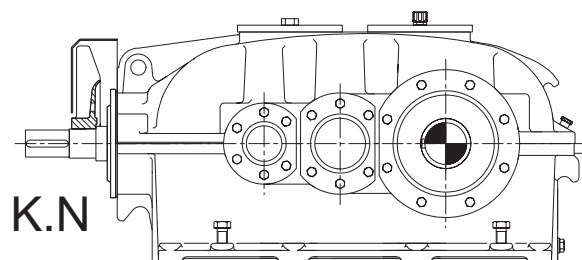
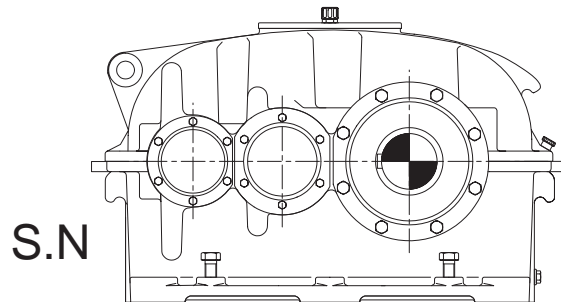


Operating Instructions

BA 5200 EN 03.95

Gear Unit Types S.N and K.N
Size 80 to 560



FLENDER

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1. Technical data

1.1 General technical data

The rating plate of the gear unit contains the most essential technical data. These data and the contractual agreement for the gear unit define the limits of its proper use.

○ FLENDER D 46393 Bocholt ○			
N 0 ①			
②		P ③	kW
n ₁ ④	/min	n ₂ ⑤	/min
CLP-Oil DIN 51517/3	VG ⑥	Oil ≈ ⑦	l
Betriebsvorschrift beachten! / Observe operating instructions! / Suivre les instructions!			
○ ⑧ ○			
... DE/EN/FR			

○ FLENDER D 46393 Bocholt ○			
N 0			
		T ₂	Nm
n ₁	/min	n ₂	/min
CLP-Oil DIN 51517/3	VG	Oil ≈	l
Betriebsvorschrift beachten! / Observe operating instructions! / Suivre les instructions!			
○ ○			
... DE/EN/FR			

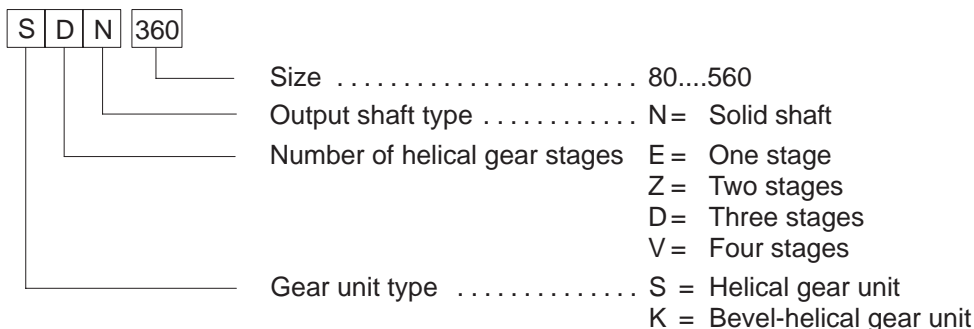
○ FLENDER D 46393 Bocholt ○			
N 0			
		P	kW
n ₁	/min	n ₂	/min
PG - Oil (synth. Oil)	VG	Oil ≈	l
Betriebsvorschrift beachten! / Observe operating instructions! / Suivre les instructions!			
○ ○			
... DE/EN/FR			

○ FLENDER D 46393 Bocholt ○			
N 0			
		T ₂	Nm
n ₁	/min	n ₂	/min
PG - Oil (synth. Oil)	VG	Oil ≈	l
Betriebsvorschrift beachten! / Observe operating instructions! / Suivre les instructions!			
○ ○			
... DE/EN/FR			

- ① Order No. - Item - Consecutive No.
- ② Type / Size *)
- ③ Power rating P in kW or T₂ in Nm
- ④ Speed n₁

- ⑤ Speed n₂
- ⑥ Oil viscosity in VG Class
- ⑦ Quantity of oil for main housing in litres
- ⑧ Measuring face sound pressure level and BA number of the Operating Instructions

e.g. *)



Further technical data will be found in the drawings in the gear unit documentation.

1.1.1 Measuring surface sound pressure level

The gear unit has a measuring surface sound pressure level at a distance of 1 m which will be found on the rating plate.

The measurement is carried out in accordance with DIN 45635 part 1 and part 23 by the sound intensity method.

The work place of the operating personnel is defined as the area on the measuring surface located at a distance of 1 m around the gear unit in the vicinity of which persons are present.

The sound pressure level is valid for planetary gear unit at operating temperature running at input drive speed n₁ and input drive power P₁ in accordance with the rating plate. In the case of several data, the highest speed and the highest power rating will apply.

Included in the measuring surface sound pressure level are - where present - attached lubrication units. In the case of outgoing and ingoing pipes, the flanges will be considered interfaces.

If during repeat measurement on site clear measurement conditions cannot be established, the measurement obtained on FLENDER test rigs will apply.

The given sound pressure level was determined by statistical evaluations of our quality control department. In accordance with the confidence coefficient, it can be expected that the gear unit noise will be within the given value.

2. General notes

2.1 General

These Operating Instructions constitute part of the gear unit shipment and should be kept in the immediate vicinity of the gear unit at all times.

Only a precise knowledge of the Operating Instructions will ensure trouble-free operation of the gear unit. It is therefore in the interest of the operator for the Operating Instructions to be read, understood and observed in all respects by the persons responsible for handling, installation and operation.

Note: We accept no liability for any damage or malfunction resulting from non-observance of the Operating Instructions.

The "FLENDER REDUREX-gear unit" dealt with in these Operating Instructions has been developed for stationary use in general engineering. Possible applications for gear units of this series are for example sewage plants, excavators, the chemical industry, iron and steel manufacture, conveyor systems, crane systems, the foodstuffs industry, paper machines, cableways, the cement industry, etc.

The gear unit is only designed for the field of application as specified in Section 1. "Technical data". Operating conditions which differ from that stated will require fresh contractual agreements.

The gear unit described here is in accordance with the state of the art at the time of these Operating Instructions going to print.

In the interest of further development, we reserve the right to introduce modifications to the individual subassemblies and accessories which, while retaining the essential features, can be regarded as desirable to increase their efficiency and safety.

The copyright of these Operating Instructions remains the property of **FLENDER AG**.

These Operating Instructions may not be duplicated in part or whole, utilized for the purpose of publicity or communicated to third parties without our express consent.

Please contact our works listed below in respect of all technical queries:

FLENDER AG

D-46393 Bocholt

Tel.: 02871/92-0

Fax: 02871/92-2596

or one of our service branches which are listed in Section 11. "Stocking spare parts, service facility addresses".

3. Safety notes

3.1 Safety notes

- The gear unit is constructed in accordance with the state of the art and is reliable in the condition as shipped. Unauthorized modifications which impair its reliability are NOT permissible. This also applies to guards which are fitted as protection against accidental contact.
- The gear unit may only be used and operated within the scope of the conditions specified in the contract of performance and supply.
- The operator should ensure that the persons entrusted with installation, operation, care and maintenance, and repair have read, understood the Operating Instructions and observe them in all respects in order that:
 - Prevent hazard to life and limb of the user and third parties
 - Ensure the reliability of the gear unit

and

- Prevent failure and environmental pollution due to incorrect handling.

