

# Planetary Gear Unit Types PLANUREX

**P.A, PS.A, P.B, P.F**  
**Sizes 90 to 400**

Assembly and operating instructions  
BA 9200 en 03/2012

FLENDER gear units

**SIEMENS**

# SIEMENS

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P.A, PS.A, P.B, P.F  
Sizes 90 to 400

### Assembly and operating instructions

Translation of the original assembly and operating instructions

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## Notes and symbols in these assembly and operating instructions

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

### Legal notes

#### Warning note concept

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



**WARNING! Imminent explosion!**

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



**WARNING! Imminent personal injury!**

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



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

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



**NOTE!**

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



**WARNING! Hot surfaces!**

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

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

### Qualified personnel

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

# Intended use of Siemens products

## Observe also the following:



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

## Trademarks

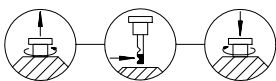
All designations indicated with the registered industrial property mark ® are registered trademarks of Siemens AG. Other designations used in these instructions may be trademarks the use of which by third parties for their own purposes may infringe holders' rights.

## Exclusion of liability

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

## Symbols

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



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



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

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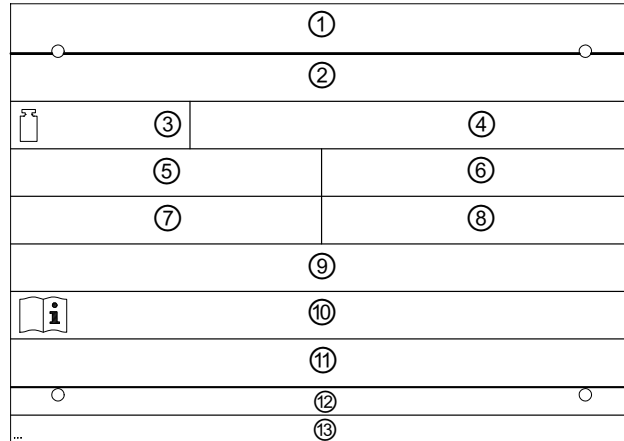
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# 1. Technical data

## 1.1 General technical data

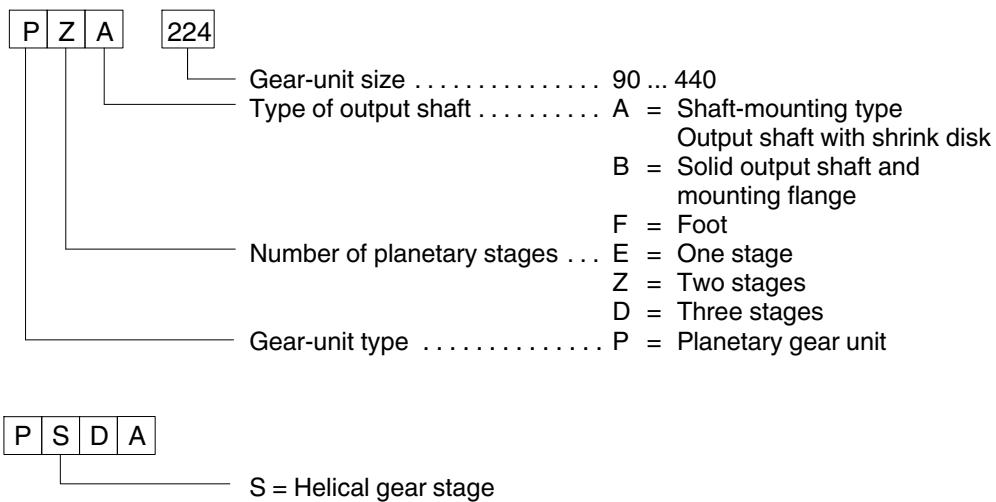
The most important technical data are shown on the rating plate. These data and the contractual agreements between Siemens and the customer for the gear unit determine the limits of its correct use.



**Fig. 1:** Rating plate gear unit

- |   |   |   |   |
|---|---|---|---|
| ① | Company logo  | ⑧ | Speed $n_2$   |
| ② | Order number, item, sequence number /<br>Year built | ⑨ | Oil data<br>(oil type, oil viscosity, oil quantity) |
| ③ | Total weight in kg                                  | ⑩ | Instructions number(s)                              |
| ④ | Special information                                 | ⑪ | Special information                                 |
| ⑤ | Type / size *)                                      | ⑫ | Manufacturer and place of manufacture               |
| ⑥ | Power rating P2 in kW or torque T2 in Nm            | ⑬ | Country of origin                                   |
| ⑦ | Speed $n_1$   |   |   |

\*) Example

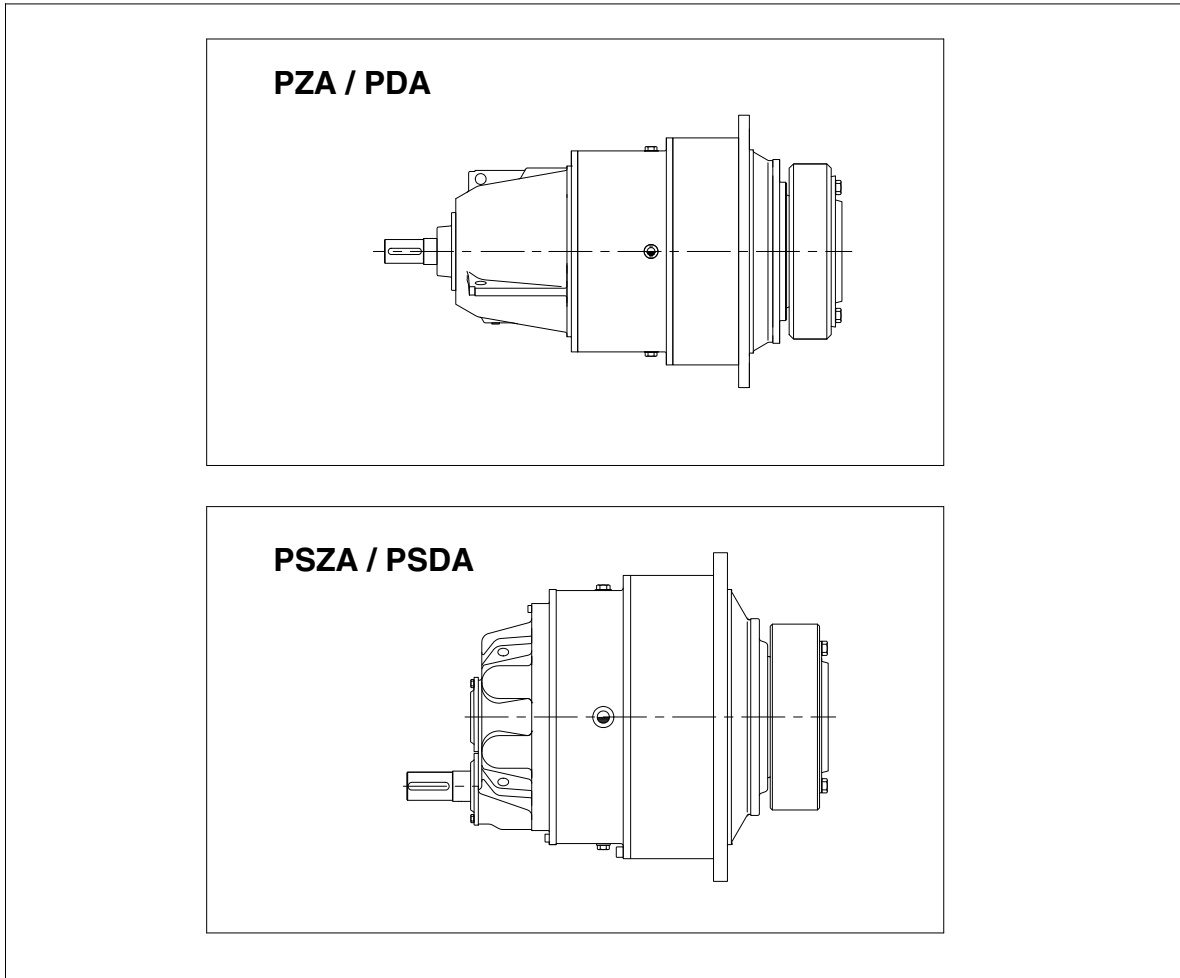


Data on weights and measuring-surface sound-pressure levels of the various gear types are given in items 1.1.1 and 1.1.2.

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

1.1.1 Designs and weights

1.1.1.1 Standard designs



**Table 1:** Weights (approximate values)

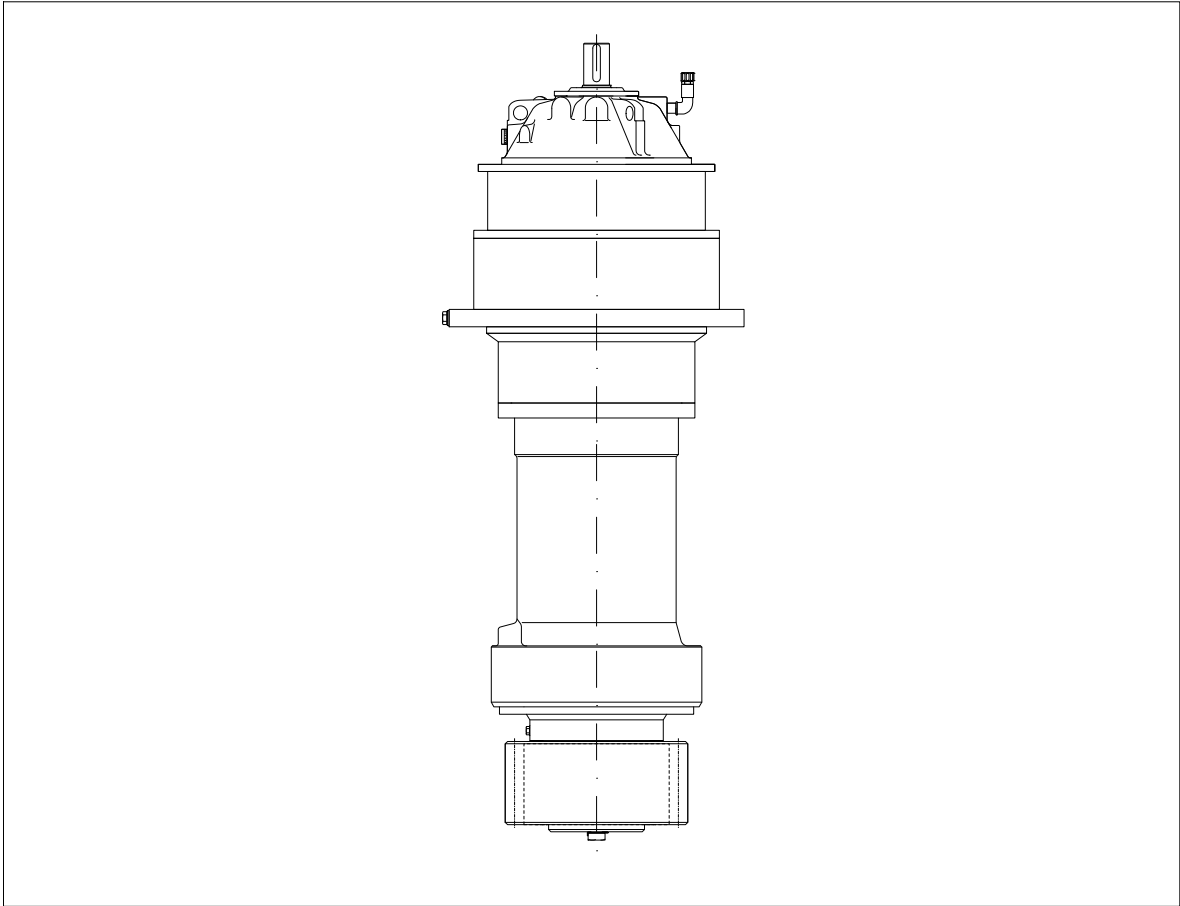
Type	Approx. weight (kg) including shrink disk																				
	90	100	112	125	140	150	170	190	200	224	250	265	280	300	315	335	355	375	400	425	440
<b>PZA</b>	195	260	360	520	570	750	1000	1310	1560	1970	2620	3150	3920	4700	5520	6500	7100	8400	9900	11700	14000
<b>PSZA</b>	200	270	370	550	580	790	1050	1400	1760	2320	3000	3500	4400	5400	6250	7450	8300	9600	11500	13000	14300
<b>PDA</b>	210	285	390	560	730	840	1160	1450	1700	2200	2900	3500	4300	5100	6000	7100	7800	9200	10900	12900	15300
<b>PSDA</b>	220	295	400	560	720	820	1150	1400	1860	2400	3160	3850	4700	5500	6500	7800	8500	10000	11900	14100	16700



