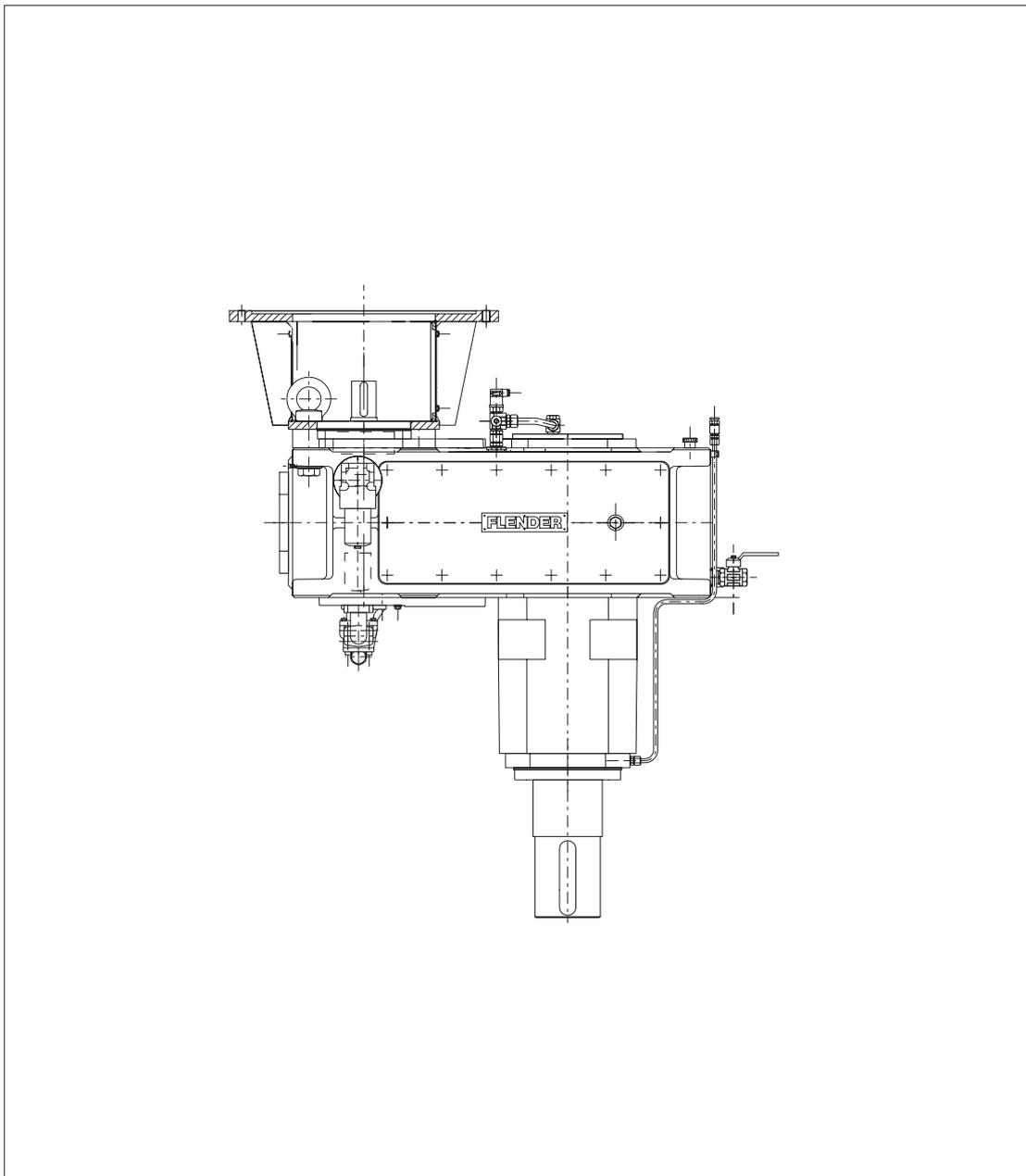


Operating Instructions

BA 5019 EN 07.01

Cooling Tower Gear Unit Type
H2NV
Sizes 5 to 12



FLENDER

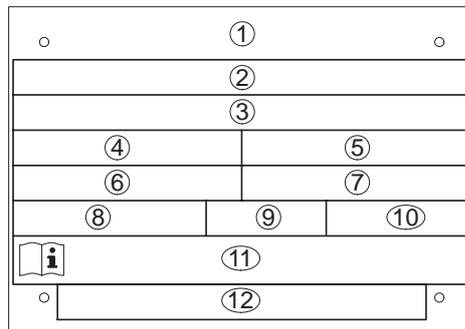
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1. Technical data

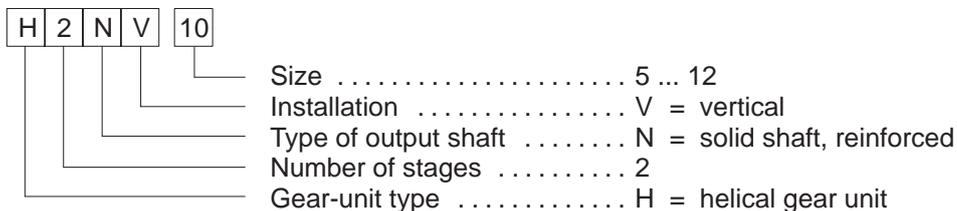
1.1 General technical data

The most important technical data are shown on the rating plate. These data along with the contractual agreements on the gear unit determine the limits of its proper use.



- | | |
|---|---|
| ① Company logo and production location | ⑦ Speed n_2 |
| ② For custom-made particulars | ⑧ Type of oil |
| ③ Order no. - item - serial no. | ⑨ Viscosity of oil in VG class |
| ④ Type / Size *) | ⑩ Quantity of oil in litres for main gear housing |
| ⑤ Power rating P_2 in kW or T_2 in Nm | ⑪ Number of operating instruction(s) |
| ⑥ Speed n_1 | ⑫ Special information |

e.g. *)



Note: The lubricating points are identified with the following identification plate:



For further technical data please refer to the technical data sheet and the drawings in the gear-unit documentation which are supplied separately.

1.1.1 Measuring-surface sound level

The measuring-surface sound level of the gear unit at a distance of 1 m can be found in the technical data sheet supplied separately.

The measurement is carried out to DIN 45635 parts 1 and 23 using the sound-intensity method.

The workplace of the operating personnel is defined as the area on the measuring surface at a distance of 1 metre, in whose vicinity persons may be present.

The sound level applies for the warmed-up gear unit at input speed n_1 and output power P_2 stated on the rating plate. If several figures are given, the highest speed and power values apply.

The measuring-surface sound level includes attached lubrication units (if applicable). With outgoing and ingoing pipes, the interfaces are the flanges.

If repeat measurements on site do not produce conclusive results with regard to measuring technology, the measurement achieved on the FLENDER test bench will apply.

2. General notes

2.1 Introduction

These Operating Instructions (BA) are an integral part of the gear unit supplied and must be kept in its vicinity for reference at all times.

Caution!

All persons involved in the installation, operation, maintenance and repair of the gear unit must have read and understood these Operating Instructions and must comply with them at all times. We accept no responsibility for damage or disruption caused by disregard of these Instructions.

The “**FLENDER gear unit**” described in these Instructions has been developed for stationary use in general engineering applications. Possible areas of use for gear units of this type are (e.g.) air cooling systems for power stations.

The gear unit is designed only for the application described in section 1 “Technical data”. Possible use in any other area must be contractually agreed.

The gear unit described in these Instructions reflects the state of technical development at the time these Instructions went to print.

In the interest of technical progress, we reserve the right to make changes to the individual assemblies and accessories which we regard as necessary to preserve their essential characteristics and improve their efficiency and safety.

2.2 Copyright

The copyright to these Operating Instructions is held by **FLENDER AG**.

These Operating Instructions must not be wholly or partly reproduced for competitive purposes, used in any unauthorised way, or made available to third parties without our agreement.

Technical enquiries should be addressed to the following plant:

A. FRIEDR. FLENDER AG
Getriebewerk Penig
Thierbacher Straße 24
D-09322 Penig

Tel.: 037381/60
Fax: 037381/80286

or to our customer-service addresses. A list of our customer-service addresses is given in section 11 “Spare parts, customer-service addresses”.

3. Safety notes

3.1 Proper use

- The gear unit has been manufactured in accordance with the state of the art and is delivered in a condition for safe and reliable use. All changes to the gear unit on the part of the user which may affect its safety and reliability are prohibited. This applies equally to safety features designed to prevent accidental contact.
- The gear unit should be used and operated only within the context of the conditions laid down in the contract governing performance and supply.

3.2 Obligations of the user

- The user must ensure that all persons involved in the installation, operation, maintenance and repair of the gear unit have read and understood these Operating Instructions and comply with them at all times in order to:

- avoid injury or damage,
- ensure the safety and reliability of the unit,

and

- avoid disruptions and environmental damage through incorrect use.
- During transport, assembly, installation, dismantling, operation and maintenance of the unit, the relevant safety and environmental regulations must be complied with at all times.
- The gear unit should be operated, maintained or repaired by authorised, trained and qualified personnel.
- The gear unit must not be cleaned using high-pressure cleaning equipment.
- All work on the gear unit must be carried out with great care and with due regard to safety.
- All work on the gear unit must be carried out only when it is not in operation. The drive assembly must be secured against being switched on accidentally (e.g. by locking the key switch or removing the fuses from the power supply). A notice should be attached to the ON switch stating clearly that work is in progress.
- No welding work should be done on the gear unit. The gear unit must not be used as an earthing point for welding operations. Delicate teeth and bearings may be irreparably damaged by welding.
- If any changes are noticed during operation (e.g. overheating or unusual noises), the drive assembly must be switched off immediately.
- Rotating drive components such as couplings, gearwheels, belt drives etc. must be protected against accidental contact.
- If the gear unit is intended for installation in plant or machinery, the manufacturer of such plant or machinery must ensure that the contents of these Instructions are incorporated in his own instructions.
- Notices attached to the gear unit, e.g. rating plate, direction arrows etc. must always be observed. They must be kept free from dirt and paint at all times. Missing plates must be replaced.
- All spare parts must be obtained from FLENDER.

