

Gear unit

H..V, B..V
Sizes 23 to 28

Assembly and operating instructions
BA 5071 EN 03/2011

FLENDER gear units

SIEMENS

SIEMENS

Gear unit

H..V, B..V
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

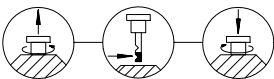
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Exclusion of liability

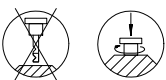
We have checked the content of the instructions for compliance with the hard- and software described. Nevertheless, variances may occur, and so we can offer no warranty for complete agreement. The information given in these instructions is regularly checked, and any necessary corrections are included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

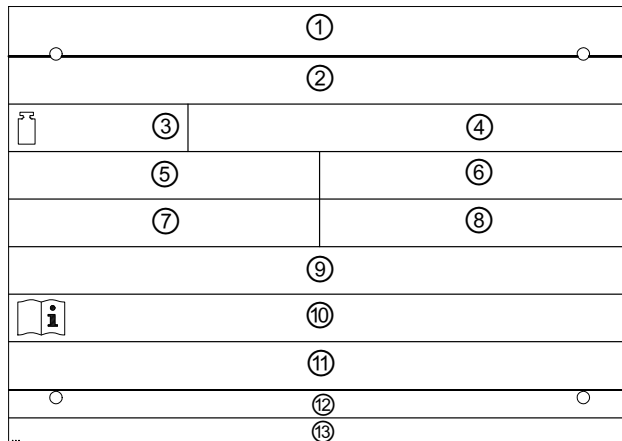
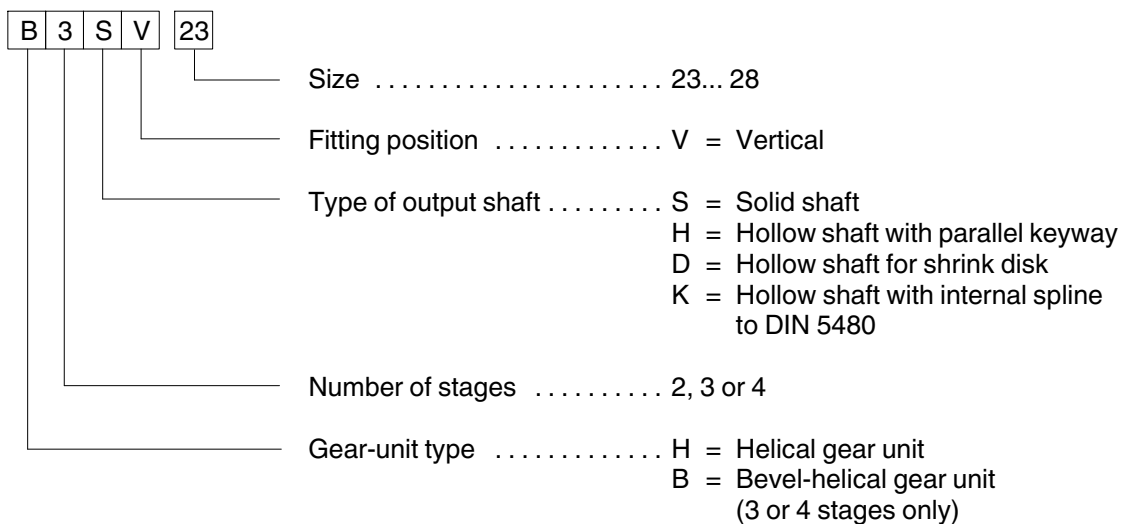


Fig. 1: Rating plate gear unit

- | | | | |
|---|---|---|--|
| 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 | Special information |
| ⑤ | Type, size *) | ⑫ | Manufacturer and place of manufacture |
| ⑥ | Power rating P_2 in kW or T_2 in Nm | ⑬ | Country of origin |
| ⑦ | Speed n_1 | | |

*) Example 1



Data on weights and measuring-surface sound-pressure levels of the various gear types are given in items 1.2 and 1.3.

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

1.1.1 Ambient atmosphere and ambient temperature



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

1.2 Types and weights

1.2.1 Types

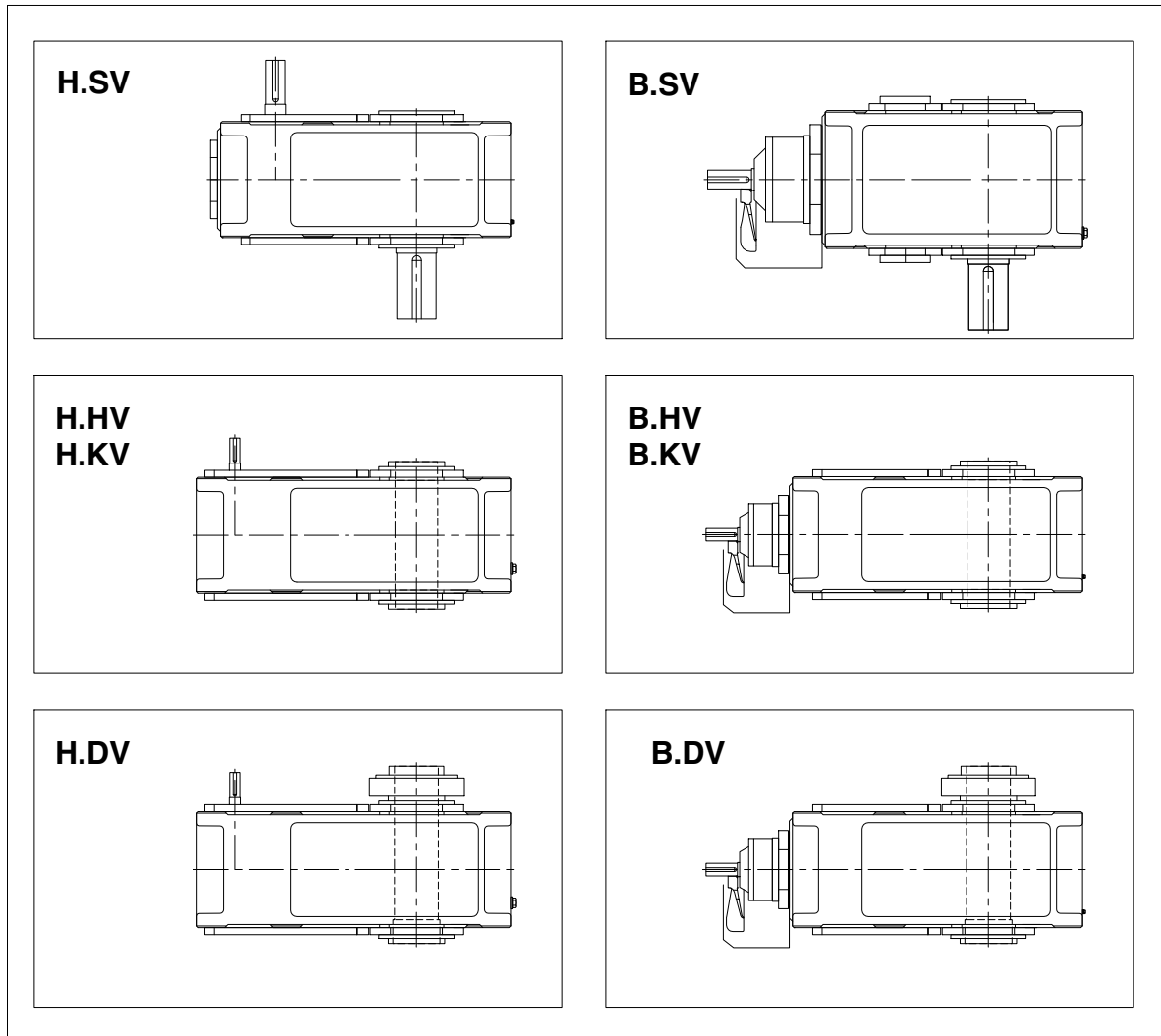


Fig. 2: Helical gear unit and bevel-helical gear unit of types H..V and B..V

1.2.2 Weights



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

1.3 Measuring-surface sound-pressure level

The gear unit has a measuring-surface sound-pressure level at a distance of 1 m, which can be found in tables 1 to 5.

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.

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

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

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

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

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

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

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

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

Type	i_N	n_1 1/min	Gear-unit size					
			23	24	25	26	27	28
H2	6.3	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	86	-	-	-	-	-
	10	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	11.2	1000	88	88	-	-	-	-
		900	-	-	-	-	-	-
		750	83	84	84	85	-	-
	16	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	18	1000	86	87	-	-	-	-
		900	-	-	-	-	-	-
		750	82	82	82	83	-	-
22.4	1800	-	-	-	-	-	-	
	1500	-	-	-	-	-	-	
	1200	-	-	-	-	-	-	
H3	22.4	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	35.5	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	40	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	63	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	71	1000	-	-	-	-	-	-
		900	-	-	-	-	-	-
		750	-	-	-	-	-	-
	100	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
-	1000	-	-	-	-	-	-	
	900	-	-	-	-	-	-	
	750	-	-	-	-	-	-	

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

Table 4: 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	-	-	-	-	-	-
	-	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	1800	-	-	-	-	-	-
		1500	-	-	-	-	-	-
		1200	-	-	-	-	-	-
	-	1000	81	82	83	83	-	-
		900	-	-	-	-	-	-
		750	78	79	79	80	-	-
	31.5	1800	-	-	-	-	-	-
		1500	84	84	-	-	-	-
		1200	-	-	-	-	-	-
	-	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	-	-	-	-	-	-	
-	1000	76	77	77	78	-	-	
	900	-	-	-	-	-	-	
	750	73	73	74	75	-	-	
71	1800	-	-	-	-	-	-	
	1500	81	82	82	83	-	-	
	1200	-	-	-	-	-	-	
-	1000	76	77	77	78	-	-	
	900	-	-	-	-	-	-	
	750	73	73	74	75	-	-	
100	1800	-	-	-	-	-	-	
	1500	81	82	82	83	-	-	
	1200	-	-	-	-	-	-	
-	1000	76	77	77	78	-	-	
	900	-	-	-	-	-	-	
	750	73	73	74	75	-	-	

Table 5: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units 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 most various industry areas. Possible areas of applications for gear units of this series include sewage treatment, chemical, food processing, paper 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.

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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Am Industriepark 2
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 and 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.

- 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! 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**.



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.



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

- Removed safety equipment must be re-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 must always be obtained from Siemens (see section 11, "Spare parts, customer service").

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



In the 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 does not comply with the requirements in Directive 94/9/EC and must therefore, in the area of applicability of this directive, not be used in potentially explosive areas.

Caution, serious danger!

Should the gear unit be used outside the area of applicability of Directive 94/9/EC within potentially explosive areas, the nationally applying protective prescriptions with regard to explosion protection must always be observed.

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:

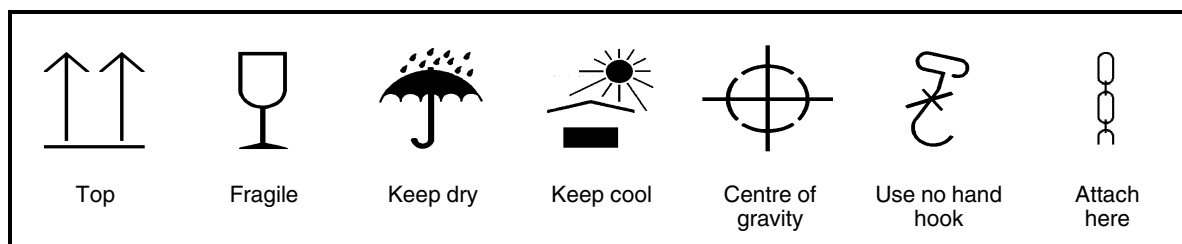


Fig. 3: Transport symbols



**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 unit should be left without oil filling and on the transport packing.



**Use only the eyes 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.**

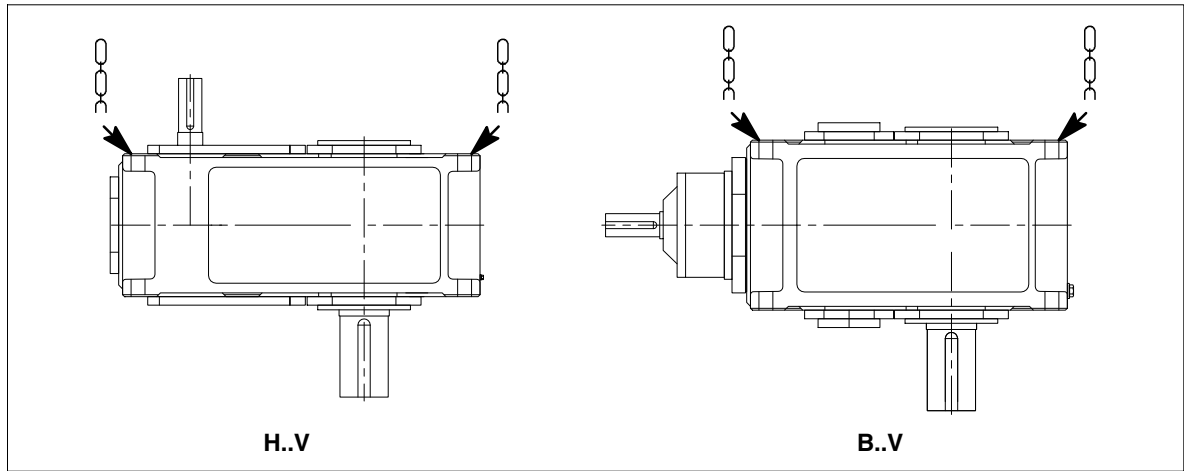


Fig. 4: Attachment points on gear units of types H..V and B..V

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

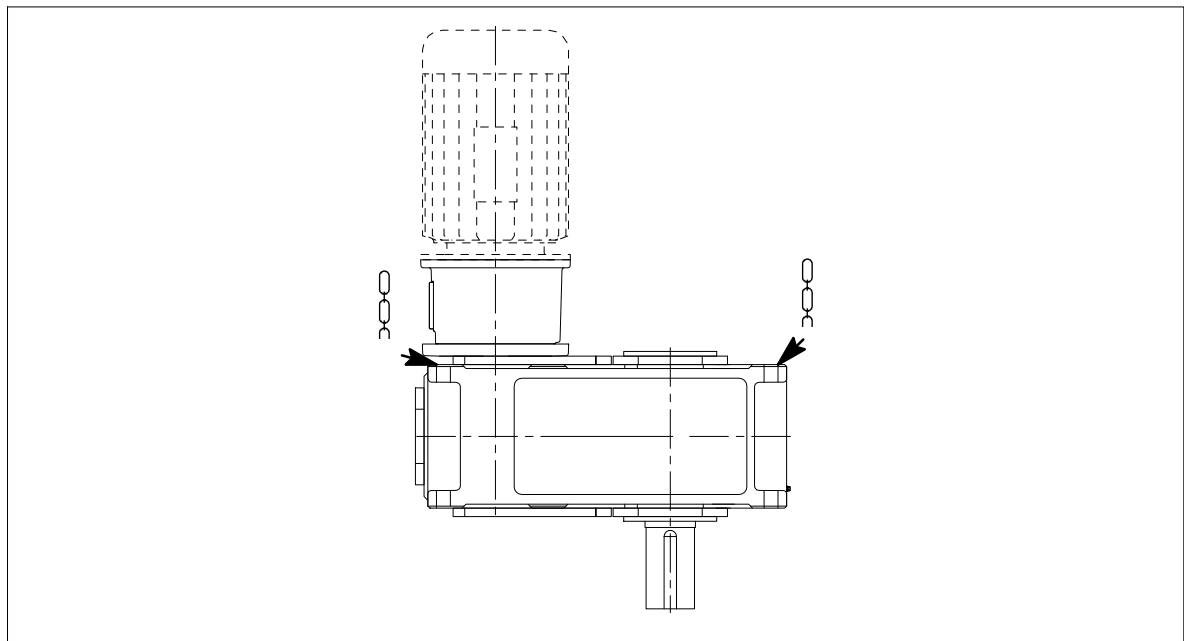


Fig. 5: Attachment points on gear units types H..V with motor

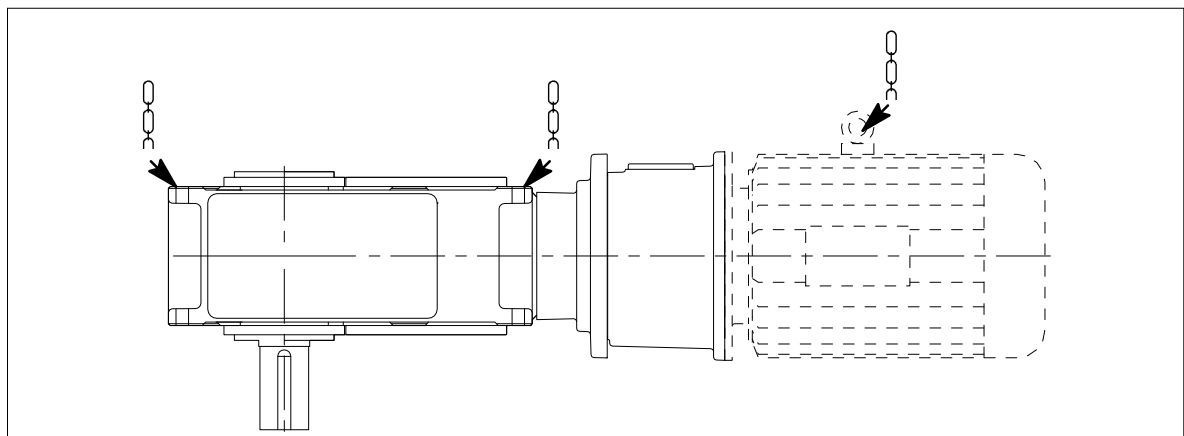


Fig. 6: Attachment points on gear units types B..V with motor

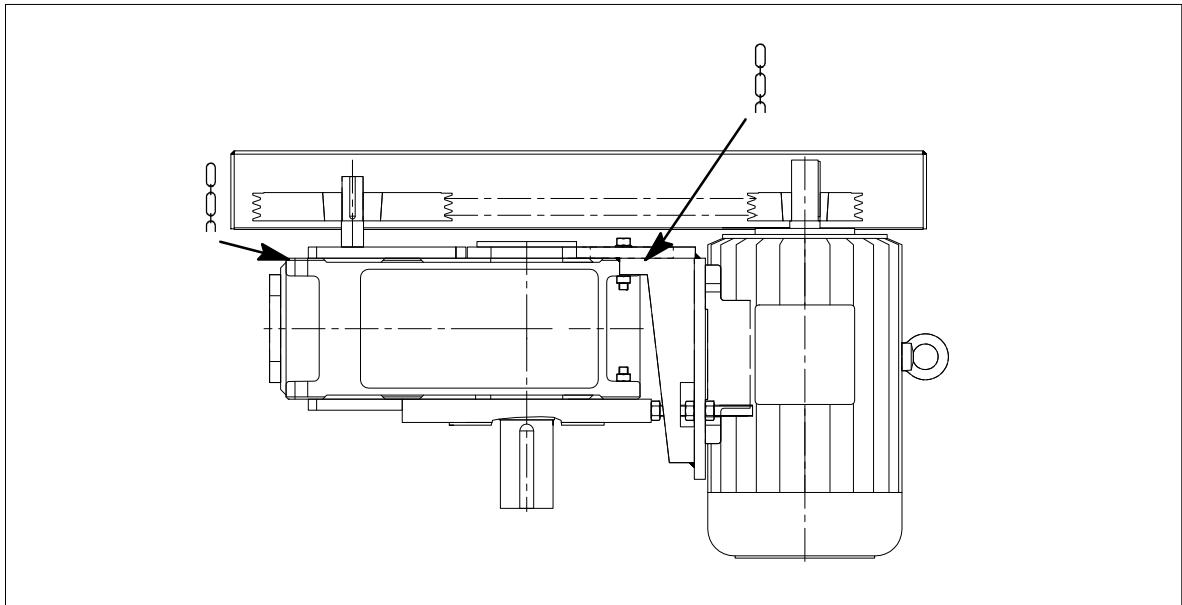


Fig. 7: Attachment points on gear units types H..V with motor bedplate



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.



Units which are slung by eyebolts must not be tilted.

4.3 Storing the gear unit

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



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.

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



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 6 or 7 will apply, provided the related requirements are adhered to. The durability period for the exterior preservation and the related requirements can be found in table 8.

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

In case of a storage period other than that indicated in table 6 or 7 and in table 8, the interior and the exterior preservation must be checked and, as necessary, be repeated (see items 7.4.1 and 7.4.2).

4.4.1 Preservation in case of Tacolab seals

Gear units with Tacolab seal are airtight sealed applying the standard preservation with an adhesive tape on the gap seal.

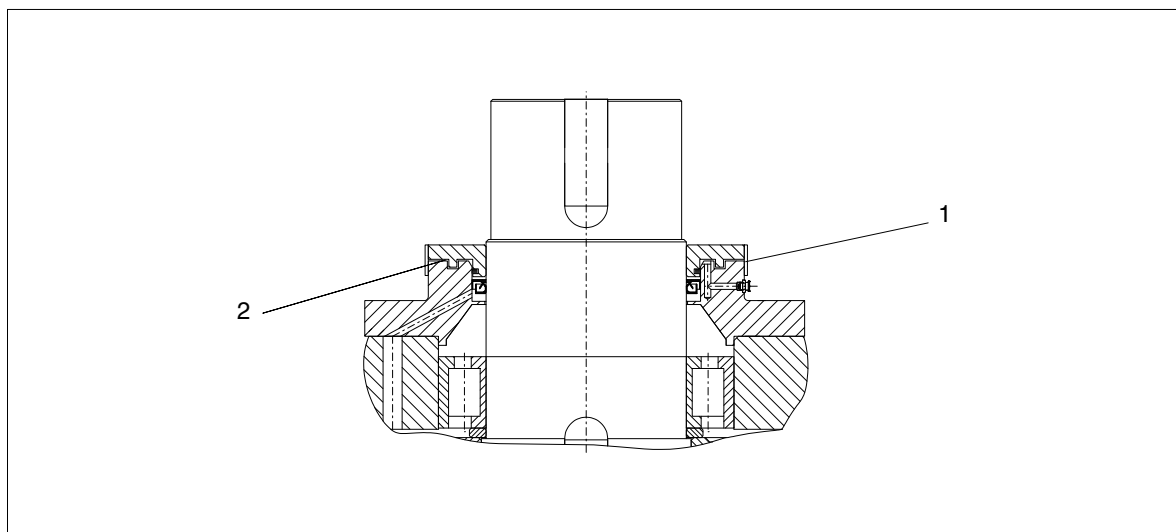


Fig. 8: Tacolab seal

1 Adhesive tape

2 Air gap



The adhesive tape must not be removed before start-up.