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



### 1.1.1.2 Planetary slewing gear units



**Table 2:** Weights for slewing gear units without further add-on parts

Type	Approx. weight (kg) for gear-unit size														
	90	100	112	125	140	150	170	190	200	224	250	265	280	300	315
<b>PZB/PDB 1)</b>	450	550	700	1000	1200	1500	1750	2250	2600	3000	4000	5000	6000	7000	8300
<b>PZB/PDB 2)</b>	18	20	25	30	35	45	50	60	70	80	90	100	110	130	150

**Table 3:** Weights for slewing gear units with bevel-helical gear unit

Type	Approx. weight (kg) for gear-unit size														
	90	100	112	125	140	150	170	190	200	224	250	265	280	300	315
<b>PZB/PDB 1)</b>	450	550	700	1000	1200	1500	1750	2250	2600	3000	4000	5000	6000	7000	8300
<b>PZB/PDB 2)</b>	18	20	25	30	35	45	50	60	70	80	90	100	110	130	150

**Table 4:** Weights for slewing gear units with bevel-gear unit

Type	Approx. weight (kg) for gear-unit size														
	90	100	112	125	140	150	170	190	200	224	250	265	280	300	315
<b>PZB/PDB 1)</b>	450	550	700	1000	1200	1550	1800	2300	2600	3000	4000	5000	6000	7200	8600
<b>PZB/PDB 2)</b>	18	20	25	30	35	45	50	60	70	80	90	100	110	130	150

**Table 5:** Weights for slewing gear units with CAVEX worm gear unit

Type	Approx. weight (kg) for gear-unit size														
	90	100	112	125	140	150	170	190	200	224	250	265	280	300	315
<b>PZB/PDB 1)</b>	450	550	700	1000	1200	1550	1750	2300	2650	3050	4100	5150	6300	7500	9200
<b>PZB/PDB 2)</b>	18	20	25	30	35	45	50	60	70	80	90	100	110	130	150

**Table 6:** Weights for slewing gear units with HYDREX radial piston motor

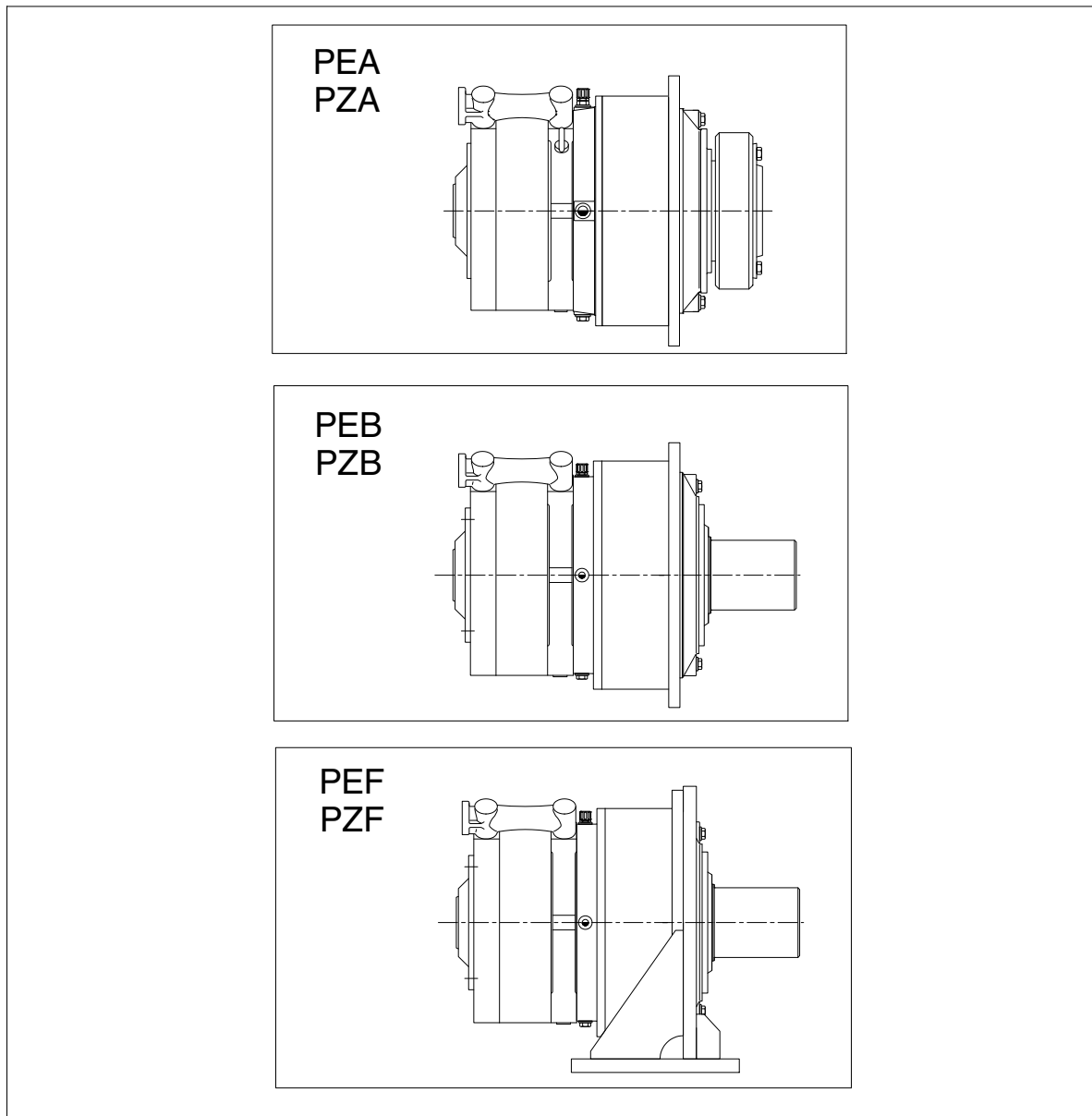
Type	Approx. weight (kg) for gear-unit size																
	112		125		140		150		170		200		224		250	265	280
<b>PEB</b>																	
<b>HMS</b>	345	410	410	455	455	515	515	575	575	635	635	690	690	745	745	910.1	910
<b>1)</b>	750	900	1100	1200	1450	1600	1800	1950	2250	2500	2900	3200	3550	3900	4200	5750	7000
<b>2)</b>	25		30		35		45		50		70		80		90	100	110

- 1) Weight specifications are without oil filling, without drive-shaft pinion and without further add-on parts.
- 2) Weight per 100 mm drive-shaft length



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

1.1.1.3 Radial piston motor with planetary gear unit



**Table 7:** Weights for combined gear unit with hydraulic motor type PE.

Type	Approx. weight (kg) for combined gear unit (gear-unit size/motor size)																								
	112		125		140		150		170		200		224		250		265		280		300		335		
	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	HMS	
PEA	455	565	650	720	750	855	980	1110	1300	1460	1920	2090	2300	2500	2800	4100	4800	6200	7500						
PEB	355	470	520	590	750	855	920	1050	1220	1380	1810	1980	2200	2400	2600	3700	4300	5500	6800						
PEF	415	530	595	665	830	935	1020	1150	1350	1510	1990	2160	2420	2620	2880	4100	4800	6100	7500						

**Table 8:** Weights for combined gear unit with hydraulic motor type PZ

Type	Approx. weight (kg) for combined gear unit (gear-unit size/motor size)																						
	170			200			250			265			300			315			355			375	
Bauart	HMS			HMS			HMS			HMS			HMS			HMS			HMS				
	345	345	410	410	455	455	515	515	575	575	635	635	690	690	745	745	805	805	865	865	925	925	985
<b>PZA</b>	1100	1660	1725	2785	2840	3370	3460	5010	5130	5950	6100	7530	7680	7850	8980	9150	9320						
<b>PZB</b>	1020	1550	1620	2610	2670	3170	3260	4710	4830	5630	5780	7230	7380	7550	8580	8750	8920						
<b>PZF</b>	1150	1730	1795	2895	2950	3500	3590	5160	5280	6230	6380	8130	8280	8450	9680	9850	10020						



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

1.1.2 Measuring-surface sound-pressure level

The gear unit has a measuring-surface sound-pressure level at a distance of 1 m which will be found on the rating plate.

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

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

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

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

The specified sound-pressure level was determined by statistical evaluations of our quality control department. The gear unit can be statistically expected to comply with these sound-pressure levels.

## 2. General notes

### 2.1 Introduction

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



**All persons carrying out work on the gear unit must have read and understood these instructions and must adhere to them. Siemens accepts no responsibility for damage or disruption caused by disregard of these instructions.**

The "**FLENDER 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 are (e.g.) sewage treatment, excavators, chemical industry, iron and steel industry, conveyor systems, crane systems, foodstuffs industry, paper machinery, cableways, cement industry, etc.

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

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

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

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

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

### 2.2 Copyright

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

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

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

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

### 3. Safety instructions



For the safety notes for the attached hydraulic motor, if any, see the operating instructions for this motor.



