

Gear unit

H.SH, H.HH, H.DH, H.KH,
H.HM, H.DM, H.KM,
B.SH, B.HH, B.DH, B.KH,
B.HM, B.DM, B.KM
Sizes 23 to 28

Assembly and operating instructions
BA 5070 en 01/2016

FLENDER gear units

SIEMENS

Gear unit

H.SH, H.HH, H.DH, H.KH,
H.HM, H.DM, H.KM,
B.SH, B.HH, B.DH, B.KH,
B.HM, B.DM, B.KM
Sizes 23 to 28

Assembly and operating instructions

Translation of the original assembly and operating instructions

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Warning note concept

This manual comprises notes which must be observed for your personal safety and for preventing material damage. Notes for your personal safety are marked with a warning triangle, those only for preventing material damage appear without a warning triangle. Depending on the level of hazard, the warning notes are shown in reverse order of seriousness, as follows.

DANGER

means, that death or serious injury will result, if the appropriate preventive action is not taken.
--

WARNING
--

means that death or serious injury may result, if the appropriate preventive action is not taken.
--

CAUTION
--

means that a slight injury may result, if the appropriate preventive action is not taken.

NOTICE

means that material damage may result, if the appropriate preventive action is not taken.

Where there is more than one hazard level, the warning note for whichever hazard is the most serious is always used. If in a warning note a warning triangle is used to warn of possible personal injury, a warning of material damage may be added to the same warning note.

Qualified personnel

The product or system to which this documentation relates may be handled only by **persons qualified** for the work concerned and in accordance with the documentation relating to the work concerned, particularly the safety and warning notes contained in those documents.
Qualified personnel must be specially trained and have the experience necessary to recognise risks associated with these products and to avoid possible hazards.

Proper use of Siemens products

Observe also the following:

WARNING
--

Siemens products must be used only for the applications provided for in the catalogue and the relevant technical documentation. If products and components of other makes are used, they must be recommended or approved by Siemens. The faultfree, safe operation of the products calls for proper transport, proper storage, erection, assembly, installation, start-up, operation and maintenance. The permissible ambient conditions must be adhered to. Notes in the relevant documentations must be observed.

Trademarks

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Exclusion of liability

We have checked the content of the document for compliance with the hard- and software described. Nevertheless, variances may occur, and so we can offer no warranty for complete agreement. The information given in this document is regularly checked, and any necessary corrections are included in subsequent editions.

Foreword

The term "Assembly and operating instructions" will in the following also be shortened to "instructions" or "manual".

The term "2014/34/EU" used in these instructions applies to the version designed in conformity to directive 94/9/EC, if the product is put on the market by 19.04.2016, and to the version designed in conformity to directive 2014/34/EU, if the product is put on the market on or after 20.04.2016.

Symbols in these assembly and operating instructions



This symbol additionally indicates an imminent risk of explosion in the meaning of Directive 2014/34/EU.

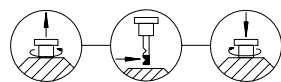


This symbol additionally indicates an imminent risk of burns due to hot surfaces in the meaning of standard "DIN EN ISO 13732-1".



This symbol warns against risks from lifted and/or suspended loads.

Earth-connection point		Air-relief point		yellow	
Oil-filling point		yellow	Oil-draining point		white
Oil level		red	Oil level		red
Oil level		red	Connection for vibration-monitoring device		
Lubricating 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.



These symbols indicate that the oil dipstick must always be firmly screwed in.

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1. Technical data

1.1 General technical data

The most important technical data are shown on the rating plate. These data and the contractual agreements between Siemens and the customer for the gear unit determine the limits of its correct use.

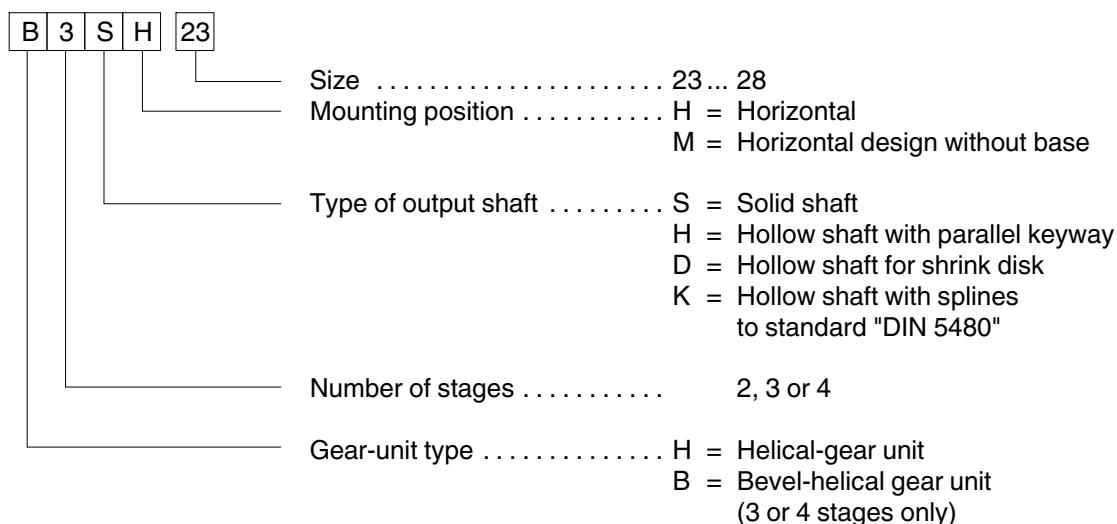
①	
②	
③	④
⑤	⑥
⑦	⑧
⑨	
⑩	
⑪	
⑫	
⑬	

Fig. 1: Rating plate on gear unit

- | | | | |
|---|--|---|--|
| ① | Company logo | ⑧ | Speed n_2 |
| ② | Manufacturing number #) | ⑨ | Oil data (oil type, oil viscosity, oil quantity) |
| ③ | Total weight in kg | ⑩ | Numbers of the instruction manuals |
| ④ | Special information | ⑪ | Special information |
| ⑤ | Type, size *) | ⑫ | Manufacturer and place of manufacture |
| ⑥ | Power rating P_2 in kW or torque T_2 in Nm | ⑬ | Country of origin |
| ⑦ | Speed n_1 | | |

#) Code production plant / order number, item, sequence number / year built

*) Example



Data on weights and measuring-surface sound-pressure levels of the various gear types are given in items 1.2.2 and 1.3.

For further technical data, refer to the drawings in the gear-unit documentation and the order-specific data sheet.

1.1.1 Ambient temperature

Note

Unless otherwise agreed by contract, the gear unit must not be exposed to harmful environmental factors such as chemically aggressive products. By adopting various suitable measures the gear unit may be used at ambient temperatures of between - 40 °C and + 60 °C. Siemens must always have approved and confirmed the temperature range and the extended temperature range in the order specification.

1.2 Configurations and weights

1.2.1 Gear-unit types

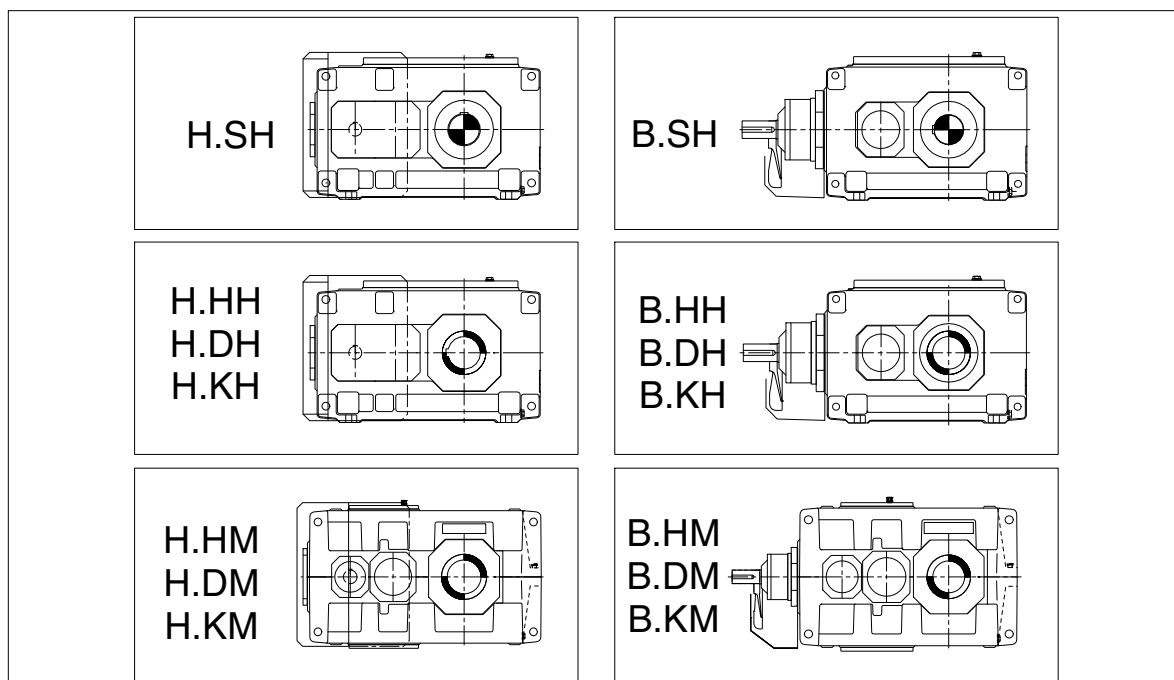


Fig. 2: Types

1.2.2 Weights

Note

For the exact weights, refer to the drawings in the gear-unit documentation or the rating plate.

1.3 Measuring-surface sound-pressure level

The measuring-surface sound-pressure level for the gear unit at a distance of 1 m can be found in table 1.

The measurement is carried out to standard "DIN EN ISO 9614" Part 2, using the sound-intensity method.

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

The sound-pressure level applies to the warmed-up gear unit at input speed n_1 and output power P_2 stated on the rating plate, as measurement obtained on the Siemens test bench. If several figures are given, the highest speed and power values apply.

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

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

1.3.1 Measuring-surface sound-pressure level for bevel-helical gear units (B...) with fan

Table 1: Measuring-surface sound-pressure level L_{pA} in dB(A) for bevel-helical gear units with fan

Type	i_N	n_1 1/min	Gear-unit size					
			23	24	25	26	27	28
B3	20	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	89	90	91	-	-	-
		900	-	-	-	-	-	-
		750	82	84	85	85	-	-
	31.5	750	82	84	85	85	-	-
	35.5	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	86	87	88	89	-	-
		900	-	-	-	-	-	-
		750	80	81	82	82	-	-
	56	750	80	81	82	82	-	-
	63	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	84	85	86	86	-	-
		900	-	-	-	-	-	-
		750	78	79	79	80	-	-
	80	750	78	79	79	80	-	-

1.3.2 Measuring-surface sound-pressure level for bevel-helical gear units (B...) without fan

Table 2: Measuring-surface sound-pressure level L_{pA} in dB(A) for bevel-helical gear units without fan

Type	i_N	n_1 1/min	Gear-unit size					
			23	24	25	26	27	28
B3	20	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	88	89	90	-	-	-
		900	-	-	-	-	-	-
		750	81	82	83	84	-	-
	31.5	1800	-	-	-	-	-	-
	35.5	1500	-	-	-	-	-	-
		1200	--	-	-	-	-	-
		1000	84	85	86	87	-	-
	56	900	-	-	-	-	-	-
		750	78	80	80	80	-	-
	63	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	81	81	83	83	-	-
		900	-	-	-	-	-	-
		750	74	75	76	76	-	-
	80	1800	-	-	-	-	-	-
B4	80	1500	87	88	87	89	-	-
		1200	-	-	-	-	-	-
		1000	81	82	82	83	-	-
	-	900	-	-	-	-	-	-
		750	74	75	75	76	-	-
	125	1800	-	-	-	-	-	-
		1500	83	84	85	86	-	-
		1200	-	-	-	-	-	-
	140	1000	78	78	79	80	-	-
		900	-	-	-	-	-	-
		750	71	72	73	73	-	-
	224	1800	-	-	-	-	-	-
		1500	80	80	81	82	-	-
		1200	-	-	-	-	-	-
	250	1000	74	75	76	77	-	-
		900	-	-	-	-	-	-
		750	67	68	69	70	-	-
	355	1800	-	-	-	-	-	-
		1500	80	80	81	82	-	-
		1200	-	-	-	-	-	-
	-	1000	74	75	76	77	-	-
		900	-	-	-	-	-	-
		750	67	68	69	70	-	-

1.3.3 Measuring-surface sound-pressure level for helical-gear units (H...) with fan

Table 3: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units with fan

Type	i_N	n_1 1/min	Gear-unit size					
			23	24	25	26	27	28
H2	6.3	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	86	-	-	-	-	-
	10	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	88	88	-	-	-	-
		900	-	-	-	-	-	-
		750	83	84	84	85	-	-
	16	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	86	87	-	-	-	-
		900	-	-	-	-	-	-
		750	82	82	82	83	-	-
	22.4	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
H3	22.4	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	35.5	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	40	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	-	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	63	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	71	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	100	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-

1.3.4 Measuring-surface sound-pressure level for helical-gear units (H...) without fan

Table 4: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units of types H2 and H3 without fan

Type	i_N	n_1 1/min	Gear-unit size					
			23	24	25	26	27	28
H2	6.3	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	10	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	81	-	-	-	-	-
	11.2	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	16	1000	83	83	-	-	-	-
		900	-	-	-	-	-	-
		750	79	80	81	81	-	-
	18	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	22.4	1000	80	81	-	-	-	-
		900	-	-	-	-	-	-
		750	77	77	78	78	-	-
H3	22.4	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	31.5	1000	81	82	83	83	-	-
		900	-	-	-	-	-	-
		750	78	79	79	80	-	-
	35.5	1800	-	-	-	-	-	-
		1500	84	84	-	-	-	-
		1200	-	-	-	-	-	-
	63	1000	79	79	80	80	-	-
		900	-	-	-	-	-	-
		750	76	76	77	77	-	-
	71	1800	-	-	-	-	-	-
		1500	81	82	82	83	-	-
		1200	-	-	-	-	-	-
	100	1000	76	77	77	78	-	-
		900	-	-	-	-	-	-
		750	73	73	74	75	-	-

Table 5: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units of type H4 without fan

Type	i_N	n_1 1/min	Gear-unit size					
			23	24	25	26	27	28
H4	100	1800	-	-	-	-	-	-
		1500	79	80	81	81	-	-
		1200	-	-	-	-	-	-
	-	1000	74	76	76	77	-	-
		900	-	-	-	-	-	-
		750	71	72	73	73	-	-
	140	1800	-	-	-	-	-	-
		1500	76	78	78	79	-	-
		1200	-	-	-	-	-	-
	-	1000	72	73	74	74	-	-
		900	-	-	-	-	-	-
		750	68	70	70	71	-	-
	250	1800	-	-	-	-	-	-
		1500	74	75	76	76	-	-
		1200	-	-	-	-	-	-
	-	1000	69	70	71	72	-	-
		900	-	-	-	-	-	-
		750	65	67	68	68	-	-

1.4 List of equipment

Note

All important accessory components are listed in the order-specific list of equipment as well as the related technical data.

2. General notes

2.1 Introduction

These instructions are an integral part of the gear unit supplied and must be kept in its vicinity for reference at all times.

NOTICE

Material damage

Risk of damage to the gear unit or malfunctions.

All persons carrying out work on the gear unit must have read and understood these instructions and must adhere to them.

Siemens accepts no responsibility for damage or malfunctions caused by disregard of these instructions.

The "**FLENDER gear unit**" dealt with in these instructions has been developed for driving machines in general engineering applications. Possible applications for gear units of this series are the chemical, rubber, food processing, plastics and other industries.

The gear unit is designed only for the application specified in section 1, "Technical data". Other operating conditions must be agreed by contract.

The gear unit has been manufactured in accordance with the state of the art and is delivered in a condition for safe and reliable use.

The gear unit must be used and operated strictly in accordance with the conditions laid down in the contract governing performance and supply agreed by Siemens and the customer.

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

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

2.2 Copyright

The copyright to these instructions is held by **Siemens AG**.

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

Technical enquiries should be addressed to the following works or to one of our customer services:

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46562 Voerde

Tel.: +49 (0)2871 / 92-0
Fax: +49 (0)2871 / 92-1544

3. Safety instructions



WARNING

Risk of falling

Risk of serious injury through falling.

The gear unit and its add-on parts must not be entered while they are in operation.

The gear unit must be entered for maintenance and repair work only when it is at a standstill.



WARNING

Risk of injury through unauthorised modifications

Any changes on the part of the user are not permitted.

This applies equally to safety features designed to prevent accidental contact.

3.1 Basic obligations of the user

- The operator must ensure that everyone carrying out work on the gear unit has read and understood these instructions and is adhering to them in every point in order to:
 - avoid injury or damage,
 - ensure the safety and reliability of the gear unit,
 - avoid disruptions to operation and environmental damage through incorrect use.
- During transport, assembly, fitting, demounting, operation and maintenance of the unit, the relevant safety and environmental regulations must be complied with.
- The gear unit may only be operated, maintained and/or repaired by persons qualified for the work concerned (see "Qualified personnel" on page 3 of this manual).
- The outside of the gear unit must not be cleaned with high-pressure cleaning equipment.
- All work must be carried out with great care and with due regard to safety.



DANGER

Danger to life through switched-on installation

To carry out work, the gear unit and any add-on or separate oil-supply unit must always be stopped. The drive unit must be secured against being switched on accidentally (e.g. by locking the key switch or by removing the fuses from the power supply).

Attach a notice to the ON switch stating clearly that work is in progress on the gear unit.

At the same time the complete installation must be without load, so that no danger occurs during demounting operations.

- No welding work must be done at all on the drive system.
The drive systems must not be used as an earthing point for electric-welding operations. Toothed parts and bearings may be irreparably damaged by welding.

NOTICE

Material damage

Risk of damage to the gear unit.

Care must be taken to ensure that **no electric current can flow** through gear units that are operated together with electrical equipment that generate electric current or in which electric current flows (e.g. motors, generators). Electric-current flow can cause irreparable damage to bearings and teeth. Electric-current flow can be caused by e.g. short circuiting, voltage flash-overs and conductive dust layers.

Suitable measures may be:

- Use of insulators
- Proper earthing of the gear unit

- A potential equalisation in accordance with the applying regulations and directives must be carried out! If no threaded holes for earth connection are available on the gear unit, other appropriate measures must be taken. This work must always be done by **specialist electricians**.

NOTICE

Material damage

Risk of damage to the gear unit.

If any inexplicable changes are noticed during operation of the gear unit, such as an important increase in temperature or unusual noises, the drive assembly must be stopped immediately.



DANGER

Danger to life through rotating and/or moving parts

Risk of being caught or drawn in by rotating and/or moving parts.

Rotating and/or moving parts must be fitted with suitable safeguards to prevent contact.

Note

When the gear unit is incorporated in plant or machinery, the manufacturer of such plant or machinery must ensure that the prescriptions, notes and descriptions contained in these instructions are incorporated in his own instructions.

- Removed safety equipment must be re-fitted prior to starting up.
- Notices attached to the gear unit, such as rating plate and direction arrow, must always be observed. They must be kept free from dirt and paint at all times. Missing plates must be replaced.
- Screws which have been damaged during assembly or disassembly work must be replaced with new screws of the same strength class and type.
- Spare parts must be obtained from Siemens (see section 11, "Spare parts, customer service").

3.2 Special dangers and personal protective equipment

Depending on operating conditions, the surface of the gear unit may heat up or cool down to extreme temperatures.



WARNING

Risk of burns

Risk of serious injury through burns on hot surfaces ($> 55\text{ °C}$).
Wear suitable protective gloves and protective clothing.



WARNING

Danger through low temperatures

Risk of serious injury through frost (pain, numbness, frostbite) on cold surfaces ($< 0\text{ °C}$).
Wear suitable protective gloves and protective clothing.



WARNING

Risk of scalding

Risk of serious injury through escaping hot operating media, when they are being changed.
Wear suitable protective gloves, protective glasses and protective clothing.



WARNING

Risk of eye injury

Small foreign matter such as sand or dust can get into the cover plates of the rotating parts and be thrown back by these.
Wear suitable protective glasses.

Note

In addition to any generally prescribed personal safety equipment (such as safety shoes, safety clothing, helmet) handling the gear unit requires wearing **suitable safety gloves** and **suitable safety glasses**.



DANGER

Risk of explosion

Danger to life through ignition of any explosible atmosphere resulting from the gear unit.
The gear unit **does not comply** with the requirements in Directive 2014/34/EU and, therefore **must not be used** in potentially explosive areas, in the area of applicability of this directive.

Should the gear unit be used outside the area of applicability of Directive 2014/34/EU within potentially explosive areas, the nationally applying protective prescriptions with regard to explosion protection must always be observed.

3.3 The five safety rules

For your personal safety and to avoid material damage, comply always with the safety-relevant instructions and the safety rules to standard "DIN EN 50110-1, Working in voltage-free status" indicated below, when working on electrical components of the plant. Apply the five safety rules in the indicated order, before starting work on the machine.

- 1) Disconnect completely.
Disconnect the auxiliary circuits such as stand-by heating as well.
- 2) Secure against re-connection.
- 3) Verify that the installation is voltage-free ("dead").
- 4) Connect to earth and short-circuit.
- 5) Cover or shield adjacent live parts.

After completion of the work the taken measures should be undone in the reverse order.

3.4 Environmental protection

- Dispose of any packaging material in accordance with regulations or separate it for recycling.
- When changing oil, the used oil must be collected in suitable containers. Any pools of oil which may have collected should be removed at once with an oil-binding agent.
- Preservative agents should be stored separately from used oil.
- Used oil, preservative agents, oil-binding agents and oil-soaked cloths must be disposed of in accordance with environmental legislation.
- Disposal of the gear unit after its useful life:
 - All the operating oil, preservative agent and/or cooling agent must be drained from the gear unit and disposed of in accordance with regulations.
 - Gear-unit components and/or add-on parts may have to be disposed of or separated for recycling in accordance with national regulations.

4. Transport and storage

Observe the instructions in section 3, "Safety instructions"!

4.1 Scope of delivery and incoming-goods inspection

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



WARNING

Serious injury through defective product

If there is any visible damage, the gear unit must not be put into operation.

When checking the goods supplied proceed as follows:

- Remove packaging material and transporting equipment and dispose of in accordance with regulations.
- Perform a visual check for any damage and contamination.

NOTICE

Material damage

Risk of damage to the gear unit through corrosion.

If the gear unit was delivered in seaworthy packaging, only the outer packaging (crate and foil) must be opened. The preservative agent on the gear unit itself must not be removed.

4.2 Transport

Note

The weight of the product is specified on the rating plate.



DANGER

Danger to life

Danger to life from loads falling through incorrect slinging.

Do not stay under suspended loads.

When attaching, lifting, lowering and shifting loads, observe the following:

- Note the load limits.
- Correct fastening of the slinging equipment.
- Any centre of gravity which is off the load centre.
- Even load distribution when using load-carrying means with several load hooks.
- Low displacement speed.
- The load must not be swung and/or attached to objects or building parts.
- Lifting hooks must not be loaded by the tip.
- Always place the items on an even, slipfree and stable surface.



WARNING

Danger of squeezing

Risk of being squeezed by a transported component, when the used lifting gear and load-carrying means are not suitable and the component gets loose.

The unit may be attached only at the marked slinging points. Use only lifting and load-carrying equipment of sufficient load-bearing capacity.

When lifting items, observe the notes regarding load distribution on the packing.

The gear unit must be handled slowly and carefully, when lifted, to avoid personal injury and damage to the gear unit.

If, for example, the free shaft ends are knocked, this may cause damage in the gear unit.

The gear unit is delivered in the fully assembled condition. Additional items may be delivered separately packaged, if applicable.

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

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

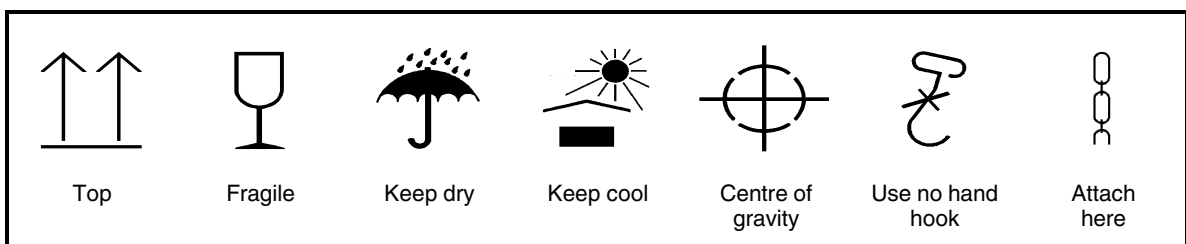


Fig. 3: Transport symbols

Note

The gear unit must be transported only with appropriate transport equipment.

During transport the gear unit should be left without oil filling and in the transport packing.

NOTICE

Material damage

Risk of damage to the gear unit when using incorrect attachment points. Use only the twirls provided to attach lifting equipment to the unit.

Transport of the unit by attaching it to the pipework is not permitted.

The pipework must not be damaged.

Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.

Slinging and lifting gear must be adequate for the weight of the gear unit.



DANGER

Danger to life

Risk of being squeezed or killed by an axially not secured shrink disk.

If fitted with a shrink disk, the shrink disk must be secured axially before handling.

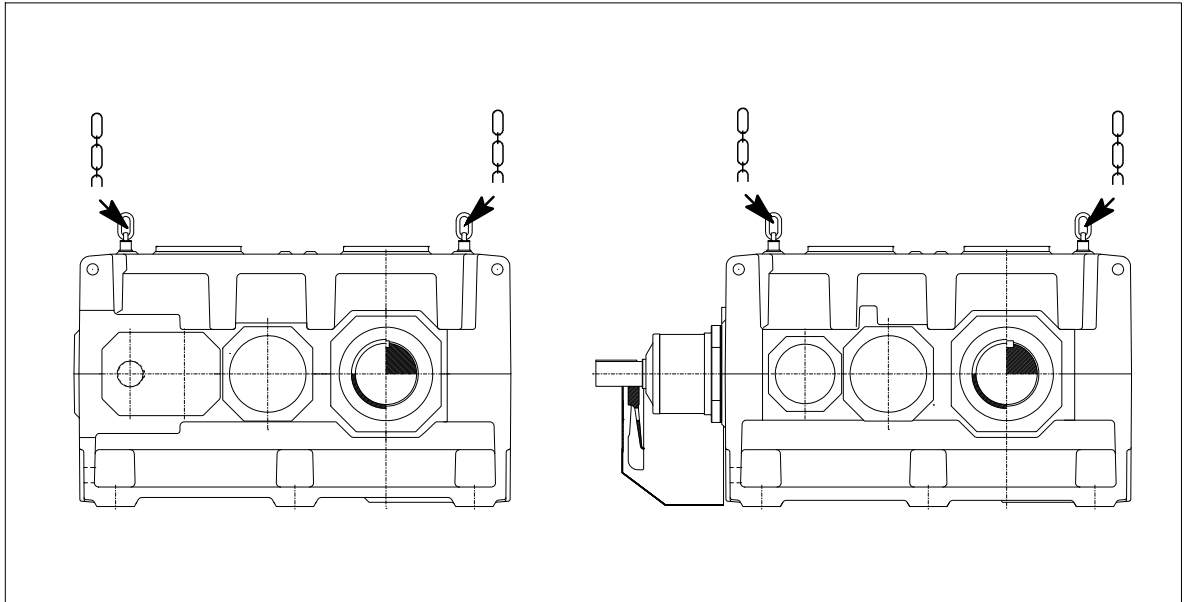


Fig. 4: Attachment points on gear units of types H... and B...

For drive units where add-on parts such as drive motor or add-on coupling are fitted on the gear unit, an additional attachment point may be required because of the shift in the centre of gravity.

