Planetary gear unit

FLENDER SIP
Types O.C, O.R, O.RP, O.RR
Sizes 30 to 60

Assembly and operating instructions
BA 9300 en 07/2014

FLENDER gear units

SIEMENS

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Planetary gear unit

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Types O.C, O.R, O.RP, O.RR
Sizes 30 to 60

Assembly and operating instructions

Translation of the original assembly and operating instructions

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, those only for preventing material damage appear without a warning triangle. Depending on the level of hazard, the warning notes are shown in reverse order of seriousness, as follows.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

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

Qualified personnel

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

Proper use of Siemens products

Observe also the following:

⚠ WARNING

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

Trademarks

All designations to which the registered industrial property mark ® is appended are registered trademarks of Siemens AG. Other designations used in this document 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 document for compliance with the hard- and software described. Nevertheless, variances may occur, and so we can offer no warranty for complete agreement. The information given in this document is regularly checked, and any necessary corrections are included in subsequent editions.

Foreword

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

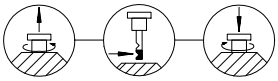
Symbols in these assembly and operating instructions

This symbol additionally indicates an imminent risk of explosion in the meaning of Directive 94/9/EC.

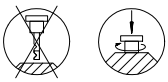
This symbol additionally indicates an imminent risk of burns due to hot surfaces in the meaning of standard "DIN EN ISO 13732-1".

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

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



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



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

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.

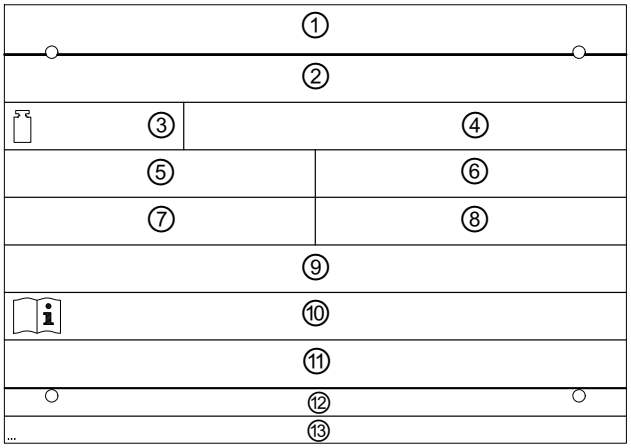
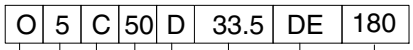


Fig. 1: Rating plate on gear unit

①	Company logo	⑦	Speed n_1
②	Manufacturing number #)	⑧	Speed n_2
③	Total weight in 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

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

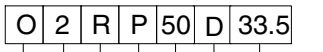
*) Example of types O.C and O.R



Motor size (IEC motor)	63 ... 280
Motor adaptation	K2 = Motor bell housing K2 K3 = Motor bell housing K3 K4 = Motor bell housing K4 K5 = Motor bell housing K5 K8 = Motor bell housing K8 KQ = Motor bell housing KQ A = Free shaft end DE = Direct fitting IEC motor
Total transmission ration	25 ... 14.497
Version "LSS" 1)	D = Hollow shaft for shrink disk K = Hollow shaft with splines to standard "DIN 5480" S = Cilindrical shaft end with parallel key A = Cylindrical shaft end with splines to standard "DIN 5480" F = Flanged shaft
Gear-unit size	30 ... 60
Shaft configuration: "HSS to LSS" 1)	C = Coaxial R = Rectangular
Total number of stages	2 ... 5
FLENDER SIP planetary gear unit series	O = "OmniDrive"

1) HSS: "High speed shaft"
LSS: "Low speed shaft"

*) Example of types O.RP and O.RR



Nominal ratio	25 ... 45
Version "LSS" 1)	D = Hollow shaft for shrink disk K = Hollow shaft with splines to standard "DIN 5480" S = Cilindrical shaft end with parallel key A = Cylindrical shaft end with splines to standard "DIN 5480" F = Flanged shaft
Size	30 ... 60
Shaft configuration: "HSS to LSS" 1)	C = Coaxial P = Parallel; add-on "Motox" R = Rectangular; add-on "Motox"
Gear-unit identification	R = Round
Number of stages	2
FLENDER SIP planetary gear unit series	O = "OmniDrive"

1) HSS: "High speed shaft"
LSS: "Low speed shaft"

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

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

1.1.1 Ambient temperature

Note

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

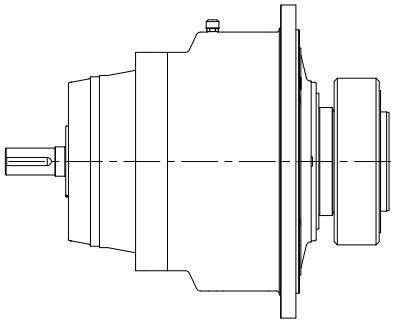
Note

For use of the gear unit at low temperatures, see item 5.1.3.

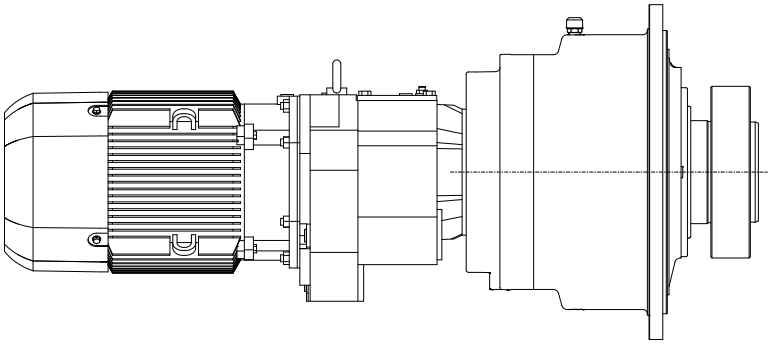
1.2 Configurations and weights

1.2.1 Standard types

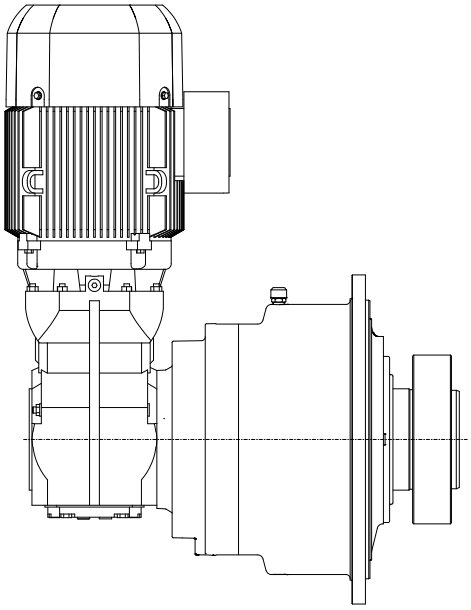
O2C



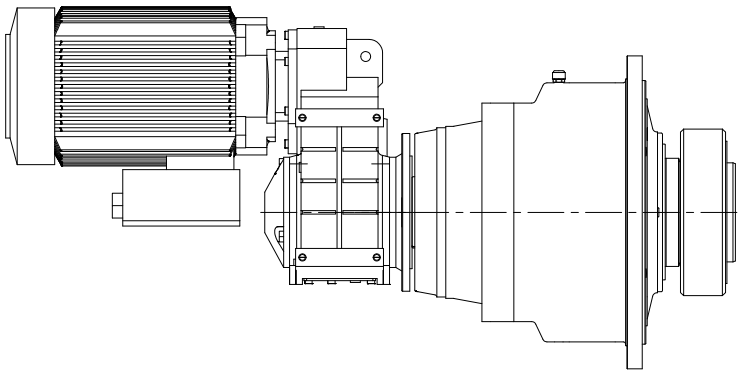
O4C,
O5C



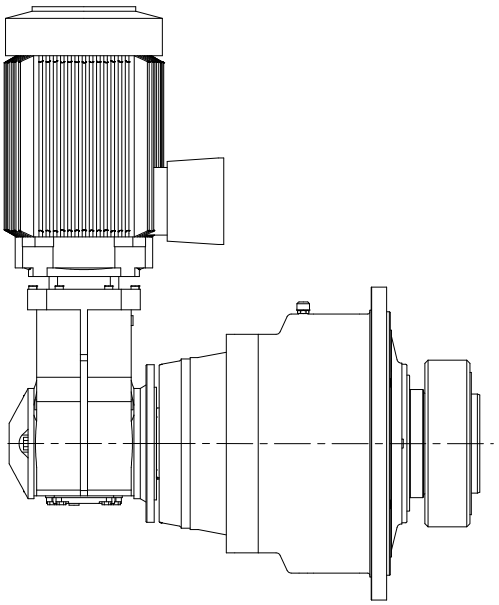
O5R



RP



RR



Note

Types O.RP and O.RR are versions with MOTOX geared motors. The planetary gear unit and all fitting and maintenance instructions relating to them in these operating instructions are identical with those relating to the types O.C and O.R. Types O.RP and O.RR are only available for horizontal mounting position.

1.2.2 Weights

Table 1: Weights (approximative values for 2-stage gear unit)

Approximate weight (kg)								
Type	Gear-unit size							
	30	**35**	**37**	**40**	**45**	**50**	**55**	**60**
O2C	115	150	190	200	280	350	520	605
O4C, O5C	305	340	370	390	720	780	1260	1260
O5R	240	270	425	450	770	820	1250	1250

All the weight indications relate to the gear unit including the shrink disk but without oil filled in. For exact weight specifications, please refer to the drawings in the gear-unit documentation.

Note

For the types O.RP and O.RR the masses of the geared motor will result in higher total-mass values.

1.3 Measuring-surface sound-pressure level

The measuring-surface sound-pressure level for the gear unit at a distance of 1 m can be found in table 2.

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

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

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

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

If repeat measurements on site do not produce conclusive results with regard to measuring technology, the measurement obtained on the Siemens test bench will apply.

Table 2: Measuring-surface sound-pressure level

Measuring-surface sound-pressure level L_{pA} in dB(A)									
Type	i_N	Gear-unit size							
		30	**35**	**37**	**40**	**45**	**50**	**55**	**60**
O2C	25 ... 45	83	83	83	83	83	84	84	84
O4C, O5C	98 ... 14700	see operating instructions for the geared motor							
O5R	146 ... 15000	see operating instructions for the geared motor							
O2RP	275 ... 12000	see operating instructions for the geared motor							
O2RR	350 ... 10000	see operating instructions for the geared motor							

Note

The measuring-surface sound-pressure levels shown apply with a tolerance of + 3 dB(A) for n_1 = 1500 1/min.

1.4 List of equipment

Note

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

2. General notes

2.1 Introduction

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

NOTICE
Material damage Risk of damage to the gear unit or disruptions to operation. 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 disruptions to operation caused by disregard of these instructions.

The **"FLENDER planetary gear unit"** dealt with in these instructions has been developed for driven machines in the most various industry areas. Possible areas of use for gear units of this type include sewage treatment, excavators, chemical industry, iron and steel industry, conveyor systems, crane systems, foodstuffs industry, paper machinery, cableways, cement industry.

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

The range of permissible ambient temperatures (t_a) is: - 20 °C ≤ t_a ≤ 40 °C (optional - 40 °C ≤ t_a ≤ 40 °C). Be sure to consult Siemens, if temperatures are lower than - 40 °C.

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

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

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

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

2.2 Copyright

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

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

Technical enquiries should be addressed to the following factory 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

⚠ WARNING

Risk of falling

Risk of serious injury through falling.
The gear unit and its add-on parts must not be entered.

⚠ WARNING

Risk of injury through unauthorised modifications

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

3.1 Obligations of the user

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

⚠ DANGER

Danger to life through switched-on installation

To carry out work on the gear unit, the gear unit must always be stopped.
The drive unit must be secured against being switched on accidentally (e.g. by locking the key switch or removing the fuses from the power supply).
A notice should be attached to the ON switch stating clearly that work is in progress on the gear unit.

- No welding work must be done at all on the drive system.
  The drive systems must not be used as an earthing point for electric-welding operations. Toothed parts and bearings may be irreparably damaged by welding.
- A potential equalisation in accordance with the applying regulations and directives must be carried out! If no threaded holes for earth connection are available on the gear unit, other appropriate measures must be taken. This work must always be done by **specialist electricians**.

NOTICE

Material damage

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

⚠ DANGER

Danger to life through rotating and/or movable parts

Risk of being caught or drawn in by rotating and/or movable parts.
Rotating and/or movable parts must be fitted with suitable safeguards to prevent contact.

Note

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

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

3.2 The five safety rules

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

1) Disconnect completely.
   Disconnect the auxiliary circuits, e.g. stand-by heating.
2) Secure against re-connection.
3) Verify that the installation is voltage-free ("dead").
4) Carry out earth and short-circuiting.
5) Provide protection against adjacent live parts.

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

3.3 Environmental protection

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

3.4 Special dangers and personal protective equipment

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

⚠ WARNING

Risk of burns

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

⚠ WARNING

Danger through low temperatures

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

⚠ WARNING

Risk of scalding

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

⚠ WARNING

Risk of eye injury

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

Note

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

⚠ DANGER

Risk of explosion

Danger to life through ignition of any explosible atmosphere resulting from of the gear unit.
The gear unit **does not comply** with the requirements in Directive 94/9/EC and **must** therefore, in the area of applicability of this directive, **not** be used in potentially explosive areas.

4. Transport and storage

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

Note

For transport and storage of the add-on geared motors the operating instructions of each geared motor must be observed.

4.1 Scope of supply

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

⚠ WARNING

Serious injury through defective product

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

If the unit is fitted with a shrink disk, this will be shipped as a loose component.

4.2 Transport

Note

The weight of each product is specified on its rating plate.

⚠ DANGER

Danger to life

Danger to life from loads falling through incorrect slinging.
Do not stay under suspended loads.
When attaching, lifting, lowering and shifting loads, observe the following:

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

⚠ WARNING

Danger of squeezing

Risk of being squeezed by a transported component, when the used lifting gear and load-carrying means are not suitable and the component gets loose.
When handling these products, use only lifting and load-carrying equipment of sufficient load-bearing capacity. Wedges or rails must be used to prevent rolling.
When lifting items, observe the notes regarding load distribution on the packing.
Transport of the gear unit must be carried out so as to avoid personal injury and damage to the gear unit. If, for example, the free shaft ends are knocked, this may cause damage in the gear unit.

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

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

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

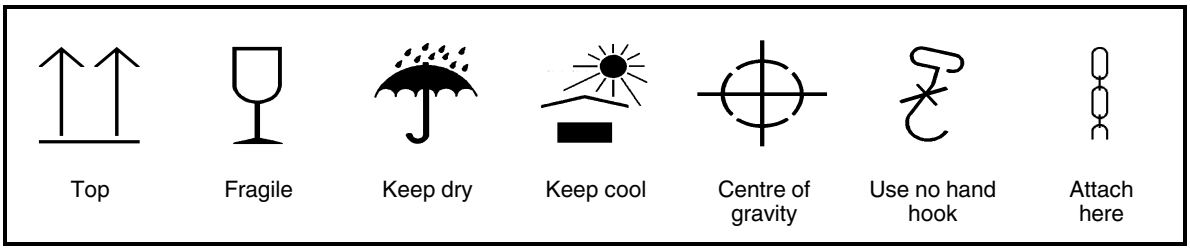


Fig. 2: Transport symbols

Note

The planetary gear unit or the planetary geared motor unit must be transported using suitable equipment only.
During transport the planetary gear unit or the planetary geared motor should be left without oil filling and on the transport packing.

NOTICE

Material damage

Danger to the planetary gear unit or the planetary geared motor possible when using incorrect attachment points. Use only the slinging points provided to attach lifting equipment to the planetary gear unit or the planetary geared motor. All the attachment points must be used.
Transport of the unit by attaching it to the pipework is not permitted.
The pipework must not be damaged.
Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.
Slinging equipment must be adequate for the weight of the planetary gear unit or the planetary geared motor. If required, use additional suitable bearing means for transport or during fitting work.
Any additional instructions can be found in the operating instructions to the geard motor.

NOTICE

Material damage

Risk of damage to the eye bolts.
When attaching to eye bolts, no lateral pull against the direction in the eye plane must be allowed to occur, as otherwise the eye bolts may break.

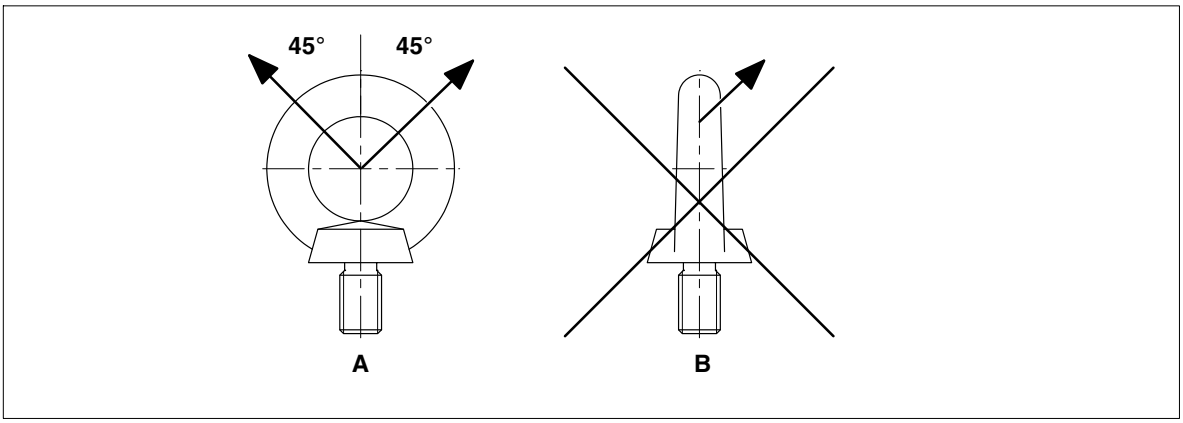


Fig. 3: Diagonal and lateral pull on eye bolts

A **permitted** diagonal pull in the direction of the eye plane (maximum angle 45°)

B **not permitted** lateral pull against the direction of the eye plane

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

NOTICE

Material damage

Damage to the shrink disk due to missing transport lock.
If fitted with a shrink disk, the shrink disk must be secured axially before handling.