- The relevant regulations concerning industrial safety and pollution control should be observed during handling, installation, operation, and care and maintenance.
- The gear unit may only be operated, serviced and repaired by authorized, trained and properly instructed personnel.
- Cleaning with a high-pressure cleaning device is not permissible.
- All work should be carried out with care with the safety aspect in mind.
- All work on the gear unit may only be carried out when it is stationary.
The drive unit must be secured to prevent accidental startup (e.g. by locking the key switch or by removing the fuses in the power supply). A notice should be displayed at the switch-on point stating that work is in progress on the gear unit.
- On the occasion of oil changes, the old oil should be collected in a suitable receptacle. Any pools of oil which have occurred should be removed at once with an oil binding agent.
Very dirty and oil-soaked cleaning rags should be kept in suitable containers.
The oil, the oil binding agent and the cleaning rags should be disposed of in accordance with the relevant pollution control requirements.
- The drive unit should be shut off at once if changes in the gear unit are detected during operation, such as for example increased operating temperature or a change in gear unit noises.
- Rotating parts, such as couplings, gear wheels or belt drives must be protected by means of suitable guards to prevent accidental contact.
- During installation of the gear unit in units or systems, the manufacturer of the units or systems is obliged to incorporate the requirements, notes and descriptions contained in these Operating Instructions in his own Operating Instructions.
- Notes affixed to gear units, such as for example rating plate, direction of rotation arrows, etc., must be observed. They must be kept free from paint and dirt. Missing plates must be replaced.

3.1.1 Notes and symbols in the operating instructions

Instructions in the Operating Instructions which concern operating safety are emphasized as follows:



This symbol draws attention to safety measures which **MUST** be observed to prevent **personal injury**.

Caution!

This symbol draws attention to safety measures which **MUST** be observed to prevent **damage to the gear unit**.

Note: This note draws attention to general **operating notes** which should be specially observed.

4. Handling and storage

4.1 Scope of supply

The contents of the shipment are listed in the shipping documents. They should be checked for completeness on receipt. Any shipping damage and/or missing parts should be reported in writing at once.

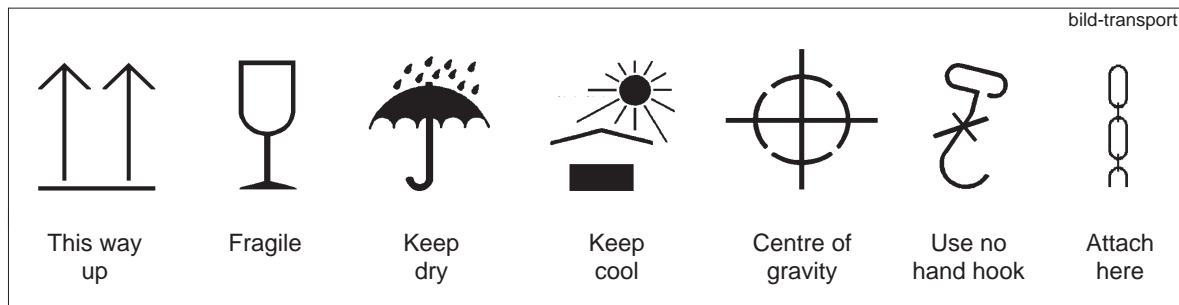
4.2 Handling and storage

4.2.1 Handling

The gear unit is shipped in assembled state. Ancillary equipment (such as for example oil coolers, pipes and valves) are shipped packed separately.

The packing of the gear unit will differ, dependent on method of shipment and size. The packing, unless otherwise agreed contractually, complies with **HPE Packing Guidelines**.

The symbols shown on the packing should be noted. Their significance is as follows:

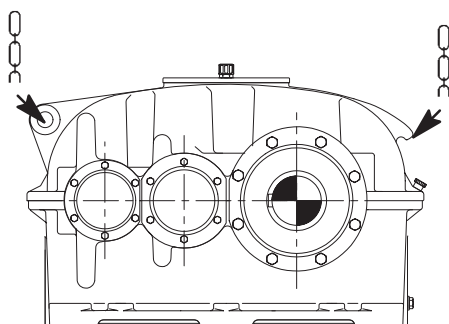


Caution!

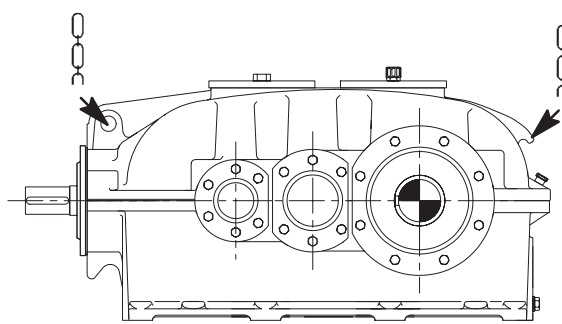
When handling the gear unit, exercise special care to avoid damage due to the use of force or careless loading and unloading.

The gear unit may only be handled using the lifting eye, possibly a lifting bar or the lifting lugs on the gear unit housing. Straps should be attached with shackles to the lifting eye or with rope slings to the lifting bar or the lifting lugs.

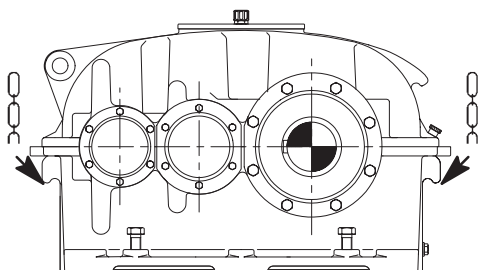
On gear units with fitted motor the centre of gravity may vary. In such a case attach slings also to the motor.



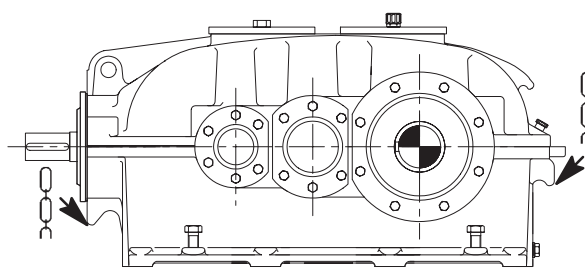
Type S.N <280



Type K.N <280



Type S.N ≥280



Type K.N ≥280

Detailed illustrations of the gear unit will be found in the drawings in the gear unit documentation.

4.2.2 Storage

The gear unit should be stored in a protected place in its position of use on a horizontal wooden support and covered.



It is NOT permissible to stack gear units on top of one another!

The gear unit is provided with internal preservation and the shaft ends with a protective coating.

The external coating is resistant to weak acids and alkalis, oils and solvents. It is seawater-resistant, tropic-proof and heat resistant up to 140 °C.

Note: Unless agreed to the contrary by contract, we warrant the internal preservation for a warranty period of 6 months and the preservation of the free shaft ends for one of 12 months. The warranty period starts to run on the date of delivery of the gear unit.

In the case of prolonged interim storage (> 6 months), it is advisable to check the internal preservation and to renew it if necessary (see Section 7. "Startup").

Caution!

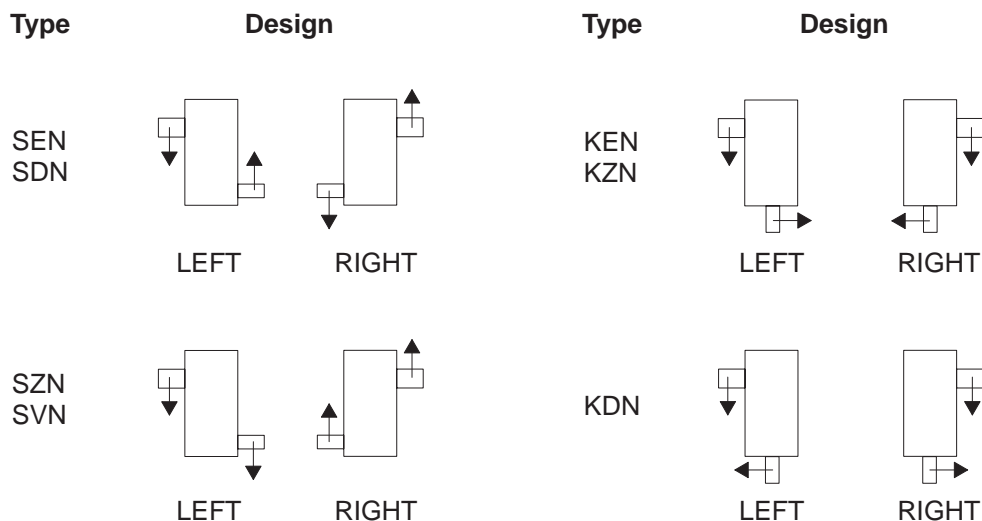
If stored in the open, the gear unit should be covered with special care and it should be ensured that neither moisture nor foreign matter are allowed to collect on the gear unit.

