: CS2)

The heat exchanger of the oil/air cooling unit (option CS2) must be cleaned regularly according to the documentation of the product manufacturer in order to maintain the efficiency of the unit.

5.2.3 Covering cap and attachment adapter (only for 2D)

For gear units with cover caps (Option: H) the cover cap must be removed in case of severe soiling. Dust deposits in the cover cap, on the output shaft and on the shrink disk must be removed. After this, the cover must be re-fitted (Section 3.13 "Cover cap air baffle (Option: H, H66, FAN, MF.., MS…)").

If the interior of the IEC/NEMA adapter is severely soiled, the motor must be removed and the dust deposits removed from the interior and the coupling.

Then fit the motor as described in Section 3.14.

5.2.4 Oil level

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

⚠ DANGER

Explosion hazard

- 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 (please see chapter 5.2.4.6 "No-seal adapter for mixers (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 5.2.9 "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.

5.2.4.1 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 32. 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 (please see chapter 7.4 "Screw tightening torques").

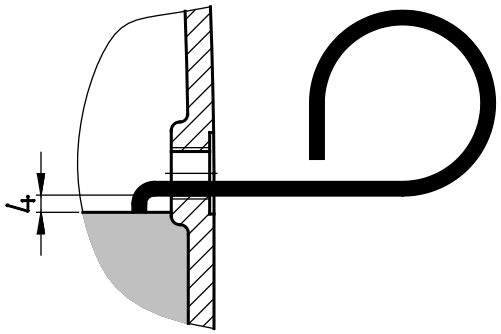


Figure 32: Checking the oil level with a dipstick

5.2.4.2 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.

5.2.4.3 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.

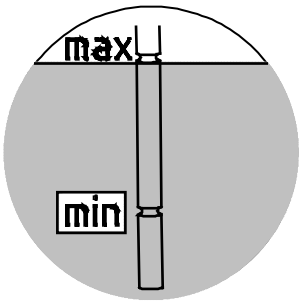


Figure 33: Checking the oil level with an oil dip-stick

5.2.4.4 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.

- Find and correct the reason for the low 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 expansion vessel is completely filled by NORD. High oil levels may result in damage to the gear unit.

- The operator must ensure that the oil level is correct before 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 type 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 level 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 level 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").

5.2.4.5 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.

5.2.4.6 No-seal adapter for mixers (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 lubricating 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

This option is equipped with a 3D oil inspection glass in the gear unit housing and an oil inspection glass in the SAFOMI-IEC adapter. The 3D oil inspection glass cannot be used if the SAFOMI-IEC adapter has been retrofitted. In this case the oil level must be checked with a dipstick.

- The 3D oil inspection glass in the gear unit housing is used to check the oil level and must always be completely filled with oil.
- The oil inspection glass in the SAFOMI-IEC adapter is an inspection window. It 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.

Before topping up the oil, closing cap vent of the SAFOMI container must be unscrewed so that air can escape from the gear unit.

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

5.2.5 Rubber buffer (Option: ED)

Gear units with an elastic torque support (Option ED) have rubber elements. If these show damage such as tears to the rubber surface, the elements must be replaced. In this case, please contact NORD Service.

5.2.6 Piping

5.2.6.1 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.

5.2.6.2 Hose lines (Option: LC, LCX, CS1, CS2, OT)

DANGER

Explosion hazard

Electrostatic discharge may result in sparks.

- Use only electrically conductive hoses.

Hose lines are used as intake and pressure lines for lubricant circulation and for cooling units. In addition, if an oil tank is present, this is connected to the gear unit with hose lines.

Hose lines are subjected to a natural ageing process due to external influences (e.g. UV radiation) to a greater extent than pipes.

When checking hose lines, look out for leaks, cuts, cracks, porous areas and chafing. In such cases, the affected hose lines must be replaced. Please contact the NORD Service department.

5.2.7 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.

5.2.8 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.

5.2.9 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 (optionally the drain tap), vents and devices for checking the oil level can be obtained from the specific dimension sheet for the order.

Procedure:

1. Select a catchment container according to the quantity of oil which is stated on the type plate and place the catchment container under the oil drain screw or the oil drain tap (optional).
2. Unscrew the vent 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.
5. Clean the interior of the gear unit by flushing with oil so that oil sludge particles, due to wear and old residues, are removed. For this, use the same type of oil which is used during operation.
6. Clean the thread of the oil drain screw or the closing cap of the oil drain tap and moisten it with securing adhesive (e.g. Loctite 242 or Loxeal 54-03) before screwing it in. Tighten the oil drain screw or the closing cap of the oil drain tap with the correct torque (please see chapter 7.4 "Screw tightening torques").
7. Fill the gear unit with the specified quantity of fresh oil according to the type plate through the vent hole. If the gear unit is equipped with a dipstick, the oil may be filled through this hole.
8. After approx. 15 minutes (for oil level tanks 30 minutes), check the oil level as described in Section 5.2.4 "Oil level"and correct as necessary.
9. Other attached components such as filters and piping should also be drained if necessary.
10. For gear units with oil circulation lubrication and oil supply systems, the oil bearing system must be drained according to the manufacturer's specifications (maintenance instructions).

5.2.10 Internal cooling system (Option: CC)

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

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

5.2.11 Venting

5.2.11.1 Vent filter (Option: FV)

The ventilation filter uses a wire mesh as the filter material and is intended to ensure that any excessive pressure can escape from the gear unit housing. It must be inspected 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 ((please see chapter 7.4 "Screw tightening torques"))

Figure 34: Vent filter (option FV)

5.2.11.2 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

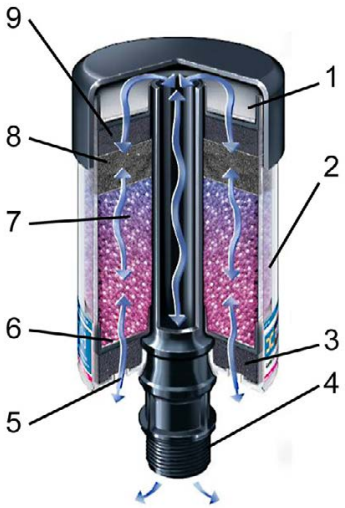
Figure 35: Cellulose filter (Option EF)

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

NOTICE

Risk of breakage

- The filter must be protected with a cover.