3.3 Environmental protection

- When changing oil, the used oil must be collected in suitable containers. Any spillage of oil must be removed immediately.
- Conservation agent should be stored separately from used oil.
- Used oil, conservation agent, oil-binding agents and oil-soaked cloths must be disposed of in accordance with environmental legislation.

3.4 Special dangers

- Depending on operating conditions, the surface of the gear unit may heat up considerably.
Danger of burns!
- When changing oil, take care to prevent scalding by hot oil.

3.5 Warnings and symbols used in these Instructions



This symbol indicates safety measures which must be observed to avoid **personal injury**.

Caution!

This symbol indicates safety measures which must be observed to avoid **damage to the gear unit**.

Note: This symbol indicates general **operating procedures** which are of particular importance.

4. Handling and storage

Note: Observe the "Safety notes" in section 3.

4.1 Scope of supply

The products supplied are listed in the dispatch papers. Check immediately on receipt to ensure that all the products listed have actually been delivered. Damaged or missing parts must be notified in writing immediately.

4.2 Handling

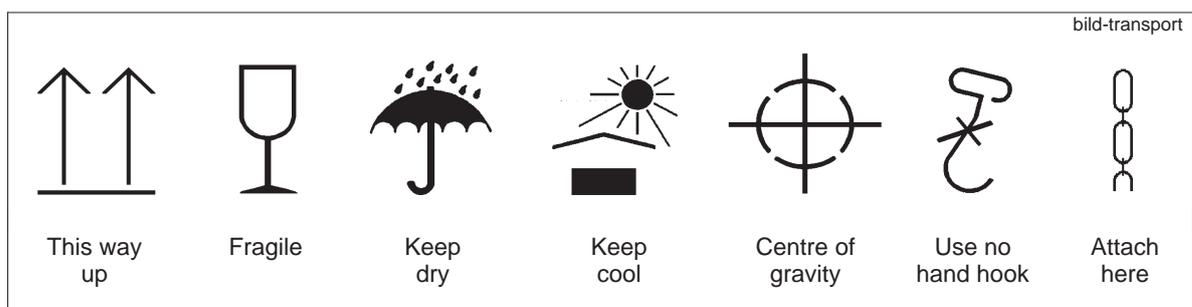


When handling FLENDER products use only lifting and handling equipment of sufficient load-carrying capacity!

The gear unit is delivered in the fully assembled state. Additional items (e.g. oil cooler, pipes and fittings) are delivered separately packaged.

Different forms of packaging may be used depending on the size of the unit and method of transport. Unless otherwise agreed, the packaging complies with the **HPE Packaging Guidelines**.

The symbols marked on the packaging must be observed at all times. These have the following meanings:



FLENDER

Caution!

The gear unit must always be transported with due care to avoid danger to persons and property. Avoid bumping the ends of shafts as this may damage the gear unit.

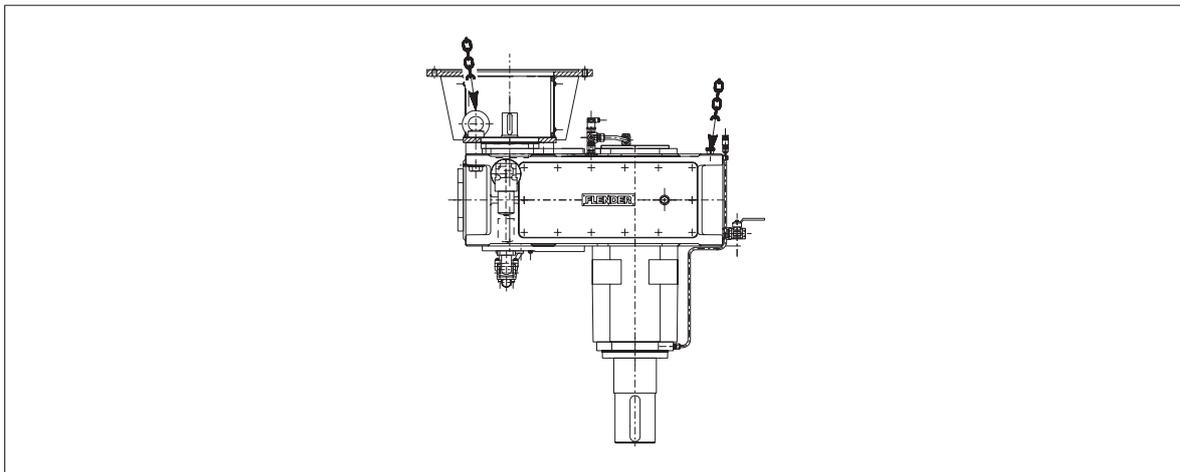
Note:

The gear unit must be transported using suitable equipment only. Never transport the gear unit with an oil charge.

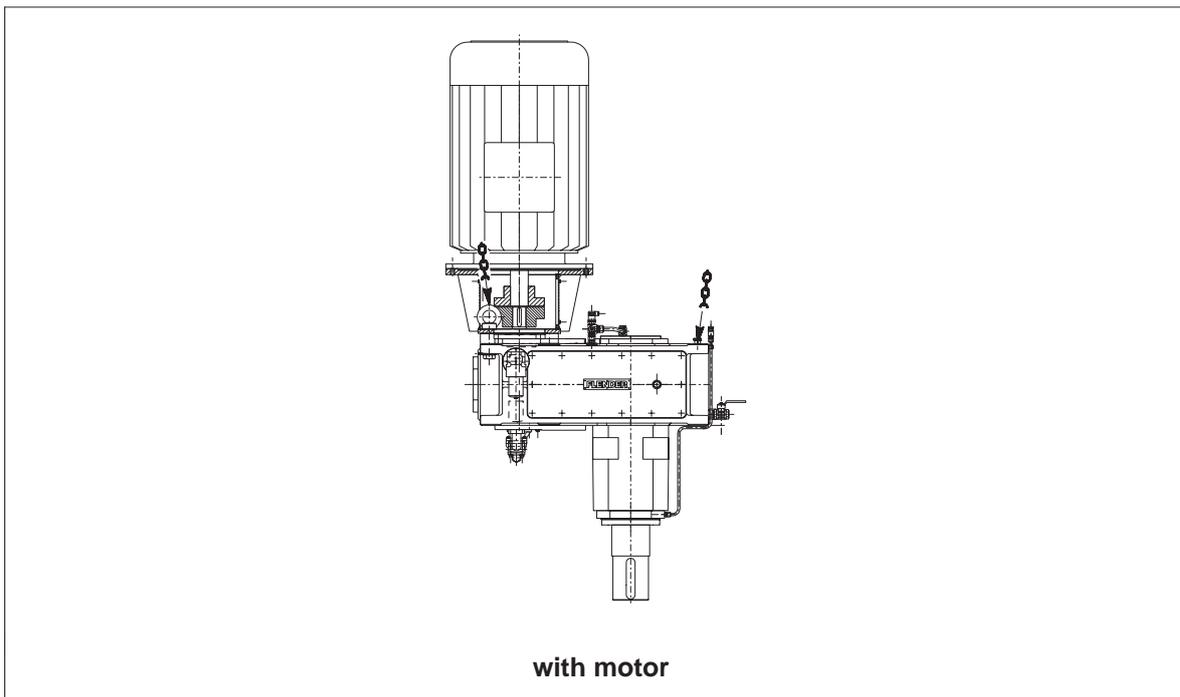
Caution!

Use only the ring bolts and/or lifting eyes provided for attaching lifting equipment to the unit.

Do not use the front thread at the end of the shaft for attaching ring bolts for transport purposes.



For drive units, where additional components (e.g. motor, coupling etc.) are mounted on the gear unit, an additional attachment point may be required because of the shift in the centre of gravity.



For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

The position of the attachment points is shown in the documentation for each specific order.

Caution!

When handling the unit in a situation which is different from the mounting position, be sure to repack with a corresponding quantity of grease using a grease gun (see point 7.1.2.2).

4.3 Storing the gear unit

The gear unit must be stored in the position of use in a sheltered place. It must be placed on a vibration-free wooden base and covered over.



Do not stack gear units on top of one another.

Caution!

If the gear unit is being stored out of doors, it must be covered with particular care. It must be ensured that neither moisture nor foreign material can collect on the unit.

Note: Provision for special environmental conditions during transport (e.g. transport by ship) and storage (climate, termites etc.) must be contractually agreed.

Caution!

When storing the unit in a situation which is different from the mounting position, be sure to repack with a corresponding quantity of grease using a grease gun (see point 7.1.2.2).

4.4 Standard corrosion protection

The gear unit is filled with conservation agent. The free shaft ends are painted for protection.

The properties of the outer paint coating are as follows: Resistance to acids, weak alkalis, solvents, atmospheric action, temperatures up to 120 °C (temporarily up to 140 °C) and to tropical-climate conditions.

Note: Ensure that the paint is not damaged!
Mechanical damage (scratches), chemical damage (acids, alkalis) and thermal damage (sparks, welding beads, heat) cause corrosion which may cause failure of the exterior protective coating.

Note: Unless otherwise agreed, we grant a guarantee of 6 months on the interior corrosion protection, and 24 months on the protective coating on the free shaft ends. The guarantee period commences on the date of delivery.

For longer periods of storage (> 6 months) we advise regular checking and, if necessary, renewal of the interior corrosion protection (see section 7 "Start-up").

5. Technical description

Note: Observe the "Safety notes" in section 3.

5.1 General description

The gear unit is supplied as a two-stage helical gear unit. It is designed for installation in a vertical position. If necessary, it can also be designed for installation in a different position.

Attachment of a backstop establishes the gear unit for a certain direction of rotation.

The speed range indicated to us in the design stage is covered by the use of a pump. On-load operation of the gear units at different speeds can cause damage.

The gear units are characterised by a low noise level. This is achieved by helical gears with a high contact ratio and special sound-damping housings.

The good temperature characteristics of the gear unit are achieved by its high degree of efficiency, large housing surface and performance-related cooling system.

Note: Unless otherwise agreed by contract, the gear units must not be exposed to harmful environmental factors such as chemical products, high-air pollution and temperatures outside the range 0 to +20 °C.

5.2 Housing

The housings are of cast iron. If required, it may also be of steel.