**Entry to the gear unit and its added components is not permitted during operation!  
Entry for maintenance and repair work is only permitted when the gear unit is at a standstill!  
Caution! Risk of falling!**



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

#### 3.1 Obligations of the user

- The operator must ensure that everyone carrying out work on the gear unit has read and understood these instructions and is adhering to them in every point in order to:
  - avoid injury or damage,
  - ensure the safety and reliability of the unit,
  - avoid disruptions and environmental damage through incorrect use.
- During transport, assembly, installation, dismantling, operation and maintenance of the unit, the relevant safety and environmental regulations must be complied with at all times.
- The gear unit must be operated, maintained and/or repaired only by authorised, properly trained and qualified personnel.
- The outside of the gear unit must not be cleaned with high-pressure cleaning equipment.
- All work on the coupling must be carried out with great care and with due regard to safety.



**All work on the gear unit must be carried out only when it is not in operation.  
The drive unit must be secured against being switched on accidentally (e.g. by locking the key switch or removing the fuses from the power supply). A notice should be attached to the start switch stating clearly that work is in progress.**

- No electrical welding work must be done at all on the drive.  
The drives must not be used as an earthing point for welding operations. Toothed parts and bearings may be irreparably damaged by welding.
- A potential equalisation in accordance with the applying regulations and/or directives must be carried out, if it is not possible to ensure, that voltages possibly occurring can be equalised by way of the complete machinery, the machine frame, or the like. To this purpose free threaded holes on the gear unit must be used.  
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 electrotechnical specialists.



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



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



**When the gear unit is incorporated in plant or machinery, the manufacturer of such plant or machinery must ensure that the contents of these instructions are incorporated in his own instructions.**

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

### 3.2 Environmental protection

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

### 3.3 Special dangers and personal protective equipment

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



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



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



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



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



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



**The gear unit is not suitable for operation in explosion hazard locations. It must under no circumstances be used in such locations because of the risk to life and limb.**

## 4. Transport and storage

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



For transport and storage of the hydraulic motor, if added on, please refer to operating instructions for this motor.

### 4.1 Scope of supply

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



**If damage has occurred, the gear unit must not be put into operation.**

The gear unit is delivered in the fully assembled condition. Additional items (e.g. oil cooler, pipes and fittings) can be delivered separately packaged.

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

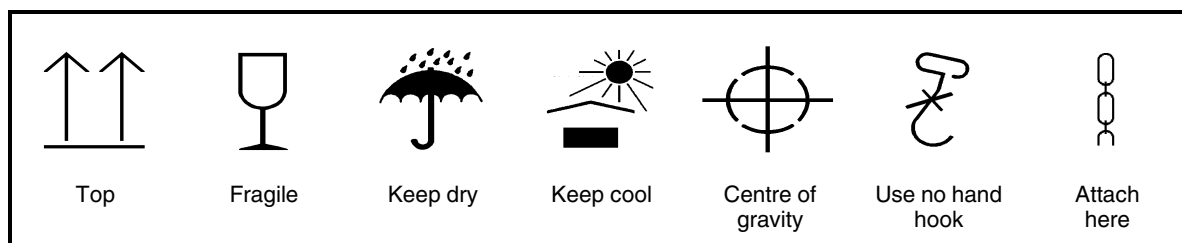
### 4.2 Transport



**When transporting Siemens products, use only lifting and handling equipment of sufficient load-bearing capacity!  
Wedges and/or rails must be used to prevent rolling.**

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

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



**Fig. 2:** Transport symbols



**The gear unit must always be transported with due care to avoid danger to persons and the gear unit.  
If, for example, the free shaft ends are knocked, this may damage the gear unit.**



The gear units must be transported with suitable equipment only.  
Never transport the gear unit with an oil filling.

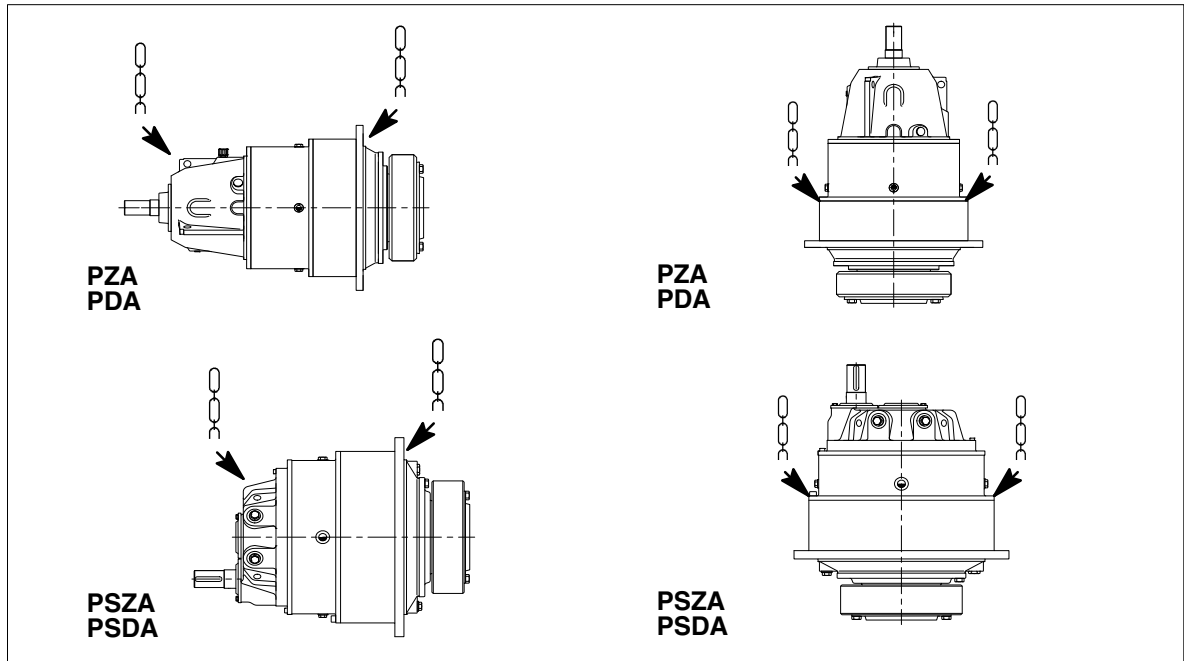


**The gear unit may be transported and handled only with the existing brackets, eye bolts or lifting eyes.  
Do not use the front threads at the shaft ends to attach eye bolts for transport.**

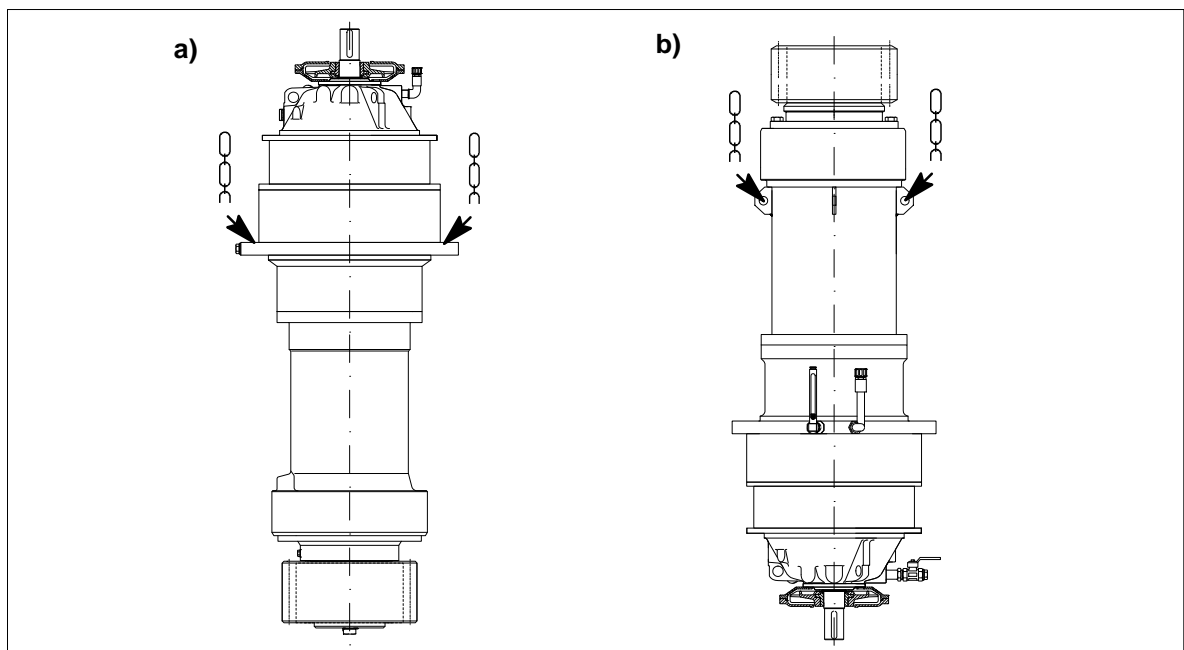


**If fitted with a shrink disk, the shrink disk must be secured axially before handling.**





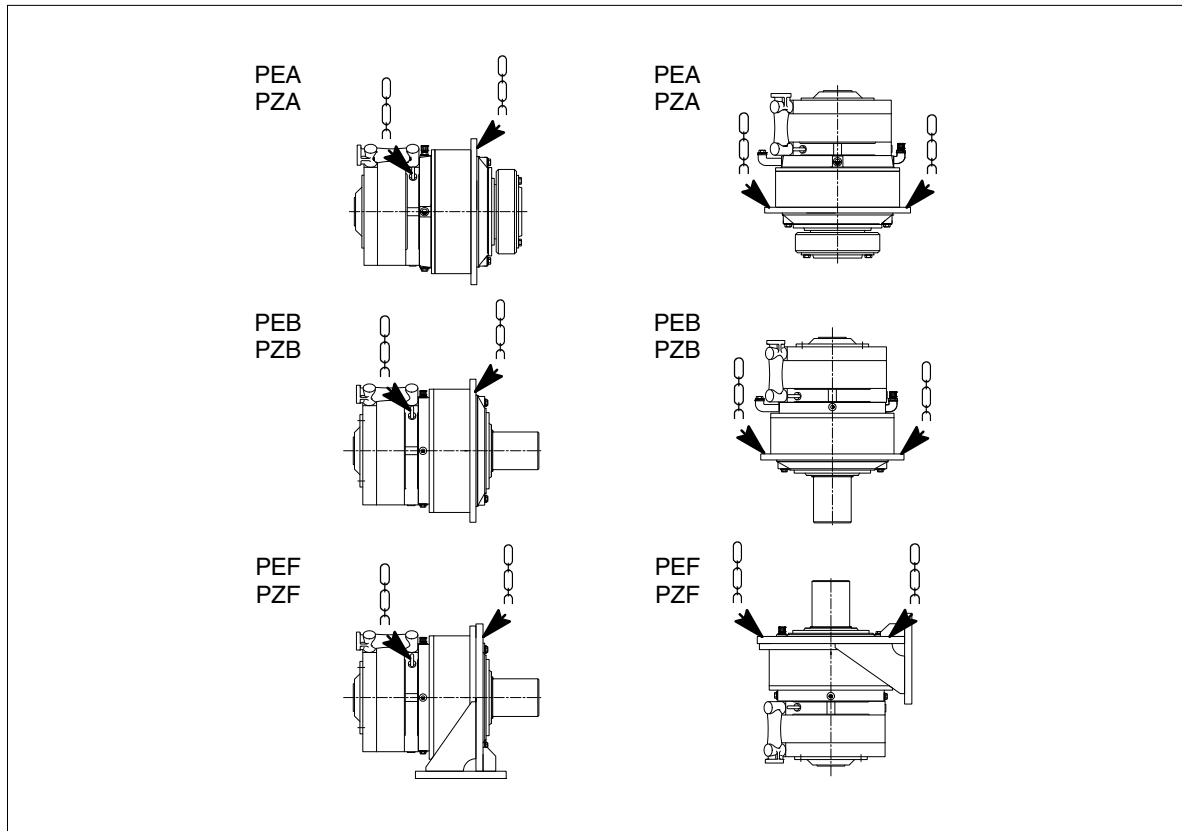
**Fig. 3:** Attachment points in standard design



**Fig. 4:** Attachment points on slewing gear units

Depending on the design, the slewing gear unit can be used for shaft  $d_1$  at the top, see figure a) or shaft  $d_1$  at the bottom, see figure b).

