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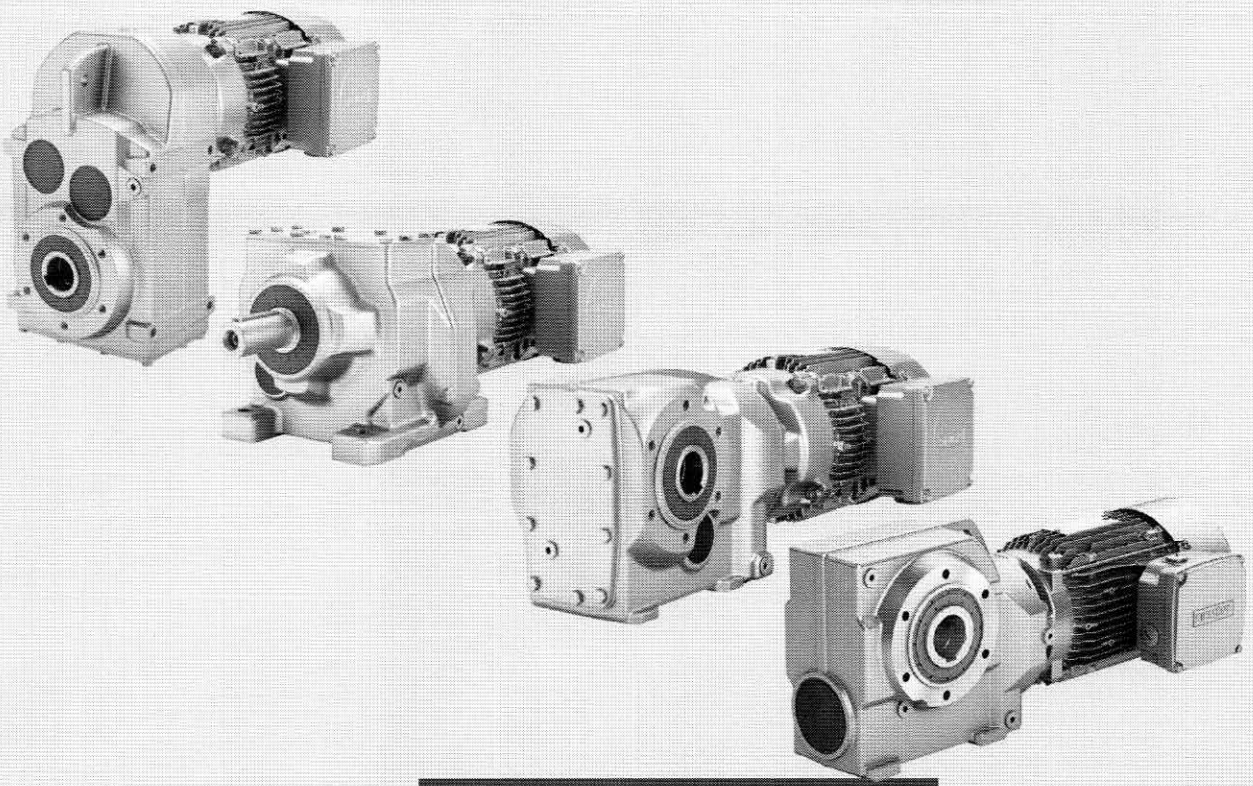

Operating Instructions

SIMOGEAR

Gearbox

BA 2030

Edition 04/2020

siemens.com/simogear

SIEMENS

SIMOGEAR

Gearbox BA 2030

Operating Instructions

Translation of the original instructions
04/2020
A5E37880173A/RS-AL

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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A5E37880173A/RS-AL
℗ 04/2020 Subject to change

Table of contents

General information and safety notes

1

1.1 General information

ATEX version gearboxes

Instructions and measures applying in particular to ATEX version gearboxes.

Note

Siemens AG does not accept any liability for damage and failures that result from the non-observance of these operating instructions.

Note

European RoHS directive

SIMOGEAR geared motors comply with the stipulations set up in the Directive 2011/65/EU regarding the restriction of the use of certain hazardous substances.

These operating instructions are part of the gearbox delivery. Store the operating instructions near the gearbox. Please read the operating instructions prior to handling the gearbox and observe the information they contain. This is how you ensure safe and disturbance-free function.

These operating instructions apply to the standard version of SIMOGEAR gearboxes:

- Helical gearboxes E, D and Z, sizes 19 to 189
- Parallel shaft gearboxes FD / FZ, sizes 29 to 189
- Bevel gearboxes B, K, sizes 19 to 189
- Helical worm gearboxes C, sizes 29 to 89

For the description of the precise designation see Type designation (Page 99).

Table 1- 1 Article number code

SIMOGEAR gearbox	Article number position				
	1	2	3	4	5
Helical gearbox E	2	K	J	3	0
Helical gearbox D	2	K	J	3	2
Helical gearbox Z	2	K	J	3	1
Parallel shaft gearbox FD	2	K	J	3	4
Parallel shaft gearbox FZ	2	K	J	3	3
Bevel gearbox B, K	2	K	J	3	5
Helical worm gearbox C	2	K	J	3	6

Note

In addition to these operating instructions, special contractual agreements and technical documentation apply to a special gearbox design and the associated supplementary equipment.

Please refer to the other operating instructions supplied with the product.

The described gearboxes correspond to the state-of-the-art at the time these operating instructions were printed.

Siemens AG reserves the right to change individual components and accessory parts in the interest of further development. The changes serve to improve the performance and safety. The significant features are retained. The operating instructions are always being updated with new contents.

The latest versions of the operating instructions, the declaration of incorporation and the declarations of conformity are available in electronic form in the Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/13424/man).

You can find technical configuration data, spare parts lists and certificates of compliance on the Intranet at Once Delivered (https://c0p.siemens.com:8443/sie/1nce_delivered).

You can find the contact data of your Technical Support in the Database of contacts at Siemens AG (www.siemens.com/yourcontact).

