

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, BKM
Sizes 23 to 28

Assembly and operating instructions
BA 5090 EN 02/2011



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,
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Sizes 23 to 28

Assembly and operating instructions

Translation of the original assembly and operating instructions

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Notes and symbols in these assembly and operating instructions

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

Legal notes

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 or an "Ex" symbol (when applying Directive 94/9/EC), those only for preventing material damage with a "STOP" sign.



WARNING! Imminent explosion!

The notes indicated by this symbol are given to prevent **explosion damage**. Disregarding these notes may result in serious injury or death.



WARNING! Imminent personal injury!

The notes indicated by this symbol are given to prevent **personal injury**. Disregarding these notes may result in serious injury or death.



WARNING! Imminent damage to the product!

The notes indicated by this symbol are given to prevent **damage to the product**. Disregarding these notes may result in material damage.



NOTE!

The notes indicated by this symbol must be treated as general **operating information**. Disregarding these notes may result in undesirable results or conditions.



WARNING! Hot surfaces!

The notes indicated by this symbol are made to prevent **risk of burns due to hot surfaces** and must always be observed. Disregarding these notes may result in light or serious injury.

Where there is more than one hazard, 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 these instructions relate may be handled only by persons qualified for the work concerned and in accordance with the instructions relating to the work concerned, particularly the safety and warning notes contained in those instructions. Qualified personnel must be specially trained and have the experience necessary to recognise risks associated with these products or systems and to avoid possible hazards.

Intended use of Siemens products

Observe also the following:



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

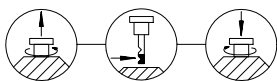
All designations indicated with the registered industrial property mark ® are registered trademarks of Siemens AG. Other designations used in these instructions may be trademarks the use of which by third parties for their own purposes may infringe holders' rights.

Exclusion of liability

We have checked the content of the instructions 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 these instructions is regularly checked, and any necessary corrections are included in subsequent editions.

Symbols

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		
Lubrication point		red	Apply grease		
Lifting eye		Eye bolt			
Do not unscrew					
Alignment surface, horizontal		Alignment surface, vertical			



These symbols indicate the oil-level checking procedure using the oil dipstick.



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.

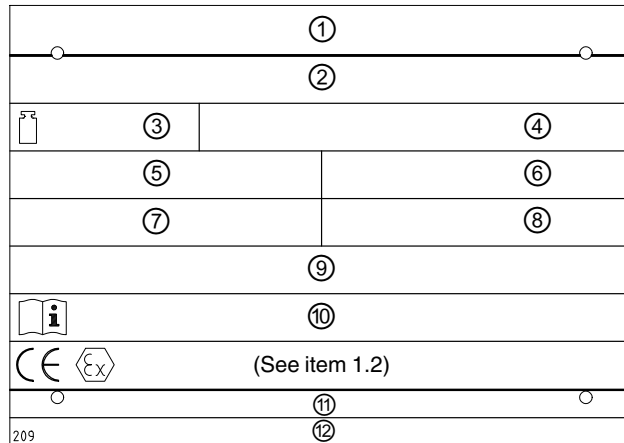
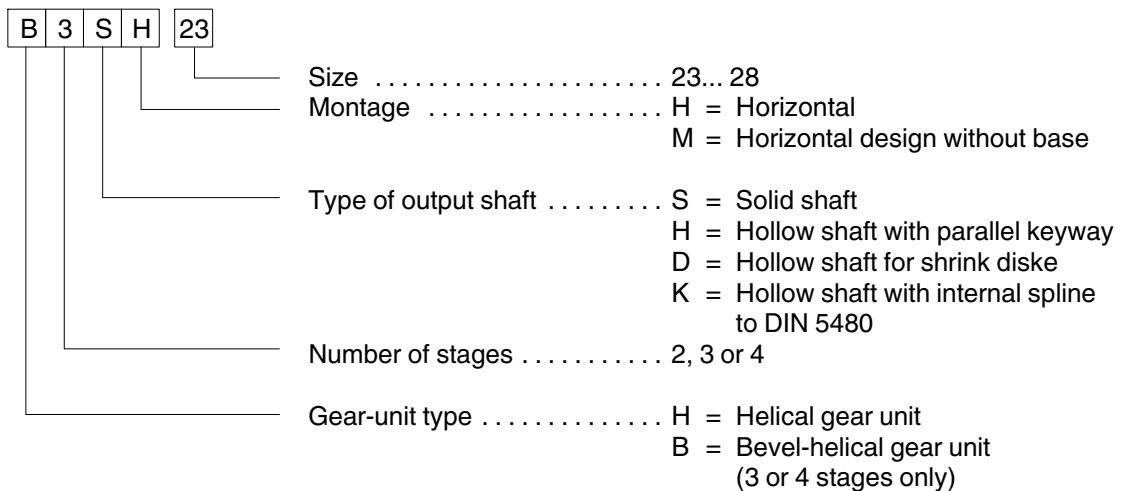


Fig. 1: ATEX Rating plate gear unit

- | | | | |
|---|-------------------------------------------------|---|-----------------------------------------------------|
| ① | Company logo | ⑧ | Speed n_2 |
| ② | Order number, item, sequence number, year built | ⑨ | Oil data
(oil type, oil viscosity, oil quantity) |
| ③ | Total weight in kg | ⑩ | Instructions number(s) |
| ④ | Special information | ⑪ | Manufacturer and place of manufacture |
| ⑤ | Type, size *) | ⑫ | Country of origin |
| ⑥ | Power rating P_2 in kW or torque T_2 in Nm | | |
| ⑦ | Speed n_1 | | |

*) Example







Data on weights and measuring-surface sound-pressure levels of the various gear types are given in items 1.3.2 and 1.4.

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

1.2 Marking of the gear unit designed in accordance with Directive 94/9/EC

Table 1: ATEX identification

Equipment group	Equipment category ¹⁾	"Ex" atmosphere	Explosion group ²⁾	Temperature class ³⁾	Identification marking ⁵⁾
II	2, 3	Gas (G)	IIA, IIB, IIC	T3, T4	  II 2 G IIA T4 bck T _a .. ⁴⁾
		Gas (G) and dust (D)	IIA, IIB, IIC	T3, T4	  II 2 G IIA T4 D 120 °C bck T _a ⁴⁾

- 1) Always only one equipment category can be indicated.
- 2) The explosion groups relate to the gaseous atmosphere (G). Always only one explosion group can be indicated.
- 3) Always only one temperature class can be indicated.
- 4) $T_{a \text{ min.}} \leq T_a \leq T_{a \text{ max.}}$ = permissible ambient temperature range in °C:
 $T_{a \text{ min.}}$ = minimum permissible ambient temperature
 $T_{a \text{ max.}}$ = maximum permissible ambient temperature
 T_a = symbol for ambient temperature in °C
- 5) The indications relating to equipment category, explosion group and temperature class are to be understood as an example.



With gear units without electrical explosion hazard monitoring device (such as temperature, oil level) no ignition protection "b" is available.



The rating plate on the gear unit indicates the marking for the applicable case of application.

1.2.1 Ambient atmosphere and ambient temperature

The specifications of Directive 94/9/EC apply to the ambient temperature range of from - 20 °C to + 40 °C. By adopting various suitable measures the gear unit may be used at ambient temperatures of between - 40 °C and + 60 °C. However, this must always be approved by Siemens. In individual cases the permissible ambient temperature range specified on the rating plate always applies.



Unless otherwise agreed by contract, the gear unit must not be exposed to harmful environmental factors such as chemically aggressive products.

1.3 Types and weights

1.3.1 Types

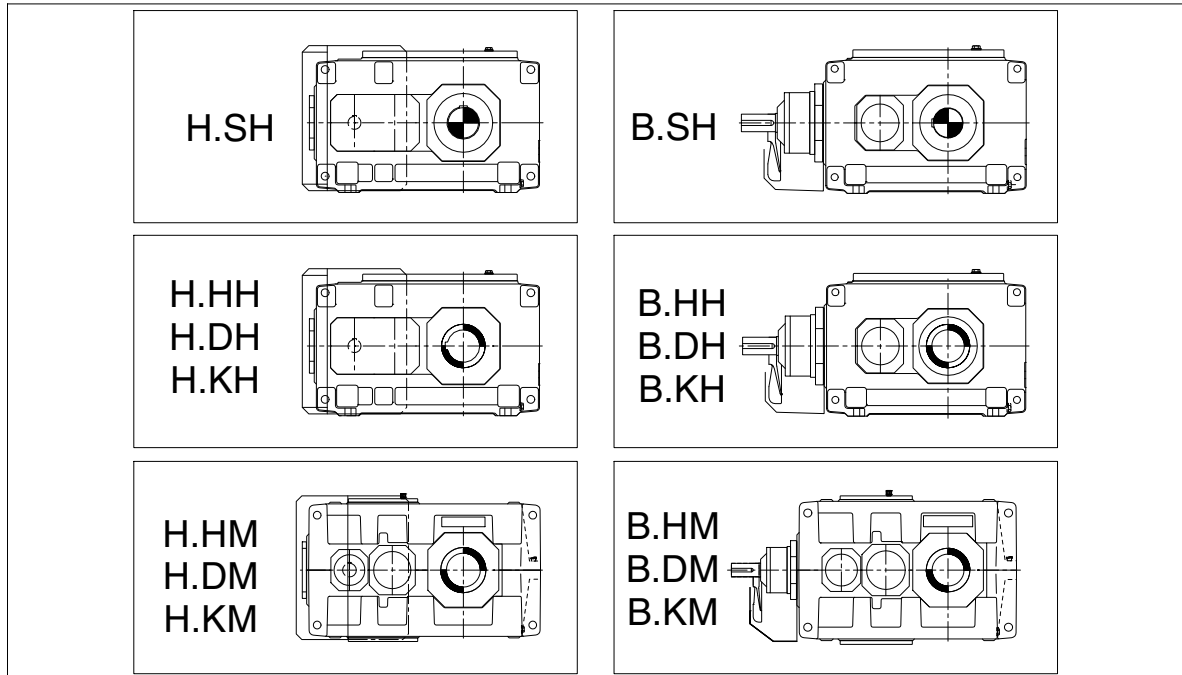


Fig. 2: Helical-gear unit and bevel-helical gear unit of types H... and B...

1.3.2 Weights



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

1.4 Measuring-surface sound-pressure level

The gear unit has a measuring-surface sound-pressure level at a distance of 1 m, which can be found in tables 2 to 6.

The measurement is carried out to 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 interfaces are the flanges.

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

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

Table 2: 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	-	-	-	-	-	-
	31.5	750	82	84	85	85	-	-
	35.5	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
	-	1200	-	-	-	-	-	-
		1000	86	87	88	89	-	-
		900	-	-	-	-	-	-
	56	750	80	81	82	82	-	-
	63	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
	-	1200	-	-	-	-	-	-
		1000	84	85	86	86	-	-
		900	-	-	-	-	-	-
	80	750	78	79	79	80	-	-

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

Table 3: 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	-	-	-	-	-	-
	31.5	750	81	82	83	84	-	-
		1800	-	-	-	-	-	-
	35.5	1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
		1000	84	85	86	87	-	-
	-	900	-	-	-	-	-	-
		750	78	80	80	80	-	-
	56	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
		1000	81	81	83	83	-	-
		900	-	-	-	-	-	-
		750	74	75	76	76	-	-
	63	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
1200		-	-	-	-	-	-	
1000		81	81	83	83	-	-	
900		-	-	-	-	-	-	
750		74	75	76	76	-	-	
B4	80	1800	-	-	-	-	-	-
		1500	87	88	87	89	-	-
		1200	-	-	-	-	-	-
	-	1000	81	82	82	83	-	-
		900	-	-	-	-	-	-
	125	750	74	75	75	76	-	-
		1800	-	-	-	-	-	-
	140	1500	83	84	85	86	-	-
		1200	-	-	-	-	-	-
		1000	78	78	79	80	-	-
	-	900	-	-	-	-	-	-
		750	71	72	73	73	-	-
		1800	-	-	-	-	-	-
	224	1500	80	80	81	82	-	-
		1200	-	-	-	-	-	-
		1000	74	75	76	77	-	-
	-	900	-	-	-	-	-	-
		750	67	68	69	70	-	-
1800		-	-	-	-	-	-	
250	1500	80	80	81	82	-	-	
	1200	-	-	-	-	-	-	
	1000	74	75	76	77	-	-	
-	900	-	-	-	-	-	-	
	750	67	68	69	70	-	-	
355	1800	-	-	-	-	-	-	
	1500	80	80	81	82	-	-	

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

Table 4: 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	-	-	-	-	-	-
	11.2	1000	88	88	-	-	-	-
		900	-	-	-	-	-	-
		750	83	84	84	85	-	-
	16	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	86	87	-	-	-	-
		900	-	-	-	-	-	-
		750	82	82	82	83	-	-
18	1800	-	-	-	-	-	-	
	1500	-	-	-	-	-	-	
	1200	-	-	-	-	-	-	
-	1000	86	87	-	-	-	-	
	900	-	-	-	-	-	-	
	750	82	82	82	83	-	-	
H3	22.4	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	35.5	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	40	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	63	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
71	1800	-	-	-	-	-	-	
	1500	-	-	-	-	-	-	
	1200	-	-	-	-	-	-	
-	1000	-	-	-	-	-	-	
	900	-	-	-	-	-	-	
	750	-	-	-	-	-	-	
100	1800	-	-	-	-	-	-	
	1500	-	-	-	-	-	-	
	1200	-	-	-	-	-	-	
-	1000	-	-	-	-	-	-	
	900	-	-	-	-	-	-	
	750	-	-	-	-	-	-	

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

Table 5: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units without fan of types H2 and H3

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	81	-	-	-	-	-
	10	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	11.2	1000	83	83	-	-	-	-
		900	-	-	-	-	-	-
		750	79	80	81	81	-	-
	16	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	80	81	-	-	-	-
		900	-	-	-	-	-	-
		750	77	77	78	78	-	-
18	1800	-	-	-	-	-	-	
	1500	-	-	-	-	-	-	
	1200	-	-	-	-	-	-	
-	1000	80	81	-	-	-	-	
	900	-	-	-	-	-	-	
	750	77	77	78	78	-	-	
22.4	1800	-	-	-	-	-	-	
	1500	-	-	-	-	-	-	
	1200	-	-	-	-	-	-	
H3	22.4	1000	81	82	83	83	-	-
		900	-	-	-	-	-	-
		750	78	79	79	80	-	-
	-	1800	-	-	-	-	-	-
		1500	84	84	-	-	-	-
		1200	-	-	-	-	-	-
	31.5	1000	79	79	80	80	-	-
		900	-	-	-	-	-	-
		750	76	76	77	77	-	-
	35.5	1800	-	-	-	-	-	-
		1500	84	84	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	79	79	80	80	-	-
		900	-	-	-	-	-	-
		750	76	76	77	77	-	-
	63	1800	-	-	-	-	-	-
		1500	81	82	82	83	-	-
		1200	-	-	-	-	-	-
71	1000	76	77	77	78	-	-	
	900	-	-	-	-	-	-	
	750	73	73	74	75	-	-	
-	1800	-	-	-	-	-	-	
	1500	81	82	82	83	-	-	
	1200	-	-	-	-	-	-	
100	1000	76	77	77	78	-	-	
	900	-	-	-	-	-	-	
	750	73	73	74	75	-	-	

Table 6: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units without fan of type H4

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	-	-	-	-	-	-
	140	750	71	72	73	73	-	-
	160	1800	-	-	-	-	-	-
		1500	76	78	78	79	-	-
		1200	-	-	-	-	-	-
		1000	72	73	74	74	-	-
		900	-	-	-	-	-	-
	250	750	68	70	70	71	-	-
	280	1800	-	-	-	-	-	-
		1500	74	75	76	76	-	-
		1200	-	-	-	-	-	-
		1000	69	70	71	72	-	-
		900	-	-	-	-	-	-
		400	750	65	67	68	68	-

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.



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 disruption 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 contractually agreed.

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. It complies with the requirements in Directive 94/9/EC.

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
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3. Safety instructions



**Entry to the gear unit and its add-on components is not permitted!
Caution! Risk of falling!**



Any changes on the part of the user are not permitted. This applies equally to safety features designed to prevent accidental contact.

3.1 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 and danger of life of operator and third parties,
 - ensure the safety and reliability of the unit,
 - avoid disruptions and environmental damage through incorrect use.
- During transport, assembly, installation, dismantling, operation and maintenance of the system, the relevant safety and environmental regulations must be complied with at all times.
- 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.



All work on the gear unit must be carried out only when it is at a standstill. Secure the drive unit to prevent unintentional switch-on! (e.g. by locking the key switch or removing the fuses from the power supply). The add-on or separate oil-supply system, if any, must also be stopped, if installed. A notice should be attached to the start switch stating clearly that work is in progress. At the same time the complete installation must be without load, so that no danger occurs during demounting operations (e.g. change of the backstop).

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



**A potential equalisation in accordance with the applying regulations and directives must be carried out!
On the gear units threaded holes are available for establishing an earth connection. This work must always be done by specialist electricians.**



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 switched off immediately.



Rotating and/or movable drive components must be fitted with suitable safeguards to prevent contact.



All add-on parts must satisfy the requirements in Directive 94/9/EC.

Simple electrical means (such as monitoring devices, switches, Pt 100 resistance) without identification in accordance with Directive 94/9/EC are to be connected intrinsically safely by suitable isolation amplifiers.



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.



**The coating must not carry an electrostatic charge!
The operator must ensure that highly effective mechanisms which can set up a charge in the coating are safely avoided.**

- Removed safety equipment must be re-installed prior to starting up.
- Notices attached to the gear unit, e.g. rating plate, direction arrows etc., must always be observed. They must be kept free from dirt and paint at all times. Missing plates must be replaced.
- Screws which have been damaged during assembly or disassembly work must be replaced with new ones of the same strength class and type.
- Spare parts should always be obtained from Siemens (refer also to section 11).

3.2 Environmental protection

- Dispose of any packing 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:
 - Drain all the operating oil, preservative agent and/or cooling agent from the gear unit and dispose of in accordance with regulations.
 - Depending on national regulations, gear-unit components and/or add-on parts may have to be disposed of or sent for recycling separately.

3.3 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.



In case of hot surfaces (> 55 °C) there is a risk of burns!



In case of cold surfaces (< 0 °C) there is a risk of frost injury (pain, numbness, frostbite)!



During oil changes there is a risk of scalding from escaping oil!



**Small foreign matter such as sand, dust, etc. can get into the cover plates of the rotating parts and be thrown back by these.
Risk of eye injury!**



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**!



The gear unit complies with the requirements in Directive 94/9/EC.



When carrying out assembly and disassembly work, ensure that no explosive gas mixtures and dust concentrations are present.

