

FLENDER GEAR UNITS

FLENDER ONE

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Original assembly and operating instructions

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Version 03/2026

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Introduction

1

1.1 About these instructions

1.1.1 General

Please note the following information to achieve the best results when working with the instructions.

This product, which can be used as a reduction gear unit and/or multiplier gear unit, is referred to below as “gear unit”.

Chapter

A chapter means a single structure level within a part of the instructions. The chapter appears as a heading and is listed in the table of contents.

Subheading

A subheading is used to subdivide a chapter. The subheading is not listed in the table of contents.

List

Lists are shown as follows.

- List point 1st level
- List point 2nd level

Action instructions

Action instructions describe a complete action and consist of several elements, which are shown as follows.

- Requirement before the action
- 1. Action step 1
- 2. Action step 2
 - ⇒ Interim result
- 3. Action step 3
 - ⇒ Action instruction result

Action steps

Action steps are numbered in order.

Always perform the steps in the order given.

Information

Information provides additional assistance and tips for handling the product and is provided as follows:



Information

Definition

Information provides additional assistance and tips for handling the product.

1.1.2 Safety-relevant information

These instructions contain information you must observe for your own personal safety as well as to avoid property damage.

Safety information

Specifications for handling the product safely and the associated safety information are described in the “Safety information” chapter.

Warnings

Warnings are associated with an action and apply not only to a specific action step, but to a complete action instruction.

Warnings regarding your personal safety are highlighted with a warning triangle. Information regarding property damage alone is not marked with a warning triangle. Depending on the hazard class, the warnings shall be depicted as follows, in descending order.

 DANGER

means that death or severe physical injury **will** occur if the relevant precautionary measures are not taken.

 WARNING

means that death or severe physical injury **may** occur if the relevant precautionary measures are not taken.

 CAUTION

means that mild physical injury may occur if the relevant precautionary measures are not taken.

NOTE

means that damage to property may occur if the relevant precautionary measures are not taken.

If multiple hazard classes come into play, the warning for the highest level in question shall always be used. If a warning includes a warning triangle indicating the risk of personal injury, the same warning may also include a warning regarding property damage.

The following example shows how a warning is formally structured.

Hazard class
Type and source of danger Potential consequences of non-compliance Measures to avert the danger

1.2 Technical documentation

These instructions form part of the complete documentation supplied with the gear unit. The complete documentation encompasses other documents, including:

- Data sheet
- List of equipment
- Dimension drawing
- Instructions 7300 on gear unit lubrication and preservation
- Instructions for mounted components
- Instructions for third-party devices

Please keep the complete documentation for later use.

1.3 Liability disclaimer

These instructions have been prepared with the utmost care. Please make sure that every person who is commissioned to handle and/or work on the product has read and understood these instructions and adheres to all of the points. This is the basic requirement for safe operation.

The manufacturer accepts no liability or warranty for product, property and/or personal damage resulting from non-compliance with the instructions and technical regulations, improper and unintended use, alteration or damage to the product.

1.4 Copyright

The copyright of these instructions is held by the manufacturer. Without the express authorisation of the manufacturer, this document may not be used wholly or in parts for competitors' purposes or be given to third parties.

1.5 Trademarks

All trademarks identified by ® are registered trademarks of the manufacturer. Other designations in these instructions may be trademarks whose use by third parties for their own purposes may violate the rights of the owner.

2.1 Introduction

The intention of the following basic safety information is to prevent injury to persons and property damage; it primarily relates to the use of the gear units as described here. Ensure that you also observe the user information in the complete documentation.

2.2 Professional User

A professional user will have a set of specialist skills that relate to their job. As a result of their training and experience, professional users are capable of detecting risks and avoiding potential hazards when using this product.

Qualified specialist in application planning

Qualified specialists in application planning have specialist skills in areas such as application and operation planning, and they correctly apply relevant standards and regulations.

Qualified specialists in application planning are responsible for the following tasks, among others:

- Planning of the gear unit throughout all life phases in accordance with the use for which it is intended

Qualified specialist in transport

Qualified specialists in transport have specialist skills in areas such as transport, and they correctly apply relevant standards and regulations.

Qualified specialists in transport are responsible for the following tasks, among others:

- Performance of proper and professional transport services

Qualified specialist in mechanical engineering

Qualified specialists in mechanical engineering have specialist skills in areas such as mechanics and fluid technology. A qualified specialist in mechanical engineering applies the relevant standards and regulations correctly.

Qualified specialists in mechanical engineering are responsible for the following tasks, among others:

- Assembly and dismantling
- Commissioning and decommissioning of products
- Scheduled and standardised servicing in line with intervals to reduce and avoid malfunctions by means of:
 - Determining and assessing the actual status (inspection)
 - Maintaining the target state (maintenance)
 - Restoration to the target state (repair)

2.3 Intended use

- Material requirements planning and storage management (stock of spare parts, consumables)
- Ensuring and monitoring the oil supply
- Ensuring and monitoring disposal of used materials and consumables
- Use of personal protective equipment, including inspection thereof and replacement in a timely manner

Qualified specialist in electrics

Qualified specialists in electrics have specialist skills in areas such as electrical systems, automation and control engineering. A qualified specialist in electrics applies the relevant standards and regulations correctly.

Qualified specialists in electrics must have undergone specialised training in the field of electrical engineering. This could include training as an electrician, electrical engineer or holding a degree in electrical engineering.

Qualified specialists in electrics are responsible for the following tasks, among others:

- Assessing and ensuring the safe condition of electrical equipment (5 safety rules)
- Connecting and disconnecting electrical equipment
- Commissioning and decommissioning electrical equipment
- Scheduled and standardised servicing in line with intervals to reduce and avoid malfunctions by means of:
 - Determining and assessing the actual status (inspection)
 - Maintaining the target state (maintenance)
 - Restoration to the target state (repair)
- Material requirements planning and storage management (stock of spare parts, consumables)
- Ensuring and monitoring the power supply and signal processing
- Ensuring and monitoring disposal of used materials and consumables
- Use of personal protective equipment, including inspection thereof and replacement in a timely manner

Qualified specialist in disposal

Qualified specialists in disposal have specialist skills in areas such as disposal, and they correctly apply relevant standards and regulations.

Qualified specialists in disposal are responsible for the following tasks, among others:

- Ensuring and monitoring the disposal of entire products
- Use of personal protective equipment, including inspection thereof and replacement in a timely manner

2.3 Intended use

The gear unit must only be used for the intended purpose. The gear unit is used as intended by complying with these instructions. This also includes references to other documents.

The limits of the intended use of the gear unit are defined on the basis of the contractual agreements concerning the gear unit concluded between Flender and the customer.

The gear unit is only intended for use in industrial machines and plants.

Work on the gear unit must be performed by professional users.

The gear unit may only be commissioned once it has been established that the machine or plant in which the gear unit is to be installed adheres to local and national regulations.

2.4 Foreseeable misuse

The gear unit must not be used for purposes other than those specified in the intended use.

Do not perform any welding work anywhere on the gear unit or on the connected parts. Do not use the gear unit or any connected parts as an earthing point for electric-welding operations. Geared parts and rolling-contact bearings can be irreparably damaged by welding.

Do not start up the gear unit in potentially explosive atmospheres. The gear unit can ignite a potentially explosive atmosphere.

2.5 Personal protective equipment

Protective equipment can help to avoid injuries.

Always wear the following personal protective equipment when handling the gear unit.

Symbol	Personal protective equipment
	Protective clothing protects the torso, arms and legs from external hazards during work.
	Safety shoes are intended to protect feet from external hazards and to prevent slipping.

Table 2-1 : Personal protective equipment

In addition, wear the following prescribed personal protective equipment, depending upon the risk scenario.

Symbol	Protective equipment
	Head protection is intended to provide protection for the head against external, damaging effects.
	Eye protection protects the eyes from mechanical, optical, biological, chemical, thermal or electrical hazards.

Symbol	Protective equipment
	Protective gloves are gloves that provide protection for the hands against damage resulting from external mechanical, thermal or chemical effects.
	Hearing protection reduces the impact of noise on hearing in order to prevent noise-induced hearing loss from occurring or worsening.

Table 2-2 : Additional protective equipment

2.6 Product labelling

2.6.1 Introduction

The product labelling sets out important and safety-relevant information about this gear unit. Take note of the product labelling when handling the gear unit. Any labelling must be free from paint and dirt.

2.6.2 Warning signs

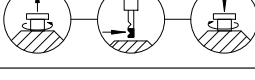
The following table provides an overview of the warning signs and their meaning.

ISO	ANSI	Meaning
		Warning – hazardous electrical voltage
		Warning – explosive substances
	---	Warning – entanglement hazard
	---	Warning – hot surfaces
	---	Warning – corrosive substances
	---	Warning – suspended load
	---	Warning – hand injuries

Table 2-3 : Warning signs

2.6.3 Symbols

The following symbols apply to the gear unit; some of which are found as coloured markings on the gear unit:

Symbol	Colour Marking	Meaning
		Earth connection point
	yellow	Air release point
	yellow	Oil filling point
	white	Oil draining point
	red	Oil-level indicator
	red	Oil level measurement
		Oil overflow
		Connection point for vibration monitoring
	red	Grease lubrication point
		Apply grease
		Lifting eye
		Eye bolt
		Do not unscrew
		Alignment surface, horizontal
		Alignment surface, vertical
		Oil measuring procedure

2.6 Product labelling

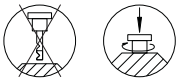
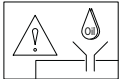
Symbol	Colour Marking	Meaning
		Tightly screw in the oil dipstick
	green	Transport attachment point
		Stipulated direction of rotation
	red	Oil filling point Fill required minimum amount of oil prior to commissioning
	green	Covered attachment point

Table 2-4 : Symbols and markings

2.6.4

Rating plate

The rating plate of the gear unit contains the most important technical specifications.

①		
No.	②	⑤
③	T _{amb} ④	
⑥	⑦	
⑧	⑨	
n ₁ ⑩ /min	n ₂ ⑪ /min	
Oil:	⑫	
	⑬	
	⑭	
	⑮	
	⑯	

Figure 2-1: Rating plate

- | | |
|---|---|
| ① Company logo | ⑨ Power specification P ₂ in kW or torque T ₂ in Nm |
| ② Serial no.: Production plant code / order no.-item ser. no. / year of manufacture | ⑩ Speed n ₁ |
| ③ Designation of the partly completed machine | ⑪ Speed n ₂ |
| ④ Ambient temperature | ⑫ Oil data: Oil type, oil viscosity, oil quantity |
| ⑤ DMC (Data Matrix Code) | ⑬ Number(s) of instructions, including issue date |
| ⑥ Total weight in kg | ⑭ For special information |
| ⑦ For special information | ⑮ Manufacturer documentation / Country of origin |
| ⑧ Model, size | ⑯ Contact |

Further information

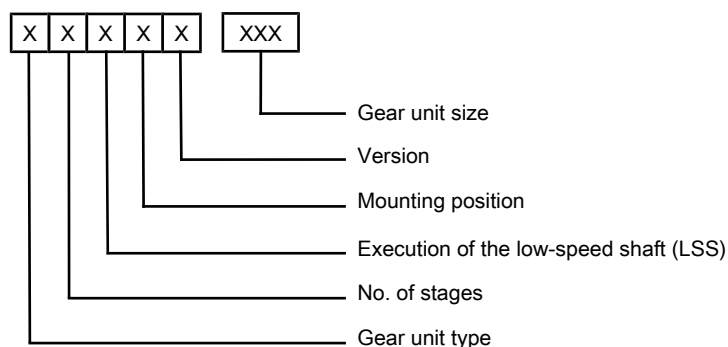
You can find further information about the technical specifications in the separate data sheet and in the dimension drawing provided in the complete documentation for the gear unit.

You can find further information about all major accessories, including their technical specifications and control instructions, in the order-specific list of equipment in the complete documentation for the gear unit.

2.6.5 Structure of gear unit markings

Field 5 of the rating plate contains the gear unit markings.

The following diagram offers an overview of the breakdown of the gear unit marking.



The following tables explain the meaning of each letter and number.

Gear unit type	
H	Helical gear unit
B	Bevel helical gear unit

No. of stages	
2	No. of stages 2
3	No. of stages 3
4	No. of stages 4

Execution of the low-speed shaft (LSS)	
S	With coupling connection
H	Shaft-mounted gear unit
F	Shaft-mounted gear unit

Mounting position	
H	Horizontal
U	Low-speed shaft (LSS) over high-speed shaft (HSS)
L	High-speed shaft (HSS) over low-speed shaft (LSS)

Version	
N	Normal version
L	Additional forces
P	increased additional forces in the direction of the gear unit
U	Universal series

Gear unit size	
42 – 355	Gear unit size 42 – 355

Further information

You can find further information about weights and enveloping surface sound pressure levels in the Chapters Weights (Page 155) and Enveloping surface sound pressure level (Page 156).

You can find further information about the technical specifications in the separate data sheet and in the dimension drawing provided in the complete documentation for the gear unit.

2.6.6 Grease lubrication point plate

The grease lubrication points are designated using the following plate:

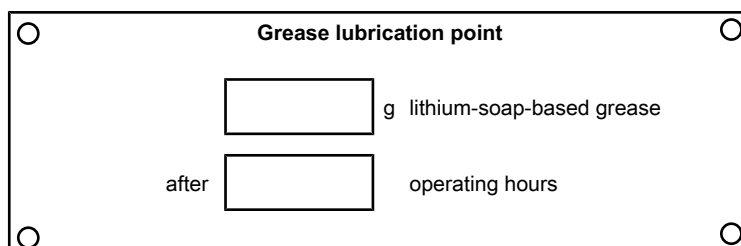


Figure 2-2: Plate: Grease lubrication point plate

2.7 Safety information

2.7.1 Information on safe application planning

Emission sound pressure level

During operation, it is possible that an emission sound pressure level of 80 dB (A) might be exceeded. This might result in tinnitus or hearing loss.

- An increased emission sound pressure level for the gear unit must be taken into consideration as part of the safety concept of the machine.

Rotating and moving parts

During operation, it may be possible to injure yourself on rotating and moving parts.

- Take into consideration any rotating and moving parts in the safety concept of the machine.

Hot surfaces

The surface temperature of the gear unit can exceed 55 °C during operation. Touching the surface may result in burns.

- Hot surfaces on the gear unit must be taken into consideration as part of the safety concept of the machine.

Leakage current

During operation, it is possible for components to become live as a result of defective electrical equipment. Touching live components will result in an electric shock.

- Possible leakage current must be taken into consideration as part of the safety concept of the machine.

2.7.2 Information on safe transport

Gear unit

Improper transport could result in life-threatening injuries.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the load limits of the hoisting or lifting equipment.

Attachments and components

Crushing or injury through heavy lifting can result if attachments or components are not lifted properly.

- Lift heavy attachment and components with suitable hoisting gear.

2.7.3 Information on secure methods of working

Emission sound pressure level

During operation, it is possible that an emission sound pressure level of 80 dB (A) might be exceeded. This might result in tinnitus or hearing loss.

- Wear hearing protection.

Unexpected starts

If the gear unit starts unexpectedly, there is a risk of being cut or drawn in.

- Turn the machine off before working on it and ensure the machine cannot be switched back on.
- Before beginning to work on the machine, make sure that the gear unit is de-energised and not under load.

Hot surfaces

The surface temperature of the gear unit can exceed 55 °C during operation. Touching the surface may result in burns.

- Allow the gear unit to cool down sufficiently before starting work.
- Wear protective clothing and suitable protective gloves.

Cold surfaces

The surface temperature of the gear unit may be lower than 0 °C due to weather conditions. Touching the surface may result in cold burns.

- Wear protective clothing and suitable protective gloves.

Sharp edges

When working on shaft ends, you may cut yourself on sharp ends of parallel keyway.

- Wear protective clothing and suitable protective gloves.

Height above ground

There is a risk of falling and of serious injury if you step onto the gear unit or its mounted components.

- Do not step onto the gear unit or its mounted components.

Falling mounted components and components

When working on the gear unit, there is a risk of injury from falling mounted components and components (e.g. dismantled inspection covers).

- Secure dismantled mounted components and components against falling.
- Wear safety shoes and suitable protective gloves.

Handling gear unit oil

There is a risk of injury to hands and eyes when handling chemically corrosive consumables.

- Only professional users should handle gear unit oil.
- Please observe the safety information in the data sheets of the oil used.
- Use a binding agent to immediately remove any oil spillage.
- Wear protective clothing, protective gloves and eye protection.

Hot oil

When changing oil, hot oil can result in serious injuries.

- Allow the gear unit to cool down sufficiently before starting work.
- Wear protective clothing, protective gloves and eye protection.

Slippery surfaces

Leakages or an oil drain that is not fully closed can result in the leaking of gear unit oil. It is possible to slip on leaking oil and injure yourself.

- Only professional users should handle gear unit oil.
- Immediately repair any leaks.
- Leaked oil must be properly removed and disposed of.
- Wear protective gloves and eye protection.

Pressurised hose lines

The spraying of oil from pressurised hose lines can penetrate the body and thereby result in serious injury.

- Only professional users can work on the hydraulic systems.
- Shut down the machine and oil supply before working on the hydraulic system.
- Secure the oil supply system and machine against being switched back on.
- Before starting any work, make sure that the hydraulic system has been depressurised.
- Observe the safety data sheet for the oil that is used.
- In the event of an accident, call a doctor and tell them about the composition of the oil.

Use of chemical substances

Injuries can be sustained when using chemical substances.

- Only professional users can work with chemical substances.
- Carefully observe the safety data sheet for chemical substances.
- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Remove any spilled solvent with binding agents.
- Wear protective gloves and eye protection.

Live parts

There is a risk of fatal injury from an electric shock when working on live parts.

- Only specialists in electrical engineering may carry out work on live parts.
- Call a doctor in the event of an electrical accident.

The five safety rules

Before commencing work on the machine, apply the following safety rules:

1. Disconnect
Also disconnect the auxiliary circuits, e.g. anti-condensation heating.
2. Safeguard against restart.
3. Ensure the system is de-energised.
4. Earth and short circuit.
5. Cover or safeguard neighbouring live parts.

When all the work is complete, reverse the measures taken by performing them in reverse order.

2.8 Industrial Security

Flender offers products and solutions with industrial security functions which support the safe and secure operation of plants, systems, machines and networks.

In order to safeguard plants, systems, machines and networks against cyber threats, it is necessary to implement (and continually maintain) a holistic industrial security concept that corresponds to the current state of the art. Flender Products and solutions undergo continuous development in this respect.

Customers are responsible for preventing unauthorised access to their plants, systems, machines and networks. These systems, machines and components shall be connected to the company network or the Internet only when and to the extent that this is absolutely necessary and provided that appropriate protective measures (e.g. firewalls and/or network segmentation) are taken.

You can find further information about possible protection measures as part of industrial security in the international series of standards IEC 62443 "Network and system security", for example.

Flender Products and solutions undergo continuous development in order to make them even safer. Flender strongly recommends that you regularly implement product updates as soon as they become available and that you only use the current product versions. Use of older or no longer supported versions can increase the risk of cyber threats.

Description

3.1 Gear unit description

The gear unit dealt with in these instructions was developed to drive machines in general mechanical engineering. This series of gear units is suitable for applications in the chemical, rubber, foodstuff and plastics industries, for example.

The gear unit is used to transmit and adjust torque and speed.

Lubrication

Lubrication of the gear unit reduces friction between the moving gear unit components. Depending on the order specification, components of the gear unit are lubricated as follows:

- Dip lubrication
- Grease lubrication of individual rolling-contact bearings
- Pressure lubrication via an attached or separate oil supply system

Cooling

Excess heat is dissipated by the cooling system. Depending on the order specification, cooling is carried out as follows:

- Fan
- Motor fan
- Cooling coil
- Attached oil supply system with air-oil cooler
- Attached oil supply system with water-oil cooler
- Separate oil supply system

Heating

At low temperatures, it may be necessary to preheat the gear unit oil before the gear unit is switched on or also during operation. Depending on the order specification, heating is carried out as follows:

- Heating element

Shaft seal

Seals can prevent oil from escaping from the gear unit and impurities from entering the gear unit. Depending on the order specifications, the following seals may be fitted to the gear unit:

- Labyrinth seal
- Radial shaft seal
- Taconite seal
- Taconite-light seal
- Tacolab seal

3.2 Arrangement of shafts and directions of rotation

Oil level check

A sufficient oil level is needed for optimum lubrication and cooling of the gear unit. The following components can be mounted on the gear unit to visually check the oil level. If several components for checking the oil level are mounted on the gear unit, the oil dipstick should be regarded as the most reliable.

- Oil dipstick
- Oil level gauge
- Oil level indicator

Bearing monitoring

The bearing monitoring system monitors the temperature and any vibrations of the gear unit. Depending on the order specification, bearing monitoring is carried out as follows:

- Resistance thermometer
- Shock-pulse transducer
- Accelerometers

Further information

Further information and a detailed illustration of the gear unit can be found in the dimension drawing provided in the complete gear unit documentation.

Further information about installed components as per scope of supply can be found in the data sheet, list of equipment or instructions for the components provided in the complete documentation for the gear unit.

3.2 Arrangement of shafts and directions of rotation

Various arrangements of shafts (designs and directions of rotation) are possible; the direction of rotation arrows indicate the dependence of the direction of rotation on the high-speed shaft (HSS) and low-speed shaft (LSS).

The various shaft arrangements are shown schematically below as a solid shaft.

Version	Model					
	H2.H	H3.H	H4.H	B2.H	B3.H	B4.H
A/P						
B/Q						
C/R						

Version	Model					
	H2.H	H3.H	H4.H	B2.H	B3.H	B4.H
D/S						
E/T						
F/U						
G/V			---	---	---	---
H/W			---	---	---	---
I/J			---	---	---	---

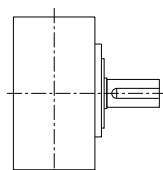
Table 3-1 : Versions and associated directions of rotation

When an auxiliary drive is mounted (as maintenance or load drive), the assignment of the direction of rotation to the specific version is defined in the dimension drawing.

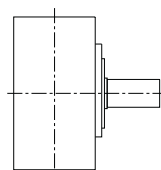
3.3 Execution of the low-speed shaft (LSS)

The low-speed shaft (LSS) can be supplied as one of the following variants:

- S = low-speed shaft (LSS) for mounting the coupling

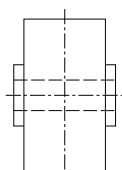


Solid shaft

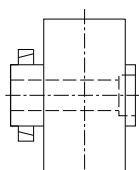


Solid shaft without parallel keyway groove

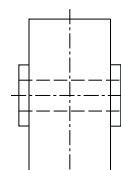
- H = Shaft-mounted gear unit



Hollow shaft with parallel keyway



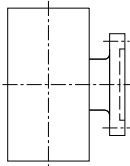
Hollow shaft for shrink disk



Hollow shaft with splines

3.3 Execution of the low-speed shaft (LSS)

- F = Shaft-mounted gear unit



Flange shaft

The following illustration shows the possible designs of the low-speed shaft (LSS):

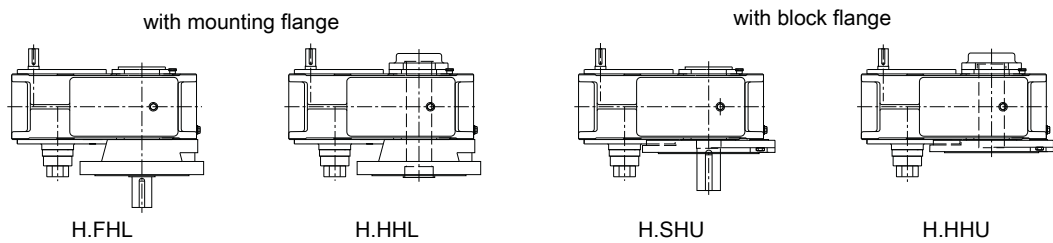


Figure 3-1: Designs of the low-speed shaft (LSS)

H.FHL	Low-speed shaft (LSS) for mounting the coupling	H.SHU	Low-speed shaft (LSS) for mounting the coupling
H.HHL	Shaft-mounted gear unit with parallel keyway	H.HHU	Shaft-mounted gear unit with parallel keyway

Further information

Further information and a detailed illustration of the gear unit can be found in the dimension drawing provided in the complete gear unit documentation.

3.4 Gear unit components

The diagram below shows the gear unit components for a model H..HN gear unit:

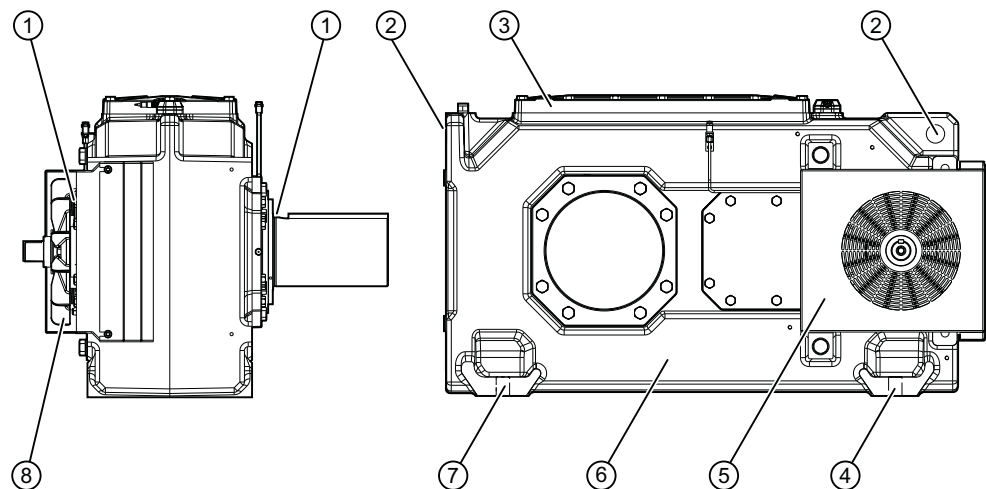


Figure 3-2: Gear unit components for gear units of model H..HN

- | | |
|---|-----------------------|
| ① Shaft seal | ⑤ Fan cover |
| ② Lifting eyes | ⑥ Housing |
| ③ Inspection and assembly cover | ⑦ Gear unit fastening |
| ④ Fastening for torque arm or gear unit | ⑧ Fan |
- Gear unit

The diagram below shows the gear unit components for a model B..HN gear unit:

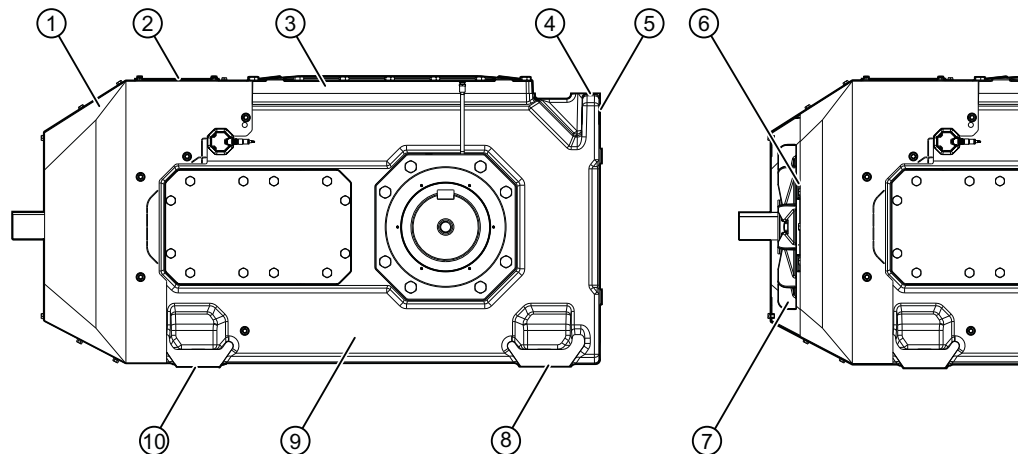


Figure 3-3: Gear unit components for gear units of model B..HN

- | | |
|---------------------------------|---|
| ① Air guide cover | ⑥ Shaft seal |
| ② Covered lifting eye | ⑦ Fan |
| ③ Inspection and assembly cover | ⑧ Gear unit fastening |
| ④ Lifting eyes | ⑨ Housing |
| ⑤ Rating plate | ⑩ Fastening for torque arm or gear unit |

3.5 Oil supply system

Gear unit components for gear units with auxiliary drive

The diagram below shows the gear unit components for a model B..HN gear unit with auxiliary drive:

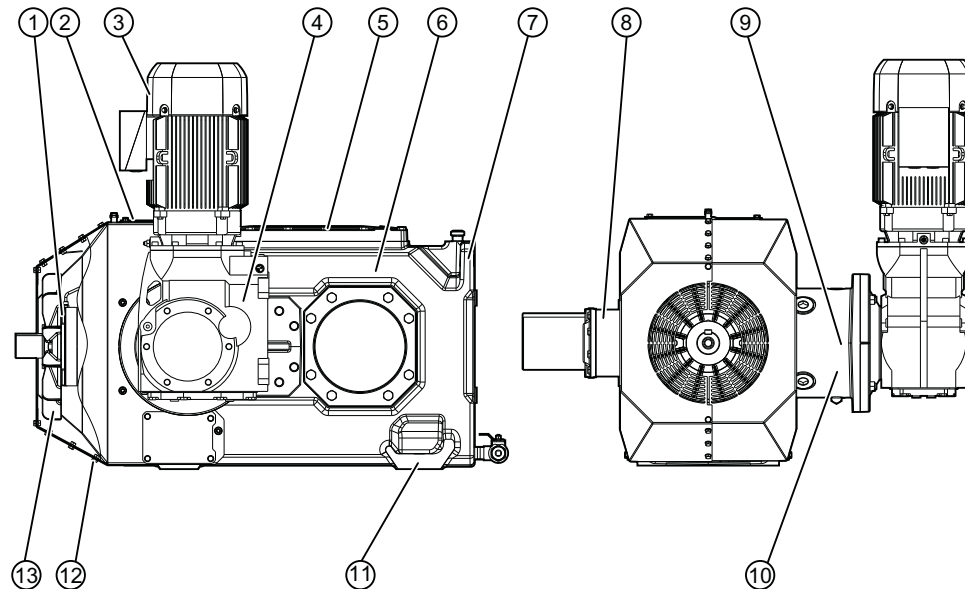


Figure 3-4: Gear unit components for gear units with auxiliary drive of model B..HN

- | | |
|--|-----------------------|
| ① Shaft seal | ⑧ Backstop |
| ② Covered lifting eye | ⑨ Overrunning clutch |
| ③ Electric motor for the auxiliary gear unit | ⑩ Speed monitoring |
| ④ Auxiliary gear unit | ⑪ Gear unit fastening |
| ⑤ Inspection and assembly cover | ⑫ Fan cover |
| ⑥ Main gear unit | ⑬ Fan |
| ⑦ Lifting eyes | |

Further information

You can find further information about the position of the mounted components and a detailed illustration of the gear unit in the dimension drawing in the complete documentation for the gear unit.