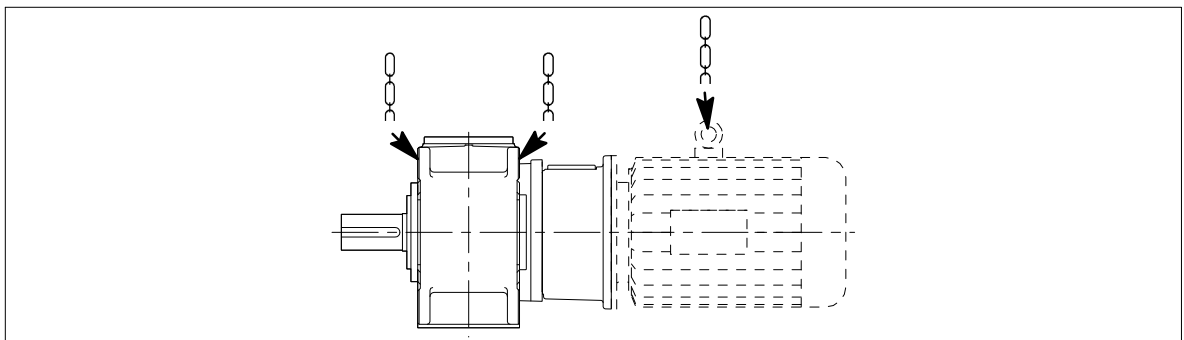


Fig. 5: Attachment points on gear units of type H... with motor

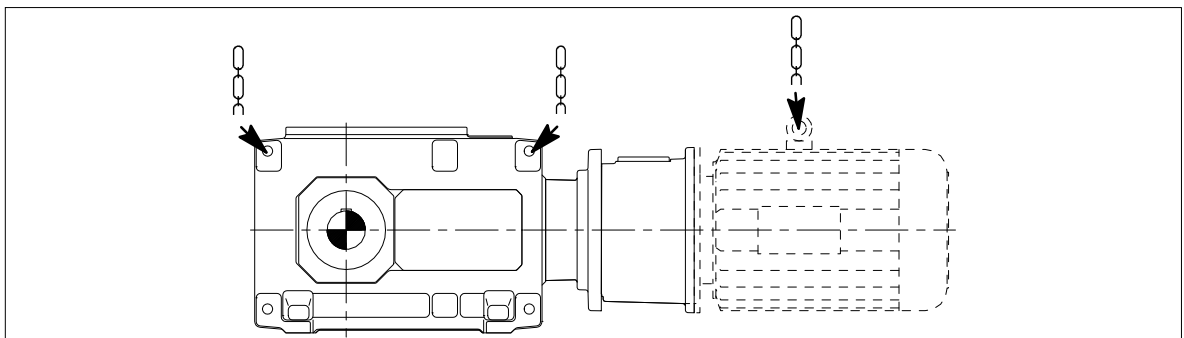


Fig. 6: Attachment points on gear units of type B... with motor

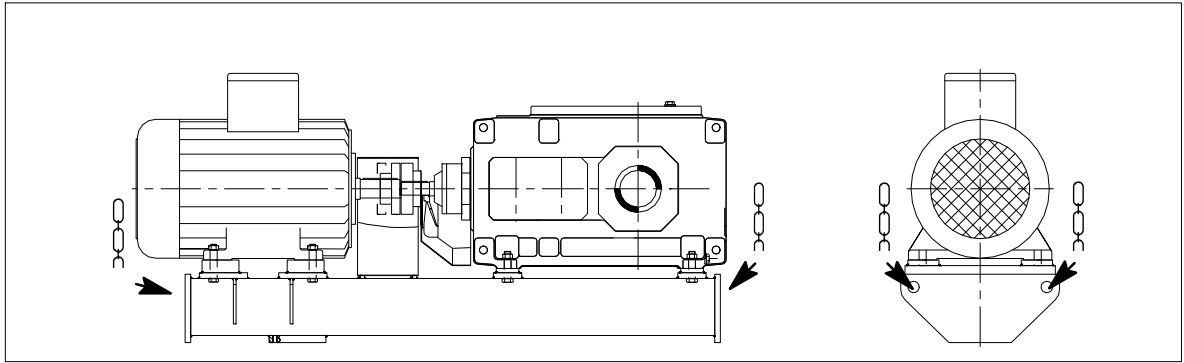


Fig. 7: Attachment points on gear units of type B... with gear-unit swing base

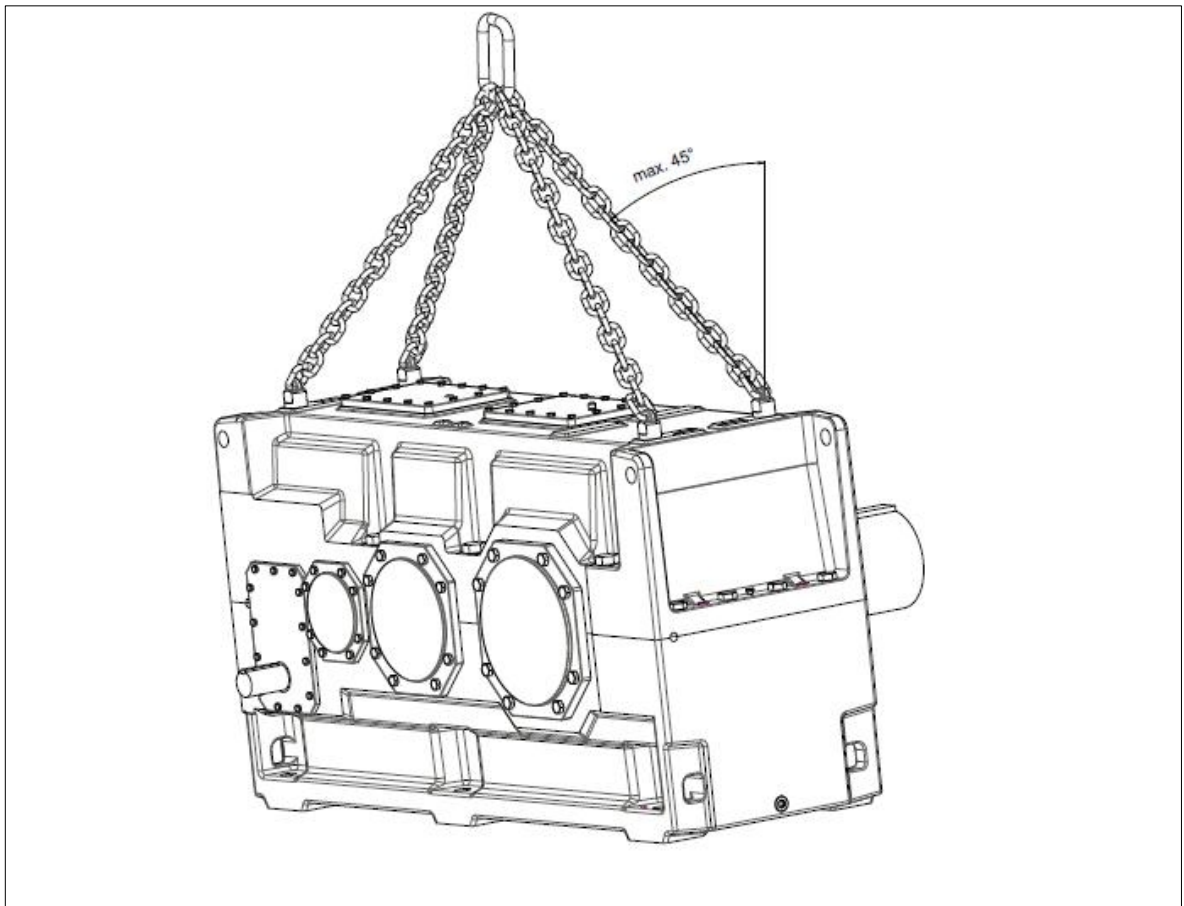


Fig. 8: Maximum angle when tilted

For a detailed illustration of the gear unit and the position of the attachment points, refer to the drawings in the order-specific gear-unit documentation.

4.3 Storing the gear unit

The gear unit must be stored in a sheltered place in the position of the original packaging or in the position of use, placed on a vibration-free, dry base, and covered over.

Gear units with grease-lubricated rolling bearings must be stored in the position of use.

NOTICE

Material damage

Any damage to the coating may cause failure of the exterior protective coating and thus corrosion. When temporarily storing the gear unit and any single components supplied with it, the preservative agent should be left on them. Ensure that the coat is not damaged.



DANGER

Danger to life through tilting or falling gear unit

Risk of being squeezed or killed by a tipping or falling gear unit. Do not stack gear units on top of one another.

NOTICE

Material damage

Risk of damage to the gear unit through build-up of a layer of foreign bodies or moisture. If the gear unit is being stored out of doors, it must be particularly carefully covered, and care must be taken that neither moisture nor foreign material can collect on the unit. Waterlogging must be avoided.

NOTICE

Material damage

Risk of damage to the gear unit through external sources. Unless otherwise agreed by contract, the gear unit must not be exposed to harmful environmental factors such as chemically aggressive products. Provision for special environmental conditions during transport (e.g. transport by ship) and storage (climate, termites) must be contractually agreed.

4.4 Standard coating and preservation

The gear unit is provided with an interior preservative agent; the free shaft ends are painted for protection.

The characteristics of the exterior coat depend on the ambient conditions stipulated in the order relating to method of transport and area of application.

NOTICE

Material damage

Risk of damage to the gear unit through corrosion.

The gear unit is normally delivered completely ready, with a priming and a finish coat.

Where gear units are delivered with a priming coat only, it is necessary to apply a finish coat in accordance with directives applying to the specific application.

The priming coat alone is not suitable to provide a sufficient long-term corrosion protection.

NOTICE

Material damage

Damage to the shaft seals possible.

When doing cleaning work and/or applying the top coat, the shaft seals must be protected with suitable means (e.g. sealing with adhesive tape).

This protection prevents paint or cleaning agents from getting into the gear unit and coming into contact with the shaft seal.

NOTICE

Material damage

Any damage to the coating may cause failure of the exterior protective coating and thus corrosion.

Ensure that the coat is not damaged.

Note

Unless otherwise contractually agreed, the durability periods of the interior gear-unit preservation specified in table 6 or 7 will apply, provided the related requirements are adhered to. The durability period for the exterior preservation and the related requirements can be found in table 8.

The guarantee period starts on the date of delivery or that of the notice that the item is ready for shipment.

In case of a storage period other than the durability periods indicated in table 6 or 7 and in table 8, the interior and the exterior preservation must be checked and, as necessary, be renewed (see items 7.3.1 and 7.3.2).

4.4.1 Preservation in case of Tacolab seals

In case of gear units with Tacolab seal, after the standard preservation procedure, the air gap on the output shaft (position 3 in figure 9) must be closed airtightly with adhesive tape. A V-ring prevents air exchange on the input shaft.

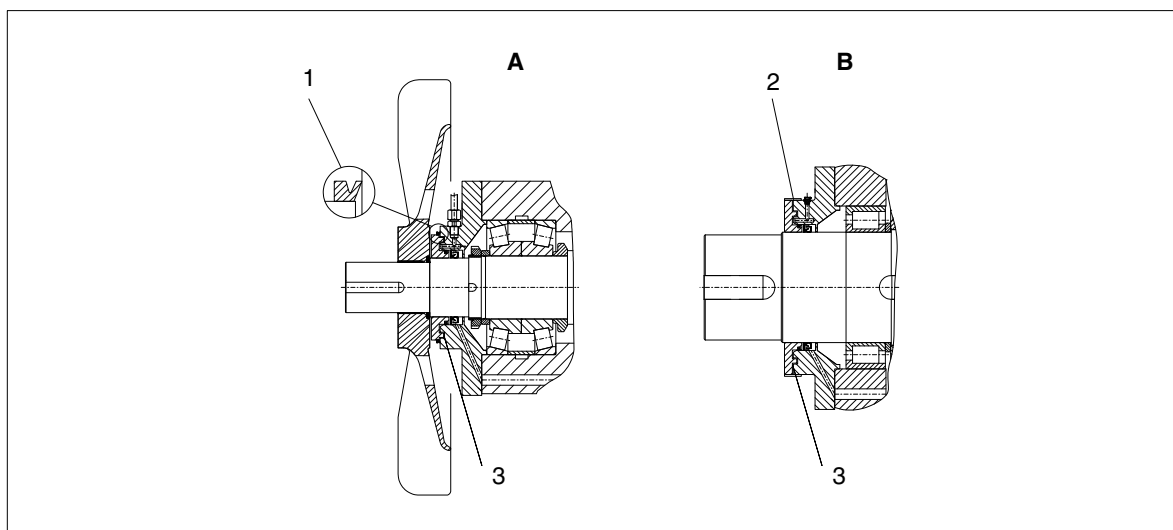


Fig. 9: Tacolab seal

A Input shaft

B Output shaft

1 V-ring

2 Adhesive tape

3 Air gap

NOTICE

Material damage

Corrosion possible through opening the gear unit too early.

The adhesive tape on the Tacolab seal must not be removed before start-up.

4.4.1.1 Interior preservation with preservative agent

Table 6: Durability period and measures for interior preservation when using mineral oil or PAO-based synthetic oil

Durability period	Preservative agent	Special measures
up to 6 months	Castrol Alpha SP 220 S	None
up to 24 months		– Seal all holes on the gear unit. – Replace the air filter with a screw plug. (Prior to start-up replace the screw plug with the air filter.) – Seal the labyrinth seal on the output shaft with adhesive tape. (Remove the adhesive tape before startup.) ¹⁾
For storage periods longer than 24 months, renew the preservative agent (see item 4.4.1.2).		

¹⁾ In case of Tacolab seal only (see item 5.6.4).

The input shaft is sealed with a V-ring in the area of the labyrinth (see figure 9).

Table 7: Durability period and measures for interior preservation when using PG-based synthetic oil

Durability period	Preservative agent	Special measures
up to 6 months	Special anti-corrosion oil TRIBOL 1390 ¹⁾	None
up to 36 months		– Seal all holes on the gear unit. – Replace the air filter with a screw plug. (Prior to start-up replace the screw plug with the air filter.) – Seal the labyrinth seal on the output shaft with adhesive tape. (Remove the adhesive tape before startup.) ²⁾
For storage periods longer than 36 months, renew the preservative agent (see item 4.4.1.2).		

1) Resistant to tropical conditions and sea water; maximum ambient temperature 50 °C

2) In case of Tacolab seal only (see item 5.6.4).
The input shaft is sealed with a V-ring in the area of the labyrinth (see figure 9).

Note

The procedure for interior-preservation treatment is described in section 7 (see item 7.3.1).

4.4.1.2 Re-preserving the interior of the gear unit in case of longer periods of storage

 CAUTION
Risk of injury Risk of injury to eyes or hands through chemically aggressive operating media. Wear suitable protective glasses and protective gloves. Remove any oil spillage immediately with a binding agent.

For storage periods longer than 24 months (see table 6) or 36 months (see table 7), the interior preservation of the gear unit must be renewed. The following procedure is recommended:

- Remove the screw plug.
- Undo and remove the fastening screws of the inspection and/or assembly cover.
- Remove the cover with the seal from the housing (the seal must not be damaged, it will be used again).
- Place a suitable container under the oil-drain point of the gear-unit housing.
- Unscrew the oil-drain plug and/or open the oil-drain cock and drain the used preservative oil into a suitable container.
- Dispose of the residue of the preservative oil in accordance with regulations.
- Shut the oil-drain cock and/or screw in the oil-drain plug.
- Fill the gear unit with "Castrol Alpha SP 220 S".
Determine the filling quantity according to the gear-unit dimensions: length x width x height x 0.05.

NOTICE
Material damage Corrosion possible through use of an unsuitable preservative agent. Use special oil "Castrol Alpha SP 220 S" with additional anti-corrosive agent (additive "S").

NOTICE

Material damage

Corrosion possible through leaving the gear unit open too long.
Close the gear unit airtightly at the latest one hour after opening.
Before re-starting the gear unit take the following measure:

- Replace the screw plug with the air filter.

NOTICE

Material damage

Corrosion possible through leaving the gear unit open too long.
When using Tacolab seals the gear unit must be closed airtightly at the latest one hour after its opening.
Take the following measures:

- Seal the air gap of the Tacolab seal with adhesive tape.
- Replace the air filter or wet-air filter with a screw plug.

- Screw the screw plug in again.
- Place the inspection and/or assembly cover with the seal on the housing.
- Screw in the fastening screws of the inspection and/or assembly cover and tighten them to the specified tightening torque (see item 6.20).

The gear unit has thus been preserved for another period of 24 months.

NOTICE

Material damage

Risk of damage to the gear unit through inadequate lubrication through preservative agent and operating oil being mixed up.
If the gear unit is to be filled with a PG-based synthetic operating oil after preservation, the preservative oil must be drained off before initial start-up and the gear unit thoroughly flushed out with operating oil (for this see item 10.2.2).
The flushing oil must not be used for operation of the unit.

4.4.2 Exterior preservation

Table 8: Durability period for exterior preservation of shaft ends and other bright machined surfaces

Durability period	Preservative agent	Layer thickness	Remarks
In case of indoor storage up to 36 months ¹⁾	Tectyl 846 K19	Approx. 50 µm	Long-term wax-based preservative agent:
In case of outdoor storage up to 12 months ²⁾			– resistant to seawater – resistant to tropical conditions – soluble with CH compounds

¹⁾ The gear unit must be stored in the position of use in a sheltered place; it must be placed on a vibration-free, dry base, and covered over.

²⁾ If the gear unit is being stored out of doors, it must be particularly carefully covered, and care must be taken that neither moisture nor foreign material can collect on the unit. Waterlogging must be avoided.

Note

The procedure for exterior-preservation treatment is described in section 7 (see item 7.3.2).

4.4.2.1 Re-preservation of the metallic bright exterior surfaces of the gear unit

In case of storage periods exceeding the periods specified in table 8 the exterior of the gear unit must be re-preserved using the preservative agent specified in table 8.

5. Technical description

Observe the instructions in section 3, "Safety instructions"!

5.1 General description

The gear unit described is a "**FLENDER gear unit**" developed for driving machines in general engineering applications.

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

NOTICE

Material damage

Risk of destruction of the gear unit or gear-unit components through incorrect direction of rotation.

The gear unit can be operated in both directions of rotation.

However, it is possible that a certain direction of rotation has been specified in the order which is realised by adding-on a backstop or an overrunning clutch.

A number of shaft configurations (types and rotation directions) are possible. These are shown in the following table as solid shafts. The arrows with the direction of rotation show the correlation between the directions of rotation of the input and output shafts.

Table 9: Versions and corresponding directions of rotation

Type	Version								
	A	B	C	D	E	F	G	H	I
H2SH H2HH H2HM H2DH H2DM H2KH H2KM									
H3SH H3HH H3HM H3DH H3DM H3KH H3KM									
H4SH H4HH H4HM H4DH H4DM H4KH H4KM									
B3SH B3HH B3HM B3DH B3DM B3KH B3KM									
B4SH B4HH B4HM B4DH B4DM B4KH B4KM									

5.2 Output versions

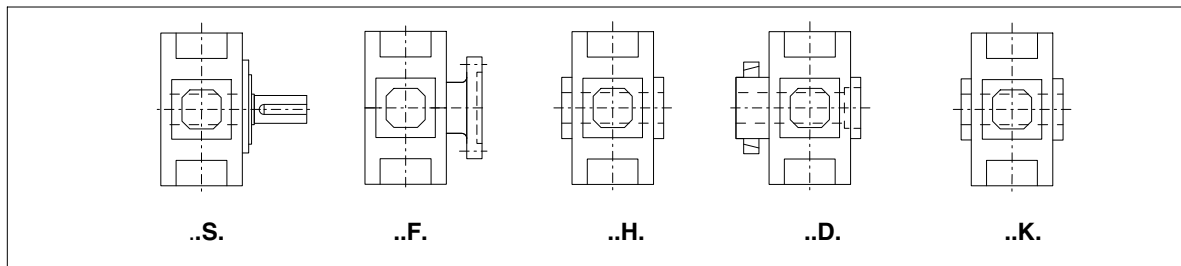


Fig. 10: Output versions

S	Solid shaft	D	Hollow shaft for shrink disk
F	Flanged shaft	K	Hollow shaft with splines to standard "DIN 5480"
H	Hollow shaft with parallel keyway		

5.3 Housing

The housing is in two sections and made of cast iron; if required, it may also be of steel. The housing is of torsionally rigid design and due to its shape imparts very favourable noise and temperature characteristics.

The gear-unit housing comes with the following equipment:

- Sling swivels (adequately dimensioned for the transport)
- Inspection and/or assembly cover (for oil filling and/or inspection)
- Oil-sight glass or dipstick with MIN and MAX marks (for checking the oil level)
- Oil-drain plug and/or oil-drain cock (to drain the oil)
- Air filter (for ventilation and bleeding)

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

Air-relief point		yellow	Oil-drain point		white
Oil-filling point		yellow	Lubricating point *)		red
Oil level: Oil-sight glass		red	Oil level: Dipstick		red

*) The lubricating points are identified with the following identification plate.

○	Schmierstelle	○
	g Lithiumseifenfett (Mineralölbasis)	
○ nach	Betriebsstunden	○
045		

Lubricating point
[...] grams of lithium-based grease (mineral oil)
after [...] operating hours

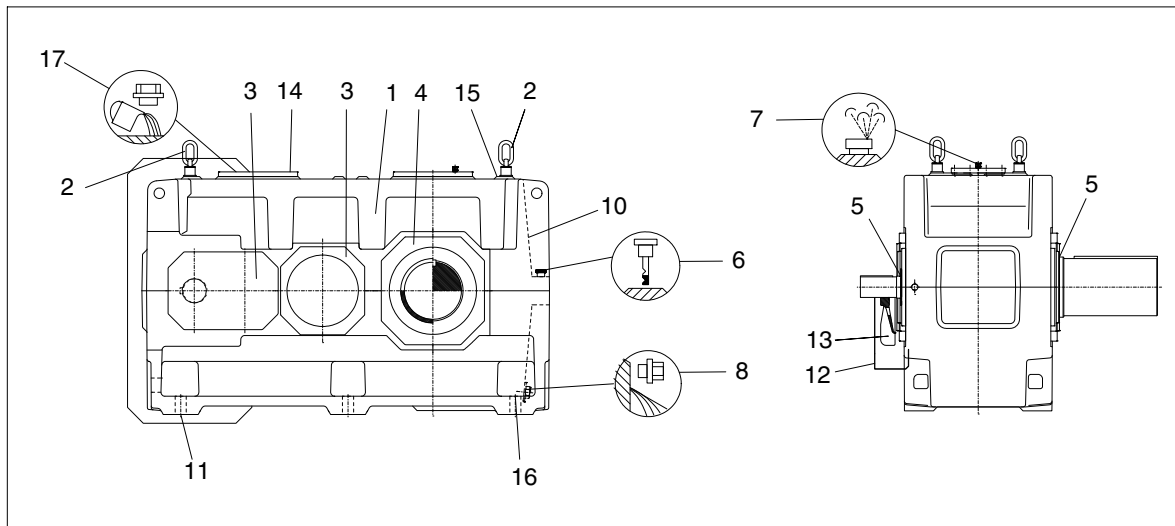


Fig. 11: Gear-unit features on gear units type H..H

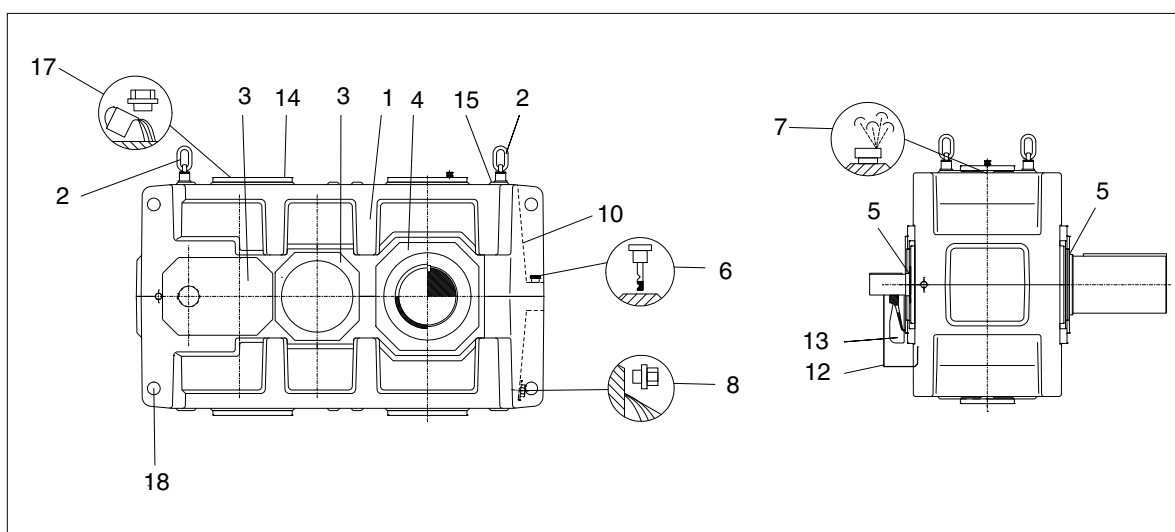


Fig. 12: Gear-unit features on gear units type H..M

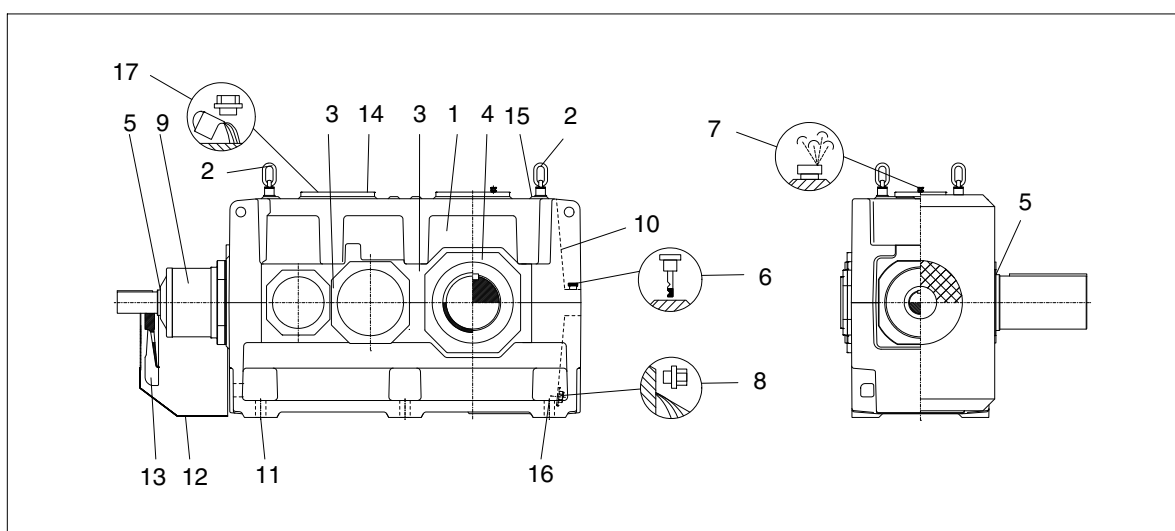


Fig. 13: Gear-unit features on gear units type B..H

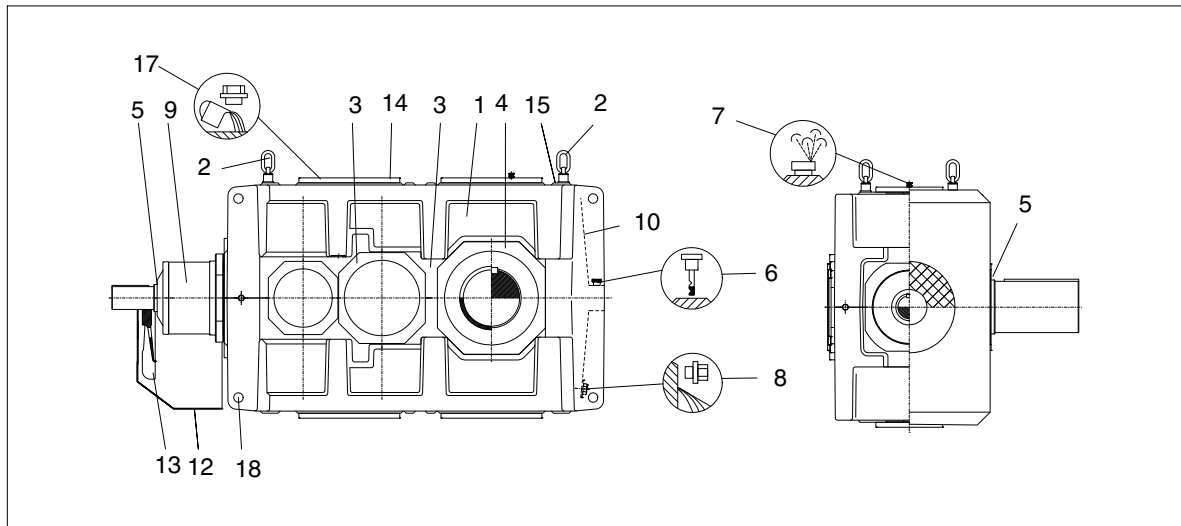


Fig. 14: Gear-unit features on gear units type B..M

- | | | | |
|---|---------------------|----|----------------------------------|
| 1 | Housing | 10 | Rating plate |
| 2 | Sling swivel | 11 | Gear-unit fastening |
| 3 | Cover | 12 | Air-guide cover |
| 4 | Cover | 13 | Fan |
| 5 | Shaft seal | 14 | Inspection and/or assembly cover |
| 6 | Dipstick | 15 | Alignment surface |
| 7 | Housing ventilation | 16 | Alignment thread |
| 8 | Oil-drain plug | 17 | Oil inlet |
| 9 | Bearing journal | 18 | Fastening for torque arm |

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

5.4 Lubrication

5.4.1 Splash lubrication

Unless otherwise agreed in the order, the teeth and bearings are adequately splash-lubricated with oil. The gear unit thus requires very little maintenance.

