FLENDER SIG
Standard industrial gear unit

H.SH, H.HH, H.DH,H.KH, H.FH
B.SH, B.HH, B.DH, B.KH, B.FH
Sizes 504 to 514

Assembly and operating instructions
BA 5510 EN 09/2011

FLENDER gear units

SIEMENS

SIEMENS

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H.SH, H.HH, H.DH,H.KH, H.FH
B.SH, B.HH, B.DH, B.KH, B.FH
Sizes 504 to 514

Assembly and operating instructions

Translation of the original assembly and operating instructions

Notes and symbols in these assembly and operating instructions

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

Legal notes

Warning-note concept

This manual comprises notes which must be observed for your personal safety and for preventing material damage. Notes for your personal safety are marked with a warning triangle or an "Ex" symbol (when applying Directive 94/9/EC), those only for preventing material damage with a "STOP" sign.

WARNING! Imminent **explosion!**

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

WARNING! Imminent **personal injury!**

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

WARNING! Imminent **damage to the product!**

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

NOTE!

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

WARNING! Hot surfaces!

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

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

Qualified personnel

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

Intended use of Siemens products

Observe also the following:

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

Trademarks

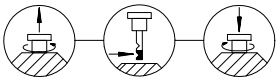
All designations indicated with the registered industrial property mark ® are registered trademarks of Siemens AG. Other designations used in these instructions may be trademarks the use of which by third parties for their own purposes may infringe holders' rights.

Exclusion of liability

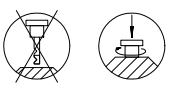
We have checked the content of the instructions for compliance with the hard- and software described. Nevertheless, variances may occur, and so we can offer no warranty for complete agreement. The information given in these instructions is regularly checked, and any necessary corrections are included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

Symbols

Earth connection point			Air relief point	 yellow
Oil-filling point		yellow	Oil-draining point	 white
Oil level		red	Oil level	 red
Oil level		red	Connection for vibration-monitoring device	
Lubrication point		red	Apply grease	
Lifting eye			Eye bolt	
Do not unscrew				
Alignment surface, horizontal			Alignment surface, vertical	



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



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

Contents

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.

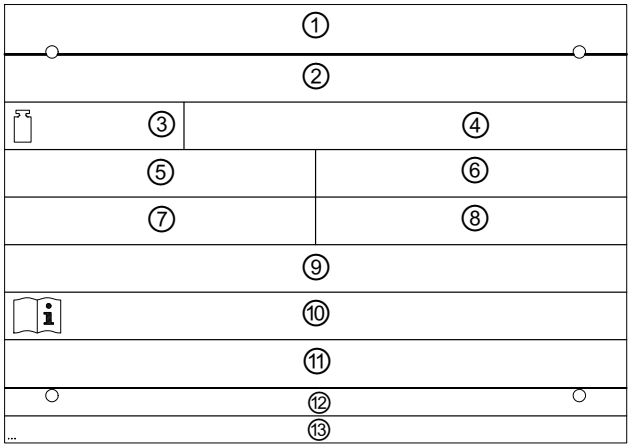
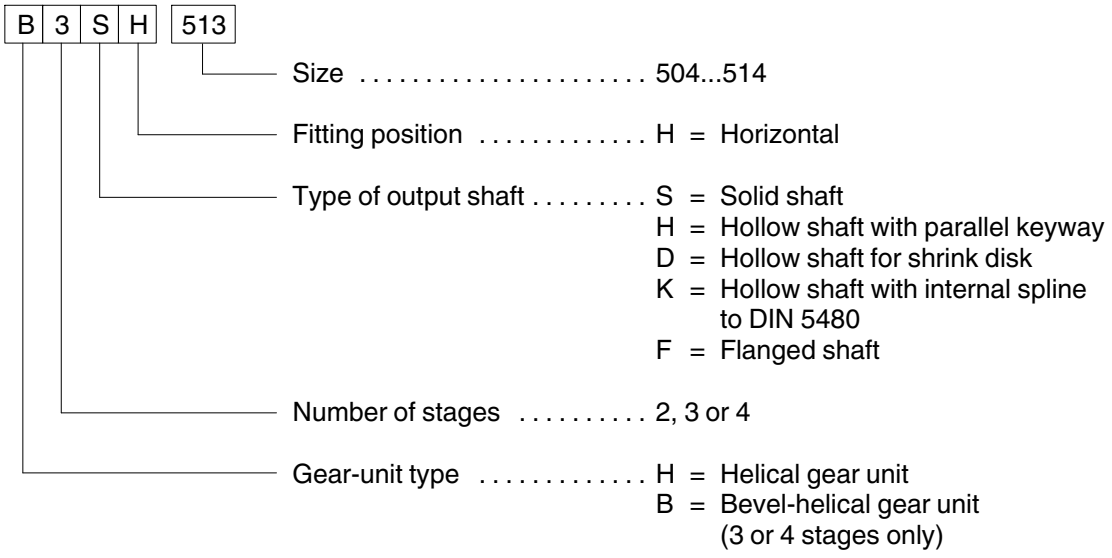


Fig. 1: Rating plate on gear unit

①	Company logo	⑦	Speed n_1
②	Order number, item, sequence number, year built	⑧	Speed n_2
③	Total weightin kg	⑨	Oil data (oil type, oil viscosity, oil quantity)
④	Special information	⑩	Instructions number(s)
⑤	Type, size *)	⑪	Special information
⑥	Power rating P_2 in kW or torque T_2 in Nm	⑫	Manufacturer and place of manufacture
		⑬	Country of origin

*) Example

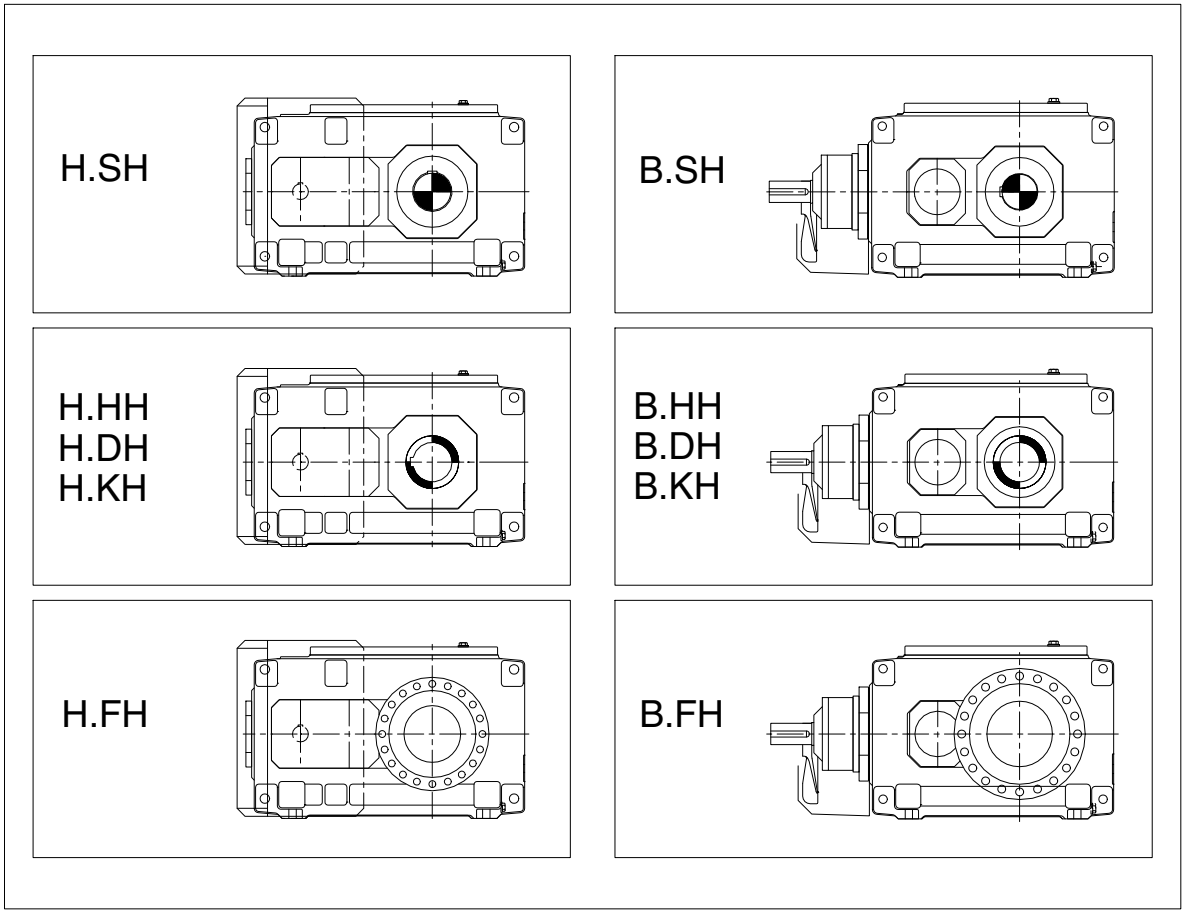


Data on weights and measuring-surface sound-pressure levels of the various gear types are given in items 1.2.2 and 1.2.3.

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

1.2 Configurations and weights

1.2.1 Versions



1.2.2 Weights

Table 1: Weights (approximate values)

Type	Approximative weight (kg) for size										
	504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
H2.H	190	285	360	505	600	830	945	1365	1570	2600	2965
H3.H	-	310	380	535	630	875	1025	1460	1670	2510	2860
H4.H	-	-	-	520	615	820	980	1410	1620	2375	2690
B3.H	195	320	380	540	630	820	1025	1455	1665	2500	2850
B4.H	-	330	375	530	625	830	995	1425	1630	2400	2695

☞ All weights are indicated for units without oil filling and add-on parts. For the exact weights, refer to the drawings in the gear-unit documentation.

Table 2: Total weights (approximate values) for gear units including auxiliary drive (maintenance drive)

Type	Approximative weight (kg) for size										
	504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
B3.H	257	387	447	645	735	985	1190	1665	1875	2820	3170

Table 3: Weights (approximate values) for gear units including auxiliary drive (load drive)

Type	Approximative weight (kg) for size										
	504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
B3.H	280	442	502	685	775	1060	1265	1845	2055	3050	3400

☞ All weights are for units without oil charge, however with fitted auxiliary drive, including motor of the auxiliary drive.
For the exact weights, refer to the drawings in the gear-unit documentation.

1.2.3 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 4 to 7.

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.

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

Table 4: 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										
			504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
B3	14	1500	72	75	77	79	80	81	82	83	85	88	89
	.	1000	65	68	69	71	72	73	74	77	78	80	82
	31.5	750	1)	63	64	66	68	69	70	71	73	74	75
	35.5	1500	69	72	73	74	75	77	79	82	84	86	87
	.	1000	63	65	66	67	69	71	72	73	75	77	78
	50	750	1)	1)	1)	62	64	65	67	69	70	71	72
	56	1500	68	70	71	73	74	76	78	81	83	85	86
	.	1000	61	63	64	66	68	69	71	73	75	77	78
	80	750	1)	1)	1)	61	63	64	66	67	68	70	71

1) $L_{pA} < 60$ dB(A)

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

Table 5: 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										
			504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
B3	14	1500	68	71	74	75	76	77	79	81	83	84	85
	.	1000	63	66	68	69	70	72	73	75	77	78	80
	31.5	750	1)	1)	61	62	64	65	66	68	71	71	73
	35.5	1500	65	67	70	71	71	72	74	77	79	80	81
	.	1000	1)	62	65	65	66	66	69	71	73	75	76
	50	750	1)	1)	1)	1)	1)	1)	62	65	67	68	69
	56	1500	61	64	70	67	68	68	70	73	75	76	78
	.	1000	1)	1)	63	62	62	62	65	68	70	71	72
	80	750	1)	1)	1)	1)	1)	1)	1)	61	63	64	65
B4	63	1500	-	64	65	67	68	70	72	75	76	77	79
	.	1000	-	1)	1)	61	63	64	67	69	70	72	73
	125	750	-	1)	1)	1)	1)	1)	1)	62	64	65	66
	140	1500	-	60	61	63	65	66	68	71	72	73	75
	.	1000	-	1)	1)	1)	1)	61	63	65	67	68	69
	200	750	-	1)	1)	1)	1)	1)	1)	1)	1)	61	62
	224	1500	-	1)	1)	1)	62	63	65	67	69	70	71
	.	1000	-	1)	1)	1)	1)	1)	1)	62	63	64	66
	355	750	-	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)

1) $L_{pA} < 60$ dB(A)

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

Table 6: 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										
			504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
H2	6.3	1500	75	76	77	80	81	82	84	85	86	88	90
	.	1000	69	71	72	74	75	77	79	80	81	83	84
	9	750	66	68	69	70	72	73	75	76	77	79	80
	10	1500	73	75	77	79	80	81	82	85	88	90	91
	.	1000	68	69	70	72	73	75	77	79	80	82	83
	14	750	64	66	67	69	70	71	73	74	76	78	79
	16	1500	71	73	75	77	78	80	82	84	86	87	90
	.	1000	65	67	68	71	72	73	75	77	78	80	81
	25	750	62	64	65	67	68	69	71	73	74	75	77
H3	20	1500	-	71	72	75	75	77	77	80	80	81	81
	.	1000	-	65	66	69	70	71	72	74	75	75	75
	28	750	-	62	62	66	67	67	68	70	70	71	72
	31.5	1500	-	70	71	73	74	76	76	79	79	80	80
	.	1000	-	64	65	67	68	69	70	73	73	73	74
	56	750	-	62	62	63	64	65	66	69	69	69	70
	63	1500	-	70	70	72	72	75	75	78	78	78	78
	.	1000	-	64	64	65	66	68	69	71	72	72	72
	100	750	-	61	61	62	62	64	65	67	67	68	68

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

Table 7: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units without fan

Type	i_N	n_1 1/min	Gear-unit size										
			504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
H2	6.3	1500	71	74	75	76	77	79	79	80	81	81	82
	.	1000	66	69	70	71	72	74	74	75	76	76	77
	9	750	63	66	67	67	69	70	71	72	73	73	74
	10	1500	69	72	73	74	75	77	77	78	79	79	80
	.	1000	64	67	68	69	70	72	72	73	74	74	75
	14	750	61	64	65	66	67	69	69	70	71	71	72
	16	1500	66	69	70	71	72	74	74	75	76	77	78
	.	1000	61	64	65	66	68	69	69	70	71	72	73
	25	750	1)	61	62	63	64	66	66	67	68	69	70
H3	20	1500	-	68	69	73	74	74	75	77	77	78	79
	.	1000	-	63	65	68	69	69	71	72	73	73	74
	28	750	-	60	61	65	66	65	67	69	69	70	71
	31.5	1500	-	65	67	70	71	71	73	74	75	76	76
	.	1000	-	1)	62	65	66	66	68	69	70	71	72
	56	750	-	1)	1)	62	63	63	65	66	67	67	68
	63	1500	-	62	64	67	68	68	70	71	72	73	74
	.	1000	-	1)	1)	62	63	63	65	66	67	68	69
	100	750	-	1)	1)	1)	1)	1)	62	63	64	65	66
H4	80	1500	-	-	-	66	67	68	69	70	71	72	73
	.	1000	-	-	-	62	63	63	64	65	66	67	68
	125	750	-	-	-	1)	1)	1)	61	62	63	64	64
	140	1500	-	-	-	64	65	66	66	68	68	69	70
	.	1000	-	-	-	1)	60	61	62	63	64	64	65
	224	750	-	-	-	1)	1)	1)	1)	60	61	61	62
	250	1500	-	-	-	61	62	63	64	65	66	67	67
	.	1000	-	-	-	1)	1)	1)	1)	60	61	62	63
	400	750	-	-	-	1)	1)	1)	1)	1)	1)	1)	1)

1) $L_{pA} < 60$ dB(A)

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

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

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

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

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

Siemens Industriegetriebe GmbH
Thierbacher Straße 24
09322 Penig

Tel.: +49 (0)37381 / 61-0
Fax: +49 (0)37381 / 80286

3. Safety instructions

Entry to the gear unit and its added components is not permitted during operation. Entry for maintenance and repair work is only permitted when the gear unit is at a stillstand. Protective covers, components added-on and pipework must not be entered.
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 or damage,
  - ensure the safety and reliability of the unit,
  - avoid disruptions and environmental damage through incorrect use.
- During transport, assembly, installation, demounting, operation and maintenance of the unit, 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.
The drive unit must be secured against being switched on accidentally (e.g. by locking the key switch or removing the fuses from the power supply). A notice should be attached to the start switch stating clearly that work is in progress.
At the same time the complete installation must be without load, so that no danger occurs during demounting operations (e.g. change of the backstop).

- No welding work must be done at all on the drive.
  The drive systems must not be used as an earthing point for electric-welding operations. Toothed parts and bearings may be irreparably damaged by welding.
- A potential equalisation in accordance with the applying regulations and directives must be carried out! Potential equalisation is carried out via the metal contact with other earthed component parts or by connection of a suitable earth line to existing tapped holes. 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, such as rating plate and direction arrow, must always be observed. They must be kept free from dirt and paint at all times. Missing plates must be replaced.
- Screws which have been damaged during assembly or disassembly work must be replaced with new ones of the same strength class and type.

3.2 Environmental protection

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

3.3 Special dangers and personal protective equipment

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

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

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

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

Small foreign matter such as sand or dust 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 is not suitable for operation in explosion-hazard locations. It must under no circumstances be used in such locations.
Caution, danger to life.

4. Transport and storage

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

4.1 Scope of supply

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

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

4.2 Transport

When handling these 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. These have the following meanings:

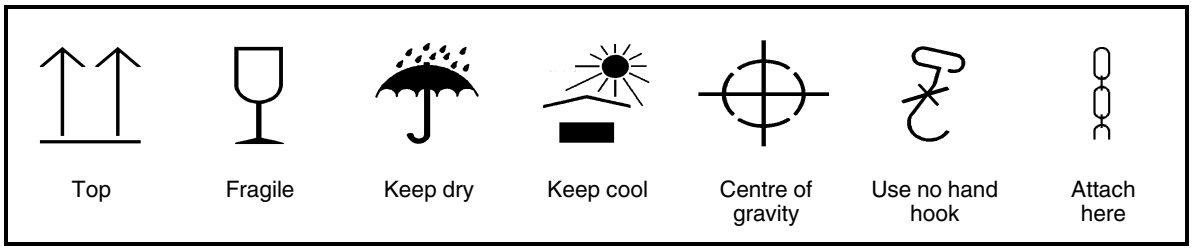


Fig. 2: Transport symbols

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 unit must be transported only with the appropriate transport equipment.
The gear unit should be transported without an oil filling.

Exception: In case of gear units with auxiliary drive, the auxiliary gear unit will be delivered ex works with oil filling. Gear units delivered by Siemens with an oil filling must be transported in their mounting position. The additional weight (number of litres x 10 N) must be taken into account.

Use only the eyes provided to attach lifting equipment to the unit.
Handling of the gear unit by attaching it to the pipework is not permitted.
The pipework and projecting add-on parts 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.

