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

Assembly and operating instructions
BA 5091 en 03/2013
SIEMENS

Gear unit

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

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.

<table>
<thead>
<tr>
<th>▼ DANGER ▼</th>
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</thead>
<tbody>
<tr>
<td>means that death or serious injury will result, if the appropriate preventive action is not taken.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>▼ WARNING ▼</th>
</tr>
</thead>
<tbody>
<tr>
<td>means that death or serious injury may result, if the appropriate preventive action is not taken.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>▼ CAUTION ▼</th>
</tr>
</thead>
<tbody>
<tr>
<td>means that a slight injury may result, if the appropriate preventive action is not taken.</td>
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</table>

<table>
<thead>
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<th>▼ NOTICE ▼</th>
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<tbody>
<tr>
<td>means that material damage may result, if the appropriate preventive action is not taken.</td>
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</table>

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:

<table>
<thead>
<tr>
<th>▼ WARNING ▼</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 fault-free, 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.</td>
</tr>
</tbody>
</table>

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".

Earth-connection point

Air-relief point

Yellow

Oil-filling point

Oil-draining point

Yellow, White

Oil level

Oil level

Red

Red

Oil level

Connection for vibration-monitoring device

Red

Lubricating point

Apply grease

Red

Lifting eye

Eye bolt

Do not unscrew

Alignment surface, horizontal

Alignment surface, vertical

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

These symbols indicate that the oil dipstick must always be firmly screwed in.
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1. **Technical data**

1.1 **General technical data**

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

![ATEX Rating plate on gear unit](image)

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

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

*) Example

```
B 3 S V 23
```

- **Size** .................... 23 ... 28
- **Installation** ............ $V = \text{vertical}$
- **Version output shaft** .... $S = \text{Solid shaft}$
- $H = \text{Hollow shaft with parallel keyway}$
- $D = \text{Hollow shaft for shrink disk}$
- $K = \text{Hollow shaft with splines}$
  according to the standard
  "DIN 5480"
- **Number of stages** ....... 2, 3 or 4
- **Gear unit type** .......... $H = \text{Helical gear unit}$
  $B = \text{Bevel-helical gear unit}$
  (3 or 4 stages only)

Data on weights and measuring-surface sound-pressure levels of the various gear unit types are given in items 1.3 and/or 1.4.

For further technical data, refer to the drawings in the gear unit documentation and the order specific data sheet.
1.2 Marking of the gear unit designed in accordance with Directive 94/9/EC

Table 1: ATEX identification for above-ground applications

<table>
<thead>
<tr>
<th>Equipment group</th>
<th>Equipment category</th>
<th>Explosive atmosphere</th>
<th>Explosion group</th>
<th>Temperature class</th>
<th>Identification marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>2, 3</td>
<td>Gas (G)</td>
<td>IIA, IIB, IIC</td>
<td>T3, T4</td>
<td>Ex II G IIA T4 bck Tₐ ⁴)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gas (G) and dust (D)</td>
<td>IIA, IIB, IIC</td>
<td>T3, T4</td>
<td>Ex II G IIA T4 D 120 °C bck Tₐ ⁴)</td>
</tr>
</tbody>
</table>

1) Always **only one** equipment category can be indicated.

2) The explosion groups relate to the gaseous atmosphere (G). Always **only one** explosion group can be indicated.

3) Always **only one** temperature class can be indicated.

4) \( T_{a \text{ min.}} \leq T_a \leq T_{a \text{ max.}} \) = permissible ambient temperature range in °C:
   - \( T_{a \text{ min.}} \) = minimum permissible ambient temperature
   - \( T_{a \text{ max.}} \) = maximum permissible ambient temperature
   - \( T_a \) = symbol for ambient temperature

5) The indications relating to equipment category, explosion group and temperature class are to be understood as an example.

**Note**

The ignition protection type "b" is not available for gear units without electrical explosion hazard monitoring device (e.g. temperature, oil level).

**Note**

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

1.2.1 Ambient temperature

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

**Note**

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

1.3.1 Types

<table>
<thead>
<tr>
<th>H.SV</th>
<th>B.SV</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.HV</td>
<td>B.HV</td>
</tr>
<tr>
<td>H.KV</td>
<td>B.KV</td>
</tr>
<tr>
<td>H.DV</td>
<td>B.DV</td>
</tr>
</tbody>
</table>

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

1.3.2 Weights

**Note**

For the exact weights, refer to the drawings in the gear unit documentation.
1.4 Measuring-surface sound-pressure level

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

The measurement is carried out to 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 m round the gear unit and in the vicinity of which persons may be present.

The sound-pressure level applies to the warmed-up gear unit as well as the 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 flanges are considered the intersection.

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

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

Table 2: Measuring-surface sound-pressure level $L_{pA}$ in dB(A) for bevel-helical gear units with fan

<table>
<thead>
<tr>
<th>Type</th>
<th>$i_N$</th>
<th>$n_1 \text{ 1/min}$</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
<th>28</th>
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<tbody>
<tr>
<td>B3</td>
<td>20</td>
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</table>
### 1.4.2 Measuring-surface sound-pressure level for bevel-helical gear units (B...) without fan

**Table 3:** Measuring-surface sound-pressure level \(L_{PA}\) in dB(A) for bevel-helical gear units without fan

<table>
<thead>
<tr>
<th>Type</th>
<th>(i_N)</th>
<th>(n_1) 1/min</th>
<th>Gear unit size</th>
<th>23</th>
<th>24</th>
<th>25</th>
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1.4.3 Measuring-surface sound-pressure level for helical gear units (H...) with fan

Table 4: Measuring-surface sound-pressure level $L_{pA}$ in dB(A) for helical gear units with fan

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

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

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

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<td>1000</td>
<td>69</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>900</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>750</td>
<td>65</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>1800</td>
<td>-</td>
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<tr>
<td></td>
<td>1500</td>
<td>74</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>1200</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>69</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>900</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>750</td>
<td>65</td>
<td>67</td>
</tr>
</tbody>
</table>

### 1.5 List of equipment

**Note**

All important accessory components are specified in the order-specific equipment list including your technical data.
2. General notes

2.1 Introduction

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

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property damage</td>
</tr>
<tr>
<td>Damage to the gear unit or occurrence of operating failures is possible. All persons carrying out work on the gear unit must have read and understood the instructions and must adhere to them. Siemens accepts no responsibility for damage or disruption caused by disregard of these instructions.</td>
</tr>
</tbody>
</table>

The "FLENDER gear unit" described in these instructions was developed for driving machines that are used in a wide range of industrial sectors. Possible areas of application for gear units of this series are e. g. sewage treatment, the chemicals or food industry, paper machines.

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

The gear unit is manufactured in accordance with the state of the art and is delivered in a condition ready for safe and reliable use. It complies with the requirements in Directive 94/9/EC.

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

The gear unit described in these instructions conforms to 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 service centres:

Siemens AG
Am Industriepark 2
46562 Voerde

Tel.: +49 (0)2871 / 92-0
Fax: +49 (0)2871 / 92-1544
3. Safety instructions

![WARNING]

**Risk of falling**
Serious injury from falling is possible.
The gear unit and its add-on parts must not be accessed.

![WARNING]

**Risk of injury due to changes made on own initiative**
Any changes on the part of the user are not permitted.
This also pertains to the protection equipment that is installed as contact protection.

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 to the user and third parties,
  - ensure the safety and reliability of the unit,
  - avoid disruptions and environmental damage through incorrect use.
- During transport, assembly, installation, demounting, operation and maintenance of the unit, the relevant safety and environmental regulations must be complied with at all times.
- The gear unit may only be operated, maintained and/or repaired by persons qualified for the work concerned (see "Qualified personnel" on page 3 of this manual).
- The outside of the gear unit must not be cleaned with high-pressure cleaning equipment.
- All work must be carried out with great care and with due regard for safety.

![DANGER]

**Danger to life from switched on system**
For carrying out work on the gear unit, the gear unit and a possibly added on or separate oil supply system must generally be shut down.
The drive unit must be secured against accidental start-up (e.g. by locking the key switch or removing the fuses from the power supply).
A notice should be attached to the start switch stating clearly that work is in progress.
At the same time the complete installation must be without load, so that no danger occurs during demounting operations.

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

![DANGER]

**Electrostatic discharge**
Danger to life from ignition of present explosive atmosphere by electrostatic discharge.
A potential equalisation in accordance with the applying regulations and directives must be carried out.
On the gear units threaded holes are available for establishing an earth connection. This work must always be done by **specialist electricians**.
### NOTICE

**Property damage**

Damage to the gear unit is possible. Immediately stop the gear unit by turning off the drive unit when inexplicable changes are noticed during the operation, such as a significantly increased operating temperature or changed sounds of the gear unit.

### DANGER

**Danger to life from rotating and/or moving parts**

Risk of being gripped or drawn in by rotating and/or moving parts. Rotating and/or movable drive 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.

### DANGER

**Explosion hazard**

Danger to life from ignition of present explosive atmosphere by use of unsuitable add-on parts. All add-on parts must satisfy the requirements in Directive 94/9/EC. Simple electrical means (such as monitoring devices, switches, Pt 100 measuring resistance) without identification in accordance with Directive 94/9/EC must be connected intrinsically safe by means of suitable isolation amplifiers.

### DANGER

**Electrostatic discharge**

Danger to life from ignition of present explosive atmosphere by electrostatic discharge. The coating must not carry an electrostatic charge. The operator must ensure that highly effective mechanisms which can set up a charge in the coating are safely avoided.

- Removed safety equipment must be re-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 ones of the same strength class and type.
- Spare parts must be obtained from Siemens (see section 11. “Spare parts, customer service”).
3.2 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:
  - 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.

⚠️ **WARNING**

**Risk of burns**

Serious injury caused by burns on hot surfaces (> 55 °C) is possible. Wear suitable protection gloves and protection clothing.

⚠️ **WARNING**

**Risk caused by low temperatures**

Serious injury from cold damage (pain, numbness, frostbites) on cold surfaces (< 0 °C) is possible. Wear suitable protection gloves and protection clothing.

⚠️ **WARNING**

**Risk of scalding**

Serious injury from discharging hot operating media when these are changed is possible. Wear suitable protection gloves, protection glasses and protection 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.

### Note

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

---

## DANGER

Explosion hazard

Danger to life from ignition of a present explosive atmosphere is possible when carrying out assembly and disassembly works on the gear unit. The gear unit must not be assembled and disassembled in an explosive environment.
4. Transport and storage

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

4.1 Scope of supply

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

⚠️ WARNING

Serious physical injury from defective product
If there is any visible damage, the gear unit must not be put into operation.

4.2 Transport

⚠️ WARNING

Risk of crushing
Risk of being crushed by a transported component when the used lifting gear and load-bearing equipment is not suitable and the component comes loose.
When handling these products, use only lifting and handling equipment of sufficient load-bearing capacity.
Observe the notes regarding load distribution on the packaging.
Transport of the gear unit must be carried out so as to avoid injury to persons and damage to the gear unit.
If, for example, the free shaft ends are knocked, this may damage the gear unit.

The gear unit is delivered in a fully assembled condition. Additional items are delivered separately packaged, if applicable.
Different forms of packaging may be used, depending on the size of the unit and method of transport. Unless agreed otherwise by contract, the packaging complies with the HPE Packaging Guidelines.

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="top.png" alt="Up Arrow" /></td>
<td>Top</td>
</tr>
<tr>
<td><img src="fragile.png" alt="Chalice" /></td>
<td>Fragile</td>
</tr>
<tr>
<td><img src="keep_dry.png" alt="Umbrella" /></td>
<td>Keep dry</td>
</tr>
<tr>
<td><img src="keep_cool.png" alt="Sun" /></td>
<td>Keep cool</td>
</tr>
<tr>
<td><img src="centre_of_gravity.png" alt="Circle" /></td>
<td>Centre of gravity</td>
</tr>
<tr>
<td><img src="use_no_hand_hook.png" alt="X" /></td>
<td>Use no hand hook</td>
</tr>
<tr>
<td><img src="attach_h.png" alt="Oval" /></td>
<td>Attach here</td>
</tr>
</tbody>
</table>

Fig. 3: Transport symbols

Note

The gear unit must be transported only with the appropriate transport equipment. During transport the gear unit should be left without oil filling and on the transport packing.
NOTICE

Property damage

Damage to the gear unit is possible when using the wrong attachment points. Use only the eyes provided to attach lifting equipment to the unit.

Transporting of the gear unit by attaching it to the pipework is not permitted.

The pipework must not be damaged.

Do not use the threads in the front sides of the shaft ends to attach slinging and lifting gear for transport. Slinging and lifting gear must be adequate for the weight of the gear unit.

---

![Fig. 4: Attachment points on gear units of types H..V and B..V](image)

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

---

NOTICE

Property damage

Damage to the eye bolts is possible.

When slinging to eye bolts, no lateral pull must be created counter to the direction of the ring level in order to avoid breakage of the eye bolts.

---

![Fig. 5: Tilted and lateral pull with eye bolts](image)

A  Permitted tilting in the direction of the ring level (angle maximally 45°)

B  Not permitted lateral pull counter to the direction of the ring level
Fig. 6: Attachment points on gear units of type H..V with motor

Fig. 7: Attachment points on gear units of type B..V with motor

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

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

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property damage</td>
</tr>
<tr>
<td>Any damage to the coating may cause failure of the exterior protective coating and 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger to life from gear units toppling or dropping</td>
</tr>
<tr>
<td>Risk of being crushed or struck by a gear unit toppling of falling down. Do not stack gear units on top of one another.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property damage</td>
</tr>
<tr>
<td>Damage to the gear unit by deposit of foreign matter or moisture. If the gear unit is being stored outdoors, 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property damage</td>
</tr>
<tr>
<td>Damage to the gear unit from external effects. Unless agreed otherwise by contract, the gear unit must not be exposed to harmful environmental factors such as chemically aggressive products. Provision for special environmental conditions during transport (e.g., transport by ship) and storage (climate, termites, etc.) must be contractually agreed.</td>
</tr>
</tbody>
</table>
4.4 Standard coating and preservation

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

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

**NOTICE**

<table>
<thead>
<tr>
<th><strong>Property damage</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to the gear unit from corrosion is possible.</td>
</tr>
<tr>
<td>The gear unit is normally delivered completely ready, with a priming and a finish coat.</td>
</tr>
<tr>
<td>Where gear units are delivered with a priming coat only, it is necessary to apply a finish coat in accordance with directives relevant to the specific application.</td>
</tr>
<tr>
<td>The priming coat alone is not suitable to provide sufficient long-term corrosion protection.</td>
</tr>
</tbody>
</table>

**Note**

The coating complies with the requirements for the conductivity of the coating and the limitation of the layer thickness of the applied coating in accordance with standard "DIN EN 13463-1". The permissible maximum coating thickness depends on the indicated explosion group (IIA or IIB or IIC). Where lacquer coatings have a thickness < 200 μm, no electrostatic charge is to be expected.

**DANGER**

<table>
<thead>
<tr>
<th><strong>Electrostatic discharge</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger to life from ignition of present explosive atmosphere by electrostatic discharge.</td>
</tr>
<tr>
<td>The coating must not carry an electrostatic charge.</td>
</tr>
<tr>
<td>The operator must ensure that highly effective mechanisms which can set up a charge in the coating are safely avoided.</td>
</tr>
</tbody>
</table>

**Note**

Examples of highly effective charge-generating mechanisms are:

- the rapid passage of air with high concentration of dust
- the sudden escape of compressed gases containing particles
- other heavy friction action (not manual cleaning or rubbing with cleaning cloths)

**NOTICE**

<table>
<thead>
<tr>
<th><strong>Property damage</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any damage to the coating may cause failure of the exterior protective coating and corrosion.</td>
</tr>
<tr>
<td>Ensure that the coat is not damaged.</td>
</tr>
</tbody>
</table>

**Note**

Unless agreed otherwise by contract, the durability periods of the interior gear unit preservation specified in table 7 or 8 apply, provided the related requirements are adhered to. The durability period for the exterior preservation and the related requirements can be found in table 9.