If you have any technical questions, please contact Technical Support (https://support.industry.siemens.com/cs/ww/en/sc/2090).

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Valid operating instructions for SIMOGEAR

- BA 2030 - operating instructions for SIMOGEAR gearboxes
- BA 2031 - operating instructions for permissible mounting position deviations of SIMOGEAR gearboxes
- KA 2032 - compact operating instructions for SIMOGEAR worm geared motor S
- BA 2039 - operating instructions for adapters for mounting on SIMOGEAR gearboxes
- BA 2330 - operating instructions for LA/LE/LES motors for mounting on SIMOGEAR gearboxes
- BA 2535 - operating instructions for SIMOGEAR gearboxes for monorail conveyors
- BA 2730 - operating instructions for SIMOGEAR geared motors with encoder for safety-relevant applications

1.2 Copyright

1.3 Intended use

ATEX version gearboxes

The ATEX gearbox fulfills the requirements of the Explosion Protection Directive 2014/34/EU.

In the case of ATEX version gearboxes, please observe the instructions marked with this symbol.

The SIMOGEAR gearboxes described in these operating instructions have been designed for stationary use in general engineering applications.

Unless otherwise agreed, the gearboxes have been designed for use in plants and equipment in industrial environments.

The gearboxes have been built based on state-of-the-art technology and are shipped in an operationally reliable condition. Changes made by users could affect this operational reliability and are forbidden.

Note

The data on the rating plate assumes an installation altitude of up to 1 000 m above sea level.

The permissible ambient temperature is stamped on the rating plate.

For different installation altitudes and ambient temperatures, contact Technical Support.

The gearboxes have been designed solely for the application described in the Technical data (Page 99). Do not operate the gearbox outside the specified power limit. Other operating conditions must be contractually agreed.

Do not climb on the gearbox. Do not place any objects on the gearbox.

1.4 Geared motor with encoder for safety-relevant applications

For a SIMOGEAR geared motor with encoder for safety-relevant applications, it is crucial that you observe the operating instructions BA 2730. These operating instructions are valid for the functionally safe encoders that are mounted onto SIMOGEAR geared motors. The functionally safe encoders are in compliance with the relevant standards for safety-relevant applications listed in the declaration of conformity of BA 2730.

The SIMOGEAR geared motor with functionally safe encoder has a signal yellow marking on the fan cover. Marking SI04 for the functionally safe encoder is stamped on the rating plate. The safety level is marked on the functionally safe encoder.

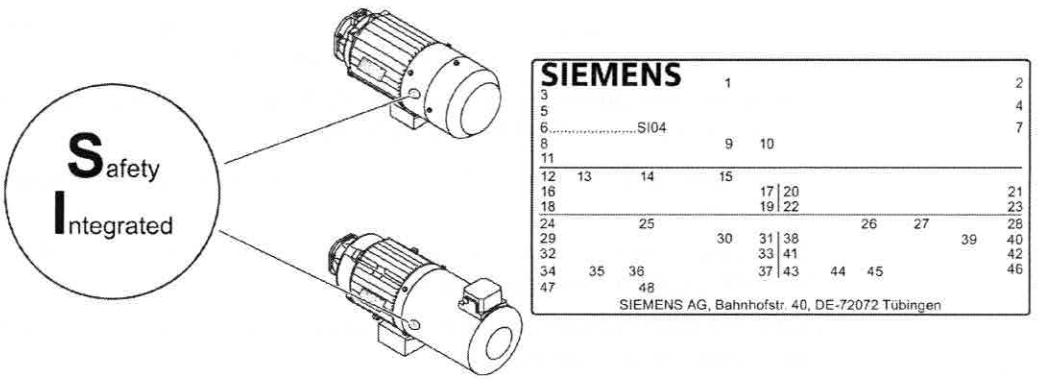


Figure 1-1 Marking for functional safety

1.5 Obligations of the user

The company operating the unit must ensure that all persons assigned to work on the geared motor have read and understood these operating instructions and that they comply with them in all points in order to:

- Eliminate the risk to life and limb of users and others
- Ensure the operational safety of the geared motor.
- Avoid disruptions and environmental damage through incorrect use.

Comply with the following safety instructions:

Shut down the geared motors and disconnect the power before you carry out any work on them.

Make sure that the drive unit cannot be turned on accidentally, e.g. lock the key-operated switch. Place a warning notice at the drive connection point which clearly indicates that work is in progress on the geared motor.

Carry out all work with great care and with due regard to "safety".

For all work, carefully comply with the relevant regulations for work safety and environmental protection.

Comply with the instructions on the rating plates attached to the geared motor. The rating plates must be kept free from paint and dirt at all times. Replace any missing rating plates.

In the event of changes during operation, switch off the drive unit immediately.

Take appropriate protective measures to prevent accidental contact with rotating drive parts, such as couplings, gear wheels or belt drives.

Take appropriate protective measures to prevent accidental contact with parts and equipment that heat up to over +70 °C during operation.

When removing protective equipment, keep fasteners in a safe place. Re-attach removed protective equipment before commissioning.

Collect and dispose of used oil in accordance with regulations. Immediately remove any spilt oil with an oil-binding agent.

Do not carry out any welding work on the geared motor. Do not use the geared motor as a grounding point for welding operations.

Carry out equipotential bonding in accordance with applicable regulations and directives by electrotechnology specialists.

Do not use high-pressure cleaning equipment or sharp-edged tools to clean the geared motor.

Comply with the permissible tightening torque of the fastening bolts.

Replace damaged bolts with new bolts of the same type and strength class.

Siemens AG accepts the warranty only for original spare parts.

The manufacturer who installs the geared motors in a plant must include the regulations contained in the operating instructions in its own operating instructions.

During operation, observe the maximally permissible vibration values specified in DIN ISO 10816-3.