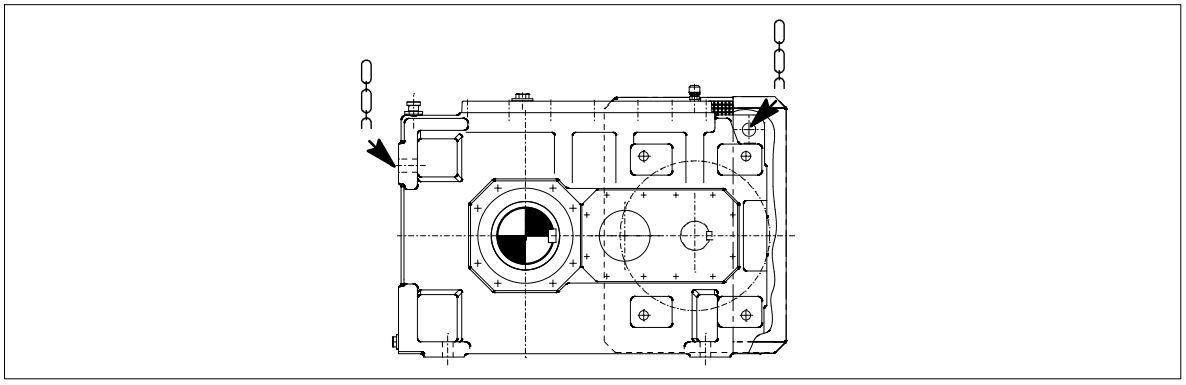


Fig. 3: Attachment points on gear units of types H2.. and H3.. up to size 512

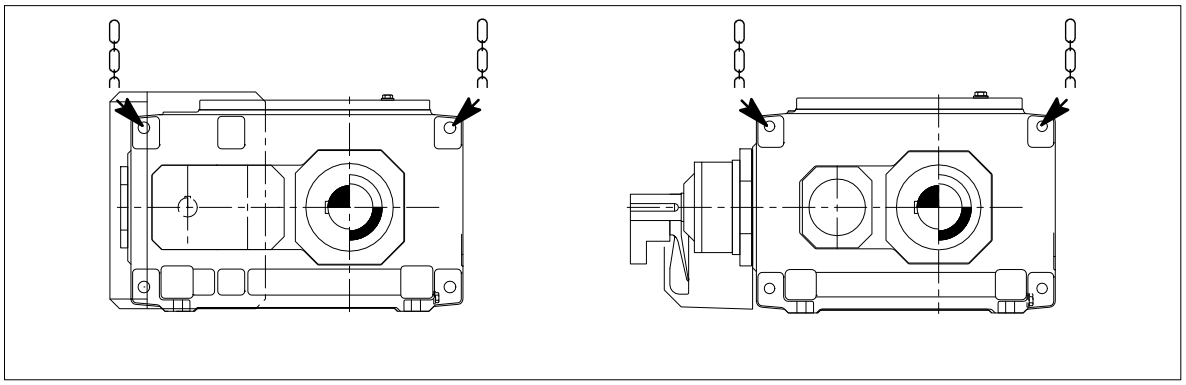


Fig. 4: Attachment points on gear units of types H4.. and B4.. up to size 514 and H2.., H3.. and B3.. of sizes 513 and 514

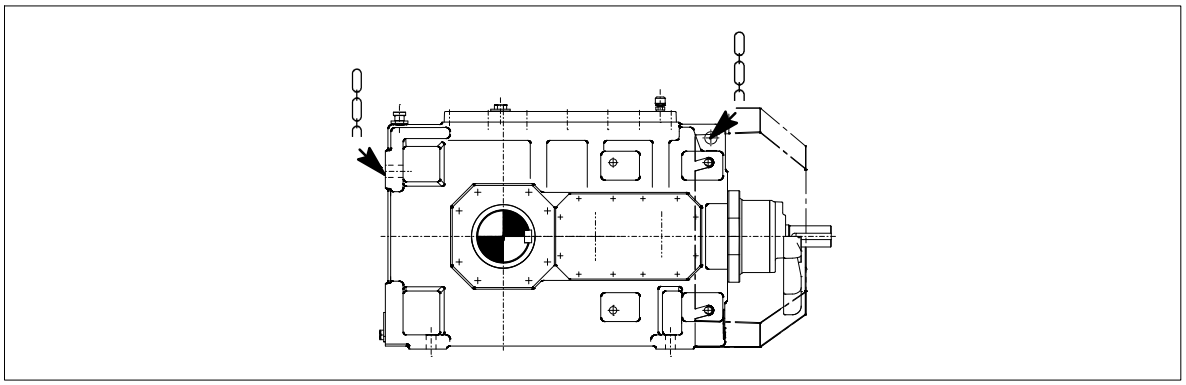


Fig. 5: Attachment points on gear units of type B3.. up to size 512

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

STOP **Units which are slung by eyebolts must not be tilted.**

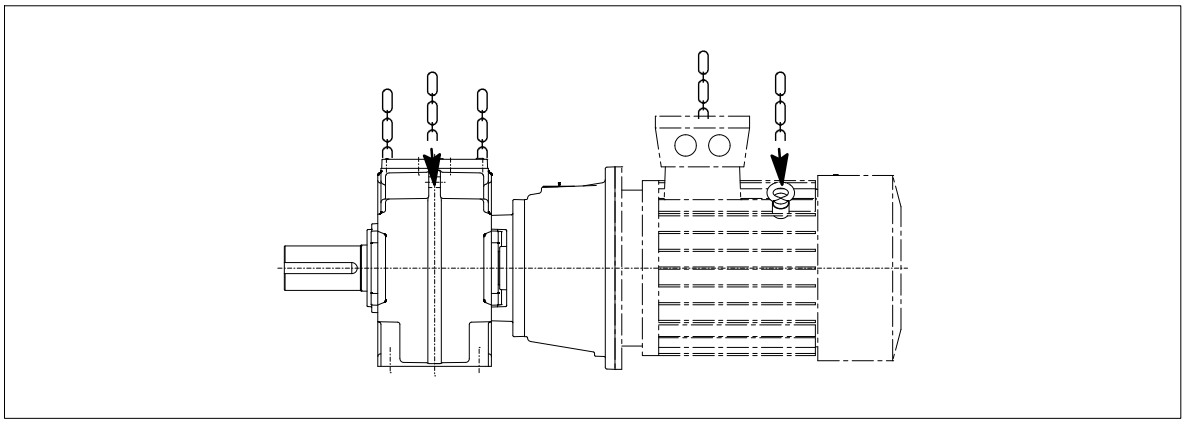


Fig. 6: Attachment points on gear units of types H2.. and H3.. up to size 512 with motor and bell housing

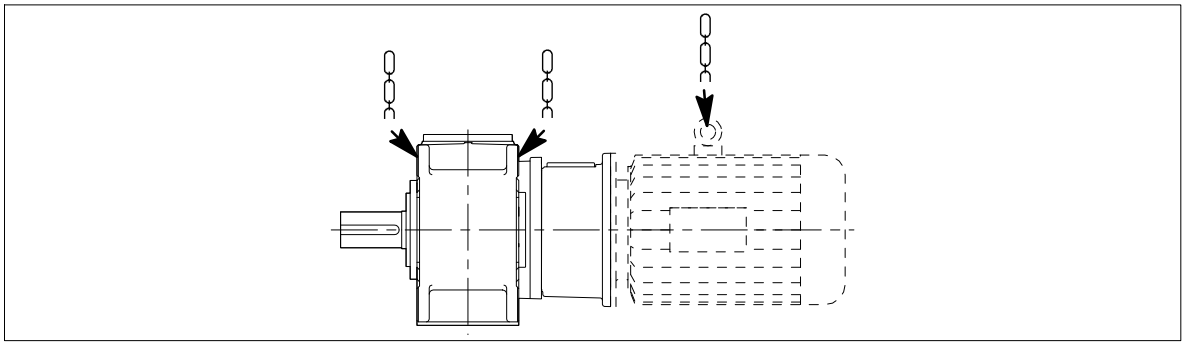


Fig. 7: Attachment points on gear units with motor of types H4.. up to size 514 and H2.., H3.. of sizes 513 and 514

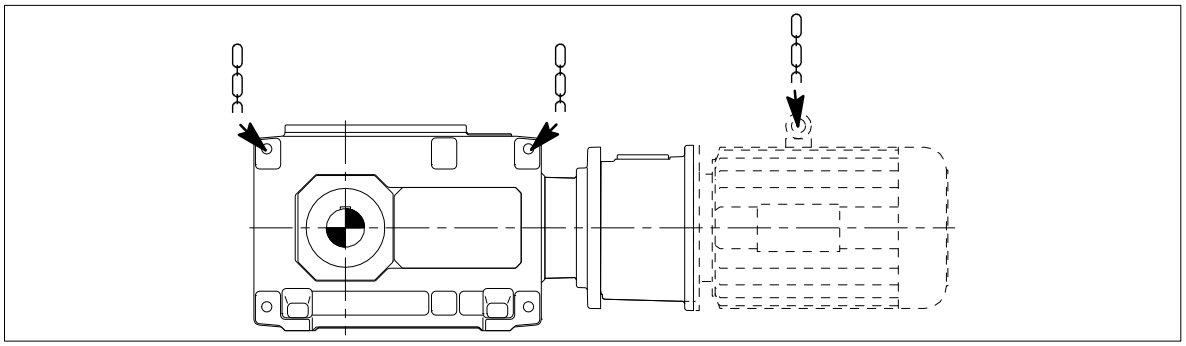


Fig. 8: Attachment points on gear units with motor of types B4.. up to size 514 and B3.. of sizes 513 and 514

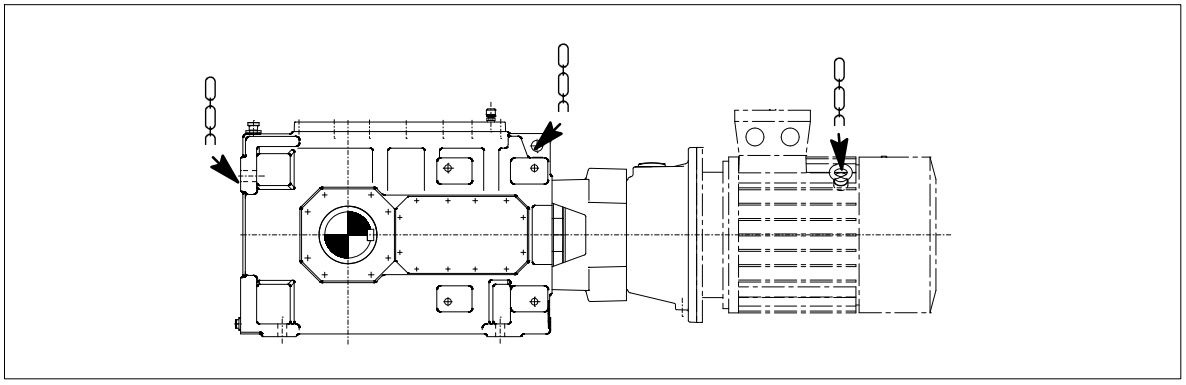


Fig. 9: Attachment points on gear units of type B3.. up to size 512 with motor and bell housing

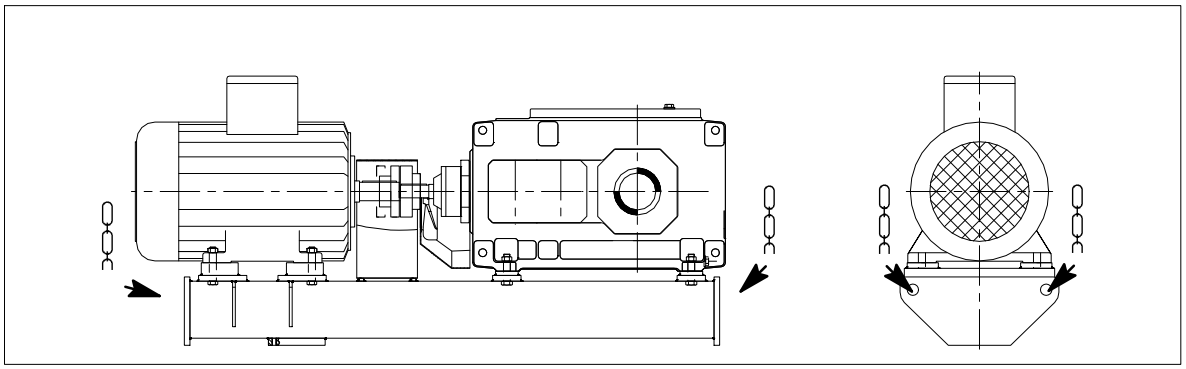


Fig. 10: Attachment points on gear units types B... with gear-unit swing base

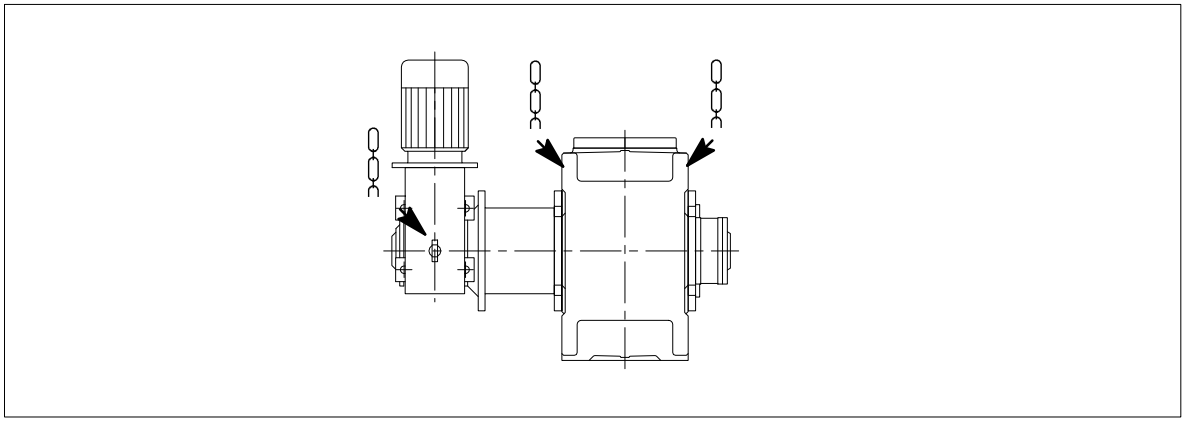


Fig. 11: Attachment points on gear units of type B3.H with auxiliary drive

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

4.3 Storing the gear unit

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

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 finish coat in accordance with directives applying to the specific application.
The priming coat alone is not suitable to provide a sufficient long-term corrosion protection.

Ensure that the coat is not damaged!

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

Unless otherwise contractually agreed, the interior preservation is guaranteed for 6 months, and the preservation of the free shaft ends for 24 months, provided that storage is in dry, frostfree sheds.

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

For longer periods of storage (> 6 months) we advise regular checking and, if necessary, renewal of the interior and exterior preservation (see section 7, "Start-up").

The output shaft must then be rotated at least one turn to change the position of the rolling element in the bearings. The input shaft must not be in the same position as before rotation.

This procedure must be repeated and documented every 6 months until start-up.

4.4.1 Preservation in case of Tacolab seals

In case of gear units with Tacolab seal, after the standard preservation procedure, the air gap on the output shaft (position 3 in figure 12) must be closed airtight with adhesive tape. A V-ring prevents air exchange on the input shaft.

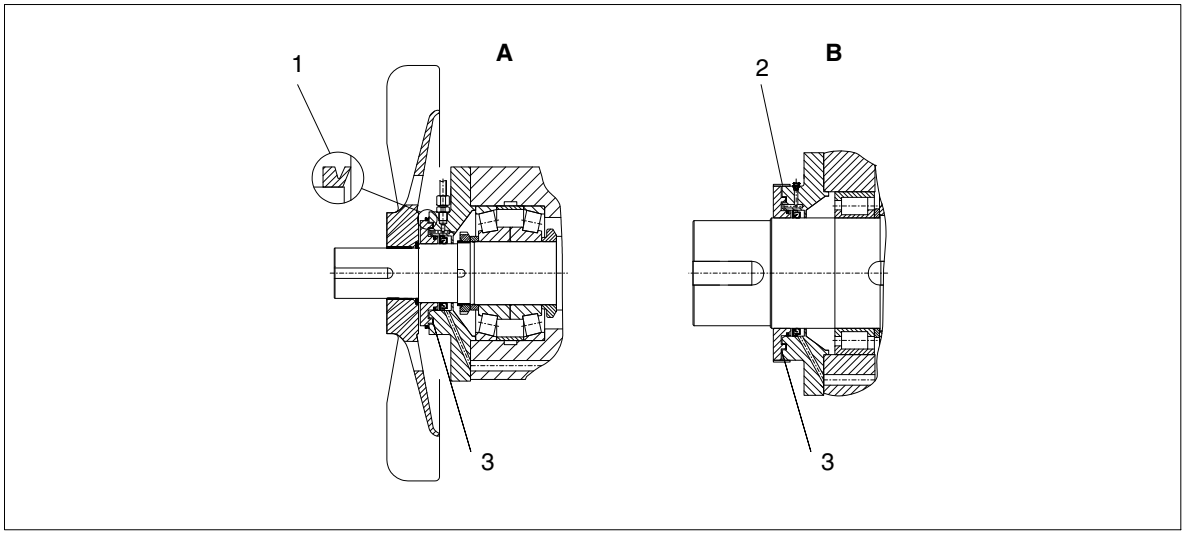


Fig. 12: Tacolab seal

A	Drive shaft	B	Output shaft
1	V-ring	3	Air gap (1 mm)
2	Adhesive tape		

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

4.4.1.1 Interior preservation with preservative agent

Table 8: 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 **6** months	Castrol Alpha SP 220 S	None
up to **24** months		- Close all holes in the gear unit. - Replace wet-air filter with screw plug. (Prior to start-up replace screw plug with wet-air filter.)
For storage periods longer than 24 months, renew the preservative agent.		

Table 9: Durability period and measures for interior preservation when using PG-based synthetic oil

Duration of protection	Preservative agent	Special measures
up to **6** months	Special anti-corrosion oil TRIBOL 1390 [1)]	None
up to **36** months		- Close all holes in the gear unit. - Replace wet-air filter with screw plug. (Prior to start-up replace screw plug with wet-air filter.)

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

STOP **Gear unit with a preservative agent in accordance with table 8 must not be filled with PG-based synthetic oils. Gear unit with a preservative agent in accordance with table 9 must not be filled with PAO-based synthetic oils or mineral oil. If it has been however, the gear unit must after draining off the preservative oil and before start-up be thoroughly flushed out with operating oil (see also item 10.2.2). The flushing oil must not be used for operation of the unit.**

If oils not specified on the rating plate are used, Siemens must be consulted.

4.4.1.2 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 8) or 36 months (see table 9), the interior preservation of the gear unit must be renewed. The following procedure is recommended:

- Remove screw plug on the middle of the assembly cover.
- Place a suitable container under the oil-draining point of the gear-unit housing.
- Unscrew the oil-drain plug and/or open the oil-drain cock and drain the used preservation oil into a suitable container.
- Dispose of the residue of the preservative oil in accordance with regulations.
- Close the oil-drain cock and/or screw in the oil-drain plug.
- Fill the gear unit with "Castrol Alpha SP 220 S".
  Calculate the filling quantity on the basis of the gear-unit dimensions (length x width x height) x 0.05.

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

- Screw in screw plug on the middle of the assembly cover.

STOP **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.

STOP **If the gear unit is to be filled with a PG-based synthetic operating oil after preservation or if it had been preserved with TRIBOL 1390 before the represervation, the preservative oil must be drained off before initial start-up and the gear unit thoroughly flushed out with operating oil (for this see also item 10.2.2). The flushing oil must not be used for operation of the unit.**

4.4.2 Exterior preservation

Table 10: 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 7.3.1 and 7.3.2).

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

In case of storage periods exceeding the periods specified in table 10 the exterior of the gear unit must be re-preserved using the preservative agent shown in table 10.

5. Technical description

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

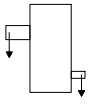
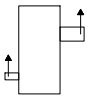
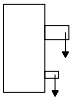
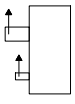
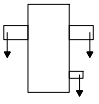
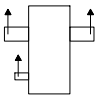
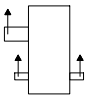
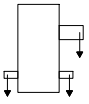
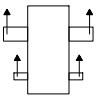
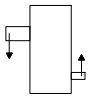
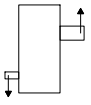
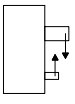
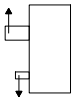
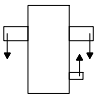
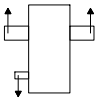
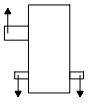
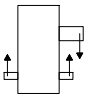
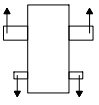
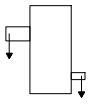
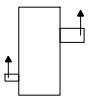
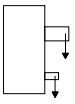
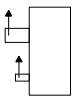
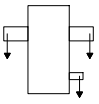
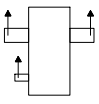
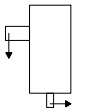
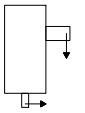
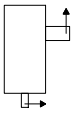
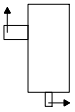
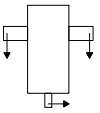
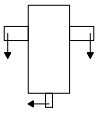
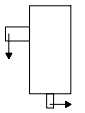
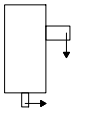
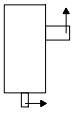
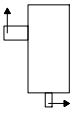
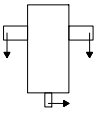
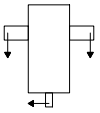
5.1 General description

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. The gear unit may also be supplied as a multi-stage bevel-helical gear unit or helical gear unit with fitted auxiliary drive. It is designed for installation in the horizontal mounting position. If necessary, it can also be designed for installation in a different position.

As a principle, the gear unit can be operated in both directions of rotation. The only exceptions are gear types with backstop or overrunning clutch. If rotation reversal is required for these types of unit, Siemens should be consulted.

A number of shaft configurations (types and rotation directions) are possible. These are shown in the following table as solid shafts.

Table 11: Versions and directions of rotation

Type	Version								
	A	B	C	D	E	F	G	H	I
H2SH H2HH H2DH H2KH H2FH									
H3SH H3HH H3DH H3KH H3FH									
H4SH H4HH H4DH H4KH H4FH									
B3SH B3HH B3DH B3KH B3FH									
B4SH B4HH B4DH B4KH B4FH									

When fitting the auxiliary drive (as maintenance and/or load drive) the assignment of the direction of rotation to the design is defined in the dimensioned drawing.

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.