3.5 Oil supply system

3.5.1 Attached oil supply system

With a mounted oil supply system, pressure lubrication is possible.

Pressure lubrication supplies the rolling-contact bearings and gears located above the oil level adequately with oil through pipework.

The pump can be designed as a flange pump or motor pump.

The oil filter protects downstream units, measuring and control devices against dirt or contaminants. The oil filter comprises a housing with connections and a filter element. The oil flows through the filter housing. Depending on the filter mesh size, the filter retains dirt particles from a defined size.

The following diagram shows a gear unit with an attached oil supply system for flange pumps with a double change-over filter:

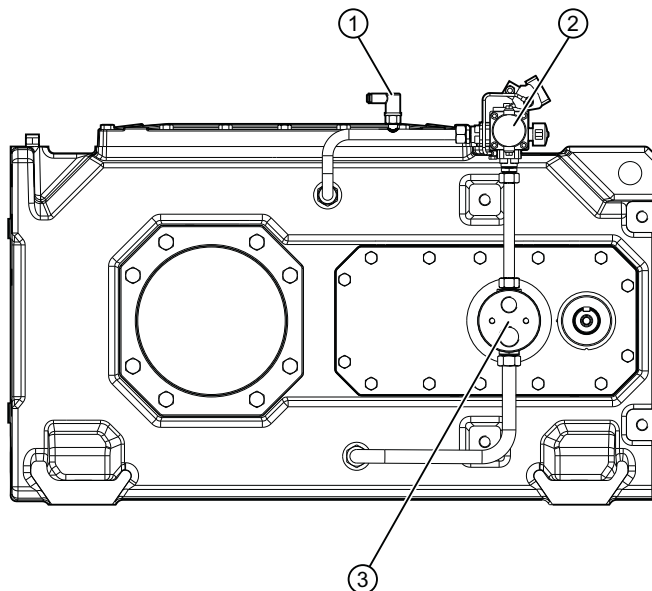


Figure 3-5: Mounted oil supply system for flange pumps with a double change-over filter

- | | |
|-----------------------------|---------------|
| ① Pressure monitor | ③ Flange pump |
| ② Double change-over filter | |

The following diagram shows a gear unit with an attached oil supply system for flange pumps with a coarse filter:

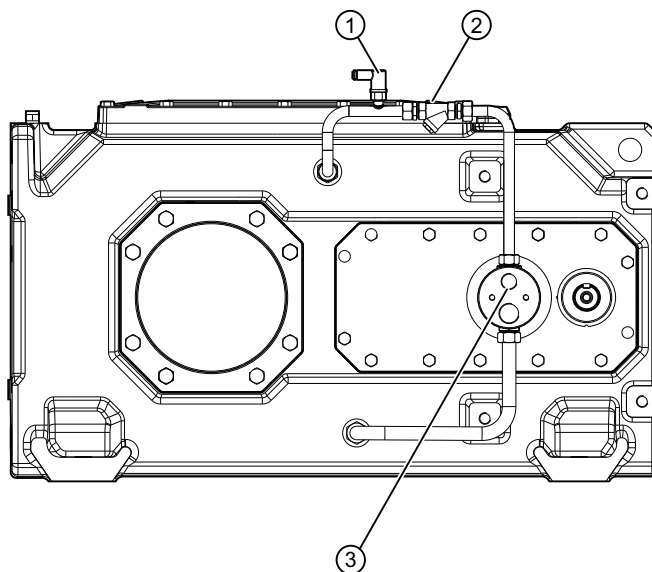


Figure 3-6: Mounted oil supply system for flange pumps with a coarse filter

- | | |
|--------------------|---------------|
| ① Pressure monitor | ③ Flange pump |
| ② Coarse filter | |

3.5 Oil supply system

Further information

You can find further information and a detailed illustration of the gear unit and the oil supply system in the dimension drawing in the complete documentation for the gear unit.

For further information on the oil supply system and control instructions, refer to the list of equipment and the complete documentation for the gear unit.

3.5.2 Attached oil supply system with air-oil cooler

An oil supply system with air-oil cooler is permanently mounted on the gear unit.

The air-oil cooler is used to cool down the gear unit oil. Ambient air is used as the cooling medium. The oil is fed through the cooler in one or several channels, depending on the volumetric flow, while passing by the ambient air blown through the cooler by the fan. For cold starts, a bypass pipe with a temperature control valve is provided.

The pump can be designed as a flange pump or motor pump.

The oil filter protects downstream units, measuring and control devices against dirt or contaminants. The oil filter comprises a housing with connections and a filter element. The oil flows through the filter housing. Depending on the filter mesh size, the filter retains dirt particles from a defined size.

Further information

You can find further information and a detailed illustrated description of the gear unit and the connection dimensions in the dimension drawing in the complete documentation for the gear unit.

You can find further information on the oil supply system and control instructions in the separate data sheet, in the list of equipment, and in the instructions for the components, which are part of the complete documentation of the gear unit.

3.5.3 Attached oil supply system with water-oil cooler

An oil supply system with water-oil cooler is permanently mounted on the gear unit.

The water-oil cooler is used to cool down the gear unit oil. Water is used as the cooling medium.

The pump can be designed as a flange pump or motor pump.

The oil filter protects downstream units, measuring and control devices against dirt or contaminants. The oil filter comprises a housing with connections and a filter element. The oil flows through the filter housing. Depending on the filter mesh size, the filter retains dirt particles from a defined size.

Further information

You can find further information and a detailed illustrated description of the gear unit and the connection dimensions in the dimension drawing in the complete documentation for the gear unit.

You can find further information about the oil supply system, control instructions, the required cooling water flow rate and the maximum permissible water intake temperature in the separate data sheet, in the list of equipment and in the oil supply system instructions in the complete gear unit documentation.

3.5.4 Separate oil supply system

A separate oil supply system can be used to cool the oil and lubricate the machine.

With a separate oil supply system, pressure lubrication is possible.

Further information

Further information about the oil supply system as per scope of supply can be found in the oil supply system instructions contained in the complete documentation for the gear unit.

You can find further information about the components of the oil supply system as per scope of supply in the instructions for the components, which are part of the complete documentation of the gear unit.

You can find further information about the technical specifications as per scope of supply in the separate data sheet and in the list of equipment provided in the complete documentation for the gear unit.

3.6 Rolling-contact bearings

All shafts are mounted in rolling-contact bearings.

3.7 Shaft seal

3.7.1 Labyrinth seals

Seals can prevent oil from escaping from the gear unit and impurities from entering the gear unit.

Labyrinth seals as non-contact seals prevent shaft wear. They do not require any maintenance and improve the temperature behaviour of the gear unit.

3.7 Shaft seal

A labyrinth seal is illustrated in the diagram below:

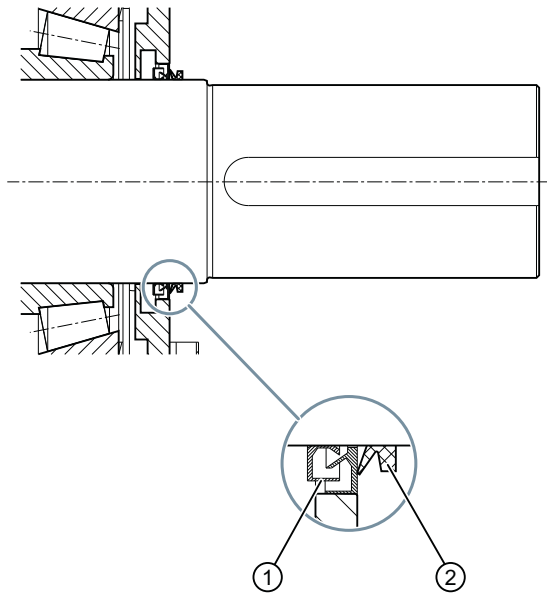


Figure 3-7: Labyrinth seal with V-ring seal (V-seal)

① Labyrinth seal

② V-ring seal (V-seal)

To work reliably, labyrinth seals must be installed in stationary, horizontal positions without wastewater or any substantial amount of dust. Overfilling of the gear unit or oil with a high foam content can lead to leakage. The V-ring seal prevents air exchange when at a stand-still.

3.7.2 Rotary shaft sealing rings

Seals can prevent oil from escaping from the gear unit and impurities from entering the gear unit.

Wherever possible, radial shaft seals are equipped with an additional dust lip that protects the actual sealing lip against external contaminants. Depending on the order specification, 2 radial shaft seals may also be fitted.

The figure below shows a radial shaft seal:

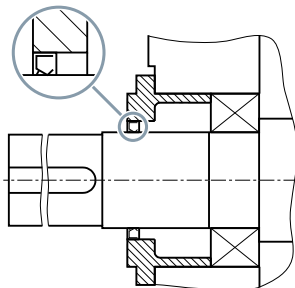


Figure 3-8: Radial shaft seal

3.7.3 Taconite seal

Seals can prevent oil from escaping from the gear unit and impurities from entering the gear unit.

The Taconite seal is a combination of two sealing elements:

- Radial shaft seal to prevent the escape of lubricating oil
- Grease-filled dust seal (comprising a labyrinth and a lamellar seal) to allow operation of the gear unit in extremely dusty environments

The following diagram shows the Taconite seal:

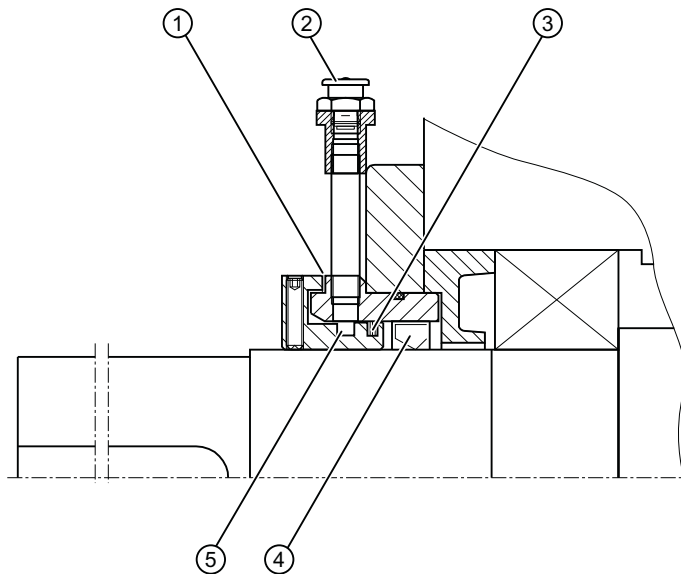


Figure 3-9: Taconite seal

- | | |
|-----------------------------------|--|
| ① Gap | ④ Radial shaft seal |
| ② Grease nipple | ⑤ Labyrinth, filled with grease, can be re-greased |
| ③ Ring carrier with lamellar seal | |

The following figure shows the gap dimension at the grease labyrinth:

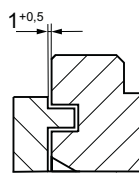


Figure 3-10: Gap dimension at grease labyrinth

3.7 Shaft seal

A distinction is made between the following design variants of Taconite seals:

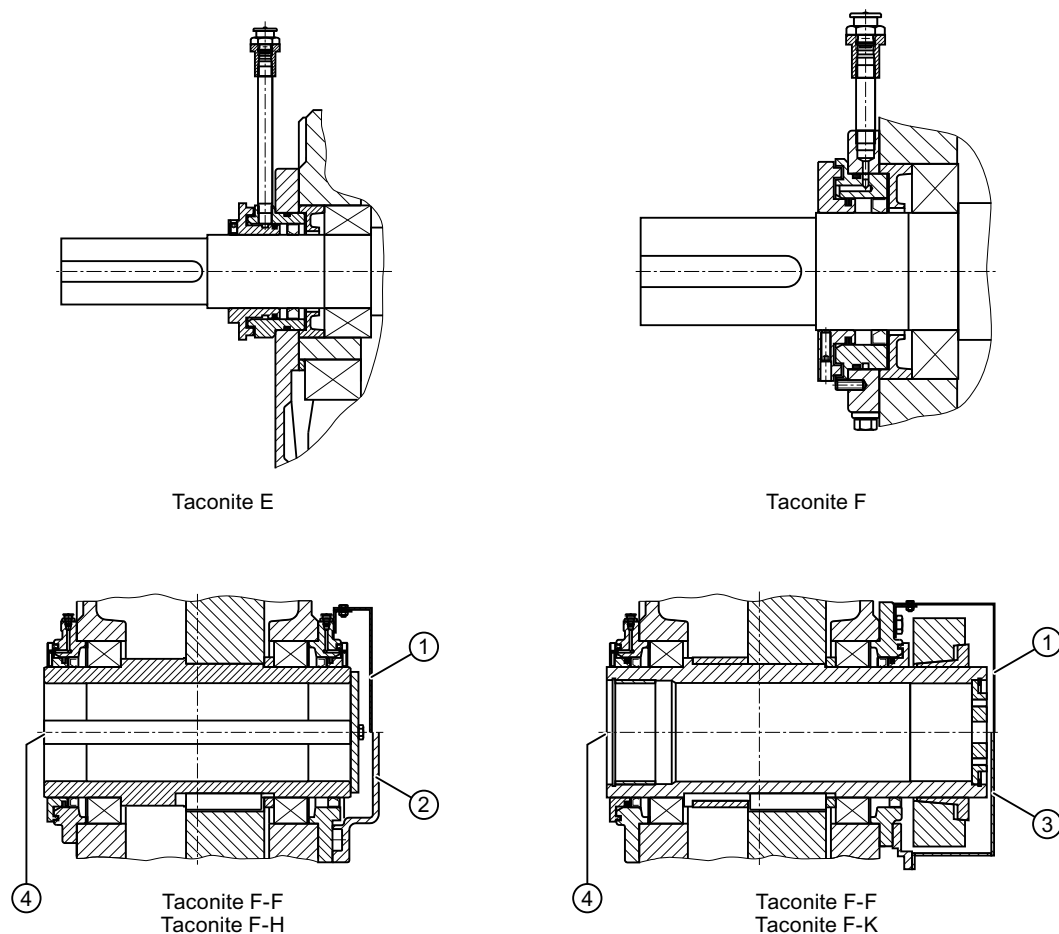


Figure 3-11: Taconite seal, variants E, F, F-F, F-H and F-K

The various Taconite seals are described in the following table:

Taconite seal versions	Application	Remarks
"E"	All high-speed shafts with or without fan	• Regreasable labyrinth
"F"	Low-speed shaft for mounting the coupling Flange shaft	
"F-F"	Hollow shaft with parallel keyway Hollow shaft with splines Hollow shaft for shrink disk	• Labyrinth which can be regreased on both sides, including the protective cover as contact protection facing the inlet side of the machine shaft

Taconite seal versions	Application	Remarks
"F-H"	Hollow shaft with parallel keyway Hollow shaft with splines	• Regreasable labyrinth on the inlet side of the machine shaft, dust-proof protective cover on the opposite side
"F-K"	Hollow shaft for shrink disk	

Table 3-2 : Taconite seal versions

3.7.4 Taconite-light seal

Seals can prevent oil from escaping from the gear unit and impurities from entering the gear unit.

The Taconite-light seal is a combination of three sealing elements:

- The non-woven disc is a sealing disc made from non-woven material. The non-woven disc offers protection from external contamination and acts as dry-running protection for the following sealing components.
- The outer radial shaft seal is a sealing ring with a loose sealing lip. The outer radial shaft seal functions as a second barrier to ensure external contamination is kept away from the inside of the gear unit.
- The inner radial shaft seal prevents the escape of lubricating oil. The area between the two radial shaft seals acts as a grease reservoir. There is no need for the grease reservoir to be relubricated.

The non-woven disc and the outer sealing ring also protect the inner radial shaft seal and optimise the sealing performance.

The following diagram shows the Taconite-light seal:

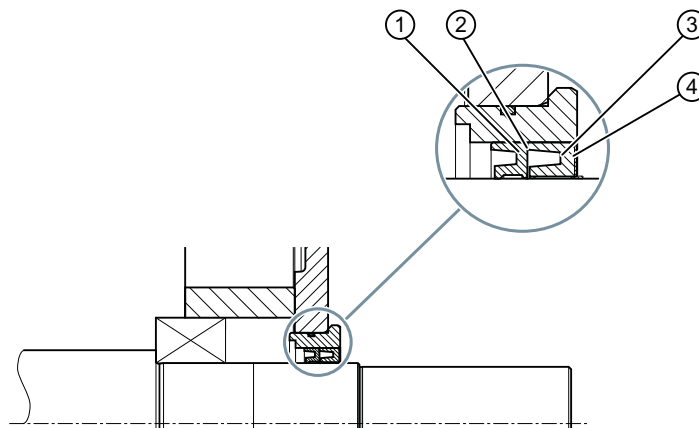


Figure 3-12: Taconite-light seal

- | | |
|-----------------------------------|-----------------------------------|
| ① Inner radial shaft sealing ring | ③ Outer radial shaft sealing ring |
| ② Grease reservoir | ④ Non-woven disc |

3.7.5 Tacolab seal

Seals can prevent oil from escaping from the gear unit and impurities from entering the gear unit.

Tacolab seals as non-contact seals prevent shaft wear. This improves the temperature behaviour of the gear unit. Tacolab seals also provide protection against dust ingress.

The Tacolab seal is a combination of two sealing elements:

- Labyrinth seal comprising two labyrinth sealing rings to prevent the escape of lubricating oil
- Grease-filled dust seal (comprising a labyrinth and a lamellar seal) to allow operation of the gear unit in extremely dusty environments

A Tacolab seal is illustrated in the diagram below:

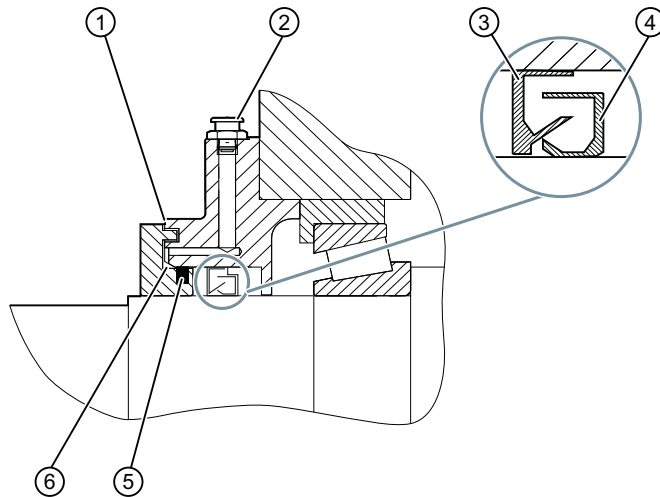


Figure 3-13: Tacolab seal

- | | |
|------------------------|--|
| ① Gap | ④ Inner labyrinth seal |
| ② Grease nipple | ⑤ Ring carrier with lamellar seal |
| ③ Outer labyrinth seal | ⑥ Labyrinth, filled with grease, can be re-greased |

The following figure shows the gap dimension at the grease labyrinth:

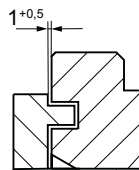


Figure 3-14: Gap dimension at grease labyrinth

To ensure reliable operation of Tacolab seals, the gear unit must be permanently installed in a horizontal position and not exposed to spray or wastewater.

Overfilling of the gear unit or oil with a high foam content can lead to leakage.

3.8 Backstop

In operation, the backstop only permits the specified direction of rotation. The direction of rotation is specified at the gear unit input and output by a rotation arrow.

The backstop is mounted to the gear unit through an intermediate flange creating an oil tight seal; the backstop is integrated in the gear unit oil circuit.

The backstop is fitted with centrifugally operated sprags. If the gear unit rotates in the specified direction, the inner ring rotates together with the sprag cage in the direction of rotation of the shaft, while the outer ring remains stationary. Above a certain speed, i.e. the disengagement speed, the sprags disengage from the outer ring. In this operating condition, the backstop runs without any wear.

The diagram below shows a backstop:

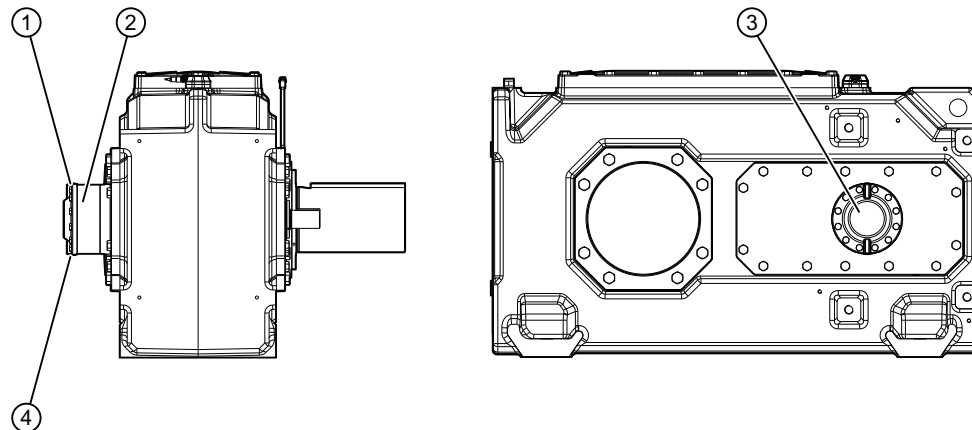


Figure 3-15: Backstop

- ① Oil filling screw of the backstop
- ② Outer ring

- ③ Cover
- ④ Residual oil drain

3.9 Torque limiting backstop

The torque-limiting backstop is a combination of a backstop with centrifugally operated sprags and a brake. The torque-limiting backstop is mounted on the gear unit through an intermediate flange, creating an oil-tight seal; the backstop is integrated in the gear unit oil circuit.

The slipping torque is set using a number of compression springs. As a result of the "slip-page", the gear unit and the sprags of the backstop are protected against inadmissible high stresses when rotating backwards. In addition, for twin drives, the load distribution will be uniformly distributed across both gear units when rotating backwards.

The following diagram shows a torque-limiting backstop:

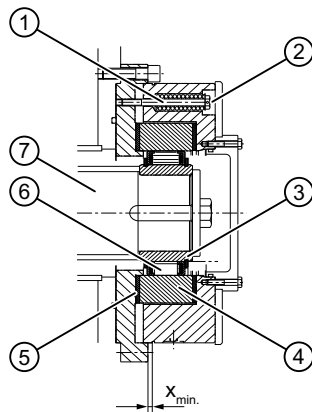


Figure 3-16: Torque-limiting backstop

- | | |
|---------------------------------------|-------------------------------|
| ① Guide screw with compression spring | ⑤ Friction lining |
| ② Safety wire | ⑥ Cage with sprags |
| ③ Inner ring | ⑦ Shaft (intermediate flange) |
| ④ Outer ring | |

Further information

You can find further information on the torque-limiting backstop in the instructions for the torque-limiting backstop, which are part of the complete documentation of the gear unit.

3.10 Fan

Generally, the fan is mounted on the high-speed shaft of the gear unit and is protected from accidental contact using an air guide cover. The fan draws in air through the protective grille of the air guide cover and blows it through its lateral air ducts on the gear unit housing. The fan dissipates a certain amount of heat from the housing.

A fan mounted on a model H... gear unit is illustrated in the figure below:

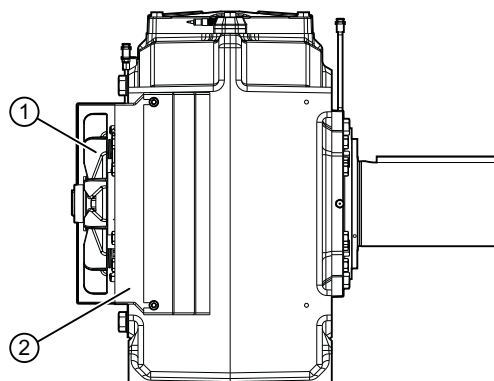


Figure 3-17: Fan for model H...

- | | |
|-------|-------------------|
| ① Fan | ② Air guide cover |
|-------|-------------------|

A fan mounted on a model B... gear unit is illustrated in the figure below:

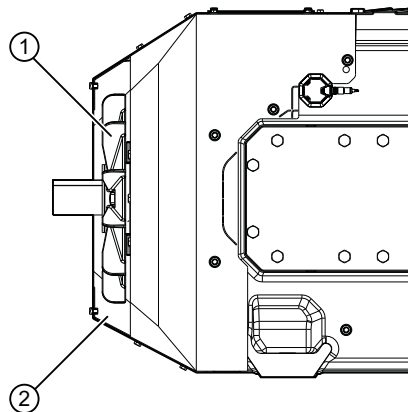


Figure 3-18: Fan for model B...

① Fan

② Air guide cover

Further information

You can find further information about the position of the mounted components and a detailed illustration of the gear unit in the dimension drawing in the complete documentation for the gear unit.

3.11 Motor fan

Depending on the order specification, the gear unit may be equipped with a motor fan.

The following diagram shows a motor fan on a gear unit:

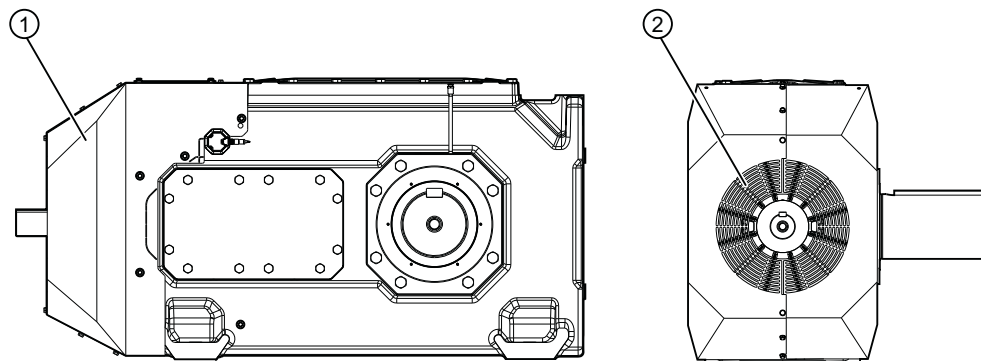


Figure 3-19: Motor fan

① Air guide cover

② Motor fan

Further information

You can find further information about the position of the mounted components and a detailed illustration of the gear unit in the dimension drawing in the complete documentation for the gear unit.

You can find further information about motor fans in the motor fan instructions provided in the complete documentation for the gear unit.

3.12 Cooling coil

The gear unit can be equipped with a cooling coil in the oil sump.

The cooling coil is connected to a cooling water supply. A certain amount of heat from the gear unit oil is transferred to the cooling water as it flows through the cooling coil.

Locknuts fix the cooling coil in the gear unit.

The diagram below shows the cooling coil connections:

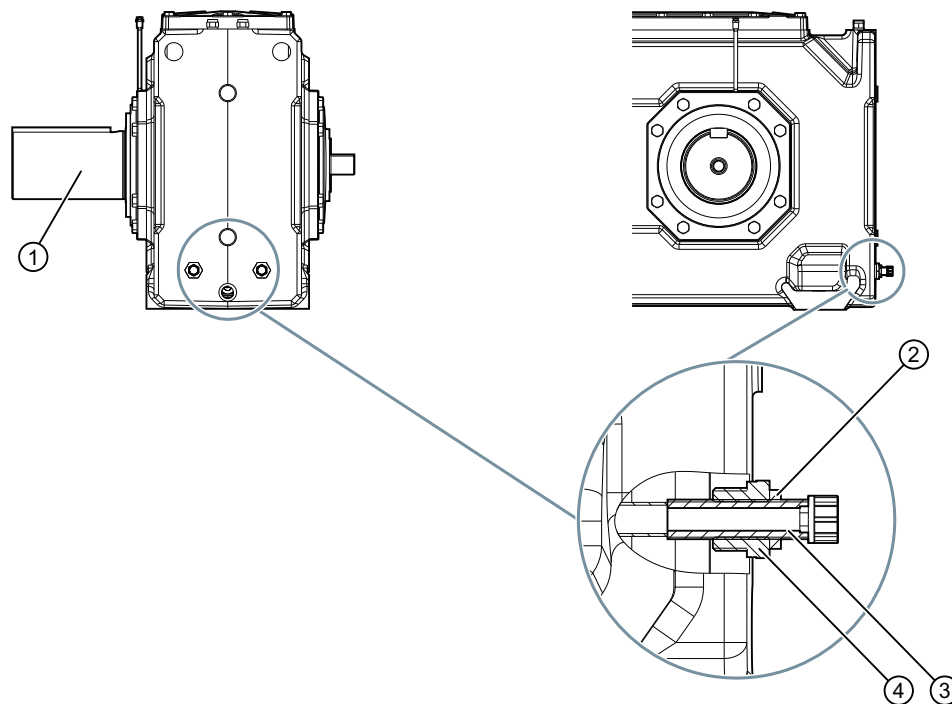


Figure 3-20: Cooling coil connections

- | | |
|-------------------------|----------------------------|
| ① Low-speed shaft (LSS) | ③ Cooling water connection |
| ② Locknut | ④ Reducer screw |

Further information

You can find further information and a detailed illustrated description of the gear unit and the connection dimensions in the dimension drawing in the complete documentation for the gear unit.

Further information about the required cooling water flow rate and the maximum permissible inlet temperature can be found in the dimension drawing in the complete documentation for the gear unit.

3.13 Heating element

The heating element converts electrical energy into heat energy and transfers this heat energy into the surrounding oil.

The diagram below shows the position of the heating element on a gear unit:

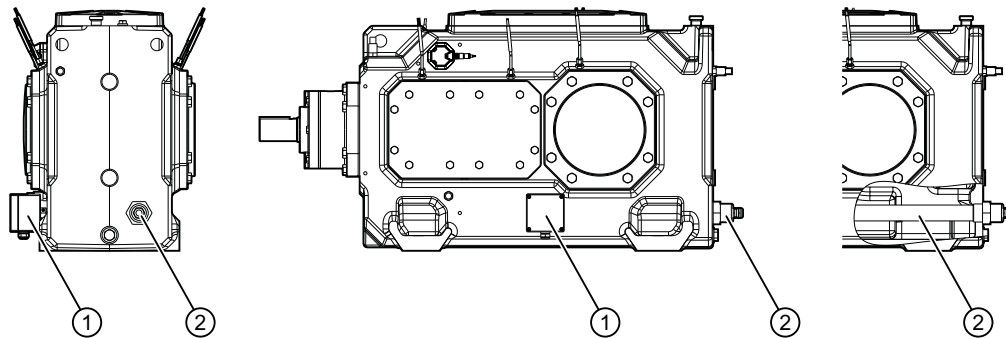


Figure 3-21: Position of the heating element

① Temperature monitor

② Heating element

Heating element control

The heating element can be controlled by a temperature monitor or an oil-temperature monitoring system (Page 53). The temperature monitor provides a signal that must be amplified when the minimum and maximum temperatures are reached.

Oil-level indication system for the heating element

A gear unit with a heating element can be equipped with an oil-level indication system. This oil-level indication system checks the minimum oil level of the gear unit for immersing the heating element.

Further information

You can find further information about the position of the mounted components and a detailed illustration of the gear unit in the dimension drawing in the complete documentation for the gear unit.