4. Transport and storage

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

4.1 Scope of supply

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



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

4.2 Transport



**When transporting our products, use only lifting and handling equipment of sufficient load-bearing capacity!
Observe the notes regarding load distribution on the packing.**

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

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

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

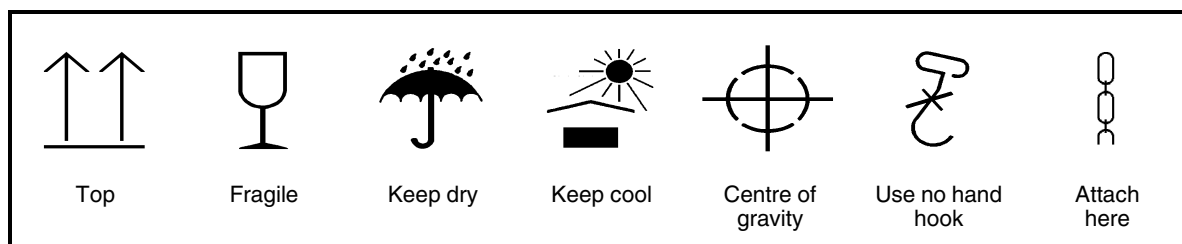


Fig. 3: Transport symbols



**Transport of the gear unit must be carried out so as to avoid personal damage and damage to the gear unit.
If, for example, the free shaft ends are knocked, this may damage the gear unit.**



The gear units must be transported with suitable equipment only. During transport the gear units should be left without oil filling and on the transport packaging.



**Use only the twirls provided to attach lifting equipment to the unit.
Handling of the gear unit by attaching it to the piping 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.**

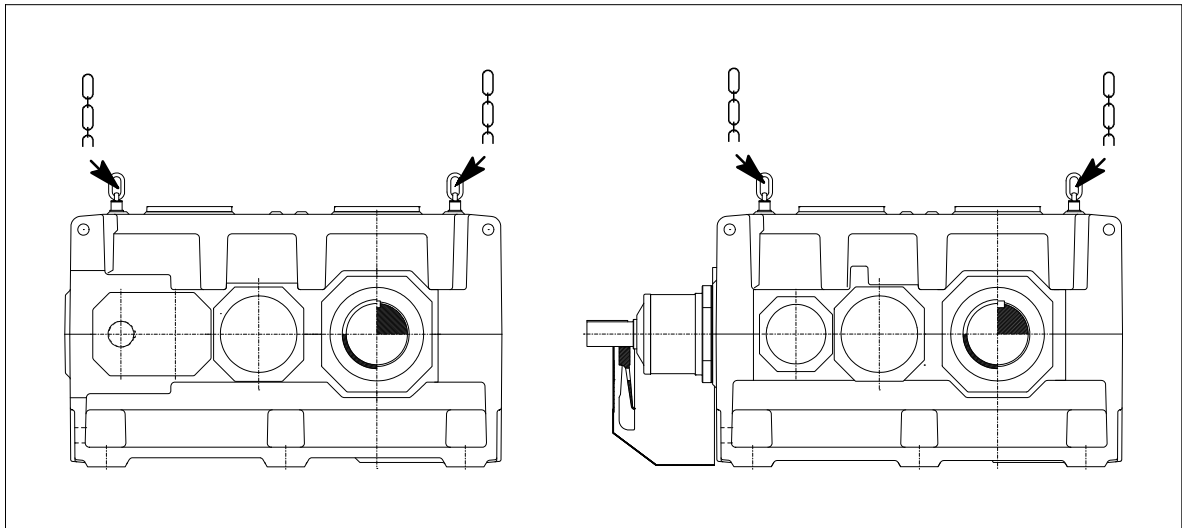


Fig. 4: Attachment points on gear units types H... and B...

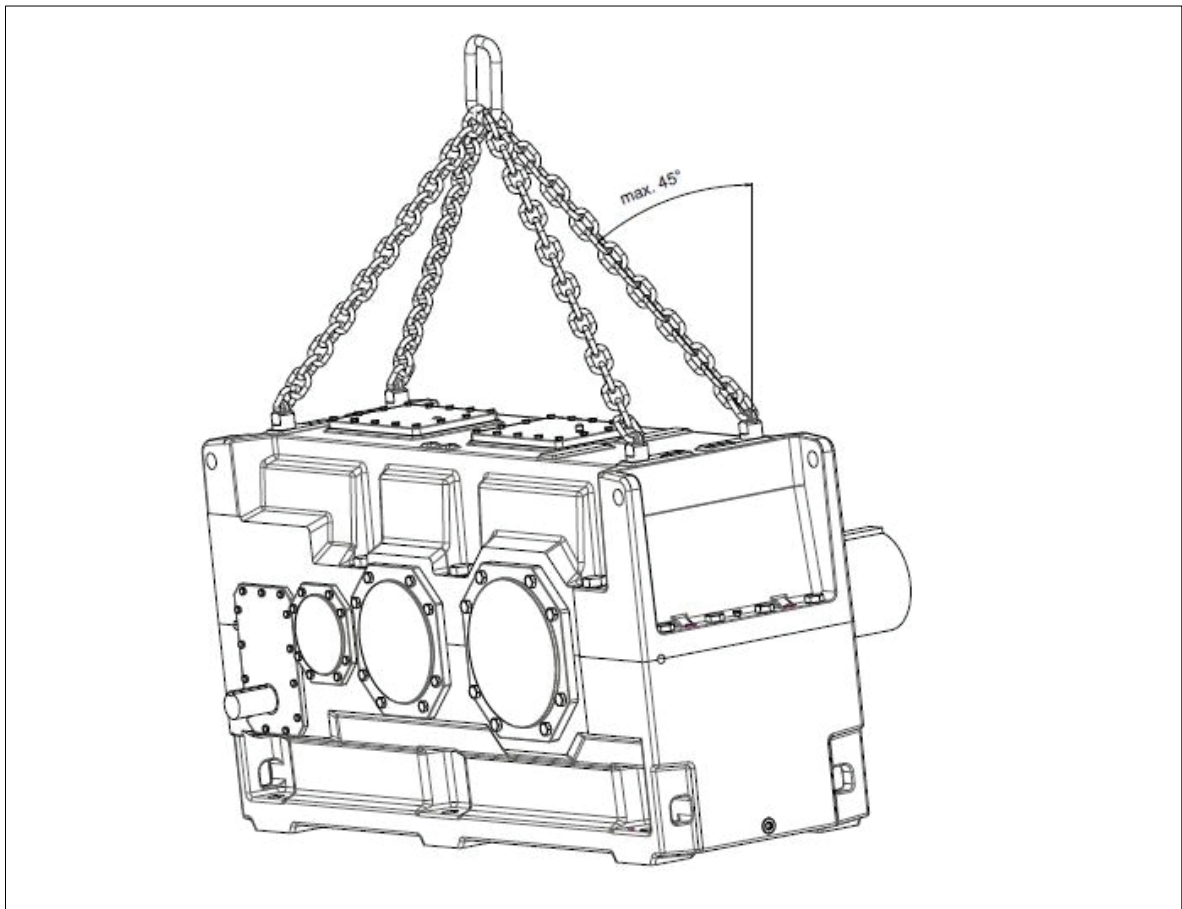


Fig. 5: Maximum try-square when tilted



When attached to slinging twirls the tilting angle must not exceed 45°.



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

4.3 Storing the gear unit

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



When temporarily storing the gear unit and any single components supplied with it, the preservative agent should be left on them. It must not be damaged, otherwise there is a risk of corrosion.



Do not stack gear units on top of one another.



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 should be avoided.



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, etc.) 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 external coat depend on the ambient conditions stipulated in the order relating to method of transport and area of application.



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

The coating complies with the requirements for the conductivity of the coating and the limitation of the layer thickness of the applied coating in accordance with DIN EN 13 463-1. The permissible maximum coating thickness depends on the indicated explosion group (IIA or IIB or IIC). Where lacquer coatings have a thickness less than 200 µm, no electrostatic charge is to be expected.

Where gear units are delivered with a priming coat only it is necessary to apply a finish coat in accordance with the directives applying to the specific case of application. The priming coat alone is not suitable to provide a sufficient long-term corrosion protection.



The coating must not carry an electrostatic charge!

The operator must ensure that highly effective mechanisms which can set up a charge in the coating are safely avoided.



Examples of highly effective charge-generating mechanisms are:

- the rapid passage of heavily dust-laden air near by
- the sudden escape of particle-laden compressed gases
- other heavy friction action (not manual cleaning/rubbing with cleaning cloths)



Ensure that the coat is not damaged!

Any damage may cause failure of the external protective coating and corrosion.



Unless otherwise contractually agreed, the durability periods of the interior gear unit preservation specified in table 7 or 8 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 9.

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

In the case of a storage period other than that indicated in table 7 or 8 and in table 9, the interior and the exterior preservation must be checked and, as necessary, be repeated (see items 7.3.1 and 7.3.2).

4.4.1 Interior preservation with preservative agent

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

Duration of protection	Preservative agent	Special measures
up to 24 months	Castrol Alpha SP 220 S	- Close all holes on the gear unit. - Replace air filter with screw plug. (Prior to start-up replace screw plug with air filter.)
For storage periods longer than 24 months, renew the preservative agent (see item 4.4.1.1).		

Table 8: Durability period and measures for interior preservation when using PG-based synthetic oil

Duration of protection	Preservative agent	Special measures
up to 6 months	Special anti-corrosion oil TRIBOL 1390 ¹⁾	None
up to 36 months		- Close all holes on the gear unit. - Replace air filter with screw plug. (Prior to start-up replace screw plug with air filter.)
For storage periods longer than 36 months, renew the preservative agent (see item 4.4.1.1).		

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

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



**Wear safety gloves and safety glasses!
Any oil spillage must be removed immediately with an oil-binding agent.**

For storage periods longer than 24 months (see table 7) or 36 months (see table 8), the interior preservation of the gear unit must be renewed. The following procedure is recommended:

- Undo and remove fastening screws on the inspection and/or assembly cover.
- Remove cover with seal from housing (seal will be used again).
- Place a suitable container under the oil-draining point of the gear-unit housing.
- Unscrew the oil-drain plug and/or open the oil-drain cock and drain the used preservation oil into a suitable container.
- Dispose of the residue of the preservation oil in accordance with regulations.
- Close the oil-drain plug and/or screw in the oil-drain plug.
- Fill the gear unit with "Castrol Alpha SP 220 S".
Filling quantity according to the gear-unit dimensions (length x width x height) x 0.05



In all cases the special oil "Castrol Alpha SP 220 S" with additional corrosion-prevention features (addition "S") must be used.

- Place inspection and/or assembly cover including seal on the housing.
- Place the fastening bolts of the inspection and/or fitting cover and tighten them to the specified torque (see item 6.20).



The maximum permitted time between opening and air-tightly reclosing the gear unit is one hour.



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



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 also item 10.2.2). The flushing oil must not be used for operation of the unit.

4.4.2 Exterior preservation

Table 9: Durability period for exterior preservation of shaft ends and other bright machined surfaces

Duration of protection	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: - resistant to seawater - resistant to tropical conditions - (soluble with CH compounds)
in case of outdoor storage up to 12 months ²⁾			

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 wooden 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 should be avoided.



The procedure for interior and exterior preservation treatment is described in section 7 (see items 7.3.1 and 7.3.2.1).

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 9 the exterior of the gear unit must be re-preserved using the preservative agent shown in table 9.

5. Technical description

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

5.1 General description

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 position.



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 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 10: Types and correlation of direction 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									

The gear unit is characterised by a low noise level. This is achieved by bevel and helical gears with a high contact ratio and special sound-damping housings.

The good temperature characteristics of the gear unit are achieved by its high degree of efficiency, large housing surface and performance-related cooling system.

5.2 Output types

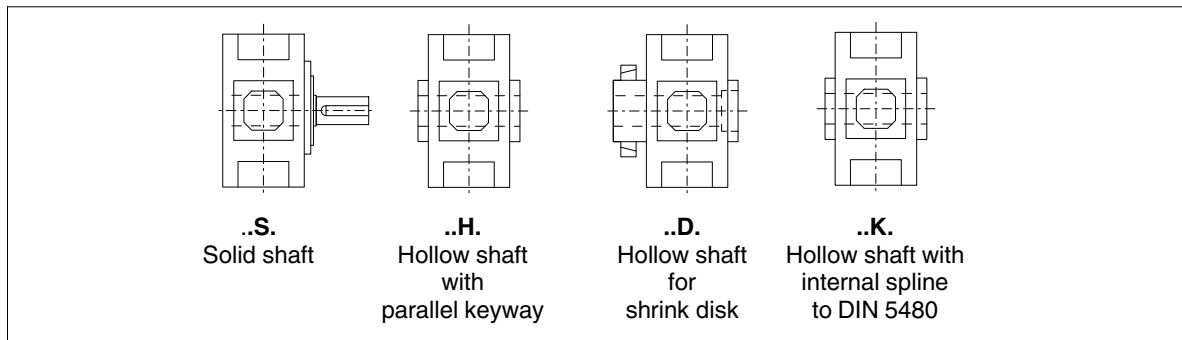


Fig. 6: Output types

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

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 rigid in design and due to its form has excellent noise and temperature characteristics.

The gear-unit housing comes with the following equipment:

- Slinging twirls (adequately dimensioned for transport)
- Inspection and/or assembly cover (for oil filling and/or inspection).
- Oil-sight glass or oil dipstick (to check the oil level).
- Oil-drain plug and/or oil-drain cock (to drain the oil).
- Air filter (for aerating and venting).

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

Air-relief point: yellow		Oil-draining point: white	
Oil-filling point: yellow		Lubricating point: red	
Oil level: red		Oil level: red	

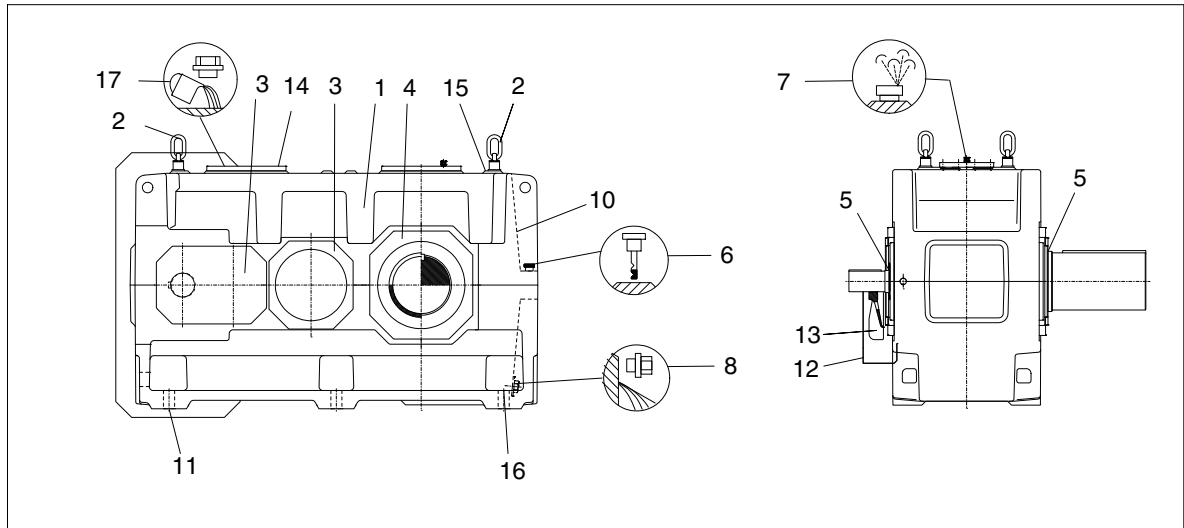


Fig. 7: Gear-unit features on gear units type H..H

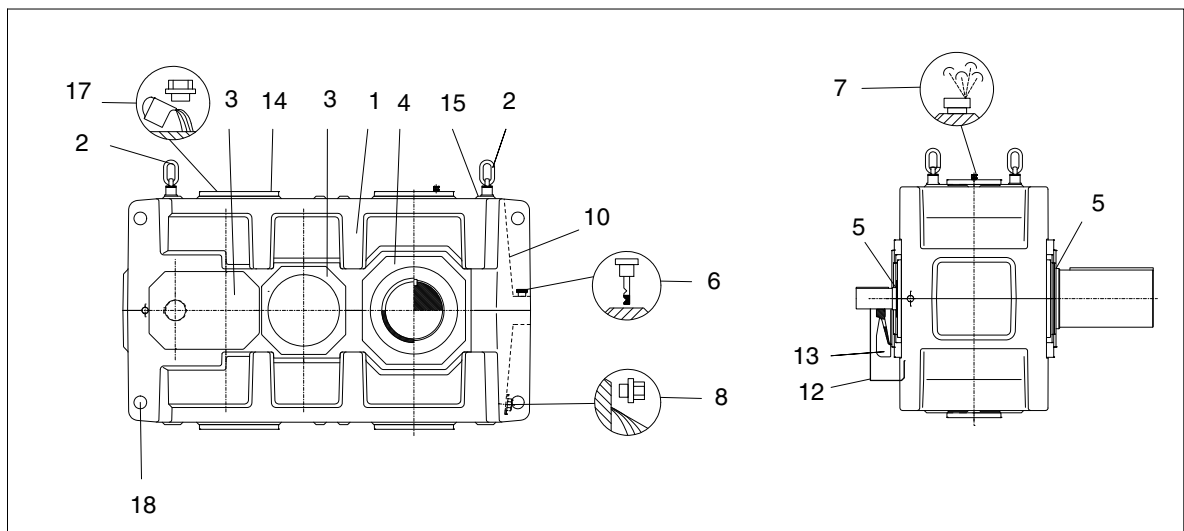


Fig. 8: Gear-unit features on gear units type H..M

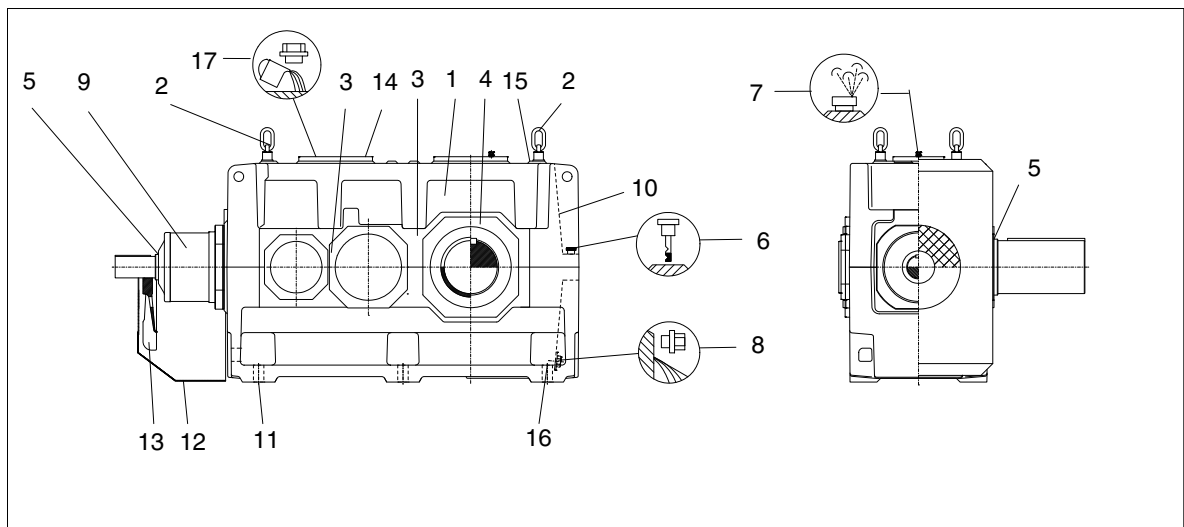


Fig. 9: Gear-unit features on gear units type B..H

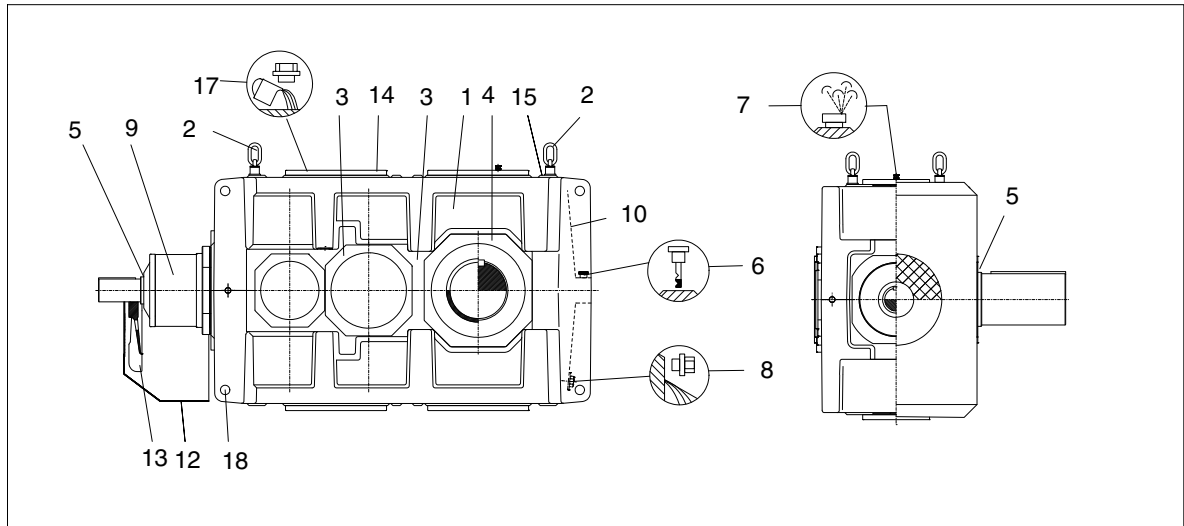


Fig. 10: Gear-unit features on gear units type B..M

- | | | | |
|---|---------------------|----|----------------------------------|
| 1 | Housing | 10 | Rating plate |
| 2 | Slings twirl | 11 | Gear-unit fastening |
| 3 | Cover | 12 | Fan cowl |
| 4 | Cover | 13 | Fan |
| 5 | Shaft seals | 14 | Inspection and/or assembly cover |
| 6 | Oil dipstick | 15 | Alignment surfaces |
| 7 | Housing ventilation | 16 | Alignment thread |
| 8 | Oil-drain plug | 17 | Oil inlet |
| 9 | Bearing journal | 18 | Fastening for torque arm |