5.2 Output versions

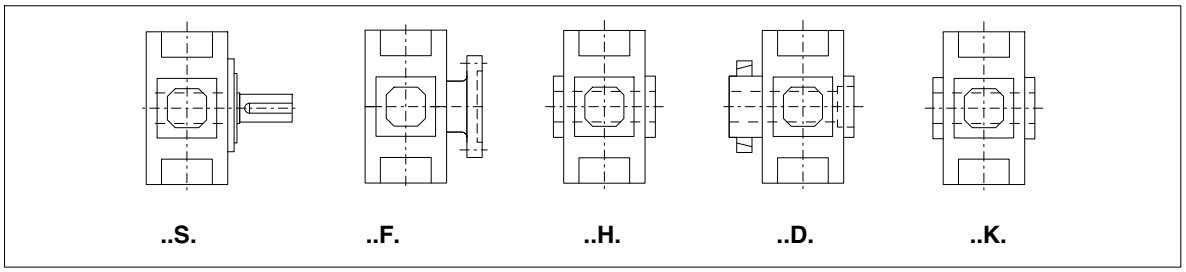


Fig. 13: Output versions

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

5.3 Housing

The housing is of cast iron; if required, they may also be of steel.

Housings up to size 514 are made in one part. 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 (screw plug for filling with oil)
- Oil-sight glass or oil dipstick (for checking the oil level)
- Oil-drain plug (for oil drain)
- 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

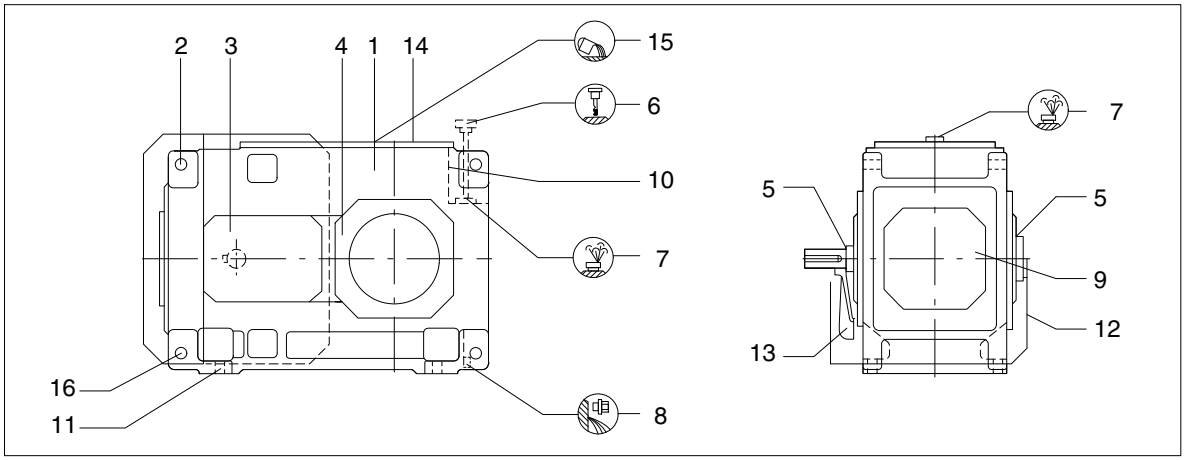


Fig. 14: Gear-unit features on gear units of type H..H ≤ 514

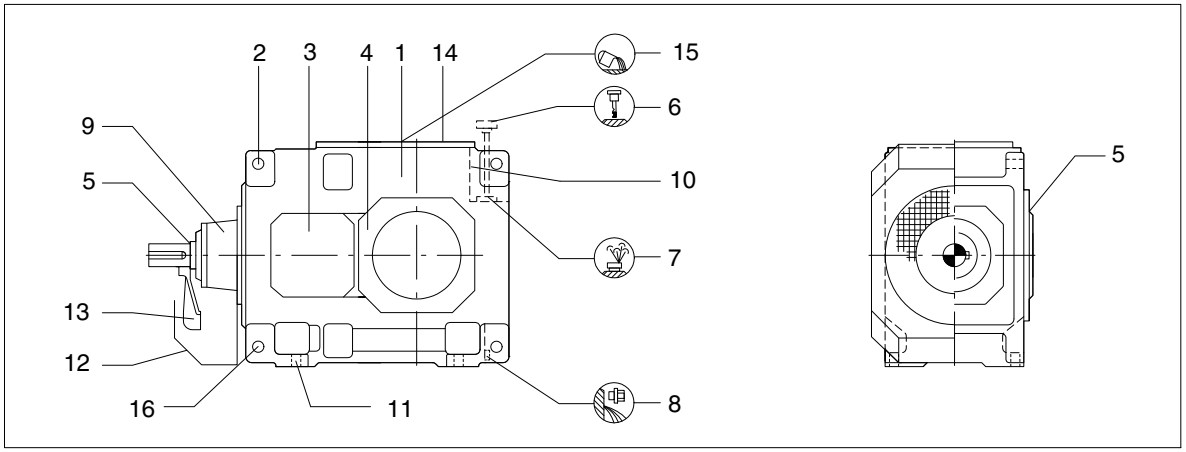


Fig. 15: Gear-unit features on gear units of type B..H ≤ 514

1	Housing	10	Rating plate
2	Lifting eye	11	Gear-unit fastening
3	Cover	12	Air-guide cover
4	Cover	13	Fan
5	Shaft seal	14	Inspection and/or assembly cover
6	Oil dipstick	15	Oil-filler plug
7	Housing ventilation	16	Fastening for torque arm (on types H4.. and B4.. and sizes 513 and 514 of all other types)*
8	Oil-drain plug		
9	Cover and/or bearing journal		

*) All other types and sizes the torque arm is bolted to the gear-unit fastening by means of a plate (11 in figure 14 or figure 15).

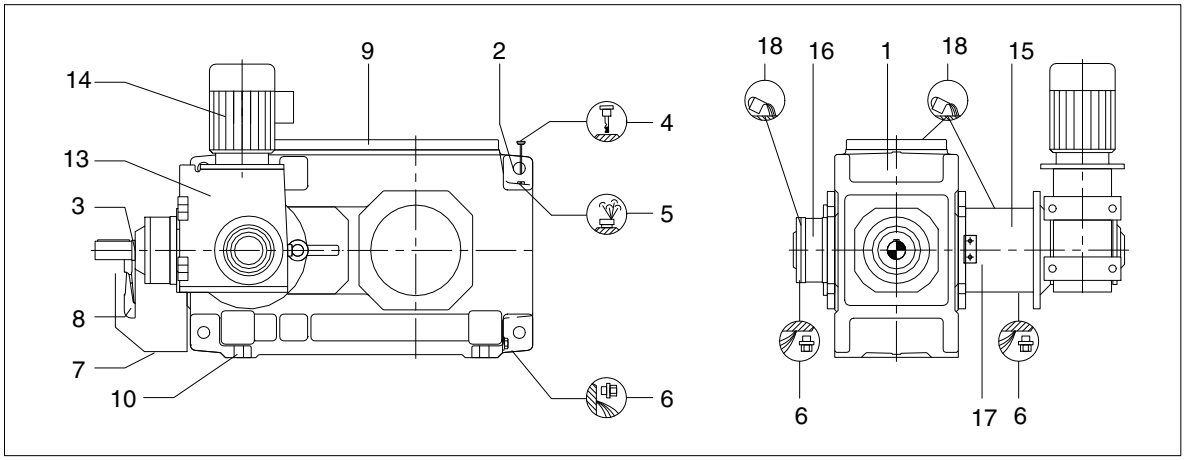


Fig. 16: Gear-unit features on gear units of type B3.H ≥ 514

1	Main gear unit	10	Gear-unit fastening
2	Lifting eye	11	Alignment surface
3	Shaft seal	12	Alignment thread
4	Oil dipstick	13	Auxiliary gear unit
5	Housing ventilation	14	Electric motor
6	Oil-drain plug	15	Overrunning clutch
7	Air-guide cover	16	Backstop
8	Fan	17	Speed-monitoring device
9	Inspection and assembly cover	18	Oil-filler plug of the backstop

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

5.4 Toothed components

The externally toothed components of the gear unit are case-hardened. The helical-gear teeth are ground. 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 the torques generated with adequate reliability.

5.5 Lubrication

5.5.1 Splash lubrication

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

5.5.2 Force-feed lubrication by means of add-on oil-supply system

In non-horizontal positions, with high bearing speeds or peripheral velocities on the teeth, the splash lubrication system may, if specified in the order, be supported and/or replaced with a force-lubrication system.

The oil-supply system is permanently attached to the gear unit and consists of a flanged-on pump, a coarse filter, a pressure-monitoring device and 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 actual flow direction must however be observed.

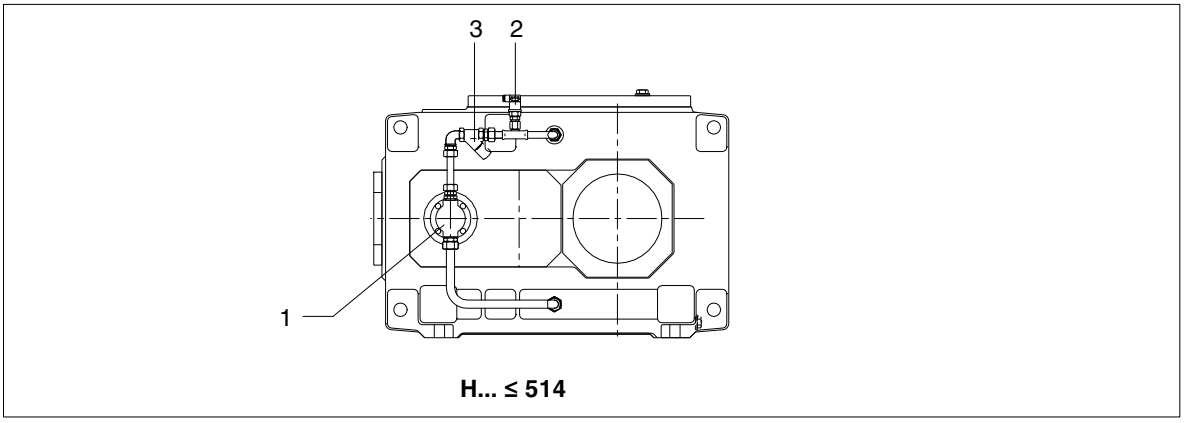


Fig. 17: Add-on oil-supply system on gear units of type H...

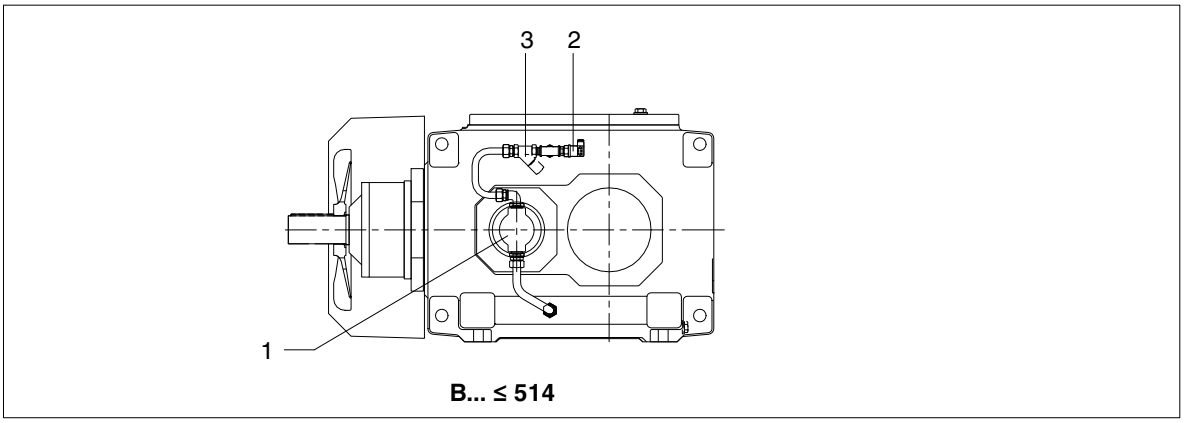
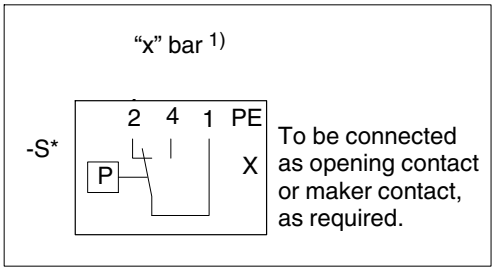


Fig. 18: Add-on oil-supply system on gear units of type B...

1 Flanged-on pump
2 Pressure monitor
3 Coarse filter or double change-over filter

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

In case of gear units with a combined splash and force-feed lubrication, it is necessary to connect the pressure monitor as an opening contact or closing contact prior to start-up.



1) Oil pressure in accordance with order-specific documentation

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

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

5.6 Shaft bearings

All shafts are fitted in rolling bearings.

5.7 Shaft seals

Depending on requirements, radial shaft-sealing rings, labyrinth seals, Taconite seals or Tacolab seals are fitted at the shaft exits to prevent oil from leaking from the housing and dirt from entering it.

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 of these sealing rings in an area with much dust is not possible.

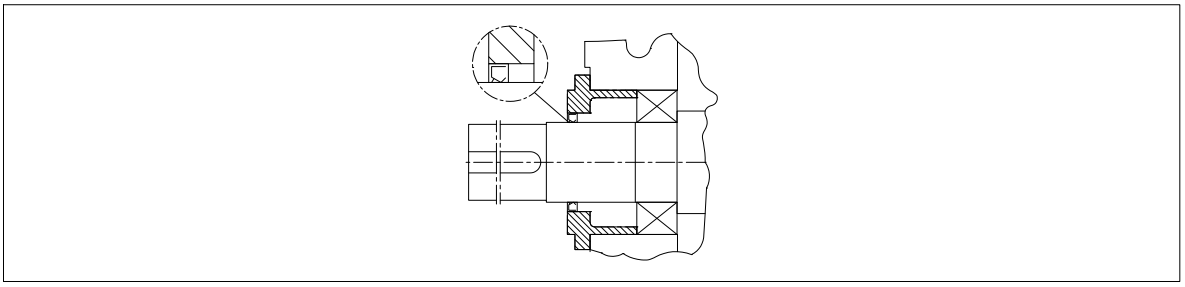


Fig. 19: Radial shaft-sealing ring

5.7.2 Labyrinth seals

Labyrinth seals are non-contacting and avoid wear to the shaft. They therefore require no maintenance and ensure favourable temperature characteristics. They can be used only with certain transmission ratios and minimum speeds.

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

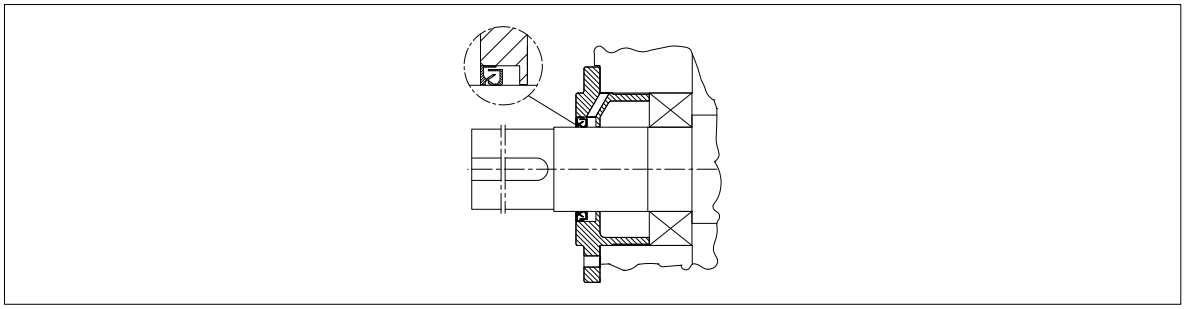


Fig. 20: Labyrinth seal

For reliable operation, this type of seal requires stationary, horizontal positioning in a splash-free and relatively dust-free environment. Overfilling of the gear unit can cause leakage, as can oil with high foam content.

5.7.3 Taconite seal

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

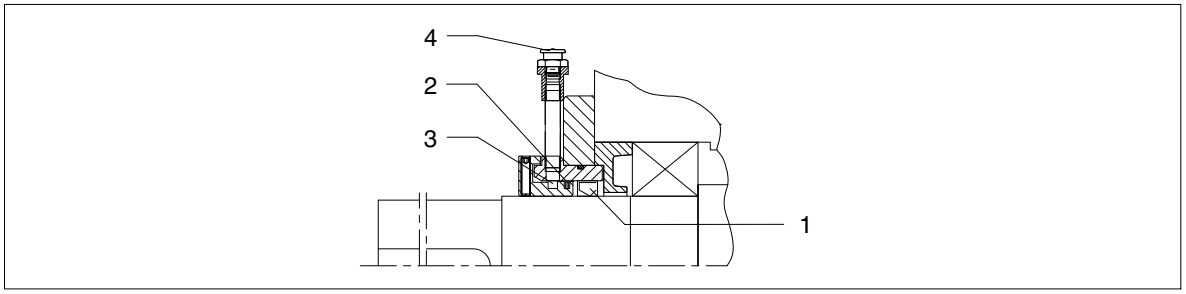


Fig. 21: Taconite seal

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 variants:

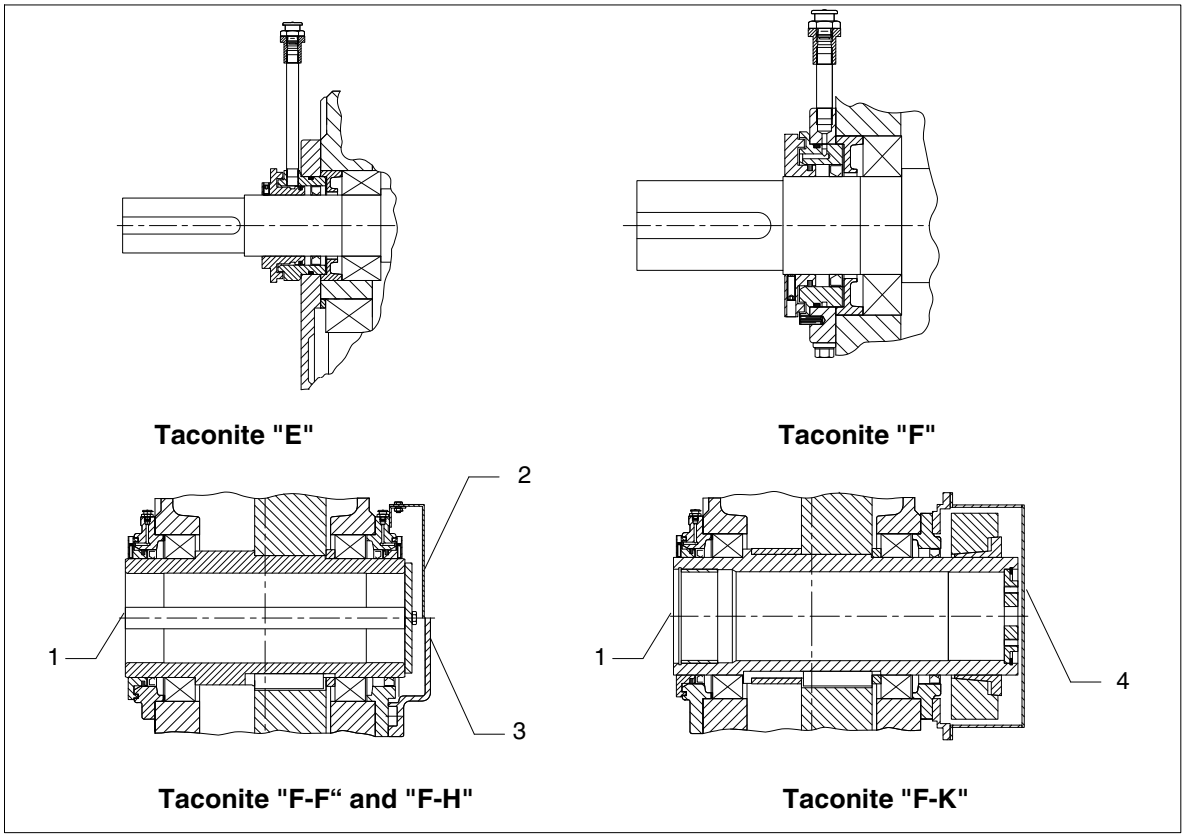


Fig. 22: Taconite seal, variants E, F, F-F, F-H and F-K

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

Table 12: Variant description Taconite seal

Variants of the Taconite seals	Application	Remarks
"E"	All input shafts with or without fan	Re-chargeable labyrinth
"F"	Output shaft Type S (solid shaft) Type F (flanged shaft)	
"F-F"	Output shaft Type H (hollow shaft with parallel keyway) Type K (hollow shaft with internal spline to DIN 5480)	Labyrinth re-chargeable on both sides, incl. non-dustproof cowl to prevent contact on gear-unit side facing away from output
"F-H"	Output shaft Type H (hollow shaft with parallel keyway) Type K (hollow shaft with 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)	

STOP **The specified frequencies must be observed (see section 10, "Maintenance and repair") for re-charging the labyrinth seals with grease.**

5.7.4 Tacolab seal

Tacolab seals are non-contacting seals, operating wearfreely and requiring very little maintenance and which thus do not cause operating interruptions.