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

For a storage period deviating from the period indicated in table 7 or 8 and in table 9, the interior preservation and exterior preservation must be checked and repeated if necessary (see items 7.4.1 and 7.4.2).
4.4.1 Interior preservation with preservative agent

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

<table>
<thead>
<tr>
<th>Duration of protection</th>
<th>Preservative agent</th>
<th>Special measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 6 months</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Up to 24 months</td>
<td>Castrol Alpha SP 220 S</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Close all openings on the gear unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Replace the air filter with the screw plug. (Prior to start-up replace screw</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plug with air filter,)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Store in a dry hall.</td>
</tr>
</tbody>
</table>

For storage periods longer than 24 months, renew the preservative agent (see item 4.4.1.1).

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

<table>
<thead>
<tr>
<th>Duration of protection</th>
<th>Preservative agent</th>
<th>Special measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 6 months</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Up to 36 months</td>
<td>Special anti-corrosion oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TRIBOL 1390 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Close all openings on the gear unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Replace the air filter with the screw plug. (Prior to start-up replace screw</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plug with air filter,)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Store in a dry hall.</td>
</tr>
</tbody>
</table>

For storage periods longer than 36 months, renew the preservative agent (see item 4.4.1.1).

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

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

**CAUTION**

**Risk of injury**

Risk of injury to eyes or hands from chemically aggressive operating substances. Wear suitable protection glasses and protection gloves. Any oil spillage must be removed immediately with a binding agent to avoid any hazard to the environment.

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

- Unscrew and remove the oil filler plug (screw plug or oil dipstick) (see figures 8 to 11, part no.: 17).
- Place a suitable container under the oil-draining point, part 8, of the gear unit housing.
- Unscrew the oil drain plug and/or open the oil drain cock and drain the used preservation oil into a suitable container.
- Dispose of the residual preservative oil in accordance with regulations.
- Close the oil drain cock and/or screw in the oil drain plug.
- Fill the gear unit with "Castrol Alpha SP 220 S". Establish the filling quantity in accordance with the gear unit dimensions: Length x width x height x 0.05.

### NOTICE

**Property damage**

Corrosion is possible when using the wrong preservative. Use the special "Castrol Alpha SP 220 S" oil with extra corrosion protection (addition "S").

- Screw oil filling screw (screw plug or oil dipstick) back in and tighten.

### NOTICE

**Property damage**

Corrosion is possible when the gear unit is opened for too long. Close the gear unit airtight again at the latest one hour after opening.

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

### NOTICE

**Property damage**

Damage to the gear unit possible from inadequate lubrication due to mixing of preservative and operating oil.

If the gear unit is to be filled with a PG-based synthetic operating oil after preservation, the gear unit must be thoroughly flushed out with operating oil after draining the preservative oil and before the start-up (for this see item 10.2.2). The flushing oil must not be used for operation of the unit.

### 4.4.2 Exterior preservation

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

<table>
<thead>
<tr>
<th>Duration of protection</th>
<th>Preservative agent</th>
<th>Layer thickness</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| with indoor storage up to 36 months ¹) | Tectyl 846 K19 | approx. 50 μm | Long-term wax-based preservative agent:  
- resistant to sea water  
- resistant to tropical conditions  
- soluble with CH compounds |
| with 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 outdoors, 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 interior and exterior preservation treatment is described in section 7. (see items 7.4.1 and 7.4.2.1).

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

In case of storage periods exceeding the periods specified in table 9 the exterior of the gear unit must be re-preserved using the preservative agent shown in table 9.
5. Technical description

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

5.1 General description

The gear unit described is a "FLENDER gear unit" which was developed for driving machines that are used in the wide range of industrial sectors.

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

**NOTICE**

**Property damage**

Destruction of the gear unit or gear unit parts from wrong rotation direction is possible.
The gear unit can be operated in both directions of rotation.

Different shaft configurations (types and rotation directions) are possible, which are shown schematically as a solid shaft in the following: The arrows with the direction of rotation show the correlation between the directions of rotation of the input and output shafts.

**Table 10:** Versions and directions of rotation

<table>
<thead>
<tr>
<th>Type</th>
<th>Version</th>
<th>Type</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2SV</td>
<td>A</td>
<td>H2DV</td>
<td>B</td>
</tr>
<tr>
<td>H2KV</td>
<td>C</td>
<td>H3SV</td>
<td>D</td>
</tr>
<tr>
<td>H2HV</td>
<td>E</td>
<td>H3HV</td>
<td>F</td>
</tr>
<tr>
<td>H2DV</td>
<td>G</td>
<td>H3DV</td>
<td>H</td>
</tr>
<tr>
<td>H3DV</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3HV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3SV</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

Preferably the following two versions are applied:

- Version with oil compensating tank (see figures 8 and 10)
- Version with add-on oil-supply system (see figures 9 and 11)
- Separate or external oil-supply system (mounted separately, see item 5.8.5).
5.1.1 Basic type

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

Fig. 8: Gear unit features on gear units type H..V with oil compensating tank

Fig. 9: Gear unit features on gear units type H..V with add-on oil-supply system

1 Housing
2 Lifting eye
3 Cover
4 Cover
5 Shaft seal
6 Oil level indicator / Oil dipstick / Oil sight glass
7 Housing supply and exhaust ventilation
8 Oil drain plug
9 Cover or bearing journal
10 Rating plate
11 Gear unit fastening
14 Oil compensating tank (splash lubrication)
15 Flanged-on pump (option)
16 Motor pump (option)
17 Oil inlet
18 Inspection and/or assembly cover
Fig. 10: Gear unit features on gear units type B..V with oil compensating tank

Fig. 11: Gear unit features on gear units type B..V with add-on oil-supply system

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

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

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

The output shaft rotates in an oil retaining pipe (see item 5.7.5). This prevents gear oil from escaping at the shaft end. The oil is supplied through a flanged-on oil pump or motor pump.

![Diagram of Aerator gear unit of type H.BV](image1)

**Fig. 12:** Aerator gear unit of type H.BV

![Diagram of Aerator gear unit of type B.BV](image2)

**Fig. 13:** Aerator gear unit of type B.BV

1. Housing
2. Lifting eye
3. Cover
4. Shaft seal
5. Oil dipstick
6. Oil inlet
7. Housing supply and exhaust ventilation
8. Oil drain plug
9. Bearing journal
10. Rating plate
11. Gear unit fastening
12. Motor bell housing
13. Lubrication point
14. Inspection and/or assembly cover
15. Flanged-on pump (option)
16. Motor pump (option)
17. Oil inlet
18. Coupling flange

A detailed view of the gear unit can be obtained from the drawings in the gear unit documentation.
5.1.3 Gear unit with mounting flange

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

![Diagram of gear unit with mounting flange](image)

**Fig. 14:** Gear unit with mounting flange (e.g. H3SV with oil compensating tank)

1. Housing
2. Lifting eye
3. Cover
4. Mounting flange
5. Shaft seal
6. Oil dipstick
7. Housing supply and exhaust ventilation
8. Oil drain plug
9. Bearing journal
10. Rating plate
11. Gear unit fastening
12. Inspection and/or assembly cover
13. Oil compensating tank (splash lubrication)
14. Oil compensating tank
15. Oil inlet

A detailed view of the gear unit can be obtained from the drawings in the gear unit documentation.
5.1.4 Gear unit with coupling flange on output side

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

![Gear unit with coupling flange on output side]

**Fig. 15:** Gear unit with coupling flange on output side

- 1 Housing
- 2 Lifting eye
- 3 Cover
- 4 Cover
- 5 Shaft seal
- 6 Oil dipstick
- 7 Housing supply and exhaust ventilation
- 8 Oil drain cock
- 9 Cover
- 10 Rating plate
- 11 Gear unit fastening
- 12 Motor bell housing
- 13 Coupling flange
- 14 Motor pump

A detailed view of the gear unit can be obtained from the drawings in the gear unit documentation.
5.2 Output versions

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

Fig. 16: Output versions

1) Variant with mounting flange
2) Variant with block flange

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

1) H.SV
2) H.HV

1) Variant with mounting flange
2) Variant with block flange

S Solid shaft
H Hollow shaft with parallel keyway

Fig. 17: Drive models for agitator drives of the type H..V
5.3 Housing

The housing is made of cast iron; if necessary, it may also be made of steel.

The housing is in two sections. It is of torsionally rigid design and due to its shape imparts very favourable noise and temperature characteristics.

The gear unit housing comes with the following equipment:
- Lifting eyes (adequately dimensioned for transport).
- Inspection and/or assembly cover (for inspection).
- Oil filler plug (for oil filling point).
- Oil sight glass, oil indicator with MIN and MAX marking or oil dipstick with MIN and MAX marking (for oil level check).
- Oil drain plug and/or oil drain cock (to drain the oil).
- Air filter (for aerating and venting).

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

<table>
<thead>
<tr>
<th></th>
<th>Air relief point</th>
<th>Oil-draining point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour code</td>
<td>yellow</td>
<td>white</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Oil-filling point</th>
<th>Lubricating point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour code</td>
<td>yellow</td>
<td>red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Oil level</th>
<th>Oil level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour code</td>
<td>red</td>
<td>red</td>
</tr>
</tbody>
</table>

5.4 Toothed components

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

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

5.5.1 Splash lubrication

When installed vertically, all teeth and bearings are submerged in oil. The space required for expansion of the oil is provided by an oil compensating tank bolted-on (see figures 8 and 10 in item 5.1.1).

5.5.2 Force-feed lubrication

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

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

**Note**

The flow direction of the pump used is dependent on the direction of rotation, unless it is specified otherwise in the documentation. When connecting the fittings, the actual flow direction must be observed however.

---

**Fig. 18:** Add-on oil-supply system with flanged-on pump in case of type H..V

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

1. Flange pump
2. Pressure monitor
3. Double change-over filter

A detailed view of the gear unit can be obtained from the drawings in the gear unit documentation.
Depending on the order specification and application, the flanged pump may be replaced with a motor pump.

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

1 Flange pump  
2 Pressure monitor  
3 Double change-over filter

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

The following configurations are possible:

– Add-on oil-supply system (fixed to the gear unit, see item 5.8.4)
– Separate or external oil-supply system (fitted separately, see item 5.8.5).

**Note**

For gear units with oil-supply system, all monitors must be connected so as to be ready for operation before starting up.

**Note**

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

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

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

5.6 Shaft bearings

All shafts are fitted in rolling bearings.
5.7 Shaft seal
Radial shaft-sealing rings, Taconite, Tacolab or special seals (oil retaining pipe, centrifugal disk) at the
shaft outlets prevent oil from escaping from, and dirt from entering into the gear unit.

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

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property damage</td>
</tr>
<tr>
<td>Destruction of the radial shaft sealing ring caused by high dust concentrations is possible.</td>
</tr>
<tr>
<td>Radial shaft sealing ring is not to be used in high concentrations of dust.</td>
</tr>
</tbody>
</table>

For special mounting positions the radial shaft-sealing ring is used with a grease filling in combination with
a ring.
In addition, the radial shaft sealing ring may be equipped with a protection against dry running on the input
shaft (see item 5.7.2).
If there are large quantities of dust, use is only permitted in combination with the Taconite seal as specified
by the requirements in Directive 94/9/EC (see item 5.7.3).

![Fig. 22: Radial shaft-sealing ring](image)

5.7.2 Protection against dry running
In order to safely avoid dry running of the shaft-sealing ring arranged at the top, a grease filling (4) and a
ring (3) are provided above the shaft sealing ring (2). In such case, a shaft-sealing ring with no additional
dust lip is applied. The ring (3) is fitted with a set screw (1) on the input shaft and prevents grease from
escaping upwards. The ring (3) rotates contactless in the housing cover, during operation.

![Fig. 23: Protection against dry running](image)

1  Set screw
2  Radial shaft sealing ring
3  Ring
4  Grease filling
5.7.3 Taconite seal

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

Fig. 24: 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"

Taconite seals are divided into the following type variants:

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

1 Output
2 Taconite "F-F"
3 Taconite "F-H"
4 Taconite "F-K"
Table 11: Variant description Taconite seal

<table>
<thead>
<tr>
<th>Variants of the Taconite seals</th>
<th>Application</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;E&quot;</td>
<td>All input shafts with or without fan</td>
<td></td>
</tr>
<tr>
<td>&quot;F&quot;</td>
<td>Output shaft Type S: (solid shaft)</td>
<td>Re-chargeable labyrinth</td>
</tr>
<tr>
<td>&quot;F-F&quot;</td>
<td>Output shaft Type H: (hollow shaft with parallel keyway) Type K: (hollow shaft with internal spline to standard &quot;DIN 5480&quot;) Type D (hollow shaft with shrink disk)</td>
<td>Labyrinth re-chargeable on both sides, incl. non-dustproof cowl to prevent contact on gear unit side facing away from output</td>
</tr>
<tr>
<td>&quot;F-H&quot;</td>
<td>Output shaft Type H: (hollow shaft with parallel keyway) Type K: (hollow shaft with internal spline to standard &quot;DIN 5480&quot;)</td>
<td>Labyrinth re-chargeable on output side; dust-proof cowl on opposite side</td>
</tr>
<tr>
<td>&quot;F-K&quot;</td>
<td>Output shaft Type D: (hollow shaft for shrink disk)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTICE**

Property damage

Leakages of the gear unit caused by absent sealing is possible. For re-charging the labyrinth seals with grease, the specified intervals for renewal of the lubrication must be observed (see table 19 in item10.1).

5.7.4 Centrifugal disk

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

![Centrifugal disk](image)

**Fig. 26:** Centrifugal disk on output side

1 Centrifugal disk
5.7.5 Oil retaining pipe

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

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

**NOTICE**

**Property damage**

Damage to the bottom bearing is possible from inadequate lubrication. For refilling grease in the lower bearing, the specified frequencies must be observed (see section 7. "Start-up" and table 19 in section 10. "Maintenance and repair").

---

**Fig. 27: Oil retaining pipe**

1 Oil retaining pipe 2 Lubrication point

5.8 Cooling

As needed the gear unit is fitted with a fan, a cooling coil, a water-oil cooler, an air-oil cooler, a separately provided or external oil-supply system. If a separately provided or external oil-supply system is used, the specific instructions for this oil-supply system must also be observed.

**Note**

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

**Note**

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

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

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

![Diagram of a fan on a gear unit]

**Fig. 28:** Fan on gear unit of type B..V

1. Fan
2. Air-guide cover

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

**NOTICE**

**Property damage**

Overheating of the drive unit is possible by inadequate air supply. For gear units fitted with a fan, sufficient space must be allowed as suction opening for cooling air intake when mounting the safety guards for the coupling or similar. The correct distance is given in the dimensioned drawing in the gear unit documentation. It must be ensured that the air-guide cover is correctly fastened. The air-guide cover must be protected against damage from outside. The fan must not come into contact with the air-guide cover.

**NOTICE**

**Property damage**

Overheating of the gear unit by a dirt layer with insulating effect on the gear unit or by soiled fan is possible. The cooling effect is considerably reduced if the the fan or the housing surface is soiled. Observe the information on cleaning contained in section 10. "Maintenance and repair".
5.8.2 Cooling coil

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

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

![Diagram of cooling coil on gear units of types H..V and B..V](image)

**Fig. 29:** Cooling coil on gear units of types H..V and B..V (only with a compensating tank, see figures 8 and 10 in item 5.1.1)

1. Cooling-water flow regulator
2. Reducer screw
3. Output shaft

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

**Note**

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

**NOTICE**

**Property damage**

Damage to the cooling coil is possible.

The pressure of the cooling water must not exceed 8 bar. The ends of the cooling coil must not be twisted and the reducer screws must not be tightened or removed.

When there is a risk that the cooling water will freeze the cooling water must be drained and the residual water must be blown out with pressurised air.

The water can flow through the gear unit in either direction.