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



**Fig. 5:** Attachment point on combined gear units with hydraulic motor

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

#### 4.3 Storing the gear units

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



**Do not stack gear units on top of one another.**



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



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

Provision for special environmental conditions during transport (e.g. transport by ship) and storage (climate, termites, etc.) must be contractually agreed.

#### 4.4 Standard preservation

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

The properties of the outer paint coat are as follows: Resistant to acids, weak alkalis, solvents, atmospheric action, temperatures up to 120 °C (briefly up to 140 °C), and to tropical conditions.



Ensure that the paint is not damaged!

Mechanical damage (scratches), chemical damage (acids, alkalis) and thermal damage (sparks, welding beads, heat) cause corrosion which may cause failure of the external protective coating.

Unless otherwise contractually agreed, the interior preservation and the preservation of the free shaft ends are guaranteed for 24 months, provided that storage is in dry, frostfree sheds and that the gear unit is duly sealed. The period of validity of the guarantee starts on the date of delivery of the gear unit.

For longer periods of storage (> 24 months) we advise regular checking and, if necessary, renewal of the interior preservation (see section 7, "Start-up"). The output shaft must be rotated at least one turn to change the position of the rolling element in the bearings. The input shaft must not come to a standstill in the same position as before rotation. This procedure must be repeated and documented every 24 months until start-up.

## 5. Technical description

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

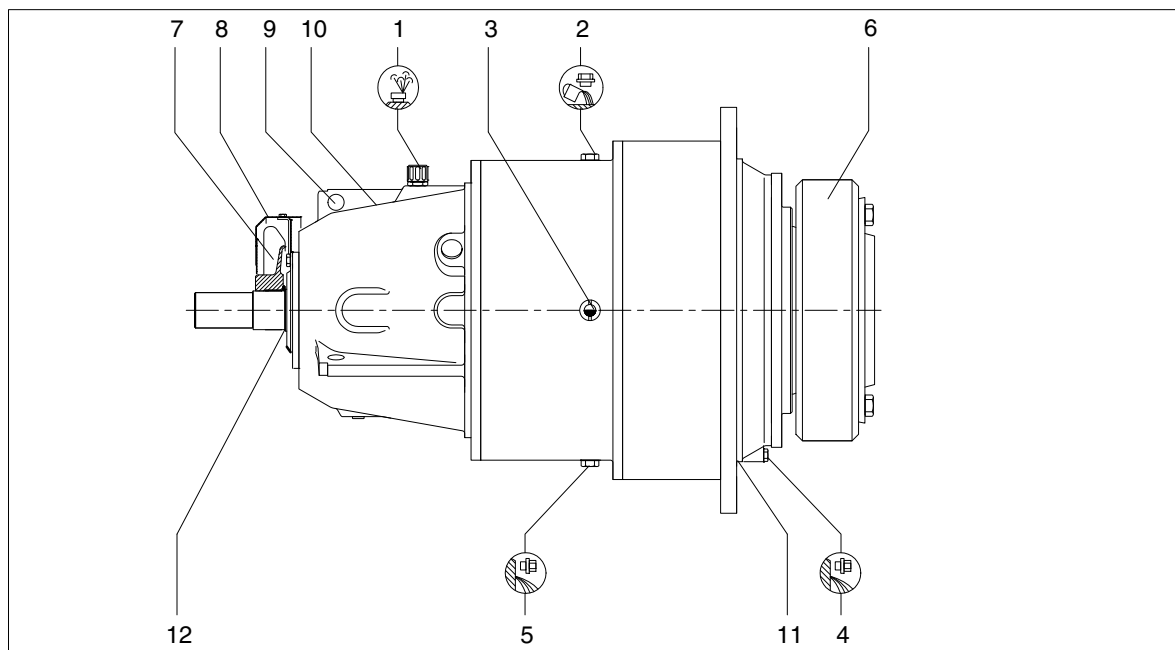
### 5.1 General descriptions

#### 5.1.1 Two- or three-stage planetary gear unit

The gear unit is supplied as a two- or three-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 position.

As a principle, 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 fan, motor bell housing, oil cooler, angular oil-level indicator, temperature sensor and backstop.



**Fig. 6:** Gear-unit items

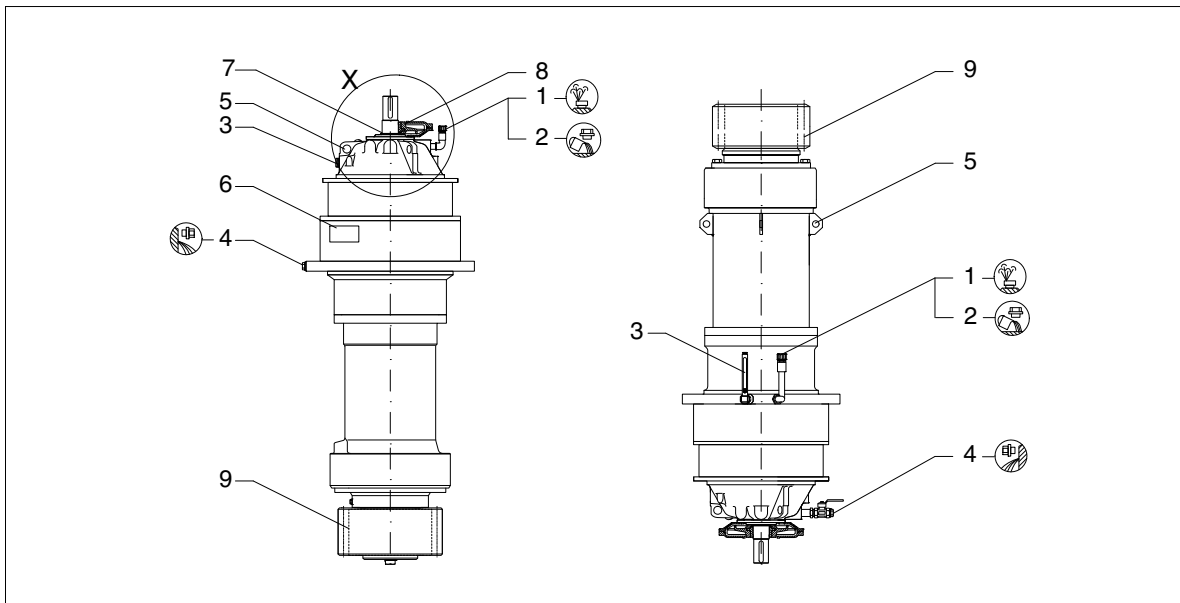
1	Housing ventilation	7	Fan
2	Oil inlet	8	Fan cowl
3	Oil sight glass / oil level	9	Lifting eyes
4	Oil drain	10	Rating plate
5	Residual-oil drain	11	Mounting position for torque arm
6	Shrink disk	12	Shaft seal

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

### 5.1.2 Planetary slewing gear units

Slewing gear units in the standard design programme are supplied as a two- or three-stage planetary gear unit. As combined gear unit with a bevel-helical, bevel, CAVEX worm gear unit or in one-stage design with a HYDREX radial piston motor.

Depending on type and size, the gear units of the standard range can be fitted with fan, motor bell housing, motor console, oil cooler, angular oil-level indicator, temperature sensor and backstop.

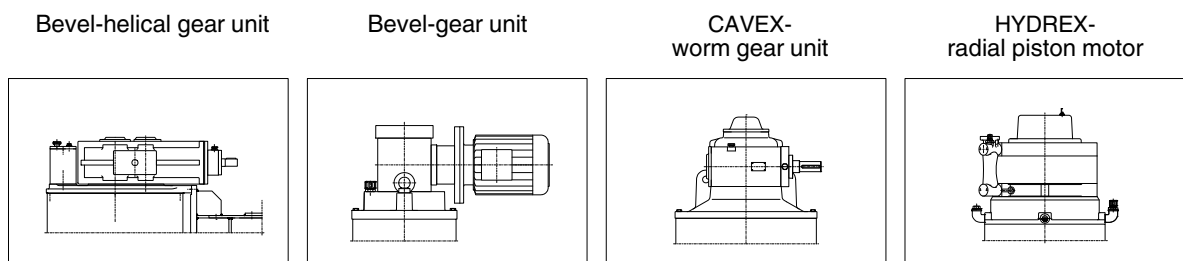


**Fig. 7:** Gear-unit items

- |   |                                       |   |                    |
|---|---------------------------------------|---|--------------------|
| 1 | Housing ventilation                   | 6 | Rating plate       |
| 2 | Oil inlet                             | 7 | Shaft seal         |
| 3 | Angular oil level-indicator/oil level | 8 | Fan/fan cowl       |
| 4 | Oil drain                             | 9 | Drive shaft pinion |
| 5 | Lifting eyes                          |   |                    |

#### 5.1.2.1 Combination possibilities

### Detail "X"



**Fig. 8:** Possibilities of combination for slewing gear units

### 5.1.3 Planetary gear units with hydraulic motor

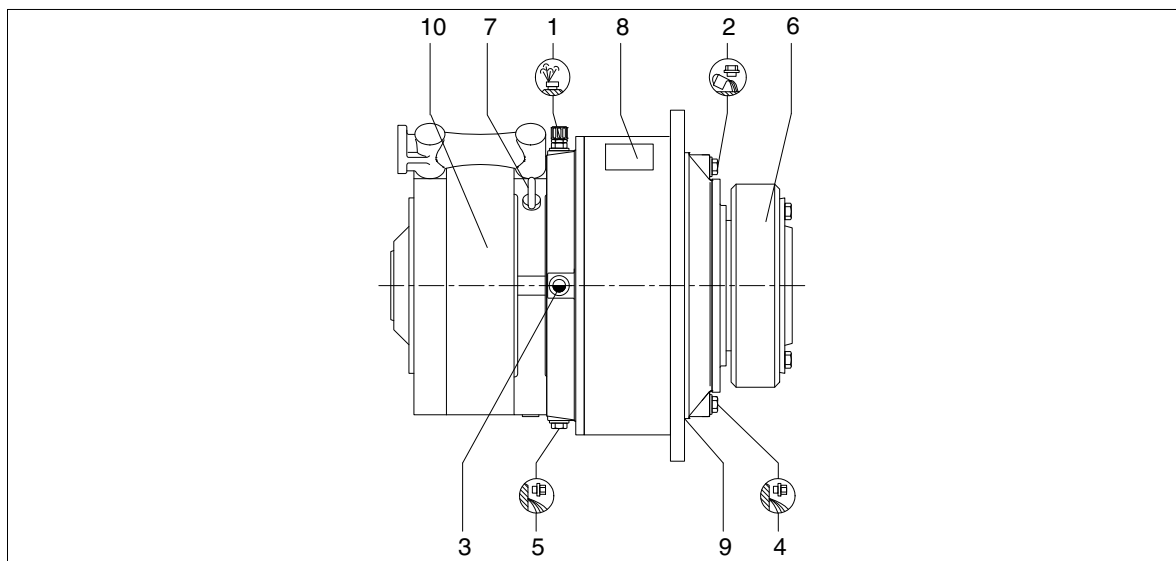
The combined gear unit consists of one or two planetary stages with a hydraulic motor added-on on the input side. The combined gear unit is designed for a horizontal and vertical mounting position. If desired, the combined gear unit can also be supplied for a different mounting position.