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.

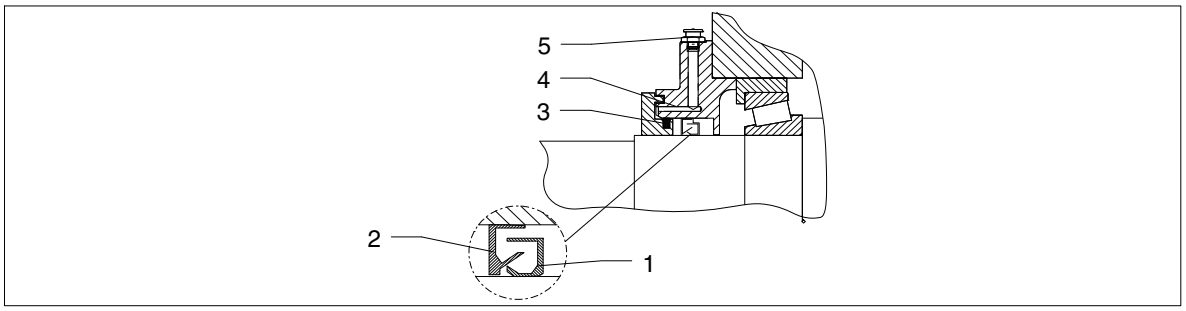


Fig. 23: Tacolab seal

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

STOP **The specified frequencies must be observed (see section 10, "Maintenance and repair") for re-charging the labyrinth seals with grease.**

5.8 Backstop

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

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

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

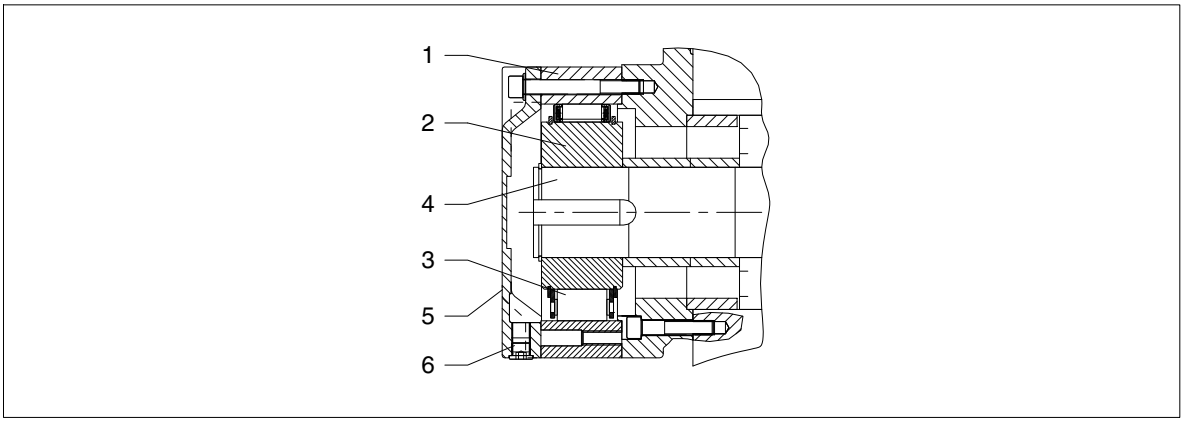


Fig. 24: Backstop

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

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

STOP

To avoid damaging the backstop or the gear unit, the motor must not be run adversely to the stop direction of the gear unit.
Observe the notice fixed to the gear unit.
If the minimum lift-off speed is fallen below, the backstop must be regularly changed, like a wearing part. You can see from the gear-unit documentation whether the backstop is operating below lift-off speed and what the specification for the changing interval is. The contractually agreed minimum speeds must not be fallen below during continuous operation. If they are, Siemens must be consulted.

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

5.9 Torque-limiting backstop (special design)

A torque-limiting backstop is available for special uses, e.g. dual drives. The backstop is a combination of a backstop with centrifugally operated sprags and a brake. The slipping torque is set by a number of compression springs.

This "slipping" will protect the gear unit and the sprags of the backstop from inadmissibly high stresses during negative rotation. In addition, a uniform load distribution onto both gear units is achieved during negative rotation when using dual drives.

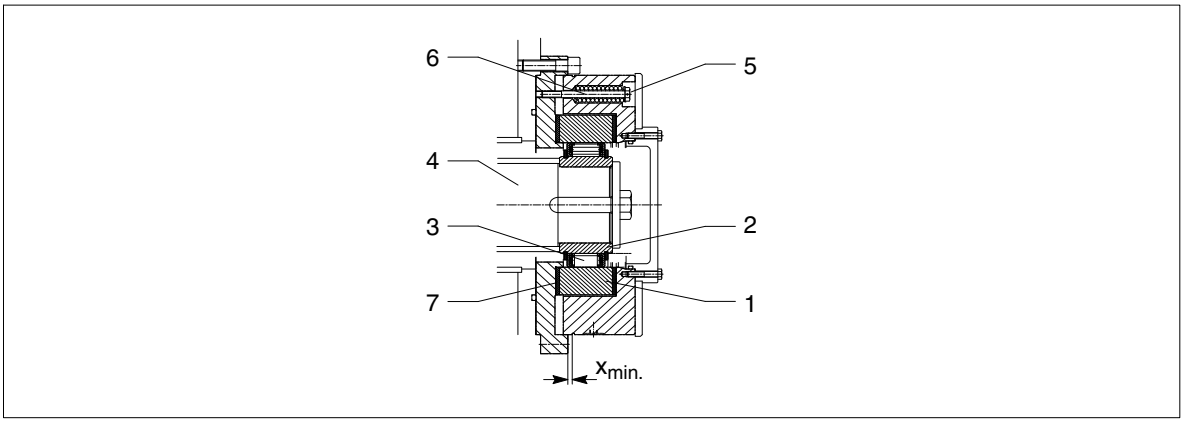


Fig. 25: Torque-limiting backstop

1 Outer ring
2 Inner ring
3 Cage with sprags
4 Shaft (adapter flange)
5 Locking wire
6 Lead screw with compression spring
7 Friction lining

The torque-limiting backstop is attached to the gear unit by means of an adapter flange to form an oiltight seal and is integrated in its oil-circulation system.

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

The slipping torque was set at the correct value during the manufacturing process; resetting during startup is not permissible.

To safeguard the set slipping torque, the lead screws of the compression springs are secured with locking wire. The warranty will expire if the locking wire for the screws is missing or has been damaged.

For safety reasons, it is absolutely prohibited to change the slipping torque.
After having stopped the motor, there is a danger that the load is not safely held in its position and can run in reverse direction at high speed.

As a rule, the backstop operates without wear. As a precaution, the dimension "$x_{min.}$" must be checked once yearly and after every releasing operation (type FXRT only).

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

5.10 Cooling

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

5.10.1 Fan

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

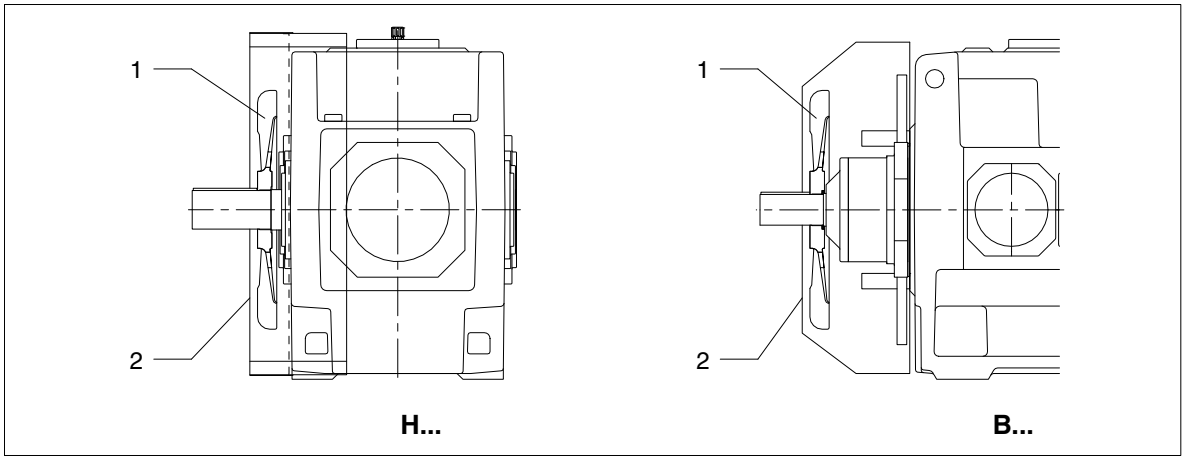


Fig. 26: Fan on gear units of types H... and B...

1 Fan
2 Air-guide cover

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

STOP **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.

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

5.10.2 Cooling coil

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

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

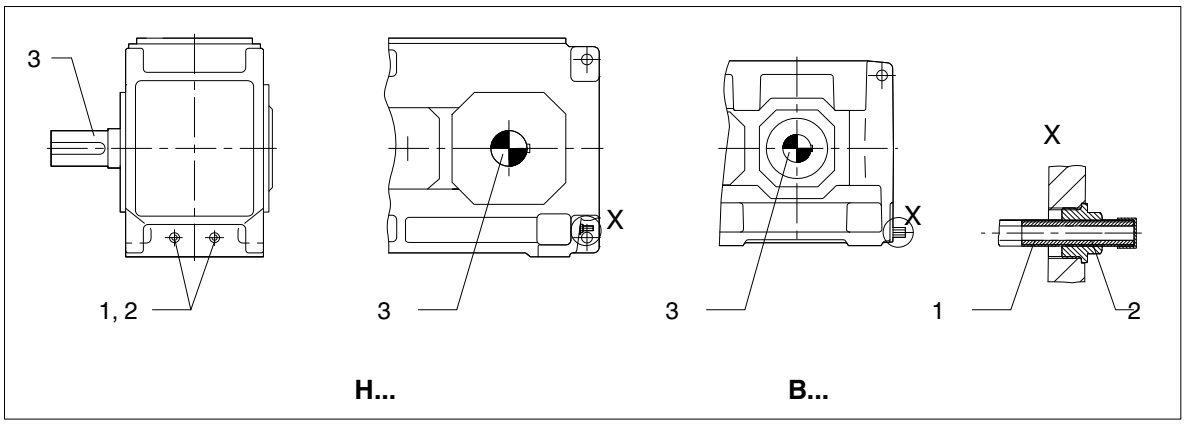


Fig. 27: Cooling coil on gear units of types H... and B...

1 Cooling-water connection
2 Reducing screw
3 Output shaft

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

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. The reducing screw is secured with a lock nut, which must not be undone.

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 in the order-related documentation and/or the list of equipment.

Table 13: Cooling-water quantity required (l/min)

Type	504	505	506	507	508	509	510	511	512	513	514
H2.H	4	4	4	4	4	4	4	8	8	8	8
H3.H	-	4	4	4	4	4	4	8	8	8	8
B3.H	4	4	4	4	4	4	4	8	8	8	8

Refer to the order-specific dimensioned drawing for connecting dimensions.

5.10.3 Oil-supply unit with air oil-cooler

An order-specific oil-supply system with air oil-cooler can be used. This oil-cooling system can be permanently attached to the gear unit.

Components:

– one air oil-cooler

– one flanged-on pump

– one pressure-monitoring device

– one 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 actual flow direction must however be observed.

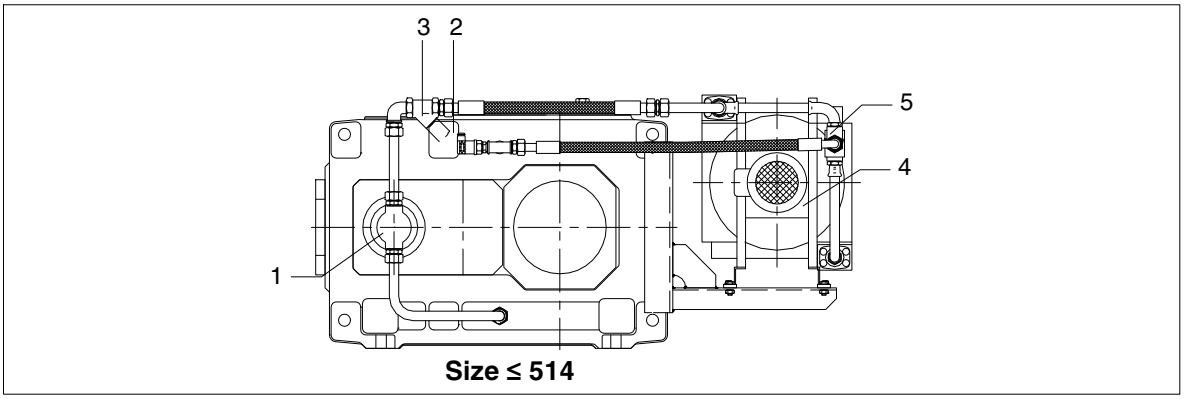


Fig. 28: Air oil-cooling system on the gear unit

1 Flanged-on pump
2 Pressure monitor (circuit diagram see item 5.5.2)
3 Coarse filter or double change-over filter
4 Air oil-cooler
5 Temperature-control valve

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

STOP **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 on the drawings in the gear-unit documentation.
Add-on pressure monitors must be connected as shown in item 5.5.2.

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

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

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

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

Depending on the order specification an oil-supply system with water oil-cooler can be used. This is permanently attached to the gear unit.

Components:

– one pump

– one water oil-cooler

– pipework

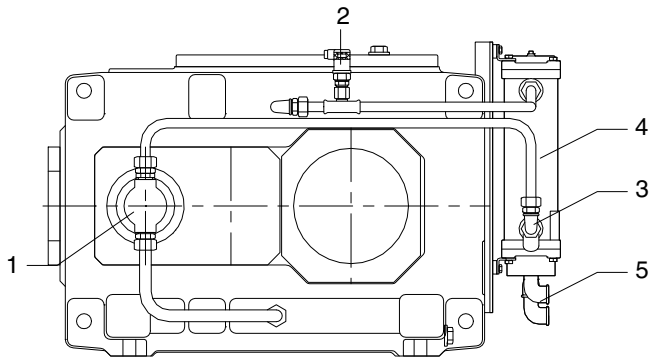
Depending on size and/or order-specification the oil-supply system with water oil-cooler may in addition include the following components:

– one filter

– monitoring equipment

☞ 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 actual flow direction must however be observed.

☞ The required water connection must be provided by the user.



Size ≤ 514

Fig. 29: Water oil-cooling system on the gear unit

1 Flanged-on pump
2 Pressure monitor (circuit diagram see item 5.5.2)
3 Coarse filter or double change-over filter
4 Water oil-cooler
5 Water inlet and outlet

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

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.

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

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.

5.10.4.1 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 lubrifying delivery medium.

5.10.4.2 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 in the order-related documentation and/or the list of equipment.

5.10.4.3 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 trough the pipe are retained.
Dirty filter elements must be cleaned or replaced.

5.11 Heating

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

Complete immersion of the heating elements in the oil bath must be ensured.

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

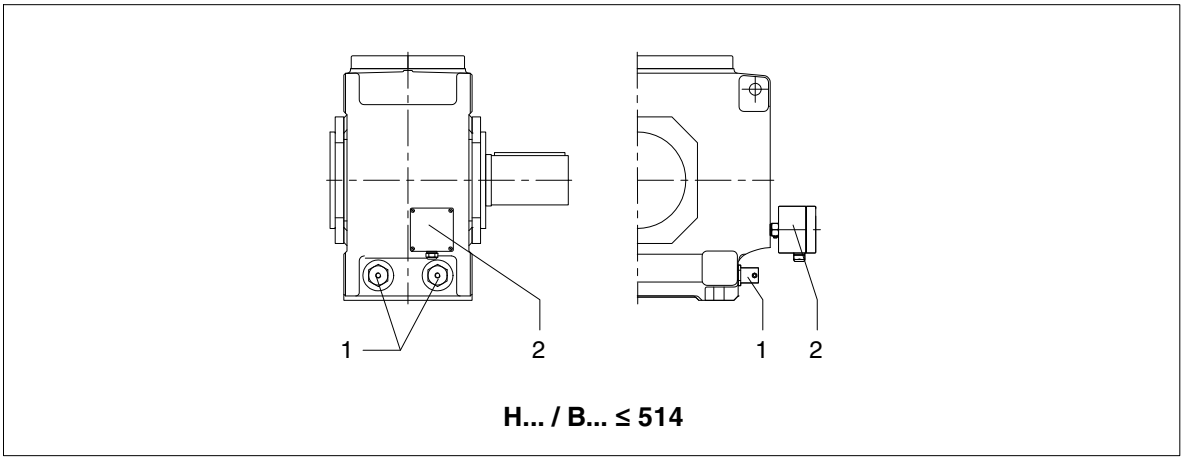


Fig. 30: Heating on gear units of types H... and B...

1 Heating element 2 Temperature monitor

For a detailed illustration of the gear unit and the position of the add-on parts, please refer to the drawings 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 maximum heating capacity (see table 14) on the outer surface of the heating element must not be exceeded.

Table 14: Specific heating output P_{Ho} as a function of the ambient temperature

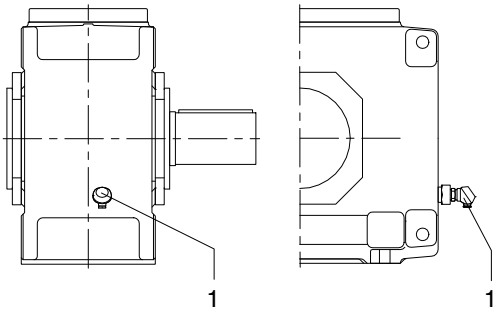
P_{Ho} (W/cm^2)	Ambient temperature °C
0.9	+ 10 up to 0
0.8	0 up to - 25
0.7	-25 up to - 50

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

5.12 Oil-temperature monitoring system

Depending on the order specification, the gear unit may be fitted with a Pt 100 resistance thermometer for measuring the oil temperature in the sump. In order to measure the temperatures or temperature differences, the Pt 100 resistance thermometer should be connected to a suitable instrument provided by the customer. The resistance thermometer has a connection head for the wiring. A two-wire circuit is provided by the manufacturer. However, the customer may fit his own three- or four-wire circuit if required.

For control information, refer to the list of equipment.
Observe the operating instructions relating to the device in all instances.



H... / B... ≤ 514

Fig. 31: Measurement of the oil temperature on gear units of types H... and B...

1 Pt 100 resistance thermometer

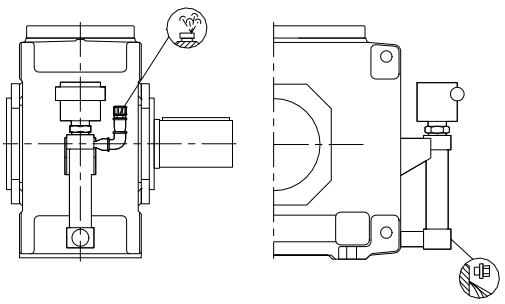
For a detailed illustration of the gear unit and the position of the add-on parts, please refer to the drawings in the gear-unit documentation.

☞ When operating and servicing the components, observe the operating instructions relating to the components.
For technical data, refer to the order-related documentation and/or list of equipment.

5.13 Oil-level monitoring system

Depending on the order specification, the gear unit can be fitted with an oil-level monitor in the form of a level-limit switch. This monitoring is designed as a standstill monitoring (gear unit stop) and checks the level of the oil before the unit is started up. It should be wired in such a way that, when the signal "oil level too low" is given, the drive motor cannot start and that an alarm is given. During operation, any signal should be bridged.

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



H... / B... ≤ 514

Fig. 32: Oil-level monitoring on gear units of types H... and B...

For a detailed illustration of the gear unit and the position of the add-on parts, 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 order-related documentation and/or list of equipment.

5.14 Bearing-monitoring system

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

The gear unit may also be fitted with or have been set up for a temperature-monitoring device at the bearing points. If set up for temperature monitoring, the gear unit is equipped with tapped holes for fitting Pt 100 resistance thermometers. In order to measure the temperatures or temperature differences, the Pt 100 resistance thermometer should be connected to a suitable instrument provided by the customer. For this version Siemens must be consulted.