Further information about heating elements can be found in the separate data sheet, in the list of equipment and in the heating element instructions in the complete documentation for the gear unit.

You can find further information about the temperature monitor as well as control instructions in the list of equipment and the temperature monitor instructions in the complete documentation for the gear unit.

Further information about the oil-level indication system, such as control instructions and the technical specifications can be found in the instructions for the oil-level indication system, in the list of equipment and in the separate data sheet in the complete documentation for the gear unit.

3.14 Coupling

A flexible coupling or safety coupling is generally used at the high-speed shaft (HSS) and low-speed shaft (LSS) of the gear unit.

3.15 Shrink disk

Use of rigid couplings or other input or output elements that generate additional radial or axial forces (e.g., gear wheel, belt pulley, flywheel or hydraulic coupling) must be agreed contractually.

If a hydraulic coupling is to be used in combination with a gear unit with a fan, mount the hydraulic section of the hydraulic coupling on the motor shaft in order to provide sufficient space for intake of cooling air.

Further information

You can find further information about the couplings or other input and output elements in the instructions on couplings or other input and output elements provided in the complete documentation for the gear unit.

3.15 Shrink disk

A shrink disk is provided as a frictional clamping connection between the gear-unit hollow shaft and the driven machine on shaft-mounted gear units.

The shrink disk allows an interference fit to be created between a hollow shaft and a stub shaft (machine shaft). The interference fit is capable of transferring torques, bending moments and forces. The joint pressure between the hollow shaft and stub shaft generated by the shrink disk is crucial to the successful transmission of torques and/or power.

Further information

Further information about the shrink disk can be found in the shrink disk instructions contained in the complete documentation for the gear unit.

3.16 Auxiliary drives designed as maintenance drive; load drive

Applications for auxiliary drives

Depending on the particular application, auxiliary drives with different ratings are available for each gear unit size.

- Auxiliary drives designed as maintenance drive:
The auxiliary drive motor is dimensioned so that it is possible to operate the machine under no-load conditions at low speeds in the same direction of rotation.
- Auxiliary drive designed as load drive:
The auxiliary drive motor is dimensioned so that the machine can be operated according to its intended use at low speeds in the same direction of rotation.

Fundamental design of the auxiliary drive

The basic configuration of the gear unit with main and auxiliary drive is shown in the following diagram.

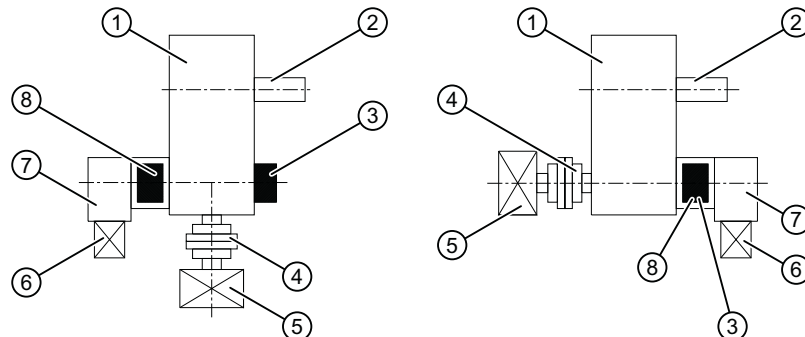


Figure 3-22: Fundamental design of gear unit with main and auxiliary drives

- | | |
|--|-----------------------|
| ① Main gear unit | ⑤ Main motor |
| ② Low-speed shaft (LSS) for the main gear unit | ⑥ Auxiliary motor |
| ③ Backstop | ⑦ Auxiliary gear unit |
| ④ Coupling | ⑧ Overrunning clutch |

Auxiliary drive

The auxiliary drive comprises the auxiliary motor and the auxiliary gear unit.

The auxiliary drive unit drives the main gear unit so it can be operated at a lower output speed. The low-speed shaft of the main motor rotates in the same direction of rotation, irrespective of whether the main gear unit is used or the auxiliary drive.

The auxiliary drive is flanged to the main gear unit through an intermediate flange and coupled to the main gear unit by an overrunning clutch.

Overrunning clutch

The overrunning clutch is located in the intermediate flange and is supplied with oil from the main gear unit.

When the auxiliary drive is used to drive the gear unit, the overrunning clutch allows torque transmission to be transferred in one direction of rotation, while “free-wheeling” operation applies when driven by the main drive.

The output shaft of the main gear unit rotates in the same direction of rotation, irrespective of whether the main motor or the auxiliary drive is used as the actuator.

The overrunning clutch has centrifugally operated sprags. When the main gear unit rotates with the specified direction of rotation, the inner ring with the sprags rotates, while the outer ring remains stationary. Above a certain speed the sprags disengage, and the overrunning clutch operates without any wear.

When the auxiliary drive motor is used as drive via the outer ring, then the overrunning clutch is also driven; this means that the main gear unit is slowly rotated in the selected direction of rotation. In this case, the high-speed shaft of the main gear unit and the main motor simultaneously also slowly rotate when a flexible coupling is used between the main motor and gear unit.

3.17 Motor bracket for belt drive

Speed monitoring

To avoid overspeed if the overrunning clutch were to malfunction, a speed monitoring system is used.

To ensure safe operation, the customer must equip the supplied drive combination with speed monitoring. The speed monitoring should comprise of a pulse encoder and an evaluation unit, which is mounted in the intermediate flange.

Further information

You can find further information, a detailed illustration of the gear unit and the position of the auxiliary drive in the dimension drawing in the complete documentation for the gear unit.

You can find further information about the auxiliary drive in the auxiliary drive instructions provided in the complete documentation for the gear unit.

You can find the precise designation of the geared motor and the mounting position in the dimension drawing in the complete gear unit documentation.

3.17 Motor bracket for belt drive

The motor bracket holds the motor in place. The motor is connected via a belt to the high-speed shaft. A belt guard is used to protect the belt drive from contact. A device for tensioning and untensioning the belt is integrated into the motor bracket.

Further information

Further information and a detailed illustration of the gear unit with motor bracket can be found in the dimension drawing provided in the complete gear unit documentation.

3.18 Monitoring devices

3.18.1 Filling-level limit switch

The gear unit can be equipped with a filling-level limit switch for the oil-level indication system. The oil-level indication system has been designed to check the oil level when the gear unit is at a standstill before it starts.

1. When using an oil-level indication system, observe the mounting position specified in the dimension drawing.

The illustration below shows the oil-level indication system for a gear unit:

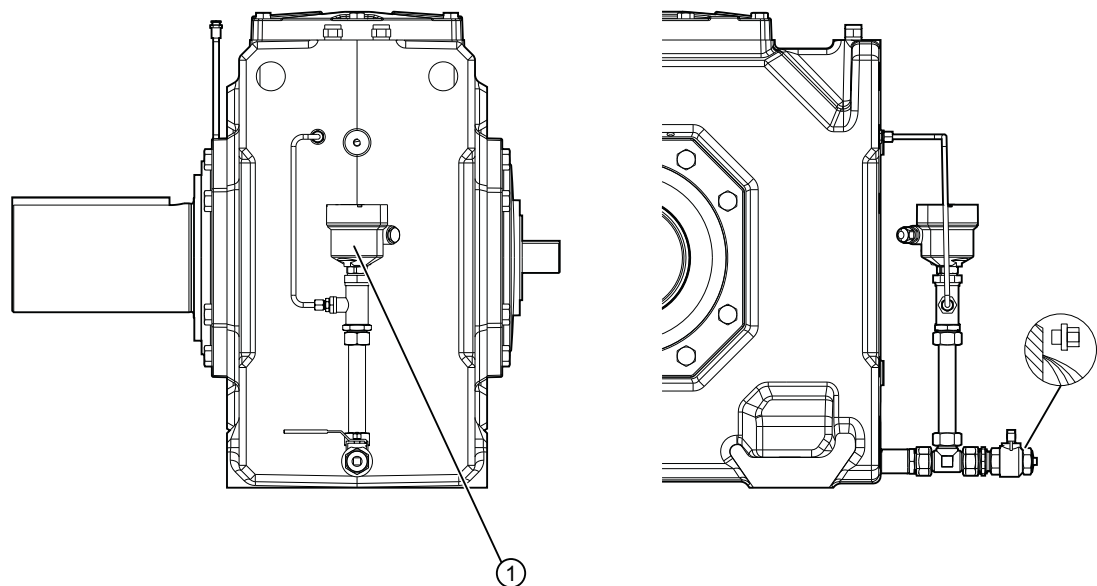


Figure 3-23: Oil-level indication system

- ① Filling-level limit switch

Further information

You can find further information about the position of the mounted components and a detailed illustration of the gear unit in the dimension drawing in the complete documentation for the gear unit.

Further information about the oil-level indication system, such as control instructions and the technical specifications can be found in the instructions for the oil-level indication system, in the list of equipment and in the separate data sheet in the complete documentation for the gear unit.

3.18.2 Resistance thermometer

Resistance thermometer for oil-temperature monitoring system

Gear units can be equipped with a resistance thermometer for measuring the oil temperature in the oil sump.

3.18 Monitoring devices

To measure temperatures or temperature differences, the resistance thermometer must be connected to an evaluation unit by the customer. The resistance thermometer has a connection head for the wiring.

The diagram below shows the oil-temperature monitoring system for a gear unit:

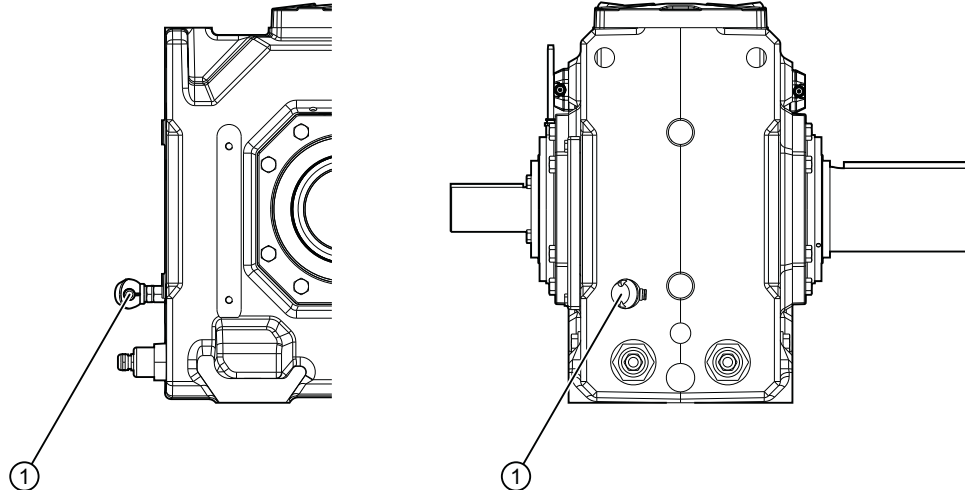


Figure 3-24: Oil-temperature monitoring system

① Resistance thermometer

A temperature monitor can be fitted in the oil sump as an alternative method of monitoring the oil temperature.

Resistance thermometer for bearing monitoring

The gear unit can be equipped with resistance thermometers for bearing monitoring or prepared for the installation of such thermometers.

To measure temperatures or temperature differences, the resistance thermometer must be connected to an evaluation unit by the customer. The resistance thermometers have a connection head for the wiring.

The following diagram shows the position of the bearing monitoring using a resistance thermometer:

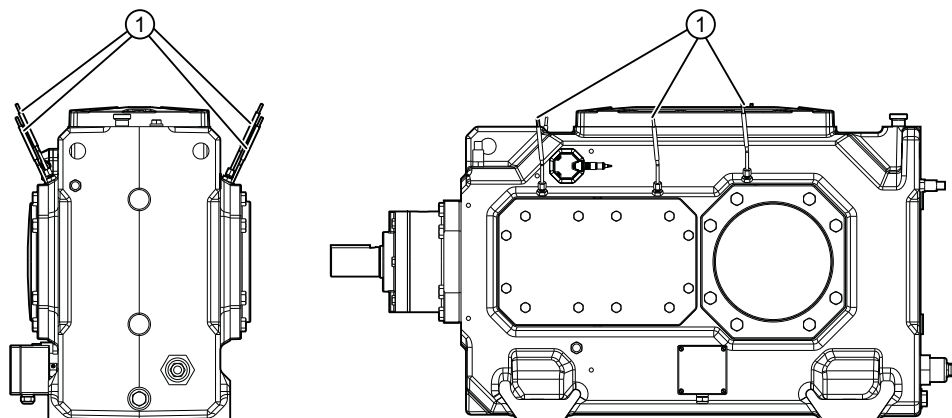


Figure 3-25: Bearing monitoring using a resistance thermometer

① Resistance thermometer

The resistance thermometer can be equipped as a Pt 100 or compact Pt 100.

Further information

You can find further information about the position of the mounted components and a detailed illustration of the gear unit in the dimension drawing in the complete documentation for the gear unit.

Further information about temperature monitoring, such as control instructions and the technical specifications, is provided in the instructions of the temperature monitoring system and in the list of equipment in the complete documentation for the gear unit.

3.18.3 Shock-pulse transducer for bearing monitoring

The measuring nipples for bearing monitoring can be installed on the gear unit close to the rolling-contact bearings to be monitored. Alternatively, the gear unit can be supplied with pre-machined threaded holes for the installation of measuring nipples.

These measuring nipples are used to attach shock-pulse transducers with a quick-release coupling.

The following diagram shows a bearing monitoring system that uses a shock-pulse transducer:

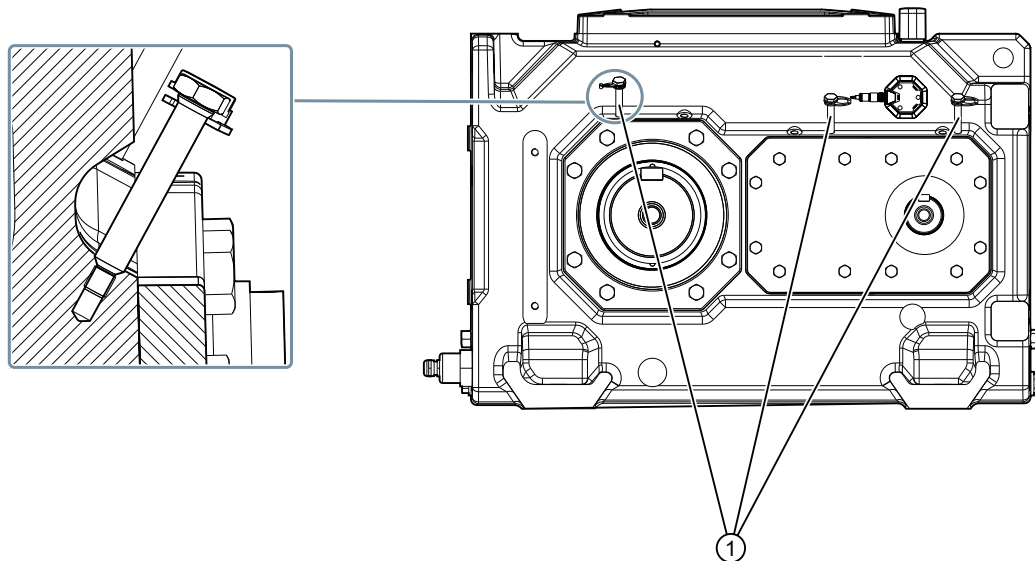


Figure 3-26: Bearing monitoring using a shock-pulse transducer

- ① Shock-pulse transducer

Further information

You can find further information about the position of the mounted components and a detailed illustration of the gear unit in the dimension drawing in the complete documentation for the gear unit.

Further information about shock-pulse transducers can be found in the shock-pulse transducer instructions in the complete documentation for the gear unit.

You can find further information about the technical specifications in the separate data sheet and in the list of equipment provided in the complete documentation for the gear unit.

3.19 Terminal boxes and wiring

Depending on the order specification, the gear unit can be equipped with one or more terminal boxes and corresponding wiring.

Further information

You will find further information on terminal boxes and the corresponding wiring in the complete documentation for the gear unit.

4.1 Scope of delivery

The scope of delivery is listed in the shipping documents. Immediately upon receiving the gear unit, check that everything has been delivered. Report any damaged and/or missing parts to Customer Service (Page 147) immediately.

4.2 Packaging

The gear unit is delivered fully assembled. Individual components of the gear unit are supplied in separate packaging where applicable.

The way the gear unit is packaged may vary, depending on the transport route and size.

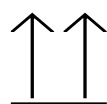
NOTE

Damage to the gear unit due to unpacking it too early

Unpacking the gear unit too early can lead to a lack of stability and corrosion.

- Avoid any damage to the packaging.
- Leave the gear unit in its packaging until it is time to assemble it.

The symbols on the packaging must be observed.



This way up



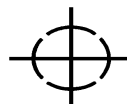
Fragile goods



Keep dry



Keep cool



Centre of gravity



Do not use hand hooks



Attaching

Figure 4-1: Transport symbols

4.3 Storage

Please observe the information in instructions 7300 about storing the gear unit.

Incorrect storage can cause damage to the gear unit. Be sure to take the following precautions during storage:

- Only store the gear unit on the sub-assembly provided and in the transport position.
- Store the gear unit on a firm and solid surface.
- Do not stack gear units on top of each other.

4.4 Lubricants

Flender recommends one of the approved oils in the Instructions 7300 to be used as a lubricant. The approved oils have been tested accordingly and meet the quality requirements. Flender cannot guarantee the quality of the oils that are used. The manufacturer of the relevant lubricant is responsible for the quality of the oil that is used.

Any oils that are used that are not approved by Flender, must meet the quality requirements set out in Instructions 7300. If the quality requirements are not met, this could have a negative impact on the service life of the gear unit and might even result in damage to the gear unit.

Details on the type of base oil used, the oil viscosity and the required oil quantity can be found on the gear unit rating plate and in the complete documentation that is supplied.

The oil quantity specified on the rating plate is an approximate value. The actual oil quantity required is determined by the markings on the oil dipstick or oil level gauge.

The current lubricant recommendations of Flender can also be viewed on the Internet (<https://www.flender.com/lubricants>).

The approved oils undergo continuous testing. Under certain circumstances, the approved oil types might in future be removed from the list or replaced by more advanced oils.

Flender recommends regularly checking whether the selected oil continues to be approved by Flender. If it is not, another brand of oil should be selected instead.

4.5 Special features relating to gear unit lubrication

4.5.1 Grease-lubricated rolling-contact bearing

The gear unit can be equipped with grease-lubricated rolling-contact bearings.

Grease-lubricated rolling-contact bearings are filled with grease prior to shipment. Please refer to the plates (Page 26) at the regreasing points for information about grease quantities and regreasing intervals.

4.6 Special features relating to gear unit preservation

4.6.1 Internal preservation through oil filling

Do not fill gear units with the following features with oil filling for interior preservation:

- Grease-lubricated rolling-contact bearing
- Labyrinth seals
- Tacolab seal



Information

Gear unit with internal preservation through oil filling must not be transported.

4.7 Construction of foundations

NOTE

Damage to gear unit due to lack of stability

The gear unit can be damaged if the foundation is incorrectly installed.

- Make sure that the foundation is horizontal and level. The flatness of the gear unit base surface influences the contact pattern of the teeth and the load on the bearings.
- Design the base surface so that all points on the gear unit mounting surface lie between two imaginary parallel planes that are 0.1 mm per 1 m apart.

Properties of the foundation

The foundation must have the following properties:

- Horizontal and level
- Stable
- The foundation must be designed for torsional rigidity
- Reaction forces from the gear unit must be braced

Requirements of the foundation

The foundation must meet the following requirements:

- Construct the foundation in such a way that it does not produce any resonance vibrations and that it is isolated against the transmission of vibrations from adjacent foundations.
- Design the foundation according to the relevant weight and torque, taking into account the forces acting on the gear unit.
- Align the foundation carefully with the equipment installed on the input and output sides of the gear unit.
- Take any elastic deformation that may be caused by operating forces into account.
- Install lateral stops to prevent displacement if external forces are acting on the gear unit.

Further information

You can find further information about dimensions, space requirements and arrangement of supply connections in the dimension drawing in the complete documentation for the gear unit.

Further information about the weight and details of the torque (speed and power) can be found in the Chapter Weight (Page 155) and in the dimension drawing in the complete documentation for the gear unit.

4.8 Information on cooling water

The operator must provide the cooling water connection. Please note the following information about cooling water:

- Use fresh, sea or brackish water as cooling water.
- The cooling water must not contain any solid substances.
- The maximum permissible particle size in the cooling water is 0.6 mm.
- The recommended pH value of the cooling water is 7 to 9.5 in order to prevent corrosion.
- When using cooling coils made from stainless steel, cooling water with a pH value of up to 12 can be used, depending on the alloy.
- The cooling water pressure should be regulated, e.g. with a pressure reducing valve.
- The temperature of the cooling water should not fall below 4 °C.

Further information

Further information about cooling water requirements can be found in the instructions for the cooling components contained in the complete documentation for the gear unit.

4.9 External influences

Sunlight

Observe the permissible ambient temperatures in the event of exposure to sunlight.

During operation, the gear unit must not overheat as a result of external influences such as exposure to direct sunlight or other heat sources. The following measures can be followed to prevent the gear unit from heating up:

- Install a canopy over the gear unit.
- Use an additional cooling unit.
- Install a temperature monitoring device with shutdown function in the oil sump of the gear unit.

Lightning

Protect the gear unit from lightning strikes.

Slipping

Do not allow solids or liquids to be spilled on the gear unit.

Dust

Ensure that no current can flow through the gear unit as a result of conductive layers of dust.

Environment

Ensure that there is sufficient space and lighting when working on the gear unit.

4.10 Electrical equipment

Permitted switch-off times

When choosing overcurrent protection devices, observe the permissible switch-off times for the expected residual or short-circuit current.

Further information

You can find further information about the electrical connections in the terminal diagrams, lists of equipment and instructions for the electrical components in the complete documentation for the gear unit.

5.1 Information on transport



WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.

Transport information

Observe the following information on transport to avoid damaging the gear unit:

- The gear unit may only be transported using suitable means of transport.
- Transport the gear unit emptied of oil and leave the gear unit on the transport packaging. Depending on the order specification, the gear unit can be shipped filled with oil. Take the extra weight into account (number of litres x 10 N) and transport the gear unit in its final mounting position.
- Gear units with Tacolab or labyrinth seals are not suitable for transport filled with oil.
- Only move very slowly.
- It is not permitted for the load to sway.
- Avoid damaging the packaging or the coating of the gear unit.
- Avoid impact against the free shaft end.
- Do not stack gear units on top of each other.
- Always place the products down on a level, non-slip and stable base.

Attaching

Observe the following attachment information to avoid damaging the gear unit:

- Observe the instructions of the sling swivels when transporting using sling swivels
- Use lifting equipment that can bear the weight of the gear unit plus a safety margin.
- Observe the load limits.
- Only use the labelled attachment points for transport.
- Carefully observe proper attachment of lifting equipment.
- The load must not be attached to objects or parts of buildings.
- Do not use the pipework for moving the gear unit.
- Do not use the threads in the end faces of the shaft ends for attaching lifting equipment.
- Carefully ensure that the load distribution of the shackles or sling swivels is even.

5.1 Information on transport

- Observe any centre of gravity that is off-centre.
- Ensure horizontal alignment by using additional tensioning means.

Number of shackles for transport

When transporting, use shackles according to the following table, or shackles that have at least the same load capacity.

Number of shackles on version N

Gear unit size		42	63	70	96	104	136	151	179	200	234	257	294	312	355
Shackle DIN 82101	Form A/B/C	1	2.5	2.5	2.5	2.5	4	4	6	6	8	8	12	10	12
Quantity required (pieces)		3	3	3	3	3	3	3	3	3	3	3	3	3	3

Table 5-1 : Number of shackles for transport on version N

Number of sling swivels for transport

When transporting, use the sling swivel according to the following table, or a sling swivel that has, as a minimum, the same load capacity.

Number of sling swivels on the versions L, P and U

Model		Gear unit size													
		42	63	70	96	104	136	151	179	200	234	257	294	312	355
B2	TP	1.4	1.4	1.4	2.5	2.5	4	4	6.7	6.7	6.7	6.7	10	10	10
	D5 (4x)	M16	M16	M16	M20	M20	M24	M24	M30	M30	M30	M30	M36	M36	M36
B3	TP	1.4	1.4	1.4	2.5	2.5	4	4	6.7	6.7	6.7	6.7	6.7	10	10
	D5 (4x)	M16	M16	M16	M20	M20	M24	M24	M30	M30	M30	M30	M30	M36	M36
B4	TP	-	1.4	1.4	2.5	2.5	4	4	6.7	6.7	6.7	6.7	6.7	10	10
	D5 (4x)	-	M16	M16	M20	M20	M24	M24	M30	M30	M30	M30	M30	M36	M36
H2	TP	1.4	1.4	1.4	2.5	2.5	4	4	6.7	6.7	6.7	6.7	6.7	10	10
	D5 (4x)	M16	M16	M16	M20	M20	M24	M24	M30	M30	M30	M30	M30	M36	M36
H3	TP	-	1.4	1.4	2.5	2.5	4	4	6.7	6.7	6.7	6.7	6.7	10	10
	D5 (4x)	-	M16	M16	M20	M20	M24	M24	M30	M30	M30	M30	M30	M36	M36
H4	TP	-	1.4	1.4	2.5	2.5	4	4	6.7	6.7	6.7	6.7	6.7	10	10

Model		Gear unit size													
		42	63	70	96	104	136	151	179	200	234	257	294	312	355
H4	D5 (4x)	-	M16	M16	M20	M20	M24	M24	M30	M30	M30	M30	M30	M36	M36

Table 5-2 : Number of sling swivels for transport on the versions L, P and U

Further information

Further information about whether shackles or sling swivels are used for transport can be found in the dimension drawing in the complete documentation for the gear unit.

5.2 Attachment points

5.2.1 Lifting eyes

Depending on the order specification, lifting eyes on the gear unit are provided for transport.

Carefully ensure that the angle of the vertical load at the gear units lifting eyes does not exceed 45°.

5.2.2 Sling swivel

For transportation during manufacturing and assembly, gear units have threads for transport lugs to attach sling swivels.

When attaching using sling swivels, ensure that the shear pulling load is no more than 45°.

5.2.3 Position of attachment points

Depending on the order specification, it may be necessary to dismantle the air guide cover of the gear unit (Page 73) in order to transport the gear unit.

5.2 Attachment points

The following diagram shows the position of the attachment points for model H...N gear units.

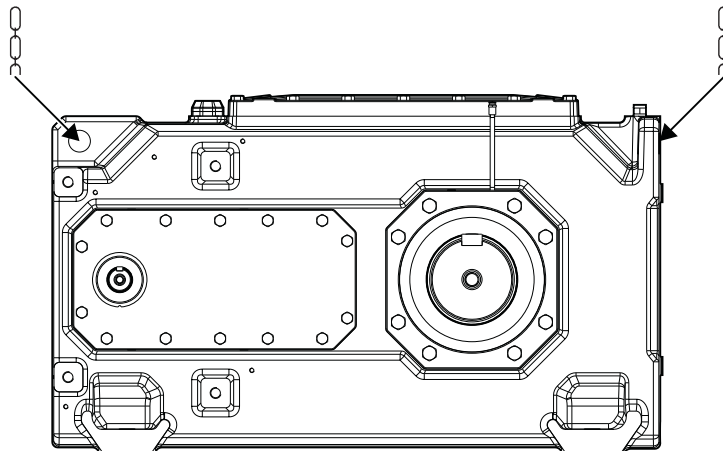


Figure 5-1: Position of the attachment points for gear units, type H...N

The following diagram shows the position of the attachment points for model H...U gear units.

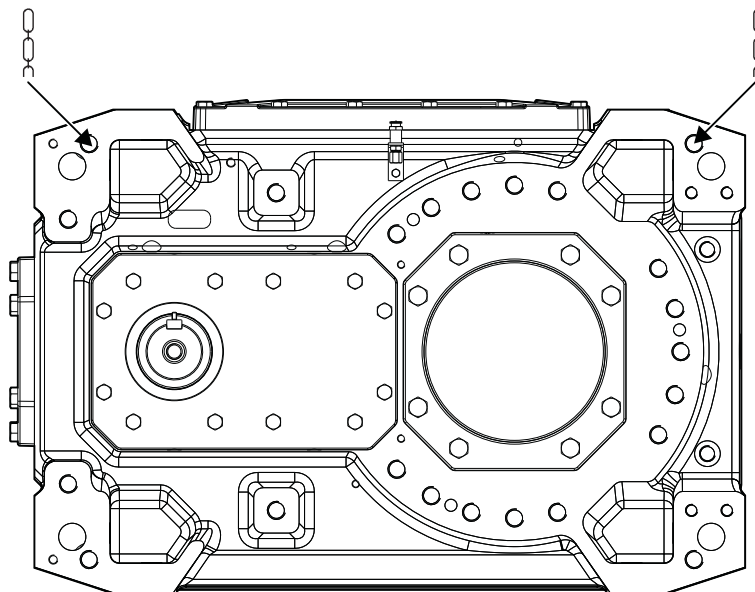


Figure 5-2: Position of the attachment points for gear units, type H...U

The following diagram shows the position of the attachment points for model B...N gear units.

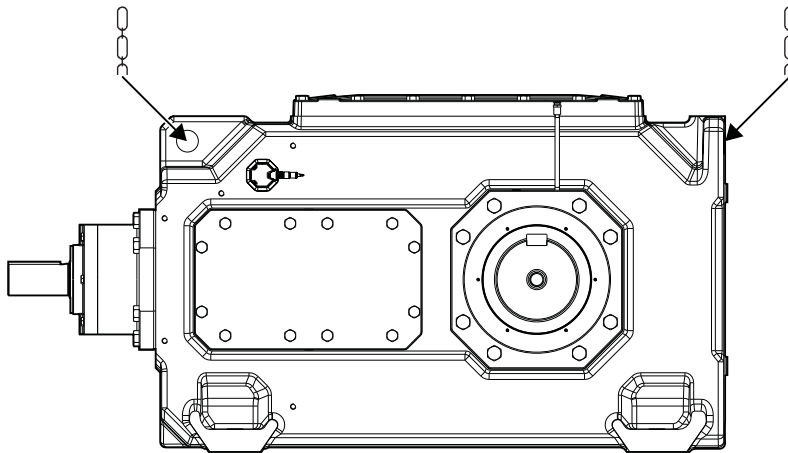


Figure 5-3: Position of the attachment points for gear units, type B...N

The following diagram shows the position of the attachment points for model B... gear units on a gear unit swing base:

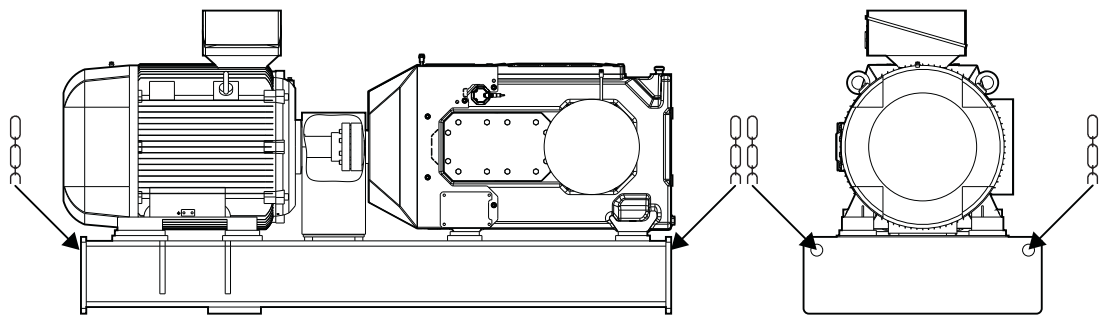


Figure 5-4: Position of the attachment points for type B... gear units on a gear unit swing base

Only transport gear units on gear unit swing bases using the attachment points on the gear unit swing base.