The attached operating instructions for the hydraulic motor must be observed.

As a principle, the gear unit can be operated in both directions of rotation.

Depending on type and size, gear units of the standard programme can be equipped with angular oil level indicator, backstop and torque arm.



**Fig. 9:** Gear-unit items

- |                               |                                    |
|-------------------------------|------------------------------------|
| 1 Housing ventilation         | 6 Shrink disk                      |
| 2 Oil inlet                   | 7 Lifting eyes / ring bolts        |
| 3 Oil sight glass / oil level | 8 Rating plate                     |
| 4 Oil drain                   | 9 Mounting position for torque arm |
| 5 Residual-oil drain          | 10 Radial piston motor             |

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

### 5.2 Housing

The gear unit housing is made of cast iron; the housing flange is made of nodular cast iron. If necessary, the housing may also be made of nodular cast iron or steel.

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

- |                           |  |                        |  |
|---------------------------|--|------------------------|--|
| Air relief point: yellow  |  | Oil drain point: white |  |
| Oil filling point: yellow |  | Lubrication point: red |  |
| Oil level: red            |  |                        |  |

### 5.3 Toothed components

Externally toothed spur gears are made of case-hardening steel 18CrNiMo7. The tooth flanks are case-hardened and ground.

Depending on size, the internal gear teeth are made of heat-treatable steel or bainitic nodular cast iron. The teeth are shaped, milled or ground (depending on size).

### 5.4 Lubrication

The teeth and rolling bearings of the gear units are adequately supplied with oil by splash lubrication. For special mounting positions and/or gear units requiring additional cooling it may be necessary to provide pressure-feed or oil circuit lubrication.



For safety reasons, the gear unit is supplied without oil filling for transport.

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-base grease.



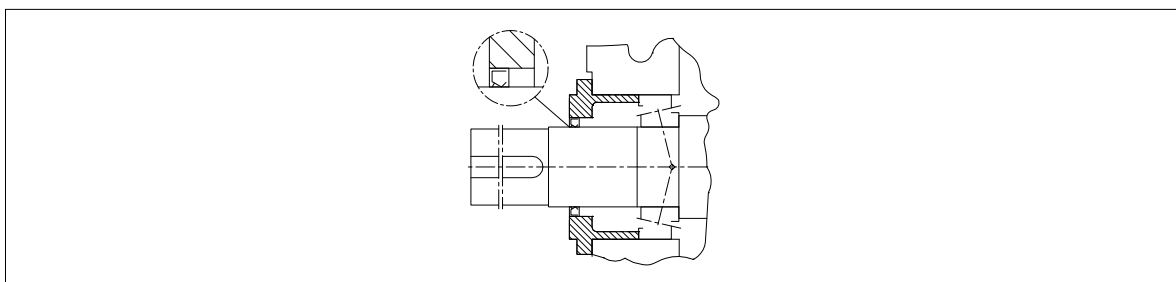
Do not mix greases of different soap bases when relubricating.

### 5.5 Shaft bearings

All shafts are mounted in rolling bearings.

### 5.6 Shaft seals, static seals

As a rule radial shaft sealing rings are used as standard seals. They are fitted preferably with an additional dust lip to protect the actual sealing lip from external contamination.



**Fig. 10:** Radial shaft-sealing ring

Alternatively, and depending on the order, it is also possible to provide the gear units with regreasable labyrinth seals to prevent the ingress of dust (Taconite seal).

The individual housing components are sealed statically with Loctite 640 to prevent leakages.

### 5.7 Cooling

If required, planetary gear units are fitted either with fan or with oil cooler according to the order.

#### 5.7.1 Fan

In case of planetary gear units fitted with fans, the fan is mounted on the high-speed drive shaft of the gear unit and protected against accidental contact by a fan cowl. The fan sucks air through the grid on the cowl and blows it along the air ducts on the side of the gear housing. This removes heat from the housing.



**Make sure that the air intake at the fan cowl is not obstructed.**

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

## 5.7.2 Oil cooling system

The oil cooler is an essential part of the oil cooling system and dissipates a certain heat quantity of the warm gear unit oil. The required water connection must be provided by the user.

The equipment manufacturer's operating instructions should be observed for operation of the oil-cooling system.



**To ensure optimum cooling performance, the specified direction of flow in the water oil-cooler must be observed. The cooling-water inlet and outlet must not be reversed. The pressure of the cooling water must not exceed 8 bar.**

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



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

## 5.8 Couplings, clutches

As a rule, flexible couplings must be provided for the input and output drive sides of the gear unit.

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



**Couplings with peripheral velocities on the outer diameter of up to 30 m/s must be statically balanced. Couplings with peripheral velocities over 30 m/s must be dynamically balanced.**

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



When installing the drives, the individual components must be very precisely aligned with one another in order to minimise restoring forces caused by angle and shaft offset and avoid premature wear to flexible coupling components.

## 5.9 Shrink disk

In the 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 machine.

## 5.10 Backstop

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

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

The backstop is fitted with centrifugally operated sprags. When the gear unit is running in the specified direction, the inner ring and the cage with the sprags also rotates while the outer ring remains stationary. From a certain speed of rotation, the sprags lift off and the backstop now operates without wear.



The direction of rotation can be changed by reversing the cage. Siemens must be consulted in all cases on this matter.



**To prevent damage to or destruction of the backstop, it is essential to ensure that the motor is not run in opposition to the locked backstop. Observe the sign fixed to the gear unit.**



### 5.11 Attachment of IEC motors

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



**Do not use a motor with a motor speed exceeding the specified speeds of the gear unit shown on the rating plate, as otherwise the gear unit may be damaged.**

## 6. Fitting

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

### 6.1 General information on fitting



When installing a hydraulic motor, observe the operating instructions for this motor.

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

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

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



**Exposure to direct sunlight may cause overheating.  
Safety equipment such as covers, roofing, etc. must be provided as required!  
The operator should ensure that no foreign bodies affect the proper function of the gear unit (e.g. falling objects or heaping over).**



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



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

To ensure proper lubrication, the installation position specified in the order must always be observed.

### 6.2 Foundation

The foundation must be horizontal and level.

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



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

### 6.3 Description of installation work

- Remove corrosion protection coat from the solid shaft, the hollow shaft and the machined add-on surfaces with a suitable cleaning medium.



**Adequate ventilation must be ensured, when using cleaners containing solvent additives.  
No naked flames! Danger of explosion!  
Observe current regulations.**



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

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

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



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



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



**The coupling components must be fitted with the aid of suitable equipment to avoid damaging the shaft bearings through axial joining forces.  
Always use suitable lifting equipment.  
When fitting the components, care must be taken that the shaft-sealing rings and shaft running surface are not damaged.**

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



**Fit the coupling with the aid of suitable fitting equipment. Never use force or knock the couplings into position, as this may damage the gearwheels, rolling bearings, locking rings, etc.**



Gear units whose weight requires the use of lifting gear must be attached as shown in section 4, "Transport and storage". When add-on parts are mounted on the gear unit, appropriate additional attachment points must be provided in accordance with the order-specific dimensioned drawing.

6.4 Type of shrink disk  
 6.4.1 Fitting the shrink disk

The shrink disk is delivered ready for installation.

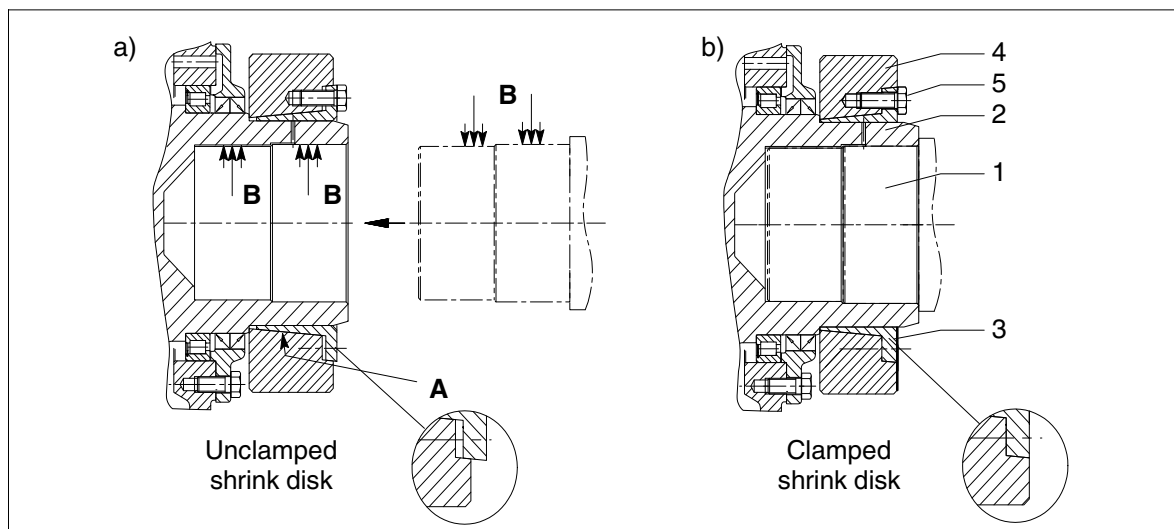


**It must not be dismantled before clamping for the first time.**



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

**This is essential for safe and reliable torque transmission.  
 Do not use contaminated solvents or dirty cloths for removing grease.**



**Fig. 11:** Fitting the shrink disk

- |          |               |          |                        |
|----------|---------------|----------|------------------------|
| <b>A</b> | Greased       | <b>B</b> | Absolutely grease-free |
| <b>1</b> | Machine shaft | <b>3</b> | Inner ring             |
| <b>2</b> | Hollow shaft  | <b>4</b> | Outer ring             |
|          |               | <b>5</b> | Tensioning bolt        |

- Mounting the shaft and/or fitting the hub onto the shaft.