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 36: 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.

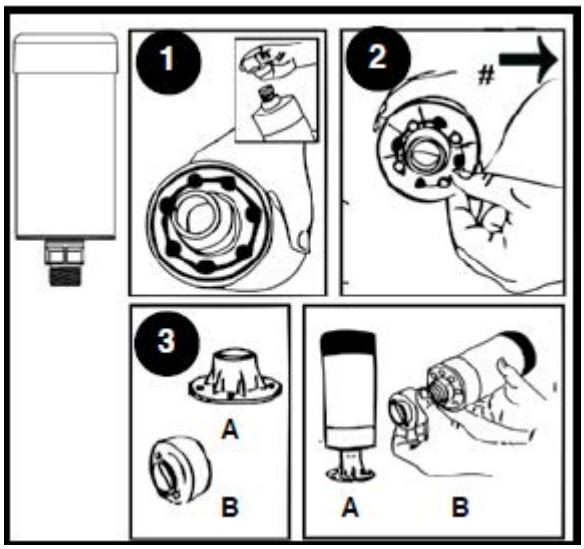


Figure 37: Installing the drying agent filter

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).

Information

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

5.2.11.4 Pressure venting (Option: DR)

The pressure venting only releases excess pressure from the gear unit. Ambient air cannot enter the gear unit via the pressure vent. Because of this, the pressure vent is not equipped with filter material.

1. Unscrew the pressure vent screw from the gear unit
2. Thoroughly clean the vent (e.g with compressed air)
3. Perform a function test
4. Optional: Replace the pressure vent screw
5. Screw the pressure vent screw into the gear unit together with a new sealing ring ((please see chapter 7.4 "Screw tightening torques"))

5.2.12 Replacing the shaft sealing ring

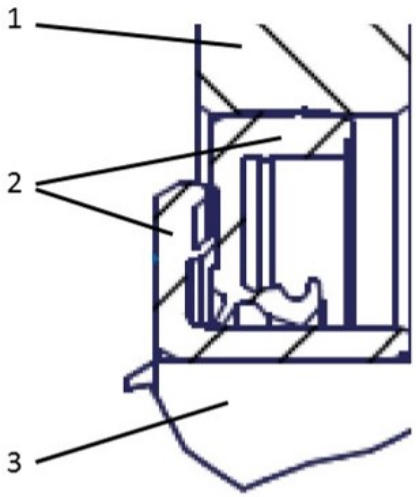
Replace the shaft sealing ring

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

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 38: MSS7 seal). Please contact the NORD Service department in case of any queries.



Legend

1: Bushing
2: MSS7 seal
3: Shaft

Figure 38: MSS7 seal

5.2.13 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 bis 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. ((please see chapter 7.3.1 "Roller bearing greases"))

5.2.14 Bearings is the output flange (Option: VL2/3/4/6, KL2/3/4/6)

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 maintenance table).

⚠ 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 un it 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.

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 ((please 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 13: Grease quantities for re-greasing the lower output shaft bearing

5.2.15 Gear unit monitoring (only for 2G / 2D)

5.2.15.1 Resistance thermometer

A check of the effectiveness of the temperature monitoring is necessary for the function test. The limiting value which is set must be reduced to a value which is achieved in normal operation and the triggering behaviour observed. The function test must be documented. After this, the old limit value must be set again.

5.2.15.2 Pressure monitor

A check of the effectiveness of the pressure monitoring is necessary for the function test. The limiting value which is set must be increased to a value which is achieved in normal operation and the triggering behaviour observed. The function test must be documented. After this, the old limit value must be set again.

5.2.16 General overhaul

DANGER

Explosion hazard

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

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

1. Clean all components of the gear unit
2. Examine all gear unit components for damage
3. All damaged components must be replaced
4. Replace all roller bearings
5. Replace all seals, shaft sealing rings and Nilos rings
6. Optional: Replace the backstop
7. Optional: Replace the elastomers in the coupling

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

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

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

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

$N_A = C_M \cdot f_L \cdot k_A$

C_M: Maintenance class according to field MI of the type plate

f_L: Running time factor

- f_L = 10 Maximum running time 2 hours per day
- f_L = 6 Running time 2 to 4 hours per day
- f_L = 3 Running time 4 to 8 hours per day
- f_L = 1.5 Running time 8 to 16 hours per day
- f_L = 1 Running time 16 to 24 hours per day

k_A: Utilisation factor (usually k_A = 1)

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

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

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

P_{tat}: Actual drive power or motor power in kW which is required by the application at the rated speed., determined e.g. by measurements

For variable loads with differing actual drive powers with nominal speeds P_{tat1}, P_{tat2}, P_{tat3}, … with known percentage times q_1, q_2, q_3, …, the following equivalent average drive power applies:

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

6 Disposal

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

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

Table 14: Disposal of materials

7 Appendix

7.1 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

Option	Installation orientation	5x07, 6x07				7x07-10x07				11x07-15x07				5x17 – 11x17
		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 15: Position of housing options on oil screw holes (standard installation positions)