4.4.2 Interior preservation with preservative agent

Table 6: 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	<ul style="list-style-type: none"> - Close all holes on the gear unit. - Replace the air filter or wet-air filter with a screw plug. (Replace the screw plug with the air filter or wet-air filter before start-up.) - Seal labyrinth seal with adhesive tape. (Remove this adhesive tape before startup.) ¹⁾
For storage periods longer than 24 months, renew the preservative agent (see item 4.4.2.1).		

¹⁾ In case of Tacolab seal only (see item 5.7.3 and/or figure 8).

Table 7: 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 ²⁾	None
Up to 36 months		<ul style="list-style-type: none"> - Close all holes on the gear unit. - Replace the air filter or wet-air filter with a screw plug. (Replace the screw plug with the air filter or wet-air filter before start-up.) - Seal labyrinth seal with adhesive tape. (Remove this adhesive tape before startup.) ¹⁾
For storage periods longer than 36 months, renew the preservative agent (see item 4.4.2.1).		

¹⁾ In case of Tacolab seal only (see item 5.7.3 and/or figure 8).

²⁾ Resistant to tropical conditions and sea water; max. ambient temperature 50 °C

4.4.2.1 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 6) or 36 months (see table 7), the interior preservation of the gear unit must be renewed. The following procedure is recommended:

- Unscrew and remove oil-filler plug (including air filter or wet-air filter on the gear unit or the oil dipstick on the oil-equalising tank) (see figs. 9 to 12, part 17).
- Place a suitable container under the oil-draining point, part 8, 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.

- Screw in and tighten oil-filler plug (including the air filter or the wet-air filter on the gear unit or the oil dipstick on the oil-equalising tank).



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.

4.4.3 Exterior preservation

Table 8: 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 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 7.4.1 and 7.4.2.1)!

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

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

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 a vertical 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.

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

Table 9: Types and correlation of direction of rotation

Type	Version								
	A	B	C	D	E	F	G	H	I
H2SV H2HV H2DV H2KV									
H3SV H3HV H3DV H3KV									
H4SV H4HV H4DV H4KV									
B3SV B3HV B3DV B3KV									
B4SV B4HV B4DV B4KV									

The gear units are characterised by a low noise level. This is achieved by helical and bevel-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.

Preferably the following two versions are applied:

- Version with oil-equalising tank (see figure 9 and figure 11)
- Version with add-on oil-supply system (see figure 10 and figure 12)

5.1.1 Basic type

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

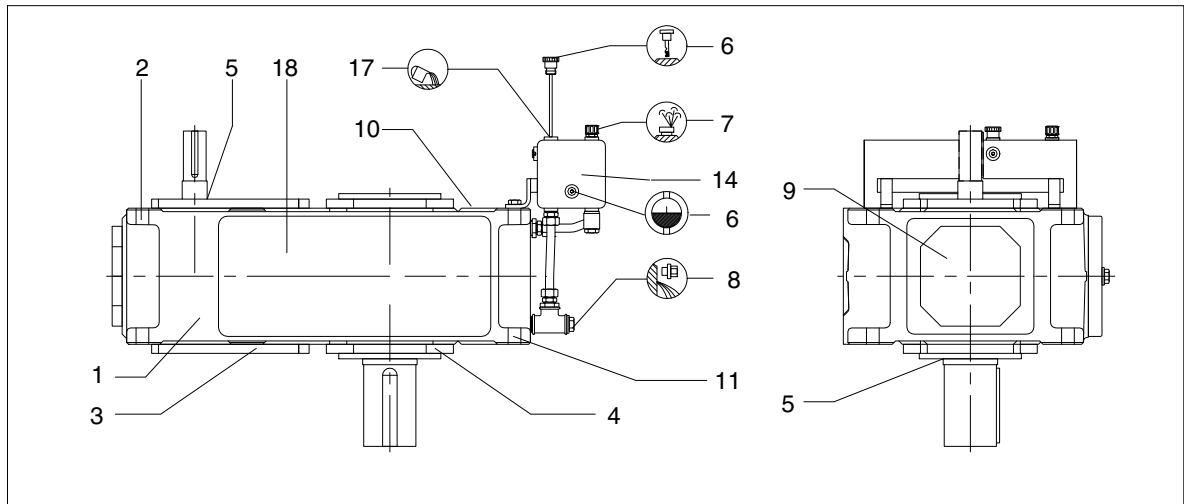


Fig. 9: Gear-unit features on gear units type H..V with oil-equalising tank

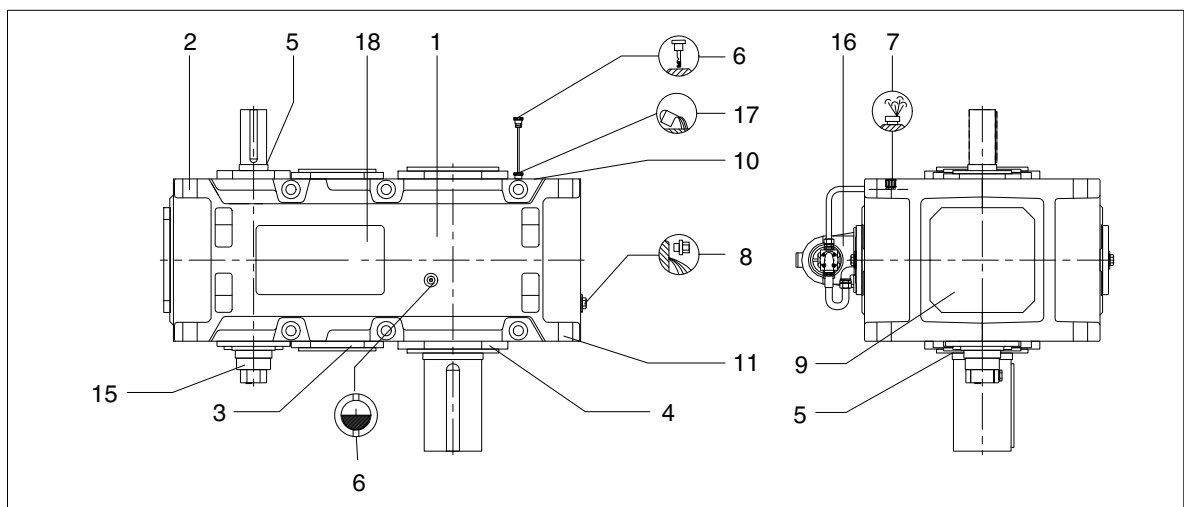


Fig. 10: Gear-unit features on gear units type H..V with add-on oil-supply system

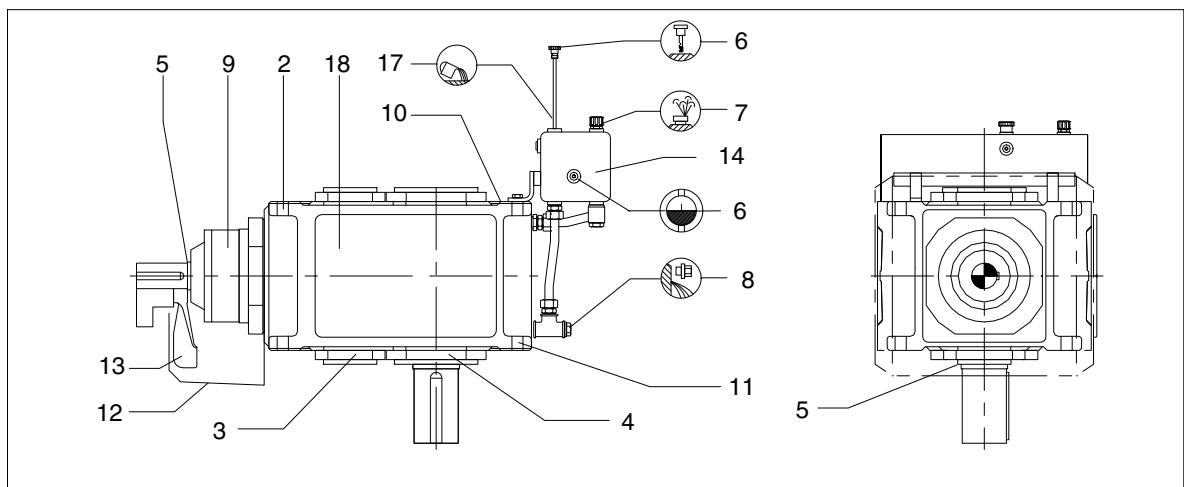


Fig. 11: Gear-unit features on gear units type B..V with oil-equalising tank

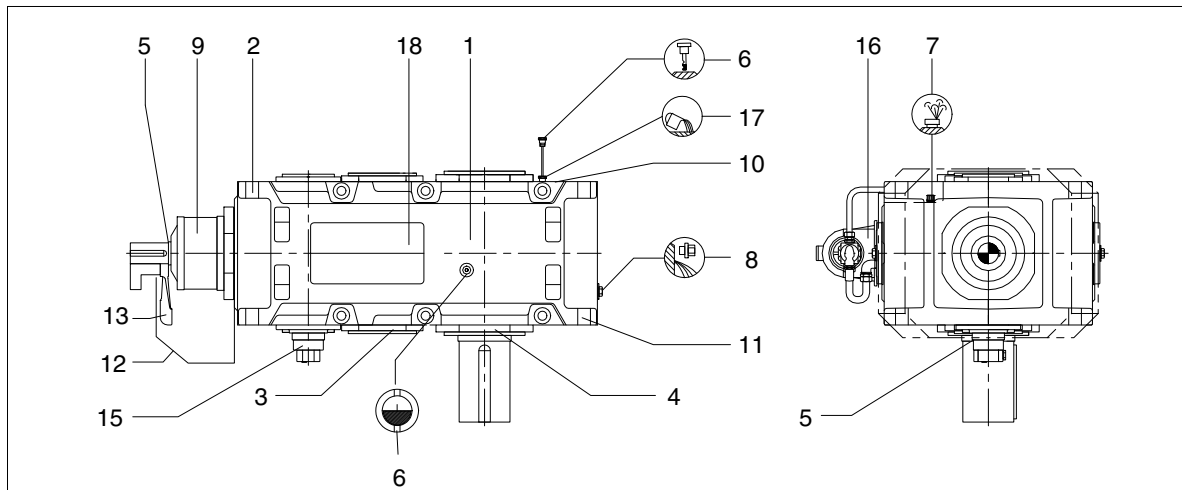


Fig. 12: Gear-unit features on gear units type B..V with add-on oil-supply system

- | | | | |
|---|-------------------------------|----|--|
| 1 | Housing | 10 | Rating plate |
| 2 | Lifting eyes | 11 | Gear-unit fastening |
| 3 | Cover | 12 | Air-guide cover |
| 4 | Cover | 13 | Fan |
| 5 | Shaft seals | 14 | Oil-equalising tank (splash lubrication) |
| 6 | Oil dipstick, oil-sight glass | 15 | Flanged-on pump (option) |
| 7 | Housing ventilation | 16 | Motor pump (option) |
| 8 | Oil-drain plug | 17 | Oil inlet |
| 9 | Cover or bearing journal | 18 | Inspection and/or assembly cover |

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

5.1.2 Aerator gear unit

The gear unit is supplied as a helical or bevel-helical gear unit.

The output shaft rotates in an oil-pressure tube (see item 5.7.2). This prevents gear oil from escaping at the shaft end. The oil supply takes place by a flanged-on oil pump or by a motor pump.

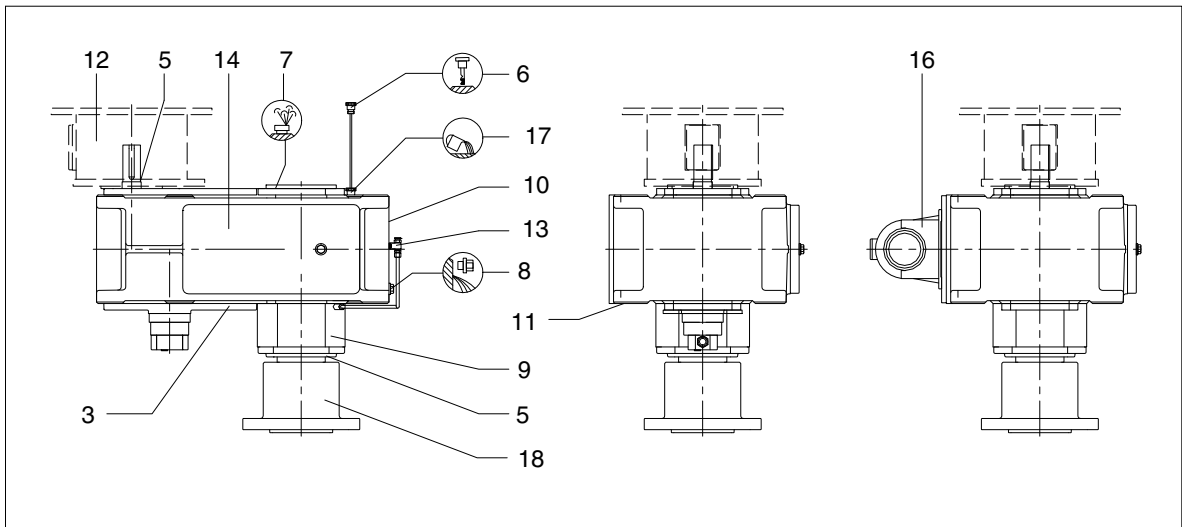


Fig. 13: Aerator gear unit of type H.BV

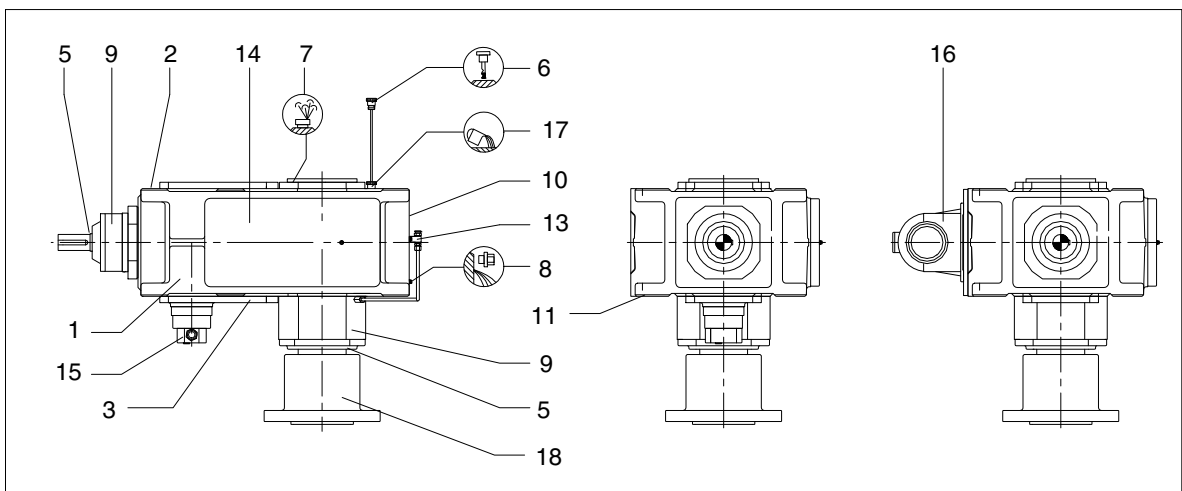


Fig. 14: Aerator gear unit of type B.BV

- | | | | |
|----|---------------------|----|----------------------------------|
| 1 | Housing | 11 | Gear-unit fastening |
| 2 | Lifting eyes | 12 | Motor bell housing |
| 3 | Cover | 13 | Lubricating point |
| 5 | Shaft seals | 14 | Inspection and/or assembly cover |
| 6 | Oil dipstick | 15 | Flanged-on pump |
| 7 | Housing ventilation | 16 | Motor pump |
| 8 | Oil-drain plug | 17 | Oil inlet |
| 9 | Bearing journal | 18 | Coupling flange |
| 10 | Rating plate | | |
- } optional

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

5.1.3 Gear unit with mounting flange

The gear unit is supplied as a helical or bevel-helical gear unit.

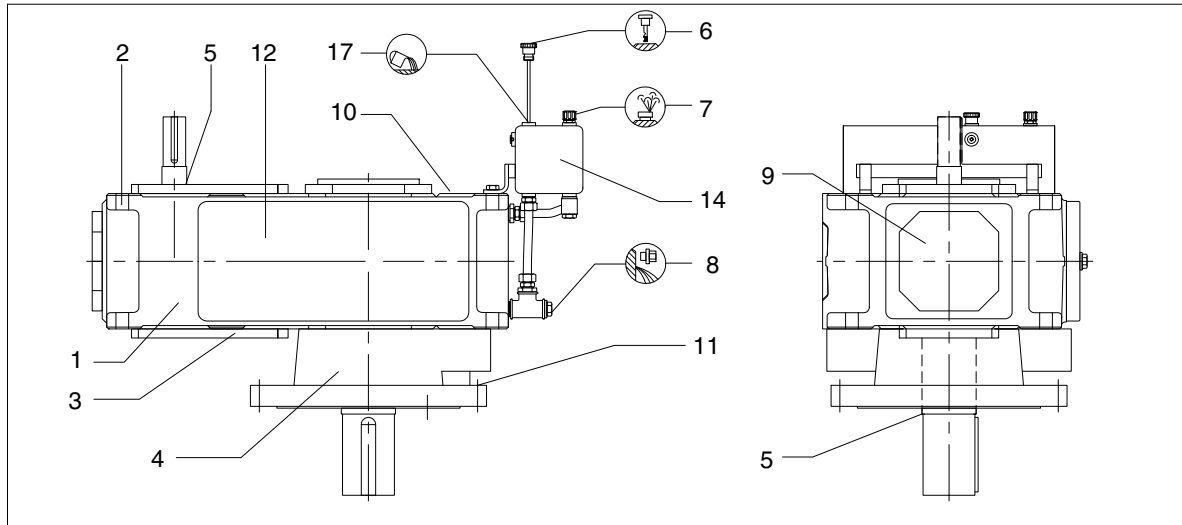


Fig. 15: Gear unit with mounting flange (e.g. H3SV with oil-equalising tank)

- | | | | |
|---|---------------------|----|----------------------------------|
| 1 | Housing | 9 | Bearing journal |
| 2 | Lifting eyes | 10 | Rating plate |
| 3 | Cover | 11 | Gear-unit fastening |
| 4 | Mounting flange | 12 | Motor bell housing |
| 5 | Shaft seals | 14 | Inspection and/or assembly cover |
| 6 | Oil dipstick | 15 | Flanged-on pump |
| 7 | Housing ventilation | 16 | Motor pump |
| 8 | Oil-drain plug | 17 | Oil inlet |
- } optional

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

5.1.4 Gear unit with coupling flange on output side

The gear unit is supplied as a helical or bevel-helical gear unit.