In order to prevent an excessive water pressure on the cooling water inlet, a suitable cooling water control must be applied (e. g. by means of a pressure reducer or an appropriate locking valve).

**WARNING**

**Risk of injury to the eyes from pressurised air**

Residual water and/or dirt particles can injure the eyes.

Wear suitable protective glasses.
Note
For connection dimensions, refer to the dimensioned drawing of the gear unit. The required cooling-water quantity and the maximum permissible inlet temperature are given on the data sheet and/or the list of equipment.
A detailed view of the gear unit can be obtained from the drawings in the gear unit documentation.

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

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

The air-oil cooler is designed to cool the gear oil by means of air from the surrounding atmosphere. The oil is led through the cooler in one or several flows, depending on the volume flow, while passing by the ambient air supplied by the ventilator. For cold starts, a bypass pipe with a temperature-control valve is provided for.

Minimum components:
- one air-oil cooler
- a flanged-on or motor pump
- a double change-over filter
- one pressure-monitoring device
- one temperature-control valve
- pipework

Note
The operation is monitored by a temperature monitor in the oil sump or by a pressure monitor. For control information, refer to the list of equipment.
The operating instructions for the device must be observed.

Note
The flow direction of the pump used is dependent on the direction of rotation, unless it is specified otherwise in the documentation.
When connecting the fittings, the actual flow direction must however be observed.
Fig. 30: Air-oil cooling system on gear unit of type H2.V

Fig. 31: Air-oil cooling system on gear unit of type B3.V

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flanged-on or motor pump</td>
</tr>
<tr>
<td>2</td>
<td>Pressure monitor</td>
</tr>
<tr>
<td>3</td>
<td>Double change-over filter</td>
</tr>
<tr>
<td>4</td>
<td>Air-oil cooler</td>
</tr>
<tr>
<td>5</td>
<td>Temperature control valve</td>
</tr>
</tbody>
</table>

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

**NOTICE**

<table>
<thead>
<tr>
<th>Property damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overheating of the drive unit is possible by inadequate air supply.</td>
</tr>
<tr>
<td>When installing the gear unit with an add-on air-oil cooler, it must be ensured that the air circulation is not obstructed.</td>
</tr>
<tr>
<td>The required minimum distance from adjacent components, such as walls, is indicated on the drawings in the gear unit documentation.</td>
</tr>
<tr>
<td>Added on pressure monitors must be connected according to the documentation.</td>
</tr>
<tr>
<td>The cooling effect is considerably reduced if the cooler and housing surface is dirty (observe section 10. &quot;Maintenance and repair&quot;).</td>
</tr>
</tbody>
</table>

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

**Note**

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

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

**NOTICE**

<table>
<thead>
<tr>
<th>Property damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overheating of the gear unit caused by a dirt layer with insulating effect on the gear unit or by soiled cooler is possible.</td>
</tr>
<tr>
<td>The cooling effect is considerably reduced if the cooler and/or the housing surface are soiled.</td>
</tr>
<tr>
<td>Observe the information on cleaning contained in section 10. &quot;Maintenance and repair&quot;.</td>
</tr>
</tbody>
</table>
5.8.3.1 Air-oil cooler

The air-oil cooler is suitable for cooling oils. The cooling medium used is air.

**Note**

For the connection dimensions, refer to the dimensioned drawings of the gear unit.

5.8.3.2 Pump

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

5.8.3.3 Filter

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

5.8.3.4 Pressure monitor

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

**Note**

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

5.8.3.5 Temperature-control valve

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

**Note**

Observe the operating instructions of the temperature control valve for operation and maintenance. For technical data, refer to the data sheet and/or the list of equipment.
5.8.4 Add-on oil-supply system with water-oil cooler

An oil supply system with water-oil cooler may be used for types H2.. and B3.., depending on the order. This is permanently attached to the gear unit.

Components:

- one water-oil cooler
- a flanged-on or motor pump
- a double change-over filter
- pressure monitor
- pipework

Note

The operation is monitored by a temperature monitor in the oil sump or by a pressure monitor. For control information, refer to the list of equipment. The operating instructions for the device must be observed.

Note

The flow direction of the pump used is dependent on the direction of rotation, unless it is specified otherwise in the documentation. When connecting the fittings, the actual flow direction must however be observed.

Note

The required cooling water connection must be provided by the customer.

---

Fig. 32: Water oil-cooling system on gear unit of type H2.V

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flanged-on or motor pump</td>
</tr>
<tr>
<td>2</td>
<td>Pressure monitor</td>
</tr>
<tr>
<td>3</td>
<td>Double change-over filter</td>
</tr>
<tr>
<td>4</td>
<td>Water-oil cooler</td>
</tr>
<tr>
<td>5</td>
<td>Cooling water in- and outlet</td>
</tr>
</tbody>
</table>
Fig. 33: Water oil-cooling system on gear unit of type B3.V

1 Flanged-on or motor pump
2 Pressure monitor
3 Double change-over filter
4 Water-oil cooler
5 Cooling water in- and outlet

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

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

**NOTICE**

**Property damage**

Overheating of the gear unit caused by the wrong flow direction of the water-oil cooler is possible. 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.

When there is a risk that the cooling water will freeze the cooling water must be drained and the residual water must be blown out with pressurised air.

Added on pressure monitors must be connected according to the order-specific documentation.

**WARNING**

**Risk of injury to the eyes from pressurised air**

Residual water and/or dirt particles can injure the eyes. Wear suitable protective glasses.

**Note**

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

For technical data, refer to the data sheet and/or the list of equipment.
5.8.4.1 Water-oil cooler
The water-oil coolers are suitable for cooling oil. The cooling medium used is water.

**Note**
For the connection dimensions, refer to the dimensioned drawings of the gear unit. The required cooling-water quantity and the maximum permissible inlet temperature are given on the data sheet and/or the list of equipment.

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

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

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

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

5.8.5 Separate or external oil-supply system
It is possible to use an oil-supply system which is separately supplied by Siemens or an external system to ensure cooling of the oil.

**Note**
Observe the operating instructions of the oil-supply system including all components for operation and maintenance of the oil-supply system. For technical data, refer to the data sheet and/or the list of equipment.

5.9 Couplings
As a rule, flexible couplings or safety couplings are used for driving the gear unit.
If rigid couplings or other in- and/or output elements, which create additional radial and/or axial forces, (e. g. gear wheels, hydraulic couplings) are to be used, this must be agreed by contract.
5.10 Heating

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

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

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

---

**Fig. 34:** Heating on gear unit with oil compensating tank of types H..V and B..V

1 Heating rod 2 Temperature monitor

**Fig. 35:** Heating on gear unit without oil compensating tank of types H..V and B..V

1 Heating rod 2 Temperature monitor

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

---

**DANGER**

Explosion and fire hazard

Fire hazard or ignition of an explosive atmosphere by exposed heating rods is possible. Never switch on the heating elements, unless complete immersion of the heating element in the oil bath is ensured. If heating rods are retrofitted, the maximum heating capacity (see table 12) on the outer surface of the heating rods must not be exceeded.
**Table 12**: Specific heating capacity $P_{Ho}$ as a function of the ambient temperature

<table>
<thead>
<tr>
<th>$P_{Ho}$ (W/cm²)</th>
<th>Ambient temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>+10 to 0</td>
</tr>
<tr>
<td>0.8</td>
<td>0 to -25</td>
</tr>
<tr>
<td>0.7</td>
<td>-25 to -50</td>
</tr>
</tbody>
</table>

**Note**

For operation and maintenance the operating instructions provided specifically for the order must be observed. For technical data, refer to the list of equipment.

5.10.1 Oil-level monitoring of the heating elements

The gear unit is moreover equipped with an oil-level monitoring system. This monitoring system checks the oil level in the gear unit (minimum oil level for immersion of the heating rods).

The "Oil level too low" signal must be wired so that, when the signal is given, the heating elements are switched off. This ensures that the heating elements are not operated, if not completely immersed.

**DANGER**

Explosion and fire hazard

Fire hazard or ignition of an explosive atmosphere by exposed heating elements is possible. Never switch on the heating elements, unless complete immersion of the heating element in the oil bath is ensured. If heating rods are retrofitted, the maximum heating capacity (see table 12) on the outer surface of the heating rods must not be exceeded.

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

**Note**

Be sure to observe the operating instructions of the oil-level monitoring device for operation and maintenance. For technical data and control information, refer to the data sheet prepared specially for the order or the equipment list.

5.11 Indication of oil level

The gear unit is fitted with an oil level indicator (oil sight glass, oil level indicator with MIN and MAX marking, or oil dipstick with MIN and MAX marking) for a visual check of the oil level in standstill. The check of the oil level can be carried out on the oil sight glass or the oil level indicator, or the oil dipstick when the oil has cooled down.

A detailed view of the gear unit can be obtained from the drawings in the gear unit documentation.
5.12 Oil-temperature monitoring system

The gear unit is fitted with a Pt 100 resistance thermometer for measuring the oil temperature in the oil sump. In order to measure the temperatures and/or temperature differences, the Pt 100 resistance thermometer, which complies with the requirements of Directive 94/9/EC, must be connected to a suitable analysis instrument provided by the customer. A two-wire circuit is provided by the manufacturer. However, the customer may fit his own three- or four-wire circuit if required.

**Note**

For control information, refer to the list of equipment. The operating instructions for the device must be observed.

![Fig. 36: Oil-temperature measurement on gear unit of types H..V and B..V](image)

1. Resistance thermometer Pt 100

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

**Note**

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

5.13 Oil-level monitoring system

The gear unit can be fitted with an oil-level monitor by means of a filling-level limit switch. The oil-level monitoring device has been designed for checking the oil level when the gear unit is at a standstill, prior to operating start.

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

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

**Note**

For operation and maintenance, the operating manuals in the order-specific annex must be observed. For technical data and control information, refer to the list of equipment prepared specifically for the order.
5.14 Bearing-monitoring system

5.14.1 Bearing monitoring by Pt 100 resistance thermometer

The gear unit can be fitted with a Pt 100 resistance thermometer for measuring the oil temperature in the oil sump. In order to measure the temperatures or temperature differences, the Pt 100 resistance thermometer have to be connected to a suitable instrument provided by the customer. The resistance thermometers have a connection head for the wiring. A two-wire circuit is provided by the manufacturer. However, the customer may also fit a three- or four-wire circuit.

**Note**

For control information, refer to the list of equipment.
The operating instructions for the device must be observed.

---

**Fig. 37:** Bearing monitoring by Pt 100 resistance thermometer on gear units type H2.V

1  Resistance thermometer Pt 100
Fig. 38: Bearing monitoring by Pt 100 resistance thermometer on gear units type B3.V

1 Resistance thermometer Pt 100

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

**Note**

For operation and maintenance, the operating manuals in the order-specific annex must be observed. For technical data, refer to the order-specific list of equipment.
5.14.2 Bearing monitoring by shock-pulse transducer

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

**Fig. 39:** Bearing monitoring by shock-pulse transducer on gear units type H2.V

1  Shock-pulse transducer
**Fig. 40:** Bearing monitoring by shock-pulse transducer on gear units type B3.V

1 Shock-pulse transducer

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

The gear unit can have been provided with threaded bores, suitable for receiving accelerometers. Depending on variant type these threaded bores are provided with thread M6 or M8 (see figures 41 and 42).

Fig. 41: Accelerometer complete ("A") and thread connection ("B") for variants 1 to 4

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

Fig. 42: Accelerometer complete ("C") and thread connection ("D") for variants 5A and 5B

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

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

An incremental speed transmitter may be fitted. The wiring and the required analysis instrument have to be provided by the customer.

**Fig. 43:** Speed-monitoring device

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

**Note**

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

A detailed view of the gear unit can be obtained from the drawings in the gear unit documentation.
6. **Fitting**

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

<table>
<thead>
<tr>
<th>Ex</th>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explosion hazard</td>
</tr>
<tr>
<td></td>
<td>Danger to life from ignition of a present explosive atmosphere is possible when carrying out assembly works on the gear unit. The gear unit must not be installed whilst the environment is explosive.</td>
</tr>
</tbody>
</table>

6.1 **General assembly information**

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

Assembly requires greatest care and may only be performed by qualified personnel (see "Qualified personnel" on page 3 of these Instructions). The manufacturer cannot be held liable for damage caused by incorrect assembly and installation.

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

**Note**

Free convection through the surface of the housing must be ensured by suitable measures. If the gear unit is fitted with a fan, there sufficient space for air intake should be ensured. Adequate lifting equipment must be available before beginning the fitting work.

<table>
<thead>
<tr>
<th>Ex</th>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explosion hazard</td>
</tr>
<tr>
<td></td>
<td>Danger to life is possible from overheating of the gear unit due to external influences and thereby ignition of explosive atmosphere. Heating up due to exposure to external influences, such as direct exposure to the sun and other heat sources is not permissible and has to be prevented by suitable measures. This can be ensured as follows: - fitting a sunshade roof or - fitting an additional cooling unit or - by a temperature monitoring device in the oil sump with a shut-off function. The ambient temperature range indicated on the rating plate must be adhered to.</td>
</tr>
</tbody>
</table>

**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

Property damage
Damage to the gear unit by objects falling down, heaping over, welding work or inadequate fastening.
The operator must ensure the following:
- The gear unit must be protected against objects falling down and heaping over.
- No welding work must be done at all on the drive.
- The gear unit must not be used as an earthing point for electrical welding work.
- All fastening points provided by the design of the unit must be used.
- Access openings are shown in the drawings of the gear unit documentation.
- The works relating to assembly and disassembly of screws that have become useless must be replaced by new screws of the same tightness class and model.

NOTICE

Property damage
Damage to the gear unit is possible when using the wrong attachment points. Use only the eyes provided to attach lifting equipment to the unit. (see section 4. "Transport and storage")

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

6.2 Unpacking

NOTICE

Property damage
Damage to the gear unit from corrosion is possible.
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 physical injury from 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 on a housing base

6.3.1 Foundation

**NOTICE**

**Property damage**

Damage from absent stability of the gear unit is possible. The foundation must be horizontal and level. The gear unit must not be excessively stressed when tensioning the fastening bolts.

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

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

**NOTICE**

**Property damage**

Damage from absent stability of the gear unit is possible. Fastening bolts and nuts must be tightened to the prescribed tightening torque. For the correct tightening torque refer to item 6.23. Bolts of the minimum strength class 8.8 must be used.

If external forces are acting on the gear unit, it is necessary to prevent the unit from shifting by means of lateral stops.

**Note**

For dimensions, space requirement and arrangement of supply connections, refer to the drawings in the gear unit documentation.
6.3.2 Description of assembly work

<table>
<thead>
<tr>
<th><strong>DANGER</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explosion hazard</strong></td>
</tr>
<tr>
<td>Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work. The gear unit must not be cleaned in an explosive atmosphere. Observe the following:</td>
</tr>
<tr>
<td>- Ensure adequate ventilation.</td>
</tr>
<tr>
<td>- Do not smoke.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th><strong>NOTICE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>Damage to the shaft sealing rings from chemically aggressive cleaning agents is possible. Any contact of the cleaning agent with the shaft sealing rings must be avoided.</td>
</tr>
</tbody>
</table>

- Fit and secure input 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.

<table>
<thead>
<tr>
<th><strong>WARNING</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of burns</strong></td>
</tr>
<tr>
<td>Serious injury caused by burns on hot surfaces (&gt; 55 °C) is possible. Wear suitable protection gloves and protection clothing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>NOTICE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>Damage to the shaft sealing rings from heating above 100 °C is possible. Use heat shields to protect against radiant heat.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th><strong>NOTICE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>Damage in the gear unit from blows or impact is possible. Fit the coupling with the aid of suitable fitting equipment (see item 6.9). The shaft-sealing rings and running surfaces of the shaft must not be damaged when pulling in the coupling parts.</td>
</tr>
</tbody>
</table>
NOTICE

Property damage

Damage to the gear unit or individual components is possible from inadequate alignment. When installing the drives, make absolutely certain that the individual components are accurately aligned to one other. Unacceptable large errors in the alignment of the shaft ends to be connected due to angular and/or axial misalignments result in premature wear and material damage. Insufficiently rigid base frames or sub-structures can also cause a radial and/or axial misalignment during operation, 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-related dimensioned drawing.