5. Technical description

5.1 General description

The gear unit is supplied as a single, two, three or four-stage helical gear unit or bevel-helical gear unit. It is designed for a horizontal position of installation. On request, the gear unit can also be supplied for a different position of installation.

Various shaft configurations (designs and directions of rotation) are possible; these are illustrated in diagrammatic form below (standard designs). As a variation, the gear units can also be supplied for different shaft configurations with different directions of rotation.



The gear unit is distinguished by its favourable noise characteristic which is achieved by means of ground bevel and helical gears with high contact ratio and a noise absorbing housing.

Combined with high efficiency, the gear unit possesses a favourable temperature characteristic by virtue of:

- its large housing surface area
- predominantly contact-free shaft seals (labyrinth seals) for high-speed shafts of types SE. and SZ.
- and a performance related cooling system.

According to requirements, gear units of the standard range can be fitted with motor mounting flange, motor bracket, torque support, oil cooler and backstop.




5.2 Housing

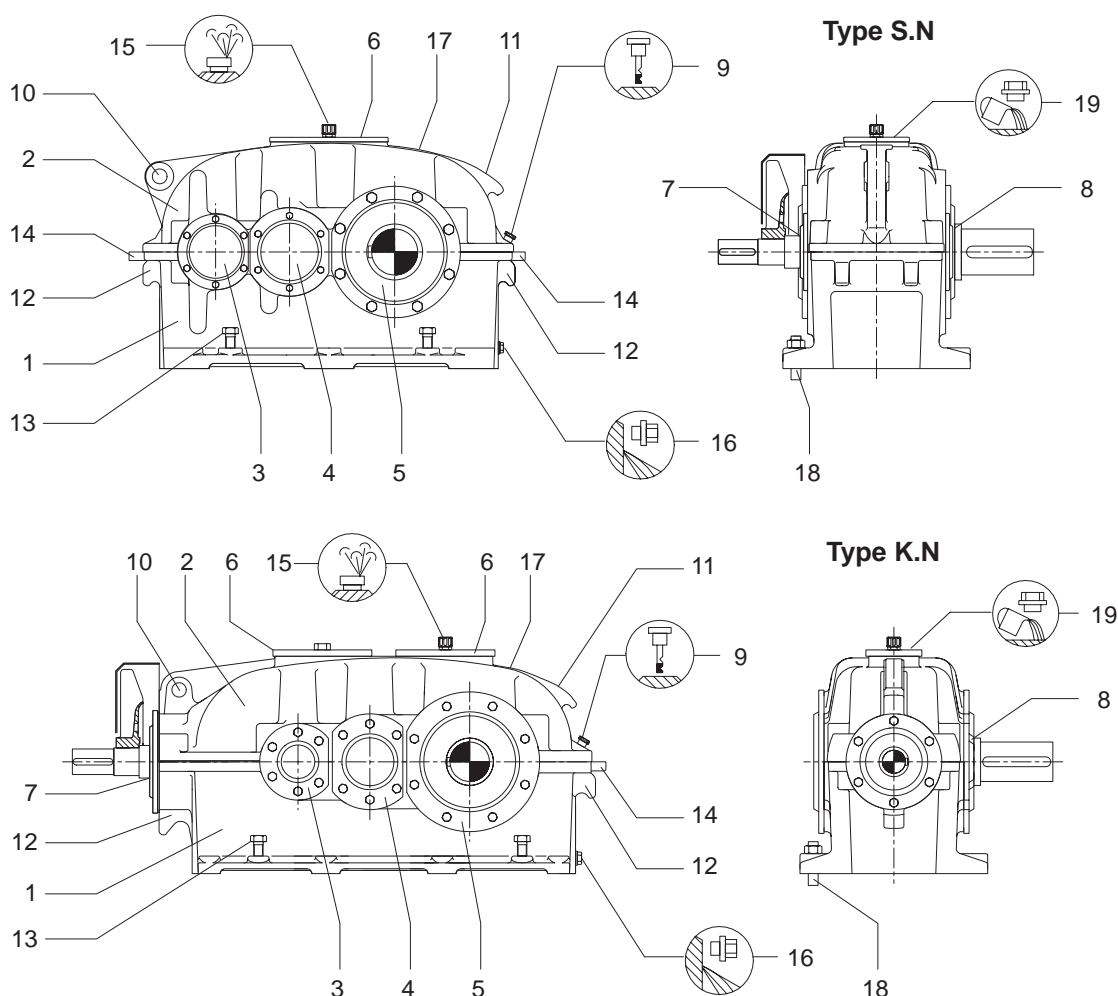
The gear unit housing is in 2 sections and is made of cast iron. It is of torsionally rigid design and its shape imparts very favourable noise and temperature characteristics. In case of need the housing can also be made out of steel.

The housing is provided with generously dimensioned lifting eyes or lifting lugs and inspection covers.

A dipstick for oil level checking, an oil drain plug for oil changes and a vent plug for venting and breathing of the housing are provided.

Colour coding of vent, oil level, oil drain and symbolic representation:

Vent:	yellow	
Oil filler:	yellow	
Oil level:	red	
Lubrication points:	red	
Oil drain:	white	



- | | | | |
|---|-----------------------|----|-----------------------------------|
| 1 | Lower part of housing | 10 | Lifting eyes |
| 2 | Upper part of housing | 11 | Lifting lug |
| 3 | Cover | 12 | Lifting lug (≥ 360) |
| 4 | Cover | 13 | Set screws (≥ 360) |
| 5 | Cover | 14 | Alignment surfaces (≥ 360) |
| 6 | Inspection cover | 15 | Housing vent and breather |
| 7 | Shaft seal | 16 | Oil drain plug |
| 8 | Shaft seal | 17 | Rating plate |
| 9 | Oil dipstick | 18 | Gear unit fastening |
| | | 19 | Oil filler |

Detailed illustrations of the gear unit will be found in the drawings in the gear unit documentation.

5.3 Toothed components

The toothed gear unit components are case hardened. The helical gears and bevel gears are ground. The noise level of the gear unit is minimized by virtue of the high quality of the tooth system and ensures reliable running.

The gear wheels are joined to the shafts by interference fit and parallel keys. The joints transmit the torque occurring extremely positively.

5.4 Lubrication

The tooth systems are adequately supplied with oil for horizontal position of installation by splash lubrication. This ensures that the gear units are maintenance-free.

5.5 Bearings

All shafts are mounted in anti-friction bearings.

Lubrication of the anti-friction bearings is effected for horizontal position of installation by splash lubrication assisted by the gear wheels.

5.6 Shaft seals

Labyrinth seals or radial shaft seal rings at the shaft outlets prevent oil escaping from the housing and dirt entering the housing. The labyrinth seals, as non-contacting seals, prevent shaft wear and ensure optimum temperature behaviour.

5.7 Cooling

According to requirements, the gear unit is fitted with a fan, a cooling coil or an oil cooler for cooling purposes.

5.7.1 Fan

The fan is mounted on the high-speed shaft of the gear unit and protected against accidental contact by a fan cowl. The fan draws air through the protective grille of the fan cowl and causes it to flow through its lateral air ducts along the gear unit housing, thus dissipating a certain amount of the housing heat.

Caution!

In the case of gear units which are fitted with a fan, adequate clearance for the cooling air in the form of intake cross-section must be provided when fitting the guard for the coupling or anything similar.

Fouling of the fan and the housing surface will significantly reduce the cooling action. (Observe Section 10. "Maintenance and repair").

