FLENDER GEAR UNITS

Cooling-tower gear unit

Assembly and operating instructions B5040-02en
Edition 07/2022

H2NV

105...112

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FLENDER

Original assembly and operating instructions

B5040-02
Edition 07/2022

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V4
12/08/2022
14:03:10

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Introduction

1

Naming convention

This product, which can be used as a gear reduction unit or multiplier gear unit, is referred to below as "gear unit".

1.1 Legal information

Warning system

These instructions contain information you must observe for your own personal safety as well as to avoid damage to property and persons. The information regarding your personal safety is highlighted with a warning triangle. Information exclusively 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.

NOTICE

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 containing the warning triangle warns of harm to individuals, the same warning may also include a warning regarding damage to property.

Information

Information

Information offers additional notes, assistance and tips for handling the product.

Qualified personnel

The product/system associated with this documentation may only be used by **qualified personnel** trained to perform the relevant tasks, taking into account the associated documentation for the relevant tasks, particularly the safety information and warnings included therein. Due to their qualification and experience, qualified personnel are capable of detecting risks and avoiding potential hazards when dealing with these products/systems.

Intended use of Flender products

Please note the following:

⚠ WARNING

Flender products are only suitable for the uses set out in the catalogue and associated technical documentation. If third-party products and components are used, these must be recommended and/or authorised by Flender. Safe and flawless operation of the products requires proper transport, proper storage, setup, assembly, installation, commissioning, operation and maintenance. The permissible environmental conditions must be adhered to. Instructions in the associated documentation must be followed.

Trademarks

All designations marked with the trademark symbol ® are registered trademarks of Flender GmbH. Other designations in this document may be trademarks whose use by third parties for their own purposes may violate the rights of the owner.

Liability disclaimer

We have assessed the contents of these instructions for compliance with the hardware and software described. However, deviations cannot be ruled out, so we are unable to accept liability for full compliance. The details in these instructions are regularly reviewed and necessary corrections are contained in subsequent editions.

1.2 General information

Purpose of the operating instructions

These operating instructions describe the gear unit and inform you about its handling, from installation to maintenance.

Keep these operating instructions for later use. Read the operating instructions before handling the gear unit. Follow the instructions.

Information

Liability disclaimer

Please make sure that every person who is commissioned to work on the gear unit has read and understood these instructions prior to handling the gear unit and adheres to all of the points. Failure to observe these instructions can cause product or property damage or personal injury.

Flender does not accept any liability for damage or operating failures which are due to non-adherence to these instructions.

The described gear unit represents the state of the art at the time these instructions were printed.

In the interest of further development, Flender reserves the right to make such changes to the individual assembly units and accessories that increase performance and safety whilst maintaining the essential features.

Required basic knowledge

In order to understand these operating instructions, you will need to have general knowledge about gear units. You will also need a basic understanding of the following topics:

- Application planning
- Assembly
- Commissioning
- Maintenance

Documentation landscape

These operating instructions form part of the delivery of your gear unit.

These operating 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
- Operating Instructions 7300 on gear unit lubrication and preservation
- Operating instructions for mounted components
- Instructions for third-party devices

Copyright

The copyright for these instructions is held by Flender.

Without the authorisation of Flender, these instructions may not be used wholly or in parts for competitors' purposes or be given to third parties.

If you have any technical queries, please contact the Customer Services address (Page 81).

1.3 Lubricants

The quality of the oil used must meet the requirements of the instructions 7300, which is provided as a separate item, otherwise the warranty provided by Flender will be void. Flenderurgently recommends that one of the oil types listed in instructions 7300, which have been appropriately tested and comply with the requirements, is used.

To avoid misunderstandings, Flender points out that, by making this recommendation, it is not approving the product in the sense of expressing a warranty for the quality of the lubricants supplied by your supplier. Every lubricant manufacturer is required to guarantee the quality of his/her products.

Information such as oil type, oil viscosity and required oil quantity can be found on the rating plate of the gear unit and in the documentation supplied with the gear unit.

The oil quantity specified on the rating plate is an approximate value. The actual quantity of oil required is determined by the marking on the oil dipstick or oil sight glass.

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

The oils listed there undergo continuous testing. As a result, the recommended oil types might in future be removed from the list or replaced by more advanced oils.

Flender recommends regular inspection to ascertain whether the selected lubricating oil is still approved by Flender. If it is not, another brand of oil should be selected instead.

Safety instructions

2

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 appropriate protective measures (e.g. firewalls and/or network segmentation) shall be taken.

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

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.

2.1 The five safety rules

In order to protect yourself and prevent any damage to property, always observe the safety relevant information and the following five safety rules (as per EN 50110-1 "Working on isolated equipment") when working on electrical components of the plant.

Prior to starting work on the machine, follow the safety rules listed below:

1. Disconnect
   Also disconnect auxiliary circuits such as the anti-condensation heater
2. Safeguard against restart
3. Ensure that the system is de-energised
4. Earth and short circuit
5. Cover or cordon off adjacent live parts

When all the work is complete, cancel the safety measures in the reverse sequence.

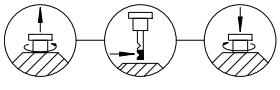
2.2 General information

Introduction

All work on the gear unit should be performed with care and only by qualified personnel.

Symbols on the gear unit

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

Points labelled on the gear unit	**Symbol**	**Coloured markings**
Earth connection point		
Air relief point		yellow
Oil filling point		yellow
Oil draining point		white
Oil level indicator		red
Oil level measurement		red
Oil overflow		
Connection point for vibration monitoring		
Lubrication point		red
Apply grease		
Lifting eye		
Eye bolt		
Do not unscrew		
Alignment surface, horizontal		
Alignment surface, vertical		
These symbols indicate the oil level checking procedure using the oil dipstick.		

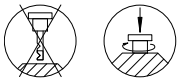
Points labelled on the gear unit	Symbol	Coloured markings
These symbols indicate that the oil dip-stick must be firmly screwed in.		

Table 2-1: Symbols and markings

2.3 General warnings and symbols

The following table contains general warnings and their associated symbols.

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

Table 2-2: General warnings

2.4 Special types of danger and personal protective equipment

Requirements

Fulfil the following requirements before commencing work on the gear unit:

- Ensure that the oil pressure lines are depressurised.
- Only perform work on the gear unit when it is not in operation.
- Disconnect electrical systems from the power supply.



⚠ DANGER

Electric shock

Live parts can cause electric shock.

Ensure that the entire plant is de-energised before starting electrical installation work.

Protective equipment

Wear the following personal protective equipment when handling the gear unit:

- Safety shoes
- Overalls
- Helmet
- Safety gloves
- Safety goggles

⚠ WARNING

Risk of eye injury

Small foreign particles such as sand or dust can enter the cover plates of the rotating parts and be hurled back by them.

Wear safety goggles.

Dangers during operation

Damage to the gear unit is possible.

Switch the gear unit to standstill immediately if inexplicable changes are noticed during operation. Such changes may include unusual gear unit noise or a significant increase in operating temperature.

⚠ WARNING

Risk of falling

There is an increased risk of falling when standing or walking on the gear unit during operation.

Only walk or stand on the gear unit and its mounted components for maintenance and repair work when it is at a standstill. Do not walk or stand on shaft ends, protection covers, mounted components or pipes.



⚠ WARNING

Danger to life through rotating or moving parts

There is danger that rotating or moving parts may catch hold of you or pull you in.

Secure rotating and/or moving parts against contact using safeguards.

Surface temperature

The surface temperatures of the gear unit can become very extreme depending on the operating conditions.



⚠ WARNING

Risk of burns

Possible risk of serious burn injury from hot surfaces (> 55 °C).

Wear suitable protective gloves and protective clothing.

⚠ WARNING

Risk of scalding

Risk of serious injury possible through escaping hot operating media when these are being changed.

Wear suitable protective gloves, safety goggles and protective clothing.

⚠ WARNING

Danger due to low temperatures

Possible risk of serious injuries due to frost (pain, numbness, frostbite) on cold surfaces (< 0 °C).

Wear suitable protective gloves and protective clothing.

Chemical substances

Injuries can be sustained when using chemical substances.



⚠ WARNING

Risk of chemical burns due to chemical substances

There is a risk of chemical burns when handling aggressive cleaning agents.

Please observe the manufacturer's guidelines on how to handle cleaning agents and solvents. Wear suitable protective equipment (gloves, safety goggles). Please use binding agents to immediately clear up any spilt solvent.

⚠ CAUTION

Risk of injury due to chemically aggressive operating materials

There is a risk of injury to eyes and hands when handling chemically aggressive operating materials.

Please observe the safety instructions in the data sheets of the oil used. Wear suitable protective equipment (gloves, safety goggles). Use an oil-binding agent to immediately clean up spilt oil.

Danger of explosion

An explosion may occur in a potentially explosive atmosphere.



⚠ DANGER

Danger of explosion through ignition of a potentially explosive atmosphere

Danger to life through ignition of a potentially explosive atmosphere possible when operating the gear unit

Do not use the gear unit in potentially explosive atmospheres.

2.5 Intended use

Only use the gear unit according to the conditions specified in the service and delivery contract and the technical data in the Annex (Page 89). Deviating operating conditions are considered improper use. The user or operator of the machine or plant is solely liable for any resulting damage.

When using the gear unit, please specifically observe the following:

- Do not make any modifications to the gear unit that go beyond the permissible handling described in these operating instructions. This also applies to the guards designed to prevent accidental contact.
- Only ever use original replacement parts.
  Other replacement parts are not tested and approved by Flender. Non-approved replacement 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 replacement parts. The same applies to any accessories which were not supplied by Flender.

If you have any questions, please contact Customer Service (Page 81).

⚠ WARNING

Risk of falling

Risk of serious injury through falling.

Only walk or stand on the gear unit for maintenance and repair work when it is at a standstill. Do not walk or stand on shaft ends, protective covers, mounted components or pipework.

Using the gear unit

When using the gear unit, please observe the following basic rules:

- Ensure that the gear unit is operationally safe.
- The gear unit must only be operated, maintained and repaired by authorised, trained, instructed and qualified personnel.
- The relevant occupational safety and environmental protection provisions must be taken into account in transport, assembly and dismantling, operation, servicing and maintenance.

- Cleaning the outside of the gear unit with a high-pressure cleaning device is not permitted.
- Do not perform any welding work anywhere on the gear unit or connected parts. Do not use the gear unit or connected parts as an earthing point for electric-welding operations. Gear parts and rolling-contact bearings may be irreparably damaged by welding.
- Perform potential equalisation in accordance with the applicable regulations and directives.
  If there are no threaded holes on the gear unit for an earth connection, other suitable measures must be taken. This work must be carried out by specialists in electrical engineering.
- In the case of gear units that are operated in combination with electrical machines that generate current or through which current flows (e.g. motors and generators), take measures to ensure that no current can flow through the gear unit.
  Current flowing through the gear unit can result in irreparable damage to rolling-contact bearings and gears. Short circuits, voltage flashovers and deposits of conductive dust, for example, can all allow current to flow.
  Use insulators and earth the gear unit properly.
- When removing any guards, store their fixings in a safe place.
- Removed guards must be re-fitted prior to starting.
- Observe the notices mounted on the gear unit, e.g. rating plate, direction of rotation arrow symbol, etc. The notices must be kept free from paint or dirt. Replace missing plates.
- Screws which have become unusable during assembly and dismantling must be replaced with new screws of the same strength class and design.

⚠ DANGER

Danger to life when the system is switched on

Death or serious injury will occur.