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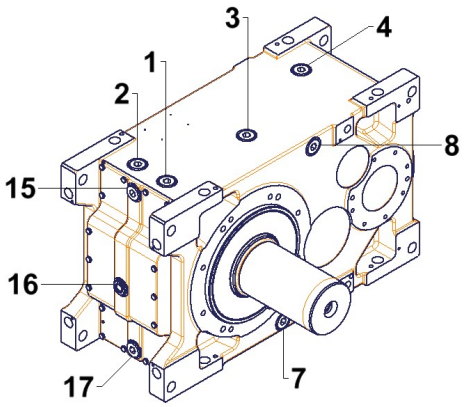
<tr><td rowspan="2">M1 oil screw holes</td><td> 
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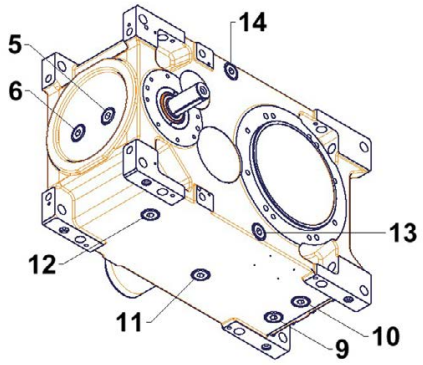
<tr><td> 
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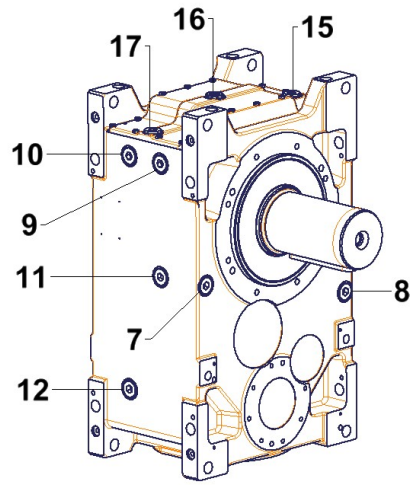
<tr><td rowspan="2">M2 oil screw holes</td><td> 
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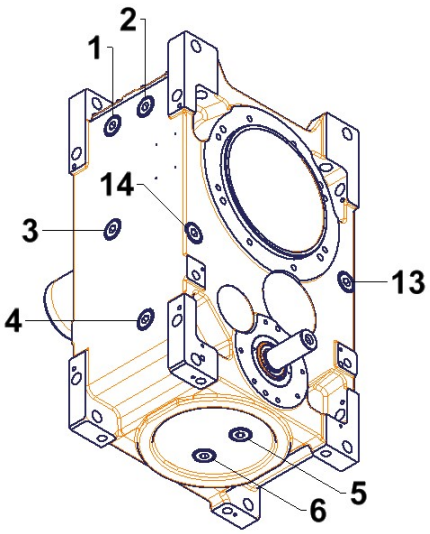
<tr><td> 
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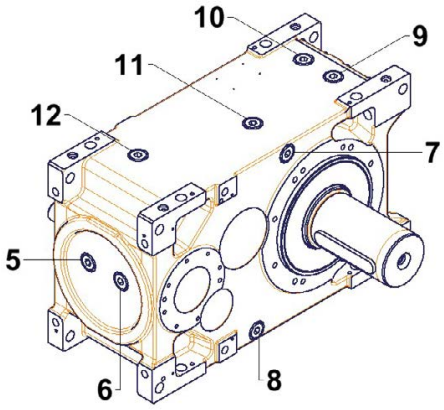
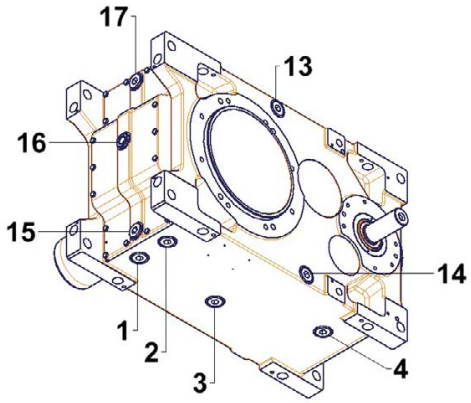
Gear units SK 5207 – SK 10507	
M3 oil screw holes	 

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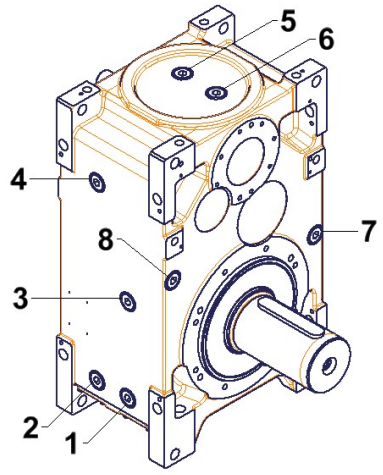
<tr><td rowspan="2">M4 / oil screw holes</td><td> 
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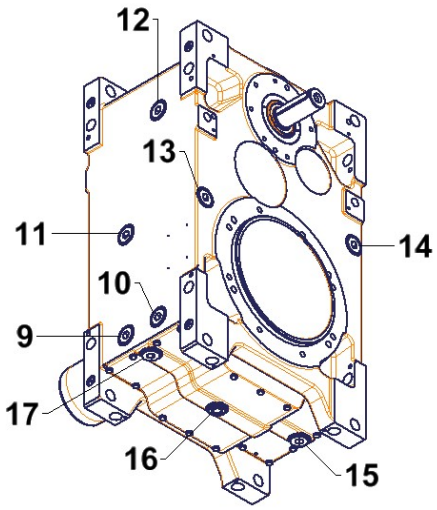
<tr><td> 
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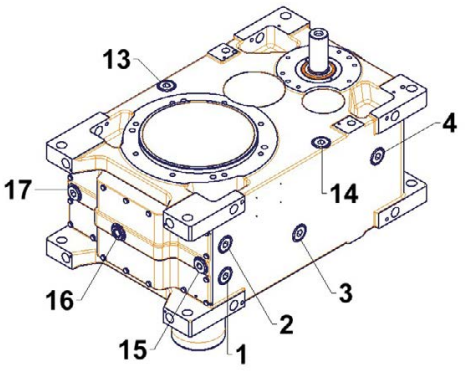
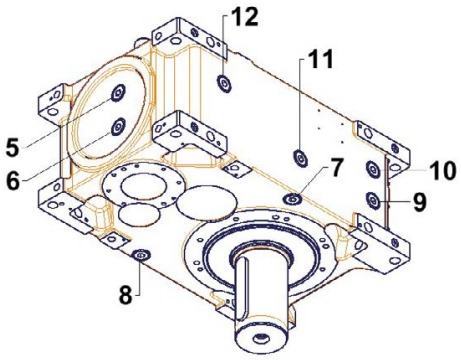
Gear units SK 5207 – SK 10507	
M5 oil screw holes	 