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

5.4 Toothed components

The externally toothed components of the gear unit are case-hardened. Helical-gear teeth are ground. Depending on their size and transmission ratio, the bevel-helical gear teeth are lapped, ground or HPG-gear-cut. The high quality of the teeth leads to a significant noise reduction and ensures safe and reliable running.

The gears are connected with the shafts by interference fits and parallel keys or by shrink fits. These types of joints transmit with adequate reliability the torques generated.

5.5 Lubrication

5.5.1 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.

5.5.2 Forced lubrication

Depending on the order the splash lubrication system may be supported and/or replaced with a forced-lubrication system.

The oil-supply system is permanently attached to the gear unit and consists of a flanged-on pump, a double change-over filter, a pressure-monitoring device and pipework.

The direction of flow from the flanged-on pumps is **independent of the direction of rotation**.

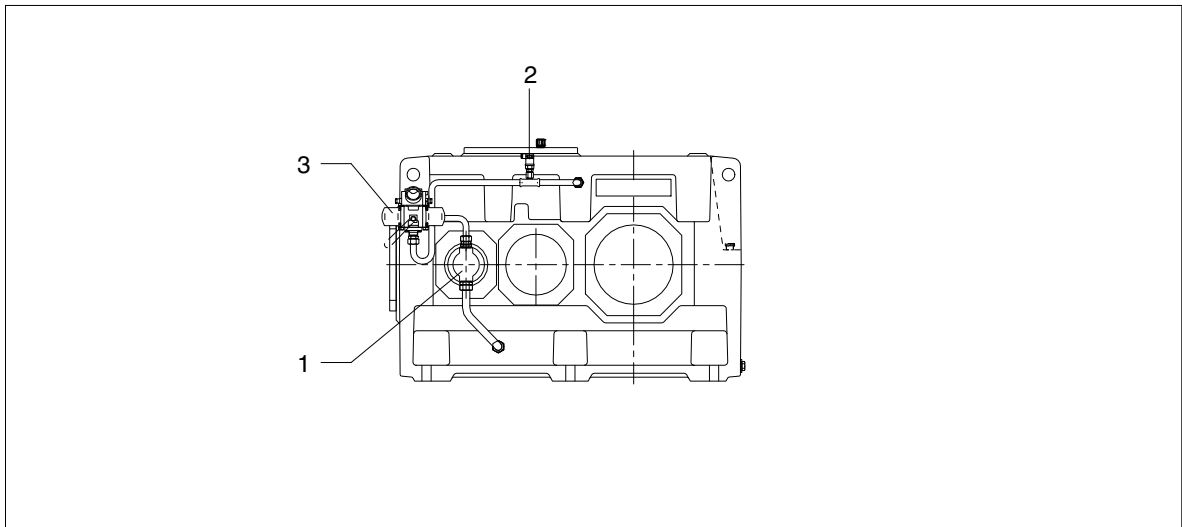


Fig. 11: Add-on oil-supply system on gear units type H...

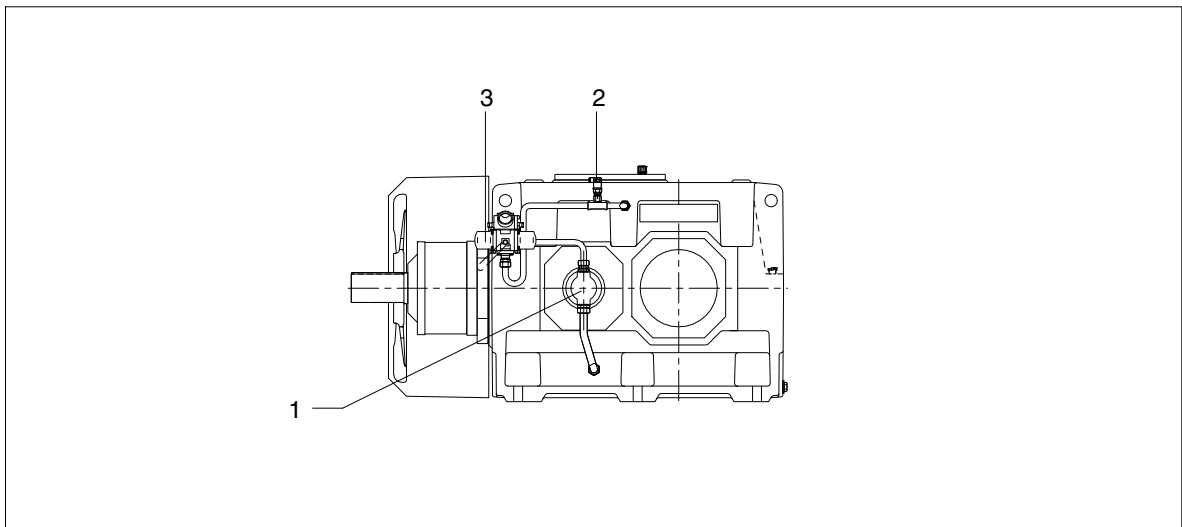


Fig. 12: Add-on oil-supply system on gear units type B...

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

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

Depending on the order specification and application, the flanged pump may be replaced with a motor pump.

The following configurations are possible:

- Add-on oil-supply system
- External oil-supply system



In the 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.



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

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

5.6 Shaft bearings

All shafts are mounted in rolling bearings.

5.7 Shaft seals

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

5.7.1 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.



Where large quantities of dust occur as specified by the requirements in Directive 94/9/EC, use is provided only in combination with the Taconite seal (see item 5.7.2).

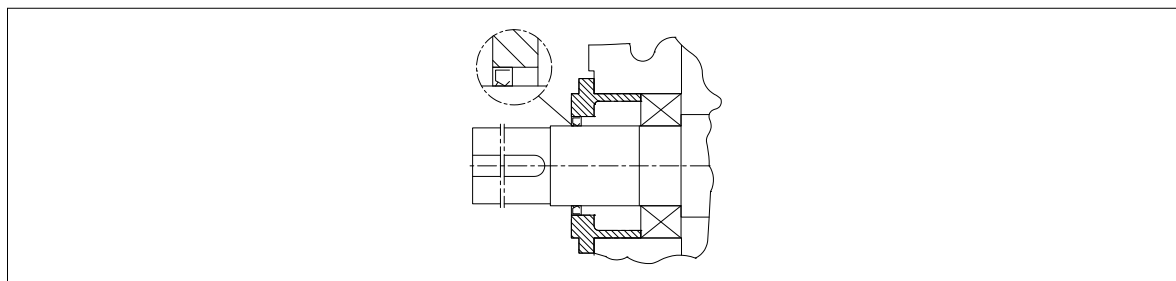


Fig. 13: Radial shaft-sealing ring

5.7.2 Taconite seal



Taconite seals were specially developed for use in a dusty environment. The penetration of dust is prevented by a combination of three seal elements (radial shaft-sealing ring, lamellar seal and grease-charged labyrinth seal).

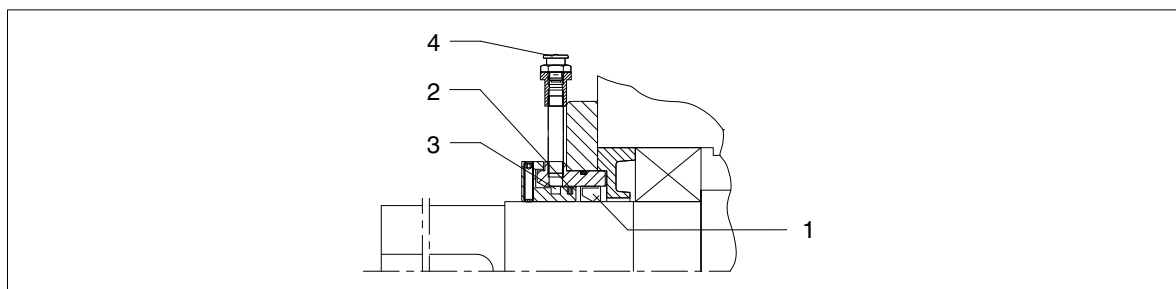


Fig. 14: Taconite seal

- 1 Radial shaft-sealing ring
- 2 Lamellar seal

- 3 Grease-charged labyrinth seal, re-chargeable
- 4 Flat grease nipple

Taconite seals are divided into the following types:

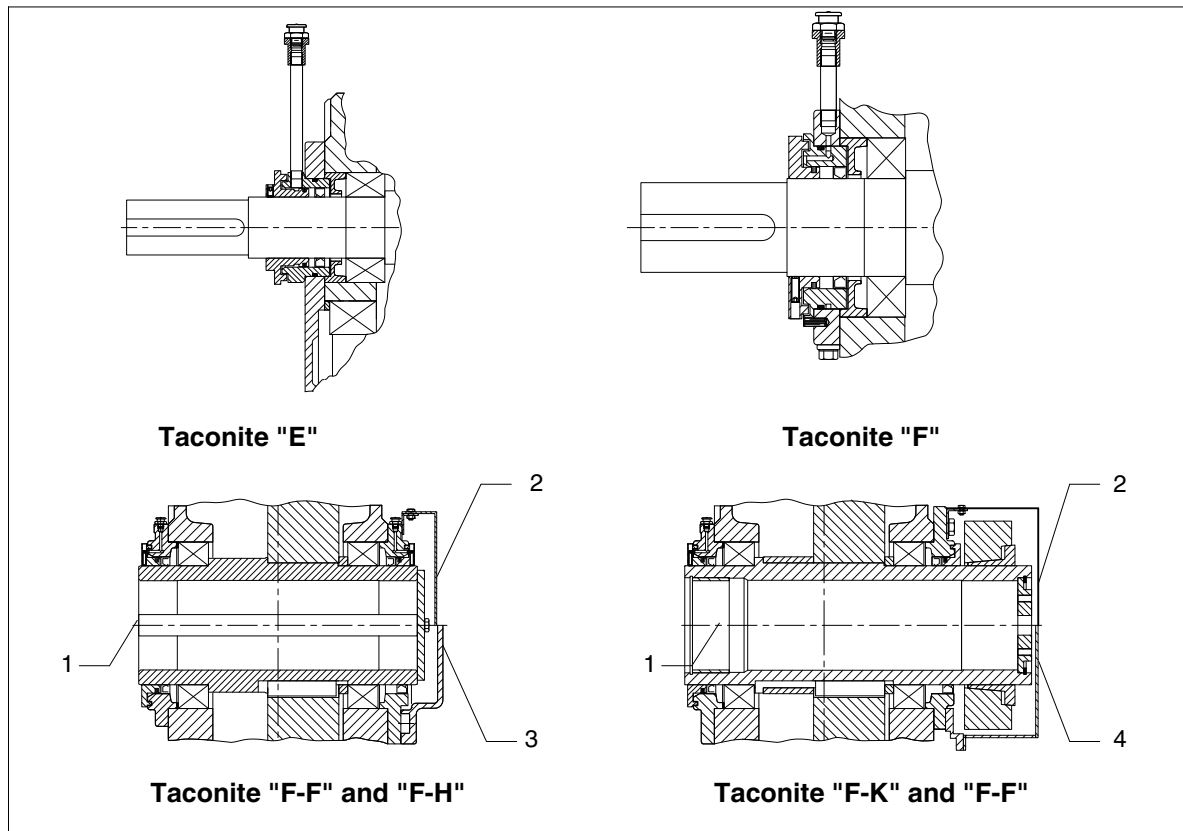


Fig. 15: Taconite seal, variants E, F, F-F, F-H and F-K

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

Table 11: Variant description Taconite seal

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



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

5.8 Backstop

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

The backstop is mounted oiltight 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.

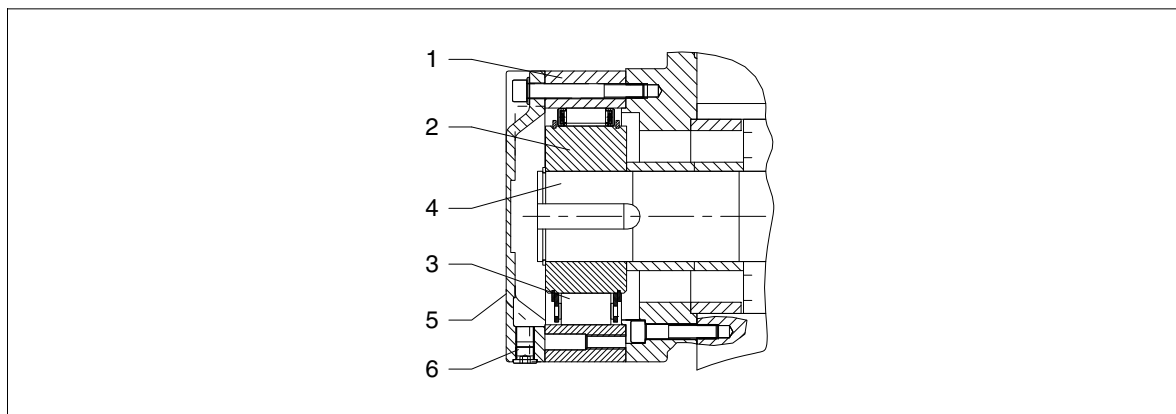


Fig. 16: Backstop

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



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



To avoid damaging the backstop or the gear unit, the motor must not be run adversely to the stop 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, and connect the motor in accordance with the pre-determined direction of rotation.



If the gear unit is operated at speeds below the speed at which the backstop disengages, the backstops must be regularly renewed. The frequency of change 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.

5.9 Cooling



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



The oil-supply system must have been designed and manufactured for use in accordance with Directive 94/9/EC.



When installing the gear unit free convection must be ensured on the housing surface, in order to definitely avoid overheating the gear unit.

5.9.1 Fan

As a rule the fan is mounted 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 along the air ducts on the side of the gear-unit housing. It thereby dissipates a certain amount of heat from the housing.

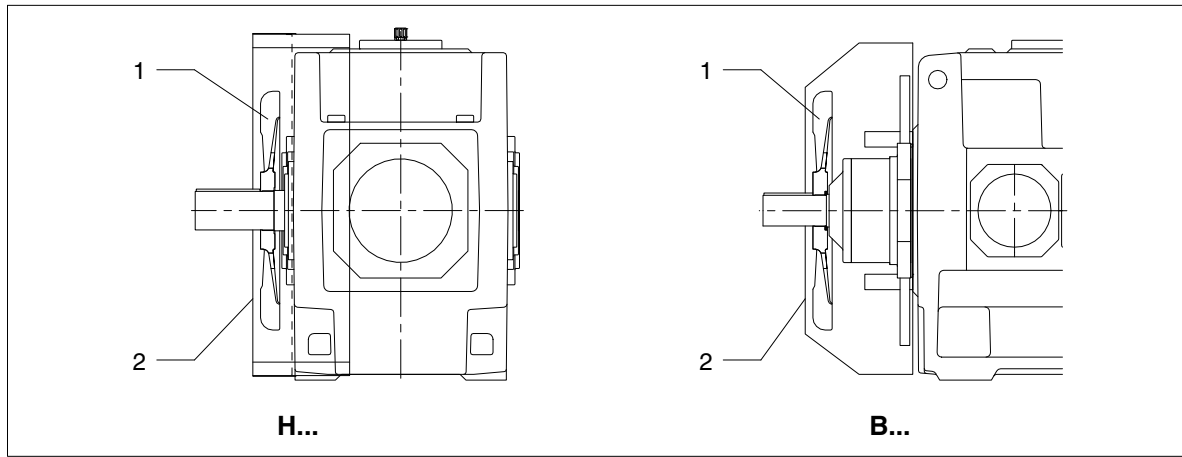


Fig. 17: Fan on gear units types H... and B...

1 Fan

2 Air-guide cover

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.



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

The correct distance is given in 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.



The cooling effect is considerably reduced if the fan or the housing surface are dirty (see section 10, "Maintenance and repair").

5.9.2 Cooling coil

The gear unit can be fitted with a cooling coil in the oil sump. Cooling water is supplied 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 oil to the water and thereby removed from the system.