1.6 The five safety rules

For your own personal safety and to prevent material damage when carrying out any work, always observe the safety-relevant instructions and the following five safety rules according to EN 50110-1 Working in a voltage-free state. Apply the five safety rules in the sequence stated before starting work.

Five safety rules

1. Disconnect.
   Also disconnect the auxiliary circuits, for example the anti-condensation heating.
2. Secure against reconnection.
3. Verify absence of operating voltage.
4. Ground and short circuit.
5. Cover or safeguard neighboring live parts.

After the work has been completed, undo the measures taken in the reverse order.

1.7 Particular types of hazards

⚠WARNING
Extreme surface temperatures
Hot surfaces over +55 °C pose a burn risk.
Cold surfaces below 0 °C pose a risk of damage due to freezing.
Do not touch the gearbox without protection.

⚠WARNING
Hot, escaping oil
Before starting any work wait until the oil has cooled down to below +30 °C.

⚠WARNING
Poisonous vapors when working with solvents
Avoid breathing in vapors when working with solvents.
Ensure adequate ventilation.

⚠WARNING
Risk of explosion when working with solvents
Ensure adequate ventilation.
Do not smoke!

⚠WARNING
Risk of eye injury
Rotating parts can throw off small foreign particles such as sand or dust.
Wear protective eyewear!

In addition to the prescribed personal protection gear, also wear suitable protective gloves and safety glasses.

Technical description

2

2.1 General technical description

The gearbox is supplied with one, two or three transmission stages.

The gearbox is suitable for various mounting positions. Observe the correct oil level.

Gearbox housing

The housings for sizes 19 and 29 are made of die-cast aluminum.

Depending on the gearbox type, the housings of sizes 39 and 49 are made of die-cast aluminum or cast iron.

Table 2- 1 Housing material

Gearbox type	Size		
	39	39A	49
Helical gearbox E	Cast iron		Cast iron
Helical gearbox D/Z	Aluminum		Cast iron
Parallel shaft gearbox F	Cast iron		Cast iron
Bevel gearbox B	Aluminum		Aluminum
Bevel gearbox K	Cast iron		Cast iron
Helical worm gearbox C	Cast iron	Aluminum	Cast iron

From size 59, the gearbox housings are made of cast iron.

Geared components

The geared components are hardened and ground.

For the helical worm gearbox, the worm is hardened and ground. The gear is manufactured from high-quality bronze.

The bevel gear stage of the bevel gearbox is lapped in pairs.

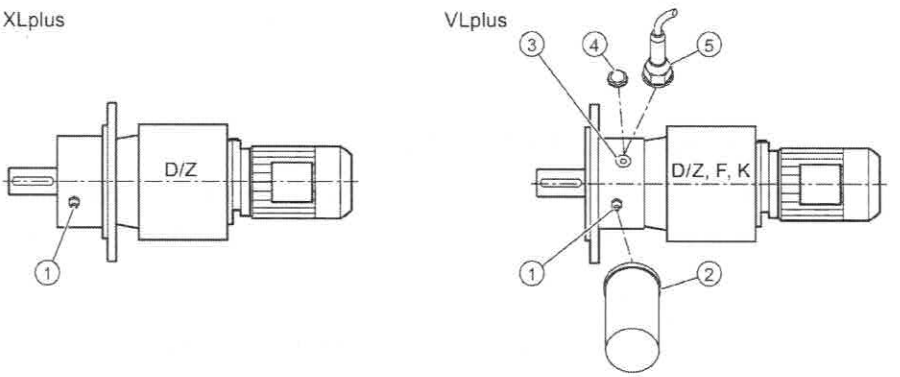
Lubrication

The geared components are supplied with adequate lubricant by means of dip lubrication.

Shaft bearings

All shafts are mounted in roller bearings. The roller bearings are lubricated using splash lubrication or oil-spray lubrication. Bearings that are not supplied with lubricant are closed and grease-lubricated.

XLplus and VLplus heavy-duty bearing systems



① Grease nipple
② Automatic regreasing device (optional)
③ Screw plug
④ Dry-well oil sight glass (optional)
⑤ Dry-well oil sensor (optional)

Figure 2-1 XLplus and VLplus heavy-duty bearing systems

The multi-stage helical gearbox sizes 89-169 can be supplied with an XLplus or VLplus heavy-duty bearing system.

The parallel-shaft gearbox and the helical gearbox sizes 89-169 can be supplied with a VLplus heavy-duty bearing system.

With an upstream locating bearing, the bearing system is suitable for high external forces. The absorbed radial and axial loads are transmitted to the machine via the flange.

The bearings are lubricated independently of the frame size. Initial greasing has already been carried out. The relubrication is made with the provided grease nipple.

Options for the VLplus heavy-duty bearing system:

An automatic regreasing device ② can be supplied as option. The automatic regreasing device ② can be installed at any position and can be used underwater.

A dry-well version with oil sight glass ④ or oil sensor ⑤ can be supplied as option. The dry-well version offers increased protection against oil leaks when the output shaft points down. The flange captures any escaping gear oil for leakages at the oil chamber. The escaping oil is signaled optically with an oil sight glass ④ or electronically by an oil sensor ⑤. If the oil sensor ⑤ is deployed in ATEX version gearboxes, the sensor must be operated with a disconnector approved for ATEX.

2.2 Shaft seals

The shaft sealing rings on the output side prevent lubricant from escaping from the housing at the shaft outlet and prevent pollution from entering the housing.

The optimum use of the seals depends on the ambient conditions and the lubricant being used.

Radial shaft sealing ring

A high-quality radial shaft sealing ring is used as standard seal. The ring is provided with an additional dust lip to protect against contaminants from outside.

Permitted oil sump temperatures -40° C to +80° C.

Seal for a longer service life (optional)

The radial shaft sealing ring with dust lip has an additional buffer axial seal towards the inside of the gearbox. The sealing system has a high degree of reliability as a result of the insensitivity with respect to contaminations in the oil.