Always shut down the gear unit and any oil supply system (whether separate or attached to the gear unit) before you perform any work. Secure the drive aggregate against being operated accidentally as follows:

- Turn off the key-operated switch.
- Remove the fuses in the power supply.
- Attach an information notice to the start switch, clearly stating that work is being carried out on the gear unit.
- Ensure that the entire system is not under a load to avoid danger during dismantling work.

Further use of the gear unit

When integrating the gear unit in machines or systems, the machine or system manufacturer is obliged to include the provisions, instructions and descriptions contained in this set of instructions in their machine instructions.

Description 3

3.1 General description

The FLENDER® gear unit (referred to below simply as "gear unit") described in these operating instructions has been developed to drive an air cooling system in a power plant.

The gear unit is available as a two-stage helical gear unit. This is designed for vertical mounting. The gear unit has an output shaft with increased bearing span for mounting of a fan. It is important to operate the fan within the specified load limits. The lower rolling-contact bearing on the low-speed shaft is grease-lubricated.

It can essentially be operated in both directions of rotation. Gear units equipped with a backstop are the exceptions in this case. Flender must be consulted if, for these versions, the direction of rotation is to be reversed.

The output shaft rotates in an oil retaining pipe (Page 29). This prevents the gear unit oil from escaping at the end of the shaft. A flange-mounted oil pump or a motor pump can be used to supply the gear unit with oil.

The unit can be operated within the design speed range specified by Flender provided that a pump is installed. Operating the gear unit under load at other speeds could result in gear damage.

NOTICE
Destruction of the gear unit or parts of the gear unit due to incorrect direction of rotation is possible Depending on the order specification, the gear unit can have one direction of rotation if it is equipped with a backstop.

3.2 Housing

Introduction

The housing is made of cast iron. When specified, the housing can also be manufactured out of steel.

The housing is a one-part component.

The gear unit housing has the following features:

- Attachment points for moving the gear unit
- Inspection and assembly cover for inspection
- Oil filling point for refilling with oil
- Oil sight glass, oil level indicator or dipstick for checking the oil level
- Oil drain screw or oil drain valve for changing the oil
- Air filter or wet-air filter for ventilation and bleeding

If several mounted components for checking the oil level are mounted on the gear unit, the dipstick should be regarded as the most reliable.

More information

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

The grease lubrication points are designated using the following plate:

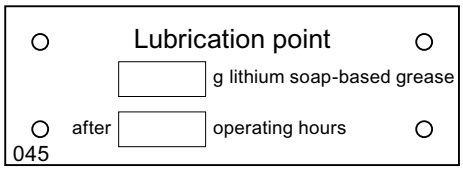


Figure 3-1: Plate: Lubrication point

Gear unit components

The diagram below shows the gear unit components of a cooling tower gear unit:

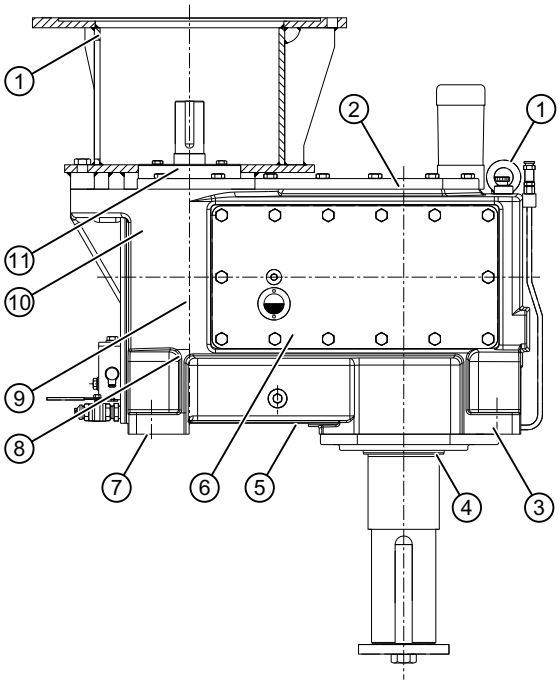


Figure 3-2: Gear unit components of a cooling tower gear unit

① Eye bolts / lifting eyes
② Rating plate
③ Gear unit fastening
④ Shaft seal
⑤ Residual oil drain
⑥ Inspection and assembly cover
⑦ Gear unit fastening
⑧ Flange pump
⑨ Backstop
⑩ Housing
⑪ Shaft seal

More information

You can find additional 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.

3.3 Oil supply of the gear unit

The individual gear unit components are lubricated by a combination of splash and pressure lubrication.

3.3.1 Combined splash and pressure lubrication by mounted oil pump

The rolling-contact bearings and the gear stages are supplied with oil by splash and pressure lubrication systems. The lower rolling-contact bearing of the output shaft is grease-lubricated. The upper rolling-contact bearings and helical gears are supplied with oil by a pressure lubrication system.

The function is monitored using temperature monitoring in the oil sump or by a pressure monitoring system.

The oil supply system is mounted on the gear unit and comprises the following components:

- Flange or motor pump
- Oil filter (coarse filter)
- Pressure monitor
- Pipes

The diagram below shows a type H2NV gear unit with flange pump:

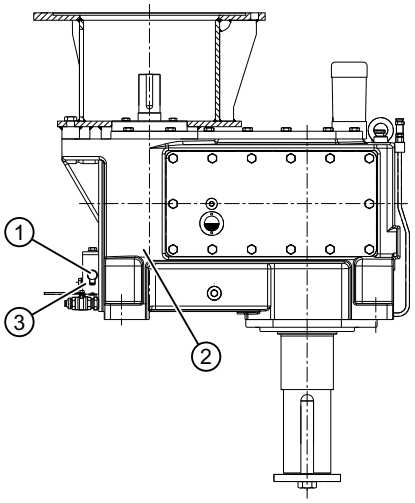


Figure 3-3: Gear unit design with flange pump

① Pressure monitor
② Flange pump (integrated in gear unit)
③ Coarse filter

The diagram below shows a type H2NV gear unit with motor pump:

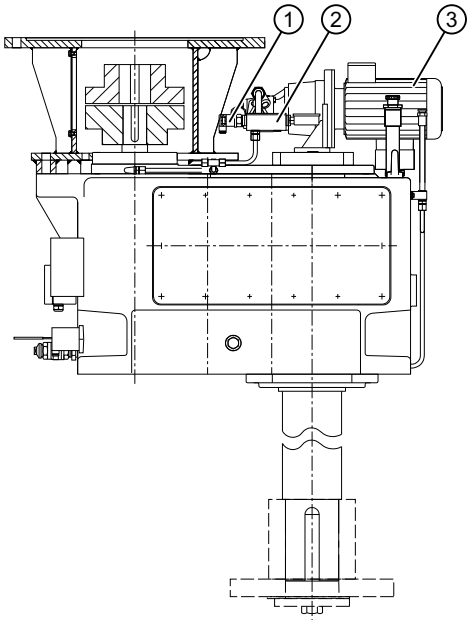


Figure 3-4: Gear unit design with motor pump

① Pressure monitor
② Coarse filter
③ Motor pump

Further information

Further information and a detailed illustrated description of the gear unit can be found in the dimension drawing in the complete documentation for the gear unit.

Further information about the pump, the pressure monitor or the coarse filter can be found in the relevant operating instructions in the complete documentation for the gear unit.

Further information about the technical data can be found in the data sheet or in the list of equipment in the complete documentation for the gear unit.

3.3.1.1 Pump

Requirements placed on the medium being pumped

The pump being used is suitable for pumping lubricating oil. It is not permissible that the oil contains abrasive components and must not chemically attack the materials used in the pump. Clean oil with good lubricating properties is a precondition for ensuring the correct function, high operational reliability and long service life of the pump.

3.3.1.2 Oil filter

Introduction

The oil filter protects downstream units, measuring and control devices against dirt and pollution.

Principle of operation

The oil filter comprises a housing with connections and a filter cartridge. The medium flows through the filter housing, where, depending on the filter gauge, most of the dirt particles larger than a defined size in the oil are filtered out. Dirty filter cartridges must be cleaned or replaced.

3.4 Bearing arrangement of the shafts

All shafts are mounted on rolling-contact bearings.

3.5 Shaft seal

Introduction

Depending on requirements, shaft seals prevent oil from escaping from the gear unit or dirt from entering the gear unit.

3.5.1 Rotary shaft sealing rings

Rotary shaft sealing rings are the standard seal used. Wherever possible, rotary shaft sealing rings are equipped with an additional dust lip which protects the actual sealing lip against external contaminants.

NOTICE

Irreparable damage to the rotary shaft sealing ring caused by high concentration of dust

A damaged rotary shaft sealing ring might not be able to effectively seal the gear unit.

In very dusty atmospheres, do not use rotary shaft sealing rings unless they have additional protection.

The diagram below shows a rotary shaft sealing ring

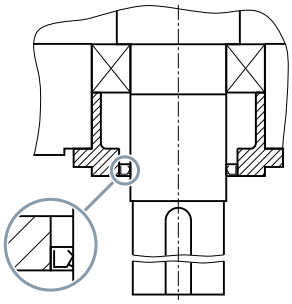


Figure 3-5: Rotary shaft sealing ring

3.5.2 Taconite seal

The taconite seal is a combination of two sealing elements:

- Rotary 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 taconite seal is ideal for use in dusty environments.

NOTICE

Gear unit leaks caused by poor sealing

Regrease the labyrinth seals at the specified regreasing intervals. The regreasing intervals are specified in the Maintenance schedule (Page 69).

A taconite seal is illustrated in the diagram below:

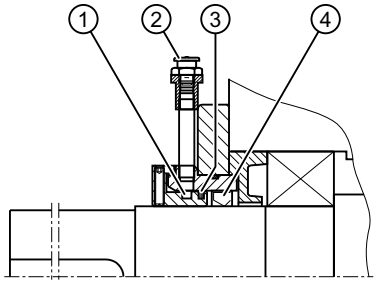
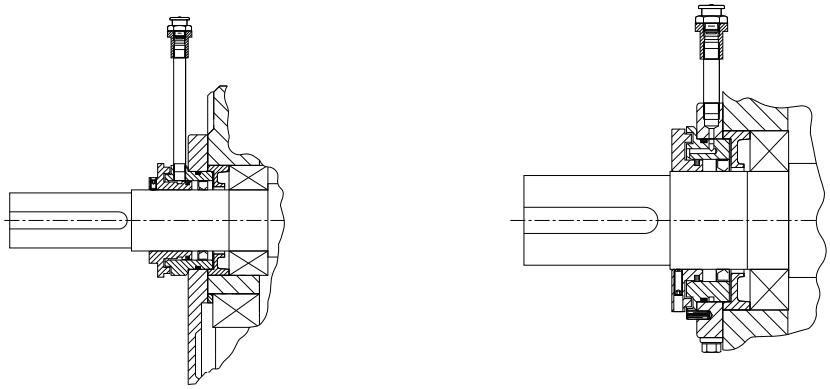


Figure 3-6: Taconite seal

① Labyrinth, filled with grease, can be re-greased
② Grease nipple
③ Lamellar seal
④ Rotary shaft sealing ring

The following design variants of taconite seal are available:



Taconite "E" Taconite "F"

Figure 3-7: Design variants of taconite seals

The various taconite seals are described in the following table:

Taconite seal versions	Application	Remarks
"E"	All input shafts with or without fan	• Regreasable labyrinth

Taconite seal versions	Application	Remarks
"F"	Output shaft Design N: Solid shaft with reinforced bearings	• Regreasable labyrinth

Table 3-1: Taconite seal versions

NOTICE

Sparking, inadmissible temperature rise and shaft seal wear due to insufficient gap dimension

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

In the case of a shaft seal with taconite seals, ensure that the set gap dimension of $1^{+0.5}$ mm on the grease labyrinth is not changed when the input and output elements (e.g. coupling parts) are mounted. Rotating and stationary parts must not touch.