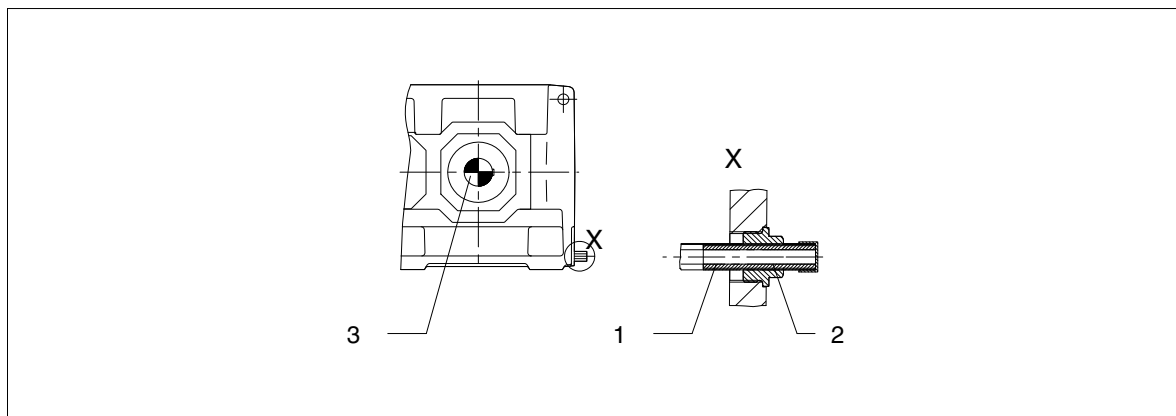


Fig. 18: Cooling coil on gear units types H... and B...

1 Cooling-water connection 2 Reducing screw 3 Output shaft

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.



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



The water can flow through the gear unit in either direction. The pressure of the cooling water must not exceed 8 bar.

If the gear unit is being withdrawn from service for a longer period and if there is a danger of freezing, the cooling water must be drained off. Remove any remaining water with compressed air.

The ends of the cooling coil must never be twisted because this could destroy the cooling coil.

The reducing bolt must not be tightened or demounted because this may result in damage to the cooling coil.



Be especially careful when blowing with compressed air. Wear protective glasses!



Avoid too high pressure on the cooling-water entry. For this a cooling-water flow control must be used (e.g. a pressure reducer or a suitable valve).



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 the list of equipment.

5.9.3 Separate / 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.



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



When operating and servicing the components of the oil-supply system, observe the operating instructions of the components. For technical data, refer to the data sheet and/or the list of equipment.

5.10 Couplings, clutches

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

If rigid couplings or other in- and/or output elements, which create additional radial and/or axial forces, (e.g. gear wheels, belt pulleys, disk flywheels, hydraulic couplings) are to be used, this must be agreed by contract.

5.11 Heating

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



Complete immersion of the heating elements in the oil bath must be guaranteed by adhering to the mounting position in accordance with the drawings in the gear-unit documentation, and to the oil level.

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

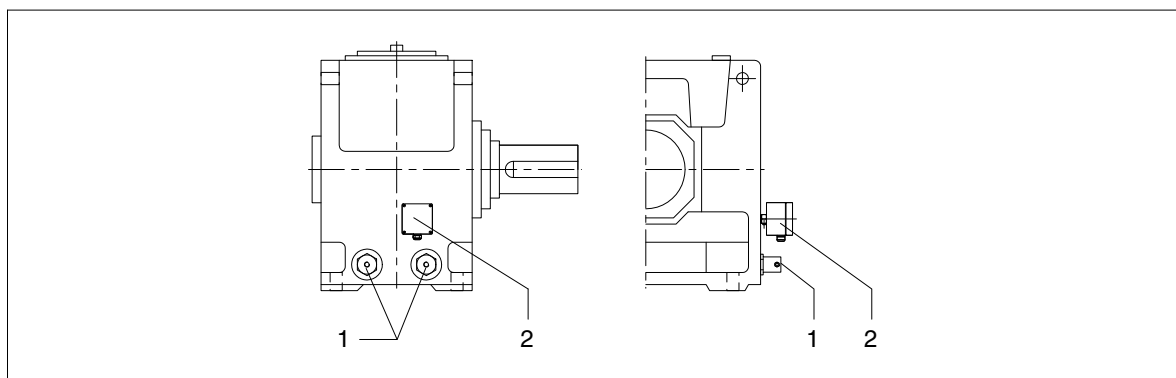


Fig. 19: Heating on gear units types H... and B...

1 Heating element

2 Temperature monitor

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



Never switch on the heating elements, unless complete immersion of the heating rod in the oil bath is ensured. Fire hazard!
If heating elements are installed afterwards, the max. heating capacity (see table 12) on the outer surface of the heating element must not be exceeded.

Table 12: Specific heating output P_{Ho} as a function of the ambient temperature

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



Operation and maintenance must be in accordance with the pertinent operating instructions. For technical data, refer to the list of equipment.

5.12 Indication of oil level

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

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

5.13 Oil-temperature monitoring system



The gear unit can be 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, which should comply with the requirements of Directive 94/9/EC, must be connected to a suitable evaluating instrument provided by the customer. The temperature monitor has a connection head for the wiring. A two-wire circuit is provided by the manufacturer. However, the customer may fit his own three- or four-conductor circuit if required.

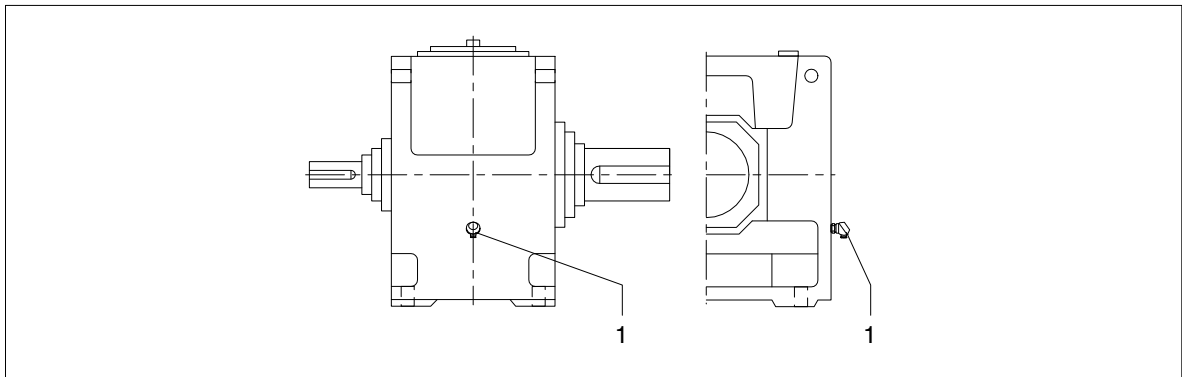


Fig. 20: Oil-temperature measurement on gear units types H... and B...

1 Pt 100 temperature monitor

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



When operating and servicing the components, observe the operating instructions relating to the components.

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

5.14 Oil-level monitoring system



Depending on the order specification, the gear unit can be fitted with an oil-level monitor in the form of a level-limit switch, which should comply with the requirements of Directive 94/9/EC. This device monitors the level of the oil when the unit is at a standstill i.e. before it is started up. It should be wired in such a way that, when the signal "oil level too low" is given, the drive motor cannot start and that an alarm is given. During operation, any signal should be bridged.



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

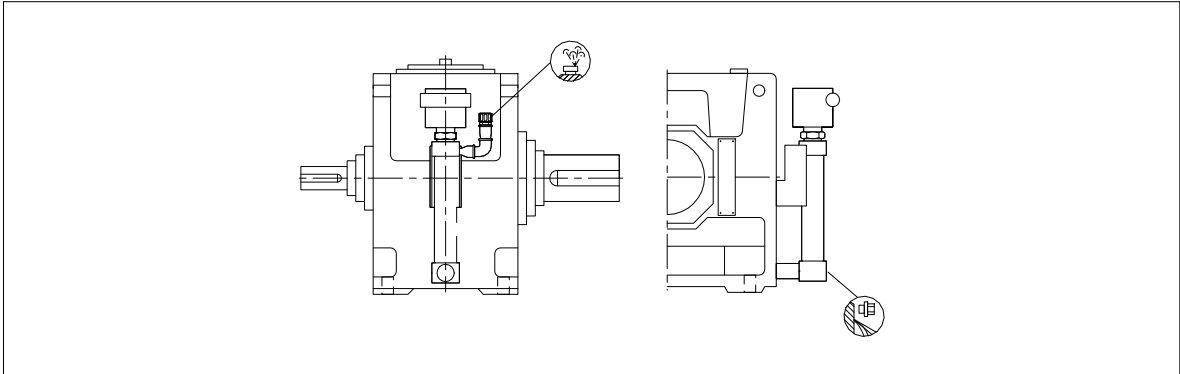


Fig. 21: Oil-level monitoring on gear units types H... and B...

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



When operating and servicing the components, observe the operating instructions relating to the components.
For technical data, refer to the data sheet and/or the list of equipment.

5.15 Bearing-monitoring system

5.15.1 Bearing monitoring by temperature monitor



The gear unit may be fitted with a temperature monitor for monitoring the bearings. In order to measure the temperatures and/or temperature differences, the temperature monitor, which should comply with the requirements of Directive 94/9/EC, must be connected to a suitable evaluating instrument provided by the customer. The temperature monitor has a connection head for the wiring. A two-wire circuit is provided by the manufacturer. However, the customer may also fit a three- or four-wire circuit.

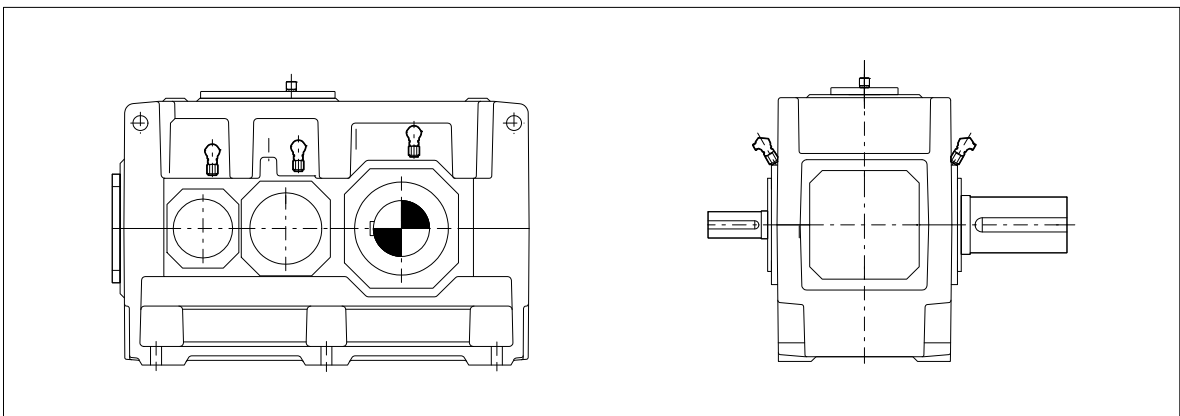


Fig. 22: Bearing monitoring by Pt 100 resistance thermometer on gear units type H2.H

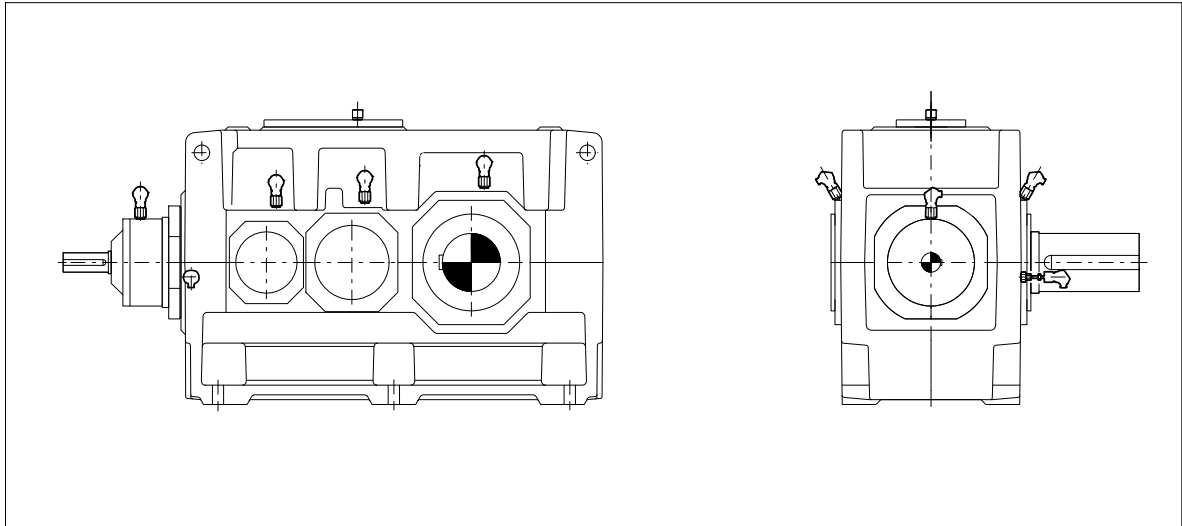


Fig. 23: Bearing monitoring by Pt 100 resistance thermometer on gear units type B3.H

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



When operating and servicing the components, observe the operating instructions relating to the components.
For technical data, refer to the data sheet and/or the list of equipment.

5.15.2 Bearing monitoring by shock-pulse transducer

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

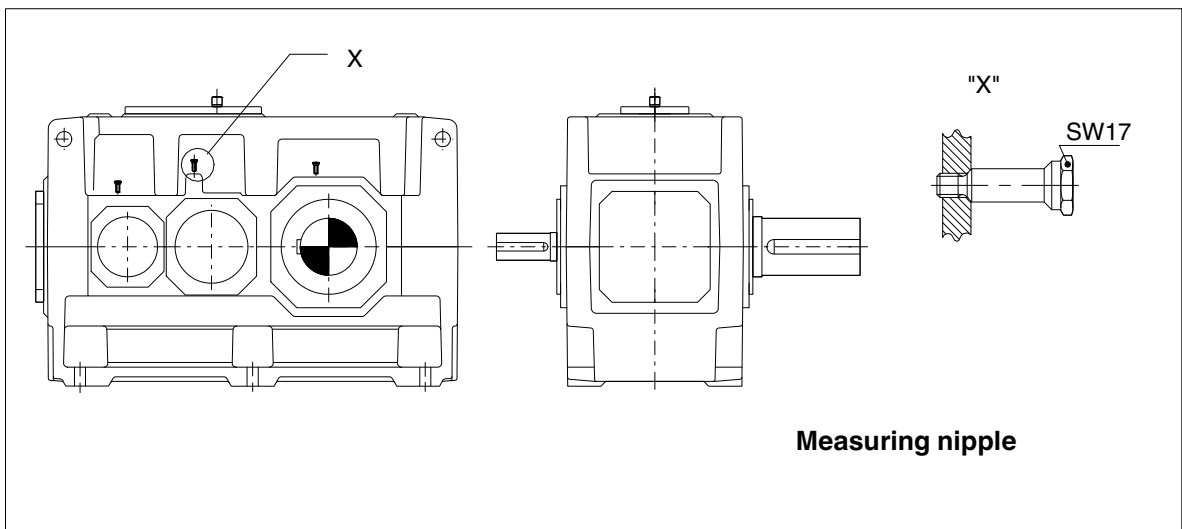
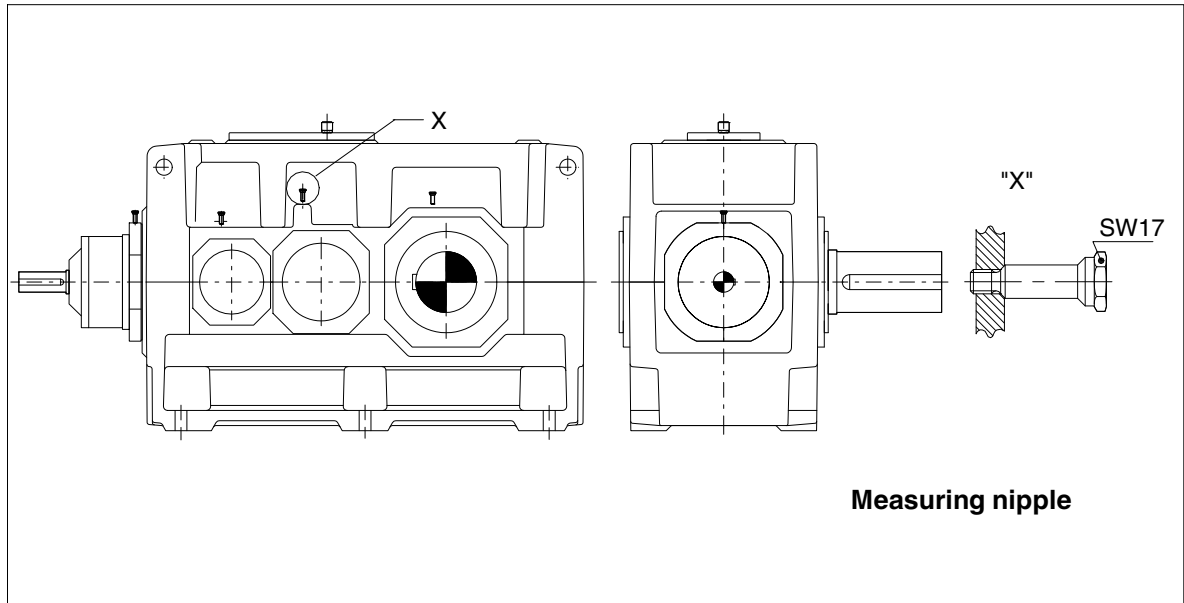


Fig. 24: Bearing monitoring by shock-pulse transducer on gear units type H2.H



Measuring nipple

Fig. 25: Bearing monitoring by shock-pulse transducer on gear units type B3.H

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

5.15.3 Bearing monitoring by accelerometer

The gear unit can have been provided with threaded bores, suitable for receiving accelerometers. Depending on variant type these threaded bores are provided with thread M6 or M8 (see figures 26 and 27).