5.4.2 Force-feed lubrication through an add-on oil-supply system

In case of horizontal mounting position or other inclined position, high input speeds or high peripheral speeds at the teeth, the splash lubrication can be supplemented or replaced by an order-specific force-feed lubrication.

In case of force-feed lubrication the bearings and/or teeth situated higher than the oil level are adequately supplied with oil by way of pipework.

The oil-supply system is fixed to the gear unit.

Components:

- Flanged-on pump
- Double change-over filter
- Pressure monitor
- Pipework

Note

The flow direction of the pump used is **independent of the direction of rotation**, if nothing is specified in the documentation to the contrary.

When connecting the fittings the actual flow direction must however be observed.

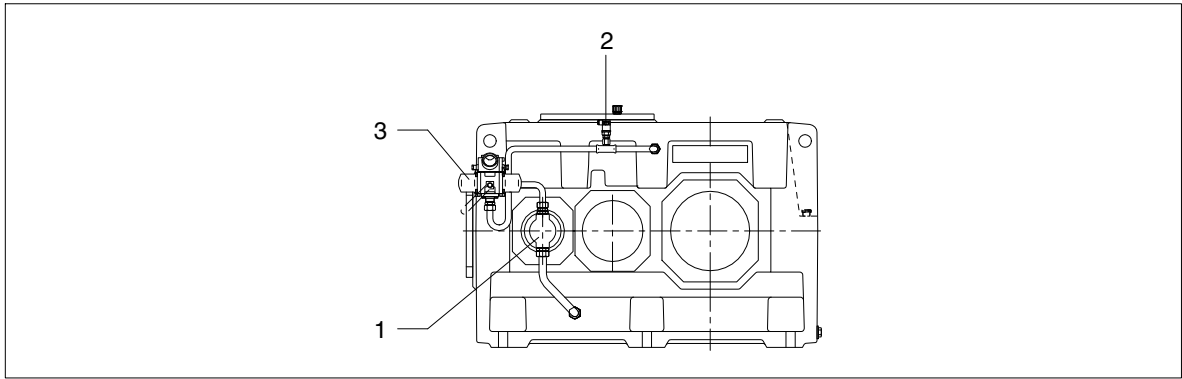


Fig. 15: Add-on oil-supply system on gear units of type H...

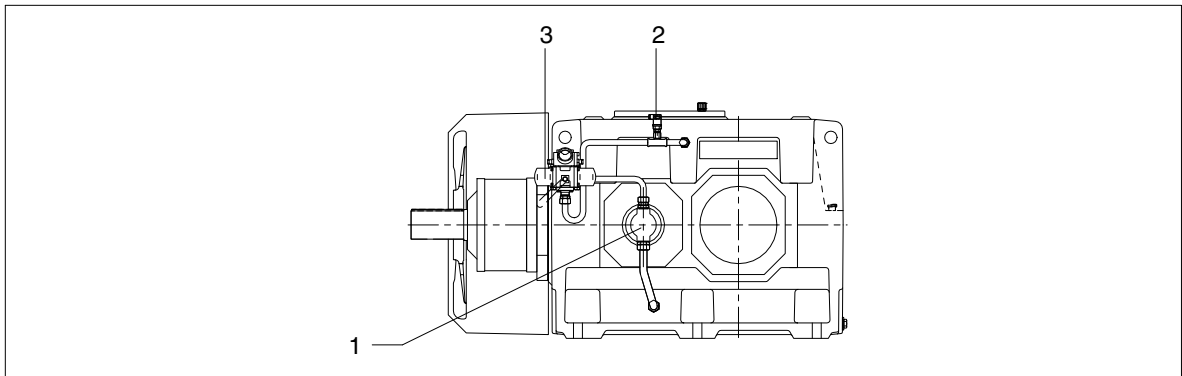


Fig. 16: Add-on oil-supply system on gear units of type B...

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

For a detailed illustration of the gear unit and the oil-supply system, refer to the drawings in the gear-unit documentation.

In certain applications, the flanged-on pump may have been replaced with a motor pump.

The following configuration is possible differing from item 5.4.2:

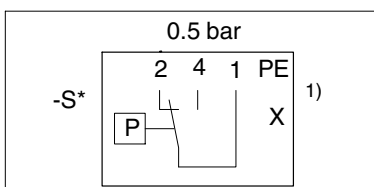
- External oil-supply system (fitted separately, see item 5.8.3).

Note

In case of gear units with oil-supply system, before starting the unit up all monitors must be connected so as to be ready for operation.

Note

In case of gear units with an add-on oil-supply system, it is necessary to connect the pressure monitor as an opening contact or maker contact prior to start-up and so as to be ready for operation.



1) To be connected as opening contact or maker contact, as required.

Note

When operating and servicing the components of the oil-supply system, observe the operating instructions of the components.

For technical data and control information, refer to the data sheet and/or the list of equipment.

5.5 Shaft bearings

All shafts are fitted in rolling bearings.

5.6 Shaft seal

Radial shaft-sealing rings, labyrinth seals, Taconite seals or Tacolab seals at the shaft outlets prevent oil from escaping from, or dirt from entering into the gear unit.

5.6.1 Radial shaft-sealing rings

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

NOTICE

Material damage

Destruction of the radial shaft-sealing ring possible through high dust concentration.
Do not use radial shaft-sealing ring in an environment with high dust concentration.

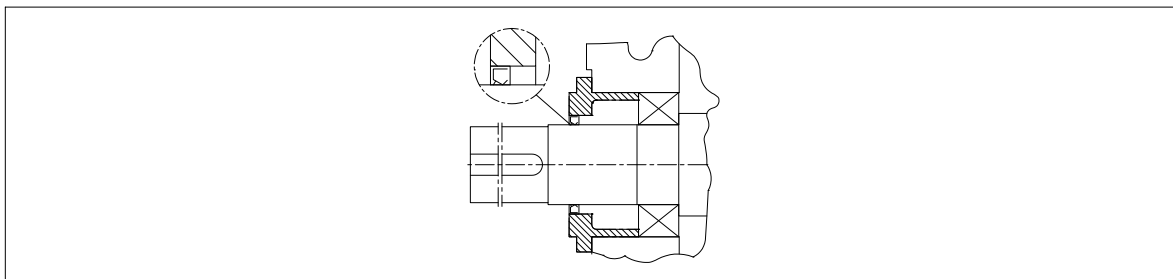


Fig. 17: Radial shaft-sealing ring

5.6.2 Labyrinth seals

Labyrinth seals are non-contacting seals. Labyrinth seals avoid wear to the shafts; they require no maintenance and ensure favourable temperature characteristics. The labyrinth seals can be used only with force-feed lubrication and with reduced oil level.

Check on the spare-parts drawing and the spare-parts list whether the gear unit is provided with labyrinth seals.

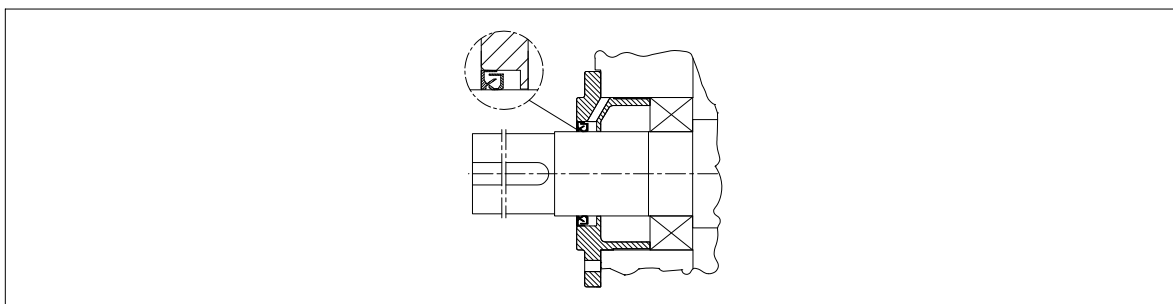


Fig. 18: Labyrinth sealing ring

NOTICE

Material damage

Insufficient lubrication is possible through leakage of oil from the gear unit.
For reliable operation, labyrinth seals require stationary, horizontal positioning away from dirty water and heavy dust concentration.
Overfilling of the gear unit can cause leakage, as can oil with high foam content.

5.6.3 Taconite seal

Taconite seals have been especially developed for use in a dusty environment. The entry of dust is prevented by the combination of three sealing elements (radial shaft-sealing ring, lamellar seal and a grease-charged, re-chargeable labyrinth seal).

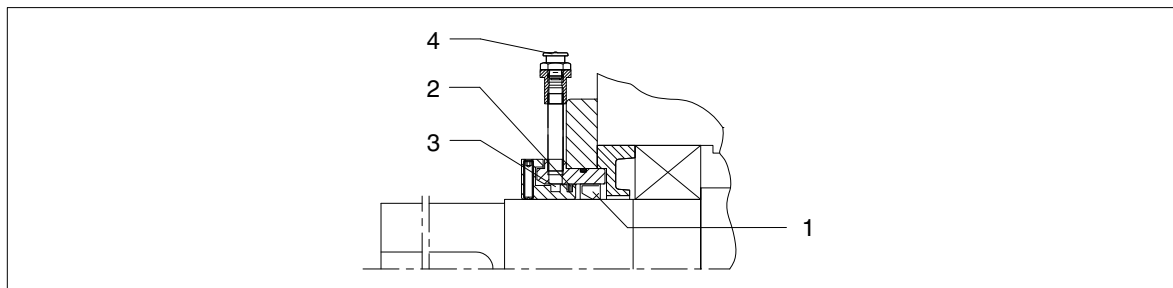


Fig. 19: Taconite seal

- | | | | |
|---|---------------------------|---|--|
| 1 | Radial shaft-sealing ring | 3 | Grease-charged labyrinth seal, re-chargeable |
| 2 | Lamellar seal | 4 | Flat grease nipple |

The following types of Taconite seals are distinguished:

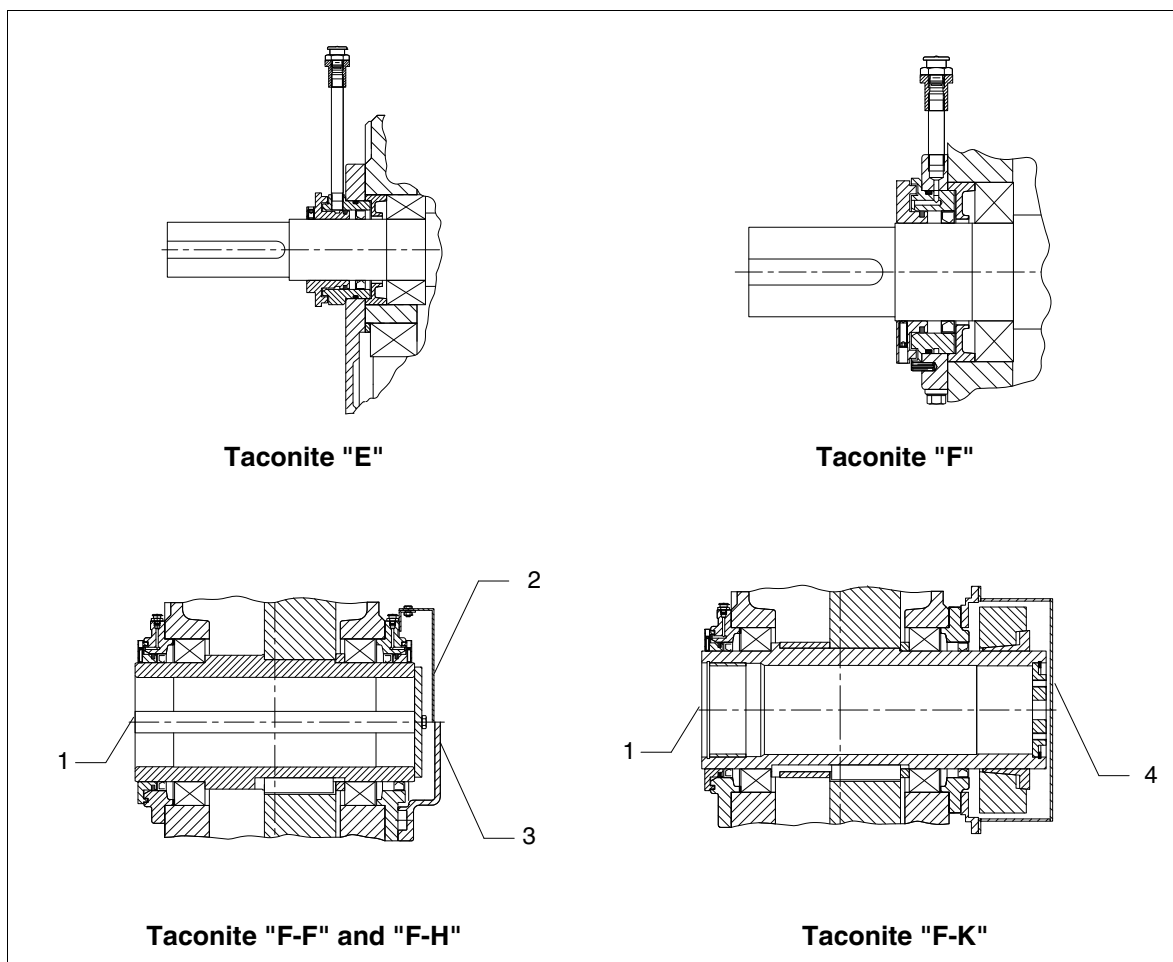


Fig. 20: Taconite seal, variants E, F, F-F, F-H and F-K

- | | | | |
|---|----------------|---|----------------|
| 1 | Output | 3 | Taconite "F-H" |
| 2 | Taconite "F-F" | 4 | Taconite "F-K" |

Table 10: Variant description Taconite seal

Variants of the Taconite seals	Application	Remarks
"E"	All input shafts with or without fan	Re-chargeable labyrinth
"F"	Output shaft Type S: (Solid shaft) Type F: (Flanged shaft)	
"F-F"	Output shaft Type H: (Hollow shaft with parallel keyway) Type K: (Hollow shaft with splines to standard "DIN 5480") Type D: (Hollow shaft for shrink disk)	Labyrinth re-chargeable on both sides, incl. dustproof cowl to prevent contact on gear-unit side facing away from output
"F-H"	Output shaft Type H: (Hollow shaft with parallel keyway) Type K: (Hollow shaft with splines to standard "DIN 5480")	Labyrinth re-chargeable on output side; dustproof cowl on opposite side
"F-K"	Output shaft Type D: (Hollow shaft for shrink disk)	

NOTICE**Material damage**

Leakage of the gear unit is possible through insufficient sealing.

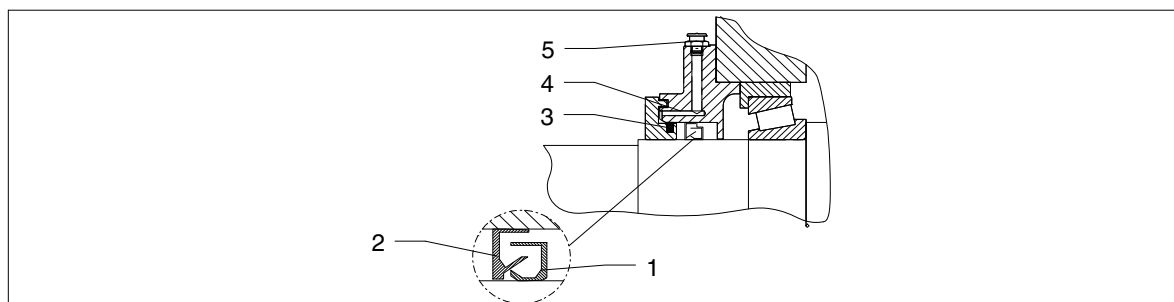
For re-charging the labyrinth seals with grease, the specified frequency must be observed (see table 19 in item 10.1).

5.6.4 Tacolab seal

Tacolab seal are non-contacting seals. Tacolab seals avoid wear to the shafts; they require no maintenance and ensure favourable temperature characteristics. Tacolab seals can be used only with certain transmission ratios and minimum speeds.

The Tacolab seal is made up of the following parts:

- an oil labyrinth preventing lubricating oil from escaping,
- a lamellar seal,
- a dust seal filled with grease, which permits the use in a very dusty environment.

**Fig. 21:** Tacolab seal

- | | | | |
|---|------------------------|---|---|
| 1 | Labyrinth sealing ring | 4 | Grease-charged labyrinth, re-chargeable |
| 2 | Labyrinth sealing ring | 5 | Flat grease nipple |
| 3 | Lamellar seal | | |

NOTICE

Material damage

Insufficient lubrication is possible through leakage of oil from the gear unit.
For reliable operation, Tacolab seals require stationary, horizontal positioning. Overfilling of the gear unit can cause leakage, as can oil with high foam content.

NOTICE

Material damage

Leakage of the gear unit is possible through insufficient sealing.
For re-charging the Tacolab seals with grease, the specified frequencies (see table 19 in item 10.1) must be observed.

5.7 Backstop

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

The backstop is fitted oiltightly on an adapter flange on the gear unit and integrated in its oil-circulation system.

The backstop is fitted with centrifugally operated sprags. If the gear unit rotates in the prescribed direction, the inner ring rotates with the sprag cage in the direction of shaft rotation, while the outer ring remains stationary. From a specific speed up (disengagement speed) the sprags disengage from the outer ring. In this operating condition the backstop operates wearfreely.

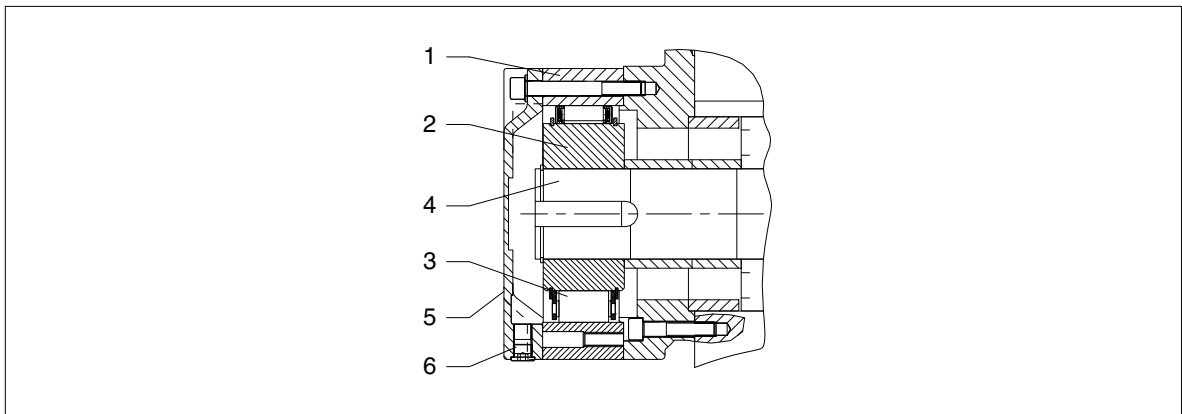


Fig. 22: Backstop

- | | | | |
|---|------------------|---|--------------------|
| 1 | Outer ring | 4 | Shaft |
| 2 | Inner ring | 5 | Sealing cover |
| 3 | Cage with sprags | 6 | Residual-oil drain |

Note

The locking direction can be changed by turning the cage around. If a change in locking direction is required, Siemens should always be consulted.

NOTICE

Material damage

Risk of damage to or destruction of the backstop and/or the gear unit through incorrect direction of rotation.
Do not allow the motor to run adversely to the blocking direction of the gear unit.
Observe the notice fixed to the gear unit.

Before connecting the motor, determine the direction of rotation of the three-phase current supply using a phase-sequence indicator. Connect the motor in accordance with the specified direction of rotation.

NOTICE

Material damage

Damage to or destruction of the backstop possible through increased wear during operation at speeds below disengagement speed.

If the gear unit is operated at speeds below the speed at which the backstop disengages, the backstop must be regularly replaced.

The frequency of replacement is stated on the dimensioned drawing of the gear unit and on a plate on the gear unit. This plate is attached to the gear-unit housing close to the backstop.

5.8 Cooling

Depending on requirements, the gear unit is fitted with a fan, a cooling coil or a separately provided oil-supply system. In case of use of a separately provided oil-supply system, the separate operating instructions for this oil-supply system must also be observed.

Note

When fitting the gear unit free convection must be ensured on the housing surface, in order to definitely avoid excessive heating the gear unit.

5.8.1 Fan

As a rule the fan is fitted on the high-speed shaft of the gear unit and is protected from accidental contact by an air-guide cover. The fan sucks air through the grid of the air-guide cover and blows it by way of its air ducts on the side along the gear-unit housing. It thereby dissipates a certain amount of heat from the housing.

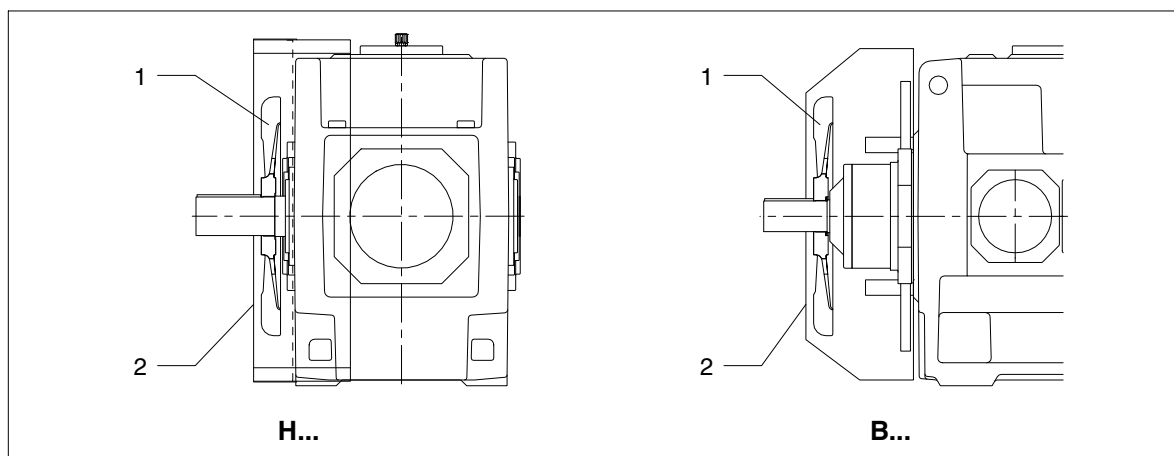


Fig. 23: Fan on gear units of types H... and B...

1 Fan

2 Air-guide cover

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

NOTICE

Material damage

Risk of overheating of the gear unit possible through insufficient air feed.

For gear units fitted with a fan, sufficient space must be allowed for air intake when fitting the safety guards for the coupling or other components.

The required distance is shown on the dimensioned drawing in the gear-unit documentation.

It must be ensured that the air-guide cover is correctly fastened. The air-guide cover must be protected against damage from outside. The fan must not come into contact with the air-guide cover.

NOTICE

Material damage

Risk of overheating of the gear unit because a layer of dirt on the gear unit or a dirty air filter is having an insulating effect.

The cooling effect is considerably reduced if the fan and the housing surface are dirty.

Observe instructions for cleaning in section 10, "Maintenance and repair".

5.8.2 Cooling coil

The gear unit can be fitted with a cooling coil in the oil sump. Cooling water is supplied to the cooling coil by way of a water connection. The operator must ensure this. Either fresh water, sea water or brackish water can be used for cooling purposes.

When water is flowing through the cooling coil, a certain amount of heat is transferred from the gear-unit oil to the water and thereby removed from the system.

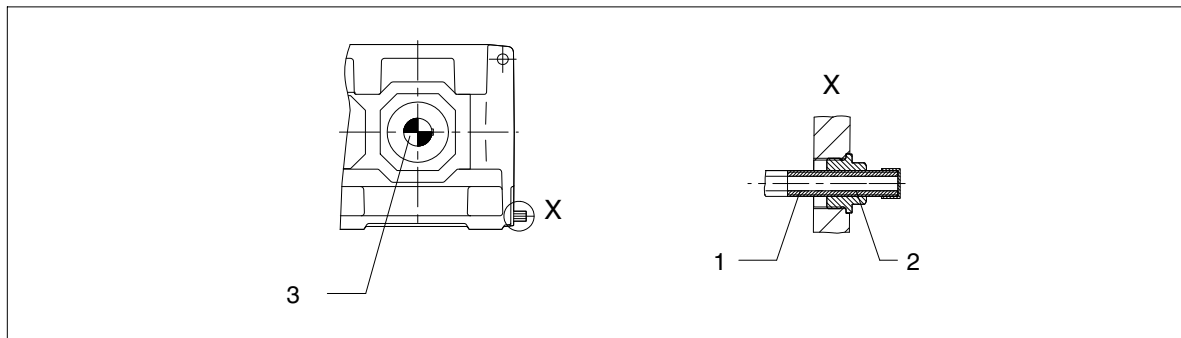


Fig. 24: Cooling coil on gear units of types H... and B...

- 1 Cooling-water connection
- 2 Reducing screw

- 3 Output shaft

Note

Complete immersion of the cooling coil must be ensured, because otherwise water condensation may occur.

NOTICE

Material damage

Damage to the cooling coil possible.

The pressure of the cooling water must not exceed 8 bar. The ends of the cooling coil must not be twisted nor must the reducing screws be removed.

If there is a danger of freezing, the cooling water must be drained off. Remaining water must be blown out using compressed air.

The water can flow through the gear unit in either direction.

To avoid excessive water pressure, the cooling-water inlet must be fitted with a suitable cooling-water quantity-control device (e.g. a pressure reducer or suitable stop valve).



WARNING

Risk of eye injury through compressed air

Remains of water and/or dirt particles may be harmful to the eyes.

Wear suitable protective glasses.

Note

For connection dimensions, refer to the dimensioned drawing of the gear unit. The required cooling-water quantity and the maximum permissible inlet temperature are given on the data sheet and/or in the list of equipment.

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

5.8.3 Separate or external oil-supply system

It is possible to use an oil-supply system which is separately supplied by Siemens or an external system to ensure cooling of the oil.

Note

Be sure to observe the operating instructions of the oil-supply system for operation and maintenance.

Note

When operating and servicing the components of the oil-supply system, observe the operating instructions of these components.

For technical data, refer to the data sheet and/or the list of equipment.

5.9 Couplings, clutches

As a rule, flexible couplings or safety clutches are used for driving the gear unit.

The use of rigid couplings or other in- and/or output elements, which generate additional radial and/or axial forces (e.g. gear wheels, belt pulleys, disk flywheels, hydraulic couplings), this must be agreed by contract.

5.9.1 Shrink disk

The shrink disk makes a press-fit connection between a hollow shaft and a stub shaft (driven-machine shaft) (in the following called "stub shaft"). The interference fit can transfer torques, bending moments and forces. The joining pressure between the hollow shaft and the stub shaft generated by the shrink disk is essential for the torque and/or force transmission.

Note

For the shrink disk used, take the instructions in the related operating instructions "B 3233" into account. These operating instructions are an integral part of the order-specific documentation.

5.10 Heating

At low temperatures it may be necessary to preheat the gear-unit oil before switching on the drive unit or even during operation. In such cases the use of heating rods is possible. The heating rods convert electrical energy into heat which is transferred to the surrounding oil. The heating rods are located in protective tubes inside the housing, thus making it possible to replace the heating rods without draining off the oil.