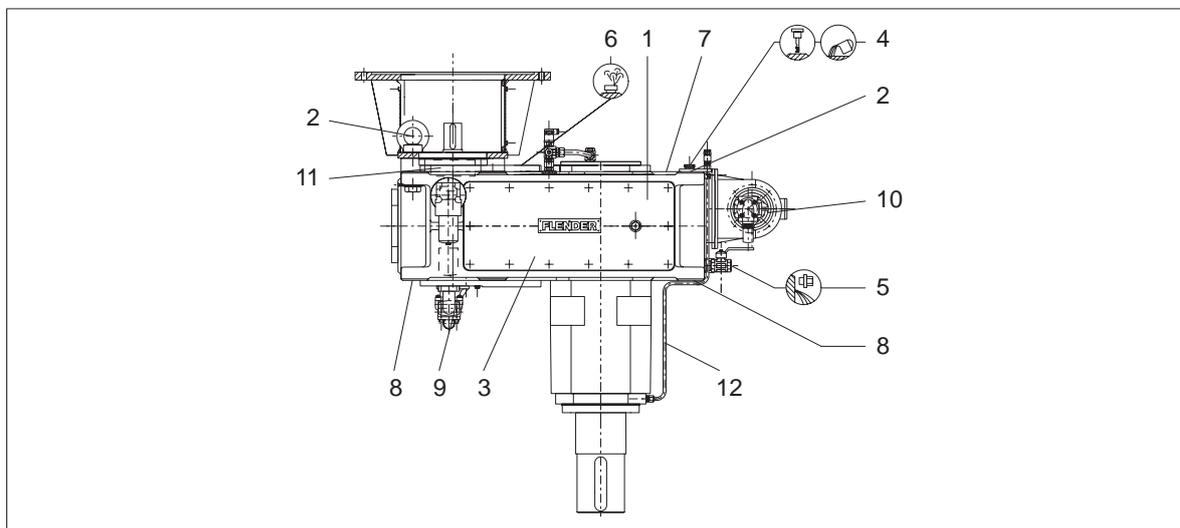
The housing is made in one part. The housing is rigid in design and due to its form has excellent noise and temperature characteristics.

The housing is fitted with adequately dimensioned lifting eyes, inspection or assembly covers.

A dipstick or an oil level indicator for oil-level checking, grease nipples for grease lubrication, an oil drain plug or an oil drain cock for the oil change and a breather screw or a wet-air filter for aeration and ventilation of the gear unit are available.

Colour codes for venting, oil inlet, oil level and oil drainage:

Venting:	yellow	
Oil inlet:	yellow	
Oil level:	red	
Lubrication points:	red	
Oil drain:	white	



1	Housing	7	Rating plate
2	Ring bolts / lifting eyes	8	Gear-unit fastening
3	Inspection or assembly cover	9	Flange pump
4	Oil dipstick / oil inlet	10	Motor pump
5	Oil drain cock / oil drain plug	11	Backstop
6	Housing ventilation	12	Lubricating point

} optional

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

5.3 Toothed components

The toothed components of the gear unit are case hardened. Helical-gear teeth are ground. The high quality of the teeth lead to a significant noise reduction and ensure safe and reliable running.

The gear wheels are joined to the shafts by interference fitting and parallel keys. These types of joints transmit the torques generated with adequate reliability.

5.4 Setup of lubrication system

The rolling bearings and gear stages are supplied with oil by means of splash and forced lubrication.

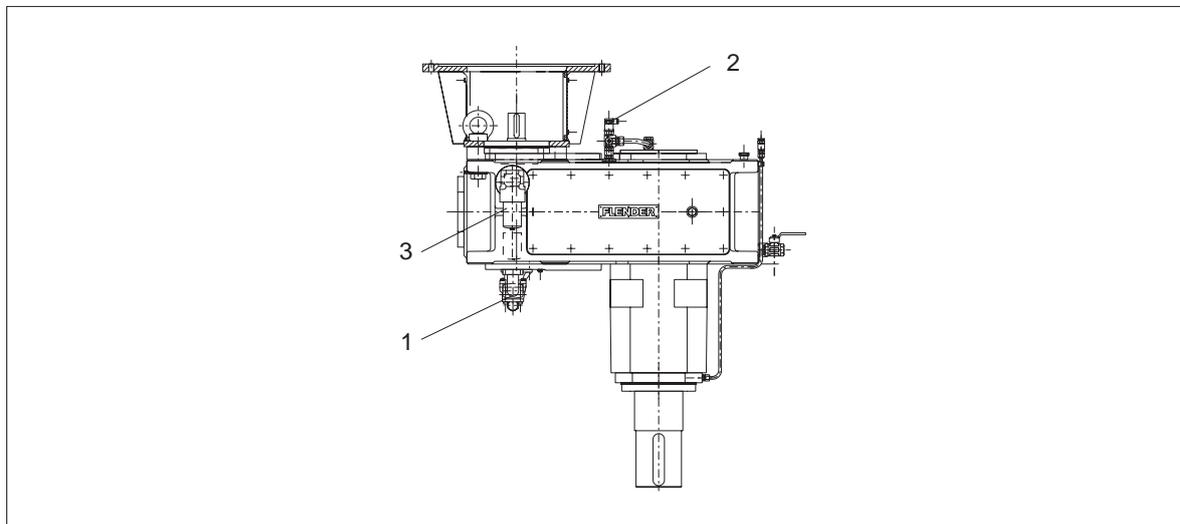
The output-shaft rolling bearing arranged at the bottom is grease-lubricated. In case of prolonged storage in a situation which is different from the mounting position, a corresponding quantity of grease should be repacked using a grease gun prior to initial operation. This requires consultation with FLENDER (see also point 7.1.2.2).

5.4.1 Combined splash/forced lubrication by means of an attached oil pump

The rolling bearings and helical gears arranged at the top are supplied with oil by means of forced lubrication.

The oil supply system is fixed to the gear unit and comprises a flanged-on or power-operated pump, a filter, a pressure monitor and the necessary pipework.

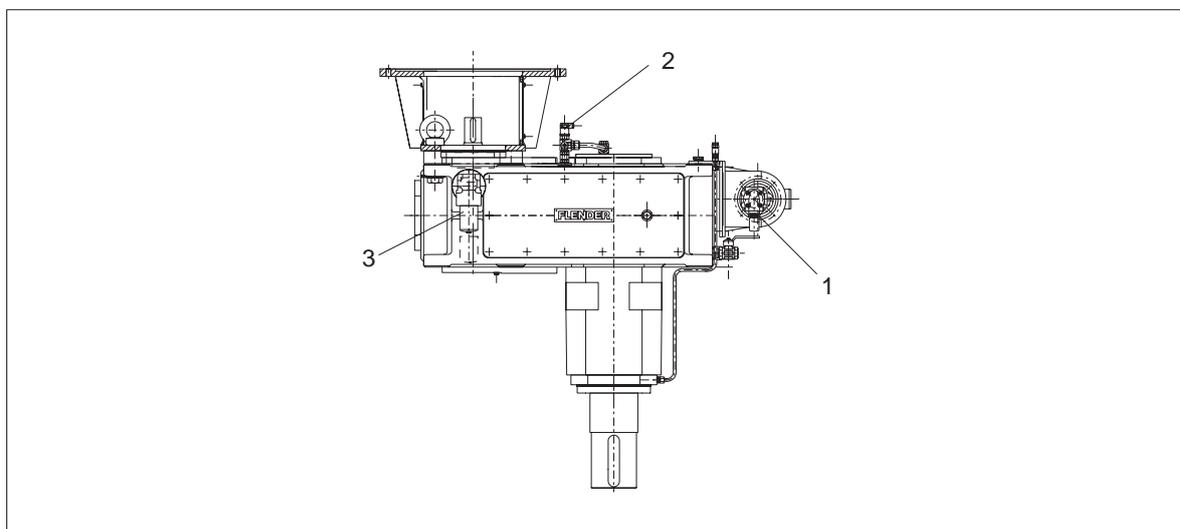
Type fitted with flange pump



1 Flange pump 2 Pressure monitor 3 Filter

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Type fitted with motor pump



1 Motor pump 2 Pressure monitor 3 Filter

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Caution!

In the case of gear units with attached oil supply system, it is absolutely necessary to connect the pressure monitor (as a maker) prior to startup.

Note:

The operation and maintenance of the pump, pressure monitor and filter are described in instructions included (where applicable) with the products. For technical details, refer to the order-specific equipment list.

5.5 Shaft bearings

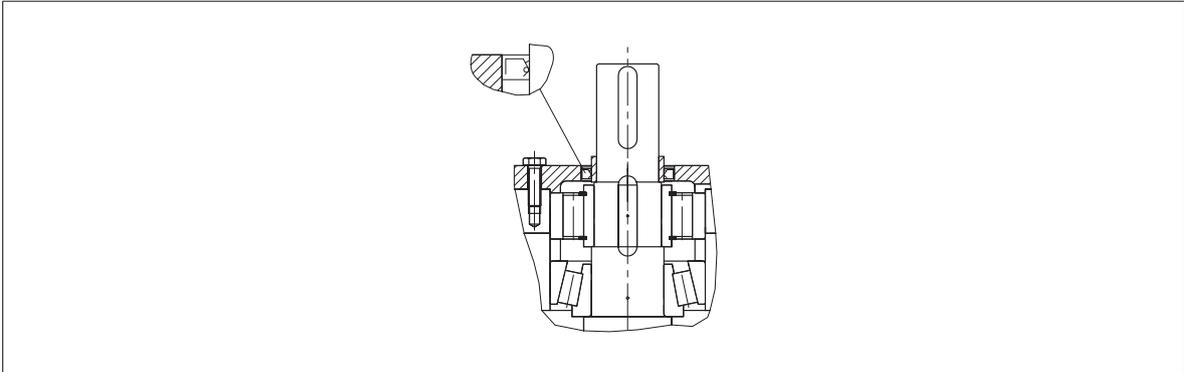
All shafts are mounted on anti-friction bearings.

5.6 Shaft seals

Depending on requirements, radial shaft sealing rings are provided at the shaft outlets to prevent oil or grease from escaping from the gear unit or dirt from entering it.