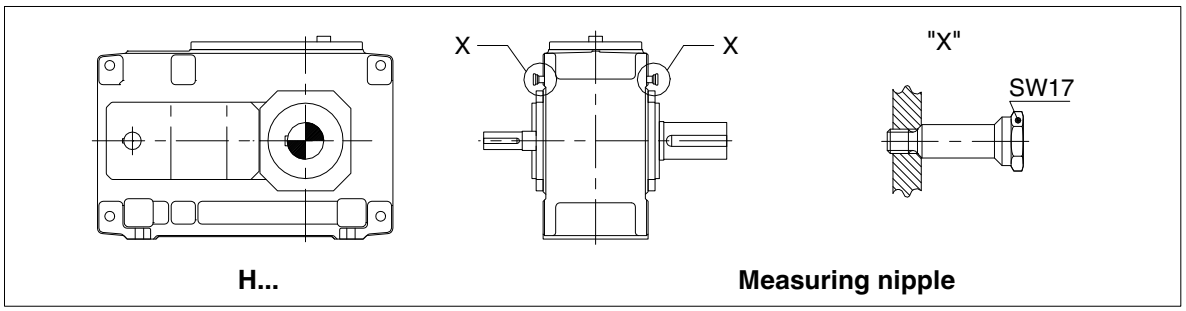


Fig. 33: Bearing monitoring on gear units of type H...

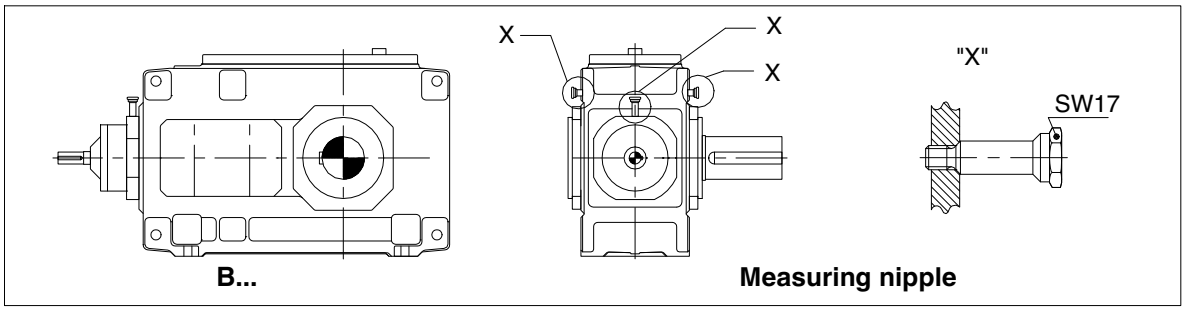


Fig. 34: Bearing monitoring on gear units of type B...

☞ When operating and servicing the components, observe the operating instructions relating to the components.
For technical data, refer to the order-related documentation and/or list of equipment.

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.

5.15 Speed transmitter

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

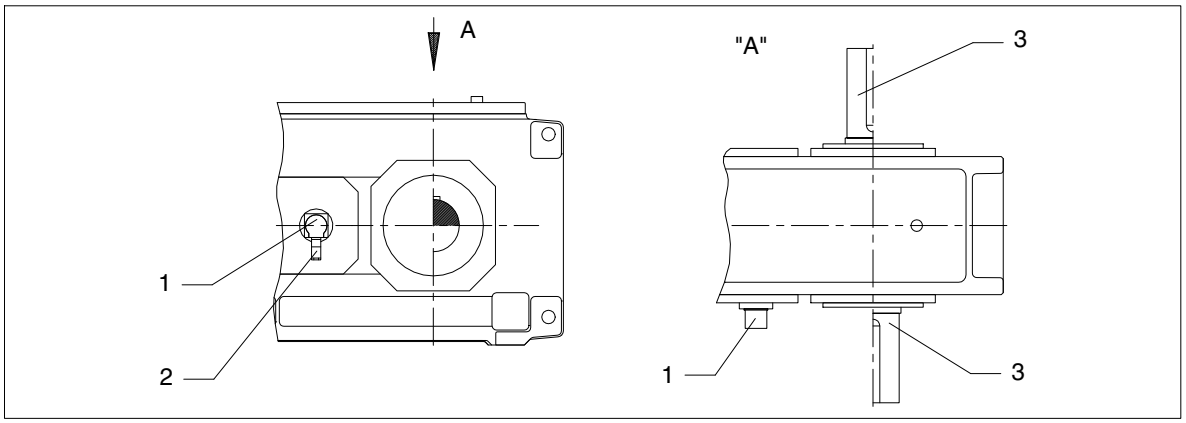


Fig. 35: Speed-monitoring device

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 order-related documentation and/or list of equipment.

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

5.16 Auxiliary drive

For certain applications the gear unit can, in addition to the main drive unit, be equipped with an auxiliary drive unit. This enables the main gear unit to be operated at a lower output speed in the same direction of rotation. The auxiliary drive is connected with the main gear unit by an overrunning clutch. For the basic drive-train configuration refer to figure 36.

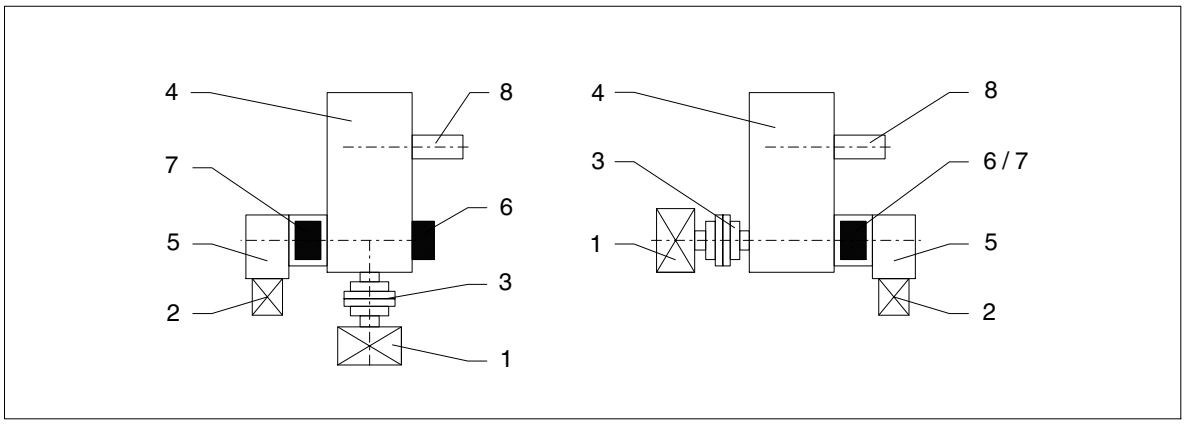


Fig. 36: Basic design of the gear unit with main and auxiliary drives

1 Main motor
2 Auxiliary motor
3 Coupling
4 Main gear unit
5 Auxiliary gear unit
6 Backstop
7 Overrunning clutch
8 Output shaft of the main gear unit

Depending on use, two auxiliary drives of different capacities are available for each gear-unit size.

5.16.1 Auxiliary drive, designed as a maintenance drive

The auxiliary drive should be protected from overloads.
The drive of a bucket elevator via the auxiliary drive must only be effected during idle running, i.e. without load.

For the exact designation of the geared motor as well as the mounting position please refer to the drawings (see section 1, "Technical Data"). The auxiliary gear unit has its own oil circulation system which is separated from that of the main gear unit. The auxiliary gear unit is already filled with oil when delivered.

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

The special operating instructions should be observed for operation of the auxiliary gear unit.

To avoid overspeeds in case of malfunctions of the overrunning clutch, the drive combination must be equipped with a speed-monitoring device by the customer for safety reasons. The speed-monitoring device consists of a pulse generator fitted in the intermediate flange (figure 37) and of an evaluating instrument.

A threaded hole M12x1 for the pulse generator to be made available by the customer is provided at a suitable position in the intermediate flange. The dimension "**x**" depends on the instructions given by the equipment manufacturer (see figure 37). The pulse generator must satisfy the requirement "**suitable for flush fitting**".

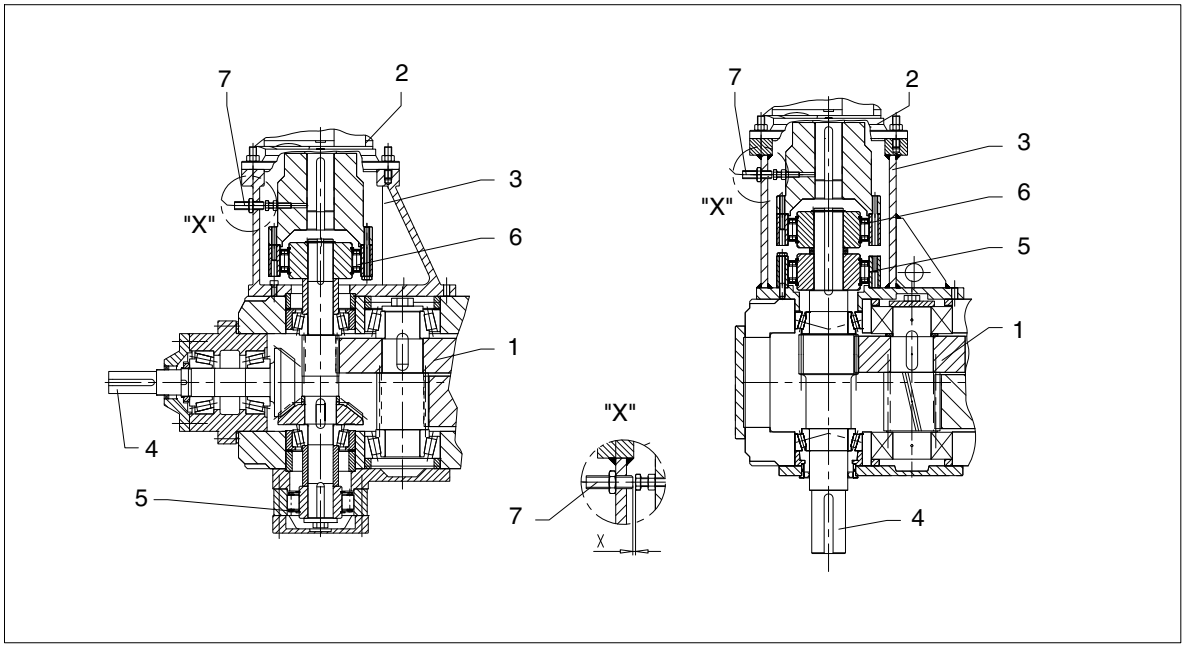


Fig. 37: Design of the gear unit with main and auxiliary drives

1 Main gear unit
2 Auxiliary gear unit
3 Intermediate flange
4 Drive shaft of main gear unit
5 Backstop
6 Overrunning clutch
7 Pulse generator for speed monitoring

The speed-monitoring device must be connected in such a manner that the main drive is disabled automatically at **"> Zero"** speed at the output shaft of the auxiliary drive. For safety reasons, the disabling function must be checked at regular intervals, i.e. at least quarterly. To check the disabling function, the auxiliary drive is switched on. If the speed-monitoring device connects - which can be verified, for instance, by means of a warning light - the speed-monitoring device is ready for operation.

This speed-monitoring device is an absolute must for safety reasons since in case of a defect in the overrunning system the auxiliary drive can be destroyed with explosive effect due to overspeeds.

5.16.2 Auxiliary drive, designed as a load drive

The motors of the auxiliary drives are dimensioned in such a manner that a properly loaded conveyor system can be operated at low speed in the same direction of rotation.

Furthermore the conditions set out in item 5.16.1 are applicable.

5.16.3 Overrunning clutch

If the gear unit is fitted with an auxiliary drive in addition to the main drive, coupling is realized by an overrunning clutch. This allows, when driving by the auxiliary drive, a torque transmission in one direction of rotation, while there is **"free-wheeling operation"** when driven by the main drive.

The output shaft of the main drive will rotate in the same direction of rotation both if the drive is effected via the main motor and via the auxiliary drive.

The overrunning clutch is fitted in an adapter flange and integrated in the oil circuit of the gear unit. Maintenance and oil change take place simultaneously with maintenance and oil change of the main drive.

The overrunning clutch is provided with centrifugally operated grippers. If the main gear unit is rotating in the specified direction of rotation, the inner ring will rotate together with the grippers, while the outer ring remains stationary. From a certain speed of rotation, the grippers will lift off and the overrunning clutch will operate without wear. If the drive is effected by the motor of the auxiliary drive via the outer ring, the overrunning clutch will be in **"carrier operation",** i.e. the main gear unit is turned over slowly in the chosen direction of rotation. At the same time, the drive shaft of the main gear unit and, if a flexible coupling is used between main motor and gear unit, possibly the main motor will rotate slowly along with it.

The main motor and the motor of the auxiliary drive should be interlocked electrically in such a manner that only one of the two motors can be switched on.

When driving via the auxiliary drive, the drive shaft of the main gear unit will rotate along simultaneously. This rotary motion **must not be impeded**. A brake arranged on the drive side in the main drive must be released if the drive is effected via the auxiliary drive.

When filling the main gear unit with oil, start by supplying lubricating point 1 at the intermediate flange with the oil quantity and oil grade specified on the rating plate. Prior to startup, the overrunning clutch should be checked for proper function according to item 7.2.4.

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 qualified specialist personnel. The manufacturer cannot be held liable for damage caused by incorrect assembly and installation.

As early as 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.

STOP **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 shut-off function.**

STOP **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.

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 welding work must be done at all on the drive.
The drive systems must not be used as an earthing point for electric-welding operations. Toothed parts and bearings may be irreparably damaged by welding.

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.

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

6.2 Unpacking

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

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

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

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

6.3 Fitting the gear-unit on a housing base

6.3.1 Foundation

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

The foundation should be designed in such a way that no resonance vibrations are created and that no vibrations are transmitted from adjacent foundations. The structure on which the unit is to be fitted must be rigid. 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 corrosion-preventive agent on the shafts using a suitable cleaning agent.

The cleaner must in no way be allowed to come into 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.
Wear suitable protective gloves.

Protect shaft-sealing rings against damage and heating to over + 100 °C. Use heat shields to protect against radiant heat.

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

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

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

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

6.3.2.1 Alignment surfaces, alignment thread

Preliminary alignment of the gear units in the horizontal direction is done by the surfaces of the inspection and/or assembly cover.

Alignment surface: 

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

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

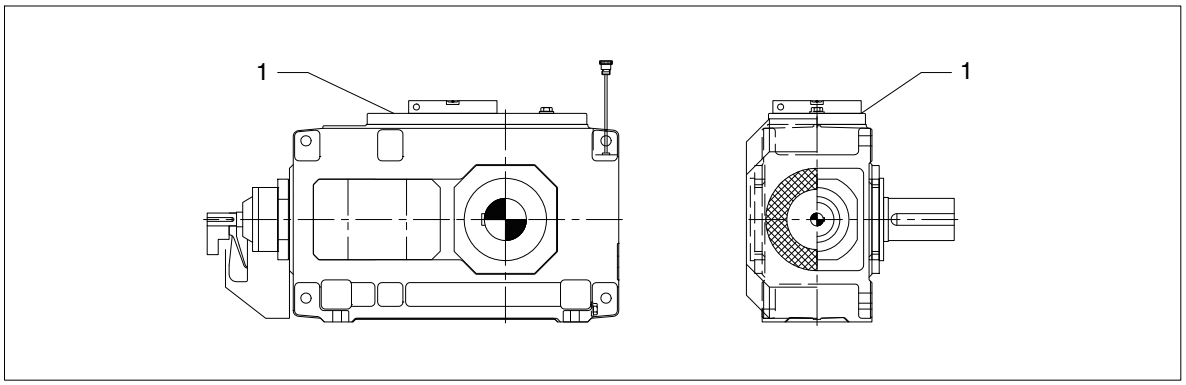


Fig. 38: Alignment surfaces (1) on gear units up to size 514

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.

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).

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

- Record alignment dimensions.

The record must be kept with these instructions.

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

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

6.3.2.2 Fitting on a foundation frame

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

Tighten the foundation bolts to the specified torque (see item 6.23); if necessary, use stops to prevent displacement.

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

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

The record must be kept with these instructions.

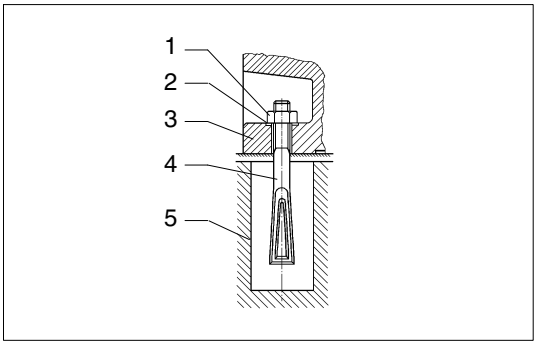
6.3.2.3 Fitting on a concrete foundation by means of stone bolts or foundation blocks

- Clean the undersurface of the gear-unit base.

If using stone bolts:

- Hook stone bolts with washers and hexagon nuts into the foundation fastening points on the gear-unit housing (see figure 39).

The hexagon nuts must only be tightened when the concrete has set.



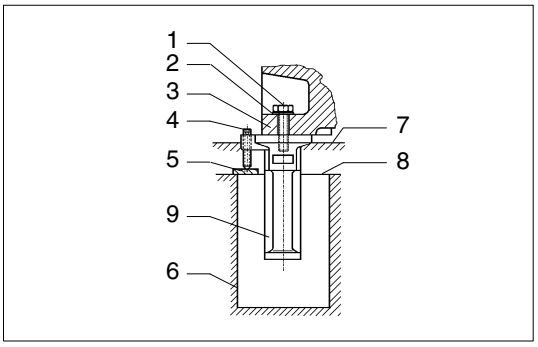
1 Hexagon nut
2 Washer
3 Gear-unit base
4 Stone bolt
5 Foundation

Fig. 39: Stone bolt

If using foundation blocks:

- Hook the foundation blocks with washers and fastening bolts into the foundation-fastening points on the gear-unit housing (see figure 40).

The fastening bolts must only be tightened 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

Fig. 40: Foundation block

Applies to both variants:

- Using suitable lifting gear, place the gear unit on the concrete foundation.
- Align the gear unit exactly with the input and output units (see item 6.3.2.1).
  - if using stone bolts, with shims,
  - if using foundation blocks, with the aid of the set screws (if available).
- Record alignment dimensions.

The record must be kept with these instructions.

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

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

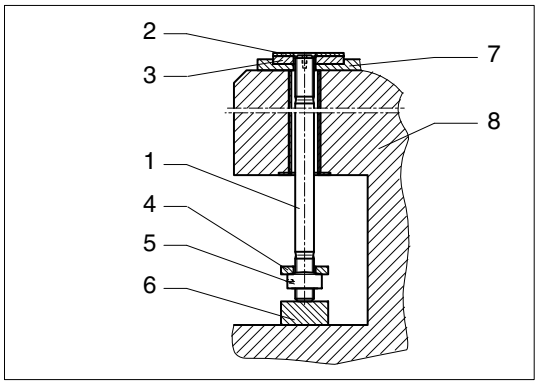
- Pour concrete into the recesses of the stone bolts or foundation blocks.

When the concrete has set, tighten the hexagon nuts of the stone bolts or 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 hexagon nuts or 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 figure 41).

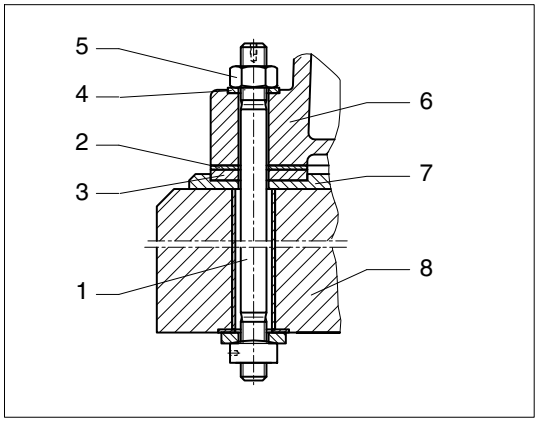


1 Anchor bolt
2 Support
3 Base plate
4 Pressure plate
5 Hexagon nut
6 Wood
7 Fine-grout concrete
8 Raw foundation

Fig. 41: Anchor bolt

- Using suitable lifting gear, place the gear unit on the concrete foundation.
- 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 the gear unit exactly with the input and output units (see item 6.3.2.1).
- Record alignment dimensions.

The record must be kept with these instructions.



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

Fig. 42: 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 adjustment of the pretensioning tool, the manufacturer's operating instructions of the pretensioning tool must be adhered to.

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

The record must be kept with these instructions.

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

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

6.4.1 Preparatory work

To facilitate demounting (see also item 6.4.3), we recommend providing a connection for pressure oil on the end of the driven-machine shaft end, which is drilled through to the hollow-shaft recess (see figure 43). This connection may also be used for supplying rust-releasing agent.

☞ Failure to adhere to this recommendation will not result in the equipment manufacturer's liability to the operator.