Permitted oil sump temperatures -40° C to +100° C.

Seal to handle increased environmental stress (optional)

This seal is equipped with an additional fiber disk. The disk so provides increased protection against higher environmental stress caused by dirt and dust.

Permitted oil sump temperatures -20° C to +80° C.

High temperature-resistant seal (optional)

The deployed radial shaft sealing rings are made of a temperature-resistant material.

Permitted oil sump temperatures -25° C to +110° C.

2.3 Cooling

NOTICE
Dust deposits prevent heat radiation
Dust deposits prevent heat radiation and cause a high housing temperature.
Keep the gearbox free from dirt, dust, etc.

The gearbox does not normally require additional cooling. The generously dimensioned housing surface is sufficient for dissipating heat losses where there is free convection. If the housing temperature exceeds a value of +80 °C, please contact Technical Support.

2.4 Rating plate

The rating plate on the gearbox or geared motor is of coated aluminum foil. The rating plate is glued using a special masking film. The film ensures permanent resistance to UV radiation and media of all kinds, such as oils, greases, salt water and cleaning agents.

The adhesive and the material ensure firm adhesion and long-term legibility within the operating temperature range from -40 °C to +155 °C.

The edges of the rating plate are paint-finished to match the color of the gearbox or motor to which it is affixed.

2.5 Surface treatment

2.5.1 General information on surface treatment

All paint finishes are sprayed on.

ATEX version gearboxes

The gearbox is delivered complete with primer and paint finish.

If the gearbox is delivered with primer only or unpainted, a paint finish must be applied which meets the applicable guidelines for the specific application. The primer does not provide adequate corrosion protection.

ATEX version gearboxes

When applying conductive paint, the operator must ensure that the paint remains in a perfect state.
The paint finish must be checked at intervals of approximately 2 - 3 years.

ATEX version gearboxes

An excessively high electrostatic charge must be avoided.
Ensure that highly active mechanisms that cause the paint finish to generate a charge are avoided.
Highly active mechanisms that can generate charges:

- Fast air with high dust content directed past the gearbox
- Sudden escape of compressed gases that contain particles
- Harsh abrasive processes (this does not mean manual cleaning / wiping with cleaning cloths)

⚠WARNING

Danger due to electrostatic discharge

For paint finishes in explosion group III, the paint can be electrostatically charged as a result of intensive dust turbulence or processes with high levels of electrostatic charging.

Risk of explosion as a result of processes with high levels of electrostatic charging

Minimize the risk of electrostatic charging by applying effective measures according to IEC 60079-32-1.

NOTICE

Failure of the external protection

If the paint finish is damaged, the geared motor may corrode.

Do not damage the paint finish.

Note

Information about the ability to be repainted does not guarantee the quality of the paint product supplied by your supplier.

Only the paint manufacturer is liable for the quality and compatibility.

Note

C1 paints are not suitable for ambient air temperatures below -20° C.

2.5.2 Painted version

The corrosion protection system is classified according to the corrosiveness categories in DIN EN ISO 12944-2.

Table 2- 2 Paint according to corrosiveness categories

Paint system	Description
Corrosiveness category C1, unpainted for gearbox and motor housings made of aluminum	
-	• Indoor installation • Heated buildings with neutral atmospheres • Resistance to greases and some resistance to mineral oils, aliphatic solvents • Standard

Paint system	Description
Corrosiveness category C1 for normal environmental stress	
1-component hydro paint, top coat	• Indoor installation • Heated buildings with neutral atmospheres • Resistance to greases and some resistance to mineral oils, aliphatic solvents • Standard paint for gearbox housings made of cast iron
Corrosiveness category C2 for low environmental stress	
2-component - polyurethane top coat	• Indoor and outdoor installation • Unheated buildings with condensation, production areas with low humidity, e.g. warehouses and sports facilities • Atmospheres with little contamination, mostly rural areas • Resistance to greases, mineral oils and sulfuric acid (10 %), caustic soda (10 %) and some resistance to aliphatic solvents
Corrosiveness category C3 for medium environmental stress	
2-component epoxy zinc phosphate base coat, 2-component polyurethane top coat	• Indoor and outdoor installation • Production areas with high humidity and some air contamination, e.g. food production areas, dairies, breweries and laundries • Urban and industrial atmospheres, moderate contamination from sulfur dioxide, coastal areas with low salt levels • Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (10 %)

Paint system	Description
Corrosiveness category C4 for high environmental stress	
2-component epoxy zinc phosphate base coat, 2-component polyurethane top coat	• Indoor and outdoor installation • Chemical plants, swimming pools, wastewater treatment plants, electroplating shops, and boathouses above seawater • Industrial areas and coastal areas with moderate salt levels • Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (10 %)
Corrosiveness category C5 for very high environmental stress	
2-component epoxy zinc phosphate base coat, 2-component polyurethane intermediate coat, 2-component polyurethane top coat	• Indoor and outdoor installation • Buildings and areas with almost constant condensation and high contamination, e.g. malt factories and aseptic areas • Industrial areas with high humidity and aggressive atmosphere, coastal areas and offshore environments with high salt levels • Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (20 %)

In case of corrosiveness category C1, overpainting with a 1-component hydrosystem after prior rubbing down is possible.

In case of corrosiveness categories C2 to C5, overpainting with 2-component polyurethane paint, 2-component epoxide paint and 2-component acrylic paint after prior rubbing down is possible.