6.3.2.1 Alignment

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

Alignment surface:

For the exact position of the alignment surfaces, refer to the drawings in the gear unit documentation. The alignment surfaces are for aligning the gear unit horizontally, in order to ensure correct running of the gear unit.

Note

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

Fig. 44: Alignment surface

1 Alignment surface

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

- rulers
- spirit level
- dial gauge
- feeler gauge, etc.
Only then should the gear unit be fastened and then the alignment should be checked once again.

- Record alignment dimensions (see also item 7.3).

**Note**
The record must be kept with these instructions.

---

**DANGER**

**Danger to life from air-borne fracture pieces**

Disregard for the precision of alignment can cause shaft rupture, resulting in serious injury and danger to life and limb.

Align gear unit precisely (observe specified values).

Damage to the gear unit or its components or add-on parts is possible. The accuracy of shaft-axis alignment is an important factor in determining the life span of shafts, bearings and couplings. If possible, the deviation should be zero (exception: ZAPEX couplings). For this purpose, e.g. also refer to the special requirements for the couplings in the specific operating instructions.

---

6.3.2.2 Fitting on a foundation frame

**NOTICE**

**Property damage**

Damage to the gear unit is possible from failure to observe the alignment precision for the gear unit base or as a result of uneven tightening of the fastening bolts.

The foundation frame must be horizontal and plane.

Tighten fastening screws evenly, the gear unit must not be excessively stressed when tensioning the fastening screws.

The levelness of the gear unit standing surface is especially important, as the contact pattern of the teeth and the load of the bearings depend on it and the service life of the gear unit is affected by it.

All points on the gear unit standing surface must lie between two imaginary parallel planes 0.1 mm per 1 m apart.

- Clean the bottom side of the gear unit base and the foundation frame.
- Using suitable lifting gear, set the gear unit down on the foundation frame.

**NOTICE**

**Property damage**

Damage to the gear unit is possible when using the wrong attachment points. Use only the eyes provided to attach lifting equipment to the unit.

Transporting of the gear unit by attaching it to the pipework is not permitted.

The pipework must not be damaged.

Do not use the threads in the front sides of the shaft ends to attach slinging and lifting gear for transport. Slinging and lifting gear must be adequate for the weight of the gear unit.

- Tighten the foundation bolts to the specified torque (see item 6.23); if necessary, use stops to prevent displacement, if required.
- Align the gear unit exactly with the input and output units (see item 6.3.2.1).
- Record alignment dimensions (see also item 7.3).

**Note**
The record must be kept with these instructions.
6.3.2.3 Fitting on a concrete foundation by means of foundation blocks

- Clean the bottom side of the gear unit base.
- Hook the foundation blocks with washers and fastening bolts into the foundation-fastening points on the gear unit housing (see figure 45).

**Note**

The fastening bolts must only be tightened when the concrete has set.

---

Fig. 45: Foundation block

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

**NOTICE**

**Property damage**

Damage to the gear unit is possible when using the wrong attachment points. Use only the eyes provided to attach lifting equipment to the unit.

Transporting of the gear unit by attaching it to the pipework is not permitted.

The pipework must not be damaged.

Do not use the threads in the front sides of the shaft ends to attach slinging and lifting gear for transport. Slinging and lifting gear must be adequate for the weight of the gear unit.

- Align gear unit vertically by in- and output shafts:
  - when using foundation blocks, with the aid of the set screws (if available).
- Record alignment dimensions, also see item 7.3.

**Note**

The record must be kept with these instructions.
• If necessary in the case of more powerful forces, use stops to prevent the unit from displacement.
• Before pouring the concrete foundation, fill up the openings in the foundation blocks with adequate material (e. g. polystyrene).
• Pour concrete into the recesses for the foundation blocks.
• When the concrete has set, tighten the fastening bolts of the foundation blocks to the specified fastening torque (see item 6.23).

<table>
<thead>
<tr>
<th>NOTICE</th>
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<tbody>
<tr>
<td><strong>Property damage</strong></td>
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<tr>
<td>Damage to the gear unit from uneven tensioning of the hexagon nuts or fastening screws is possible. Tighten hexagon nuts or fastening screws evenly, the gear unit must not be overstressed during the tensioning process.</td>
</tr>
</tbody>
</table>

6.3.2.4 Fitting on a concrete foundation with anchor bolts
• Clean the bottom side of the gear unit base.
• Place support on the base plate in the fine grout.
• Inserting anchor bolt.
• Set pressure plate in position and screw nuts on.
• Place wood under the anchor bolts so that they are about 10 mm from the upper edge of the support (see figure 46).

![Fig. 46: Anchor bolt](image)

<table>
<thead>
<tr>
<th></th>
<th>Anchor bolt</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Anchor bolt</td>
</tr>
<tr>
<td>2</td>
<td>Support</td>
</tr>
<tr>
<td>3</td>
<td>Base plate</td>
</tr>
<tr>
<td>4</td>
<td>Pressure plate</td>
</tr>
<tr>
<td>5</td>
<td>Hexagon nut</td>
</tr>
<tr>
<td>6</td>
<td>Wood</td>
</tr>
<tr>
<td>7</td>
<td>Fine-grout concrete</td>
</tr>
<tr>
<td>8</td>
<td>Raw foundation</td>
</tr>
</tbody>
</table>

• Place gear unit on foundation.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>Damage to the gear unit is possible when using the wrong attachment points. Use only the eyes provided to attach lifting equipment to the unit. Do not use the threads in the front sides of the shaft ends to attach slinging and lifting gear for transport. Slinging and lifting gear must be adequate for the weight of the gear unit.</td>
</tr>
</tbody>
</table>
• Pull anchor bolts up; for this purpose, a screw or a threaded rod can be screwed into the thread on the front side.

• Fit washer.

• Screw on hexagon nut a few turns by hand.

• Align gear unit with supports (see figure 47).
  – The values punched into the alignment strips must always be observed.
  – Alignment tolerances in relation to the units on the input and output sides are to be in accordance with the permissible angular and axial displacements of the couplings (see coupling drawings).

• Record alignment dimensions.

**Note**
The record must be kept with these instructions.

---

**Fig. 47:** Anchor bolt

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

**NOTICE**

**Property damage**

Damage from absent stability of the gear unit is possible due to lacking hardness of the concrete. Prior to tensioning the anchor bolts, the fine-grout concrete must have set for at least 28 days.

---

• Keep anchor bolts in their position by tightening the nut with your fingers.

• Place the protective sleeve.

• Set hydraulic clamping device in place.

• Pre-tension the screws one-by-one. For initial stressing forces, see item 6.23.

• Using a suitable tool, tighten hexagon nuts on as far as the stop.

**CAUTION**

**Physical injury possible by wrong operation.**

Risk of injury from wrong operation of the pretensioning tool. To ensure correct handling and adjustment of the pretensioning tool, the manufacturer's operating instructions of the pretensioning tool must be adhered to.

The tensioning pressures and/or the initial stressing forces have to be recorded, also see item 7.3.

**Note**
The record must be kept with these instructions.
6.4 Coupling flange on output side

- Before starting assembly, the front area of the coupling flange must be cleaned thoroughly.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of injury from chemical substances</td>
</tr>
</tbody>
</table>
Observe manufacturer's instructions for handling lubricants and solvents.
Wear suitable protective clothing.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
</table>
Do not allow cleaning agent or solvent to affect surfaces with paint coating.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
</table>
The front area of the coupling flange must be absolutely free from grease.
This is essential for safe and reliable torque transmission.
Contaminated solvents or dirty cloths as well as cleaning agents containing oil (e. g. petroleum or turpentine) are not suitable for removing grease.
Before tightening the tensioning bolts it must be ensured that the flanges are centred.

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
</table>
Explosion hazard |
Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work.
The gear unit must not be cleaned in an explosive atmosphere.
Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
</table>
Property damage |
Damage to the gear unit from uneven tensioning of the tightening bolts is possible.
Fasten the tightening bolts evenly crosswise to full torque, the gear unit must not be excessively stressed when tensioning the tightening bolts.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
</table>
Damaged bolts must be replaced with new bolts of the same type and strength class.
6.5 Assembly of the gear unit with mounting flange or block flange

6.5.1 Counterflange on the machine side

**NOTICE**

**Property damage**

Damage to the gear unit is possible from inadequate alignment of the counterflange. The counterflange must be horizontal and plane. The gear unit must not be excessively stressed when tensioning the fastening bolts.

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

The unit must be carefully aligned with the input and output sides of the machine, meanwhile possible strain deformations due to operating forces must be taken into account.

**NOTICE**

**Property damage**

Damage from absent stability of the gear unit is possible. Fastening bolts and nuts must be tightened to the prescribed tightening torque. For the correct tightening torque refer to item 6.23. Bolts of the minimum strength class 8.8 must be used.

**Note**

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

6.5.2 Description of assembly work

**DANGER**

**Explosion hazard**

Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work. The gear unit must not be cleaned in an explosive atmosphere. Observe the following:

- Ensure adequate ventilation.
- Do not smoke.

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

**NOTICE**

**Property damage**

Damage to the shaft sealing rings from chemically aggressive cleaning agents is possible. Any contact of the cleaning agent with the shaft sealing rings must be avoided.

- Fit and secure input 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**

Serious injury caused by burns on hot surfaces (> 55 °C) is possible.
Wear suitable protection gloves and protection clothing.

**NOTICE**

**Property damage**

Damage to the shaft sealing rings from heating above 100 °C is possible.
Use heat shields to protect against radiant heat.

**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-related dimensioned drawing.

6.5.2.1 Assembly of gear units with mounting or block flange

Fig. 48: Gear unit with mounting or block flange

1 Mounting flange 2 Block flange

The mounting or block flange on the output side of gear units is provided with a centring shoulder (Ø d₃). The counterflange on the machine side has to be provided with a bore (fit H7) which matches the centring shoulder.

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

**DANGER**

**Danger to life from air-borne fracture pieces**

Disregard for the precision of alignment can cause shaft rupture, resulting in serious injury and danger to life and limb.
Align gear unit precisely (observe specified values).

Damage to the gear unit or its components or add-on parts is possible.
The accuracy of shaft-axis alignment is an important factor in determining the life span of shafts, bearings and couplings. If possible, the deviation should be zero (exception: ZAPEX couplings). For this purpose, e. g. also refer to the special requirements for the couplings in the specific operating instructions.
• Clean the supporting surface of the mounting or block flange of the gear unit and the counterflange on the machine side.

⚠️ **CAUTION**

**Risk of injury from chemical substances**

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

**Note**

The front area of the mounting flange and counterflange must be absolutely free from grease. This is essential for safe and reliable torque transmission. Contaminated solvents or dirty cloths as well as cleaning agents containing oil (e.g. petroleum or turpentine) are not suitable for removing grease.

⚠️ **DANGER**

**Explosion hazard**

Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work. The gear unit must not be cleaned in an explosive atmosphere. Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

• Place the gear unit on the counterflange with the aid of suitable lifting gear.
• Tighten the flange bolts.

⚠️ **NOTICE**

**Property damage**

Damage to the gear unit from uneven tensioning of the flange screws is possible. Fasten the flange screws evenly crosswise to full torque, the gear unit must not be excessively stressed when tensioning the flange screws.

⚠️ **NOTICE**

**Property damage**

Damage from absent stability of the gear unit is possible. Fastening bolts and nuts must be tightened to the prescribed tightening torque. For the correct tightening torque refer to item 6.23. Bolts of the minimum strength class 8.8 must be used. The transmittable tensioning torque is limited by the bolted joint on bolt circle K₁.
6.5.2.2 Assembly of gear units with hollow output shaft

The mounting or block flange on the output side of gear units is provided with a centring shoulder (Ø d₃) if the machine shaft is supported only on one side, i.e. the gear unit takes over the function of the 2nd bearing location, the counterflange on the machine side has to be provided with a bore (fit H7) which matches the centring shoulder.

**NOTICE**

**Property damage**

Damage to the gear unit due to "double centring" is possible. If the machine shaft has a double support in the counterflange on the machine side, centring of the agitator gear unit with the centring shoulder Ød₃ in the counterflange is not permitted.

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

**DANGER**

**Danger to life from airborne fragments.**

Disregard for the precision of alignment can cause shaft rupture, resulting in serious injury and danger to life and limb. Align gear unit precisely (observe specified values).

Damage to the gear unit or its components or add-on parts is possible. The service life of the shaft and bearings largely depends on the aligning accuracy of the machine shaft in relation to the counterflange. Therefore, the deviation should be zero in nearly all cases. The tolerances permissible in this regard can be found in the related operating instructions.
• Clean the supporting surface of the mounting or block flange of the gear unit and the counterflange on the machine side.

⚠️ CAUTION
Risk of injury from chemical substances
Observe manufacturer's instructions for handling lubricants and solvents.
Wear suitable protective clothing.

Note
The front area of the mounting flange and counterflange must be absolutely free from grease.
This is essential for safe and reliable torque transmission.
Contaminated solvents or dirty cloths as well as cleaning agents containing oil (e. g. petroleum or turpentine) are not suitable for removing grease.

⚠️ DANGER
Explosion hazard
Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work.
The gear unit must not be cleaned in an explosive atmosphere.
Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

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

⚠️ NOTICE
Property damage
Damage to the shaft sealing rings from chemically aggressive cleaning agents is possible.
Any contact of the cleaning agent with the shaft sealing rings must be avoided.

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

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

• Pull up the gear unit with suitable lifting gear by means of nut and threaded spindle and put down on the counterflange on the machine side.
6.6 Assembly of a shaft-mounted gear unit with hollow shaft and parallel keyway

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

6.6.1 Preparatory work

For simpler disassembly (see item 6.6.3) we recommend connecting the shaft end of the machine to a pressure oil supply, which terminates in the recess of the hollow shaft (see figure 50). This connection may also be used for supplying rust-releasing agent.

![Fig. 50: Hollow shaft with parallel keyway, preparation](image)

<table>
<thead>
<tr>
<th>1</th>
<th>Machine shaft</th>
<th>3</th>
<th>Parallel key</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Hollow shaft</td>
<td>4</td>
<td>Pressure oil connection</td>
</tr>
</tbody>
</table>
6.6.2 Fitting

⚠️ **DANGER**

Explosion hazard
Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work. The gear unit must not be cleaned in an explosive atmosphere.
Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

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

⚠️ **CAUTION**

Risk of injury from chemical substances
Observe manufacturer's instructions for handling lubricants and solvents.
Wear suitable protective clothing.

**NOTICE**

Property damage
Damage to the shaft sealing rings from chemically aggressive cleaning agents is possible. Any contact of the cleaning agent with the shaft sealing rings must be avoided.

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

**Note**

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

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

**NOTICE**

**Property damage**

Damage to the gear unit from canting during assembly is possible. The hollow shaft must be aligned exactly to the machine shaft when the gear unit is fitted onto the machine shaft. Canting must be avoided.

![Hollow shaft with parallel keyway, fitting with threaded spindle](image)

**Fig. 51:** Hollow shaft with parallel keyway, fitting with threaded spindle

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

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

**NOTICE**

**Property damage**

Damage of the rolling bearings possible by canting when fitting the gear unit. The hollow shaft may be tightened against a machine-shaft collar only if the gear unit configuration is one of the following:
- Torque arm or pedestal required (see item 6.11)
With a different configuration the bearings may be excessively stressed.

6.6.2.2 Axial fastening

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

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see figure 50) by means of a pump.
- When the rust-releasing agent has taken effect, pull off the gear unit (see figures 52 and 53).
- Removing the gear unit from the driven-machine shaft can be done, depending on local possibilities, as follows:
  - preferably using forcing screws in an end plate (see figure 52) or
  - using a central threaded spindle or
  - using a hydraulic lifting device.