5.7.2 Cooling coil

The cooling coil is located in the oil sump of the gear unit and is provided with cooling water by a water supply which is to be provided by the operator. Fresh water, seawater or brackish water can be used as cooling water. When flowing through the cooling coil, a certain quantity of heat is extracted from the gear unit oil and transferred to the cooling water.

Caution!

The direction of flow of the cooling water is optional. The maximum cooling water pressure may not exceed 8 bar. In the case of frost hazard and prolonged standstill of the gear unit, the cooling water should be drained off. Water residues should be blown out with compressed air.

To prevent high pressures occurring, a cooling water flow regulator must be provided at the cooling water inlet, for example by means of a pressure reducer or corresponding stop valves.

5.7.3 Water-oil cooler

The water-oil cooler is installed in the discharge line of the oil cooling system. The water-oil cooler dissipates a certain quantity of heat from the gear unit oil to the cooling water flowing through the cooler housing. A suitable cooling water supply should be provided by the operator.

The Operating Instructions of the manufacturer should be observed for operation of the water-oil cooler.

Caution!

The maximum cooling water pressure may not exceed 8 bar. In the case of frost hazard and prolonged standstill of the gear unit, the cooling water should be drained off. Water residues should be blown out with compressed air.

5.8 Couplings

As a rule, flexible couplings should be provided for the input drive and output drive sides of the gear unit.

If rigid couplings or other input drive and output drive elements are used which give rise to additional radial and/or axial forces (for example gear wheels, belt pulleys, etc.), this must be agreed by contract.

Caution!

Couplings with peripheral speeds at the outside diameter up to 30 m/s MUST be statically balanced. Couplings with peripheral speeds above 30 m/s require dynamic balancing.

The special Operating Instructions should be noted for operation of the couplings.

5.9 Backstop

For certain requirements, the gear unit can be fitted with a mechanical backstop. During operation, this only permits rotation in the specified direction of rotation. This direction is marked on the gear unit input drive side by a corresponding direction of rotation arrow.

The backstop is attached to the gear unit by means of an adapter flange to form an oiltight seal and is integrated in its oil circulation system.

The backstop incorporates centrifugally operated grippers. When the gear unit is rotating in the specified direction of rotation, the inner ring and the cage with the grippers rotate, the outer ring remaining stationary. From a certain speed of rotation, the grippers lift off and the backstop now operates without wear.

Note: The direction of rotation can be changed by reversing the cage. FLINDER MUST be consulted in all cases on this matter.

Caution!

**To prevent damage to or destruction of the backstop, it is essential to ensure that the motor is not run in opposition to the locked backstop!
The plate stuck on the gear unit should be noted.**

6. Assembly

6.1 General information on installation

During installation, the safety notes in Section 3. should be observed.

Installation should be carried out by specialist personnel with the extreme care. We earnestly recommend that the customer should have installation carried out by us to prevent damage caused by improper execution and the resultant exclusion of our liability.

Right at the planning stage, it should be ensured that there is adequate space around the gear unit for installation and subsequent care and maintenance.

Adequate space for air intake should be left for gear units with fan.

Before commencing installation, adequate space must be provided for lifting gear.

6.2 Foundation

The foundation must be flat and horizontal.

It should be executed such that no sympathetic vibration occurs and no vibration can be transmitted from adjacent foundations. Steel structures on which the gear unit is installed must be torsionally rigid. They are to be designed in accordance with the mass and the torque, taking account of the forces acting on the gear unit.

When fixing the gear unit on a concrete foundation, using foundation blocks, suitable recesses should be provided in the foundation.

When alignment has been completed, slide rails should be grouted to the concrete foundation.

Note: Dimensions, space requirement, layout of the supply connections (in the case of gear units with oil cooling) should be taken from the drawings in the gear unit documentation.

6.3 Description of installation operations

- Remove corrosion protective coating from the shaft ends with benzine

Caution!

When doing so, avoid under any circumstances that benzine contacts the shaft seals.



Ensure adequate ventilation. Do NOT smoke. Explosion hazard!!

- Fit input drive and output drive elements on the shaft ends and secure if necessary.

Caution!

Fit coupling with a fitting device. Hammering or tapping on is NOT permissible, as this would damage gear wheels, anti-friction bearings, circlips and the like. If couplings are used which are to be fitted after heating, the Operating Instructions of the coupling in question should be observed.

Note: Gear units requiring the use of a hoist by virtue of their weight should be slung as illustrated in Section 4. "Handling and storage".

6.3.1 Alignment surfaces, alignment threads (≥ 360)

The alignment surfaces on the top of the housing and the alignment threads provided in the bottom of the housing are used for the purpose of alignment.

Note: During alignment of the gear unit, the values punched into the alignment surfaces MUST be observed.

6.3.2 Installation on a baseframe

- Clean the underneath of the gear unit foot surface
- Lower the gear unit onto the baseframe with a suitable hoist
- Align gear unit in relation to the input drive shaft and output drive shaft with suitable measuring equipment

Note: The maximum deviation may not exceed 0.2 mm over 100 mm of shaft length (only applies to gear unit size < 360).

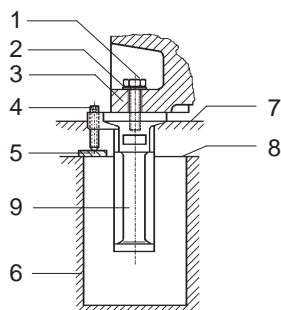
- Tighten foundation bolts, if necessary fit stops to prevent displacement

Caution!

The gear unit housing may not be stressed when the fixing bolts are tightened.

6.3.3 Installation on a concrete foundation

- Clean the underneath of the gear unit foot surface.
- Engage foundation blocks with washers and fixing bolts in the foundation fastenings on the gear unit housing and tighten the fixing bolts (see figure below).



- | | |
|---|-------------------------------|
| 1 | Fixing bolt |
| 2 | Washer |
| 3 | Gear unit foot |
| 4 | Setscrew |
| 5 | Iron flat |
| 6 | Foundation |
| 7 | Height of finished foundation |
| 8 | Height of prepared foundation |
| 9 | Foundation block |

- Lower gear unit onto the concrete foundation with a suitable hoist.
- When using foundation blocks, level the gear unit with the aid of the setscrews, using the input drive and output drive shafts as reference surfaces.

Note: The maximum deviation may not exceed 0.2 mm over 100 mm of shaft length (**only applies to gear unit size < 360**).

- Grout the recesses of the foundation blocks in the concrete foundation with concrete.

Note: The openings in the foundation blocks should be sealed with expanded polystyrene before grouting the foundation.
After the concrete has set, tighten the fixing bolts of the foundation blocks at the recommended tightening torque.

Caution! The gear unit housing may not be distorted when the fixing bolts are tightened.

- The input drive and output drive side units should be accurately aligned in relation to the shafts of the gear unit and secured with the aid of:
 - Straightedge
 - Spirit level
 - Dial gauge
 - Feeler gauge, etc.

Note: The service life of the shafts, bearings and couplings will depend significantly on the accuracy of axial alignment of the shafts in relation to one another.

6.3.4 Gear units with oil cooling system

- Before connecting the water-oil cooler, remove the sealing plugs from the connecting unions and flush the water-oil cooler through to remove any foreign matter present.
- Fit water-oil cooler at place of installation
- Lay and connect oil lines with valves
- Install cooling water inlet and outlet lines
- Connect pressure monitor electrically

Note: Plans for connection of the water-oil cooler, the cooling water inlet and outlet and pressure monitor are contained in the gear unit documentation.

- Fit safety devices on the gear unit.