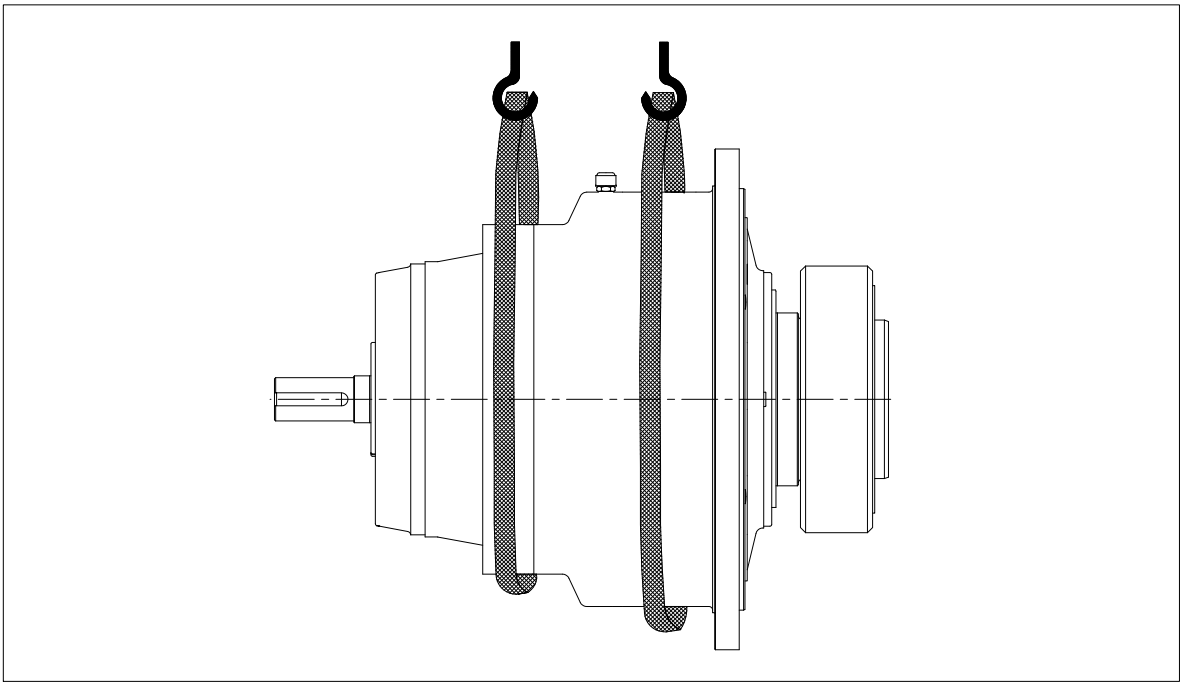


Fig. 4: Attachment points on gear units of type O2C

4.2.1 Transport "Horizontal"

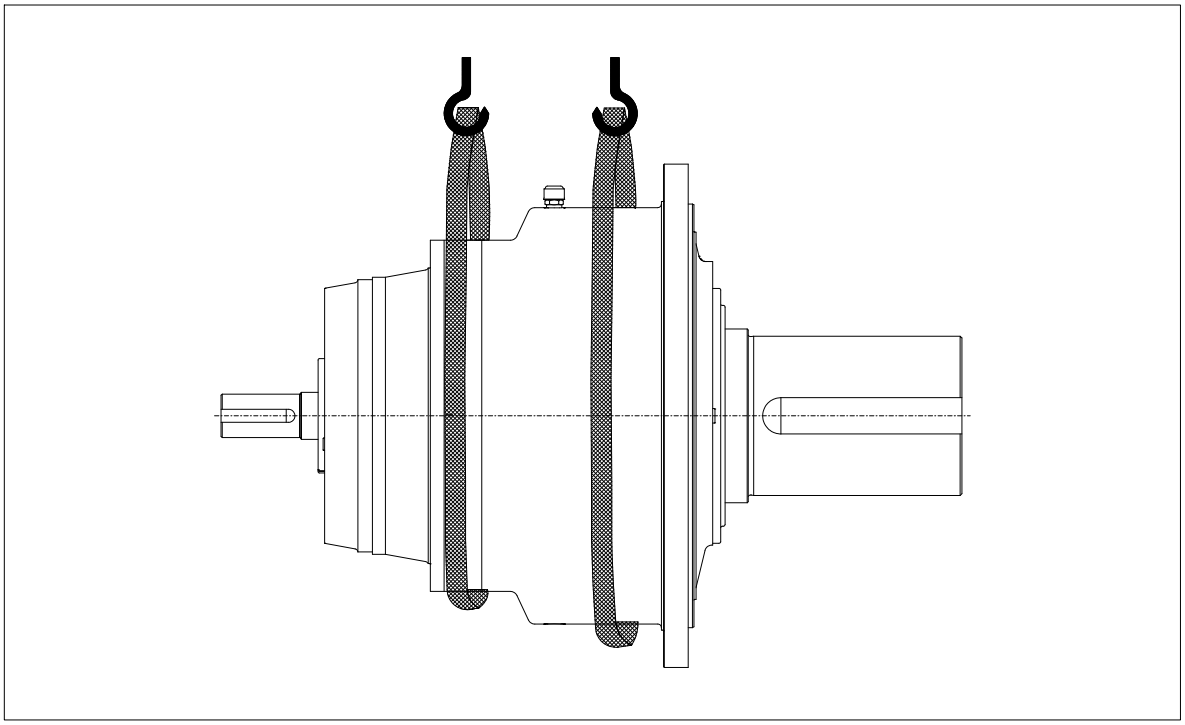


Fig. 5: Attachment points on gear units of type O2C

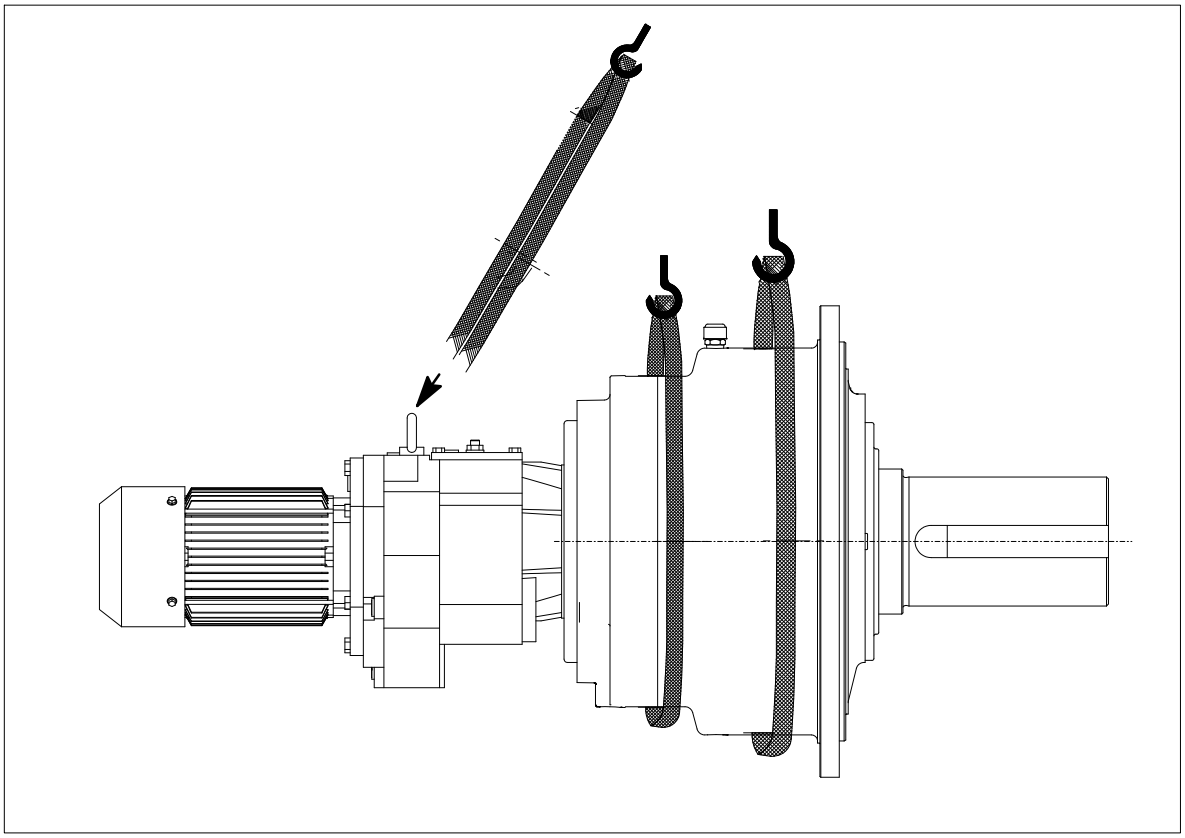


Fig. 6: Attachment points on gear units of types O4C, O5C

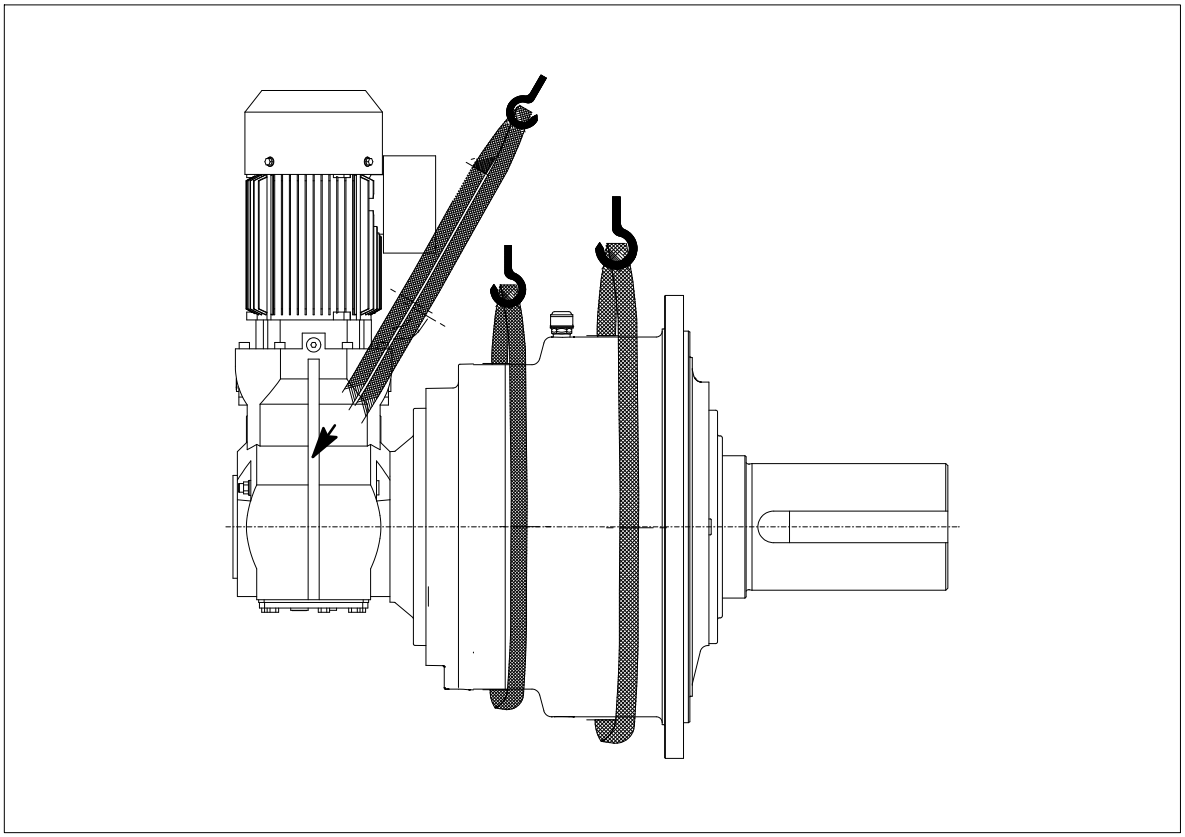


Fig. 7: Attachment points on gear units of type O5R

4.2.2 Transport "Vertical"

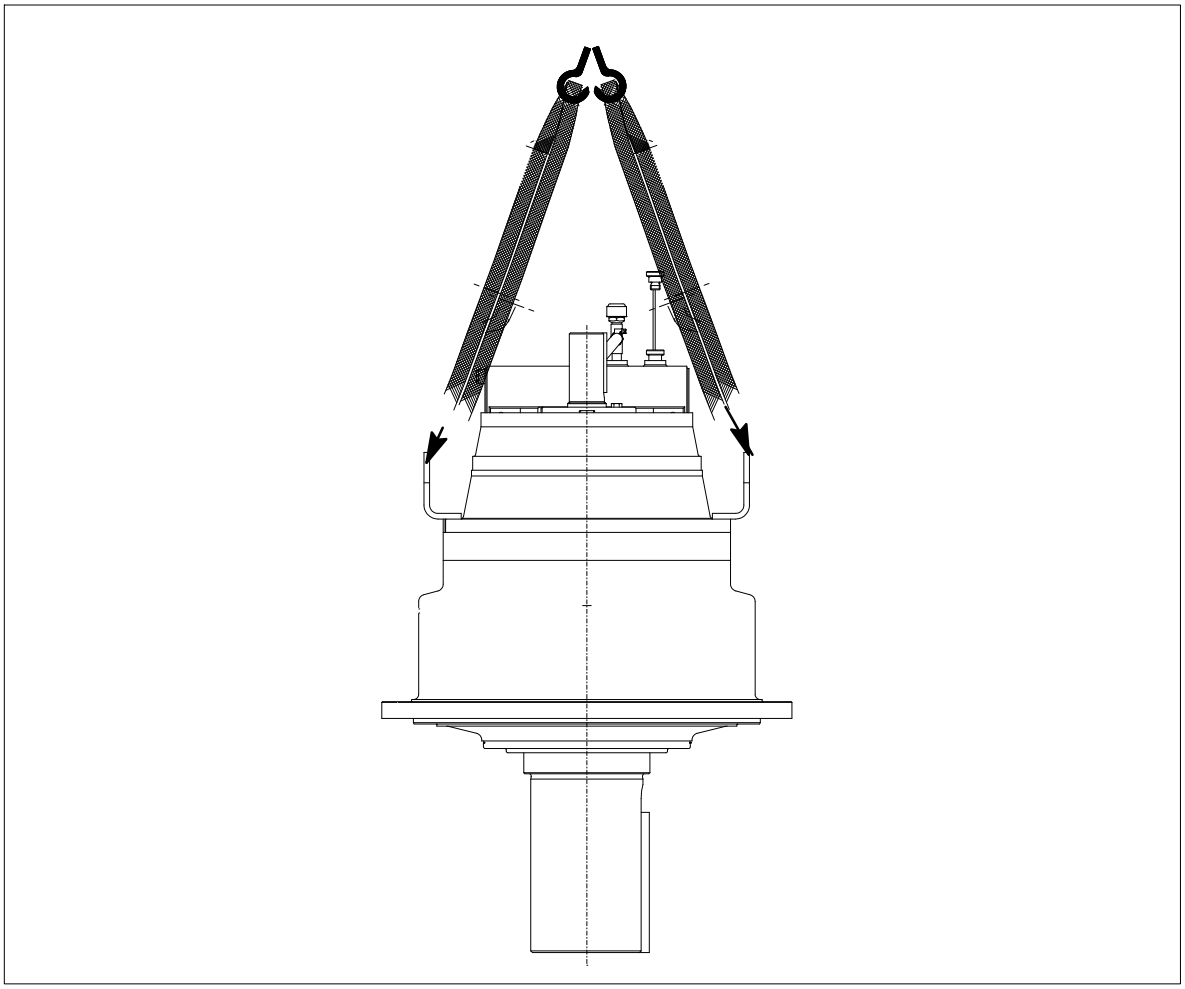


Fig. 8: Attachment points on gear units of type O2C ("LSS" bottom) [1)]

[1)] LSS: "Low speed shaft"

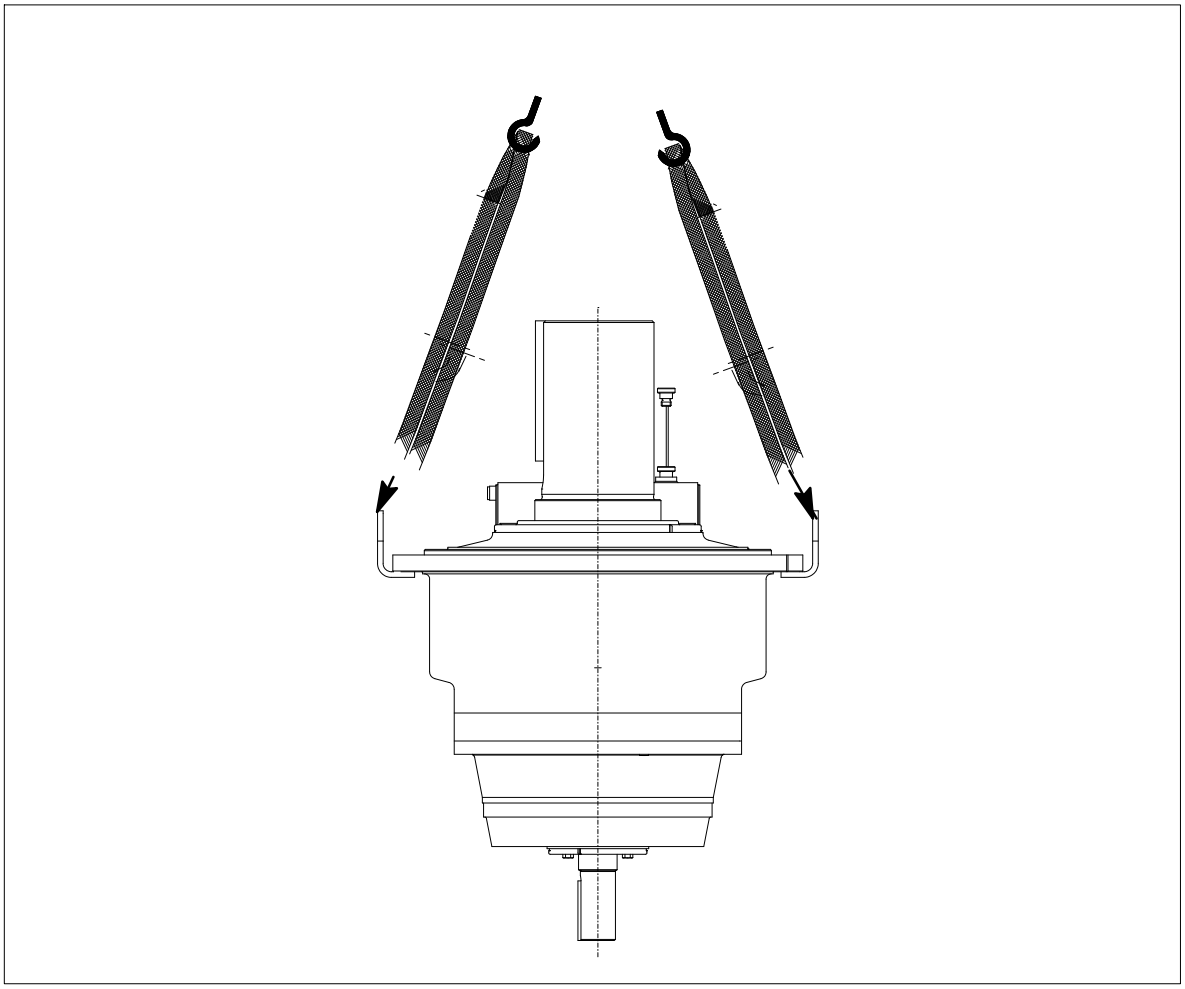


Fig. 9: Attachment points on gear units of type O2C ("LSS" top) [1)]

[1)] LSS: "Low speed shaft"