Note

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

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

Fig. 52: Hollow shaft with parallel keyway, demounting with end plate

1 Machine shaft
2 Hollow shaft
3 Parallel key
4 End plate for forcing out
5 Screws
6 Forcing screws
Fig. 53: Hollow shaft with parallel keyway, demounting with hydraulic lifting unit

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Machine shaft</td>
<td>5</td>
<td>Threaded spindle</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Hollow shaft</td>
<td>6</td>
<td>Pressure oil connection</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Parallel key</td>
<td>7</td>
<td>Auxiliary plate for forcing out</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hydraulic lifting unit</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTICE**

**Property damage**

Damage to the gear unit from canting during disassembly is possible. When disassembling the gear unit from the machine shaft, canting must be avoided.

**NOTICE**

**Property damage**

Damage to the gear unit housing or other gear unit components. When using a hydraulic lifting unit for forcing the gear unit off, excessively high forces may occur which act on the housing, bearings and other gear unit components. Prior to refitting the gear unit onto the machine shaft, the hollow shaft bearings must be checked for damage.

**Note**

When using forcing-off screws or threaded spindles, the head of the thread pressing against the driven machine should be rounded and well greased to reduce the risk of seizing at this point.
6.7 Shaft-mounted gear unit with hollow shaft with spline to standard "DIN 5480"

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

6.7.1 Preparatory work

For simpler disassembly (also see item 6.7.3) we recommend connecting the shaft end of the machine to a pressure oil supply, which terminates in the recess of the hollow shaft (see figure 54). This connection may also be used for supplying rust-releasing agent.

![Fig. 54: Hollow shaft with internal spline, preparation](image_url)

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

⚠️ DANGER

Explosion hazard
Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work. The gear unit must not be cleaned in an explosive atmosphere.
Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

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

⚠️ CAUTION

Risk of injury from chemical substances
Observe manufacturer's instructions for handling lubricants and solvents.
Wear suitable protective clothing.

NOTICE

Property damage
Damage to the shaft sealing rings from chemically aggressive cleaning agents is possible. Any contact of the cleaning agent with the shaft sealing rings must be avoided.

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

Note
Coat with a suitable lubricant to prevent frictional corrosion of the contact surfaces.
6.7.2.1 Fitting with integrated DU bush

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

**NOTICE**

**Property damage**

Damage to the gear unit from canting during assembly is possible. When fitting the gear unit, attention must be paid to the alignment of the hollow shaft to the machine shaft and the matching position of the machine shaft's teeth relative to the hollow shaft. The correct position can be determined by turning the input shaft or by swivelling the gear unit lightly around the hollow shaft.

**Fig. 55:** Hollow shaft with internal spline, fitting with integrated DU bush

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

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

**NOTICE**

**Property damage**

Damage of the rolling bearings possible by canting when fitting the gear unit. The hollow shaft may be tightened against a machine-shaft collar only if the gear unit configuration is one of the following:
- Torque arm or pedestal required (see item 6.11)
With a different configuration the bearings may be excessively stressed.
6.7.2.2 Axial fastening

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

6.7.3 Demounting

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see figure 54) by means of a pump.
- The end plate and the locking ring must first be removed.
- When the rust-releasing agent has taken sufficient effect, pull the gear unit off with the device (see figures 56 and/or 57).
- When the rust-releasing agent has taken enough effect, pull the gear unit off.
- Removing the gear unit from the driven-machine shaft can be done, depending on local possibilities, as follows:
  - preferably using forcing screws in an end plate (see figure 56) or
  - using a central threaded spindle or
  - using a hydraulic lifting unit

Note

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

A detailed view of these threaded holes can be found in the drawings in the order-specific gear unit documentation.
Fig. 56: Hollow shaft with internal spline, demounting with end plate

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

Fig. 57: Hollow shaft with internal spline, demounting with hydraulic lifting device

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

Property damage
Damage to the gear unit from canting during disassembly is possible. When disassembling the gear unit from the machine shaft, canting must be avoided.

NOTICE

Property damage
Damage to the gear unit housing or other gear unit components. When using an hydraulic lifting unit for forcing the gear unit off, excessively high forces may occur which act on the housing, bearings and other gear unit components. Prior to refitting the gear unit onto the machine shaft, the hollow shaft bearings must be checked for damage.

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

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

The shaft end of the machine shaft (material C60+N or higher strength) must be provided with centring to standard "DIN 332" form DS (with thread) on its from side. For the connection dimensions of the driven-machine shaft, see dimensioned drawing in the gear unit documentation.

6.8.1 Fitting

⚠️ DANGER

Explosion hazard
Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work. The gear unit must not be cleaned in an explosive atmosphere. Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

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

⚠️ CAUTION

Risk of injury from chemical substances
Observe manufacturer's instructions for handling lubricants and solvents. Wear suitable protective clothing.

NOTICE

Property damage
Damage to the shaft sealing rings from chemically aggressive cleaning agents is possible. Any contact of the cleaning agent with the shaft sealing rings must be avoided.
• Check the hollow and machine shafts for any damage on the seats and edges. If necessary, rework the parts with a suitable tool and clean them again.

**Note**

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. Contaminated solvents or dirty cloths as well as cleaning agents containing oil (e.g., petroleum or turpentine) are not suitable for removing grease.

---

**Ex**

⚠️ **DANGER**

**Explosion hazard**

Danger to life from ignition of explosive atmosphere by sparks or hot surfaces. Sliding through between hollow and stub shaft or sliding through of the shrink disk on the hollow shaft can lead to formation of sparks and/or hot surfaces.

- Ensure that the drill holes on the hollow shaft and the stub shaft in the area of the shrink disk position are clean, and free from grease and oil.
- Ensure that the shrink disk is fitted correctly and not overstressed before the system is turned on.

6.8.1.1 Fitting with integrated DU bush

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

**NOTICE**

**Property damage**

Damage to the gear unit from canting during assembly is possible. The hollow shaft must be aligned exactly to the machine shaft when the gear unit is fitted onto the machine shaft. Canting must be avoided.

• Draw the gear unit with the hollow shaft until the seat under the shrink disk onto the machine shaft.
  – The machine shaft is then centred in the seat under the shrink disk and in the DU bush.

**NOTICE**

**Property damage**

Damage of the rolling bearings possible by canting when fitting the gear unit. The hollow shaft may be tightened against a machine-shaft collar only if the gear unit configuration is one of the following:
- Torque arm or pedestal required (see item 6.11)
Fig. 58: Hollow shaft in shrink-disk design, fitting with integrated DU bush

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

Parts 4, 5 and 6 are not included in the scope of Siemens’ delivery.

6.8.1.2 Fitting with loose DU bush

The loose DU bush is pushed onto the machine shaft, fixed rigidly in position with a locating tie and then pulled into the hollow shaft along with the machine shaft of the gear unit (see figure 58).

**NOTICE**

**Property damage**

Damage to the gear unit from canting during assembly is possible. The hollow shaft must be aligned exactly to the machine shaft when the gear unit is fitted onto the machine shaft. Canting must be avoided.

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

**NOTICE**

**Property damage**

Damage of the rolling bearings possible by canting when fitting the gear unit. The hollow shaft may be tightened against a machine-shaft collar only if the gear-unit configuration is one of the following:
- Torque arm or pedestal required (see item 6.11)
6.8.1.3 Axial fastening

If the shrink disk is fitted according to instructions (see item 6.8.2.1), the gear unit is fixed securely in the axial direction. Additional axial fastening is not required.

6.8.2 Shrink disk

The shrink disk realizes a press-fit connection between a hollow shaft and a stub or driven-machine shaft, subsequently referred to as "stub shaft". The interference fit can transfer torques, bending moments and forces. The jointing pressure between the hollow and stub shafts generated by the shrink disk is essential for the torque and/or force transmission.

The shrink disk is delivered ready for fitting.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious physical injury</td>
</tr>
<tr>
<td>Risk of injury possible from airborne parts of the shrink disk.</td>
</tr>
<tr>
<td>The shrink disk must not be disassembled before fitting for the first time.</td>
</tr>
<tr>
<td>Fitting and start-up must be carried out by properly trained specialist personnel.</td>
</tr>
<tr>
<td>Prior to start-up these instructions must be read, understood and adhered to. Siemens accepts no liability for personal injury or damage due to non-compliance with the instructions.</td>
</tr>
</tbody>
</table>

6.8.2.1 Fitting the shrink disk

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

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of injury from chemical substances</td>
</tr>
<tr>
<td>Observe manufacturer's instructions for handling lubricants and solvents.</td>
</tr>
<tr>
<td>Wear suitable protective clothing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not allow cleaning agent or solvent to affect surfaces with paint coating.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The bore of the hollow shaft and the machine shaft must be absolutely free of grease in the area of the shrink-disk seat.</td>
</tr>
<tr>
<td>This is essential for safe and reliable torque transmission.</td>
</tr>
<tr>
<td>Contaminated solvents or dirty cloths as well as cleaning agents containing oil (e.g., petroleum or turpentine) are not suitable for removing grease.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosion hazard</td>
</tr>
<tr>
<td>Danger to life from ignition of explosive atmosphere by sparks or hot surfaces.</td>
</tr>
<tr>
<td>Sliding through between hollow and stub shaft or sliding through of the shrink disk on the hollow shaft can lead to formation of sparks and/or hot surfaces.</td>
</tr>
<tr>
<td>- Ensure that the drill holes on the hollow shaft and the stub shaft in the area of the shrink disk position are clean, and free from grease and oil.</td>
</tr>
<tr>
<td>- Ensure that the shrink disk is fitted correctly and not overstressed before the system is turned on.</td>
</tr>
</tbody>
</table>
Fig. 59: Fitting the shrink disk

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

1 Stub shaft  2 Hollow shaft  3 Inner ring  4 Outer ring  5 Tensioning bolt

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

A detailed illustration can be found in the dimensioned drawing of the gear unit documentation.

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

⚠️ WARNING

Serious physical injury
Risk of injury from dropping shrink disk or its parts.
Make sure that the shrink disk cannot slip off the hollow shaft.
For transporting and lifting the shrink disk it may be required to use a suitable lifting device.

NOTICE

Property damage
Damage to the hollow shaft is possible.
Do not tighten the tensioning bolts (5) until the stub shaft has been installed too.

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

Note
The correct clamping condition can thus be checked visually.
NOTICE

Property damage
Damage or destruction of the tensioning bolts from wrong tightening is possible. To avoid overloading the individual bolts, the maximum tightening torque (see table 13) must not be exceeded. Tightening the tensioning bolts using an impact screwdriver is not permitted. If, when tightening the clamping bolts at max. tightening torque, the inner and outer ring are not aligned, Siemens must be consulted.

Table 13: Maximum tightening torques for tensioning bolts

<table>
<thead>
<tr>
<th>Tensioning bolt thread</th>
<th>Max. tightening torque per bolt</th>
<th>Tensioning bolt thread</th>
<th>Max. tightening torque per bolt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strength class 12.9 Nm</td>
<td></td>
<td>Strength class 12.9 Nm</td>
</tr>
<tr>
<td>M 8</td>
<td>35</td>
<td>M 20</td>
<td>570</td>
</tr>
<tr>
<td>M 10</td>
<td>70</td>
<td>M 24</td>
<td>980</td>
</tr>
<tr>
<td>M 12</td>
<td>120</td>
<td>M 27</td>
<td>1450</td>
</tr>
<tr>
<td>M 14</td>
<td>193</td>
<td>M 30</td>
<td>1970</td>
</tr>
<tr>
<td>M 16</td>
<td>295</td>
<td>M 33</td>
<td>2650</td>
</tr>
</tbody>
</table>

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

DANGER

Danger to life from rotating and/or moving parts
Risk of being gripped or drawn in by rotating and/or moving parts. Rotating and/or movable drive parts must be fitted with suitable safeguards to prevent contact.

NOTICE

Property damage
Damage to the shrink disk is possible by combining parts that do not belong together. Only the complete shrink disks supplied by the manufacturer may be used. Combining components from different shrink disks is not permitted.
6.8.2.2 Demounting the shrink disk

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

⚠️ WARNING

**Serious physical injury**

Risk of injury from airborne fragments of the tensioning bolts. Do not unscrew the tensioning bolts one by one in order to prevent tearing off due to excessive strain or uncontrolled loosening of the shrink disk.

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

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

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

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

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

⚠️ WARNING

**Serious physical injury**

Risk of injury from dropping shrink disk or its parts. Make sure that the shrink disk cannot slip off the hollow shaft. For transporting and lifting the shrink disk it may be required to use a suitable lifting device.

6.8.2.3 Cleaning and greasing the shrink disk

**Note**

Only dirty shrink disks must be disassembled and cleaned.

- Check all parts for damage.

⚠️ WARNING

**Serious physical injury**

Risk of injury from parts hurled out (e.g. tensioning bolts). Damaged parts must be replaced with new ones. The use of damaged parts is not permitted. Only the complete shrink disks supplied by the manufacturer may be used. Combining components from different shrink disks is not permitted.
• Thoroughly clean all parts.

⚠️ **CAUTION**

**Risk of injury from chemical substances**

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

---

**Note**

The conical surfaces of the inner and outer rings (3 and 4, see figure 59) must be free of grease and oil.

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

---

⚠️ **DANGER**

**Explosion hazard**

Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work. The gear unit must not be cleaned in an explosive atmosphere.

Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

---

• A thin layer of lubricant must be applied evenly to the conical surfaces of the inner and outer rings (3 and 4, see figure 59).

• Provide the tensioning bolts (5, see figure 59) on the contact surface and on the thread with lubricant.

Use a solid lubricant paste with a high MoS₂-based molybdenum disulphide content which will not slide during fitting work and which shows the following characteristics:

- Friction coefficient "μ" = 0.04
- Resistant to pressure up to a maximum pressure of 300 N/mm²
- Ageing resistant

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

<table>
<thead>
<tr>
<th>Lubricant</th>
<th>Form</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molykote G Rapid</td>
<td>Spray or paste</td>
<td>DOW Corning</td>
</tr>
<tr>
<td>Aemasol MO 19 P</td>
<td>Spray or paste</td>
<td>A. C. Matthes</td>
</tr>
<tr>
<td>Unimoly P 5</td>
<td>Powder</td>
<td>Klüber Lubrication</td>
</tr>
<tr>
<td>gleitmo 100</td>
<td>Spray or paste</td>
<td>Fuchs Lubritec</td>
</tr>
</tbody>
</table>

¹) Other lubricants may be used; however they must have the same characteristics.

• Join the inner ring (3) and the outer ring (4).

• Place the tensioning bolts and screw in some threads by hand.
6.8.2.4 Re-fitting the shrink disk

**Note**
For re-fitting the shrink disk the procedure described in item 6.8.2.1 must be adhered to.

6.8.2.5 Inspection of the shrink disk

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

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

- Loose bolts
- Damage caused by force
- Flush position of the inner ring (3) in relation to the outer ring (4)

6.8.3 Demounting the shaft-mounted gear unit

- Demount the shrink disk (see item 6.8.2.2).
- Using the forcing-off screws (part 4) force the gear unit off the machine shaft, until the seat under the shrink disk and the DU bush are clear.
- Using suitable lifting gear, lift the gear unit from the machine shaft.

**NOTICE**

**Property damage**

Damage to the gear unit is possible when using the wrong attachment points. Use only the eyes provided to attach lifting equipment to the unit.
Transporting of the gear unit by attaching it to the pipework is not permitted.
The pipework must not be damaged.
Do not use the threads in the front sides of the shaft ends to attach slinging and lifting gear for transport.
Slinging and lifting gear must be adequate for the weight of the gear unit.
6.9 Couplings

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

If rigid couplings or other in- and/or output elements, which create additional radial and/or axial forces, (e.g. gear wheels, hydraulic couplings) are to be used, 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.