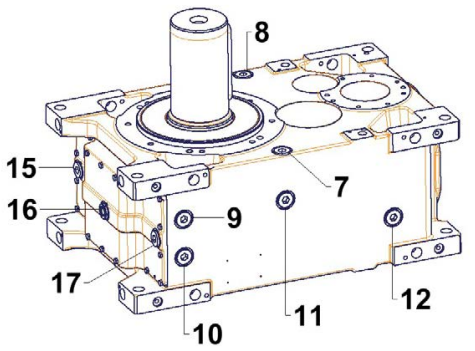
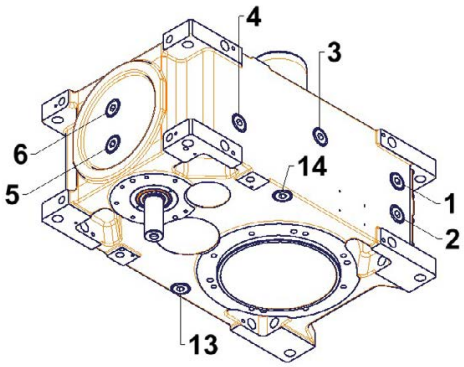
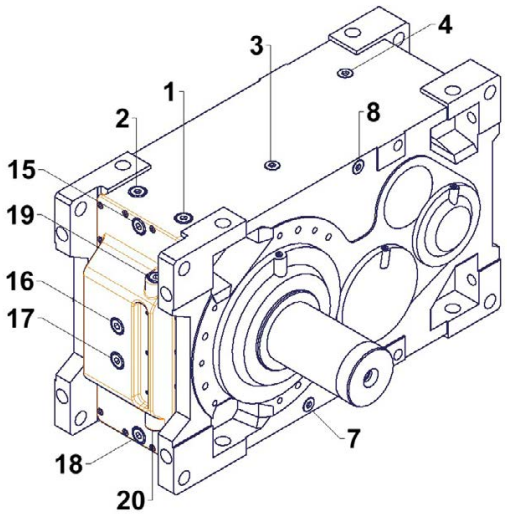
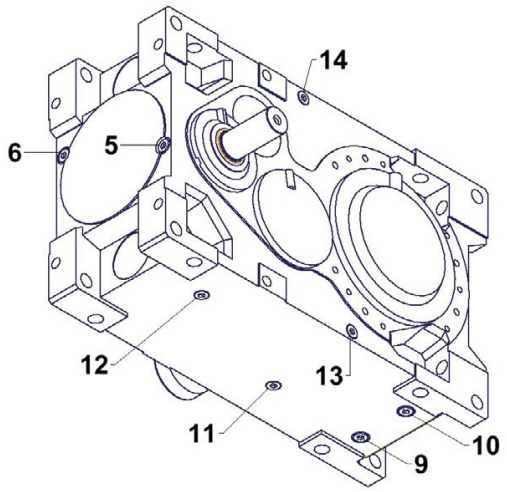
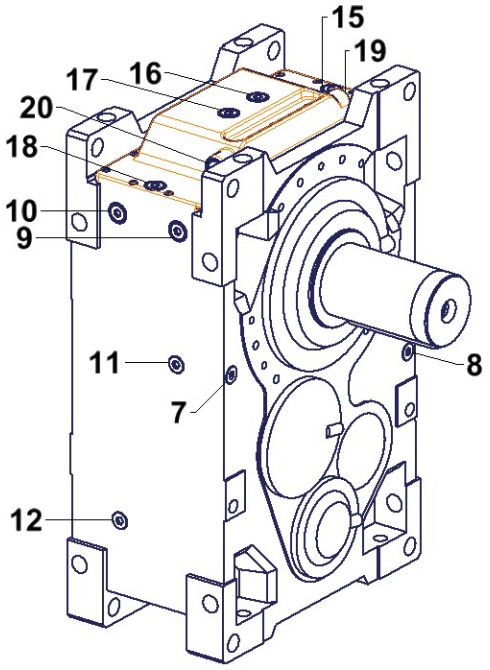
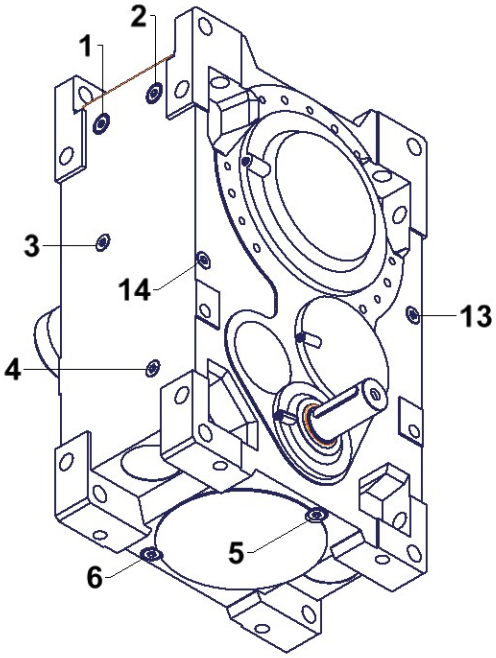
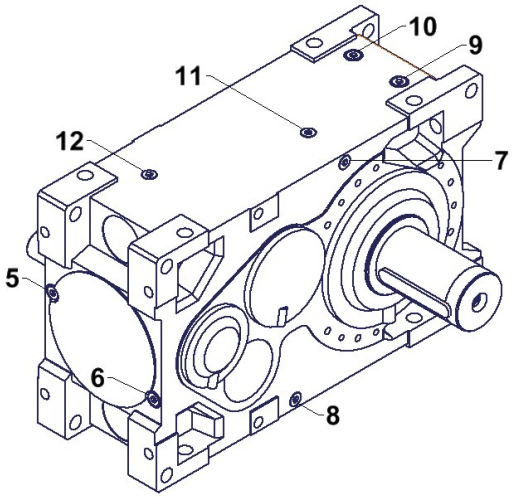
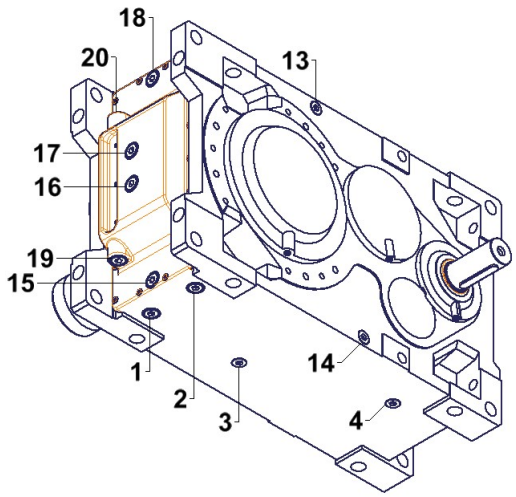
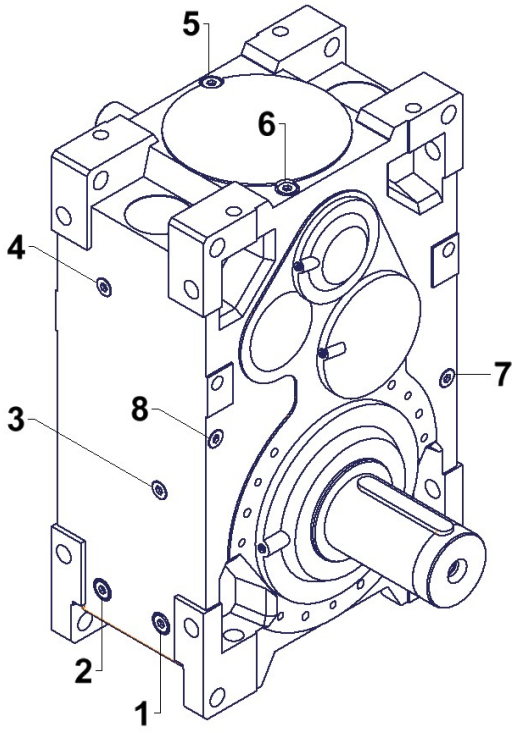
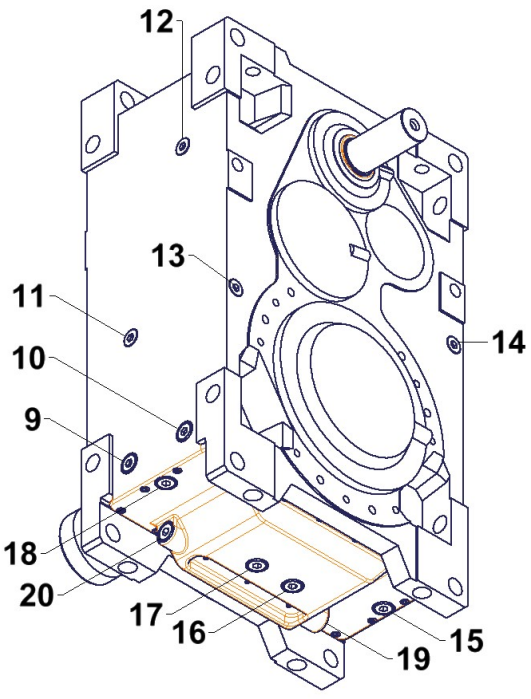
Gear units SK 5207 – SK 10507	
M6 oil screw holes	 