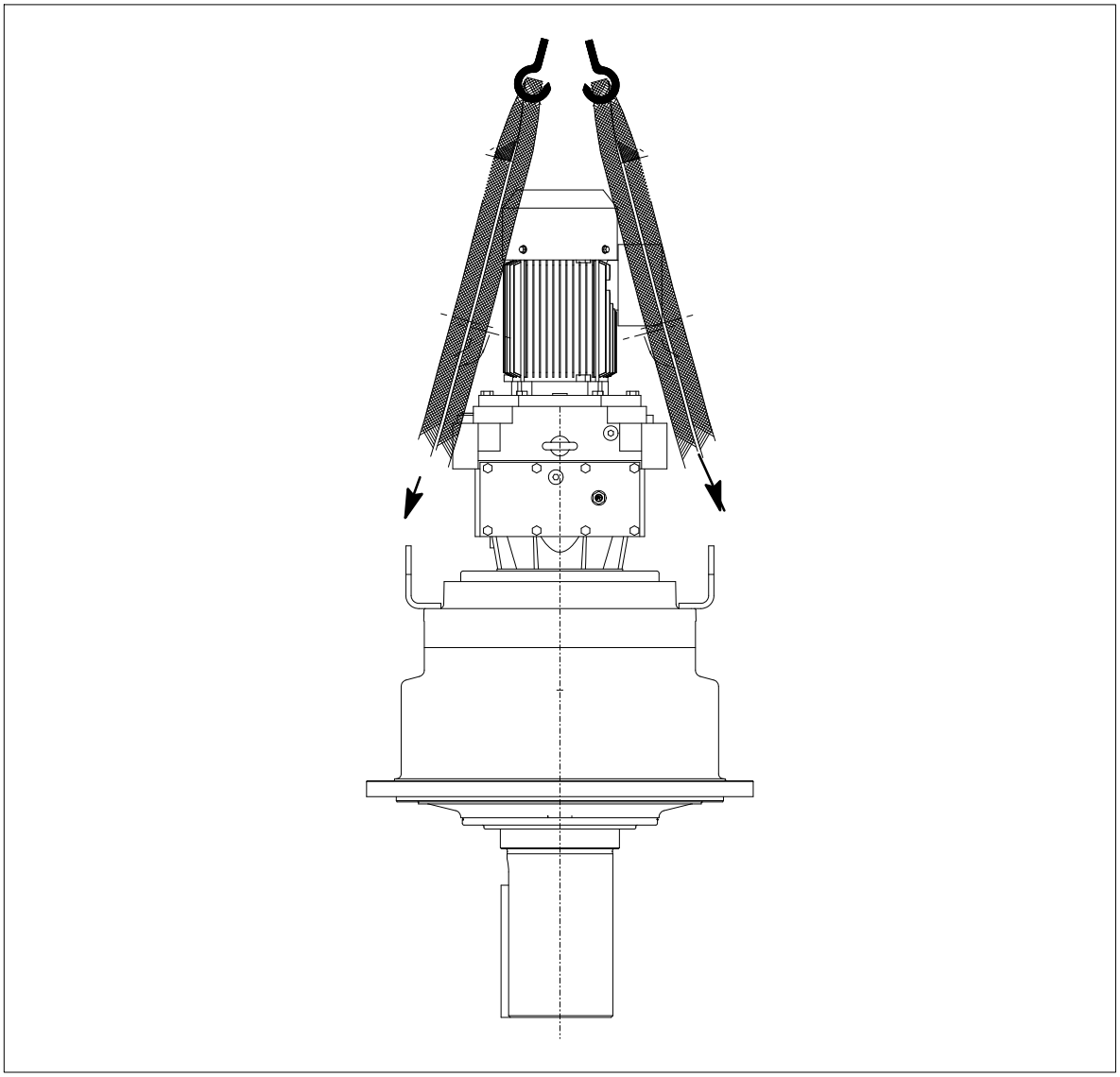


Fig. 10: Attachment points on gear units of types O4C, O5C ("LSS" bottom) [1)]

[1)] LSS: "Low speed shaft"

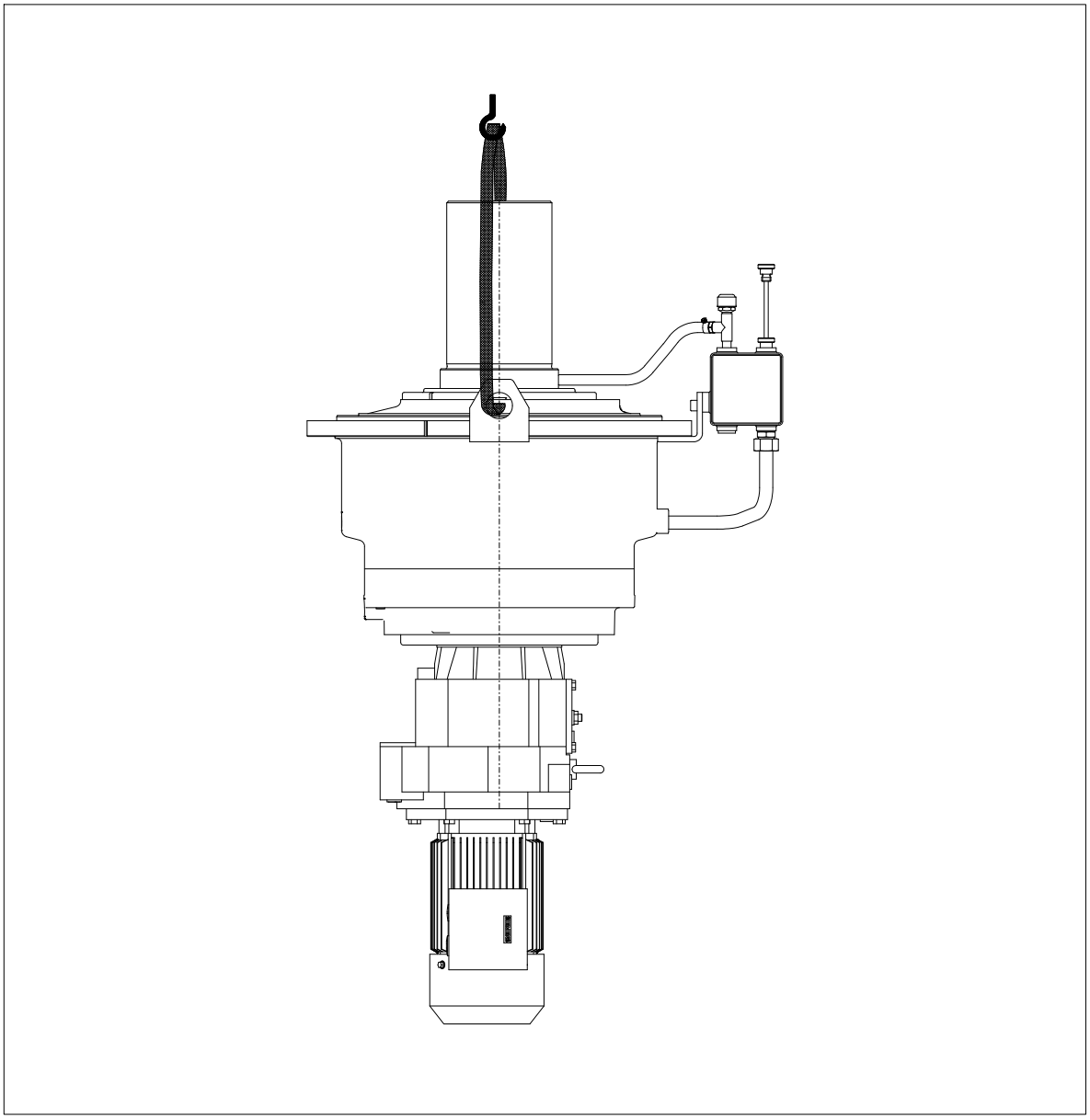


Fig. 11: Attachment points on gear units of types O4C, O5C ("LSS" top) [1)]

[1)] LSS: "Low speed shaft"

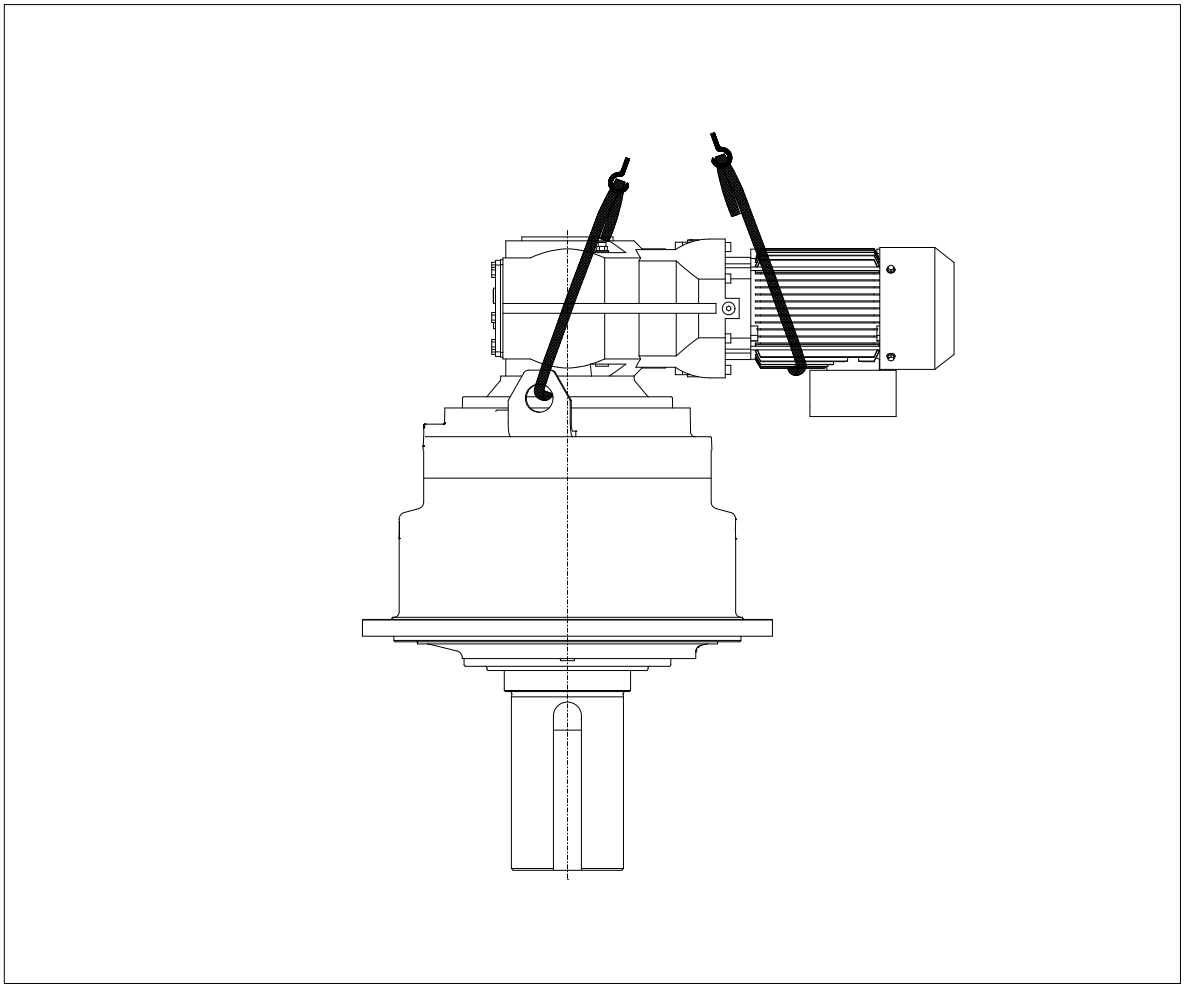


Fig. 12: Attachment points on gear units of type O5R ("LSS" bottom) [1)]

[1)] LSS: "Low speed shaft"

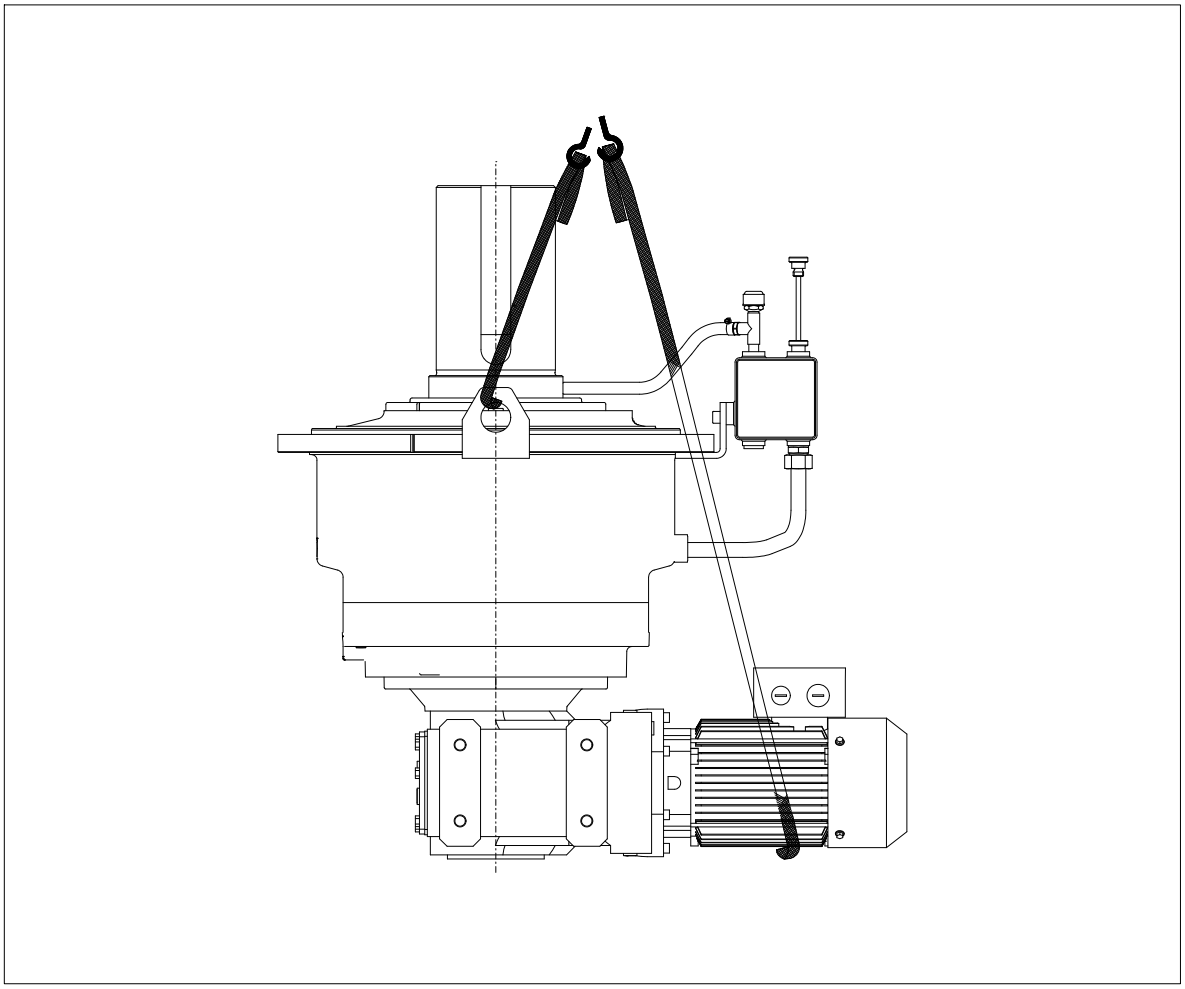


Fig. 13: Attachment points on gear units of type O5R ("LSS" top) [1)]

[1)] LSS: "Low speed shaft"

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

4.3 Storing the gear unit

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

NOTICE

Material damage

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

⚠ DANGER

Danger to life through tilting or falling gear unit

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

NOTICE

Material damage

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

NOTICE

Material damage

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

4.4 Standard coating and preservation

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

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

NOTICE

Material damage

Risk of damage to the gear unit through corrosion.
The gear unit is normally delivered completely ready, with a priming and a finish coat.
Where gear units are delivered with a priming coat only, it is necessary to apply a finish coat in accordance with directives applying to the specific application.
The priming coat alone is not suitable to provide a sufficient long-term corrosion protection.

NOTICE

Material damage

Any damage to the coating may cause failure of the exterior protective coating and thus corrosion.
Ensure that the coat is not damaged.

Note

Unless otherwise agreed by contract, the interior preservation is guaranteed for 24 months, and the exterior preservation 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 (> 24 months) we advise regular checking and, if necessary, renewal of the interior and exterior preservation (see items 7.3.1 and 7.3.2).

4.4.1 Interior preservation

Note

As indicated on the rating plates, the gear units have been preserved with the preservative agent specified in table 3 or table 4.

NOTICE

Material damage

Risk of damage to the gear unit through inadequate lubrication through preservative agent and operating oil being mixed up.
Gear units with a preservative agent in accordance with table 3 must not be filled with PG-based synthetic oils without additional measures. Gear units with a preservative agent in accordance with table 4 must not be filled with PAO-based synthetic oils, mineral oils or synthetic esters without additional measures.
If a gear unit preserved in accordance with table 3 is to be operated with PG-based oil or if a gear unit preserved in accordance with table 4 is to be operated with a mineral oil, a PAO-based synthetic oil or synthetic esters, the gear unit must be thoroughly flushed with operating oil, after draining the preservative agent off and before it is started up (see item 10.2.2 in this respect).
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.

Table 3: Durability period and measures for interior preservation when using mineral oil or PAO-based synthetic oil or synthetic esters

Durability period	Preservative agent	Special measures
up to **6** months	Castrol Alpha SP 220 S	None, if stored in dry, frostfree rooms.
up to **24** months		– Close all holes on the gear unit. – Replace the air filter with the screw plug. (Prior to start-up replace the screw plug with the air filter.) – Seal the labyrinth seal with adhesive tape. (Remove the adhesive tape before startup.)
For storage periods longer than 24 months, renew the preservative agent (see item 4.4.2).		

Table 4: Durability period and measures for interior preservation when using PG-based synthetic oil

Durability period	Preservative agent	Special measures
up to **6** months	Special anti-corrosion oil TRIBOL 1390 [1)]	None, if stored in dry, frostfree rooms.
up to **36** months		– Close all holes on the gear unit. – Replace the air filter with the screw plug. (Prior to start-up replace the screw plug with the air filter.) – Seal the labyrinth seal with adhesive tape. (Remove the adhesive tape before startup.)
For storage periods longer than 36 months, renew the preservative agent (see item 4.4.2).		

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

4.4.2 Prolongation of preservation of the interior of the gear unit in case of longer periods of storage

⚠ CAUTION

Risk of injury

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

NOTICE

Material damage

Risk of damage to the gear unit through inadequate lubrication through preservative agent and operating oil being mixed up.
If the gear unit is to be filled with a PG-based synthetic operating oil after preservation or if it had been preserved with "Tribol 1390" before the re-preservation, the preservative oil must be drained off before initial start-up and the gear unit thoroughly flushed out with operating oil (for this see item 10.2.2).
The flushing oil must not be used for operation of the unit.