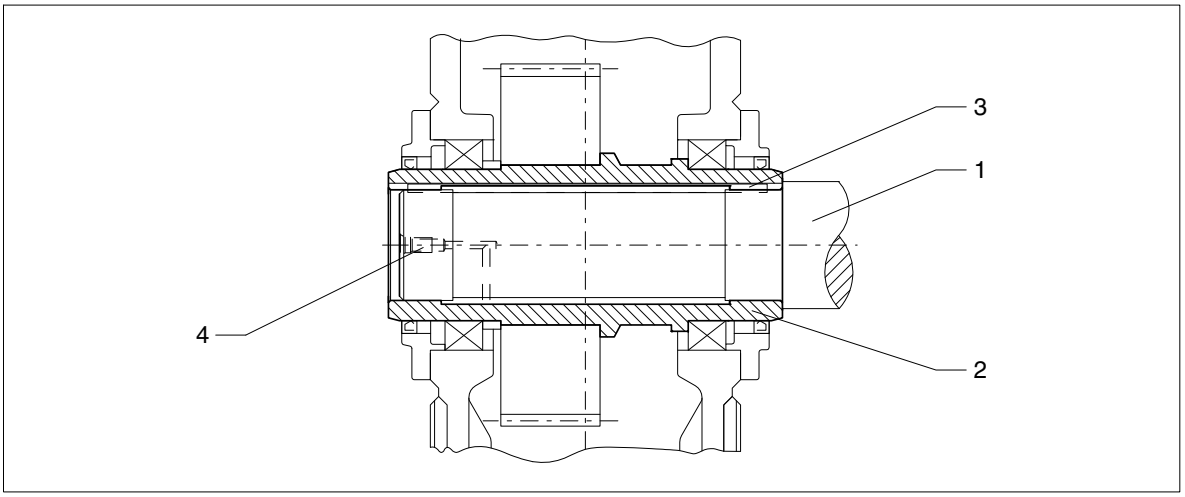


Fig. 43: Hollow shaft with parallel keyway, preparation

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

6.4.2 Fitting

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

STOP **The cleaner must in no way be allowed to come into contact with the shaft-sealing rings.**

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

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

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

6.4.2.1 Fitting

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

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

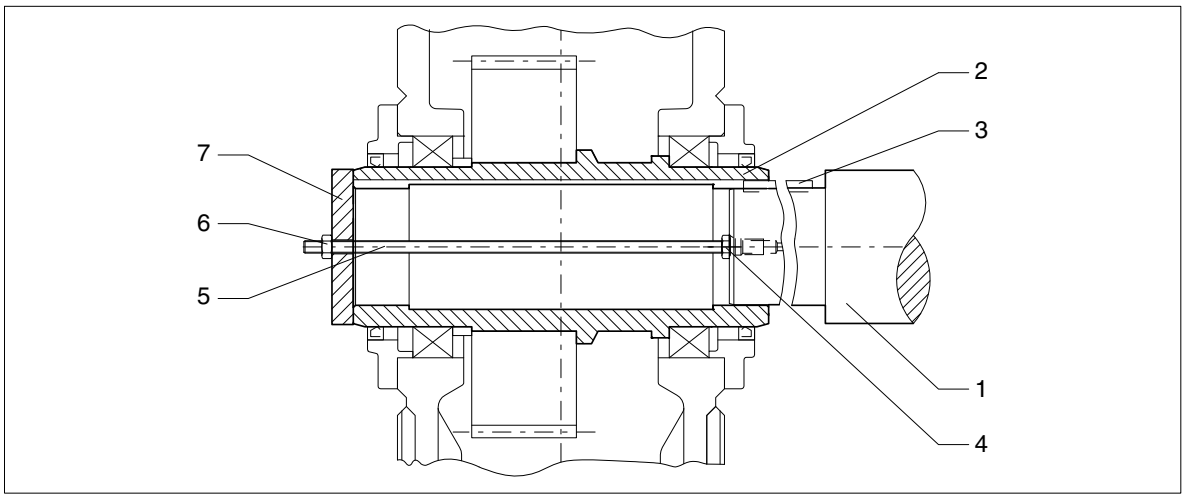


Fig. 44: Hollow shaft with parallel keyway, fitting with threaded spindle

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

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

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

- **Torque arm**
- **Support with gear-unit swing base**

With a different configuration the bearings may be excessively stressed.

6.4.2.2 Axial fastening

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

6.4.3 Demounting

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used in order to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see figure 43), e.g. using a pump.
- When the rust-releasing agent has taken effect, pull the gear unit off with the device (see figures 45 and/or 46).
- Removing the gear unit from the driven-machine shaft can be done, depending on local possibilities, as follows:
  - preferably using a hydraulic lifting unit (see figure 45)
  - using forcing screws in an end plate (see figure 46) or
  - using a central threaded spindle or (see figure 44)

☞ 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 2 threaded holes (for dimensions, see figure 47) to receive bolts for fastening the end plate to the hollow shaft.

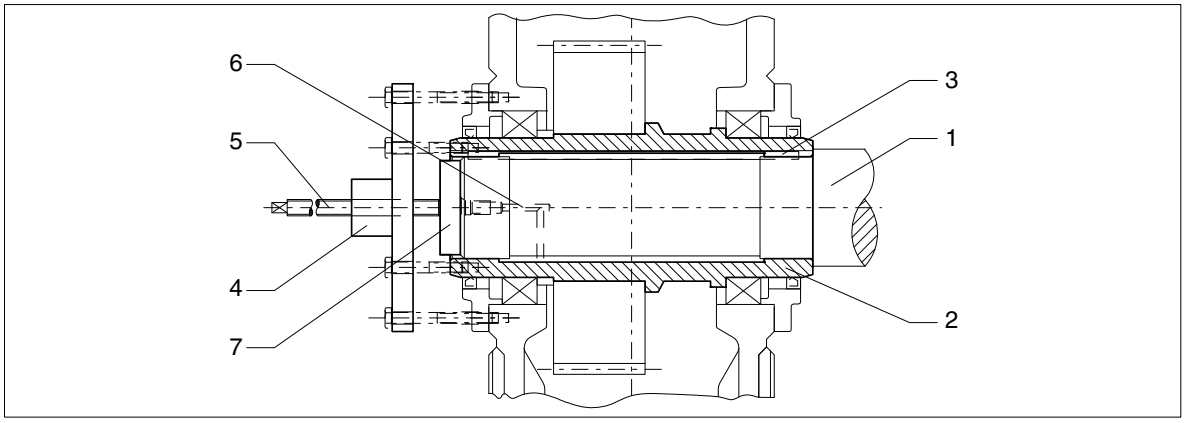


Fig. 45: Hollow shaft with parallel keyway, demounting with hydraulic lifting unit

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

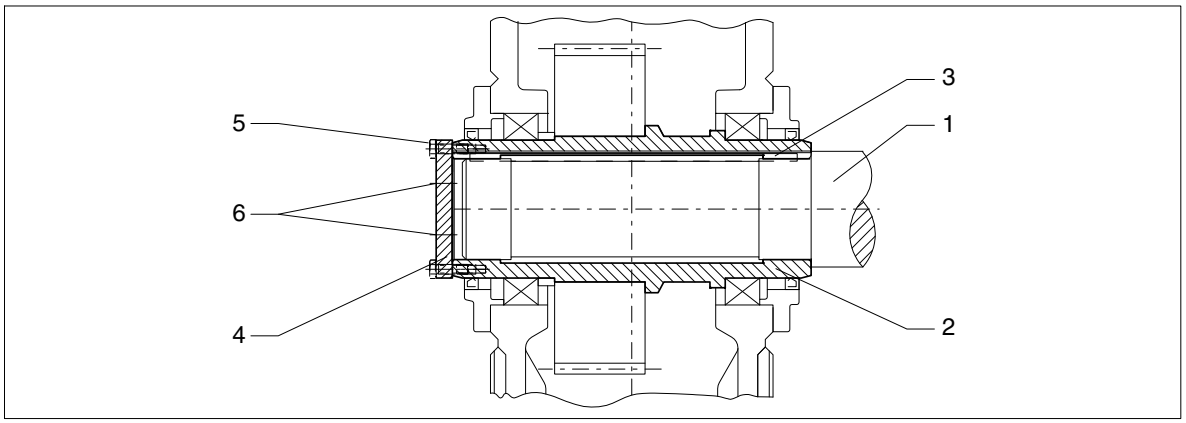


Fig. 46: Hollow shaft with parallel keyway, demounting with end plate

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

Avoid canting when pulling the unit off.

The auxiliary plate for forcing-out is not included in our delivery.

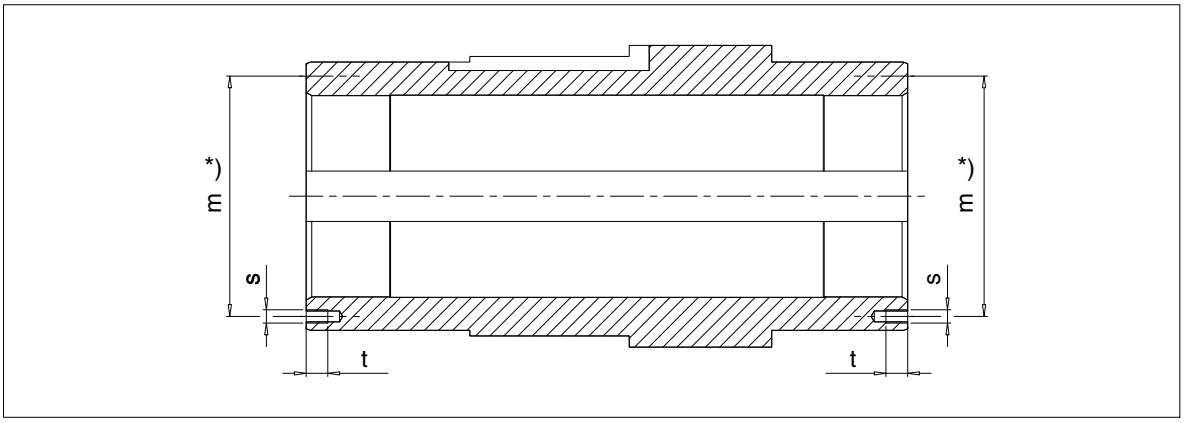


Fig. 47: Hollow shaft with parallel keyway

*) 2 threads offset 180°

Table 15: Threaded holes on the end faces of the gear-unit hollow shafts

Gear-unit size	m mm	s	t mm	Gear-unit size	m mm	s	t mm
504	95	M 8	14.5	510	180	M 12	19.5
505	115	M 8	14.5	511	195	M 12	19.5
506	125	M 8	14.5	512	215	M 12	19.5
507	140	M 10	17	513	230	M 12	19.5
508	150	M 10	17	514	250	M 12	19.5
509	160	M 10	17				

If the support is provided not only by the hollow shaft, but also by the housing, as shown in figure 45, the forces used must not exceed the values given in the following table 16.

Table 16: Maximum forcing pressures

Gear-unit size	Maximum forcing pressure N	Gear-unit size	Maximum forcing pressure N
504	22600	510	82000
505	33000	511	97200
506	37500	512	113600
507	50000	513	140000
508	56000	514	160000
509	65000		

If the above values are exceeded, the housing, the hollow-shaft bearings or other gear-unit components may be irreparably damaged. 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.

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

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

6.5.1 Preparatory work

To facilitate demounting (see also item 6.4.3), we recommend providing a connection for pressure oil on the end of the driven-machine shaft end, which is drilled through to the hollow-shaft recess (see figure 48). This connection may also be used for supplying rust-releasing agent.

☞ Failure to adhere to this recommendation will not result in the equipment manufacturer's liability to the operator.

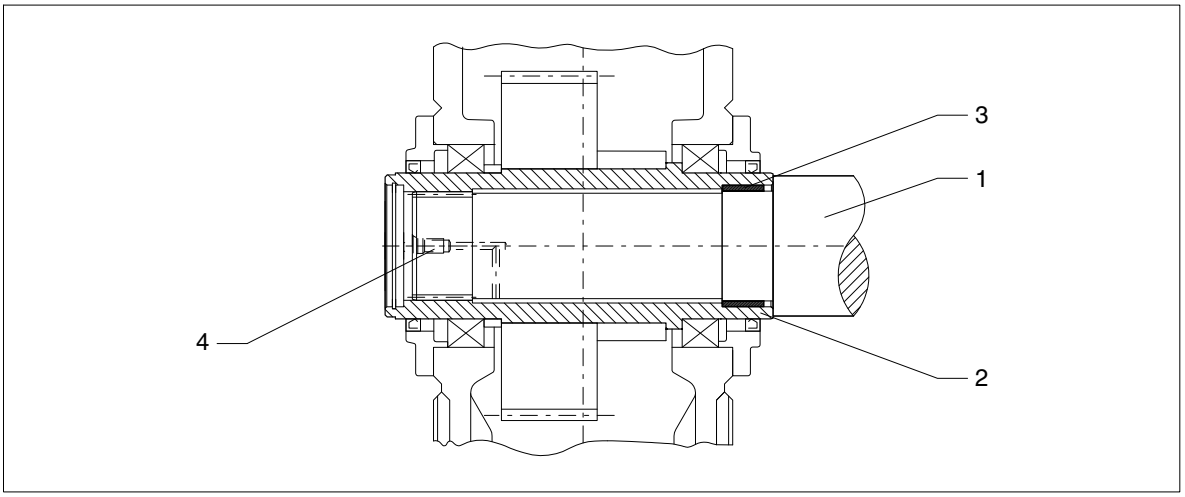


Fig. 48: Hollow shaft with internal spline, preparation

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

6.5.2 Fitting

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

STOP **The cleaner must in no way be allowed to come into contact with the shaft-sealing rings.**

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

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

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

6.5.2.1 Fitting with integrated DU bush

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

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

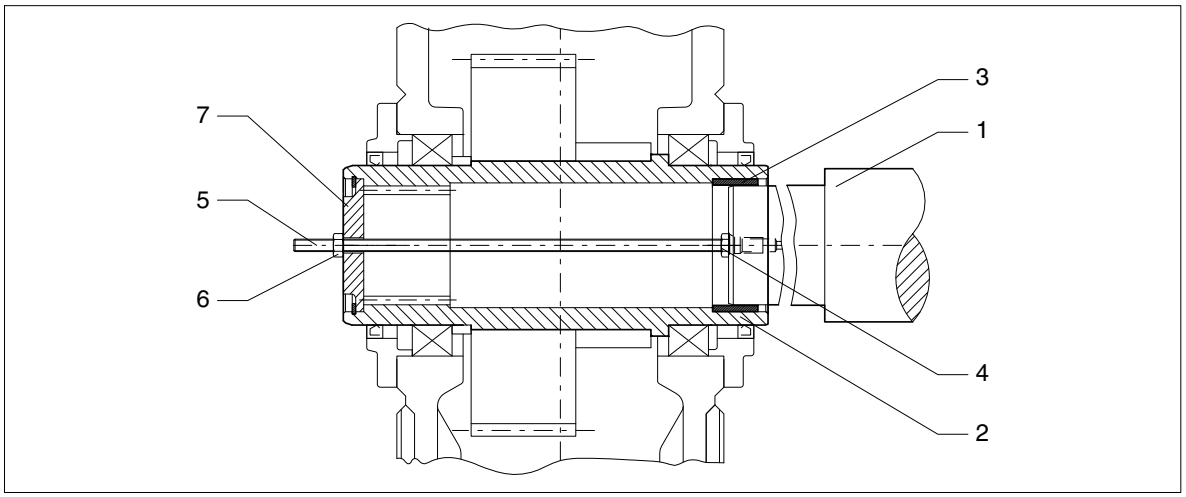


Fig. 49: Hollow shaft with internal spline, fitting with DU bush

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

6.5.2.2 Fitting with loose DU bush

The loose DU bush is pushed onto the machine shaft, fixed rigidly in position with a locating tie and then pulled into the hollow shaft along with the machine shaft of the gear unit (see figure 49).

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.

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

– Torque arm
– Support with gear-unit swing base

With a different configuration the bearings may be excessively stressed.

6.5.2.3 Axial fastening

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

6.5.3 Demounting

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see figure 48), e.g. using a pump.
- The end plate and the locking ring must first be removed.
- When the rust-releasing agent has taken effect, pull the gear unit off with the device (see figures 50 and/or 51).
- Removing the gear unit from the driven-machine shaft can be done, depending on local possibilities, as follows:

– preferably using a hydraulic lifting unit (see figure 50)

– using forcing screws in an end plate (see figure 51) or

– using a central threaded spindle or (see figure 49)

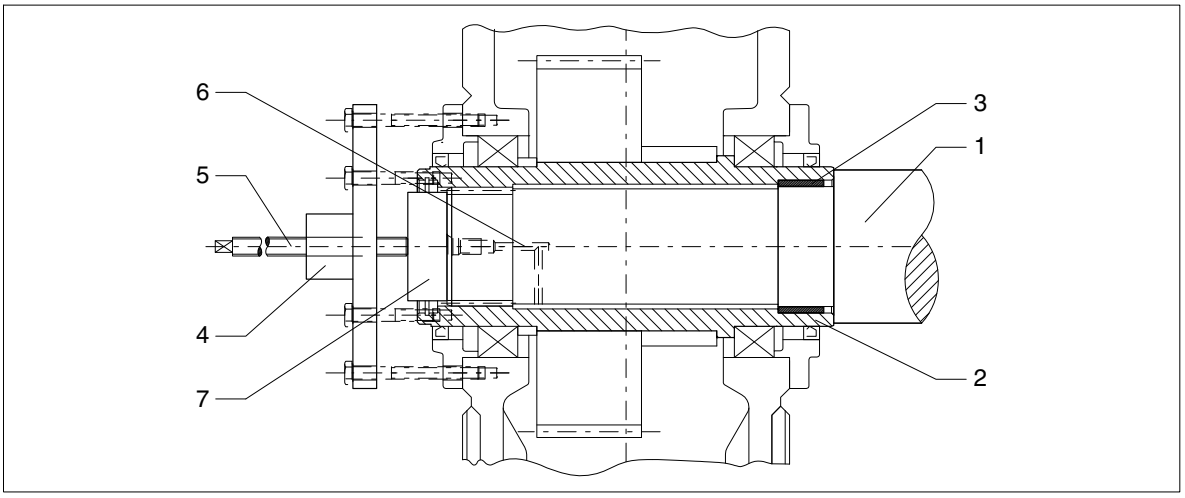


Fig. 50: Hollow shaft with internal spline, demounting with hydraulic lifting unit

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

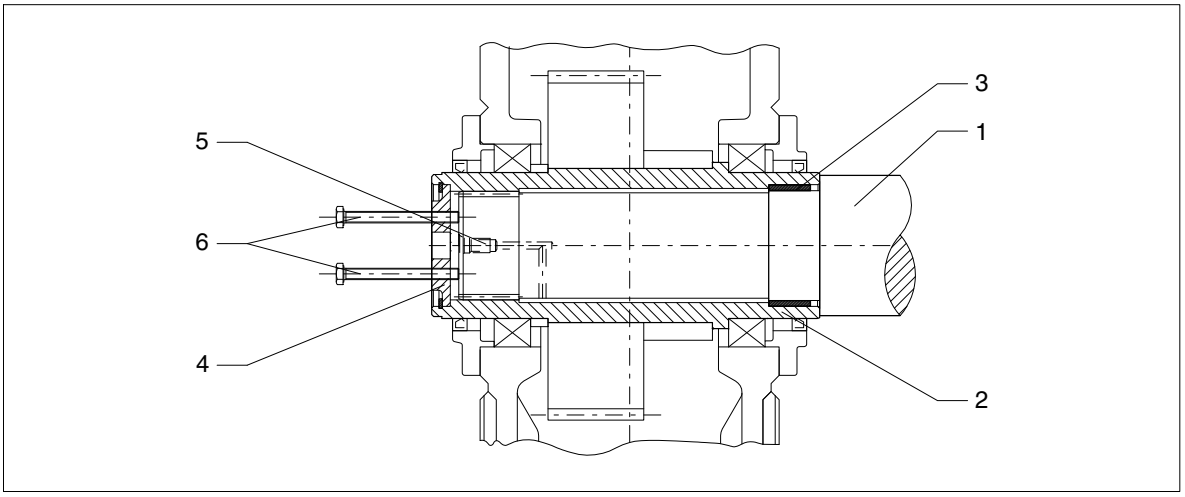


Fig. 51: Hollow shaft with internal spline, demounting with end plate

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

Avoid canting when pulling the unit off.

The auxiliary plate for forcing-out is not included in our delivery.

If the support is provided not only by the hollow shaft, but also by the housing, as shown in figure 50, the forces used must not exceed the values given in the following table 17.

Table 17: Maximum forcing pressures

Gear-unit size	Maximum forcing pressure N	Gear-unit size	Maximum forcing pressure N
504	22600	510	82000
505	33000	511	97200
506	37500	512	113600
507	50000	513	140000
508	56000	514	160000
509	65000		

If the above values are exceeded, the housing, the hollow-shaft bearings or other gear-unit components may be irreparably damaged. 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.