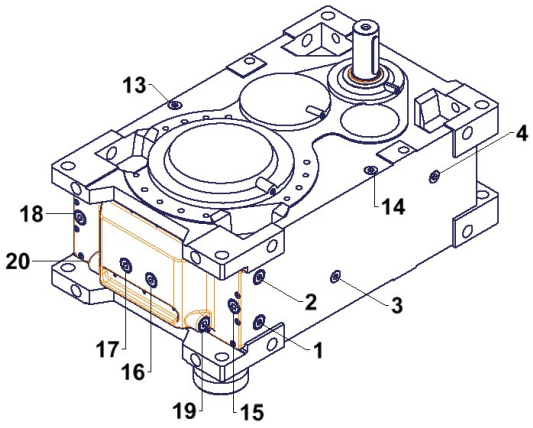
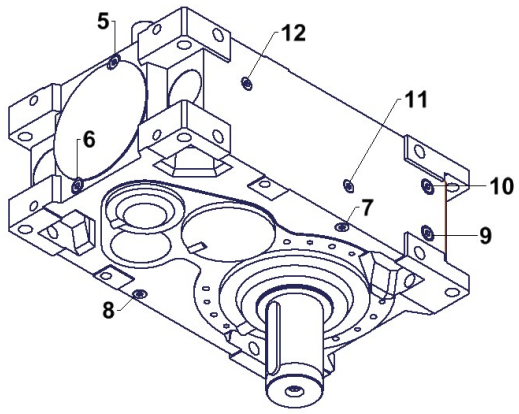
Figure 39: Numbering of oil screw holes on SK 5207 – SK 10507