2.5.3 Primed version

Table 2- 3 Primer according to corrosiveness category

Paint system	Can be overpainted with
Unpainted corrosiveness category C1	
Cast iron parts immersion primed, steel parts primed or zinc-plated, aluminum and plastic parts untreated	• Synthetic paint, synthetic resin paint, oil paint • 2-component polyurethane paint • 2-component epoxy paint

Paint system	Can be overpainted with
Primed according to corrosiveness category C2 G	
2-component epoxy zinc phosphate, desired coat thickness 60 µm	• 2-component - polyurethane paint • 2-component - epoxy paint • 2-component - acrylic paint • Acid-hardening paint
Primed according to corrosiveness category C4 G	
2-component epoxy zinc phosphate, desired coat thickness 90 µm	• 2-component - polyurethane paint • 2-component - epoxy paint • 2-component - acrylic paint • Acid-hardening paint

2.6 ATEX ignition hazards in accordance with DIN EN 80079-37

ATEX version gearboxes

ATEX marking

Regardless of the type of protection, the letter »h« is always assigned. In addition to the marking on the rating plate, the valid types of protection below are applied:

Constructional safety "c"

The constructional safety is ensured by the selection of suitable materials and components, the dimensioning of the product for the customer's application, suitable sealing systems, adequate lubrication of rolling bearings, geared components and seals, and by thermal testing.

Liquid immersion "k"

The liquid immersion is achieved through oil bath lubrication. Refer to the rating plate and the Operating Instructions for the original oil filling.

Control of ignition sources "b"

Control of ignition sources is achieved by a temperature check and/or electrical oil level check.

ATEX version gearboxes

Servicing and maintenance work that are relevant for the type of protection shall only be carried out by SIEMENS service personnel or by SIEMENS authorized partners.

Incoming goods, transport, and storage

3

3.1 Incoming goods

NOTICE
Transport damage impairs correct functioning
Do not commission faulty gearboxes or geared motors.

Note

Do not open or damage parts of the packaging that preserve the product.

Note

Check that the technical specifications are in accordance with the purchase order.

Inspect the delivery immediately on arrival for completeness and any transport damage.

Notify the freight company of any damage caused during transport immediately (this is the only way to have damage rectified free of charge). Siemens AG will not accept any claims relating to items missing from the delivery and which are submitted at a later date.

The gearbox or geared motor is delivered in a fully assembled condition. Additional items are sometimes delivered packaged separately.

The products supplied are listed in the dispatch papers.

3.2 Transport

3.2.1 General information on transport

NOTICE
The use of force will damage the gearbox or geared motor
Transport the gearbox or geared motor carefully. Avoid knocks.
Before putting the drive into operation, remove any transport fixtures and keep them safe or render them ineffective. You can then use them again for transporting further items or you can apply them again.

Different forms of packaging may be used, depending on the size of the gearbox or geared motor and the method of transport. Unless contractually agreed otherwise, the seaworthy packaging complies with HPE Packaging Guidelines (Bundesverband Holzpackmittel Paletten Exportverpackungen e.V., the German Federal Association for wooden packaging, pallets, and export packaging).

Note the symbols which appear on the packaging. These have the following meanings:


This way up


Center of gravity


Fragile


Do not use hand hook


Keep dry


Attach here


Keep cool

3.2.2 Fastening for suspended transport

⚠WARNING

Inadequately secured gearbox or geared motors can free themselves

Use only the transport eye or eyebolt of the gearbox to transport the gearbox or geared motor. Because they are designed only for the weight of the gearbox or geared motor, it is not permissible to add additional loads.

Do not rig eyebolts to the front threads at the shaft ends for transportation purposes.

Do not use the integrally cast lifting eyes on the motor for transport because of the risk of breaking.

If necessary, use additional, suitable lifting accessories for transport or during installation.

When attaching by a number of chains and ropes just two strands must be sufficient to bear the entire load. Secure lifting accessories against slipping.

Table 3- 1 Maximum load of the eyebolt on the gearbox

Thread size	m	d_3	Thread size	m	d_3
	[kg]	[mm]		[kg]	[mm]
M8	140	36	M20	1 200	72
M10	230	45	M24	1 800	90
M12	340	54	M30	3 200	108
M16	700	63	-	-	-

The eyebolt corresponds to DIN 580.

3.3 Storage

3.3.1 General information for storage

⚠WARNING

Danger of serious injuries caused by falling objects

Danger of damage to the gearbox when stacked

Do not stack gearboxes or geared motors on each other.

NOTICE

Failure of the external protection

Mechanical damage, chemical damage and thermal damage, such as scratches, acids, alkalis, sparks, welding beads and heat cause corrosion.

Do not damage the paint finish.

Unless contractually agreed otherwise, the guarantee period for the standard preservative lasts 6 months from the date of delivery.

In the case of storage in transit over 6 months, special arrangements must be made for preservation. Please contact Technical Support.

Store the gearbox or geared motor in dry, dust-free rooms that are maintained at a constant temperature.

The storage location must be vibration- and shock-free.

The free shaft ends, sealing elements and flange surfaces must have a protective coating.

3.3.2 Storage up to 36 months with long-term preservation (optional)

3.3.2.1 General notes for storage up to 36 months

Store the gearbox or geared motor in dry, dust-free rooms that are maintained at a constant temperature. Special packing is then not necessary.

If such premises are not available, pack the gearbox or the geared motor in plastic film or air-tight sealed film and materials. The films and materials must be able to accept moisture. Cover them to provide protection against heat, direct sunlight and rain.

The permissible ambient temperature is -25 °C to +50 °C.

The life of the corrosion protection is 36 months from delivery.

3.3.2.2 Gearbox filled with operating oil and anti-corrosive agent

NOTICE
Damage to the gearbox caused by incorrect oil quantities
Check the oil level before commissioning.
Observe the information and procedures for Checking the oil level (Page 71).

The gearbox is filled with oil corresponding to the mounting position so that it is ready for operation, and is sealed airtight using a screw plug or with a pressure breather valve with transport fixture.

For storage up to 36 months, a VCI anti-corrosion agent (**V**olatile **C**orrosion **I**nhibitor) is added.

3.3.2.3 Gearbox completely filled with oil

NOTICE
Damage to the gearbox caused by incorrect oil quantities
Prior to commissioning, remove excessive oil until it has the correct oil level.
Observe the information and procedures for Correcting the oil level (Page 71).