4.4.2.1 Prolongation of the preservation with "Castrol Corrosion Inhibitor N 213"

For prolonging the preservation period the VCI-emitting preservative oil "Castrol Corrosion Inhibitor N 213" is recommended. It must be able to close the gear units airtightly. Existing labyrinth or gap seals must be sealed with adhesive tape or other suitable means. The following procedure is recommended:

- Remove any contamination from the gear unit.
- Remove screw plug and/or filter or open oil-drain cock (optional) (see figures 29 to 34 in item 7.1.3).

Note

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

- Fill "Castrol Corrosion Inhibitor N 213" in the specified quantity (1 litre per cubic metre of the total free volume of the gear-unit interior) in the gear unit. It is not necessary to drain off any oil already filled in.

NOTICE

Material damage

Destruction of the gear unit.
When using pumps, filters and/or oil sensors the mixture of oil and Corrosion Inhibitor must not be used as operating oil.

- Close the gear unit airtightly as early as possible, however at the latest one hour after filling in "Corrosion Inhibitor 213".
- Screw in the screw plug with a new sealing ring or shut the oil-drain cock (optional). Replace the filter with a screw plug.
- Close labyrinth or gap seals with suitable means.
- When using pumps, filters and/or oil sensors, and/or in case of larger quantities of "Castrol Corrosion Inhibitor N 213" (more than 5 % of the operating-oil quantity), the mixture of oil and Corrosion Inhibitor should be drained off before starting up, and disposed of in accordance with regulations.

Note

See the item "Procedure for emptying the gear unit" in manual BA 7300 (for a link to the Internet, see the back cover).

NOTICE

Material damage

Destruction of the gear unit.
Fill the required quantity of operating oil in, and screw in the filter before start-up.

Approximately the total volume (length x width x height) can be considered as the free volume of the gear-unit interior. Spaces of additional components (such as oil cooler) must be taken into account.

Assuming correct application and storage, the new durability period of the preservation is 24 months.

"Castrol Corrosion Inhibitor N 213" must be stored airtightly, to ensure the efficiency of the preservation.

Additional information on handling "Castrol Corrosion Inhibitor" can be obtained from the safety data sheet, which is available for downloading at "http://msdspds.castroladvantage.com/ILS/msdspdsv2.nsf (search key e.g. "N 213").

4.4.3 Exterior preservation

Table 5: Durability period for exterior preservation of shaft ends and other bright machined surfaces

Durability period	Preservative agent	Layer thickness	Remarks
In case of indoor storage Up to **36** months [1)]	Tectyl 846 K19	Approx. 50 µm	Long-term wax-based preservative agent: – 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 must be avoided.

Note

The procedure for exterior-preservation treatment is described in section 7 (see item 7.3.2.1).

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

In case of storage periods exceeding the periods specified in table 5 the exterior of the gear unit must be re-preserved using the preservative agent specified in table 5.

5. Technical description

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

5.1 General description

The gear unit described is a **"FLENDER planetary gear unit"** developed for driving machines in most various industry areas. The gear unit is supplied as a two-, three-, four- or five-stage planetary gear unit. It is designed for a horizontal and vertical mounting position. If necessary, it can also be designed for installation in a different mounting position.

5.1.1 "Horizontal" design

Note

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

Depending on type and size, the gear units of the standard range can be fitted with a motor bell housing or a temperature sensor.

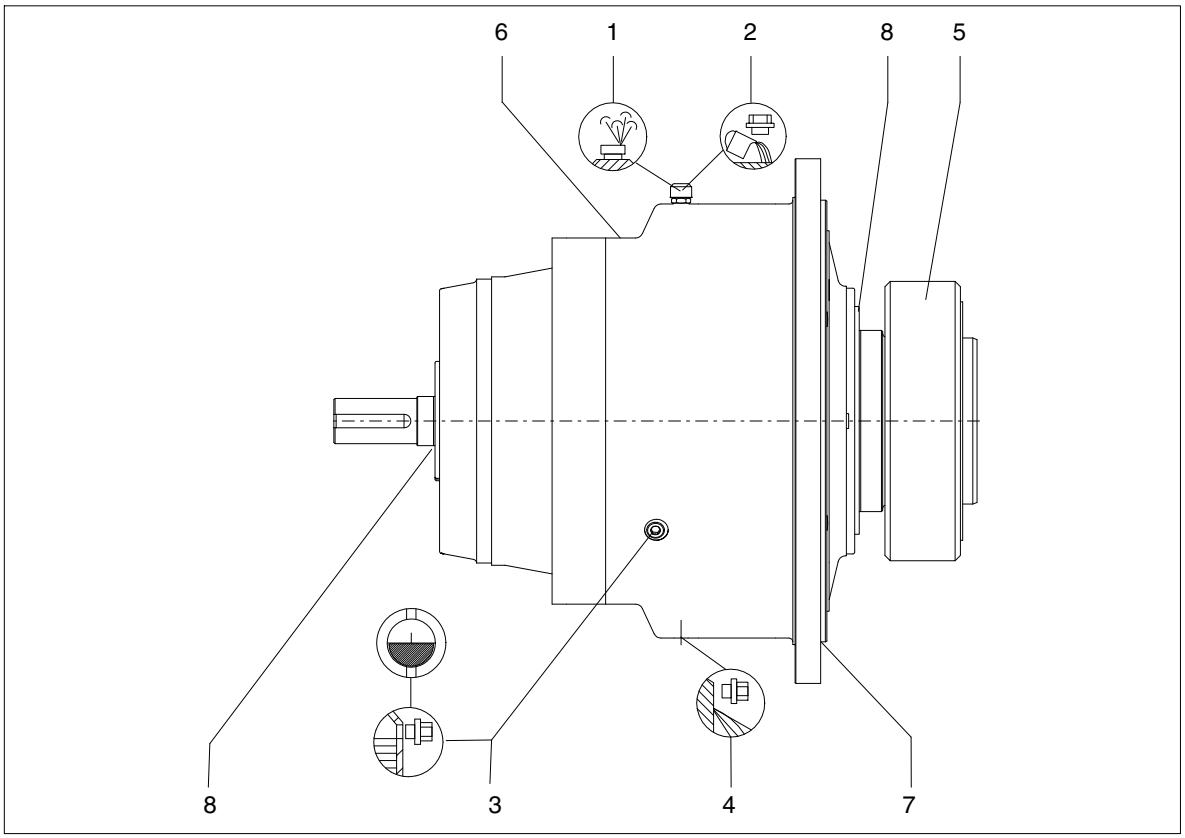


Fig. 14: Gear-unit features on gear units of type O2C

1 Housing ventilation
2 Oil inlet
3 Oil-level plug, oil-sight glass (optional)
4 Oil drain
5 Shrink disk
6 Rating plate
7 Centring for flange provided by customer
8 Shaft seal

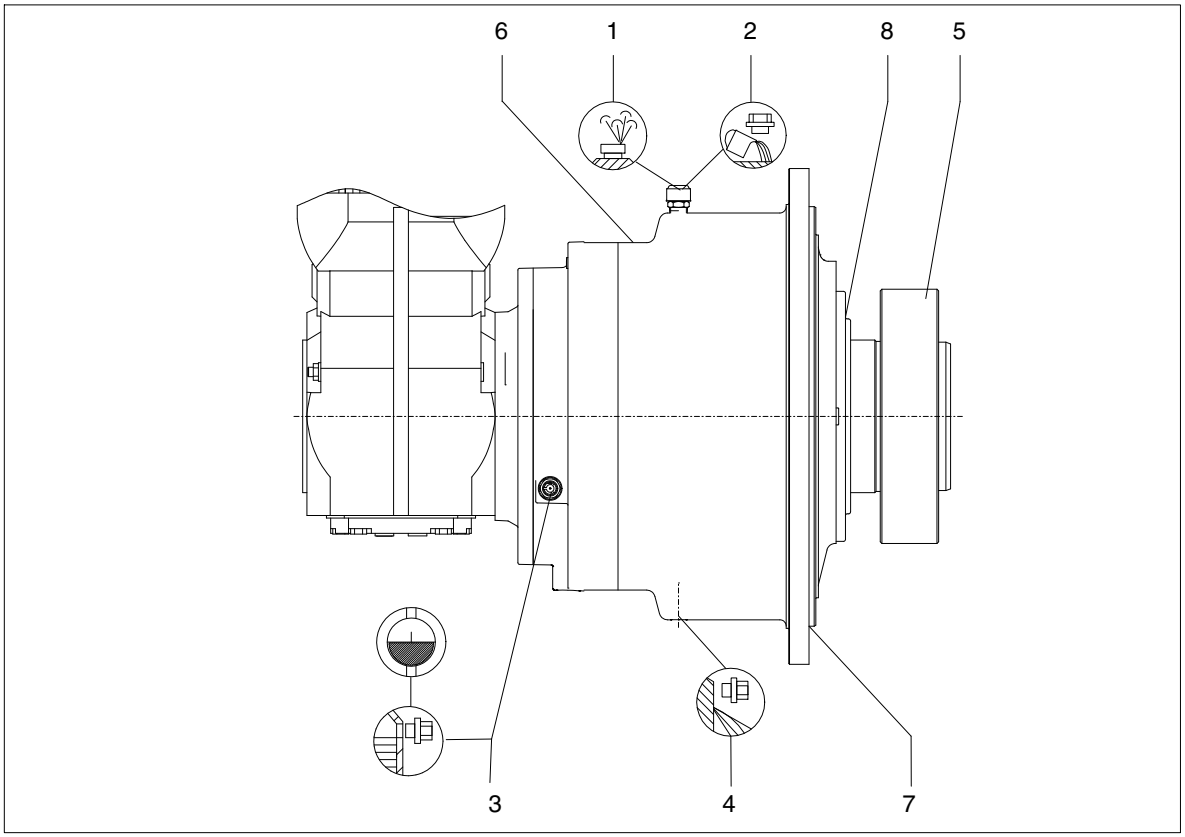


Fig. 15: Gear-unit features on gear units of type O5R

1	Housing ventilation	5	Shrink disk
2	Oil inlet	6	Rating plate
3	Oil-level plug, oil-sight glass (optional)	7	Centring for flange provided by customer
4	Oil drain	8	Shaft seal

The gear-unit features on types O4C und O5C are identical with those on type O5R.

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

5.1.2 "Vertical" design

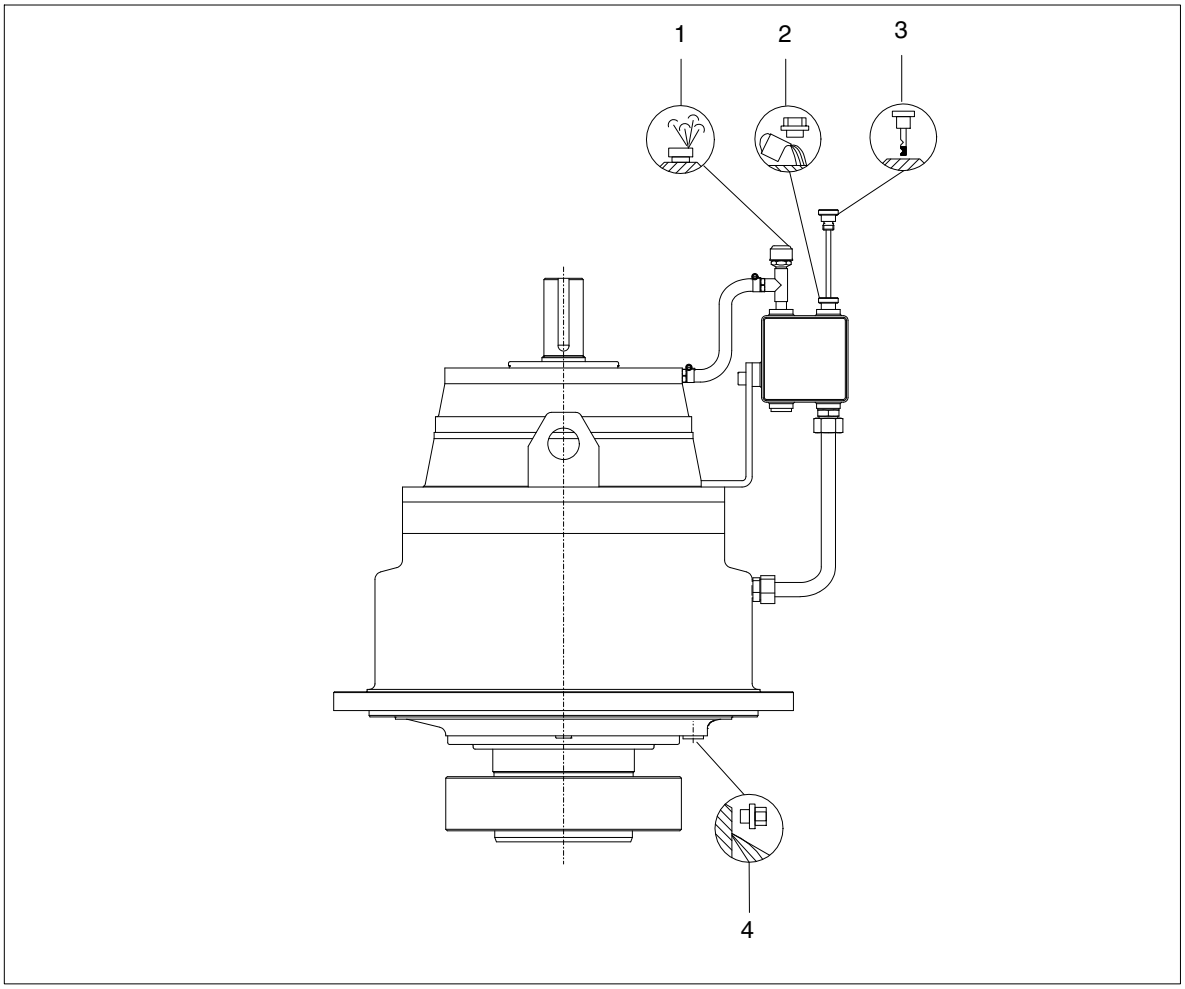


Fig. 16: Gear-unit features on gear units of type O2C ("LSS" bottom) [1)]

1	Housing ventilation	3	Dipstick
2	Oil inlet	4	Oil drain

[1)] LSS: "Low speed shaft"

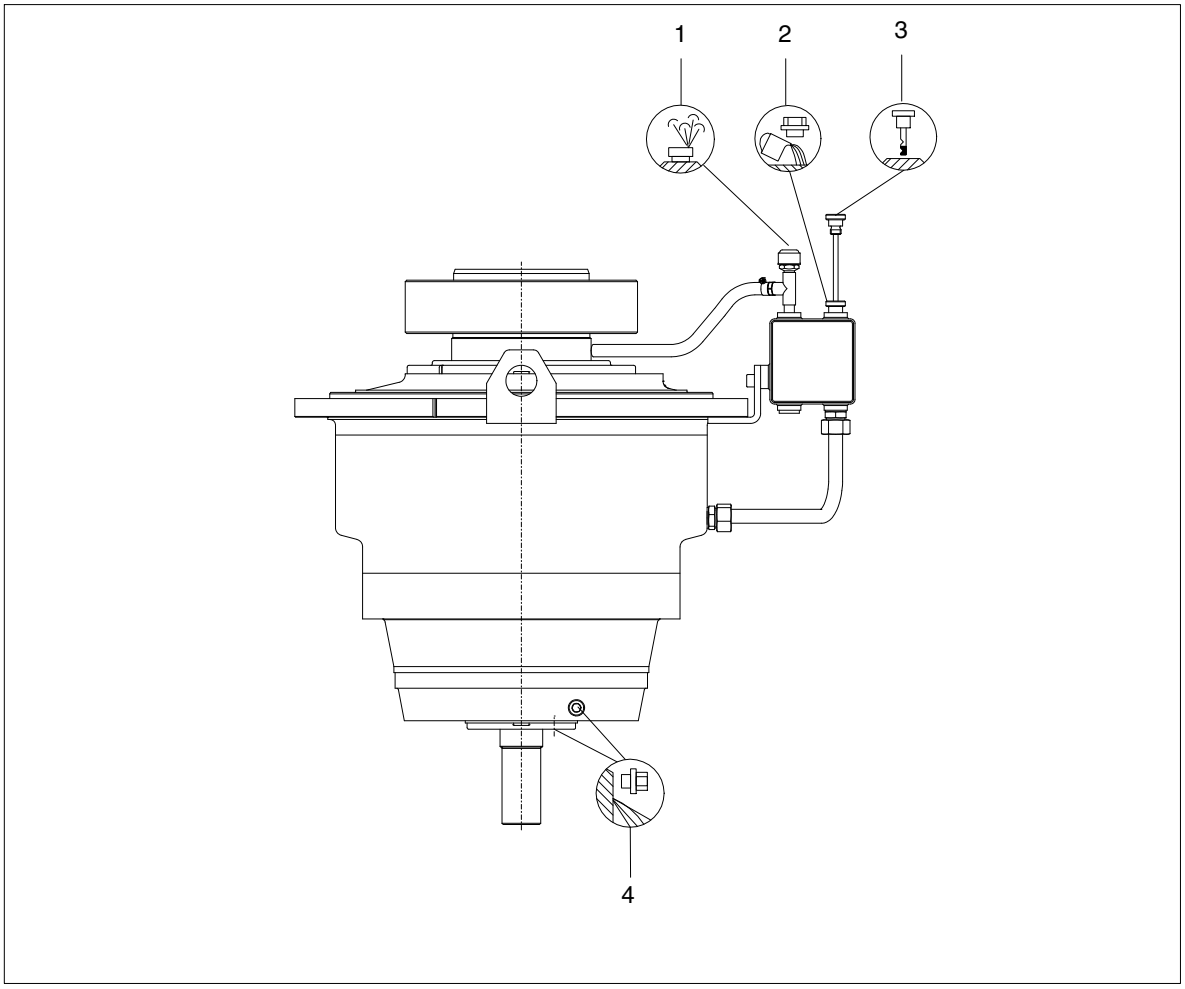


Fig. 17: Gear-unit features on gear units of type O2C ("LSS" top) [1)]

1	Housing ventilation	3	Dipstick
2	Oil inlet	4	Oil drain

[1)] LSS: "Low speed shaft"