Drive units with additional components mounted on the gear unit (such as oil supply system, coupling, etc.) may require an extra attachment point owing to the displacement in the centre of gravity caused by the mounted components.

Further information

You can find further information and a detailed illustration of the gear unit and the position of the attachment points in the dimension drawing in the complete documentation for the gear unit.

5.2.4 Covered attachment points

The following illustration shows the position of the covered attachment points for model B...N gear units:

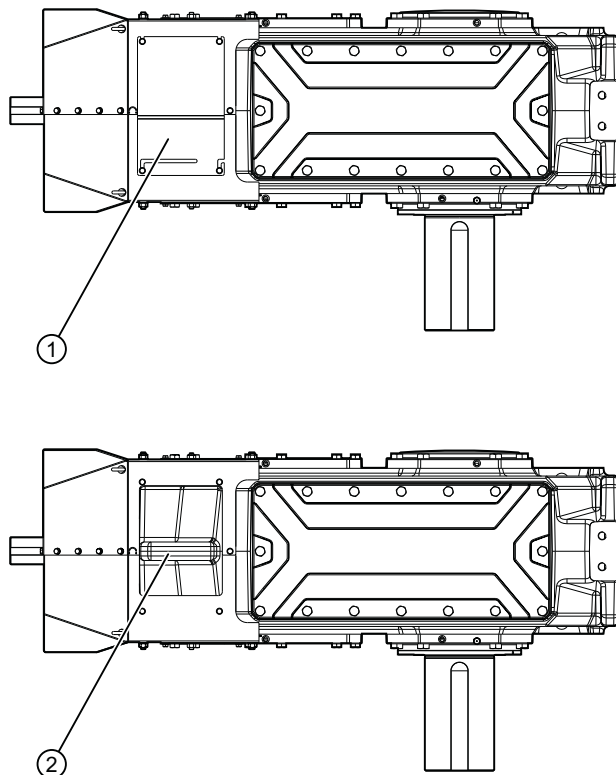


Figure 5-5: Position of the covered attachment points on model B...N gear units

① Cover plate

② Attachment point

The attachment points may be covered by the air guide cover. The following symbol identifies covered attachment points.

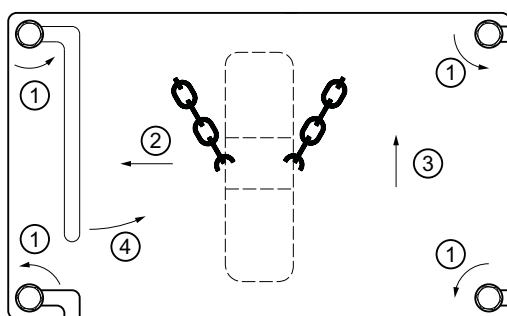


Figure 5-6: Symbol for covered attachment points

Removing the cover plate

To uncover the covered attachment point, remove the cover plate as follows:

1. Unscrew the screws (1) until the stop.
2. Push the cover plate in the direction of the arrow (2) out of the right screws.
3. Push the cover plate in the direction of the arrow (3) out of the lower screw.
4. Turn the cover plate in the direction of the arrow (4) and uncover the attachment point.

Affixing the cover plate

Follow the instructions in reverse order to affix the cover plate. Ensure that the cover plate is pushed between the washers of the screw.

5.3 Position of the transport braces

The following diagram shows the position of the transport lock for type H... gear units with motor:

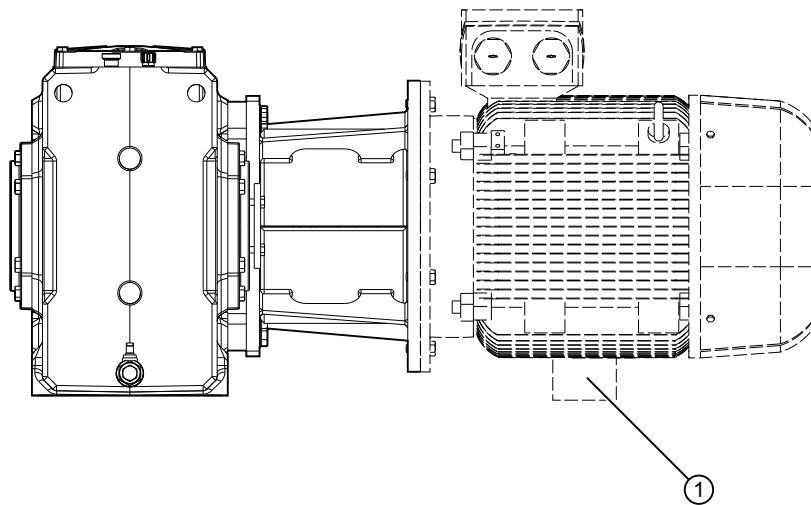


Figure 5-7: Position of the transport lock for type H... gear units with motor

- ① Transport lock for supporting mounted components during transportation

The following diagram shows the position of the transport lock for type B... gear units with motor:

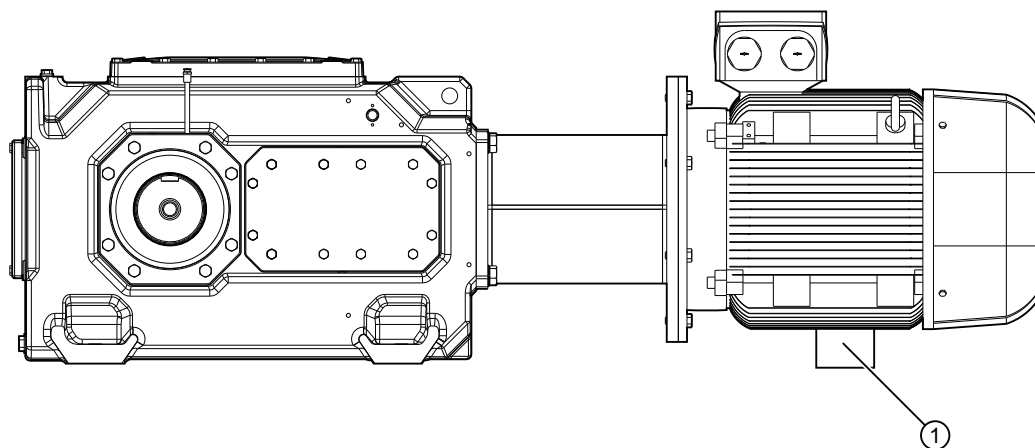


Figure 5-8: Position of the transport lock for type B... gear units with motor

- ① Transport lock for supporting mounted components during transportation

5.3 Position of the transport braces

The following diagram shows the position of the transport lock for type B... gear units with auxiliary drive:

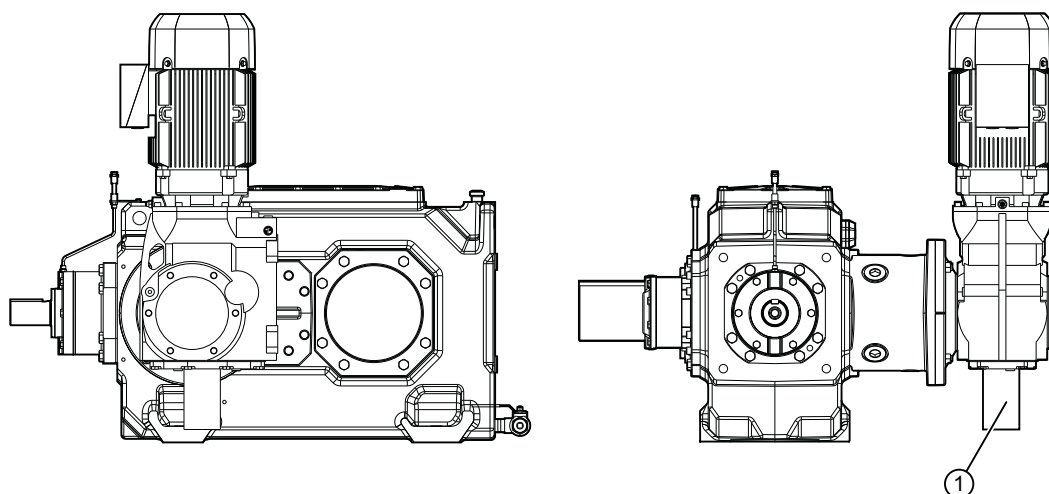


Figure 5-9: Position of the transport lock for type B... gear units with auxiliary drive

- ① Transport lock for supporting mounted components during transportation

6.1 General notes regarding assembly

Ambient temperatures during assembly

Low temperatures affect the material properties and the assembly process, as well as potentially damaging the gear unit.

- Do not assemble the gear unit at temperatures below -20 °C.
- At ambient temperatures of below -20 °C, the environment must be heated before assembling the gear unit.

Mounting position of the assembly

Incorrect assembly can damage the gear unit.

- Observe the mounting position specified on the dimension drawing.
- Ensure there is free convection on the housing surface.
- For gear units with fans:
Ensure the free flow of air to the gear unit by leaving free space around it.

Remove corrosion protection with cleaning agent

Cleaning agents can damage the shaft sealing rings.

- Use a suitable cleaning agent to remove the corrosion protection from the shafts and mounting surfaces.
- Do not allow cleaning agents to come into contact with the shaft sealing rings.

6.2 Unpacking the gear unit

The scope of delivery is listed in the shipping documents. Check that everything has been delivered immediately upon receipt.

To unpack the gear unit, please proceed as follows:

1. Check the condition of the delivery before unpacking.
2. Check that the transport lock is not damaged.
3. Remove packaging and transport devices in accordance with regulations.
4. Carry out a visual inspection for damage and dirt.
5. Report any damaged or missing parts to Customer Service (Page 147).
6. Dispose of packaging material and transport devices in accordance with regulations.

6.3 Gear unit alignment

The service life of the shafts, bearings and couplings will mainly depend on the accuracy of the alignment of the shaft axes with each other. Aim to achieve the alignment accuracy that is specified in the coupling instructions. Further information about the couplings can be found in the relevant coupling instructions.

Depending on the order specification, machined surfaces (alignment surfaces) are provided on the upper side of the housing for prealignment in the horizontal axis.

The gear unit can be equipped with alignment threads and alignment surfaces in the housing foot to make it simpler to align.



Figure 6-1: Alignment surface

Proceed as follows to align the gear unit at the alignment surface:

1. For the precise position of the alignment surfaces, refer to the following diagram or the dimension drawing in the complete documentation.
2. Using these alignment surfaces, horizontally align the gear unit so that perfect gear unit operation is ensured.

The following illustration shows the alignment surface on the gear unit:

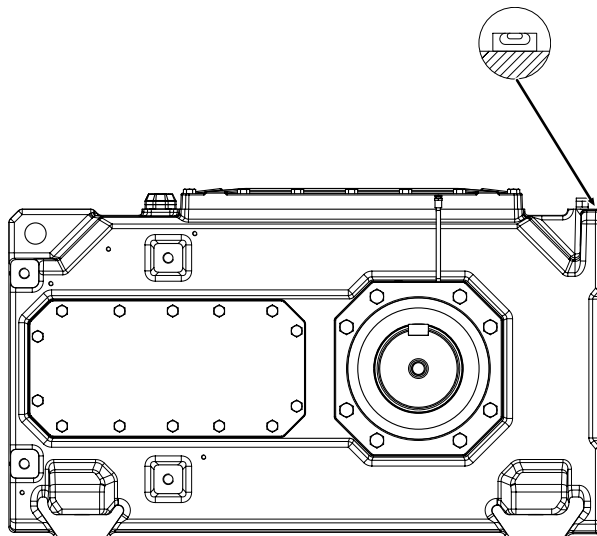


Figure 6-2: Alignment surface for version N

The following illustration shows the alignment surface on the gear unit:

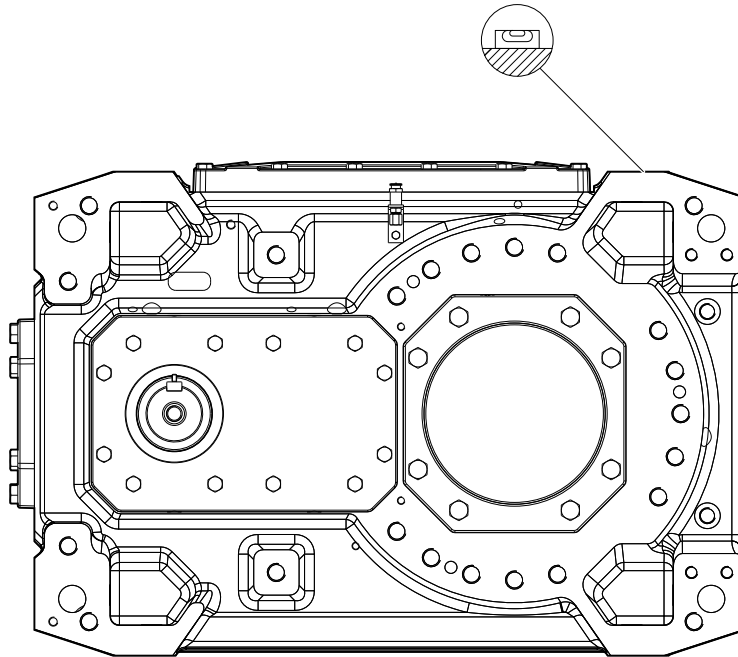


Figure 6-3: Alignment surface on the versions L, P and U

Further information

Further information and a detailed illustration of the gear unit can be found in the dimension drawing provided in the complete gear unit documentation.

Tools

Final fine alignment relative to equipment connected at the input and output is performed along the shaft axes using the following tools:

- Rulers
- Spirit level
- Dial gauge
- Laser alignment system
- Feeler gauge etc.

Once the gear unit is finely aligned, tighten the gear unit and check the settings again. Document the alignment dimensions in the form of a report, and archive this together with these instructions.

6.4 Gear unit version with feet

6.4.1 Dismantling the air guide cover

Depending on the order specification, it may be necessary to dismantle the air guide cover of the gear unit. To transport the gear unit or mount it on a foundation.

1. Loosen the screws or nuts on the air guide cover.
2. Remove the air guide plate.
3. Once the work has ended, reassemble the air guide cover on the gear unit.

6.4.2 Mount the gear unit on a base frame with foundation bolts



WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

To install the gear unit on a base frame, proceed as follows:

1. Requirements of the foundation (Page 59).
2. Clean the contact surfaces between the gear unit and the installation location.
3. Use suitable hoisting gear to set the gear unit down on the base frame.
4. Tighten the foundation bolts to the specified tightening torque (Page 115).
 - Ensure the gear unit is not subjected to mechanical stress when tightening the foundation bolts.
 - Tighten the foundation bolts crosswise.
 - If necessary, install stops to prevent displacement.
5. Align the gear unit precisely with the input and output equipment. (Page 72)
6. Record the alignment dimensions. Archive the report together with these instructions.

6.4.3 Mount gear units on a concrete foundation using stone bolts

The following diagram shows a stone bolt:

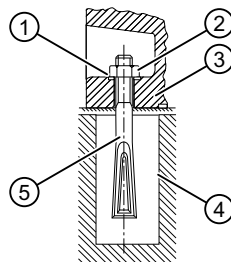


Figure 6-4: Stone bolt

- | | |
|------------------|--------------|
| ① Washer | ④ Foundation |
| ② Hexagon nut | ⑤ Stone bolt |
| ③ Gear unit foot | |



WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.

Proceed as follows to mount the gear unit using stone bolts:

1. Clean the contact surfaces between the gear unit and the installation location.
2. Attach the stone bolts with washers and hexagon nuts in the foundation mounting points in the gear unit housing.
3. Use suitable hoisting gear to set the gear unit down on the concrete foundation.
4. Align the gear unit so that the high-speed shafts (HSS) and low-speed shafts (LSS) are horizontal using adjustable chocks. (Page 72)
5. For higher external forces, if necessary, use stops to prevent displacement.
6. Pour concrete into the recesses in the concrete foundation for the stone bolts.
7. Ensure the gear unit is not subjected to mechanical stress when tightening the stone bolt.
8. After the concrete has set, tighten the hexagon nuts of the stone bolts equally with the specified tightening torque (Page 115).
9. Record the alignment dimensions. Archive the report together with these instructions.

6.4.4 Mount the gear unit on a concrete foundation using foundation blocks

The following diagram shows a foundation block:

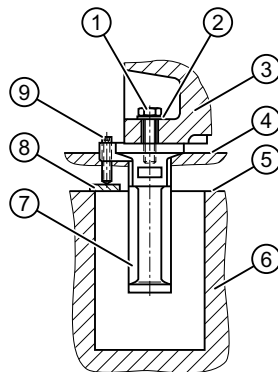


Figure 6-5: Foundation block

- | | |
|--------------------------------------|--------------------|
| ① Fastening bolt | ⑥ Foundation |
| ② Washer | ⑦ Foundation block |
| ③ Gear unit foot | ⑧ Flat steel plate |
| ④ Height of the completed foundation | ⑨ Set screw |
| ⑤ Height of the prepared foundation | |



WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.

Proceed as follows to mount the gear unit using foundation blocks:

1. Clean the contact surfaces between the gear unit and the installation location.
2. Attach the foundation blocks with washers and fastening bolts in the foundation mounting points in the gear unit housing.
3. Tighten the fastening bolts until the housing feet are lying flat on the foundation blocks.
4. Use suitable hoisting gear to set the gear unit down on the concrete foundation.
5. Align the gear unit so that the high-speed shafts (HSS) and low-speed shafts (LSS) are horizontal using the set screws (if available) (Page 72).
6. For higher external forces, if necessary, use stops to prevent displacement.
7. Before casting the foundation, close the openings in the foundation blocks using a suitable material (e.g. using polystyrene).
8. Pour concrete into the recesses in the concrete foundation for the foundation blocks.
9. Ensure the gear unit is not subjected to mechanical stress when tightening the fastening bolts.

10. After the concrete has set, tighten the fastening bolts of the foundation blocks equally with the specified tightening torque (Page 115).

11. Record the alignment dimensions. Archive the report together with these instructions.

6.4.5 Mount the gear unit on a concrete foundation using anchor bolts

6.4.5.1 Inserting the anchor bolt

The following diagram shows the inserted anchor bolt:

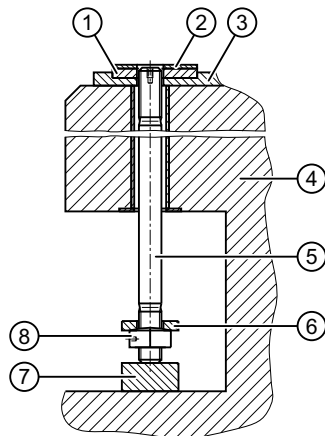


Figure 6-6: Inserted anchor bolt

- | | |
|-----------------------|------------------|
| ① Baseplate | ⑤ Anchor bolt |
| ② Support | ⑥ Pressure plate |
| ③ Fine-grout concrete | ⑦ Wood |
| ④ Raw foundation | ⑧ Hexagon nut |



WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.

Proceed as follows to insert the anchor bolt:

1. Place the support on the baseplate embedded in the fine-grout concrete.
2. Insert the anchor bolt.
3. Attach the pressure plate and tighten the nuts.
4. Place a piece of wood under the anchor bolt so that it is set back approximately 10 mm from the upper edge of the support.

6.4 Gear unit version with feet

5. Clean the underside of the gear unit feet.
6. Using suitable hoisting gear, set the gear unit down in position.

6.4.5.2 Mounting the gear unit using anchor bolts

The following diagram shows a tightened anchor bolt:

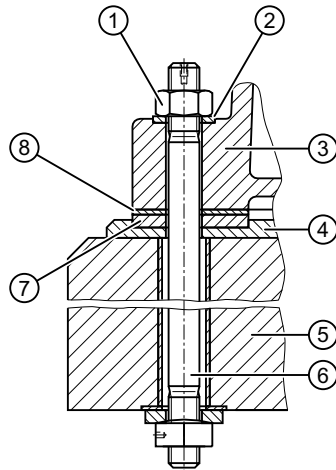


Figure 6-7: Tightened anchor bolt

- | | |
|-----------------------|------------------|
| ① Hexagon nut | ⑤ Raw foundation |
| ② Washer | ⑥ Anchor bolt |
| ③ Housing foot | ⑦ Baseplate |
| ④ Fine-grout concrete | ⑧ Support |

NOTE

Lack of strength in concrete

Damage caused by inadequate stability of the gear unit as a result of inadequate concrete hardness and strength is possible.

- The fine-grout concrete must be allowed to harden for at least 28 days before tensioning the anchor bolts.

Proceed as follows to mount the gear unit using anchor bolts:

1. Pull the anchor bolts upwards. To do this you can screw a bolt or threaded rod into the thread on the face end.
2. Attach the washer.
3. Screw on the hexagon nut by hand a few turns.
4. Align the gear unit with the supports (Page 72).
5. Observe the values inscribed on the alignment strips.
6. Maintain the alignment tolerances to the units connected at the input and output according to the permissible angular and axial displacements of the couplings.
7. Record the alignment dimensions. Archive the report together with these instructions.
8. Keep the anchor bolts in their position by tightening the nuts by hand.
9. Fit the protective sleeve.
10. Attach the hydraulic clamping device.

11. Pretighten the screws in alternation, taking into account the preload forces (Page 115).
12. Tighten the hexagon nuts as far as possible using a suitable tool.
13. Record the clamping pressures and preload forces. Archive the report together with these instructions.

6.5 Gear unit version with flange shafts

6.5.1 Mounting a gear unit with flange shaft

Take the following precautions before assembly of the gear unit with flange shaft:

- The area around the face of the flange shaft and mating flange must be absolutely free of any grease. The reliability with which torque is transmitted depends to a large extent on this.
- Do not use any contaminated solvents, cleaning cloths or cleaning agents containing oil (e.g. petroleum or turpentine) to remove the grease.



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

To mount the gear unit with the flange shaft, proceed as follows:

1. Clean the contact surfaces of the flange shaft and the mating flange.
2. Using suitable hoisting gear, set the gear unit down on the mating flange.
3. Before tightening the connecting bolts, make sure that the centrings of the flanges are interlocked.
4. Tighten the connecting bolt with the specified tightening torque (Page 115).
 - Ensure the gear unit is not subjected to mechanical stress when tightening the connecting bolt.
 - Tighten the connecting bolt crosswise.
 - If necessary, install stops to prevent displacement.

6.5 Gear unit version with flange shafts

The following table lists the tightening torques at the flange connections:

Gear unit size	Strength class		Tightening torque
	Bolt DIN 931	Nut DIN 934	
63 to 70	10.9	10	610 Nm
96 to 151	10.9	10	1,050 Nm
179 to 355	10.9	10	2,100 Nm

Table 6-1 : Tightening torques at the flange connections

6.5.2 Gear unit with low-speed shaft without parallel keyway

Gear units with a low-speed shaft without parallel keyway can be installed as foot-mounted or shaft-mounted gear units. These gear units are suitable for couplings with exclusively force-locked torque transmission. Please note the following:

1. During and after the assembly of the coupling, it is imperative to avoid that contact with the gear unit sealing elements at all times.
2. Observe the Chapter entitled General notes regarding assembly (Page 71) and Gear unit alignment (Page 72).

6.6 Other gear unit versions

6.6.1 Mounting the gear unit on a gear unit swing base

The motor and gear unit swing base may only be mounted after prior consultation with Flender.

Mount the gear unit swing base on the gear unit in such a way that it is free of mechanical stress to avoid any distortion.

The diagram below shows the supports for gear unit swing bases:

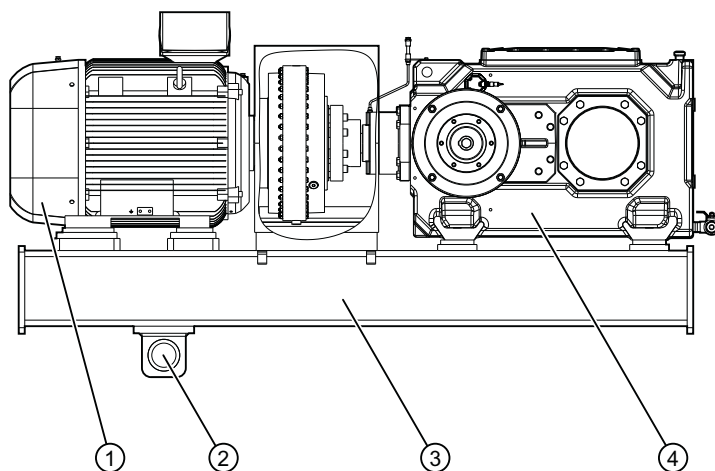


Figure 6-8: Support for gear unit swing base

- | | |
|--------------------|------------------------|
| ① Motor | ③ Gear unit swing base |
| ② Elastic pedestal | ④ Gear unit |

The diagram below shows the supports for gear unit swing bases:

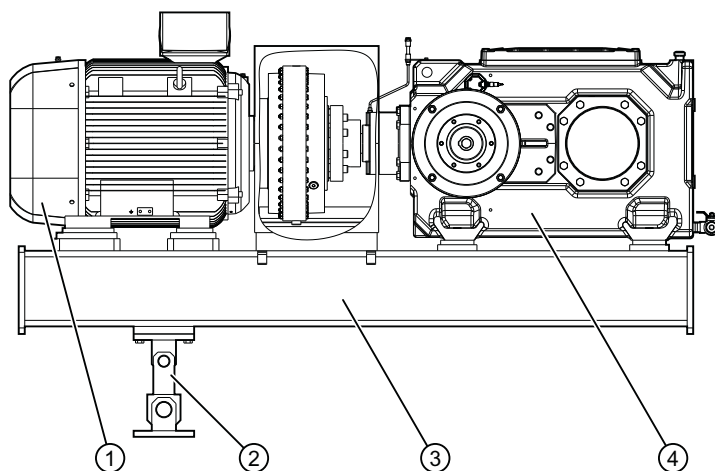


Figure 6-9: Support for gear unit swing base

- | | |
|--------------|------------------------|
| ① Motor | ③ Gear unit swing base |
| ② Torque arm | ④ Gear unit |

If you are intending to install a torque arm supplied by the customer, use an elastic element to connect it to the foundation.



⚠ WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.



⚠ CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

To mount the gear unit swing base, proceed as follows:

1. Clean the underside of the gear unit feet and the gear unit swing base.
2. Using a suitable hoisting gear, place the gear unit down on the gear unit swing base.
3. Tighten the foot fastening bolts with the specified tightening torque (Page 115).
 - Ensure the gear unit is not subjected to mechanical stress when tightening the fastening bolts.
 - Tighten the foundation bolts crosswise.
 - If necessary, install stops to prevent displacement.
4. Align the gear unit precisely with the input and output equipment. (Page 72)
5. Record the alignment dimensions. Archive the report together with these instructions.

Further information

Further information about constructing the foundation for a torque arm can be found in the Chapter Construction of foundations (Page 59).

6.6.2 Mounting the torque arm for the gear unit housing

For all shaft-mounted gear units, absorb the reaction torque corresponding to the shaft of the driven machine – and which acts in an opposite direction at the housing.

The motor and torque arm may only be mounted after prior consultation with Flender.

The motor assignment of the torque arm can be found in the “Technical specifications” chapter.

The diagram below shows the torque arm for the gear unit housing:

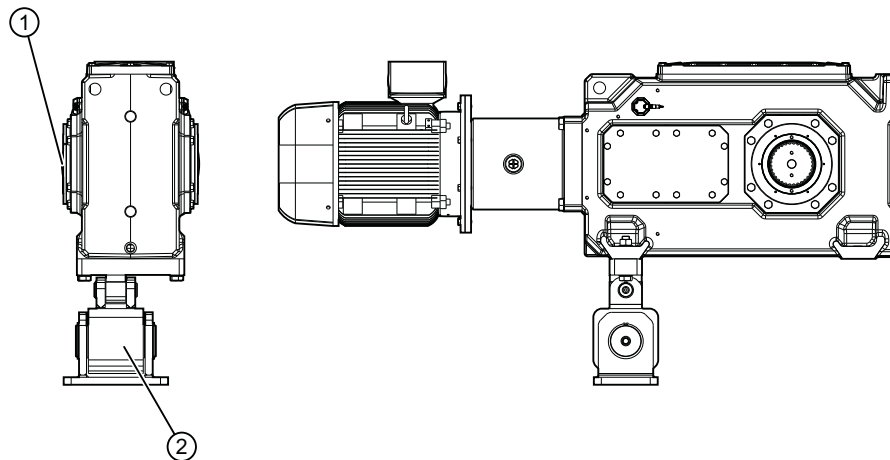


Figure 6-10: Torque arm for the gear unit housing

① Machine side

② Torque arm

If you are intending to install a torque arm supplied by the customer, use an elastic element to connect it to the foundation.

To mount the gear unit on the torque arm, proceed as follows:

1. Clean the underside of the gear unit feet and the torque arm.
2. Place the gear unit with the low-speed shaft on the machine shaft.
3. Attach the gear unit to the torque arm.
4. Attach the torque arm to the foundation or beam.
5. Tighten the foot fastening bolts with the specified tightening torque (Page 115).
 - Ensure the gear unit is not subjected to mechanical stress when tightening the fastening bolts.
 - Tighten the foundation bolts crosswise.
6. Align the gear unit precisely with the input and output equipment (Page 72).
7. Record the alignment dimensions. Archive the report together with these instructions.

Further information

Further information about constructing the foundation for a torque arm can be found in the Chapter Construction of foundations (Page 59).

6.6.3 Gear unit with a mounting flange or block flange

6.6.3.1 Notes regarding assembly for machine-side mating flange

Designing the mating flange construction

Take the following precautions before assembly of the mating flange on the machine side:

- Design and construct the mating flange so that no resonant vibration occurs – and no shock and vibration can be transmitted from adjacent foundations.
- The mating flange assembly that is to be mounted on the gear unit must be torsionally stiff.
- Design the mating flange corresponding to the weight and the torque, taking into account the forces that act on the gear unit itself.

Poor alignment

The gear unit can be damaged as a result of poor mating flange alignment:

- The mating flange must be flat. When tightening the fastening bolts, make sure that the gear unit is free of mechanical stress.
- Very carefully align the units connected at the input and output – and take into account, where relevant, any elastic deformation as a result of the operational forces.