3.5.3 Oil retaining pipe

By sealing the output shaft pointing vertically downward with a contactless and wear-free shaft seal (oil retaining pipe) the shaft outlet is completely oil tight. This design is used only for pressure lubrication.

The following diagram shows an oil retaining pipe

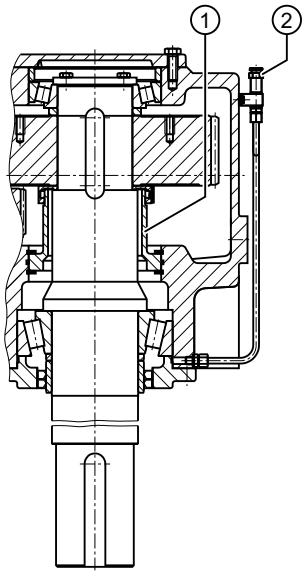


Figure 3-8: Oil retaining pipe

① Oil retaining pipe ② Lubrication point

The lower rolling-contact bearing of the output shaft is separated from the inside of the gear unit by the oil retaining pipe and is grease lubricated. A rotary shaft sealing ring is used to prevent grease from escaping.

NOTICE

Damage to the lower bearing is possible as a result of inadequate lubrication

Make sure that the lower rolling-contact bearing is regreased at the specified intervals. The regreasing intervals are specified in the Maintenance schedule (Page 69).

3.6 Backstop

Introduction

For some requirements, the gear unit can be equipped with a mechanical 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 using an arrow.

The backstop is integrated in the gear unit and is supplied with oil by the gear unit's oil circuit.

Principle of operation

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 (disengagement speed) the sprags disengage from the outer ring. In this operating state, the backstop operates without any wear.

Before connecting the motor, identify the phase sequence of the three-phase power system using a phase sequence indicator. Connect the motor corresponding to the defined direction of rotation.

The blocking direction of the backstop can be changed by turning over the cage. You must always contact Flender in advance if you wish to change the blocking direction.

NOTICE

Damage to the backstop and gear unit due incorrect direction of rotation

Damage to the backstop and gear unit due incorrect direction of rotation possible.

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

The diagram below shows a backstop:

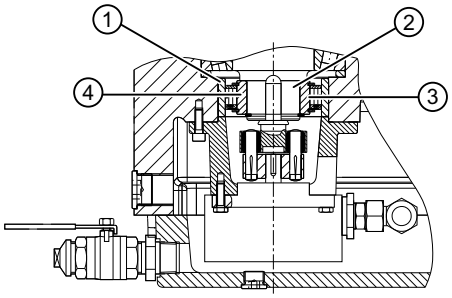


Figure 3-9: Backstop

① Outer ring
② Shaft
③ Cage with sprags
④ Inner ring

3.7 Cooling

Introduction

Depending on the actual requirement, the gear unit can be equipped with a fan.

When installing the gear unit, make sure that unhindered convection across the housing surface is possible in order to protect the gear unit against overheating.

3.7.1 Fan

Principle of operation

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

Improper use can damage the gear unit. Follow the instructions given below in order to protect the gear unit against overheating:

- When you install the protective device for the coupling or similar on gear units that are equipped with a fan, make sure that you leave sufficient clearance for cooling air to be drawn into the fan.
  The required clearance is specified in the dimension drawing in the complete documentation for the gear unit.
- Make sure that the cover plates are correctly fastened.
- Protect the cover plates against damage by external components.
- Make sure that there is no contact between the fan and the cover plates.
- Note that the cooling effect can be significantly impaired if the fan is dirty or if the surface of the housing is covered with dust or contaminants that act as an insulating layer.
  Clean the fan and the gear unit. Observe the cleaning information in chapter Cleaning the fan and gear unit (Page 72).

The diagram below shows a gear unit fan:

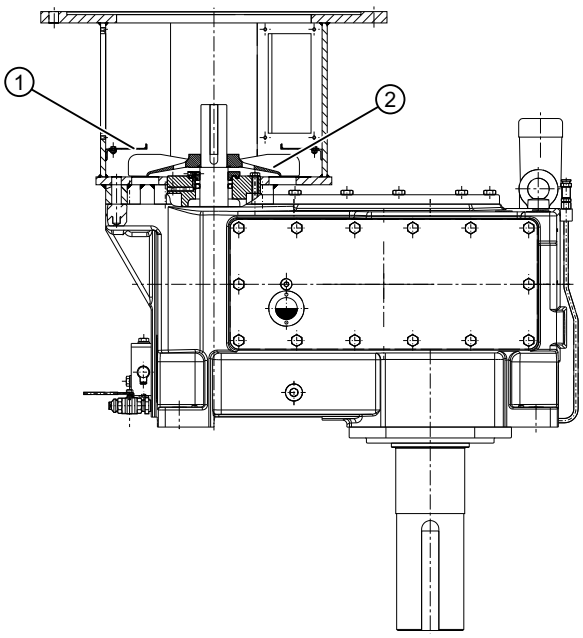


Figure 3-10: Fan

① Fan cover plate ② Fan

Further information

Further information and a detailed illustration of the gear unit and the position of the mounted components can be found in the dimension drawings in the complete documentation for the gear unit.

3.8 Couplings

Flexible couplings are generally used to drive the gear unit.

Radial or axial forces generated by the fan mounted on the output shaft must be agreed contractually.

Further information

You can find additional information about the couplings in the coupling operating instructions provided in the complete gear unit documentation.

3.9 Heating

Introduction

At low ambient temperatures it may be necessary to preheat the gear unit oil before switching on the drive or while it is in operation.

Heating elements

Heating elements can be used for these applications, for example. Heating elements convert electricity into heat and transfer this to the oil in which they are immersed. The heating inserts of the heating elements are installed in protective tubes in the housing so that they can be replaced without draining off the oil first.

Make sure that the heating elements are fully immersed in the oil bath by mounting the gear unit in the correct position as shown in the dimension drawings in the complete documentation, and by keeping the oil topped up to the minimum level.

⚠ WARNING

Fire hazard

Exposed heating elements pose a fire hazard.

Do not switch on the heating elements unless you have checked that they are completely immersed in the oil bath.

If heating elements are retrofitted, the heat output at the outer surface of the heating element must not exceed the maximum values stated in the table below.

The following table contains information about the specific heat output P_{HO} as a function of ambient temperature:

P_{HO} in W/cm^2	Ambient temperature in °C
0.9	10 to 0
0.8	0 to -25
0.7	-25 to -50

Table 3-2: Information about the specific heat output

The diagram below shows a heating system on type H2NV gear units:

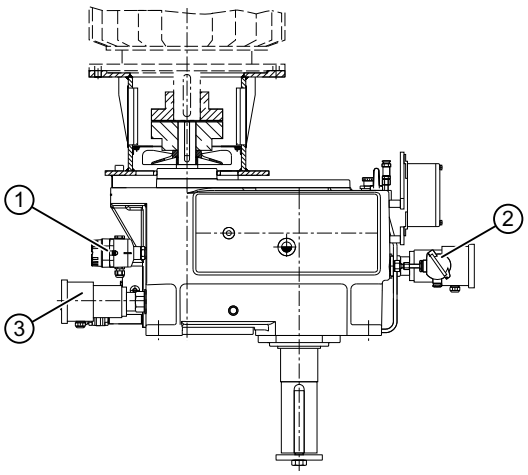


Figure 3-11: Heating on type H2NV gear units

① Level monitor
② Pt 100 resistance thermometer
③ Heating element

Heating element control

The heating elements can be controlled by a temperature monitor or an oil temperature monitoring system (Page 34). The temperature monitor provides a signal to be amplified when the minimum and maximum temperatures are reached.

More information

More information about the position of the mounted components and a detailed illustration of the gear unit can be found in the dimension drawing in the complete documentation for the gear unit.

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

More information about the temperature monitor as well as control instructions can be found in the list of equipment and the temperature monitor operating instructions in the complete documentation for the gear unit.

3.10 Oil level indicator

The following components can be mounted to the gear unit to visually check the oil level:

- Oil sight glass
- Oil level indicator
- Oil dipstick

If several components for checking the oil level are mounted on the gear unit, the oil dipstick should be regarded as the most reliable.

Check the oil level when the gear unit is stationary and with the oil in a cool state.

More information

You can find additional information about the oil level indicator and checking the oil in the instructions 7300 in the complete documentation for the gear unit.

More information, a detailed illustration of the gear unit and the position of the mounted components can be found in the dimension drawing in the complete documentation for the gear unit.

3.11 Oil temperature monitoring

Depending on the order specification, the gear unit can be fitted with a Pt 100 resistance thermometer for measuring the oil temperature in the oil sump.

To measure temperatures or temperature differences, connect the Pt 100 resistance thermometer to an evaluation unit (to be supplied by the customer). The resistance thermometer is fitted with a connector head for the wiring.

The diagram below shows the oil temperature monitoring system on type H2NV gear units:

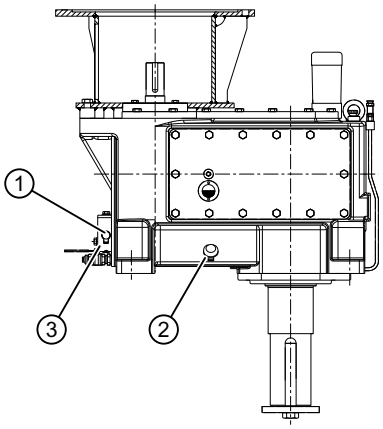


Figure 3-12: Oil temperature monitoring system on type H2NV gear units

① Pressure monitor
② Pt 100 resistance thermometer
③ Coarse filter

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

Further information

Further information and a detailed illustration of the gear unit and the position of the mounted components can be found in the dimension drawing in the complete documentation for the gear unit.

Further information about oil temperature monitoring (such as control instructions) and the technical data can be found in the operating instructions for the oil temperature monitor and in the list of equipment in the complete documentation for the gear unit.

3.12 Bearing monitoring

3.12.1 Bearing monitoring using a Pt 100 resistance thermometer

Depending on the order specification, the gear unit can be equipped with Pt 100 resistance thermometers to monitor the bearings, or prepared for the installation of such thermometers.

You must connect the Pt 100 resistance thermometer to an evaluation unit provided by the customer to be able to measure temperatures or temperature differences. The resistance thermometer has a connection head for the wiring.

The following diagram shows bearing monitoring using a Pt 100 resistance thermometer:

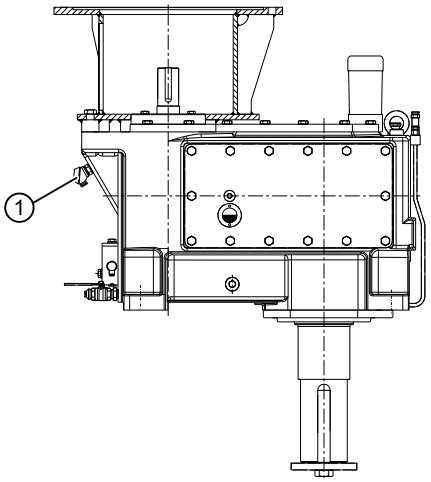


Figure 3-13: Bearing monitoring using a Pt 100 resistance thermometer:

① Pt 100 resistance thermometer

Further information

Further information and a detailed illustration of the gear unit and the position of the mounted components can be found in the dimension drawing in the complete documentation for the gear unit.