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

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

6.6.1 Fitting

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

STOP **The cleaner must in no way be allowed to come into contact with the shaft-sealing rings.**

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

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

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

6.6.1.1 Fitting with integrated DU bush

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

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

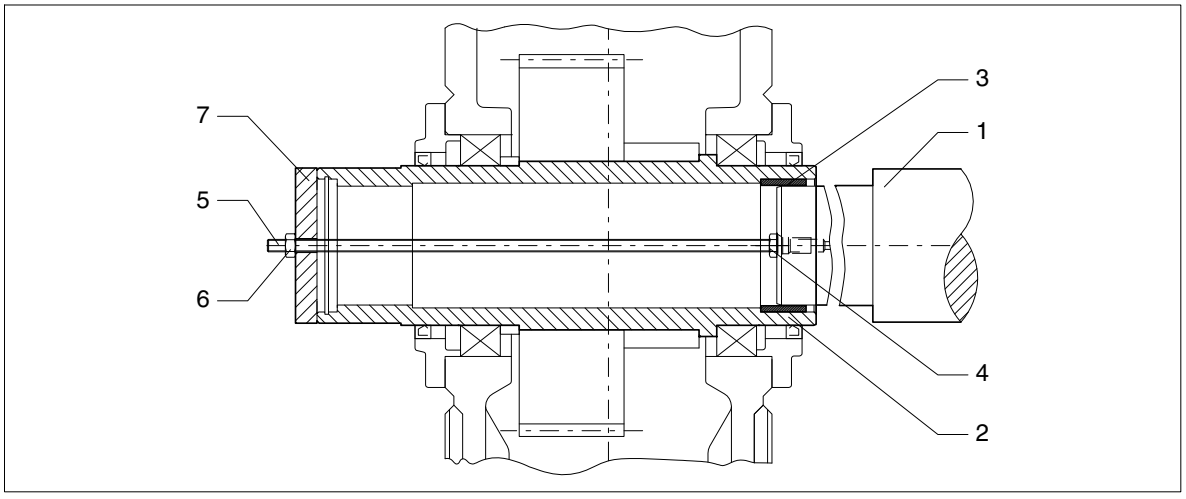


Fig. 52: Hollow shaft in shrink-disk design, mounting with DU bush

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

6.6.1.2 Fitting with loose DU bush

The loose DU bush is pushed onto the machine shaft, fixed rigidly in position with a locating tie and then pulled into the hollow shaft along with the machine shaft of the gear unit (see figure 52).

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

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

- **Torque arm**
- **Support with gear-unit swing base**

With a different configuration the bearings may be excessively stressed.

6.6.1.3 Axial fastening

If the shrink disk is fitted according to instructions (see item 6.6), the gear unit is fixed securely in the axial direction. Additional axial fastening is not required.

6.7 Shrink disk

The shrink disk realizes a press-fit connection between a hollow shaft and a stub or driven-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 fitting

The shrink disk must not be disassembled before fitting for the first time.

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

6.7.1 Fitting the shrink disk

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

Observe manufacturer's instructions for handling lubricants and solvents.

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

The bore of the hollow shaft and the stub shaft must be absolutely clean and free of grease and oil in the area of the shrink-disk seat.
This is essential for safe and reliable torque transmission.
Contaminated solvents or dirty cloths as well as cleaning agents containing oil (such as paraffin or turpentine) are not suitable for removing grease.

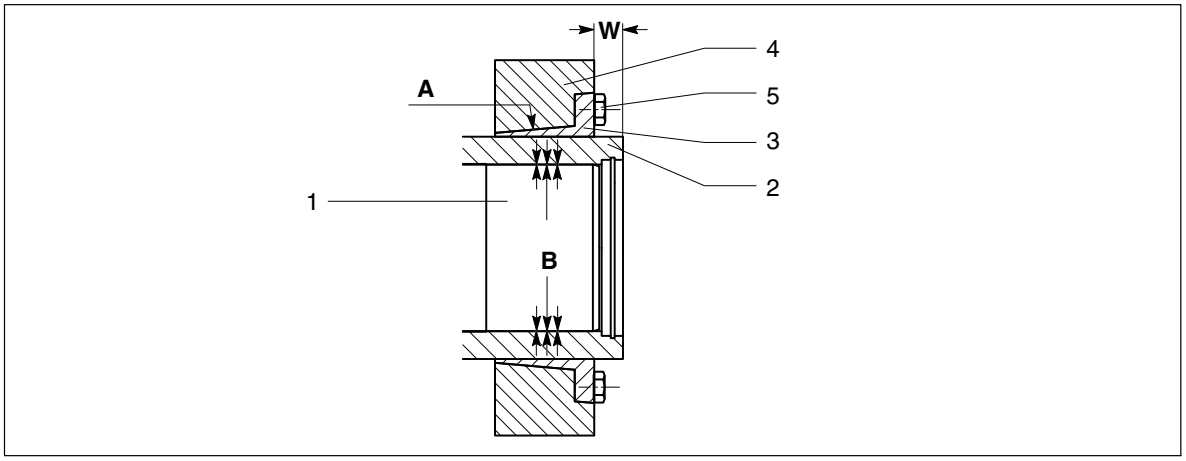


Fig. 53: Fitting the shrink disk

A	Greased	**B**	Absolutely grease- and oil-free	**W**	Installation height

1	Stub shaft	5	Outer ring
2	Hollow shaft	6	Tensioning bolt
3	Inner 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.

STOP **Do not tighten the tensioning bolts (5) until the stub shaft has been 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 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 18) 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 18: Maximum tightening torques for tensioning bolts

Tensioning-bolt thread	Max. tightening torque per bolt Strength class 10.9 Nm
M 12	105
M 14	170
M 16	260
M 20	500
M 24	870

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

If the shaft is at the same time sealed with Taconite seals on the shrink-disk side, the set gap dimension of 1 mm on the grease labyrinth must be checked.

For safety reasons a protective cowl must be fitted.
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 tensioning bolts using an impact screwdriver is not permitted.

6.7.2 Demounting the shrink disk

- Demount the protective cowl and keep the bolts on a safe place for re-fitting.
- 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. For this to be carried out correctly, the procedure described here must be carefully adhered to.

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

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

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

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

6.7.3 Cleaning and greasing the shrink disk

Only dirty shrink disks must be disassembled and cleaned.

- 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.

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

- The conical surfaces of the inner and outer rings (3 and 4, see figure 53) must be free of grease and oil.
  - A thin layer of lubricant must be applied evenly to the conical surfaces of the inner and outer rings (3 and 4, see figure 53).
  - Provide the tensioning bolts (5, see figure 53) on the contact surface and on the thread with lubricant.
  - Use a solid lubricant paste with a **high MoS_2-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 360 N/mm^2
    - Ageing-resistant

Table 19: 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, however they must have the same characteristics.

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

Observe the manufacturer's instructions for handling lubricants.

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

6.7.4 Re-fitting the shrink disk

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

6.7.5 Inspection of the shrink disk

In all cases the examination of 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 bolts

– damage caused by force

– flush position of the inner ring (3) in relation to outer ring (4).

6.8 Couplings, clutches

As a rule, flexible couplings or safety slip clutches are used 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.

STOP **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.

STOP **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 instructions 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:

– by imprecise alignment during assembly or installation

– during operation of the system due to:

  – heat expansion,

  – shaft flexure,

  – too weak machine frames, etc.

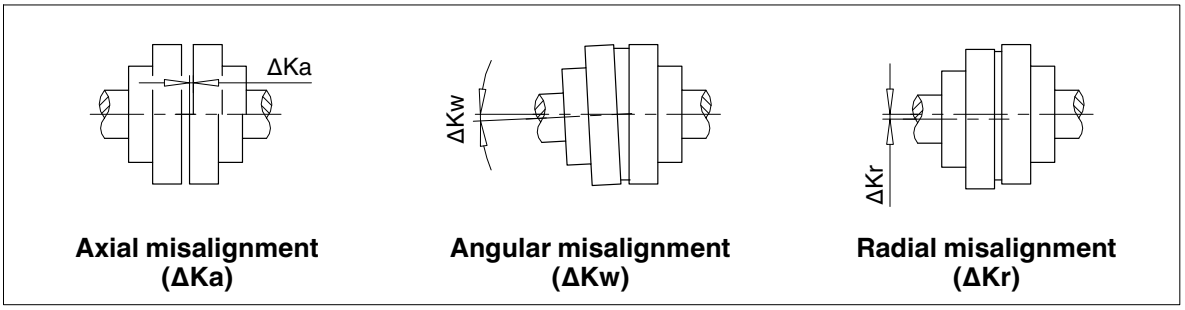


Fig. 54: Possible misalignments

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

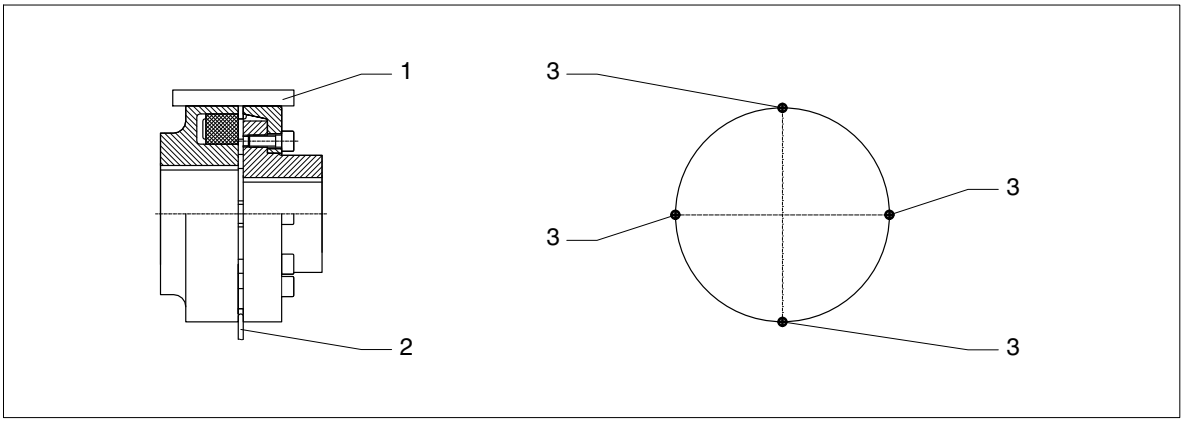


Fig. 55: Example of alignment on a flexible coupling

1 Ruler
2 Feeler gauge
3 Measuring points

The maximum permissible misalignment values are specified in the operating instructions for the coupling; they must under no circumstances be exceeded during operation.
Angular and radial misalignments may occur at the same time. The sum of both misalignments must not exceed the maximum permissible value of the angular or radial misalignment.
If you use couplings manufactured by other manufacturers, ask these manufacturers which alignment errors are permissible, stating the radial loads occurring.

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

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

6.9 Shaft-mounted gear unit with flanged shaft

The front area of the flanged shaft must be absolutely free of 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 flange centring means are inserted one inside the other.
Then tighten diametrically opposed tensioning bolts to full torque.

Table 20: Tightening torques of flange bolts for gear units

Gear-unit size	Strength class		Tightening torque
	Bolt DIN 931	Nut DIN 934	
505 ... 506	10.9	10	610 Nm
507 ... 510	10.9	10	1050 Nm
511 ... 514	10.9	10	2100 Nm

6.10 Shaft mounting gear unit with block flange

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

Tighten the tensioning bolts crosswise to full torque.

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

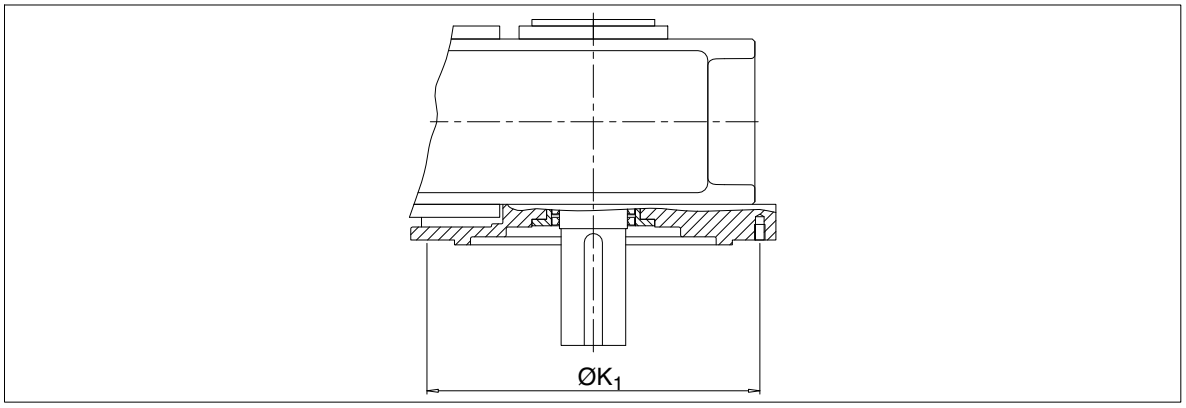
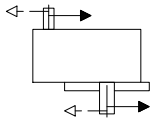
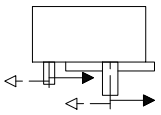
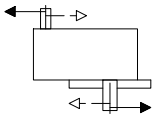
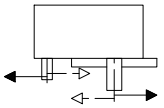
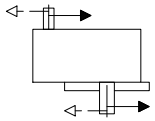
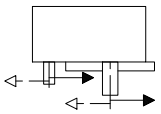
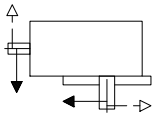
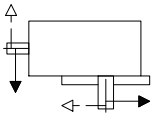
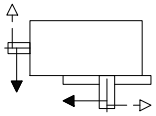
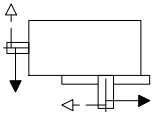


Fig. 56: Illustration with block flange

Table 21: Versions and directions of rotation

Type	Variant [1]	
	B	C
H2..		
H3..		
H4..		
B3..		
B4..		

[1] Versions with hollow output shaft on request

6.11 Fitting the torque arm for the gear-unit housing

6.11.1 Attaching the torque arm

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

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

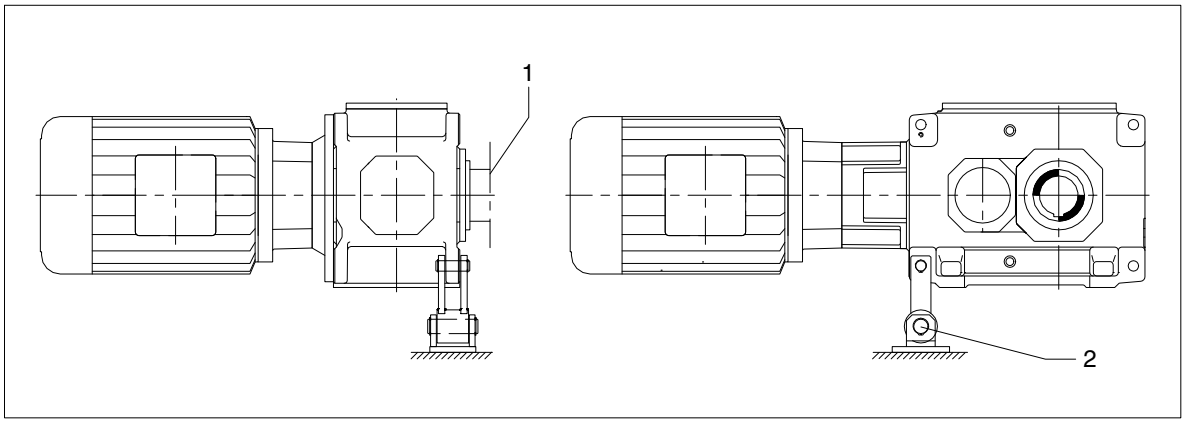


Fig. 57: Torque arm for gear-unit housing

1 Machine side

2 Flexible support block

The maximum permitted motor size with direct housing support must be agreed with Siemens according to gear-unit size and type.

- For design of the foundation for fastening the torque arm, see item 6.3.1, "Foundation".
- If the customer fits a torque arm, connection to the foundation must be by means of a flexible element.

6.12 Fitting supports for gear-unit swing base

6.12.1 Attaching the support

The support for the gear-unit swing base must be fitted free of stress.

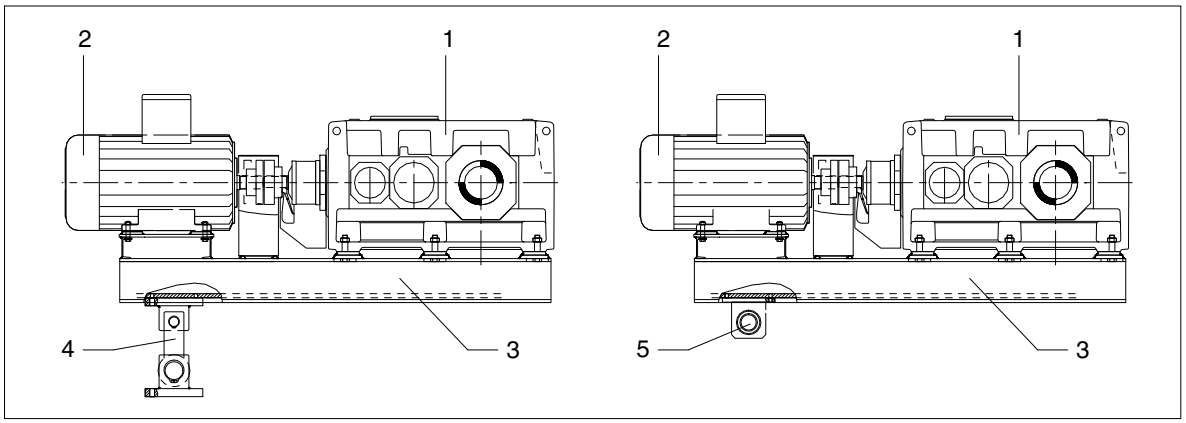


Fig. 58: Support for gear-unit swing bases

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

Table 22: Motor assignment gear-unit swing base

Gear-unit size	**Maximum standard-motor size** Gear type	
	B3	B4
504	200	-
505 ...506	225M	160
507 ...508	280M	200
509 ...510	315	225M
511 ...512	355	280S
513 ...514	400M	315M

Larger motors should be used only with approval of Siemens.

- For design of the foundation for fastening the torque arm, see item 6.3.1, "Foundation".
- If the customer fits a torque arm, connection to the foundation must be by means of a flexible element.

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 5.10.2.

6.14 Gear unit with add-on components

For the technical data to the add-on components, as stated in items 6.15 to 6.21, refer to the order-specific list of equipment.

- The electrical equipment for regulation and control must be wired in accordance with the equipment suppliers' instructions.
- For operation and maintenance the operating instructions provided specifically for the order and the specifications in items 5.10.2 to 5.15 must be observed.

6.15 Gear units with air oil-cooler

- Wire the contamination indicator for switchover filter (for gear-unit sizes ≥ 13) and pressure monitor electrically.
- Wire the fan motor electrically.

6.16 Gear units with 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 pipework 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 5.10.4.

6.17 Gear unit with heating element

- Wire the heating elements electrically.

6.18 Gear unit with oil-temperature monitoring system

- Wire the resistance thermometer with evaluating instrument (to be provided by customer) electrically.

6.19 Gear unit with oil-level monitoring

- Wire the level-limit switch electrically.
- Wire the oil-level monitor electrically.

6.20 Bearing-monitoring system

- The bearing-monitoring device must be fitted by the customer.

6.21 Gear unit with speed transmitter

- Wire the speed transmitter electrically.

6.22 Final work

- □ After installation of the gear unit check all screw connections for tight fit.
- □ Check the alignment after tightening the fastening elements (the alignment must not have been changed).
- □ Check that all the devices which have been demounted for transport reasons have been refitted. For this refer to the details in the order-related documentation, the list of equipment and the associated drawings.
- □ Existing 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! Potential equalisation is carried out via the metal contact with other earthed component parts or by connection of a suitable earth line to existing tapped holes. This work must always be done by **specialist electricians**.
- □ Cable entries should be protected against moisture.

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 observing the table below.

Table 23: Screw-connection classes

Screw-connection class	**Distribution of emitted torque on the tool**	**Tightening procedure** (Usually the tightening processes lie within the stated tool distribution)
C	± 5 % up to ± 10 %	- Hydraulic tightening with mechanical screwdriver - Torque-controlled tightening with torque wrench or signal-emitting torque wrench - Tightening with precision mechanical screwdriver with dynamic torque measuring
D	± 10 % up to ± 20 %	- Torque-controlled tightening with mechanical screwdriver
E	± 20 % up to ± 50 %	- Tightening with pulse screwdriver or impact wrench without adjustment checking device - Tightening by hand, using a spanner without torque measuring device

6.23.2 Tightening torques and initial-tensioning forces

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

Table 24: Initial-tensioning forces and tightening torques for screw connections of strength classes **8.8; 10.9; 12.9** with a common friction coefficient of **$\mu_{total} = 0.14$**

Nominal thread diameter	Strength class of the bolt	Initial-tensioning force for screw-connection classes from table 23			Tightening torque for screw-connection classes from table 23		
		C	D	E	C	D	E
d mm		$F_{M\,min.}$ 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	Strength class of the bolt	Initial-tensioning force for screw-connection classes from table 23			Tightening torque for screw-connection classes from table 23		
		C	D	E	C	D	E
d mm		$F_{M\ min.}$ 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.