Poor stability

Damage to the gear unit is possible if it is not mounted on a stable foundation:

- Tighten the fastening bolts and nuts to the specified tightening torque.
- In respect of this, use the required bolt connections and strength class.
- Please refer to the Chapters Properties of the bolts and mating threads (Page 113), Bolt connection classes (Page 114), Tightening torques and preload forces (Page 115).

6.6.3.2 Mount gear unit with a mounting flange or block flange



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

NOTE

Risk of damage to shaft sealing rings from cleaning agents

Aggressive chemical cleaning agents may cause damage to shaft sealing rings.

- Do not allow cleaning agents to come into contact with the shaft sealing rings.



Information

Grease-free mounting flange and mating flange

Take care to ensure that the area around the face of the mounting and mating flange is completely free of any grease. The reliability with which torque is transmitted depends to a large extent on this.

Do not use any contaminated solvents, cleaning cloths or cleaning agents containing oil (e.g. petroleum or turpentine) to remove the grease.

Do not allow any cleaning agent to come into contact with the shaft sealing rings.



WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.

To mount the gear unit with mounting flange or block flange, proceed as follows:

1. Observe the information in the Chapter General notes regarding assembly (Page 71).
2. Check the mounting or block flange and the machine-side mating flange for damaged seats and edges. If necessary, rework the parts using a suitable tool and then clean these parts again.



Information

The mounting or block flange on the gear unit must be provided with a centring shoulder ($\varnothing d3$) on the side with the low-speed shaft.

3. Machine a bore (fit H7) that matches this centring shoulder in the mating flange on the machine side. Carefully observe the information in chapter Special aspects for shaft-mounted gear units (Page 86).
4. Clean and degrease the contact surfaces of the components to be joined: The mounting or block flange of the gear unit and the mating flange on the machine side.
5. Immediately prior to assembly, apply Loctite 640 to the contact surfaces between the flange hub and the mating flange supplied by the customer.
6. Insert the gear unit into the mating flange using suitable hoisting gear.
7. Tighten the flange screws with full tightening torque.
 - Ensure the gear unit is not subjected to mechanical stress when tightening the flange screws.
 - Tighten the flange screws crosswise.
 - If necessary, install stops to prevent displacement.

6.6.3.3 Special aspects of shaft-mounted gear units

NOTE

Damage to the shaft-mounted gear unit caused by centring the gear unit in the mating flange

If the machine shaft is supported at two points in the mating flange on the machine side, it is possible to damage the gear unit by centring the gear unit (centring shoulder $\varnothing d_3$) in the mating flange.

- Do not centre the gear unit (centring shoulder $\varnothing d_3$) in the mating flange if the machine shaft is supported at two points in the mating flange on the machine side (over-determination).
- For a machine shaft supported at one point, machine a bore (fit H7) that matches this centring shoulder in the mating flange on the machine side.

Further information

You can find further information about the permissible tolerances in the relevant instructions contained in the complete documentation for the gear unit.

6.6.3.4 Illustration of the low-speed shaft

Gear unit with solid shaft or flange shaft

The following figure shows the gear unit with solid shaft or flange shaft:

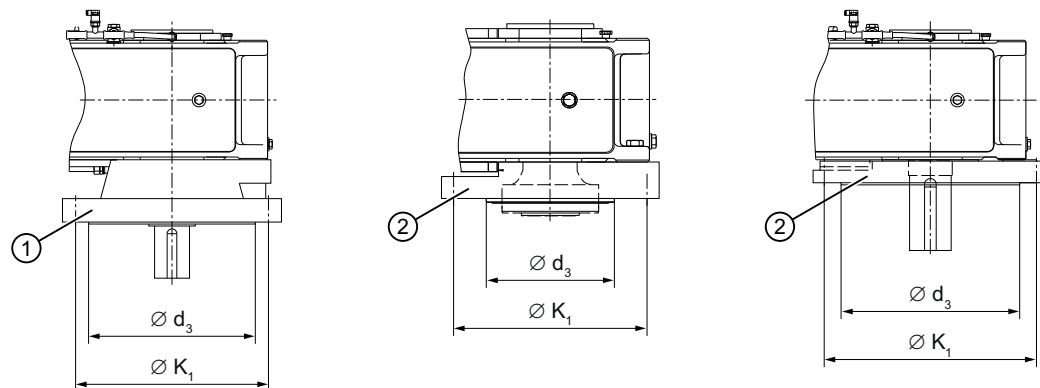


Figure 6-11: Gear unit with solid shaft or flange shaft

① Mounting flange

② Block flange

Gear unit with hollow shaft

The following diagram shows the gear unit with hollow shaft:

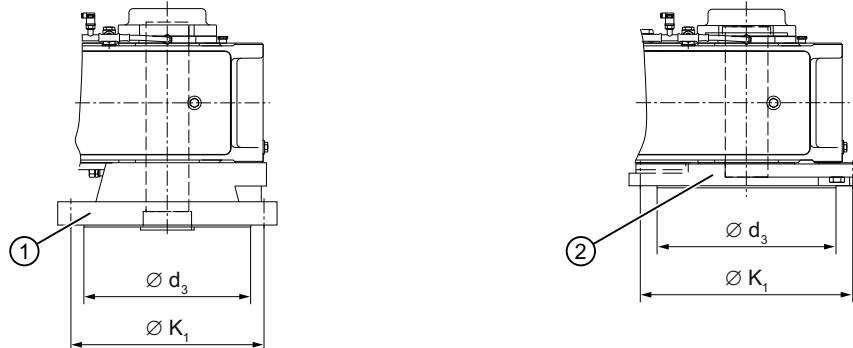


Figure 6-12: Gear unit with hollow shaft

① Mounting flange

② Block flange

Axial locking

Depending on the version, lock the hollow shaft axially on the machine shaft (e.g. by a locking ring, end plate, set screw).

6.6.3.5 Dismantling a gear unit with mounting flange or block flange



WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.

NOTE

Damage to the machine shaft due to the oscillating movement of the drive unit

The machine shaft may be damaged by the oscillating movement of the drive unit.

- Ensure that the drive unit does not hit against the machine shaft during dismantling.
- Ensure that the oscillating movement is dampened by the crane.

Proceed as follows to dismantle the gear unit:

1. Dismantle any mounted components. Also dismantle any associated connection components. Observe the manufacturer's instructions.
2. Attach the gear unit to the crane with the attachment points provided.
3. Release and remove the screws from the flange connection.
4. Gradually move the crane away from the machine.

6.7 Shaft-mounted gear unit with hollow shaft

5. To prevent oscillation, compensate the movement of the gear unit with the crane.
6. Put the gear unit down carefully, e.g. on a wooden support.

6.7 Shaft-mounted gear unit with hollow shaft

6.7.1 Shaft-mounted gear unit with hollow shaft and parallel keyway

6.7.1.1 Mounting a shaft-mounted gear unit on a machine shaft



WARNING

Risk of crushing due to falling load

Falling load can cause serious physical injury or death.

- Transport may only be carried out by professional users.
- Make sure that there are no persons in the hazard area for suspended loads.
- Use the specified attachment points.
- Observe the instructions for transportation and attaching.
- Observe the load limits of the hoisting or lifting equipment.



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

NOTE

Risk of damage to shaft sealing rings from cleaning agents

Aggressive chemical cleaning agents may cause damage to shaft sealing rings.

- Do not allow cleaning agents to come into contact with the shaft sealing rings.



Information

Insert the pressure oil connector

To facilitate dismantling, you can insert a pressure oil connector into the shaft end of the driven machine. The pressure oil connector opens out into the recess of the hollow shaft and can be used to supply rust remover.

Proceed as follows to mount the gear unit:

1. Observe the information in the Chapter General notes regarding assembly (Page 71).
2. Use a suitable cleaning agent to remove the corrosion protection from the hollow shaft and the machine shaft.
3. Inspect the hollow and machine shafts for damaged seats and edges.
4. If necessary, rework the components with an appropriate tool and then clean them again.
5. Apply an appropriate lubricant to the contact surfaces to protect them against fretting corrosion.
6. Use suitable hoisting gear to lift the gear unit.
7. Carefully align the hollow shaft with the machine shaft.
8. Secure the gear unit so that it cannot inadvertently move.
9. Mount the gear unit using the nut and threaded spindle.
The gear unit is braced by the hollow shaft.
10. Depending on the version, lock the hollow shaft axially on the machine shaft (e.g. by a locking ring, end plate, set screw).
11. Remove the locking element that prevents the gear unit from making inadvertent movements.

The diagram below shows the mounting process with threaded spindle for gear units with a hollow shaft and parallel keyway:

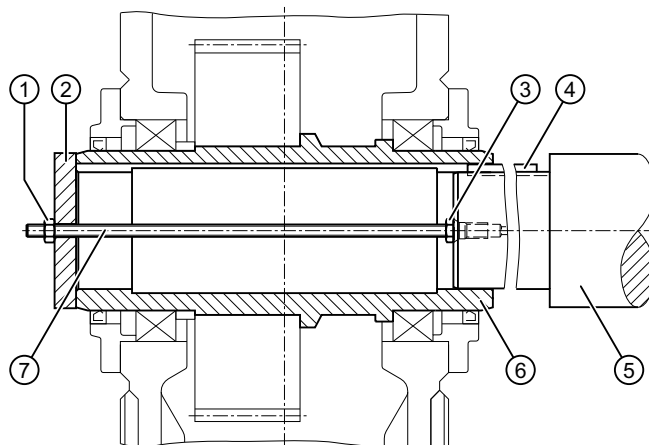


Figure 6-13: Mounting with a threaded spindle

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

Parts 1, 3, 4, 5 and 7 are not included in the scope of supply.

6.7.1.2 Dismantle the shaft-mounted gear unit on machine shaft

NOTE

Damage to the gear unit due to skewing

The gear unit can become damaged if it skews during dismantling.

- Do not allow the gear unit to skew when you remove it from the machine shaft.
- When removing the gear unit using hydraulic pulling equipment, excessive force can be placed on the housing, bearings and other gear unit components.
- Always check the hollow shaft bearings for damage before reattaching the gear unit to the machine shaft.



Information

Reducing the risk of corrosion

When using jacking screws or threaded spindles, round off and grease the end of the thread (head) that presses against the driven machine to avoid the risk of corrosion.

Depending on the conditions on site, you can use one of the following methods to remove the gear unit from the machine shaft:

- With jacking screws in an end plate
- With a central threaded spindle
- Using hydraulic pulling equipment

To remove the shaft-mounted gear unit with hollow shaft from the machine shaft, proceed as follows:

1. Secure the gear unit in position.
2. Remove the axial locking element from the hollow shaft.
3. If fretting corrosion has formed on the seat surfaces, rust remover must be applied so that the gear unit can be more easily detached. The rust remover can be pumped into the machine shaft through the pressure oil connector.
4. To do this, first remove the end plate and locking ring, where necessary.
5. Wait for the rust remover to work and then use suitable hoisting gear to lift the gear unit and dismantle it using a fixture.

The following diagram shows the dismantling procedure using an end plate for gear units with a hollow shaft and parallel keyway:

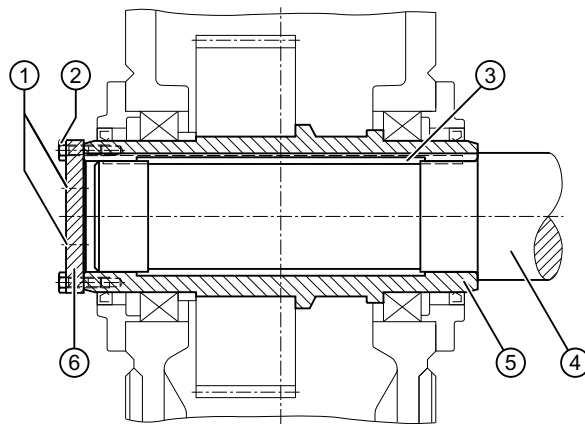


Figure 6-14: Dismantling using an end plate

- | | |
|------------------|------------------------------|
| ① Jacking screws | ④ Machine shaft |
| ② Bolts | ⑤ Hollow shaft |
| ③ Parallel key | ⑥ End plate for pressing out |

The following diagram shows the dismantling procedure using hydraulic pulling equipment for gear units with hollow shaft:

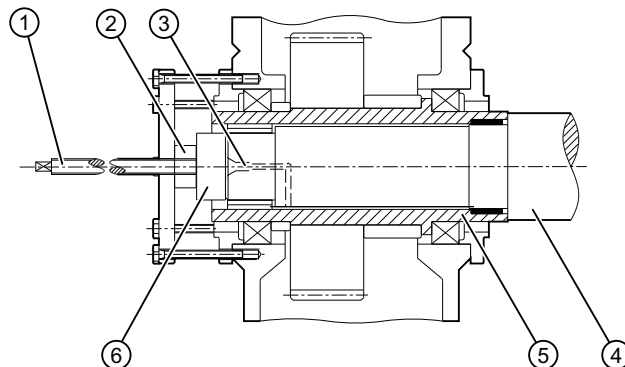


Figure 6-15: Dismantling using hydraulic pulling equipment

- | | |
|-------------------------------|------------------------------------|
| ① Threaded spindle | ④ Machine shaft |
| ② Hydraulic pulling equipment | ⑤ Hollow shaft |
| ③ Pressure oil connector | ⑥ Auxiliary plate for pressing out |

End plate and auxiliary plate

The end plate and auxiliary plate for removing the gear unit are not part of the scope of supply of the gear unit.

Threaded holes at the face sides of gear unit hollow shafts

Both end faces of the hollow shaft have threaded holes for attaching the end plate to the shaft.

6.7 Shaft-mounted gear unit with hollow shaft

The following diagram shows a hollow shaft with parallel keyway:

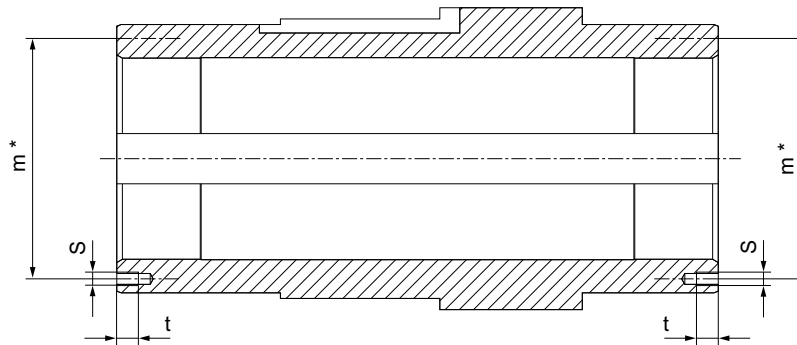


Figure 6-16: Hollow shaft with parallel keyway

*) 2 threads offset by 180°

Refer to the following table for the dimensions of the threaded holes at the face sides of standard gear-unit hollow shafts:

Gear unit size	m in mm	s	t in mm	Gear unit size	m in mm	s	t in mm
42	95	M8	14.5	179	195	M12	19.5
63	115	M8	14.5	200	215	M12	19.5
70	125	M8	14.5	234	230	M12	19.5
96	140	M10	17	257	250	M12	19.5
104	150	M10	17	312	270	M16	24
136	160	M10	17	355	280	M16	24
151	180	M12	19.5				

Table 6-2 : Dimensions for the threaded holes at the face sides of standard gear-unit hollow shafts

Further information

You will find further information and a detailed illustration of the threaded hole in the dimension drawing, which is part of the complete documentation of the gear unit.

Maximum forcing pressures

NOTE

Damage to the gear unit housing or other gear unit components

The gear unit housing or other gear unit components might sustain damage if forcing pressures in excess of the maximum specified values are applied.

- When removing a gear unit that is not only supported at the hollow shaft but also at the housing, the forcing pressures specified in the tables below must not be exceeded.
- The hollow shaft bearings must always be checked for damage before the gear unit is attached to the machine shaft.

Refer to the following table for the maximum forcing pressures:

Gear unit size	Maximum forcing pressures in N	Gear unit size	Maximum forcing pressures in N
42	22,600	179	97,200
63	33,000	200	113,600
70	37,500	234	140,000
96	50,000	257	160,000
104	56,000	312	193,000
136	65,000	355	215,000
151	82,000		

Table 6-3 : Maximum forcing pressures

6.7.1.3 Easier dismantling as a result of the pressure oil connector

To facilitate dismantling, you can insert a pressure oil connector into the shaft end of the driven machine. The pressure oil connector opens out into the recess of the hollow shaft and can be used to supply rust remover.

The following diagram illustrates the pressure oil connector required for gear units with a hollow shaft and parallel keyway:

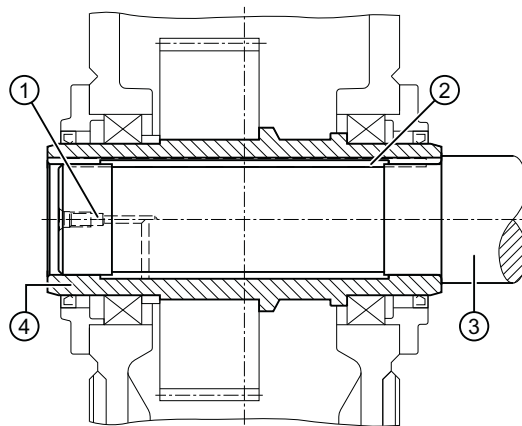


Figure 6-17: Gear unit with a hollow shaft and parallel keyway

- | | |
|--------------------------|-----------------|
| ① Pressure oil connector | ③ Machine shaft |
| ② Parallel key | ④ Hollow shaft |

6.7.2 Shaft-mounted gear unit with a hollow shaft and spline

6.7.2.1 Mounting a shaft-mounted gear unit on a machine shaft

Mounting with integrated DU bushing



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

NOTE

Risk of damage to shaft sealing rings from cleaning agents

Aggressive chemical cleaning agents may cause damage to shaft sealing rings.

- Do not allow cleaning agents to come into contact with the shaft sealing rings.

Proceed as follows to mount the gear unit with integrated DU bushing:

1. Observe the information in the Chapter General notes regarding assembly (Page 71).
2. Use a suitable cleaning agent to remove the corrosion protection from the hollow shaft and the machine shaft.
3. Inspect the hollow and machine shafts for damaged seats and edges.
4. If necessary, rework the components with an appropriate tool. Clean the parts again.
5. Apply an appropriate lubricant to the contact surfaces to protect them against fretting corrosion.
6. Use suitable hoisting gear to lift the gear unit.
7. Carefully align the hollow shaft with the machine shaft.
8. Secure the gear unit so that it cannot inadvertently move.
9. Mount the gear unit using the nut and threaded spindle.
The gear unit is supported by the end plate in the hollow shaft.
10. Mount the hollow shaft against the machine shaft collar, if necessary.
11. Depending on the version, lock the hollow shaft axially on the machine shaft (e.g. by a locking ring, end plate, set screw).
12. Remove the locking element that prevents the gear unit from making inadvertent movements.

The following diagram shows the mounting process with integrated DU bushing for gear units with a hollow shaft and spline:

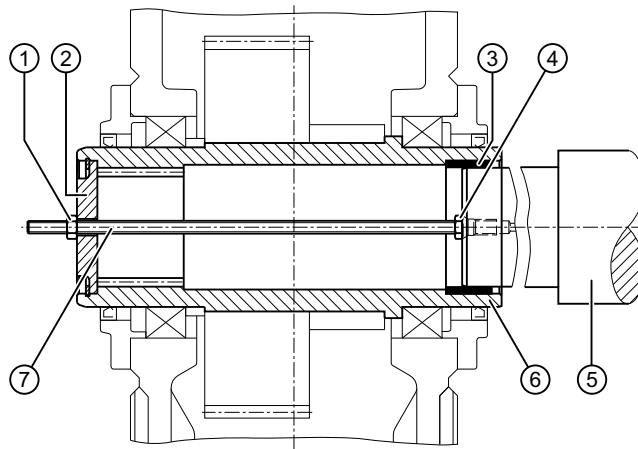


Figure 6-18: Mounting with integrated DU bushing

- | | |
|--------------|--------------------|
| ① Nut | ⑤ Machine shaft |
| ② End plate | ⑥ Hollow shaft |
| ③ DU bushing | ⑦ Threaded spindle |
| ④ Nut | |

Parts 1, 4 and 7 are not included in the scope of supply.

Hydraulic pulling equipment can be used instead of the nut and threaded spindle shown in the diagram.

Mounting with DU bushing as separate component



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

NOTE

Risk of damage to shaft sealing rings from cleaning agents

Aggressive chemical cleaning agents may cause damage to shaft sealing rings.

- Do not allow cleaning agents to come into contact with the shaft sealing rings.

Proceed as follows to mount the gear unit with hollow shaft and spline onto the shaft of the driven machine with a DU bushing as a separate component:

1. Observe the information in the Chapter General notes regarding assembly (Page 71).
2. Push the separately supplied DU bushing onto the machine shaft.
3. Use suitable hoisting gear to lift the gear unit.

6.7 Shaft-mounted gear unit with hollow shaft

4. Carefully align the hollow shaft with the machine shaft.
5. Secure the gear unit so that it cannot inadvertently move.
6. Use a ratchet tie to tighten the DU bushing until it makes secure contact with the shaft.
7. Move the DU bushing together with the machine shaft into the gear-unit hollow shaft.
8. Mount the gear unit using the nut and threaded spindle.
The gear unit is braced by the end plate in the hollow shaft.
9. Depending on the version, lock the hollow shaft axially on the machine shaft (e.g. by a locking ring, end plate, set screw).
10. Remove the locking element that prevents the gear unit from making inadvertent movements.

6.7.2.2 Dismantle the shaft-mounted gear unit on machine shaft

NOTE

Damage to the gear unit due to skewing

The gear unit can become damaged if it skews during dismantling.

- Do not allow the gear unit to skew when you remove it from the machine shaft.
- When removing the gear unit using hydraulic pulling equipment, excessive force can be placed on the housing, bearings and other gear unit components.
- Always check the hollow shaft bearings for damage before reattaching the gear unit to the machine shaft.



Information

Reducing the risk of corrosion

When using jacking screws or threaded spindles, round off and grease the end of the thread (head) that presses against the driven machine to avoid the risk of corrosion.

Depending on the conditions on site, you can use one of the following methods to remove the gear unit from the machine shaft:

- With jacking screws in an end plate
- With a central threaded spindle
- Using hydraulic pulling equipment

To remove the shaft-mounted gear unit with hollow shaft from the machine shaft, proceed as follows:

1. Secure the gear unit in position.
2. Remove the axial locking element from the hollow shaft.
3. If fretting corrosion has formed on the seat surfaces, rust remover must be applied so that the gear unit can be more easily detached. The rust remover can be pumped in through the pressure oil connector.
4. To do this, first remove the end plate and locking ring, where necessary.
5. Wait for the rust remover to work and then use suitable hoisting gear to lift the gear unit and dismantle it using a fixture.

The following diagram shows the dismantling procedure using an end plate for gear units with a hollow shaft and spline:

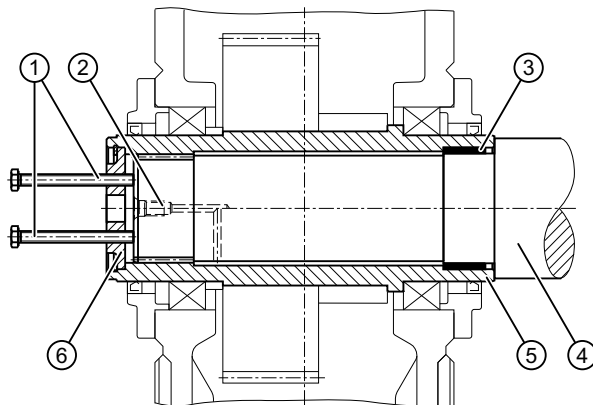


Figure 6-19: Dismantling using an end plate

- | | |
|--------------------------|-----------------|
| ① Jacking screws | ④ Machine shaft |
| ② Pressure oil connector | ⑤ Hollow shaft |
| ③ DU bushing | ⑥ End plate |

The following diagram shows the dismantling procedure using hydraulic pulling equipment for gear units with hollow shaft:

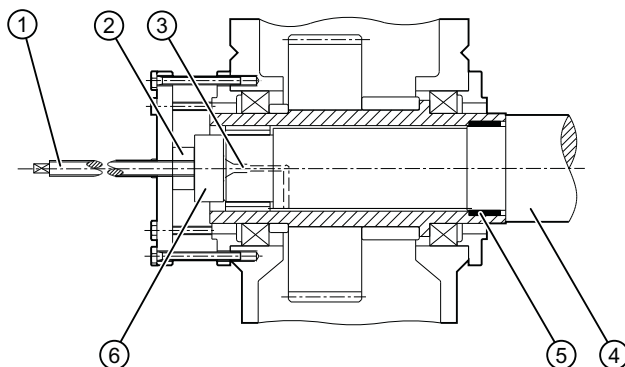


Figure 6-20: Dismantling using hydraulic pulling equipment

- | | |
|-------------------------------|------------------------------------|
| ① Threaded spindle | ④ Machine shaft |
| ② Hydraulic pulling equipment | ⑤ Hollow shaft |
| ③ Pressure oil connector | ⑥ Auxiliary plate for pressing out |

End plate and auxiliary plate

The end plate and auxiliary plate for removing the gear unit are not part of the scope of supply of the gear unit.

6.7 Shaft-mounted gear unit with hollow shaft

Maximum forcing pressures

NOTE**Damage to the gear unit housing or other gear unit components**

The gear unit housing or other gear unit components might sustain damage if forcing pressures in excess of the maximum specified values are applied.

- When removing a gear unit that is not only supported at the hollow shaft but also at the housing, the forcing pressures specified in the tables below must not be exceeded.
- The hollow shaft bearings must always be checked for damage before the gear unit is attached to the machine shaft.

Refer to the following table for the maximum forcing pressures:

Gear unit size	Maximum forcing pressures in N	Gear unit size	Maximum forcing pressures in N
42	22,600	179	97,200
63	33,000	200	113,600
70	37,500	234	140,000
96	50,000	257	160,000
104	56,000	312	193,000
136	65,000	355	215,000
151	82,000		

Table 6-4 : Maximum forcing pressures

6.7.2.3 Easier dismantling as a result of the pressure oil connector

To facilitate dismantling, you can insert a pressure oil connector into the shaft end of the driven machine. The pressure oil connector opens out into the recess of the hollow shaft and can be used to supply rust remover.

The following illustration shows a pressure oil connector for gear units with a hollow shaft and spline:

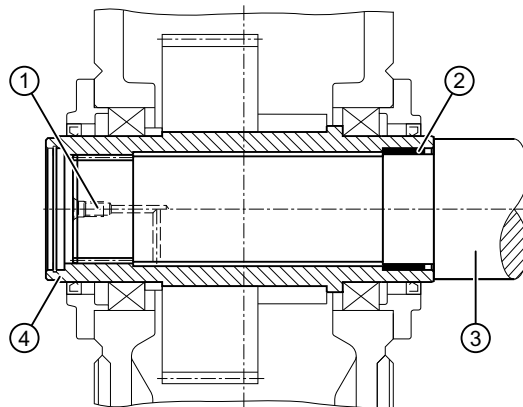


Figure 6-21: Hollow shaft with spline

- | | |
|--------------------------|-----------------|
| ① Pressure oil connector | ③ Machine shaft |
| ② DU bushing | ④ Hollow shaft |

6.7.3 Shaft-mounted gear unit with hollow shaft and shrink disk

6.7.3.1 Mounting a shaft-mounted gear unit on a machine shaft

Mounting with integrated DU bushing



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

NOTE

Risk of damage to shaft sealing rings from cleaning agents

Aggressive chemical cleaning agents may cause damage to shaft sealing rings.

- Do not allow cleaning agents to come into contact with the shaft sealing rings.

Proceed as follows to mount the gear unit with hollow shaft and shrink disk onto the shaft of the driven machine with integrated DU bushing:

1. Observe the information in the Chapter General notes regarding assembly (Page 71).
2. The hollow shaft and the machine shaft must be free of grease.
Use a suitable cleaning agent to remove the corrosion protection from the hollow shaft and the machine shaft.

6.7 Shaft-mounted gear unit with hollow shaft

3. Inspect the hollow shaft and machine shaft for damaged seats and edges.
4. If necessary, rework the components with an appropriate tool and then clean them again.
5. Use suitable hoisting gear to lift the gear unit.
6. Carefully align the hollow shaft with the machine shaft.
7. Secure the gear unit so that it cannot inadvertently move.
8. Mount the gear unit using the nut and threaded spindle.
The gear unit is supported by the end plate in the hollow shaft.
9. Mount the hollow shaft against the machine shaft collar, if necessary.
10. Place the shrink disk on the hollow shaft as specified in the instructions for the shrink disk.
11. Lock the shrink disk to prevent axial misalignment on the hollow shaft.
12. As specified in the shrink disk instructions, the hollow shaft and the journal must be completely free of oil and grease.
13. Fasten the end plate.
14. Connect the hollow shaft with the machine shaft by clamping the shrink disk as specified in the shrink disk instructions.
15. Remove the locking element that prevents the gear unit from making inadvertent movements.

The following diagram shows the preparation for gear units with hollow shaft and shrink disk:

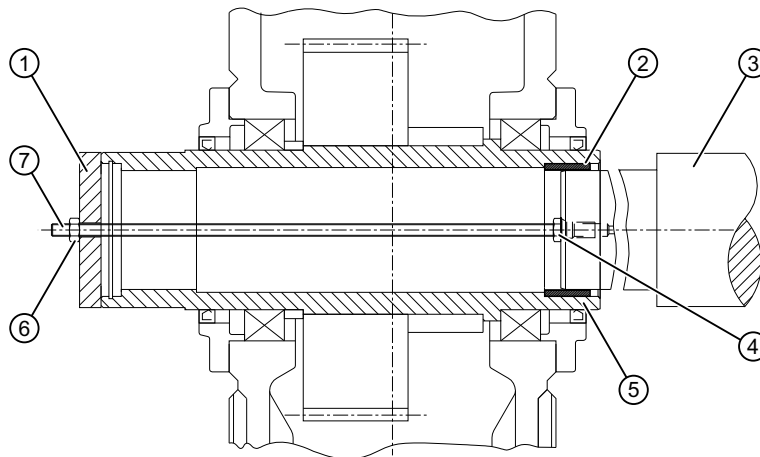


Figure 6-22: Preparation for gear units with hollow shaft and shrink disk

- | | |
|-----------------|--------------------|
| ① End plate | ⑤ Hollow shaft |
| ② DU bushing | ⑥ Nut |
| ③ Machine shaft | ⑦ Threaded spindle |
| ④ Nut | |

Parts 4, 6 and 7 are not included in the scope of supply.

Hydraulic pulling equipment can be used instead of the nut and threaded spindle shown in the diagram.

Mounting with DU bushing as separate component



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

NOTE

Risk of damage to shaft sealing rings from cleaning agents

Aggressive chemical cleaning agents may cause damage to shaft sealing rings.

- Do not allow cleaning agents to come into contact with the shaft sealing rings.