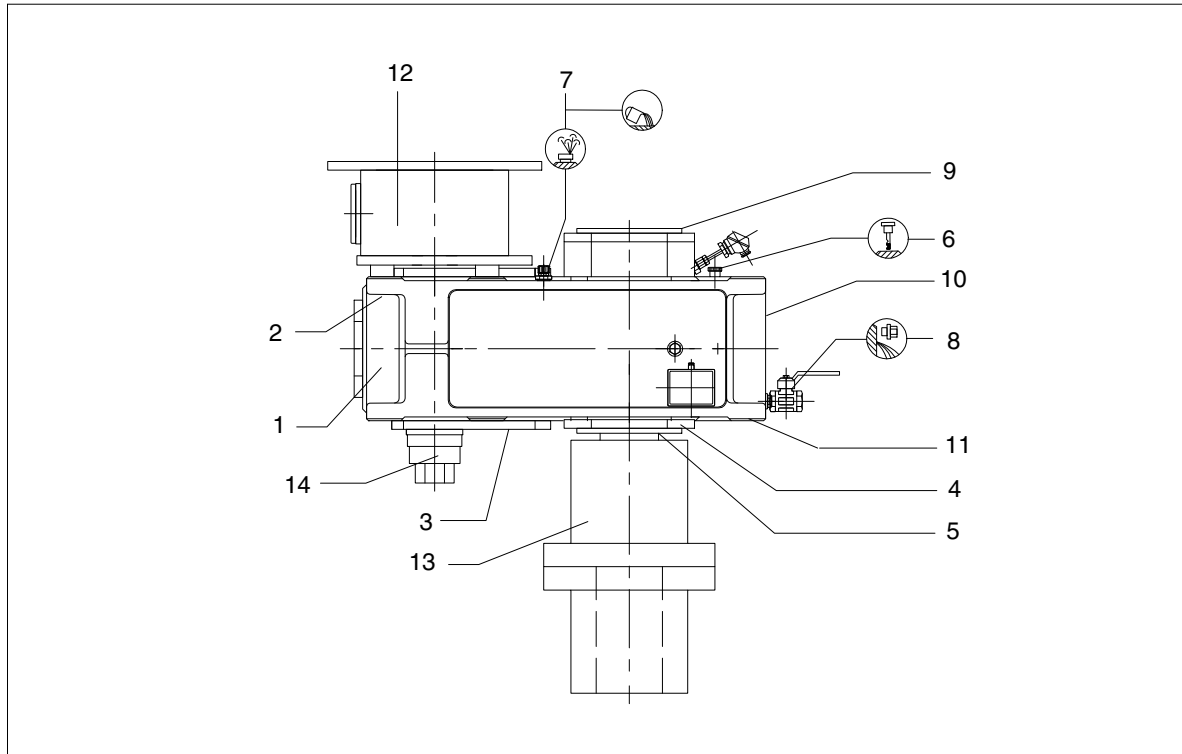


Fig. 16: Gear unit with coupling flange on output side

- | | | | |
|---|--|----|---------------------|
| 1 | Housing | 8 | Oil-drain cock |
| 2 | Lifting eyes | 9 | Cover |
| 3 | Cover | 10 | Rating plate |
| 4 | Cover | 11 | Gear-unit fastening |
| 5 | Shaft seals | 12 | Motor bell housing |
| 6 | Oil dipstick | 13 | Coupling flange |
| 7 | Housing ventilation, oil-filling point | 14 | Motor pump |

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

5.2 Output versions

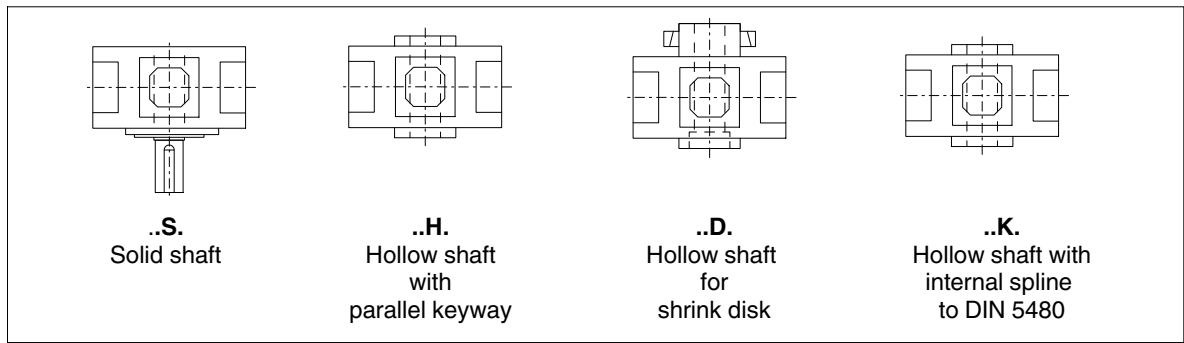


Fig. 17: Output versions

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

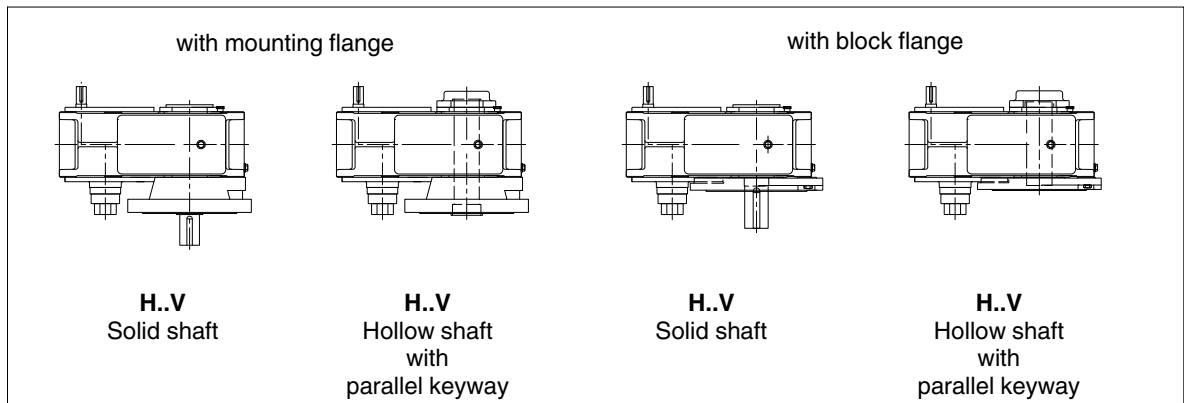


Fig. 18: Output versions of agitator gear units

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:

- Lifting eyes (adequately dimensioned for transport).
- Inspection and/or assembly cover (for inspection).
- Oil-filler plug (for oil-filling point).
- Oil-sight glass, oil-level indicator or oil dipstick (to check the oil level).
- Oil-drain plug and/or oil-drain cock (to drain the oil).
- Air filter or wet-air filter (for aeration and ventilation).

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	

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

When installed vertically, all teeth and bearings are submerged in oil. The space required for expansion of the oil is provided by an oil-equalising tank bolted to the unit (see figure 9 and figure 11 in item 5.1.1).

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 flange or motor 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.

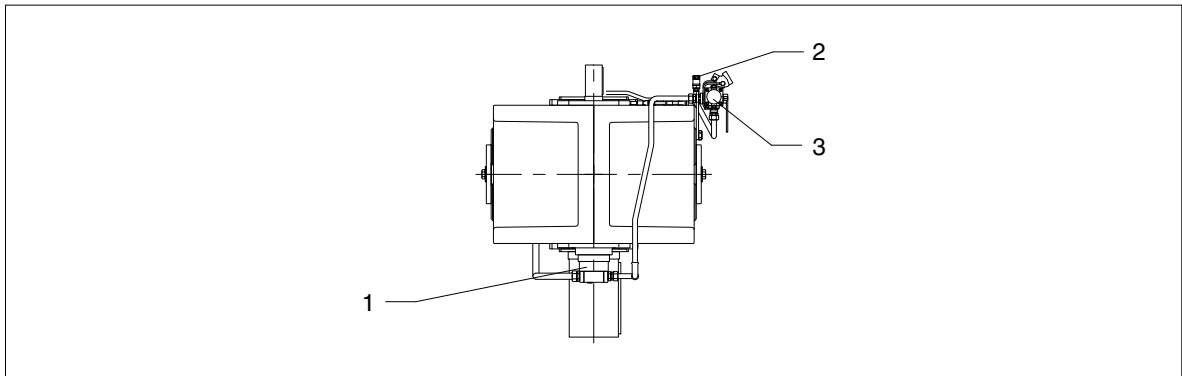


Fig. 19: Add-on oil-supply system with flanged-on pump in case of type H..V

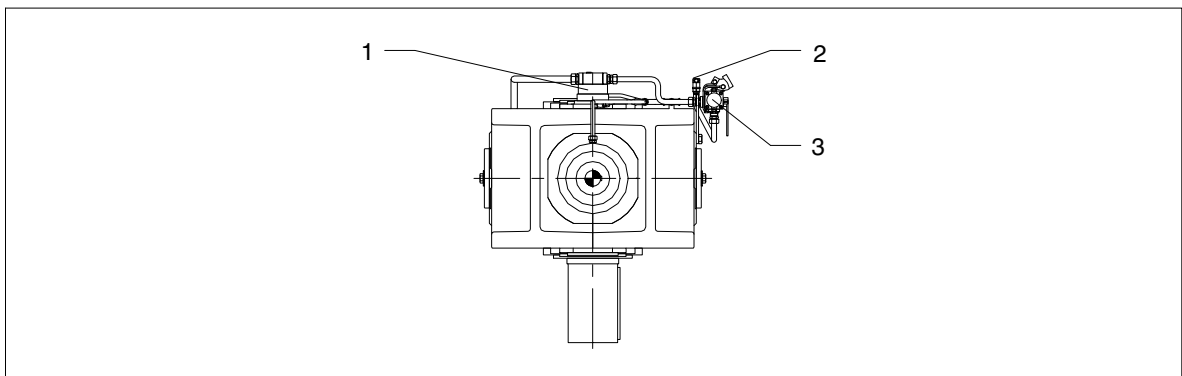


Fig. 20: Add-on oil-supply system with flanged-on pump in case of type B..V

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

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-on pump may be replaced with a motor pump.

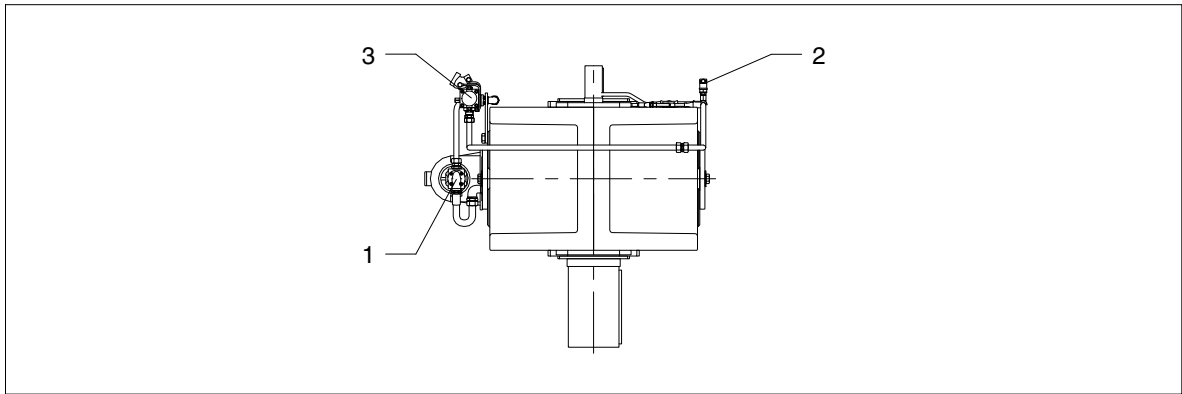


Fig. 21: Add-on oil-supply system with motor pump in case of type H..V

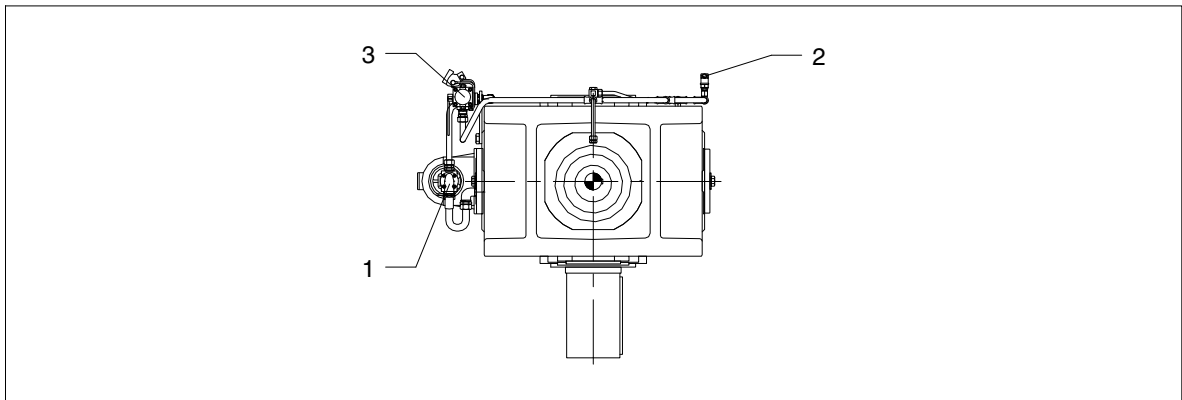


Fig. 22: Add-on oil-supply system with motor pump in case of type B..V

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

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

The following configurations are possible:

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



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



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, Taconite, Tacolab or special seals (oil-dam pipe, centrifugal disk) 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.



Use in an area with much dust is not possible.

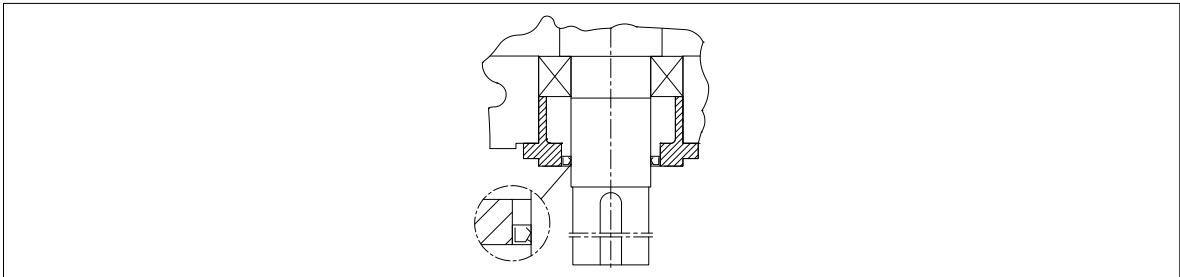


Fig. 23: Radial shaft-sealing ring

5.7.2 Taconite seal



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

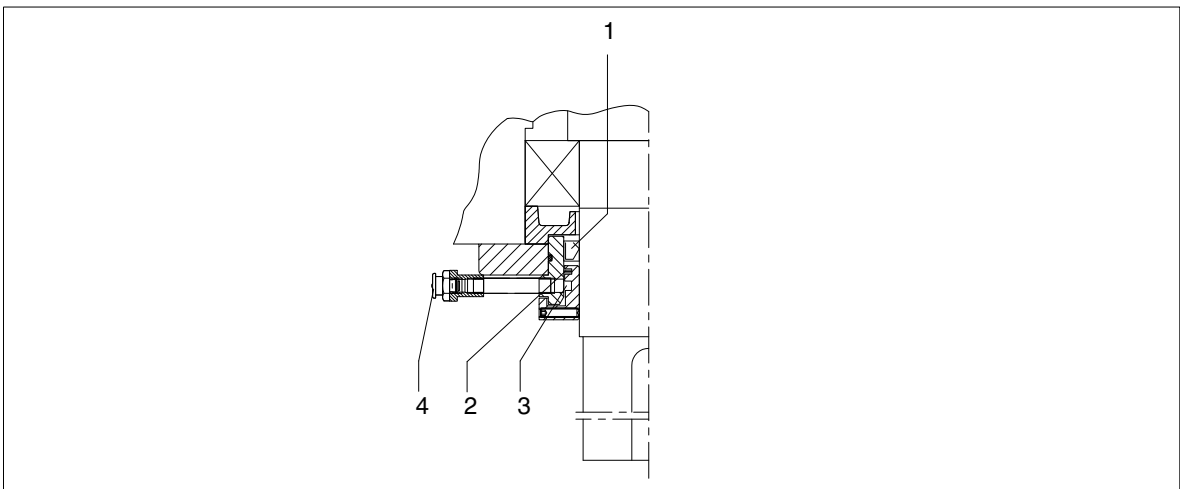


Fig. 24: Taconite seal

- 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:

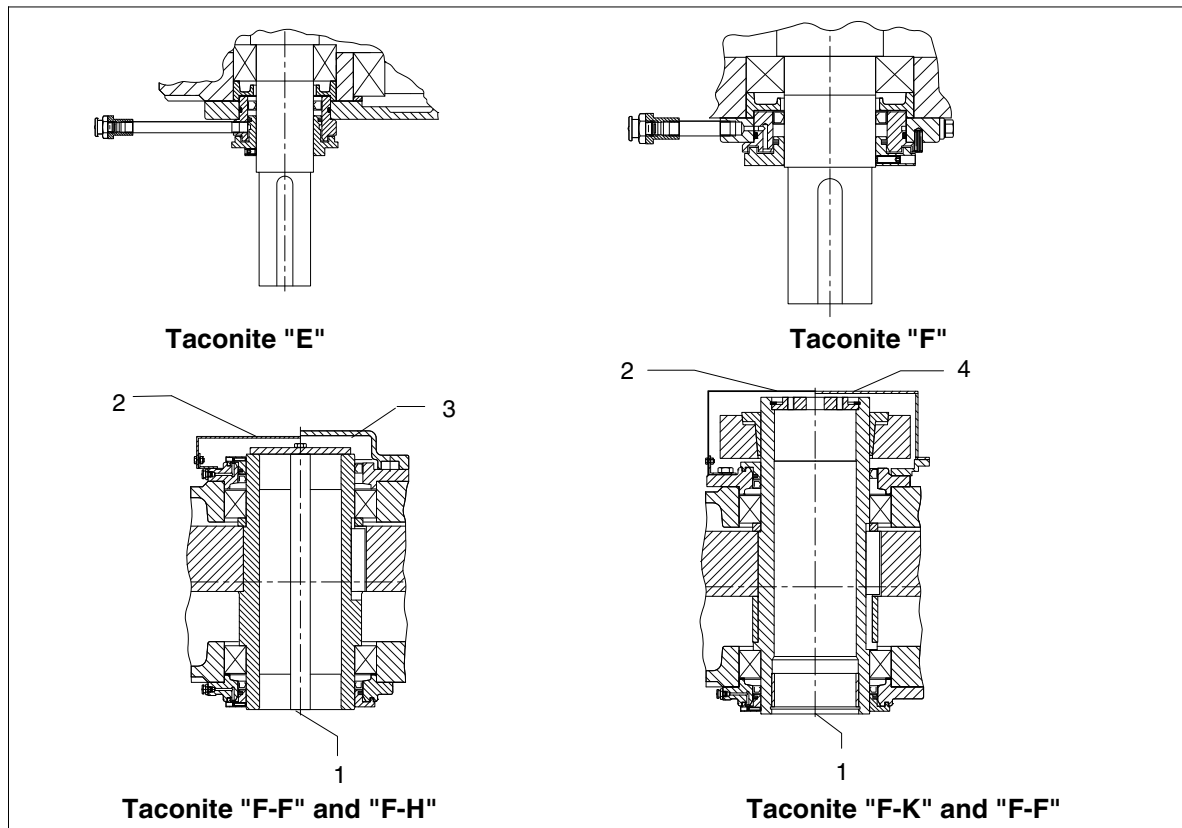


Fig. 25: Taconite seal, variants E, F, F-F, F-H and F-K

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

Table 10: Variant description Taconite seal

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 Taconite seals with grease, the specified frequencies (see table 18 in item 10.1) must be observed.

5.7.3 Tacolab seal

Tacolab seals are non-contacting, wear-free seals requiring little maintenance, which ensure favourable temperature characteristics and do not cause operating interruptions, which would occur due to the possibly necessary exchange of the radial-shaft sealing rings. They can be used only with forced lubrication and with reduced oil level. The shaft journal must here be oriented upwards.

The Tacolab seal is made up of two parts:

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

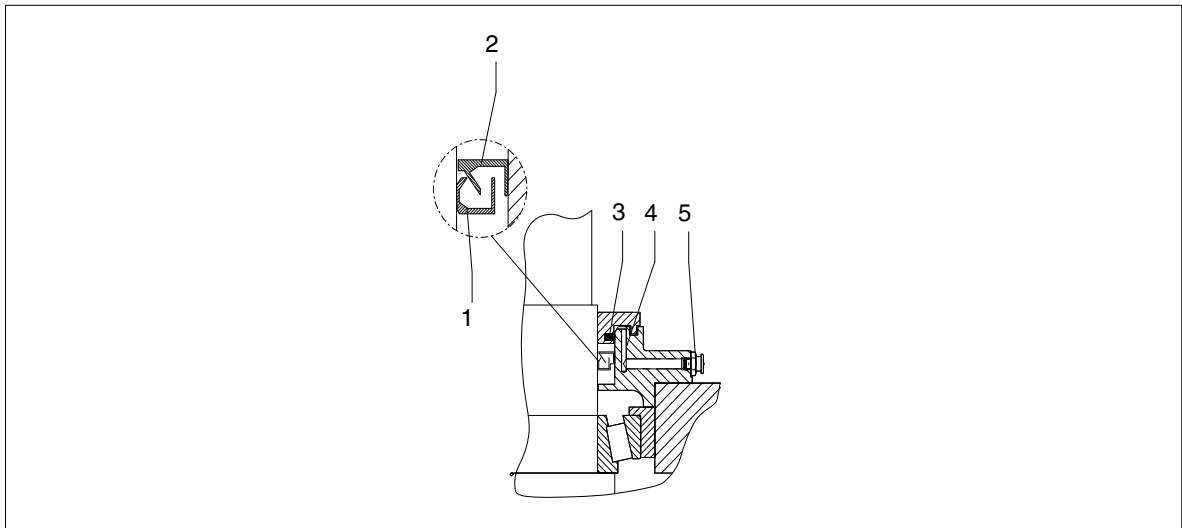


Fig. 26: Tacolab seal

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



For reliable operation, this type of seal requires stationary, horizontal positioning. Overfilling of the gear unit can cause leakage, as can oil with high foam content.



For re-charging the Tacolab seals with grease, the specified frequencies (see table 18 in item 10.1) must be observed.

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

5.7.4 Centrifugal disk

A centrifugal disk on the output shaft prevents water from penetrating the gear unit.

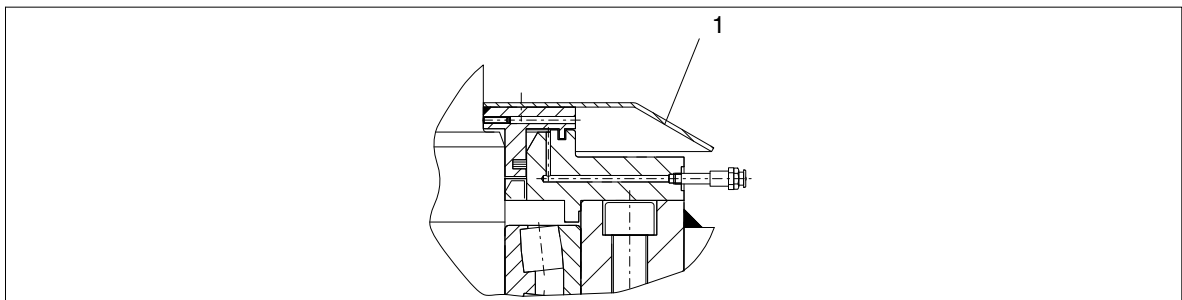


Fig. 27: Centrifugal disk on output side

- | | |
|---|------------------|
| 1 | Centrifugal disk |
|---|------------------|

5.7.5 Oil-dam pipe

By sealing the vertically downward pointing input shaft with a contact-free and wear-free shaft seal (a so-called "oil-dam pipe") the shaft outlet is sealed absolutely tight to prevent oil escaping. This system is used only for forced lubrication.