**If the gear unit is fitted in a vertical position with the output shaft down, the fitted shrink disk must be protected from dropping.**



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



**Do not tighten the tensioning bolts until the machine shaft is installed.**

Tighten all the tensioning bolts gradually one after the other, working round several times.



**Do not tighten diametrically opposite bolts one after the other.**

**Tighten all the tensioning bolts until the front surfaces of the inner and outer rings are aligned (see fig. b).**



This allows the clamping condition to be checked visually.



**To avoid overloading the individual bolts, the maximum tensioning torque (see table 9) must never be exceeded. The alignment of the front surfaces has priority. If alignment cannot be achieved by clamping, consult Siemens.**

**Table 9:** Maximum torques for tensioning bolts

Tensioning-bolt thread	Max. tensioning torque per bolt (with $\mu = 0.1$ )		Tensioning-bolt thread	Max. tensioning torque per bolt (with $\mu = 0.1$ )	
	Strength class			Strength class	
	10.9 Nm	12.9 Nm		10.9 Nm	12.9 Nm
M 6	12	14.5	M 20	470	570
M 8	29	35	M 24	820	980
M 10	58	70	M 27	1210	1450
M 12	100	121	M 30	1640	1970
M 14	160	193	M 33	2210	2650
M 16	240	295	M 36	2850	3420



**For safety reasons, a protective cover should be mounted over the shrink disk.**

6.4.1.1 Demounting and remounting the shrink disk

Remove the protective cover.

The releasing process is similar to that of clamping.

To enable the stored energy of the outer ring during disassembly to be lowered slowly via the bolts to be loosened, the bolts must be loosened evenly and in sequence, initially only by a quarter turn.



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

If after loosening all the bolts approx. one turn the outer ring does not come free of the inner ring of its own accord, the outer ring can be detensioned with the forcing threads by screwing some of the adjacent fastening bolts into them. The now loosening outer ring is braced against the remaining bolts. This operation must be carried out until the outer ring releases of its own accord.

Releasing is then possible without difficulty.

Pull the shrink disk off the hollow shaft.



**The hollow shaft of the gear unit can be provided with an additional oil hole for injecting oil for demounting the hollow shaft from the machine shaft. When using this hole, observe the maximum permissible pressures shown in the drawings of the gear-unit documentation.**

6.4.1.2 Cleaning and greasing the shrink disk

Released shrink disks do not have to be disassembled and re-greased before being re-clamped.

The shrink disk should only be disassembled and cleaned if it is dirty.



**Following cleaning, only the inner sliding surfaces of the shrink disk should be re-greased.**

Use a solid lubricant with a high MoS<sub>2</sub>-based molybdenum disulphide content and with a coefficient of friction of  $\mu = 0.04$  according to the following table.

**Table 10:** Lubricants for shrink disk after cleaning

Lubricant	Form	Manufacturer
Molykote 321 R (lubricating paint)	Spray	DOW Corning
Molykote Spray (powder spray)	Spray	DOW Corning
Molykote G Rapid	Spray or paste	DOW Corning
Aemasol MO 19 P	Spray or paste	A. C. Matthes
Molykombin UMFT 1	Spray	Klüber Lubrication
Unimoly P 5	Powder	Klüber Lubrication

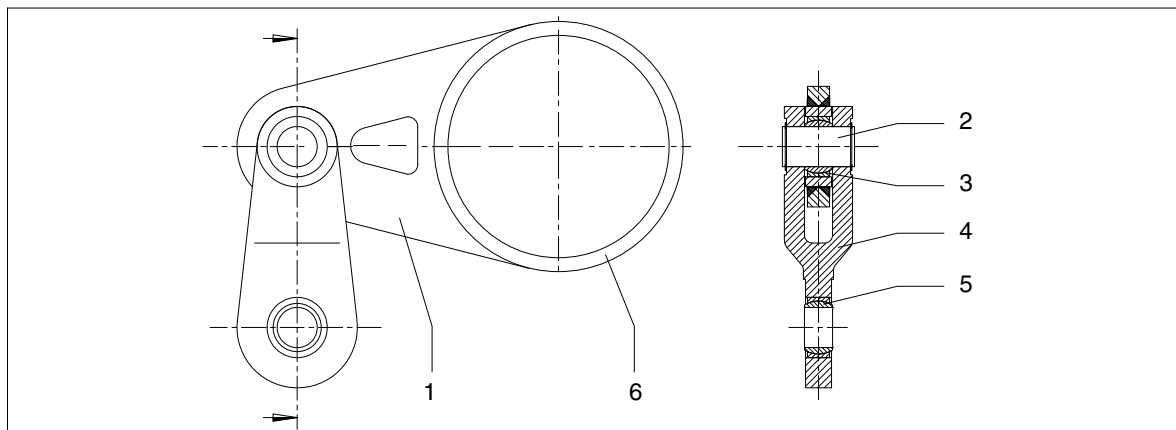
6.5 Fitting a torque arm



For all shaft mounting gear units, the reaction torque corresponding to the torque of the machine and acting in an opposite direction on the housing must be absorbed.

6.5.1 One-sided torque arm

In the case of a one-sided torque arm, a ball and socket joint (see figure 12) or a flexible bush should be provided.



**Fig. 12:** One-sided torque arm

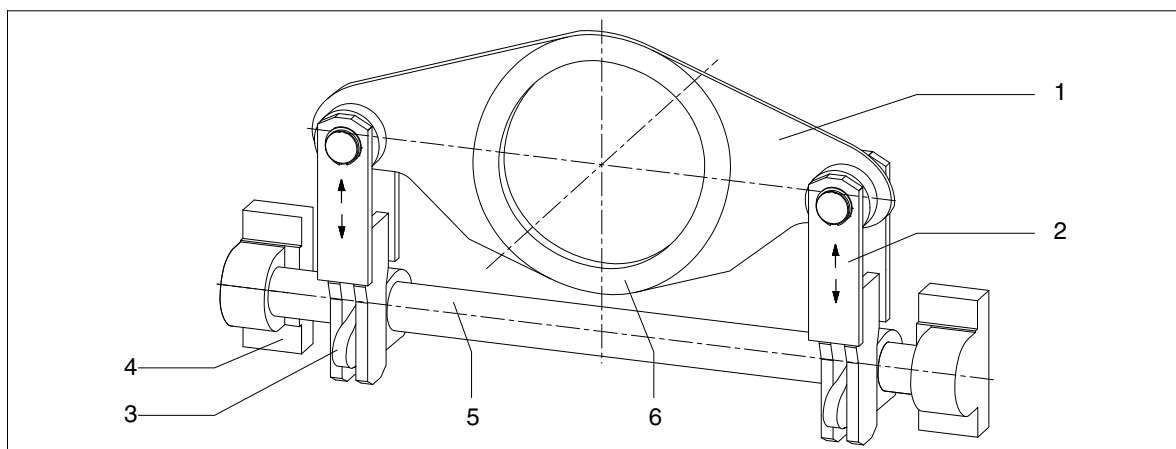
- |   |                      |   |                       |   |                       |
|---|----------------------|---|-----------------------|---|-----------------------|
| 1 | One-sided torque arm | 3 | Ball and socket joint | 5 | Ball and socket joint |
| 2 | Axle                 | 4 | Lever                 | 6 | Gear-unit connection  |

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

6.5.2 Double-sided torque arm

In the case of a double-sided torque arm, if any, the torque is supported by bars and joints on a torsion shaft. The screw-on surface of the torque arm on the gear unit should be treated as described under 6.5.1.

This type of construction ensures that the machine bearings are freed from any shearing forces, except for the weights. Figure 13 shows a possible variant.



**Fig. 13:** Double-sided torque arm

- |   |                         |   |                  |   |                      |
|---|-------------------------|---|------------------|---|----------------------|
| 1 | Double-sided torque arm | 3 | Joint component  | 5 | Torsion shaft        |
| 2 | Bar                     | 4 | Bearing pedestal | 6 | Gear-unit connection |

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

The bearing pedestals may be mounted both to a vertical wall (as illustrated) and on a horizontal foundation.

## 6.6 Gear unit with oil cooling system

The operating instructions for the oil cooling system must be observed.

## 6.7 Final work



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

**In addition, after tightening the fixings a check must be made to see that the alignment has not changed.**

**Check by means of the list of equipment as well as the associated drawings whether all units which may have been removed for transport have been refitted.**

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

**The gear unit must be protected against falling objects.**

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

## 7. Start-up

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

### 7.1 Procedure before start-up



When starting a hydraulic motor, observe the operating instructions for this motor.

#### 7.1.1 Removal of preservative agent

- Unscrew and open oil drain plug and drain remaining preservative agent and/or running-in oil from the housing into a suitable container and dispose of in accordance with regulations. Any residual-oil drain plugs should also be opened. The location of the oil draining point is marked by an appropriate symbol in the dimensioned drawing in the gear-unit documentation.



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

- Screw in the oil drain plug.



**Before start-up, replace the yellow plastic plug with a breather screw with cap (see also notice on gear unit).**



**The oil must not come into contact with the skin (e.g. the operator's hands). The safety notes on the data sheets for the oil used must be observed here!**

## 7.2 Filling with lubricant

- Open oil filler plug.



**Fill the gear unit with fresh oil of the grade specified on the rating plate, using a filter (max. mesh 25 µm).**



The quality of the oil used must meet the requirements of the separately enclosed BA 7300 operating instructions, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in BA 7300, because they have been tested and meet the requirements.

Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit.

The quantity of oil indicated on the rating plate is an approximation only. The actual oil quantity to be put in is shown by the marks on the oil sight glass, on the angular oil level indicator and/or on the oil dipstick.



In the case of gear units with an oil cooling system, the oil circuit should also be filled up. To do so, the gear unit should be started and then run briefly, as described in section 8.

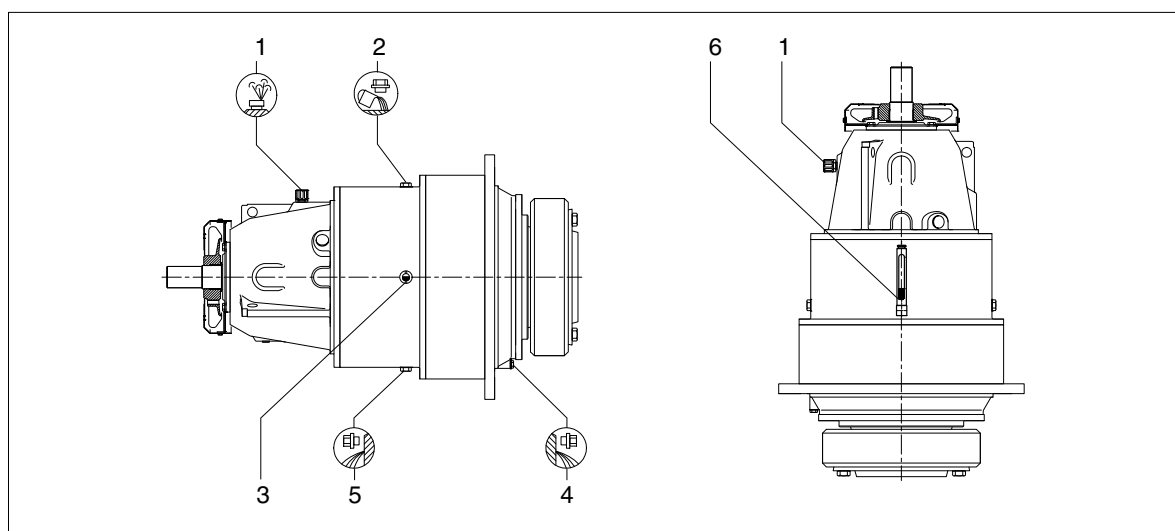
- Check oil level on the oil sight glass, angular oil level indicator and/or oil level dipstick.