Proceed as follows to mount the gear unit with hollow shaft and shrink disk onto the shaft of the driven machine with a DU bushing as a separate component:

1. Observe the information in the Chapter General notes regarding assembly (Page 71).
2. Use a suitable cleaning agent to remove the corrosion protection from the hollow shaft and the machine shaft.
3. Inspect the hollow shaft and machine shaft for damaged seats and edges.
4. If necessary, rework the components with an appropriate tool and then clean them again.
5. Push the separately supplied DU bushing onto the machine shaft.
6. Use suitable hoisting gear to lift the gear unit.
7. Carefully align the hollow shaft with the machine shaft.
8. Secure the gear unit so that it cannot inadvertently move.
9. Mount the gear unit using the nut and threaded spindle.
The gear unit is supported by the end plate in the hollow shaft.
10. Mount the hollow shaft against the machine shaft collar, if necessary.
11. Place the shrink disk on the hollow shaft as specified in the instructions for the shrink disk.
12. Lock the shrink disk to prevent axial misalignment on the hollow shaft.
13. As specified in the shrink disk instructions, the hollow shaft and the journal must be completely free of oil and grease.
14. Fasten the end plate.
15. Connect the hollow shaft with the machine shaft by clamping the shrink disk as specified in the shrink disk instructions.
16. Remove the locking element that prevents the gear unit from making inadvertent movements.

6.7 Shaft-mounted gear unit with hollow shaft

The following diagram shows the preparation for gear units with hollow shaft and shrink disk:

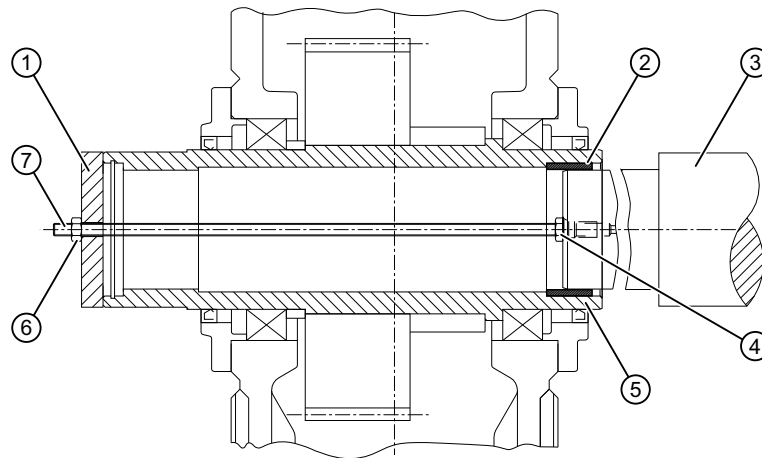


Figure 6-23: Preparation for gear units with hollow shaft and shrink disk

- | | |
|-----------------|--------------------|
| ① End plate | ⑤ Hollow shaft |
| ② DU bushing | ⑥ Nut |
| ③ Machine shaft | ⑦ Threaded spindle |
| ④ Nut | |

Parts 4, 6 and 7 are not included in the scope of supply.

Hydraulic pulling equipment can be used instead of the nut and threaded spindle shown in the diagram.

6.7.3.2 Dismantle the shaft-mounted gear unit on machine shaft

To remove the shaft-mounted gear unit with hollow shaft and shrink disk, proceed as follows:

1. Secure the gear unit in position.
2. Dismantle the shrink disk as specified in the instructions for the shrink disk.
3. Lift the gear unit off the machine shaft using jacking screws until the seats under the shrink disk and the DU bushing are exposed.
4. Use a suitable hoisting gear to lift the gear unit off the machine shaft.

6.8 Coupling and further input and output elements

6.8.1 Information on heating and mounting position of input and output elements

Heating coupling parts or other input and output elements prior to mounting

To heat up the coupling parts or other input and output elements, depending on the order specification, proceed as follows:

1. Refer to the dimension drawings in the coupling instructions for the joining temperatures that are required and the mounting dimensions.
2. Unless otherwise specified in the instructions for the coupling or the other input and output elements, heat the coupling parts inductively with a burner or in a furnace.
 - Use heat shields that are designed to protect against radiant heat in order to safeguard the shaft sealing rings against damage or heating above 100 °C.
3. Quickly fit the coupling parts or the other input and output elements on the shafts.

Mounting couplings or input and output elements

Coupling, input and output elements, and other components that are not fitted properly can damage the gear unit.

1. Use a fitting tool to mount the input and output elements (e.g. coupling part) onto the shafts and lock them securely.
2. Do not use force (hammer blows, etc.) to fit the coupling parts or input and output elements as this can cause internal damage to the gear unit.
3. Take care not to damage the shaft sealing rings or shaft running surfaces when fitting the coupling parts or input and output elements.

Further information

You can find further information about the couplings or other input and output elements in the instructions on couplings or other input and output elements provided in the complete documentation for the gear unit.

Further information on joining temperatures, the connection dimensions and the position of the coupling or other input and output elements can be found on the dimension drawing in the complete documentation for the gear unit.

6.8.2 Mounting the coupling and other input and output elements

CAUTION

Cutting hazard due to sharp edges

Sharp edges on the parallel keyway can cause injuries to the hand.

- Wear protective gloves.

NOTE

Property damage as a result of cleaning agents and shocks

Premature wear and material damage to gear units are possible.

- Protect the shaft against shocks.
- Prevent cleaning agents from coming into contact with the shaft sealing ring.

Follow the information on installing couplings and other input and output elements.

6.8 Coupling and further input and output elements

1. Read the instructions for the corresponding input and output elements. Take note of the procedure for alignment.
2. Do not exceed the maximum permissible offsets.
3. If you must heat up the input and output elements before assembly, observe the permitted ambient temperature.
4. Pull the input and output elements onto the shaft as intended.

Further information

Further information on joining temperatures, the connection dimensions and the position of the coupling or other input and output elements can be found on the dimension drawing in the complete documentation for the gear unit.

6.8.3 Aligning the coupling and other input and output elements

The coupling or other input and output elements must be balanced as specified in the relevant instructions. If necessary, balance the coupling or other input and output elements.

Misalignment might be the result of:

- Failure to accurately align the parts during assembly
- During operation of the system, e.g.:
 - Due to thermal expansion
 - Due to shaft deflection
 - Due to machine frames or substructures that are too soft

If the gear unit and the motor are connected through a motor bell housing, no alignment of the couplings is necessary.

The diagram below illustrates the possible misalignment:

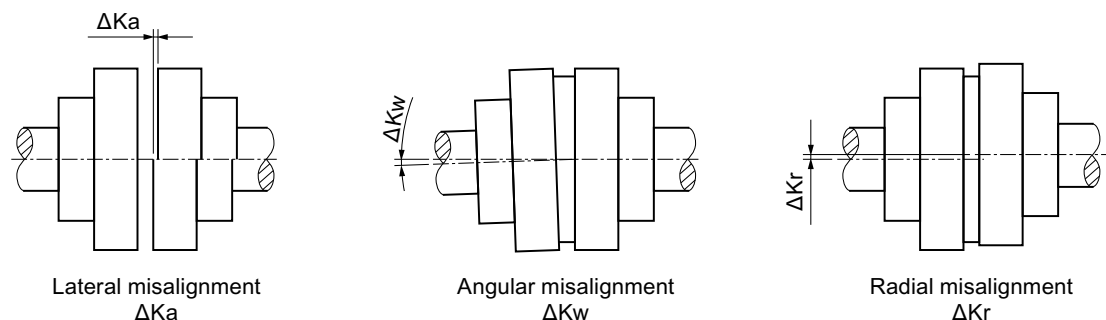


Figure 6-24: Possible misalignment



Information

It is advisable to insert shims or metal sheets under the mounting feet to align the drive components in the vertical direction. It is helpful to use clamping claws with adjusting screws on the foundation to adjust the drive components laterally.

Alignment is carried out in two axis planes that are vertical with respect to one another. This is possible using rulers (radial offset) and feeler gauges (angular offset) as shown in the diagram. You will achieve a greater degree of alignment accuracy by using a dial gauge or laser alignment system.

The following diagram shows the alignment process using the example of a flexible coupling:

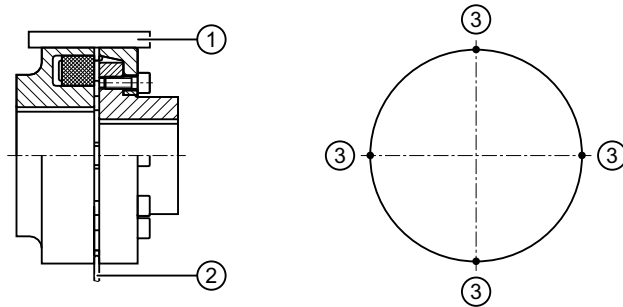


Figure 6-25: Alignment, based on the example of a flexible coupling

- ① Ruler
- ② Measuring points
- ③ Feeler gauge

Further information

Further information about alignment errors for coupling supplied by Flender can be found in the relevant instructions for the coupling in the complete documentation for the gear unit.

For further information on using couplings from other manufacturers, ask the manufacturer which alignment errors are permissible, making sure that you specify the radial loads that occur.

You can find further information about couplings in the related coupling instructions.

6.9 Gap dimension at grease labyrinth

NOTE

Sparking and wear due to insufficient gap

An insufficient gap dimension can cause sparking, inadmissible temperature rise and shaft seal wear.

- Ensure that the set gap dimension at the grease labyrinth is maintained.
- Rotating and stationary parts must not touch.

6.10 Mounting and dismantling the belts

The gap is preset. The gap may change while work is performed on the coupling, the Taconite seal or Tacolab seal.

1. Ensure that the set gap dimension of $1^{+0.5}$ mm is maintained at grease labyrinth.

The following figure shows the gap dimension at the grease labyrinth:

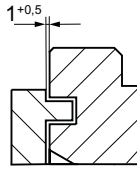


Figure 6-26: Gap dimension at grease labyrinth

Further information

Detailed information on regreasing of the grease labyrinth can be found in the dimension drawing.

6.10 Mounting and dismantling the belts

CAUTION

Risk of crushing between the belt and motor bracket

There is a risk of being crushed between the belt and the motor bracket.

- Screw the nuts on the threaded rods of the motor bracket alternately upwards and downwards.
- Mount the protective cover after working.

Mounting the belts

1. Switch off the machine before starting work and secure the machine against it being switched on again.
2. Before starting work, ensure that the gear unit is unladen and de-energised.
3. Remove the protective cover.
4. Clean the belts and belt pulleys.
All components that transmit power must be clean and free of grease.
5. Place the belt on the belt pulley.
The number of belts to be fitted may vary in number depending on the power class of the drive system.
6. Screw the nuts on the threaded rods of the motor bracket alternately and upwards.
7. Ensure the necessary preload force.
8. Check that the preload force is evenly absorbed.
9. Ensure that the belt has worn evenly.
10. Mount the protective cover.

Removing the belts

1. Switch off the machine before starting work and secure the machine against it being switched on again.
2. Before starting work, ensure that the gear unit is unladen and de-energised.
3. Remove the protective cover.
4. Slowly and steadily remove the weight from the belt to avoid injury.
Do this by screwing the nuts on the threaded rods of the motor bracket alternately and downwards.
5. Remove the belt.
6. Mount the protective cover.

6.11 Connecting components

6.11.1 Connecting electrical components

The following electrical components can be connected depending on the order specification:

- Heating element
- Motor pump
- Motor fan
- Air-oil cooler
- Water-oil cooler
- Separate oil supply system
- Further electrical components



WARNING

Electric shock due to live parts

Death or serious injury

- Carefully observe the five safety rules in the safety information chapter.
- Ensure that the entire system is disconnected from the power supply before starting electrical installation work.

Connect electrical components as follows:

1. Ensure that the connections of the electrical components are not damaged.
2. Connect the electrical components according to the terminal diagram and the relevant instructions.
3. Insulate all cable entry points (glands) at electrical components according to the operating environment.

Further information

You can find further information about the electrical connections in the terminal diagrams, lists of equipment and instructions for the electrical components in the complete documentation for the gear unit.

6.11.2 Connecting the monitoring devices

The following monitoring devices can be connected depending on the order specification:

- Pressure monitoring
- Resistance thermometer
- Temperature monitor
- Shock-pulse transducer
- Accelerometer
- Oil-level indication system
- Further monitoring devices

To connect the monitoring device to the gear unit, proceed as follows:

1. Make sure that the monitoring device connection is not damaged.
2. Wire up the monitoring device electrically to the evaluation unit supplied by the customer.

Further information

You can find further information about the monitoring device in the monitoring device instructions in the complete documentation for the gear unit.

6.11.3 Attaching the speed monitoring of the auxiliary drive

WARNING

Severe personal injury as a result of the auxiliary drive bursting

If the overrunning system develops a fault, due to the high resulting speeds, the auxiliary drive can suddenly break apart explosively.

- Only operate an auxiliary drive with speed monitoring.

NOTE

Overload of the auxiliary drive

Destruction or damage of the maintenance auxiliary drive as a result of overload.

- The machine may only be driven by the maintenance auxiliary drive when operating under no-load operation.

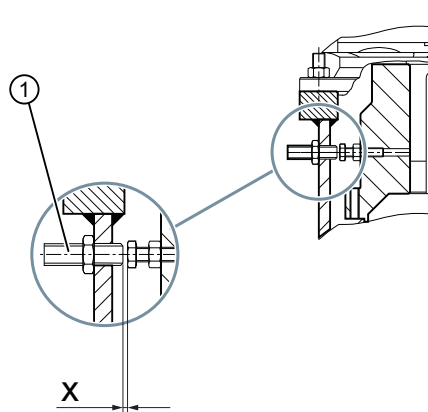


Figure 6-27: Auxiliary drive speed encoder

- ① Pulse encoder for speed monitoring

A threaded hole is provided at a suitable location in the intermediate flange to attach the pulse encoder. Dimension "x" depends on the data of the device manufacturer. The pulse encoder must be able to be mounted flush.

1. Switch the speed monitoring so that the main drive is automatically switched off at a speed "> zero" on the shaft of the auxiliary drive.
2. Check the shutdown function at regular intervals.

6.11.4 Connect the gear unit to the terminal boxes

1. Wire all pre-wired components as shown on the circuit diagram in the terminal boxes.

Further information

You can find further information about pre-wired components in the order-specific list of equipment in the complete gear unit documentation.

6.11.5 Guard for gear units with fan

If you install guards for the coupling or other components on the high-speed shaft of a gear unit with fan, take note of the following:

1. Ensure that there is sufficient clearance at the intake opening for the cooling air.
2. Ensure the clearance specified in the dimension drawing, which is part of the complete documentation of the gear unit.

6.11.6 Connecting the cooling coil

To connect the cooling coil to the gear unit, proceed as follows:

- Observe the conditions for the cooling water (Page 60).
- Do not loosen the locknuts. Observe the information in the Chapter on Cooling coil (Page 48).

6.11 Connecting components

- Make sure that the reducer screws are not removed or re-tightened.
1. Before connecting the cooling coil, remove the sealing plugs from the connection sleeves.
 2. Flush through the cooling coil to remove any dirt or contaminants. Do not use any sharp objects when cleaning.
 3. Connect the cooling water inlet and drain lines. Refer to the dimension drawing for the position of the connections.

Further information

You can find further information about connection dimensions and cooling water parameters in the dimension drawing in the complete documentation for the gear unit.

6.11.7 Connecting the air-oil cooler

WARNING

Compressed air can cause injuries

Water residue and dirt particles can cause damage to eyes.

- Wear suitable eye protection.



Information

Observe the flow direction of the pump

When connecting the valves, observe the flow direction of the pump.

Refer to the pump instructions in the complete gear unit documentation to ascertain whether the flow direction of the pump used depends on the direction of rotation.

To connect the air-oil cooler to the gear unit, proceed as follows:

- Observe the information provided in the Chapter Attached oil supply system with air-oil cooler (Page 38).
 - When installing a gear unit with attached air-oil cooler, carefully ensure that air can freely circulate.
The necessary minimum clearance to adjacent components such as walls and panels is specified in the dimension drawing in the complete documentation for the gear unit.
1. Make sure that air can circulate freely before you connect up the air-oil cooler.
 2. Blast the air-oil cooler with compressed air.
 3. Connect the electric wiring of the contamination indicator of the double change-over filter and the pressure monitoring (only for correspondingly equipped gear units).
 4. Connect the electric wiring of the fan motor.

Further information

You can find further information about the air-oil cooler in the instructions for the air-oil cooler contained in the complete documentation for the gear unit.

6.11.8 Connecting the water-oil cooler



Information

Observe the flow direction of the pump

When connecting the valves, observe the flow direction of the pump.

Refer to the pump instructions in the complete gear unit documentation to ascertain whether the flow direction of the pump used depends on the direction of rotation.

To connect the water-oil cooler to the gear unit, proceed as follows:

- Observe the Chapter Attached oil supply system with water-oil cooler (Page 38) and Information on cooling water (Page 60).
 - The operator must provide the required cooling water connection.
 - Maintain the specified flow direction of the water-oil cooler so that an optimum cooling power is achieved. Do not mix up the cooling water intake and cooling water return.
1. Remove the sealing pipe sleeves from the cooling water connection before connecting the water-oil cooler.
 2. Flush the water-oil cooler to remove any dirt or contaminants.
 3. Connect the cooling water supply line and cooling water return line.
Refer to the dimension drawing for the direction of flow and the position of the connections.
 4. Connect the electric wiring of the pressure monitoring (only for appropriately equipped gear units).

Further information

You can find further information about the water-oil cooler in the water-oil cooler instructions in the complete documentation for the gear unit.

6.11.9 Connecting the heating element

Make sure that the heating element is fully immersed in the oil bath in the following way:

- Maintain the mounting position.
- Carefully observe the oil quantity (Page 156).

To connect the heating element to the gear unit, proceed as follows:

1. Check that the heating element connection is not damaged.
2. Connect the oil-temperature monitoring system in the oil sump.
3. Electrically wire the heating element.

Further information

Further information on the heating element can be found in the heating element instructions contained in the complete documentation for the gear unit.

Further information on the mounting position of the heating element can be found in the dimension drawing in the complete documentation for the gear unit.

6.11.10 Connecting the separate oil supply system

To connect the oil supply system to the gear unit, proceed as follows:

1. Remove the dummy flange from the suction and pressure pipe before connecting the system.
2. Make the hose or pipe connections for suction and pressure side between the oil supply system and the gear unit.
3. Connect the oil supply system to the gear unit in accordance with the dimension drawings in the complete documentation and install the oil supply system as a separate system.
4. When assembling the system, make sure that the pipework is not subjected to mechanical stresses.

Further information

Further information about the oil supply system as per scope of supply can be found in the oil supply system instructions contained in the complete documentation for the gear unit.

6.11.11 Connecting the motor pump



Information

Observe the flow direction of the pump

When connecting the valves, observe the flow direction of the pump.

Refer to the pump instructions in the complete gear unit documentation to ascertain whether the flow direction of the pump used depends on the direction of rotation.

To connect the motor pump, proceed as follows:

1. Make sure that the connections of the motor pump are not damaged.
2. Connect the motor pump according to the terminal diagram and the relevant instructions.

Further information

You can find further information about the motor pump in the terminal diagram and the list of equipment provided in the complete documentation for the gear unit.

6.11.12 Mounting the backstop

If a backstop is to be fitted, contact FlenderCustomer Service (Page 147).

Pay attention to the direction of rotation when connecting a motor. If you wish to change the blocking direction, contact Flender Customer Service.

6.11.13 Connecting the motor

NOTE

Property damage due to incorrect direction of rotation of the motor

The backstop and gear unit may be damaged if operated in the wrong direction of rotation.

- Do not operate the motor adversely to the blocking direction of the gear unit.
- Observe the note attached to the gear unit.

**Information**

When driven by the auxiliary drive, the high-speed shaft of the main gear unit also slowly rotates. Do not prevent this rotary motion. A brake located in the main drive must be released when driven by the auxiliary drive.

**Information**

Electrically interlock the main motor and the auxiliary drive motor so that only one of the two motors can be switched on.

Perform the following steps before connecting the motor electrically:

1. Before connecting the motor, determine the phase sequence of the three-phase mains using a phase sequence indicator.
2. Connect the motor corresponding to the defined direction of rotation.
3. Observe the note on the gear unit regarding the direction of rotation.
4. Observe the details regarding speed on the gear unit rating plate.

6.12 Properties of the bolts and mating threads

Bolts

**Information****Replacing bolts**

Replace any bolts that are no longer fit for use by bolts of the same type and strength class.

The bolts must have the following properties:

- Made of steel
- Black-annealed or phosphatised
- Lightly oiled (do not add additional oil)

Mating threads

**Information****Using a lubricant**

As a rule, lubricants may not be used, because this can result in the bolt connection becoming overloaded.

The mating threads must have the following properties:

- Made of steel or cast iron
- Dry, cut threads

6.13 Bolt connection classes

NOTE

Damage to gear unit due to lack of stability

Incorrect connections can cause damage to the gear unit.

- Always use fastening screws with a minimum strength class of 8.8.
- Tighten fastening bolts and nuts with the specified tightening torque.

For screwing fastening bolts, note the information in the following table:

Fastening of	Bolt connection class	Range of the torque exerted by the tool	Tightening procedure
Gear unit Torque arm	C	$\pm 5\%$ to $\pm 10\%$	• Hydraulic tightening with mechanical screwdriver • Torque-controlled tightening with a torque wrench or a signal-emitting torque spanner • Tightening with a precision mechanical screwdriver with dynamic torque measurement
	D	$\pm 10\%$ to $\pm 20\%$	• Torque-controlled tightening with mechanical screwdriver
Protective cover Canopy	E	$\pm 20\%$ to $\pm 50\%$	• Tightening with an impact wrench or impact driver, without adjustment checking device • Tightening by hand, using a spanner without torque measuring device

Table 6-5 : Information on screwing fastening bolts

Tighten the foundation bolts, hub bolts and bearing cover bolts in accordance with bolt connection class "C".

Further information

You can find further information about tightening torques and the fastening of order-specific components such as the motor and brake in the instructions from the particular manufacturer.

6.14 Tightening torques and preload forces

6.14.1 Tightening torques and preload forces for general connections

The specified bolt connections must be tightened to the tightening torques stated in the table below.

The tightening torques apply to friction values of $\mu_{\text{total}} = 0.14$.

The following table lists the preload forces and tightening torques for bolt connections, strength classes 8.8; 10.9; 12.9:

Nominal thread diameter	Strength class of the bolt	Preload force for bolt connection classes from table in the Chapter Bolt connection classes (Page 114)			Tightening torque for bolt connection classes from table in the Chapter Bolt connection classes (Page 114)		
d mm		C	D	E	C	D	E
		$F_{M \text{ min.}}$ N			M_A Nm		
M10	8.8	18,000	11,500	7,200	44.6	38.4	34.3
	10.9	26,400	16,900	10,600	65.4	56.4	50.4
	12.9	30,900	19,800	12,400	76.5	66.0	58.9
M12	8.8	26,300	16,800	10,500	76.7	66.1	59.0
	10.9	38,600	24,700	15,400	113	97.1	86.6
	12.9	45,100	28,900	18,100	132	114	101
M16	8.8	49,300	31,600	19,800	186	160	143
	10.9	72,500	46,400	29,000	273	235	210
	12.9	85,000	54,400	34,000	320	276	246
M20	8.8	77,000	49,200	30,800	364	313	280
	10.9	110,000	70,400	44,000	520	450	400
	12.9	129,000	82,400	51,500	609	525	468
M24	8.8	109,000	69,600	43,500	614	530	470
	10.9	155,000	99,200	62,000	875	755	675
	12.9	181,000	116,000	72,500	1,020	880	790
M30	8.8	170,000	109,000	68,000	1,210	1,040	930

6.14 Tightening torques and preload forces

Nominal thread dia- meter	Strength class of the bolt	Preload force for bolt connection classes from table in the Chapter Bolt connection classes (Page 114)			Tightening torque for bolt connec- tion classes from table in the Chapter Bolt connection classes (Page 114)		
		C	D	E	C	D	E
		$F_{M \min.}$ N			M_A Nm		
M30	10.9	243,000	155,000	97,000	1,720	1,480	1,330
	12.9	284,000	182,000	114,000	2,010	1,740	1,550
M36	8.8	246,000	157,000	98,300	2,080	1,790	1,600
	10.9	350,000	224,000	140,000	2,960	2,550	2,280
	12.9	409,000	262,000	164,000	3,460	2,980	2,670
M42	8.8	331,000	212,000	132,000	3,260	2,810	2,510
	10.9	471,000	301,000	188,000	4,640	4,000	3,750
	12.9	551,000	352,000	220,000	5,430	4,680	4,180
M48	8.8	421,000	269,000	168,000	4,750	4,090	3,650
	10.9	599,000	383,000	240,000	6,760	5,820	5,200
	12.9	700,000	448,000	280,000	7,900	6,810	6,080
M56	8.8	568,000	363,000	227,000	7,430	6,400	5,710
	10.9	806,000	516,000	323,000	10,500	9,090	8,120
	12.9	944,000	604,000	378,000	12,300	10,600	9,500
M64	8.8	744,000	476,000	298,000	11,000	9,480	8,460
	10.9	1,060,000	676,000	423,000	15,600	13,500	12,000
	12.9	1,240,000	792,000	495,000	18,300	15,800	14,100
M72x6	8.8	944,000	604,000	378,000	15,500	13,400	11,900
	10.9	1,340,000	856,000	535,000	22,000	18,900	16,900
	12.9	1,570,000	1,000,000	628,000	25,800	22,200	19,800
M80x6	8.8	1,190,000	760,000	475,000	21,500	18,500	16,500
	10.9	1,690,000	1,100,000	675,000	30,500	26,400	23,400
	12.9	1,980,000	1,360,000	790,000	35,700	31,400	27,400
M90x6	8.8	1,510,000	968,000	605,000	30,600	26,300	23,500
	10.9	2,150,000	1,380,000	860,000	43,500	37,500	33,400
	12.9	2,520,000	1,600,000	1,010,000	51,000	43,800	39,200
M100x6	8.8	1,880,000	1,200,000	750,000	42,100	36,200	32,300
	10.9	2,670,000	1,710,000	1,070,000	60,000	51,600	46,100
	12.9	3,130,000	2,000,000	1,250,000	70,000	60,400	53,900

Table 6-6 : Preload forces and tightening torques

6.14.2 Tightening torques for flange shaft, mounting flange and block flange

The fastening bolts with the specified tightening torques are for the flange shaft, mounting flange and block flange.

The following table lists tightening torques for flange shaft, mounting flange and block flange with strength class 10.9:

Bolt size	Bolt DIN 931	Nut DIN 934	Tightening torque in Nm
M12	10.9	10	125
M16	10.9	10	310
M20	10.9	10	610
M24	10.9	10	1 050
M30	10.9	10	2 100
M36	10.9	10	3 560
M42	10.9	10	5 720

Table 6-7 : Tightening torques for flange shaft, mounting flange and block flange

6.15 Final work

Once all the elements have been mounted and connected, perform the following final work:

1. Check whether all devices dismantled for transportation have been reassembled.
2. Remove the sling swivels that were used for transport.
3. Check all bolt connections for tightness after installation of the gear unit has been completed.
4. Check the alignment after tightening the fastening elements. The alignment must not have changed in any way.
5. Lock the oil drainage valves against accidental opening.
6. Protect the gear unit against falling objects.
7. Check that the guards over rotating parts are securely fastened.
Contact with rotating parts is not permitted.
8. Check whether transport locks and protective guards of components have been removed from components.
9. Protect any oil level gauges from damage.
10. Establish the appropriate potential equalisation connections. If no threaded holes are available on the gear unit for an earth connection, please take suitable alternative measures. This work must be carried out by specialists in electrical engineering.
11. Protect the cable entries against penetrating moisture.
12. Properly remount components that have been unfastened or removed (cover plate, screw plugs, protective covers, etc.).
13. If safety devices have tripped, cancel a restarting lockout before recommissioning.

Further information

You can find further information about the gear unit and all mounted or separately supplied components in the instructions of the relevant components included in the complete documentation for the gear unit.

You can find further information about the technical specifications in the separate data sheet contained in the complete documentation for the gear unit.

7.1 List of the measures prior to commissioning

WARNING

Risk of being pulled in by belt drive

There is danger that an open belt drive may pull you in.

- Switch off the machine before starting work and secure the machine against it being switched on again.
- Before starting work, ensure that the gear unit is unladen and de-energised.
- Mount the protective cover before switching on the gear unit.

CAUTION

Risk of injury due to chemically aggressive operating materials

There is a risk of injury to eyes and hands when handling chemically corrosive consumables.

- Please observe the safety information in the data sheets of the oil used.
- Wear suitable protective equipment, such as gloves and safety glasses.
- Immediately clean up any spilt oil using a binding agent.

Take the following measures before commissioning the gear unit:

1. Observe the complete documentation and especially Instructions 7300 with regards to oil, the oil filter and the wet-air filter.
2. Replace the screw plug with the air filter or the wet-air filter.
3. Gear unit with labyrinth seals:
Remove any tape which may be on the seals.
4. Check that the guards over rotating parts (e.g. air guide cover) are securely fastened.
5. Ensure that all pipework and hose lines are connected.
6. Fill the gear unit with oil.
7. Gear unit with oil supply system:
Check that the oil supply system is working properly.
8. Check the oil level.
If several components for measuring are mounted, the oil dipstick should be regarded as the most reliable.
9. Check the gear unit for leaks.
10. Gear unit with Taconite or Tacolab seals:
Ensure that the gap (Page 105) is maintained.
11. Check whether the monitoring devices are connected and switched on.
12. Gear units with backstop:
Note the measures for gear units with backstops (Page 120).
13. Gear unit with auxiliary drive:
Note the measures for gear units with auxiliary drives (Page 122).

7.2 Measures prior to commissioning for additional components

14. Gear unit with oil-level indication system:
Note the measures for the oil-level indication system (Page 123)
15. Gear unit with cooling coil:
Note the measures for gear units with cooling coil (Page 123).
16. Gear unit with heating element:
Note the measures for gear units with heating elements (Page 124).
17. Gear unit with oil supply system:
Take the appropriate measures before commissioning gear units with an oil supply system (Page 124).
18. Ensure that all pipework and components are filled with oil.
19. Gear units with torque-limiting backstop:
Check dimension " $X_{min.}$ ". Note the measures for gear units with torque-limiting backstops (Page 121).
20. Gear unit with belt drive:
Ensure that the protective cover is mounted over the belt drive.
21. At temperatures under -30 °C :
preheat the gear unit for at least 6 hours.

Further information

Further information about individual components can be found in the instructions for the components in the complete documentation for the gear unit.

7.2 Measures prior to commissioning for additional components

7.2.1 Measures for gear units with backstop

NOTE

Property damage due to incorrect direction of rotation of the motor

The backstop and gear unit may be damaged if operated in the wrong direction of rotation.

- Do not operate the motor adversely to the blocking direction of the gear unit.
- Observe the note attached to the gear unit.