The lower anti-friction bearing of the output shaft is separated from the gear-unit interior by the oil-dam pipe and is lubricated by grease. Grease is prevented from escaping by the use of a radial shaft sealing ring.



For re-charging the lower bearing with grease, the specified frequencies must be observed (see table 18 in section 10, "Maintenance and repair")

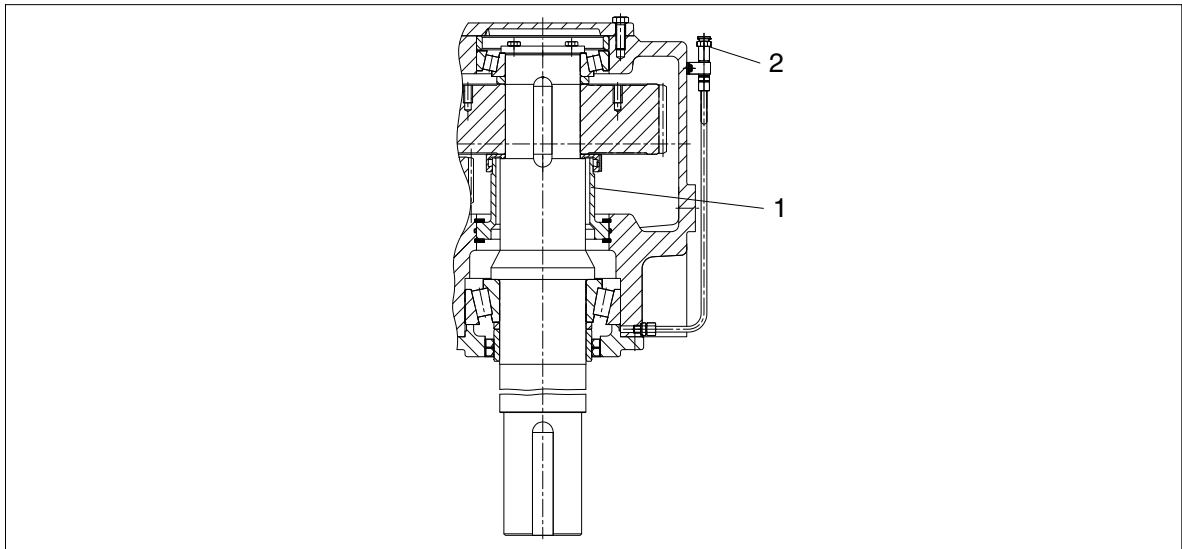


Fig. 28: Oil-dam pipe

1 Oil-dam pipe

2 Lubricating point

5.8 Cooling

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



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

5.8.1 Fan

Installation of a fan is possible only with type B..V (bevel-helical gear unit).

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

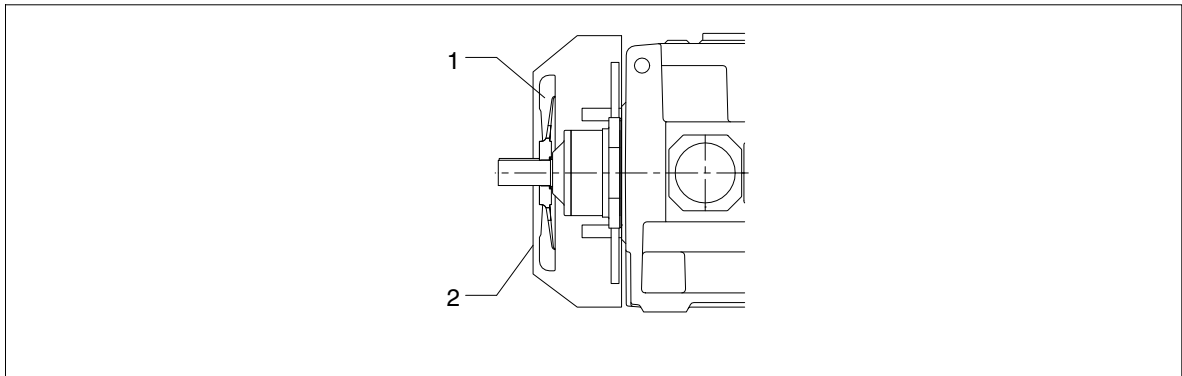


Fig. 29: Fan on gear unit of type B..V

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").

5.8.2 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.

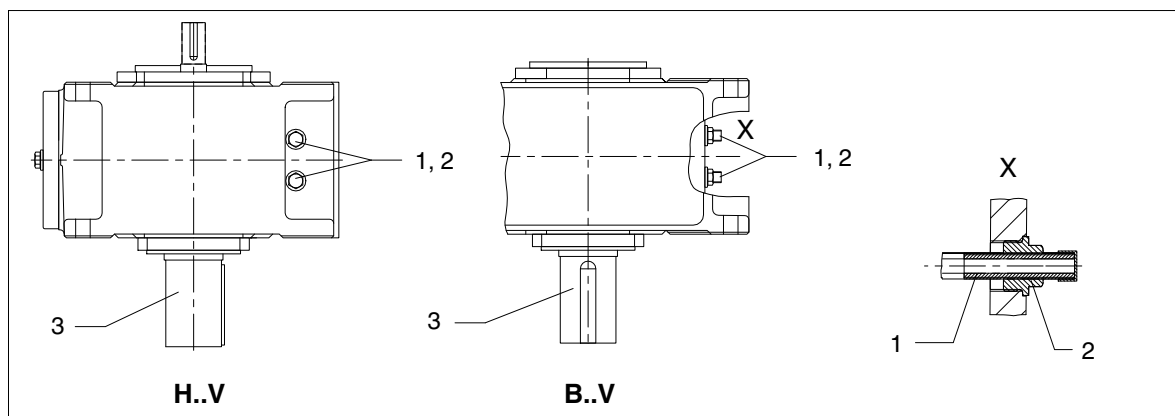


Fig. 30: Cooling coil on gear unit of types H..V and B..V
(only version with oil-equalising tank, see figure 9 and figure 11 in item 5.1.1)

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.

5.8.3 Add-on oil-supply system with air oil-cooler

For types H2.. and B3.., an oil-supply system with air oil-cooler may be applied. This oil-cooling system is permanently attached to the gear unit.

Components:

- an air oil-cooler
- a flanged-on pump
- a double change-over filter
- a pressure-monitoring device
- a temperature-control valve
- pipework

The air oil-cooler is designed to cool the gear oil by means of air from the surrounding atmosphere. Depending on the volume flow, the oil passes through the cooler in one or more streams and through the current of air blown in by the fan. For cold starts, a bypass pipe with a temperature-control valve is provided for.



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

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

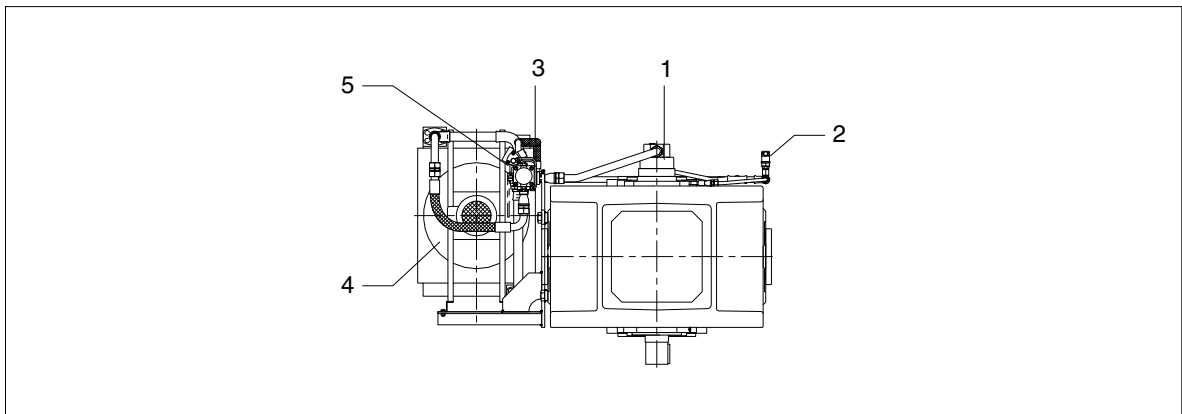


Fig. 31: Air oil-cooling system on gear unit of type H2.V

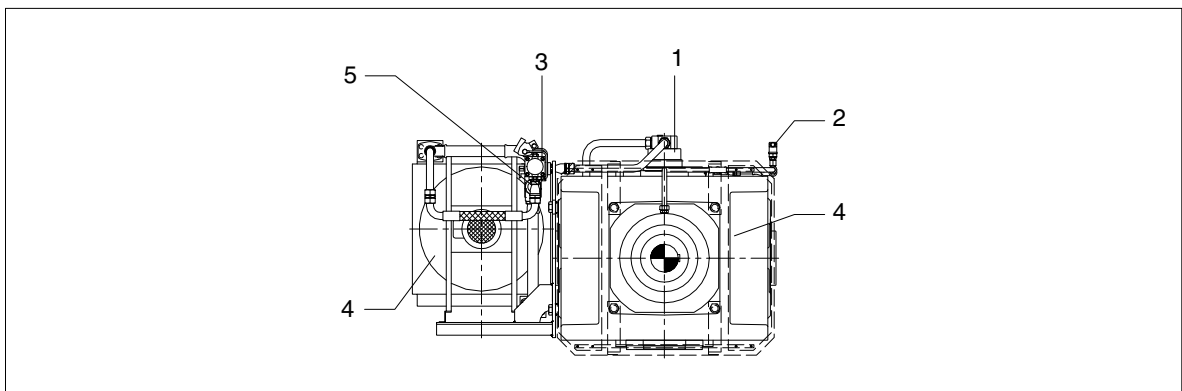


Fig. 32: Air oil-cooling system on gear unit of type B3.V

- | | | | |
|---|---------------------------|---|---------------------------|
| 1 | Flanged-on pump | 4 | Air oil-cooler |
| 2 | Pressure monitor | 5 | Temperature-control valve |
| 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 application, the flanged-on pump may have been replaced with a motor pump.



When installing gear units with add-on air oil-cooling units, it must be ensured that the air circulation is not obstructed.
The required minimum distance from adjacent components, walls, etc. is indicated in the drawings in the unit documentation.
Add-on pressure monitors must be connected as shown in item 5.5.2.



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.

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

5.8.3.1 Air oil-cooler

Air oil-coolers are suitable for cooling oils. The cooling medium used is air.



For the air oil-cooler, the space required for the intake of cooling air in accordance with the drawings in the oil-supply system documentation must be ensured.
Be sure to observe the operating instructions of the air oil-cooler for operation and maintenance.

5.8.3.2 Pump

The pumps used are suitable for the delivery of lubricants. The flow medium must not contain abrasive components and must not chemically affect the materials of the pump. A precondition of a proper functioning, high reliability and long service life of the pump is in particular a clean and lubricating delivery medium.

5.8.3.3 Filter

The filter protects downstream aggregates, measuring and control devices from contamination. The filter comprises a housing with connections and a sieve. The medium flows through the housing where the dirt particles flowing through the pipe are retained.
Dirty filter elements must be cleaned or replaced.

5.8.3.4 Pressure monitor

The pressure in the add-on oil-supply system is monitored by means of a pressure monitor.



Be sure to observe the operating instructions of the pressure monitor for operation and maintenance.
For technical data, refer to the data sheet and/or the list of equipment.

5.8.3.5 Temperature-control valve

A temperature control valve is located in the by-pass of the air oil-cooler. At a preset temperature value the valve will start enabling the flow-through to the cooler, until at a second preset temperature value the total oil quantity will start flowing to the oil cooler.



Be sure to observe the operating instructions of the temperature-control valve for operation and maintenance.
For technical data, refer to the data sheet and/or the list of equipment.

5.8.4 Add-on oil-supply system with water oil-cooler

For types H2.. and B3.., an oil-supply system with water oil-cooler may be applied, if required in the order. This is permanently attached to the gear unit.

Components:

- a water oil-cooler
- a flanged-on pump
- a double change-over filter
- a pressure-monitoring device
- pipework



The flow direction of the pump used is **independent of the direction of rotation**, if nothing is specified in the documentation to the contrary. When connecting the fittings the actual flow direction must however be observed.



The required water connection must be provided by the user.

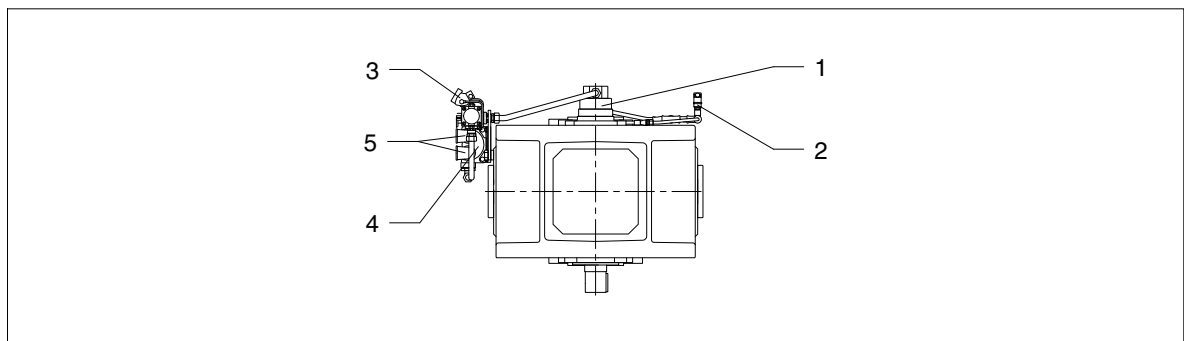


Fig. 33: Water oil-cooling system on gear unit of type H2.V

- | | | | |
|---|---------------------------|---|------------------------|
| 1 | Flanged-on pump | 4 | Water oil-cooler |
| 2 | Pressure monitor | 5 | Water inlet and outlet |
| 3 | Double change-over filter | | |

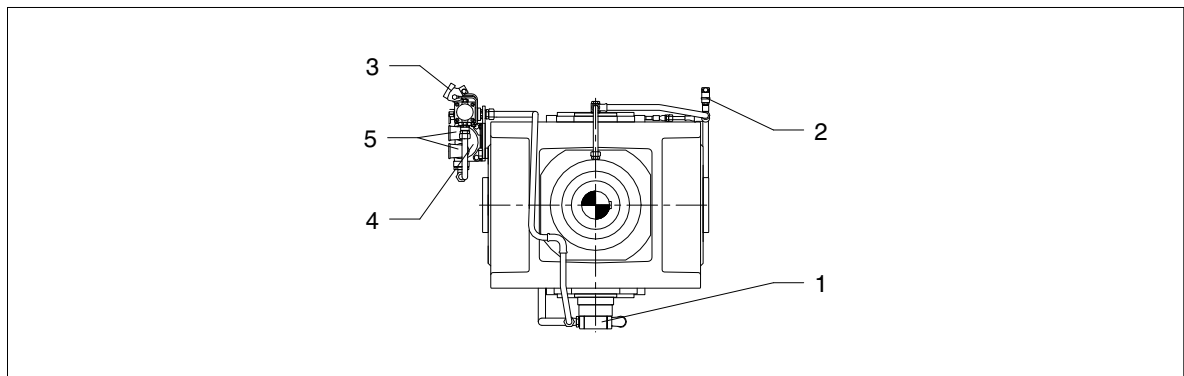


Fig. 34: Water oil-cooling system on gear unit of type B3.V

- | | | | |
|---|---------------------------|---|------------------------|
| 1 | Flanged-on pump | 4 | Water oil-cooler |
| 2 | Pressure monitor | 5 | Water inlet and outlet |
| 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 application, the flanged-on pump may have been replaced with a motor pump.



To ensure optimum cooling performance, the specified direction of flow in the water oil-cooler must be observed. The cooling-water inlet and outlet must not be reversed. 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.

Add-on pressure monitors must be connected as shown in item 5.5.2.



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



For operation and maintenance, always observe the operating instructions indicated in the order-specific appendix.

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

5.8.4.1 Water oil-cooler

Water oil-coolers are suitable for cooling oils. The cooling medium used is water.

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.

5.8.4.2 Pump

The pumps used are suitable for the delivery of lubricants. The flow medium must not contain abrasive components and must not chemically affect the materials of the pump. A precondition of a proper functioning, high reliability and long service life of the pump is in particular a clean and lubricating delivery medium.

5.8.4.3 Filter

The filter protects downstream aggregates, measuring and control devices from contamination. The filter comprises a housing with connections and a sieve. The medium flows through the housing where the dirt particles flowing through the pipe are retained.

Dirty filter elements must be cleaned or replaced.

5.8.4.4 Pressure monitor

The pressure in the add-on oil-supply system is monitored by means of a pressure monitor.



Be sure to observe the operating instructions of the pressure monitor for operation and maintenance.

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

5.8.5 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.

5.9 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.

5.10 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 minimum and maximum temperatures are reached.

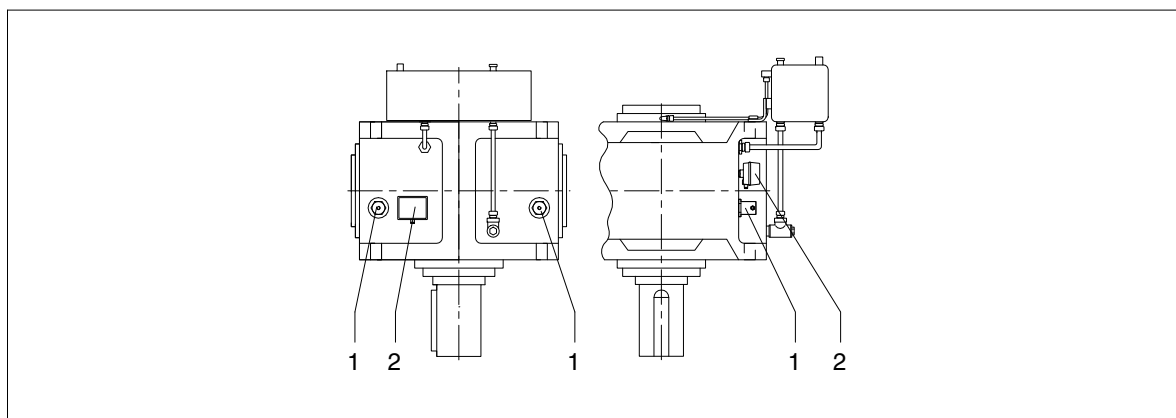


Fig. 35: Heating on gear unit with oil-equalising tank of types H..V and B..V

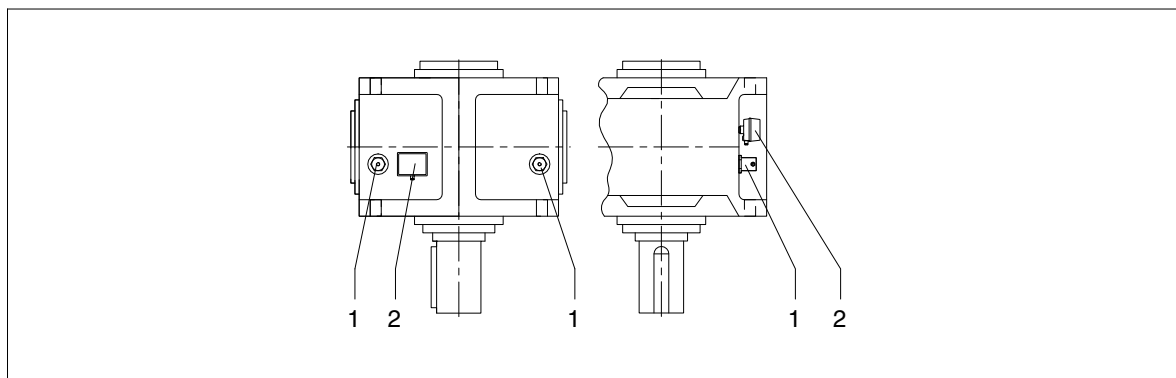


Fig. 36: Heating on gear unit without oil-equalising tank of types H..V and B..V

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 in the gear-unit documentation.



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

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

Table 11: 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.

5.11 Indication of oil level

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

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

5.12 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 should be connected to an evaluating device by the customer.

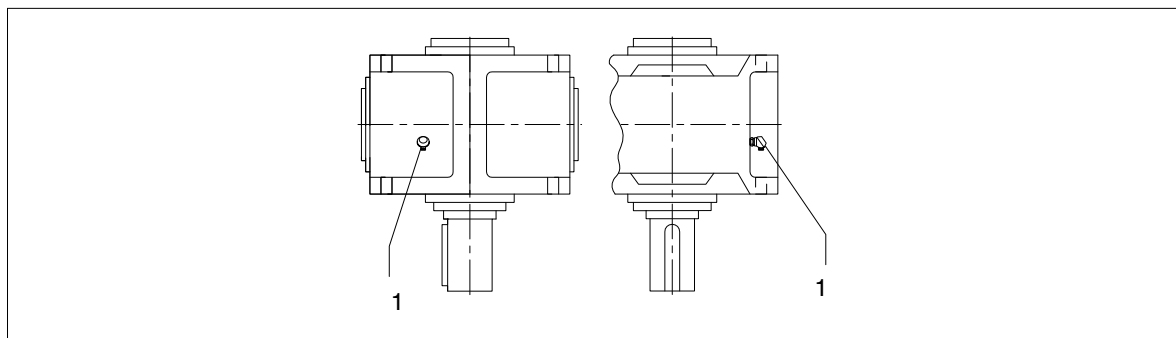


Fig. 37: Oil-temperature measurement on gear unit of types H..V and B..V

1 Pt 100 resistance thermometer

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

5.13 Bearing-monitoring system

5.13.1 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 should be connected to an evaluating device by the customer.