Ensure that the heating rods are completely immersed in the oil bath.

The heating rods can be controlled by a temperature monitor which emits a signal when minimum and maximum temperatures are reached; the signal requires amplification.

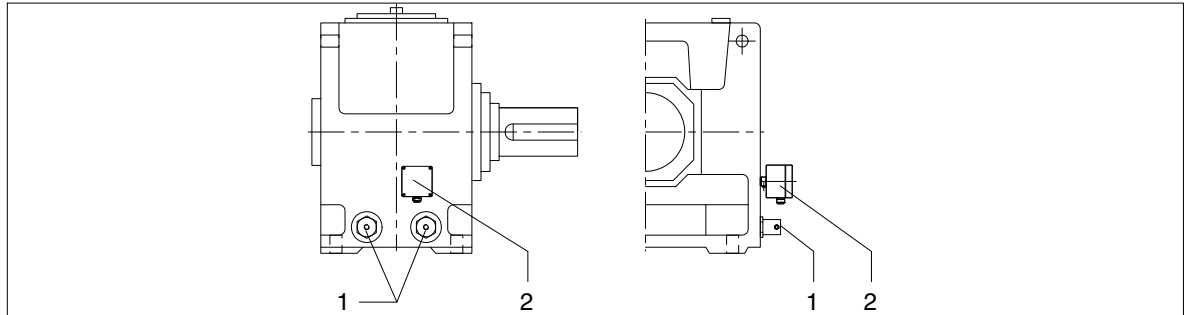


Fig. 25: Heating on gear units of types H... and B...

1 Heating rod

2 Temperature monitor

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.



WARNING

Fire hazard

Fire hazard through exposed heating rods possible.

Never switch on the heating rods, unless complete immersion of the heating rods in the oil bath is ensured.

If heating rods are fitted afterwards, the maximum heating capacity (see table 11) on the outer surface of the heating rods must not be exceeded.

Table 11: Specific heating capacity P_{Ho}
as a function of the ambient temperature

P_{Ho} (W/cm ²)	Ambient temperature °C		
0.9	+ 10	up to	0
0.8	0	up to	- 25
0.7	-25	up to	- 50

Note

For operation and maintenance the instructions in the corresponding operating instructions must be observed.

For technical data and control information, refer to the list of equipment.

5.11 Indication of oil level

The gear unit is fitted with an oil-level indication (oil-sight glass or dipstick with MIN and MAX marks) for visual oil-level checking at standstill. Checking of the oil level is carried out after the oil has cooled down by looking through the oil-sight glass or at the dipstick.

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

5.12 Oil-temperature monitoring system

The gear unit may have been fitted with a temperature monitor for measuring the oil temperature in the oil sump. In order to measure the temperatures and/or temperature differences, the temperature monitor should be connected to an evaluating device by the customer.

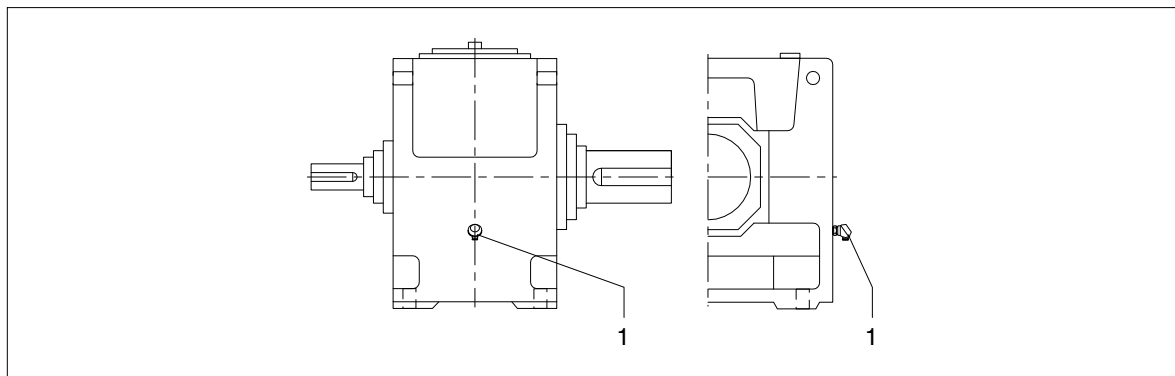


Fig. 26: Oil-temperature monitoring on gear units of types H... and B...

1 Pt 100 resistance thermometer

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

Note

For the operation and maintenance the operating manuals specified in the order-specific annex must be observed.

For technical data and control information, refer to the order-specific list of equipment.

5.13 Oil-level monitoring system

The gear unit may have been fitted with an oil-level limit switch for monitoring the oil level. The oil-level monitoring device has been designed for checking the oil level when the gear unit is at a standstill, prior to operating start.

If an oil-level monitoring device is in use, it is very important that the unit is in the horizontal position.

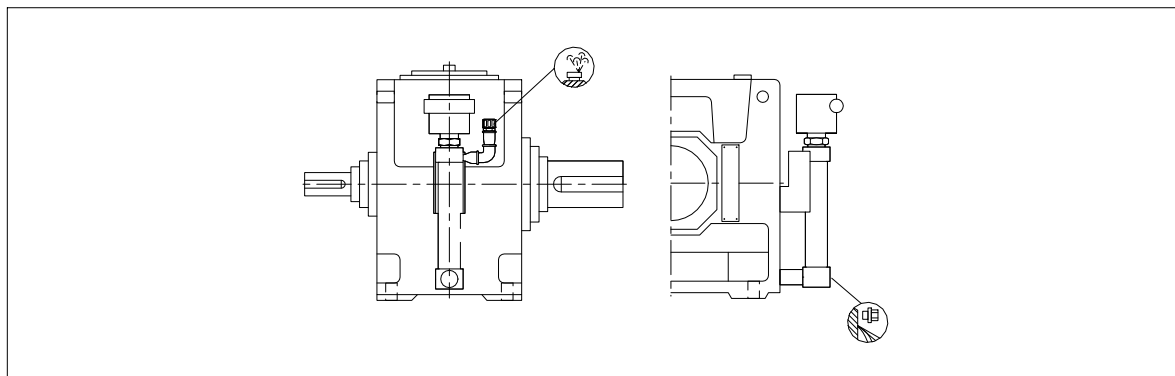


Fig. 27: Oil-level monitoring on gear units of types H... and B...

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

Note

For the operation and maintenance the operating manuals specified in the order-specific annex must be observed.

For technical data and control information, refer to the order-specific list of equipment.

5.14 Bearing-monitoring system

5.14.1 Bearing monitoring by Pt 100 resistance thermometer

The gear unit may have been fitted with Pt 100 resistance thermometers for monitoring the bearings. In order to measure the temperatures and/or temperature differences, the Pt 100 resistance thermometers must be connected to a suitable evaluating instrument by the customer.

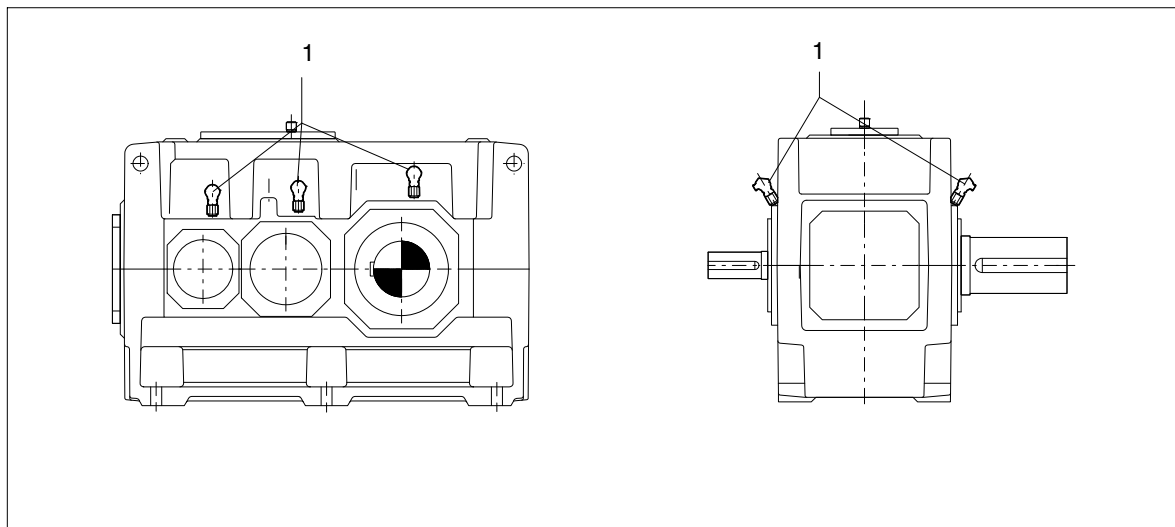


Fig. 28: Bearing monitoring by Pt 100 resistance thermometer on gear units of type H2.H

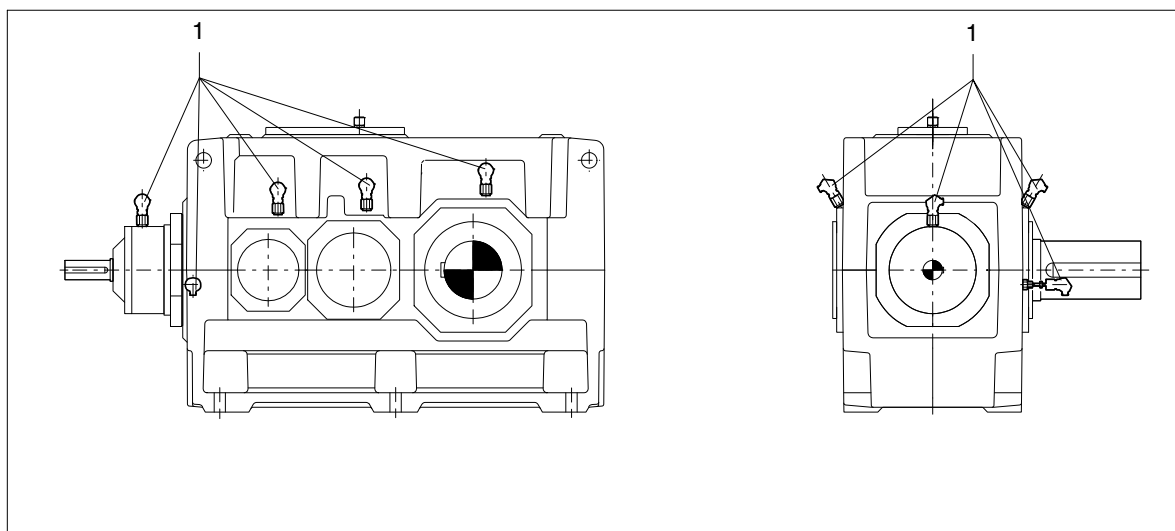


Fig. 29: Bearing monitoring by Pt 100 resistance thermometer on gear units of type B3.H

1 Pt 100 resistance thermometer

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

Note

For the operation and maintenance the operating manuals specified in the order-specific annex must be observed.

For technical data and control information, refer to the order-specific list of equipment.

5.14.2 Bearing monitoring by shock-pulse transducer

The gear unit may have been fitted with measuring nipples for monitoring the bearings. These measuring nipples are intended for attachment of shock-pulse transducers with rapid-action coupling and are located on the housing in the vicinity of the bearings to be monitored.

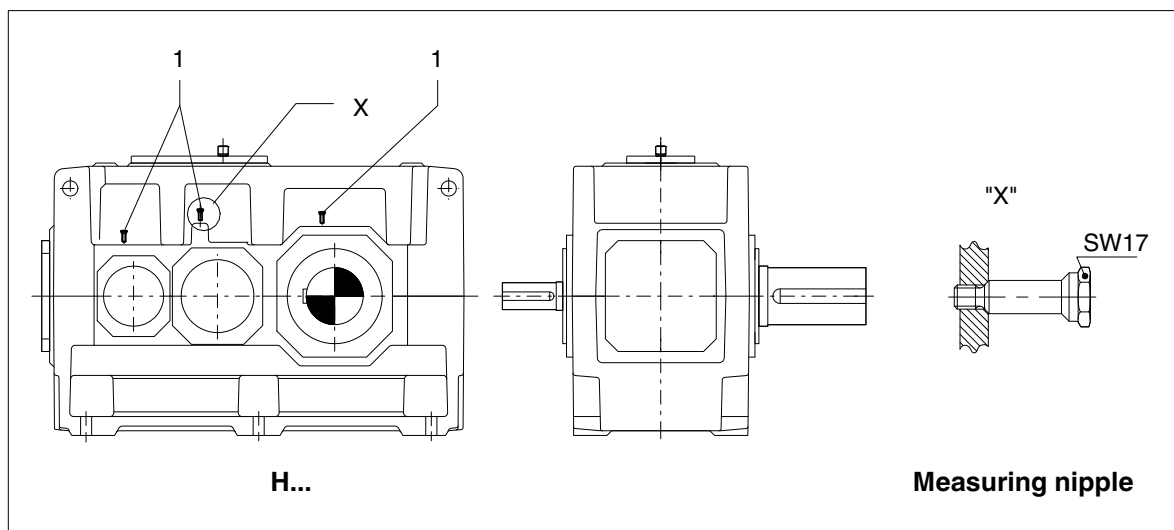


Fig. 30: Bearing monitoring by shock-pulse transducer on gear units of type H2.H

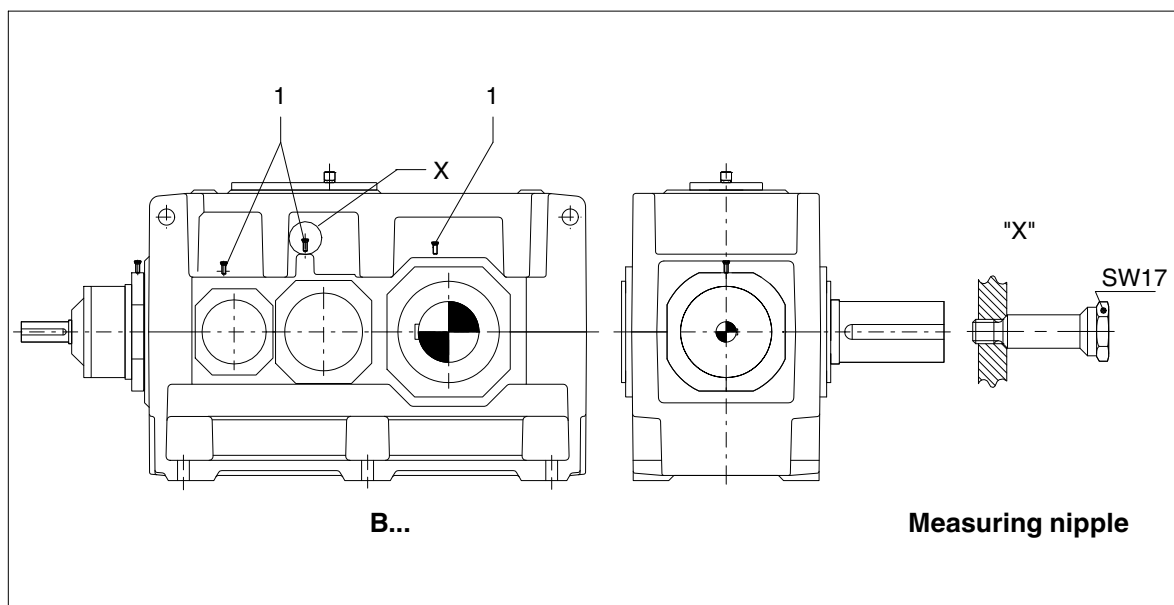


Fig. 31: Bearing monitoring by shock-pulse transducer on gear units of type B3.H

1 Measuring nipple

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

5.14.3 Bearing monitoring by accelerometer

The gear unit may have been provided with threaded bores, suitable for receiving accelerometers. Depending on variant, these threaded bores are provided with thread M6 or M8 (see figures 32 and 33).

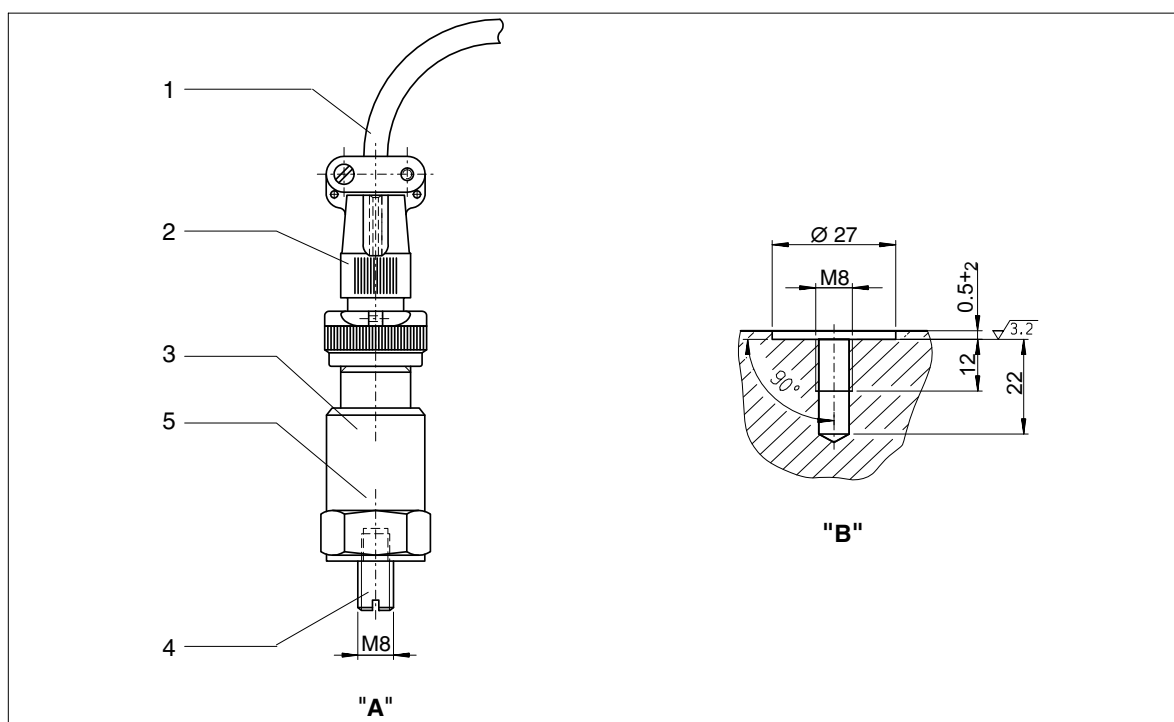


Fig. 32: Accelerometer complete ("A") and tapped hole ("B") for variants 1 to 4

- | | | | |
|---|---------------------------|---|-------------------------------|
| 1 | Screened lead (oil-proof) | 4 | Set screw |
| 2 | MIL plug | 5 | Indication of the sensitivity |
| 3 | Accelerometer | | |

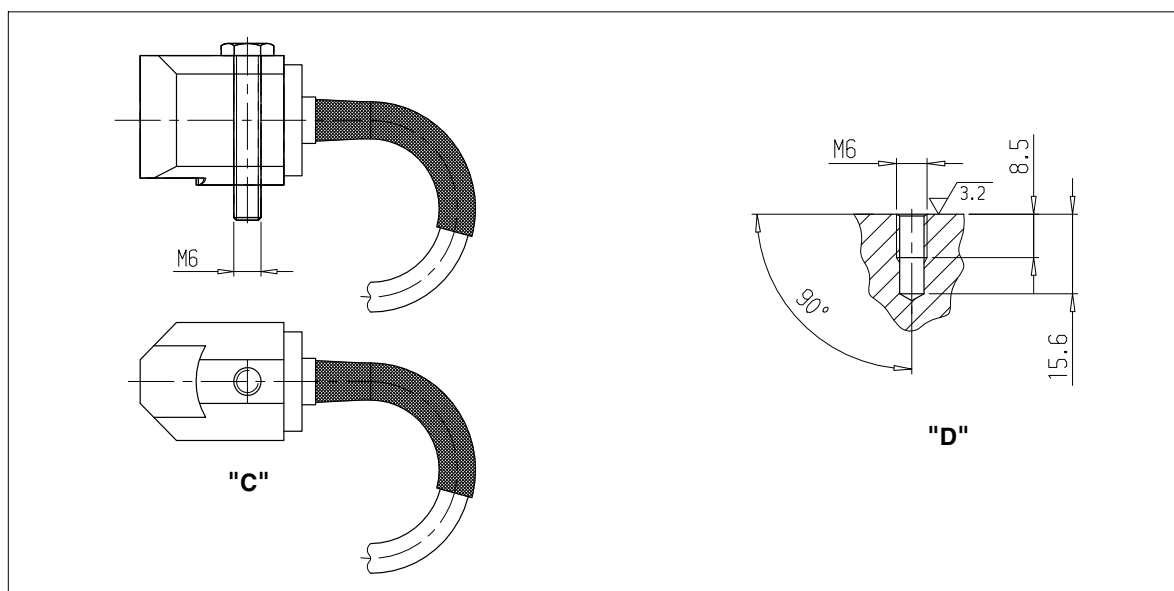


Fig. 33: Accelerometer complete ("C") and threaded hole ("D") for variants 5A and 5B

For a detailed view of the gear unit with sensors added-on, please refer to the drawings in the gear-unit documentation.

Note

For operation of the sensors, the special operating instructions should be observed.

5.15 Speed transmitter

An incremental speed transmitter may have been fitted. Wiring and evaluating instrument must be provided by the customer.

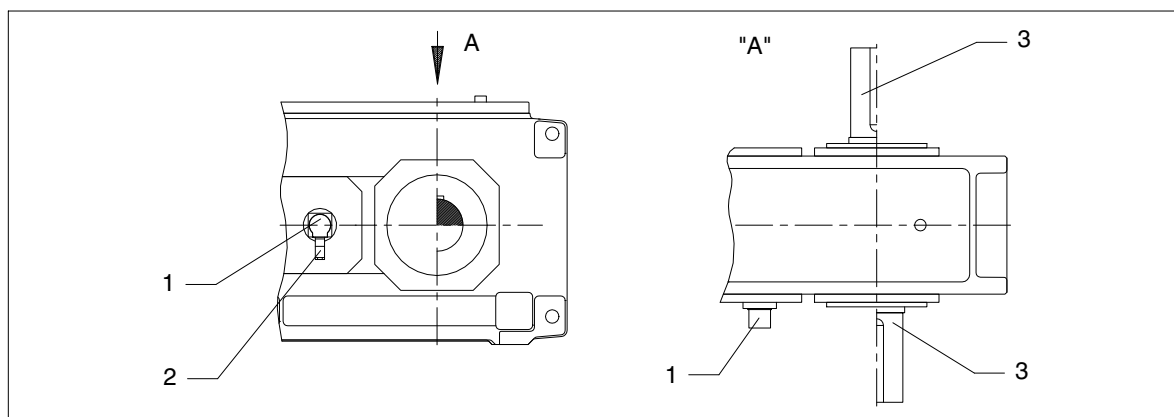


Fig. 34: Speed transmitter

- 1 Incremental transmitter
- 2 12-pole brass plug

- 3 Output

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

Note

For the operation and maintenance the operating manuals specified in the order-specific annex must be observed.

For technical data and control information, refer to the order-specific list of equipment.

5.16 Reversing device

For certain requirements, the gear unit may have been fitted with a reversing device. This enables a jammed driven machine (e.g. a cane mill) to be reversed at a low output speed and the blockage to be removed.

The reversing device comprises an auxiliary gear unit and a clutch. It is linked to the main gear unit by means of a bell housing. For the basic drive-train configuration, refer to figure 35.

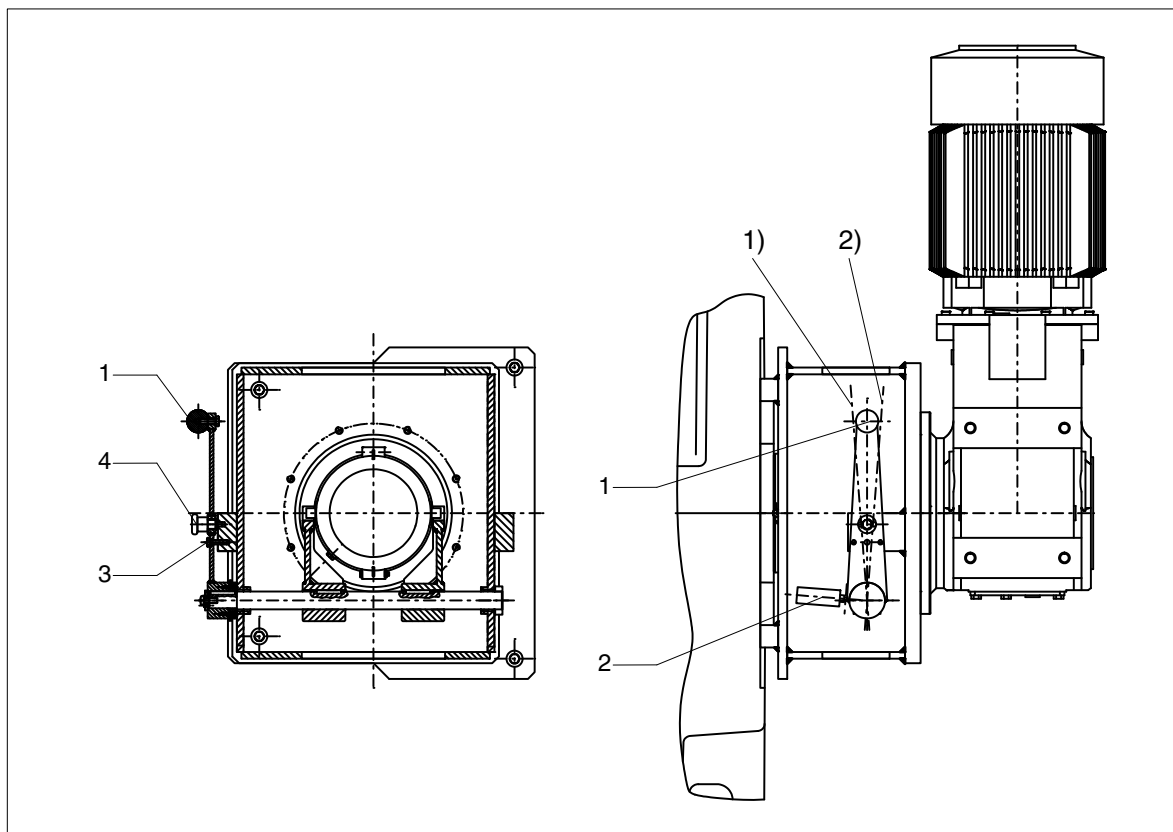


Fig. 35: Design of the reversing device

- 1 Shift lever
- 2 Limit switch

- 3 Locking bolt
- 4 Stop knob

1) Clutch "engaged"

2) Clutch "disengaged"



DANGER

Danger to life through switched-on installation

It must be possible to start the reversing drive motor only on site. The machine must be monitored while doing so. Fast reaction can prevent damage caused by overload. If an oil-supply system has been added-on, it must be in operation while starting.

For the operation of the reversing device, the separate operating instructions relating to the auxiliary gear unit with motor and those relating to the clutch must be observed.

5.16.1 Switching

The reversing device can be engaged and disengaged by means of the clutch. Changeover is done manually by moving the shift lever.

NOTICE

Material damage

Damage to the gear unit and the reversing device possible. The changing operation must be done while the unit is at rest.

Before switching, the locking bolt must be released and the stop knob pulled out of the stop position.

Note

Switching causes a limit switch to be actuated.

NOTICE

Material damage

Damage to the gear unit and the reversing device possible. The limit switch must ensure that the main motor cannot be switched on.

The end faces of the clutch teeth to be engaged when changing over are chamfered to enable the slight rotary movement necessary for "tooth - space alignment" to occur automatically when the shift ring is shifted axially. If the teeth meet in such a way that the rotary movement does not occur automatically, the shift lever must be returned to the initial position. By inching or shifting the reversing-device motor with the handwheel the gears are shifted to a new position to enable changeover. When switching the limit switch on the limit switch is activated, which prevents the drive unit from being switched on.



DANGER

Danger to life through switched-on installation
--

It must be ensured by means of electric interlock with the limit switch that the drive unit cannot be switched on, when the reversing device is engaged.
--

6. Fitting

Observe the instructions in section 3, "Safety instructions"!