7.1 Procedure before start-up

7.1.1 Removal of preservative agent

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

Oil-draining point:

- Place suitable containers under the oil-draining points.
- Unscrew the oil-drain plug 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.

- Screw in the oil-drain plug or reclose the oil-drain cock.
- Screw in any removed residual-oil plugs again.

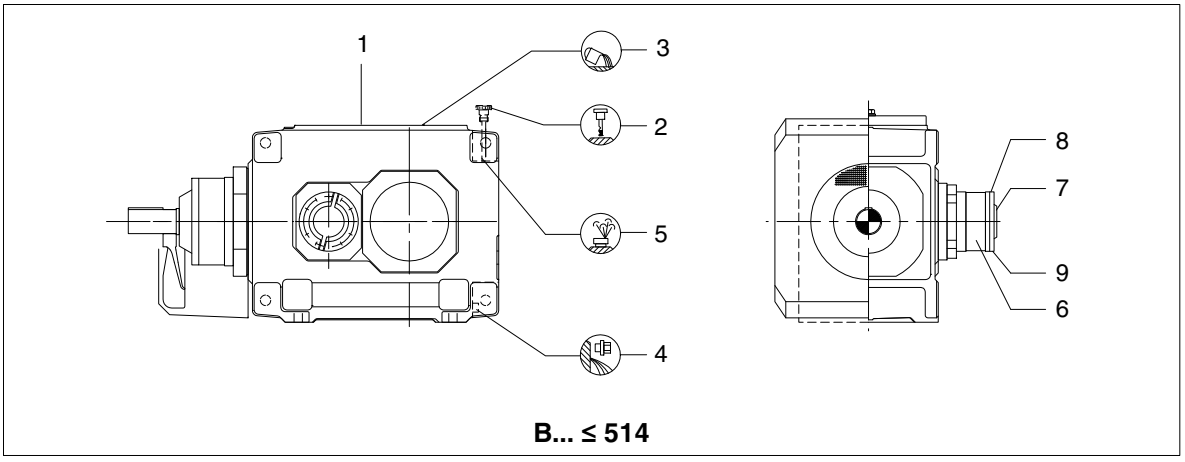


Fig. 59: Oil inlet and oil drain on the gear unit

1 Inspection and/or assembly cover
2 Oil dipstick
3 Oil inlet
4 Oil-drain plug
5 Air filter or screw plug
6 Backstop
7 Sealing cover for backstop
8 Oil inlet backstop
9 Residual-oil drain for backstop

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

7.1.2 Filling with lubricant

- Remove screw plug on the middle of the assembly cover.

Using a filling filter (maximum filter mesh 25 µm), fill the gear unit with fresh oil up to the MAX mark on the oil dipstick or the middle of the oil-sight glass.

- In case of gear units with add-on backstop, release the screw plug on the sealing cover and pour in approx. 0.5 l fresh oil of the total oil quantity via a filling filter (maximum filter mesh 25 µm).
- Screw in the screw plug.

The sealing surfaces must not be contaminated nor damaged.

The quality of the oil used must meet the requirements of the separately supplied BA 7300 instructions manual, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in table "T 7300" (for a link to the internet, see back cover), because they have been tested and meet the requirements.
Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit.
The oil quantity shown on the rating plate is to be understood as an approximate quantity. The marks on the oil dipstick or oil-sight glass are decisive for the amount of oil to be filled in.

In case of gear units fitted with force-feed 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 the add-on pump (observing the description in section 8).

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

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

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

- Screw in screw plug on the middle of the assembly cover again.

7.1.2.1 Oil quantities

Table 25: Approximate values for required oil quantities in horizontal gear units with **radial shaft-sealing rings and Taconite seals**

Type	Oil quantity (approximate value) in litres for size										
	504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
H2.H	12	18	19	32	35	52	55	84	89	150	155
H3.H	-	20	21	34	37	58	59	98	103	175	180
H4.H	-	-	-	30	32	58	60	93	100	145	155
B3.H	10	18	19	32	35	53	55	84	89	145	155
B4.H	-	19	21	35	38	58	60	93	103	160	165

Table 26: Approximate values for required oil quantities in horizontal gear units with **labyrinth seals**

Type	Oil quantity (approximate value) in litres for size										
	504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
H2.H	9	14	15	26	28	43	44	71	73	135	145

Table 27: Approximative values for additional oil quantities for the **intermediate flange** when adding on the auxiliary drive to the main gear unit

Type	Additional oil quantity (approximate value) in litres for size										
	504	**505**	**506**	**507**	**508**	**509**	**510**	**511**	**512**	**513**	**514**
B3.H	1	2	2	5	5	5	6	12	12	15	15

☞ For details regarding the auxiliary gear unit please see the Special operating instructions. (The auxiliary gear unit is delivered ex works with oil filling.)

7.2 Start-up

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

7.2.1 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.

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

STOP **It must in no case be allowed to fall below the lower mark; if necessary, top up to the correct level.**

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

The permissible pressure and oil-temperature values specified in the order-related documentation and/or the list of equipment must not be exceeded. The specified permissible oil-pressure values must likewise not be fallen below.
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 in the order-related documentation and/or the list of equipment.

7.2.3 Gear unit with backstop

Observe details at item 5.8, "Backstop".

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

To avoid damaging the backstop or the gear unit, the motor must not be run adversely to the stop direction of the gear unit.
Observe the notice fixed to the gear unit.
If the minimum lift-off speed is fallen below, the backstop must be regularly changed, like a wearing part. You can see from the gear-unit documentation whether the backstop is operating below lift-off speed and what the specification for the changing interval is. The contractually agreed minimum speeds must not be fallen below during continuous operation. If they are, Siemens must be consulted.

If a backstop with release mechanism is used, the operating instructions for this backstop must be followed.
Moreover, the dimension "$x_{min.}$" must be checked; "$x_{min.}$" must not be smaller than that stated on the backstop rating plate.

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

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

7.2.4 Gear unit with overrunning clutch

Observe details at item 5.16.3, "Overrunning clutch".

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

The overrunning clutch is in free-wheeling operation if the motor shaft of the auxiliary drive is rotated in opposed operating direction of rotation.
When rotating in the operating direction of rotation, the blocking action of the overrunning clutch (carrier operation) becomes effective. Coupling and, thus, rotation of the output shaft of the main gear unit in operating direction of rotation takes place.
In case of auxiliary drives designed for load operation, the brake at the auxiliary motor must first be lifted in order to check for proper functioning of the overrunning clutch.

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

7.2.5 Temperature measurement

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

The maximally permissible oil-sump temperature is 90 °C (for mineral oil) or 100 °C (for synthetic oil).

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

7.2.6 Oil-level monitoring system

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

7.2.7 Bearing monitoring (vibration measurement)

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

7.2.8 Heating

Never switch the heating on, unless complete immersion of the heating elements in the oil bath is ensured. Fire hazard.
If heating elements are installed afterwards the maximum heating capacity (see table 14 in item 5.11) on the outer surface of the heating element must not be exceeded.

The correct setting of the switch points must be checked.

7.2.9 Checking procedure

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

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

The tension pressures and/or initial-tensioning forces in accordance with item 6.3.2.4 must also be recorded in this document.

The report must be kept with these instructions.

7.3 Removal from service

- To take the gear unit out of service, first switch off the drive assembly.

Secure the drive unit to prevent it from being started up unintentionally.
A notice should be attached to the start switch stating clearly that work is in progress.

- 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).
- Treat the gear unit with preservative agent, see items 7.3.1 and 7.3.2 (before a shut-down period exceeding 6 months).

7.3.1 Interior preservation for longer disuse

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

7.3.1.1 Interior preservation with gear oil

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

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

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

The leaktightness of the gear unit must be checked regularly.

7.3.1.2 Interior preservation with preservative agent

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

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

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

- Remove screw plug on the middle of the assembly cover.

- Fill the gear unit with "Castrol Alpha SP 220 S".
  Calculate the filling quantity on the basis of 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 screw plug on the middle of the assembly cover again.

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, remove the adhesive tape and replace the screw plug with the air filter.

If the gear unit is to be filled with a PG-based synthetic operating oil after preservation or if such oil has been used as operating oil, the preservative oil must be drained off before initial start-up and the gear unit thoroughly flushed out with operating oil (for this see also item 10.2.2). The flushing oil must not be used for operation of the unit.

7.3.2 Exterior preservation

7.3.2.1 Exterior-preservation procedure

- Clean the surfaces.

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

- Apply preservative agent.

For preservative agent, see table 10 in item 4.4.2.

8. Operation

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

8.1 General

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

During operation the gear unit must be monitored for:

- Operating temperature — The gear unit is designed for an operating temperature at continuous operation of:
  90 °C (applies to mineral oil and/or synthetic esters)
  The maximum permitted temperature is:
  100 °C (applies to synthetic oil)
  The maximum permissible temperature may be exceeded by 10 K for a short while.
- Oil pressure of the oil-supply system — (in accordance with order-specific documentation)
- Change 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:
– Middle of the oil-sight glass
– Upper mark on the oil dipstick
When the oil is hot, the oil-level marks may be slightly exceeded. It must in no case be allowed to fall below the mark; if necessary, top up to the correct level.

☞ The oil level in the oil-supply system must be checked.
For this, the operating instructions of the oil-supply system must be observed.

8.3 Irregularities

STOP **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-supply system triggers alarm (only with correspondingly equipped gear units).

Determine the cause of the fault, using table 28, "Faults, causes and remedy" (see item 9.2).

Table 28, "Faults, causes and remedy", contains a list of possible faults, their causes and suggested remedies.

If the cause cannot be found, a specialist from one of our customer-service centres should be called in (see section 2).

9. Faults, causes and remedy

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

9.1 General information on faults and malfunctions

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

In case of faults and malfunctions occurring after the guarantee period and the cause of which 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 the approval by Siemens 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. A notice should be attached to the start switch stating clearly that work is in progress.

9.2 Possible faults

Table 28: Faults, causes and remedy

Faults	Causes	Remedy
Changes in gear-unit noise.	Damage to gear teeth.	Contact Customer Service. Check all toothed components; replace any damaged parts, if necessary.
	Excessive bearing play.	Contact Customer Service. Adjust bearing backlash.
	Bearing defective.	Contact Customer Service. Replace defective bearings.
	Overrunning noise caused by the frequency-converter operation.	Contact Customer Service. Check motor control.
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; if necessary, top up oil.
	Oil too old.	Check date of last oil change; 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
Oil leakage from the gear unit.	Inadequate sealing of housing covers and/or joints.	Check and, if necessary, replace seals. Seal joints and/or housing cover.
	Radial shaft-sealing rings defective.	Check radial shaft-sealing rings; if necessary, replace.
Oil foaming in the gear unit.	Preservative agent not completely drained.	Oil change.
	Oil-supply system has been operated too long at low temperatures.	Stop oil-supply system. Allow the oil to degas.
	Gear unit too cold in operation.	Shut down gear unit and have oil degassed. Restart without cooling water.
	Water in oil.	Test the oil; change the oil, if necessary.
	Oil too old (defoaming agent used up).	Test the oil; change the oil, if necessary.
	Unsuitable oils mixed up.	Test the oil; change the oil, if necessary.
Water in oil.	Defective oil-supply system or cooling coil.	Check the oil-supply system and cooling coil; replace any defective parts. Consult operating instructions for oil-supply system.
	Gear unit exposed to cold air from machine-room ventilator: Water condensing.	Protect gear unit with suitable heat insulation. Close air outlet or alter its direction by structural measures.
	Climatic conditions.	Contact Customer Service; if necessary, fit wet-air filter.
	Wet-air filter changes colour from top to bottom.	Contact Customer Service. Change oil.

Faults	Causes	Remedy
Increased operating temperature.	Oil level in housing too high.	Check the oil level; if necessary, adjust te oil level.
	Oil too old.	Check date of last oil change; if necessary, change oil. See section 10.
	Oil badly contaminated.	Change oil. See section 10.
	Defective oil-supply system or cooling coil.	Check the oil-supply system and cooling coil; replace any defective parts. Consult operating instructions for oil-supply system.
	Gear unit with water oil-cooler: Coolant flow too low.	Fully open valves in in- and outflow pipes. Check for free flow through water oil-cooler.
	Gear unit with air oil-cooler: cooler block contaminated.	Clean cooler block. See section 10.
	Coolant temperature too high.	Check the temperature; if necessary, adjust.
	Oil flow through water oil-cooler too low due to: seriously contaminated oil filter.	Clean the oil filter. See section 10.
	Oil pump defective.	Check function of oil pump; if necessary, repair or replace oil pump.
	On gear units with fan: Suction opening in air-guide cover and/or gear-unit housing badly contaminated.	Clean air-guide cover and gear-unit housing.
Temperature at backstop too high. Locking function fails.	Damage to backstop.	Contact Customer Service. Check and, if necessary, replace backstop.
Pressure monitor triggers alarm. (Gear units with force-feed lubrication, water oil-cooler or air oil-cooler.)	Pressure falls below the minimum pressure specified in the order-related documentation.	Check oil level at room temperature; 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.
Wet-air filter completely discoloured.	Wet-air filter worn out.	Replace wet-air filter.
Fault in oil-supply system.		Consult operating instructions for oil-supply system.

9.2.1 Leakage / leaktightness

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

Table 29: Notes on the leaktightness of radial shaft-sealing rings (RWDR[2)])

Condition	Description	Measures	Notes
Leaktight, dry	No moisture to be seen on radial shaft-sealing ring	None	
Leaktight, damp	Film of moisture formed functionally in the area of the sealing edge but not extending beyond the bottom side of the radial shaft-sealing ring.	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**

*) Siemens AG, Mechanical Drives "MD" Business Unit

1) FVA = Forschungsvereinigung Antriebstechnik e. V.

2) RWDR = radial shaft-sealing ring

☞ Oil mist escaping from a breather 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 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 30 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 oil temperature of	**80**	**°C**
maximum oil temperature of	**90**	**°C (applies to mineral oil and synthetic esters)**
	100	**°C (applies to synthetic oil)**

The operator must ensure that the intervals stated in table 30 are adhered to.
This also applies if the maintenance work is included in the operator's internal maintenance schedules.

Table 30: Maintenance and repair work

Measures	Periods	Remarks
Check the oil temperature	Daily	
Check for unusual gear-unit noise	Daily	
Check the oil level	Monthly	
Check the 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 [1)]	See item 10.2.2.
Perform subsequent oil changes	Every 24 months or 10 000 operating hours	See item 10.2.2.
Clean the air filter	Every 3 months	See item 10.2.3.
Clean fan and gear unit	Depending on requirements, at least every 2 years	See item 10.2.5.
Refill Taconite seals with grease	Every 3000 operating hours or at least every 6 months	See item 10.2.6.
Refill Tacolab seals with grease	Every 3000 operating hours or at least every 6 months	See item 10.2.7.

Measures	Periods	Remarks
Check the hose lines	Yearly	See item 10.2.11.
Change the hose lines	6 years from the manufacturing date impressed	See item 10.2.11.
Check cooling coil	Every 2 years	See item 10.2.8.
Checking friction linings of torque-limiting backstop	Once per year at least	See item 5.9.
Checking auxiliary drive		See item 5.16.
Checking speed-monitoring device for auxiliary drive	Every 3 months	See item 5.16.1.
Check tightness of fastening bolts	After the first oil change, then every 2 years	See item 10.2.15.
Check shrink disk	Every 12 months	See item 6.7.5.
Inspection of the gear unit	Approx. every 2 years	See item 10.4.

[1] Where gear units are delivered with oil filled in (e.g. auxiliary gear unit), the period is specified for the first oil change after the delivery.

10.1.1 General service lives of oils

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

– for mineral oils, 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 Test the water content of the oil

More information about examining the oil for water content or conducting oil analyses is obtainable from your lubricant manufacturer or 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 30 (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.

☞ Observe the separately attached operating 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.

- Place a suitable container under the oil-draining point of the gear-unit housing.
- Unscrew the air filter including reducing screw at the housing top.
- Unscrew the oil-drain plug or 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.

- Screw in the oil-drain plug or close the oil-drain cock.
- Clean the oil filter in the oil-cooling system (see operating instructions to the oil-supply system).
- Clean the air filter (see item 10.2.3).
- Screw in the air filter including the reducing screw.
- Fill fresh oil into the gear unit (see item 7.1.2).

10.2.3 Clean the air filter

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

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

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

Foreign bodies must be prevented from entering the gear unit.

10.2.4 Replace the 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.

10.2.5 Clean the fan and gear unit

The instructions in item 5.10.1 must be observed.

- Demount the air-guide cover and keep the bolts on a safe place for re-fitting.
- Using a stiff brush, remove any dirt adhering to the fan wheel, air-guide cover and safety grid.
- Remove any corrosion.
- Refit the air-guide cover and protective grid again using the fastening screws.

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

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

10.2.6 Refill Taconite seals with grease

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

Remove and dispose of any old grease escaping.

10.2.7 Refill Tacolab seals with grease

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

Remove and dispose of any old grease escaping.

10.2.8 Check cooling coil

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

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

- If thick deposits have formed on the inside of the cooling coil, the cooling water and/or the deposits themselves should be chemically analysed. These analyses are carried out by companies which specialise in chemical cleaning. They also supply the special cleaning agents required.
- Before using these cleaning agents, check that they will not damage the coiling-coil materials (contact Siemens). Observe the manufacturer's instructions at all times when using different cleaning agents by several manufacturers.

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

Wear suitable 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.

10.2.9 Check air oil-cooler

The instructions in items 5.10.3, 7.1.2 and 10.1 must be observed.

- Close the stop valves in the coolant in- and outflow pipes.
- Remove dirt from the cooler block.
- Check the condition of screw connections and, if necessary, replace.

10.2.10 Check water oil-cooler

The instructions in items 5.10.4, 7.1.2 and 10.1 must be observed.

- Close the stop valves in the coolant in- and outflow pipes.
- Inspect the cooler for leaks in the water-conducting pipework.
- Check the condition of screw connections and, if necessary, replace.

10.2.11 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 a fault is found, this must be rectified immediately or suitable countermeasures taken.

10.2.12 Top up oil

The instructions in item 7.1.2 must be observed.

- Always top up with the same type of oil as already used in the unit (see also item 10.2.2).

10.2.13 Checking friction linings of torque-limiting backstop

The instructions in item 5.9 must be observed.

10.2.14 Checking auxiliary drive

The instructions in item 5.16 must be observed.

- Be sure to observe the supplied operating instructions relating to the auxiliary gear unit for operation and maintenance.

10.2.15 Check tightness of fastening bolts

The instructions in item 10.1 must be observed.

- Close the stop valves in the coolant in- and outflow pipes (gear units with cooling coil or water oil-cooling system).
- 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 instructions manuals and the specifications in sections 5 and 7 must be observed.
For technical data, refer to the order-related documentation and/or list of equipment.

☞ Observe also item 6.22.

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

10.4 General inspection of the gear unit

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

10.5 Lubricants

The quality of the oil used must meet the requirements of the separately supplied BA 7300 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 to the internet, see back cover), 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 oil quantity shown on the rating plate is to be understood as an approximate quantity. The marks on the oil dipstick or oil-sight glass are decisive for the amount of oil to be filled in.

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

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

We recommend 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, position Type, size Part number Quantity

11.2 Adresses for spare parts and customer service

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

12. Declarations

12.1 Declaration of incorporation

Declaration of incorporation

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

The manufacturer, Siemens Industriegetriebe GmbH, 09322 Penig, Germany, declares with regard to the partly completed machinery

FLENDER SIG Standard industrial gear unit
H.SH, H.HH, H.DH,H.KH, H.FH
B.SH, B.HH, B.DH, B.KH, B.FH
Sizes 504 to 514

developed for driving machines in general engineering applications:

- The special technical documents described in Annex VII B have been prepared.
- The following basic health and safety requirements set out in Directive 2006/42/EC, Annex I, are applied and are satisfied:

  1.1.1, 1.1.2, 1.1.3, 1.1.5; 1.2.6; 1.3.1 - 1.3.4, 1.3.6, 1.3.7, 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; 1.6.1, 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:
  Jens Kiesenbauer (Head of Product Engineering SGU)

Penig, 2011-09-02

Jens Kiesenbauer (Head of Product Engineering SGU)

Penig, 2011-09-02

Michael Kupke (Director Business Subsegment SGU)

Further Information:

"FLENDER gear units" on the Internet
www.siemens.com/gearunits

"FLENDER couplings" on the Internet
www.siemens.com/couplings

Service & Support:
http://support.automation.siemens.com/WW/view/en/10803928/133300

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

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