When biodegradable oils or oils for the food-processing sector are used, the gearbox is filled completely with operating oil. The gearbox is closed air-tight with a sealing plug or a pressure venting with transport fixture.

Do not lower the oil level during short-time commissioning for 10 minutes in no-load operation.

Installation

4

4.1 Unpacking

NOTICE
Transport damage impairs the correct function of the gearbox
Never commission faulty gearboxes.

Check the gearbox for completeness and for damage. Report any missing parts or damage immediately.

Remove and dispose of the packaging material and transport equipment in compliance with regulations.

4.2 General information on installation

ATEX version gearboxes

Effect on bearings of stray electric currents from electrical equipment.

When mounting the gearbox on or connecting it to the machine, take care to ensure potential equalization. The information on grounding and equipotential bonding provided by the motor supplier must be observed.

⚠ WARNING
Operating under load
Under load, the system can start or reverse in an uncontrolled fashion.
The entire system must be load-free so that there is no danger during this work.

NOTICE
Destruction caused by welding
Welding destroys the geared parts and bearings.
Do not weld on the gearbox. The gearbox must not be used as a grounding point for welding operations.

NOTICE

Overheating caused by solar radiation

Overheating of the gearbox due to exposure to direct sunlight.

Provide suitable protective equipment such as covers or roofs. Prevent heat accumulation.

NOTICE

Malfunction resulting from foreign objects

The operator must ensure that no foreign objects impair the function of the gearbox.

NOTICE

Damaged components impair the correct function of the gearbox

If any components are damaged, the correct function of the gearbox will no longer be ensured.

Do not install any damaged gearbox components.

NOTICE

Violation of the maximum permissible oil sump temperature

The oil sump temperature may be exceeded if the temperature monitoring equipment is incorrectly set.

An alarm must be output when the maximum permissible oil sump temperature is reached. The geared motor must be switched off when the maximum permissible temperature is exceeded. If the geared motor is shut down, then this can cause the machine to come to a stop.

NOTICE

Destruction of the machine

If the vibration values in operation are not maintained in accordance with DIN ISO 10816-3, the machine can be mechanically destroyed.

- During operation, observe the vibration values specified in DIN ISO 10816-3.

Exercise particular care during mounting and installation. The manufacturer cannot be held liable for damage caused by incorrect mounting and installation.

Make sure that there is sufficient space around the gearbox or geared motor for mounting, maintenance and repair.

On geared motors with a fan, leave sufficient free space for the entry of air. Observe the installation conditions for the geared motor.

Provide sufficient lifting gear at the start of mounting and fitting work.

Observe the mounting position specified on the rating plate. This ensures that the correct quantity of lubricant is provided.

Use all the fastening means that have been assigned to the particular mounting position and mounting type.

Cap bolts cannot be used in some cases due to a lack of space. In such cases, please contact Technical Support quoting the type of gearbox.

4.3 Thread sizes and tightening torques for fastening bolts

The general tolerance for the tightening torque is 10 %. The tightening torque is based on a friction coefficient of $\mu = 0.14$.

Table 4- 1 Tightening torques for fastening bolts

Thread size	Tightening torque for strength class		
	8.8	10.9	12.9
	[Nm]	[Nm]	[Nm]
M4	3	4	5
M5	6	9	10
M6	10	15	18
M8	25	35	41
M10	50	70	85
M12	90	120	145
M16	210	295	355
M20	450	580	690
M24	750	1 000	1 200
M30	1 500	2 000	2 400
M36	2 500	3 600	4 200

4.4 Gearbox with foot mounting

NOTICE
Impermissible housing loadings when unevenness present
Do not subject the gearbox to excessive stress when tightening the fastening bolts.
The foundation must be level and free from dirt.
The deviation in flatness of the gearbox's contact surface may not exceed the following values:
For gearboxes up to size 89: 0.1 mm
For gearboxes from size 109: 0.2 mm.

The foundation should be designed in such a way that no resonance vibrations are created and no vibrations are transmitted from adjacent foundations.

The foundation structure on which the gearbox is to be mounted must be torsionally rigid. It must be dimensioned according to the weight and torque, taking into account the forces acting on the gearbox. If the substructure is too weak, it will cause radial or axial displacement offset during operation that cannot be measured at a standstill.

If the gearbox is fastened to a concrete foundation, use foundation blocks for the appropriate recesses.

Align and grout the slide rails into the foundation.

Align the gearbox carefully with the units on the input and output side. Take into account the elastic deformation due to operating forces.

Prevent displacement from external forces due to lateral impacts.

Use stud bolts or headless screws of strength class 8.8 or higher for the mounting foot. Observe the tightening torque.

Table 4- 2 Thread size of the fastening bolt

Thread size	Helical gearbox		Parallel shaft gearbox F	Bevel gearbox B, K	Helical worm gearbox C
	E	D/Z			
	Size				
M8	-	19, 29, 39	29, 39	B19, B29, B39	29
M10	39	-	49	B49, K39, K49	39, 49
M12	49	49, 59, 69	69, 79	K69, K79	69
M16	69, 89	79, 89	89, 109	K89	89
M20	109, 129	109	129	K109	-
M24	-	129	149	K129	-
M30	149	149	169	K149	-
M36	-	169, 189	189	K169, K189	-

4.5 Gearbox with flange fastening

Note

Siemens AG recommends an anaerobic adhesive to enhance the friction lock between flange and mounting surface.