5.6.1 Radial shaft sealing rings

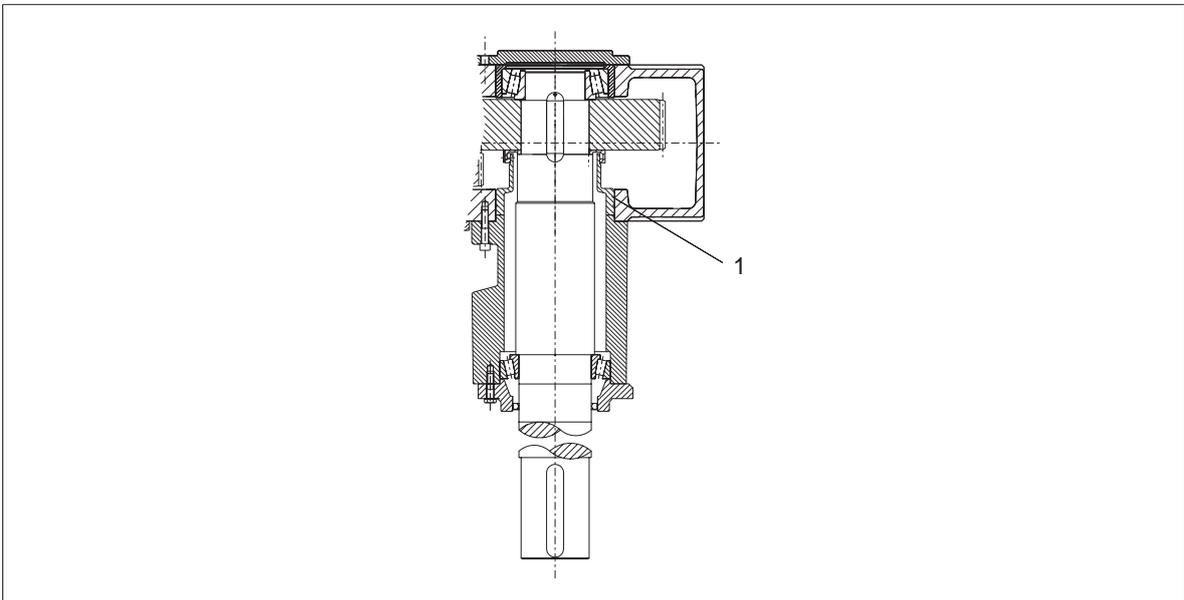
Radial shaft sealing rings are the standard type of seal. They are fitted with an additional dust lip to protect the actual sealing lip from external contamination.



5.6.2 Oil-dam pipe

Sealing from the main housing to the bell housing (bearing reinforcement) on the output side is effected by a so-called "oil-dam pipe". This is a non-contacting and non-wearing seal. It is used exclusively with combined splash/forced lubrication.

Note: The relubrication intervals must be observed for relubrication of the lower bearing (see Section 7, "Startup", and Section 10, "Maintenance and Repair").



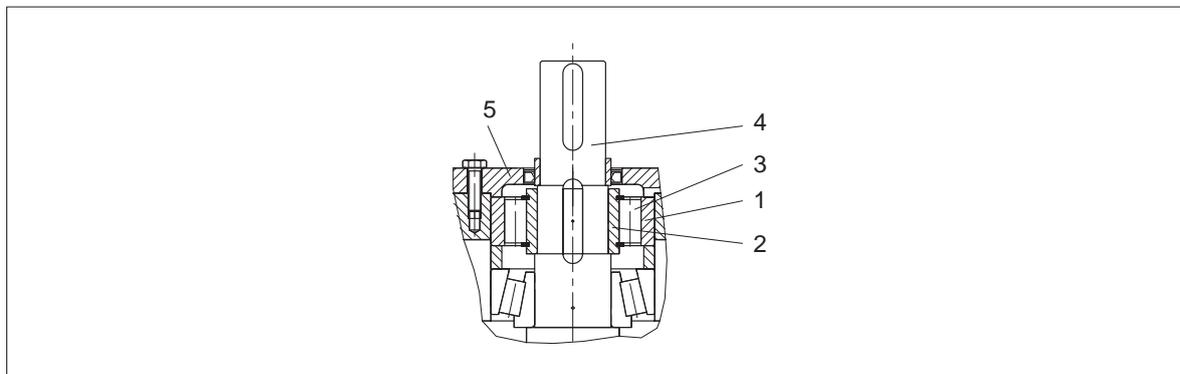
1 Oil-dam pipe

5.7 Backstop

For certain requirements, the gear unit can be fitted with a mechanical backstop. This permits only the correct direction of rotation during the operation of the unit. The direction of rotation is marked by an arrow on the input side of the gear unit.

The backstop is fitted to the gear unit oiltight and is integrated into its oil supply system.

The backstop is fitted with centrifugally operated grippers. When the gear unit is started in the established direction of rotation, the inner ring with the cage and the grippers will rotate, while the outer ring remains stationary. At a certain speed, the grippers will lift off and the backstop is now operating without any wear.



- 1 Backstop outer ring
- 2 Backstop inner ring
- 3 Cage with grippers

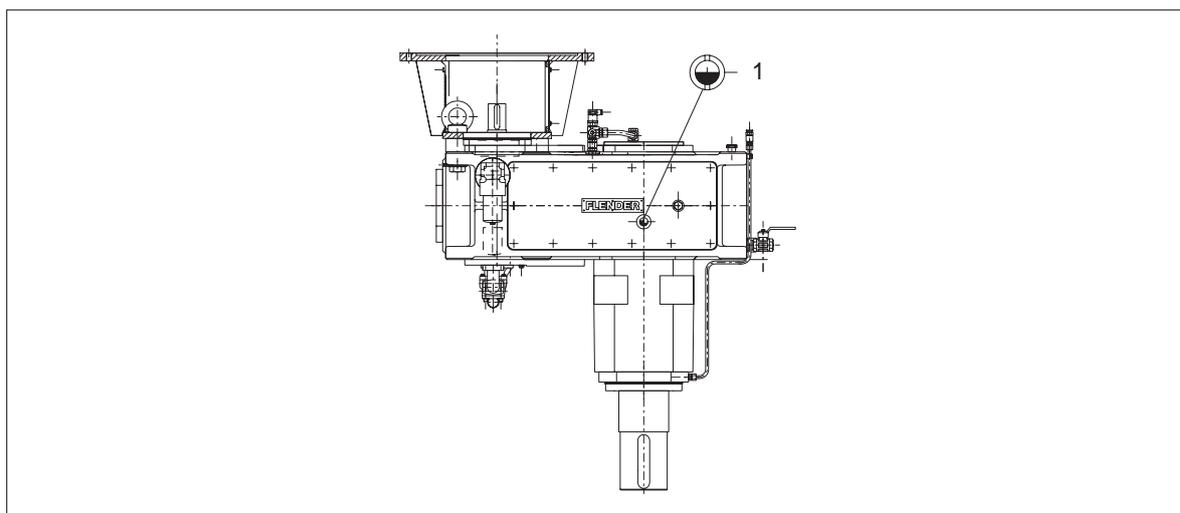
- 4 Shaft
- 5 Cover

Caution!

To avoid damaging the backstop or the gear unit, the motor should not be run in the locked direction of the gear unit. Observe the sign fixed to the gear unit.

5.8 Oil-sight glass

The gear unit may also be fitted with an oil-sight glass for visual checking of the oil level when the unit is at a standstill. Checking of the oil level can be carried out by looking at the MIN and MAX marks at the inspection window of the oil-sight glass when the oil has cooled down.

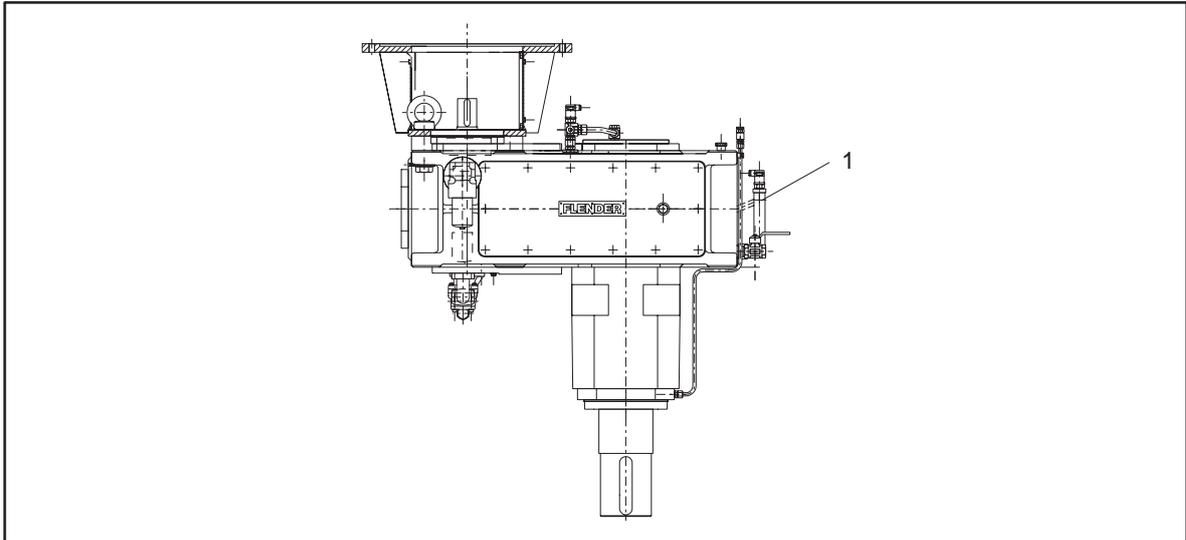


- 1 Oil-sight glass

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

5.9 Oil-level monitoring system

Depending on the order specification, the gear unit can be fitted with an oil-level monitoring system. This device monitors the level of the oil when the unit is at a standstill i.e. before it is started up. When the signal "oil level too low" is given, it should be wired in such a way that the drive motor cannot switch on and an alarm is given. During operation, any signal should be bridged.