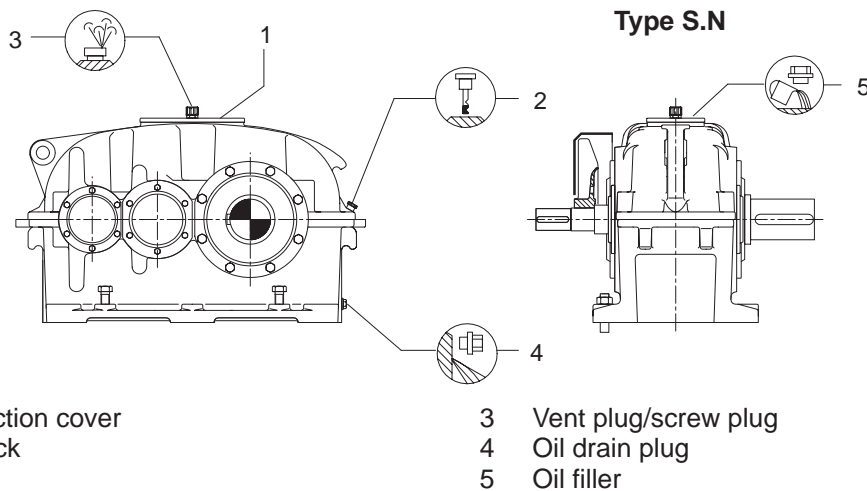
7. Startup

7.1 Measures before startup

Caution! For later, additional plastic coating (e.g. varnish), the shaft seals are under any circumstances to be covered against any contact with the coating device.

7.1.1 Depreservation

- Unscrew oil drain plug and drain off the remains of preservative or running-in oil from the housing into a suitable receptacle and dispose of in accordance with regulations.
- Replace oil drain plug
- **Gear unit preserved with VPI powder** (long term preservation > 24 months)
 - Undo fixing screws of inspection cover and remove inspection cover from the housing



Detailed illustrations of the gear unit will be found in the drawings in the gear unit documentation.

- Remove bag containing the VPI powder from the housing
- Close the inspection opening with the inspection cover and gasket until packing with lubricant is carried out.

Caution!

Before startup, replace the plastic screw plug with the vent plug and cap (see also Note on the gear unit).

7.1.2 Filling with lubricant

- Undo fixing screws of inspection cover and remove inspection cover from the housing

Caution!

Fill gear unit up with fresh oil using a filling filter (max. filter coarseness 60 μm). With it, the oil pockets above the bearings - on bevel gear units also inside the input shaft - have to be filled.

Note: The oil to be used should be taken from Section 10. "Maintenance and repair". Data, such as oil grade, oil viscosity and oil quantity required will be found on the rating plate (see Section 1. "Technical Data").

Note: In the case of gear units with oil cooling system, the oil circulation system should also be filled up.
For this purpose, the gear unit with oil pump attached should run briefly in accordance with Section 8.

- Check oil level with dipstick

Note: The oil level must be up to the top mark on the dipstick

Caution!

Any oil leaking out must immediately be removed with an oil binding agent.

- Close the inspection opening with the inspection cover and gasket.

7.2 Startup

- Check oil level in the gear unit housing with the dipstick

Note: When the oil has cooled down, the oil level should be up to the top mark on the dipstick. When the oil is hot, it may come past the top mark.
On no account may the level drop below the bottom mark; if necessary the oil should be topped up.

Gear units with oil cooling system:

- Fully open stop valves in the coolant inlet and outlet of the oil cooling system.
- The amount of cooling water required should be taken from the drawings in the gear unit documentation.

Gear units with backstop:

Before startup, check that the backstop can be turned over without the use of excessive force in freewheel direction of rotation. When doing so, note the direction of rotation arrows on the gear unit.

Caution!

**To prevent damage to or destruction of the backstop, it is essential to ensure that the motor is not run in opposition to the locked backstop!
The plate stuck on the gear unit should be noted.**

Before connecting the motor, the rotating field of the 3-phase supply network should be determined with the aid of a phase rotation indicator and the motor connected according to the predetermined direction of rotation.

Note: Startup can be carried out after the quantity of oil specified on the instruction plate has been poured in through the oil filler plug of the backstop.
The same oil grade and oil viscosity should be used as for the gear unit.

7.3 Shutdown

- To shut down the gear unit, the drive assembly should be shut off



Secure the drive assembly to prevent accidental switch-on!

- Close stop valves in the coolant inlet and outlet lines (gear units with oil cooling system only).
In the case of water-oil coolers, the water should be drained off. Frost hazard.

Note: If shut down for a considerable period of time, the gear unit should be run briefly at intervals of three weeks. If shut down for a period exceeding six months, the gear unit should be preserved; see 7.3.1.

7.3.1 Preservation for prolonged shutdown

According to the type of lubrication and of the shaft seals, the following methods of preservation can be carried out:

7.3.1.1 Preservation with gear oil

Gear units with splash lubrication and contacting shaft seals can be filled with the oil grade in use up to just below the vent plug.

7.3.1.2 Preservation with preservative oil

Gear units with pressurized oil lubrication, oil circulation cooling or contactless shaft seal rings should be run in no-load mode with preservative before prolonged storage.

We recommend the preservatives listed in the Table below for preservation of the gear unit:

Storage stability	Preservative	Special measures
up to 18 months	Shell Ensis Fluid SDC	none
up to 36 months	Shell Ensis Fluid SDC and bag with Shell VPI Powder 260 1)	seal gear unit, replace vent plug with sealing plug (change on startup)

Table 7.1: Preservation measures when using mineral oil

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Storage stability	Preservative	Special measures
up to 18 months	Special corrosion inhibitor oil TRIBOL 1390	none
up to 36 months	Special corrosion inhibitor oil TRIBOL 1390 and bag with Shell VPI Powder 260 1)	seal gear unit, replace vent plug with sealing plug (change on startup)

Table 7.2: Preservation measures when using PG base synthetic oil

Caution! 1) Change VPI bag after 2 years!

7.3.1.3 Internal preservation procedure

- Shut off gear unit and drain off oil as described in Section 10. "Maintenance and repair".
- Pour in preservative in accordance with Table 7.1 or 7.2 through the vent hole or through the inspection cover opening up to the top mark on the dipstick
- Reclose vent hole or inspection cover opening
- Run gear unit briefly
- Unscrew oil drain plug and drain preservative off into a suitable receptacle; dispose of in accordance with regulations.



There is a risk of scalding from the hot preservative emerging. Wear protective gloves.

- Replace oil drain plug
- If protection is required for more than 18 months, additionally suspend VPI bags (50 g = 2 bags per m³ of air) and seal gear unit in accordance with the notes in Table 7.1 or 7.2.



Shell Ensis Fluid SDC contains solvent! Ensure proper ventilation of area. Wear protective gloves.

Note: Before starting the gear unit up again, the bags with VPI powder should be removed and the screw plug should be replaced by the vent plug. Note item 7.1.1.

7.3.2 External preservation procedure

Protection time	Preservative name	Coating thickness	Remarks
up to 12 months	Tectyl 846 K19	approx. 50 µm	Wax base long preservation, seawater resistant tropic-proof, benzine-soluble

Table 7.3: External preservation of shaft ends and other bright metal surfaces

- Clean surfaces
- Smear shaft seal rings with grease for protection against preservative
- Apply preservative.

8. Operation

8.1 General operating data

During operation, the gear unit should be checked for:

- Excessive operating temperature (In continuous operation, using mineral oil, the gear unit is suitable for a temperature of 90 °C; at higher temperatures, it may be necessary to use synthetic oil. Short-term temperatures of 100 °C are permissible, see also Section 10: Maintenance and repair).
- Any changes in gear unit noises
- Possible oil leakage at the housing and the shaft seals

and

- Correct oil level (see also Section 7. "Startup").

Note: To check the oil level, the gear unit should be shut off.

When the oil is hot, the oil level may be slightly above the top mark on the dipstick. Under no circumstances may it fall below the bottom mark on the dipstick; top up if necessary.

Caution!

If irregularities are detected during operation or the pressure monitor in the oil cooling system trips an alarm (only with gear units equipped accordingly), the drive assembly should be shut off immediately. The cause of the malfunction should be determined with the aid of the Troubleshooting Table (Section 9.). The Troubleshooting Table lists possible malfunctions, their causes and suggestions for remedying them.

If the cause cannot be determined or there is no facility for repair with suitable equipment, we recommend calling in one of our service fitters (see Section 11.).

9. Disturbances, reasons and remedy

9.1 General information on malfunctions

Note: Malfunctions occurring during the warranty period which necessitate repair of the gear unit may only be remedied by FLENDER service personnel. Even after the warranty period has elapsed, we recommend our customers to consult our Service Division in respect of malfunctions whose cause cannot be clearly ascertained.

9.2 Possible causes

Malfunctions	Causes	Remedy
Temperature rise at bearing points	Oil level in gear unit housing too low	Check the oil level at room temperature, top up if necessary
	Oil is overaged	Check when last oil change was carried out; change oil if necessary. See Section 10.
	Mechanical oil pump defective	Check oil pump; replace if necessary
	Bearing(s) defective	Call in FLENDER Service. Check bearing(s); replace if necessary

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Malfunctions	Causes	Remedy
Excessive operating temperature	Oil level in gear unit housing too high	Check the oil level at room temperature, correct oil level if necessary
	Oil is overaged	Check when last oil change was carried out; change oil if necessary. See Section 10.
	Oil is very dirty	Change oil. See Section 10.
	Gear units with oil cooling system: Coolant flow rate insufficient	Fully open valves in inlet and outlet lines. Check water-oil cooler for free flow
	Coolant temperature too high	Check temperature; correct if necessary
	Oil flow rate through water-oil cooler too low due to: very dirty oil filter	Clean oil filter. See Section 10.
	Defective oil pump	Check function of oil pump; if necessary repair or replace oil pump
Change in gear unit running noises	Damage to tooth systems	Call in FLENDER Service. Check toothed components; if necessary replace damaged components.
	Excessive bearing play	Call in FLENDER Service. Adjust bearing play
	Bearing defective	Call in FLENDER Service. Replace defective bearings.
Loud noises in the region of the gear unit mounting	Gear unit mounting has loosened	Tighten bolts/nuts at recommended tightening torque. Replace damaged bolts/nuts
Oil leaking from the gear unit	Inadequate sealing of housing cover or joints	Check seals; replace if necessary. Seal joints
	Radial shaft seals defective	Check radial shaft seals; replace if necessary
Pressure monitor trips alarm (on gear unit with water-oil cooler)	Oil pressure < 0.5 bar	Check the oil level at room temperature, top up oil if necessary. Check oil pump; replace if necessary. Check oil filter; clean if necessary. See Section 10.
Excessive backstop temperature Stop function failure	Defective backstop	Call in FLENDER Service. Check backstop, replace if necessary.

Table 9.1: Information on malfunctions

10. Maintenance and repair

10.1 General information on maintenance

Note: All maintenance and repair work should be carried out with due care and only by thoroughly trained personnel.
The notes in Section 3. "Safety notes" should be observed.

Caution!

The periods listed in Table 10.1 are largely dependent on the conditions of use of the gear unit. For this reason, it is only possible to state average periods which relate to a:

daily operating time of	24 hours
duty factor of	ED 100 %
input drive speed of	1500 1/min
max. oil temperature of	90 °C (applicable to mineral oil)

Note: With different operating conditions, the periods should be adjusted accordingly.

Measures	Periods	Remarks
Check oil temperature	daily	
Check gear unit noise for changes	daily	
Check oil level	monthly	
Check gear unit for leakage	monthly	
Check oil for water content	after approx. 400 op.hrs/ at least once a year	see 10.2.1
Initial oil change after startup	after approx. 400 op.hrs	see 10.2.2
Subsequent oil changes	every 18 months or 5000 op.hrs 1)	see 10.2.2
Clean oil filter	every 3 months	see 10.2.3
Clean vent plug	every 3 months	see 10.2.4
Clean fan, fan cowl and gear housing	at same time as oil change	see 10.2.5
Check all fixing screws for tightness	after 1st oil change, then after every 2nd oil change	see 10.2.6
Check water-oil cooler for condition	at same time as oil change	see 10.2.7
Carry out complete inspection of gear unit	approx. every 2 years when oil change due	see 10.2.8

Table 10.1: Maintenance and repairs

1) With synthetic oils, the times can be tripled.

10.2 Description of maintenance and repairs

10.2.1 Examining oil for water content

Detailed information on examining the oil for water content can be obtained from your lubricant manufacturer.

10.2.2 Carrying out oil changes

Caution!

When changing the oil the gear unit should always be filled with the oil grade previously in use! Mixing oils of different grades or makes is NOT permissible. In particular, synthetic oils may not be mixed with mineral oils or different synthetic oils. When changing over from mineral oil to synthetic oil or from synthetic oil with a particular base to synthetic oil with another base, the gear unit must be flushed through thoroughly with the new oil grade.

When changing the oil, the housing must also be cleaned thoroughly by flushing with oil to remove oil sludge, abraded particles and residues of old oil. For this purpose, the same oil grade should be used as is in use for operation of the gear unit. Viscous oils should be warmed beforehand. Only when all residues have been removed, may the fresh oil be poured in.

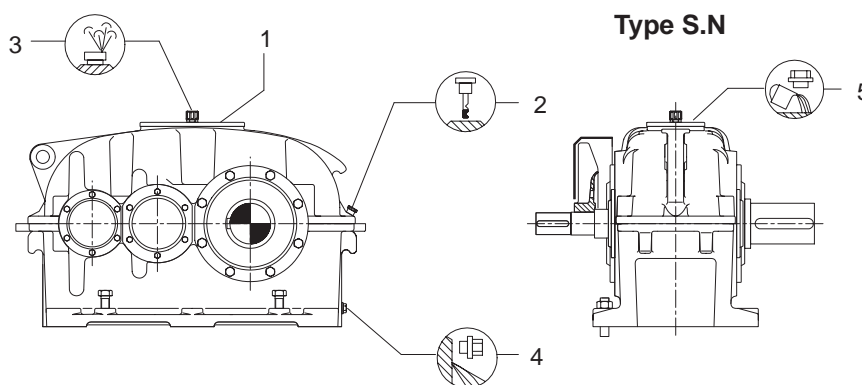
Note: The oil should be drained off, while the gear unit is still warm, after shutdown.

- Shut down gear unit by shutting off the drive unit



**Secure drive unit to prevent accidental startup.
Affix notice at the switch-on point.**

- Close stop valves in the coolant inlet and outlet lines (on gear units with oil cooler system)



- 1 Inspection cover
- 2 Dipstick

- 3 Vent plug/screw plug
- 4 Oil drain plug
- 5 Oil filler

Detailed illustrations of the gear unit will be found in the drawings in the gear unit documentation.

- Place a suitable collection receptacle under the oil drain plug of the gear unit housing
- Unscrew the vent plug on the top of the housing
- Unscrew oil drain plug and drain oil off into the receptacle



**There is a risk of scalding from the hot oil emerging.
Wear protective gloves.**

- Thoroughly clean the permanent magnet of the oil drain plug
- Screw in oil drain plug

Note: Check condition of seal washer (the seal washer is vulcanized onto the oil drain plug); use new oil drain plug if necessary.

- Clean oil filter in oil cooling system; see 10.2.3 (on gear units with oil cooler system)
- Undo fixing screws of inspection cover and remove inspection cover from the housing

Caution!

Fill gear unit up with fresh oil using a filling filter (max. filter coarseness 60 μm). With it, the oil pockets above the bearings - on bevel gear units also inside the input shaft - have to be filled.

Note: The oil to be used will be found in Table 10.3.
Data, such as oil grade, oil viscosity and quantity of oil required should be taken from the rating plate (see Section 1. "Technical Data").

Note: In the case of gear units with oil cooling system, the oil circulation system should additionally be filled. For this purpose, the gear unit with oil pump attached should be run briefly in accordance with Section 8.

- Check oil level with dipstick

Note: The oil level must come up to the top mark on the dipstick

Caution! Any oil escaping should be removed immediately with oil binding agent.

- Close the inspection opening with the inspection cover and gasket.

