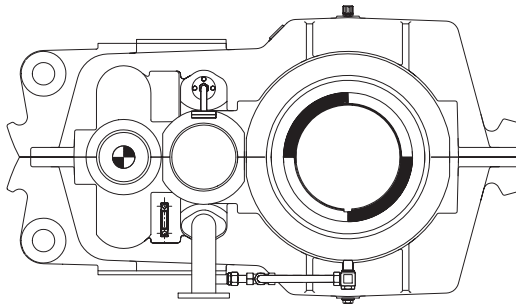


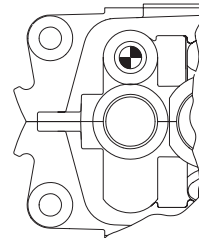
Operating Instructions

BA 5814 EN 11.01

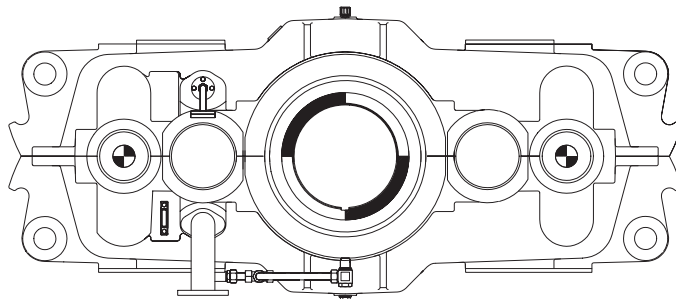
Smoothing cylinder gear units of types GHZP and GHDP
for paper machine drives
Sizes 360 to 2680



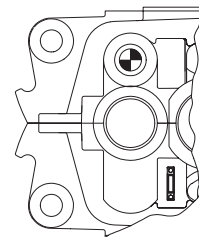
GHZP
360 – 680



GHDP
360 – 680



GHZP
2500 – 2680



GHDP
2500 – 2680

FLENDER

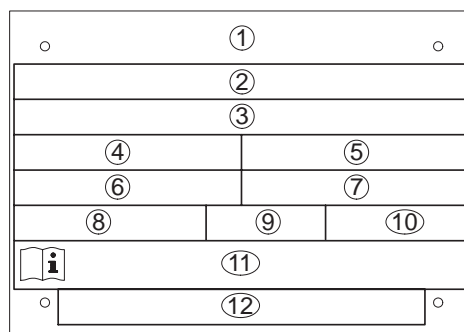
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1. Technical data

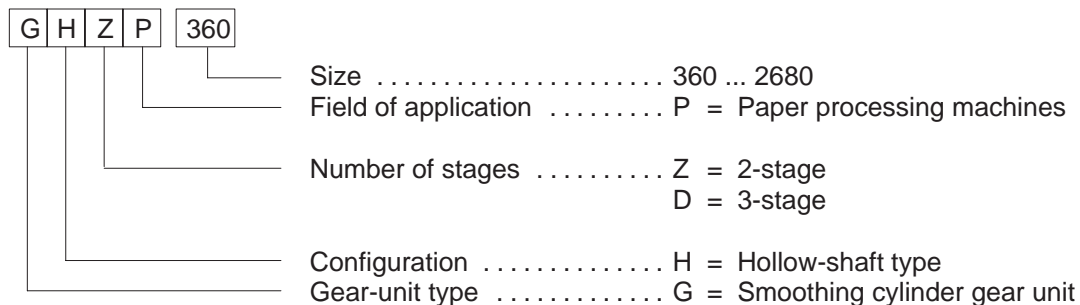
1.1 General technical data

The most important technical data are shown on the rating plate. These data together 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 Special information | 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-RDC / P-NRL in kW | ⑪ Operating instructions number |
| ⑥ Speed n_1 | ⑫ Special information |

e.g. *)



Data on weights and measuring-surface sound levels are given in sections 1.1.1 and 1.1.2.

For further technical data, please refer to the drawings in the gear-unit documentation and the separately enclosed gear-unit table.

1.1.1 Weights

Type	Approx. weight (kg) for size								
	360	400	450	500	585	680	2500	2585	2680
GHZP	1000	1200	1600	2300	3000	4000	2600	3300	4300
GHDP	1050	1250	1650	2350	3050	4050	2700	3400	4400

Table 1.1: Weights (approx. values only)

Note: All weights are for gear unit without oil filling or attachments. For the exact weights, refer to the drawings in the gear-unit documentation.

1.1.2 Measuring-surface sound level

The gear unit has a max. measuring-surface sound level at a distance of 1 m, which is indicated in table 1.2.

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 the vicinity of which persons may be present.

The sound-pressure level applies for the warmed-up gear unit at input speed n_1 and input power P-NRL indicated on the rating plate.

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

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

Type	Measuring-surface sound level L_{pA} in dB(A) for gear unit size								
	360	400	450	500	585	680	2500	2585	2680
GHZP / GHDP	83 +2	85 +2	86 +2	87 +2	88 +2	88 +2	90 +2	91 +2	91 +2
max. output in kW	100	150	200	250	350	400	2x250	2x350	2x400

Table 1.2: Measuring-surface sound level

Note: The measuring-surface sound levels L_{pA} in dB(A) have been calculated and apply for max. output.

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. We accept no responsibility for damage or disruption caused by disregard of these Instructions.

These operating instructions apply to "**Smoothing Cylinder Gear Units**". The gear unit has been designed specifically for operation as a smoothing cylinder gear unit for paper machine drives.

The gear unit is designed only for the application described in section 1 "Technical data". Other operating conditions 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 works

A. FRIEDR. FLENDER AG

D-46393 Bocholt

Tel.: 02871/92-0

Fax: 02871/92-2596

or to one of 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. Any changes on the part of the user which may affect 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 operator must ensure that all persons involved in installation, operation, maintenance and repair 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 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 unit 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 start 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. Toothed parts 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.
- Preservative agent should be stored separately from used oil.
- Used oil, preservative 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 instructions** which are of particular importance.

4. Handling and storage

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

4.1 Scope of supply

The products supplied are listed in the despatch papers. Check immediately on receipt to ensure that all the products listed have actually been delivered. Parts damaged during transport or missing parts must be reported in writing immediately.

4.2 Handling

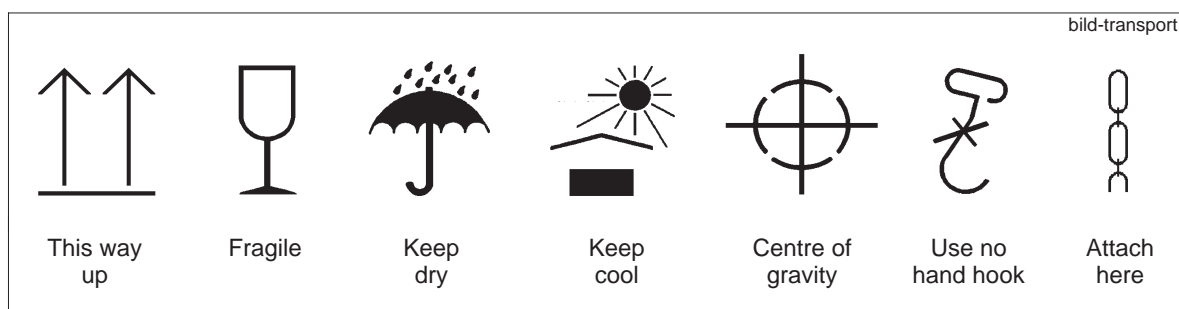


When handling FLENDER products, use only lifting and handling equipment of sufficient load-bearing capacity!

The gear unit is delivered in the fully assembled condition. Additional items (e.g. oil cooler, pipes and fittings) can be 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!

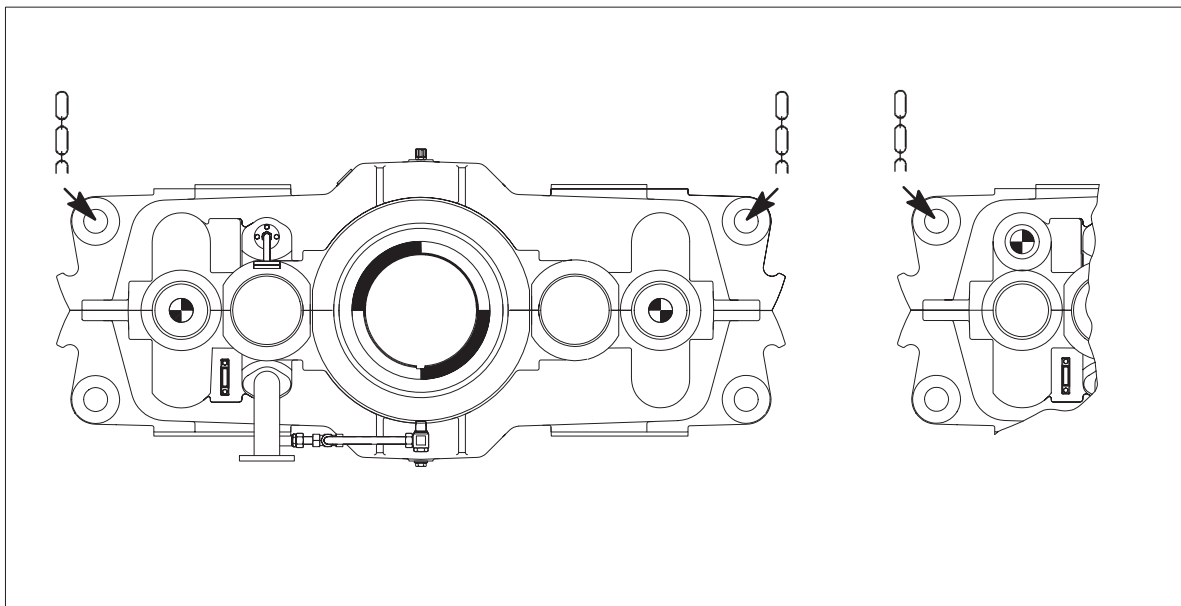
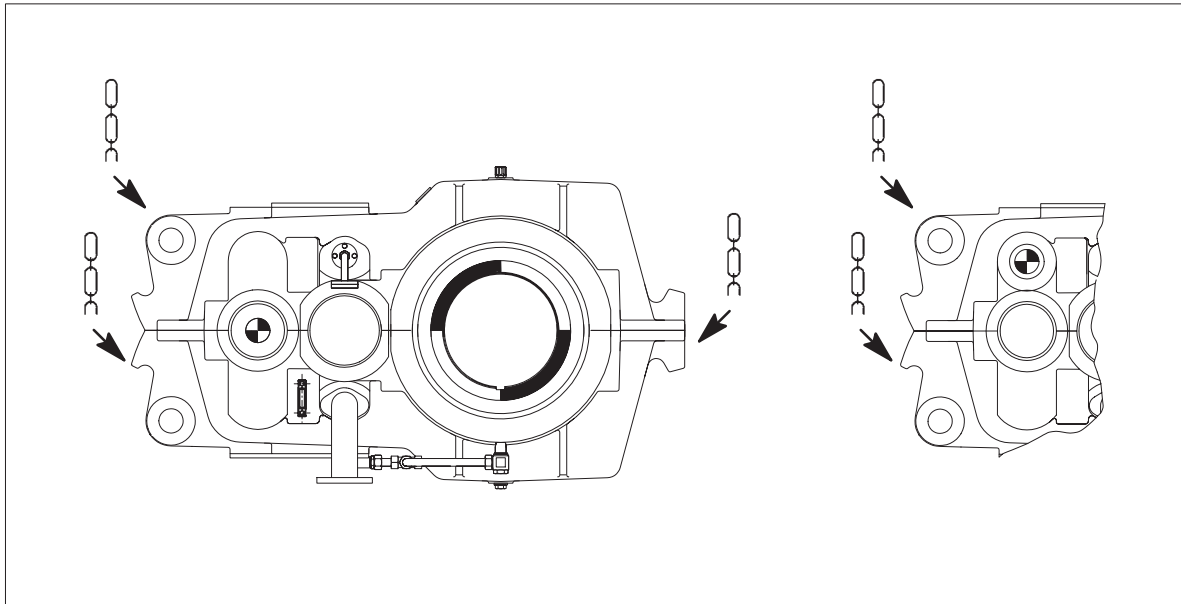
The gear unit must always be transported with due care to avoid danger to persons and the gear unit.
If, for example, the free shaft ends are knocked, this may damage the gear unit.

Note:

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

Caution!

When handling the gear unit, this must only be slung using the lifting eyes or eye bolts provided.
Do not use the front threads at the shaft ends to attach eye bolts for transport.



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

4.3 Storing the gear units

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 particularly carefully covered, and care must be taken that neither moisture nor foreign material can collect on the unit.

4.4 Standard corrosion protection

The gear unit is provided with an internal preservative agent; the free shaft end is painted for protection.

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

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 internal and external preservation (see section 7 "Start-up").

5. Technical description

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

5.1 General description

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

It can be operated in both directions of rotation.

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

The good temperature characteristics of the gear unit are achieved by its high degree of efficiency and its large housing surface area.

Note: The gear unit must be supplied with oil by a separate oil supply system.




5.2 Housing

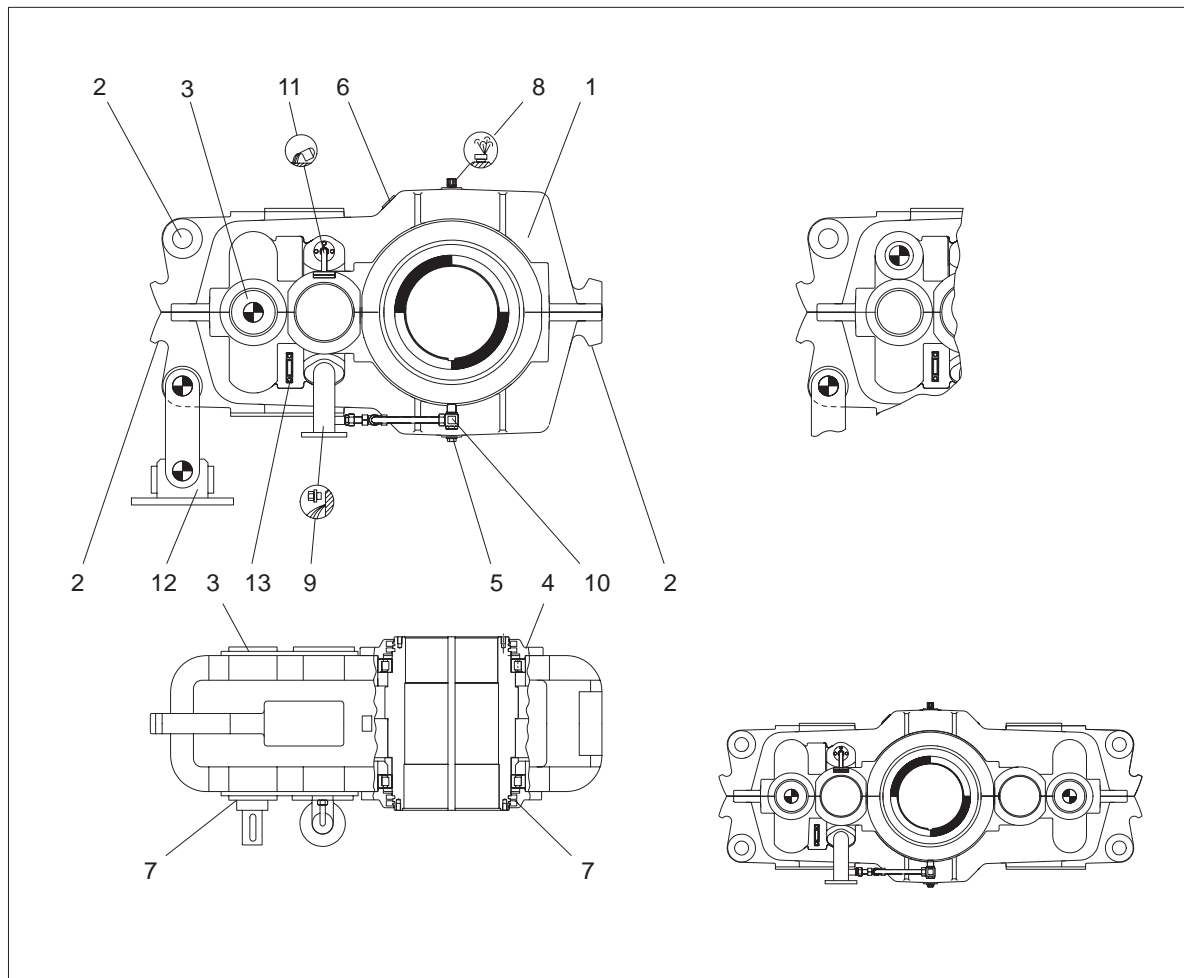
The gear unit housing is made of cast iron and in two parts. The housing is rigid in design and due to its form has excellent noise and temperature characteristics. If required, the housing can also be of steel.

The housing is fitted with adequately dimensioned lifting eyes and eye bolts.

It is also fitted with a right-angle oil level indicator and/or an oil level sight glass for checking the oil level, an oil draining screw for the oil change and a venting screw for aeration and ventilation of the gear unit.

Colour codes for breather, oil drainage and symbolic representation:

Breather:	yellow	
Oil inlet:	yellow	
Oil drain:	white	



1	Housing	8	Housing ventilation
2	Lifting eyes and/or eye bolts	9	pressureless oil return
3	Cover	10	Connection for leakage from labyrinth seal
4	Cover	11	pressurised oil feed
5	Oil drain plug	12	Torque arm
6	Rating plate	13	Oil level sight glass / right-angle oil level indicator
7	Shaft seals		

For a detailed view of the gear unit, refer to the drawings in the gear-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 leads to a significant noise reduction and ensures safe and reliable running.

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

5.4 Lubrication

For the mounting position indicated in the dimensioned drawing the teeth and rolling bearings are adequately supplied with oil by pressure circulation from a separate oil supply system.

Caution! The oil feed line must be monitored with a separate pressure monitor.

5.5 Shaft bearings

Drive shafts and helical gear wheel are mounted on rolling bearings.

5.6 Shaft seals

Labyrinth seals at the shaft outlets prevent oil from escaping from the housing and dirt from entering the housing. Labyrinth seals are non-contacting and so prevent wear to the shaft and ensure favourable temperature characteristics.

5.7 Cooling

The gear units are cooled by a separate oil supply system.

Note: The equipment manufacturer's operating instructions should be observed for operation of the oil supply system.

5.8 Couplings, cardan shafts

As a rule, cardan shafts or all-steel couplings should be provided for the gear-unit drive.

Caution!

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

The specific Operating Instructions must be observed for the operation of the couplings or cardan shafts.

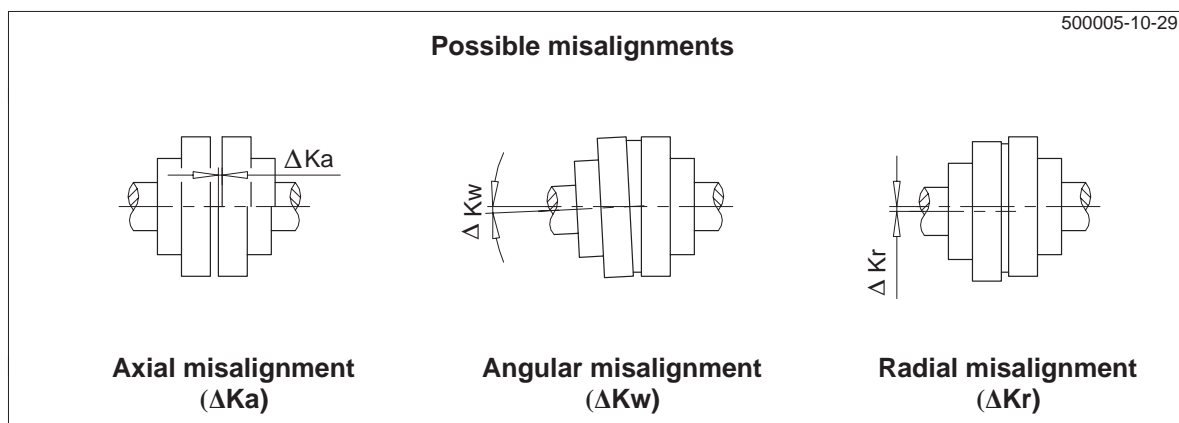
Caution!

When installing the drives, make absolutely certain that the individual components are accurately aligned in relation to each other. Inadmissibly large misalignments of the shaft ends to be connected due to angular and axial misalignments result in premature wear and material damage.

Note:

The smaller the radial and angular misalignment between coupling parts on the shaft ends to be connected, the longer the service life and the higher the reliability of the equipment and the quieter the operation.

Misalignments of the coupling parts in relation to each other can be caused by inaccurate alignment during assembly, but also by actual operation of the equipment (expansion due to heat, shaft deflection, insufficiently rigid machine frames, etc.).



Alignment has to be effected in two axial planes arranged in vertical relation to each other. This can be done by means of a ruler (radial misalignment) and feeler gauge (angular misalignment). The aligning accuracy can be increased by using a dial gauge or, optically, by using a laser.

Caution!

The maximum permissible misalignments must under no circumstances be exceeded during operation.

For the exact values please see operating instructions for the coupling.

Angular and radial misalignments may occur at the same time. The sum of both misalignments must not exceed the maximum permissible value of the angular or radial misalignment.

6. Assembly

Note: Observe the "Safety instructions" 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 must be allowed around the gear unit for later care and maintenance work.

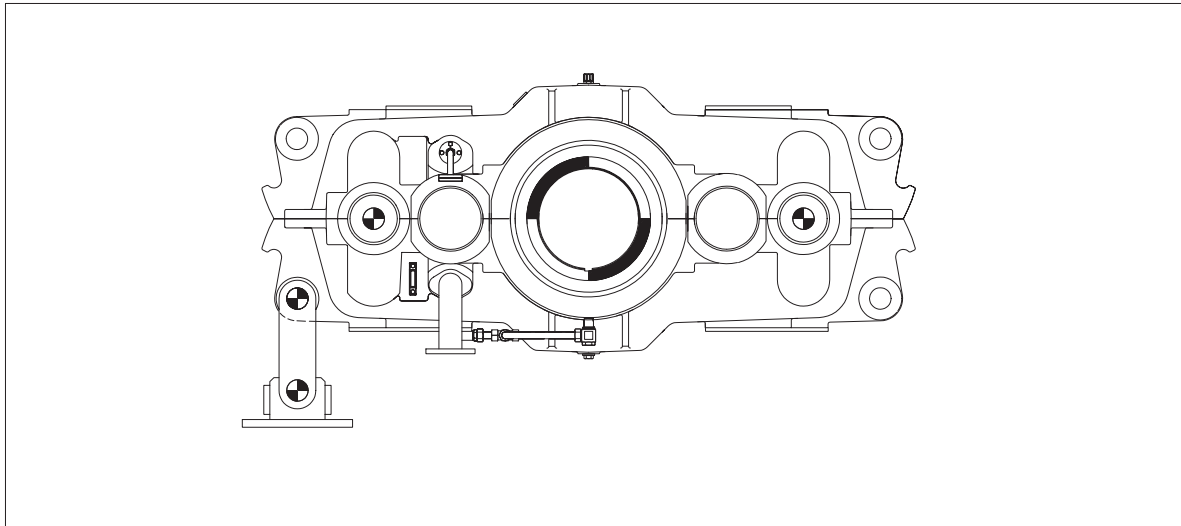
Adequate lifting equipment must be available before beginning the installation and assembly work.

Caution!

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

Note: For dimensions, space requirement, arrangement of the supply connections (on gear units with oil cooling), refer to the drawings in the gear-unit documentation.

6.2 Support bracket



Please refer to the dimensioned drawing in the gear unit documentation for the position of the torque arm.

The support bracket must be vertical and level in the area of the torque reaction arm.

It must be designed in such a way that no resonance vibrations are set up and that no vibrations can be transmitted from adjacent foundations. Steel structures on which the unit is to be mounted must be rigid. They must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

6.3 Shaft-mounted gear unit with hollow shaft and parallel key

6.3.1 Assembly

- Remove the anti-corrosion paint from the hollow shaft and machine shaft with benzine.



**Ensure adequate ventilation. Do not smoke!
Danger of explosion.**

- Check the hollow and machine shafts to ensure that seats and edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

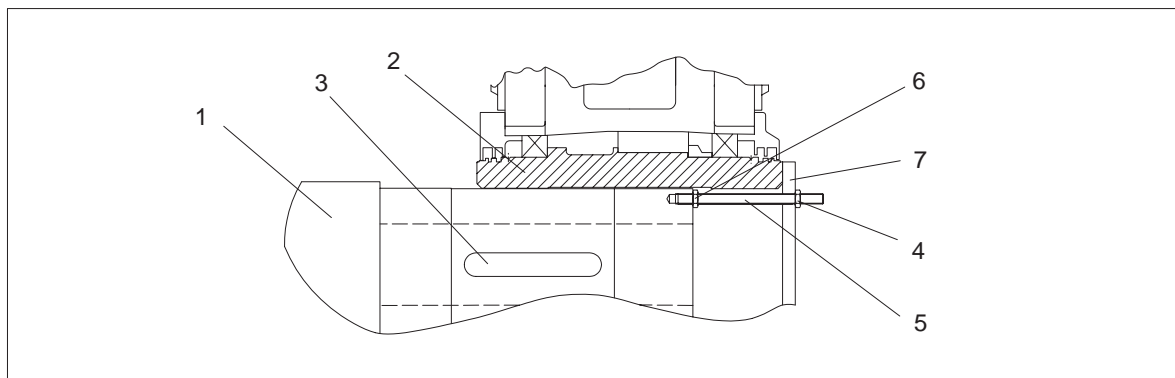
Coat with a suitable lubricant (e.g. Calypsol grease type H 443 HD88) to prevent frictional corrosion of the contact surfaces.

6.3.1.1 Fitting

- Fit the gear unit by means of nut and threaded spindle. The counter force is provided by the hollow shaft.

Caution!

The hollow shaft must be exactly aligned with the machine shaft to avoid canting.

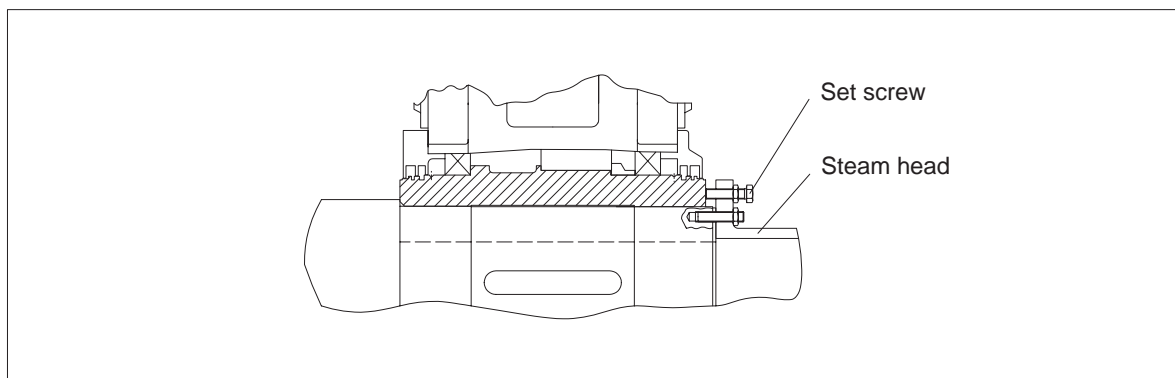


1	Machine shaft	4	Nut	7	End plate
2	Hollow shaft	5	Threaded spindle		
3	Parallel key	6	Nut		

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic lifting equipment (type Lucas) may be used.

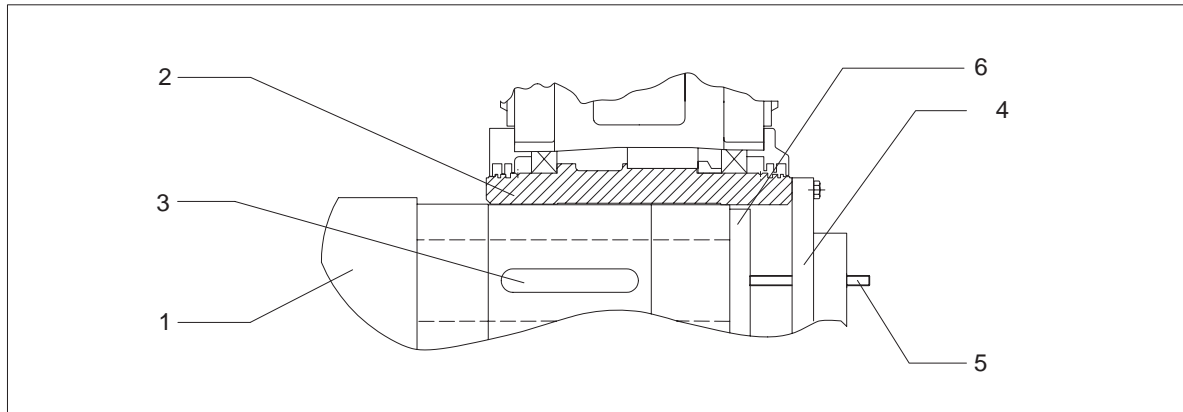
6.3.1.2 Axial securing device

Depending on type, secure the hollow shaft axially on the machine shaft (e.g. with circlip, end plate, set screw, slotted nut etc.).



6.3.2 Dismantling

- Remove the axial securing device from the hollow shaft.
- Depending on the facilities available, the gear unit can be forced off the shaft on site using forcing screws in an end plate (see fig.), a central threaded spindle or preferably a Lucas hydraulic lifting unit.



- 1 Machine shaft
- 2 Hollow shaft
- 3 Parallel key

- 4 Hydraulic lifting unit
- 5 Threaded spindle
- 6 Plate for forcing out

Instead of nut and threaded spindle, the use of a hydraulic lifting device (Lucas) should be preferred here.

Caution!

Avoid canting when pulling the unit off.

6.4 Shaft-mounting gear unit with hollow shaft and shrink disk

6.4.1 Assembly

- Remove the anti-corrosion paint from the hollow shaft and machine shaft with benzine.



**Ensure adequate ventilation. Do not smoke!
Danger of explosion.**

- Check the hollow and machine shafts to ensure that seats and edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

Caution!

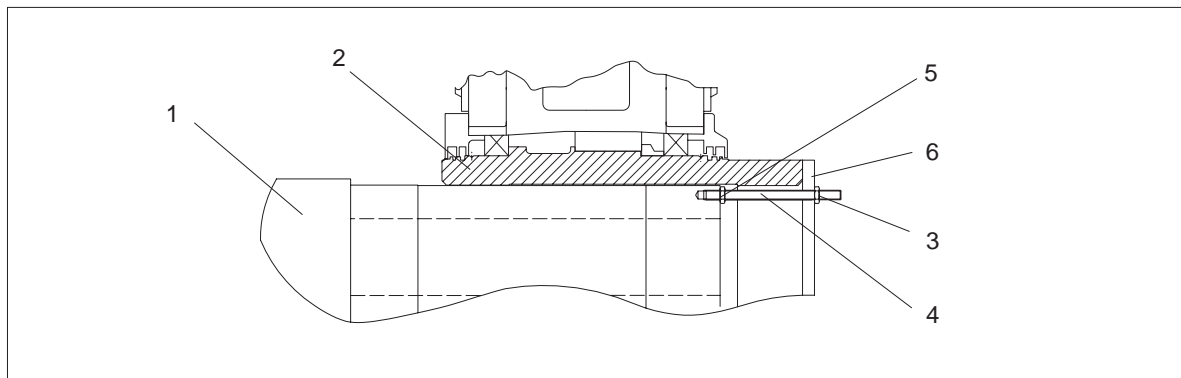
**The bore of the hollow shaft and the machine shaft must be absolutely free of grease in the area of the shrink-disk seat.
This is essential for safe and reliable torque transmission.
Do not use contaminated solvents or dirty cloths for removing grease.**

6.4.1.1 Fitting

- Fit the gear unit by means of nut and threaded spindle. The counter force is provided by the hollow shaft.

Caution!

The hollow shaft must be exactly aligned with the machine shaft to avoid canting.



- 1 Machine shaft
2 Hollow shaft
3 Nut

- 4 Threaded spindle
5 Nut
6 End plate

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic lifting equipment (type Lucas) may be used.

6.4.1.2 Axial securing device

If the shrink disk is fitted according to instructions, the gear unit is fixed securely in the axial direction. Additional securing is not required.

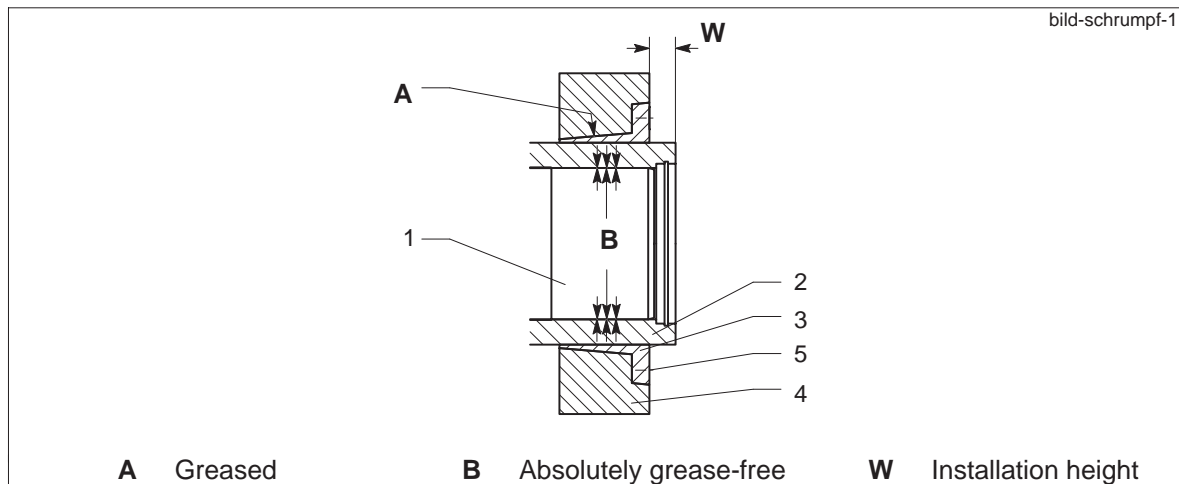
6.4.2 Shrink disk, type HSD

6.4.2.1 Assembly of shrink disk

The shrink disk is delivered ready for installation.

Caution! It must not be dismantled before tensioning for the first time.

Caution! The bore of the hollow shaft and the machine shaft must be absolutely free of grease in the area of the shrink-disk seat. This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.



1 Machine shaft
2 Hollow shaft

3 Machine shaft
4 Outer ring

5 Tensioning bolt

For the exact installation height (W) of the shrink disk, refer to the dimensioned drawing (see section 1 "Technical data")

Note: The outer surface of the hollow shaft may be greased in the area of the shrink-disk seat.

Caution! Do not tighten the tensioning bolts until the machine shaft is installed.

Tighten all the tensioning bolts gradually one after the other, working round several times.

Caution! Do not tighten diametrically opposite bolts one after the other.

Tighten the tensioning bolts until the front surfaces of the inner and outer rings are aligned.

Note: This allows the tension condition to be checked visually.

Caution!

To avoid overloading the individual bolts, the maximum tensioning torque (see table) must never be exceeded. The alignment of the front surfaces has priority. If alignment cannot be achieved by tightening, consult FLENDER.

Tensioning-bolt thread	Max. tensioning torque per bolt (with $\mu = 0.1$)	
	Strength class 10.9 Nm	Strength class 12.9 Nm
M 6	12	14.5
M 8	29	35
M 10	58	70
M 12	100	121
M 14	160	193
M 16	240	295
M 20	470	570
M 24	820	980
M 27	1210	1450
M 30	1640	1970
M 33	2210	2650
M 36	2850	3420

Table 6.1: Maximum torques for tensioning bolts

Replace the protective cowl.

6.4.2.2 Removing the shrink disk

The loosening process is similar to that of tightening.

Loosen the tensioning bolts gradually one after the other, working round several times.

If the outer ring does not release from the inner ring, several tensioning bolts can be removed and then screwed into adjacent forcing threads.

The rings can then be released without difficulty.

Pull the shrink disk off the hollow shaft.

6.4.2.3 Cleaning and greasing the shrink disk

Shrink disks do not have to be dismantled and re-greased before being re-installed.

The shrink disk should only be dismantled and cleaned if it is dirty.

Caution!

Following cleaning, only the inner sliding surfaces of the shrink disk should be re-greased.

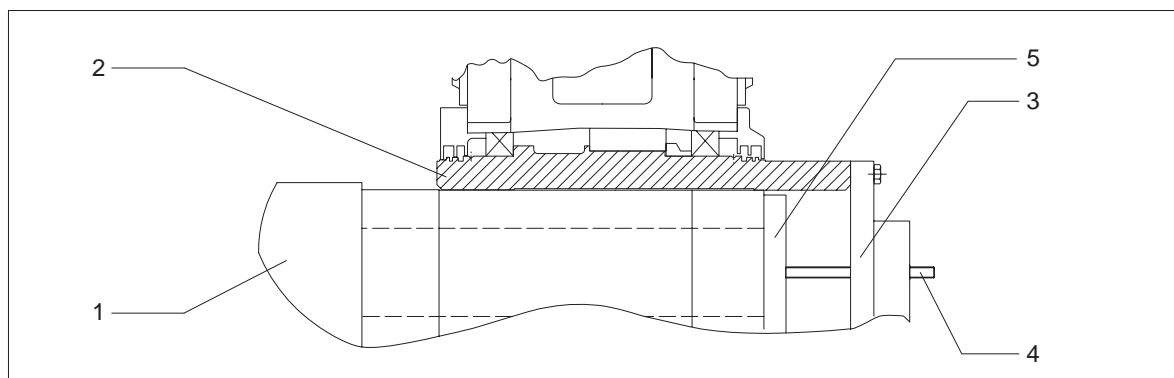
Use a solid grease with a coefficient of friction of $\mu = 0,04$ as shown in the following table.

Lubricant	Form	Form
Molykote 321 R (lubricating paint)	Spray	DOW Corning
Molykote Spray (powder spray)	Spray	DOW Corning
Molykote G Rapid	Spray or Paste	DOW Corning
Aemasol MO 19 P	Spray or Paste	A. C. Matthes
Molykombin UMFT 1	Spray	Klüber Lubrication
Unimoly P 5	Powder	Klüber Lubrication

Table 6.2: Lubricants for shrink disk after cleaning

6.4.3 Dismantling

- Depending on the facilities available, the gear unit can be forced off the shaft on site using forcing screws in an end plate (see fig.), a central threaded spindle or a Lucas hydraulic lifting unit.



- 1 Machine shaft
2 Hollow shaft
3 Hydraulic lifting unit

- 4 Threaded spindle
5 Plate for forcing out

Caution!

Avoid canting when pulling the unit off.

Caution!

If the above values are exceeded, the hollow-shaft bearings or other gear components may be irreparably damaged. Before replacing the gear unit on the machine shaft, always check the bearings for any signs of damage.

Note:

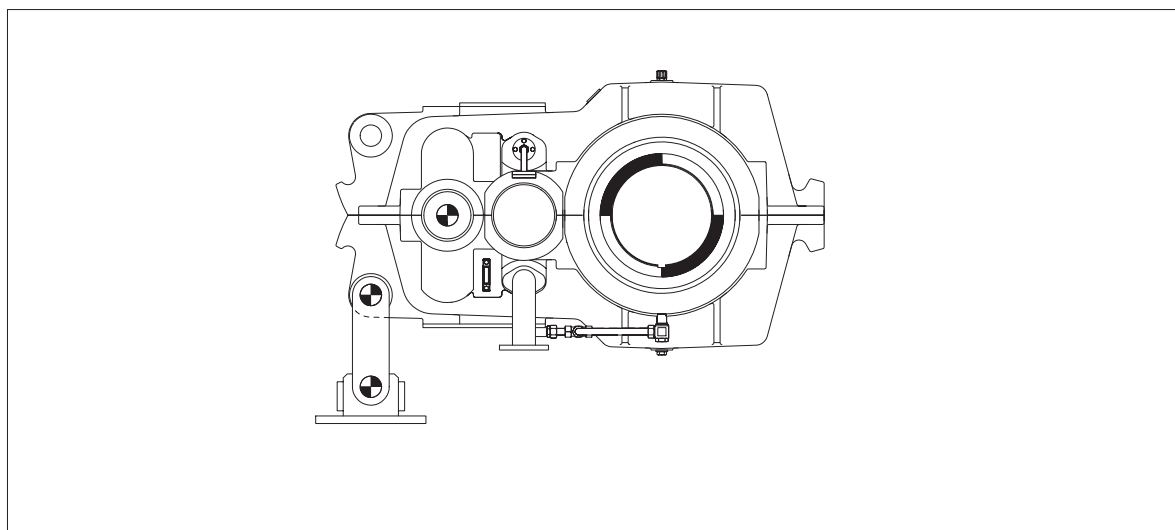
When using forcing screws or threaded spindles, the head of the thread pressing against the driven machine should be rounded and well greased to reduce the risk of seizing at this point.

6.5 Mounting the torque arm for gear housing

6.5.1 Attaching the torque arm

Caution!

The torque arm must be mounted stress-free on the machine side



- The gear unit is placed directly on the machine journal and secured against torsion by the torque arm.

6.6 Description of installation work

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



**Ensure adequate ventilation. Do not smoke!
Danger of explosion.**

- Pull drive unit onto shaft end and secure.

Caution!

Fit the coupling with the aid of suitable fitting equipment. Never use force or knock the couplings into position, as this may damage the gearwheels, rolling bearings, locking rings, etc.

Note: If couplings are used which are to be fitted after heating, the operating instructions for the coupling concerned should be observed.

Note: Gear units whose weight requires the use of lifting gear must be attached as shown in section 4 "Transport, handling and storage".

The unit on the input side must be precisely aligned with the gear-unit shaft, using:

- rulers
- spirit level
- dial gauge
- feeler gauge, etc.

The gear unit can now be fixed in position.

Note: The accuracy of shaft axis alignment is an important factor in determining the life span of shafts, bearings and couplings.

6.6.1 Gear unit with oil lubrication system

- Remove blank flanges and/or plugs on the pressure and suction lines of the gear unit and of the oil-supply unit.
- Install connection pipes between oil-supply unit and gear unit and connect.
- Connect up pressure monitor electrically

Note: The installation of the oil supply system, including cooling water in- and outflow, and the electrical installation of the monitoring equipment must be carried out in accordance with separate operating instructions.

7. Start-up

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

7.1 Procedure before start-up

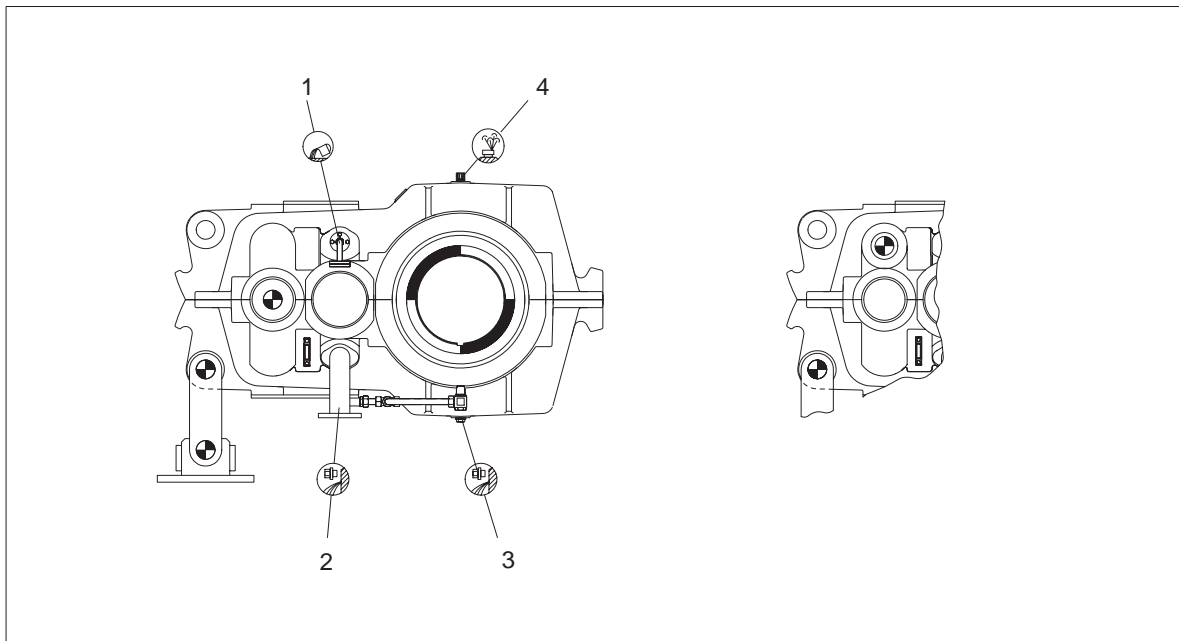
7.1.1 Removal of preservative agent

- Unscrew the oil drain plug or open the draining valve, allow the preservative or run-in oil to drain into a suitable container and dispose of it in accordance with regulations.



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

- Replace oil drain plug and/or reclose oil drain cock
- Connect oil feed and return to the oil supply unit.



1 pressurised oil feed
2 pressureless oil return

3 Oil drain plug / oil drain cock
4 Screw plug / venting screw

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

Caution!

Before start-up, replace the yellow plastic plug with a breather screw with cap (see also notice on gear unit).

7.1.2 Charging with lubricant

Note: The gear unit is supplied with lubricant by the separate oil supply system.

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

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

- Check the oil level in the gear unit housing by means of the right-angle oil level indicator or the oil level sight glass.

7.2 Start-up

Gear unit with oil supply system:

- Fully open the shutoff valves in the oil supply and drain line of the oil-supply unit.

Caution! The gear unit must be operated only together with the oil supply system. For this purpose the oil supply system should be switched on at least 2 minutes before start-up of the gear unit.

Note: The start-up can begin, when the oil pressure is higher than 1.5 bar.

7.3 Removal from service

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



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

- During longer periods of disuse, start the unit up briefly at intervals of approx. 3 weeks. If the gear unit is to remain out of service for longer than six months, it must be treated with preservative (see item 7.3.1).

7.3.1 Interior preservation during longer disuse

7.3.1.1 Interior protection with preservative agent

Before longer periods of storage gear units with forced lubrication systems, oil circulation cooling or non-contacting shaft seals should be allowed to idle with a charge of preservative agent.

Duration of protection	Preservative agent	Special measures
up to 24 months	Castrol Alpha SP 220 S	Close gear unit, replace breather screw or air filter with a yellow plug screw, (replace the original parts before start-up)
For storage periods over 24 months renew the preservative agent. For storage periods over 36 months FLENDER should be consulted.		

Table 7.1: Preservation procedure when using mineral oil or PAO-based synthetic oil

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

Table 7.2: Preservation procedure when using PG-based synthetic oil

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

7.3.1.2 Interior preservation procedure

- Switch the gear unit off and drain the oil as described in section 10 "Maintenance and repair".
- Pour in preservative according to table 7.1 or 7.2 through the venting hole so that the helical gears submerge.
- Close the venting hole.
- Start the gear unit and allow it to idle for a short time.
- Unscrew the oil drain plug and allow the preservative to drain into a suitable container and dispose of it according to regulation.



There is a risk of scalding from the hot preservative agent draining from the gear unit. Wear protective gloves.

- Replace the oil drain plug.

Caution!

**Before re-starting the gear unit replace the screw plug with the breather screw or air filter.
See also item 7.1.1.**

7.3.2 Exterior preservation

Duration of protection	Preservative agent	Layer thickness	Remarks
up to 24 months	Tectyl 846 K19	approx. 50 µm	Long-term wax-based preservative agent, resistant to sea water and tropical conditions (soluble with CH compounds)

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

7.3.2.1 Exterior preservation procedure

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

8. Operation

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

8.1 General operating data

During operation the unit must be monitored for:

- excessive operating temperature If mineral oil is used, the gear unit is suitable for a temperature of 80 °C in continuous operation. The maximum short-term operating temperature is 90 °C. See also section 10.
- changes in gear noise
- possible oil leakage at the housing and shaft seals

and

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

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 unit 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.

If the cause cannot be identified or the unit repaired with the facilities available, you are advised to contact one of our customer-service offices for specialist assistance (see section 11.).

9. Faults, causes and remedy

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

9.1 General information on faults and malfunctions

Note: Faults and malfunctions occurring during the guarantee period and requiring 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 FLENDER's agreement 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 unit to prevent it from being started up unintentionally.

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 all toothed components and replace any damaged parts.
	Bearing defective	Contact Customer Service. Adjust bearing play.
	Bearing defective	Contact Customer Service. Replace defective bearings.
Increased temperature at bearing points	Oil flow in gear unit housing too low	Check separate oil supply system and, if necessary, top up oil
	Oil too old	Check date of last oil change and, if necessary, change oil. See section 10 or operator information for separate oil supply system
	Bearing defective	Contact Customer Service. Check and, if necessary, replace bearings.
Operating temperature too high	Oil level in housing too high	Check oil return
	Oil too old	Check date of last oil change and, if necessary, change oil. See section 10 or operator information for separate oil supply system
	Oil badly contaminated	Change oil. See section 10 or operator information for separate oil supply system
	Coolant flow too low Coolant temperature too high Oil flow through oil-cooler too low through: very dirty oil filter	See operator information for separate oil supply system
Loud noises in area of gear-unit fastening	Fastening has worked loose	Tighten bolts / nuts to prescribed torque. Replace damaged bolts / nuts.
Oil leakage from gear unit	Inadequate sealing of housing covers or joints	Check and, if necessary, replace seals. Seal joints
Fault in oil supply system		See operator information for separate oil supply system

Table 9.1: Faults, causes and remedies

10. Maintenance and repair

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

10.1 General notes on maintenance

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

Caution!

The periods indicated in table 10.1 depend on the conditions under which the gear unit is operated. Only average periods can therefore be stated here. These refer to:

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

Note: Under different operating conditions the periods indicated below must be adjusted accordingly.

Measures	Periods	Remarks
Check oil temperature	daily	
Check for unusual gear-unit noise	daily	
Check gear unit for leaks	monthly	
Test oil for water content	after approx. 400 operating hours once per year at least	See item 10.2.1
First oil change after start-up	see section 10.2.2 or operator information for separate oil supply system	
Subsequent oil changes		
Cleaning the venting screw	every 3 months	See item 10.2.3
Clean gear-unit housing	every 5000 operating hours	See item 10.2.4
Checking tightness of fastening bolts	after 1 month, then every 5000 operating hours	See item 10.2.5
Carry out complete inspection of gear unit	approx. 2 years	See item 10.2.6

Table 10.1: Maintenance and repair work

10.2 Description of maintenance and repair work

10.2.1 Test water-content of oil

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

10.2.2 Changing the oil

Note: Please observe the notes in the operator information for the separate oil supply system.

Caution!

When changing the oil, always re-fill 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, metal particles and oil residue. Use the same type of oil as is used for normal operation. High-viscosity oils must 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 shutting down the machinery.

- Stop the gear unit by switching off the drive assembly



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

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

10.2.3 Cleaning the venting screw

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

10.2.4 Cleaning the gear unit

- Stop the gear unit by switching off the drive assembly



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

- Remove any corrosion.

Caution!

The gear unit must not be cleaned with high-pressure cleaning equipment.

10.2.5 Check tightness of fastening bolts

- Stop the gear unit by switching off the drive assembly



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

- Fully open the shutoff valves in the oil inlet and outlet line of the oil supply system.
- 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 must be replaced with new bolts of the same type and strength class.

- Tightening torques for fastening bolts of other strength classes are, if necessary, documented on the dimensioned drawing.

10.2.6 General inspection of gear unit

The general inspection of the gear unit must 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) indicated on the nameplate. 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 BA 7300 EN operating instructions 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 load-bearing capacity, corrosion resistance, resistance to grey staining and compatibility with seals and internal paint coats which are necessary for the type of gear unit concerned.

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

Note: To avoid misunderstandings, we should like to point out that this recommendation is in no way intended as a guarantee of the quality of the lubricant supplied. Each lubricant manufacturer is responsible for the quality of his own product.

Should you, for an important reason of your own, not wish to follow our recommendation, you assume responsibility for the technical suitability of the lubricant used.

11. Spare parts, customer-service addresses

11.1 Stocking spare parts

By stocking the most important spare and wearing 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 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 and/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 or guarantee 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 customer service addresses

When ordering spare parts or the services of our specialist engineers, apply first to FLENDER AG.

FLENDER Germany

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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

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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

Smoothing cylinder gear units of types GHZP and GHDP
for paper machine drives
Sizes 360 to 2680

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, 2001-11-23

Signature (person responsible for products)