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	 

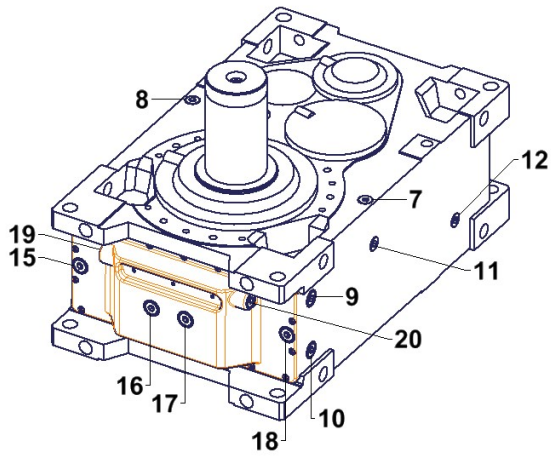
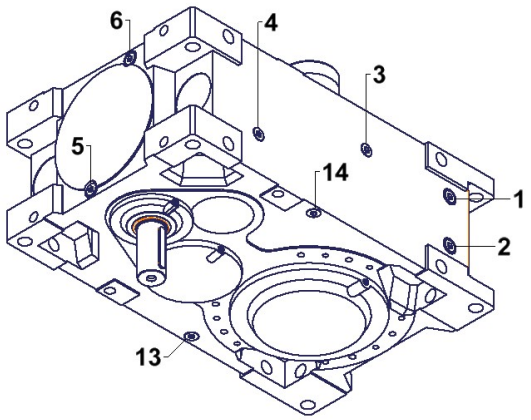
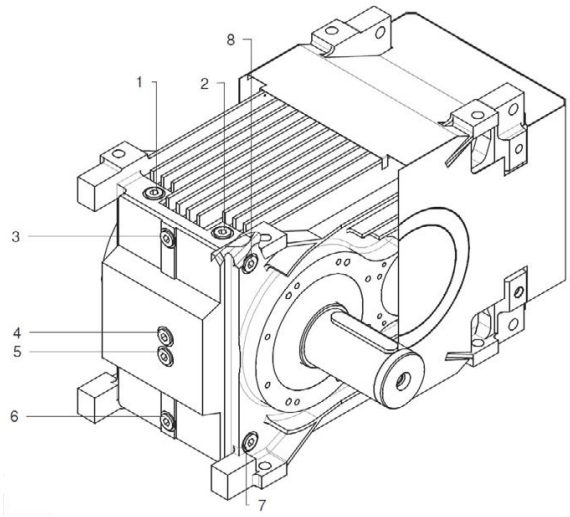
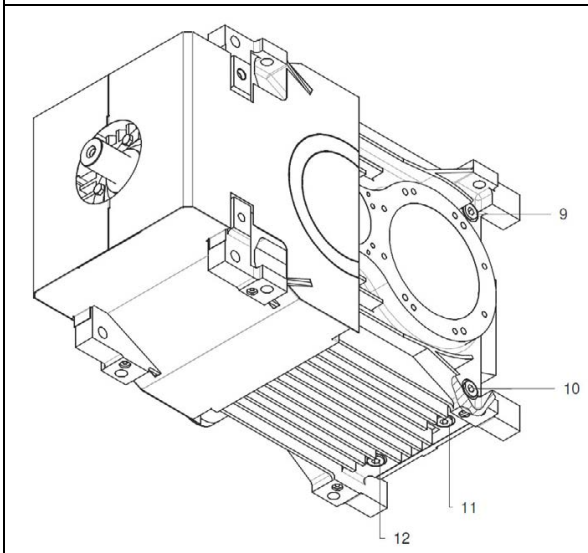
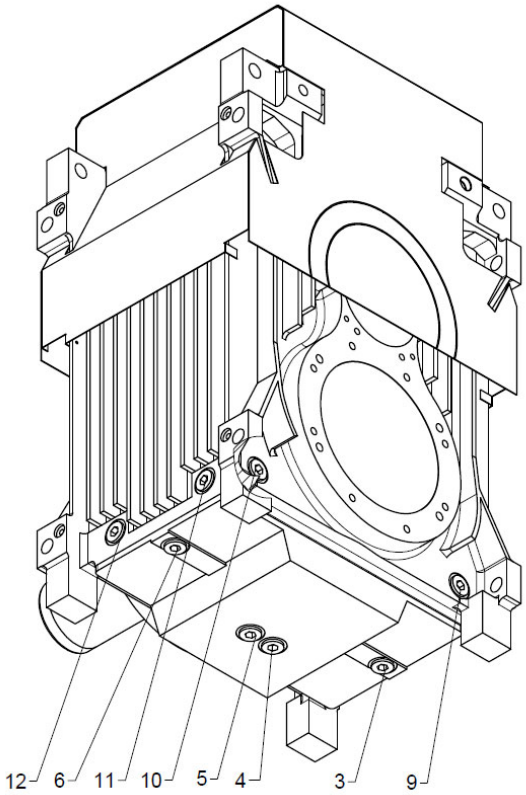
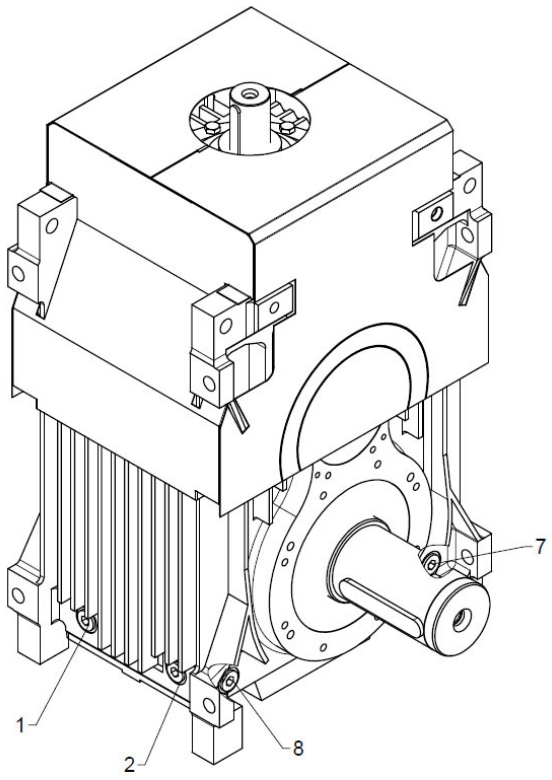
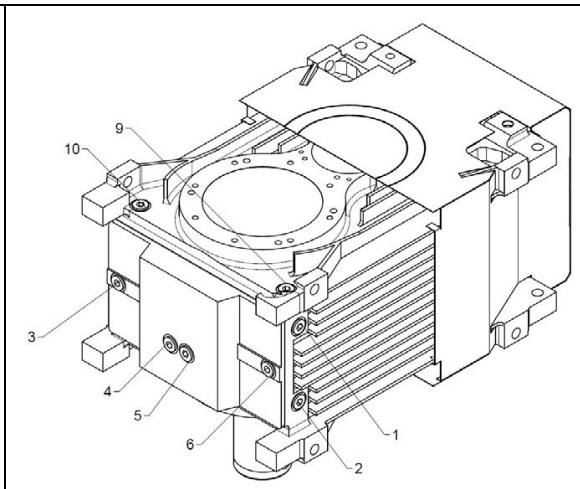
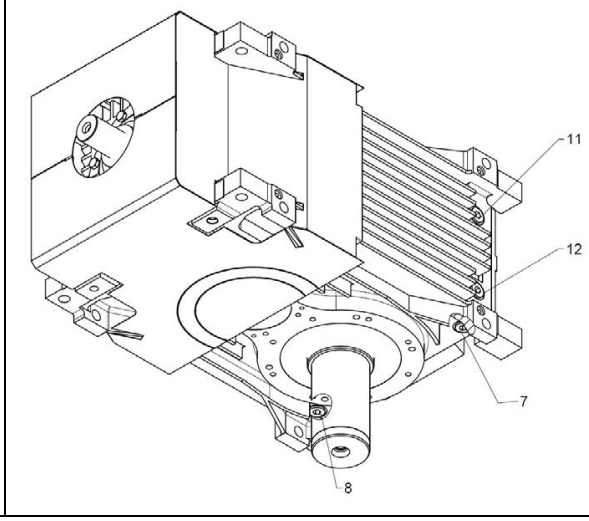
Gear units SK 11207 – SK 15507	
M6 oil screw holes	
	