Further information about bearing monitoring using a Pt 100 resistance thermometer (such as control instructions) and the technical data can be found in the operating instructions for the Pt 100 resistance thermometer and in the list of equipment in the complete documentation for the gear unit.

3.12.2 Bearing monitoring by shock-pulse transducer

Depending on the order specification, measuring nipples for monitoring the bearings 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 installation of measuring nipples.

These measuring nipples are used to attach shock-pulse transducers through a fast-release coupling.

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

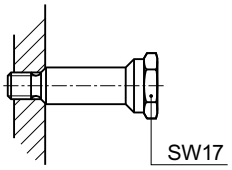


Figure 3-14: Measuring nipple

Further information

Further information and a detailed illustration of the gear unit and the position of the mounted components can be found in the dimension drawing in the complete documentation for the gear unit.

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

Further information about the technical data can be found in the separate data sheet or in the list of equipment in the complete documentation for the gear unit.

3.12.3 Bearing monitoring by acceleration sensor

Depending on the order specification, the gear unit can be supplied with threaded holes in which acceleration sensors can be inserted.

Further information

Further information and a detailed illustration of the gear unit with attached acceleration sensors can be found in the dimension drawing in the complete documentation for the gear unit.

For additional information on the acceleration sensors, please refer to the associated vibration sensor operating instructions:

Application planning 4

4.1 Scope of delivery

The scope of delivery is listed in the shipping documents. Immediately upon receiving the gearbox, check that everything has been delivered. Report any damaged and/or missing parts to Customer Services (Page 81) immediately.

⚠ WARNING

Serious injury through defective product

Serious injury may occur.

If the gearbox exhibits any visible damage, you should not put it into operation.

4.2 Transport

General information

The gear unit is delivered fully assembled. Additional items such as shrink disks, couplings, oil coolers, pipework and valves may be delivered separately packaged, as necessary.

When transporting the gear unit, observe the following instructions to avoid damaging the gear unit:

- Always use suitable equipment to transport the gear unit.
- Transport the gear unit without oil filling and leave it in 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.
- Do not use incorrect attachment points. The threads in the end faces of the shaft ends may not be used for attaching lifting equipment.
- Do not use the pipework to move the gear unit.
- Ensure that the lifting equipment is adequately designed to accommodate the weight of the gear unit.
- Always set the gear unit down onto a suitable base. The base must be designed such that there is no risk of damage to the gear unit or its mounted components.



⚠ WARNING

Risk of crushing

There is a risk of being crushed by a component that becomes detached because the hoisting gear and load suspension device are not suitable for handling it.

When lifting, please observe the load distribution information on the packaging.

When the product is in a raised position, transport it slowly and carefully to avoid injury to persons or damage to the gear unit.

Attaching the gear unit

To transport the gear unit, only attach slings to the marked attachment points that are provided for this purpose.

Please observe the following when attaching slings to the load or raising, lowering or moving it:

- Do not exceed the specified load limits
- If you are using a load suspension device with several load hooks, make sure that the load is evenly distributed between them
- Note the eccentric centre of gravity
- Make sure that the lifting equipment is securely attached
- Keep your speed down when moving the load
- Do not allow the load to sway and do not attach the load to objects or structures inside the building
- Loads must not be suspended from the tip of a load hook
- Always place the products down on a level, non-slip and stable base



⚠ DANGER

Falling load

There is a risk of fatal injury from falling loads if these have not been securely attached to the lifting equipment.

Never stand or sit under suspended loads. Do not exceed the load limits of the lifting equipment.

Packaging

The gear unit is delivered fully assembled. Additional equipment is also delivered separately packaged, as necessary.

The gear unit may be packed in various forms, depending on the size of the unit and method of transport.

Please adhere to the symbols applied on the packaging.

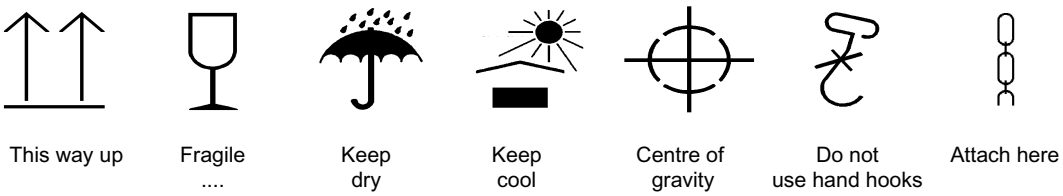


Figure 4-1: Transport symbols

4.3 Attachment points

Lifting eyes

Lifting eyes are fitted to the gear unit to assist with its transportation during manufacture and installation.

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

Sling swivels

Threads for screwing in transport lugs are provided on the gear unit to assist with its transportation during manufacture and installation.

The shear pulling must not exceed 45° when the lifting equipment is attached to sling swivels.

Eye bolts

The use of sling swivels instead of eye bolts is generally recommended.

When using eye bolts, please note that their load-bearing capacity may be reduced if they are alternately attached to different components that require moving.

It is not permitted to load eye bolts through lateral pulling contrary to the direction of the eye plane.

The following figure shows the permissible shear and lateral pulling when using eye bolts:

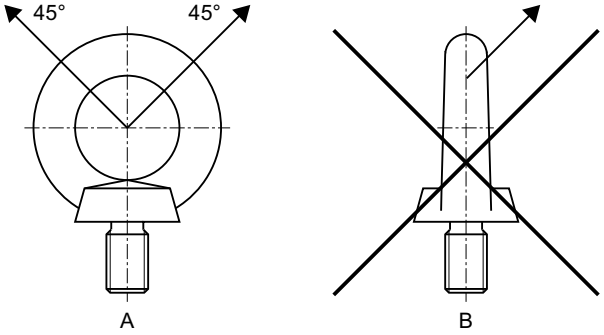


Figure 4-2: Shear and lateral pulling when using eye bolts

A Permitted shear pulling in direction of eye plane (maximum angle of 45°)

B Non-permitted lateral pulling contrary to direction of eye plane

Position of attachment points

The diagram below shows the position of the attachment points on type H2NV gear units without motor:

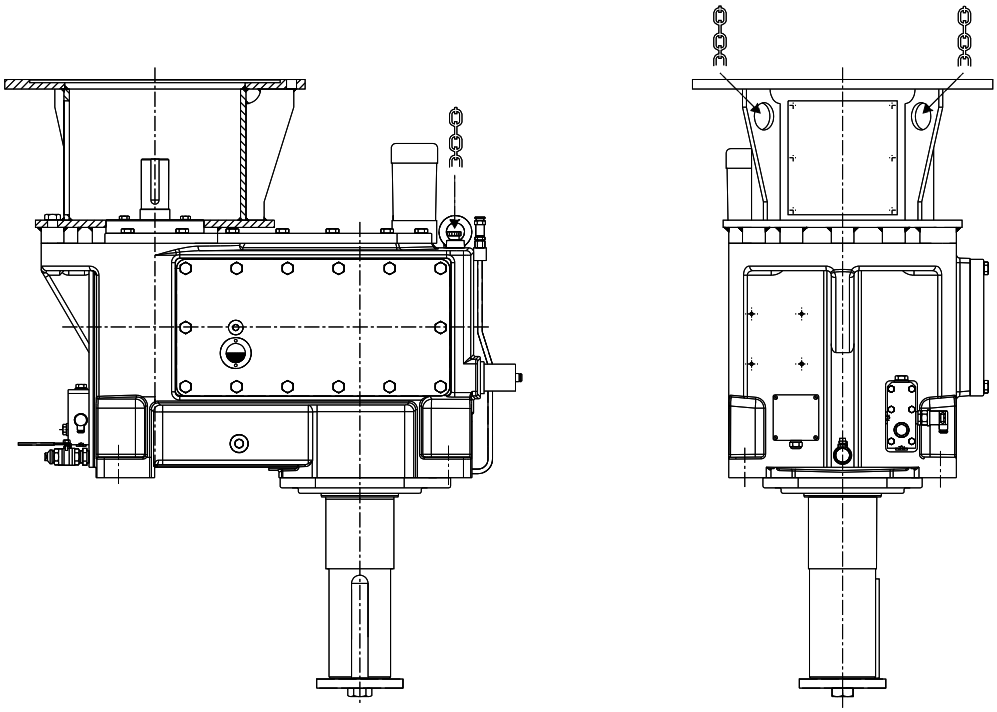


Figure 4-3: Position of the attachment points on type H2NV gear units without motor

The diagram below shows the position of the attachment points on type H2NV gear units with motor:

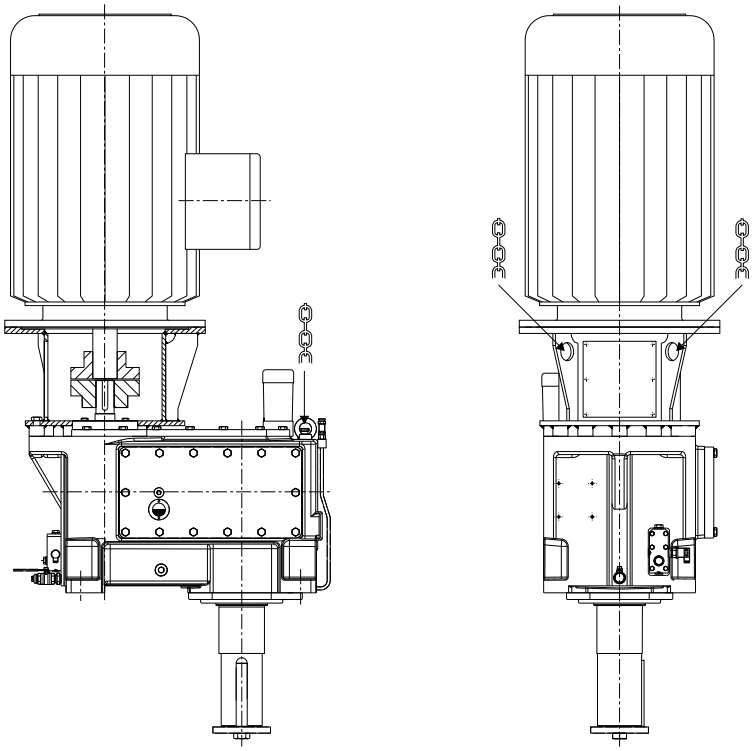


Figure 4-4: Position of the attachment points on type H2NV gear units

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

Further information

Further information and a detailed illustration of the gear unit and the position of the attachment points can be found in the drawings in the complete documentation for the gear unit.

4.4 Special aspects of gear unit lubrication and preservation

4.4.1 Regreasing rolling-contact bearings

4.4.1.1 Grease-lubricated rolling-contact bearing in oil retaining pipe

When shipped from the factory, the lower output shaft bearing of the gear unit is filled with grease.

The following diagram shows the grease lubrication point for the lower output shaft bearing:

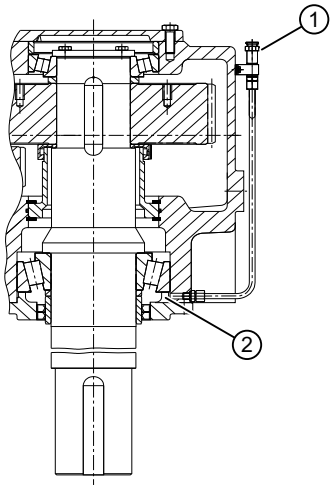


Figure 4-5: Grease lubrication point for the lower output shaft bearing

① Grease lubrication point ② Lower output shaft bearing

When stored for longer periods of time (> 6 months) in a position that deviates from the mounting position, before the gear unit is commissioned for the first time, an amount of grease listed in the following table must be pressed in. Find the correct oil grade listed in Table “T 7300” on the Internet (https://www.flender.com/lubricants).