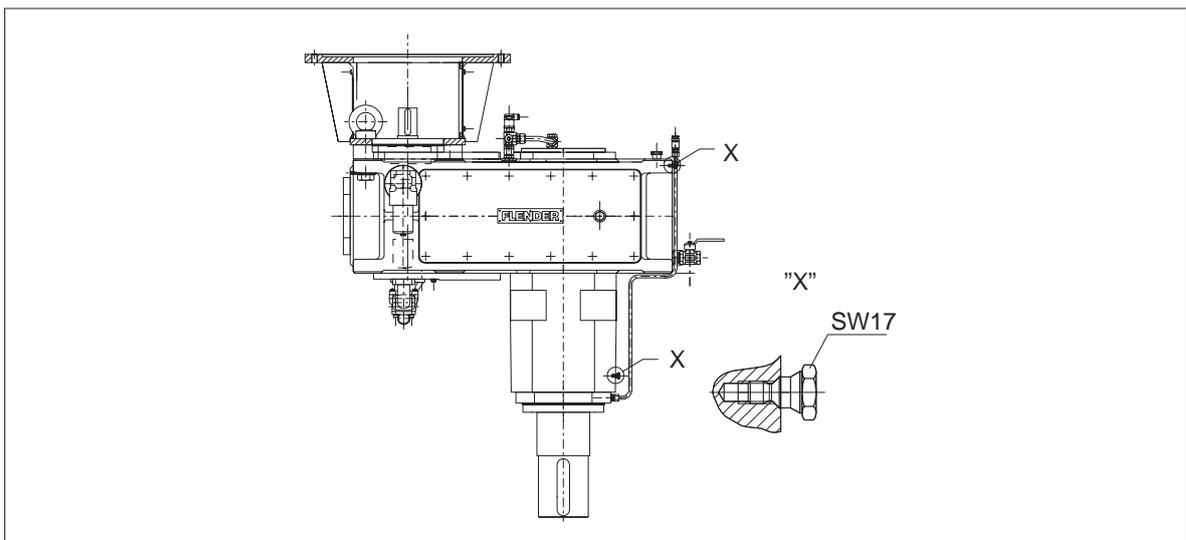
1 Oil-level switch

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

5.10 Vibration monitoring

Depending on the order specification, the gear unit can be designed with bores for an SPM instrument bearing-monitoring system (System 43) by providing measuring nipples. These nipples are intended for attachment of the shock-pulse sensor with rapid-action coupling and are located in the vicinity of the bearings to be monitored.



For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

5.11 Cooling

The gear units are designed for cooling by natural radiation.

Note: Contamination of the housing surface will cause a substantial reduction in cooling efficiency (Observe Section 10, "Maintenance and Repair").

5.12 Couplings

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

For the exact type please see the separately attached Technical Data Sheet.

As a rule, flange couplings are provided for the output shaft.

Caution!

Couplings with peripheral velocities on the outer diameter of up to 30 m/s, must be statically balanced. Couplings with peripheral velocities over 30 m/s, must be dynamically balanced.

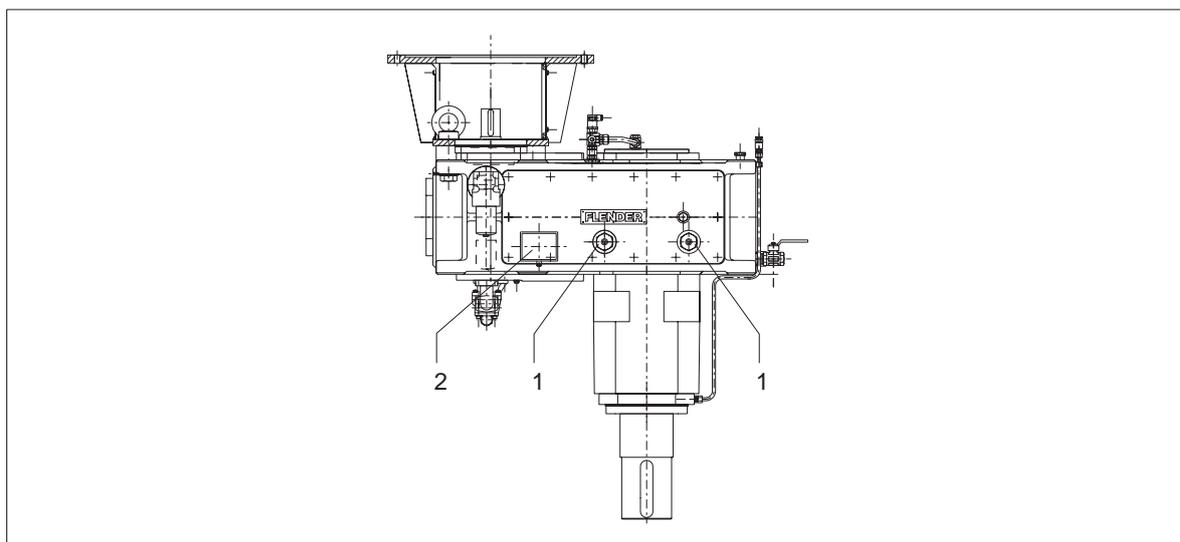
For maintenance and operation of the couplings, refer to the specific operating instructions for the coupling.

Note: When installing the drive system, the individual components must be very precisely aligned with one another in order to minimise restoring forces caused by angle and shaft offset, and avoid premature wear to flexible coupling components.

5.13 Heating elements

At low temperatures near freezing it may be necessary to heat the gear oil before starting the drive, or even during operation. In such cases, one or two heating elements may be provided if required. These convert electrical energy into heat which is conducted to the surrounding oil. The heating elements are located in protective tubes inside the housing thus making it possible to replace them without draining off the oil. They are always designed in such a way that the surface of the heating elements prevents burning of the oil.

The heating elements are controlled by a temperature monitor in the oil sump which provides a signal when maximum and minimum temperatures are reached. This signal requires amplification.



1 Heating element

2 Temperature monitor

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

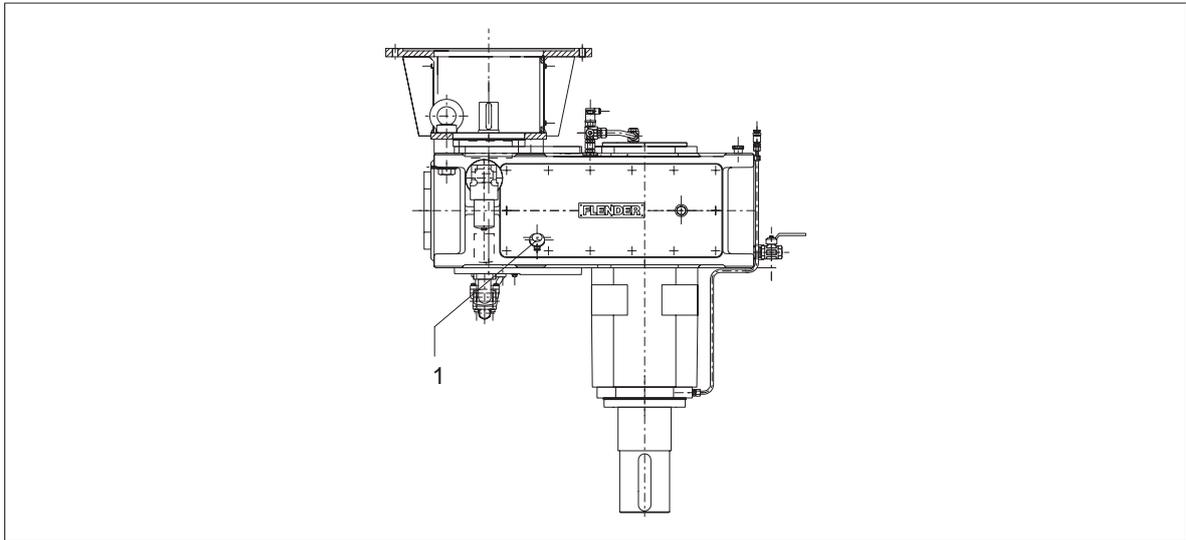
Caution!

Never switch the heating element on unless it is fully immersed in the oil bath as there is a serious risk of fire.

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

5.14 Oil-temperature measurement

Depending on the order specification, the gear unit may be fitted with a resistance thermometer PT100 for monitoring the oil temperature in the sump. In order to measure the temperatures or temperature differences, the resistance thermometer PT100 should be connected to a suitable instrument provided by the customer. The thermometer has a connection head (protection type IP54) for the wiring. A two-conductor circuit is fitted by the manufacturer. However, the customer may fit his own three or four-conductor circuit if required.



1 Resistance thermometer PT 100

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

6. Assembly

Note: Observe the "Safety notes" in section 3.

6.1 General information on installation

Assembly and installation work must be done with great care by trained and qualified personnel. The manufacturer cannot be held liable for damage caused by incorrect assembly and installation.

During the planning phase, sufficient space should be allowed around the gear unit for subsequent care and maintenance work.

Caution!

Exposure to direct sunlight may cause overheating. Protective features such as covers, roofing etc. should be provided as required.

Sufficient lifting equipment should be available before beginning the installation and assembly work.

Caution!

No welding work should be done on the drive. The drives must not be used as an earthing point for welding operations. Delicate teeth and bearings may be irreparably damaged by welding.

Caution!

All the fastening points provided by the design of the unit should be used.

To ensure proper lubrication, the installation position specified in the order must always be observed.

6.2 Installation of gear unit on housing base

6.2.1 Foundation or steel frame

The foundation and/or the steel frame must be horizontal and level.

The foundation and/or the steel frame should be designed in such a way that no resonant vibrations are created and that no vibrations can be transmitted from adjacent components. The foundation and/or the steel structure on which the unit is to be mounted must be torsionally rigid. It must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

Careful alignment in relation to the machine on the output and input sides, allowing for elastic deformations due to operating forces, is required.

Fastening bolts or nuts must be tightened to the prescribed torque. For the correct torque, refer to point 10.2.10. Bolts of the minimum strength class 8.8 must be used.

If external forces are acting upon the gear unit, it is advisable to prevent displacement by means of lateral stops.

Note: For dimensions, space requirement, arrangement of supply connections please refer to the dimensional drawings of the gear-unit documentation.

6.2.2 Description of installation work

- Remove the anti-corrosion paint on the shafts with benzene.

Caution!