6.1 General information on fitting

When transporting the gear unit, observe the instructions in section 4, "Transport and storage".

Fitting work must be done with great care by authorised, trained and qualified personnel. Siemens cannot be held liable for damage caused by incorrect assembly and installation.

As early as during the planning phase sufficient free space must be allowed around the gear unit for later care and maintenance work.

Note

Free convection through the surface of the housing must be ensured by suitable measures.

If the gear unit is fitted with a fan, sufficient space for air intake should be ensured.

Adequate lifting equipment must be available before beginning the fitting work.

NOTICE

Material damage

Risk of damage to the gear unit.

Care must be taken to ensure that **no electric current can flow** through gear units that are operated together with electrical equipment that generate electric current or in which electric current flows (e.g. motors, generators). Electric-current flow can cause irreparable damage to bearings and teeth. Electric-current flow can be caused by e.g. short circuiting, voltage flash-overs and conductive dust layers.

Suitable measures may be:

- Use of insulators
- Proper earthing of the gear unit

NOTICE

Material damage

During operation the unit must not be allowed to heat up through exposure to sunlight or through heat from other external sources, and suitable measures must be taken to prevent this.

Suitable measures may be:

- sunshade roof
- additional cooling unit
- temperature-monitoring device with a shut-off function in the oil sump.

Heat concentration must be avoided.

Note

If a sunshade roof is fitted, heat must be prevented from building up.

If a temperature-monitoring device is fitted, a warning signal must be emitted when the maximum permitted oil-sump temperature is reached. If the maximum permitted oil-sump temperature is exceeded, the drive must be shut off.

Such shutting off may cause the operator's plant to stop.

NOTICE

Material damage

Risk of damage to the gear unit caused by falling objects, heaping over, welding work or insufficient fastening.

The operator must ensure the following:

- The gear unit must be secured against falling objects and heaping over.
- No welding work must be done at all on the drive system.
- The gear unit must not be used as an earthing point for electric-welding operations.
- All the fastening points provided by the design of the unit must be used.
- Bolts which have been damaged during assembly or disassembly work must be replaced with new bolts of the same strength class and type.

Note

To ensure proper lubrication during operation, the mounting position specified on the drawings must always be adhered to.

6.2 Unpacking

NOTICE

Material damage

Risk of damage to the gear unit through corrosion.

The packaging must not be opened or damaged beforehand, if this is part of the preservation method.

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

- Remove packaging material and transporting equipment and dispose of in accordance with regulations.
- Perform a visual check for any damage and contamination.



WARNING

Serious injury through defective product

If there is any visible damage, the gear unit must not be put into operation.
The instructions in section 4, "Transport and storage", must be observed.

- 6.3 Fitting the gear unit
- 6.3.1 Fitting the gear-unit on a housing base
- 6.3.1.1 Foundation

NOTICE

Material damage

Risk of damage through insufficiently safe positioning of the gear unit.
The foundation must be horizontal and level. The gear unit must not be excessively stressed when tightening the fastening bolts.
Fastening bolts and nuts must be tightened to the prescribed tightening torque.
For the correct tightening torque, refer to item 6.20. Bolts of at least **strength class 8.8** must be used.

The foundation should be designed in such a way that no resonance vibrations are created and that no vibrations are transmitted from adjacent foundations. The structure on which the unit is to be fitted must be rigid. The structure must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

Align the gear unit carefully with the units on the input and output sides. Take the elastic deformation through operating forces into consideration.

If external forces are acting upon the gear unit, prevent the unit from displacement by means of lateral stops.

Note

For dimensions, space requirement and arrangement of supply connections, refer to the drawings in the gear-unit documentation.

- 6.3.1.2 Foundation for torque arm

NOTICE

Material damage

Risk of damage through insufficiently safe positioning of the gear unit.
The foundation must be horizontal and level. The gear unit must not be excessively stressed when tightening the fastening bolts.

The foundation should be designed in such a way that no resonance vibrations are created and that no vibrations are transmitted from adjacent foundations. The structure on which the unit is to be fitted must be rigid. The structure must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

Align the gear unit carefully with the units on the output side. Take the elastic deformation through operating forces into consideration.

NOTICE

Material damage

Risk of damage through insufficiently safe positioning of the gear unit.
Fastening bolts and nuts must be tightened to the prescribed tightening torque.
For the correct tightening torque, refer to item 6.20. Bolts of at least **strength class 10.9** must be used.

Note

For dimensions, space requirement and arrangement of supply connections, refer to the drawings in the gear-unit documentation.



WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.

Observe also the following:

- Avoid ignition sources.
- Do not smoke.
- Ensure adequate ventilation.



WARNING

Risk of injury through moving plant parts

After having stopped the motor, there is a danger that the load is not safely held in its position and can run in reverse direction at high speed.

The slipping torque was set at the correct value at the works; it must not be changed.

- Remove the anti-corrosive agent from the shafts using a suitable cleaning agent.



CAUTION

Risk of injury through chemical substances

Observe manufacturer's instructions for handling lubricants and solvents.

Wear suitable protective clothing.

NOTICE

Material damage

Risk of damage to the shaft-sealing rings through chemically aggressive cleaning agents.

The cleaning agent must in no way be allowed to come into contact with the shaft-sealing rings.

- The screw plugs and/or sealing flanges must be removed, and the fittings supplied separately must be fitted to the system according to the drawings in the gear-unit documentation.
- Fit and secure input and output elements (e.g. coupling parts) on the shafts.
If these are to be fitted in heated condition, refer to the dimensioned drawings in the coupling documentation for the correct joining temperatures.

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



WARNING

Risk of burns

Risk of serious injury through burns on hot surfaces (> 55 °C).

Wear suitable protective gloves and protective clothing.

NOTICE

Material damage

Risk of damage to the shaft-sealing rings through heating to over 100 °C.

Use heat shields to protect against radiant heat.

The elements must be pulled smartly onto the shaft as far as stated on the dimensioned drawing prepared in accordance with the order.

NOTICE

Material damage

Damage to the gear unit possible through knocking or impacts.

Fit the coupling using suitable fitting equipment.

The shaft-sealing rings and running surfaces of the shaft must not be damaged when pulling on the coupling parts.

NOTICE

Material damage

Risk of damage to the gear unit or single components through incorrect alignment.

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

Insufficiently rigid base frames or sub-structures can also during operation cause a radial and/or axial misalignment, which cannot be measured when the unit is at a standstill.

Note

Gear units with a weight that requires the use of lifting gear must be attached at the points shown in section 4, "Transport and storage". If the gear unit is to be transported with add-on parts, additional attachment points may be required. The position of these attachment points is shown on the order-specific dimensioned drawing.

6.3.2.1 Alignment

Order-specific machined surfaces (alignment surfaces) are provided on the gear-unit top side for preliminary alignment in horizontal direction. To facilitate gear-unit alignment, alignment threads are provided on the housing base.

Alignment surface:



For the exact position of the alignment surfaces, refer to the drawings in the gear-unit documentation.

These alignment surfaces are for aligning the gear unit horizontally, in order to ensure correct running of the gear unit.

Note

The values punched into the alignment surfaces must be adhered to.

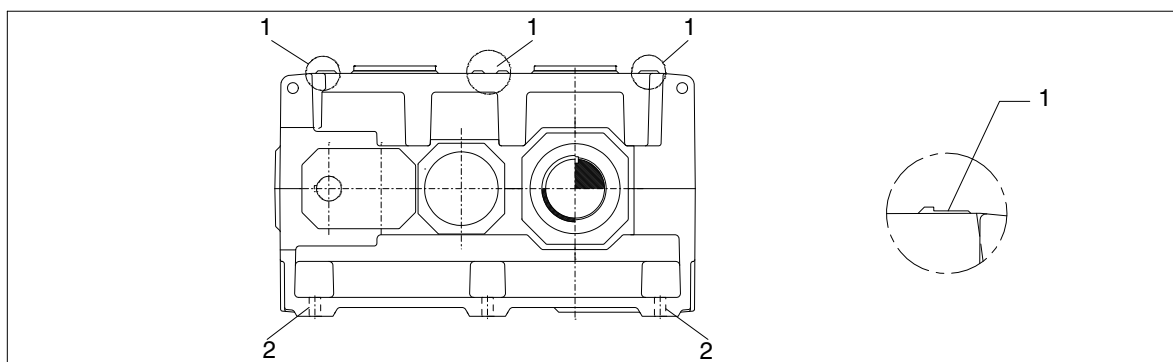


Fig. 36: Alignment surfaces on gear units of types H... and B...

1 Alignment surfaces

2 Alignment thread

The final fine alignment with the units on the in- and output side must be carried out accurately by the shaft axes, using:

- Rulers
- Spirit level
- Clock gauge
- Feeler gauge, etc.

Only then should the gear unit be fastened, and after this the alignment should be checked once again.

- Record the alignment values.

Note

The record must be kept with these instructions.

**DANGER****Danger to life through flying fragments**

Non-observance of the alignment accuracy can cause shaft rupture, resulting in serious injury and danger to life.

Align the gear unit precisely (adhere to the specified values).

Risk of damage to the gear unit or its components or add-on parts.

The accuracy of shaft-axis alignment is an important factor for the life span of shafts, bearings and couplings. If possible, the deviation should be zero (exception: ZAPEX couplings). For the special requirements for the couplings, refer to the relating operating instructions as well.

6.3.2.2 Fitting on a foundation frame

NOTICE

Material damage

Risk of damage through insufficiently safe positioning of the gear unit.
The foundation frame must be horizontal and plain.

The levelness of the gear-unit standing surface is particularly important, as the contact pattern of the teeth and the load of the bearings depend on it and the service life of the gear unit is affected by it.

All points on the gear unit's standing surface must lie between two imaginary parallel planes 0.1 mm per 1 m apart.

- Clean the undersurface of the gear-unit bases.
- Using suitable lifting gear, place the gear unit on the foundation frame.

NOTICE

Material damage

Risk of damage to the gear unit when using incorrect attachment points. Use only the twirls provided to attach lifting equipment to the unit.

Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.
Slinging and lifting gear must be adequate for the weight of the gear unit.

- Tighten the foundation bolts to the specified torque (see item 6.20). If necessary, use stops to prevent displacement.

NOTICE

Material damage

Damage to the gear unit possible through uneven tightening of the fastening bolts.

Tighten the fastening bolts evenly. The gear unit must not be excessively stressed when tightening the fastening bolts.

- Align the gear unit exactly with the units on the input and output sides (see item 6.3.2.1).
- Record the alignment values.

Note

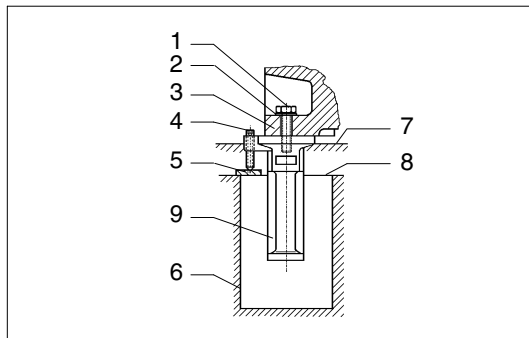
The record must be kept with these instructions.

6.3.2.3 Fitting on a concrete foundation with foundation blocks

- Hook the foundation blocks with washers and fastening bolts into the foundation-fastening points on the gear-unit housing (see figure 37).

Note

The fastening bolts must only be tightened after the concrete has set.



- | | |
|---|----------------------------|
| 1 | Fastening bolt |
| 2 | Washer |
| 3 | Gear-unit base |
| 4 | Set screw |
| 5 | Flat steel plate |
| 6 | Foundation |
| 7 | Final-foundation height |
| 8 | Prepared-foundation height |
| 9 | Foundation block |

Fig. 37: Foundation block

- Tighten the fastening bolts so far until the housing base lies level on the foundation block.
- Using suitable lifting gear, place the gear unit on the concrete foundation.

NOTICE

Material damage

Risk of damage to the gear unit when using incorrect attachment points. Use only the twirls provided to attach lifting equipment to the unit.

Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport. Slinging and lifting gear must be adequate for the weight of the gear unit.

- Align the gear unit horizontally with the in- and output shafts:
 - If using foundation blocks: by means of the set screws (if available).
- If considerable forces apply, use stops to prevent the unit from displacement, as required.
- Before pouring the concrete foundation, fill up the openings in the foundation blocks with suitable material such as polystyrene.
With type **H2**, remove the air-conducting cowls, if required, before tightening the foundation bolts, and bolt them back into position afterwards.
- Pour concrete into the recesses for the foundation blocks.
- When the concrete has set, tighten the fastening bolts of the foundation blocks to the specified tightening torque (see item 6.20).

NOTICE

Material damage

Damage to the gear unit possible through uneven tightening of the hexagon nuts or fastening bolts. Tighten the hexagon nuts or fastening bolts evenly. The gear unit must not be excessively stressed when tightening.

6.3.2.4 Fitting on a concrete foundation by means of anchor bolts

- Clean the undersurface of the gear-unit bases.
- Place support on the base plate in the fine grout.
- Insert the anchor bolt.
- Place the pressure plate in position and screw on the nuts.
- Pack the anchor bolt with wood so that it is about 10 mm from the upper edge of the support (see figure 38).

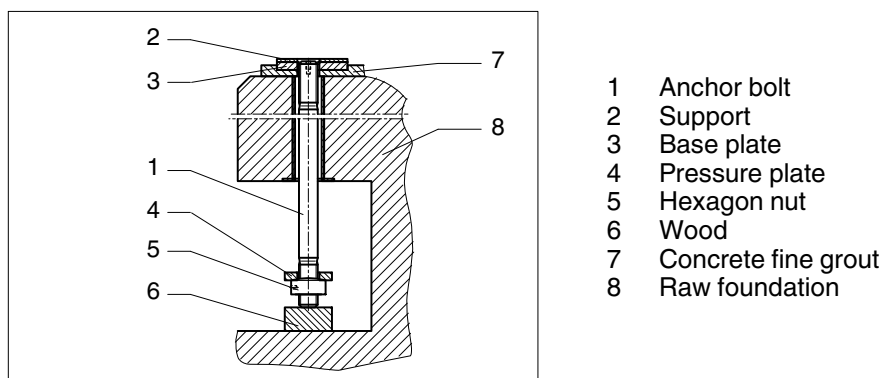


Fig. 38: Anchor bolt

- Position the gear unit.

NOTICE

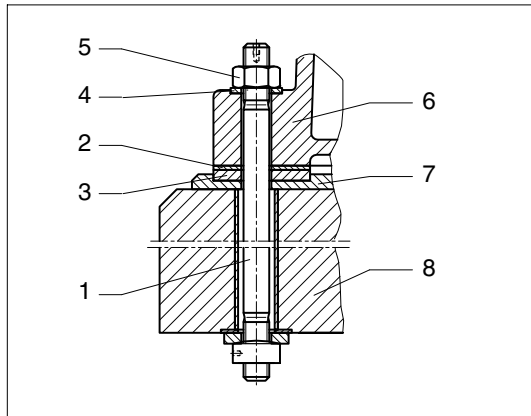
Material damage

Risk of damage to the gear unit when using incorrect attachment points. Use only the twirls provided to attach lifting equipment to the unit.
Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.
Slinging and lifting gear must be adequate for the weight of the gear unit.

- Pull up the anchor bolts; for this a bolt or threaded rod can be screwed into the thread on the front face.
- Fit washer.
- Screw on hexagon nut a few turns by hand.
- Align gear unit with supports (see figure 39).
 - The values punched into the fitting strips must be observed.
 - Alignment tolerances in relation to the units on the input and output sides are to be in accordance with the permissible angular and axial misalignments of the couplings (see coupling drawings).
- Record the alignment values.

Note

The record must be kept with these instructions.



- 1 Anchor bolt
- 2 Support
- 3 Base plate
- 4 Washer
- 5 Hexagon nut
- 6 Housing base
- 7 Concrete fine grout
- 8 Raw foundation

Fig. 39: Anchor bolt

NOTICE

Material damage

Risk of damage through insufficiently safe positioning of the gear unit through insufficient strength of the concrete.

Prior to tensioning the anchor bolts, the fine-grout concrete must have set for at least 28 days.

- Keep anchor bolts in their position by tightening the nuts by hand.
- Place the protective sleeve.
- Place the hydraulic clamping device.
- Pre-tension the bolts alternately. Initial-tensioning forces, see item 6.20.
- Using a suitable tool, tighten the hexagon nuts as far as the stop.



CAUTION

Injury through incorrect handling

Risk of injury through incorrect use of the pre-tensioning tool.

To ensure correct handling and adjustment of the pre-tensioning tool, the manufacturer's operating instructions to the pre-tensioning tool must be adhered to.

- Record the tensioning pressures and/or the initial-tensioning forces.

Note

The record must be kept with these instructions.

6.4 Fitting a shaft-mounted gear unit with hollow shaft and parallel keyway

The end of the driven-machine shaft (material C60+N or higher strength) must be provided with a parallel key to standard "DIN 6885" Part 1 Form A. There should also be a centering hole to standard "DIN 332" Form DS (with thread) on the end face. For the connection dimensions of the driven-machine shaft, see dimensioned drawing in the gear-unit documentation.

6.4.1 Preparatory work

To facilitate demounting (see item 6.4.3), we recommend providing a connection for pressure oil in the end of the driven-machine shaft end, which is drilled through to the hollow-shaft recess (see figure 40). This connection may also be used for supplying rust-releasing agent.

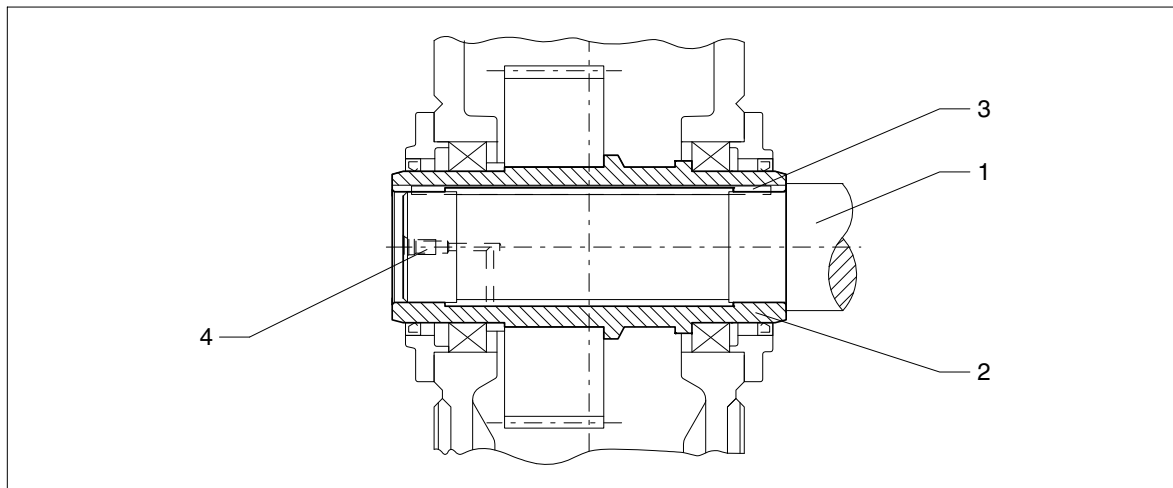


Fig. 40: Hollow shaft with parallel keyway, preparation

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



WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.

Observe also the following:

- Avoid ignition sources.
- Do not smoke.
- Ensure adequate ventilation.

- Remove the corrosion protection from the hollow shaft and driven-machine shaft with a suitable cleaning agent.



CAUTION

Risk of injury through chemical substances

Observe manufacturer's instructions for handling lubricants and solvents.

Wear suitable protective clothing.

NOTICE

Material damage

Risk of damage to the shaft-sealing rings through chemically aggressive cleaning agents.

The cleaning agent must in no way be allowed to come into contact with the shaft-sealing rings.

- Check the hollow and driven-machine shafts for any damage on the bearing seats and edges. If necessary, rework the parts with a suitable tool and clean them again.

Note

Coat the contact surfaces with a suitable lubricant to prevent frictional corrosion.

6.4.2.1 Pulling on

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

NOTICE

Material damage

Risk of damage to the gear unit through canting during fitting work.

When fitting the gear unit on the driven-machine shaft, the hollow shaft must be in line with the driven-machine shaft. Any canting must be avoided.

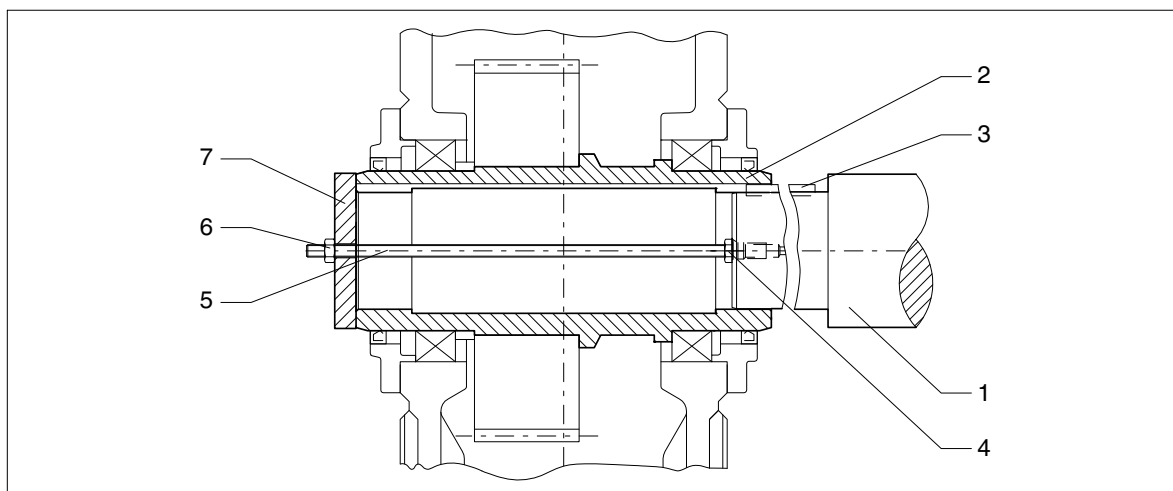


Fig. 41: Hollow shaft with parallel keyway, fitting with threaded spindle

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

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic cylinder may be used.

NOTICE

Material damage

Risk of damage to the rolling bearings through canting, when the gear unit is fitted.

The hollow shaft may be tightened against a machine-shaft collar only if the gear-unit configuration is one of the following:

- Torque arm
- Support with gear-unit swing base

6.4.2.2 Axial securing

Depending on type, secure the hollow shaft axially on the machine shaft (e.g. with locking ring, end plate, set screw).

6.4.3 Demounting

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see figure 40), using a pump.
- When the rust-releasing agent has taken effect, pull the gear unit off using the device (see figures 42 and 43).
- Removing the gear unit from the driven-machine shaft can be done as follows:
 - preferably using a hydraulic cylinder,
 - using forcing-off screws in an end plate (see figure 43), or
 - using a central threaded spindle.

Note

The end plate and/or the auxiliary plate for forcing off the gear unit are not included in the Siemens delivery.

Each of the two end faces of the hollow shaft is provided with threaded holes (for dimensions, see figure 44) for fastening the end plate to the hollow shaft.

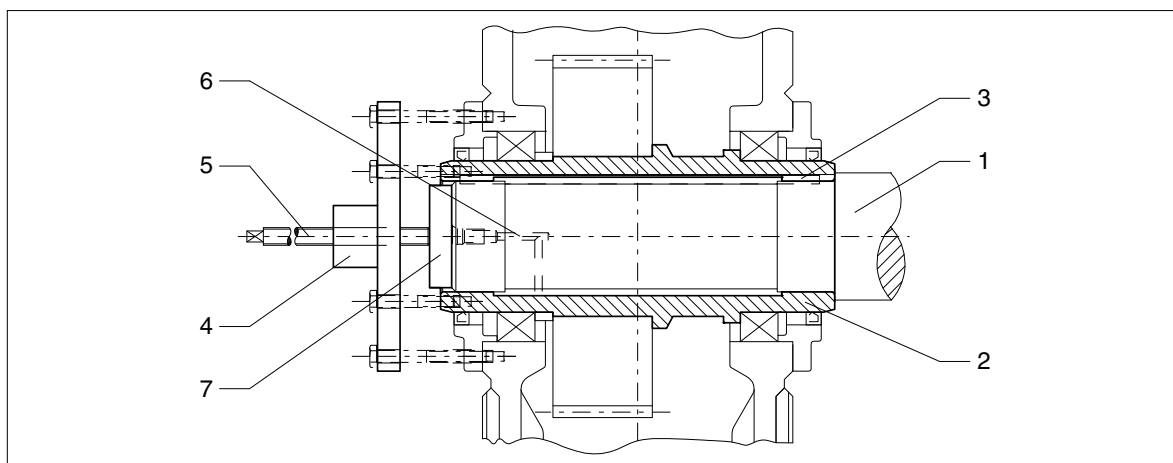


Fig. 42: Hollow shaft with parallel keyway, demounting with hydraulic cylinder

- | | | | |
|---|--------------------|---|---------------------------------|
| 1 | Machine shaft | 5 | Threaded spindle |
| 2 | Hollow shaft | 6 | Pressure-oil connection |
| 3 | Parallel key | 7 | Auxiliary plate for forcing out |
| 4 | Hydraulic cylinder | | |

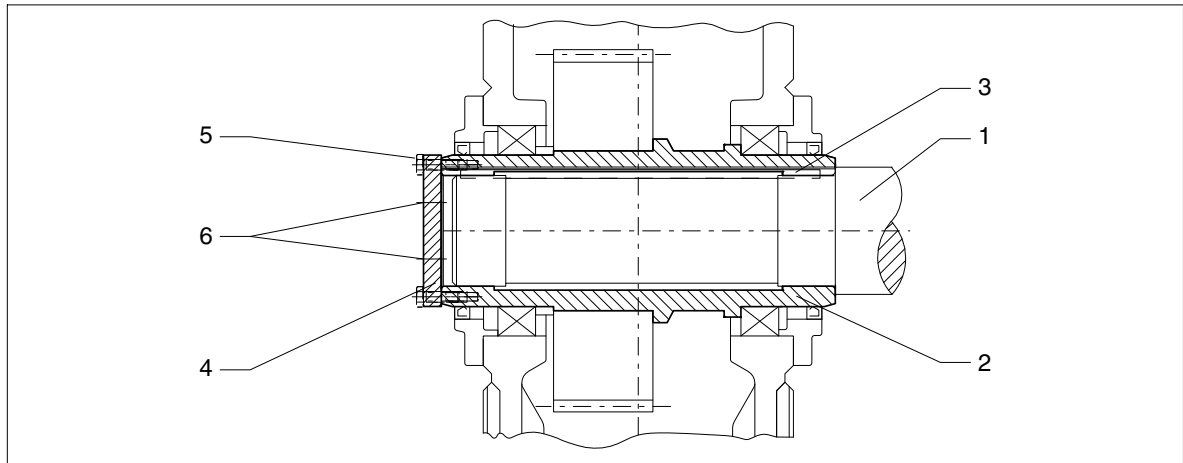


Fig. 43: Hollow shaft with parallel keyway, demounting with end plate

- | | | | |
|---|---------------|---|---------------------------|
| 1 | Machine shaft | 4 | End plate for forcing out |
| 2 | Hollow shaft | 5 | Screws |
| 3 | Parallel key | 6 | Forcing-off screws |

NOTICE

Material damage

Damage to the gear unit possible through canting during demounting work.
When pulling the gear unit off the driven-machine shaft any canting must be avoided.

Note

The auxiliary plate for forcing-out is not included in the scope of delivery of Siemens.