**NOTICE**

**Property damage**

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

**Note**

For permissible alignment errors in couplings supplied by Siemens, refer to the instructions manuals 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:

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

![Fig. 60: Possible misalignments](image)

ΔKa

Axial misalignment (ΔKa)

ΔKw

Angular misalignment (ΔKw)

ΔKr

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

![Diagram of alignment](image)

**Fig. 61:** Example of alignment on a flexible coupling

1. Ruler
2. Feeler gauge
3. Measuring points

**NOTICE**

**Property damage**

Damage or destruction of the coupling from wrong alignment is possible. The maximum permissible misalignment values are specified in the operating instructions for the coupling; they must under no circumstances be exceeded during operation. Angular and radial misalignments may occur at the same time. The sum of both misalignments must not exceed the maximum permissible value of the angular or radial misalignment.

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

**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.

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

**Note**

The front area of the coupling flange must be absolutely free from grease. This is essential for safe and reliable torque transmission. Contaminated solvents or dirty cloths as well as cleaning agents containing oil (e.g., petroleum or turpentine) are not suitable for removing grease.

---

**DANGER**

**Explosion hazard**

Danger to life from ignition of solvent steams or other explosive atmosphere during cleaning work. The gear unit must not be cleaned in an explosive atmosphere. Observe the following:
- Ensure adequate ventilation.
- Do not smoke.

---

**NOTICE**

**Property damage**

Damage to the gear unit from canting and uneven tightening of the tensioning screws during assembly is possible. Before tightening the tensioning bolts it must be ensured that the flange centring means are inserted one inside the other. Tighten the tensioning bolts evenly crosswise to full torque. Tighten fastening screws evenly, the gear unit must not be excessively stressed when tightening the tensioning screws.

---

**Note**

The tightening torque of the flange connecting screws is shown on the drawings included in the documentation of the coupling. Damaged bolts must be replaced with new bolts of the same type and strength class.
6.11 Fitting the torque arm for the gear unit housing

6.11.1 Attaching the torque arm

**NOTICE**

Property damage

Damage to the gear unit by inappropriate mounting of the motor and the torque arm is possible. Motor and torque arm should be fitted only in consultation with Siemens. The torque arm must be fitted stress-free on the machine side.

---

![Torque arm for gear unit housing of types H..V and B..V](image)

**Fig. 62:** Torque arm for gear unit housing of types **H..V** and **B..V**

1 Machine side  
2 Pedestal

**Note**

For realising the foundation for fastening the torque arm, see item 6.3.1 (Foundation).

---

6.12 Gear unit with cooling coil

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

**Note**

Also observe item 5.8.2.
6.13 Gear unit with added-on air-oil cooler

- Apply electrical wiring for the contamination indicator of the double change-over filter and pressure monitor.
- Apply electrical wiring for the fan motor.

**Note**
Also observe item 5.8.3.

6.14 Gear unit with add-on water-oil cooler

- Before connecting the water-oil cooler, remove the bushing from the cooling-water connection.
- Flush the water-oil cooler (in order to remove any contamination).
- Re-connect the water in- and outflow pipes. For the flow direction and the position of the connections, refer to the dimensioned drawing.

**NOTICE**

**Property damage**
Damage to the water-oil cooler is possible.
Make sure when installing the pipework that no forces, moments or vibrations act upon the connections of the water-oil cooler.

- Apply electrical wiring for the pressure monitor (in case of gear units with corresponding equipment only).

**Note**
Also observe item 5.8.4.

6.15 Gear unit with heating

- Apply electrical wiring for the heating system.
- Apply electrical wiring of the oil-level monitoring for the heating rods.

6.16 Gear unit with oil-temperature monitoring system

- Apply electrical wiring to connect the temperature monitor with the analysis instrument. The analysis instrument must be provided by the customer.

6.17 Oil-level monitoring system

- Apply electrical wiring for the oil-level limit switch.

6.18 Bearing-monitoring system

- Apply electrical wiring for the resistance thermometer (with a configuration according to 5.14.1). The analysis instrument have to be provided by the customer.

6.19 Gear unit with speed transmitter

- Apply electrical wiring for the speed transmitter.
6.20 Gear unit with separate or external oil-supply system

- Remove the sockets from the suction and delivery lines prior to connecting the system.
- Fit the system on the gear unit or assemble it separately according to the drawings supplied in the gear unit documentation.
- The pipework must not be overstressed during the fitting procedure.

**Note**
Consult operating instructions for oil-supply system.

6.21 Gear unit with add-on components

**Note**
For operating and servicing the components described in section 6., the pertinent instruction manuals and the specifications in section 5. must be observed.
For technical data, refer to the data sheet and/or the list of equipment.

6.22 Final work

- After installation of the gear unit check all screw connections in table 15 for a firm fit.
- Checking of the alignment after tightening the fastening elements. The alignment must not have changed.
- Check that all the devices which have been removed for transport reasons have been re-fitted. For this refer to the details in the data sheet, the list of equipment and the associated drawings.

<table>
<thead>
<tr>
<th>Ex</th>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosion hazard</td>
<td></td>
</tr>
</tbody>
</table>
Ignition of an explosive atmosphere is possible from overheating of the gear unit with too low an oil level because of leakages. Existing 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.

<table>
<thead>
<tr>
<th>Ex</th>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic discharge</td>
<td></td>
</tr>
</tbody>
</table>
Danger to life from ignition of present explosive atmosphere by electrostatic discharge. A potential equalisation in accordance with the applying regulations and directives must be carried out. On the gear units threaded holes are available for establishing an earth connection. This work must always be done by specialist electricians.

- Cable entries must be protected against moisture.
6.23 Screw-connection classes, tightening torques and initial stressing forces

6.23.1 Screw-connection classes

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

**Table 15: Screw-connection classes**

<table>
<thead>
<tr>
<th>Fastening of</th>
<th>Screw-connection class</th>
<th>Tightening procedure</th>
</tr>
</thead>
</table>
| Gear unit Motor* Brake* Torque arm | C | – Hydraulic tightening with mechanical screwdriver  
– Torque-controlled tightening with torque wrench or signal generating torque wrench  
– Tightening with precision mechanical screwdriver with dynamic torque measurement |
| | D | – Torque-controlled tightening with mechanical screwdriver. |
| Protective hood Canopy | E | – Tightening with pulse screwdriver or impact wrench without adjustment checking device  
– Tightening by hand, using a spanner without torque measurement |

*) The tightening torques applying to these add-on parts can be found in the instructions supplied by the manufacturers of the parts.

6.23.2 Tightening torques and initial initial stressing forces

The tightening torques apply to friction coefficients of $\mu_{\text{total}} = 0.14$.

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

**Table 16: Initial stressing forces and tightening torques for screw connections of strength classes 8.8; 10.9; 12.9 with a common friction coefficient of $\mu_{\text{total}} = 0.14$**

<table>
<thead>
<tr>
<th>Nominal thread diameter</th>
<th>Strength class of the bolt</th>
<th>Initial tensioning force for Screw-connection classes from Table 15</th>
<th>Tightening torque for screw connection classes from Table 15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>d mm</td>
<td>$F_{\text{Mmin}}$ N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M10</td>
<td>8.8</td>
<td>18000</td>
<td>11500</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>26400</td>
<td>16900</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>30900</td>
<td>19800</td>
</tr>
<tr>
<td>M12</td>
<td>8.8</td>
<td>26300</td>
<td>16800</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>38600</td>
<td>24700</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>45100</td>
<td>28900</td>
</tr>
<tr>
<td>M16</td>
<td>8.8</td>
<td>49300</td>
<td>31600</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>72500</td>
<td>46400</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>85000</td>
<td>54400</td>
</tr>
<tr>
<td>M20</td>
<td>8.8</td>
<td>77000</td>
<td>49200</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>110000</td>
<td>70400</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>129000</td>
<td>82400</td>
</tr>
<tr>
<td>Nominal thread diameter d mm</td>
<td>Strength class of the bolt</td>
<td>Initial tensioning force for Screw-connection classes from table 15</td>
<td>Tightening torque for screw connection classes from table 15</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------------</td>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>M24</td>
<td>8.8</td>
<td>109000</td>
<td>69600</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>155000</td>
<td>99200</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>181000</td>
<td>116000</td>
</tr>
<tr>
<td>M30</td>
<td>8.8</td>
<td>170000</td>
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<td>10.9</td>
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<td>224000</td>
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<td></td>
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<td>M42</td>
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<td>212000</td>
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<tr>
<td></td>
<td>10.9</td>
<td>471000</td>
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<td>352000</td>
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<tr>
<td>M48</td>
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<td>604000</td>
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<td>M64</td>
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<td>476000</td>
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<td>676000</td>
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<td>12.9</td>
<td>124000</td>
<td>792000</td>
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<td>604000</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>134000</td>
<td>856000</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>157000</td>
<td>100000</td>
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<td>M80x6</td>
<td>8.8</td>
<td>119000</td>
<td>760000</td>
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<tr>
<td></td>
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<td>138000</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>252000</td>
<td>160000</td>
</tr>
<tr>
<td>M100x6</td>
<td>8.8</td>
<td>188000</td>
<td>120000</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>267000</td>
<td>171000</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>313000</td>
<td>200000</td>
</tr>
</tbody>
</table>

**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"!

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of injury</td>
</tr>
<tr>
<td>The gear unit must not be started up, if the required instructions are not available.</td>
</tr>
</tbody>
</table>

7.1 Procedure before start-up

7.1.1 Removal of preservative agent from exterior

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

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of injury from chemical substances</td>
</tr>
<tr>
<td>The solvent must not come into contact with the skin (e.g. the operator's hands).</td>
</tr>
<tr>
<td>The safety notes on the data sheets for the solvent used must be observed.</td>
</tr>
<tr>
<td>Immediately remove any spilled solvent using a binding agent.</td>
</tr>
<tr>
<td>Observe manufacturer's instructions for handling lubricants and solvents.</td>
</tr>
<tr>
<td>Wear suitable protective clothing.</td>
</tr>
</tbody>
</table>

7.1.2 Removal of preservative agent from interior

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property damage</td>
</tr>
<tr>
<td>Damage to the gear unit due to absent or inadequate ventilation is possible.</td>
</tr>
<tr>
<td>Prior to start-up replace screw plug with air filter.</td>
</tr>
</tbody>
</table>

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

Oil-draining point:

- Place suitable containers under the oil-draining points.
• Unscrew the oil drain plug and/or open the oil drain cock.

• Remove remaining preservative agent and/or running-in oil from the housing using a suitable container; to do so, unscrew any existing residual oil drain plugs.

• Dispose of remaining preservative agent and/or running-in oil in accordance with regulations.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of injury from chemical substances</td>
</tr>
</tbody>
</table>
| 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.  
Any oil spillage must be removed immediately with a binding agent.  
Observe manufacturer's instructions for handling lubricants and solvents.  
Wear suitable protective clothing. |

• Screw in the oil drain plug or reclose the oil drain cock.

• Screw in any removed residual-oil plugs again.

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

7.1.3 Filling with lubricant

• Visual check of the interior parts for corrosion.

Note

If corrosion is found, contact the Siemens customer service.

• To fill with oil, unscrew the oil dipstick on the gear unit or oil compensating tank.

• Fill fresh oil into the gear unit using a filter (filter mesh approx. 10 μm), until the oil rises up to the bottom in the oil sight glass or in the oil level indicator, or until the oil is at the bottom marking on the oil dipstick. Do not put in any further oil. The viscosity of the oil in cold condition will cause the oil level to continue rising slowly. Continue filling in oil only after the oil level has steadied if necessary, up to the middle of the oil sight glass, up to the middle between the MIN and MAX marking on the oil level indicator or up to the middle of the MIN and MAX marking on the oil dipstick.

Note

The quality of the oil used must meet the requirements of the separately supplied BA 7300 instructions manual, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in table “T 7300” (for a link to the Internet, see back cover), 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. Decisive for the oil quantity to be filled in is the middle on the oil sight glass, the MIN and MAX marking on the oil level indicator or the MIN and MAX marking on the oil dipstick.

Note

In case of gear units fitted with force-feed lubrication or an oil-cooling system, the oil circuit must also be charged with oil. To do this, briefly start up the gear unit with added pump. Observe the instructions in section 8. "Operation".
• Check the oil level in the gear unit housing.

**Note**
The oil must be in the range of the middle on the oil sight glass, the middle between the MIN and MAX marking on the oil level indicator or between the MIN and MAX marking on the oil dipstick.

---

**CAUTION**

**Risk of injury from 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 spilled oil immediately using an oil-binding agent.

• Screw the oil dipstick back into the gear unit or into the oil compensating tank.

**7.2 Grease-lubricated rolling bearing**

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

---

**Fig. 63:** Lubricating point for lower output-shaft bearing of type H.BV with oil retaining pipe (see item 5.7.5)

**Fig. 64:** Lubricating point for lower output-shaft bearing of type B3BV with oil retaining pipe (see item 5.7.5)

1 Lubrication point 2 Grease-lubricated rolling bearing

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

**NOTICE**

**Property damage**

Damage to the gear unit due to absent or inadequate ventilation is possible.
Prior to start-up replace screw plug with air filter. Observe the instructions in item 7.1.2.

- Check the oil level of the gear unit (see item 7.3.1).
- After the first start-up of a separate or external oil-supply system the oil level should be checked (gear units with oil-supply system only).

### 7.3.1 Oil level

Depending on the equipment of the gear unit housing, the following oil levels are correct:
- Middle of the oil sight glass.
- The middle between the MIN and MAX marking on the oil level indicator.
- The middle between the MIN and MAX marking on the oil dipstick.

**Note**

The cooled down oil should be visibly below the middle on the oil sight glass, between the MIN and MAX marking of the oil level indicator or between the MIN and MAX marking of the oil dipstick.

Hot oil may also be slightly above the middle on the oil sight glass, the MAX marking of the oil level indicator or the MAX marking of the oil dipstick.

**DANGER**

**Explosion hazard**

Ignition of an explosive atmosphere is possible from overheating of the gear unit with too low an oil level.
Notice the oil level.
In no case may the visible bottom edge on the oil sight glass, the MIN marking of the oil level indicator or the MIN marking of the oil dipstick be fallen short of. Fill up oil if necessary.
7.3.2 Gear unit with cooling coil, water-oil cooler or separate oil-supply system

7.3.2.1 Gear units with water-oil cooler or cooling coil

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>Damage to the cooling coil or the water-oil cooler is possible. The pressure and temperature values specified in the order-specific documentation must not be exceeded. The values must be checked before the start-up.</td>
</tr>
</tbody>
</table>

- Fully open the stop valves in the coolant in- and outflow pipes of the cooling system.
- Check connecting lines for correct fastening and tightness.

**Note**

For connection dimensions, refer to the dimensioned drawing of the gear unit. The required cooling-water quantity and the maximum permissible inlet temperature are given on the data sheet and/or the list of equipment.

- Start the drive motor.

7.3.2.2 Gear unit with separate oil-supply system

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>The gear unit must be operated only together with the oil-supply system. For this the oil-supply system must be switched on at least 2 minutes before starting up the gear unit. The pressure and temperature values specified in the data sheet and/or equipment list must not be exceeded. The values must be checked before the start-up.</td>
</tr>
</tbody>
</table>

- Start the drive motor.
7.3.3 Gear unit with external oil-supply system

7.3.3.1 Pre-lubrication phase

**NOTICE**

**Property damage**

Damage to the gear unit from absent lubrication is possible. The gear unit must be operated only together with the oil-supply system. For this the oil-supply system must be switched on at least 2 minutes before starting up the gear unit. The pre-lubrication phase must not take longer than 3 minutes since there will be heavy foaming of the oil at low temperatures. If the oil temperature is below 10 °C, the oil should be pre-heated by suitable measures, or Siemens should be consulted.

**Note**

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

7.3.3.2 Initial operation

- Observe all necessary instructions.
- Start the gear unit.