Table 4- 3 Thread size of the fastening bolt

Thread size	Flange	Helical gearbox E, D/Z	Parallel shaft gearbox F	Bevel gearbox B, K	Helical worm gearbox C
		Size			
M6	A120	19, 29, 39	29	B19, B29	29
M8	A140, A160	19, 29, 39, 49, 59	29, 39	B29, B39, K39	29, 39
M10	A200	39, 49, 59, 69	49	B39, B49, K49	49, 69
M12	A250, A300	49, 59, 69, 79, 89, 109	69, 79, 89	K69, K79, K89	89
M16	A350	79, 89, 109, 129, 149	109	K109	-
M16	A450	89, 109, 129, 149, 169	129, 149	K129, K149	-
M16	A550	129, 149, 169, 189	169	K169	-
M20	A660	169, 189	189	K189	-

Use screws / nuts of strength class 8.8 for gearboxes with a flange-mounted design.

Note the following exceptions:

Table 4- 4 Strength class of the fastening bolt for FF/FAF and KF/KAF

Gearbox size	Flange	Strength class for motor size										
		90	100	112	132	160	180	200	225	250	280	315
39	A160	10.9	10.9	-	-	-	-	-	-	-	-	-
49	A200	8.8	10.9	10.9	10.9	-	-	-	-	-	-	-
69	A250	8.8	8.8	8.8	10.9	-	-	-	-	-	-	-
79	A250	8.8	8.8	8.8	10.9	10.9	-	-	-	-	-	-
89	A300	8.8	10.9	10.9	10.9	10.9	10.9	-	-	-	-	-
109	A350	8.8	8.8	8.8	8.8	10.9	10.9	10.9	10.9	-	-	-
129	A450	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	-	-	-
149	A450	-	8.8	8.8	8.8	8.8	8.8	10.9	10.9	10.9	-	-
169	A550	-	-	8.8	8.8	8.8	10.9	10.9	10.9	10.9	10.9	-
189	A660	-	-	8.8	8.8	8.8	8.8	8.8	8.8	10.9	10.9	10.9

Table 4- 5 Strength class of the fastening bolt / nut for EZ, EF, DZ/ZZ and DF/ZF

Gearbox size		Flange	Strength class
E	D/Z		
39	29, 39	A120	10.9 [1)]
-	49	A140	10.9
49	59	A160	
69	69	A200	
89	79	A250	
109	89	A300	
129, 149	109, 129	A350	
-	149, 169	A450	
-	189	A550	

1) Use suitable washers under the nuts / bolt heads

4.6 Gearboxes in foot or flange version

NOTICE
Impermissible housing loadings caused by incorrectly installed add-on elements
Do not subject the gearbox housing to excessive stress by adding add-on elements to the foot or flange.
Add-on elements must not transmit forces, torques, and vibrations to the gearbox.

To prevent strains on the housing, fasten the gearbox only on the flange or the foot fastening for force and torque transmission. Refer to Gearbox with foot mounting (Page 30).

The second mounting option (foot or flange) is intended for add-on elements, e.g. protection covers with an intrinsic weight of up to max. 30 % of the weight of the gearbox.

4.7 Mounting an input or output element on the gearbox shaft

⚠WARNING
Risk of burns caused by hot parts
Do not touch the gearbox without protection.

NOTICE
Damage to shaft sealing rings caused by solvent
Avoid any contact of solvent or benzine with the shaft sealing rings.

NOTICE
Damage to shaft sealing rings caused by heating
Use thermal shields to protect shaft sealing rings from heating above 100 °C due to radiant heat.

NOTICE
Premature wear or material damage due to misalignment
Misalignment caused by excessive angular or axis displacement to the connecting shaft ends.
Ensure precise alignment of the individual components.

NOTICE
Damage caused by improper handling
Bearings, housing, shaft and locking rings are damaged due to improper handling.
Do not use impacts or knocks to force the input and output elements to be mounted onto the shaft.

Note

Deburr the parts of elements to be fitted in the area of the hole or keyways.

Recommendation: 0.2 x 45°

Where couplings are to be fitted in a heated condition, observe the specific operating instructions for the coupling. Unless otherwise specified, apply the heat inductively using a torch or in a furnace.

Use the center holes in the shaft end faces.

Use a fitting device to fit the input or output elements.

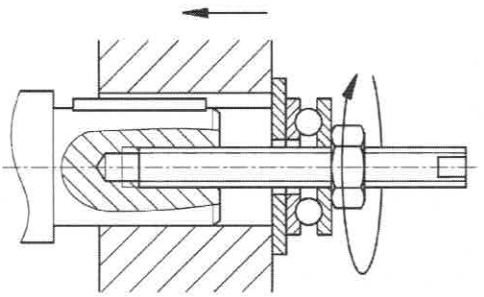
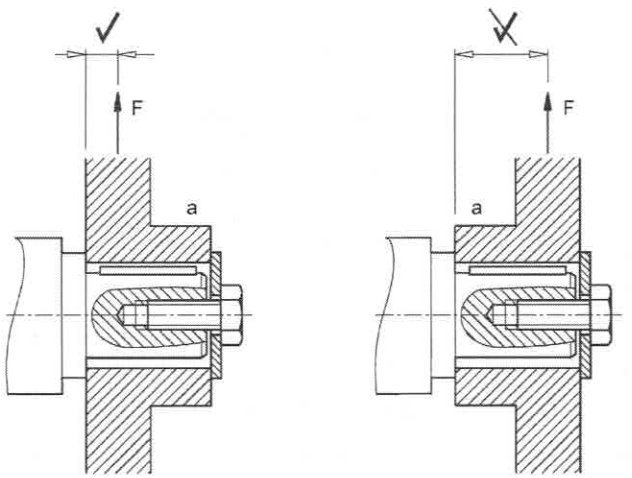


Figure 4-1 Example of a fitting device

Observe the correct mounting arrangement to minimize stress on shafts and bearings due to lateral forces.

Correct Incorrect



a Hub
F Force

Figure 4-2 Mounting arrangement for low stress on shafts and bearings

Procedure

1. Use either benzine or solvent to remove the anti-corrosion protection from the shaft ends and flanges or remove the applied protective skin.
2. Fit the drive input and output elements to the shafts. Fasten the elements when necessary.

You have now fitted the input or output element.