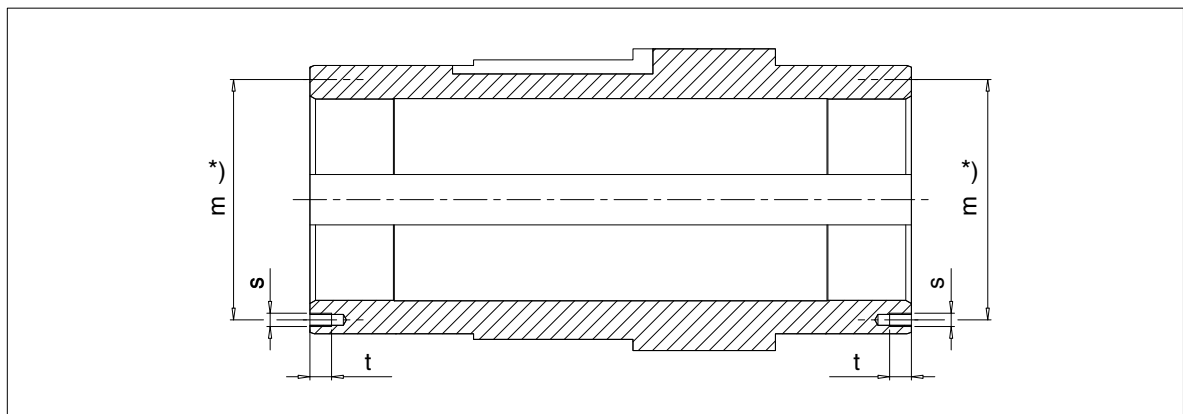


Fig. 44: Hollow shaft with parallel keyway

*) 2 threads offset 180°

Table 12: Threaded holes on the end faces of the gear-unit hollow shafts

Gear-unit size	m mm	s	t mm	Gear-unit size	m mm	s	t mm
4	95	M 8	14.5	12	215	M 12	19.5
5	115	M 8	14.5	13	230	M 12	19.5
6	125	M 8	14.5	14	250	M 12	19.5
7	140	M 10	17	15	270	M 16	24
8	150	M 10	17	16	280	M 16	24
9	160	M 10	17	17	300	M 16	24
10	180	M 12	19.5	18	320	M 16	24
11	195	M 12	19.5	19 ... 26	on request		

NOTICE**Material damage**

Damage to the gear-unit housing or other gear-unit components.

If the support is provided not only by the hollow shaft, but also by the housing, when forcing the gear unit off, as shown in figure 42, the forces used must not exceed the values given in table 13 below.

Before the gear unit is fitted on the machine shaft again, the hollow-shaft bearings must be checked for damage.

Table 13: Maximum forcing-off pressures

Gear-unit size	Maximum forcing-off pressure N	Gear-unit size	Maximum forcing-off pressure N
4	22600	12	113600
5	33000	13	140000
6	37500	14	160000
7	50000	15	193000
8	56000	16	215000
9	65000	17	240000
10	82000	18	266000
11	97200	19 ... 26	on request

NOTICE**Material damage**

Damage to the gear unit possible through canting during demounting work.

When pulling the gear unit off the driven-machine shaft any canting must be avoided.

When using an hydraulic cylinder for forcing the gear unit off, excessively high forces may occur which act on the housing, bearings and other gear-unit components. Before replacing the gear unit on the machine shaft, always check the bearings for any signs of damage.

Note

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

6.5 Shaft-mounted gear unit with hollow shaft and splines to standard "DIN 5480"

The shaft end of the driven machine must be designed with splines to standard "DIN 5480". There should also be a centering hole to standard "DIN 332" Form DS (with thread) on the end face. For the connection dimensions of the driven-machine shaft, see dimensioned drawing in the gear-unit documentation.

6.5.1 Preparatory work

To facilitate demounting (see item 6.5.3), we recommend providing a connection for pressure oil in the end of the driven-machine shaft end, which is drilled through to the hollow-shaft recess (see figure 45). This connection may also be used for supplying rust-releasing agent.

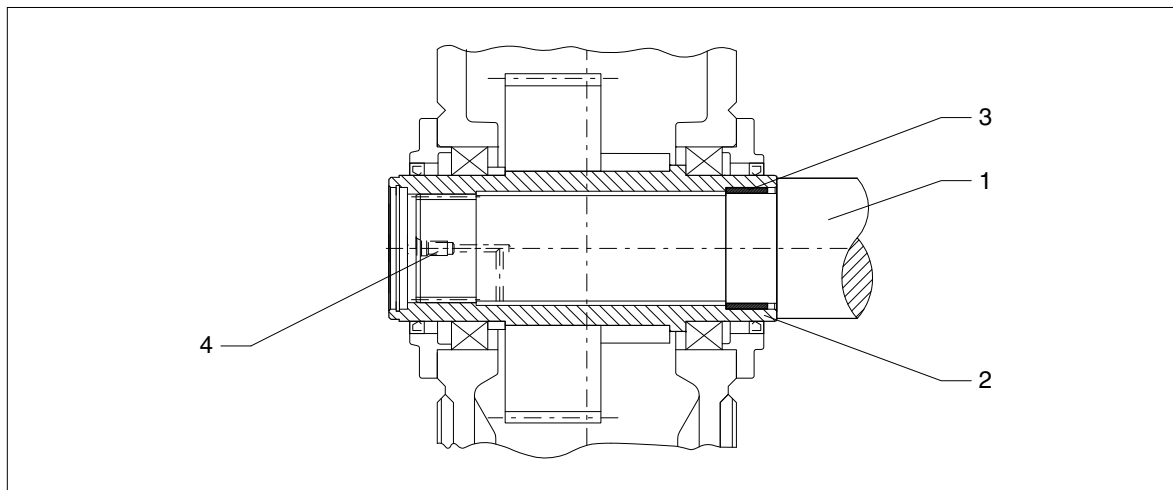


Fig. 45: Hollow shaft with splines, preparation

- 1 Machine shaft
- 2 Hollow shaft

- 3 DU bush
- 4 Pressure-oil connection



WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.

Observe also the following:

- Avoid ignition sources.
- Do not smoke.
- Ensure adequate ventilation.

- Remove the corrosion protection from the hollow shaft and driven-machine shaft with a suitable cleaning agent.



CAUTION

Risk of injury through chemical substances

Observe manufacturer's instructions for handling lubricants and solvents.

Wear suitable protective clothing.

NOTICE

Material damage

Risk of damage to the shaft-sealing rings through chemically aggressive cleaning agents.

The cleaning agent must in no way be allowed to come into contact with the shaft-sealing rings.

- Check the hollow and driven-machine shafts for any damage on the bearing seats and edges. If necessary, rework the parts with a suitable tool and clean them again.

Note

Coat the contact surfaces with a suitable lubricant to prevent frictional corrosion..

6.5.2.1 Fitting with integrated DU bush

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

NOTICE

Material damage

Risk of damage to the gear unit through canting during fitting work.

When fitting the gear unit, care must be taken that the hollow shaft and the machine shaft are aligned and that the tooth position of the machine shaft relative to the hollow shaft is correct.

The correct tooth position can be determined by turning the input shaft or by swivelling the gear unit lightly around the hollow shaft.

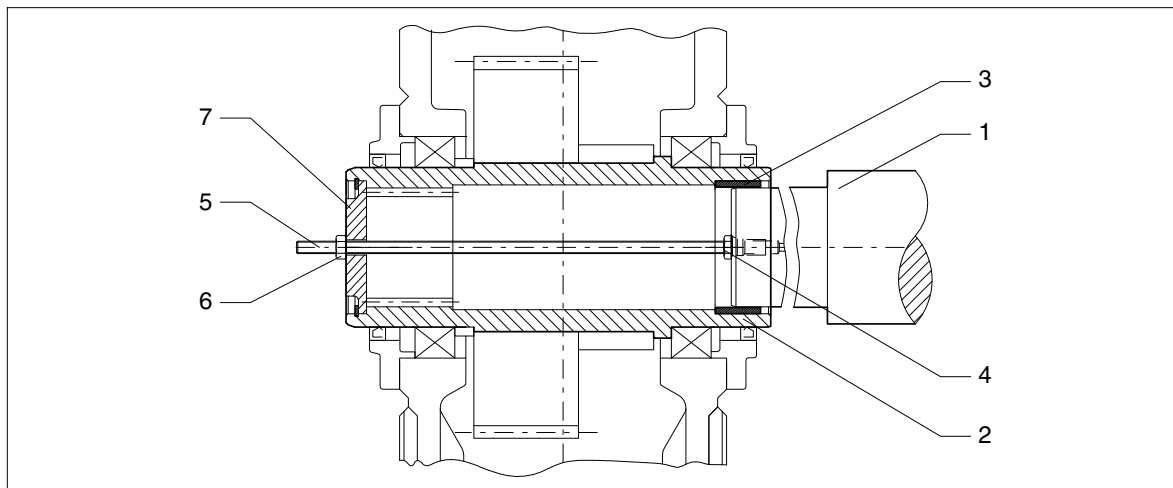


Fig. 46: Hollow shaft with splines, fitting with integrated DU bush

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

6.5.2.2 Axial securing

Depending on type, secure the hollow shaft axially on the machine shaft (e.g. with locking ring, end plate, set screw).

6.5.3 Demounting

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see figure 47), using a pump.
- The end plate and the locking ring must first be removed.
- When the rust-releasing agent has taken effect, pull the gear unit off using the device (see figures 47 and/or figure 48).
- Removing the gear unit from the driven-machine shaft can be done as follows:
 - preferably using a hydraulic cylinder,
 - using forcing-off screws in an end plate (see figure 48), or
 - using a central threaded spindle.

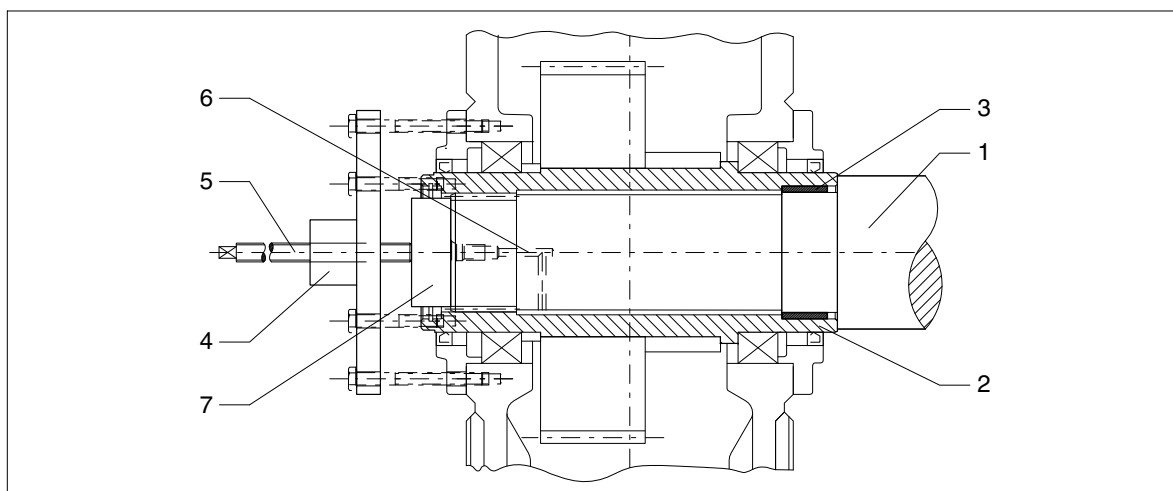


Fig. 47: Hollow shaft with splines, demounting with hydraulic cylinder

- | | |
|----------------------|-----------------------------------|
| 1 Machine shaft | 5 Threaded spindle |
| 2 Hollow shaft | 6 Pressure-oil connection |
| 3 DU bush | 7 Auxiliary plate for forcing out |
| 4 Hydraulic cylinder | |

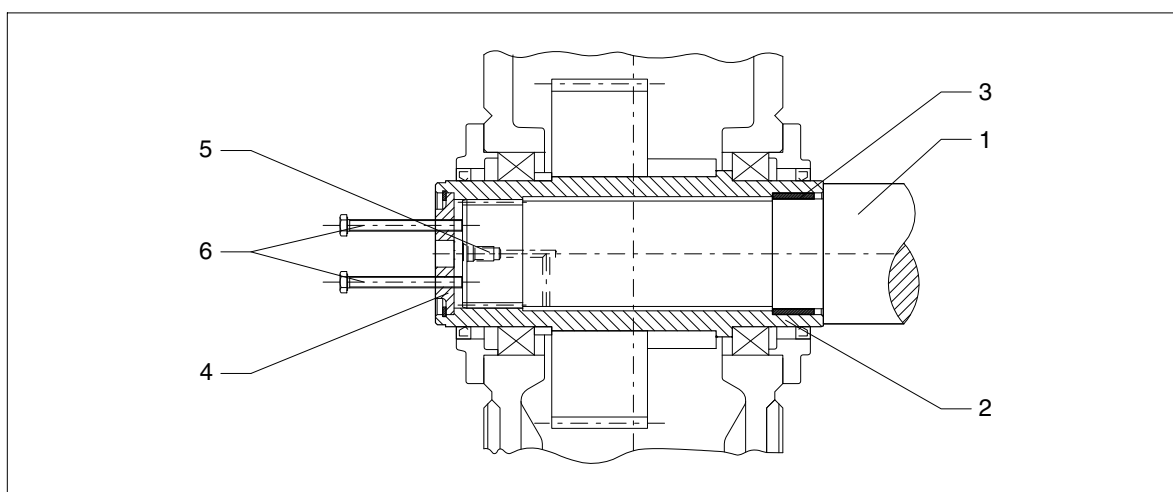


Fig. 48: Hollow shaft with splines, demounting with end plate

- | | |
|-----------------|---------------------------|
| 1 Machine shaft | 4 End plate |
| 2 Hollow shaft | 5 Pressure-oil connection |
| 3 DU bush | 6 Forcing-off screws |

NOTICE

Material damage

Damage to the gear unit possible through canting during demounting work.
When pulling the gear unit off the driven-machine shaft any canting must be avoided.

Note

The auxiliary plate for forcing-out is not included in the scope of delivery of Siemens.

NOTICE

Material damage

Damage to the gear-unit housing or other gear-unit components.
If the support is provided not only by the hollow shaft, but also by the housing, when forcing the gear unit off, as shown in figure 47, the forces used must not exceed the values given in table 14 below.

Before the gear unit is fitted on the machine shaft again, the hollow-shaft bearings must be checked for damage.

Table 14: Maximum forcing-off pressures

Gear-unit size	Maximum forcing-off pressure N	Gear-unit size	Maximum forcing-off pressure N
4	22600	12	113600
5	33000	13	140000
6	37500	14	160000
7	50000	15	193000
8	56000	16	215000
9	65000	17	240000
10	82000	18	266000
11	97200	19 ... 26	on request

NOTICE

Material damage

Damage to the gear unit possible through canting during demounting work.
When pulling the gear unit off the driven-machine shaft any canting must be avoided.
When using an hydraulic cylinder for forcing the gear unit off, excessively high forces may occur which act on the housing, bearings and other gear-unit components. Before placing the gear unit back on the machine shaft, always check the bearings for any signs of damage.

Note

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

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

The end of the driven-machine shaft (material C60+N or higher strength) should have a centring means to standard "DIN 332" Form DS (with thread) in its end face. For the connection dimensions of the driven-machine shaft, see dimensioned drawing in the gear-unit documentation.

6.6.1 Fitting



WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.

Observe also the following:

- Avoid ignition sources.
- Do not smoke.
- Ensure adequate ventilation.

- Remove the corrosion protection from the hollow shaft and driven-machine shaft with a suitable cleaning agent.



CAUTION

Risk of injury through chemical substances

Observe manufacturer's instructions for handling lubricants and solvents.

Wear suitable protective clothing.

NOTICE

Material damage

Risk of damage to the shaft-sealing rings through chemically aggressive cleaning agents.

The cleaning agent must in no way be allowed to come into contact with the shaft-sealing rings.

- Check the hollow and driven-machine shafts for any damage on the bearing seats and edges. If necessary, rework the parts with a suitable tool and clean them again.

Note

The bore of the hollow shaft and the driven-machine shaft must be absolutely free of grease in the area of the shrink-disk seat.

This is essential for safe and reliable torque transmission.

Contaminated solvents, dirty cloths and cleaning agents containing oil (such as paraffin or turpentine) are not suitable for removing grease.

6.6.1.1 Fitting with integrated DU bush

- Fit the gear unit by means of nut and threaded spindle. The support is provided by the end plate in the hollow shaft.

NOTICE

Material damage

Risk of damage to the gear unit through canting during fitting work.

When fitting the gear unit on the driven-machine shaft, the hollow shaft must be in line with the driven-machine shaft. Any canting must be avoided.

- Draw the gear unit with the hollow shaft until the seat under the shrink disk onto the machine shaft.
 - The machine shaft is then centred in the seat under the shrink disk and in the DU bush.
- Draw the hollow shaft against the collar of the machine shaft.

NOTICE

Material damage

Risk of damage to the rolling bearings through canting, when the gear unit is fitted.

The hollow shaft may be tightened against a machine-shaft collar only if the gear-unit configuration is one of the following:

- Torque arm
- Support with gear-unit swing base

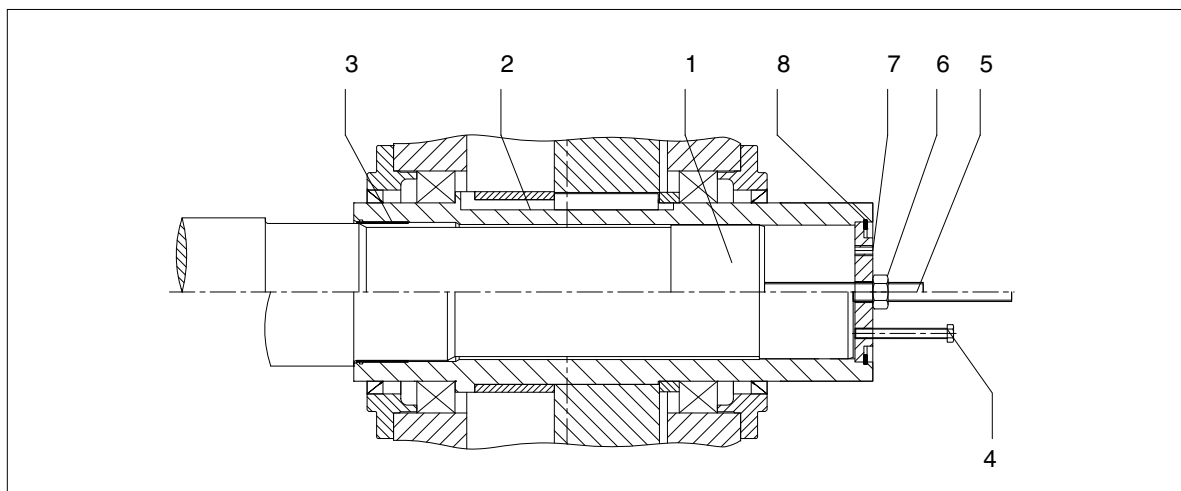


Fig. 49: Hollow shaft in shrink-disk design, fitting with integrated DU bush

- | | |
|--------------------|--------------------|
| 1 Machine shaft | 5 Threaded spindle |
| 2 Hollow shaft | 6 Nut |
| 3 DU bush | 7 End plate |
| 4 Forcing-off bolt | 8 Locking ring |

Parts 4, 5 and 6 are not included in the delivery.

6.6.1.2 Axial securing

If the shrink disk is tightened according to instructions (see item 6.6.2), the gear unit is fixed securely enough in the axial direction. Additional axial securing is not required.

6.6.1.3 Demounting the shaft-mounted gear unit

- Demount the shrink disk (see item 6.6.2).
- Using the forcing-off bolts (part 4) force the gear unit off the machine shaft, until the seat under the shrink disk and the integrated DU bush are clear.
- Using suitable lifting gear, lift the gear unit from the machine shaft.

NOTICE

Material damage

Risk of damage to the gear unit when using incorrect attachment points. Use only the twirls provided to attach lifting equipment to the unit.
Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.
Slinging and lifting gear must be adequate for the weight of the gear unit.

6.6.2 Shrink disk

The shrink disk is delivered ready for fitting.

Note

For the shrink disk used, adhere to the instructions in the related operating instructions "B 3233". These operating instructions are an integral part of the order-specific documentation.

6.7 Couplings, clutches

As a rule, flexible couplings or safety slip clutches are used for driving the gear unit.

The use of rigid couplings or other in- and/or output elements, which generate additional radial and/or axial forces (e.g. gear wheels, belt pulleys, disk flywheels, hydraulic couplings), must be agreed by contract.

Note

Couplings must be balanced in accordance with the specifications in the applicable instructions manual. When operating and servicing the couplings, observe the operating instructions relating to the couplings.

Increased system service life and reliability and reduced running noise can be achieved through the least possible radial and angular misalignment.

NOTICE

Material damage

Risk of damage to the gear unit or single components through incorrect alignment.
When fitting the drives, make absolutely certain that the individual components are accurately aligned in relation to each other. Inadmissibly large errors in the alignment of the shaft ends to be connected through angular and/or axial misalignments result in premature wear and material damage.
Insufficiently rigid base frames or sub-structures can also during operation cause a radial and/or axial misalignment, which cannot be measured when the unit is at a standstill.

Note

For permissible alignment errors in case of couplings supplied by Siemens, refer to the operating instructions for the couplings.

When using couplings manufactured by other manufacturers, ask these manufacturers which alignment errors are permissible, stating the radial loads occurring.

Note

If the gear unit and motor are coupled by a motor bell housing there is no need for aligning the couplings.

The coupling parts may get out of alignment:

- through imprecise alignment during assembly or installation,
- during operation of the system
 - through heat expansion,
 - through shaft flexure,
 - through too weak machine frames, etc.

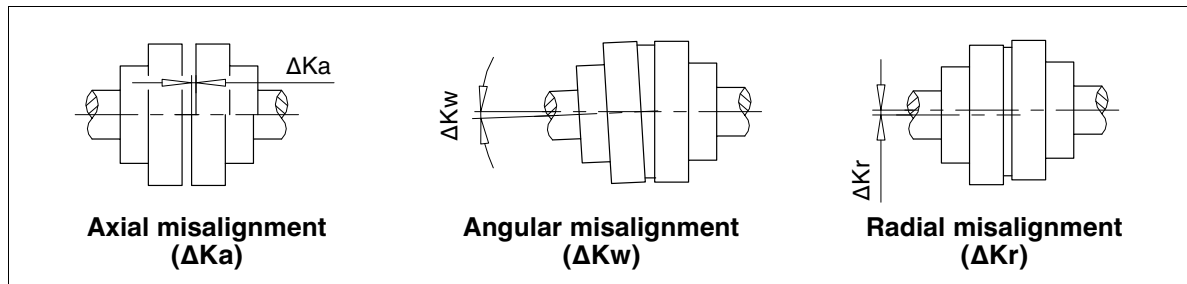


Fig. 50: Possible misalignments

Alignment has to be done in two axial planes situated perpendicularly to each other. This can be done by means of a ruler (radial misalignment) and feeler gauge (angular misalignment), as shown in the illustration. The aligning accuracy can be increased by using a dial gauge or a laser alignment system.

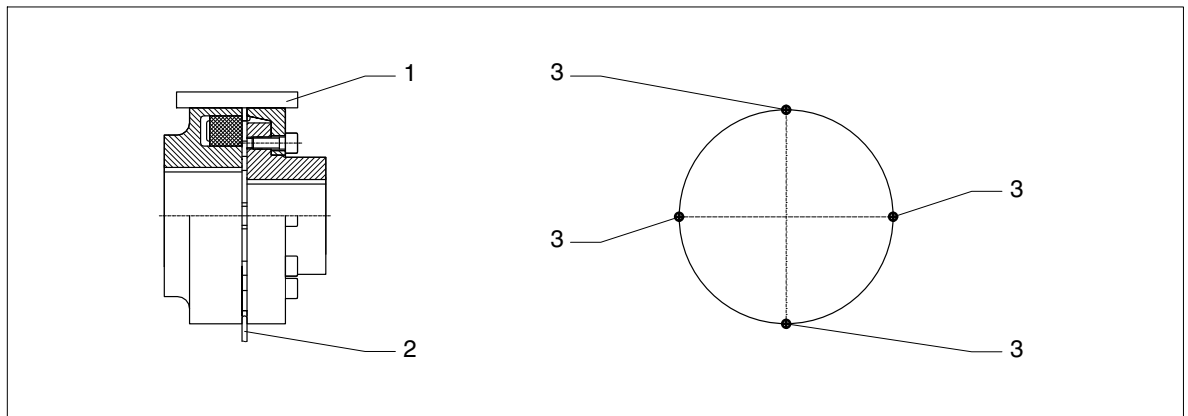


Fig. 51: Example of alignment on a flexible coupling

1 Ruler

2 Feeler gauge

3 Measuring points

NOTICE

Material damage

Risk of damage to or destruction of the coupling through incorrect alignment.

The maximum permissible misalignment values are specified in the operating instructions for the coupling; they must under no circumstances be exceeded during operation.

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

If you use couplings manufactured by other manufacturers, ask these manufacturers which alignment errors are permissible, stating the radial loads occurring.

Note

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

For gear units with hollow output shaft, the coupling on the output side is not required. Gear units with hollow output shaft must be fitted on the shafts of the customer's machinery. Gear units with flanged coupling on the output side must be fitted on the customer's shaft via a counterflange.

6.8 Shaft-mounted gear unit with flanged coupling

Note

The bore of the hollow shaft and the driven-machine shaft must be absolutely free of grease in the area of the shrink-disk seat.

This is essential for safe and reliable torque transmission.

Contaminated solvents, dirty cloths and cleaning agents containing oil (such as paraffin or turpentine) are not suitable for removing grease.

**WARNING****Serious injury**

Risk of injury through ignition of solvent-agent vapours during cleaning work.

Observe also the following:

- Avoid ignition sources.
- Do not smoke.
- Ensure adequate ventilation.

NOTICE**Material damage**

Risk of damage to the gear unit through canting and uneven tightening of the tightening bolts during assembly.

Before tightening the tightening bolts it must be ensured that the flange centering means are inserted one inside the other.

Tighten the tightening bolts crosswise evenly to full torque; the gear unit must not be excessively stressed when tightening the tightening bolts.

Note

The tightening torque of the tightening bolts is shown on the drawings included in the documentation of the coupling. Damaged bolts must be replaced with new bolts of the same type and strength class.

**WARNING****Risk of injury from gear unit or individual parts getting loose**

Risk of injury from gear unit or individual parts getting loose, if they are not supported.

Damage to the gear unit possible through missing support.

To prevent overstressing, the gear unit must be braced with a torque arm or a gear-unit swing base (for this see items 6.9 and 6.10). The gear unit must not be overstressed.

6.9 Fitting the torque arm for the gear-unit housing

6.9.1 Attaching the torque arm

NOTICE

Material damage

Damage to the gear unit possible through incorrect fitting of the motor and torque arm.

Motor and torque arm should be fitted only in consultation with Siemens. The torque arm must be fitted stress-free on the machine side.

On helical gear units with a motor bell housing the torque arm is located opposite the motor bell housing.

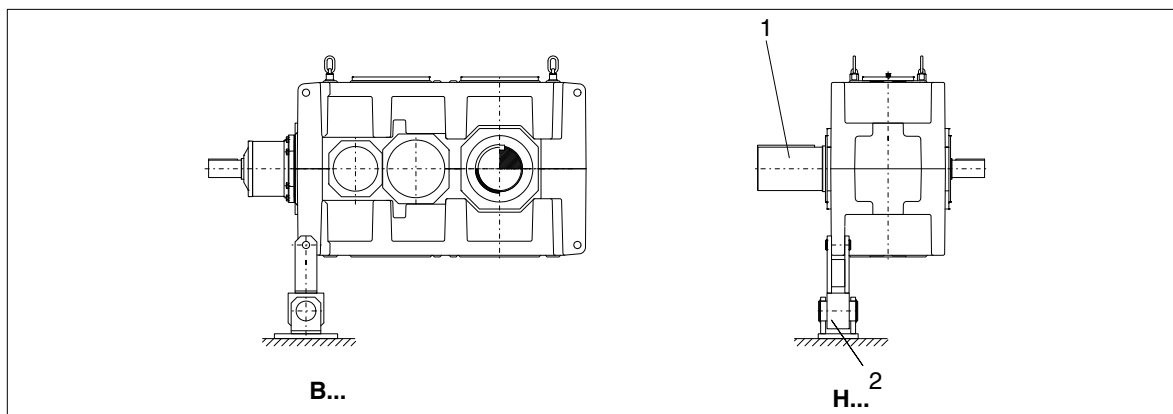


Fig. 52: Torque arm for the gear-unit housing of types B... and H...

1 Machine side

2 Support block

Note

For design of the foundation for fastening the torque arm, see item 6.3.1.2 ("Foundation").