Do not allow the benzene to contact the shaft sealing rings



**Ensure adequate ventilation. Do not smoke when working with benzene!
Explosion hazard!**

- Mount and secure input and output drive elements (e.g. coupling components) on shafts. These should be heated before mounting. For the correct joining temperatures, refer to the dimensional drawings in the coupling documentation.

Unless otherwise instructed, the components may be heated inductively, with a burner or in a furnace.



Take precautions to avoid burns from hot components!

Caution!

Protect shaft sealing rings from damage and heating over +100 °C. Use heat-protection screens to reduce radiant heat.

Caution!

**The coupling components should be fitted using suitable equipment to avoid possible damage to the shaft bearings through axial joining forces.
Always use suitable lifting equipment.
When fitting the components, ensure that the shaft sealing rings and running surface are not damaged.**

The components should be pushed smartly onto the shaft, up to the position specified in the order specific dimensional drawing.

Caution!

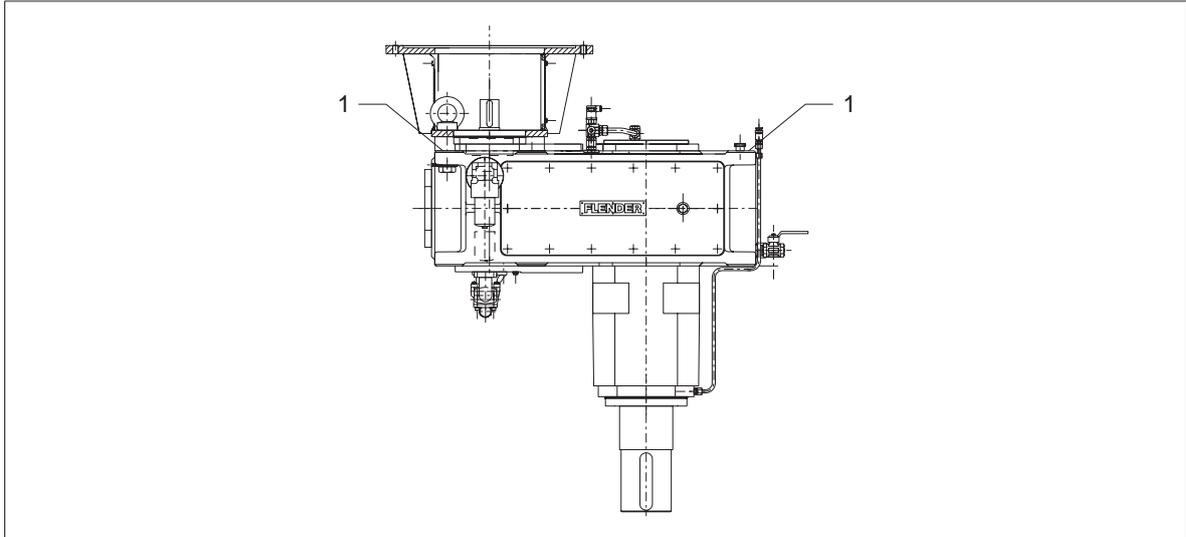
Fit the coupling using suitable fitting equipment. Never use force or knock the couplings into position, as this will cause irreparable damage to the gearwheels, anti-friction bearings, retaining rings etc.

Note:

Gear units whose weight requires the use of lifting gear must be attached at the points shown in section 4 "Handling and storage". When additional components are mounted on the gear unit, appropriate attachment points should be provided in accordance with the order-specific dimensional drawing.

6.2.2.1 Aligning surfaces

The machined surfaces on the top of the housing are intended for initial alignment of the gear unit.



1 Alignment surfaces

The final fine alignment with the assemblies on the output side must be carried out accurately to the shaft axes using:

- laser measuring instruments
- rulers
- spirit level
- dial gauge
- feeler gauge etc.

The gear unit can now be fixed in its position.

Note: The accuracy of the alignment process is an important factor in determining the life span of shafts, bearings and couplings. If possible, the deviation should be zero. For the special requirements for the couplings, refer to the specific operating instructions.

6.2.2.2 Installation on a foundation or steel frame

- Clean the lower surfaces of the gear-unit base.
- Deposit gear unit on foundation or steel frame using suitable lifting gear.
- Careful alignment in relation to the machine on the output and input sides, allowing for elastic deformations due to operating forces, is required.
- Fastening bolts or nuts must be tightened to the prescribed torque. For the correct torque, refer to point 10.2.10. Bolts of the minimum strength class 8.8 must be used.
- If external forces are acting upon the gear unit, it is advisable to prevent displacement by means of lateral stops.

Caution!

The gear unit must not be twisted when tensioning the fastening bolts.

- 6.3 Gear unit with forced lubrication
- Wire pressure monitor electrically
 - Connection as a maker
 - During startup, the signal of the pressure monitor should be bridged for appr. 20 seconds. This is necessary since the pressure buildup in the gear unit needs time to stabilize.
- 6.4 Gear units with heating element
- Connect temperature monitor electrically
 - Connect heating elements electrically
- 6.5 Gear units with oil-level monitoring
- Connect oil-level monitor electrically
- 6.6 Gear units with oil-temperature measurement
- Connect resistance thermometer with evaluating instrument (to be provided by customer) electrically
- 6.7 General note on add-on components
- Note:** For operation and maintenance of the components described in points 6.3 to 6.6, observe the instructions in the order-specific appendix.
For technical details, refer to the order-specific equipment list.
- Note:** All cable lead-ins at electrical devices should be insulated as required by the operating environment.
- 6.8 Final work
- After installation of the gear unit check all screw connections for tight fit.
 - In addition, a check must be made after tightening of the fixings to see that the alignment has not changed.
 - Check by means of the order specific equipment list as well as the associated drawings whether all units which might have been removed for transport have been refitted.

7. Start-up

Note: Observe the "Safety notes" in section 3.

7.1 Procedure before start-up

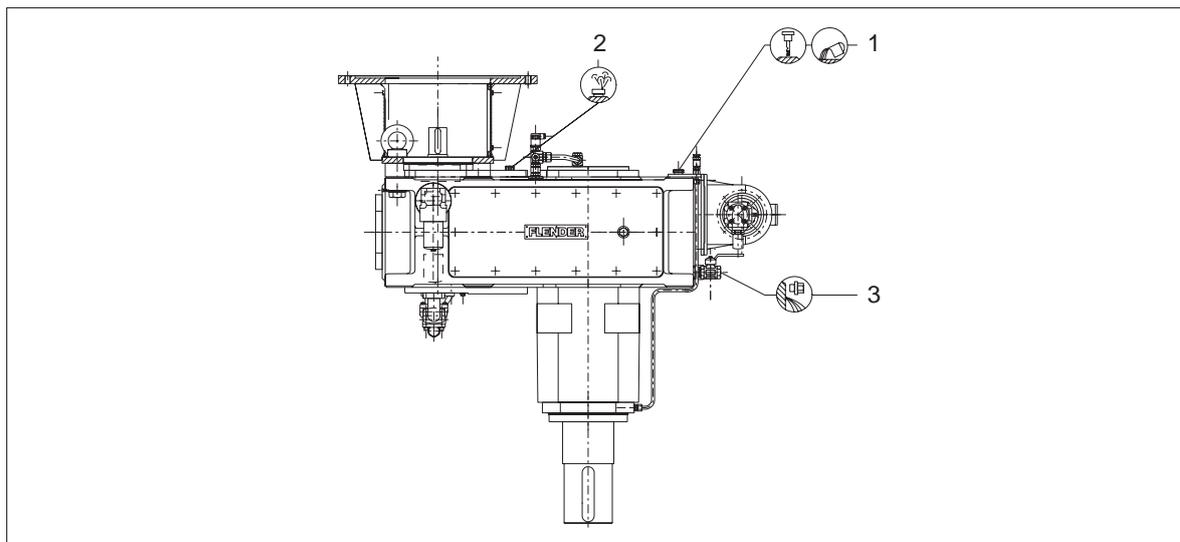
7.1.1 Removal of conservation agent

- Unscrew the oil drain plug or open the draining valve, allow the conservation agent or run-in oil to drain into a suitable container and dispose of it in accordance with regulation. Any residual-oil draining screws should also be opened e.g. in the case of gear units with backstop). The location of the oil draining point is marked by the symbol in the dimensional drawing in the unit documentation.



Remove any oil spillage immediately with an oil-binding agent.

- Replace oil drain plug and/or reclose oil drain cock



- 1 Oil dipstick / oil inlet
- 2 Breather screw or wet-air cleaner / screw plug
- 3 Oil drain cock / oil drain plug

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Caution!

Before start-up, replace the yellow plastic plug with venting screws with cap (see notice on gear unit).

If a wet-air filter is inserted instead of the breather screw, 2 of the 8 bores (closed with adhesive film) at the bottom side of the wet-air filter must be opened. Next the wet-air filter should be inserted into the preassembled white socket (see notice on gear unit).

7.1.2 Charging with lubricant

- Unscrew oil dipstick at gear unit for oil filling

Caution! Fill the gear unit with fresh oil using a filter (max. mesh 25 µm).

Note: For the correct type of oil (of various brands) to be used refer to the operating instructions BA 7300 EN supplied separately. Information on the type, viscosity and quantity of the oil is given on the rating plate on the gear unit.

The quantity of oil stated on the rating plate is an approximation only. The marks of the oil dipstick or of the oil-level indicator are crucial to the oil quantity to be filled in.

- Screw oil dipstick back in place
- Check oil level in gear-unit housing with the screwed-in oil dipstick and/or oil-level indicator

Note: The oil level should be at the upper mark of the oil dipstick and/or oil-level indicator.