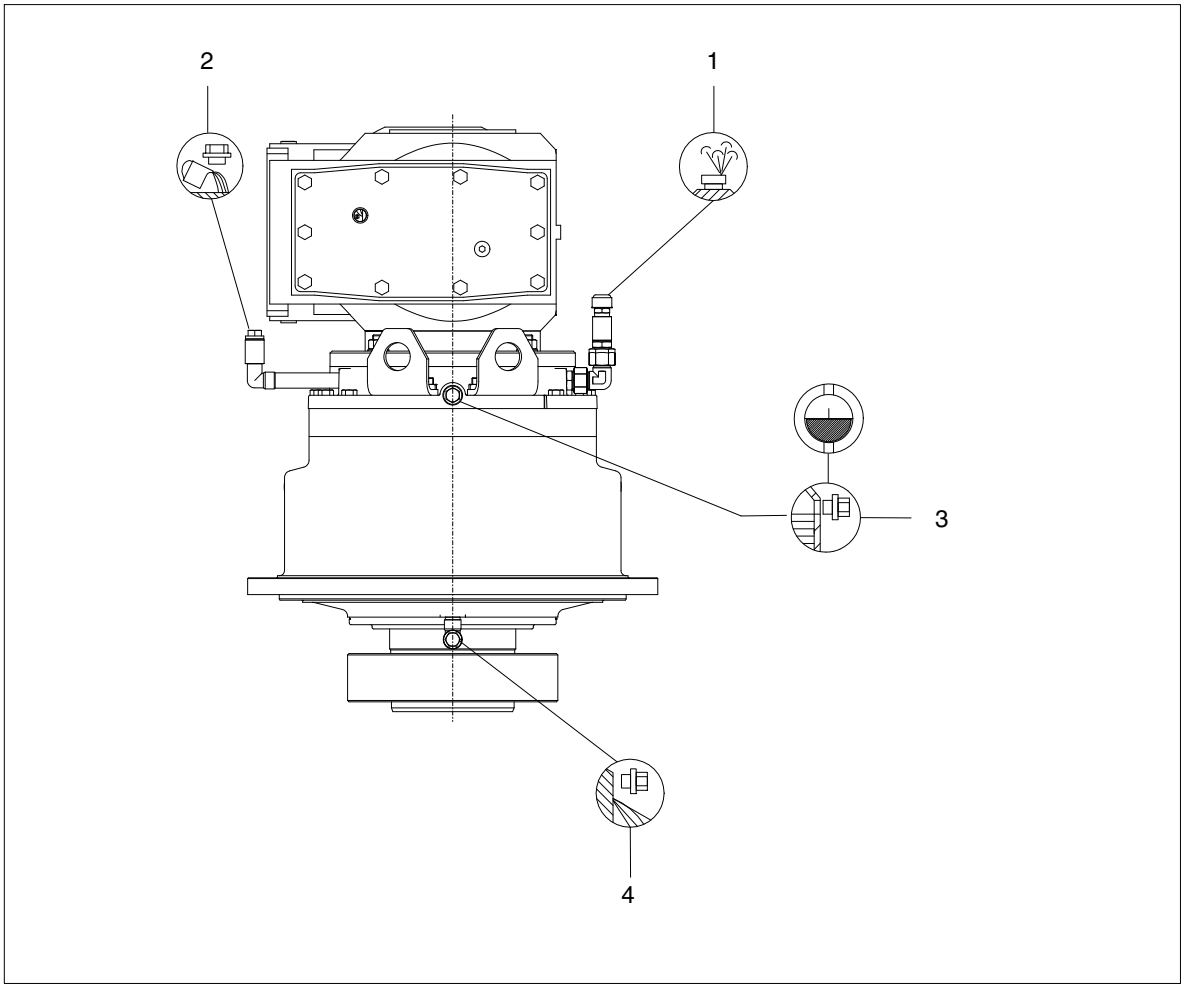


Fig. 18: Gear-unit features on gear units of type O5R ("LSS" bottom) [1)]

1 Housing ventilation
2 Oil inlet
3 Oil-level plug, oil-sight glass (optional)
4 Oil drain

1) LSS: "Low speed shaft"

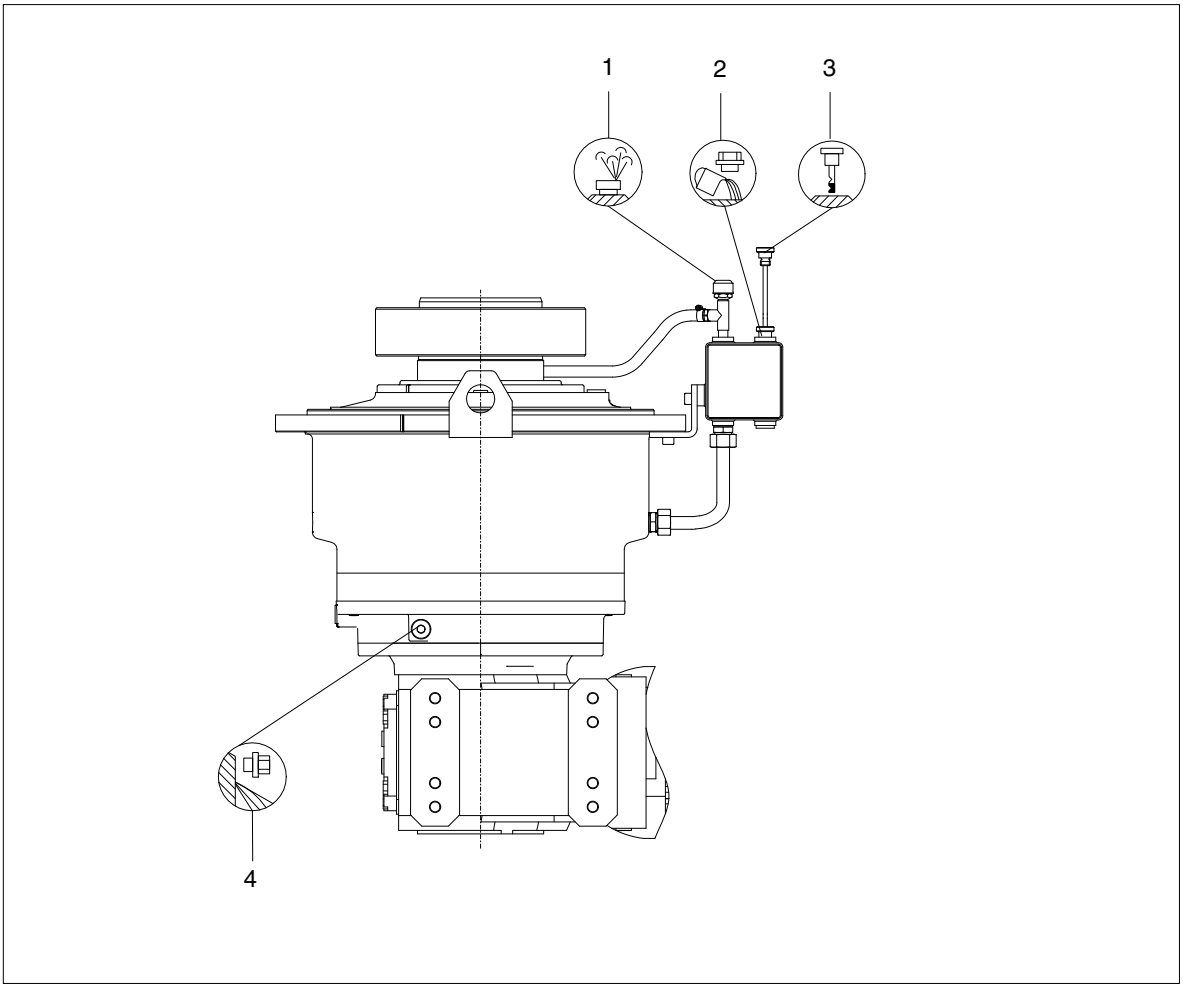


Fig. 19: Gear-unit features on gear units of type O5R ("LSS" top) [1)]

1	Housing ventilation	3	Dipstick
2	Oil inlet	4	Oil drain

1) LSS: "Low speed shaft"

The gear-unit features on types O4C und O5C are identical with those on type O5R.

5.1.3 Low-temperature design

Depending on the order the gear unit can be equipped for use at low temperatures (ambient temperature – 40 °C ≤ t_a ≤ – 20 °C).
The use of the gear unit at low temperatures must be agreed in the order.

If it is to be used at low temperatures, the gear unit is fitted with special radial shaft-sealing rings.

The use of the gear unit at ambient temperatures below - 20 °C requires the application of an oil with suitability for low temperatures (PAO-T-oil).

NOTICE
Material damage Damage to the bolts possible through incorrect tightening. Tighten the screw fastenings at ambient temperatures above - 20 °C.

5.2 Housing

The housing is made of cast iron.

The gear-unit housing comes with the following equipment:

– Lifting eyes (vertical mounting)

– Oil-sight glass, dipstick with MIN and MAX marks or oil-level plug (for checking the oil level)

– Oil-drain plug (to drain the oil)

– Oil-drain cock (optional)

– Air filter (for ventilation and bleeding)

– Oil-equalising tank (optional)

– Oil-filling point

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

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

5.3 Toothed components

The externally toothed components of the gear unit are case-hardened. The helical-gear teeth are ground. The internal teeth of the internal gear are of made of quenched and tempered steel. The gear teeth are shaped.
The high quality of the teeth leads to a significant noise reduction and ensures safe and reliable running.

5.4 Lubrication

The teeth and rolling bearings are adequately supplied with oil by splash lubrication.

Note

For safety reasons, the gear unit is supplied without oil filling for transport.
In special cases supply can also be with oil filled in.

Depending on the mounting position, it is possible that the bearings are not lubricated by the gear-unit oil. In such cases, these bearings are lubricated with lithium-based grease.

Note

Do not mix greases of different soap bases when relubricating.

5.5 Shaft bearings

All shafts are fitted in rolling bearings.

5.6 Shaft seal

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

5.6.1 Radial shaft-sealing rings

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

NOTICE

Material damage

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

Alternatively it is also possible to provide the gear unit with regreasable labyrinth seals to prevent the penetration of dust (Taconite seal). The individual housing components are sealed statically with Loctite 128068 to prevent leakages.

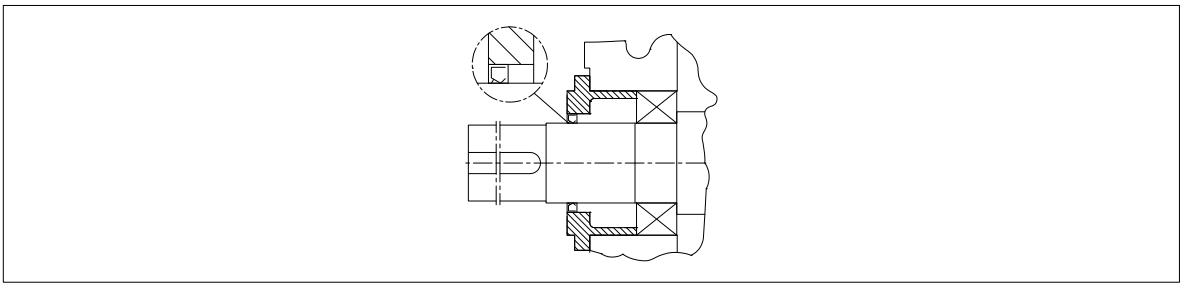


Fig. 20: Radial shaft-sealing ring

5.6.2 Taconite seal

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

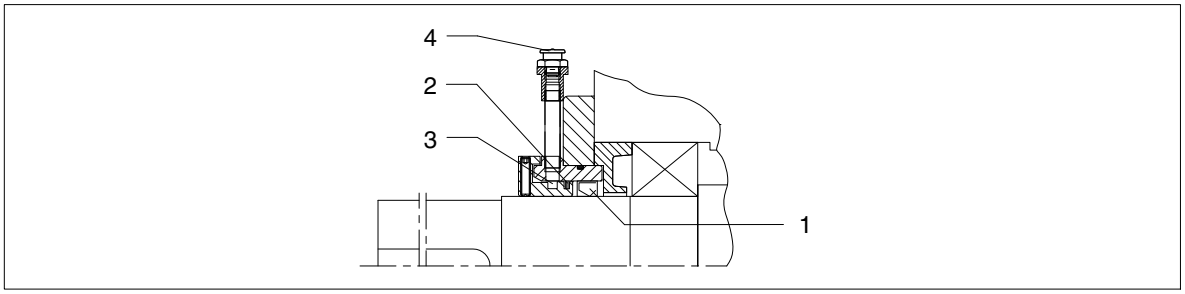


Fig. 21: Taconite seal

1 Radial shaft-sealing ring
2 Lamellar seal
3 Grease-charged labyrinth seal, re-chargeable
4 Flat grease nipple AM10x1 to standard "DIN 3404"

NOTICE

Material damage

Leakage of the gear unit is possible through insufficient sealing.
For re-charging the labyrinth seals with grease, the specified frequency must be observed (see table 11 in item 10.1).

5.7 Couplings, clutches

As a rule, flexible couplings are provided for the drive of the gear unit.

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

5.8 Indication of oil level

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

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

5.9 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, the Pt 100 resistance thermometer should be connected to a suitable instrument provided by the customer. The Pt 100 resistance thermometer has a connection head for the wiring. A three-wire circuit is provided by the manufacturer.

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

Note

For the operation and maintenance the operating manuals specified in the order-specific annex must be observed.
For technical data and control information, refer to the order-specific list of equipment.

5.10 Shrink disk

In case of a shaft-mounting gear unit, a shrink disk should be used as a frictional clamping connection between the gear-unit hollow shaft and the driven machine.

Note

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

6. Fitting

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

6.1 General information on fitting

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

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

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

Note

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

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

NOTICE

Material damage

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.
Heat concentration must be avoided.

This can be done as follows:
- 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.

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

Note

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

NOTICE

Material damage

Risk of damage to the gear unit caused by falling objects, heaping over, welding work or insufficient fastening.
The operator must ensure the following:
- The gear unit must be secured against falling objects and heaping over.
- No welding work must be done at all on the drive system.
- The gear unit must not be used as an earthing point for electric-welding operations.
- All the fastening points provided by the design of the unit must be used.
- Screws which have been damaged during assembly or disassembly work must be replaced with new screws of the same strength class and type.

Note

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

6.2 Unpacking

NOTICE

Material damage

Risk of damage to the gear unit through corrosion.
The packaging must not be opened or damaged beforehand, if this is part of the preservation method.

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

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

⚠ WARNING

Serious injury through defective product

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

6.3 Fitting the gear unit

6.3.1 Foundation

NOTICE

Material damage

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

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.

NOTICE

Material damage

Risk of damage through insufficiently safe positioning of the gear unit.
Fastening bolts and nuts must be tightened to the prescribed tightening torque.
For the correct tightening torque, refer to item 6.13. Bolts of at least strength class 8.8 must be used.

Note

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

6.3.2 Description of fitting work

⚠ WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.
Observe the following:
– Ensure adequate ventilation.
– Do not smoke.

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

⚠ CAUTION

Risk of injury through chemical substances

Observe manufacturer's instructions for handling lubricants and solvents.
Wear suitable protective clothing.

NOTICE

Material damage

Risk of damage to the shaft-sealing rings through chemically aggressive cleaning agents.
The cleaning agent must in no way be allowed to come into contact with the shaft-sealing rings.

- Fit and secure drive elements (e.g. coupling parts) on shafts.
  If these are to be fitted in heated condition, refer to the dimensioned drawings in the coupling documentation for the correct joining temperatures.

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

⚠ WARNING

Risk of burns

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

NOTICE

Material damage

Risk of damage to the shaft-sealing rings through heating to over 100 °C.
Use heat shields to protect against radiant heat.

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

⚠ WARNING

Serious injury

Risk of injury through incorrect balancing.
Couplings with peripheral velocities on the outer circumference of up to 30 m/s must be statically balanced. Couplings with peripheral velocities over 30 m/s must be dynamically balanced.

NOTICE

Material damage

Damage to the gear unit possible through knocking or impacts.
Fit the coupling using suitable fitting equipment.
The shaft-sealing rings and running surfaces of the shaft must not be damaged when pulling on the coupling parts.

NOTICE

Material damage

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

Note

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

6.4 Attachment of IEC Motors

When attaching IEC motors, the operating instructions for the motors are to be observed.

NOTICE

Material damage

Damage to the gear unit.
Do not use a motor with a motor speed exceeding the specified speeds of the gear unit shown on the rating plate.

6.5 Attachment of torque arms, flanges on the output side, or gear-unit bases

Before fitting the torque arms, flanges on the output side or gear-unit bases, the screw-on faces of these parts must be degreased and smeared with Loctite 640. This Loctite 640 agent increases the friction coefficient of the torque-carrying faces and protects against corrosion at the same time.

6.6 Shrink disk

The shrink disk is delivered ready for fitting.

Note

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

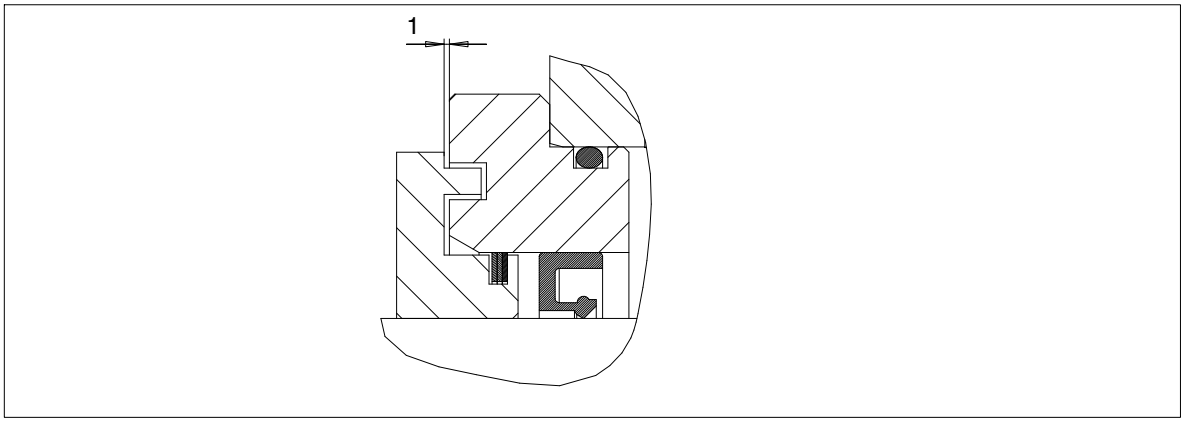


Fig. 22: Gap dimension on the grease labyrinth

NOTICE

Material damage

Sparking possible through too small gap dimension. Wear of the shaft seal.
If the shaft is at the same time sealed with Taconite seals on the shrink-disk side, fitting the shrink disk must not change the set gap dimension of 1 mm on the grease labyrinth. Rotating and fixed components must not have contact. Too small gap dimension causes wear, contact of the components and impermissible heating.

Note

For using the gear unit at low temperatures, see item 5.1.3.

6.7 Shaft-mounted gear unit with splines to standard "DIN 5480"

Depending on the order the low speed shaft (LSS) of the gear unit can be designed as a cylindrical shaft end with exterior splines to standard "DIN 5480", and as a hollow shaft with splines to standard "DIN 5480".

The shaft end of the driven machine must be designed with splines to standard "DIN 5480".

6.7.1 Fitting

⚠ WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.
Observe the following:
– Ensure adequate ventilation.
– Do not smoke.

- Remove the corrosion protection from the low speed shaft (LSS) and driven-machine shaft, using a suitable cleaning agent.

⚠ CAUTION

Risk of injury through chemical substances

Observe manufacturer's instructions for handling lubricants and solvents.
Wear suitable protective clothing.

NOTICE

Material damage

Risk of damage to the shaft-sealing rings through chemically aggressive cleaning agents.
The cleaning agent must in no way be allowed to come into contact with the shaft-sealing rings.