6.10 Fitting supports for gear-unit swing bases

6.10.1 Attaching the support

NOTICE

Material damage

Damage to the gear unit possible through incorrect fitting of the gear-unit swing base.
A gear-unit swing base should be fitted only in consultation with Siemens. The torque arm must be fitted stress-free on the machine side.

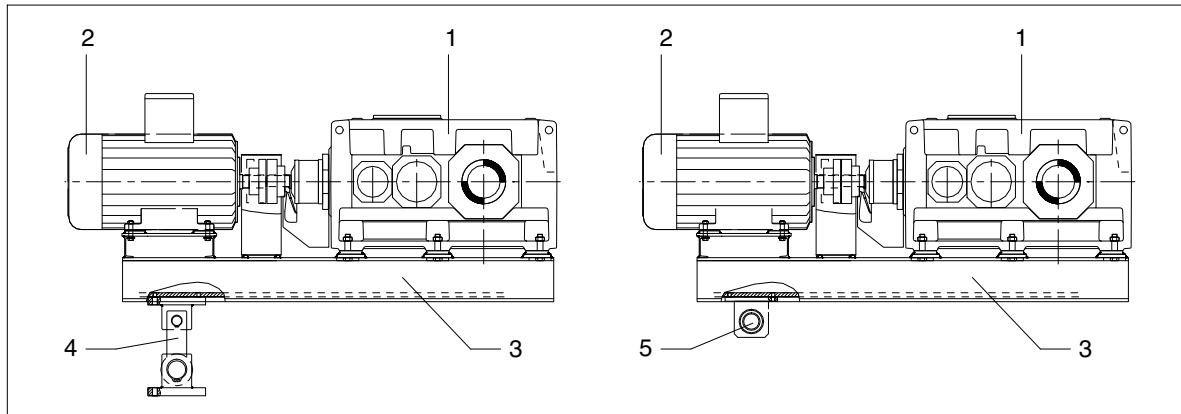


Fig. 53: Support for gear-unit swing bases

- | | | | |
|---|----------------------|---|------------------------|
| 1 | Gear unit | 4 | Torque arm |
| 2 | Motor | 5 | Flexible support block |
| 3 | Gear-unit swing base | | |

Note

For design of the foundation for fastening the torque arm, see item 6.3.1.2 ("Foundation").

6.11 Gear unit with cooling coil

- Before connecting the cooling coil the screw plugs must be removed from the connection bushes.
- Flush the cooling coil (in order to remove any contamination).
- Connect the cooling-water in- and outflow pipes. For the position of the connections, refer to the dimensioned drawing.

Note

Observe item 5.8.2.

6.12 Gear unit with separate oil-supply system

- Remove the plugs out of the suction and delivery lines prior to connecting the system.
- Fit the system to the gear unit or install it separately, in accordance with the drawings supplied in the gear-unit documentation.
- The pipework must not be overstressed during the fitting procedure.

Note

Consult operating instructions for the oil-supply system.

- 6.13 Gear unit with heating
- Wire the heating system electrically.
- 6.14 Gear unit with oil-temperature monitoring system
- Wire the temperature monitor with evaluating device (to be provided by customer) electrically.
- 6.15 Oil-level monitoring system
- Wire the oil-level limit switch electrically.
 - Wire the oil-level monitor electrically.
- 6.16 Bearing-monitoring system
- The bearing-monitoring device must be fitted by the customer.
- 6.17 Gear unit with speed transmitter
- Wire the speed transmitter electrically.
- 6.18 General notes on add-on components

Note

For operating and servicing the components described in section 5, the corresponding operating instructions and the specifications in section 6 must be observed.

For technical data and control information, refer to the data sheet and/or the order-specific list of equipment.

- 6.19 Final work
- ☐ After installation of the gear unit check all screw connections for tight fit.
 - ☐ Check the alignment after tightening the fastening elements. The alignment must not have been changed.
 - ☐ Check that all the devices which have been demounted for transport reasons have been re-fitted. For this refer to the details on the data sheet, in the list of equipment and on the associated drawings.

NOTICE
Material damage Risk of damage to the gear unit through overheating in case of too low oil level due to leakage. Any oil-drain cocks must be secured against accidental opening.

- ☐ The gear unit must be protected against falling objects.
- ☐ Protective devices for rotating parts must be checked for correct seating. Contact with rotating parts is not permitted.
- ☐ A potential equalisation in accordance with the applying regulations and directives must be carried out! If no threaded holes for earth connection are available on the gear unit, other appropriate measures must be taken. This work must always be done by **specialist electricians**.
- ☐ Cable entries must be protected against moisture.

6.20 Screw-connection classes, tightening torques and initial-tensioning forces

6.20.1 Screw-connection classes

The specified screw connections are to be fastened applying the tightening torques specified observing the table below.

Table 15: Screw-connection classes

Fastening of	Screw-connection class	Tightening procedure
Gear unit Motor* Brake* Torque arm	C	- Hydraulic tightening with mechanical screwdriver - Torque-controlled tightening with torque wrench or signal-emitting torque wrench - Tightening with precision mechanical screwdriver with dynamic torque measuring
	D	Torque-controlled tightening with mechanical screwdriver
Protective hood Sun roof	E	- Tightening with pulse screwdriver or impact wrench without adjustment checking device - Tightening by hand, using a spanner without torque measuring device

*) The tightening torques applying to these add-on parts can be found in the instructions supplied by the manufacturers of the parts.

6.20.2 Tightening torques and initial-tensioning forces

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

The friction coefficient $\mu_{\text{total}} = 0.14$ applies here to lightly oiled steel bolts, black-annealed or phosphatised and dry, cut mating threads in steel or cast iron. Lubricants which alter the friction coefficient must not be used and may overload the screw connection.

Table 16: Initial-tensioning forces and tightening torques for screw connections of strength classes **8.8; 10.9; 12.9** with a common friction coefficient of $\mu_{\text{total}} = 0.14$

Nominal thread diameter d mm	Strength class of the bolt	Initial-tensioning force for screw-connection classes from table 15			Tightening torque for screw-connection classes from table 15		
		C	D	E	C	D	E
		$F_{M \text{ min.}}$ N			M_A Nm		
M10	8.8	18000	11500	7200	44.6	38.4	34.3
	10.9	26400	16900	10600	65.4	56.4	50.4
	12.9	30900	19800	12400	76.5	66.0	58.9
M12	8.8	26300	16800	10500	76.7	66.1	59.0
	10.9	38600	24700	15400	113	97.1	86.6
	12.9	45100	28900	18100	132	114	101
M16	8.8	49300	31600	19800	186	160	143
	10.9	72500	46400	29000	273	235	210
	12.9	85000	54400	34000	320	276	246
M20	8.8	77000	49200	30800	364	313	280
	10.9	110000	70400	44000	520	450	400
	12.9	129000	82400	51500	609	525	468

Nominal thread diameter d mm	Strength class of the bolt	Initial-tensioning force for screw-connection classes from table 15			Tightening torque for screw-connection classes from table 15		
		C	D	E	C	D	E
		$F_{M\ min.}$ N			M_A Nm		
M24	8.8	109000	69600	43500	614	530	470
	10.9	155000	99200	62000	875	755	675
	12.9	181000	116000	72500	1020	880	790
M30	8.8	170000	109000	68000	1210	1040	930
	10.9	243000	155000	97000	1720	1480	1330
	12.9	284000	182000	114000	2010	1740	1550
M36	8.8	246000	157000	98300	2080	1790	1600
	10.9	350000	224000	140000	2960	2550	2280
	12.9	409000	262000	164000	3460	2980	2670
M42	8.8	331000	212000	132000	3260	2810	2510
	10.9	471000	301000	188000	4640	4000	3750
	12.9	551000	352000	220000	5430	4680	4180
M48	8.8	421000	269000	168000	4750	4090	3650
	10.9	599000	383000	240000	6760	5820	5200
	12.9	700000	448000	280000	7900	6810	6080
M56	8.8	568000	363000	227000	7430	6400	5710
	10.9	806000	516000	323000	10500	9090	8120
	12.9	944000	604000	378000	12300	10600	9500
M64	8.8	744000	476000	298000	11000	9480	8460
	10.9	1060000	676000	423000	15600	13500	12000
	12.9	1240000	792000	495000	18300	15800	14100
M72x6	8.8	944000	604000	378000	15500	13400	11900
	10.9	1340000	856000	535000	22000	18900	16900
	12.9	1570000	1000000	628000	25800	22200	19800
M80x6	8.8	1190000	760000	475000	21500	18500	16500
	10.9	1690000	1100000	675000	30500	26400	23400
	12.9	1980000	1360000	790000	35700	31400	27400
M90x6	8.8	1510000	968000	605000	30600	26300	23500
	10.9	2150000	1380000	860000	43500	37500	33400
	12.9	2520000	1600000	1010000	51000	43800	39200
M100x6	8.8	1880000	1200000	750000	42100	36200	32300
	10.9	2670000	1710000	1070000	60000	51600	46100
	12.9	3130000	2000000	1250000	70000	60400	53900

Note

Damaged bolts must be replaced with new bolts of the same type and strength class.

7. Start-up

Observe the instructions in section 3, "Safety instructions"!

7.1 Procedure before start-up

7.1.1 Removal of preservative agent from exterior

- The preserved shaft ends in the area of the couplings to be fitted must be depreserved, using suitable agents (special solvent).
The depreservation also applies to bright surfaces of the gear unit, onto which components are to be fitted.

CAUTION

Risk of injury through chemical substances

The solvent must not come into contact with the skin (e.g. the operator's hands).
The safety notes on the data sheets for the solvent used must be observed.
Remove any solvent spillage immediately with a binding agent.
Observe manufacturer's instructions for handling lubricants and binding agents.
Wear suitable protective clothing.

7.1.2 Removal of preservative agent from interior

NOTICE

Material damage

Risk of damage to the gear unit through missing or insufficient ventilation.
Prior to start-up replace the screw plug with the air filter.
Remove the adhesive tape from the labyrinth seals (in case of Tacolab seals only, see item 4.4.1).

The position of the oil-drain points is marked by a symbol on the dimensioned drawing in the gear-unit documentation.

Oil-drain point:



- Place suitable containers under the oil-drain points.
- Unscrew the oil-drain plug and/or open the oil-drain cock.
- Remove remaining preservative agent and/or running-in oil from the housing using a suitable container; to do so, unscrew all existing residual-oil drain plugs.
- Dispose of remaining preservative agent and/or running-in oil in accordance with regulations.

CAUTION

Risk of injury through chemical substances

The oil must not come into contact with the skin (e.g. the operator's hands).
The safety notes on the data sheets for the oil used must be observed.
Remove any oil spillage immediately with a binding agent.
Observe manufacturer's instructions for handling lubricants and binding agents.
Wear suitable protective clothing.

- Screw in the oil-drain plug and/or shut the oil-drain cock again.
- Screw in any removed residual-oil drain plugs again.

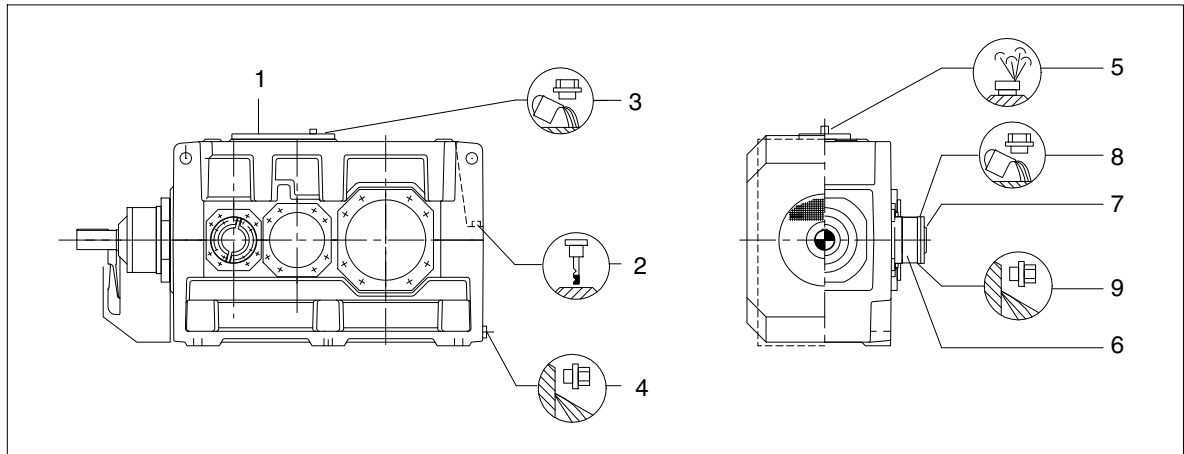


Fig. 54: Oil-filling and oil-drain points on gear units of type B3..

- | | | | |
|---|----------------------------------|---|-----------------------------|
| 1 | Inspection and/or assembly cover | 6 | Backstop |
| 2 | Dipstick | 7 | Sealing cover backstop |
| 3 | Oil inlet | 8 | Oil inlet backstop |
| 4 | Oil-drain plug | 9 | Residual-oil drain backstop |
| 5 | Air-relief point | | |

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

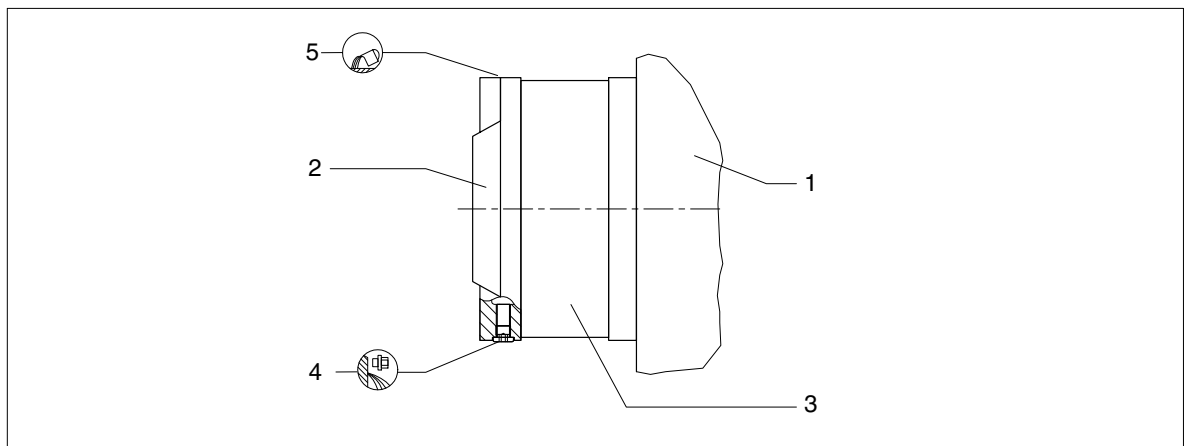


Fig. 55: Gear unit with backstop

- | | | | |
|---|------------------------|---|-------------------------------|
| 1 | Gear unit | 4 | Screw plug Residual-oil drain |
| 2 | Sealing cover backstop | 5 | Screw plug Oil filling |
| 3 | Backstop | | |

For a detailed illustration of the gear unit and the position of the add-on parts, refer to the drawings in the gear-unit documentation.

7.1.3 Filling with lubricant

- Undo and remove the fastening screws of the inspection and/or assembly cover.
- Remove the cover with the seal from the housing. The seal will be used again.
- Unscrew the air filter including the reducing screw.
- Using a filling filter (maximum mesh 25 µm), fill the gear unit with fresh oil until the oil comes up to the lower edge of the oil-sight glass or until the lower mark on the oil-dipstick. Do not put in any further oil. The viscosity of the oil in cold condition will cause the oil level to continue rising slowly. If necessary, but only after the oil level has steadied, pour in further oil up to the middle of the oil-sight glass or to the middle between the MIN and MAX marks on the oil-dipstick.

Note

The quality of the oil used must meet the requirements of the separately supplied BA 7300 operating instructions, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in table "T 7300" (for a link to the Internet, see the back cover), as they have been tested and meet the requirements.

Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit. The oil quantity shown on the rating plate is to be understood as an approximate quantity. The actual oil quantity to be put in is shown by the middle on the oil-sight glass or the MIN and MAX marks on the oil-dipstick.

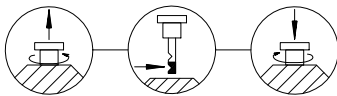
Note

In case of gear units fitted with force-feed lubrication or an oil-cooling system, the oil circuit must also be charged with oil. To do so, briefly start up the gear unit with add-on pump. Observe the instructions in section 8, "Operation".

- Check the oil level in the gear-unit housing.
-

Note

The oil must come up to the middle of the oil-sight glass or as far as between the MIN and MAX marks on the oil-dipstick.



CAUTION

Risk of injury through chemical substances

The oil must not come into contact with the skin (e.g. the operator's hands).

The safety notes on the data sheets for the oil used must be observed.

Remove any oil spillage immediately with a binding agent.

Observe manufacturer's instructions for handling lubricants and binding agents.

Wear suitable protective clothing.

- Place the inspection and/or assembly cover with the seal on the housing.
- Screw in the fastening screws of the cover and tighten them to the specified tightening torque (see item 6.20).
- Screw in the air filter with the reducing screw.

7.1.4 Filling in lubricant in case of gear units with add-on backstop

- In case of gear units with add-on backstop remove the screw plugs (5) on the backstop (3) and top up with the oil quantity indicated on the rating plate or additional plate by way of a filling filter with maximum 25 µm filter mesh size (see figure 54 and figure 55).

Note

Before filling the main gear unit with oil, **start by** supplying lubricating point **8** at the backstop (see figure 54 and figure 55) with the oil quantity and oil type specified on the rating plate or additional plate. Prior to startup, the backstop should be checked for proper function according to item 7.2.3.

- Screw the screw plug in again.
- Undo and remove the fastening screws of the inspection and/or assembly cover of the gear unit.
- Remove the cover with the seal from the housing. The seal will be used again.
- Unscrew the air filter including the reducing screw.
- Visual check of the interior parts for corrosion.

Note

If corrosion is found, always contact the Siemens customer service.

- Using a filter (maximum mesh 25 µm), fill the gear unit with fresh oil up to the middle of the oil-sight glass or the MAX mark on the dipstick.
Remember to fill the oil pockets above the bearings and (with bevel-gear units) also at the drive shaft on the inside.



CAUTION

Risk of injury through chemical substances

The oil must not come into contact with the skin (e.g. the operator's hands).
The safety notes on the data sheets for the oil used must be observed.
Remove any oil spillage immediately with a binding agent.
Observe manufacturer's instructions for handling lubricants and binding agents.
Wear suitable protective clothing.

Note

The sealing surfaces must not be contaminated nor damaged.

Note

The quality of the oil used must meet the requirements of the separately supplied BA 7300 operating instructions, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in table "T 7300" (for a link to the Internet, see the back cover), as they have been tested and meet the requirements.

Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit. The oil quantity shown on the rating plate is to be understood as an approximate quantity. The actual oil quantity to be put in is shown by the middle on the oil-sight glass or the MIN and MAX marks on the oil-dipstick.

Note

In case of gear units fitted with force-feed lubrication or an oil-cooling system, the oil circuit must also be charged with oil. To do so, briefly start up the gear unit with add-on pump. Observe the instructions in section 8, "Operation".

- Check the oil level in the gear-unit housing.

Note

Depending on the type the following oil levels are correct:

Middle of the oil-sight glass

Middle between the MIN and MAX marks on the dipstick

- Place the inspection and/or assembly cover with the seal on the housing.
 - Screw in the fastening screws of the cover and tighten them to the specified tightening torque (see item 6.20).
 - Screw the air filter in, including the reducing screw.
-

Note

For the oil quantity see the rating plate or the documentation. These data are approximative. The mark on the the oil-sight glass or on the dipstick must always be considered as decisive (see item 8.2).

7.2 Start-up

NOTICE

Material damage

Risk of destruction of the gear unit or gear-unit components through incorrect direction of rotation. The gear unit can be operated in both directions of rotation. A certain direction of rotation may have been specified in the order which is realised by adding-on a backstop or an overrunning clutch.

NOTICE

Material damage

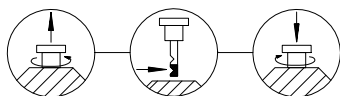
Risk of damage to the gear unit through missing or insufficient ventilation. Prior to start-up replace the screw plug with the air filter.

- Check the oil level of the gear unit (see item 7.2.1).
- After the initial start-up of an external oil-supply system the oil level in the gear unit must be checked (see item 7.2.1).

7.2.1 Oil level

Depending on the type the following oil levels are correct:

- Middle of the oil-sight glass
- Middle between the MIN and MAX marks on the dipstick



Note

When cooled down the oil must come up to the middle of the oil-sight glass or as far as between the MIN and MAX marks on the oil-dipstick.

Hot oil may slightly exceed the middle of the oil-sight glass or the MAX mark on the oil-dipstick.

NOTICE

Material damage

Insufficient lubrication possible through too low oil level.

Check the oil level.

Under no circumstances must it be allowed to fall below the lower mark on the oil-sight glass or the MIN mark on the oil-dipstick. If necessary, top up oil to the correct level.

7.2.2 Gear unit with cooling coil or external oil-supply system

NOTICE

Material damage

Risk of damage to the gear unit through missing or insufficient cooling and/or lubrication.

Fully open the stop valves in the coolant in- and outflow pipes of the cooling system.

After starting up the external oil-supply system for the first time the oil level in the gear unit must be once more checked in accordance with item 7.2.1.

Note

The permissible pressure and temperature values specified on the data sheet and/or in the list of equipment must not be exceeded.

This is to be checked before the start-up.

For technical data and control information, refer to the data sheet and/or the list of equipment.

NOTICE

Material damage

Risk of damage to the gear unit through missing lubrication.

The gear unit must be operated only together with the oil-supply system. For this the oil-supply system must be switched on at least 2 minutes before starting up the gear unit.

- Start the drive motor.

7.2.3 Gear unit with backstop

Note

Observe details in item 5.7, "Backstop".

Before start-up, check whether the backstop can be turned manually in the free-wheeling direction without exerting undue force. Observe the direction-of-rotation arrows on the housing.

NOTICE**Material damage**

Risk of damage to or destruction of the backstop and/or the gear unit through incorrect direction of rotation.

Do not allow the motor to run adversely to the blocking direction of the gear unit.

Observe the notice fixed to the gear unit.

Before connecting the motor, determine the direction of rotation of the three-phase current supply using a phase-sequence indicator. Connect the motor in accordance with the specified direction of rotation.

NOTICE**Material damage**

Risk of damage to the backstop through missing lubrication.

Prior to startup pour in the amount of oil indicated on the notice plate through the oil-filler screw plug of the backstop.

Always use oil of the same oil type and viscosity as that for the gear unit.

7.2.4 Temperature measurement

During the first start-up and after maintenance work, the oil-sump temperature must be measured during correct use (maximum machine performance) after warming up.

NOTICE**Material damage**

Risk of damage to the gear unit through insufficient lubrication resulting from too high oil temperature. The maximum permissible oil-sump temperature is:

90 °C (applies to mineral oil)

100 °C (applies to synthetic oil)

At higher temperatures the gear unit must be shut down immediately and Siemens customer service consulted.

7.2.5 Oil-level monitoring system

The gear unit can have been fitted with an oil-level monitor by means of a filling-level limit switch. The oil-level monitoring device has been designed for checking the oil level when the gear unit is at a standstill, prior to operating start.

NOTICE**Material damage**

Risk of damage to the gear unit through too low oil level.

Wire the signal in such a manner that the drive motor cannot start on the occurrence of the signal "Oil level too low". Bridge any such signal during operation.

7.2.6 Bearing monitoring (vibration measurement)

If measures have been taken for a vibration measurement as bearing monitoring (see item 5.14), vibration measurements must be taken in order to obtain initial values and/or reference values for the diagnosis. These measurement values must be recorded and filed for comparison with later measurements.

Note

The record must be kept with these instructions.

7.2.7 Heating

The heating rods can be controlled by a temperature monitor which emits a signal when minimum and maximum temperatures are reached; the signal requires amplification.

**WARNING****Fire hazard**

Fire hazard through exposed heating elements possible.

Never switch on the heating elements, unless complete immersion of the heating elements in the oil bath is ensured.

If heating elements are fitted afterwards, the maximum heating capacity (see table 11) on the outer surface of the heating elements must not be exceeded.

Note

The correct setting of the switch points must be checked (see item 5.10).

7.2.8 Reversing device

NOTICE**Material damage**

Damage to the gear unit and the reversing device possible.

Before start-up the shift lever of the reversing device must be at position "Disengage", the stop knob engaged and the locking screw tightened (see item 5.16).

7.2.9 Checking procedure

The following visual checks must be conducted and recorded when starting up:

- ☐ Oil level
- ☐ Leaktightness of the oil-cooling or oil-supply lines
- ☐ Opening condition of the shut-off valves
- ☐ Effectiveness of the shaft seals
- ☐ Freedom of the rotating parts from contact

The tension pressures or pretensioning forces shown in items 6.3.2.2 to 6.3.2.4 must also be recorded in this record.

Note

The record must be kept with these instructions.

7.3 Shutting down

- Switch off the drive unit.



DANGER

Danger to life through switched-on installation

To carry out work on the gear unit, the gear unit must always be stopped.

The drive unit must be secured against being switched on accidentally (e.g. by locking the key switch or by removing the fuses from the power supply).

Attach a notice to the ON switch stating clearly that work is in progress on the gear unit.

- In case of gear units fitted with cooling coil or water oil-cooler, close the stop valves on the cooling-water in- and outflow pipes. If there is a danger of freezing and in case of a longer standstill of the gear unit, the cooling water must be drained off and remaining water must be blown out using compressed air.
- During a shut-down period no longer than 6 months, start the gear unit approximately every 3 weeks and allow it to run for 5 to 10 minutes.
- During a shut-down period exceeding 6 months, the gear unit must be treated with preservative agent as described in items 7.3.1 and 7.3.2.

7.3.1 Interior preservation for longer disuse

Depending on the type of lubrication and/or shaft sealing, the following types of interior preservation can be applied.

7.3.1.1 Interior preservation with gear-unit oil

Gear units with splash-lubrication systems and contacting shaft seals can be filled with the type of oil already filled in up to a point just below the air filter.

The duration of this preservation depends on the age of the shaft-sealing rings and the oil.

Note

After a preservation period exceeding 36 months the radial shaft-sealing rings must be replaced before start-up.

NOTICE

Material damage

Risk of damage through insufficient lubrication due to undetected leakage.

The leaktightness of the gear unit must be checked regularly every 4 weeks.

- Undo and remove the fastening screws of the inspection and/or assembly cover.
- Remove the cover with the seal from the housing (the seal must not be damaged, it will be used again).
- Unscrew the air filter including the reducing screw.
- Top up gear-unit oil through the hole up to just beneath the air filter.

Note

For gear-unit oils, refer to table "T 7300" (for a link to the Internet, see the back cover).



CAUTION

Risk of injury through chemical substances

The oil must not come into contact with the skin (e.g. the operator's hands).

The safety notes on the data sheets for the oil used must be observed.

Remove any oil spillage immediately with a binding agent.

Observe manufacturer's instructions for handling lubricants and binding agents.

Wear suitable protective clothing.

- Place the inspection and/or assembly cover with the seal on the housing.
- Screw in the fastening screws of the inspection and/or assembly cover and tighten them to the specified tightening torque (see item 6.20).
- Replace the air filter and reducing screw with the screw plug.

7.3.1.2 Interior preservation with preservative agent

Before longer shut-down periods gear units with force-feed lubrication systems, oil-circulation cooling and/or non-contacting shaft seals should be filled with preservative agent and run without load.



WARNING

Risk of scalding

Serious injury through escaping operating media possible whilst they are replaced.

Wear suitable protective gloves, protective glasses and protective clothing.

- Place a suitable container under the oil-drain point of the gear-unit housing.
- Unscrew the oil-drain plug and/or open the oil-drain cock.
- Drain the oil into a suitable container (see section 10, "Maintenance and Repair").
- Undo and remove the fastening screws of the inspection and/or assembly cover.
- Remove the cover with the seal from the housing (the seal must not be damaged, it will be used again).
- Unscrew the air filter including the reducing screw.
- Pour in the preservative agent through the hole up to the middle of the oil-sight glass or up to the middle between the MIN and MAX marks on the oil-dipstick.

Note

For preservative agent, see table 6 or 7 in item 4.4.1.1.