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

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

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

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

7.3.4 Oil-level check

**Note**

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

7.3.5 Temperature measurement

**NOTICE**

**Property damage**

Damage to the gear unit from inadequate lubrication because of excessively high oil temperature is possible. The maximum permissible oil-sump temperature is 90 °C. At higher temperatures the gear unit must be shut down immediately and Siemens customer service consulted.
7.3.6 Oil-level monitoring system

The gear unit can be fitted with an oil-level monitor by means of a filling-level limit switch. The oil-level monitoring device has been designed for checking the oil level when the gear unit is at a standstill, prior to operating start.

**Note**

The signal should be wired in such a way that, when the signal "oil level too low" is given, the drive motor cannot start and that a warning is given. During operation, any signal should be bridged.

7.3.7 Bearing monitoring (vibration measurement)

If corresponding arrangements are present for the measurements of vibrations serving for purposes of monitoring the bearings (see items 5.14.2 or 5.14.3), vibration measurements have to be taken in order to obtain initial values and/or standard values for the diagnosis during the first start-up. These measurements must be recorded and filed.

7.3.8 Heating

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

The gear unit is equipped with oil level monitoring. This monitoring system checks the oil level in the gear unit (minimum oil level for immersion of the heating rods).

**Note**

The "Oil level too low" signal must be wired so that, when the signal is given, the heating elements are switched off. This ensures that the heating elements are not operated, if not completely immersed.

**Ex**

**DANGER**

Explosion and fire hazard

Fire hazard or ignition of an explosive atmosphere by exposed heating rods is possible. Never switch on the heating elements, unless complete immersion of the heating element in the oil bath is ensured.

If heating rods are retrofitted, the maximum heating capacity (see table 12 in item 5.10) on the outer surface of the heating rods must not be exceeded.

**Note**

Be sure to observe the operating instructions of the oil-level monitoring device for operation and maintenance.

For technical data and control information, refer to the written data sheet or the equipment list.

**Note**

The correct setting of the switch points must be checked.
7.3.9 Checking procedure

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

- Presence of explosion-protection marking.
- Oil level.
- Leak tightness of the oil-cooling or oil-supply lines.
- Opening condition of the shut-off valves.
- Effectiveness of the shaft seals.
- Freedom of the rotating parts from contact.

The alignment dimensions according to items 6.3.2.1 to 6.3.2.4 and the tensioning pressures or the initial stressing forces according to items 6.3.2.2 to 6.3.2.4 must also be recorded in this document.

---

**Note**

The report must be kept with these instructions.

7.4 Removal from service

- Switch off the drive unit.

---

**DANGER**

Danger to life from switched on system

For carrying out work on the gear unit, the gear unit must generally be set in standstill. The drive unit must be secured against accidental start-up (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.

- If the gear units are fitted with cooling coil or water-oil cooler, close the stop valves on the cooling water in- and outflow pipes. To prevent freezing, drain the water from the cooling coil or the water-oil cooler.
- Start the gear unit and allow it to run briefly (5 to 10 minutes) approx. every 3 weeks (during a shut-down period no longer than 6 months).
- For standstill periods longer than 6 months and if there is a connection to an oil-supply system, the oil-supply system and the gear unit should be disconnected. The holes on the gear unit (oil return line and pressure line) must be closed airtight.
- Treat the gear unit with preservative, see items 7.4.1 and 7.4.2 (before a shut-down period exceeding 6 months).
7.4.1 Interior preservation for longer disuse

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

7.4.1.1 Interior preservation with gear oil

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

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

**Note**

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

**NOTICE**

**Property damage**

Damage from inadequate lubrication due to unnoticed leaks is possible. The leak tightness of the gear unit must be checked regularly every 4 weeks.

7.4.1.2 Interior preservation with preservative agent

**Note**

For this, see figures 8 to 11 in item 5.1.1.

- Place a suitable container under the oil-draining point of the gear unit housing.
- Unscrew the oil drain plug and/or open the oil drain cock.
- Drain the oil into a suitable container (see section 10. "Maintenance and Repair").

**WARNING**

**Risk of scalding**

Serious injury from discharging operating media is possible when these are changed. Wear suitable protection gloves, protection glasses and protection clothing.

**CAUTION**

**Risk of injury from 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 here. Any oil spillage must be removed immediately with a binding agent.

**Note**

Check the condition of the sealing ring (the sealing ring is vulcanised onto the oil drain plug). If necessary, use a new oil drain plug.
• Close the oil drain cock and/or screw in the oil drain plug.
• Unscrew and remove the air filter from the housing top.
• Replace the air filter with the screw plug.

**Note**
Carefully clean the air filter (see item 10.2.4) and keep it in a safe place; it will be required when starting up again.

• Unscrew oil filler plug including the oil dipstick.
• Fill the gear unit with "Castrol Alpha SP 220 S".
  Establish the filling quantity by means of the gear unit dimensions: (Length x width x height) x 0.1

**NOTICE**

**Property damage**
Corrosion is possible when using the wrong preservative.
Use the special "Castrol Alpha SP 220 S" oil with extra corrosion protection (addition "S").

**NOTICE**

**Property damage**
Corrosion is possible when the gear unit is opened for too long.
Close the gear unit airtight again at the latest one hour after opening.
Before restarting the gear unit carry out the following action:
- replace the screw plug with the air filter/wet-air filter.

**CAUTION**

**Risk of injury from 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 here.
Remove any spilled oil immediately using an oil-binding agent.

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

**Note**
Before restarting the gear unit carry out the following action:
- Replace the screw plug with the air filter.

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

7.4.2.1 Exterior-preservation procedure

- Clean the surfaces.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property damage</td>
</tr>
<tr>
<td>Damage to the shaft sealing ring from 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 of the sealing lip.</td>
</tr>
</tbody>
</table>

- Apply preservative agent.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preservative agent, see table 9 in item 4.4.2.</td>
</tr>
</tbody>
</table>
8. **Operation**

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

8.1 **General**

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

<table>
<thead>
<tr>
<th>☐ Operating temperature</th>
<th>The maximum permitted temperature is: 90 °C (applies to mineral oil)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At higher temperatures the gear unit must be shut down immediately and Siemens customer service consulted.</td>
</tr>
<tr>
<td>☐ Oil pressure of the oil-supply system</td>
<td>min. 0.5 bar</td>
</tr>
<tr>
<td>☐ Changes in gear noise</td>
<td></td>
</tr>
<tr>
<td>☐ Possible oil leakage on the housing and shaft seals</td>
<td></td>
</tr>
<tr>
<td>☐ Bearing vibrations with present measuring device</td>
<td></td>
</tr>
</tbody>
</table>
8.2 Oil level

Note
For checking the oil level, the gear unit must be shut down.
Depending on the equipment 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 marking on the oil level indicator
– middle between the MIN and MAX marking on the oil dipstick

The cooled down oil should be visibly below the middle on the oil sight glass, between the MIN and MAX marking on the oil level indicator or between the MIN and MAX marking on the oil dipstick. Hot oil may also be slightly above the middle on the oil sight glass, the MAX marking on the oil level indicator or the MAX marking on the oil dipstick.

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

⚠️ DANGER
Explosion hazard
Ignition of an explosive atmosphere is possible from overheating of the gear unit with too low an oil level.
Notice the oil level.
In no case may the visible bottom edge on the oil sight glass, the MIN marking on the oil level indicator or the MIN marking on the oil dipstick be fallen short of. Fill up oil if necessary.
### 8.3 Irregularities

#### NOTICE

**Property damage**

Damage to the gear unit from error states is possible. Turn off the drive unit immediately in the cases stated below.

- If irregularities are found during the operation.
- If the pressure monitor in the oil-supply system triggers alarm.

#### Note

Determine the cause of the fault, using table 17 (see item 9.2). Table 17, "Faults, causes and remedy," contains a list of possible faults, their causes and suggested remedies. If the cause cannot be found, a specialist from one of the Siemens customer-service centres should be called in (see section 2. "General notes").

#### DANGER

**Explosion hazard**

Ignition of an explosive atmosphere is possible from overheating of the gear unit with too low an oil level because of leakages. Existing 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. If any safety device has triggered, it must only be possible to start the drive again after releasing the reclosing interlock. The operator must ensure this.
9. Faults, causes and remedy

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

9.1 General information on faults and malfunctions

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

If faults and malfunctions occur after the guarantee period, the cause of which cannot be precisely identified, we advise our customers to contact our customer service.

**NOTICE**

**Property damage**

Damage to the gear unit from improper use is possible. Siemens will not be bound by the terms of the guarantee or otherwise be responsible in cases of improper use of the gear unit, modifications carried out without the approval by Siemens or use of spare parts not originally supplied by Siemens.

**DANGER**

**Danger to life from switched on system**

For carrying out maintenance and/or repair work on the gear unit, the gear unit must generally be set in standstill.

The drive unit must be secured against unintentional start-up. A notice should be attached to the start switch stating clearly that work is in progress.

9.2 Possible faults

**Table 17: Faults, causes and remedy**

<table>
<thead>
<tr>
<th>Faults</th>
<th>Causes</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bearing is defective.</td>
<td>Contact Customer Service. Replace defective bearings.</td>
</tr>
<tr>
<td>Loud noises in the area of the</td>
<td>Gear unit fastening has worked</td>
<td>Tighten bolts or nuts to the specified tightening torque. Replace damaged bolts and nuts.</td>
</tr>
<tr>
<td>gear unit fastening.</td>
<td>loose.</td>
<td></td>
</tr>
<tr>
<td>Grease escaping on the output shaft.</td>
<td>Radial sealing-shaft rings</td>
<td>Check and, if necessary, replace radial shaft sealing rings.</td>
</tr>
<tr>
<td></td>
<td>defective.</td>
<td></td>
</tr>
<tr>
<td>Faults</td>
<td>Causes</td>
<td>Remedy</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Increased temperature at the bearing points</td>
<td>Oil level in gear unit housing too low or too high.</td>
<td>Check oil level at room temperature. Refill oil if necessary.</td>
</tr>
<tr>
<td></td>
<td>Oil too old.</td>
<td>Check when the last oil change was done. Change oil if necessary. See section 10.</td>
</tr>
<tr>
<td></td>
<td>Oil-supply system defective.</td>
<td>Check the oil-supply system. If necessary replace defective components. Consult operating instructions for oil-supply system.</td>
</tr>
<tr>
<td></td>
<td>Bearing is defective.</td>
<td>Contact Customer Service. Check and, if necessary, replace bearings.</td>
</tr>
<tr>
<td>Exterior of gear unit is oiled up.</td>
<td>Inadequate sealing of housing covers and/or joints.</td>
<td>Seal housing cover and/or joints.</td>
</tr>
<tr>
<td>Oil leakage from the gear unit.</td>
<td>Inadequate sealing of housing covers and/or joints.</td>
<td>Check and, if necessary, replace seals. Seal housing cover and/or joints.</td>
</tr>
<tr>
<td></td>
<td>Radial sealing-shaft rings defective.</td>
<td>Check and, if necessary, replace radial shaft sealing rings.</td>
</tr>
<tr>
<td>Oil foaming in the gear unit.</td>
<td>Preservative agent not completely drained.</td>
<td>Change oil.</td>
</tr>
<tr>
<td></td>
<td>Oil-supply system has been operated for too long at low temperatures.</td>
<td>Stop oil-supply system. Allow the oil to degas.</td>
</tr>
<tr>
<td></td>
<td>Gear unit too cold in operation.</td>
<td>Shut down gear unit and have oil degassed. Restart without cooling water.</td>
</tr>
<tr>
<td></td>
<td>Water in oil.</td>
<td>Check state of oil by the test-tube method for water contamination. Have oil analysed by a chemical laboratory. Change oil if necessary.</td>
</tr>
<tr>
<td></td>
<td>Oil too old (defoaming agent used up).</td>
<td>Examine oil. Change if necessary.</td>
</tr>
<tr>
<td></td>
<td>Unsuitable oils mixed up.</td>
<td>Examine oil. Change if necessary.</td>
</tr>
<tr>
<td>Water in oil.</td>
<td>Defective oil-supply system or cooling coil.</td>
<td>Check the oil-supply system or cooling coil; replace any defective parts, if necessary. Consult operating instructions for oil-supply system.</td>
</tr>
<tr>
<td></td>
<td>Gear unit exposed to cold air from machine-room ventilator: Water condensing.</td>
<td>Protect gear unit with suitable heat insulation. Close air outlet or alter its direction by structural measures.</td>
</tr>
<tr>
<td></td>
<td>Climatic conditions.</td>
<td>Contact Customer Service.</td>
</tr>
<tr>
<td>Faults</td>
<td>Causes</td>
<td>Remedy</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Increased operating temperature.</td>
<td>Oil level in the gear unit housing too high.</td>
<td>Check the oil level. Adjust oil level if necessary.</td>
</tr>
<tr>
<td></td>
<td>Oil too old.</td>
<td>Check when the last oil change was done. Change oil if necessary. See section 10.</td>
</tr>
<tr>
<td></td>
<td>Oil badly contaminated.</td>
<td>Have oil be analysed; filter or change if necessary. See section 10.</td>
</tr>
<tr>
<td></td>
<td>Defective oil-supply system or cooling coil.</td>
<td>Check oil-supply system or cooling coil. If necessary replace defective components. Consult operating instructions for oil-supply system.</td>
</tr>
<tr>
<td></td>
<td>Gear unit with water-oil cooler: Coolant flow too low.</td>
<td>Fully open valves in in- and outflow pipes. Check water-oil cooler for free Check flow-through.</td>
</tr>
<tr>
<td></td>
<td>Gear unit with air-oil cooler: cooler block contaminated.</td>
<td>Clean cooler block. See section 10.</td>
</tr>
<tr>
<td></td>
<td>Coolant temperature too high.</td>
<td>Check temperature, and correct if necessary.</td>
</tr>
<tr>
<td></td>
<td>Oil flow through water-oil cooler too low due to: seriously contaminated oil filter.</td>
<td>Clean the oil filter. See section 10.</td>
</tr>
<tr>
<td></td>
<td>Oil pump defective.</td>
<td>Check that oil pump is working correctly. If necessary, repair or replace oil pump.</td>
</tr>
<tr>
<td></td>
<td>On gear units with fan: Suction opening in air-guide cover and/or gear unit housing badly contaminated.</td>
<td>Clean air-guide cover and gear unit housing.</td>
</tr>
<tr>
<td>Pressure monitor triggers alarm. (Gear units with force-feed lubrication, water-oil cooler or air-oil cooler.)</td>
<td>Oil pressure &lt; 0.5 bar.</td>
<td>Check oil level at room temperature; if necessary, top up oil. Check oil pump, replace if necessary. Check oil filter, clean if necessary, see section 10.</td>
</tr>
<tr>
<td>Contamination indicator on double change-over filter triggers alarm.</td>
<td>Double change-over filter clogged.</td>
<td>Change double change-over filter over as instructed in separate operating instructions, clean clogged filter element.</td>
</tr>
<tr>
<td>Fault in the oil-supply system.</td>
<td></td>
<td>Consult operating instructions for oil-supply system.</td>
</tr>
</tbody>
</table>
9.2.1 Leakage and leak tightness

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 18: Notes on the leak tightness of radial shaft-sealing rings (RWDR ²)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th>Measures</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaktight, dry</td>
<td>No moisture to be seen on radial shaft-sealing ring.</td>
<td>None</td>
<td>The radial shaft-sealing ring often dries by itself in further operation.</td>
</tr>
<tr>
<td>Leaktight, damp</td>
<td>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.</td>
<td>Only if dirt adheres, clean below the sealing lip with a clean rag. The sealing lip must not be soiled. Monitor.</td>
<td>No reason for complaint.</td>
</tr>
<tr>
<td>Leaktight, wet</td>
<td>Moisture film extending beyond the bottom side of the radial shaft-sealing ring but not dripping.</td>
<td>Clean below the sealing lip with a clean rag. The sealing lip must not be soiled. Monitor.</td>
<td>The radial shaft-sealing ring often dries by itself in further operation. No reason for complaint.</td>
</tr>
<tr>
<td>Measurable leak</td>
<td>Small trickle to be seen on the bottom side of the radial shaft-sealing ring, dripping.</td>
<td>Replace radial shaft sealing ring if necessary; identify possible cause of radial shaft-sealing ring failure and rectify.</td>
<td>May be a reason for complaint; one drop of oil a day is acceptable.</td>
</tr>
<tr>
<td>Short-term leak</td>
<td>Short-term failure of the sealing system.</td>
<td>Clean below the sealing lip with a clean rag. The sealing lip must not be soiled. Monitor.</td>
<td>E. g. through small particles on the seal edge, which are removed again in further operation. No reason for complaint.</td>
</tr>
<tr>
<td>Apparent leak</td>
<td>Temporary leak.</td>
<td>Clean below the sealing lip with a clean rag. The sealing lip must not be soiled.</td>
<td>Mostly due to excessive grease filling between seal and dust lip or oil secretions from the grease filling of labyrinth seals. No reason for complaint.</td>
</tr>
</tbody>
</table>

¹) Siemens AG, Business Unit Mechanical Drives "MD"

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**

The notes in the section 3. "Safety instructions" and in section 9 "Faults, causes and remedy" have to be observed!