10.2.3 Cleaning the oil filter

See the Operating Instructions for the make of oil filter in use in each case.

10.2.4 Cleaning the vent plug

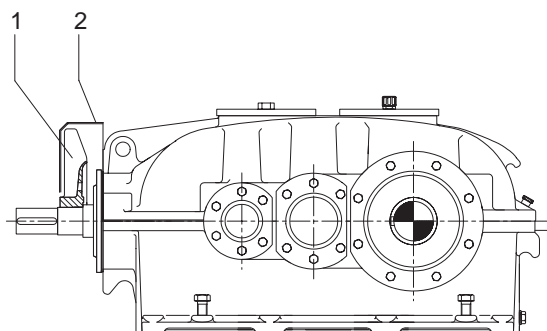
The vent plug should be cleaned when a coating of dust has collected - at least every 3 months -. For this purpose, the vent plug should be unscrewed, rinsed in benzine or a similar cleaning agent and dried or blown through with compressed air.

10.2.5 Cleaning the fan and the gear unit

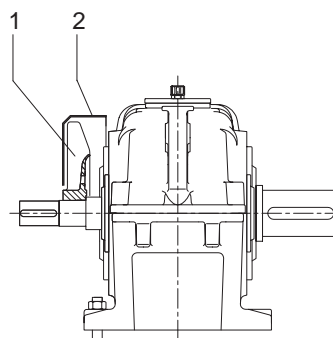
- Shut down gear unit by shutting off the drive unit



**Secure drive unit to prevent accidental startup.
Affix notice at the switch-on point.**



Type K.N



Type S.N

1 Fan

2 Fan cowl

Detailed illustrations of the gear unit will be found in the drawings in the gear unit documentation.

- Remove fan cowl
- Remove any dirt adhering to the fan impeller, cowl and mesh guard with a stiff brush.
- Clean off any corrosion
- Screw the mesh guard onto the fan cowl with the fixing screws.

Caution! Cleaning the gear unit with a high-pressure cleaning device is not permissible.

10.2.6 Checking all fixing screws for tightness

- Shut down gear unit by shutting off the drive unit



**Secure drive unit to prevent accidental startup.
Affix notice at the switch-on point.**

- Close stop valves in the coolant inlet and outlet lines (on gear units with oil cooler system)
- Check all fixing screws for tightness with a torque wrench.

Thread size	Property class	Tightening torque
M 6	8.8	12 Nm
M 8	8.8	30 Nm
M 10	8.8	60 Nm
M 12	8.8	105 Nm
M 16	8.8	255 Nm
M 20	8.8	500 Nm
M 24	8.8	870 Nm
M 30	8.8	1750 Nm
M 36	8.8	3050 Nm
M 42	8.8	4950 Nm
M 48	8.8	7400 Nm
M 56	8.8	11700 Nm

Table 10.2: Tightening torques

Note: Unserviceable screws should be replaced by fresh ones of the same property class and type.

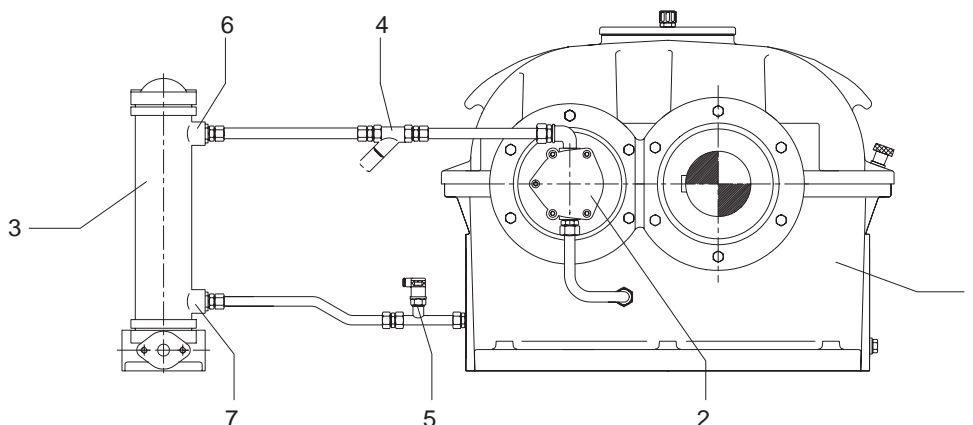
10.2.7 Checking water-oil cooler

- Shut down gear unit by shutting off the drive unit



**Secure drive unit to prevent accidental startup.
Affix notice at the switch-on point.**

- Close stop valves in the coolant inlet and outlet lines (on gear units with oil cooler system)



- | | |
|----------------------------------|--------------------------------|
| 1 Gear unit | 5 Pressure monitor (B 5925 EN) |
| 2 Flange-mounting pump | 6 Cooling water inlet |
| 3 Water-oil cooler | 7 Cooling water outlet |
| 4 Coarse mesh filter (B 5911 EN) | |

Detailed illustrations of the gear unit will be found in the drawings in the gear unit documentation.

- Check the water-oil cooler for condition in accordance with the manufacturer's Operating Instructions.
- Operating Instructions B 5911 EN and B 5925 EN should be observed for operation and maintenance of the coarse-mesh filter and the pressure monitor.

Note: Check screw fastenings for tightness; replace if necessary.

- Run gear unit briefly
- Shut gear unit down and measure oil level with dipstick

Note: The oil level must come up to the top mark on the dipstick

To top up oil:

- Undo fixing screws of inspection cover and remove inspection cover from the housing

Caution!

Fill gear unit up with fresh oil using a filling filter (max. filter coarseness 60 µm). With it, the oil pockets above the bearings - on bevel gear units also inside the input shaft - have to be filled.

Note: Use only the oil grade previously in use (see also 10.2.2).
Data, such as oil grade, oil viscosity and quantity of oil required should be taken from the rating plate (see Section 1. "Technical data").

Note: In the case of gear units with oil cooling system, the oil circulation system should additionally be filled.
For this purpose, the gear unit with oil pump attached should be run briefly in accordance with Section 8.

- Check oil level with dipstick

Note: The oil level must come up to the top mark on the dipstick

Caution!

Any oil escaping should be removed immediately with oil binding agent.

- Close the inspection opening with the inspection cover and gasket

10.2.8 Gear unit inspection

The gear unit inspection should be entrusted to our Service Division, as by virtue of their experience, our technicians can most reliably assess whether and which parts of the gear unit must be replaced.

10.3 Lubricants

Oil selection should always be determined by the oil viscosity (VG Class) specified on the rating plate of the gear unit. The viscosity class is valid for the operating conditions agreed by the contract.

Under different operating conditions, it will be necessary to consult us at FLENDER.

We have compiled a Lubricant Table of the lubricants suitable for the gear unit (see Table 10.3).

We are acquainted with the composition of these lubricants and in accordance with our present state of knowledge know that they possess values in respect of loadability, corrosion protection, load carrying capacity with micro-pitting, as well as compatibility with seals and internal coating on which the design of the gear unit has been based.

Thus, we recommend that our customers should select a lubricant from this Table, taking account of the viscosity class stated on the rating plate.

Note: As a precaution against misunderstandings, we would point out that this recommendation does not imply any release in the sense of a warranty for the quality of the lubricant provided by your supplier. Each lubricant manufacturer must warrant the quality of his product himself.

If for any reason you deem important, you do not follow our recommendation, you yourself will assume the responsibility for the technical suitability of the lubricant.

In order to assist you to minimize the technical risk in such cases, we recommend that you insist on the following minimum prerequisites:

- The oil must fulfil all requirements imposed on a CLP oil in accordance with DIN 51517. Fail Stage 12 must be reached in the FZG scuffing test.
- In the micro-pitting test in accordance with FVA Project No. 54, the oil must reach Fail Stage 10.
- In the FLENDER foam test, the foam content may not exceed a maximum of 10%.

We will be pleased to carry out the FLENDER foam test at cost (cost on request).