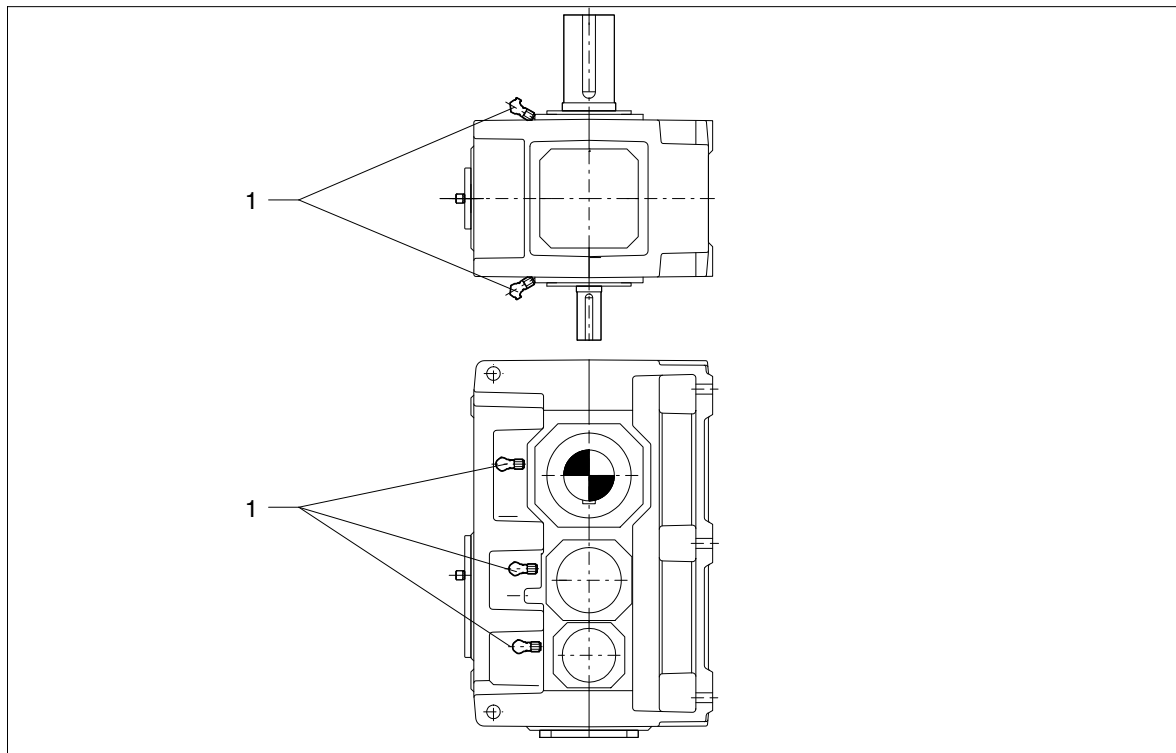


Fig. 38: Bearing monitoring by Pt 100 resistance thermometer on gear units type H2.V

- 1 Pt 100 resistance thermometer

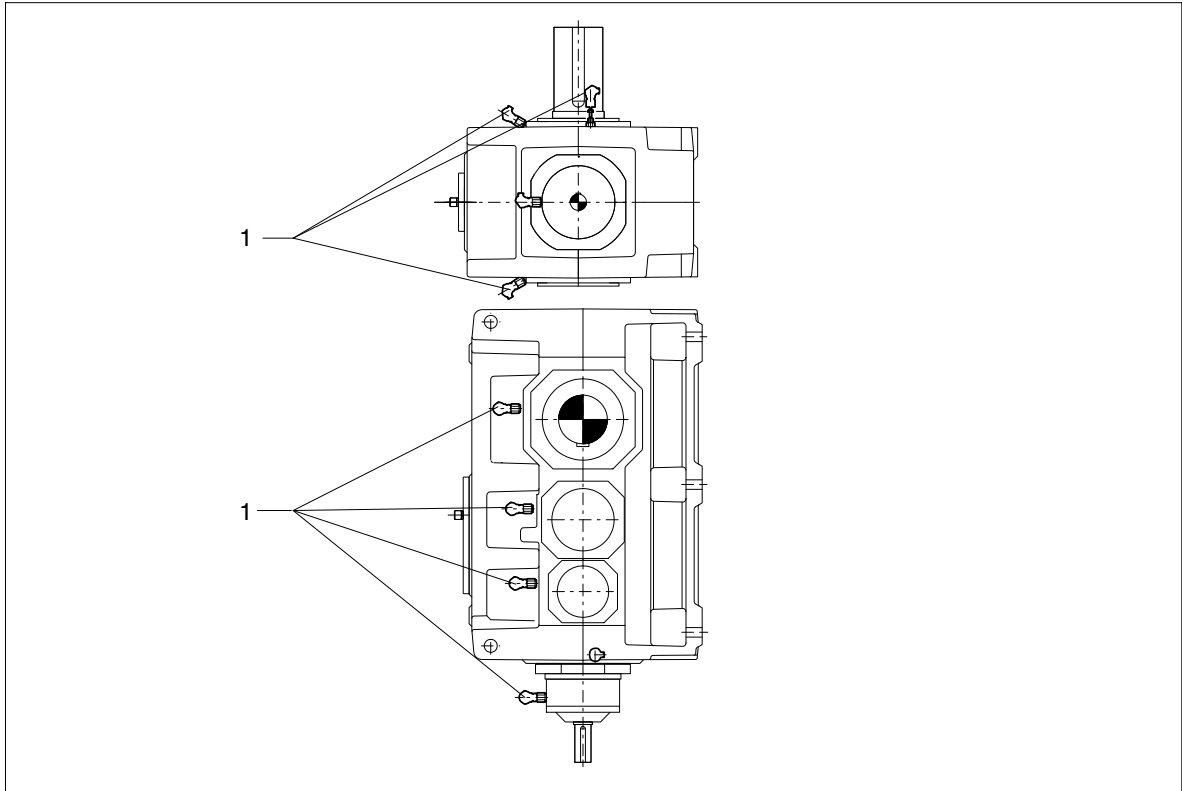


Fig. 39: Bearing monitoring by Pt 100 resistance thermometer on gear units type B3.V

1 Pt 100 resistance thermometer

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

5.13.2 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.

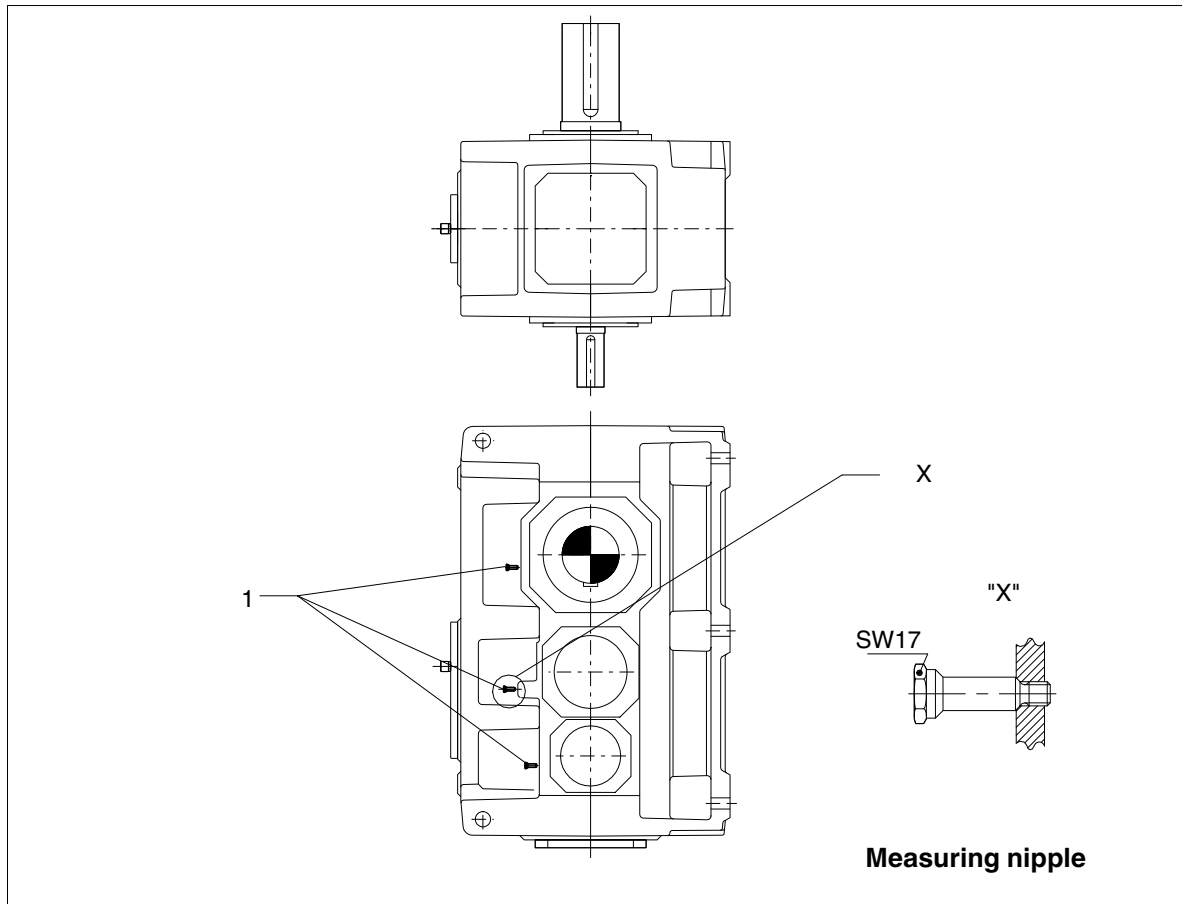


Fig. 40: Bearing monitoring by shock-pulse transducer on gear units type H2.V

- 1 Shock pulse transducer

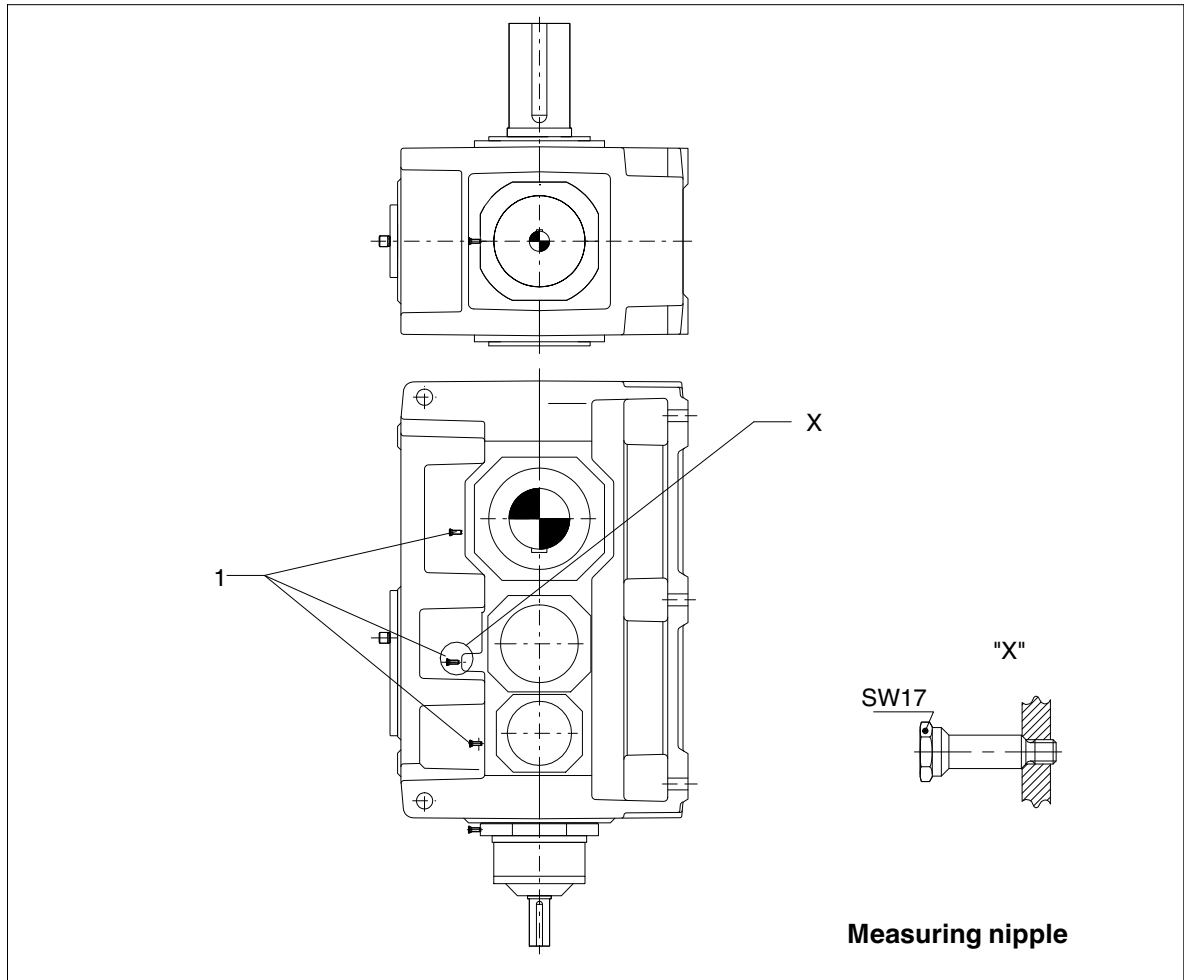


Fig. 41: Bearing monitoring by shock-pulse transducer on gear units type B3.V

1 Shock pulse transducer

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

5.13.3 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 42 and 43).

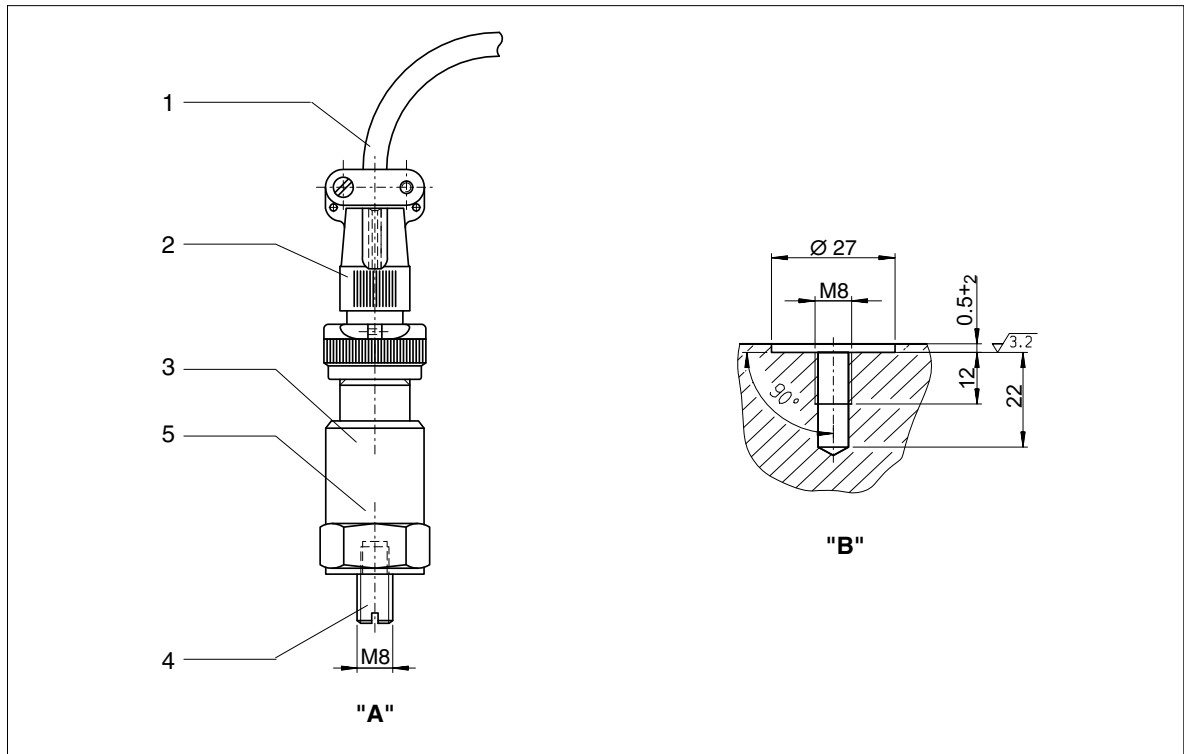


Fig. 42: Accelerometer complete ("A") and thread connection ("B") for variants 1 to 4

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

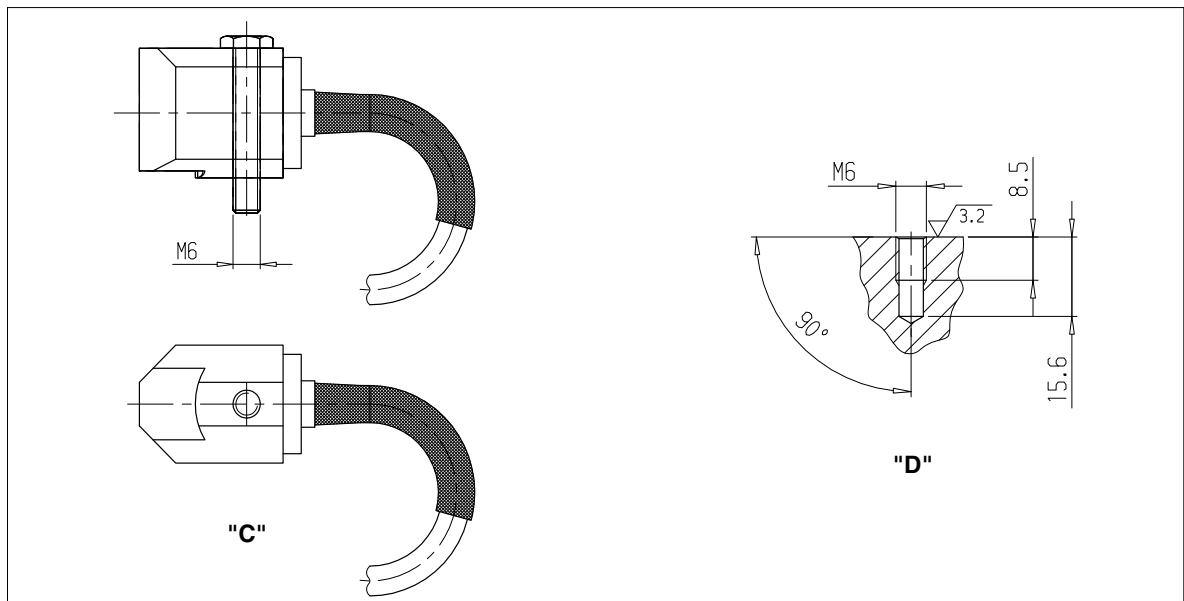


Fig. 43: Accelerometer complete ("C") and thread connection ("D") for variants 5A and 5B



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.

5.14 Speed transmitter

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

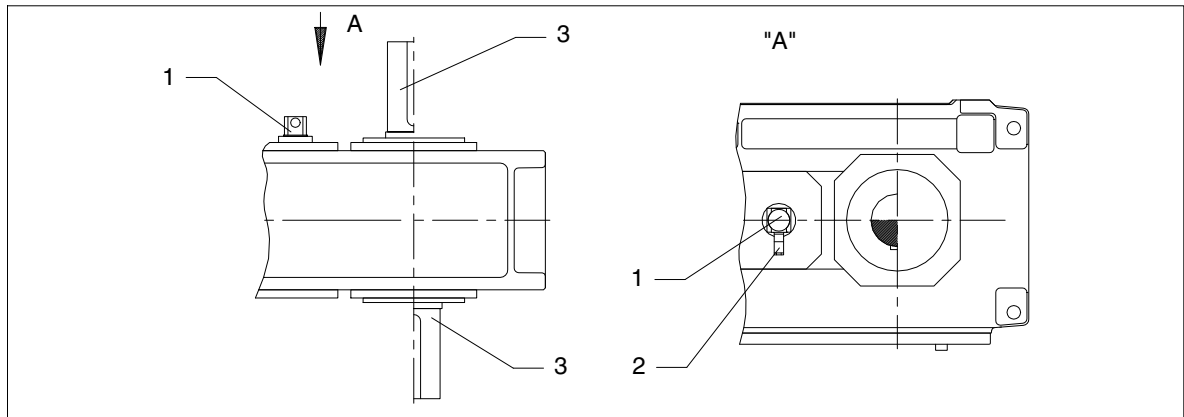


Fig. 44: Speed-monitoring device

- 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"!

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.



**If a sunshade roof is fitted, heat must be prevented from building up!
If a temperature-monitoring device is fitted, a warning signal must be emitted when the maximum permitted oil-sump temperature is reached. If the maximum permitted oil-sump temperature is exceeded, the drive must be shut off.
Such shutting off may cause the operator's plant to stop!**



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

**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.**

**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.**



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 6.23. 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

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



The cleansing agent must never be allowed to come in contact with the shaft-sealing rings. Observe the manufacturer's instructions for handling cleansing agents!



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

- Fit and secure input and output drive elements (e.g. coupling parts) on the shafts. If these are to be heated before fitting, 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 elements must be pulled smartly onto the shaft as far as stated in the dimensioned drawing prepared in accordance with the order.



Fit the coupling with the aid of suitable fitting equipment (see also item 6.10). The parts must not be driven on by abrupt force, as this may damage the gear unit. 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

The machined surfaces (alignment surfaces) on the top of the housing serve for preliminary alignment of the gear unit.

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 machined surfaces on the top of the gear-unit housing serve for preliminary alignment of the gear units.