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 these instructions).

The following applies to all work in item 10.2:

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Danger to life from switched on system</strong></td>
</tr>
<tr>
<td>For carrying out maintenance and/or repair work on the gear unit, the gear unit must generally be set in standstill. The drive unit must be secured against unintentional start-up. A notice should be attached to the start switch stating clearly that work is in progress.</td>
</tr>
</tbody>
</table>

The periods indicated in table 19 largely depend on the conditions under which the gear unit is operated. Only average periods can therefore be stated here. These refer to the following values:

- **a daily operating time of** 24 h
- **a duty factor "ED" of** 100%
- **an input-drive speed of** 1500 1/min
- **an operating temperature of** 90 °C (applies for mineral oil)

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>Damage to the gear unit possible from non-compliance with the specified periods for maintenance and repair works is possible. The operator must ensure that the intervals stated in table 19 are adhered to. This also applies if the maintenance work is included in the operator's internal maintenance schedules.</td>
</tr>
</tbody>
</table>

**Table 19: Maintenance and repair work**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Periods</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check the oil temperature</td>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td>Check for unusual gear unit noise</td>
<td>Daily</td>
<td></td>
</tr>
</tbody>
</table>
| Check the oil level | Monthly | – middle of the oil sight glass  
– middle between MIN and MAX marking on the oil level indicator  
– middle between MIN and MAX marking on the oil dipstick |
<p>| Comparison of vibration values for bearing monitoring with initial values (reference values) on starting up | Every 3,000 operating hours | See item 7.3.7 |</p>
<table>
<thead>
<tr>
<th>Measures</th>
<th>Periods</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>The proper function and measurement accuracy of the ignition-protection</td>
<td>See instructions of the manufacturer</td>
<td>The operator must ensure this.</td>
</tr>
<tr>
<td>system for the temperature monitoring should be checked at regular intervals according to the instructions of the manufacturer of the ignition-protection device.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the gear unit for leaks.</td>
<td>Monthly</td>
<td></td>
</tr>
<tr>
<td>Test the water content of the oil.</td>
<td>After approx. 400 operating hours, at least once per year</td>
<td>See item 10.2.1.</td>
</tr>
<tr>
<td>Perform the first oil change.</td>
<td>Approx. 400 operating hours after start-up</td>
<td>See item 10.2.2.</td>
</tr>
<tr>
<td>Perform subsequent oil changes.</td>
<td>Every 24 months or 10 000 operating hours</td>
<td>See item 10.2.2.</td>
</tr>
<tr>
<td>Clean the oil filter.</td>
<td>Every 3 months</td>
<td>See item 10.2.3.</td>
</tr>
<tr>
<td>Clean air filter.</td>
<td>Every 3 months</td>
<td>See item 10.2.4.</td>
</tr>
<tr>
<td>Clean fan, air guide cover and gear unit.</td>
<td>As required, at least every 2 years</td>
<td>See item 10.2.5.</td>
</tr>
<tr>
<td>Refill the Taconite seals with grease.</td>
<td>Every 3000 operating hours or at least every 6 months</td>
<td>See item 10.2.6.</td>
</tr>
<tr>
<td>Repack grease for the oil retaining pipe model.</td>
<td>Every 5000 operating hours, at least every 10 months</td>
<td>See item 10.2.7.</td>
</tr>
<tr>
<td>Check the cooling coil.</td>
<td>Every 2 years</td>
<td>See item 10.2.8.</td>
</tr>
<tr>
<td>Check air-oil cooler as to condition.</td>
<td>As required, at least every 2 years</td>
<td>See item 10.2.9.</td>
</tr>
<tr>
<td>Check water-oil cooler as to condition.</td>
<td>As required, at least every 2 years</td>
<td>See item 10.2.10.</td>
</tr>
<tr>
<td>Check the hose lines.</td>
<td>Annually</td>
<td>See item 10.2.11.</td>
</tr>
<tr>
<td>Change the hose lines.</td>
<td>6 years from the manufacturing date impressed</td>
<td>See item 10.2.11.</td>
</tr>
<tr>
<td>Check screw connections for tightness.</td>
<td>After the first oil change, thereafter every 2 years</td>
<td>See item 10.2.13.</td>
</tr>
<tr>
<td>Check the shrink disk.</td>
<td>Every 12 months</td>
<td>See item 6.8.2.5.</td>
</tr>
<tr>
<td>Inspection of the gear unit.</td>
<td>approx. every 2 years</td>
<td>See item 10.4.</td>
</tr>
</tbody>
</table>

⚠ **DANGER**

**Electrostatic discharge**

Danger to life from ignition of present explosive atmosphere by electrostatic discharge. The coating must not carry an electrostatic charge. The operator must ensure that highly effective mechanisms which can set up a charge in the coating are safely avoided.
10.1.1 General 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 like 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

More 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.
- The oil sample must be taken downstream of the filter of the oil-supply system while the gear unit is running. A suitable connection point is normally located upstream of the gear unit input (e.g. oil-drain cock in the pressure line).
- A special sample container should be filled with the specified quantity of oil. If there is no such sample container available, at least one litre of oil must be filled into a clean, transportworthy, sealable vessel.

10.2.2 Change oil

As an alternative to the oil-change intervals indicated in table 19 (see item 10.1), it is possible to have an oil sample tested at regular intervals by the technical service of the relevant oil company and to have it cleared for further use.

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

**Note**

Observe the separately attached operating instructions BA 7300 and the information in item 7.1.

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

**NOTICE**

**Property damage**

Damage to the gear unit possible from inadequate lubrication because of 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. Never mix synthetic oils with mineral-based oils or with other synthetic oils.

When changing to any different oil type, the gear unit must be flushed thoroughly using the new oil type.
Note
When changing the oil, the housing and the oil-supply system, if available, must be flushed with oil to remove sludge, metal particles and oil residue. Use the same type of oil as is used for normal operation. High-viscosity oils must be heated beforehand using suitable means. Ensure that all residues have been removed before filling with fresh oil.

- Stop the gear unit by switching off the drive unit (see item 7.4).
- Place a suitable container under the oil-draining point of the gear unit housing.
- Unscrew the air filter on the top of the housing.
- Unscrew the oil drain plug and/or the open the oil drain cock and drain the oil into the collecting container.
- Drain the oil from the oil-supply system (if present) (see operating instructions to the oil-supply system).

⚠️ CAUTION

Risk of scalding
Risk of injury from escaping hot oil.
Wear suitable protection gloves, protection glasses and protection clothing.
Any oil spillage must be removed immediately with an oil-binding agent.

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

- Close the oil drain cock and/or screw in the oil drain plug.
- Clean the oil filter in the oil-cooling system (see operating instructions of the oil filter and/or the oil-supply system).
- Clean the air filter (see item 10.2.4).
- Screw the air filter back in.
- Unscrew the oil filler plug including the oil dipstick to fill oil in.
- Fill fresh oil into the gear unit (see item 7.1.3).
- Screw in again the oil filler plug including the oil dipstick.

Note
In case of gear units fitted with force-feed lubrication or an oil-cooling system, the oil circuit must also be charged with oil. To do this, briefly start up the gear unit with added pump. Observe the instructions in section 8. "Operation".
### 10.2.3 Clean the oil filter

**Note**

Observe the operating instructions of the oil filter for operation and maintenance. For technical data, refer to the data sheet and/or the list of equipment.

### 10.2.4 Clean the air filter

**Note**

A period of 3 months applies to the cleaning of the air filter. If a layer of dust has built up, the air filter must already be cleaned, whether or not before the 3-month period has expired.

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

<table>
<thead>
<tr>
<th><strong>WARNING</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of injury to the eyes from pressurised air</strong></td>
</tr>
<tr>
<td>Residual water and/or dirt particles can injure the eyes.</td>
</tr>
<tr>
<td>Wear suitable protective glasses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>NOTICE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>Damage to the gear unit due to penetration of foreign bodies is possible. The penetration of foreign bodies into the gear unit must be prevented.</td>
</tr>
</tbody>
</table>
10.2.5 Cleaning fan, air-guide cover and gear unit

- Observe the instructions in item 5.8.1!
- Demount the air-guide cover.
- Using a stiff brush, remove any dirt adhering to the fan wheel, air-guide cover and safety grid.
- Remove any corrosion.
- Screw safety grid with fastening screws back onto the air guide cover.

**NOTICE**

**Property damage**

Damage to the gear unit from absent cooling due to a soiled or damaged fan and/or damage to the gear unit by penetrating moisture.

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

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

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

---

**DANGER**

**Explosion hazard**

Ignition of an explosive atmosphere is possible from overheating of the gear unit or from sparks in contact of fan and air-guide cover.

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

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

The cleaning of the gear unit with a high-pressure cleaning device is not permitted, because the gear unit might be damaged by penetrating moisture.

---

10.2.6 Refill the Taconite seals with grease

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

**CAUTION**

**Risk of slipping**

Risk of slipping on leaked grease.

Remove and dispose of any old grease escaping.
10.2.7 Refill the oil retaining pipe with grease.

- Stop the gear unit by deactivating the drive unit, and secure electrically and mechanically against turning.
- Recharge the lubricating point on the oil retaining pipe with lithium-based roller bearing grease. The quantity and frequency can be seen on the plate which attached nearby this point.

The lubricating points are identified with the following identification plate.

<table>
<thead>
<tr>
<th>Lubricating point</th>
<th>[g lithium-based grease]</th>
</tr>
</thead>
<tbody>
<tr>
<td>after [Operating hours]</td>
<td></td>
</tr>
</tbody>
</table>

Note
For the exact specification of the lubrication nipple, refer to the drawings in the gear unit documentation.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of slipping</td>
</tr>
<tr>
<td>Risk of slipping on leaked grease.</td>
</tr>
<tr>
<td>Remove and dispose of any old grease escaping.</td>
</tr>
</tbody>
</table>

10.2.8 Check cooling coil

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

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosion hazard</td>
</tr>
<tr>
<td>Ignition of an explosive atmosphere is possible from overheating of the gear unit due to absent cooling.</td>
</tr>
<tr>
<td>If the cooling coil is dirty, heat is no longer withdrawn effectively from the gear unit. Any dirt adhering to the inside of the coil should be removed by chemical cleaning or the cooling coil should be replaced with a new one.</td>
</tr>
</tbody>
</table>

- If thick deposits have formed on the inside of the cooling coil, the cooling water and/or the deposits themselves should be chemically analysed. Such analyses are offered by specialist companies for chemical cleaning. Such companies also sell special cleaning agents for removing such deposits.
• Before these cleaning agents may be used, a check of the cleaning agents' compatibility with the materials of the coiling-coil materials is required (contact Siemens). Observe the manufacturer's instructions at all times when using different cleaning agents by several manufacturers.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of burns from chemical substances</td>
</tr>
<tr>
<td>Avoid burns when working with corrosive cleaning agents. Observe manufacturer's instructions for handling lubricants and solvents. Wear suitable personal protective equipment (gloves, safety glasses).</td>
</tr>
</tbody>
</table>

• Seriously contaminated cooling coils must be replaced. Consultation with Siemens Customer Service is required for this.
• Re-connect the water in- and outflow pipes.

10.2.9 Check air-oil cooler.
• Observe the instructions in items 5.8.3 and 10.1!
• Remove dirt from the cooler block.
• Check the condition of screw connections and, if necessary, replace.

10.2.10 Check water-oil cooler.
• Observe the instructions in items 5.8.4 and 10.1!
• Inspect the cooler for leaks in the pipework.
• Check the condition of screw connections and, if necessary, replace.

10.2.11 Check hose lines

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

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property damage</td>
</tr>
<tr>
<td>Damage to the hose lines from ageing or external influences. The period of use of the hose lines must not exceed 6 years. For control purposes, the manufacturing date is printed on the hose lines. If a fault is found during the inspections, it must be corrected immediately.</td>
</tr>
</tbody>
</table>

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

**Note**

The operator of the system must ensure that hose lines are replaced at suitable intervals of time, even if no defects which may affect their safe operation are identifiable on them.

Hose lines must be inspected for safe working condition by an expert before the plant is first put into operation and thereafter at least once a year.

10.2.12 Top up oil

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

- The instructions in item 10.1 must be observed!
- Check tightness of all 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 relevant instructions manuals and the specifications in sections 5. "Technical description" and 7. "Start-up", must be observed.
For technical data, refer to the data sheet and/or the list of equipment.

Observe the instructions in item 6.22.

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

10.4 General inspection of the gear unit

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

10.5 Lubricants

The quality of the oil used must meet the requirements of the separately supplied BA 7300 instructions manual, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in the table "T 7300" (for a link to the internet, see 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. Decisive for the oil quantity to be filled in is the middle of the oil sight glass, the middle between the MIN and MAX marking on the oil level indicator or the middle between MIN and MAX marking on the oil dipstick.

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.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property damage</strong></td>
</tr>
<tr>
<td>Damage to the gear unit from improper use. Siemens guarantee only the original spare parts supplied by Siemens. Non-original spare parts have not been tested or approved by Siemens. Non-original 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.</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Order no., position</th>
<th>Type, size</th>
<th>Part no.</th>
<th>Quantity</th>
</tr>
</thead>
</table>

11.2 **Addresses for ordering spare parts and customer service**

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

Siemens AG  
Am Industriepark 2  
46562 Voerde

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

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

developed for driving machines in the most varied industrial sectors:

- 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, 1.2.6; 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.6, 1.3.7, 1.3.8, 1.3.8, 1.3.8, 1.4.1, 1.4.2; 1.4.2.1;
  1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.6, 1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.5.11, 1.5.13, 1.5.15; 1.6.1, 1.6.2; 1.7.1,
  1.7.1.1, 1.7.2, 1.7.4, 1.7.4.1, 1.7.4.2, 1.7.4.3
- The partly completed machinery must not be put into service until it has been established that the machinery into which the partly completed machinery is to be incorporated has been declared to be in conformity with the provisions of Directive 2006/42/EC, as appropriate.
- The partly completed machinery is in conformity with the provisions of the Directive(s):
  94/9/EC
- 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, 2013-03-04

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

Voerde, 2013-03-04

Dr. Bernhard Hoffmann
(Vice-President Business Subsegment DA)
EC declaration of conformity

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

The manufacturer, Siemens AG, 46395 Bocholt, Germany, declares that the equipment described in these assembly and operating instructions:

**Gear unit**

H..V, B..V

Sizes 23 to 28

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

- DIN EN 1127-1 : 10-2011
- DIN EN 13463-1 : 07-2009
- DIN EN 13463-5 : 10-2011
- DIN EN 13463-6 : 07-2005
- DIN EN 13463-8 : 01-2004
- DIN EN 60079-0 : 03-2010

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

DEKRA EXAM GmbH, 44727 Bochum, Germany, code number: 0158.

Voerde, 2013-03-04

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

Voerde, 2013-03-04

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

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

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

Service & Support:

Lubricants: