

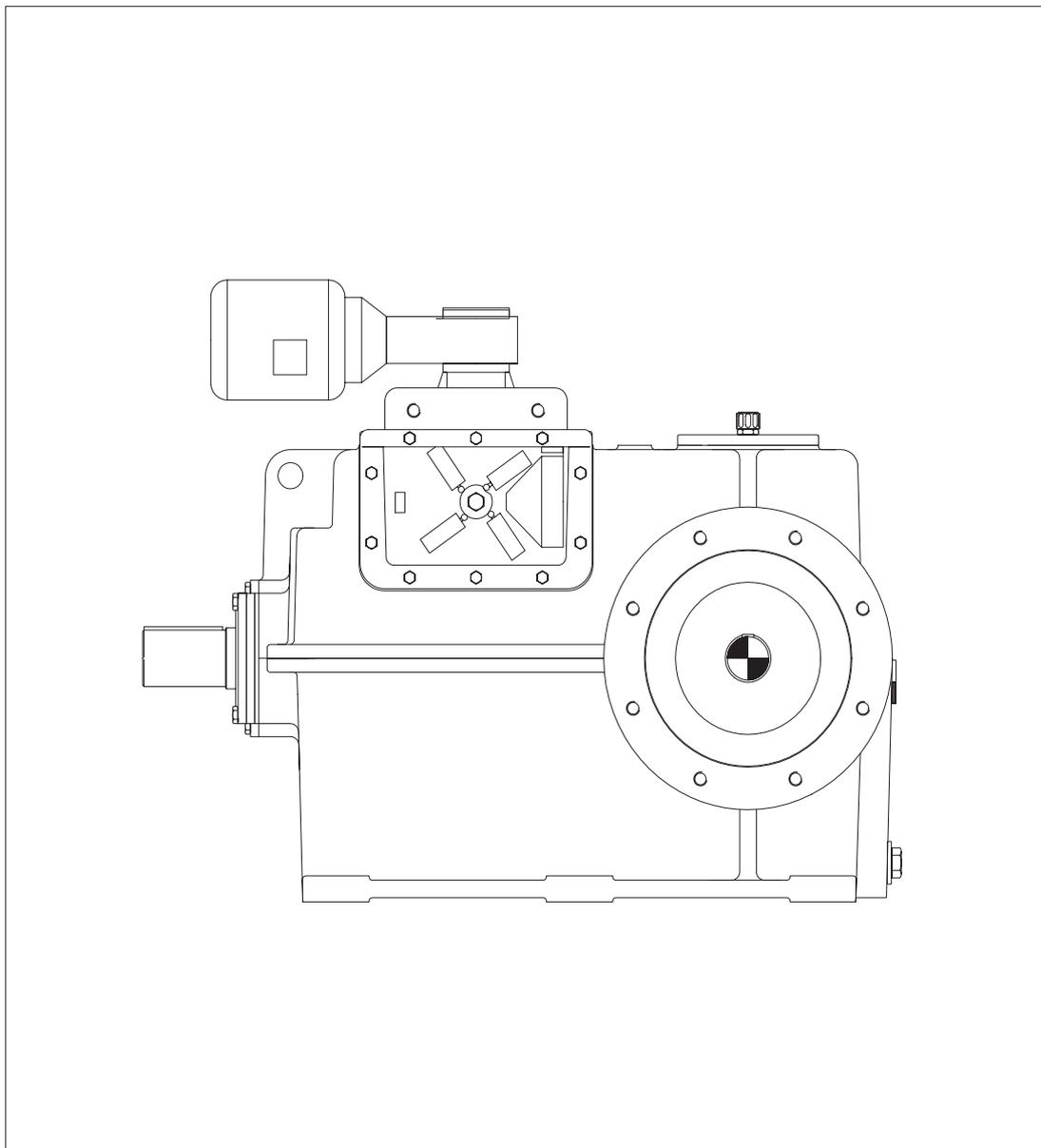
# Operating Instructions

## BA 5801 EN 11.02

Crane installation gear units of Type

**BHUS**

Sizes 140 to 180



**FLENDER**

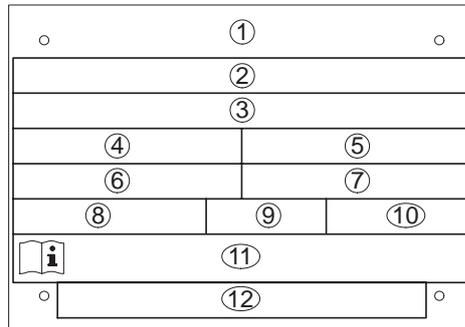
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## 1. Technical data