The oil level should be up to the middle of the oil sight glass and/or to middle markings on the angular oil level indicator and/or at the upper mark on the oil level dipstick.



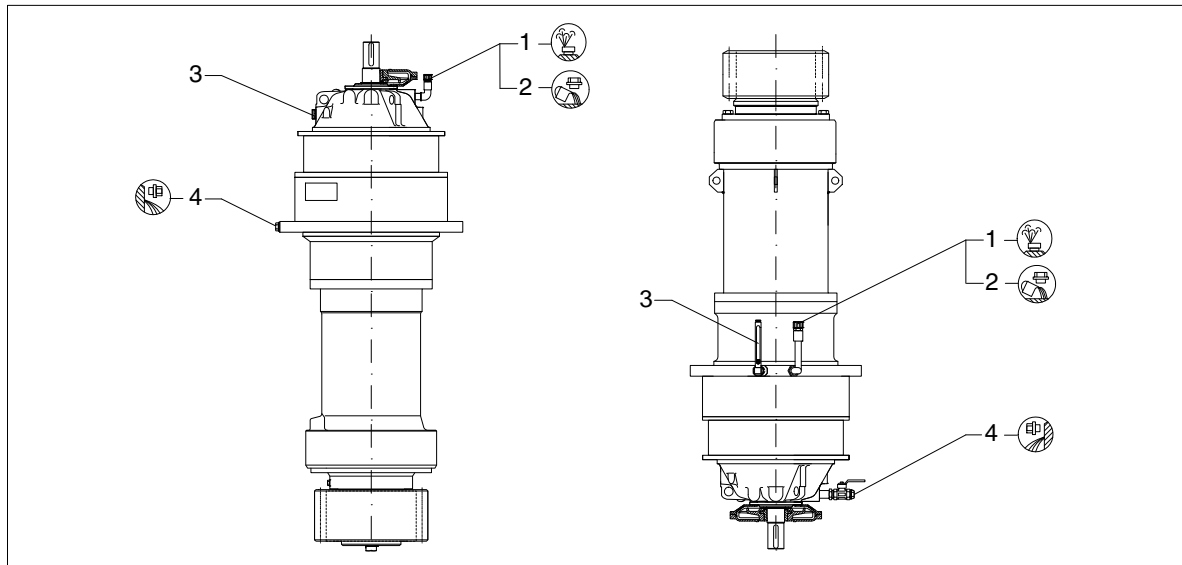
**Remove any oil spillage immediately with an oil-binding agent. The oil must not come into contact with the skin (e.g. the operator's hands). The safety notes on the data sheets for the oil used must be observed here!**



**Fig. 14:** Oil inlet, oil drain, oil level, ventilation and venting on standard design

1	Housing ventilation	3	Oil-sight glass	5	Residual-oil drain
2	Oil filler plug	4	Oil drain	6	Angular oil level indicator/oil level dipstick

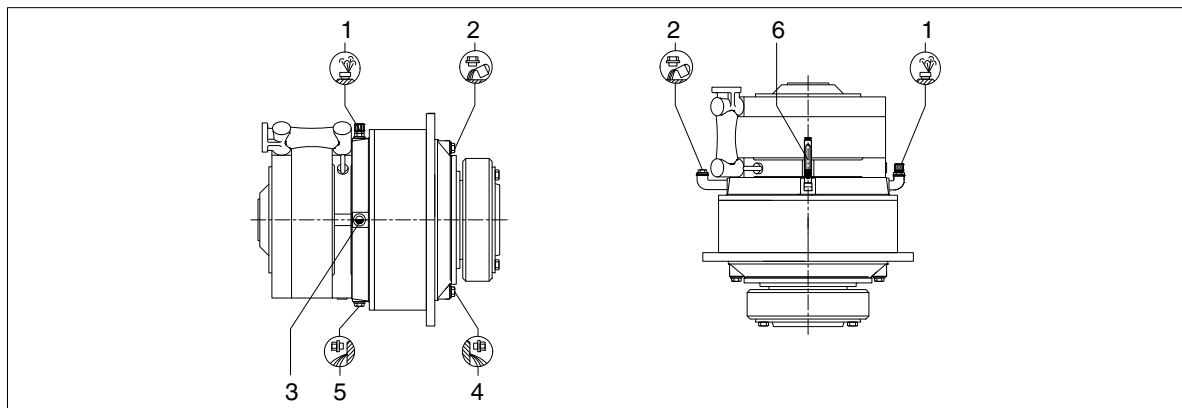
A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.



**Fig. 15:** Oil inlet, oil drain, oil level, ventilation and venting on a planetary slewing gear unit

- |   |                                 |   |  |
|---|---------------------------------|---|--|
| 1 | Housing ventilation and venting | 3 | Oil level sight glass, angular oil-level indicator |
| 2 | Oil filler plug                 | 4 | Oil drain  |

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



**Fig. 16:** Oil inlet, oil drain, oil level, ventilation and venting on a design with a hydraulic motor

- |   |                                 |   |                             |
|---|---------------------------------|---|-----------------------------|
| 1 | Housing ventilation and venting | 4 | Oil drain                   |
| 2 | Oil filler plug                 | 5 | Residual-oil drain          |
| 3 | Oil-sight glass                 | 6 | Angular oil-level indicator |

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

- Screw in oil filler plug.

### 7.3 Gear unit with backstop

Before start-up, check whether the backstop can be turned manually in the free-running direction without exerting undue force. When doing so, note the direction of rotation arrow on the gear unit.



**To prevent damage to or destruction of the backstop, it is essential to ensure that the motor is not run in opposition to the locked backstop. Observe the sign fixed to the gear unit.**

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



## 7.4 Start-up

- Check the oil level in the gear unit.



When the oil has cooled down, the oil level should be up to the middle of the oil sight glass and/or the middle of the marks on the angular oil level indicator and/or at the upper mark on the oil level dipstick. If the oil is hot, the marks may be slightly exceeded. It must in no case be allowed to fall below the mark. If necessary, top up to the correct level.

### **Gear unit with water oil-cooling systems:**

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



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

## 7.5 Removal from service

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



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

- With gear units fitted with water oil-coolers, close the stop valves on the water in- and outflow pipes. To prevent freezing, drain the water from the cooling coil or the water oil-cooler.
- During longer periods of disuse, start the unit up briefly at intervals of approx. 3 weeks. If it is to remain out of service for longer than six months, fill it with preservative agent (see item 7.5.1).

### 7.5.1 Interior preservation during longer disuse

Depending on the type of lubrication and/or shaft sealing, the following types of interior preservative agent can be used.

#### 7.5.1.1 Interior preservation with gear oil

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

#### 7.5.1.2 Interior preservation with preservative agent

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

### **Interior preservation procedure:**

- Switch the gear unit off and drain the oil as described in section 10, "Maintenance and repair".
- Fill with preservative agent according to table 11 or 12 up to the middle of the oil sight glass or up to the mark on the angular oil level indicator.
- Start the gear unit and allow it to idle briefly.
- Unscrew the oil drain plug and allow the preservative to drain into a suitable container and dispose of it according to regulation.



**There is a risk of scalding from the hot preservative agent draining from the gear unit. Wear protective gloves!**

- Screw in the oil drain plug.



**Before re-starting the gear unit replace the screw plug with the breather screw and/or air filter. Observe here also item 7.1.1.**

**Table 11:** Preservation procedure when using mineral oil or PAO-based synthetic oil

Duration of protection	Preservative agent	Special measures
up to 6 months	Castrol Alpha SP 220 S	none
up to 24 months		Close gear unit, replace breather screw and/or air filter with a screw plug (yellow) (replace the original parts before start-up).  Storage in enclosed dry rooms.
For storage periods longer than 24 months, renew the preservative agent. For storage periods longer than 36 months, Siemens should be consulted before.		

**Table 12:** Preservation procedure when using PG-based synthetic oil

Duration of protection	Preservative agent	Special measures
up to 6 months	Special anti-corrosion oil TRIBOL 1390 <sup>1)</sup>	none
up to 36 months		Close gear unit, replace breather screw and/or air filter with a screw plug (yellow) (replace the original parts before start-up).  Storage in enclosed dry rooms.
For storage periods longer than 36 months, Siemens should be consulted before.		

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

#### 7.5.2 Exterior preservation

##### Exterior preservation procedure:

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

**Table 13:** Exterior preservation of shaft ends and other bright machined surfaces

Duration of protection	Preservative agent	Layer thickness	Remarks
up to 36 months	Tectyl 846 K19	approx. 50 µm	Long-term wax-based preservative agent, resistant to sea water and tropical conditions (soluble with CH compounds).  Storage in enclosed dry rooms.

## 8. Operation

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

- During operation the gear unit must be monitored for:
  - Oil temperature (The gear unit is designed for a temperature of **90 °C** with mineral oil in continuous operation. For higher temperatures, synthetic oils must be used. Short-term operating temperatures of **100 °C** are permitted; see also section 10.)
  - Changes in gear noise
  - Possible oil leakage at the housing and shaft seals
  - Correct oil level (see section 7, "Start-up")



To check the oil level, stop operation of the gear unit.

When the oil has cooled down, the oil level should be up to the middle of the oil sight glass and/or the middle of the marks on the angular oil level indicator and/or at the upper mark on the oil level dipstick. If the oil is hot, the marks may be slightly exceeded. It must in no case be allowed to fall below the mark. If necessary, top up to the correct level.



**If any irregularities are noticed during operation or if the pressure monitor in the oil-cooling system (if installed) triggers the alarm, switch the drive unit off at once. Determine the cause of the fault, using the table in section 9.**

**The trouble-shooting table contains a list of possible faults, their causes and suggested remedies.**

**If the cause cannot be identified and/or the unit repaired with the facilities available, you are advised to contact one of our customer-service offices for specialist assistance (see section 11).**

## 9. Faults, causes and remedy

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



For possible faults in the hydraulic motor, refer to the operating instructions for this 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 the case of faults and malfunctions occurring after the guarantee period and whose cause cannot be precisely identified, we advise our customers to contact our customer service.