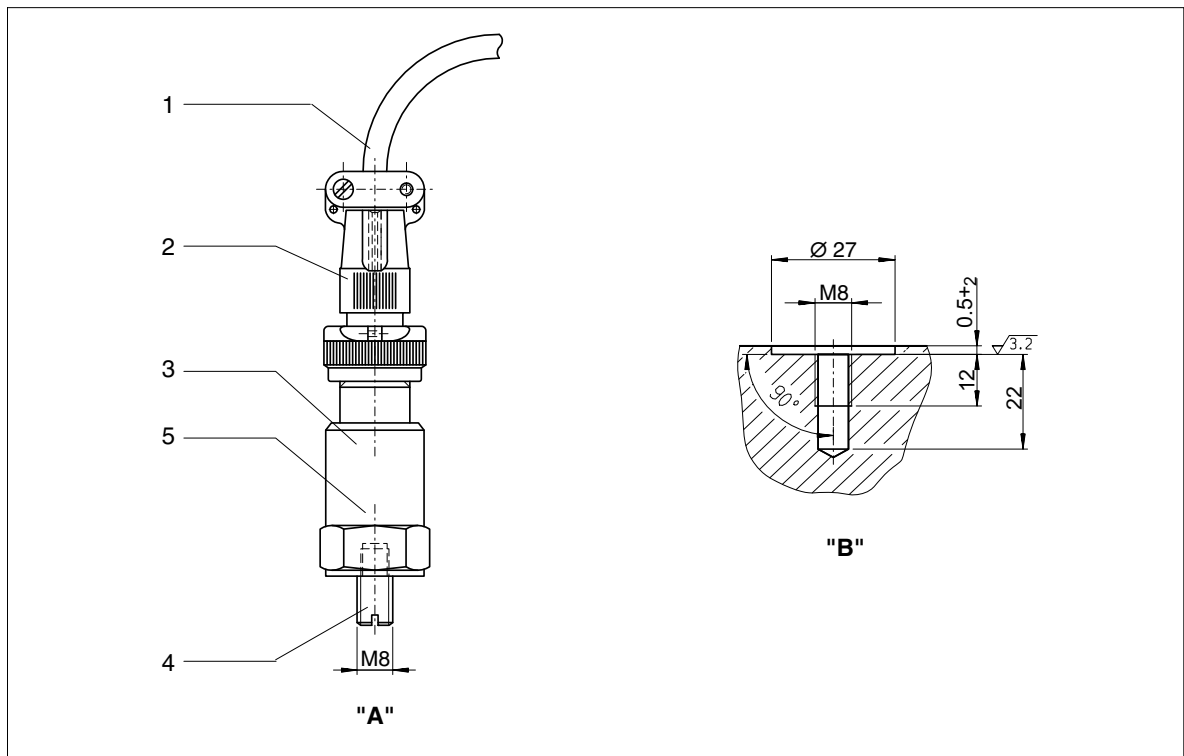


Fig. 26: Accelerometer complete ("A") and thread connection ("B") for variants 1 to 4

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

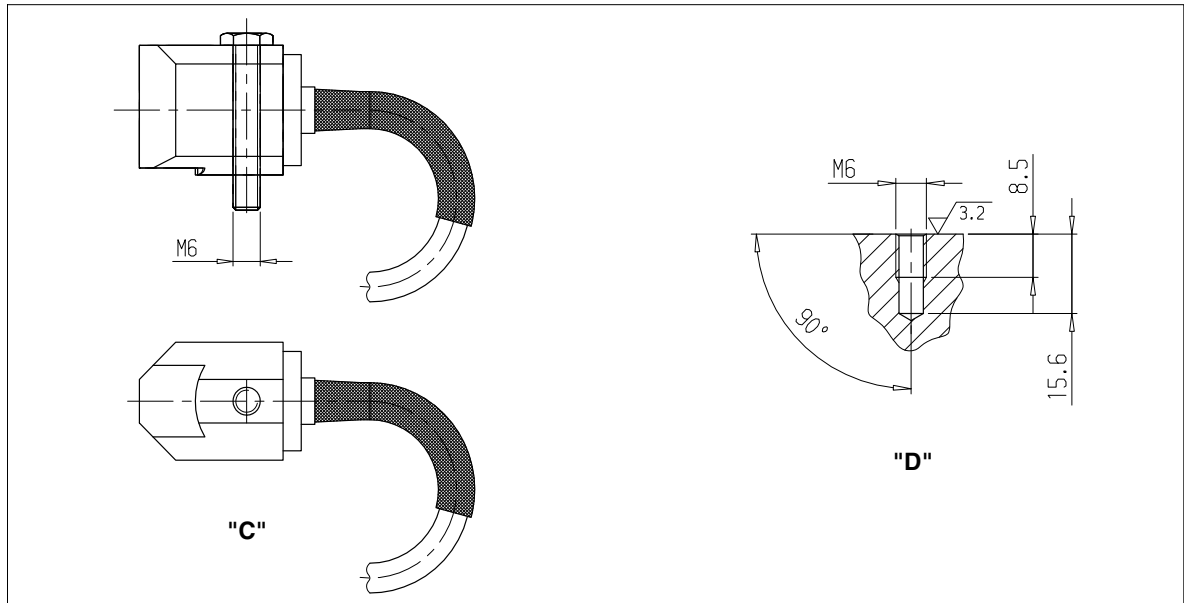


Fig. 27: Accelerometer complete ("C") and thread connection ("D") for variants 5A and 5B



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

A detailed view of the gear unit with sensors added-on can be obtained from the drawings in the gear-unit documentation.

5.16 Speed transmitter

An incremental speed transmitter may be fitted. Wiring and evaluation instrument should be provided by the customer.

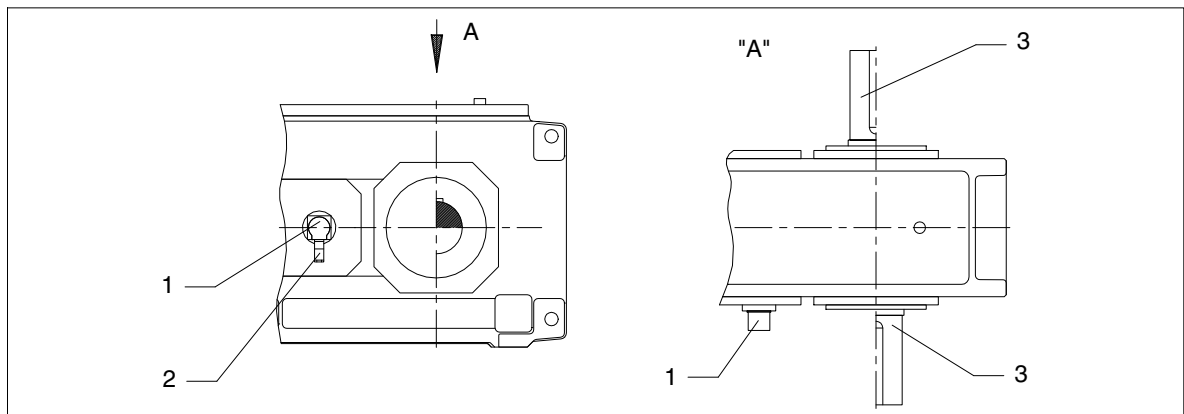


Fig. 28: Speed-monitoring device

- | | | | | | |
|---|-------------------------|---|--------------------|---|--------|
| 1 | Incremental transmitter | 2 | 12-pole brass plug | 3 | Output |
|---|-------------------------|---|--------------------|---|--------|



When operating and servicing the components, observe the operating instructions relating to the components.

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

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

6. Fitting

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



The gear unit must not be installed whilst the environment is explosive.

6.1 General information on fitting

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



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

During the planning phase sufficient space must be allowed around the gear unit for later care and maintenance work.



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

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

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



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

Such measures may be:

- fitting a sunshade roof,
or
- fitting an additional cooling unit,
or
- fitting the oil sump with a temperature-monitoring device with a cut-out function.

The ambient-temperature range indicated on the rating plate must be adhered to!



**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 system to stop!**



The operator should ensure that no foreign bodies affect the proper function of the gear unit (e.g. falling objects or heaping over).

**All the fastening points provided by the design of the unit must be used.
Screws which have been damaged during assembly or disassembly work must be replaced with new ones of the same strength class and type.**



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



The gear unit must be slung by the points marked (see section 4, "Transport and storage").



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

6.2 Unpacking

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



The packaging must not be opened or damaged, when this is part of the preservation method!

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



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 Installation of gear unit on housing base

6.3.1 Foundation

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 mounted must be rigid. It must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

Careful alignment with the units on the in- and output sides must be ensured. Any elastic deformation through operating forces must be taken into consideration.



Fastening bolts or nuts must be tightened to the prescribed torque. For the correct torque, refer to item 6.20. Bolts of the minimum strength class 8.8 must be used.

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



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

6.3.2 Description of installation work



The gear unit must not be cleaned in an explosive environment.

- Remove the anti-corrosion coating from the shafts with suitable cleaning agent (see item 7.1.1).



The cleaner must not be allowed to come into contact with the shaft-sealing rings. Observe the manufacturer's instructions for handling cleaning agents!



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

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

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



**Take precautions to avoid burns from hot parts!
Wear suitable protective gloves!**



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

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



**Fit the coupling with the aid of suitable fitting equipment. The parts must not be driven on by abrupt force, as this may damage the gear unit (see also item 6.8).
The shaft-sealing rings and running surfaces of the shaft must not be damaged when pulling in the coupling parts.**



**When installing 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 due to angular and/or axial misalignments result in premature wear and/or 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.**



Gear units whose weight 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 in the order related dimensioned drawing.

6.3.2.1 Alignment

For aligning the gear unit special alignment surfaces are provided on the upper part of the housing. To facilitate gear-unit alignment, alignment threads are provided on the housing base.

Alignment surface:



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

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



The values punched into the alignment surfaces must always be observed.

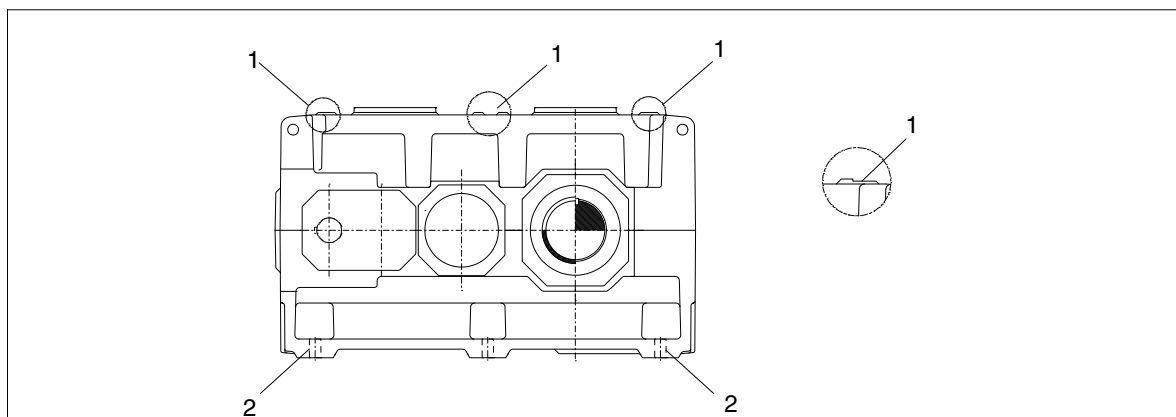


Fig. 29: Alignment surfaces and alignment thread

1 Alignment surfaces

2 Alignment thread

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

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

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

- Record alignment dimensions (see also item 7.2).



The report must be kept with these instructions.



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



Non-observance can cause shaft rupture, resulting in serious injury or danger of life.

6.3.2.2 Fitting on a foundation frame



The foundation frame must be horizontal and plain. The gear unit must not be excessively stressed when tensioning the fastening bolts.

The levelness of the gear-unit standing surface is especially 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 standing surface must lie between two imaginary parallel planes 0.1 mm per 1 m apart.

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



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.

- Tighten the foundation bolts to the specified torque (see item 6.20); if necessary, use stops to prevent displacement.
- Align the gear unit exactly with the input and output units (see item 6.3.2.1).
- Record alignment dimensions (see also item 7.2).



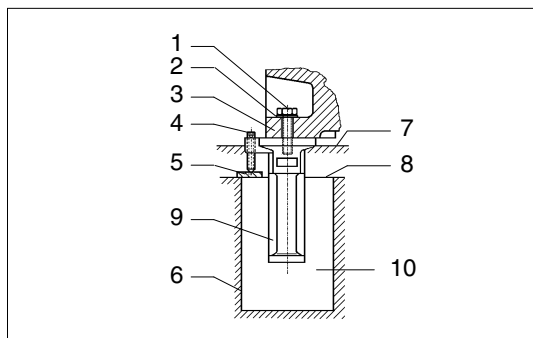
The report must be kept with these instructions.

6.3.2.3 Fitting on a concrete foundation by means of foundation blocks

- Clean the undersurface of the gear-unit base.
- Hook the foundation blocks with washers and fastening bolts into the foundation fastening points on the gear-unit housing (see fig. 30).



The fastening bolts must only be tightened to the tightening torque when 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
- 10 Recess for the foundation block

Fig. 30: Foundation block

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



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.

- Align gear unit horizontally by in- and output shafts.
- Align the gear unit exactly with the input and output units (see item 6.3.2.1), with the aid of the set screws (if available).
- Record alignment dimensions, see item 7.2.



The report must be kept with these instructions.

- If considerable forces may apply, use stops to prevent the unit from displacement.



Before pouring the concrete foundation, fill up the openings in the foundation blocks with adequate material such as polystyrene. With type **H2**, remove the air-conducting cowl before tightening the foundation bolts and then bolt it back into position.

- Pour concrete into the recesses for the foundation blocks.

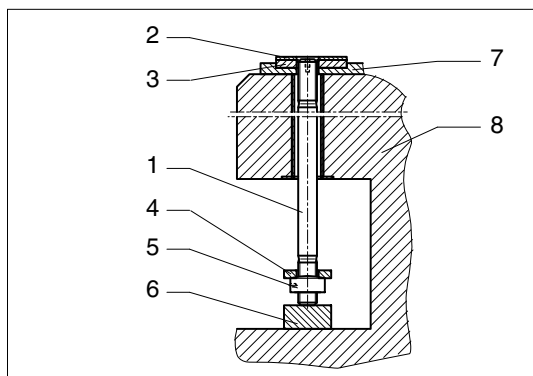


When the concrete has set, tighten the fastening bolts of the foundation blocks to the specified torque (see item 6.20).

The gear unit must not be excessively stressed when tensioning the fastening bolts.

6.3.2.4 Fitting on a concrete foundation by means of anchor bolts

- Clean the undersurface of the gear-unit base.
- Place support on the base plate in the fine grout.
- Insert anchor bolts.
- Place pressure plates in position and screw nuts on.
- Place wood under the anchor bolts so that they are about 10 mm from the upper edge of the support (see fig. 31).



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

Fig. 31: Anchor bolt

- Place the gear unit.

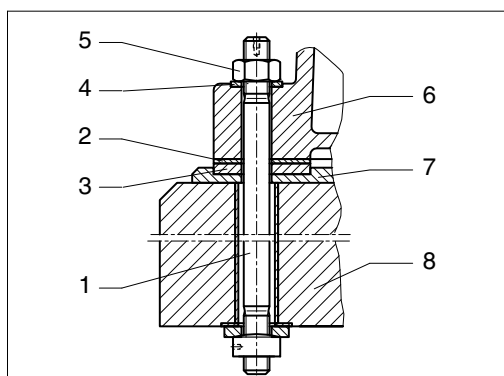


**Use only the twirls provided to attach lifting equipment to the unit.
Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.**

- Pull anchor bolts up (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 fig. 32).
 - The values punched into the screeds must always 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 displacements of the couplings (see coupling drawings).
- Record alignment dimensions (see also item 7.2).



The report must be kept with these instructions.



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

Fig. 32: Anchor bolt



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 nut with your fingers.
- Place the protective sleeve.
- Place hydraulic tensioning device in position.
- Initially tension the bolts alternately (for initial-tensioning forces, see item 6.20).
- Using a suitable tool, screw hexagon nuts on as far as the stop.



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

- The tensioning pressures and/or the initial-tensioning forces should be recorded (see item 7.2).



The report must be kept with these instructions.

6.4 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 DIN 6885 Part 1 Form A. Furthermore, a centring hole to DIN 332 Form DS (tapped) should be provided (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 also item 6.4.3), we recommend providing a connection for pressure oil on the end of the driven machine shaft. For this a hole must be drilled through to the hollow shaft bore (see figure 33). This connection may also be used for supplying rust-releasing agent.

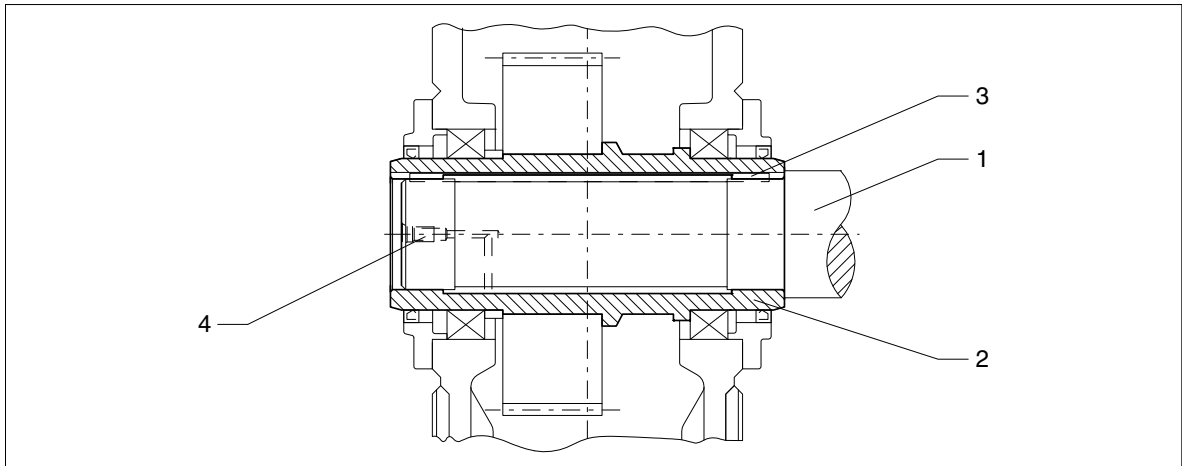


Fig. 33: hollow shaft with parallel keyway, preparation

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

6.4.2 Fitting



The gear unit must not be cleaned in an explosive environment.

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



The cleaner must not be allowed to come into contact with the shaft-sealing rings.



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

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



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

6.4.2.1 Fitting

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



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

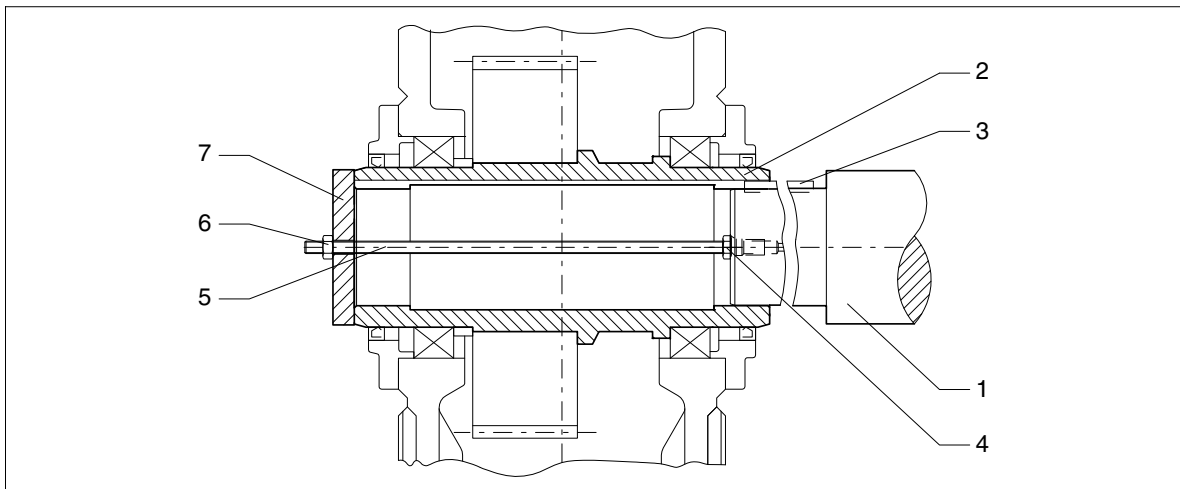


Fig. 34: Hollow shaft with parallel keyway, fitting with threaded spindle

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

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

- The hollow shaft is drawn against the collar of the machine shaft.



**In order to avoid any distortion, it must be supported by a torque arm or a pedestal (see item 6.10).
Under no circumstances may the gear unit be stressed.**

6.4.2.2 Axial fastening

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 in order to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see figure 33), e.g. using a pump.
- When the rust-releasing agent has taken effect, pull the gear unit off with the device (see figures 35 and 36).
- Removing the gear unit from the driven-machine shaft can be done, depending on local possibilities, as follows:
 - preferably using forcing screws in an end plate (see figure 35) or
 - using a central threaded spindle or
 - using a hydraulic lifting unit ("Lukas").