- The oil must be approved by Messrs Freudenberg in respect of seal ring compatibility. Suitable trials will be carried out by Messrs Freudenberg with materials 72 NBR 902 and 75 FKM 585.

Address: Carl Freudenberg / SIMRIT Ct E1 / D 69469 Weinheim

- In the case of synthetic oils, the corrosiveness of the oil to our internal coating should also be checked. A check of this nature is carried out by us at cost (cost on request).

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Lubricant	Viscosity ISO-VG DIN 51519 at 40 °C mm ² /s	Examples of lubricants									
											
Synthetic oils 1)	VG 1000	Degol GS 1000							TRIBOL 800 / 1000		
	VG 680	Degol GS 680		Polydea PGLP 680			Glygoyle HE 680		TRIBOL 800 / 680		
	VG 460	Degol GS 460	Enersyn SG-XP 460	Polydea PGLP 460			Glygoyle HE 460		TRIBOL 800 / 460		
	VG 320	Degol GS 320					Glygoyle HE 320		TRIBOL 800 / 320		
	VG 220	Degol GS 220	Enersyn SG-XP 220	Polydea PGLP 220			Glygoyle 30		TRIBOL 800 / 220		
	VG 150	Degol GS 150		Polydea PGLP 150			Glygoyle 22		TRIBOL 800 / 150		
	VG 100								TRIBOL 800 / 100		
Mineral oils 2)	VG 1000								TRIBOL 1100 / 1000		Optigear BM 1000
	VG 680	Degol BG 680			SPARTAN EP 680		Mobilgear 636		TRIBOL 1100 / 680		Optigear BM 680
	VG 460	Degol BG 460			SPARTAN EP 460		Mobilgear 634		TRIBOL 1100 / 460		Optigear BM 460
	VG 320	Degol BG 320			SPARTAN EP 320		Mobilgear 632		TRIBOL 1100 / 320		Optigear BM 320
	VG 220	Degol BG 220			SPARTAN EP 220		Mobilgear 630		TRIBOL 1100 / 220		Optigear BM 220
	VG 150	Degol BG 150			SPARTAN EP 150		Mobilgear 629		TRIBOL 1100 / 150		Optigear BM 150
	VG 100	Degol BG 100			SPARTAN EP 100		Mobilgear 627		TRIBOL 1100 / 100		Optigear BM 100
Gear unit grease	Aralub FD 00 FDP 00	Energrease HTO HT 00 EP	Orona 00 Orona FG EP 0	FIBRAX EP 370	MICROLUBE GB 00	Mobilplex 44	Special-gear unit grease H	MOLUB-ALLOY Multi-purp. grease 00 TRIBOL 5000	Wiolub GFW	Longtime PD 00	
Lithium saponified anti-friction bearing greases	Aralub HL 2	Energrease LS 3	Glissando 20 Glissando 30	BEACON 3	CENTOPLEX GLP 402	Mobilux 2 Mobilux 3	Alvania grease R3 Alvania grease G3	MOLUB-ALLOY BRB 572	Wiolub LFK 2	Longtime PD 2	

Table 10.3: Lubricant Selection

1) Synthetic lubricants (polyglycols) in accordance with designation PG as per DIN 51 502. These oils are distinguished by their high ageing resistance and favourable effect on the efficiency of the gear unit.

They are suitable for operating temperatures from -20 °C to +100 °C (briefly +110 °C).

2) Mineral base gear oils in accordance with designation CLP as per DIN 51 502. These oils comply with the minimum requirements as specified in DIN 51517 Part 3. They are suitable for operating temperatures from -10 °C to +90 °C (briefly +100 °C).

Note: If the operating temperature of the gear unit exceeds or undershoots the limit values stated under 1) or 2), the oil selected should be checked for suitability.

Oils marked with a ▼ can also be utilized when using Freudenberg shaft seal rings of Viton 83 FKM 575 or 75 FKM 585!

If your gear unit is fitted with Viton shaft seal rings out of the mentioned materials, this will be indicated by a plate on the gear unit.

11. Spare parts stock, service facility addresses

11.1 Stocking spare parts

Maintaining a stock of the most essential replacement and wearing parts on site will ensure that the gear unit is serviceable at all times.

When ordering spare parts, please make use of the Spare Parts List which forms part of this documentation.

Further information will be found in the Spares Parts Drawing listed in the Spare Parts List.

We assume warranty only for original spare parts supplied by us.

Caution!

We would expressly draw attention to the fact that spare part(s) and accessories not supplied by us have not been tested or approved by us either. Fitting and/or use of such products can therefore under certain circumstances adversely affect structurally specified properties of the gear unit and will thus impair active and/or passive safety. No form of reliability or warranty will be assumed by FLENDER for damage occasioned by the use of non-original spare parts and accessories.

Please note that production and supply specifications frequently exist for components and we will always offer spare parts in accordance with the state of the art and in accordance with the latest legal requirements.

When ordering spare parts, the following data should be stated:

Order No.	Part No.	Quantity
-----------	----------	----------

11.2 Service facility addresses

When ordering spare parts or requesting a Service fitter, please contact FLENDER AG first of all.

FLENDER Germany

A. FRIEDR. FLENDER AG

46393 Bocholt - Tel.: (0 28 71) 92-0 - Fax: (0 28 71) 92 25 96
E-mail: contact@flender.com • www.flender.com
Shipping address: Alfred - Flender - Strasse 77 - 46395 Bocholt

A. FRIEDR. FLENDER AG - Kupplungswerk Mussum

Industriepark Bocholt - Schlavenhorst 100 - 46395 Bocholt - Tel.: (0 28 71) 92 28 68 - Fax: (0 28 71) 92 25 79
E-mail: couplings@flender.com • www.flender.com

A. FRIEDR. FLENDER AG - Werk Friedrichsfeld

Am Industriepark 2 - 46562 Voerde - Tel.: (0 28 71) 92-0 - Fax: (0 28 71) 92 25 96
E-mail: contact@flender.com • www.flender.com

Winergy AG

Am Industriepark 2 - 46562 Voerde - Tel.: (0 28 71) 924 - Fax: (0 28 71) 92 24 87
E-mail: info@winergy-ag.com • www.winergy-ag.com

A. FRIEDR. FLENDER AG - Getriebewerk Penig

Thierbacher Strasse 24 - 09322 Penig - Tel.: (03 73 81) 60 - Fax: (03 73 81) 8 02 86
E-mail: ute.tappert@flender.com • www.flender.com

FLENDER - TÜBINGEN GMBH

72007 Tübingen - Tel.: (0 70 71) 7 07-0 - Fax: (0 70 71) 70 74 00
E-mail: sales-motox@flender-motox.com • www.flender.com
Shipping address: Bahnhofstrasse 40 - 72072 Tübingen

LOHER GMBH

94095 Ruhstorf - Tel.: (0 85 31) 3 90 - Fax: (0 85 31) 3 94 37
E-mail: info@loher.de • www.loher.de
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FLENDER SERVICE GMBH

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24h Service Hotline +49 (0) 17 22 81 01 00
Shipping address: Südstrasse 111 - 44625 Herne

A. FRIEDR. FLENDER AG - FLENDER GUSS

Obere Hauptstrasse 228-230 - 09228 Chemnitz / Wittgensdorf - Tel.: (0 37 22) 64 - 0 - Fax: (0 37 22) 94 - 138
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12. Declaration by the manufacturer

Declaration by the manufacturer

in accordance with EC Engineering Guideline 98/37/EC, Appendix II B

We hereby declare that the

Gear Unit Types S.N and K.N Size 80 to 560

described in these Operating Instructions are intended for incorporation in a machine, and that it is prohibited to put them into service before verifying that the machine into which they are incorporated complies with the EC Guidelines (original edition 98/37/EC including any subsequent amendments thereto).

This Manufacturer's Declaration takes into account all the unified standards (inasmuch as they apply to our products) published by the European Commission in the Official Journal of the European Community.



Bocholt, 1995-03-20

Signature (person responsible for products)