Figure 40: 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	 

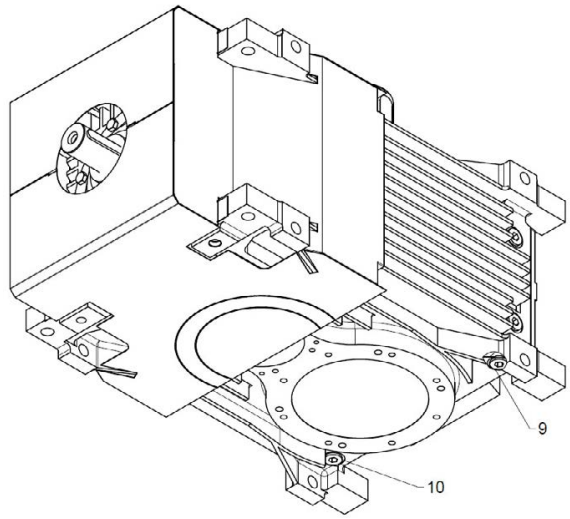
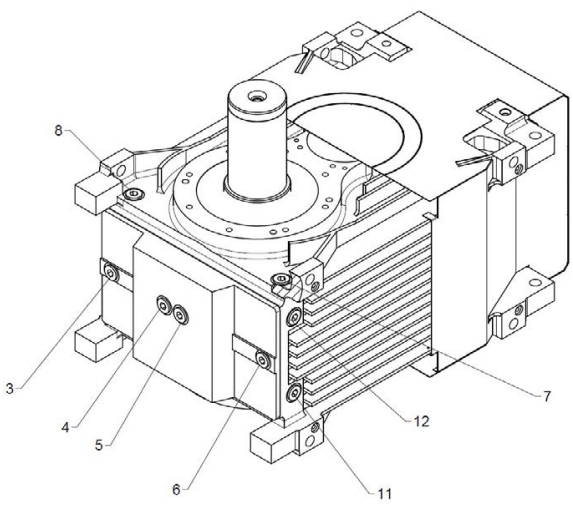
Gear units SK 5217 – SK 11217	
M6 oil screw holes	 

Figure 41: Numbering of oil screw holes on SK 5217 – SK 11217

7.2 Installation orientation

7.2.1 Helical gear unit

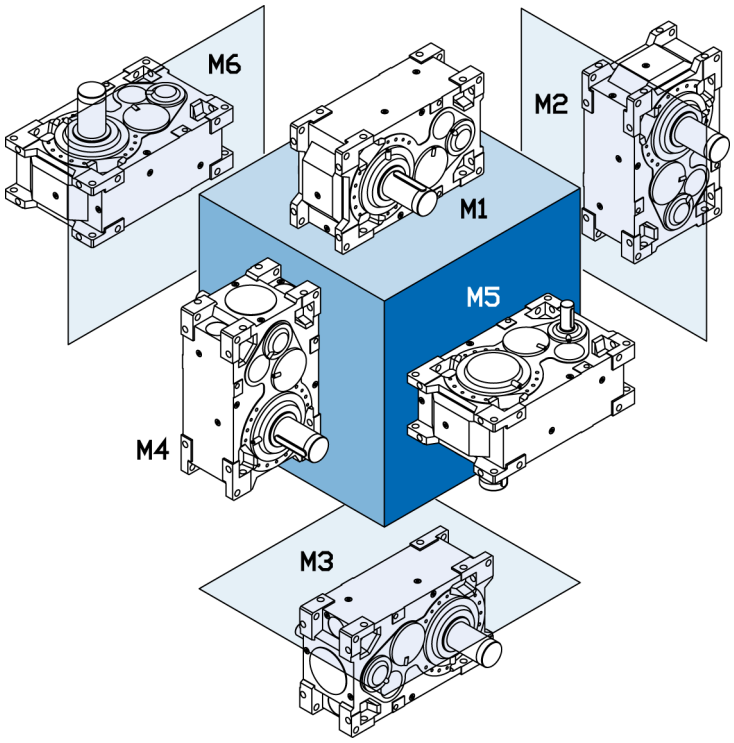


Figure 42: Helical gear unit installation positions with standard mounting surface

7.2.2 Bevel helical gear unit

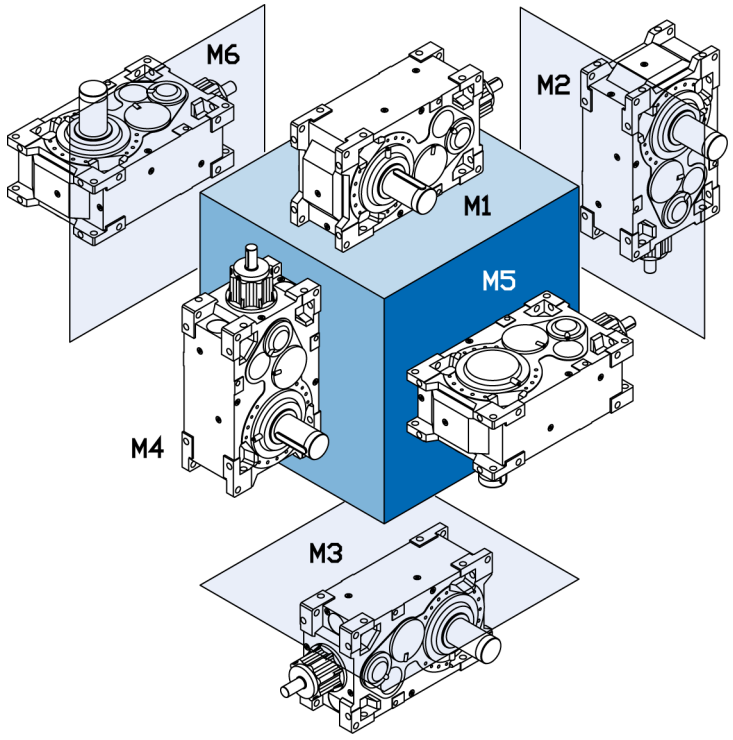


Figure 43: Bevel gear unit installation positions with standard mounting surface

7.3 Lubricants

7.3.1 Roller bearing greases

This table shows comparable roller bearing greases from various manufacturers.