The end plate and/or the auxiliary plate for forcing off the gear unit are not included in our delivery. Each of the two end faces of the hollow shaft is provided with threaded holes to receive bolts for fastening the end plate to the hollow shaft.



A detailed view of these threaded holes can be obtained from the drawings in the order-specific gear-unit documentation.

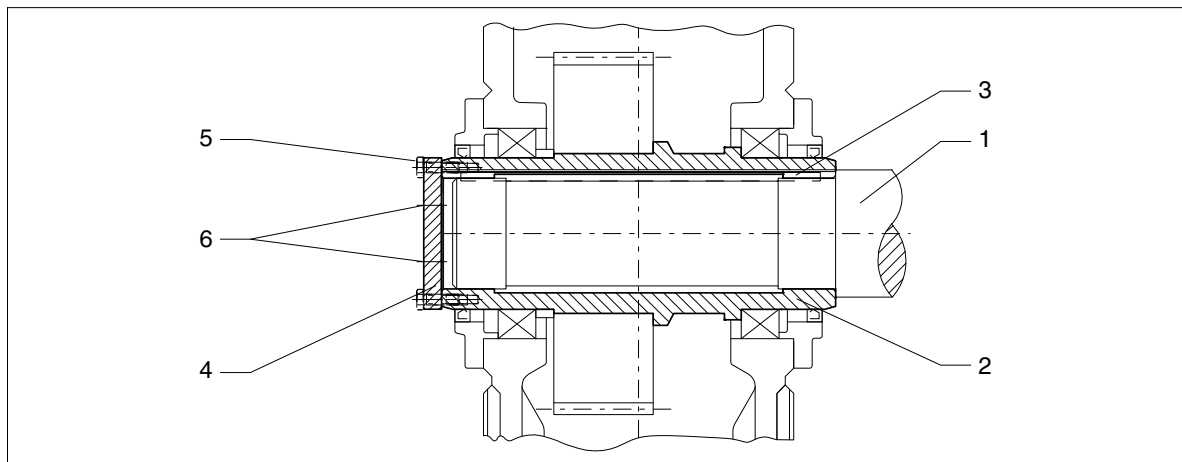


Fig. 35: Hollow shaft with parallel keyway, demounting with end plate

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

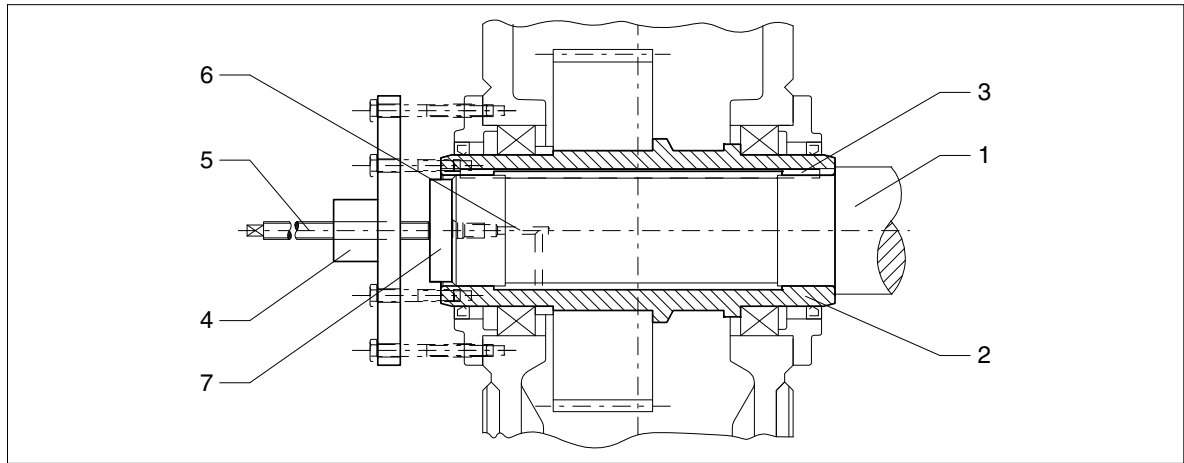


Fig. 36: Hollow shaft with parallel keyway, demounting with hydraulic lifting unit ("Lukas")

- | | | | |
|---|----------------------------------|---|-------------------------|
| 1 | Machine shaft | 5 | Threaded spindle |
| 2 | Hollow shaft | 6 | Pressure-oil connection |
| 3 | Parallel key | 7 | Plate for forcing out |
| 4 | Hydraulic lifting unit ("Lukas") | | |



Avoid canting when pulling the unit off.



When using an hydraulic lifting unit 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.



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

6.5 Shaft-mounted gear unit with hollow shaft and internal spline to DIN 5480

The shaft end of the driven machine must be designed with internal splines to DIN 5480. Furthermore, a centring hole to DIN 332 Form DS (tapped) should be provided (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 also item 6.5.3.), we recommend providing a connection for pressure oil on the end of the driven machine shaft. For this a hole must be drilled through to the hollow shaft bore (see figure 37). This connection may also be used for supplying rust-releasing agent.

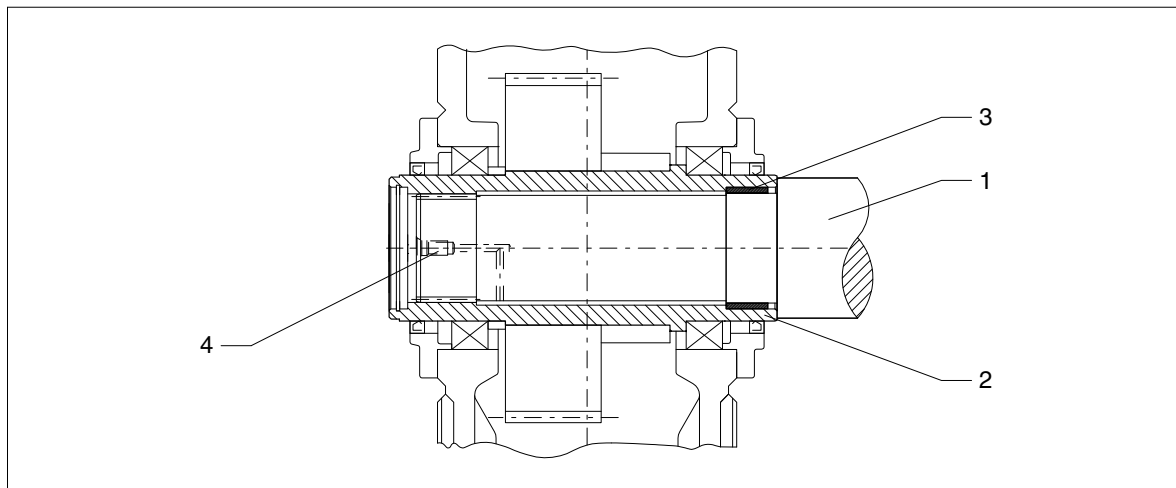


Fig. 37: Hollow shaft with internal spline, preparation

- | | | | |
|---|---------------|---|-------------------------|
| 1 | Machine shaft | 3 | DU bush |
| 2 | Hollow shaft | 4 | Pressure-oil connection |

6.5.2 Fitting



The gear unit must not be cleaned in an explosive environment.

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



The cleaner must not be allowed to come into contact with the shaft-sealing rings.



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

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



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

6.5.2.1 Fitting with integrated DU bush

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



The hollow shaft must be exactly aligned with the machine shaft to avoid canting. When fitting, ensure that the position of the teeth between the machine shaft and hollow shaft is correct. The correct position can be determined by turning the input shaft and/or by swivelling the gear unit lightly around the hollow shaft.

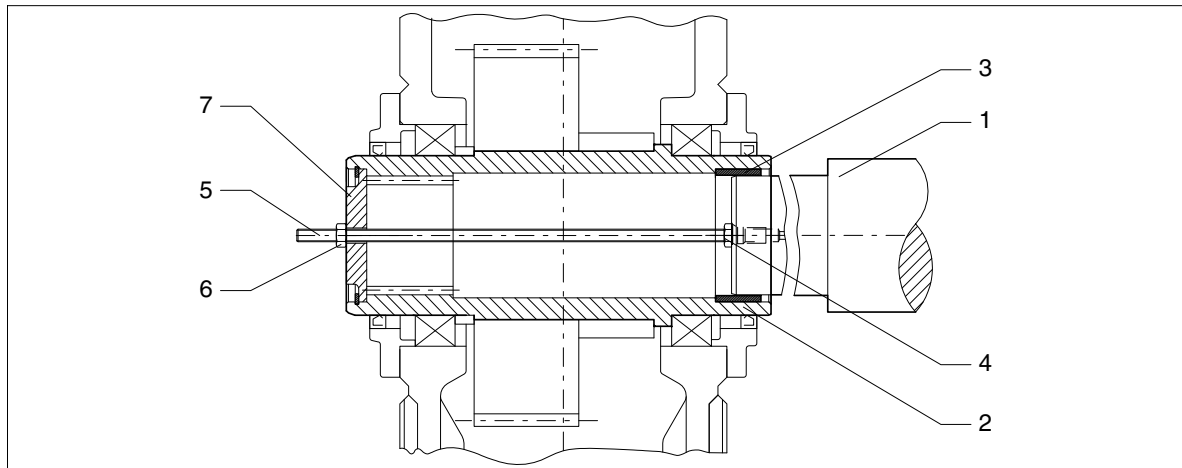


Fig. 38: Hollow shaft with internal spline, fitting with DU bush

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

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

- The hollow shaft is drawn against the collar of the machine shaft.



In order to avoid any distortion, it must be supported by a torque arm or a pedestal (see item 6.10). Under no circumstances may the gear unit be stressed.

6.5.2.2 Axial fastening

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 in order to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see figures 39 and 40), e.g. using a pump.
- The end plate and the locking ring must first be removed.
- When the rust-releasing agent has taken enough effect, pull the gear unit off.
- Removing the gear unit from the driven-machine shaft can be done locally as follows:
 - preferably using forcing screws in an end plate (see figure 39) or
 - using a central threaded spindle or
 - using a hydraulic lifting unit ("Lukas").



The end plate and/or the auxiliary plate for forcing off the gear unit are not included in our delivery.
Each of the two end faces of the hollow shaft is provided with threaded holes to receive bolts for fastening the end plate to the hollow shaft.



A detailed view of these threaded holes can be obtained from the drawings in the order-specific gear-unit documentation.

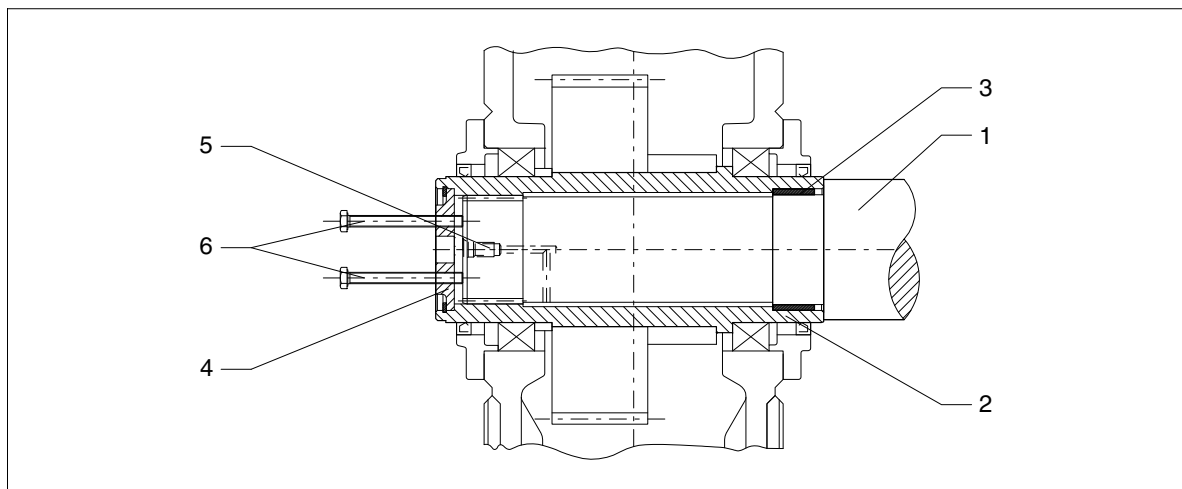


Fig. 39: Hollow shaft with internal spline, demounting with end plate

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

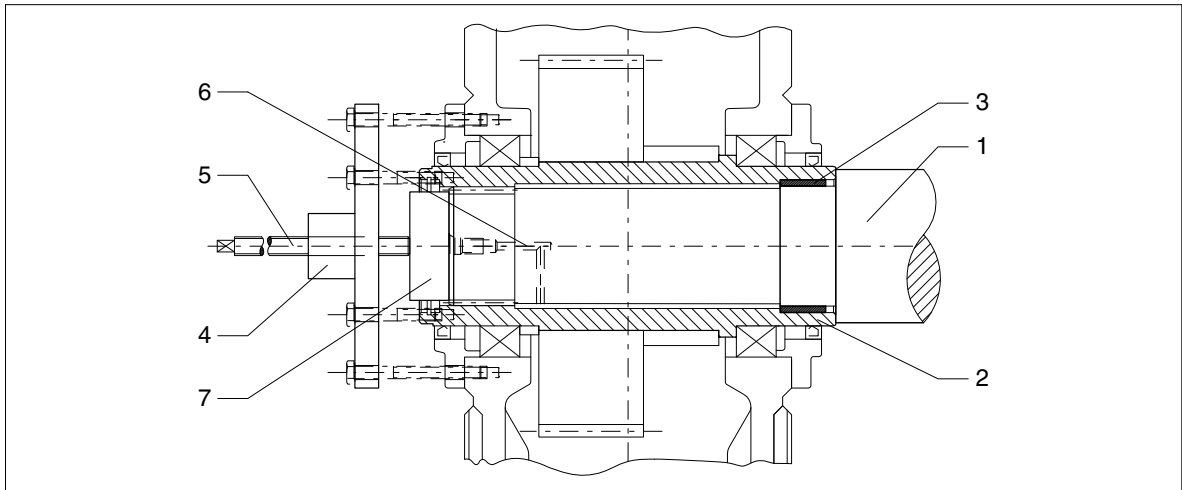


Fig. 40: Hollow shaft with internal spline, demounting with hydraulic lifting unit ("Lukas")

- | | | | |
|---|----------------------------------|---|-------------------------|
| 1 | Machine shaft | 5 | Threaded spindle |
| 2 | Hollow shaft | 6 | Pressure-oil connection |
| 3 | DU bush | 7 | Plate for forcing out |
| 4 | Hydraulic lifting unit ("Lukas") | | |



Avoid canting when pulling the unit off.



When using an hydraulic lifting unit 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.



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

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

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

6.6.1 Fitting



The gear unit must not be cleaned in an explosive environment.

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



The cleaner must not be allowed to come into contact with the shaft-sealing rings.



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

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



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

6.6.1.1 Fitting with integrated DU bush

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



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

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



In order to avoid any distortion, it must be supported by a torque arm or a pedestal (see item 6.10).

Under no circumstances may the gear unit be stressed.

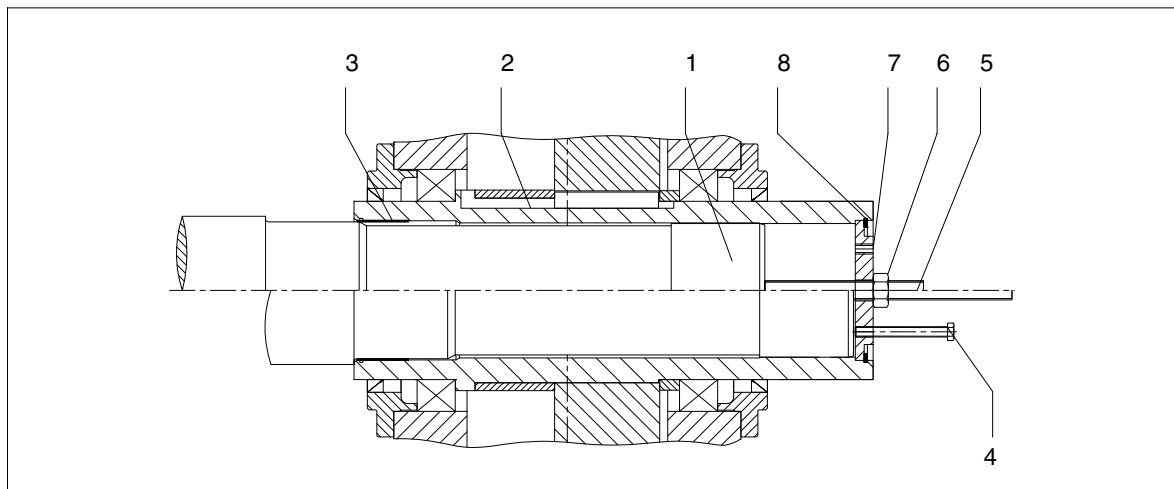


Fig. 41: Hollow shaft in shrink-disk design, mounting with DU bush

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

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

6.6.1.2 Axial fastening

If the shrink disk is fitted according to instructions (see item 6.7.1), the gear unit is fixed securely in the axial direction. Additional axial fastening is not required.

6.6.1.3 Demounting the shaft-mounted gear unit

- Demount the shrink disk (see item 6.7.2).
- Using the forcing screws (part 4) force the gear unit off the machine shaft, until the seat under the shrink disk and the DU bush are clear.
- Using suitable lifting gear, lift the gear unit from the machine shaft.



Use only the twirl 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.

6.7 Shrink disk

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

The shrink disk is delivered ready for installation.



The shrink disk must not be dismantled before mounting for the first time.

Fitting and start-up must be carried out by properly trained specialist personnel. Prior to start-up these instructions must be read, understood and adhered to. We accept no liability for personal injury or damage due to non-observance.

6.7.1 Fitting the shrink disk

- Before beginning installation, the hollow shaft and the stub shaft must be carefully cleaned.



Observe manufacturer's instructions for handling lubricants and solvents.



Do not allow cleansing agent or solvent to affect surfaces with paint coating.



The bore of the hollow shaft and the stub shaft must be absolutely clean, free of grease and oil in the area of the shrink disk seat.

This is essential for safe and reliable torque transmission.

Do not use contaminated solvents or dirty cloths nor cleansing agents containing oil (such as paraffin or turpentine) for removing grease.