- Place the inspection and/or assembly cover with the seal on the housing.
- Screw in the fastening screws of the inspection and/or assembly cover and tighten them to the specified tightening torque (see item 6.20).
- Screw in the air filter with the reducing screw.

NOTICE

Material damage

Risk of damage to the gear unit through missing or insufficient ventilation.

Prior to start-up replace the screw plug with the air filter.

7.3.1.3 Interior preservation with "Castrol Alpha SP 220 S" preservative agent

- Place a suitable container under the oil-drain point of the gear-unit housing.
- Unscrew the oil-drain plug and/or open the oil-drain cock.
- Drain the oil into a suitable container (see section 10, "Maintenance and Repair").



WARNING

Risk of scalding

Serious injury through escaping operating media possible whilst they are replaced.
Wear suitable protective gloves, protective glasses and protective clothing.



CAUTION

Risk of injury through chemical substances

The oil must not come into contact with the skin (e.g. the operator's hands).
The safety notes on the data sheets for the oil used must be observed.
Remove any oil spillage immediately with a binding agent.
Observe manufacturer's instructions for handling lubricants and binding agents.
Wear suitable protective clothing.

Note

Check the condition of the sealing ring; the sealing ring is vulcanised onto the oil-drain plug. If necessary, use a new oil-drain plug.

- Shut the oil-drain cock and/or screw in the oil-drain plug again.
- Unscrew and remove the air filter from the housing top.
- Replace the air filter with a screw plug.

Note

Carefully clean the air filter (see item 10.2.3) and keep it on a safe place; it will be required when starting up again.

- Undo and remove the fastening screws of the inspection and/or assembly cover.
- Remove the cover with the seal from the housing; the seal will be used again.
- Fill the gear unit with "Castrol Alpha SP 220 S".
Determine the filling quantity according to the gear-unit dimensions: length x width x height x 0.1.

NOTICE

Material damage

Corrosion possible through use of an unsuitable preservative agent.
Use special oil "Castrol Alpha SP 220 S" with additional anti-corrosive agent (additive "S").

- Place the inspection and/or assembly cover with the seal on the housing.
- Screw in the fastening screws of the inspection and/or assembly cover and tighten them to the specified tightening torque (see item 6.20).

NOTICE

Material damage

Corrosion possible through leaving the gear unit open too long.

When using Tacolab seals the gear unit must be closed airtightly at the latest one hour after its opening.

Take the following measures:

- Seal the air gap of the Tacolab seal with adhesive tape.
- Replace the air filter with a screw plug.

NOTICE

Material damage

Risk of damage to the gear unit through inadequate lubrication through preservative agent and operating oil being mixed up.

If the gear unit is to be filled with a PG-based synthetic operating oil after preservation, the preservative oil must be drained off before initial start-up and the gear unit thoroughly flushed out with operating oil (for this see item 10.2.2).

The flushing oil must not be used for operation of the unit.

7.3.2 Exterior preservation

7.3.2.1 Exterior-preservation procedure

- Clean the surfaces.

NOTICE

Material damage

Risk of damage to the shaft-sealing ring through contact with chemically aggressive preservative agent.

For separation between the sealing lip of the radial shaft-sealing ring and the preservative agent, the shaft should be brushed with grease in the area around the sealing lip.

- Apply preservative agent.

Note

For preservative agent, see table 8 in item 4.4.2.

8. Operation

Observe the instructions in section 3, "Safety instructions", in section 9, "Faults, causes and remedy", and in section 10, "Maintenance and repair"!

8.1 General

To achieve a satisfying and trouble-free operation of the equipment, be certain to observe the operating values specified in section 1, "Technical Data", as well as the information given in the operating instructions of the oil-supply system.

During operation the gear unit must be monitored for the following:

- | | |
|---|--|
| ☐ Operating temperature | The gear unit is designed for an operating temperature in continuous operation of:

90 °C (applies to mineral oil)

The maximum permitted temperature is:
100 °C (applies to mineral oil) |
| ☐ Oil pressure of the oil-supply system | minimum 0.5 bar |
| ☐ Changes in gear noise | |
| ☐ Oil leakage at the housing and shaft seals | |
| ☐ Bearing vibrations, with fitted measuring device | |

8.2 Oil level

Note

For checking the oil level, the gear unit must be stopped.

Depending on the type of the gear-unit housing the following oil levels are correct when the oil has cooled down:

- Middle of the oil-sight glass
- Middle between the MIN and MAX marks on the dipstick

When cooled down the oil must come up to the middle of the oil-sight glass or as far as between the MIN and MAX marks on the oil-dipstick. Hot oil may slightly exceed the middle of the oil-sight glass or the MAX mark on the oil-dipstick.

NOTICE

Material damage

Insufficient lubrication possible through too low oil level.

Check the oil level.

Under no circumstances must it be allowed to fall below the lower mark on the oil-sight glass or the MIN mark on the oil-dipstick. If necessary, top up oil to the correct level.

Note

The oil level in the oil-supply system must be checked.

For this, the operating instructions of the oil-supply system must be observed.

NOTICE

Material damage

Risk of damage to the gear unit through fault conditions.

Switch off the drive unit immediately on occurrence of the following situations.
--

- ☐ If irregularities are found during operation.
- ☐ If the pressure monitor in the oil-supply system triggers alarm

Note

Determine the cause of the fault, using table 17, "Faults, causes and remedy" (see item 9.2).

Table 17, "Faults, causes and remedy", contains a list of possible faults, their causes and suggested remedies.

If the cause cannot be found, a specialist from a Siemens customer-service centre should be called in (see section 2, "General notes").

9. Faults, causes and remedy

Observe the instructions in section 3, "Safety instructions", and in section 10, "Maintenance and repair"!

9.1 General information on faults and malfunctions

Faults and malfunctions occurring during the guarantee period and requiring repair work on the gear unit must be carried out only by Siemens customer service.

In case of faults and malfunctions occurring after the guarantee period and whose cause cannot be precisely identified, we advise our customers to contact our customer service.

NOTICE

Material damage

Risk of damage to the gear unit through improper use.

Siemens will not be bound by the terms of the guarantee or otherwise be responsible for further operation in cases of improper use of the gear unit, modifications carried out without the approval by Siemens or use of spare parts not originally supplied by Siemens.



DANGER

Danger to life through rotating and/or moving parts

Risk of being caught or drawn in by rotating and/or moving parts.

Stop the gear unit and any add-on or separate oil-supply unit to carry out maintenance and/or repair work or before removing any protective equipment. Secure the drive unit against being switched on accidentally. Attach a notice to the ON switch stating clearly that work is in progress on the gear unit.



WARNING

Risk of injury from live parts

The removal of covers, incorrect use of the system, incorrect operation or inadequate maintenance may result in death, serious injury or material damage.

- When working on the system, always adhere to the "Five safety rules" (see section 3, "Safety Instructions").
- Always remove covers strictly in accordance with these operating instructions.
- Operate the system correctly.
- Maintain the system regularly and correctly.

9.2 Possible faults

Table 17: Faults, causes and remedy

Faults	Causes	Remedy
Changes in gear noise.	Damage to gear teeth.	Contact Customer Service. Check toothed components. If necessary, replace damaged components.
	Excessive bearing play.	Contact Customer Service. Adjust bearing play.
	Bearing is defective.	Contact Customer Service. Replace defective bearings.
Loud noises in the area of the gear-unit fastening.	Gear-unit fastening has worked loose.	Tighten bolts and nuts to the specified tightening torque. Replace damaged bolts and nuts.

Faults	Causes	Remedy
Increased temperature at the bearing points.	Oil level in gear-unit housing too low or too high. Oil too old. Bearing is defective. Oil-supply system defective.	Check the oil level at ambient temperature. Top up or drain oil, if necessary. Check date of last oil change. Change oil, if necessary. See section 10. Contact Customer Service. Check and, if necessary, replace bearings. Check the oil-supply system. Replace defective components, if necessary. Consult operating instructions for oil-supply system.
Exterior of gear unit is oiled up.	Inadequate sealing of housing covers and/or joints. Labyrinth seals oiled up. Incorrect transport position.	Seal housing covers and/or joints. Check oil filling. Clean labyrinth seals.
Oil leakage from the gear unit.	Inadequate sealing of housing covers and/or joints. Radial shaft-sealing rings defective. Pipework leaky.	Check and, if necessary, replace seals. Seal housing covers and/or joints. Check sealing pressure; if necessary, retighten bolts. Replace radial shaft-sealing rings. Check and, if necessary, replace or seal.
Oil foaming in the gear unit.	Preservative agent not completely drained. Gear unit too cold in operation. Water in oil. Oil too old (defoaming agent used up). Unsuitable oils are mixed up. Oil-supply system has been operated too long at low temperatures.	Change oil. Shut down gear unit and have oil degassed. Restart without cooling water. Check state of oil by the test-tube method for water contamination. Have the oil analysed in a chemical laboratory. Change oil, if necessary. Examine the oil; change the oil, if necessary. Examine the oil; change the oil, if necessary. Stop oil-supply system. Allow the oil to degas.

Faults	Causes	Remedy
Water in oil.	Gear unit exposed to cold air from machine-room fan: Water condensing. Climatic conditions. Oil-supply system or cooling coil defective.	Protect gear-unit housing with suitable heat insulation. Close air outlet or alter its direction by structural measures. Contact Customer Service. If necessary, use wet-air filter. Check the oil-supply system or cooling coil; replace any defective parts. Consult operating instructions for oil-supply system.
Increased operating temperature.	Oil level in housing too high. Oil too old. Oil badly contaminated. Oil-supply system or cooling coil defective. Gear unit with cooling coil: Deposits in cooling coil. Gear unit with fan: Suction opening and/or housing badly contaminated.	Check the oil level. Adjust oil level, if necessary. Check date of last oil change. If necessary, change the oil; see section 10. Change the oil; see section 10. Check oil-supply system or cooling coil. Replace defective components, if necessary. Consult operating instructions for oil-supply system. If necessary, clean or replace cooling coil, see section 10. Clean fan and/or gear unit.
Increased temperature at backstop. Locking function fails.	Damage to backstop.	Contact Customer Service. Check and, if necessary, replace backstop.
Fault in the oil-supply system.		Consult operating instructions for oil-supply system.

NOTICE

Material damage

Risk of damage to the gear unit through use of operating oils of insufficient quality.

The quality of the oil used must comply with the requirements specified in the separately supplied BA 7300 operating instructions.

9.2.1 Leakage and leaktightness

In standard "DIN 3761" information is given on the subject of leakage on gear units. Based on this and building on the extensive experience gained at Siemens ^{*)} and other FVA ¹⁾ member companies, brief descriptions, required measures and notes on this subject are included in the following overview.

Table 18: Notes on the leaktightness of radial shaft-sealing rings (RWDR ²⁾)

Condition	Description	Measures	Notes
Leaktight, dry	No moisture to be seen on radial shaft-sealing ring.	None	
Leaktight, damp	Film of moisture formed functionally in the area of the sealing edge but not extending beyond the bottom side of the radial shaft-sealing ring.	Only when contaminated, wipe with clean cloth underneath sealing lip. The sealing lip must not be contaminated. Observe.	The radial shaft-sealing ring often dries by itself in further operation. No reason for complaint.
Leaktight, wet	Moisture film extending beyond the bottom side of the radial shaft-sealing ring but not dripping.	Wipe with clean cloth underneath sealing lip. The sealing lip must not be contaminated. Observe.	The radial shaft-sealing ring often dries by itself in further operation. No reason for complaint.
Measurable leak	Small trickle to be seen on the bottom side of the radial shaft-sealing ring, dripping.	If necessary, change radial shaft-sealing ring; identify possible cause of radial shaft-sealing ring failure and rectify.	May be a reason for complaint; one drop of oil a day is acceptable.
Short-term leak	Short-term failure of the sealing system.	Wipe with clean cloth underneath sealing lip. The sealing lip must not be contaminated. Observe.	E.g. through small particles on the seal edge, which are removed again in further operation. No reason for complaint.
Apparent leak	Temporary leak.	Wipe with clean cloth underneath sealing lip. The sealing lip must not be contaminated.	Due mostly to excessive grease filling between seal and dust lip or oil secretions from the grease filling of labyrinth seals. No reason for complaint.

^{*)} Siemens AG, Mechanical Drives "MD" Business Unit

¹⁾ FVA = Forschungsvereinigung Antriebstechnik e. V.

²⁾ RWDR = radial shaft-sealing ring

Note

Oil mist escaping from a breather valve or a labyrinth seal is functional and therefore **not a reason for complaint.**

9.3 Removal of blockages (only if reversing device available)

9.3.1 Switching the reversing device on



DANGER

Danger to life through switched-on installation

Switch the motor of the main drive off.

- Undo locking screw.
- Pull stop knob.
- Move shift lever into position "Engaged" (see item 5.16.1).

Note

The clutch in the bell housing will now connect the reversing device to the main gear unit.

- Engage the locking bolt.
- Tighten the locking screw.

NOTICE

Material damage

Damage to the gear unit and the reversing device possible.
The changing operation must be done while the unit is at a standstill.

- Start the motor of the reversing device (see item 5.16).

9.3.2 Switching the reversing device off

- Undo locking screw.
- Pull stop knob.
- Move shift lever into position "Disengaged" (see item 5.16.1).

Note

The clutch in the bell housing is now no longer connected to the reversing device.

- Engage the locking bolt.
- Tighten the locking screw.

10. Maintenance and repair

Observe the instructions in section 3, "Safety instructions", and in section 9, "Faults, causes and remedy"!

10.1 General notes on maintenance

All maintenance and repair work must be carried out carefully and by qualified personnel only (see section "Qualified Personnel" on page 3 of this manual).

The following applies to all work in item 10.2:



WARNING

Serious risk of injury through switched-on installation

Stop the gear unit and any add-on or separate oil-supply unit to carry out maintenance and/or repair work or before removing any protective equipment. Secure the drive unit against being switched on accidentally. Attach a notice to the ON switch stating clearly that work is in progress on the gear unit.



WARNING

Risk of injury from live parts

The removal of covers, incorrect use of the system, incorrect operation or inadequate maintenance may result in death, serious injury or material damage.

- When working on the system, always adhere to the "Five safety rules" (see section 3, "Safety Instructions").
- Always remove covers strictly in accordance with these operating instructions.
- Operate the system correctly.
- Maintain the system regularly and correctly.

The periods indicated in table 19 largely depend on the conditions under which the gear unit is operated. Only average periods can therefore be stated here. These refer to the following values:

Daily operating time:	24 h
Duty factor "ED":	100 %
Input speed:	1500 1/min
Operating temperature:	90 °C (applies to mineral oil)
	100 °C (applies to synthetic oil)

NOTICE

Material damage

Risk of damage to the gear unit through non-observance of the periods specified for maintenance and repair work.

The operator must adhere to the periods set out in table 19 and, if necessary, include them in its own maintenance schedules.

Table 19: Maintenance and repair work

Measures	Periods	Remarks
Check the oil temperature	Daily	See item 7.2.4.
Check for unusual gear-unit noise	Daily	
Check the oil level	Monthly	– Middle of the oil-sight glass – Upper mark on the dipstick
Comparison of vibration values for bearing monitoring with initial values (reference values) on starting up	Every 3000 operating hours	See item 7.2.6.
Check the gear unit for leaks	Monthly	
Examine the water content of the oil	After approx. 400 operating hours, at least once a year	See item 10.2.1.
Perform the first oil change	Approx. 400 operating hours after start-up	See item 10.2.2.
Perform subsequent oil changes	Every 24 months or 10 000 operating hours	See items 10.2.2 + 10.1.1.
Clean the air filter	Every 3 months	See item 10.2.3.
Clean the fan and gear unit	Depending on requirements, at least every 2 years	See item 10.2.4.
Repack grease in the Taconite seals	Every 3000 operating hours, at least every 6 months	See item 10.2.5.
Repack grease in the Tacolab seals	Every 3000 operating hours, at least every 6 months	See item 10.2.6.
Check cooling coil	Every 2 years	See item 10.2.7.
Check hose lines	Yearly	See item 10.2.8.
Replace hose lines	6 years from the manufacturing date impressed	See item 10.2.8.
Check tightness of fastening bolts	After the first oil change, then every 2 years	See item 6.20.
Check shrink disk	See operating instructions of the shrink disk.	
Inspection of the gear unit	Every 2 years	See item 10.4.

10.1.1 General service lives of oils

According to the oil manufacturers, the following are the expected periods during which the oils can be used without undergoing any significant change in quality. They are calculated on the basis of an average oil temperature of 80 °C:

- for mineral oils, bio-degradable oils and physiologically safe oils (synthetic esters): 10 000 operating hours or maximally 2 years. Does not apply to natural esters such as rape seed oils.
- for synthetic oils, poly- α -olefins and polyglycols: 20 000 operating hours or maximally 4 years.

Note

The actual service lives may differ. The general rule is that an increase in temperature of 10 K will halve the service life and a temperature decrease of 10 K will approximately double the service life.

10.2 Maintenance and repair work

10.2.1 Examine water content of oil, conduct oil analyses

Detailed information about examining the oil for water content or conducting oil analyses is obtainable from your lubricant manufacturer or the Siemens customer service.

- For reference purposes, a fresh sample of the operating lubricating oil used must be sent with the used-oil sample to the analysing institute for analysis.
- The oil sample must be taken downstream of the filter of the oil-supply system while the system is running. A suitable connection point is normally located upstream of the gear-unit entry (e.g. oil-drain cock in the pressure line).
- A special sample container should be filled with the specified quantity of oil.
If there is no such sample container available, at least one litre of oil must be put in a **clean**, transportworthy, sealable vessel.

10.2.2 Change oil

As an alternative to the oil-change intervals specified in table 19 (see item 10.1), it is possible to have an oil sample tested at regular intervals, **every 4 weeks**, by the technical service of the relevant oil company and to have it cleared for further use.

If further usability has been confirmed, no oil change will be necessary.

Note

Observe the separately annexed operating instructions BA 7300 and the notes in item 7.1.

- Drain the oil while the gear unit is still warm, i.e. immediately after stopping the machinery.

NOTICE

Material damage

Risk of damage to the gear unit through incorrect lubrication resulting from mixed oils.

When changing the oil, always re-fill the gear unit with the same type of oil.

Never mix different types of oil and/or oils made by different manufacturers. Polyglycol-based synthetic oils in particular must not be mixed with PAO-based synthetic oils or mineral oils. If changing to a different type and/or make of oil, the gear unit must be flushed out with the new oil type.

Flushing is not necessary, if the new operating oil is fully compatible with the previously used operating oil in all respects. The compatibility must be confirmed by the oil supplier.

If there is a change to another oil, Siemens recommends flushing out the gear unit with the new type of operating oil.

Note

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

- Place suitable containers under the oil-drain points.
- Undo and remove the fastening screws of the inspection and/or assembly cover.
- Remove the cover with the seal from the housing. The seal will be used again.
- Unscrew the air filter with the reducing screw at the housing top.
- Unscrew the oil-drain plug and/or open the oil-drain cock and drain the oil into the collecting container.
- Drain the oil from the oil-supply system (see operating instructions to the oil-supply system).

**CAUTION****Risk of scalding**

Risk of injury through escaping hot oil.

Wear suitable protective gloves, protective glasses and protective clothing.

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

Note

Check the condition of the sealing ring; the sealing ring is vulcanised onto the oil-drain plug. If necessary, use a new oil-drain plug.

- Screw in the oil-drain plug and/or shut the oil-drain cock.
- Clean the oil filter in the oil-cooling system (see operating instructions to the oil-supply system).
- Clean the air filter (see item 10.2.3).
- Fill fresh oil into the gear unit (see item 7.1.3).
- Place the inspection and/or assembly cover with the seal on the housing.
- Screw in the fastening screws of the cover and tighten them to the specified tightening torque (see item 6.20).
- Screw in the air filter with the reducing screw.

10.2.3 Clean the air filter

Note

A period of 3 months has been specified for cleaning the air filter.
If a layer of dust has built up, the air filter must already be cleaned, whether or not the period of 3 months has expired.

Note

If the air filter is protected with a filter cap, the filter cap must be removed for cleaning the air filter. After the air filter has been cleaned, the filter cap must be fitted again.

- Unscrew the air filter including the reducing screw.
- Clean the air filter using a suitable cleaning agent.
- Dry the air filter and/or blow out with compressed air.

**WARNING****Risk of eye injury through compressed air**

Remains of water and/or dirt particles may be harmful to the eyes.
Wear suitable protective glasses.

NOTICE**Material damage**

Risk of damage to the gear unit through entry of foreign bodies.
Foreign bodies must be prevented from entering the gear unit.

10.2.4 Clean the fan and gear unit

- The instructions in item 5.8.1 must be observed!
- Demount the air-guide cover.
- Using a stiff brush, remove any dirt adhering to the fan wheel, air-guide cover and safety grid.
- Remove any corrosion.
- Screw safety grid with fastening screws back onto the air-guide cover.

NOTICE**Material damage**

Damage to the gear unit through insufficient cooling caused by dirty or damaged fan and/or damage to the gear unit through moisture penetration.
It must be ensured that the air-guide cover is correctly fastened. The fan must not come into contact with the air-guide cover.
To prevent the build-up of dust on the gear unit, cleaning must be done in accordance with the local operating conditions.
The gear unit must not be cleaned with high-pressure cleaning equipment.

10.2.5 Repack grease in the Taconite seals

- Inject approx. 30 g lithium-based rolling-bearing grease into each of the lubricating points of the Taconite seal. The lubricating points have been provided with a flat grease nipple.

Note

For the exact position and identification of the grease nipples, refer to the drawings in the gear-unit documentation.

**CAUTION****Danger of slipping**

Risk of slipping on spilled grease.

Remove and dispose of any old grease escaping.

10.2.6 Repack grease in the Tacolab seals

- Inject approx. 30 g lithium-based rolling-bearing grease into each of the lubricating points of the Tacolab seal. The lubricating points have been provided with a flat grease nipple.

Note

For the exact position and identification of the grease nipples, refer to the drawings in the gear-unit documentation.

**CAUTION****Danger of slipping**

Risk of slipping on spilled grease.

Remove and dispose of any old grease escaping.

10.2.7 Check cooling coil

- Shut off the cooling-water supply.
- Disconnect the water in- and outflow pipes from the cooling coil.
- Check the inside wall of the cooling coil for deposits.

NOTICE

Material damage

Damage to the gear unit possible through overheating.

If the cooling coil is dirty, heat is no longer withdrawn effectively from the gear unit. Any dirt adhering to the inside of the cooling coil should be removed by chemical cleaning or the cooling coil should be replaced with a new one.

If thick deposits have formed on the inside of the cooling coil, the cooling water and/or the deposits themselves should be chemically analysed. Such analyses are offered by specialist companies for chemical cleaning. Such companies also sell special cleaning agents for removing such deposits.

Before using these cleaning agents, check that they will not damage the cooling-coil materials (contact Siemens). Observe the manufacturer's instructions at all times when using different cleaning agents from several manufacturers.



CAUTION

Risk of corrosion burns through chemical substances

Avoid burns when working with corrosive cleaning agents.

Observe manufacturer's instructions for handling lubricants and solvents.

Wear suitable personal protective equipment (gloves, safety glasses).

- Seriously contaminated cooling coils must be replaced. Consult the Siemens Customer Service for this.
- Re-connect the cooling-water in- and outflow pipes.

10.2.8 Check hose lines

Even when adequately stored and subjected to permitted loads, hoses and hose lines are subject to a natural ageing process. This limits their period of use (service life).

NOTICE

Material damage

Risk of damage to the hose lines through excessive ageing or external influences.

The period of use of the hose lines must not exceed 6 years.

For checking purposes, the manufacturing date is printed on the hose lines.

If a fault is found during inspections, this must be rectified immediately.

The period of use can be determined using available test results and empirical values, taking into account the conditions of use.

Note

The operator of the system must ensure that hose lines are replaced at suitable intervals of time, even if no defects which may affect their safe operation are identifiable on them.

Hose lines must be inspected for safe working condition by an expert before the plant is first put into operation and thereafter at least once a year.

10.2.9 Top up oil

- The instructions in item 7.1 must be observed!
- Always top up with the same type of oil as already used (see also item 10.2.2).

10.2.10 Check tightness of fastening bolts

- The instructions in item 10.1 must be observed!
- Check tightness of all the fastening bolts.

Note

Damaged bolts must be replaced with new bolts of the same type and strength class.

10.3 Final work

Note

For operating and servicing all components, the pertinent operating instructions and the specifications relating to the components in sections 5, "Technical description", and 7, "Start-up", must be observed. For technical data and control information, refer to the data sheet and/or the list of equipment.

The instructions in item 6.19 must be observed.

Damaged bolts must be replaced with new bolts of the same type and strength class.

10.4 General inspection of the gear unit

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

10.5 Lubricants

The quality of the oil used must meet the requirements of the separately supplied BA 7300 operating instructions, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in table "T 7300" (for a link to the Internet, see the back cover), as they have been tested and meet the requirements.

Note

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

Information on the type, viscosity and required quantity of the oil is given on the rating plate on the gear unit and/or in the supplied documentation.

The oil quantity shown on the rating plate is to be understood as an approximate quantity. The actual oil quantity to be put in is shown by the middle on the oil-sight glass or the middle between the MIN and MAX marks on the oil-dipstick.

The BA 7300 instructions manual relating to gear-unit lubrication and table "T 7300" containing the current lubricant recommendations of Siemens can also be consulted on the internet (see back cover).

The oils listed there are subjected to continuous tests. Under certain circumstances the oils recommended there may therefore later be removed from the range or replaced with further developed oils.

We recommend checking before any oil change whether the chosen lubricant is still approved by Siemens.

11. Spare parts, customer service

11.1 Stocking spare parts

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

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

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

NOTICE

Material damage

Risk of damage to the gear unit through improper use.

Siemens guarantees only the genuine spare parts supplied by Siemens.

Non-genuine spare parts have not been tested nor approved by Siemens. Non-genuine spare parts may alter technical characteristics of the gear unit, thereby posing an active or passive risk to safety.

Siemens will assume no liability or guarantee for damage caused by spare parts not supplied by Siemens. The same applies to any accessories not supplied by Siemens.

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

When ordering spare parts, always state the following:

Order number, position	Type, size	Part number	Quantity
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11.2 Addresses for ordering spare parts and customer service

When ordering spare parts or requesting a service specialist, please contact Siemens first.

Siemens AG
Am Industriepark 2
46562 Voerde

Tel.: +49 (0)2871 / 92-0
Fax: +49 (0)2871 / 92-1544

12. Declarations

12.1 Declaration of incorporation

Declaration of incorporation

in accordance with Directive 2006/42/EC, Annex II 1 B

The manufacturer, Siemens AG, 46395 Bocholt, Germany, declares with regard to the partly completed machinery

Gear unit
H.SH, H.HH, H.DH, H.KH,
H.HM, H.DM, H.KM,
B.SH, B.HH, B.DH, B.KH,
B.HM, B.DM, B.KM
Sizes 23 to 28

for driving machines in general engineering applications:

- The special technical documents described in Annex VII B have been prepared.
- The following basic health and safety requirements set out in Directive 2006/42/EC, Annex I, are applied and are satisfied:
1.1, 1.1.2, 1.1.3, 1.1.5; 1.2.4.4, 1.2.6; 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, 1.7.1.1, 1.7.2, 1.7.4 - 1.7.4.3
- The partly completed machinery must not be put into service until it has been established that the machinery into which the partly completed machinery is to be incorporated has been declared to be in conformity with the provisions of Directive 2006/42/EC, as appropriate.
- The manufacturer undertakes, in response to a reasoned request by national authorities, to transmit in electronic form relevant information about the partly completed machinery.
- The person authorised to compile the relevant technical documentation is:

Mark Zundel / Head of PD MD AP VOE

Voerde, 2016-01-06

Mark Zundel / Head of PD MD AP VOE

Voerde, 2016-01-06

Björn Podewski / Head of PD MD AP VOE BA

Further Information:

"FLENDER gear units" on the Internet

www.siemens.com/gearunits

"FLENDER couplings" on the Internet

www.siemens.com/couplings

Service & Support:

<http://support.automation.siemens.com/WW/view/en/10803928/133300>

Lubricants:

<http://support.automation.siemens.com/WW/view/en/42961591/133000>

Siemens AG
Process Industries and Drives
Mechanical Drives
Alfred-Flender-Straße 77
46395 Bocholt
GERMANY

Subject to modifications

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www.siemens.com/drive-technologies