CAUTION

Risk of injury due to chemically aggressive operating materials

There is a risk of injury to eyes and hands when handling chemically corrosive consumables.

- Please observe the safety information in the data sheets of the oil used.
- Wear suitable protective equipment, such as gloves and safety glasses.
- Immediately clean up any spilt oil using a binding agent.

Take the following measures prior to commissioning the gear unit with backstop:

1. Follow the list of measures prior to commissioning.
2. Read and observe the Instructions 7300.
3. Remove the screw plug from the backstop.
4. Fill the oil through a fill filter via the oil filling plug.
5. Fill with the quantity of oil as specified on the information notice.
Use the same oil type and oil viscosity as for the gear unit itself.
6. Screw the screw plug back in again.
7. Check that the backstop can be easily rotated in the free-wheeling direction without having to exert excessive force. When doing this, observe the direction of rotation arrows on the gear unit.
8. Before connecting the motor, identify the phase sequence of the three-phase power system using an indicator for the phase sequence direction.
Connect the motor corresponding to the defined direction of rotation.

7.2.2 Measures for gear units with torque-limiting backstops

The following diagram shows a torque-limiting backstop:

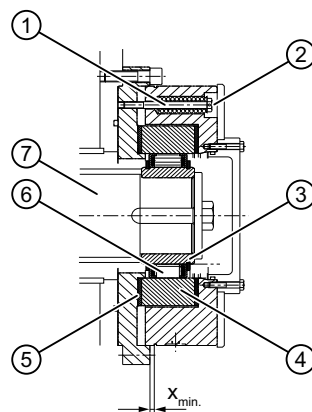


Figure 7-1: Torque-limiting backstop

- | | |
|---------------------------------------|-------------------------------|
| ① Guide screw with compression spring | ⑤ Friction lining |
| ② Safety wire | ⑥ Cage with sprags |
| ③ Inner ring | ⑦ Shaft (intermediate flange) |
| ④ Outer ring | |

The backstop can be damaged or destroyed by overheating.

Check dimension " $x_{min.}$ ". Do not allow the dimension to fall below the limit value " $x_{min.}$ " as stated on the backstop rating plate.

Further information

You can find further information on the torque-limiting backstop in the instructions for the torque-limiting backstop, which are part of the complete documentation of the gear unit.

7.2.3 Measures for gear units with auxiliary drive

WARNING

Serious injury caused by bursting of auxiliary drive

If the overrunning system develops a fault, the auxiliary drive may be destroyed due to overspeeds.

- Use speed monitoring.

CAUTION

Hearing loss due to excessive emission sound pressure level

During operation, an emission sound pressure level of 80 dB (A) may be exceeded. This may result in tinnitus or hearing loss.

- Wear hearing protection.

CAUTION

Risk of injury due to chemically aggressive operating materials

There is a risk of injury to eyes and hands when handling chemically corrosive consumables.

- Please observe the safety information in the data sheets of the oil used.
- Wear suitable protective equipment, such as gloves and safety glasses.
- Immediately clean up any spilt oil using a binding agent.

NOTE

Property damage due to incorrect direction of rotation of the motor

The backstop and gear unit may be damaged if operated in the wrong direction of rotation.

- Do not operate the motor adversely to the blocking direction of the gear unit.
- Observe the note attached to the gear unit.

Take the following measures before commissioning a gear unit with auxiliary drive:

1. Follow the list of measures prior to commissioning.
2. Please observe the details provided in the auxiliary drive instructions and Instructions 7300.
3. Remove the screw plug from the overrunning clutch.
4. Fill the overrunning clutch with oil via the intermediate flange and using a fill filter.
Use the same oil type and viscosity as for the gear unit itself.
5. Screw the screw plug back in again.
6. If required, release the brake on the auxiliary motor.
7. Check that the overrunning clutch can be easily rotated in the free-wheeling direction without having to exert excessive force.
To do this, rotate the motor shaft of the auxiliary drive in the direction opposite to that of the rotation arrow on the gear unit.

8. Before connecting the motor, identify the phase sequence of the three-phase mains using a phase sequence instrument.
Connect the motor corresponding to the defined direction of rotation.
9. Electrically interlock the main motor and the auxiliary motor so that only one of the two motors can be switched on at the same time.
10. For auxiliary drives designed as maintenance drive:
Check the shutdown function of the speed monitoring (Page 139).

Further information

You can find further information about the auxiliary drive in the auxiliary drive instructions provided in the complete documentation for the gear unit.

7.2.4 Measures for gear units with an oil-level indication system

Please observe the following measures to commission the gear unit with oil-level indication system:

1. Follow the list of measures prior to commissioning.
2. Connect the signal so that the drive motor cannot start when the “oil level too low” signal is given.
3. Connect the signal so that an alarm is output when the “oil level too low” signal is active.
4. Bypass any pending signal during operation.

7.2.5 Measures for gear units with cooling coil



Information

To prevent the formation of condensation, make sure that the cooling coil is fully immersed in the oil.

Implement the following measures before commissioning the gear unit with cooling coil:

1. Follow the list of measures prior to commissioning.
2. Check that connecting pipes are firmly seated and there is no leakage.
3. Fully open the shutoff valves in the coolant inflow and outflow lines of the coolant system.
4. Make sure that the pressure in the cooling coil does not exceed the maximum permissible pressure.
5. Make sure that the temperature of the cooling water is not higher than the maximum permissible value.
6. Make sure that the temperature of the cooling water is no higher than 4 °C.

Further information

You can find further information about connection dimensions and cooling water parameters in the dimension drawing in the complete documentation for the gear unit.

7.2.6 Measures for gear units with heating elements

WARNING

An exposed heating element poses a fire hazard

Insufficient minimum coverage of the heating element by gear oil can result in a fire.

- Only commission the heating element if the required minimum oil quantity can be ensured in the gear unit.

Take the following measures when commissioning gear units with heating elements:

1. Follow the list of measures prior to commissioning.
2. Maintain the oil level as specified by Flender.
3. Check the switching points of the temperature monitor.

Further information

Further information on the heating element can be found in the heating element instructions contained in the complete documentation for the gear unit.

7.2.7 Measures for gear units with oil supply system

CAUTION

Hearing loss due to excessive emission sound pressure level

During operation, an emission sound pressure level of 80 dB (A) may be exceeded. This may result in tinnitus or hearing loss.

- Wear hearing protection.

NOTE

Damage to the gear unit caused by inadequate or complete loss of lubrication or insufficient cooling

The gear unit can sustain damage as a result of inadequate or complete loss of cooling or lubrication.

- Fully open the shutoff valves in the coolant inflow and outflow lines of the coolant system.
- Check that the connecting pipes are firmly seated and tight.

Take the following measures before commissioning the gear unit with an oil supply system:

1. Follow the list of measures prior to commissioning.
2. Oil supply system with motor pump:
Using the oil supply system, lubricate the gear unit for 2 minutes using a pre-lubrication phase. During this time, the rolling-contact bearings and gearing are supplied with sufficient oil for starting.

3. Make sure that the pressure in the oil supply system components does not exceed the maximum permissible pressure.
4. Ensure that the maximum permissible temperature of the oil supply system components is not exceeded.

Further information

You can find further information about the oil supply system in the data sheet, in the list of equipment and in the oil supply system instructions provided in the complete gear unit documentation.

Measures for oil supply systems with water-oil coolers

WARNING

Compressed air can cause injuries

Water residue and dirt particles can cause damage to eyes.

- Wear suitable eye protection.

Improper use can damage the gear unit. Take the following precautions:

1. Observe the Requirements for cooling water (Page 60).
2. Maintain the specified flow direction of the water-oil cooler so that an optimum cooling power is achieved. Do not interchange the cooling water intake and outlet.
3. If there is a risk of freezing temperatures or in case of prolonged downtime of the gear unit, drain the cooling water. Blow any water residue out with compressed air.

7.3 List of measures during commissioning

CAUTION

Hearing loss due to excessive emission sound pressure level

During operation, an emission sound pressure level of 80 dB (A) may be exceeded. This may result in tinnitus or hearing loss.

- Wear hearing protection.

CAUTION

Risk of injury due to chemically aggressive operating materials

There is a risk of injury to eyes and hands when handling chemically corrosive consumables.

- Please observe the safety information in the data sheets of the oil used.
- Wear suitable protective equipment, such as gloves and safety glasses.
- Immediately clean up any spilt oil using a binding agent.

Take the following measures when commissioning the gear unit and document them:

7.3 List of measures during commissioning

1. Check that all rotating parts are free to move.
2. Check that the connecting pipes are firmly seated and tight.
3. Check the oil level.
4. Check whether the shutoff valves are open.
Check that all of the oil drain valves are closed.
Ensure that all of the other shutoff valves are open.
5. For a gear unit with an oil-level indication system:
Connect the signal so that the drive motor cannot start and an alarm is output when the "oil level too low" signal is given. Bypass any pending signal during operation.
6. For a gear unit with an oil supply system:
Check that the oil supply system is working properly.
7. Check for leakage at the shaft seals on the gear unit.
8. Bypass the pressure monitoring signal for around 20 seconds during commissioning.
This is necessary as the pressure in the gear unit must first stabilise. If the oil pressure has still not built up after 20 seconds, you can extend this period slightly in consultation with the manufacturer.
9. Measure the oil sump temperature (Page 133) after the gear unit has run in.
10. For a gear unit with bearing monitoring based on vibration measurement:
Measure the vibration levels of the rolling-contact bearings to create initial and comparison values.
11. For a gear unit with bearing monitoring using a Pt 100 resistance thermometer:
Measure the temperature at the rolling-contact bearings to create initial and comparison values.

Further information

You can find further information on the topic of oil in Instructions 7300, which are part of the complete documentation of the gear unit.

Further information about the oil supply system as per scope of supply can be found in the oil supply system instructions contained in the complete documentation for the gear unit.

8.1 Operating data

To achieve correct, trouble-free operation of the system, observe the operating values of the gear unit.

Depending on the order specification, also observe the data in the instructions for the oil supply system.

Oil temperature

The following operating values apply to the oil:

Maximum operating temperature	90 °C	Applicable for mineral oils (API groups I and II) and synthetic ester
	100 °C	Applicable for partially synthetic oils, PAO and PG oils
Maximum operating temperature (For brief periods)	100 °C	Applicable for mineral oils (API groups I and II) and synthetic ester
	110 °C	Applicable for partially synthetic oils, PAO and PG oils

Table 8-1 : Operating values, oil temperature

Cooling water pressure

The following operating values apply to the cooling water:

Maximum water pressure in the cooling coil	5.0 bar	
Maximum water pressure in the water-oil cooler	8.0 bar	Depending on the order, the cooling water pressure may be approved.

Table 8-2 : Operating values, cooling water

Further information

Further information on the operating values can be found in the contractual agreements, in the data sheet, in the list of equipment, in the dimension drawing or in the instructions for the cooling components in the complete documentation for the gear unit.

8.2 Rectify any irregularities

NOTE

Faults can cause damage to the gear unit

The gear unit might sustain damage if it is not shut down when a fault occurs.

- Switch off the drive aggregate immediately if any fault occurs.

A few irregularities are listed below as examples:

- Oil temperature exceeds the maximum permissible value
- Alarm tripped by the pressure monitoring in the oil cooling system or oil supply system
- Unusual operating noise
- Failure of the oil supply system

Proceed as follows to rectify any irregularities in operation:

1. Switch off the drive aggregate.
2. Refer to the Fault information (Page 141) table to find the cause of the fault.
3. If you still cannot determine the cause of the fault, contact Flender Customer Service (Page 147).
4. After safety devices have been activated and before restarting: First release a restarting lockout.

8.3 Shut down

If you shut down the unit for a prolonged period, you must take the following measures depending on the length of time that the gear unit will remain out of service:

1. Switch off the drive aggregate.
2. Take measures to preserve the gear unit if it is to be taken out of service for a prolonged period. Follow the procedure described in Instructions 7300. Oil filling must not be used as a means of preserving the interior of gear units with a labyrinth seal, Tacolab seal or grease-lubricated rolling-contact bearings.

Gear unit with cooling coil or water-oil cooler

WARNING

Compressed air can cause injuries

Water residue and dirt particles can cause damage to eyes.

- Wear suitable eye protection.

For gear units with cooling coil or a water-oil cooler, take the following additional measures before applying a preservative to the gear unit:

1. Close the shutoff valves for the cooling water inlet and drain lines.
2. If there is a risk of frost or the unit is to be taken out of service for a prolonged period, drain the water from the cooling coil or the water-oil cooler and remove residual water with compressed air.

Gear units with a separate oil supply system or a separate oil cooling system

For gear units with a separate oil supply system or separate oil cooling system, perform these additional measures before applying a preservative to the gear unit:

1. Disconnect the gear unit from the separate oil supply system or separate oil cooling system.
2. Seal the openings in the gear unit, separate oil supply system and separate oil cooling system so that they are air-tight.

9.1 General maintenance information

The operator must ensure compliance with the stipulated time limits. This also applies if the maintenance activities are included in the operator's internal maintenance schedules.

The gear unit could be damaged if the stipulated intervals for maintenance and servicing work are not observed.

The time limits stipulated in the maintenance schedule are largely dependent on the conditions of use of the gear unit. For this reason, it is only possible to state average time limits here. These refer to the following conditions of use:

- Daily operating time 24 h
- ON duration "ED" 100%
- Speed of the high-speed shaft 1,500 rpm
- Average oil temperature in the oil sump (see Instructions 7300)

9.2 Maintenance schedule

Maintenance and servicing activities

The following table provides an overview of all maintenance and servicing activities that you are required to perform on an ongoing basis or at regular intervals.

Intervals and time limits	Measures
As required	Replace the wet-air filter Clean the air filter Clean the fan and gear unit
According to manufacturer's specifications	Check flange pump bearings (see flange pump instructions for interval) Check the belts (see belt instructions for interval)
Daily	Check the oil temperature Check the oil pressure (if pressure lubrication is fitted) Check for changes in the gear unit noise Check the water pressure
Monthly and prior to every start-up	Check for leaks Check the oil level

9.2 Maintenance schedule

Intervals and time limits	Measures
400 operating hours after commissioning	Check the water content of the oil Change the oil (or depending on results of the oil sample test) Check the condition of the oil-level monitoring system (in time with oil change) Check that the fastening bolts are tight
Every 3 months	Clean the oil filter Clean the air filter Clean the air release screw
Every 3,000 operating hours	Measure the vibration levels of the rolling-contact bearings
Every 3,000 operating hours, at least every 6 months	Regrease Taconite seals Regrease Tacolab seals
At least every 6 months (see specification on plate at grease lubrication point (Page 26))	Replenish grease in grease-lubricated rolling-contact bearings
Every 5,000 operating hours, at least every 10 months	Replenish grease in the oil retaining pipe
Every 12 months	Check the friction linings of the torque-limiting back-stop Inspect the hose lines Inspect the shrink disk Check the water content of the oil
Every 10,000 operating hours, at least every 2 years	Change the oil if using a mineral oil (API group I and II) or synthetic ester (or depending on the result of the oil sample test) Check the condition of the oil-level monitoring system (the same time as you change the oil) Check the condition of the air-oil cooler (the same time as you change the oil) Check the condition of the water/oil cooler (the same time as you change the oil)
Every 2 years	Carry out a general inspection of the gear unit Check the cooling coil Check that the fastening bolts are tight Clean the fan and gear unit
Every 20,000 operating hours, at least every 4 years	Carry out an oil change if you are using partially synthetic oil, PAO and PG oil (or depending on the result of the oil sample test) Check the condition of the oil-level monitoring system (in time with oil change)
6 years after the stated date of manufacture	Change the hose lines

Table 9-1 : Maintenance and servicing activities

Further information

You can find further information about additional maintenance and servicing activities in the separate data sheet in the complete documentation for the gear unit.

Further information about individual components can be found in the instructions for the components in the complete documentation for the gear unit.

9.3 Maintenance and servicing work

9.3.1 Notes on gear unit lubrication and preservation

You can find maintenance and servicing measures relating to gear unit lubrication and preservative, which are not provided in this chapter, in Instructions 7300 in the complete documentation for the gear unit.

9.3.2 Checking the oil temperature

The gear unit can be damaged by insufficient lubrication if you operate the gear unit in the oil sump at the following oil temperatures:

- Oil temperature exceeds the maximum permissible value
- Oil temperature below the minimum permissible value



! WARNING

Risk of burns on hot surfaces and the gear unit oil

Severe burns may occur on hot surfaces and the gear unit oil (> 55 °C).

- Wear appropriate protective gloves and protective clothing.

! CAUTION

Hearing loss due to excessive emission sound pressure level

During operation, an emission sound pressure level of 80 dB (A) may be exceeded. This may result in tinnitus or hearing loss.

- Wear hearing protection.

Proceed as follows to check the oil temperature:

1. Allow the gear unit to reach its normal operating temperature.
2. Operate the gear unit with the maximum driven machine power. When doing this, carefully observe the intended use (Page 20).
3. Measure the oil temperature in the oil sump.
4. Compare the measured value with the maximum permissible oil temperature (Page 127).
5. Immediately stop the gear unit if the maximum permissible oil temperature is exceeded. Contact Flender Customer Service (Page 147).

9.3.3 Filling the backstop with oil

When filling the backstop with oil, observe the following points:

- Use the same oil type and oil viscosity as for the gear unit itself.
- Use a filling filter with the same filter mesh size as for the gear unit itself.



WARNING

Risk of burns on hot surfaces and the gear unit oil

Severe burns may occur on hot surfaces and the gear unit oil (> 55 °C).

- Wear appropriate protective gloves and protective clothing.

CAUTION

Risk of injury due to chemically aggressive operating materials

There is a risk of injury to eyes and hands when handling chemically corrosive consumables.

- Please observe the safety information in the data sheets of the oil used.
- Wear suitable protective equipment, such as gloves and safety glasses.
- Immediately clean up any spilt oil using a binding agent.

Proceed as follows to fill the backstop with oil:

1. Allow the gear unit to cool down sufficiently before starting work.
2. Clean the oil filling point of the backstop.
3. Open the oil filling screw of the backstop.
4. Fill the oil quantity that is specified on the backstop information notice.
5. Screw in the oil filling screw.

9.3.4 Filling the overrunning clutch of the auxiliary drive unit with oil

When filling the overrunning clutch with oil, observe the following points:

- Use the same oil type and oil viscosity as for the gear unit itself.
- Use a filling filter with the same filter mesh size as for the gear unit itself.



WARNING

Risk of burns on hot surfaces and the gear unit oil

Severe burns may occur on hot surfaces and the gear unit oil (> 55 °C).

- Wear appropriate protective gloves and protective clothing.

⚠ CAUTION

Risk of injury due to chemically aggressive operating materials

There is a risk of injury to eyes and hands when handling chemically corrosive consumables.

- Please observe the safety information in the data sheets of the oil used.
- Wear suitable protective equipment, such as gloves and safety glasses.
- Immediately clean up any spilt oil using a binding agent.

Proceed as follows to fill the overrunning clutch with oil:

1. Allow the gear unit to cool down sufficiently before starting work.
2. Clean the oil filling point.
3. Open the oil filling screw.
4. Fill the oil quantity that is specified in the dimension drawing.
5. Screw in the oil filling screw.

9.3.5 Checking the friction linings of the torque-limiting backstop

The friction linings of the torque-limiting backstop can wear, especially due to frequent slip-page.

1. Check the friction linings of the torque-limiting backstop in accordance with the instructions for the torque-limiting backstop.

Further information

You can find further information on the torque-limiting backstop in the instructions for the torque-limiting backstop, which are part of the complete documentation of the gear unit.

9.3.6 Checking the auxiliary drive

Follow the instructions of the auxiliary drive used that are included in the complete documentation for the gear unit.

9.3.7 Tightening the belts

⚠ CAUTION

Risk of crushing between the belt and motor bracket

There is a risk of being crushed between the belt and the motor bracket.

- Screw the nuts on the threaded rods of the motor bracket alternately upwards and downwards.
- Mount the protective cover after working.

When retensioning the belt, proceed as follows:

1. Remove the protective cover.
2. Check the pre-tension of the belt according to the belt instructions.
If the pre-tension lessens, tighten the belt again or replace it.
3. Screw on the motor bracket upwards using alternating nuts on the threaded rods.
4. Ensure the necessary preload force.
5. Mount the protective cover.

9.3.8 Cleaning the fan and gear unit

The gear unit may sustain damage due to inadequate cooling if you operate the gear unit with a defective or soiled fan. Depending on the conditions at the site of installation, it may therefore be necessary to clean the fan and gear unit more frequently than stipulated in the maintenance schedule.



WARNING

Risk of burns on hot surfaces and the gear unit oil

Severe burns may occur on hot surfaces and the gear unit oil ($> 55\text{ °C}$).

- Wear appropriate protective gloves and protective clothing.

CAUTION

Risk of crushing due to falling mounted components and components

Falling mounted components and components can result in injury.

- Secure dismantled mounted components and components against falling.
- Wear safety shoes and suitable protective gloves.



CAUTION

Risk of chemical burns from chemical substances

Contact with chemically aggressive cleaning agents can cause skin irritation and burns.

- Please observe the manufacturer's instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment, such as protective gloves and eye protection.
- Remove any spilled solvent immediately with binding agents.

NOTE

Property damage due to the use of a high-pressure cleaning device

Gear unit components can be damaged by external cleaning carried out with a high-pressure cleaning device.

- Do not use a high-pressure cleaning device to clean the gear unit or its component parts.

Proceed as follows to clean the fan and gear unit:

1. Allow the gear unit to cool down sufficiently before starting work.
2. Protect the air guide cover against damage by external components.
3. Remove the air guide cover.
4. Take appropriate measures to ensure that the shaft seals do not come into contact with cleaning agents or dirt.
5. Use a hard brush to remove any stubborn dirt from the impeller, air guide cover and protective grille. Do not use a high-pressure cleaning device.
6. Remove any spots of corrosion.
7. Reinstall the air guide cover.
Make sure that the air guide cover is correctly fastened.
Ensure that the fan does not come into contact with the air guide cover once it is assembled.

9.3.9 Checking the cooling coil

A soiled cooling coil cannot extract a sufficient amount of heat from the gear oil. Increased oil temperature can damage the gear unit. The cooling coil must be checked regularly.



WARNING

Risk of burns on hot surfaces and the gear unit oil

Severe burns may occur on hot surfaces and the gear unit oil (> 55 °C).

- Wear appropriate protective gloves and protective clothing.

To check the cooling coil, proceed as follows:

1. Allow the gear unit to cool down sufficiently before starting work.
2. Shut off the cooling water supply.
3. Connect the cooling water supply line and cooling water return line of the cooling coil.
4. Do not use sharp objects to clean the cooling coil, as this may damage the cooling coil.
5. Inspect the inner surface of the cooling coil for deposits.
6. If you discover that there are heavy deposits inside the cooling coil, arrange for the cooling water or the deposits to be analysed.
7. Before you use a cleaning agent, check whether it is suitable for use on the cooling coil material. Contact Flender Customer Service (Page 147).
8. Carefully observe the instructions of the manufacturer before using different kinds of cleaning agent.
9. Replace heavily soiled cooling coils with new ones. Contact Flender Customer Service (Page 147).
10. Re-connect the cooling water supply line and cooling water return line.



Information

Special aspects during cleaning of the cooling coil

Specialised chemical cleaning companies offer an analysis of the deposits in the cooling coil and sell special cleaning agents to remove the analysed deposits.

9.3.10 Inspecting the shrink disk

The shrink disk inspection is limited to a visual assessment of its condition.

CAUTION

Risk of crushing due to falling mounted components and components

Falling mounted components and components can result in injury.

- Secure dismantled mounted components and components against falling.
- Wear safety shoes and suitable protective gloves.

Observe the following points when inspecting the shrink disk:

1. Tighten any loose screws.
2. Replace shrink disks that have been damaged by force.
3. Check that the shrink disk is assembled correctly. The shrink disk must establish a tensioned connection between the inner ring and the outer ring.

Further information

Further information about the shrink disk can be found in the shrink disk instructions contained in the complete documentation for the gear unit.

9.3.11 Cleaning the coarse filter

To clean the coarse filter, proceed as follows:

1. Check the coarse filter.
2. Unscrew the drainage plugs.
3. Pull out the strainer and remove the particles of dirt.
4. Replace defective strainers and sealing rings.
5. Screw the drainage plugs back in again.

Further information

You can find further information about the coarse filter in the coarse filter instructions provided in the complete gear unit documentation.

You can find further information about the technical specifications in the separate data sheet and in the list of equipment provided in the complete documentation for the gear unit.

9.3.12 Cleaning the double change-over filter

To clean the double change-over filter, proceed as follows:

1. Read and observe the instructions for the double change-over filter.
2. Inspect the double change-over filter.

Further information

You can find further information about the double change-over filter in the double change-over filter instructions provided in the complete gear unit documentation.

You can find further information about the technical specifications in the separate data sheet and in the list of equipment provided in the complete documentation for the gear unit.

9.3.13 Cleaning the single filter

To clean the single filter, proceed as follows:

1. Check the single filter.
2. Read and observe the instructions for the single filter.

Further information

You can find further information about the single filter in the single filter instructions provided in the complete gear unit documentation.

You can find further information about the technical specifications in the separate data sheet and in the list of equipment provided in the complete documentation for the gear unit.

9.3.14 Checking the speed monitoring of the auxiliary drive

Proceed as follows to check the speed monitoring of the auxiliary drive:

1. Switch on the auxiliary drive.
 2. Check whether the speed monitor switches.
- ⇒ If the speed monitor does not switch, repair or replace it.

Further information

You can find further information about the auxiliary drive in the auxiliary drive instructions provided in the complete documentation for the gear unit.

9.3.15 Measuring the vibration levels of the rolling-contact bearings

NOTE

Damage to gear unit

A defective bearing may cause damage to the gear unit.

- Replace the bearing at the latest when it reaches the end of its service life.

Proceed as follows to measure the vibration levels of the rolling-contact bearings:

1. Measure the vibrations at the rolling-contact bearings.
2. Document the measurement results.

3. Compare the measured values with the comparison values that were documented when commissioning the gear unit.
4. Archive the report together with these instructions.
5. Have Customer Service (Page 147) replace defective rolling-contact bearings.

Further information

You can find further information on measuring the vibration levels at rolling-contact bearings in the instructions of the measurement sensor provided in the complete gear unit documentation.

9.3.16 Measuring the temperature at the rolling-contact bearings

NOTE

Damage to gear unit

A defective bearing may cause damage to the gear unit.

- Replace the bearing at the latest when it reaches the end of its service life.

Proceed as follows to measure the temperature at the rolling-contact bearings:

1. Measure the temperature at the rolling-contact bearings.
2. Document the measurement results.
3. Compare the measured values with the comparison values that were documented when commissioning the gear unit.
4. Archive the report together with these instructions.
5. Have Customer Service (Page 147) replace defective rolling-contact bearings.

Further information

You can find further information about measuring the temperature at the rolling-contact bearings in the instructions for the Pt 100 resistance thermometer provided in the complete documentation for the gear unit.

9.3.17 Check oil-level monitoring system

To check the oil-level indication system, proceed as follows during the oil change:

1. Before an oil change, check whether the signal "Oil level OK" is present on the evaluation unit.
2. After draining the oil, check whether the signal "Oil level too low" is present on the evaluation unit.
3. After an oil change, check whether the signal "Oil level OK" is present on the evaluation unit.

Further information

Further information about the oil-level indication system can be found in the oil-level indication system instructions contained in the complete documentation for the gear unit.

You can find further information about the technical specifications in the separate data sheet and in the list of equipment provided in the complete documentation for the gear unit.

9.3.18 Check that the fastening bolts are tight

Note the following points when checking that the fastening bolts are tight:

1. Observe the data regarding bolt connection classes (Page 114), preload forces and tightening torques (Page 115).
2. Replace any bolts that are no longer fit for use with bolts of the same strength class and type.

9.3.19 General inspection of the gear unit

Arrange for Flender Customer Service to perform a general inspection of the gear unit. Thanks to their experience, these engineers are best placed to assess whether and which gear unit components need to be replaced.

9.3.20 Retrofitting components

If you want to retrofit components such as a heating element, contact Flender Customer Services (Page 147).

9.4 Possible faults

The faults listed below are only intended as a troubleshooting guide.

If any faults occur while the unit is still under warranty, do not allow anyone except Flender Customer Service to attempt a repair.

Even after the warranty period has expired, you should still arrange for faults to be rectified by Flender Customer Service.

9.4 Possible faults

Possible faults and how to rectify them

The following table provides an overview of the possible faults and how to rectify them.