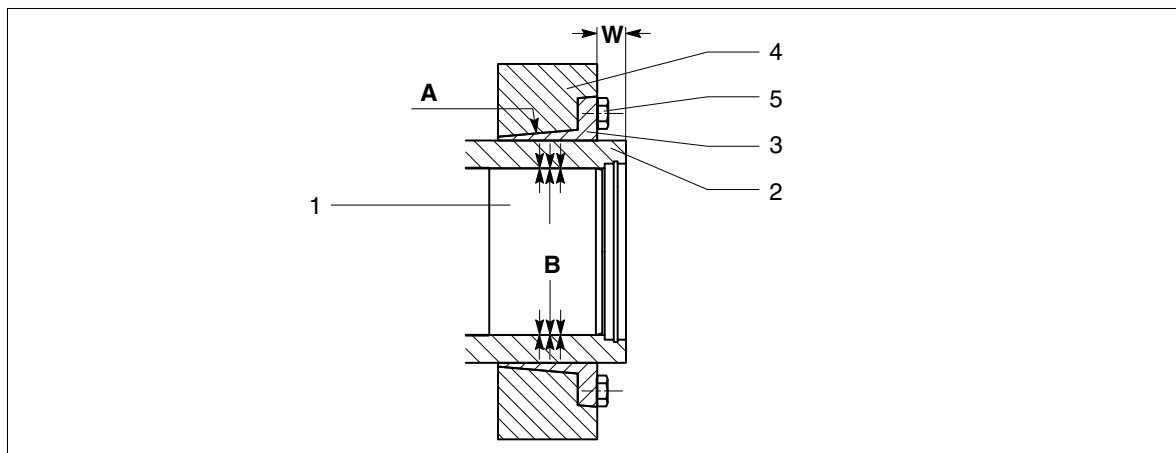


Fig. 42: Fitting the shrink disk

A	Greased	B	Absolutely grease- and oil-free	W	Installation height
1	Stub shaft	3	Inner ring	5	Tensioning bolt
2	Hollow shaft	4	Outer ring		



The outer surface of the hollow shaft must be lightly greased in the area of the shrink disk seat.

For a detailed view, refer to the dimensioned drawing in the gear-unit documentation.

- Place the shrink disk on the hollow shaft and fasten, if required. For the exact installation height (W) of the shrink disk, refer to the dimensioned drawing.



For transporting and lifting the shrink disk it may be required to use a suitable lifting device!

Make sure that the shrink disk cannot slip off the hollow shaft.



Do not tighten the tensioning bolts (5) until the stub shaft is installed too.

- Tighten the tensioning bolts (5) gradually one after the other, working round several times by quarter turns.
- Tighten all tensioning bolts (5) until the end faces of the inner ring (3) and the outer ring (4) are flush and the maximum tightening torque of the tensioning bolts has been achieved. The correct alignment is to be checked using a ruler. The max. tolerance is ± 0.2 mm.



The correct clamping condition can thus be checked visually.



To avoid overloading the individual bolts, the maximum tightening torque (see table 13) must not be exceeded. If, when tightening the clamping bolts at max. tightening torque, the inner and outer ring are not aligned, Siemens must be consulted.

Table 13: Maximum torques for tensioning bolts

Tensioning-bolt thread	max. tightening torque per bolt Strength class 12.9 Nm
M 20	570
M 24	980
M 27	1450
M 30	1970
M 33	2650



The shrink disk has been identity-marked on the outer ring (4). In case of contacting Siemens this identification must be referred to.



For safety reasons, a protective cover should be mounted to prevent contact! This cover must be applied after completion of all works on the shrink disk.



Only the complete shrink disks supplied by the manufacturer may be used. Combining components from different shrink disks is not permitted.



Tightening the fastening bolts using an impact screwdriver is not permitted!

6.7.2 Demounting the shrink disk

- Remove the protective cover.
- Remove any rust deposits from the shaft and the hollow shaft.



Under no circumstances must the tensioning bolts be unscrewed one after the other.

- Undo all tensioning bolts one after the other by approx. 1/4 turn.



The stored energy of the outer ring is slowly loosened during disassembly via the bolts to be loosened. In order that this is carried out correctly, the procedure described here must be carefully adhered to!

- All tensioning bolts should now be further loosened one after the other by approx. 1 turn.



The outer ring should now release of its own accord from the inner ring. If this is not the case, the outer ring can be detensioned with the forcing threads. To this purpose screw some of the adjacent fastening bolts into the forcing threads. The now releasing outer ring is braced against the remaining bolts. This operation must be carried out until the outer ring completely releases of its own accord.

- The shrink disk is to be secured against axial shifting.
- Draw the stub shaft out of the hollow shaft.
- Pull the shrink disk off the hollow shaft.



For transporting and lifting the shrink disk it may be required to use a suitable lifting device!

6.7.3 Cleaning and greasing the shrink disk



Only dirty shrink disks must be disassembled and cleaned.

- Inspection of all parts for any damage.



Damaged parts must be replaced with new ones! The use of damaged parts is not permissible!



Only the complete shrink disks supplied by the manufacturer may be used. Combining components from different shrink disks is not permitted.

- Thoroughly clean all parts.



Do not use contaminated solvents or dirty cloths nor cleansing agents containing oil (such as paraffin or turpentine) for removing grease.

- The conical surfaces of the inner and outer rings (3 and 4, see figure 42) must be free of grease and oil.
 - A thin layer of grease must be applied evenly to the conical surfaces of the inner and outer rings (3 and 4, see figure 42).
 - Provide the tensioning bolts (5, see figure 42) on the contact surface and on the thread with lubricant.
 - Use a solid lubricant paste with a **high MoS₂-based molybdenum disulphide content** which will not slide during fitting work and which shows the following characteristics:
 - friction coefficient " μ " = 0.04
 - resistant to pressure up to a maximum pressure of 300 N/mm²
 - ageing-resistant

Table 14: Recommended lubricants for shrink disks after their cleaning ¹⁾

Lubricant	Form	Manufacturer
Molykote G Rapid	Spray or paste	DOW Corning
Aemasol MO 19 P	Spray or paste	A. C. Matthes
Unimoly P 5	Powder	Klüber Lubrication
gleitmo 100	Spray or paste	Fuchs Lubritec

¹⁾ Other lubricants may be used if they have the same characteristics.

- Join inner ring (3) and outer ring (4).
- Place the tensioning bolts and screw in some threads by your fingers.



Observe the manufacturer's instructions for handling lubricants!

Fitting and start-up must be carried out by properly trained specialist personnel.

6.7.4 Re-fitting the shrink disk



For re-fitting the shrink disk the procedure described in item 6.7.1 must be adhered to.

6.7.5 Inspection of the shrink disk



In all cases the inspection relating to the shrink disk should be carried out simultaneously with the examination of the gear unit, **however at least every 12 months.**

Inspection of the shrink disk is limited to a visual assessment of its condition. The following must be observed when carrying out this work:

- loose screws
- damage caused by force
- flush position of the inner ring (3) in relation to outer ring (4).

6.8 Couplings, clutches

As a rule, flexible couplings or safety slip clutches are provided for the drive of the gear unit.

If rigid couplings or other in- and/or output elements, which create additional radial and/or axial forces, (e.g. gear wheels, belt pulleys, disk flywheels, hydraulic couplings) are to be used, this must be agreed by contract.



Couplings must be balanced in accordance with the specifications in the pertinent instructions manual!



For maintenance and operation of the couplings, refer to the specific operating instructions for the couplings.



When installing 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 due to angular and/or axial misalignments result in premature wear and/or 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.



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

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



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

The coupling parts may get out of alignment:

- due to imprecise alignment during assembly or installation
- during operation of the system due to:
 - heat expansion
 - shaft flexure
 - too weak machine frames

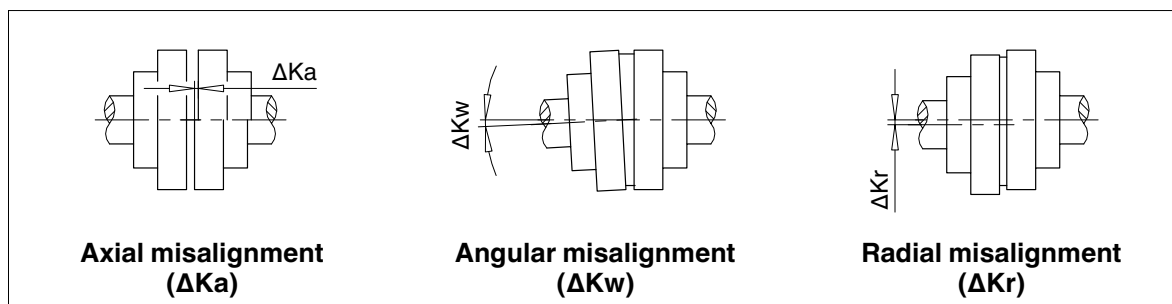


Fig. 43: Possible misalignments

6.10 Fitting the torque arm for the gear-unit housing

6.10.1 Attaching the torque arm



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.

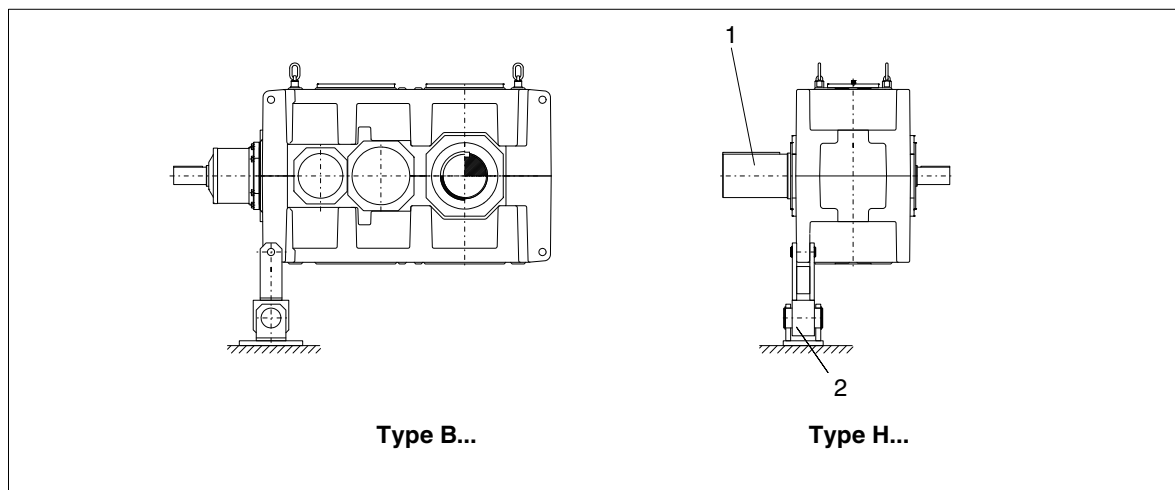


Fig. 45: Torque arm for gear-unit housing

1 Machine side

2 Support block



Motors and torque arms should be fitted only in consultation with Siemens.



Foundation type for fastening the torque arm, see item 6.3.1, "Foundation".

6.11 Gear unit with cooling coil

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



Observe also item 5.9.2.

6.12 Gear unit with add-on components

- For the technical data to the add-on components, as stated in item 6.13 to 6.18, refer to the order-specific list of equipment.



The electrical equipment for regulation and control must be wired in accordance with the equipment suppliers' instructions.



For operation and maintenance the operating instructions provided specifically for the order and the specifications in item 5.9.3 to 5.16 must be observed.

- 6.13 Gear unit with heating element
 - Wire the heating elements electrically.
- 6.14 Gear unit with oil-temperature monitoring system
 - Wire the temperature monitor with evaluating instrument (to be provided by customer) electrically.
- 6.15 Gear unit with oil-level monitoring
 - Wire the level-limit switch electrically (see item 7.1.5).
- 6.16 Bearing-monitoring system
 - Wire the temperature monitor with evaluating device electrically (in the case of a configuration as described in item 5.15.1). The evaluating device must be provided by the customer.
- 6.17 Gear unit with speed transmitter
 - Wire the speed transmitter electrically.
- 6.18 Gear unit with separate oil-supply system
 - Remove the sockets and/or flanges from 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 mounting procedure.



Consult operating instructions for oil-supply system.

- 6.19 Final work
 - After installation of the gear unit check all screw connections listed in table 15 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 refitted. For this refer to the details in the data sheet, the list of equipment and the associated drawings.



Any oil-drain cocks must be secured against accidental opening.

If an oil-sight glass is used for monitoring the oil level, it must be protected against damage.

- 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 should be protected against moisture.
- Check that protective measures have been taken!

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 in 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, signal-emitting torque wrench - Tightening with precision mechanical screwdriver with dynamic torque measuring
	D	- Torque-controlled tightening with mechanical screwdriver.
Inspection-hole cover Protective hood Canopy	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 $\mu_{total} = 0.14$. The friction coefficient $\mu_{total} = 0.14$ 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 $\mu_{total} = 0.14$

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
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

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	
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



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"!



The gear unit must not be started up, if the required instructions are not available.



When handling oils and/or preservative agents, protective gloves and safety glasses must always be worn!

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 on must be deprotected, using suitable media (white spirit, special solvent etc.).
The deprotection also applies to bright surfaces of the gear unit, onto which components are to be fitted on.



**Any solvent spillage must be removed immediately with a binding agent.
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 here!**

7.1.2 Removal of preservative agent from interior



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

The location of the oil-draining points is marked by an appropriate symbol in the dimensioned drawing in the gear-unit documentation.

Oil-draining point:



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



**Any oil spillage must be removed immediately with an oil-binding agent.
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 here!**

- Close the oil-drain plug and/or screw in the oil-drain plug.
- Screw in any unscrewed residual-oil-drain plugs again.

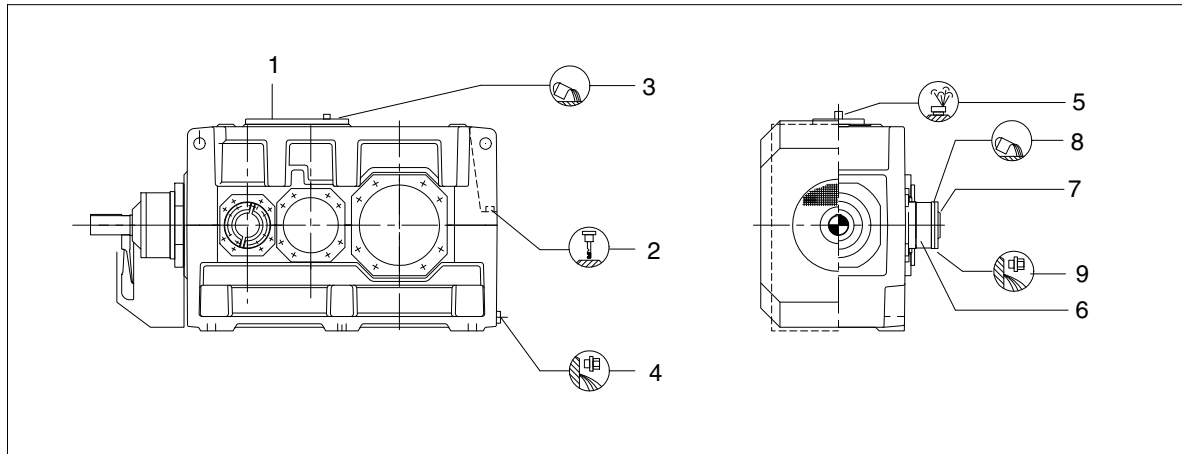


Fig. 46: Oil inlet and oil drain on gear units type B3..

- | | | | |
|---|----------------------------------|---|-----------------------------------------------|
| 1 | Inspection and/or assembly cover | 6 | Backstop |
| 2 | Oil dipstick | 7 | Cover for backstop |
| 3 | Oil inlet | 8 | Screw plug for oil inlet backstop |
| 4 | Oil-drain plug | 9 | Screw plug for residual-oil drainage backstop |
| 5 | Air filter (screw plug) | | |

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

7.1.3 Filling with lubricant



When filling oil into the gear unit first the lubricating point 8 must be provided with the oil quantity and oil type specified on the rating plate (see figure 46).

- Undo and remove fastening screws on the inspection and/or assembly cover.
- Remove cover with seal from housing (seal will be used again).
- Visual check of the interior parts for corrosion.



If corrosion is found, contact the Siemens customer service.



Using a filter (max. mesh 10 µm), fill the gear unit with fresh oil up to the MAX mark on the oil dipstick or oil-sight glass. Remember to fill the oil pockets above the bearings and (with bevel-gear units) at the input shaft on the inside.



Any oil spillage must be removed immediately with an oil-binding agent. 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 here!



The sealing surfaces must not be contaminated nor damaged.



The quality of the oil used must meet the requirements of the separately supplied BA 7300 instructions manual, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in table "T 7300" (for link, see the BA 7300 document supplied separately), because 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 marks on the oil dipstick or oil-sight glass are decisive for the amount of oil to be filled in.

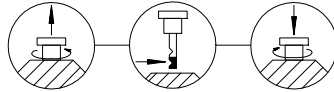


In case of gear units fitted with forced lubrication or an oil-cooling system, the oil circuit must also be charged with oil. To do this, briefly start up the gear unit with add-on pump (observing the description in section 8).

- Check the oil level in the gear-unit housing with the oil dipstick or by means of the oil-sight glass.



The oil level must be at the upper mark on the oil dipstick or oil-sight glass.



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



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

7.1.4 Gear unit with backstop



Observe details at item 5.8, "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.



To avoid damaging the backstop or the gear unit, the motor must not be run adversely to the stop direction of the gear unit. Observe the notice fixed to the gear unit.



If the gear unit is operated at speeds below the speed at which the backstop disengages, the backstops must be regularly renewed. The frequency of change is stated on the dimensioned drawing prepared in accordance with the order and on a plate on the gear unit. This plate is attached to the gear-unit housing close to the backstop.

Before connecting the motor, determine the direction of rotation of the three-phase current supply using a phase-sequence indicator, and connect the motor in accordance with the pre-determined direction of rotation.



The unit can be started up once the amount of oil indicated on the notice has been poured in through the oil-filler plug screw of the backstop. Always use oil of the same type and viscosity as for the gear unit.

7.1.5 Oil-level monitoring system



This monitoring is designed as a standstill monitoring (gear unit stop) and checks the level of the oil before the unit is started up. It should be wired in such a way that, when the signal "oil level too low" is given, the drive motor cannot start and that an alarm is given. During operation, any active signal should be bridged.

7.1.6 Heating



Never switch the heating on, unless complete immersion of the rod heater in the oil bath is ensured. Fire hazard!
If heating elements are installed afterwards the maximum heating capacity (see table 12 in item 5.11) on the outer surface of the heating element must not be exceeded.



The correct setting of the switch points must be checked!

7.2 Preparing the start-up



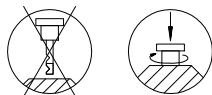
All data must be recorded (see items 7.2.1 to 7.2.4).

7.2.1 Checking procedure

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



Presence of explosion-protection marking



Oil level

The oil level must be monitored by means of the existing oil-level monitoring equipment. To do so, the gear unit must be shut down.

When the oil is cool, the level should be at the upper mark on the oil dipstick or oil-sight glass. When the oil is warm it may slightly exceed this mark.



It must in no case be allowed to fall below the mark. If necessary, top up to the correct 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 alignment dimensions in accordance with items 6.3.2.1 to 6.3.2.4 and the tensioning pressures and the initial-tensioning forces in accordance with 6.3.2.2 to 6.3.2.4 must also be recorded in this document.



The document must be kept with the instructions.

7.2.1.1 Gear unit with cooling coil or oil-supply system

Gear unit with cooling coil:

- Fully open the stop valves in the coolant in- and outflow pipes of the cooling system.
- Check that connecting lines are correctly fastened and tight.



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 the list of equipment.

- Start the drive motor.