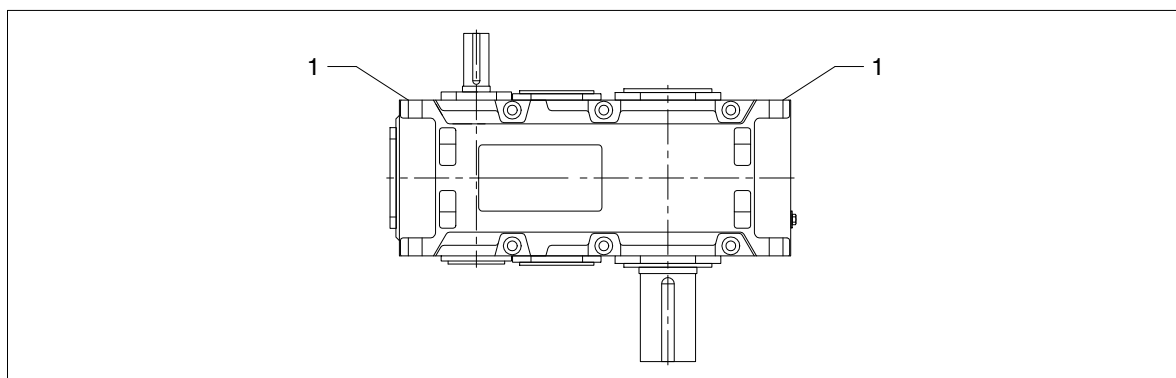


Fig. 45: Alignment surfaces

1 Alignment surfaces

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

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

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

- Record alignment dimensions (see also item 7.3).



The report must be kept with these instructions.



The accuracy of shaft axis alignment is an important factor in determining the service life 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 eyes 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 6.23); 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 7.3).



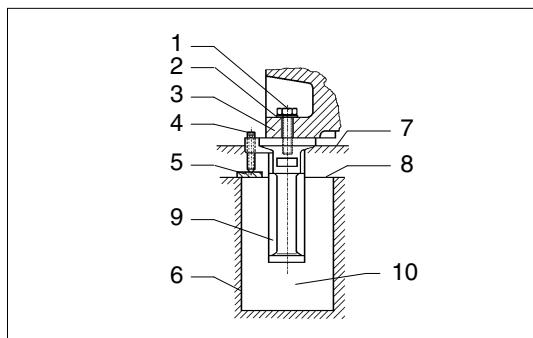
The report must be kept with these instructions.

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. 46).



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. 46: Foundation block

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



**Use only the eyes 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 vertically 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 7.3.



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.

- 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 6.23).

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. 47).

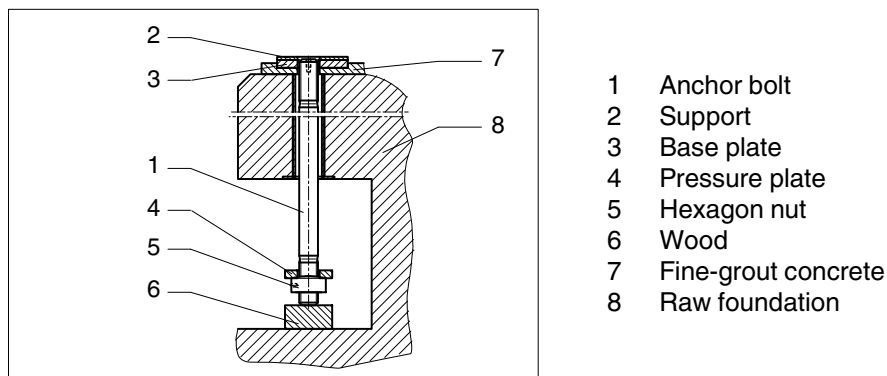


Fig. 47: Anchor bolt

- Place the gear unit.

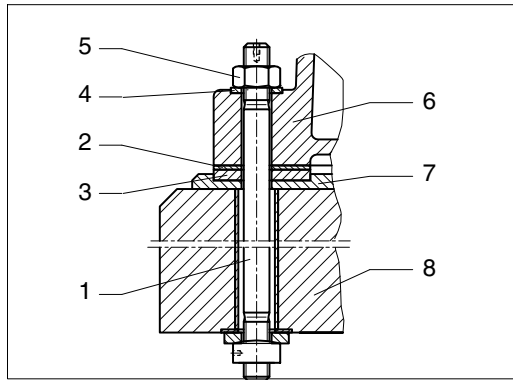


**Use only the eyes provided to attach lifting equipment to the unit.
Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.**

- 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. 48).
 - 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.



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. 48: 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 6.23).
- 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 also item 7.3.9).



The report must be kept with these instructions.

6.4 Coupling flange on output side



The front area of the coupling flange must be absolutely free from grease. This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease. Before tightening the tensioning bolts it must be ensured that the flanges are centered.



Tighten the tensioning bolts crosswise to full torque.



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

6.5 Gear-unit mounting by mounting flange or block-type mounting flange

6.5.1 Counterflange on the machine side



The counterflange must be horizontal and plain.

The counterflange should be designed such that no resonance vibrations are created and that no vibrations are transmitted from adjacent foundations. The counterflange construction on which the gear unit is to be mounted must be torsionally rigid. It must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

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



For dimensions, space requirement, arrangement of supply connections (e.g. with separate oil-cooling units), refer to the drawings in the gear-unit documentation.

6.5.2 Description of installation work

- Remove the corrosion-preventive agent on the shafts using a suitable cleansing agent.



The cleansing agent must never be allowed to come in contact with the shaft-sealing rings.



**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 fitting, refer to the dimensioned drawings in the coupling documentation for the correct joining temperatures.

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



Take precautions to avoid burns from hot parts!



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



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.

6.5.2.1 Fitting gear units with mounting flange

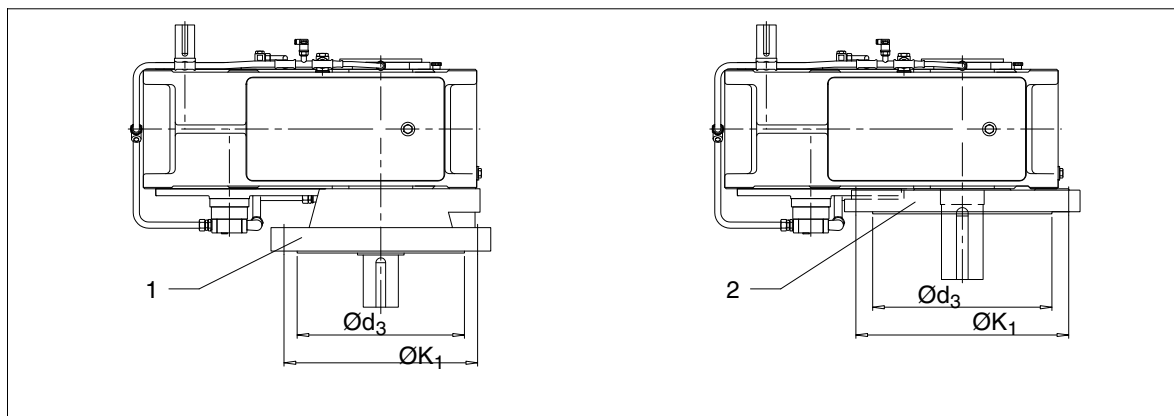


Fig. 49: Gear unit with mounting flange

1 Mounting flange

2 Block-type flange

The mounting or block-type flange on the output side of gear units is provided with a centering shoulder ($\text{Ø} d_3$). The counterflange on the machine side has to be provided with a bore (fit H7) which matches the centering shoulder.

When aligning the machine shaft in relation to the counterflange, the radial and angular misalignments should be kept as small as possible.



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

- Clean the supporting surface of the mounting and block-type flange of the gear unit and the counterflange on the machine side.



The front area of the mounting flange and counterflange must be absolutely free from grease. This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.

- Put the gear unit on the counterflange with the aid of suitable lifting gear.
- Tighten the flange bolts.



Tighten the flange bolts crosswise to full torque.

The joint bolts must be tightened to the prescribed torque. For the correct torque, refer to item 6.23. Bolts of the minimum strength class 8.8 must be used. The transmittable tensioning torque is limited by the bolted joint on bolt circle K_1 .



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

6.5.2.2 Assembly of gear units with hollow output shaft

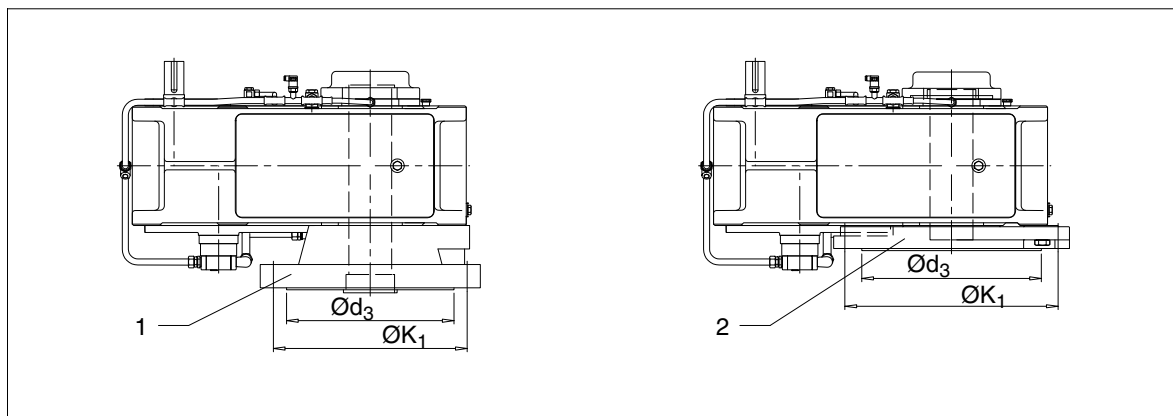


Fig. 50: Gear unit with hollow output shaft

1 Mounting flange

2 Block-type flange

The mounting or block-type flange on the output side of gear units is provided with a centering shoulder ($\text{Ø} d_3$). If the machine shaft is supported on one side only, i.e. the gear unit takes over as the second bearing location, the counterflange on the machine side has to be provided with a bore (fit H7) which matches the centering shoulder.



In case of a machine shaft which is double supported in the counterflange on the machine side, centering of the agitator gear unit (centering shoulder $\text{Ø} d_3$) in the counterflange is inadmissible (redundancy).

When aligning the machine shaft in relation to the counterflange, the radial and angular misalignments should be kept as small as possible.



The service life of the shaft and bearings within the gear unit largely depends on the aligning accuracy of the machine shaft in relation to the counterflange. If possible, the deviation should be zero. For permissible tolerances please refer to the drawings in the gear-unit documentation.

- Clean the supporting surface of the mounting or block-type flange of the gear unit and the counterflange on the machine side.



The front area of the mounting flange and counterflange must be absolutely free from grease. This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.

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



The cleansing agent must never be allowed to come in contact with the shaft-sealing rings.



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

- Check the hollow and machine shafts to ensure that seat 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.

- Pull up the gear unit with suitable lifting gear by means of nut and threaded spindle and put down on the counterflange on the machine side.

6.6 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).

6.6.1 Preparatory work

To facilitate demounting (see also item 6.6.3), 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 51). This connection may also be used for supplying rust-releasing agent.

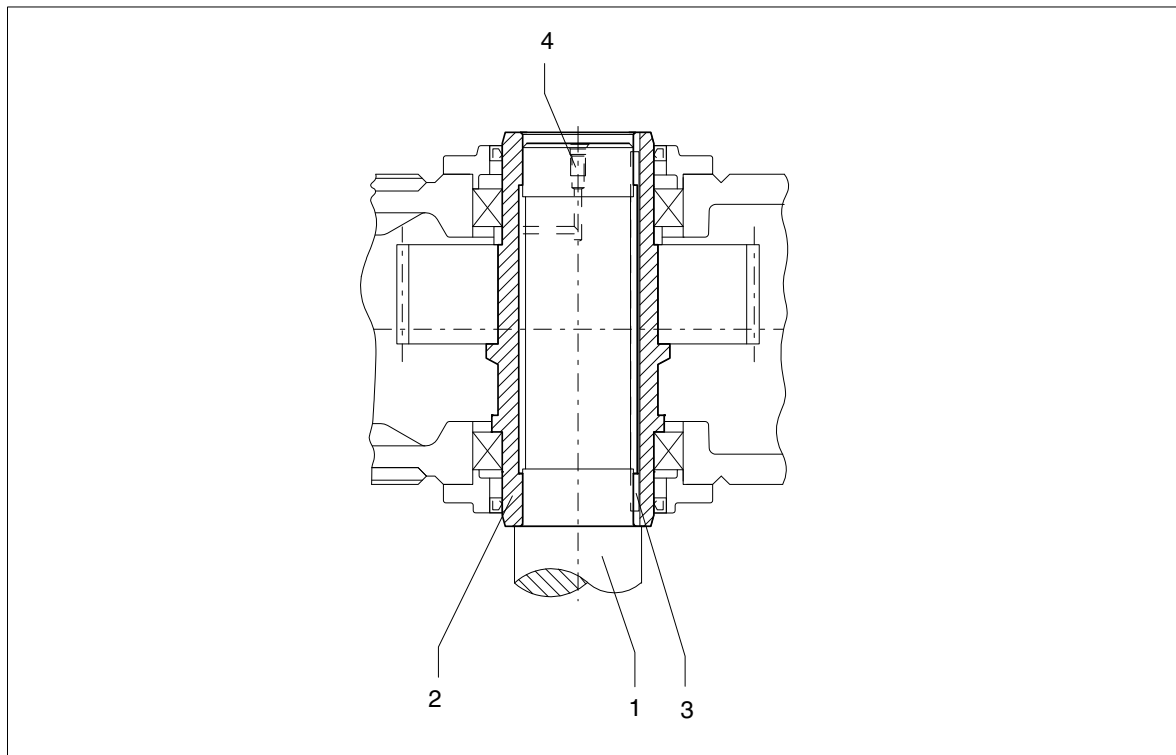


Fig. 51: Hollow shaft with parallel keyway, preparation

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

6.6.2 Fitting

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



The cleansing agent 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.

6.6.2.1 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.

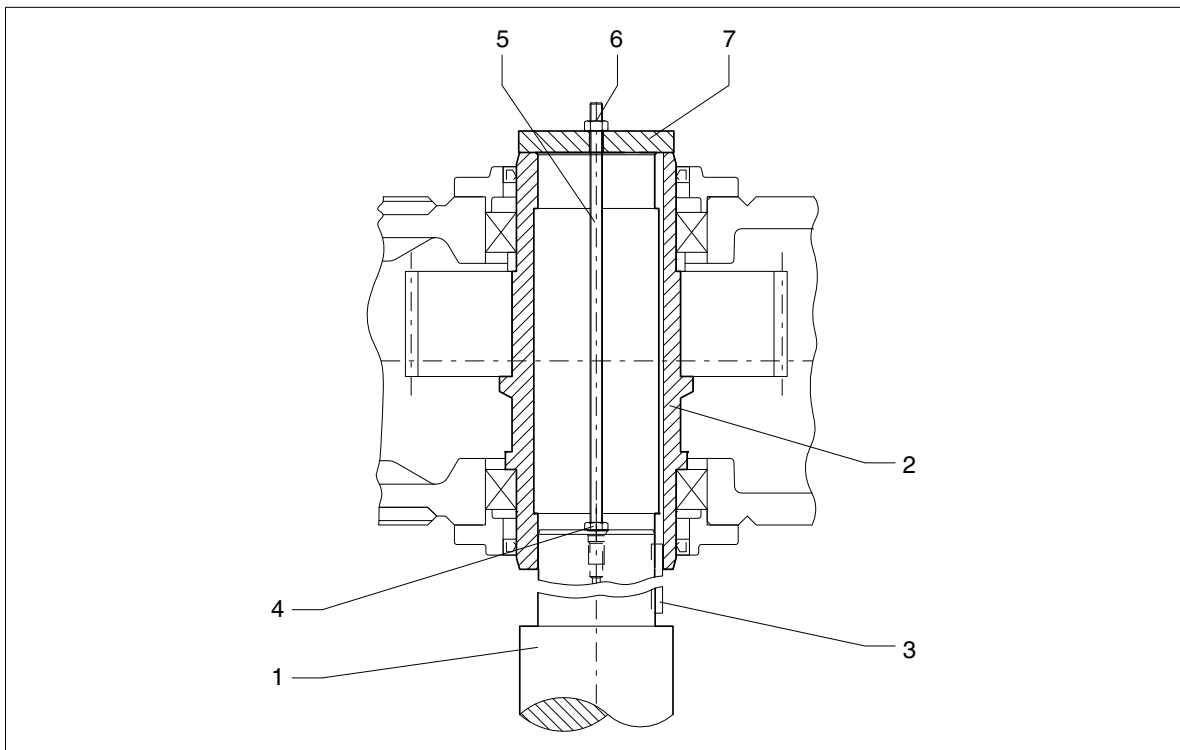


Fig. 52: Hollow shaft with parallel keyway, fitting with threaded spindle

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 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 6.12).
Under no circumstances may the gear unit be stressed.**

6.6.2.2 Axial fastening

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

6.6.3 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 51), e.g. using a pump.
- 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, depending on local possibilities, as follows:
 - preferably using forcing-off screws in an end plate (see figure 53) or
 - using a central threaded spindle or
 - using a hydraulic lifting unit.



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 documentation.

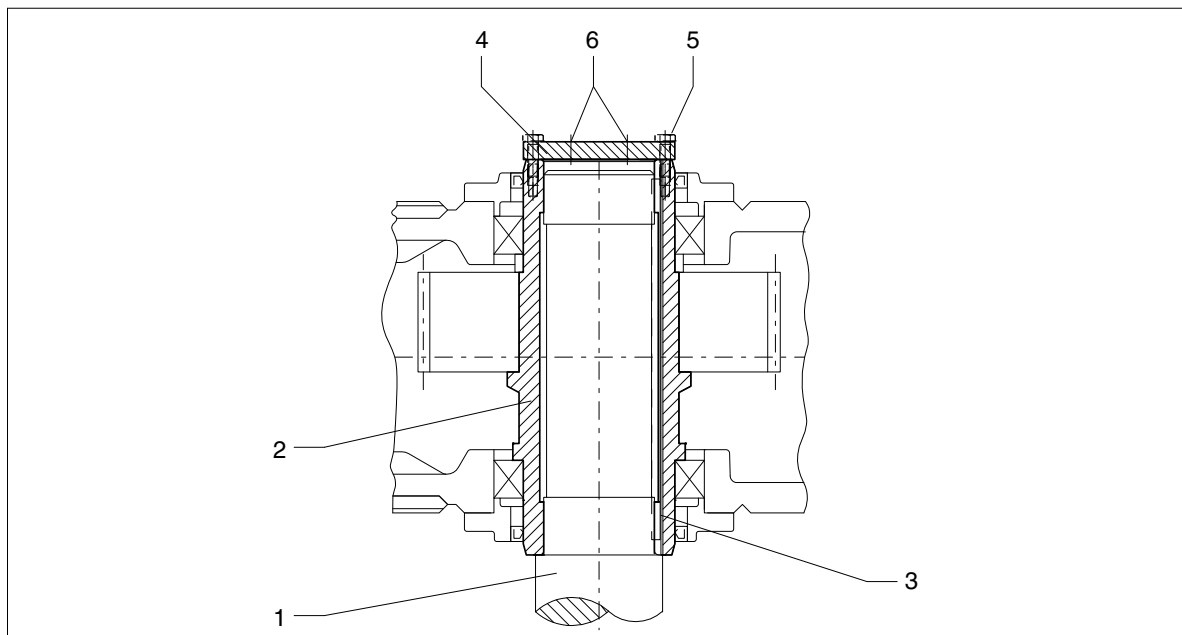


Fig. 53: Hollow shaft with parallel keyway, demounting with end plate

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

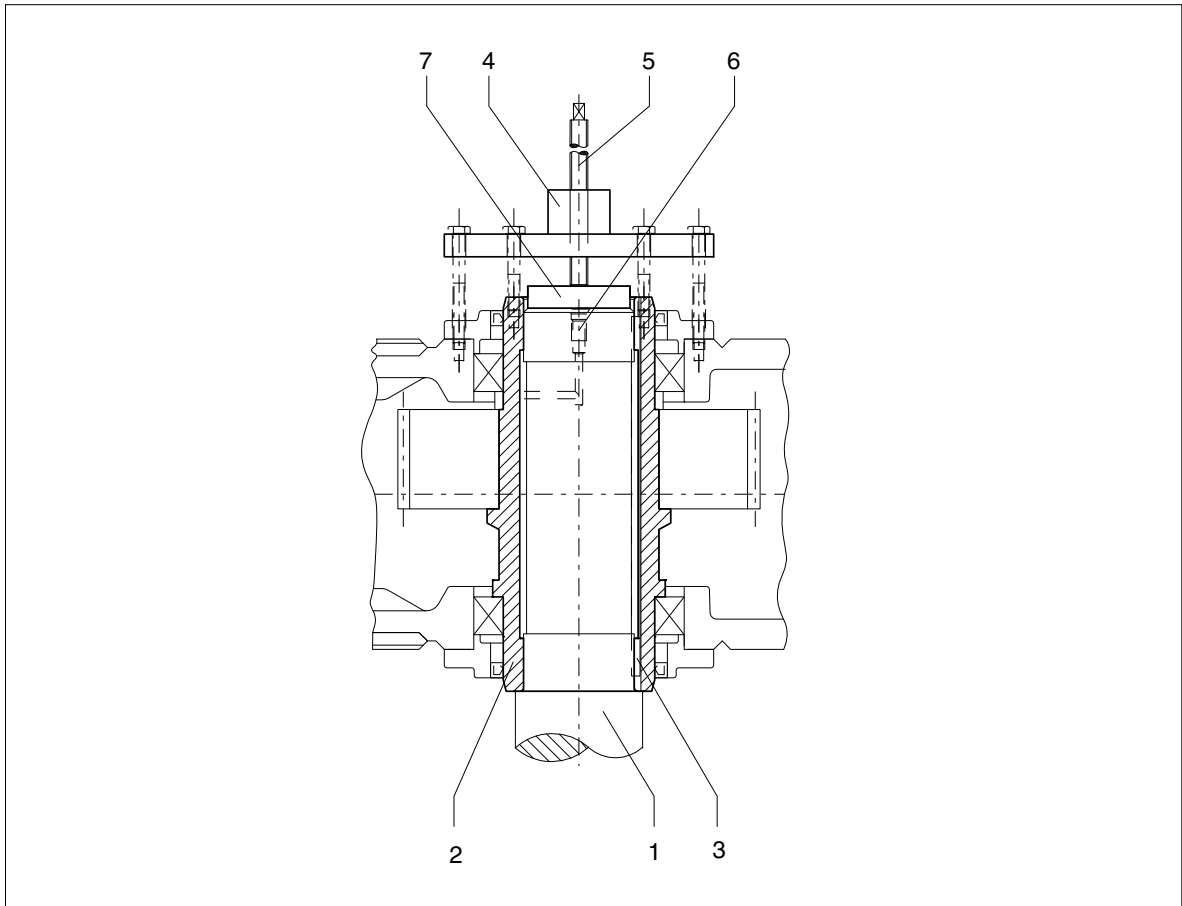


Fig. 54: Hollow shaft with parallel keyway, demounting with hydraulic lifting unit

- | | | | |
|---|------------------------|---|-------------------------|
| 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 | | |



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

6.7 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).

6.7.1 Preparatory work

To facilitate demounting (see also item 6.7.3.), 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 55). This connection may also be used for supplying rust-releasing agent.

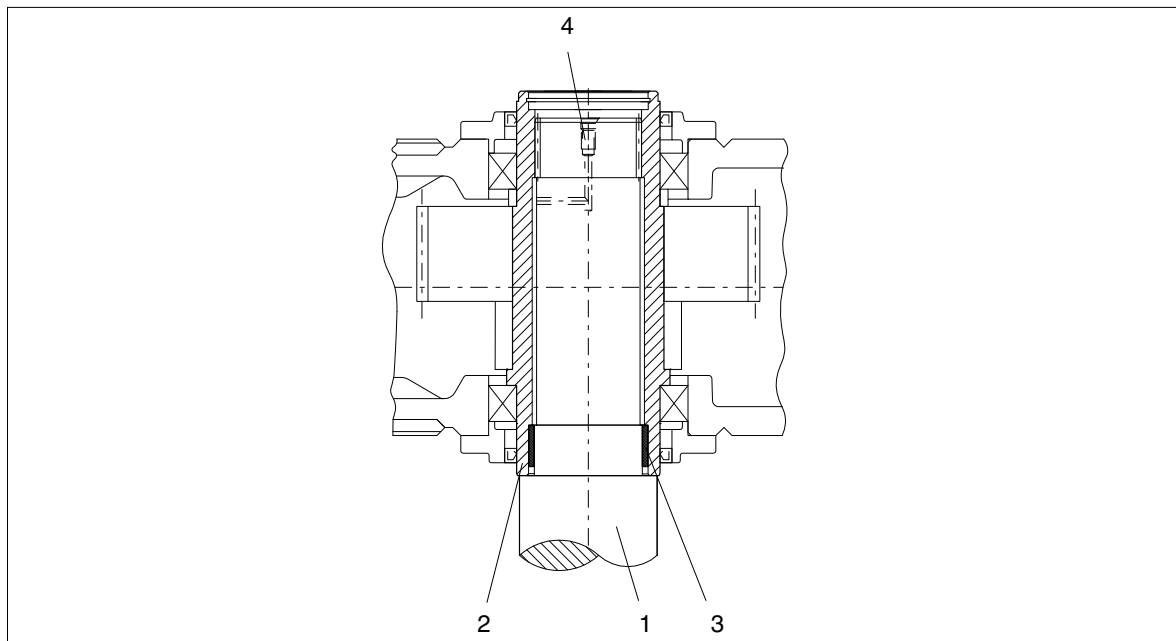


Fig. 55: Hollow shaft with internal spline, preparation

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

6.7.2 Fitting

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



The cleansing agent 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.

6.7.2.1 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.

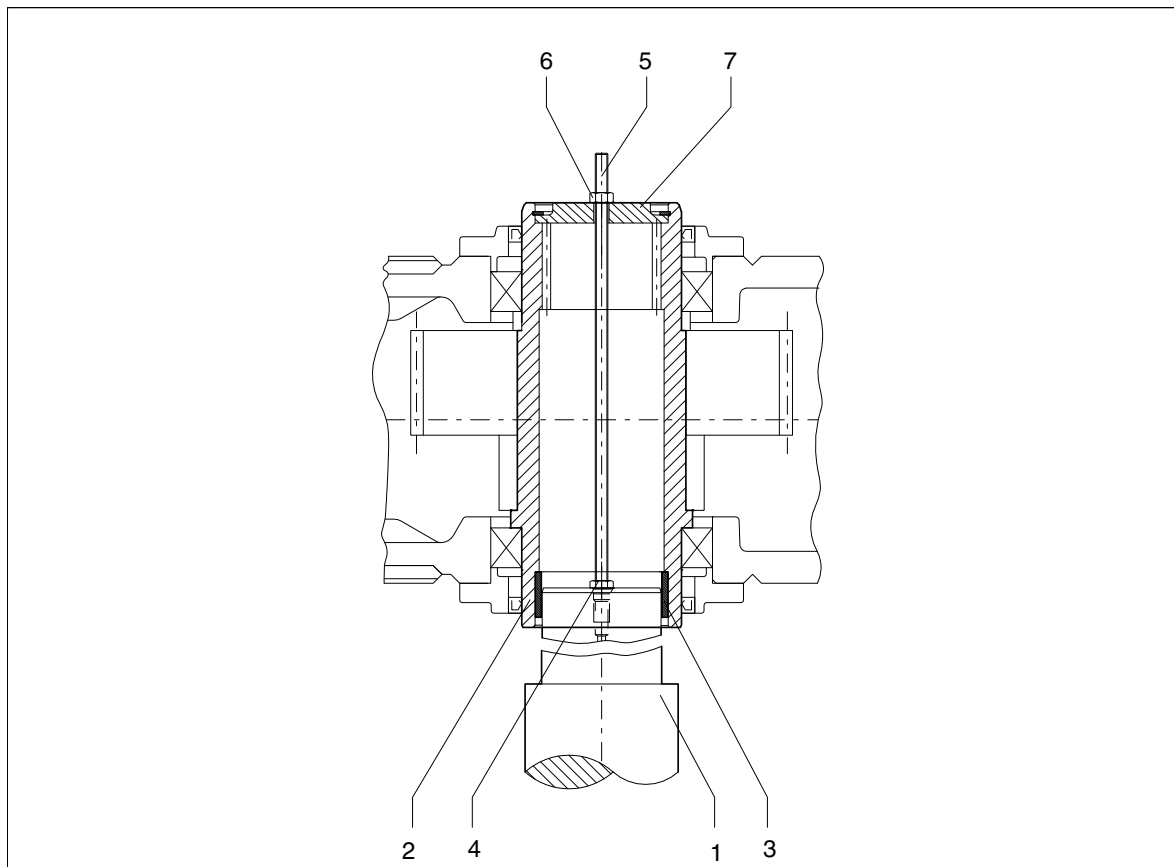


Fig. 56: Hollow shaft with internal spline, fitting with DU bush

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 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 6.12). Under no circumstances may the gear unit be stressed.

6.7.2.2 Axial fastening

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

6.7.3 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 55), 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, depending on local possibilities, as follows:
 - preferably using forcing-off screws in an end plate (see figure 57) or
 - using a central threaded spindle or
 - using a hydraulic lifting unit.



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 documentation.

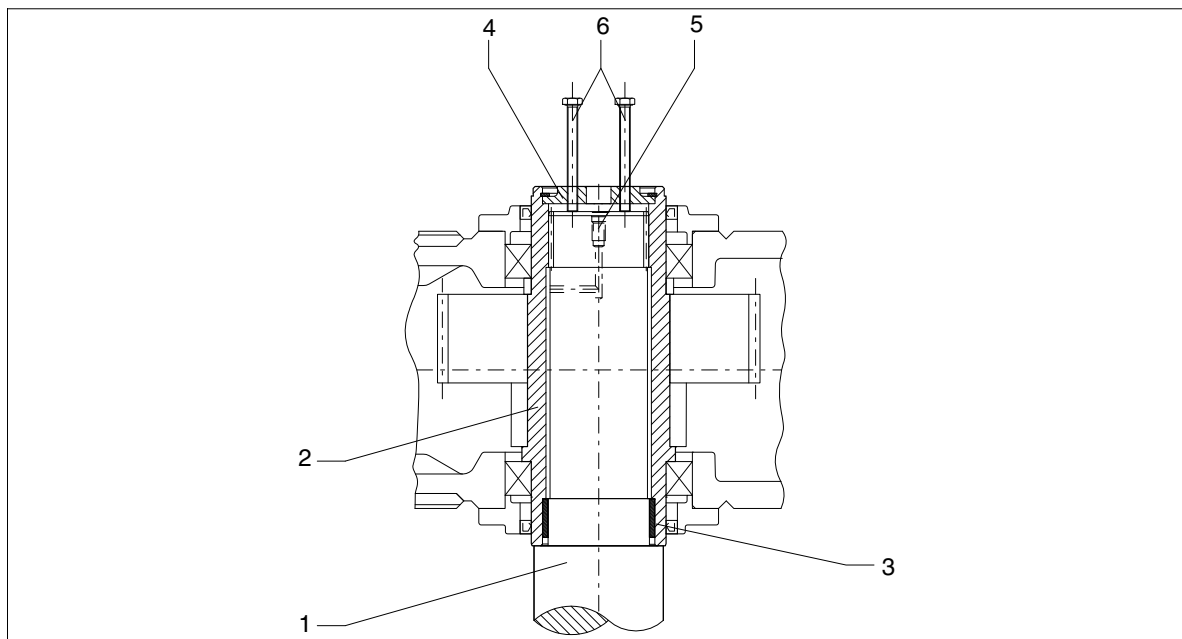


Fig. 57: Hollow shaft with internal spline, demounting with end plate

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

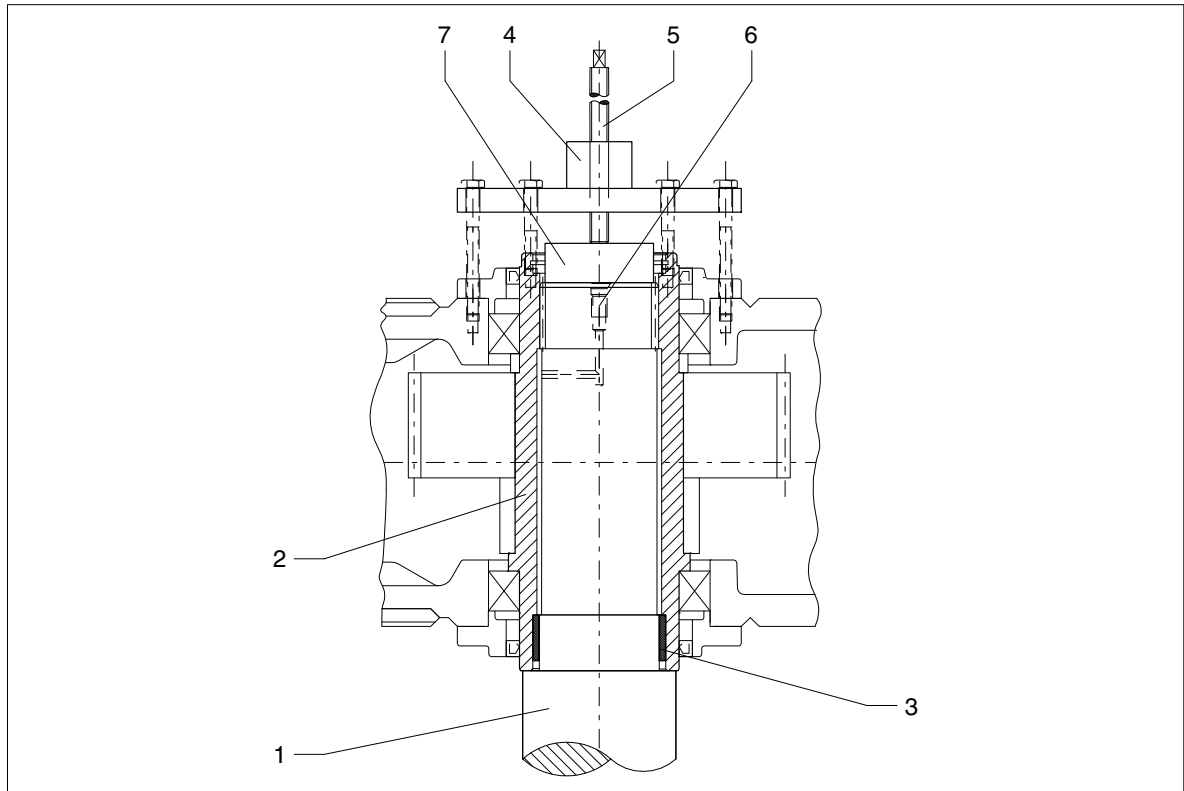


Fig. 58: Hollow shaft with internal spline, demounting with hydraulic lifting unit

- | | | | |
|---|------------------------|---|-------------------------|
| 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 | | |



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

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

The end of the driven machine shaft (material C60+N or higher strength) should have a centring means to 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).

6.8.1 Fitting

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



The cleansing agent 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.**

6.8.1.1 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 6.12).
Under no circumstances may the gear unit be stressed.**

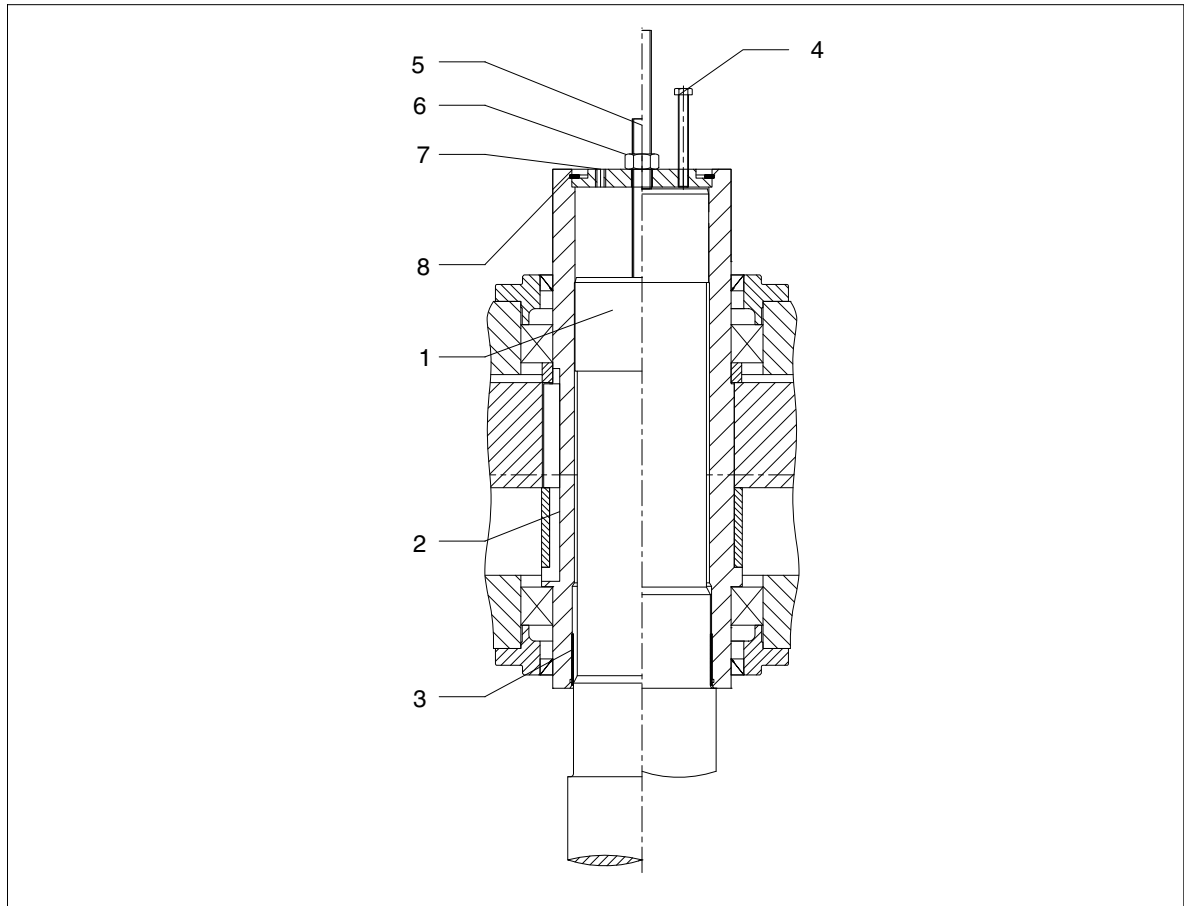


Fig. 59: Hollow shaft in shrink-disk design, mounting with DU bush

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.

6.8.1.2 Axial fastening

If the shrink disk is fitted according to instructions (see item 6.9.1), the gear unit is fixed securely in the axial direction. Additional axial fastening is not required.

6.8.1.3 Demounting the shaft-mounted gear unit

- Demount the shrink disk (see item 6.9.2).
- Using the forcing-off 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 eyes 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.**

6.9 Shrink disk

The shrink disk realizes a press-fit connection between a hollow shaft and a stub or 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/or 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.

6.9.1 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.

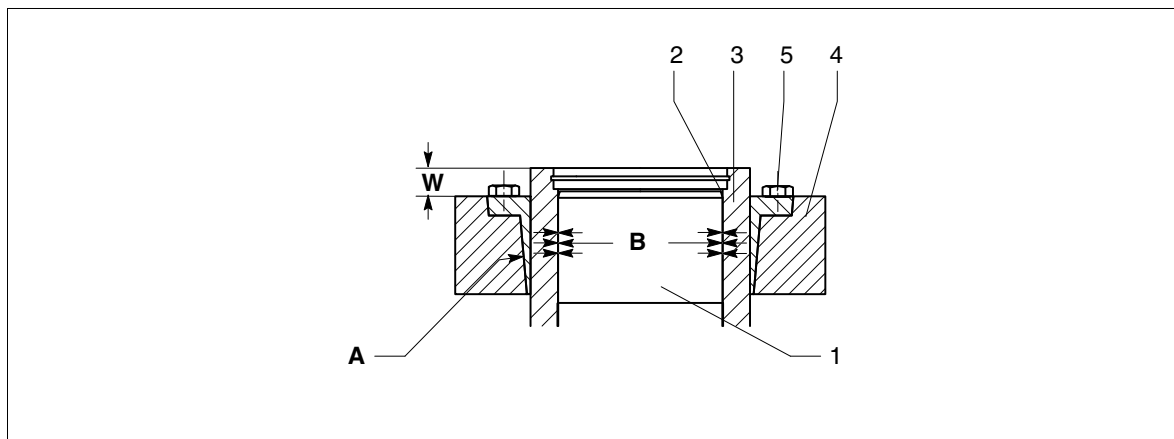


Fig. 60: Fitting the shrink disk

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 12) 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 12: 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!

6.9.2 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!

6.9.3 Cleaning and greasing the shrink disk

Only dirty shrink disks must be disassembled and cleaned.

- Check all parts for any damage.



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



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 60) 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 60).
 - Provide the tensioning bolts (5, see figure 60) 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 13: 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.

6.9.4 Re-fitting the shrink disk



For re-mounting the shrink disk the procedure described in item 6.9.1 must be adhered to.

6.9.5 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)

6.10 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, etc.

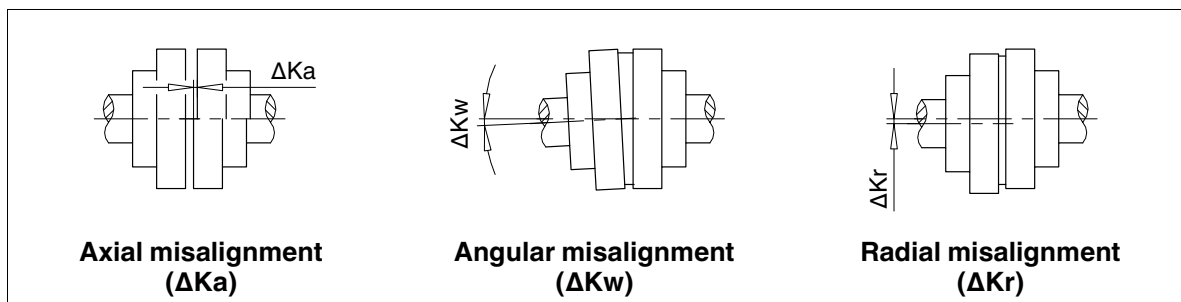


Fig. 61: Possible misalignments

6.12 Fitting the torque arm for the gear-unit housing

6.12.1 Attaching the torque arm



The torque arm must be fitted stress-free on the machine side

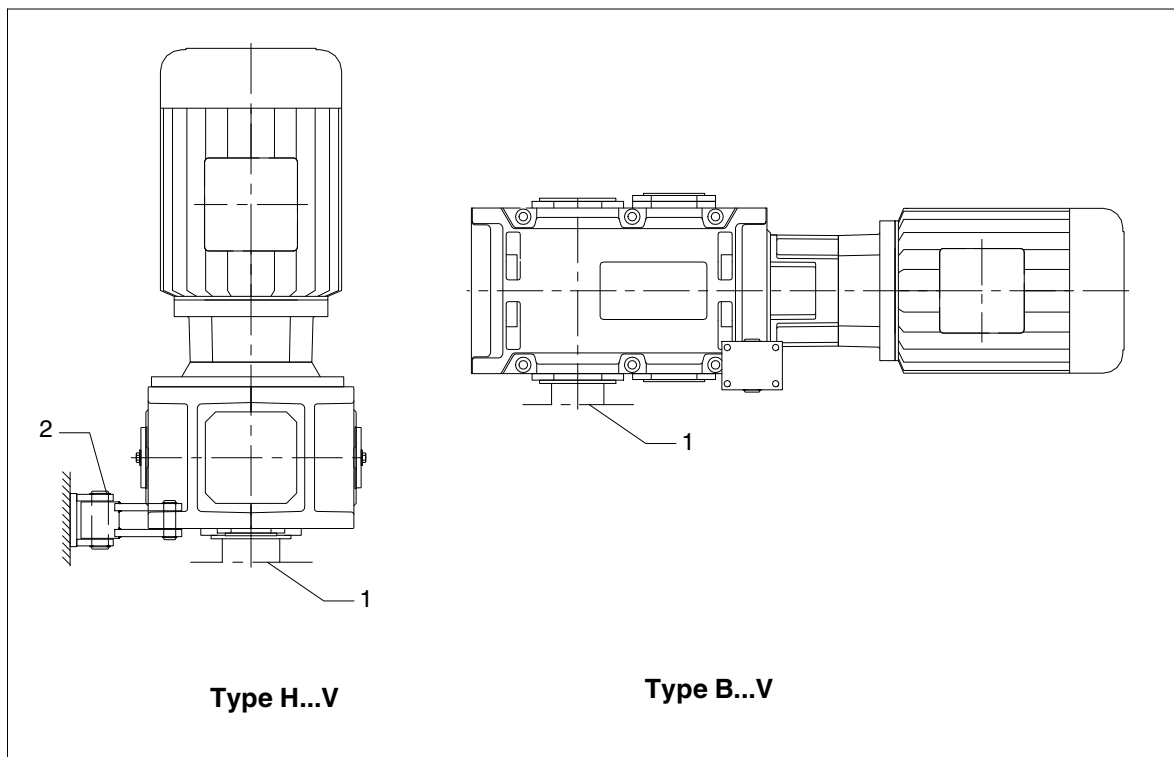


Fig. 63: Torque arm for gear-unit housing of types H..V and B..V

1 Machine side

2 Support block



Motor and torque arm should be fitted only in consultation with Siemens.



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

6.13 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 5.8.2.

6.14 Gear unit with add-on components



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

6.15 Gear units with add-on air oil-cooler

- Connect contamination indicator of the double change-over filter and pressure monitor electrically
- Wire the fan motor electrically.



Observe also item 5.8.3.

6.16 Gear units with add-on water oil-cooler

- Before connecting the water oil-cooler remove the sockets from the cooling-water connections.
- Flush the water oil-cooler (in order to remove any contamination).
- Connect the cooling-water in- and outflow pipes (for flow direction and exact position of connections, see dimensioned drawing).



Make sure when installing the piping that no forces, moments or vibrations act upon the connections of the water oil-cooler.

- Wire the pressure monitor electrically (in case of gear units with corresponding equipment only).



Observe also item 5.8.4.

6.17 Gear unit with heating

- Wire the heating system electrically.

6.18 Gear unit with oil-temperature monitoring system

- Wire the temperature monitor with evaluating instrument (to be provided by customer) electrically. The evaluating device must be provided by the customer.

6.19 Bearing-monitoring system

- Wire the temperature monitor with evaluating device electrically (in case of a configuration as described in item 5.13.1). The evaluating device must be provided by the customer.

6.20 Gear unit with speed transmitter

- Wire the speed transmitter electrically.

6.21 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.

6.22 Final work

- After installation of the gear unit check all screw connections listed in table 14 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.
- Check that all the devices which have been demounted for transport reasons have been refitted.
- Any oil-drain cocks must be secured against accidental opening.
- The gear unit must be protected against falling objects.
- Protective devices for rotating parts must be checked for correct seating. Contact with rotating parts is not permitted.
- A potential equalisation in accordance with the applying regulations and directives must be carried out! If no threaded holes for earth connection are available on the gear unit, other appropriate measures must be taken. This work must always be done by **specialist electricians**.
- Observe the operating instructions to the add-on parts.
- Cable entries should be protected against moisture.
- Check that protective measures have been taken!

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

6.23.1 Screw-connection classes

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

Table 14: 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.
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.

6.23.2 Tightening torques and initial-tensioning forces



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

Table 15: Initial-tensioning forces and tightening torques for screw connections of strength classes **8.8; 10.9; 12.9** with a common friction coefficient of $\mu_{\text{total}} = 0.14$

Nominal thread diameter d mm	Strength class of the bolt	Initial-tensioning force for screw-connection classes from table 14			Tightening torque for screw-connection classes from table 14		
		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
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

Nominal thread diameter d mm	Strength class of the bolt	Initial-tensioning force for screw-connection classes from table 14			Tightening torque for screw-connection classes from table 14		
		C	D	E	C	D	E
		$F_{M \min.}$ N			M_A Nm		
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 (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



**Replace the screw plug with the air filter or wet-air filter before start-up.
Remove adhesive tape from the labyrinth seals (in case of Tacolab seals only, see item 4.4.1). See figures 9 to 12.**

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

7.1.3 Filling with lubricant

- Unscrew the oil dipstick or screw plug (for oil filling) on the gear unit or oil-equalising tank.



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-level indicator, or the middle of the oil-sight glass.



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 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 a link, see the BA 7300 instructions manual 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, oil-level indicator 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).

- Screw in the oil dipstick or screw plug into the gear unit or into the oil-equalising tank again.
- Check the oil level in the gear-unit housing with the oil dipstick, oil-level indicator or the oil-sight glass.



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

For connection dimensions, refer to the dimensioned drawing of the gear unit in the gear-unit documentation.



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

7.2 Grease-lubricated rolling bearing



The gear unit is delivered ex works with the necessary grease charge for the lower output-shaft bearing.

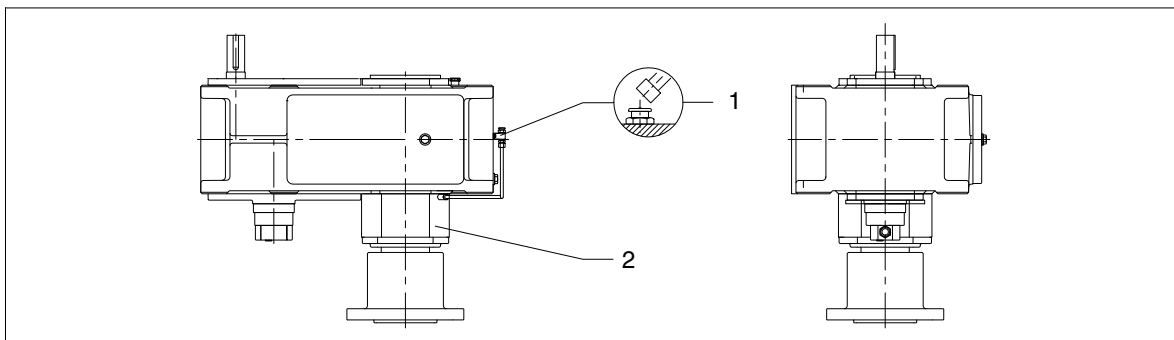


Fig. 64: Lubricating point for lower output-shaft bearing of type H.BV with oil-dam pipe (see item 5.7.5)

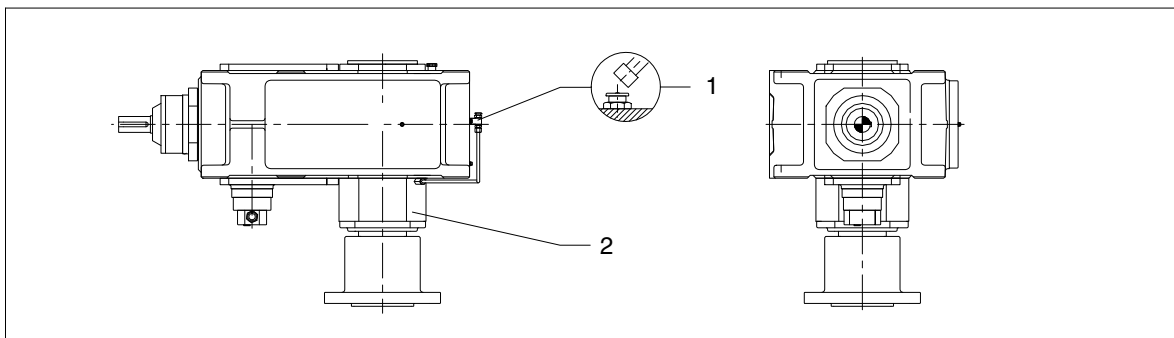


Fig. 65: Lubricating point for lower output-shaft bearing of type B3BV with oil-dam pipe (see item 5.7.5)

1 Lubricating point

2 Grease-lubricated rolling bearing

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

7.3 Start-up



Before start-up, replace the yellow plastic screw plug with the air filter or wet-air filter (see also notice on the gear unit).



Prior to using the wet-air filter, 2 of the 8 sealed bores at the underside of the wet-air filter must be opened.



After the first start-up of the external oil-supply system the oil level should be checked (gear units with oil-supply system only).

- Check the oil level in the gear unit.



When the oil has cooled down, the level should be between the marks on the oil dipstick or oil-level indicator, or at the middle of 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.

7.3.1 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.

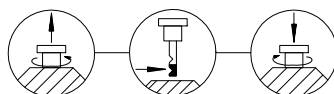
Depending on the type the following oil levels apply:

- Middle of the oil-sight glass.
- Upper mark on the oil dipstick.
- Upper mark on the oil-level indicator.

When the oil has cooled down, the level should be at the upper mark on the oil dipstick or oil-level indicator. 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.



7.3.2 Gear unit with cooling coil or water oil-cooler



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.

- 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.

7.3.3 Gear unit with cooling coil or oil-supply system

7.3.3.1 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.

7.3.3.2 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.

7.3.4 Gear unit with external oil-supply system

7.3.4.1 Pre-lubrication phase

- Prior to start-up, the gear unit should be prelubricated for approx. 3 minutes by means of the oil-supply system.
- During this time, rolling bearings and gear teeth will be adequately supplied with oil for start-up.



The pre-lubrication phase must not take longer than 3 minutes since there will be heavy foaming of the oil at low temperatures. If the oil temperature is $< 10\text{ }^{\circ}\text{C}$ the oil should be heated up applying suitable measures, or Siemens should be consulted.



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

7.3.4.2 Initial operation

- Adhere to instructions.
- Start the gear unit.

A no-load run of the gear unit should be limited to a minimum time. During this time, the following points have to be observed:

– Oil level

After the first run the oil level will fall. As the gear unit continues to heat up, the oil level will rise to the level of the mark showing the operating oil level.

If the gear unit does not heat up with too low load drop, the cooling-water supply should be restricted. This will reduce foaming of the oil.

– Oil leakages

Screw joints should be checked for oil leakages and, if necessary, resealed!

7.3.5 Oil-level check



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

7.3.6 Temperature measurement



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

The maximally permissible oil-ump temperature is $90\text{ }^{\circ}\text{C}$ (for mineral oil) or $100\text{ }^{\circ}\text{C}$ (for synthetic oil).

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

7.3.7 Bearing monitoring (vibration measurement)



If the necessary measures have been made for vibration measurement as bearing monitoring (see item 5.13.2 or 5.13.3), 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.

7.3.8 Heating



Never switch the heating on, unless complete immersion of the heating element in the oil bath is ensured. Fire hazard!
If heating elements are installed afterwards the maximum heating capacity (see table 11 in item 5.10) on the outer surface of the heating element must not be exceeded.



The correct setting of the switch points must be checked!

7.3.9 Checking procedure

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

- 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-level indicator, or at the middle of 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.

7.4 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 7.4.1 and 7.4.2 (before a shut-down period exceeding 6 months).

7.4.1 Interior preservation for longer disuse

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

7.4.1.1 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 or wet-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!

7.4.1.2 Interior preservation with preservative agent



See figures 9 to 12.

- 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 the air filter or wet-air filter on the top of the housing.
- Replace the air filter or wet-air filter with a screw plug.



Carefully clean the air filter or wet-air filter (see item 10.2.4) and keep it on a safe place (it will be required again when starting up again).

- Unscrew oil-filler plug including the oil dipstick.
- 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.

- Screw in again the oil-filler plug including the oil dipstick.



**The Tacolab seals on the shafts must be sealed airtight at the latest one hour after filling in the preservative oil (using adhesive tape) (see figure 4).
Before re-starting the gear unit the adhesive tape must be removed.**

Replace the screw plug with the air filter or wet-air filter.

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.

7.4.2 Exterior preservation

7.4.2.1 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 8 in item 4.4.3.

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.

During operation the gear unit must be monitored for:

- Operating temperature
Unless otherwise agreed, the gear unit is designed for continuous operation at a maximum operating temperature of:
90 °C when using mineral oils or synthetic esters and
100 °C when using PAO- or PG-oils.
For a short period the "temperature in continuous operation" may be exceeded by maximum 10 K.
- Oil pressure of the oil-supply system (min. 0.5 bar)
- Changes in gear noise
- Possible oil leakage at the housing and shaft seals

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.



After starting up the add-on oil-supply system, if fitted, for the first time, the gear-unit oil level must be checked.

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 16, "Faults, causes and remedy" (see item 9.2).

Table 16, "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, "General notes").

9. Faults, causes and remedy

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

9.1 General information on faults and malfunctions



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

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



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 16: 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.

Faults	Causes	Remedy
Exterior of gear unit is oiled up.	<p>Inadequate sealing of housing covers and/or joints.</p> <p>Tacolab seals oiled up.</p>	<p>Seal joints.</p> <p>Check oil charge. If necessary, clean labyrinths.</p> <p>Incorrect transport position</p>
Oil leakage from the gear unit.	<p>Inadequate sealing of housing covers and/or joints.</p> <p>Radial shaft-sealing rings defective.</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>
Grease escaping at the output shaft.	Radial shaft-sealing rings defective.	Check radial shaft-sealing rings and, if necessary, replace.
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>Oil foams in sump.</p> <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 state of oil by the test-tube method for water contamination. Have oil analysed by a chemical laboratory.</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 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>

Faults	Causes	Remedy
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>Gear unit with water oil-cooler: Coolant flow too low.</p> <p>Gear unit with air oil-cooler: cooler block contaminated.</p> <p>Coolant temperature too high.</p> <p>Oil flow through water oil-cooler too low due to: seriously contaminated oil filter.</p> <p>Oil pump defective.</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>Fully open valves in in- and outflow pipes. Check for free flow through water oil-cooler.</p> <p>Clean cooler block. See section 10.</p> <p>Check temperature and, if necessary, adjust.</p> <p>Clean the oil filter. See section 10.</p> <p>Check function of oil pump and, if necessary, repair or replace oil pump.</p> <p>Clean air-guide cover and gear-unit housing.</p>
Pressure monitor triggers alarm. (gear units with forced lubrication, water oil-cooler or air oil-cooler)	Oil pressure < 0.5 bar.	Check oil level at room temperature and, if necessary, top up oil. Check and, if necessary, replace oil pump. Check oil filter and, if necessary, clean, see section 10.
Contamination indicator on double change-over filter triggers alarm.	Double change-over filter clogged.	Change double change-over filter over as instructed in separate operating instructions, clean clogged filter element.
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 17: 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.	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 away with a 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 a 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 away with a 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 18 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
average operating temperature of	80 °C (in case of mineral oils or synthetic esters)
average operating temperature of	90 °C (in case of PAO- or PG-oils)

The operator must ensure that the intervals stated in table 18 are adhered to. This also applies if the maintenance work is included in the operator's internal maintenance schedules.

Under different operating conditions the periods indicated below must be adjusted accordingly (see item 10.1.1 "General oil-service lives").

Table 18: Maintenance and repair work

Measures	Periods	Remarks
Check the oil temperature	Daily	
Check for unusual gear-unit noise	Daily	
Check the oil level	Monthly	
Comparison of vibration values for bearing monitoring with initial values (reference values) on starting up	Observe the instructions of the manufacturer	See item 7.3.7.
Check gear unit for leaks	Monthly	
Test the water content of the oil	After approx. 400 operating hours, at least once per year	See item 10.2.1.
Perform the first oil change	Approx. 400 operating hours after start-up	See item 10.2.2.
Perform subsequent oil changes	Every 24 months or 10 000 operating hours	See item 10.2.2.
Clean the oil filter	Every 3 months	See item 10.2.3.
Replace wet-air filter	As required	See item 10.2.5.

Measures	Periods	Remarks
Clean air filter	Every 3 months	See item 10.2.4.
Clean fan, air guide cover and gear unit	Depending on requirements, at least every 2 years	See item 10.2.6.
Type with oil-dam pipe: recharge with grease	Every 5000 operating hours, every 10 months at least	See item 10.2.7.
Refill the Taconite seals with grease	Every 3000 operating hours or at least every 6 months	See item 10.2.7.
Refill Tacolab seals with grease	Every 3000 operating hours or at least every 6 months	See item 10.2.8.
Check the cooling coil	Every 2 years	See item 10.2.10.
Check condition of air oil-cooler	Depending on requirements, at least every 2 years	See item 10.2.11.
Check condition of water oil-cooler	Depending on requirements, at least every 2 years	See item 10.2.12.
Check the hose lines	Yearly	See item 10.2.13.
Change the hose lines	6 years from the manufacturing date impressed	See item 10.2.13.
Check tightness of screw connections	After the first oil change, then every 2 years	See item 10.2.15.
Check the shrink disk	Every 12 months	See item 6.9.5.
Inspection of the gear unit	Approx. every 2 years	See item 10.4.

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 18 (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 instructions BA 7300.

- 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 7.4).
- Place a suitable container under the oil-draining point of the gear-unit housing.
- Unscrew the air filter or wet-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 (see operating instructions to the oil-supply system).



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.



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 or change the wet-air filter (see item 10.2.4 or item 10.2.5).
- Screw in the air filter or wet-air filter.
- Unscrew the oil-filler plug including the oil dipstick to fill oil in.
- Fill fresh oil into the gear unit (see item 7.1.3).
- Screw in again the oil-filler plug including the oil dipstick.



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.

10.2.3 Clean the oil filter



For operation and maintenance, always observe the operating instructions indicated in the order-specific appendix.
For technical data, refer to the order-specific list of equipment.

10.2.4 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.

- Unscrew the air filter.
- Clean the air filter using a suitable 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.

10.2.5 Replace wet-air filter

The wet-air filter has a container filled with silica gel. The air humidity absorbed by the silica gel changes the colour of the gel from "blue" to "pink" (visible through the transparent container). Renewal of the wet-air filter is only necessary when the silica gel has gone completely pink.

- Unscrew the wet-air filter and replace with a new one.



Prior to using the wet-air filter, 2 of the 8 sealed bores at the underside of the wet-air filter must be opened.

10.2.6 Cleaning fan, air-guide cover and gear unit

- The instructions in item 5.8.1 must be observed!
- Demount the air-guide cover.
- Using a stiff brush, remove any dirt adhering to the 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.

10.2.7 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 points have been provided with grease nipples.



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.

10.2.8 Refill Tacolab seals with grease

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



For the exact position 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.

10.2.9 Type with oil-dam pipe: recharge with grease

- Recharge the lubricating point on the oil-dam pipe with lithium-based rolling-bearing grease. The quantity and frequency can be seen on the plate which attached nearby this point.

Lubricating point
[...] g lithium-based grease
after [...] operating hours

○	Fettschmierstelle	○
	<input type="text"/> g Lithiumseifenfett	
○	nach <input type="text"/> Betriebsstunden	○
045DE		

- The lubricating point has been provided with a grease nipple.



For the exact position of the grease nipple, please refer to the drawings in the gear-unit documentation.



Remove and dispose of any old grease escaping.

10.2.10 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. Such analyses are offered by specialist companies for chemical cleaning. Such companies also sell special cleansing agents for removing such deposits.
- Before using these cleansing agents, ensure that they will not damage the cooling coil materials (consult Siemens). Observe the manufacturer's instructions at all times when using different cleansing agents by several manufacturers.



Avoid burns when working with corrosive cleansing 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.

10.2.11 Check air oil-cooler

- The instructions in items 5.8.3 and 10.1 must be observed!
- Remove dirt from the cooler block.
- Check the condition of screw connections and, if necessary, replace.

10.2.12 Check water oil-cooler

- The instructions in items 5.8.4 and 10.1 must be observed!
- Inspect the cooler for leaks in the piping.
- Check the condition of screw connections and, if necessary, replace.

10.2.13 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.

10.2.14 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).

10.2.15 Check tightness of screw connections

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



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, "Technical description", and 7, "Start-up", must be observed. For technical data, refer to the data sheet and/or the list of equipment.



Observe also item 6.22.

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 a link, see the BA 7300 instructions manual 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, oil-level indicator or oil-sight glass are decisive for the amount of oil to be filled in.

The BA 7300 instructions manual 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
--------------------	------------	-------------	----------

11.2 Spare-parts and customer-service addresses

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

12. Declarations

12.1 Declaration of incorporation

Declaration of incorporation

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

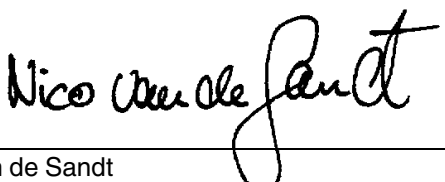
The manufacturer, Siemens AG, 46393 Bocholt, Germany, declares with regard to the partly completed machinery

Gear unit H..V, B..V Sizes 23 to 28

developed for driving machines in most various industry areas:


- The special technical documents described in Annex VII B have been prepared.
- The following basic health and safety requirements set out in Directive 2006/42/EC, Annex I, are applied and are satisfied:
1.1, 1.1.2, 1.1.3, 1.1.5; 1.2.4.4, 1.2.6; 1.3.1 - 1.3.4, 1.3.6 - 1.3.8.1; 1.4.1, 1.4.2.1;
1.5.1, 1.5.2, 1.5.4 - 1.5.11, 1.5.13, 1.5.15; 1.6.1, 1.6.2; 1.7.1, 1.7.1.1, 1.7.2, 1.7.4 - 1.7.4.3
- The partly completed machinery must not be put into service until it has been established that the machinery into which the partly completed machinery is to be incorporated has been declared to be in conformity with the provisions of Directive 2006/42/EC, as appropriate.
- The manufacturer undertakes, in response to a reasoned request by 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, 2011-03-11



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

Voerde, 2011-03-11



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

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Subject to modifications

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