The following table lists the grease quantities (guide value in kg) for the lower output shaft bearing if taken out of service for > 6 months:

Type	Gear unit size							
	105	106	107	108	109	110	111	112
H2NV	0.2	0.3	0.3	0.4	0.5	0.7	0.7	0.9

Table 4-1: Grease quantities (guide value in kg) for the lower output shaft bearing when taken out of service for > 6 months:

If the gear unit was taken out of service for longer than 36 months, or if the lower output shaft bearing was inspected or replaced, then the rolling-contact bearing space must be re-filled with rolling-contact bearing grease.

The following table lists the grease quantities (guide value in kg) for the lower output shaft bearing if taken out of service for > 36 months:

Type	Gear unit size							
	105	106	107	108	109	110	111	112
H2NV	0.6	0.8	0.9	1.1	1.3	1.7	1.8	2.2

Table 4-2: Grease quantities for the lower output shaft bearing if taken out of service for > 36 months:

The grease lubrication points are marked by the following sign.

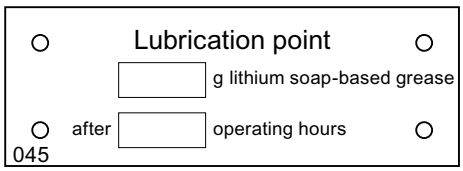


Figure 4-6: Plate: Lubrication point

Further information

Additional information and a detailed illustrated description of the gear unit can be found in the dimension drawing in the complete gear unit documentation.

4.4.2 Special aspects of gear unit preservation

Interior preservation through oil filling

Oil filling must not be used as a means of preserving the interior of gear units with an oil retaining pipe or grease-lubricated rolling-contact bearings.

Assembly 5

5.1 General assembly instructions

The assembly work must be performed very carefully by authorised, trained and suitably instructed personnel. Liability will be disclaimed for damage caused by the incorrect performance of this work.

Requirements

Improper use can damage the gear unit. Be sure to take the following precautions:

- Protect the gear unit against falling objects and from becoming covered over.
- Do not perform any welding work anywhere on the drive.
- Do not use the gear unit as an earthing point for electric-welding operations.
- Use all of the fastening points fitted to the particular unit design.
- Replace any bolts that are no longer fit for use by new bolts of the same strength class and type.
- Make sure that sufficient hoisting gear is available.

Mounting position and attachment points

During the actual planning phase, be sure to allow for sufficient space around the gear unit to enable subsequent upkeep and maintenance work. Take suitable measures to ensure that unhindered convection across the housing surface is possible so that the gear unit does not overheat. Leave sufficient space to allow a free flow of air into gear units that are equipped with a fan.

Do not use incorrect attachment points (Page 39). The position of the attachment points are shown in the dimension drawing in the complete documentation for the gear unit. To ensure that the unit is properly lubricated during operation, please observe the mounting position specified in the dimension drawings.

NOTICE

Heating of the gear unit by external heat sources

The gear unit must not be heated by external heat sources (exposure to direct sunlight, for example) while it is in operation and measures must be taken where necessary to protect it.

You can take the following measures to protect the gear unit against this hazard:

- A sun shield
- An additional cooling device
- A temperature monitoring device with trip function in the oil sump

If you use a sun shield, this may cause a build-up of heat.

If you use a temperature monitoring device, it must be capable of issuing an alarm when the maximum permissible oil sump temperature is reached. It must also be capable of tripping the drive when the maximum permissible oil sump temperature is exceeded. The operator's process might be interrupted when the drive is shut down.



⚠ WARNING

Ignition of vapours emitted from solvents.

There is a risk of injury due to ignition of vapours emitted from solvents when carrying out cleaning work.

Please note the following:

- Ensure adequate ventilation.
- Do not smoke.

5.2 Unpacking the gear unit

Introduction

The scope of delivery is listed in the shipping documents.

⚠ WARNING

Risk of serious injury due to defective product

A defective gear unit can result in serious injury.

Do not put the gear unit into operation if any damage is visible.

Contact Customer Services (Page 81).

Requirements

Check that everything has been delivered immediately upon receipt.

NOTICE

Damage to the gear unit due to corrosion

Exposing the gear unit to moisture can result in damage from corrosion.

Do not damage or open the packaging prematurely if the packaging is designed to preserve the unit.

Procedure

To unpack and use the gear unit, proceed as follows:

1. Remove packaging and transport devices in accordance with regulations.
2. Perform a visual inspection for damage and accumulations of dirt.
3. Immediately report any damaged and/or missing parts to Customer Services (Page 81).
4. Dispose of packaging material and transport devices in accordance with regulations.

5.3 Gear unit assembly

5.3.1 Description of assembly work

5.3.1.1 Introduction

Measures to be taken prior to assembly



⚠ CAUTION

Risk of chemical burns from chemical substances

There is a risk of chemical burns when handling aggressive cleaning agents.

Please observe the manufacturer's instructions on how to handle cleaning agents and solvents. Wear suitable protective equipment (gloves, safety glasses). Remove any spilled solvent immediately with binding agents.



⚠ WARNING

Risk of burns

There is a risk of serious burn injury from hot surfaces (> 55 °C).

Wear appropriate protective gloves and protective clothing.

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

- Use a suitable cleaning agent to remove the corrosion protection from the shafts and mounting surfaces.
- Do not allow the cleaning agent to come into contact with the shaft sealing rings.
- Use a fitting tool to mount the input and output elements (e.g. coupling components) onto the shafts and lock them securely.
- Do not use force (hammer blows, etc.) to fit the coupling components as this can cause internal damage to the gear unit.
- Take care not to damage the shaft sealing rings or shaft running surfaces when fitting the coupling components.
- If the input and output elements must be heated before assembly, the joining temperatures required are listed in the dimension drawings in the coupling operating instructions.
- Unless otherwise specified, heat the coupling parts with an induction heater, a torch or in an oven.
- Use heat shields designed to protect against radiant heat in order to safeguard the shaft sealing rings against damage or heating to above 100 °C.
- The elements must be quickly pulled onto the shaft as far as stated in the dimension drawing prepared in accordance with order specifications.
- Use suitable hoisting gear to place the gear unit in position.

NOTICE

Poor alignment

Damage to the gear unit or individual components due to poor alignment is possible.

When installing and mounting the drives, ensure that the individual components are precisely aligned with one another.

Inadmissibly high alignment errors of the shaft ends to be connected as a result of angular or axial offset result in premature wear and material damage. Base frames or substructures that are too soft can cause the coupling parts to become radially or axially displaced during operation. This displacement is not measurable when the drive is at a standstill.

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

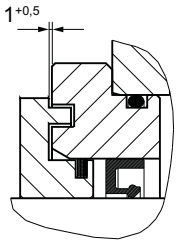


Figure 5-1: Gap dimension at grease labyrinth

NOTICE

Sparking, inadmissible temperature rise and shaft seal wear due to insufficient gap dimension

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

If the shaft is sealed by Taconite or Tacolab seals, make sure that the set gap dimension of $1^{+0.5}$ mm at the grease labyrinth is not altered when the input and output elements (e.g. coupling parts) are installed. Rotating and stationary parts must not touch.

More information

Further information about removing the corrosion protection can be found in the instructions 7300 in the complete documentation for the gear unit.

Further information about attaching gear units to hoisting gear in cases where the gear unit weight necessitates the use of hoisting gear can be found in chapter Application planning (Page 39).

If the gear unit is to be transported with mounted parts and components, then it may be necessary to use additional attachment points. The position of these attachment points can be found in the dimension drawing in the complete documentation for the gear unit.

5.3.1.2 Alignment

Introduction

Depending on the order specification, the top of the housing has machined surfaces (alignment surfaces) to assist with provisional alignment of the gear unit in the horizontal direction.

⚠ DANGER

Risk of fatal injury from flying fragments

Failure to align the unit with the required degree of accuracy can cause the shaft to rupture. A ruptured shaft can result in serious or even fatal injuries.

Align the gear unit exactly so that it conforms to the specified alignment values.

Damage to the gear unit or its components or mounted parts is possible.

The accuracy of the alignment between the shaft axes largely determines the service life of the shafts, bearings and couplings. Please therefore always endeavour to achieve zero deviation in the alignment of the shaft axes (does not apply to ZAPEX couplings or cardan shafts). In this context, please also refer to the relevant operating instructions for further information about, for example, the requirements of couplings.

Procedure

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



Figure 5-2: Alignment surface

To align the gear unit by its alignment surface, proceed as follows:

1. For the precise position of the alignment surfaces, refer to the dimension drawings in the complete documentation.
2. Note the values inscribed in the alignment surfaces.
3. Use these surfaces as a guide for aligning the gear unit horizontally to ensure that it will run smoothly.

Tools

The following tools are needed to perform the final fine alignment (Page 53) work on the shaft axes of the gear unit and the equipment installed on the input and output sides.

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

Once the gear unit is finely aligned, tighten the foundation bolts and check the settings again. Record the alignment dimensions and keep the report in a safe place together with these operating instructions.

5.3.2 Gear unit assembly on housing foot

5.3.2.1 Assembly on a steel frame

Properties of the steel frame

The steel frame must have the following properties:

- Horizontal
- Flat
- Torsionally stiff

Requirements placed on steel frames

The following requirements are placed on a steel frame:

- Design and construct the steel frame so that no resonant vibration occurs - and no shock and vibration can be transmitted from adjacent components.
- Design the steel frame according to the relevant weight and torque, taking into account the forces acting on the gear unit.
- Align the gear unit in the elongated holes of the motor bridge so that the fan mounted on the output side has the same clearance from the diffuser around its entire circumference.
- It is recommended that lateral stops are used to stop the gear unit shifting if external forces act on it.

NOTICE
Lack of stable foundation for the gear unit Damage to the gear unit is possible if it is not mounted on a stable foundation. Use bolts of at least strength class 8.8. Information and guidance on the tightening torque can be found in chapter Tightening procedure (Page 58). Tighten the fastening bolts and nuts to the specified tightening torque. When tightening the fastening bolts, make sure that the gear unit is free of mechanical stress.

Procedure

To mount the gear unit on a steel frame, proceed as follows:

1. Clean the lower side of the gear unit mounting feet.
2. Using a suitable crane or lifting gear, place the gear unit down on the steel frame.
3. Tighten the fastening bolts to the specified torque (Page 58), and if necessary use lateral stops to prevent the gear unit shifting.
   When tightening the fastening bolts, make sure that the gear unit is free of mechanical stress.
4. Precisely align the gear unit to equipment connected at its input and output.
5. Record the alignment dimensions.
   Archive this report together with these instructions.

Further information

Further information about dimensions, space requirements and arrangement of supply connections can be found in the complete documentation for the gear unit.

5.4 Couplings

Introduction

Couplings must be balanced as specified in the relevant operating instructions. Balance the couplings if required.

The coupling parts might become misaligned as a 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

NOTICE

Premature wear and material damage to gear units due to misalignment

Gear units might suffer premature wear and material damage if they are misaligned.

Make sure that the maximum permissible displacement values are never exceeded during operation. These values can be found in the operating instructions for the coupling.

Angular and radial displacement might occur simultaneously. Make sure that the total value of both displacements does not exceed the maximum permissible angular or radial displacement value.

If you are using couplings supplied by other manufacturers, contact them and ask them for the maximum permissible misalignment tolerances, making sure that you specify the potential radial loads for your application.