Possible faults	Causes	Possible remedies
Blocking function of backstop has failed	Damaged backstop	• Contact Customer Service
Pressure monitoring triggers alarm	Oil pressure has dropped below minimum value	• Check the oil level at room temperature • Top up with oil if necessary • Check the oil pump • If required, replace the oil pump • Check the oil filter and coarse filter • If required, replace the oil filter or clean the coarse filter
Grease escaping at the shafts	Defective radial shaft seals	• Inspect the radial shaft sealing rings and replace if necessary
Noise	Damage to the gears	• Contact Customer Service • Inspect the gear components • If necessary, replace damaged components
	The bearing play is excessive	• Contact Customer Service • Adjust bearing play
	Defective rolling-contact bearings	• Contact Customer Service • Replace defective rolling-contact bearings
	Overrunning noises caused by operation on frequency converter	• Contact Customer Service • Check the closed-loop motor control system
	Gear unit fastening has worked loose	• Tighten bolts and nuts to the specified tightening torque • Replace damaged bolts and nuts
Outer surface of gear unit soiled with oil	Inadequate sealing of the housing cover or joints	• Seal housing cover or joints
	Labyrinth seals soiled with oil, incorrect transport position	• Check oil filling • Clean the labyrinths
Main drive motor does not start	Motor direction of rotation incorrect	• Change polarity of motor
	Backstop cage with sprags incorrectly installed or defective	• Contact Customer Service
	Overrunning clutch blocked	• Contact Customer Service. • Install a new overrunning clutch
	Overrunning clutch cage with sprags incorrectly installed and/or defective.	• Contact Customer Service

Possible faults	Causes	Possible remedies
Main drive motor can start while the auxiliary drive is operational	Defective electrical interlocking between the main and auxiliary motor	• Check the connections • If necessary, replace defective devices
	Defective speed monitoring	• Check the connections • If necessary, replace defective devices
Auxiliary drive motor does not start	Overload at the low-speed shaft	• Reduce load at the low-speed shaft
	Defective auxiliary drive motor	• Repair or replace motor
	Motor brake not released	• Correct the electrical connection of the motor brake • If required, replace the motor brake
The auxiliary drive motor starts, but the low-speed shaft (LSS) of the main gear unit does not turn	Motor direction of rotation incorrect	• Change polarity of motor
	Overrunning clutch cage with sprags incorrectly installed	• Contact Customer Service
	Defective overrunning clutch	• Contact Customer Service • Install a new overrunning clutch
Gear unit does not start	Air in the piping	• Gear unit with flange pump: Bridge the pressure monitoring signal for 20 seconds to stabilise the pressure build-up.
Leakage	Labyrinth seals soiled with oil or incorrect transport position	• Check oil filling • Clean the labyrinths
	Inadequate sealing of the housing cover or joints	• Check the seals and if required, replace • Seal housing cover or joints
	Defective radial shaft seals	• Check the radial shaft seals • Replace, if necessary
Wet-air filter is severely discoloured	Wet-air filter is spent	• Replace the wet-air filter
Wet-air filter is becoming discoloured from the top downwards	Water in the oil	• Take test tube sample to examine oil condition for water penetration • Have the oil examined by a chemical lab • Change the oil if necessary
Oil is foaming in the gear unit	Preservation agent not completely drained off	• Change the oil
	Oil supply system left in operation for too long at low temperatures	• Switch off the oil supply system • Degas the oil
	Gear unit too cold in operation	• Switch off the gear unit • Degas the oil • Start up without cooling water during cold restart

9.4 Possible faults

Possible faults	Causes	Possible remedies
Oil is foaming in the gear unit	Water in the oil	- Take test tube sample to examine oil condition for water penetration - Have the oil examined by a chemical lab - Change the oil if necessary
	Oil defoamer has run out	- Examine the oil - Change the oil if necessary
	Unsuitable mixture of oils	- Examine the oil - Change the oil if necessary
Oil escaping from the gear unit	Inadequate sealing of the housing cover or joints	- Check the seals and if required, replace - Seal housing cover or joints - Check the compression seals and retighten screws if necessary
	Leaking pipes	Check the pipes, and replace or seal if necessary
Oil supply system malfunction	-	Observe the instructions for the oil supply system
Elevated temperature during operation	Gear unit housing very dirty	Clean the gear unit housing including the cooling fins
	Oil level in the gear unit housing too high	- Check the oil level - If required, correct the oil level
	Oil is too old	- Check when the last oil change was performed - Change the oil if necessary
	Oil is severely contaminated	Change the oil
	Oil supply system or cooling coil defective	- Check the oil supply system or cooling coil - If necessary, replace defective components - Observe the instructions for the oil supply system
	Gear unit with water-oil cooler: Coolant flow too low or too high	- Adjust the valves at the supply and return lines - Check the water-oil cooler for free flow
	Gear unit with air-oil cooler: Inadequate air flow	Clean the air-oil cooler
	Gear unit with air-oil cooler: Cooler block soiled	Clean the cooler block
	Gear unit with oil cooling system: Inadequate oil flow through the oil cooler	- Check the oil filter and coarse filter - If required, replace the oil filter or clean the coarse filter
	Gear unit with cooling coil: Deposits in the cooling coil	Clean, or if necessary, replace the cooling coil
	Gear unit with fan: Air intake opening in air guide cover or gear unit housing is soiled	Clean the air guide cover and gear unit housing

Possible faults	Causes	Possible remedies
Elevated temperature during operation	Coolant temperature too high	• Check the temperature; correct if necessary
	Defective oil pump	• Check the oil pump function • Repair or replace oil pump if required
Elevated temperature at bearing points	Oil level in the gear unit housing too low or too high	• Check the oil level at room temperature • If required, correct the oil level
	Oil is too old	• Check when the last oil change was performed • Change the oil if necessary.
	Oil supply system is defective	• Check the oil supply system • If necessary, replace defective components • Observe the instructions for the oil supply system
	Defective rolling-contact bearings	• Contact Customer Service • Inspect the rolling-contact bearings and replace if necessary
	Defective oil pump	• Check the oil pump function • Repair or replace oil pump if required
Elevated temperature at backstop	Damaged backstop	• Contact Customer Service • Inspect the backstop and replace if necessary
Increased vibration amplitude at the bearing points	Defective rolling-contact bearings	• Contact Customer Service • Inspect the rolling-contact bearings and replace if necessary
	Gear wheels defective	• Contact Customer Service • Inspect the gear wheels and replace if necessary
Contamination indicator of the double change-over filter triggers an alarm	Double change-over filter clogged	• Change over the double change-over filter as described in the separate instructions • Clean the filter element
Water in the oil	Oil supply system or cooling coil defective	• Check the oil supply system or cooling coil • If necessary, replace defective components • Observe the instructions for the oil supply system
	Engine room fan is blowing cold air onto gear unit: Water condenses	• Install suitable thermal insulation to protect gear unit housing • Close the air outlet or change the direction of the air outlet using structural measures
	Climatic conditions	• Contact Customer Service • Use wet-air filter if necessary
	Oil foams in the oil sump	• Take test tube sample to examine oil condition for water penetration • Have the oil examined by a chemical lab

Table 9-2 : Possible faults and how to rectify them

9.5 Final work after maintenance and faults

Carry out the following final work:

1. Replace any bolts that can no longer be used with bolts of the same strength class and type.
2. After completing work, check the gear unit for foreign objects and remove them from the gear unit.
3. Restore the conditions for intended operation. When doing this, observe the information in the "Commissioning" chapter.
4. Gear unit with Taconite or Tacolab seals:
Check the gap after completing the work. Observe the Chapter Gap dimension at grease labyrinth (Page 105).

10.1 Contact

When ordering replacement parts, requesting a customer service technician or if you have any technical queries, contact our factory or one of our Customer Service addresses:

Flender Industriegetriebe GmbH

Thierbacher Strasse 24

09322 Penig

Germany

Tel.: +49 (0)37381 / 61-0

Fax: +49 (0)37381 / 80286

Further information

You can find further information about service and support online:

Service and support (<https://www.flender.com/service>)

11.1 Dispose of packaging material and auxiliary materials

Take note of the following environmental protection measures during the entire service life of the gear unit:

- Use reusable packaging materials for as long as it is possible.
- Dispose of or recycle packaging material according to the applicable national regulations.
- When changing the oil, collect the used oil in suitable containers.
- Use an oil-binding agent to clean up oil spillages immediately.
- Store preservation agents separately from used oil.
- Dispose of used oil, preservative agents, oil-binding agents and oil-soaked cloths according to the relevant national regulations.

11.2 Disposal of the gear unit

The materials used for the gear unit components are largely recyclable. This applies in particular to the main components made of steel or cast iron. The reuse of recyclable materials promotes a sustainable circular economy.

Observe the following environmental protection measures when disposing of the gear unit at the end of its service life:

- Remove gear oil, preservation agents and coolant from the gear unit and dispose of these auxiliary materials in accordance with the applicable national regulations.
- Ensure recyclable components and materials are properly recycled.
- Dispose of non-recyclable components and materials according to applicable national regulations.

12.1 General information on replacement parts

By stocking the most important spare parts at the installation site, you can ensure that the gear unit is ready to use all the time.

The contact address of Flender Customer Service can be found under Service and support (Page 147).

NOTE

Damage to the gear unit due to use of unsuitable spare parts

Only use original replacement parts from Flender. Flender Shall not accept any warranty claims for spare parts that are not supplied by Flender.

Other spare parts are not tested and approved by Flender. Non-approved spare parts may possibly change the design characteristics of the gear unit and thus impair its active or passive safety.

Flender Will accept no liability or warranty whatsoever for damage occurring as a result of the use of non-approved spare parts. The same applies to any accessories which were not supplied by Flender.

Information required when ordering spare parts

To order spare parts, refer to the spare parts list. Use Flender replacement parts only.

When ordering spare parts, provide the following information:

- Order number with item
- Model and size
- Part number
- Quantity

12.1 General information on replacement parts

Declaration of Incorporation

A

EU Declaration of Incorporation valid until 19/01/2027

B7410-01 TU-01.03

Product:

Flender ONE

B2.H., B3.H., B4.H., H2.H., H3.H., H4.H., B2.U., B3.U., B4.U., H2.U., H3.U., H4.U., B2.L., B3.L., B4.L., H2.L., H3.L., H4.L.
42...355

for installation in a partly completed machine or machine.

Name and address of the manufacturer:

Flender Industriegetriebe GmbH

Thierbacher Straße 24

09322 Penig

Germany

This EU Declaration of Incorporation is issued under the sole responsibility of the manufacturer. This declaration refers to the product mentioned above. The relevant technical documentation according to Annex VII Part B has been created.

The following basic health and safety requirements under the - Machinery Directive 2006/42/EC Annex I Official Journal of the European Union, 09.06.2006, L157, page 24-86 have been applied and are complied with:

1.1.1; 1.1.2; 1.1.3; 1.1.5; 1.3.1; 1.3.2; 1.3.8.1; 1.4.1; 1.5.1; 1.5.4; 1.5.6; 1.5.7; 1.5.9; 1.5.10; 1.6.1; 1.6.2; 1.6.5; 1.7.1.1; 1.7.2; 1.7.3; 1.7.4.1; 1.7.4.2; 1.7.4.3

Information on harmonised standards or other technical specifications upon which the EU Declaration of Incorporation is based:

ISO 12100	:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
ISO 13732-1	:2006	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces
ISO 13732-3	:2005	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces

The manufacturer undertakes to send national authorities electronic copies of the technical documentation for the partly completed machine following a reasoned request.

The partly completed machine may only be put into operation if it has been determined where applicable that the machine in which the partly completed machine is to be incorporated meets the specifications of the Directive 2006/42/EC.

Signed for and on behalf of:

Flender Industriegetriebe GmbH

Penig, 2026-03-09



Armin Bittner, CEO, Flender Industriegetriebe GmbH

Translation of the Declaration of Incorporation

EU Declaration of Incorporation valid until 20/01/2027

B7410-01 TU-01.03

Product:

Flender ONE

B2.H., B3.H., B4.H., H2.H., H3.H., H4.H., B2.U., B3.U., B4.U., H2.U., H3.U., H4.U., B2.L., B3.L., B4.L., H2.L., H3.L., H4.L.

42...355

for installation in a partly completed machine or machine.

Name and address of the manufacturer:

Flender Industriegetriebe GmbH

Thierbacher Straße 24

09322 Penig

Germany

This EU Declaration of Incorporation is issued under the sole responsibility of the manufacturer. This declaration refers to the product mentioned above. The relevant technical documentation according to Annex IV Part B has been created.

The following basic health and safety requirements under the - Regulation (EU) 2023/1230 Annex III Official Journal of the European Union, 29/06/2023, L165, page 1-102 have been applied and are complied with:

1.1.1; 1.1.2; 1.1.3; 1.1.5; 1.3.1; 1.3.2; 1.3.8.1; 1.4.1; 1.5.1; 1.5.4; 1.5.6; 1.5.7; 1.5.9; 1.5.10; 1.6.1; 1.6.2; 1.6.5; 1.7.1.1; 1.7.2; 1.7.3; 1.7.4.1; 1.7.4.2; 1.7.5

Information on harmonised standards or other technical specifications upon which the EU Declaration of Incorporation is based:

ISO 12100	:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
ISO 13732-1	:2006	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces
ISO 13732-3	:2005	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces

The manufacturer undertakes to send national authorities electronic copies of the technical documentation for the partly completed machine following a reasoned request.

The partly completed machine may only be put into operation if it has been determined where applicable that the machine in which the partly completed machine is to be incorporated meets the specifications of the Regulation (EU) 2023/1230.

Signed for and on behalf of:

Flender Industriegetriebe GmbH



Penig, 2026-03-09

Armin Bittner, CEO, Flender Industriegetriebe GmbH

Translation of the Declaration of Incorporation

Technical specifications

B

B.1 Ambient temperature

The ambient temperature range can be found on the gear unit rating plate or is specified contractually. The gear unit may be used in this ambient temperature range.

Observe the heating information specified in the dimension drawing and list of equipment! At temperatures below -30 °C, the gear unit must be preheated for at least 6 hours before switching it on!

Storing the gear unit

Do not expose the gear unit to harmful effects such as aggressive chemical products, environments with high levels of air pollution or humidity, or ambient temperatures below 0 °C or above 40 °C.

B.2 Weights

All weight specifications refer to units without oil filling and mounted components.

The precise weight is specified in the dimension drawings in the complete documentation or on the rating plate.

Refer to the following table for approximate gear unit type N weights in kg:

Type	Gear unit size													
	42	63	70	96	104	136	151	179	200	234	257	294	312	355
B3..N	193	306	356	502	590	822	985	1,362	1,605	2,326	2,673	3,054	3,590	3,815
B4..N	-	320	365	515	600	845	995	1,395	1,490	2,070	2,360	2,745	3,485	3,840
H2..N	176	287	332	467	549	780	922	1,276	1,504	2,176	2,545	2,894	3,285	3,510
H3..N	-	309	354	510	589	852	991	1,393	1,613	2,304	2,659	3,031	3,511	3,910
H4..N	-	310	355	510	595	840	985	1,385	1,605	2,265	2,600	2,990	3,495	3,825

Table B-1 : Weight

Refer to the following table for approximate gear unit type U weights in kg:

Type	Gear unit size													
	42	63	70	96	104	136	151	179	200	234	257	294	312	355
B2..U	220	340	390	565	665	930	1,055	1,550	1,810	2,575	2,940	3,335	4,015	4,330
B3..U	210	330	375	540	630	885	1,035	1,440	1,680	2,540	2,895	3,320	3,905	4,130
B4..U	-	335	380	545	630	895	1,045	1,460	1,565	2,300	2,605	3,030	3,850	4,205
H2..U	195	310	355	505	590	830	970	1,345	1,585	2,390	2,770	3,160	3,600	3,825

Type	Gear unit size													
	42	63	70	96	104	136	151	179	200	234	257	294	312	355
H3..U	-	325	375	540	620	890	1,030	1,445	1,675	2,525	2,890	3,300	3,855	4,255
H4..U	-	325	370	540	625	890	1,035	1,450	1,680	2,500	2,845	3,275	3,860	4,190

Table B-2 : Weight

Depending on the options selected, the weights may be higher.

B.3 Oil quantities

The oil quantity required is specified on the rating plate attached to the gear unit.

Depending on the options selected, the oil quantity may deviate slightly. Observe the markings on the oil dipstick or oil level indicator.

Model	Gear unit size													
	42	63	70	96	104	136	151	179	200	234	257	294	312	355
B3.HN	11	16	18	28	30	46	49	77	83	131	135	161	206	220
B4.HN	-	18	19	31	33	52	54	88	95	150	160	190	240	245
H2.HN	11	17	18	29	31	47	49	78	83	132	141	165	213	220
H3.HN	-	18	19	31	34	52	53	88	94	148	156	183	252	265
H4.HN	-	17	19	30	33	51	54	87	94	150	160	185	240	245

Table B-3 : Oil quantities for model ...HN gear unit

Model	Gear unit size													
	42	63	70	96	104	136	151	179	200	234	257	294	312	355
B2.HU	11	17	19	29	33	44	48	78	89	145	158	189	234	262
B3.HU	10	15	17	27	29	43	45	74	81	136	146	170	213	229
B4.HU	-	17	19	30	32	49	52	85	93	156	165	192	245	261
H2.HU	10	16	17	27	29	43	46	74	83	138	147	173	217	232
H3.HU	-	17	19	30	32	50	53	86	93	160	170	198	257	274
H4.HU	-	17	18	29	32	44	51	84	91	153	162	189	240	260

Table B-4 : Oil quantities for model ...HU gear unit

B.4 Enveloping surface sound pressure level

The gear unit has an enveloping surface sound pressure level at a distance of 1 m.

The measurement is performed using the sound intensity method according to ISO 9614 Part 2.

The workplace of the operators is defined as the area on the measuring surface at a distance of 1 m around the gear unit and in the vicinity where persons may be present.

The sound pressure level applies to a warm-running gear unit with speed of the high-speed shaft (HSS) n_1 and power of the driven machine P_2 according to the rating plate when measured on a Flender test bench. If more than one value is stated, the highest speed and power values apply.

The enveloping surface sound pressure level includes any mounted lubrication units. With outgoing and incoming pipework, the flange is considered to be the interface.

The sound pressure levels listed in the table were obtained based on statistical evaluations carried out by our Quality Control department. You can assume that the gear unit does not exceed these sound pressure levels with statistical certainty.

The enveloping surface sound pressure levels for gear units of type B3 with fan are detailed in the following table:

Type	i_N	n_1 in rpm	Gear unit size													
			42	63	70	96	104	136	151	179	200	234	257	294	312	355
B3	12,5 ... 31,5	1,800	78	81	83	85	85	86	87	89	91	95	96	96	97	98
		1,500	72	75	77	79	80	81	82	83	85	88	89	89	90	91
		1,000	65	68	69	71	72	73	74	77	78	80	82	82	83	83
		750	60	63	64	66	68	69	70	71	73	74	75	75	76	77
	35.5 ... 56	1,800	73	78	79	80	80	83	85	88	90	93	94	94	95	96
		1,500	69	72	73	74	75	77	79	82	84	86	87	87	88	89
		1,000	63	65	66	67	69	71	72	73	75	77	78	78	79	80
		750	60	60	60	62	64	65	67	69	70	71	72	72	73	74
	63 ... 90	1,800	71	74	76	79	79	82	84	88	90	92	93	93	94	95
		1,500	68	70	71	73	74	76	78	81	83	85	86	86	87	88
		1,000	61	63	64	66	68	69	71	73	75	77	78	78	79	80
		750	60	60	60	61	63	64	66	67	68	70	71	71	72	73

Table B-5 : Enveloping surface sound pressure level for type B3 gear units with fan

The enveloping surface sound pressure levels for gear units of type B4 with fan are detailed in the following table:

Type	i_N	n_1 in rpm	Gear unit size						
			179	200	234	257	294	312	355
B4	80 ... 125	1,800	84	85	85	87	88	88	88
		1,500	79	80	80	82	82	82	81
		1,000	71	72	73	74	75	75	75
		750	66	68	69	70	69	70	65
	140 ... 224	1,800	80	82	84	86	87	88	88
		1,500	75	76	78	80	81	81	77

Enveloping surface sound pressure level

Type	i_N	n_1 in rpm	Gear unit size						
			179	200	234	257	294	312	355
B4	140 ... 224	1,000	68	70	71	72	72	73	71
		750	64	64	66	67	66	67	65
	250 ... 400	1,800	78	81	84	85	87	88	88
		1,500	73	75	78	79	80	81	73
		1,000	68	69	70	72	72	72	68
		750	63	63	66	66	65	65	61

Table B-6 : Enveloping surface sound pressure level for type B4 gear units with fan

The enveloping surface sound pressure levels for gear units of type H2 with fan are detailed in the following table:

Type	i _N	n ₁ in rpm	Gear unit size													
			42	63	70	96	104	136	151	179	200	234	257	294	312	355
H2	6,3 ... 10	1,800	79	80	81	85	85	86	88	89	90	92	94	95	97	99
		1,500	75	76	77	80	81	82	84	85	86	88	90	91	92	94
		1,000	69	71	72	74	75	77	79	80	81	83	84	85	85	86
		750	66	68	69	70	72	73	75	76	77	79	80	81	81	82
	11,2 ... 16	1,800	77	79	81	83	84	86	86	90	93	95	96	96	98	99
		1,500	73	75	77	79	80	81	82	85	88	90	91	91	92	93
		1,000	68	69	70	72	73	75	77	79	80	82	83	83	84	85
		750	64	66	67	69	70	71	73	74	76	78	79	79	79	80
	18 ... 28	1,800	75	77	79	82	83	85	87	89	91	93	96	96	97	99
		1,500	71	73	75	77	78	80	82	84	86	87	90	90	91	94
		1,000	65	67	68	71	72	73	75	77	78	80	81	81	82	86
		750	62	64	65	67	68	69	71	73	74	75	77	77	78	82

Table B-7 : Enveloping surface sound pressure level for type H2 gear units with fan

The enveloping surface sound pressure levels for gear units of type H3 with fan are detailed in the following table:

Type	i _N	n ₁ in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
H3	12,5 ... 31,5	1,800	75	77	79	79	82	81	85	85	86	85	87	88	88
		1,500	71	72	75	75	77	77	80	80	81	81	83	84	84
		1,000	65	66	69	70	71	72	74	75	75	75	77	78	78
		750	62	62	66	67	67	68	70	70	71	72	73	74	74
	35.5 ... 56	1,800	73	75	78	79	81	81	84	84	85	85	87	88	86
		1,500	70	71	73	74	76	76	79	79	80	80	82	83	82

Type	i_N	n_1 in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
H3	35.5 ... 56	1,000	64	65	67	68	69	70	73	73	73	74	76	77	77
		750	62	62	63	64	65	66	69	69	69	70	71	72	73
	63 ... 90	1,800	74	74	76	77	80	80	83	83	83	83	85	87	87
		1,500	70	70	72	72	75	75	78	78	78	78	80	82	82
		1,000	64	64	65	66	68	69	71	72	72	72	74	75	75
		750	61	61	62	62	64	65	67	67	68	68	70	71	71

Table B-8 : Enveloping surface sound pressure level for type H3 gear units with fan

The enveloping surface sound pressure levels for gear units of type H2 with motor fan are detailed in the following table:

Type	i _N	n ₁ in rpm	Gear unit size													
			42	63	70	96	104	136	151	179	200	234	257	294	312	355
H2	6,3 ... 10	1,800	75	78	79	80	81	83	83	84	85	85	85	86	88	88
		1,500	73	74	75	76	77	79	79	80	81	81	82	83	84	85
		1,000	73	73	73	73	73	74	74	75	76	76	77	78	80	80
		750	73	73	73	73	73	73	73	73	73	73	74	75	76	77
	11,2 ... 16	1,800	73	76	77	78	79	81	81	82	83	83	84	85	85	86
		1,500	73	73	73	74	75	77	77	78	79	79	80	81	82	83
		1,000	73	73	73	73	73	73	73	73	74	74	75	76	77	78
		750	73	73	73	73	73	73	73	73	73	73	73	73	74	75
	18 ... 28	1,800	73	73	74	75	76	78	78	79	80	81	82	83	84	84
		1,500	73	73	73	73	73	74	74	75	76	77	78	79	80	80
		1,000	73	73	73	73	73	73	73	73	73	73	73	74	75	75
		750	73	73	73	73	73	73	73	73	73	73	73	73	73	73

Table B-9 : Enveloping surface sound pressure level for type H2 gear units with motor fan

The enveloping surface sound pressure levels for gear units of type H3 with motor fan are detailed in the following table:

Type	i_N	n_1 in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
H3	12,5 ... 31,5	1,800	73	73	77	78	78	79	81	81	82	83	84	85	85
		1,500	73	73	73	74	74	75	77	77	78	79	80	81	81
		1,000	73	73	73	73	73	73	73	73	73	74	75	76	77
		750	73	73	73	73	73	73	73	73	73	73	73	73	73
	35.5 ... 56	1,800	73	74	74	75	75	77	78	79	80	80	81	82	83
		1,500	73	73	73	73	73	73	74	75	76	76	77	78	79

Enveloping surface sound pressure level

Type	i_N	n_1 in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
H3	35.5 ... 56	1,000	73	73	73	73	73	73	73	73	73	73	73	73	74
		750	73	73	73	73	73	73	73	73	73	73	73	73	73
	63 ... 90	1,800	73	73	73	73	73	74	75	76	77	78	79	80	80
		1,500	73	73	73	73	73	73	73	73	73	74	75	76	76
		1,000	73	73	73	73	73	73	73	73	73	73	73	73	73
		750	73	73	73	73	73	73	73	73	73	73	73	73	73

Table B-10 : Enveloping surface sound pressure level for type H3 gear units with motor fan

The enveloping surface sound pressure levels for gear units of type H4 with motor fan are detailed in the following table:

Type	i_N	n_1 in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
H4	100 ... 140	1,800	73	73	73	73	73	73	74	75	76	77	78	79	79
		1,500	73	73	73	73	73	73	73	73	73	73	74	75	75
		1,000	73	73	73	73	73	73	73	73	73	73	73	73	73
		750	73	73	73	73	73	73	73	73	73	73	73	73	73
	160 ... 250	1,800	73	73	73	73	73	73	73	73	73	74	75	76	77
		1,500	73	73	73	73	73	73	73	73	73	73	73	73	73
		1,000	73	73	73	73	73	73	73	73	73	73	73	73	73
		750	73	73	73	73	73	73	73	73	73	73	73	73	73
	280 ... 450	1,800	73	73	73	73	73	73	73	73	73	73	73	73	74
		1,500	73	73	73	73	73	73	73	73	73	73	73	73	73
		1,000	73	73	73	73	73	73	73	73	73	73	73	73	73
		750	73	73	73	73	73	73	73	73	73	73	73	73	73

Table B-11 : Enveloping surface sound pressure level for type H4 gear units with motor fan

The enveloping surface sound pressure levels for gear units of type B3 without fan are detailed in the following table:

Type	i _N	n ₁ in rpm	Gear unit size													
			42	63	70	96	104	136	151	179	200	234	257	294	312	355
B3	12,5 ... 31, 5	1,800	72	76	80	81	82	83	85	87	89	90	91	91	92	93
		1,500	68	71	74	75	76	77	79	81	83	84	85	85	86	87
		1,000	63	66	68	69	70	72	73	75	77	78	80	80	80	81
		750	60	60	61	62	64	65	66	68	71	71	73	73	73	74
	35.5 ... 56	1,800	67	70	75	76	76	78	80	83	85	86	87	87	88	89
		1,500	65	67	70	71	71	72	74	77	79	80	81	81	82	83

Type	i _N	n ₁ in rpm	Gear unit size													
			42	63	70	96	104	136	151	179	200	234	257	294	312	355
B3	35.5 ... 56	1,000	60	62	65	65	66	66	69	71	73	75	76	76	76	77
		750	60	60	60	60	60	60	62	65	67	68	69	69	70	70
	63 ... 90	1,800	61	65	74	70	71	71	75	79	81	82	84	84	84	85
		1,500	61	64	70	67	68	68	70	73	75	76	78	78	78	79
		1,000	60	60	63	62	62	62	65	68	70	71	72	72	73	73
		750	60	60	60	60	60	60	60	60	61	63	64	65	65	66

Table B-12 : Enveloping surface sound pressure level for type B3 gear units without fan

The enveloping surface sound pressure levels for gear units of type B4 without fan are detailed in the following table:

Type	i_N	n_1 in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
B4	80 ... 125	1,800	65	67	70	72	75	78	81	82	83	85	86	86	87
		1,500	64	65	67	68	70	72	75	76	77	79	80	80	81
		1,000	60	60	61	63	64	67	69	70	72	73	74	74	75
		750	60	60	60	60	60	60	62	64	65	66	67	68	68
	140 ... 224	1,800	60	61	64	67	68	72	76	78	79	81	82	82	83
		1,500	60	61	63	65	66	68	71	72	73	75	76	76	77
		1,000	60	60	60	60	61	63	65	67	68	69	70	71	71
		750	60	60	60	60	60	60	60	60	61	62	63	64	65
	250 ... 400	1,800	60	60	60	63	64	67	70	73	75	76	78	79	79
		1,500	60	60	60	62	63	65	67	69	70	71	72	73	73
		1,000	60	60	60	60	60	60	62	63	64	66	67	67	68
		750	60	60	60	60	60	60	60	60	60	60	60	60	61

Table B-13 : Enveloping surface sound pressure level for type B4 gear units without fan

The enveloping surface sound pressure levels for gear units of type H2 without fan are detailed in the following table:

Type	i _N	n ₁ in rpm	Gear unit size													
			42	63	70	96	104	136	151	179	200	234	257	294	312	355
H2	6,3 ... 10	1,800	75	78	79	80	81	83	83	84	85	85	85	86	88	88
		1,500	71	74	75	76	77	79	79	80	81	81	82	83	84	85
		1,000	66	69	70	71	72	74	74	75	76	76	77	78	80	80
		750	63	66	67	67	69	70	71	72	73	73	74	75	76	77
	11.2 ... 16	1,800	73	76	77	78	79	81	81	82	83	83	84	85	85	86
		1,500	69	72	73	74	75	77	77	78	79	79	80	81	82	83

Enveloping surface sound pressure level

Type	i_N	n_1 in rpm	Gear unit size													
			42	63	70	96	104	136	151	179	200	234	257	294	312	355
H2	11.2 ... 16	1,000	64	67	68	69	70	72	72	73	74	74	75	76	77	78
		750	61	64	65	66	67	69	69	70	71	71	72	73	74	75
	18 ... 28	1,800	68	73	74	75	76	78	78	79	80	81	82	83	84	84
		1,500	66	69	70	71	72	74	74	75	76	77	78	79	80	80
		1,000	61	64	65	66	68	69	69	70	71	72	73	74	75	75
		750	60	61	62	63	64	66	66	67	68	69	70	71	72	72

Table B-14 : Enveloping surface sound pressure level for type H2 gear units without fan

The enveloping surface sound pressure levels for gear units of type H3 without fan are detailed in the following table:

Type	i_N	n_1 in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
H3	12,5 ... 31,5	1,800	72	73	77	78	78	79	81	81	82	83	84	85	85
		1,500	68	69	73	74	74	75	77	77	78	79	80	81	81
		1,000	63	65	68	69	69	71	72	73	73	74	75	76	77
		750	60	61	65	66	65	67	69	69	70	71	72	73	73
	35.5 ... 56	1,800	67	74	74	75	75	77	78	79	80	80	81	82	83
		1,500	65	70	70	71	71	73	74	75	76	76	77	78	79
		1,000	60	62	65	66	66	68	69	70	71	72	73	73	74
		750	60	60	62	63	63	65	66	67	67	68	69	70	71
	63 ... 90	1,800	63	65	70	72	72	74	75	76	77	78	79	80	80
		1,500	62	64	67	68	68	70	71	72	73	74	75	76	76
		1,000	60	60	62	63	63	65	66	67	68	69	70	71	71
		750	60	60	60	60	60	62	63	64	65	66	67	68	68

Table B-15 : Enveloping surface sound pressure level for type H3 gear units without fan

The enveloping surface sound pressure levels for gear units of type H4 without fan are detailed in the following table:

Type	i_N	n_1 in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
H4	80 ... 125	1,800	65	67	69	70	72	73	74	75	76	77	78	79	79
		1,500	64	65	66	67	68	69	70	71	72	73	74	75	75
		1,000	60	61	62	63	68	64	65	66	67	68	69	70	70
		750	60	60	60	60	60	61	62	63	64	64	65	66	67
	140 ... 224	1,800	63	64	65	67	68	69	72	71	73	74	75	76	77
		1,500	62	63	64	65	66	66	68	68	69	70	71	72	73

Type	i_N	n_1 in rpm	Gear unit size												
			63	70	96	104	136	151	179	200	234	257	294	312	355
H4	140 ... 224	1,000	60	60	60	60	61	62	63	64	64	65	66	67	68
		750	60	60	60	60	60	60	60	61	61	62	63	64	64
	250 ... 400	1,800	60	60	61	63	64	65	67	68	70	70	71	73	74
		1,500	60	60	61	62	63	64	65	66	67	67	68	69	70
		1,000	60	60	60	60	60	60	60	61	62	63	64	64	65
		750	60	60	60	60	60	60	60	60	60	60	61	61	62

Table B-16 : Enveloping surface sound pressure level for type H4 gear units without fan

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