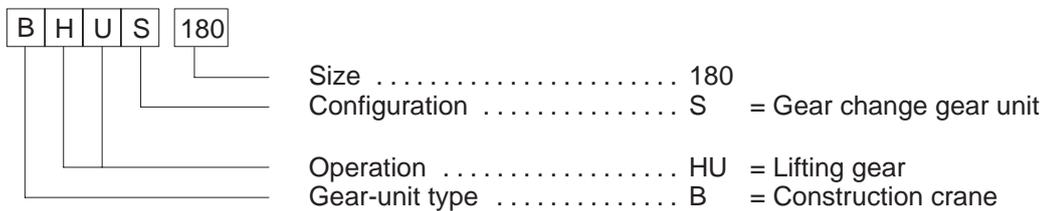
### 1.1 General technical data

The most important technical data on the gear unit 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 no entry  |
| 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 Torque $T_2$ in Nm                   | ⑪ Operating instructions number                   |
| ⑥ no entry                             | ⑫ Transmission ratio $i$                          |

e.g. \*)



Data on weights and measuring-surface sound-pressure levels of the various gear types are given in items 1.1.1 and 1.1.2.

For further technical data, refer to the drawings in the gear-unit documentation.

#### 1.1.1 Weights

Type	Approx. weight (kg) for size		
<b>BHUS</b>	<b>140</b>	<b>160</b>	<b>180</b>
	550	800	1050

Table 1.1: Weights (approx. values only)

**Note:** All weights are for unit without oil filling. For exact weight specifications, refer to the gear-unit documentation.

## 1.1.2 Measuring-surface sound-pressure level

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

The measurement is carried out 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 to the warmed up gear unit, input speed  $n_1$  and output torque  $T_2$  as stated on the rating plate. If several figures are given, the highest speed and power values apply.

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.

The sound-pressure levels stated in the table were obtained by statistical calculation by our Quality Control Dept. The gear unit can be statistically expected to comply with these sound-pressure levels.

Measuring-surface sound-pressure level in $L_{pA}$ in dB (A)			
$n_1$ 1/min	Gear-unit size		
	140	160	180
1750	85 +2	90 +2	90 +2

Table 1.2: Measuring-surface sound level

## 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.**

The "**FLENDER gear unit**" described in these operating instructions (BA) has been developed for stationary use in general engineering applications. Possible areas of use for gear units of this type include lifting gear systems for construction cranes.

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 (BA) 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. 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 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 (BA)



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

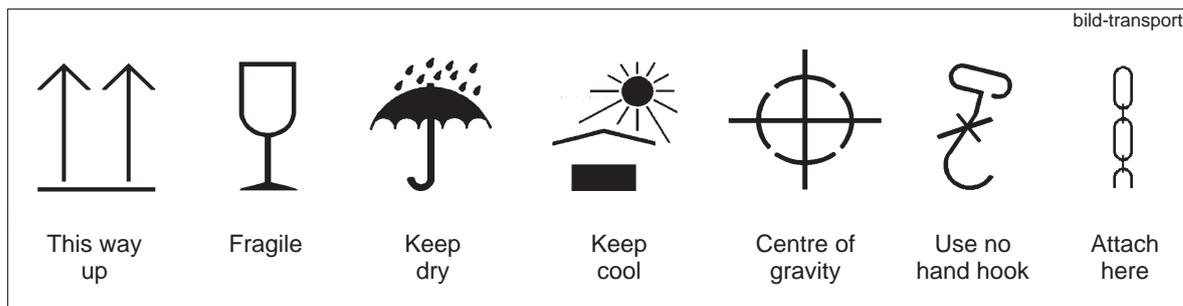


**When handling FLENDER products, use only lifting and handling equipment of sufficient load-bearing capacity!**

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:



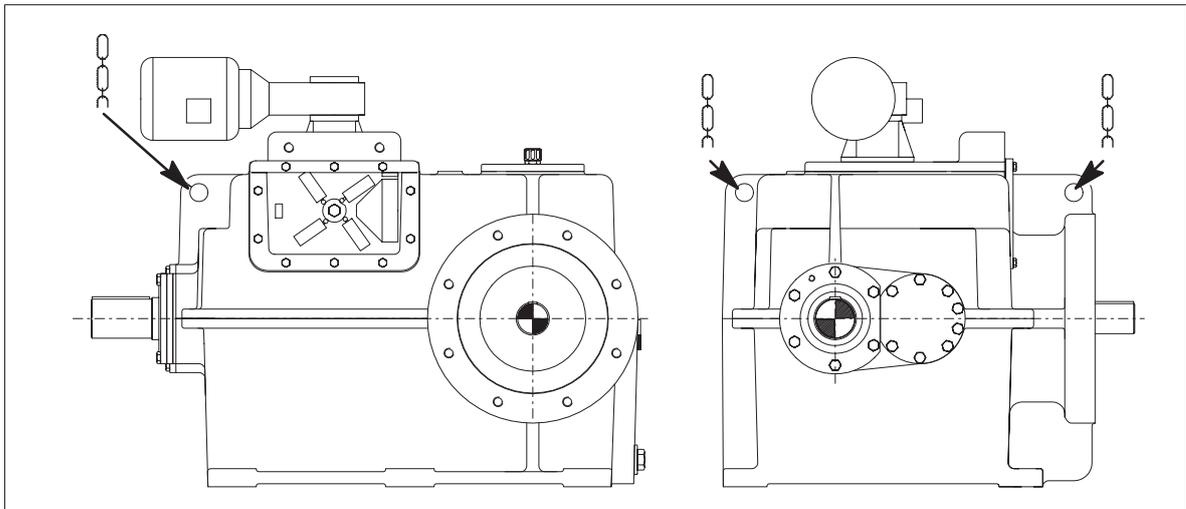
**Caution!**

**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!**

**Use only the 3 eyes provided to attach lifting equipment to the unit. –  
Do not use the front threads at the shaft ends to attach eye bolts for transport.**



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

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

#### 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 particularly carefully covered, and care must be taken 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.

#### 4.4 Standard corrosion protection

The gear unit is provided with an internal preservative agent. The free shaft ends are 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:** 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 external 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 internal and external preservative (see section 7, "Start-up").

## 5. Technical description

### 5.1 General

The gear unit is delivered as a two-stage bevel-gear unit with clutches for multi-speeds.

**Caution!** It is designed for installation in the horizontal position.

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 ambient temperatures outside the range 0 to + 20 °C.

### 5.2 Housing

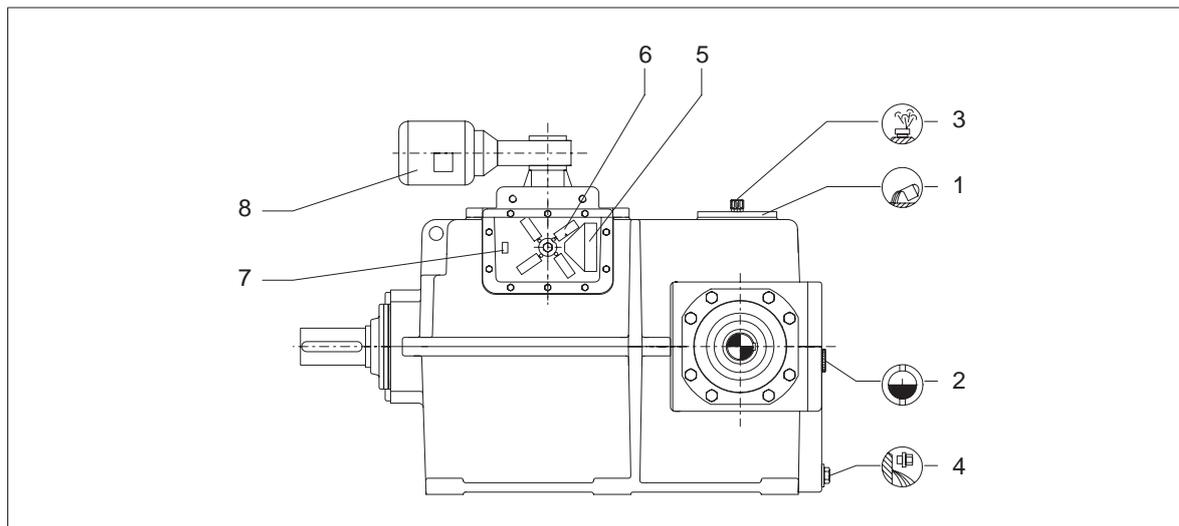
The gear unit housing is made of cast iron and in two parts. It is of torsionally rigid design and its shape imparts very favourable noise and temperature characteristics.

The housing is provided with adequately dimensioned lifting eyes and inspection and assembly covers.

It is also fitted with an oil sight glass for checking the oil level, a drain plug for oil change and a breather screw for venting the housing.

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

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



1	Oil inlet	5	Terminal strip
2	Oil hole	6	Limit switch
3	Breather	7	Arrow showing direction of rotation for gear change motor
4	Oil drain plug	8	Gear change motor

## 5.3 Toothed components

The toothed components of the gear unit are case-hardened. The helical gear teeth are ground; depending on their size and transmission ratio, bevel-helical gear teeth are lapped, ground or HPG-gear-cut. 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 parallel keys. These types of joints transmit the torques generated with adequate reliability.

## 5.4 Lubrication

The teeth on the gear units are adequately supplied with oil by dip lubrication. The gear unit thus requires very little maintenance.