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



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

### 9.2 Possible faults

**Table 14:** Faults, causes and remedies

Faults	Causes	Remedy
Changes in gear-unit noise.	Damage to gear teeth.	Contact Customer Service. Check all toothed components and replace any damaged parts.
	Excessive bearing play.	Contact Customer Service. Adjust bearing backlash.
	Bearing defective.	Contact Customer Service. Replace defective bearings.
	Labyrinth rings dragging.	Readjust labyrinth rings.
Loud noises in the area of the gear-unit fastening.	Gear-unit fastening has worked loose.	Tighten bolts / nuts to specified torque. Replace damaged bolts / nuts.
Increased temperature at the bearing points.	Oil level in housing too low.	Check oil level at room temperature and, if necessary, top up oil.
	Oil too old.	Check date of last oil change and, if necessary, change oil. See section 10.
	Bearing defective.	Contact Customer Service. Check and, if necessary, replace bearings.
Gear unit is oiled up.	Inadequate sealing of housing covers and/or joints.	Seal joints.
	Labyrinth seals oiled up.	Check oil filling. If necessary, clean labyrinth seals.

Faults	Causes	Remedy
Oil leakage from the gear unit.	<p>Inadequate sealing of housing covers and/or joints.</p> <p>Radial shaft-sealing rings defective.</p>	<p>Check and, if necessary, replace sealings. Seal joints.</p> <p>Check radial shaft-sealing rings and, if necessary, replace.</p>
The oil foams.	<p>Water in oil.</p> <p>Oil too old. (defoaming agent used up)</p> <p>Unsuitable oils mixed up.</p>	<p>Test the oil, change oil if necessary.</p> <p>Test the oil, change oil if necessary.</p> <p>Test the oil, change oil if necessary.</p>
Water in oil.	<p>Oil foams in sump.</p> <p>Defective oil cooler.</p> <p>Gear unit exposed to cold air from machine-room ventilator: Water condensing.</p>	<p>Check state of oil by the test-tube method for water contamination. Have oil analysed by laboratory.</p> <p>Repair or, if necessary, replace oil cooler. Fill with oil, look for and repair any leaks.</p> <p>Protect gear unit with suitable heat insulation. Close air outlet or alter its direction by structural measures.</p>
Increased operating temperature.	<p>Oil level in housing too high.</p> <p>Oil too old.</p> <p>Oil badly contaminated.</p> <p>On gear units with oil-cooling system: Coolant flow too low.</p> <p>Coolant temperature too high.</p> <p>Oil flow through water oil-cooler too low due to: Badly clogged oil filter.</p>	<p>Check oil level and, if necessary, adjust.</p> <p>Check date of last oil change and, if necessary, change oil. See section 10.</p> <p>Change oil. See section 10.</p> <p>Fully open valves in in- and outflow pipes. Check for free flow through water oil-cooler.</p> <p>Check temperature and, if necessary, adjust.</p> <p>Clean the oil filter. See section 10.</p>
Fault in oil-supply system.		Consult operating instructions for oil-supply system.

## 10. Maintenance and repair

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



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

### 10.1 General notes on maintenance

All maintenance and repair work must be done with care and by duly trained and qualified personnel only.

The following applies to all work in item 10.2:



**Switch the gear unit and add-on components off.**

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



**The periods indicated in table 15 depend on the conditions under which the gear unit is operated. Only average periods can therefore be stated here. These refer to:**

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



Under different operating conditions the periods indicated below must be adjusted accordingly.

**Table 15:** Maintenance and repair work

Measures	Periods	Remarks
Check oil temperature	Daily	
Check for unusual gear-unit noise	Daily	
Check oil level	Monthly	Oil level up to the middle of the oil sight glass or up to the middle of the mark on the angular oil level indicator
Check gear unit for leaks	Monthly	
Test oil for water content	After approx. 400 operating hours, once per year at least	see item 10.2.1
First oil change after start-up	After approx. 400 operating hours	see item 10.2.2
Subsequent oil changes	Every 18 months or 5000 operating hours 1)	see item 10.2.2
Clean the breather screw	Every 3 months	see item 10.2.3
Refill Taconite seals with grease	Every 3000 operating hours, every 6 months at least	see item 10.2.4
Clean gear-unit housing	Simultaneously with oil change	see item 10.2.5
Check condition of water oil-cooler	Simultaneously with oil change	see item 10.2.6
Check tightness of fastening bolts	After first oil change, then after every second oil change	see item 10.2.8

Measures	Periods	Remarks
Checking the preservation of the free shaft ends	Every 3 years	see item 7.5.2
Complete inspection of gear unit	Approx. every 2 years simultaneously with due oil change	see item 10.3.1

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

## 10.2 Description of maintenance and repair work

### 10.2.1 Testing water content of oil

For detailed information on testing the oil for water content apply to the lubricant manufacturer.

### 10.2.2 Changing oil

- The instructions in item 7.1 must be observed!
- Close the stop valves in the coolant in- and outflow pipes (for gear units with water oil-cooling system).
- Drain the oil while it is still warm, i.e. immediately after shutting down the machinery.



**When changing the oil, always re-fill the gear unit with the same type of oil. Never mix different types of oil and/or oils made by different manufacturers. If nevertheless a different type of oil is changed to, the gear unit must be flushed through with the new type of oil.**

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

- Place a suitable container under the oil drain plug of the gear-unit housing.
- Unscrew the breather screw on the top of the housing.
- Unscrew the oil drain plug and allow the oil to drain into the container.



**There is a danger of scalding from the hot oil emerging from the housing. Wear protective gloves. Remove any oil spillage immediately with an oil-binding agent.**

- Clean the permanent magnet of the oil drain plug thoroughly.
- Screw in the oil drain plug.



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

- Open oil filler plug.



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

- Fill with lubricant according to item 7.2.

### 10.2.3 Cleaning the breather screw

If a layer of dust has built up, the breather screw must be cleaned, whether or not the minimum period of 3 months has expired. To do this, the breather screw is removed, cleaned with benzine or similar agent and dried, and/or it can be cleaned by blowing out with compressed air.

### 10.2.4 Refilling Taconite seals with grease

- Inject approx. 30 g lithium-based bearing grease (refer to Ident no. H13 in the Siemens BA 7300 operating instructions) into the lubrication points of the Taconite seal. The lubrication points are fitted with flat grease nipples type AM10x1 to DIN 3404.



**Remove and dispose of any old grease escaping.**

### 10.2.5 Cleaning the gear unit

- Remove any dirt adhering to the housing with a hard brush.
- Remove any corrosion.



**To prevent the build-up of dust on the gear unit, cleaning must be done in accordance with operating conditions.**

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

### 10.2.6 Checking the oil cooling system

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



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

### 10.2.7 Topping up oil

- The instructions in item 7.2 must be observed!
- Always top up with the same type of oil as already used in the unit (see also item 10.2.2).

### 10.2.8 Checking tightness of fastening bolts

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

**Table 16:** Tightening torques and initial tensioning forces of the foundation bolts

Thread size	Tightening torque	Initial-tensioning force
M 42	4070 Nm	526000 N
M 48	6140 Nm	693000 N
M 56	9840 Nm	959000 N
M 64	14300 Nm	1268000 N
M 72 x 6	20800 Nm	1600000 N
M 80 x 6	28900 Nm	1950000 N
M 90 x 6	41650 Nm	2550000 N
M 100 x 6	57800 Nm	3200000 N



All other bolts on the gear unit should be checked for tightening torques according to the following table:

**Table 17:** Tightening torques

Thread size	Tightening torque (with $\mu = 0.14$ )		Thread size	Tightening torque (with $\mu = 0.14$ )	
	Strength class			Strength class	
	8.8	10.9		8.8	10.9
M 10	49 Nm	69 Nm	M 36	2530 Nm	3560 Nm
M 12	86 Nm	120 Nm	M 42	4070 Nm	5720 Nm
M 16	210 Nm	295 Nm	M 48	6140 Nm	8640 Nm
M 20	410 Nm	580 Nm	M 56	9840 Nm	13850 Nm
M 24	710 Nm	1000 Nm	M 64	14300 Nm	21000 Nm
M 30	1450 Nm	2000 Nm			



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

### 10.3 Final work

The final work is to be done in accordance with the instructions in item 6.7.

#### 10.3.1 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.

### 10.4 Lubricants

The quality of the oil used must meet the requirements of the separately enclosed BA 7300 operating instructions, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in BA 7300, because they have been tested and meet the requirements.



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

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

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

The manual containing the current lubricants recommended by Siemens can also be consulted on the Internet (see back cover).

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

We recommend regularly checking whether the selected lubricating oil is still recommended by Siemens. If it is not, the brand of oil should be changed.

## 11. Spare parts, customer-service addresses

### 11.1 Stocking spare parts

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

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

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



**We guarantee only the original spare parts supplied by us. Non-original spare parts have not been tested or approved by us. They may alter technical characteristics of the gear unit, thereby posing an active or passive risk to safety. Siemens will assume no liability or guarantee for damage caused by spare parts not supplied by Siemens. The same applies to any accessories not supplied by Siemens.**

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

When ordering spare parts, always state the following:

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

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

## 12. Declarations

### 12.1 Declaration of incorporation

#### Declaration of incorporation

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

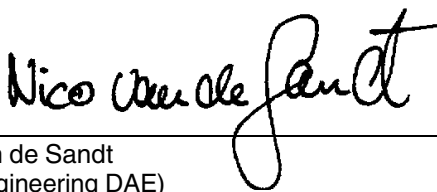
The manufacturer, Siemens AG, 46395 Bocholt, Germany, declares with regard to the partly completed machinery,

#### **Planetary Gear Unit Types PLANUREX P.A, P.S.A, P.B, P.F Sizes 90 to 400**

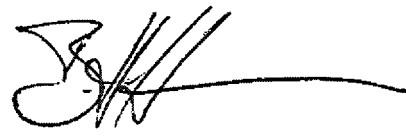
developed for driven machines in the most various industry areas:

- The special technical documents described in Annex VII B have been prepared.
- The following basic health and safety requirements set out in Directive 2006/42/EC, Annex I, are applied and are satisfied:  
1.1, 1.1.2, 1.1.3, 1.1.5; 1.2.4.4, 1.2.6; 1.3.1 - 1.3.4, 1.3.6 - 1.3.8.1; 1.4.1, 1.4.2.1;  
1.5.1 - 1.5.11, 1.5.13, 1.5.15, 1.5.16; 1.6.1 - 1.6.3; 1.7.1, 1.7.1.1, 1.7.2, 1.7.3 - 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 in conformity with the provisions of Directive 2006/42/EC, as appropriate.
- The manufacturer undertakes, in response to a reasoned request by the national authorities, to transmit in electronic form relevant information about the partly completed machinery.
- The person authorised to compile the relevant technical documentation is:  
Dr. Nico van de Sandt (Head of Engineering DAE)

Voerde, 2012-03-15

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

Voerde, 2012-03-15

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

## Further Information:

"FLENDER gear units" on the Internet

[www.siemens.com/gearunits](http://www.siemens.com/gearunits)

"FLENDER couplings" on the Internet

[www.siemens.com/couplings](http://www.siemens.com/couplings)

Service & Support:

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

Lubricants:

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

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Subject to modifications

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