Gear unit with external oil-supply system:



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



The permissible pressure and temperature values specified in the data sheet and/or list of equipment must not be exceeded. This is to be checked before the start-up.

- Start the drive motor.

7.2.2 Oil-level check



After the first start-up check the oil level. This applies in particular to oil-supply systems (see item 8.2).

7.2.3 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 appropriate running in.

The maximum permissible oil-sump temperature is 90 °C (applies to mineral oil).

At higher temperatures the gear unit must be shut down and Siemens Customer Service should be consulted.

7.2.4 Bearing monitoring (vibration measurement)



If the necessary measures have been made for vibration measurement as bearing monitoring (see item 5.15.2 or 5.15.3), vibration measurements must be taken in order to obtain initial values and/or standard values for the diagnosis. These measurements must be recorded and filed.

7.3 Removal from service

- Switch off the drive unit.



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

- 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. To prevent freezing, drain the water from the cooling coil or the water oil-cooler.
- Start the gear unit and allow it to run briefly (5 to 10 minutes) approx. every 3 weeks (during a shut-down period no longer than 6 months).
- In case of a storage period longer than 6 months and any connection to an oil-supply system, the connection between the oil-supply system and the gear unit should be disconnected. The holes on the gear unit (oil return line and pressure line) must be closed airtight.
- Treat the gear unit with preservative, see items 7.3.1 and 7.3.2 (before a shut-down period exceeding 6 months).

7.3.1 Interior preservation before 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 oil

Gear units with splash lubrication systems and contacting shaft seals can be filled and stored with the correct type of oil filled 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.



In case of a preservation period exceeding 36 months the shaft-sealing rings must be replaced before start-up.



The leaktightness of the gear unit must be checked regularly!

7.3.1.2 Interior preservation with preservative agent



See figures 7 to 10.

- Place a suitable container under the oil-draining 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").



**There is a danger of scalding from the hot oil emerging from the housing. Wear safety gloves and safety glasses!
Any oil spillage must be removed immediately with an oil-binding agent.**



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.

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



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 fastening screws on the inspection and/or assembly cover.
- Remove cover with seal from housing (seal will be used again).
- Fill the gear unit with "Castrol Alpha SP 220 S".
Filling quantity according to the gear-unit dimensions (length x width x height) x 0.1



In all cases the special oil "Castrol Alpha SP 220 S" with additional corrosion-prevention features (addition "S") must be used.



Any oil spillage must be removed immediately with an oil-binding agent.

- Place inspection and/or assembly cover including seal on the housing.
- Place the fastening bolts of the inspection and/or fitting cover and tighten them to the specified torque (see item 6.20).



Before re-starting the gear unit, replace the screw plug with the air filter. Observe the instructions in item 7.1.2.



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 also 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.



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

- Apply preservative agent.



For preservative agent see table 9 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 satisfactory 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, if applicable.



**The coating must not carry an electrostatic charge!
The operator must ensure that highly effective mechanisms which can set up a charge in the coating are safely avoided.**

During operation the gear unit must be monitored for:



Operating temperature **The permitted maximum operating temperature is:
90 °C**
At higher temperatures the gear unit must be shut down and Siemens Customer Service should be consulted.

Changes in gear noise

Oil pressure of the oil-supply system (min. 0.5 bar).

Possible oil leakage at the housing and shaft seals

Bearing vibrations with present measuring sequence.

If any safety device has triggered, it must only be possible to start the drive again after releasing the reclosing interlock. The operator must ensure this.

8.2 Oil level



**To check the oil level, stop operation of the gear unit.
Depending on the type the following oil levels apply when the motor has cooled down:**
– Upper mark on the oil dipstick
– Upper mark on the oil-level indicator
– Middle of the oil-sight glass
When the oil is hot, the oil-level marks may be slightly exceeded. It must in no case be allowed to fall below the mark. If necessary, top up to the correct level.



The oil level in the oil-supply system (if fitted) must be checked.
For this, the operating instructions of the oil-supply system must be observed!

8.3 Irregularities



The drive unit must be switched off at once,
– if irregularities are found during the operation

or

– if the pressure monitoring device in the oil-cooling system triggers alarm
(only with correspondingly equipped gear units).

**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 one of our customer-service centres should be called in (see section 2).

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.



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



To remedy faults and malfunctions, the gear unit must always be taken out of service. Secure the drive unit to prevent it from being started up unintentionally. Attach a warning notice to the start switch!

9.2 Possible faults

Table 17: Faults, causes and remedy

Faults	Causes	Remedy
Changes in gear-unit noise.	Damage to gear teeth.	Contact Customer Service. Check all toothed components and replace any damaged parts.
	Excessive bearing play.	Contact Customer Service. Adjust bearing backlash.
	Bearing 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 / nuts to specified torque. Replace damaged bolts / nuts.
Increased temperature at the bearing points.	Oil level in gear-unit housing too low or too high.	Check oil level at room temperature and, if necessary, top up oil.
	Oil too old.	Check date of last oil change and, if necessary, change oil. See section 10.
	Oil-supply system defective.	Check the oil-supply system, replace any defective parts. Consult operating instructions for oil-supply system.
	Bearing defective.	Contact Customer Service. Check and, if necessary, replace bearings.
	Oil is badly contaminated.	Have the oil analysed; if necessary filter or change the oil (see section 10).

Faults	Causes	Remedy
Oil escapes.	<p>Inadequate sealing of housing covers and/or joints.</p> <p>Radial shaft-sealing rings defective.</p> <p>Pipework leaky.</p>	<p>Check and, if necessary, replace sealings. Seal joints.</p> <p>Check radial shaft-sealing rings and, if necessary, replace (see item 9.2.1).</p> <p>Check, if necessary replace of seal.</p>
Oil foaming in the gear unit.	<p>Preservation agent not completely drained.</p> <p>Oil-supply system has been operated too long at low temperatures.</p> <p>Gear unit too cold in operation.</p> <p>Water in oil.</p> <p>Oil too old (defoaming agent used up).</p> <p>Unsuitable oils mixed up.</p>	<p>Oil change.</p> <p>Stop oil-supply system. Allow the oil to degas.</p> <p>Shut down gear unit and have oil degassed. Restart without cooling water.</p> <p>Test the oil, change oil if necessary.</p> <p>Test the oil, change oil if necessary.</p> <p>Test the oil, change oil if necessary.</p>
Water in oil.	<p>Defective oil-supply system or cooling coil.</p> <p>Gear unit exposed to cold air from machine-room ventilator: Water condensing.</p> <p>Climatic conditions.</p>	<p>Check the oil-supply system or cooling coil, replace any defective parts. Consult operating instructions for oil-supply system.</p> <p>Protect gear unit, if possible, with suitable heat insulation. Close air outlet or alter its direction by structural measures.</p> <p>Contact Customer Service. If necessary, fit wet-air filter.</p>
Increased operating temperature.	<p>Oil level in housing too high.</p> <p>Oil too old.</p> <p>Oil badly contaminated.</p> <p>Defective oil-supply system or cooling coil.</p> <p>On gear units with fan: Suction opening in air-guide cover and/or gear-unit housing badly contaminated.</p>	<p>Check oil level and, if necessary, adjust.</p> <p>Check date of last oil change and, if necessary, change oil. See section 10.</p> <p>Change oil. See section 10.</p> <p>Check the oil-supply system or cooling coil, replace any defective parts. Consult operating instructions for oil-supply system.</p> <p>Clean air-guide cover and gear-unit housing.</p>

Faults	Causes	Remedy
Temperature at backstop too high. Locking function fails.	Damage to backstop.	Contact Customer Service. Check backstop and, if necessary, replace.
Main drive motor does not start.	Incorrect direction of rotation of the motor. Incorrect installation and/or defect of cage with sprags of backstop .	Change polarity of motor. Contact Customer Service. Install cage of the backstop turned by 180° and/or replace.
Fault in oil-supply system.		Consult operating instructions for oil-supply system.

9.2.1 Leakage / leaktightness

In 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 MD and other FVA member companies, brief descriptions, required measures and notes on this subject are listed in the following overview.

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

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 RWDR	Clean carefully only, if dirt adheres; 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 down with clean cloth; 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
Temporary leak	Short-term failure of the sealing system	Wipe away with clean cloth; observe	E.g. through small particles on the seal edge, which can be removed again in further operation No reason for complaint
Apparent leak	Temporary leak	Wipe down with clean cloth	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



Escaping oil mist from a ventilation valve or a labyrinth seal is functional and therefore **not a reason for complaint**.

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 done with care and by duly trained and qualified personnel only.

The following applies to all work in item 10.2:



Switch the gear unit and add-on components off.

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



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:

a daily operating time of	24 h
a duty factor "ED" of	100 %
an input-drive speed of	1500 1/min
operating temperature of	80 °C

**The operator must ensure that the intervals stated in table 19 are adhered to.
This also applies if the maintenance work is included in the operator's internal maintenance schedules.**

Table 19: Maintenance and repair work

Measures	Periods	Remarks
Check the oil temperature	Daily	
Check for unusual gear-unit noise	Daily	
Check the oil level	Monthly	See item 8.2.
Comparison of vibration values for bearing monitoring with initial values (reference values) on starting up	Every 3000 operating hours	see item 7.2.4.
The proper function and measurement accuracy of the ignition-protection system for the temperature monitoring should be checked at regular intervals according to the instructions of the manufacturer of the ignition-protection device	See instructions of the manufacturer	The operator must ensure this!
Check the gear unit for leaks	Monthly	
Test the water content of the oil	Approx. 400 operating hours after start-up	See item 10.2.1.
Perform the first oil change	Approx. 400 operating hours after start-up	See item 10.2.2.

Measures	Periods	Remarks
Perform subsequent oil changes	Every 24 months or 10 000 operating hours	See item 10.2.2.
	or in accordance with test result	See item 10.20.1.
Clean air filter	Every 3 months	See item 10.2.3.
Clean fan, air guide cover and gear-unit surface	Depending on requirements, at least every 2 years	See item 10.2.4.
Refill the Taconite seals with grease	Every 3000 operating hours or at least every 6 months	See item 10.2.5.
Check the cooling coil	Every 2 years	See item 10.2.6.
Check the hose lines	Yearly	See item 10.2.7.
Change the hose lines	6 years from the manufacturing date impressed	See item 10.2.7.
Check tightness of screw connections.	After 400 operating hours, thereafter every 2 years	See item 10.2.9.
Check the shrink disk.	Every 12 months	see item 6.7.5.
Inspection of the gear unit	Approx. every 2 years	See item 10.4.



**The coating must not carry an electrostatic charge!
The operator must ensure that highly effective mechanisms which can set up a charge in the coating are safely avoided.**

10.1.1 General oil-service lives

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



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 Description of maintenance and repair works

10.2.1 Examine water content of oil, conduct oil analyses

More information about examining the oil for water content or conducting oil analyses can be found in our manual BA 7300 and/or is obtainable from your lubricant manufacturer or from our 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 gear unit is running. A suitable connection point is normally located upstream of the gear unit input (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 indicated in table 19 (see item 10.1) it is possible to have an oil sample tested at regular intervals by the Technical Service of the relevant oil company and to have it released for further use.

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



Please observe the separately attached operating instructions BA 7300 EN.

- The instructions in item 7.1 must be observed!
- Drain the oil while the gear unit is still warm, i.e. immediately after shutting down the machinery.



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 grade or make of oil, the gear unit must, if necessary, be flushed out with the new oil grade. Flushing is not necessary, if the new service oil is fully compatible with the old service oil in all respects. Compatibility must be confirmed by the oil supplier. If there is a change to another oil grade or make, Siemens recommends flushing out the gear unit with the new grade of service oil.



When changing the oil, the housing and the oil-supply system, if available, 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 oil.

- Stop the gear unit by switching off the drive unit (see item 7.3).
- Place a suitable container under the oil-draining point of the gear-unit housing.
- Unscrew the air filter on the top of the housing.
- Unscrew the oil-drain plug and/or the open oil-drain cock and drain the oil into the collecting container.
- Drain the oil from the oil-supply system (if fitted; see operating instructions to the oil-supply system).



There is a danger of scalding from the hot oil emerging from the housing. Wear safety gloves and safety glasses! Any oil spillage must be removed immediately with an oil-binding agent.



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.

- Clean the permanent magnet of the oil-drain plug thoroughly.
- Close the oil-drain plug and/or screw in the oil-drain plug.
- Clean the oil filter in the oil-cooling system (see operating instructions of the oil-supply system).
- Clean the air filter (see item 10.2.3).
- Screw in the air filter again.
- Fill fresh oil into the gear unit (see item 7.1.3).



In case of gear units fitted with forced lubrication or an oil-cooling system, the oil circuit must also be charged with oil. To do this, briefly start up the gear unit with add-on pump as described in section 7.

Gear units with backstop:

Loosen residual oil-drain plug (pos. 9, figure 46) and drain off the oil into a vessel. Clean oil-drain plug thoroughly and screw in place.



**There is a danger of scalding from the hot oil emerging from the housing.
Wear protective gloves!
Any oil spillage must be removed immediately with an oil-binding agent.**



When filling the gear unit with oil (see item 7.1.3), start by the supplying lubricating points (8, figure 46) with the oil quantity and oil grade specified on the additional plates.

10.2.3 Clean the air filter



If a layer of dust has built up, the air filter must be cleaned, whether or not the minimum period of 3 months has expired.

- Remove the air filter.
- Clean the air filter using benzine or a similar cleanser.
- Dry the air filter and/or blow with compressed air.



**Be especially careful when blowing with compressed air.
Wear protective glasses!**



Foreign bodies must be prevented from entering the gear unit.

10.2.4 Clean fan, air guide cover and gear-unit surface.

- The instructions in item 5.9.1 must be observed!
- Demount the air-guide cover.
- Using a stiff brush, remove any dirt adhering to the gear-unit housing, fan wheel, air guide cover and safety grid.
- Remove any corrosion.
- Screw safety grid with fastening screws back onto the air guide cover.



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 operating conditions.

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

10.2.5 Refill Taconite seals with grease

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



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



Information on approved greases can be found in our table of approved materials "T 7300" (for a link see separately attached manual BA 7300).



Remove and dispose of any old grease escaping.

10.2.6 Check cooling coil

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



If the cooling coil is dirty, heat is no longer withdrawn effectively from the gear unit. Any dirt adhering to the inside of the 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. These analyses are carried out by companies which specialise in chemical cleaning. They also supply the special cleaning agents required.
- Before using these cleaning agents, ensure that they will not damage the coil materials (contact Siemens). Observe the manufacturer's instructions at all times when using different cleaning agents by several manufacturers.



Avoid burns when working with corrosive cleaning agents. Always observe the manufacturers' instructions for safety and use.

Wear personal protective equipment (gloves, safety glasses)!

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

10.2.7 Check hose lines

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



The period of use of the hose lines must not exceed 6 years from the manufacturing date stamped on them.

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



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.



If during inspections faults are found, these must be rectified immediately or suitable countermeasures taken.

10.2.8 Top up oil

- The instructions in item 7.1.3 must be observed!
- Always top up with the same type of oil as already used in the unit (see also item 10.2.2).

10.2.9 Check tightness of screw connections

- The instructions in item 10.1 must be observed!
- Check tightness of all fastening bolts (see item 6.20).



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

10.3 Final work



For operating and servicing the components, the pertinent instruction manuals and the specifications in sections 5 and 7 must be observed.
For technical data, refer to the data sheet and/or the list of equipment.



Observe also item 6.19.

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 instructions manual, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in table "T 7300" (for link, see the BA 7300 document supplied separately), because they have been tested and meet the requirements.



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 quantity of oil indicated on the rating plate is an approximation only. The marks on the oil dipstick or oil-sight glass are decisive for the amount of oil to be filled in.

The instructions manual BA 7300 relating to the 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 regularly checking whether the selected lubricating oil is still recommended by Siemens. If it is not, the brand of oil should be changed.

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.



We guarantee only the original spare parts supplied by us. Non-original spare parts have not been tested or approved by us. They 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.

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

When ordering spare parts, always state the following:

Order number, item	Type, size	Part number	Quantity
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11.2 Spare parts and customer-service addresses

When ordering spare parts or requesting a service specialist, please contact Siemens first (see section 2).

12. Declarations

12.1 Declaration of incorporation

Declaration of incorporation

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

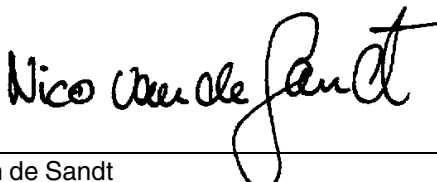
The manufacturer, Siemens AG, D - 46393 Bocholt, declares with regard to the partly completed machinery

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, BKM
Sizes 23 to 28

for driving machines in general engineering applications:

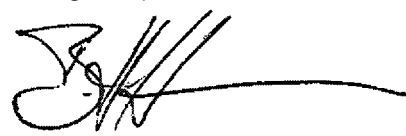
- The special technical documents described in Annex VII B have been prepared.
- The following basic health and safety requirements set out in Directive 2006/42/EC, Annex I, are applied and are satisfied:
1.1, 1.1.2, 1.1.3, 1.1.5; 1.2.4.4, 1.2.6; 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.6, 1.3.7, 1.3.8, 1.3.8.1; 1.4.1, 1.4.2.1; 1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.6, 1.5.7, 1.5.8, 1.5.9, 1.5.10, 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, 1.7.4.1, 1.7.4.2, 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 partly completed machinery is in conformity with the provisions of the Directive(s):
94/9/EG
- The manufacturer undertakes, in response to a reasoned request by the national authorities, to transmit in electronic form relevant information about the partly completed machinery.
- The person authorised to compile the relevant technical documentation is:
Dr. Nico van de Sandt (Head of Engineering DAE)

Voerde, 2011-02-25



Dr. Nico van de Sandt
(Head of Engineering DAE)

Voerde, 2011-02-25



Dr. Bernhard Hoffmann
(Vice-President Business Subsegment DA)



Declaration of conformity

within the meaning of EC Directive 94/9/EC of 23.03.1994 and the legal requirements laid down for its implementation

The manufacturer, Siemens AG, 46393 Bocholt, declares that the equipment described in these assembly and operating instructions

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, BKM
Sizes 23 to 28

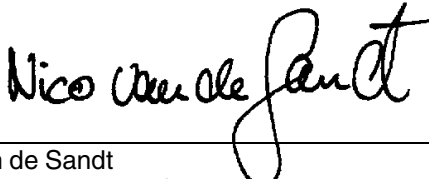
is in conformity with Article 1 and Article 8, Paragraph 1 b) ii) or 1 c) of Directive 94/9/EC and complies with the requirements of Directive 94/9/EC and the following standards:

- DIN EN 1127-1 : 02-2008
- DIN EN 13463-1 : 07-2009
- DIN EN 13463-5 : 03-2004
- DIN EN 13463-6 : 07-2005
- DIN EN 13463-8 : 01-2004
- DIN EN 60079-0 : 05-2007

The technical documentation has been delivered to the body named below:


DEKRA EXAM GmbH, 44727 Bochum, code number: 0158

Voerde, 2011-02-25



Dr. Nico van de Sandt
(Head of Engineering DAE)

Voerde, 2011-02-25



Dr. Bernhard Hoffmann
(Vice-President Business Subsegment DA)

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Subject to modifications

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www.siemens.com/drivetechnology