Roller bearing greases	Ambient temperature [°C]		bp	Castrol	FUCHS	KLÜBER LUBRICATION	Mobil	
	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 16: Roller bearing greases

The manufacturer can be changed for a given grease type. NORD must be consulted if the type of grease or the range of ambient temperatures is changed. Otherwise no guarantee can be accepted for the function of the gear unit.

7.3.2 Types of lubricant oil

DANGER **Explosion hazard**

Failure to comply is likely to cause severe or even fatal injuries.

- When changing oil or filling for the first time, the type of lubricant stated on the type plate must be used.

NOTICE

Gear unit damage

- Additives, third-party lubricants or corrosion inhibitors must not be added to the specified lubricant without testing or approval by Getriebebau NORD.

The following table assigns the type of gear oil stated on the name plate (please see chapter 2.2 "Name plate")to the particular approved product and the manufacturer.

If different oil types are mixed, damage to the gear unit is possible due to inadequate lubrication through oil incompatibility.

Fill the gear unit with the previously used oil type. Mixing of oils of various types or from different manufacturers is not permissible. In particular, polyglycol oils must not be mixed with mineral oils or other synthetic oils. If the oil type is changed, thoroughly flush the gear unit with the new oil type before filling.

Getriebebau NORD must be consulted in case of change of viscosity or lubricant type, as otherwise no warranty for the functionality of our gearboxes can otherwise be accepted.

Information

Getriebebau NORD does not accept any warranty for the quality of the lubricants which are supplied by the particular supplier. Every lubricant manufacturer guarantees the quality of their own products.

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

Viscosity class	Castrol	FUCHS	KLÜBER LUBRICATION	Mobil	Shell	TOTAL
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 17: 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) (please see chapter 4.5 "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
CS1/CS2 cooler	on request	+25 °C	+20 °C	on request

Table 18: 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
CS1/CS2 cooler	on request	+15 °C	+10 °C	on request

Table 19: 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 by visual inspection (see Section 4.1 "Oil level and venting") . Adjust the oil level as necessary (see Section 5.2.4 "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 protective covers
	8.8	10.9	12.9	V2A-70 V4A-70			
M4	3.2	5	6	2.8	-	-	-
M5	6.4	9	11	5.8	-	2	-
M6	11	16	19	10	-	-	6.4
M8	27	39	46	24	11	10	11
M10	53	78	91	48	11	17	27
M12	92	135	155	83	27	40	53
M16	230	335	390	207	35	-	92
M20	460	660	770	414	-	-	230
M24	790	1150	1300	711	80	-	460
M30	1600	2250	2650	1400	170	-	-
M36	2780	3910	4710	2500	-	-	1600
M42	4470	6290	7540	4025	-	-	-
M48	6140	8640	16610	5525	-	-	-
M56	9840	13850	24130	8860	-	-	-
G½	-	-	-	-	75	-	-
G¾	-	-	-	-	110	-	-
G1	-	-	-	-	190	-	-
G1¼	-	-	-	-	240	-	-
G1½	-	-	-	-	300	-	-

Table 20: Screw tightening torques

7.5 Tolerances for bolting surfaces

For mounting on the motor swing base or motor base frame (option MF or MS), a maximum permissible distortion of 0.1 mm at a distance of 1 m must not be exceeded.

7.6 Troubleshooting

DANGER

Explosion hazard

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

WARNING

Danger of slipping in case of leaks

- Clean the soiled floor before starting troubleshooting.

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 21: 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					
		Location of leak			
Term	**Explanation**	**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 22: 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 Declaration of Conformity

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

GETRIEBEBAU NORD
Member of the NORD DRIVESYSTEMS Group

DRIVESYSTEMS

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Getriebebau-Nord-Str. 1 . 22941 Bargteheide, Germany . Fon. +49(0)4532 289 - 0 . Fax +49(0)4532 289 - 2253 . info@nord.com

EU Declaration of Conformity

According to EU directive 2014/34/EU Annex VIII

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

Industrial gear units
SK 5..07, SK 6..07, SK 7..07, SK 8..07, SK 9..07, SK 10..07,
SK 11..07, SK 12..07, SK 13..07, SK 14..07, SK 15..07

SK 5..17, SK 6..17, SK 7..17, SK 8..17, SK 9..17, SK 10..17, SK 11..17

with ATEX labelling Ex **II 2D / 2G**

are compliant with the following directive:

ATEX directive for products **2014/34/EU**

Applied standards:

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

Getriebebau NORD has submitted the documents required as per 2014/34/EU Annex VIII to the notified body:

DEKRA EXAM GmbH
Dinnendahlstraße 9
44809 Bochum
ID number:0158
Certificate: BVS 10 ATEX H/B 017

Bargteheide, 05.03.2019

Dr. O.Sadi
Technical Manager

Figure 44: Declaration of Conformity for Category 2G / 2D, labelling according to DIN EN ISO 80079-36

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

GETRIEBEBAU NORD
Member of the NORD DRIVESYSTEMS Group

DRIVESYSTEMS

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EU Declaration of Conformity

According to EU directive 2014/34/EU Annex VIII

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

Industrial gear units

SK 5..07, SK 6..07, SK 7..07, SK 8..07, SK 9..07, SK 10..07,
SK 11..07, SK 12..07, SK 13..07, SK 14..07, SK 15..07

SK 5..17, SK 6..17, SK 7..17, SK 8..17, SK 9..17, SK 10..17, SK 11..17

with ATEX labelling Ex **II 3D / 3G**

are compliant with the following directive:

ATEX directive for products **2014/34/EU**

Applied standards:

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

Bargteheide, 05.03.2019

Dr. O.Sadi
Technical Manager

Figure 45: Declaration of Conformity for Category 3G / 3D, labelling according to DIN EN ISO 80079-36

7.10 Repair information

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

7.10.1 Repairs

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

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

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

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

Information

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

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

7.10.2 Internet information

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

7.11 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.

7.12 Abbreviations

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

Key word index

NORD DRIVESYSTEMS Group

Headquarters and Technology Centre
in Bargteheide, close to Hamburg

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for more than 100 branches of industry

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