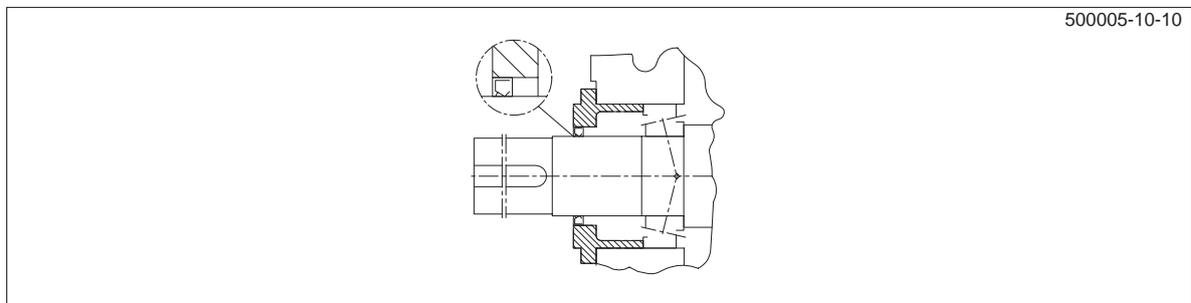
## 5.5 Shaft bearings

All shafts and change gears are mounted on rolling bearings.

The rolling bearings on the gear unit are lubricated by dip lubrication.

## 5.6 Shaft seals

Radial shaft sealing rings prevent oil from escaping from the housing and dirt from entering.



## 5.7 Coupling

As a rule, a flexible coupling must be provided for the gear unit drive.

If a rigid coupling or a drive component (e.g. gear, V-belt pulley, etc.) which sets up an additional radial and/or axial force is used, this must be contractually agreed.

### 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.

### Caution!

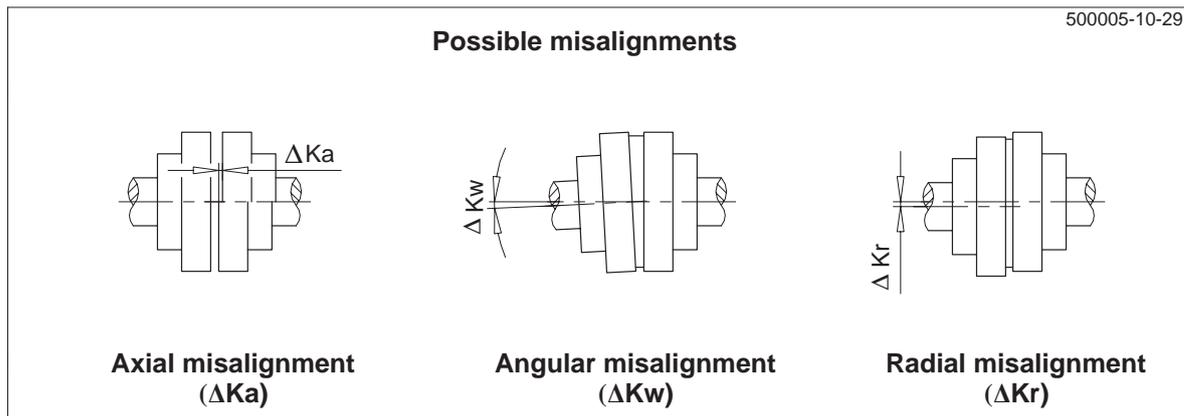
**When installing the drives, make absolutely certain that the individual components are accurately aligned in relation to each other. Inadmissibly large misalignments of the shaft ends to be connected due to angular and axial misalignments result in premature wear and material damage.**

### Note:

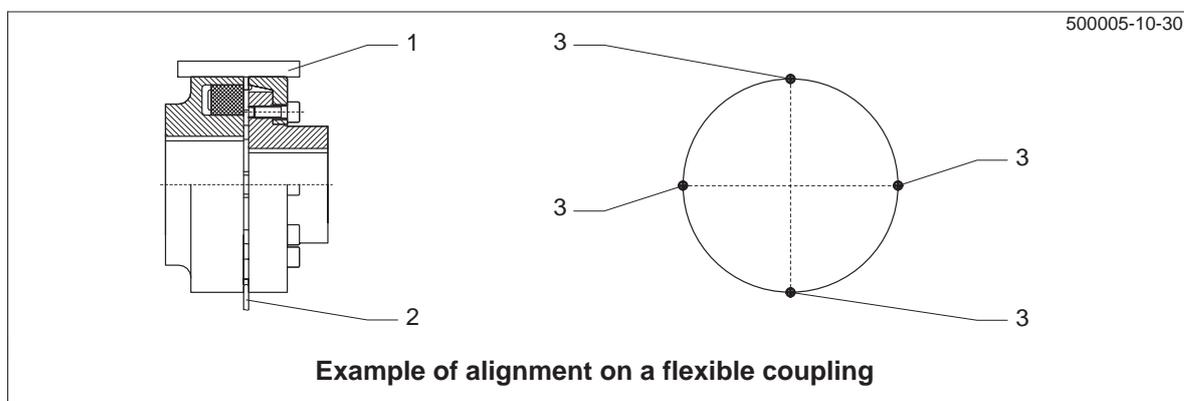
The smaller the radial and angular misalignment between coupling parts on the shaft ends to be connected, the longer the service life and the higher the reliability of the equipment and the quieter the operation.