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

Note

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

6.7.1.1 Pulling on

NOTICE

Material damage

Risk of damage to the gear unit through canting during fitting work.
The low speed shaft (LSS) must be well aligned with the driven-machine shaft, when pulling the gear unit on. Any canting must be avoided.
When pulling on, ensure that the position of the teeth between the low speed shaft (LSS) and the driven-machine shaft is correct. The correct tooth position can be determined by turning the high speed shaft (HSS) or by swivelling the gear unit lightly around the low speed shaft (LSS).

6.7.2 Demounting

- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used to facilitate forcing off the gear unit.
- When the rust-releasing agent has taken enough effect, pull the gear unit off.

NOTICE

Material damage

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

6.8 Couplings, clutches

As a rule, flexible couplings are provided for the drive of the gear unit.

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

Note

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

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

⚠ WARNING

Serious injury

Risk of injury through incorrect balancing
Couplings with peripheral velocities on the outer circumference of up to 30 m/s must be statically balanced. Couplings with peripheral velocities over 30 m/s must be dynamically balanced.

NOTICE

Material damage

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

Note

For permissible alignment errors in case of couplings supplied by Siemens, refer to the operating instructions for the couplings.
When using couplings manufactured by other manufacturers, ask these manufacturers which alignment errors are permissible, stating the radial loads occurring.

The coupling parts may get out of alignment:

– through imprecise alignment during assembly or installation,

– during operation of the system:

  – through heat expansion,

  – through shaft flexure,

  – through too weak machine frames, etc.

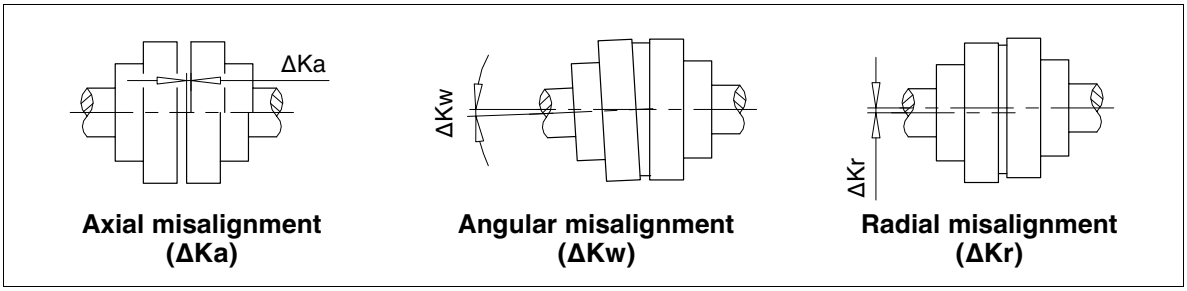


Fig. 23: Possible misalignments

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

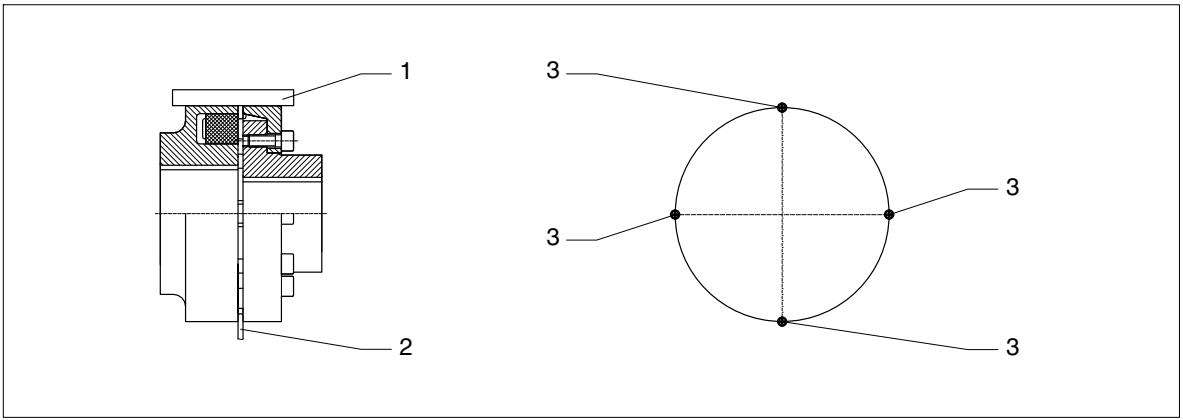


Fig. 24: Example of alignment on a flexible coupling

1 Ruler
2 Feeler gauge
3 Measuring points

NOTICE

Material damage

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

Note

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

6.9 Fitting the torque arm or gear-unit base

Note

For use of the gear unit at low temperatures in combination with a torque arm or gear-unit base, see item 5.1.3.

6.9.1 One-sided torque arm

The use of a one-sided torque arm must have been agreed by contract.

The one-sided torque arm must be fixed between the contact sufaces (see position 1 in figure 25) of the adjacent connection structure.

Note

The screw-on surface of the torque arm on the gear-unit housing must be free from grease and must be smeared with Loctite 640.
This is highly essential for safe and reliable torque transmission and protects against corrosion.
Contaminated solvents and dirty cloths as well as cleaning agents containing oil (such as paraffin or turpentine) are not suitable for removing grease.

⚠ WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.
Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

NOTICE

Material damage

Damage to the gear unit possible through incorrect fitting of the torque arm.
Torque arms should be fitted only with approval of Siemens. The torque arm must be fitted stress-free on the machine side. For fitting the torque arm, the maximum possible number of bolts should be used.

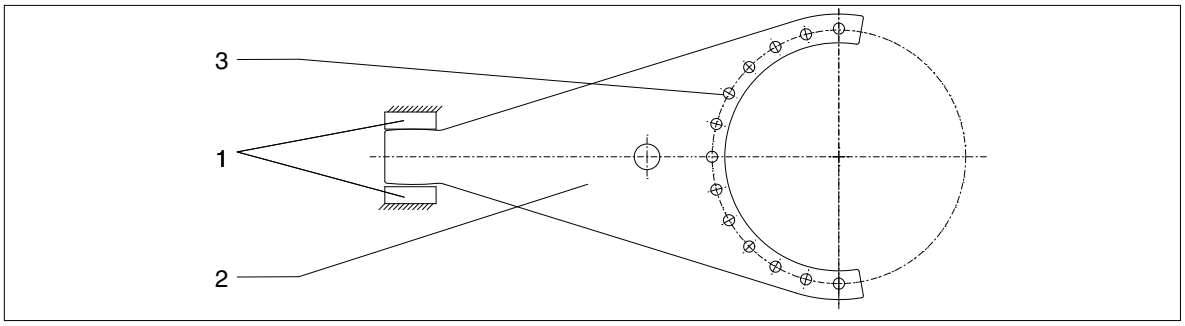


Fig. 25: One-sided torque arm

1 Contact surfaces of the connection structure
2 One-sided torque arm
3 Connection gear unit

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

NOTICE

Material damage

Damage to the gear unit possible through incorrect fitting of the torque arm.
For fastening the one-sided torque arm bolts of strength class 10.9 must be used. (For tightening torques, see table 6.) For this connection use washers to standard "ISO 7089-300 HV" under the bolt head and under the nut.

Table 6: Initial-tensioning forces and tightening torques for screw connections of strength classes **8.8; 10.9; 12.9** with a common friction coefficient of μ_{total} **= 0.14**

Nominal thread diameter d mm	Strength class of the bolt	Initial-tensioning force for screw-connection classes from table 7 C $F_{M\ min.}$ N	Tightening torque for screw-connection classes from table 7 C M_A Nm
M16	10.9	72500	273
M20	10.9	110000	520
M24	10.9	155000	875

6.9.1.1 One-sided torque arm (vibration reducing)

Note

The screw-on surface of the torque arm on the gear-unit housing must be free from grease and must be smeared with Loctite 640.
This increases the reliability of the torque transmission and protects against corrosion.
Contaminated solvents and dirty cloths as well as cleaning agents containing oil (such as paraffin or turpentine) are not suitable for removing grease.

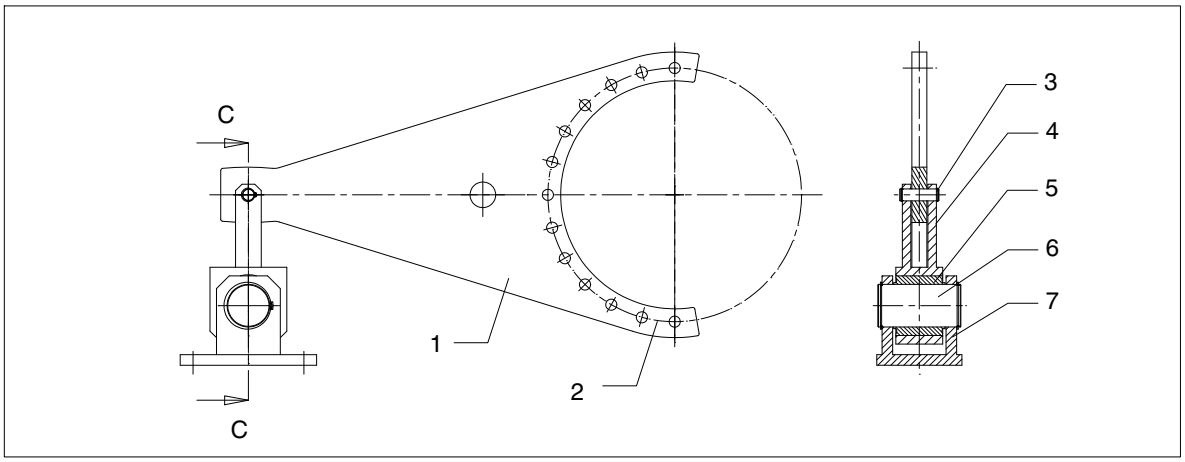


Fig. 26: One-sided torque arm (vibration reducing)

1 One-sided torque arm
2 Connection gear unit
3 Axle
4 Fork
5 Ball and socket joint
6 Axle
7 Pedestal

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

6.9.2 Double-sided torque arm (optional)

In case of a double-sided torque arm the support of the torque on the connecting structure takes place by way of supporting bearings.

This type of construction ensures that the machine bearings are nearly completely freed from any shearing forces, except for the weights. Figure 27 shows a possible variant.

Note

The screw-on surface of the torque arm on the gear-unit housing must be free from grease and must be smeared with Loctite 640.
This is highly essential for safe and reliable torque transmission and protects against corrosion.
Contaminated solvents and dirty cloths as well as cleaning agents containing oil (such as paraffin or turpentine) are not suitable for removing grease.

⚠ WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.
Observe the following:
– Ensure adequate ventilation.
– Do not smoke.

NOTICE

Material damage

Damage to the gear unit possible through incorrect fitting of the torque arm.
A torque arm should be fitted only with approval of Siemens.
The torque arm must be fitted stress-free on the machine side. For fitting the torque arm, the maximum possible number of bolts should be used.

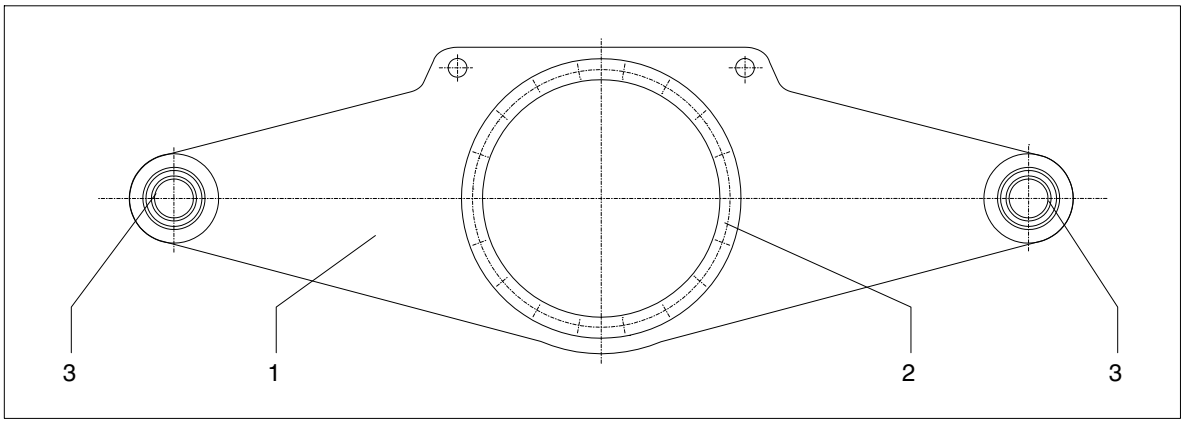


Fig. 27: Double-sided torque arm

1 Double-sided torque arm
2 Flange connection
3 Supporting bearing

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

6.9.3 Gear-unit base

If the gear unit is to be installed with a base, the torque arm rests on the foot surface.

Note

The screw-on surface of the gear-unit base on the gear-unit housing must be free from grease. Contaminated solvents and dirty cloths as well as cleaning agents containing oil (such as paraffin or turpentine) are not suitable for removing grease.
Smear the screw-on surface with Loctite 640. This increases the reliability of the torque transmission and protects against corrosion.

⚠ WARNING

Serious injury

Risk of injury through ignition of solvent-agent vapours during cleaning work.
Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

NOTICE

Material damage

Damage to the gear unit possible through incorrect fitting of the gear-unit base.
Gear-unit bases should be fitted only with approval of Siemens.

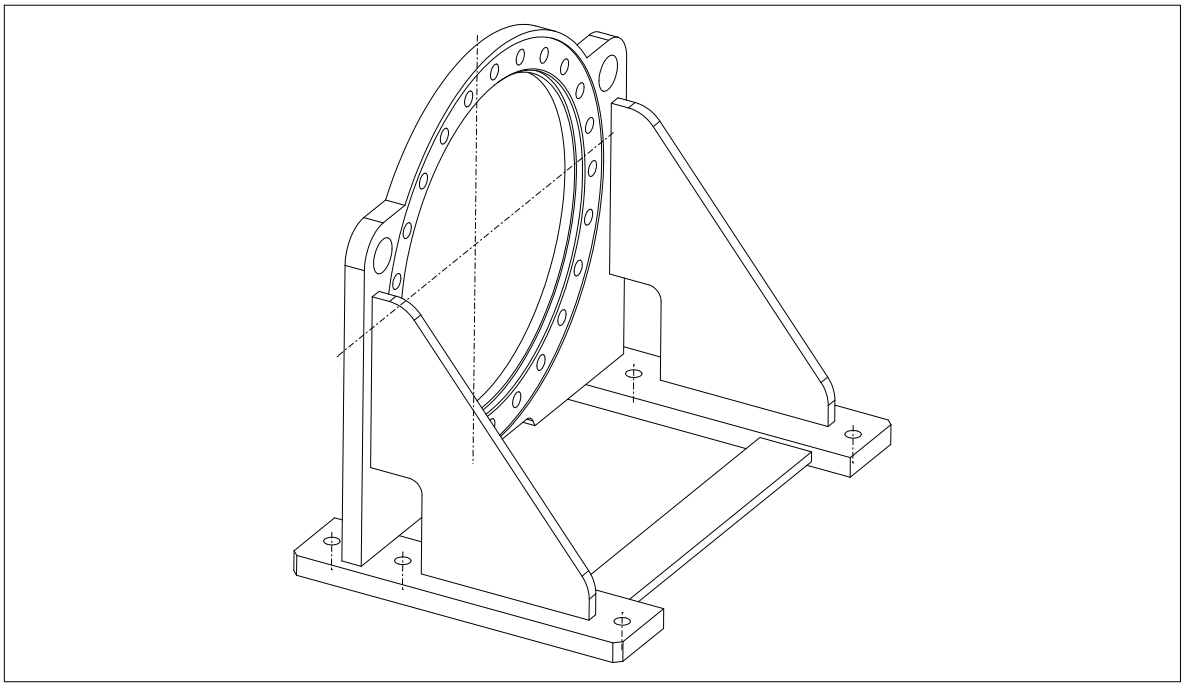


Fig. 28: Gear-unit base

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

6.10 Gear unit with oil-temperature monitoring system

- Wire the Pt 100 resistance thermometer with the evaluating instrument (to be provided by customer) electrically.

6.11 General notes on add-on components

Note

For operating and servicing the components described in section 6, the corresponding operating instructions and the specifications in section 5 must be observed.
For technical data, refer to the data sheet and/or the list of equipment.

6.12 Final work

□ After installation of the gear unit check all screw connections for tight fit.

□ Check the alignment after tightening the fastening elements. The alignment must not have been changed.

□ Check that all the devices which have been demounted for transport reasons have been re-fitted. For this refer to the details on the data sheet, in the list of equipment and on the associated drawings.

NOTICE

Material damage

Damage to the gear unit possible through overheating in case of too low oil level due to leakage.
Any oil-drain cocks must be secured against accidental opening.
If an oil-sight glass is used for monitoring the oil level, it must be protected against damage.

□ The gear unit must be protected against falling objects.

□ Protective devices for rotating parts must be checked for correct seating. Contact with rotating parts is not permitted.

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

□ Cable entries must be protected against moisture.

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

6.13.1 Screw-connection classes

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

Table 7: Screw-connection classes

Screw-connection class	Scatter of the torque emitted on the tool	Tightening procedure (Usually the tightening procedures 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

NOTICE

Material damage

Risk of damage to the bolts and/or mating threads through incorrect tightening.
Foundation bolts, hub bolts and bearing-cover bolts must always be tightened in accordance with screw-connection class "C".

Note

For use of the gear unit at low temperatures, see item 5.1.3.

6.13.2 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 8: 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 7			Tightening torque for screw-connection classes from table 7		
		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

Note

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

7. Start-up

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

The gear unit must not be started up without the required operating instructions being available.

7.1 Procedure before start-up

Note

When starting a add-on geared motor, the operating instructions for this geared motor must be observed.

7.1.1 Removal of preservative agent from exterior

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

⚠ CAUTION

Risk of injury through chemical substances

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

7.1.2 Removal of preservative agent from interior

NOTICE

Material damage

Risk of damage to the gear unit through missing or insufficient ventilation.
Prior to start-up replace the screw plug with the air filter.
Remove adhesive tape from the labyrinth seals.

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

Oil-drain point: 

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

⚠ CAUTION

Risk of injury through chemical substances

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

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

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

7.1.3 Filling with lubricant

- Unscrew the air filter including the reducing screw.
- Using a filling filter (maximum mesh 25 µm), fill the gear unit with fresh oil until the oil rises until the lower edge of the oil-sight glass, to the lower mark on the dipstick or at the lower edge of the oil-level hole. Do not put in any further oil. The viscosity of the oil in cold condition will cause the oil level to continue rising slowly. If necessary, but only after the oil level has steadied, pour in further oil up to the middle of the oil-sight glass, to the middle between the MIN and MAX marks on the dipstick or to the lower edge of the oil-level hole.
  In case of vertical mounting position of the gear unit, oil is filled in by way of the oil-equalising tank.

Note

The quality of the oil used must meet the requirements of the separately supplied BA 7300 operating instructions, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in table "T 7300" (for a link to the Internet, see the back cover), as they have been tested and meet the requirements.
Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit.
The oil quantity shown on the rating plate is to be understood as an approximate quantity. The actual oil quantity to be put in is shown by the middle on the oil-sight glass, the MIN and MAX marks on the dipstick or the lower edge of the oil-level hole.