The following diagram shows the possible displacements:

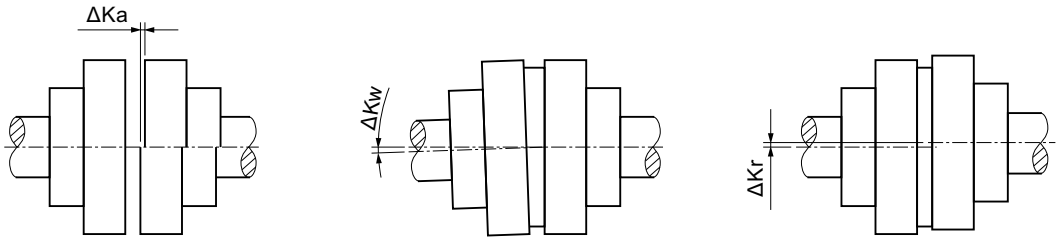


Figure 5-3: Possible displacements

Alignment

Alignment must be 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 diagram below shows the alignment process based on the example of a flexible coupling:

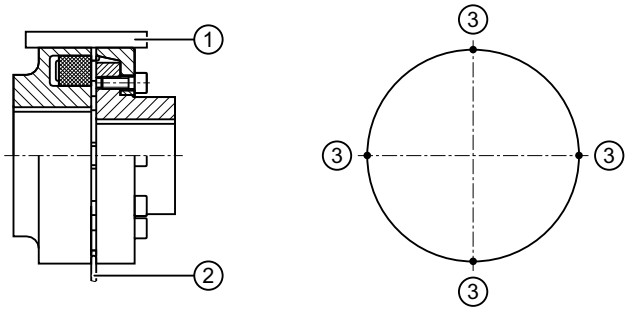


Figure 5-4: Alignment process based on the example of a flexible coupling

① Ruler
② Feeler gauge
③ Measuring points

Information

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

Further information

Further information about misalignment tolerances for couplings supplied by Flender can be found in the relevant operating instructions for the couplings in the complete documentation for the gear unit.

If couplings from other manufacturers are to be used, then, specifying the radial loads that occur, ask the manufacturer which alignment errors are permissible.

You can find additional information about couplings in the associated operating instructions.

5.5 Connecting components

5.5.1 Gear units with mounted components

Depending on the order specification, the gear unit can be equipped with various components.

Connect the closed-loop control and open-loop control electrical devices corresponding to the specifications of the device supplier.

Further information

You can find additional information on operation and maintenance in the associated operating instructions, provided in the complete gear unit documentation.

You can find the technical data of the mounted components in the contract-list of equipment provided in the complete gear unit documentation.

5.5.2 Making terminal box connections for pre-wired gear units

Procedure

Proceed as follows to wire up the gear unit:

1. Connect up all pre-wired gear units as shown on the circuit diagram in the terminal box.
2. If a pressure monitor is installed, bypass the pressure monitor signal for around 20 seconds during commissioning.
   This is necessary as the pressure in the gear unit must first stabilise.

Further information

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

5.5.3 Connecting the heating element

Procedure

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

1. Check that the heating element connection is not damaged.
2. Connect up the oil temperature monitoring system in the oil sump.
3. Install the electrical wiring for the heating elements.

⚠ WARNING

Fire hazard

Exposed heating elements pose a fire hazard.

Do not put heating elements into service until you have checked that they are completely immersed in the oil bath.

Further information

Further information about the heating can be found in the heating operating instructions in the complete documentation for the gear unit.

5.5.4 Connecting the pressure monitor

For gear units with a pressure monitor, you must connect the pressure monitor so that it functions correctly.

Bypass the pressure monitor signal for around 20 seconds during commissioning.

Further information

You can find additional information on pressure monitoring in the pressure monitor operating instructions, provided in the complete gear unit documentation.

5.5.5 Connecting the Pt 100 resistance thermometer

Procedure

To connect the Pt 100 resistance thermometer, proceed as follows:

1. Check that the Pt 100 resistance thermometer connection is not damaged.
2. Install the electrical wiring between the Pt 100 resistance thermometer and the evaluation unit. The customer is responsible for providing the evaluation unit.

Further information

Further information about the Pt 100 resistance thermometer can be found in the Pt 100 resistance thermometer operating instructions in the complete documentation for the gear unit.

5.5.6 Connecting the temperature monitor

Procedure

To connect the temperature monitor to the gear unit, proceed as follows:

1. Make sure that the temperature monitor connection is undamaged.
2. Install the electrical wiring for the temperature monitor.

Further information

Further information about the temperature monitor can be found in the temperature monitor operating instructions in the complete documentation for the gear unit.

5.5.7 Connecting the bearing monitoring system

Procedure

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

1. Make sure that the connections provided for holding the bearing monitoring equipment are undamaged.
2. Install the bearing monitoring equipment at the customer's site.

Further information

Further information about the bearing monitoring system can be found in the operating instructions for the bearing monitoring system components provided in the complete gear unit documentation.

5.5.8 Connecting the motor pump

Procedure

To connect the motor pump, proceed as follows:

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

Further information

You can find additional information about the motor pump in the terminal diagrams and the lists of equipment provided in the complete gear unit documentation.

5.5.9 Electrical connections

Procedure



⚠ DANGER

Electric shock

Live parts can cause electric shock.

Ensure that the entire plant is de-energised before starting electrical installation work. Carefully observe the five safety rules (Page 15).

To connect the motors and monitoring devices, proceed as follows:

1. Ensure that the connections of the motors and monitoring devices are not damaged.
2. Connect up the motors and monitoring devices according to the terminal diagram and the relevant operating instructions.
3. Insulate all cable entry points (glands) at electrical equipment as required for the environment in which the equipment will operate.

Further information

You can find additional information about the electrical connections in the terminal diagrams and equipment lists provided in the complete gear unit documentation.

5.6 Tightening procedure

5.6.1 Introduction

Bolts

The bolts must have the following properties:

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

Information

Replacing bolts

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

Mating threads

The mating threads must have the following properties:

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

Information

Using a lubricant

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

5.6.2 Bolt connection classes

In order to affix fastening bolts, note the information in the following table:

Mounting	Bolt connection class	Scatter of the torque emitted on the tool	Tightening procedure
Gear unit Motor Brake Torque arm	C	± 5 % to ± 10 %	• Hydraulic tightening with mechanical screwdriver • Torque-controlled tightening with a torque wrench or a signal-emitting torque wrench • Tightening with a precision mechanical screwdriver with dynamic torque measurement
	D	± 10 % to ± 20 %	• Torque-controlled tightening with mechanical screwdriver
Protection cover Sun shield	E	± 20 % to ± 50 %	• Tightening with pulse screwdriver or impact wrench, without adjustment checking device • Tightening by hand, using a wrench without torque measuring device

Table 5-1: Information on tightening fastening bolts

Further information

You can find additional information about tightening torques when mounting motor and brake in the operating instructions from the particular manufacturer.

5.6.3 Tightening torques and preload forces

The specified bolted connections must be tightened to the torques stated in the table below:

The tightening torques apply to friction values of μ_{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	Bolt strength class	Preload force for bolt connection classes from the table in chapter Bolt connection classes (Page 58)			Tightening torque for bolt connection classes from the table in chapter Bolt connection classes (Page 58)		
d mm		C	D	E	C	D	E
		$F_{M\ min.}$ 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

Nominal thread diameter	Bolt strength class	Preload force for bolt connection classes from the table in chapter Bolt connection classes (Page 58)			Tightening torque for bolt connection classes from the table in chapter Bolt connection classes (Page 58)		
d		C	D	E	C	D	E
mm		$F_{M\ min.}$ N			M_A Nm		
M12	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
	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

Nominal thread diameter	Bolt strength class	Preload force for bolt connection classes from the table in chapter Bolt connection classes (Page 58)			Tightening torque for bolt connection classes from the table in chapter Bolt connection classes (Page 58)		
d		C	D	E	C	D	E
mm		$F_{M\,min.}$ N			M_A Nm		
M72x6	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 5-2: Preload forces and tightening torques

5.7 Final work

Measures

Once all the elements have been assembled or connected, perform the following final work:

- Check whether all devices dismantled for transportation have been reassembled.
- Check all bolt connections for tightness after installation of the gear unit has been completed.
- Check the alignment after tightening the fastening elements. The alignment must not have changed in any way.
- Lock the oil drain valves against accidental opening.
- Protect the gear unit against falling objects.
- Check that the guards over rotating parts are securely fastened.
  Contact (accidental or deliberate) with rotating parts is not permitted.
- Perform potential equalisation in accordance with the applicable regulations and guidelines. If no threaded holes are available on the gear unit for an earth connection, please take suitable alternative measures. This work must always be done by specialist electricians.
- Protect the cable entries against penetrating moisture.

Further information

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

You can find additional technical specifications in the separate data sheet in the complete gear unit documentation.

Commissioning 6

6.1 Measures prior to commissioning

Take the following measures before commissioning the gear unit:

- Read and observe the operating instructions.
- Replace the screw plug with the air filter or the wet-air filter. Note the instructions 7300 for this.
- Gear unit with oil retaining pipe: If required, press in grease at the oil retaining pipe (Page 71).
- Gear units with backstop: Observe the appropriate measures prior to commissioning gear units equipped with backstop (Page 63).
- Fill the gear unit with oil.
  The grease-lubricated output bearings are protected against oil by an oil retaining pipe. The oil retaining pipe can become flooded if it is overfilled with oil.
- Gear unit with oil supply system: Check that the oil supply system is working properly.
- Check the oil level.
- Check the gear unit for leaks.
- Check whether the monitoring devices are connected and switched on.
- Gear unit with oil supply system: Take the appropriate measures before commissioning gear units with an oil supply system (Page 65).
- Ensure that all pipes and components are filled with oil.

More information

You can find additional information on oil and changing the air filter in the instructions 7300, which are part of the complete documentation of the gear unit.

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

6.1.1 Gear unit with backstop

Before connecting the motor, determine the phase sequence of the three-phase power system using a phase-sequence indicator and then connect the motor in accordance with the defined direction of rotation.

NOTICE

The backstop and the gear unit can be damaged

If you operate the gear unit adversely to the blocking direction of the backstop, then backstop and the gear unit can be damaged.

Do not operate the gear unit adversely to the blocking direction of the backstop. Observe the information on the plate attached to the gear unit.

Checking the direction of rotation by separating the coupling

Proceed as follows to check the direction of rotation:

1. Loosen the fastening bolts at the coupling section.
2. Push up the cam section.
3. Screw in the fastening bolts under the cam section so that they act as "spacers" to that you can turn the motor shaft freely.
4. Check the direction of rotation of the motor shaft.
5. Reinstall everything by following the same steps in reverse.

The diagram below shows the procedure for checking the direction of rotation:

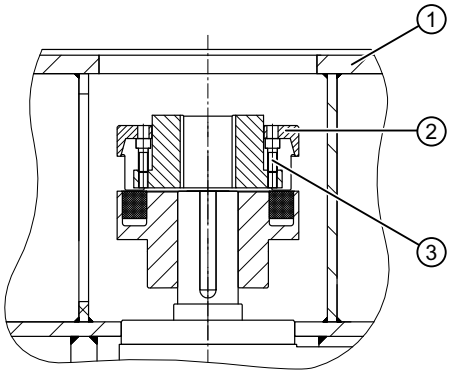


Figure 6-1: Rotational direction check

① Motor bell housing
② Cam section
③ Fastening bolts

6.1.2 Gear unit with heating

Please observe the following measures to commission the gear unit with heating:

- Ensure that the heating elements are not exposed.
- Check the switching points of the temperature monitor.