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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), as shown in the illustration. The aligning accuracy can be increased by using a dial gauge or, optically, by using a laser.



1 Ruler

2 Feeler gauge

3 Measuring points

## 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.

## Note:

For alignment of the drive components (vertical direction), it is recommended to use packing or foil plates underneath the mounting feet. The use of claws with set screws on the foundation for lateral adjustment of the drive components is also advantageous.

## 5.8 Changeover

The gear unit can be changed for several speeds. Changeover is effected by the attached gear change motor via the limit switches fitted to the gear unit.

### Caution!

Changeover must not be done while the unit is moving, even while it is coming to a stop, but only when the gear is at a complete standstill. The brake must always be switched on.

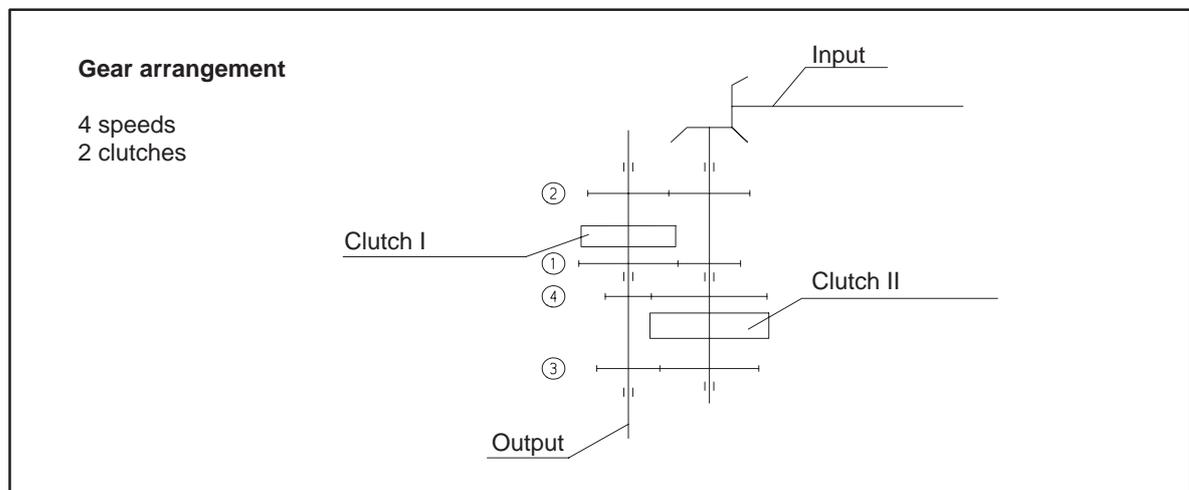


The main drive motor and the gear change motor must be interlocked via the installed limit switches so that the gear cannot be changed while the motor is running. The main motor must then be started only, if a gear is engaged and released by the limit switch.

The couplings and limit switches are set by FLENDER before delivery of the gear units.

**Note:** To ensure that the run-on of the changeover is not too great a brake control must be provided for the gear change motor. If a condenser braking system is provided as brake control, the condenser must be size  $3 \times 6.4 \mu\text{F}$ .

**Note:** Observe the operating instructions for the gear change motor.



For the exact arrangement of the gears, please refer to the drawings in the gear-unit documentation.

## 5.9 Brake

The gear units are set up for the fitting of a holding brake. The brake disk is mounted on the drive shaft (brake shaft) of the gear unit.

**Note:** Observe the operating instructions for the brake.

## 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.

**Caution!**

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

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.**

### 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.

The unit must be carefully aligned with the motor on the input and output sides. Possible strain deformations due to operating forces must be taken into account.

Fastening bolts or nuts must be tightened to the prescribed torque. For the correct torque, refer to item 10.2.6. 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 and applications arrangement, refer to the drawings in 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!  
Danger of explosion.**

- Mount and secure input and output drive elements (e.g. coupling components) on shafts.  
If these are to be heated before mounting, refer to the dimensioned drawings in the coupling documentation for the correct joining temperatures.