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

Note

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

Note

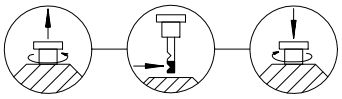
For use of the gear unit at low temperatures, see item 5.1.3.

⚠ CAUTION

Risk of injury through chemical substances

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

- Screw in the air filter again.
- Screw in the dipstick.



7.1.3.1 "Horizontal" design

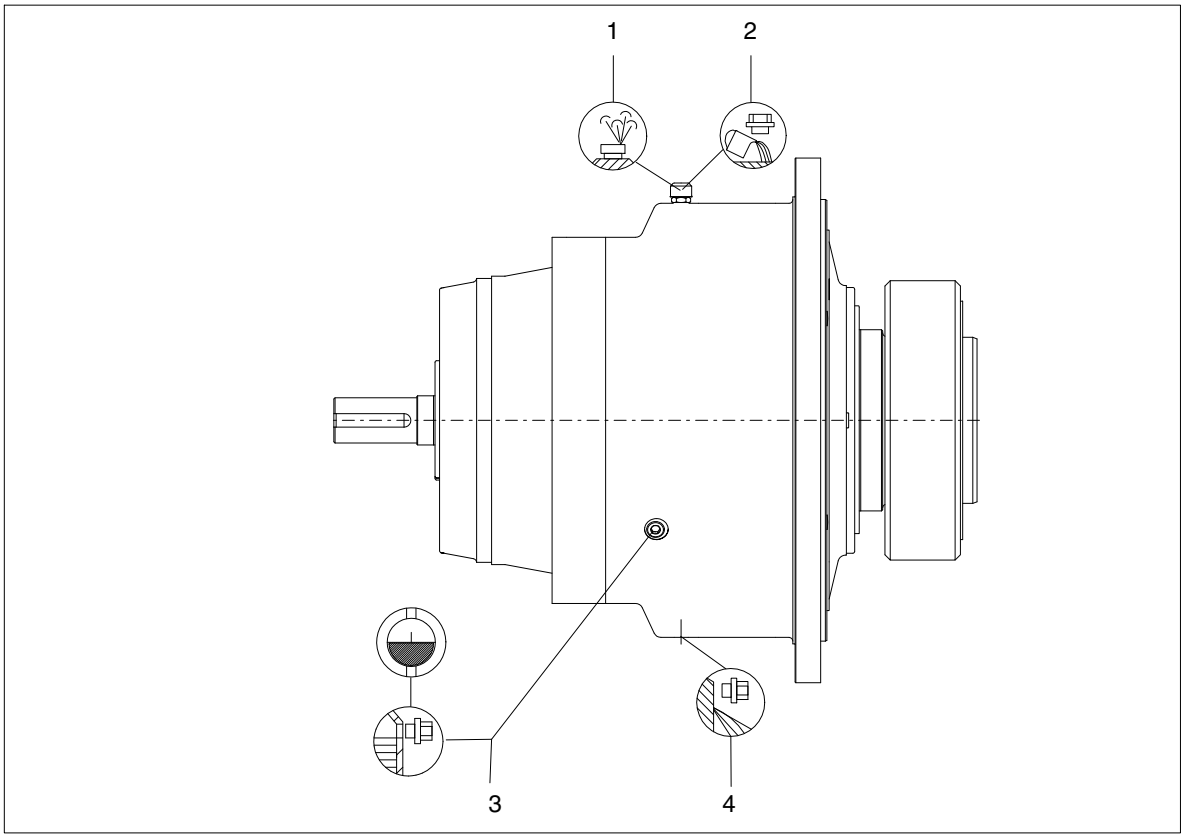


Fig. 29: Gear-unit features on gear units of type O2C

1 Housing ventilation
2 Oil inlet
3 Oil-level plug, oil-sight glass (optional)
4 Oil drain

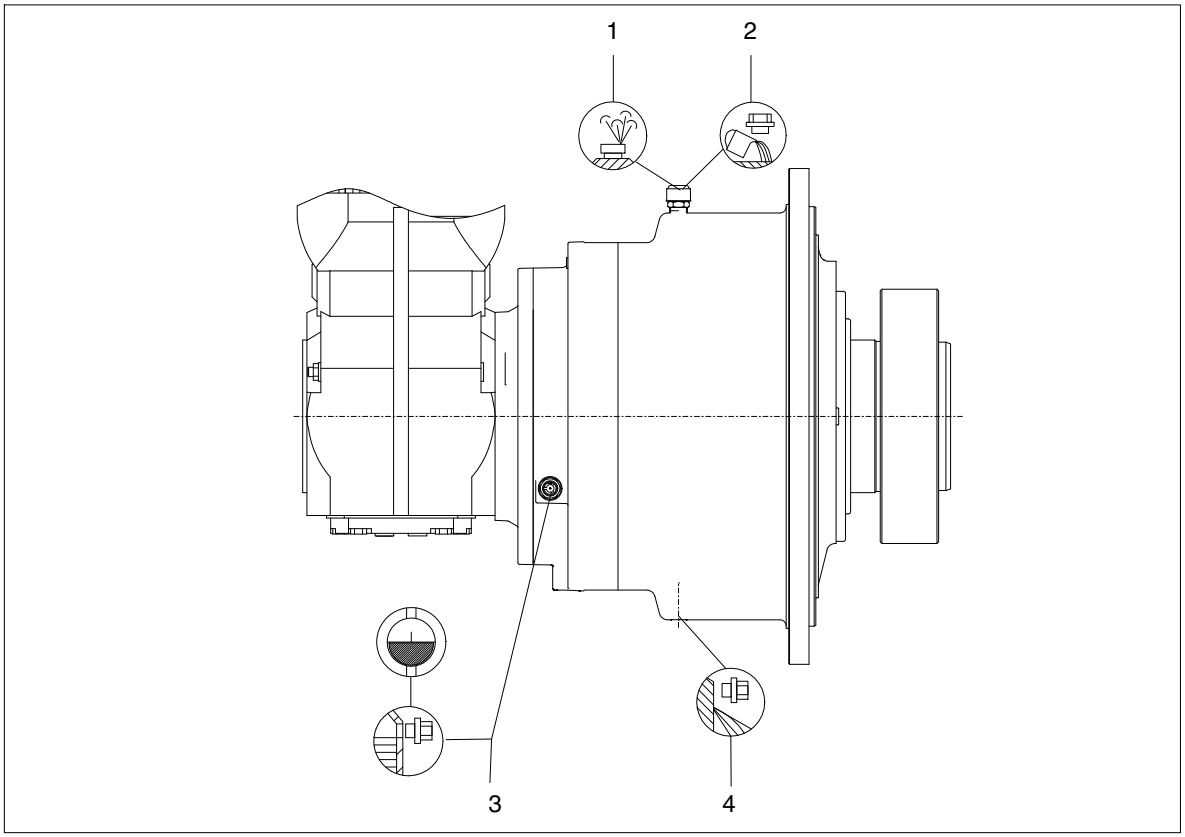


Fig. 30: Gear-unit features on gear units of type O5R

1	Housing ventilation	3	Oil-level plug, oil-sight glass (optional)
2	Oil inlet	4	Oil drain

Note

The add-on geared motors of types O4C, O5C and O5R are delivered ex works with oil filled in. The oil chambers of the geared motor and the main gear unit are not interlinked.

7.1.3.2 "Vertical" design

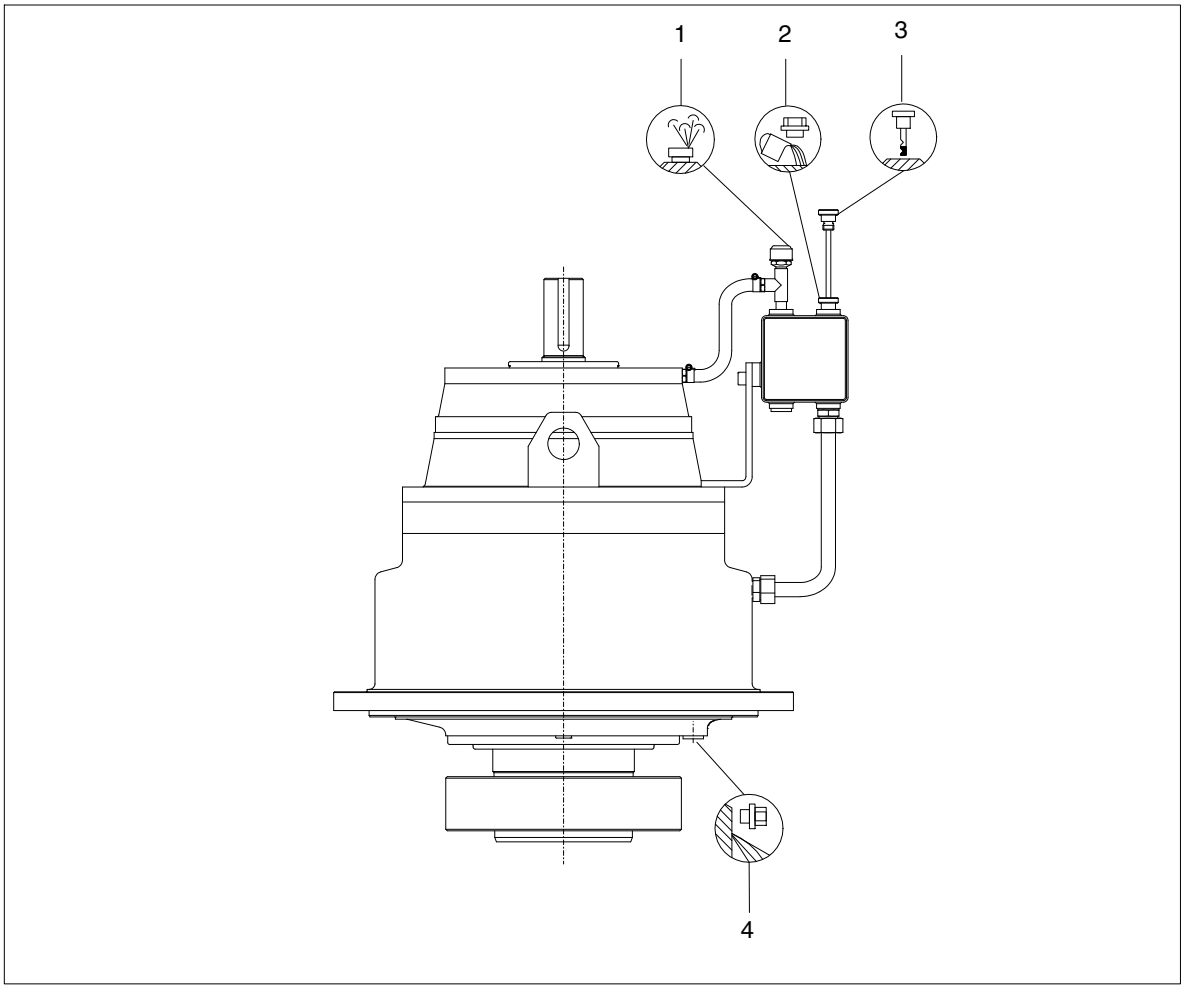


Fig. 31: Gear-unit features on gear units of type O2C ("LSS" bottom) [1)]

1	Housing ventilation	3	Dipstick
2	Oil inlet	4	Oil drain

[1)] LSS: "Low speed shaft"

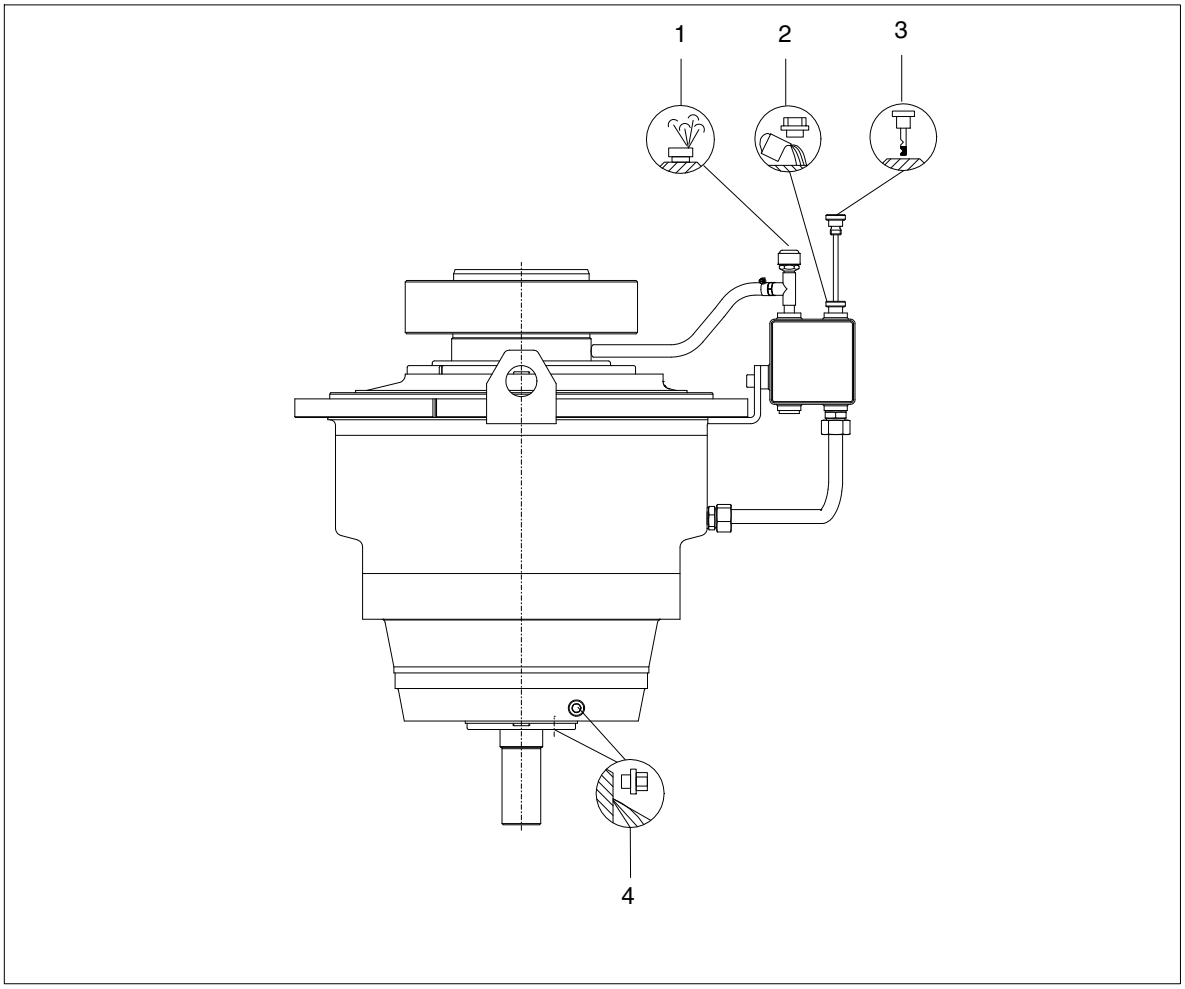


Fig. 32: Gear-unit features on gear units of type O2C ("LSS" top) [1)]

1	Housing ventilation	3	Dipstick
2	Oil inlet	4	Oil drain

[1)] LSS: "Low speed shaft"

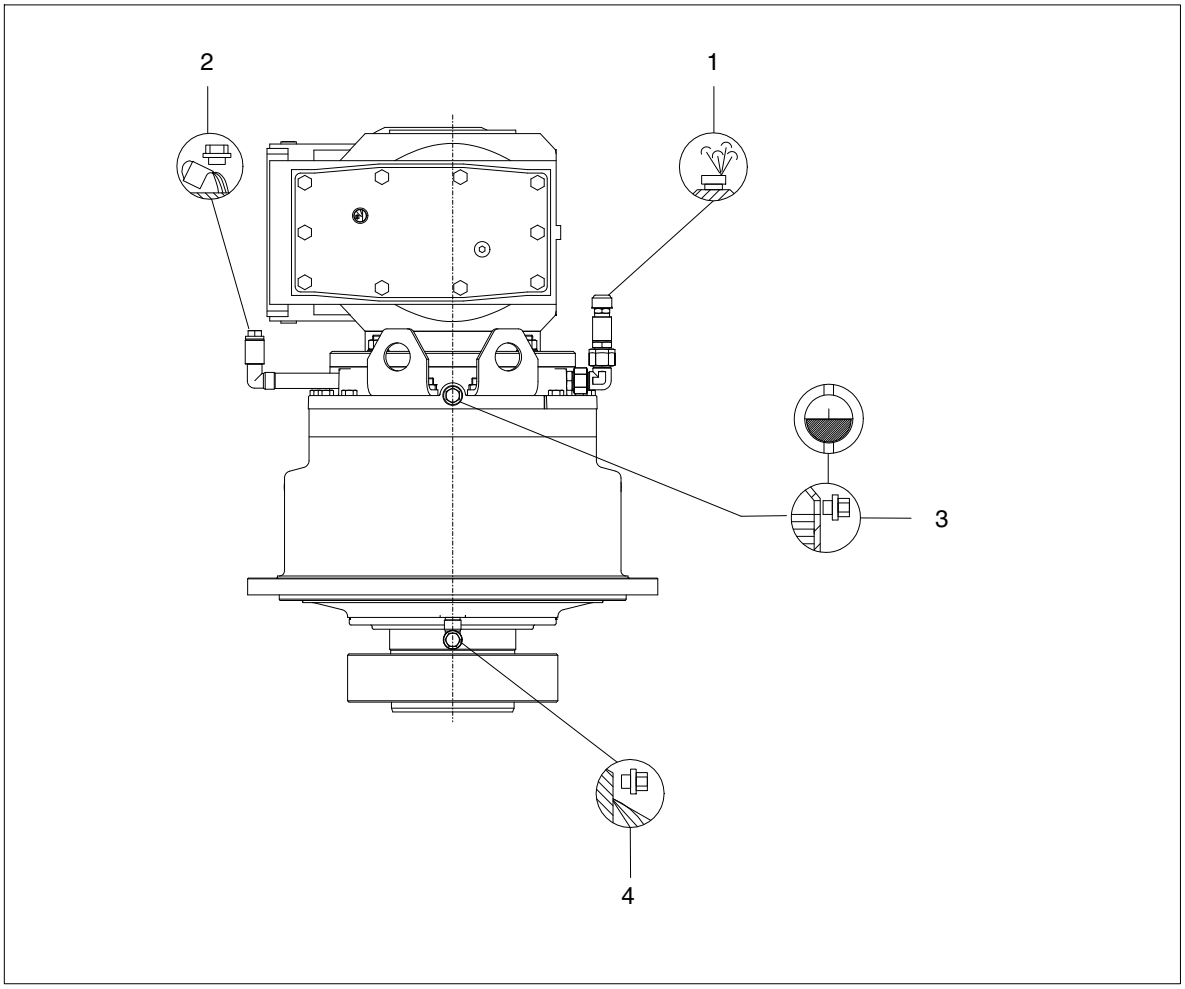


Fig. 33: Gear-unit features on gear units of type O5R ("LSS" bottom) [1)]