⚠ WARNING

Fire hazard

Exposed heating elements pose a fire hazard.

Do not put heating elements into service until you have checked that they are completely immersed in the oil bath.

Further information

Further information about heating elements can be found in the heating element operating instructions in the complete documentation for the gear unit.

6.1.3 Gear units with oil supply system

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

- Ensure that the maximum permissible pressure in the oil supply system components is not exceeded.
- Ensure that the maximum permissible temperature of the oil supply system components is not exceeded.
- 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.

NOTICE

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.

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

Further information

You will find information on the oil supply system in the data sheet, in the list of equipment and in the operating instructions for the oil supply system which are included in the complete documentation for the gear unit.

6.2 Measures during commissioning

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

- For gear units with oil supply system: Check that the oil supply system is working properly.
- Check the oil level.
- Measure the oil sump temperature (Page 71) after the gear unit has run in.
- Check the tightness of the shaft seal on the gear unit (Page 27).
- Check that all rotating parts are free to move.
- 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.
- Check that the connecting pipes are firmly seated and tight.
- For gear units with bearing monitoring based on vibration measurement: Measure the vibration levels of the rolling-contact bearings (Page 74) to create initial and comparison values.
- For gear units with bearing monitoring using a Pt 100 resistance thermometer: Measure the temperature at the rolling-contact bearings (Page 74) to create initial and comparison values.

- Bypass the pressure monitor 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.

More information

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

More information about the oil supply system can be found in the oil supply system operating instructions contained in the complete documentation for the gear unit.

6.2.1 Commissioning at low temperatures

Start gear units with a pole-changing or frequency-controlled motor at a minimum speed.

Version with flange pump

The gear unit must be warmed up if the oil sump temperature is < -16 °C. In this case, the integral heating elements must be used.

Version with motor pump

The motor pump must be switched on at least 2 minutes before you start up the gear unit.

Operation 7

7.1 Operating data

Introduction

To ensure correct, trouble-free operation of the system, observe the operating data of the gear unit and, depending on the order specification, the data in the operating instructions for the oil supply system.

The valid operating data can be found in the annex Technical data (Page 89).

The following operating data apply to the oil:

Maximum operating temperature	90 °C	is applicable for mineral oil, API groups I or II and saturated synthetic ester
	100 °C	is applicable for semi-synthetic oils, API group III, PAO and PG oils
Maximum operating temperature (for brief periods)	100 °C	is applicable for mineral oil, API groups I or II and saturated synthetic ester
	110 °C	is applicable for semi-synthetic oils, API group III, PAO and PG oils

Table 7-1: Operating data

You will find information about the oil pressure in the data sheet, in the list of equipment or in the dimension drawing in the complete documentation for the gear unit.

Further information

Further information about the technical data of the gear unit can be found in the data sheet and the list of equipment in the complete documentation for the gear unit.

7.2 Irregularities in operation

Introduction

Switch off the drive assembly immediately if it exhibits irregular behaviour during operation.

A few irregularities are listed below as examples:

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

NOTICE

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 assembly immediately if any fault condition develops.

Rectifying irregularities in operation

Proceed as follows to rectify any irregularities in operation:

1. Switch off the drive assembly if it exhibits irregular behaviour during operation.
2. Refer to the Fault information (Page 75) to find the cause of the fault.
3. If you still cannot determine the fault cause, contact FlenderCustomer Services.

7.3 Taking the unit out of service

If you take the unit out of service 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:

- Switch off the drive aggregate.
- Also lock the output end of the gear unit in position at the fan so that the fan cannot drive the unit.
- Take measures to preserve the gear unit if it is to be 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 an oil retaining pipe or grease-lubricated rolling-contact bearings.

NOTICE

Taking gear units with motor pump out of service

If the unit is to be taken out of service temporarily, e.g. due to production stoppage or plant malfunctions, the motor pump must be allowed to rotate continuously. This will ensure optimum corrosion protection while the gear unit is at a standstill. The motor pump also boosts the heat output of the heating elements at sub-zero temperatures.

Switch the motor pump off if the gear unit will be out of service long enough to require preservation.

Servicing 8

8.1 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
- Duty cycle "ED" 100%
- Gear unit input speed 1500 rpm
- Average oil temperature in the oil sump (see Instructions 7300)



⚠ WARNING

Danger to life when the system is switched on

Working on a gear unit while it is in operation is hazardous and can result in potentially fatal injuries.

Always shut down the gear unit and any oil supply system (whether separate or mounted on the gear unit) before you carry out any work. Take measures to prevent the accidental restarting of the drive aggregate. Attach a notice stating clearly that work is being performed on the gear unit.

8.2 Maintenance schedule

Maintenance and servicing activities

The following table provides an overview of all maintenance and servicing activities which you are required to perform continuously 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
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

Intervals and time limits	Measures
Monthly and prior to every start-up	Check for leaks Check the oil level
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 that all of the fastening bolts are tight
Every 3 months	Check the speed monitoring of the auxiliary drive Check the auxiliary drive Clean the oil filter Clean the air filter Clean the venting 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 lubrication point)	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 mineral oil of API Group I or II or saturated synthetic esters (or depending on the result of the oil sample test) Check the air-oil cooler (the same time as you change the oil) Check 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 all of the fastening bolts are tight Clean the fan and gear unit
Every 20 000 operating hours, at least every 4 years	Change the oil if using semi-synthetic oil of API Group III, PAO or PG oil (or depending on the result of the oil sampling)
6 years after the specified date of manufacture	Change the hoses

Table 8-1: Maintenance and servicing activities

Further information

Further information about additional maintenance and servicing activities can be found in the separate data sheet in the overall documentation for the gear unit.

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

8.3 Maintenance and servicing work

Introduction

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

8.3.1 Checking the oil temperature

Damage to the gear unit due to excessively high oil sump temperatures.

The gear unit can sustain damage due to inadequate lubrication if you allow it to operate at oil sump temperatures above the maximum permissible temperature.

Do not operate the gear unit above the maximum permissible oil sump temperature.

Procedure

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.
3. Measure the temperature of the oil in the oil sump.
4. Compare the measured value with the maximum permissible oil temperature (Page 67).
5. Immediately stop the gear unit if the maximum permissible oil temperature is exceeded. Contact Flender Customer Services.

8.3.2 Replenishing grease in the oil retaining pipe

Introduction

Only use grease that has been approved by Flender as specified in instructions 7300.

The precise designation of the grease nipple is provided in the complete documentation.

Requirements

Under the following conditions, you must replenish the grease before initial commissioning the gear unit for the first time:

- Storage extending beyond 6 months
- Storage in a position other than the mounting position

Procedure

Proceed as follows to replenish grease in an oil retaining pipe:

1. Clean the grease nipple.
2. Connect the lubrication device to the grease nipple.
3. Press in the specified quantity of lithium soap-based rolling-contact bearing grease. The grease lubrication points are marked by the following sign.

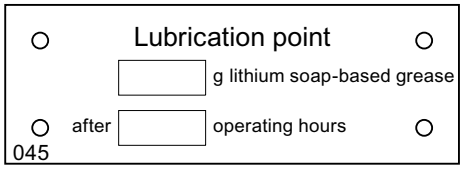


Figure 8-1: Plate: Lubrication point

4. Remove the lubrication device from the grease nipple.

⚠ CAUTION

Risk of slipping

There is a danger of slipping if the grease escapes from the oil retaining pipe.

Immediately remove any grease that has escaped from the oil retaining pipe and dispose of it correctly.

Refer to the following table for the quantities of grease (approximate values in g) to be replenished on gear units with an oil retaining pipe:

Type	Gear unit size							
	105	**106**	**107**	**108**	**109**	**110**	**111**	**112**
H2NV	40	50	50	60	70	70	90	90

Table 8-2: Grease quantities for replenishing gear units with oil retaining pipe

8.3.3 Cleaning the fan and gear unit

Introduction

The gear unit can sustain damage due to inadequate cooling if you operate it with a damaged 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.

Take appropriate measures to protect shaft seals from coming into contact with cleaning agents.

Procedure

Proceed as follows to clean the fan and gear unit:

1. Unscrew the protective grille from the motor bell housing.
2. Remove the cover plates.
3. Use a hard brush to remove any stubborn dirt from the impeller, cover plates and protective grille. Never use a high-pressure cleaning device.
4. Remove any spots of corrosion.
5. Reattach the cover plates.
   Make sure that the cover plates are correctly fastened. Make sure that there is no contact between the fan and the cover plates.
6. Reattach the protective grille to the motor bell housing by the fastening bolts.

8.3.4 Cleaning the coarse filter

Procedure

To clean the coarse filter, proceed as follows:

1. Inspect the coarse filter.
2. Remove the drain plug.
3. Pull out the strainer and remove particles of dirt.
4. Replace any strainers or sealing rings that are defective.

Further information

You can find additional information about the coarse filter in the coarse filter operating instructions provided in the complete gear unit documentation.

You can find additional technical data in the separate data sheet and in the list of equipment provided in the complete gear unit documentation.

8.3.5 Cleaning the double change-over filter

Procedure

To clean the double change-over filter, proceed as follows:

1. Inspect the double change-over filter.
2. Follow the operating instructions for the double change-over filter.

Further information

You can find additional information about the double change-over filter in the double change-over filter operating instructions provided in the complete gear unit documentation.

You can find additional technical data in the separate data sheet and in the list of equipment provided in the complete gear unit documentation.

8.3.6 Measuring the vibration levels of the rolling-contact bearings

Procedure

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 Services replace defective rolling-contact bearings.

Further information

You can find additional information on measuring the vibration levels at rolling-contact bearings in the operating instructions of the measurement sensor provided in the complete gear unit documentation.

8.3.7 Measuring the temperature at the rolling-contact bearings

Procedure

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 Services replace defective rolling-contact bearings.

Further information

Further information about measuring the temperature at the rolling-contact bearings can be found in the Pt 100 resistance thermometer operating instructions in the complete documentation for the gear unit.

8.3.8 Check that all of the fastening bolts are tight

Note the following points when checking that the fastening bolts are tight:

- Observe the data regarding connection classes (Page 58), preload forces and tightening torques (Page 59).
- Replace any bolts that are no longer fit for use by bolts of the same strength class and type.

8.3.9 General inspection of the gear unit

Arrange for Flender Customer Services to inspect the gear unit. Thanks to their experience, these engineers are best placed to assess which gear unit components need to be replaced.

8.3.10 Final work

After you have finished all the work listed in the maintenance schedule, replace any bolts that are no longer fit for use by bolts of the same strength class and type.

8.4 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 Services to attempt a repair.

Even after the warranty period has expired, you should still arrange for faults to be rectified by Flender Customer Services.

Information

Loss of warranty

You will invalidate the warranty for the gear unit if you modify it in any way without seeking the approval of Flender beforehand, or if you do not use original spare parts.

Only use original spare parts from Flender. Always arrange for Flender Customer Services to repair any faults that develop while the unit is still under warranty.

Possible faults and their rectification

The following table provides you with an overview of possible faults and indicates how they can be rectified.