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

**Caution!**

**Take precautions to avoid burns from hot components!**

**Caution!**

**Protect shaft sealing rings from damage and heating to over +100 °C (use heat-protective screens to protect against radiant heat.)**

**Caution!**

**The coupling components must be fitted with the aid of suitable equipment to avoid damaging the shaft bearings through axial joining forces.**

**Always use suitable lifting equipment.**

**When fitting the components, care must be taken that the shaft sealing rings and shaft running surface are not damaged.**

The components must be pushed smartly onto the shaft up to the position specified in the order-specific dimensioned drawing.

**Caution!**

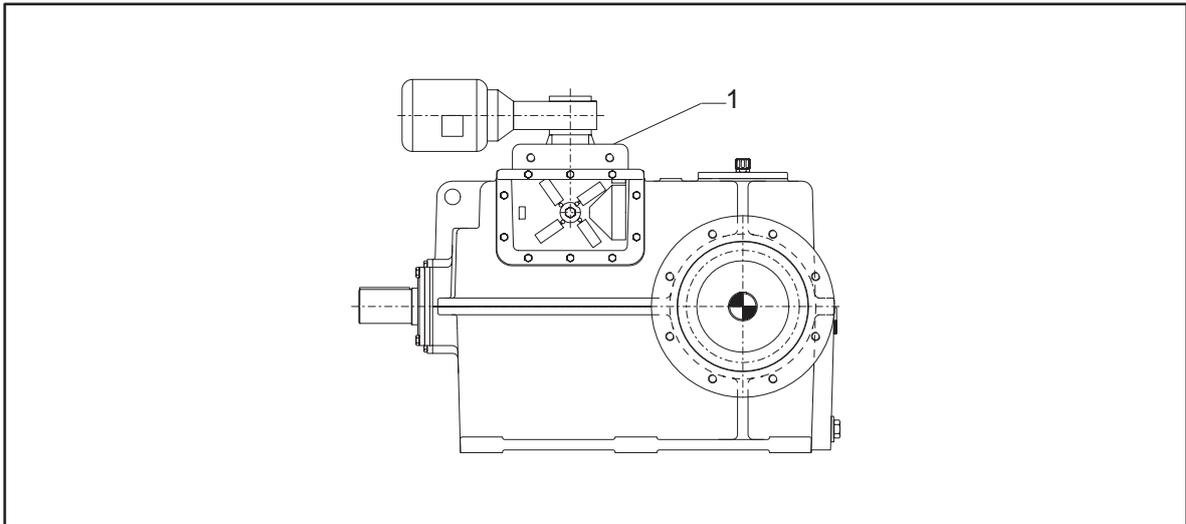
**Fit the coupling with the aid of suitable fitting equipment. Never use force or knock the couplings into position, as this may damage the gearwheels, rolling bearings, locking rings, etc.**

**Note:**

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

## 6.2.2.1 Alignment 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 in- and output side must be carried out accurately by the shaft axes, 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. If possible, the deviation should be zero. For amongst others the special requirements for the couplings, refer to the specific operating instructions.

## 6.2.2.2 Mounting on a foundation frame

- Clean the undersurface of the gear-unit base.
- Deposit gear unit on foundation or steel frame using suitable lifting gear.
- Fastening bolts or nuts must be tightened to the prescribed torque. For the correct torque, refer to item 10.2.6. 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.

## 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 oil drain plug and drain off the remaining preservative or running-in oil from the housing into a suitable receptacle and dispose of it in accordance with regulations. The location of the oil draining point is marked by an appropriate symbol in the dimensioned drawing in the unit documentation.