1 Housing ventilation
2 Oil inlet
3 Oil-level plug, oil-sight glass (optional)
4 Oil drain

[1)] LSS: "Low speed shaft"

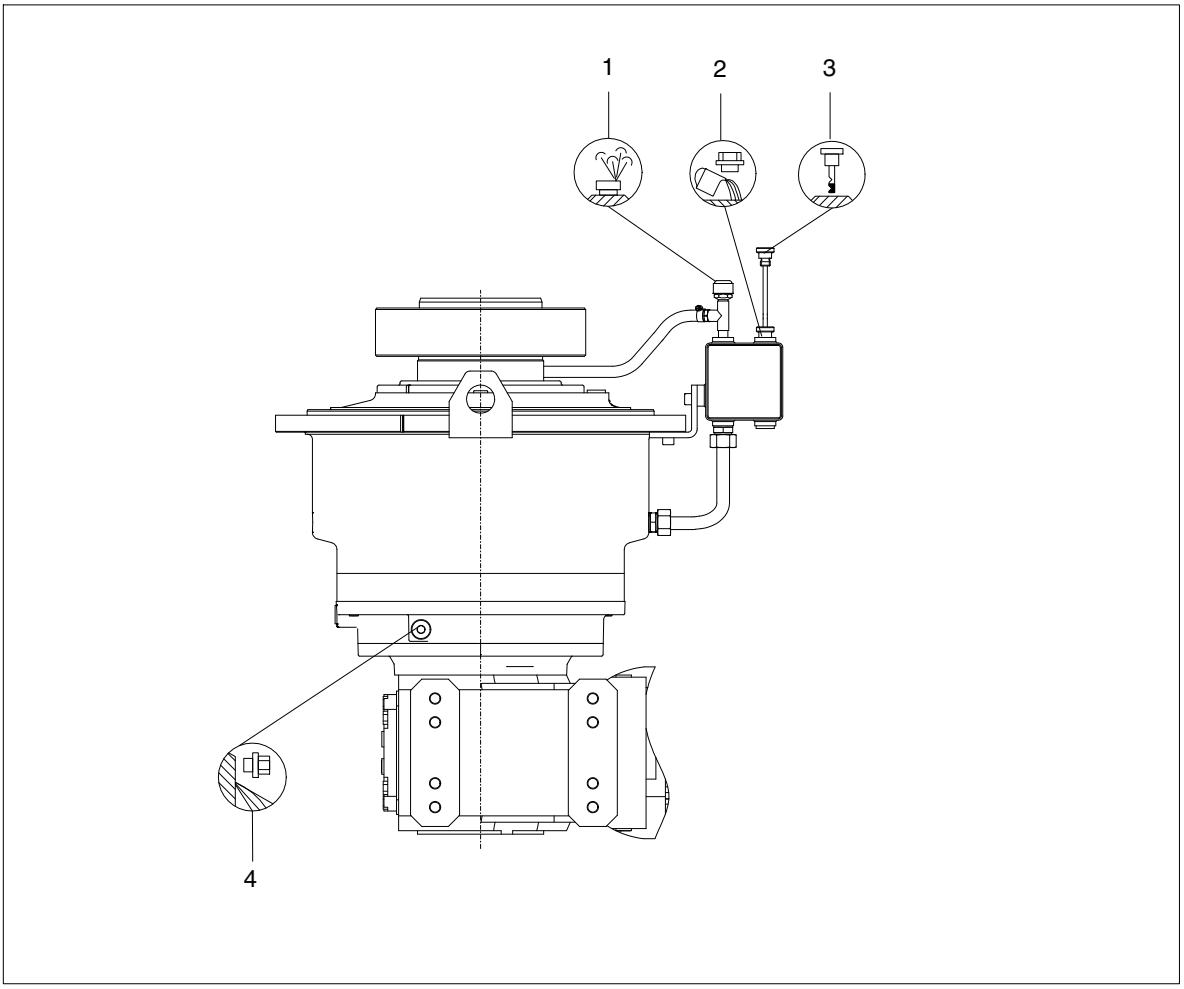


Fig. 34: Gear-unit features on gear units of type O5R ("LSS" top) [1)]

1	Housing ventilation	3	Dipstick
2	Oil inlet	4	Oil drain

1) LSS: "Low speed shaft"

7.2 Start-up

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

- Check the oil level of the gear unit (see item 7.2.1).

7.2.1 Oil level

Depending on the type the following oil levels are correct:

– Middle of the oil-sight glass

– Middle between the MIN and MAX marks on the dipstick in the oil-equalising tank (vertical mounting).

– Lower edge of the oil-level hole

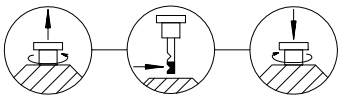
Note

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

NOTICE

Material damage

Insufficient lubrication possible through too low oil level.
Check the oil level.
Under no circumstances must it be allowed to fall below the visible lower edge of the oil-sight glass, the MIN mark on the dipstick or the lower edge of the oil-level hole. If necessary, top up oil to the correct level.



7.2.2 Temperature measurement

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

NOTICE

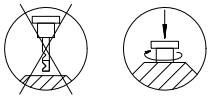
Material damage

Risk of damage to the gear unit through insufficient lubrication resulting from too high oil temperature.
The maximally permissible oil-sump temperature is 90 °C (for mineral oil), 100 °C (for synthetic oil).
At higher temperatures the gear unit must be shut down immediately and Siemens customer service consulted.

7.2.3 Checking procedure

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

□



□ Oil level

□ Effectiveness of the shaft seals

□ Freedom of the rotating parts from contact

Note

The record must be kept with these instructions.

7.3 Shutting down

- Switch off the drive unit.

⚠ DANGER

Danger to life through switched-on installation

To carry out work on the gear unit, the gear unit must always be stopped.
The drive unit must be secured against being switched on accidentally (e.g. by locking the key switch or removing the fuses from the power supply).
A notice should be attached to the ON switch stating clearly that work is in progress on the gear unit.

- 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 "Castrol Corrosion Inhibitor N 213" as preservative agent

Note

For the interior-preservation procedure with "Castrol Corrosion Inhibitor N 213", see item 4.4.2.2.

7.3.2 Exterior preservation

7.3.2.1 Exterior-preservation procedure

- Clean the surfaces.

NOTICE

Material damage

Risk of damage to the shaft-sealing ring through contact with chemically aggressive preservative agent. For separation between the sealing lip of the radial shaft-sealing ring and the preservative agent, the shaft should be brushed with grease in the area around the sealing lip. The grease type can be found in table "H" in document "T 7300" (for a link to the Internet, see the back cover).

- Apply preservative agent.

Note

For preservative agent see table 5 in item 4.4.3.

8. Operation

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

8.1 General

To achieve a satisfying and trouble-free operation of the equipment, be certain to observe the working values specified in section 1, "Technical data".

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

- □ Operating temperature

  The gear unit is designed for an operating temperature in continuous operation of:

  90 °C (applies to mineral oil)

  100 °C (applies to synthetic oil)

- □ Changes in gear noise
- □ Oil leakage at the housing and shaft seals

8.2 Oil level

Note

For checking the oil level, the gear unit must be stopped.
Depending on the type of the gear-unit housing the following oil levels are correct when the oil has cooled down:

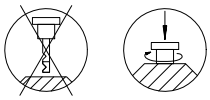
- Middle of the oil-sight glass
- Middle between the MIN and MAX marks on the dipstick in the oil-equalising tank (vertical mounting).
- Lower edge of the oil-level hole

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

NOTICE

Material damage

Insufficient lubrication possible through too low oil level.
Check the oil level.
Under no circumstances must it be allowed to fall below the visible lower edge of the oil-sight glass, the MIN mark on the dipstick or the lower edge of the oil-level hole. If necessary, top up oil to the correct level.



8.3 Irregularities

NOTICE

Material damage

Risk of damage to the gear unit through fault conditions.
Switch off the drive unit immediately on occurrence of the following situations.

□ If irregularities are found during operation.

Note

Determine the cause of the fault, using table 9, "Faults, causes and remedy" (see item 9.2).
Table 9, "Faults, causes and remedy", contains a list of possible faults, their causes and suggested remedies.
If the cause cannot be found, a specialist from a Siemens customer-service centre should be called in (see section 2, "General notes").

9. Faults, causes and remedy

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

Note

For possible malfunctions of an electric or hydraulic motor see the operating instructions of the electric or hydraulic motor.

9.1 General information on faults and malfunctions

Faults and malfunctions occurring during the guarantee period and requiring repair work on the gear unit must be carried out only by Siemens customer service.
In case of faults and malfunctions occurring after the guarantee period and whose cause cannot be precisely identified, we advise our customers to contact our customer service.

NOTICE

Material damage

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

⚠ DANGER

Danger to life through switched-on installation

To carry out maintenance and/or repair work, the gear unit must always be stopped.
Secure the drive unit to prevent unintentional switch-on. A notice should be attached to the ON switch stating clearly that work is in progress on the gear unit.

9.2 Possible faults

Table 9: Faults, causes and remedy

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

Faults	Causes	Remedy
Increased temperature at the bearing points.	Oil level in gear-unit housing too low or too high.	Check oil level at room temperature. Top up oil, if necessary.
	Oil too old.	Check date of last oil change. Change oil, if necessary. See section 10.
	Bearing is defective.	Contact Customer Service. Check and, if necessary, replace bearings.
Exterior of gear unit is oiled up.	Inadequate sealing of housing covers and/or joints.	Seal housing covers and/or joints.
	Labyrinth seals oiled up. Incorrect transport position.	Check oil filling. Clean labyrinth seals.
Oil leakage from the gear unit.	Inadequate sealing of housing covers and/or joints.	Check and, if necessary, replace seals. Seal housing covers and/or joints.
	Radial shaft-sealing rings defective.	Check and, if necessary, replace radial shaft-sealing rings.
Oil foaming in the gear unit.	Preservative agent not completely drained.	Change oil.
	Water in oil.	Check state of oil by the test-tube method for water contamination. Have oil analysed by a chemical laboratory. Change oil, if necessary.
	Oil too old (defoaming agent used up).	Examine the oil; change the oil, if necessary.
	Unsuitable oils are mixed up.	Examine the oil; change the oil, if necessary.
Water in oil.	Gear unit exposed to cold air from machine-room fan: Water condensing.	Protect gear unit with suitable heat insulation. Close air outlet or alter its direction by structural measures.
Increased operating temperature.	Oil level in housing too high.	Check the oil level. Adjust oil level, if necessary.
	Oil too old.	Check date of last oil change. If necessary, change the oil; see section 10.
	Oil badly contaminated.	Change the oil; see section 10.
Main drive motor does not start.	Incorrect direction of rotation of the motor.	Change polarity of motor.
		Consult operating instructions for the motor.

9.2.1 Leakage and leaktightness

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

Table 10: Notes on the leaktightness of radial shaft-sealing rings - "RWDR" [2)])

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

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

1) FVA = Forschungsvereinigung Antriebstechnik e. V.

2) RWDR = radial shaft-sealing ring

Note

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

10. Maintenance and repair

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

Note

For information on maintenance of the electric or hydraulic motor, refer to the operating instructions for the electric or hydraulic motor.

10.1 General notes on maintenance

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

The following applies to all work in item 10.2:

⚠ DANGER

Danger to life through switched-on installation

To carry out maintenance and/or repair work, the gear unit must always be stopped.
Secure the drive unit to prevent unintentional switch-on. A notice should be attached to the ON switch stating clearly that work is in progress on the gear unit.

The periods indicated in table 11 largely depend on the conditions under which the gear unit is operated. Only average periods can therefore be stated here. These refer to the following values:

daily operating time of	**24**	**h**	
duty factor "ED" of	**100**	**%**	
maximum operating temperature of	**90**	**°C**	**(applies to mineral oil)**
	100	**°C**	**(applies to synthetic oil)**

NOTICE

Material damage

Risk of damage to the gear unit through non-observance of the periods specified for maintenance and repair work.
The operator must ensure that the intervals stated in table 11 are adhered to. This also applies if the maintenance work is included in the operator's internal maintenance schedules.

Table 11: Maintenance and repair work

Measures	Periods	Remarks
Check the oil temperature	Daily	
Check for unusual gear-unit noise	Daily	
Check the oil level	Monthly	– Middle of the oil-sight glass – Upper mark on the dipstick in the oil-equalising tank (vertical mounting) – Lower edge of oil-level hole

Measures	Periods	Remarks
Check the gear unit for leaks	Monthly	
Examine the water content of the oil	After approx. 400 operating hours, at least once a year	See item 10.2.1.
Perform the first oil change	Approx. 400 operating hours after start-up	See item 10.2.2.
Perform subsequent oil changes	Every 18 months or 5000 operating hours [1)]	See item 10.2.2.
Clean the air filter	Every 3 months	See item 10.2.3.
Clean the gear unit	Depending on requirements, at least every 2 years	See item 10.2.4.
Refill Taconite seals with grease	Every 3000 operating hours, at least every 6 months	See item 10.2.5.
Check tightness of fastening bolts	After the first oil change, then every 2 years	See item 6.13.
Check shrink disk	See operating instructions of the shrink disk.	
Check the preservation of the free shaft ends	Every 3 years	See item 7.3.2.
Inspection of the gear unit	Every 2 years	See item 10.4.

[1)] When using synthetic oils and depending on the individual application, the periods can be extended.

10.1.1 General service lives of oils

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

- for mineral oils, bio-degradable oils and physiologically safe oils (synthetic esters): 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.

Note

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

10.2 Description of maintenance and repair works

10.2.1 Examine water content of oil, conduct oil analyses

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

– For reference purposes, a fresh sample of the operating lubricating oil used must be sent with the used-oil sample to the analysing institute for analysis.

– Carry out oil sampling, while the gear unit is still warm, immediately after stopping the machinery.

– A special sample container should be filled with the specified quantity of oil.
If there is no such sample container available, at least one litre of oil must be put in a **clean**, transportworthy, sealable vessel.

10.2.2 Change oil

As an alternative to the oil-change intervals specified in table 11 (see item 10.1), it is possible to have an oil sample tested at regular intervals, **every 4 weeks**, by the technical service of the relevant oil company and to have it cleared for further use.

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

Note

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

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

NOTICE

Material damage

Risk of damage to the gear unit through incorrect lubrication resulting from mixed oils.
When changing the oil, always re-fill the gear unit with the same type of oil.
Never mix different types of oil and/or oils made by different manufacturers. Polyglycol-based synthetic oils in particular must not be mixed with PAO-based synthetic oils or mineral oils. If changing to a different type and/or make of oil, the gear unit must be flushed out with the new oil type.
Flushing is not necessary, if the new operating oil is fully compatible with the old operating oil in all respects. The compatibility must be confirmed by the oil supplier.
If there is a change to another oil, Siemens recommends flushing out the gear unit with the new type of operating oil.

Note

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

- Place a suitable container under the oil-drain point of the gear-unit housing.
- Unscrew the air filter with the reducing screw on the top of the housing or at the oil-equalising tank.
- Unscrew the oil-drain plug and/or open the oil-drain cock and drain the oil into the collecting container.

⚠ CAUTION

Risk of scalding

Risk of injury through escaping hot oil.
Wear suitable protective gloves, protective glasses and protective clothing.
Remove any oil spillage immediately with an oil-binding agent.

- Screw in the oil-drain plug with a new sealing ring and/or shut the oil-drain cock.
- Clean the air filter (see item 10.2.3).
- Fill fresh oil into the gear unit (see item 7.1.3).
- Screw in the air filter with the reducing screw.

10.2.3 Clean the air filter

Note

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

Note

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

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

⚠ WARNING

Risk of eye injury through compressed air

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

NOTICE

Material damage

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

10.2.4 Clean the gear unit

NOTICE

Material damage

Risk of damage to the gear unit through overheating.
Layers of dust may affect the withdrawal of heat by way of the housing surface and cause overheating.
To prevent the build-up of dust on the gear unit, cleaning must be done in accordance with the local operating conditions.

- Remove any dirt adhering to the gear unit, using a hard brush.
- Remove any corrosion.

NOTICE

Material damage

Risk of damage to the gear unit through entry of moisture.
The gear unit must not be cleaned with high-pressure cleaning equipment.

10.2.5 Refill Taconite seals with grease

- Inject approx. 30 g lithium-based rolling-bearing grease into each of the lubricating points of the Taconite seal. The lubricating points are fitted with a flat grease nipple type AM10x1 to standard "DIN 3404".

Note

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

⚠ CAUTION

Danger of slipping

Risk of slipping on spilled grease.
Remove and dispose of any old grease escaping.

10.2.6 Top up oil

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

10.2.7 Check tightness of fastening bolts

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

Note

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

10.3 Final work

Note

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

The instructions in item 6.12 must be observed.

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

10.4 General inspection of the gear unit

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

10.5 Lubricants

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

Note

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

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

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

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

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

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

11. Spare parts, customer service

11.1 Stocking spare parts

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

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

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

NOTICE

Material damage

Risk of damage to the gear unit through improper use.
Siemens guarantees only the genuine spare parts supplied by Siemens.
Non-genuine spare parts have not been tested nor approved by Siemens. Non-genuine spare parts may alter technical characteristics of the gear unit, thereby posing an active or passive risk to safety.
Siemens will assume no liability or guarantee for damage caused by spare parts not supplied by Siemens. The same applies to any accessories not supplied by Siemens.

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

When ordering spare parts, always state the following:

Order number, position Type, size Part number Quantity

11.2 Addresses for ordering spare parts and customer service

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

Siemens Industriegetriebe GmbH
Thierbacher Straße 24
09322 Penig

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

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

Planetary gear unit
FLENDER SIP
Types O.C, O.R, O.RP, O.RR
Sizes 30 to 60

developed for driving machines in most various industry areas:

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

  1.1, 1.1.2, 1.1.3, 1.1.5, 1.2.4.4, 1.2.6, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.3.8, 1.3.8.1, 1.3.8.2, 1.4.1, 1.4.2.1, 1.5.2, 1.5.3, 1.5.4, 1.5.5, 1.5.6, 1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.5.11, 1.5.13, 1.5.15, 1.6.1, 1.6.2, 1.7.1, 1.7.1.1, 1.7.2, 1.7.3, 1.7.4, 1.7.4.1, 1.7.4.2, 1.7.4.3
- The partly completed machinery must not be put into service until it has been established that the machinery into which the partly completed machinery is to be incorporated has been declared to be in conformity with the provisions of Directive 2006/42/EC, as appropriate.
- The 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 (I DT MD AP PRL PRD PNG)

Penig, 2014-07-28

Jens Kiesenbauer
(I DT MD AP PRL PRD PNG)

Penig, 2014-07-28

ppa.

Christian Tyburski
(I DT MD AP EMEA)

Further Information:

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

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

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

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

Siemens AG
Industry Sector
Mechanical Drives
Alfred-Flender-Straße 77
46395 Bocholt
GERMANY

Subject to modifications

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