Possible faults	Causes	Possible remedies
Blocking function of backstop has failed	Damaged backstop	• Contact Customer Services • Check the backstop and replace if necessary

Possible faults	Causes	Possible remedies
Pressure switch 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 output shaft	Defective rotary shaft sealing rings	• Inspect the rotary shaft seals and replace if necessary
Noise	Damage to the gear teeth	• Contact Customer Services • Inspect the toothed components • If necessary, replace damaged components
	The bearing play is excessive.	• Contact Customer Services • Adjust bearing play
	Defective rolling-contact bearings	• Contact Customer Services • Replace defective rolling-contact bearings
	Overrunning noises caused by operation on frequency converter	• Contact Customer Services • 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 Services • Install the backstop cage, rotated through 180° - or replace
	Overrunning clutch blocked	• Contact Customer Services • Install a new overrunning clutch
	Overrunning clutch cage with sprags incorrectly installed and/or defective	• Contact Customer Services • Install the overrunning clutch cage, rotated through 180° - or replace
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

Possible faults	Causes	Possible remedies
Auxiliary drive motor does not start	Overload at the output	• Reduce the load at the output
	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, the main gear unit output shaft does not turn	Motor direction of rotation incorrect	• Change polarity of motor
	Overrunning clutch cage with sprags incorrectly installed	• Contact Customer Services • Install the overrunning clutch cage, rotated through 180° - or replace
	Defective overrunning clutch	• Contact Customer Services • Install a new overrunning clutch
Leakage	Labyrinth seals soiled with oil, incorrect transport position	• Check oil filling • Clean the labyrinths
	Inadequate sealing of the housing cover or joints	• Check the seals and replace if necessary • Seal housing cover or joints
	Defective rotary shaft sealing rings	• Check the rotary shaft sealing rings • 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
	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

Possible faults	Causes	Possible remedies
Oil escaping from the gear unit	Inadequate sealing of the housing cover or joints	• Check the seals and replace if necessary • 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	-	• Follow the operating instructions for the oil supply system
Elevated temperature during operation	Oil level in the gear unit housing too high	• Check the oil level • Correct the oil level if necessary
	Oil is too old	• Find out when the last oil change was done • 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 • Replace defective components if necessary • Follow the operating 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 units 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
	Coolant temperature is 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 • Correct the oil level if necessary
	Oil is too old	• Find out when the last oil change was done • Change the oil if necessary

Possible faults	Causes	Possible remedies
Elevated temperature at bearing points	Oil supply system defective	• Check the oil supply system • Replace defective components if necessary • Follow the operating instructions for the oil supply system
	Defective rolling-contact bearings	• Contact Customer Services • 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 Services • Check the backstop and replace if necessary
Increased vibration amplitude at the bearing points	Defective rolling-contact bearings	• Contact Customer Services • Inspect the rolling-contact bearings and replace if necessary
	Gear wheels defective	• Contact Customer Services • 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 corresponding to the separate operating instructions • Clean the filter element
Water in the oil	Oil supply system or cooling coil defective	• Check the oil supply system or cooling coil • Replace defective components if necessary • Follow the operating 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 Services • 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 8-3: Possible faults and their rectification

Service & Support

9

9.1 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

More information

Further information about service and support can be found on the Internet:

Service & Support (https://www.flender.com/service)

Disposal

10

Disposal of the gear unit

When disposing of the gear unit after its useful life, please observe the following measures:

- Remove operating oil, preservative agents and coolant from the gear unit and dispose of it according to regulations.
- Dispose of the gear unit parts according to applicable national regulations or recycle them.

Environmental protection

Observe the following environmental protection measures for disposal:

- Dispose of or recycle packaging material according to applicable national regulations.
- When changing the oil, collect the used oil in suitable containers. Use oil-binding agents to clean up any oil spillages immediately.
- Store preservative agents separately from used oil.
- Dispose of used oil, preservative agents, oil binding agents and oil-soaked cloths according to the applicable environmental protection regulations.

Spare parts

11

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

Information

Damage to the gear unit due to use of unsuitable spare parts

Only use original spare 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.

The contact address of Flender Customer Services can be found under Service & Support (Page 81).

Information required when ordering spare parts

To order spare parts, refer to the spare-parts list. Only ever use Flender spare parts.

When ordering spare parts, please provide the following information:

- Order number with item
- Type and size
- Part number
- Quantity

Declaration of incorporation

A

UK Declaration of Incorporation

Business name and full address of manufacturer:

Flender Industriegetriebe GmbH
Thierbacher Straße 24
09322 Penig
Germany

Name and address of the person authorised to compile the relevant technical documentation:

Richard Durham
Flender Limited
Unit 5, Off Lockside Road, Stourton
LS10 1EP Leeds
United Kingdom

Description and identification of the partly completed machine:

Cooling tower gear unit
H2NV
Sizes 105 to 112
to drive machines

The following “Essential Health and Safety Requirements” from the – Regulations 2008 No. 1597, are applied and are fulfilled:

1.1.1, 1.1.2, 1.1.3, 1.1.5; 1.2.4.4; 1.3.1 - 1.3.4, 1.3.6 - 1.3.8.1; 1.4.1, 1.4.2.1; 1.5.1, 1.5.2, 1.5.4 - 1.5.11, 1.5.13, 1.5.15; 1.6.1, 1.6.2; 1.7.1 - 1.7.2, 1.7.4 - 1.7.4.3

The relevant technical documentation according to Part 7 Annex VII Part B has been created.

The manufacturer undertakes to send national authorities electronic copies of the relevant 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 Regulations 2008 No. 1597.

Representative for issuing this Declaration of Incorporation on behalf of the manufacturer:

Flender Industriegetriebe GmbH



Penig, 2022-07-04

Jens Klein, CEO, Flender Industriegetriebe GmbH

Translation of the Declaration of Incorporation

Technical data

B

B.1 General technical data

Rating plate

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

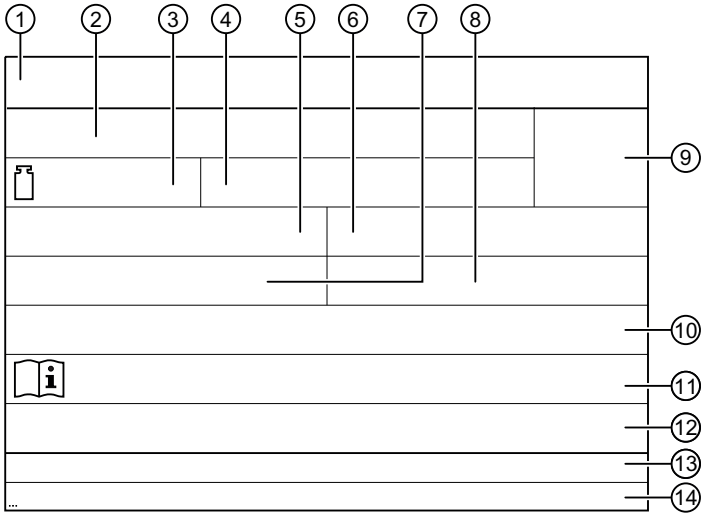


Figure B-1: Rating plate

①	Company logo	⑧	Speed n_2
②	Serial no.: Production plant code / order no.-item ser. no. / year of manufacture	⑨	Optional DMC (Data Matrix Code)
③	Total weight in kg	⑩	Oil data: Oil type, oil viscosity, oil quantity
④	For special information	⑪	Number(s) of operating instructions, including issue date
⑤	Model, size	⑫	For special information
⑥	Power rating P_2 in kW or torque T_2 in Nm	⑬	Manufacturer documentation / Country of origin
⑦	Speed n_1	⑭	Hotline

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

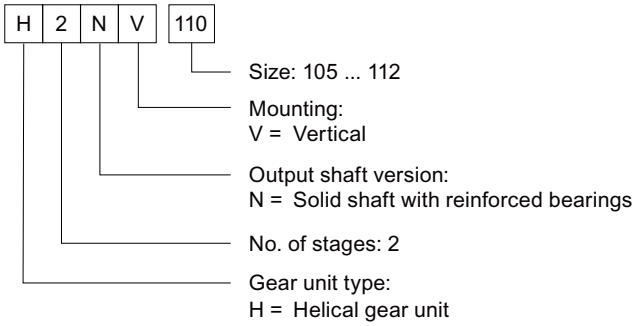
More information

Further information about these technical data can be found in the separate data sheet and the dimension drawings in the complete documentation for the gear unit.

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

Example code

The following is an example of the code printed in line 5 of the rating plate and explains the meaning of the individual letters and numbers.



More information

You can find more information on the weights and the enveloping surface sound pressure levels in chapters Weights (Page 91) and Enveloping surface sound pressure level (Page 91).

Further information about these technical data can be found in the separate data sheet and the dimension drawings in the complete documentation for the gear unit.

B.2 Ambient temperature

The gear unit may be operated in an ambient temperature range from -20 °C to 40 °C. By applying various suitable measures, the gear unit can be used in the ambient temperature range extending from -40 °C up to 60 °C. However, this must always be authorised by Flender and specified in the order text.

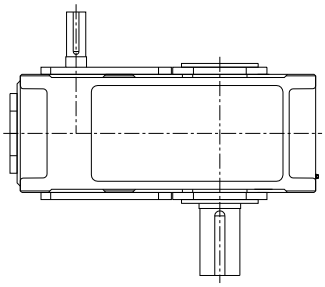
Storing the gear unit

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 range.

B.3 Types

The gear unit is available in the following types.

H2NV



Further information

Further information and a detailed illustrated description of the gear unit can be found in the dimension drawing in the complete documentation for the gear unit.

B.4 Weights

The precise weights are specified in the dimension drawings in the complete documentation or on the rating plate.

All weight specifications refer to units without oil filling or mounted components.

B.5 Oil quantities

The oil quantity required is specified on the rating plate attached to the gear unit.

B.6 Enveloping surface sound pressure level

The gear unit has an enveloping surface sound pressure level at a distance of 1 m. Refer to the following tables for the enveloping surface sound pressure level.

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 gear unit in the warm condition at an input speed n_1 and output power P_2 according to the rating plate, for measurements carried out 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 pipes, 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.

Refer to the following table for the enveloping surface sound pressure level L_{pA} in dB(A) for helical gear units with fan.

Type	i_N	n_1 in rpm	Gear unit size							
			105	**106**	**107**	**108**	**109**	**110**	**111**	**112**
H2	6.3 - 10	3000	87	-	-	-	-	-	-	-
		1500	76	77	80	81	82	84	85	86
		1000	71	72	74	75	77	79	80	81
		750	68	69	70	72	73	75	76	77
	11.2 - 16	3000	86	87	91	-	-	-	-	-
		1500	75	77	79	80	81	82	85	88
		1000	69	70	72	73	75	77	79	80
		750	66	67	69	70	71	73	74	76
	18 - 28	3000	84	85	88	90	92	-	-	-
		1500	73	75	77	78	80	82	84	86
		1000	67	68	71	72	73	75	77	78
		750	64	65	67	68	69	71	73	74

Table B-1: Enveloping surface sound pressure level

Refer to the following table for the enveloping surface sound pressure level L_{pA} in dB(A) for helical gear units without fan.

Type	i_N	n_1 in rpm	Gear unit size							
			105	**106**	**107**	**108**	**109**	**110**	**111**	**112**
H2	6.3 - 10	1500	74	75	76	77	79	79	80	81
		1000	69	70	71	72	74	74	75	76
		750	66	67	67	69	70	71	72	73
	11.2 - 16	1500	72	73	74	75	77	77	78	79
		1000	67	68	69	70	72	72	73	74
		750	64	65	66	67	69	69	70	71
	18 - 28	1500	69	70	71	72	74	74	75	76
		1000	64	65	66	68	69	69	70	71
		750	61	62	63	64	66	66	67	68

Table B-2: Enveloping surface sound pressure level

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FLENDER GEAR UNITS

Cooling-tower gear unit
Assembly and operating instructions B5040-02en
Edition 07/2022

Flender GmbH
Alfred-Flender-Straße 77
46395 Bocholt
Germany

FLENDER