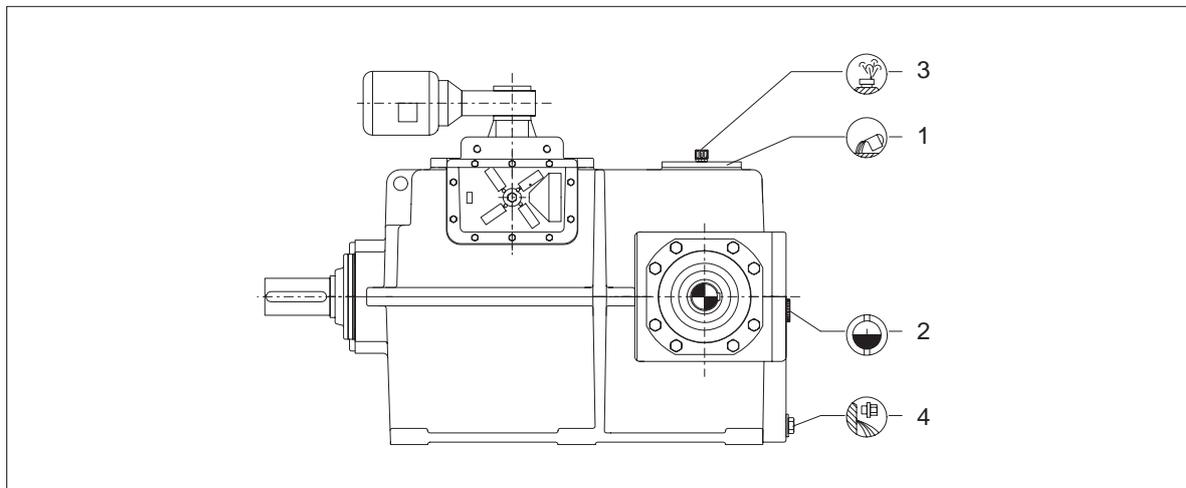


**Remove any oil spillage immediately with an oil-binding agent.**

- Replace the oil drain plug.

#### **Caution!**

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



1 Oil inlet  
2 Oil hole

3 Breather  
4 Oil drain plug

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

#### 7.1.2 Charging with lubricant

- Release the fastening bolts on the inspection cover and remove the cover (including seal) from the housing.

#### **Caution!**

**Fill the gear unit with fresh oil, using a filter (max. mesh 25  $\mu$ m).**

**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. The quantity of oil indicated on the rating plate is an approximation only.

- Check oil level on oil sight glass.

**Note:** The oil must be up to the middle of the oil sight glass



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

- Close inspection hole with inspection lid and seal

## 7.2 Start-up

- Check oil level in the gear unit housing on the oil sight glass

**Note:** When the oil has cooled down, the oil level should be in the middle of the oil-sight glass. If the oil is hot, it may be slightly above the middle mark.  
It must not be allowed to fall below the middle mark; if necessary, top up oil.

## 7.3 Removal from service

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



**Secure the drive assembly to prevent accidental switch-on!  
Attach a warning notice to the start switch.**

**Note:** During longer periods of disuse, start the unit up briefly at intervals of 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 Preservation when taking out of service for long periods

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

#### 7.3.1.1 Internal preservation with gear oil

Gear units with dip lubrication systems and contacting shaft seals can be filled with the correct type of oil up to a point just below the breather screw.

#### 7.3.1.2 Preservation 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 <b>24</b> 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 longer than 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 <b>36</b> 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

## 7.3.1.3 Internal preservation procedure

- Switch the gear unit off and drain the oil as described in section 10, "Maintenance and repair".
- Pour in the preservative agent specified in Table 7.1 or 7.2 through the venting hole or the inspection cover hole until it reaches the middle mark on the oil sight glass.
- Close the venting hole or the opening in the inspection cover.
- 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.**

## 7.3.1.4 External preservation

Duration of protection	Preservative agent	Layer thickness	Remarks
up to <b>24</b> 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

## 7.3.1.5 External 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

### 8.1 General operating data

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

During operation the unit must be monitored for:

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

- changes in gear 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.

If the oil is hot, the oil level may be slightly above the middle mark on the oil sight glass. It must not be allowed to fall below the middle mark on the oil sight glass; if necessary, top up oil.

### Caution!

**If any irregularities are noticed during operation, 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.**

**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.



**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	Malfunctions	Remedy
Changes in gear noise	Damage to gear teeth	Contact Customer Service. Check all toothed components and replace any damaged parts.
	Excessive bearing play	Contact Customer Service. Adjust bearing play.
	Bearing defective	Contact Customer Service. Replace defective bearings.
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 and, if necessary, top up oil.
	Oil too old	Check date of last oil change and, if necessary, change oil. See section 10.
	Oil badly contaminated	Change oil
	Bearing defective	Contact Customer Service. Check and, if necessary, replace bearings.
Gear unit is oiled up	Inadequate sealing of housing covers or joints	Seal joints
	Radial shaft sealing rings defective	Check radial shaft sealing rings and, if necessary, replace.
Oil leakage from gear unit	Inadequate sealing of housing covers or joints	Check and, if necessary, replace seals. Seal joints.
	Radial shaft sealing rings defective	Check radial shaft sealing rings and, if necessary, replace.
Operating temperature too high	Oil level in housing too high	Check oil level and, if necessary, adjust.
	Oil too old	Check date of last oil change and, if necessary, change oil. See section 10.
	Oil badly contaminated	Change oil. See section 10.
Gear change motor		The specific operating instructions must be observed.
Changeover		Contact Customer Service. Check and, if necessary, replace changeover.