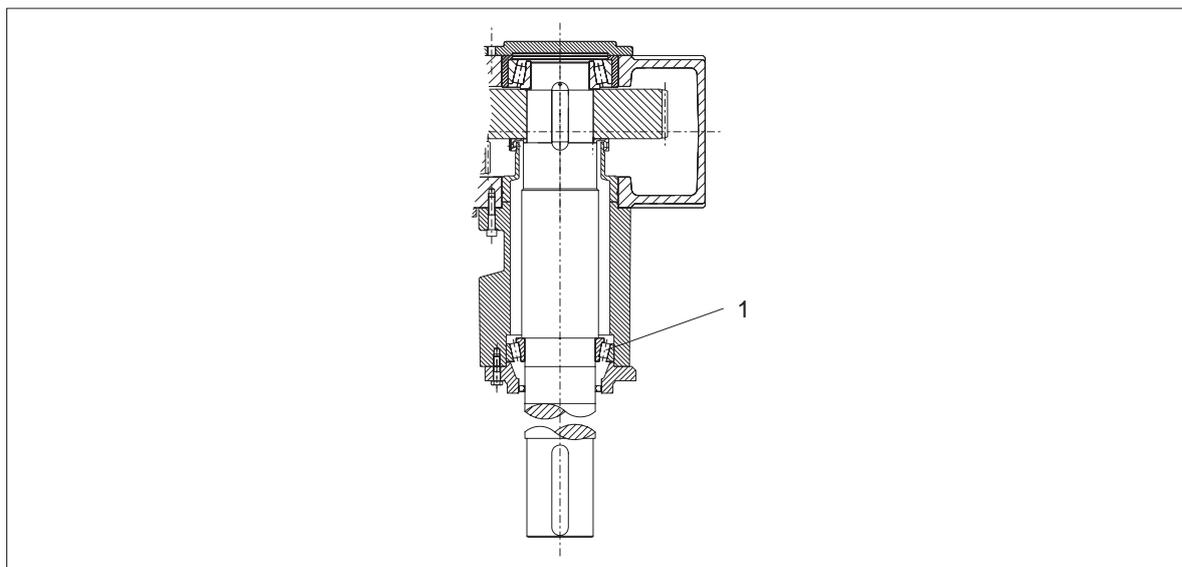
Remove any oil spillage immediately with an oil-binding agent.

7.1.2.1 Oil quantities

The exact oil quantity is indicated on the nameplate fitted to the gear unit.

7.1.2.2 Required grease quantity for relubrication

If the gear unit has been out of service for more than 6 months or if the lower output shaft bearing was inspected/renewed, the bearing space must be filled with the amount of rolling-bearing grease specified in Table 7.1 (for the type of grease please see separately attached Technical Data Sheet).



1 lower output shaft bearing

Period	Grease quantity (Standard value in kg) for size							
	5	6	7	8	9	10	11	12
< 12 months	0.150	0.150	0.200	0.200	0.500	0.700	0.700	0.800
> 12 months	0.200	0.200	0.300	0.300	0.600	0.800	0.800	0.900

Table 7.1: Standard values for grease quantities required for the lower output shaft bearing

Note: The lubricating points are identified with the following identification plate:



7.2 Start-up

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

Note: When the oil is cool, the level should be at the upper mark of the screwed-in oil dipstick or oil level indicator. When the oil is warm it may slightly exceed this mark. It must not be allowed to fall below the mark. If necessary, top up to the correct level.

7.3 Connection of monitoring instruments

- Prior to startup, the monitoring instruments (pressure monitor and other evaluating instruments) must be connected and activated.
- During startup, the signal of the pressure monitor should be bridged for appr. 20 seconds. This is necessary since the pressure buildup in the gear unit needs time to stabilize.

Note: For operation and maintenance of the components described in points 6.3 to 6.6, observe the instructions in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

7.4 Removal from service

- To take the gear unit out of service, first switch off the drive assembly.



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- During longer periods of shutdown (2 weeks), the gear unit should be started briefly for a period of approx. 1 week. If it is to remain out of service for longer than six months, fill it with conservation agent (see point 7.4.1). **It should be locked to prevent it from turning.**

7.4.1 Interior conservation during longer disuse

Depending on the type of lubrication or shaft sealing, the following types of internal corrosion protection can be used.

7.4.1.1 Interior conservation with special conservation agent

Gear units with forced lubrication should be run idle with preservative prior to any long-term storage.

Duration of protection	Conservation agent	Special measures
less than 24 months	Castrol Alpha SP 220 S	Close gear unit, replace venting screw and/or wet-air filter with a screw plug (yellow), (replace the original parts before start-up)
For storage periods longer than 24 months, renew the conservation agent. For storage periods over 36 months, FLENDER should be consulted.		

Table 7.2: Conservation procedure when using mineral oil or PAO-based synthetic oil

Duration of protection	Conservation agent	Special measures
less than 36 months	Special anti-corrosion oil TRIBOL 1390 1)	Close gear unit, replace venting screw and/or wet-air filter with a screw plug (yellow), (replace the original parts before start-up)
For storage periods over 36 months, FLENDER should be consulted.		

Table 7.3: Conservation procedure when using PG-based synthetic oil

- 1) Resistant to tropical conditions and sea water. Max. ambient temperature 50 °C

7.4.1.2 Interior conservation procedure

- Switch the gear unit off and drain the oil as described in section 10 "Maintenance and repair".
- Pour in the conservation agent given in Table 7.2 or 7.3 through the venting hole or the opening in the inspection or assembly cover until it reaches the top mark on the oil dipstick.
- Close the venting hole.
- Start the gear unit and allow it to idle for a short time.
- Unscrew oil drain plug and/or open oil drain cock and allow preservative to drain into a suitable container and dispose of it in accordance with regulations.



**The conservation agent emerging from the gear unit may be hot.
Wear gloves to avoid scalding.**

- Replace oil drain plug and/or reclose oil drain cock.

Caution!

**Before re-starting the gear unit, replace the plug screw with the venting screw and/or wet-air filter.
See also point 7.1.1.**

Caution!

Preservation of the gear unit by means of a complete oil filling is not permitted.

7.4.2 Exterior conservation

Duration of protection	Conservation agent	Layer thickness	Remarks
less than 12 months	Tectyl 846 K19	approx. 50 µm	Long-term wax-based conservation agent, resistant to sea water and tropical conditions (soluble with CH compounds)

Table 7.4: Exterior protection of shaft ends and other bare surfaces

7.4.2.1 Exterior conservation procedure

- Clean the surfaces
- For separation between the sealing lip of the shaft sealing ring and the preservative, the shaft should be brushed with grease in way of the sealing lip
- Apply conservation agent

8. Operation

Note: Observe the "Safety notes" in section 3.

8.1 General operating data

During operation, the unit must be monitored for:

- overheating (In continuous operation, the gear unit is designed for a temperature of 90 °C with mineral oil. For higher temperatures, synthetic oils must be used. The maximum short-term operating temperature is 100 °C. See also section 10.)

- changes in running noise
- possible oil leakage at the housing and shaft seals

and

- correct oil level (see section 7 "Start-up")

Note: To check the oil level, stop operation of gear unit. When the oil is warm, the level may slightly exceed the upper mark of the oil dipstick or oil-level indicator. However, it must never be allowed to drop below the lower mark. If necessary, top up with oil to the correct level.

Caution!

If any irregularities are noticed during operation, or if the pressure monitor in the oil-cooling system (if installed) triggers the alarm, switch the drive assembly off at once. Determine the cause of the fault using the table in section 9.

This table contains a list of possible faults, their causes and suggested remedies.

Should it not be possible to identify the cause, or the unit cannot be repaired with the facilities available, you are advised to contact one of our customer-service offices for specialist assistance. See section 11.

9. Disturbances, reasons and remedy

Note: Observe the "Safety notes" in section 3.

9.1 General information on faults and malfunctions

Note: Faults and malfunctions occurring during the guarantee period and which require repair work on the gear unit, must be carried out only by FLENDER Customer Service. In the case of faults and malfunctions occurring after the guarantee period, and whose cause cannot be precisely identified, we advise our customers to contact our Customer Service.

Caution!

FLENDER will not be bound by the terms of the guarantee or otherwise be responsible in cases of improper use of the gear unit, modifications carried out without the consent of FLENDER, or use of spare parts not supplied by FLENDER.



To remedy faults and malfunctions, the gear unit must always be taken out of service.

Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

9.2 Possible faults

Malfunctions	Causes	Remedy
Changes in gear noise	Damage to gear teeth	Contact Customer Service. Check teeth on all components, replace any damaged parts.
	Excessive bearing play	Contact Customer Service. Adjust bearing play.
	Defective bearing	Contact Customer Service. Replace defective bearing.
Loud noises in area of gear-unit fastening	Fastening has worked loose	Tighten bolts / nuts to prescribed torque. Replace damaged bolts / nuts.
Increased temperature at bearing points	Oil level in housing too low	Check oil level at room temperature, top up if necessary
	Oil too old	Check date of last oil change, change oil if necessary. See section 10.
	Oil pump defective	Check oil pump or replace if necessary
	Bearing defective	Contact Customer Service. Check bearings and replace if necessary
Gear unit is oily	Inadequate sealing of housing cover or joints	Seal joints
Oil leakage from gear unit	Inadequate sealing of housing cover or joints	Check seals, replace if necessary, seal joints
	Radial shaft sealing rings defective	Check radial shaft sealing rings, replace if necessary
Water in oil	Oil froths in sump	Check oil state using test-tube method for water contamination. Have oil analysed by laboratory. Flush and renew.
Operating temperature too high	Oil level in housing too high	Check oil level and adjust if necessary
	Oil too old	Check date of last oil change, change oil if necessary. See section 10.
	Oil contaminated	Change oil. See section 10.
	Clogged filter	Clean oil filter. See section 10.
	Defective oil pump	Check function of oil pump, repair or replace oil pump if necessary
Pressure monitor triggers alarm	Oil pressure < 0.5 bar	Check oil level at room temperature, top up if necessary. Check oil pump, replace if necessary. Check oil filter, clean if necessary, see section 10.

Table 9.1: Faults, causes and remedies

10. Maintenance and repair

Note: Observe the "Safety notes" in section 3.

10.1 General notes on maintenance

Note: Maintenance and repair work should be done with great care by trained and qualified personnel only.

Caution!

The periods stated in table 10.1 depend on the conditions under which the gear unit is operated. For this reason only average figures can be given which refer to:

a daily operating time of	24 hours,
a duty factor of	100%,
an input-drive speed of	1500 1/min,
and a maximum oil temperature of	90 °C (mineral oil only)
	100 °C (synthetic oil only)

Note: Under different conditions, the frequencies stated below should be adjusted accordingly.