4.8 Removing and installing the protection cover

ATEX version gearboxes

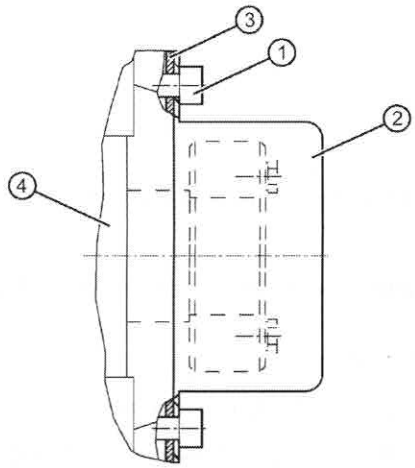
Sparks may be caused by a damaged protection cover. Replace damaged protection covers immediately.

Secure bolts ① with, e.g. Loctite 243 medium-strength adhesive.

The plastic cover is not in conformance with ATEX.

The protection cover of the hollow shaft is delivered ready-fitted to the gearbox flange. Dismantle the protection cover for installation of the output shaft.

The plastic protection cover of the hollow shaft is supplied loose as kit.



① Screw
② Protection cover
③ Flat seal / O-ring
④ Gearbox housing

Figure 4-3 Protection cover for hollow shaft

Procedure

Premounted protection cover

1. Release the screws ① and remove the protection cover ② together with the flat gasket or O-ring ③.
2. Mount the output shaft.
3. Use a suitable cleaning agent to clean the contact surface of the protection cover ② on the gearbox.
4. Ensure that the flat seal or the O-ring ③ is correctly seated.
5. Wet the bolts ① with medium-strength adhesive, e.g. Loctite 243.
6. Screw on the protection cover ②.

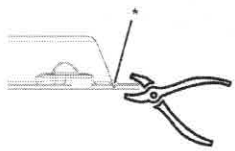
7. Protect all remaining bare areas with a suitable permanent anti-corrosive agent.

You have now installed the protection cover for operation.

Protection cover (supplied loose)

When using the plastic protection cover for gearbox F49, the cover must first be brought into the correct shape.

When using the plastic protection cover for other gearboxes, it is not necessary to bring the cover into the required shape; in this case, start with Point 2.



* Preset breaking point

Figure 4-4 Preset breaking point for F49

1. F49: Break the cover at the preset breaking point (see diagram)
2. Mount the output shaft.
3. Use a suitable cleaning agent to clean the contact surface of the protection cover ② on the gearbox.
4. Ensure that the O-ring or flat seal ③ is correctly seated.
5. Screw on the protection cover ② with a tightening torque of 10-15 Nm.
6. Protect all remaining bare areas with a suitable permanent anti-corrosive agent.

You have now mounted the plastic protection cover for operation.

4.9 Installing and removing the shaft-mounted gearbox

4.9.1 General information on installing the shaft-mounted gearbox

NOTICE
Damage to shaft sealing rings caused by solvent
Avoid any contact of solvent or benzine with the shaft sealing rings.

NOTICE
Subjecting stress to the hollow shaft causes bearing failure
Skewing or stressing the hollow shaft increases the loading. This can cause bearing failure.
The hollow shaft must be flush with the machine shaft to avoid misalignment.
Do not subject the hollow shaft to axial and radial stress.

NOTICE
For shrink disks: **Lubricants in the area between the hollow shaft and machine shaft impair torque transmission**
Keep the bore in the hollow shaft and the machine shaft completely grease-free.
Do not use impure solvents and soiled cleaning cloths.

Note

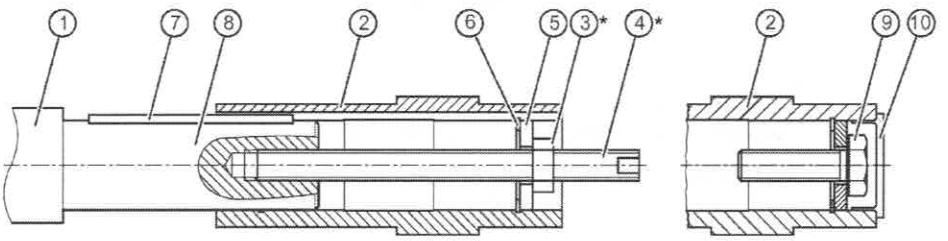
Coat the contact surfaces with the mounting paste supplied with the product or any suitable lubricant to prevent frictional corrosion.

Note

Observe the permissible concentricity tolerance of the cylindrical shaft extension of the machine shaft to the housing axle according to DIN 42955.

4.9.2 Hollow shaft with parallel key

4.9.2.1 Mounting the hollow shaft with parallel key



* Not included in scope of supply

① Machine shaft
② Hollow shaft
③ Hexagon nut
④ Lead screw
⑤ Disk
⑥ Locking ring
⑦ Parallel key
⑧ Mounting paste
⑨ Bolt
⑩ Sealing cap

Figure 4-5 Mounting the hollow shaft with parallel key

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

Procedure

1. Using benzine or a solvent, remove the anti-corrosion protection from the shaft ends and flanges.
2. Check the seats or edges of the hollow and machine shafts for any damage. Contact Technical Support if you notice any damage.
3. Apply the mounting paste provided ① to the machine shaft ⑧. Apply the paste uniformly. Carefully wipe away the rest at the shaft sealing ring of the gearbox.
4. Fit the gearbox using the disk ⑤, threaded spindle ④ and nut ③. Support is provided by the hollow shaft ②.
5. Replace the nut ③ and the threaded spindle ④ with a screw ⑨. Tighten the bolts ⑨ to the specified torque.
6. Close the open hollow shaft end using a sealing cap ⑩.

You have mounted the hollow shaft with feather key.

Table 4- 6 Tightening torque for the screw

Thread size	M5	M6	M8	M10	M12	M16	M20	M24	M30
Tightening torque [Nm]	5	8	8	14	24	60	120	200	400