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

**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	<b>24 hours</b>
a duty factor of	<b>DF 100 %</b>
an input-drive speed of	<b>1500 1/min</b>
a max. oil temperature of	<b>90 °C</b>

**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 oil level	monthly	
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	after approx. 400 operating hours	see item 10.2.2
subsequent oil changes	every 18 months or 5000 operating hours     1)	see item 10.2.2
Oil change in gear change motor	every 18 months	see separate operating instructions
Cleaning the breather screw	every 3 months	see item 10.2.3
Clean gear-unit housing	simultaneously with oil change	see item 10.2.4
Checking tightness of fastening bolts	after first oil change, thereafter after every second oil change	see item 10.2.5
Carry out complete inspection of gear unit	approx. every 2 years along with oil change	see item 10.2.6

Table 10.1: Maintenance and repair work

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

1) When using synthetic oils, the periods can be tripled.

## 10.2 Description of maintenance and repair work

### 10.2.1 Checking oil for water-content

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

### 10.2.2 Changing the oil

#### 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.**

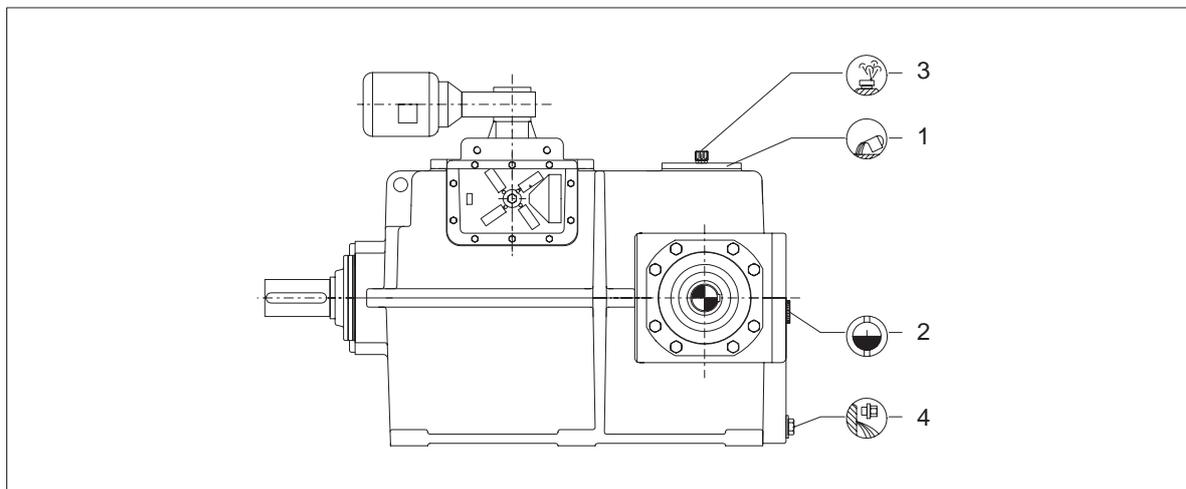
When changing the oil, the housing must be flushed with oil to remove sludge, metal particles and oil residue. Use the same type of oil as is used for normal operation. High-viscosity oils must be heated beforehand. Ensure that all residues have been removed before filling with fresh oil.

**Note:** The oil must be changed immediately after the gear unit has been shut down.

- 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.**



1 Oil inlet  
2 Oil hole

3 Breather  
4 Oil drain plug

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

- Place a suitable container under the oil drain plug
- Unscrew the breather screw on the top of the housing
- Unscrew the oil drain plug and allow the oil to drain into the container



**There is a danger of scalding from the hot oil emerging from the housing. Wear protective gloves. Remove any oil spillage immediately with an oil-binding agent.**

- Clean the permanent magnet of the oil drain plug thoroughly
- Replace the oil drain plug

**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.

- Release the fastening bolts on the inspection cover and remove the cover (including seal) from the housing.

**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 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.  
The quantity of oil indicated on the rating plate is an approximation only. The marks on the oil dipstick must always be observed, when pouring in oil.

- Check oil level in the gear unit housing on the oil sight glass

**Note:** The oil must come up to the middle of the oil sight glass.



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

- Close inspection hole with inspection cover and seal

## 10.2.3 Cleaning the breather 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 gear unit by deactivating the drive unit, and secure from turning



**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 Topping up oil

- 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.**

- Release the fastening bolts on the inspection cover and remove the cover (including seal) from the housing.

**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 used in the gear unit (see also item 10.2.2).  
Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit.

- Check oil level in the gear unit housing on the oil sight glass

**Note:** The oil must come up to the middle of the oil sight glass.



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

- Close inspection hole with inspection cover and seal

## 10.2.6 Checking tightness of all 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.**

- Check tightness of all fastening bolts with a torque wrench

Thread size	Strength class	Tightening torque (bei $\mu = 0.20$ )
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.

## 10.2.7 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.

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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

### Crane installation gear units of Type **BHUS** Sizes 140 to 180

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, 2002-11-18

\_\_\_\_\_  
Signature (person responsible for products)