Measures	Periods	Remarks
Check oil temperature	Daily	
Check for unusual gear unit noise	Daily	
Check oil level	Monthly	
Check gear unit for leaks	Monthly	
Test oil for water content	After 400 service hours, once per year at least	See point 10.2.1
First oil change after start-up	After 400 service hours	See point 10.2.2
Subsequent oil changes	Every 18 months or 5000 service hours 1)	See point 10.2.2
Clean oil filter	Every 3 months	See point 10.2.3
Clean venting screw	Every 3 months	See point 10.2.4
Replace wet-air filter	see indicator on wet-air filter	See point 10.2.5
Type with oil-dam pipe - recharge with grease	Before startup, then every 4000 service hours, at least every 10 months	See point 10.2.6
Clean gear unit housing	Simultaneously with oil change	See point 10.2.7
Check tightness of fastening bolts	After first oil change, thereafter every second oil change	See point 10.2.9
Complete inspection of gear unit	Approx. every 2 years along with oil change	See point 10.2.10

Table 10.1: Maintenance and repair work

1) when using synthetic oils the periods can be tripled.

10.2 Description of maintenance and repair work

10.2.1 Test water-content of oil

For detailed information on testing the water-content of oil, apply to the lubricant manufacturer.

10.2.2 Changing the oil

Caution!

When changing the oil, always re-charge the gear unit with the same type of oil. Never mix different types of oil or oils made by different manufacturers. Never mix synthetic oils with mineral-based oils or with other synthetic oils. When changing from mineral-based oil to synthetic oil or from one type of synthetic oil to another, flush the gear unit well with the new type of oil beforehand.

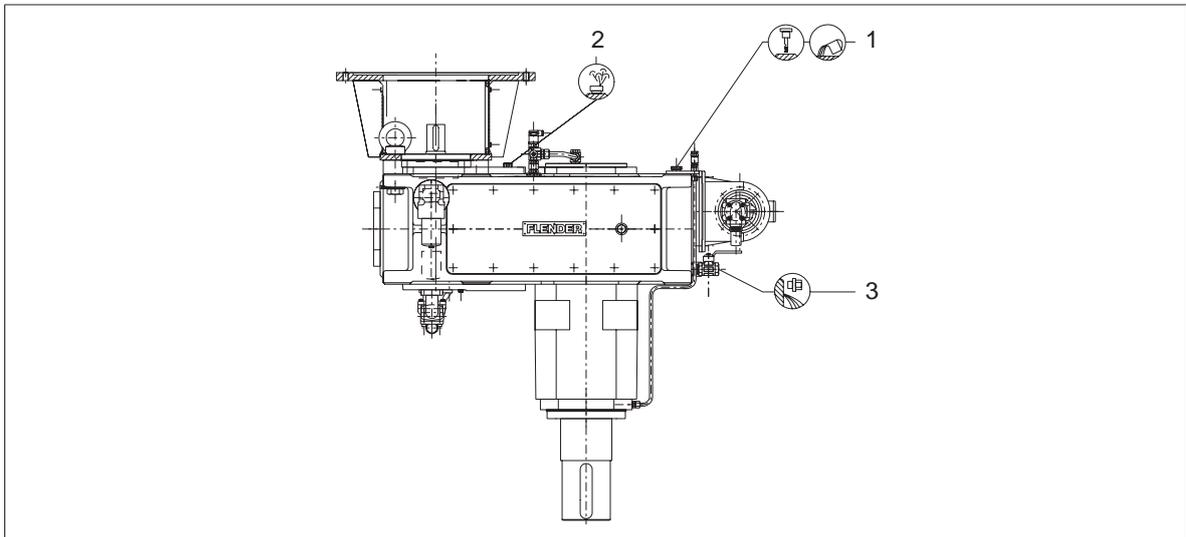
When changing the oil, the housing must be flushed with oil to remove sludge, metallic particles and oil residue. Use the same type of oil as is used for normal operation. High-viscosity oils should be heated beforehand. Ensure that all residues have been removed before filling with fresh oil.

Note: Drain the oil while it is still warm, i.e. immediately after switching the machinery off.

- Stop gear unit by deactivating the drive unit, and secure from turning



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.



- 1 Oil dipstick / oil inlet
- 2 Breather screw or wet-air cleaner / screw plug
- 3 Oil drain cock / oil drain plug

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

- Place a suitable collecting vessel under the oil drain plug and/or the oil drain cock with drain hose
- Unscrew the breather screw and/or wet-air filter at the housing top
- Unscrew oil drain plug and/or open oil drain cock and drain the oil into the collecting vessel



The oil emerging from the housing is hot. Wear gloves to prevent scalding. Remove any oil spillage immediately with an oil-binding agent.

- Clean the permanent magnet of the oil drain plug thoroughly
- Replace oil drain plug and/or reclose oil drain cock

Note: Check the condition of the sealing ring (the sealing ring is vulcanised onto the oil drain plug). If necessary, use a new oil drain plug.

- Clean oil filter in lubricating system
- Unscrew oil dipstick at gear unit for oil filling

Caution! Fill the gear unit with fresh oil using a filter (max. mesh 25 µm).

Note: For the correct type of oil (of various brands) to be used refer to the operating instructions BA 7300 EN supplied separately. Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit.

The quantity of oil stated on the rating plate is an approximation only. The marks of the oil dipstick or of the oil-level indicator are crucial to the oil quantity to be filled in.

- Replace the oil dipstick
- Check oil level in gear-unit housing with the oil dipstick and/or oil-level indicator

Note: The oil level should be at the upper mark of the screwed-in oil dipstick and/or oil-level indicator.



Remove any oil spillage immediately with an oil-binding agent.

10.2.3 Cleaning the oil filter

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix. For technical details, refer to the order-specific equipment list.

10.2.4 Cleaning the venting screw

Remove any dust which has collected on the venting screw. It should be cleaned at least every 3 months. To do this, the venting screw is removed, cleaned with benzine or similar agent and dried. It can also be cleaned by blowing out with compressed air.

10.2.5 Replace wet-air filter

Caution! Prior to using the wet-air filter, 2 of the 8 bores (closed with adhesive film) at the bottom side of the oil wetted air cleaner must be opened.

The wet-air filter has a container filled with silica gel. The air humidity absorbed by the silica gel changes the colour of the gel from "blue" to "pink" (visible through the transparent container). Renewal of the wet-air filter is only necessary when the silica gel has gone completely pink.

10.2.6 Type with oil-dam pipe - recharge with grease

- Stop gear unit by deactivating the drive unit, and secure from turning



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Repack 50g of lithiumbase grease at the lubricating point of the oil-dam pipe using a grease gun (for type of grease please see separately attached Technical Data Sheet).
- The lubrication points are fitted with flat grease nipples type AM10x1 to DIN 3404.



Remove and dispose of any old grease emerging from the seals.

10.2.7 Cleaning the gear unit

- Stop gear unit by deactivating the drive unit, and secure from turning



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Remove any corrosion.

Caution!

Never clean the gear unit with high-pressure cleaning equipment.

10.2.8 Topping up oil

- Stop gear unit by deactivating the drive unit, and secure from turning



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Unscrew oil dipstick at gear unit for oil filling

Caution!

Fill the gear unit with fresh oil using a filter (max. mesh 25 µm).

Note: Always top up with the same type of oil as already in the gear unit (see point 10.2.2). Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit.

- Replace the oil dipstick
- Check oil level in gear-unit housing with the oil dipstick and/or oil-level indicator

Note: The oil level should be at the upper mark of the screwed-in oil dipstick and/or oil-level indicator.



Remove any oil spillage immediately with an oil-binding agent.

10.2.9 Check tightness of fastening bolts

- Stop gear unit by deactivating the drive unit, and secure from turning



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Check tightness of all fastening bolts with a torque wrench

Thread size	Strength class	Tightening torque (with $\mu = 0.20$)
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: Damaged bolts should be replaced with new ones of the same type and strength class.

10.2.10 General inspection of gear unit

The general inspection of the gear unit should be carried out by the FLENDER Customer Service as our engineers have the experience and training necessary to identify any components requiring replacement.

10.3 Lubricants

The oil selected for use in the gear unit must be of the viscosity (VG class) stated on the rating plate. The viscosity class applies for the contractually agreed operating conditions.

FLENDER must be consulted for any change in operating conditions.

Note: For the correct type of oil (of various brands) to be used refer to the operating instructions BA 7300 EN supplied separately.

We are familiar with the composition of these lubricants and, as far as we are currently aware, they possess the properties with regard to bearing capacity, corrosion resistance, micropitting-bearing capacity and compatibility with seals and interior paint coatings which are necessary for the type of gear unit in question.

We therefore advise our customers to select one of the lubricants stated in the instructions BA 7300 EN, taking into account the VG class given on the rating plate.

Note: This recommendation is in no way intended as a guarantee for the quality of the lubricant supplied. Each lubricant manufacturer is responsible for the quality of his own product.

Should you not wish to follow our recommendation, you assume responsibility for the technical suitability of the lubricant used.

11. Spare parts, service facility addresses

11.1 Stocking spare parts

By stocking the most important spare and consumable parts on site, you can ensure that the gear unit is ready for use at any time.

To order spare parts, refer to the spare-parts list.

For further information, refer to the spare-parts drawing stated in the list.

We guarantee only the original list of spare parts supplied by us.

Caution!

Please note that spare parts and accessories not supplied by us have not been tested or approved by us. The installation or use of such products may therefore impair essential characteristics of the gear unit, thereby posing an active or passive risk to safety. FLENDER will assume no liability for damage caused by spare parts and accessories not supplied by FLENDER.

Please note that certain components often have special production and supply specifications and that we supply you with spare parts which comply fully with the current state of technical development as well as current legislation.

When ordering spare parts always state the following:

Order no. / Item	Type / Size	Part no.	Quantity
------------------	-------------	----------	----------

11.2 Spare-part and service facility addresses

When ordering spare parts or the services of our specialist engineers, apply to **FLENDER AG (Tel. 02871 - 92 22 52)**.

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

A. FRIEDR. FLENDER AG - Getriebewerk Penig

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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

Cooling Tower Gear Unit Type
H2NV
Sizes 5 to 12

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, 2001-07-09

Signature (person responsible for products)