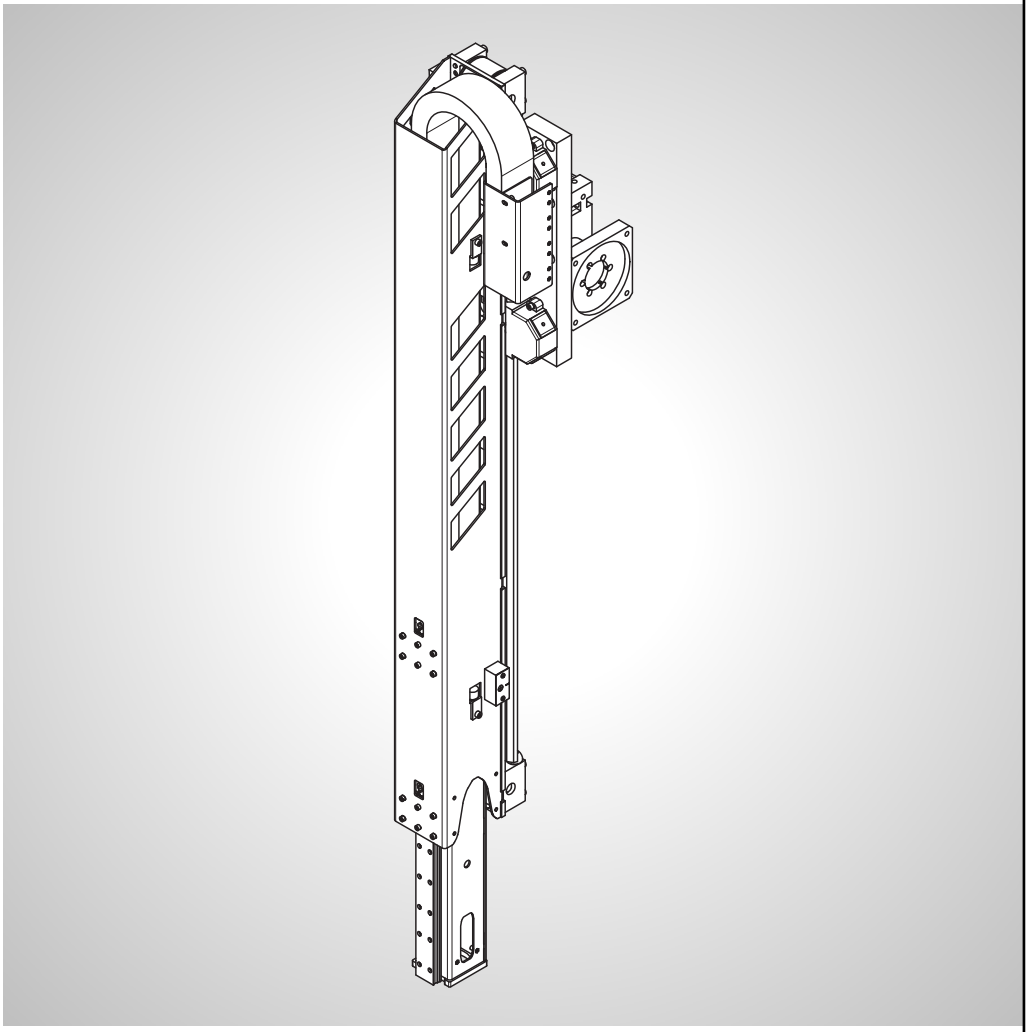
GÜDEL

SERVICE MANUAL

Telescopic axis size 6-7



Project / Order:	B1M.1xxxxxxx-xxxx
Bill of materials:	10xxxxxxxx
Serial number:	
Year of manufacture:	201x

GÜDEL

Translation of the original instructions

This manual contains standard illustrations that may deviate from the original. In the case of special models, options, or technical changes, the scope of delivery may differ from the descriptions here. Reprinting the instructions, in whole or in part, requires our permission. Subject to change due to technical improvements.

27021598048035467_v3.0_EN-US

Revision history

Version	Date	Description
3.0	29.05.2018	Modified: New gearbox unit with elastomer coupling • Replacing gearbox unit ➲ 72 • Maintenance schedules ➲ 100 • Repairs ➲ 118
2.0	27.11.2017	Updated: • Replacing the lubricating pinion ➲ 48 ➲ 101
1.0	03.10.2016	Basic version

Table -1 Revision history

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

Table of contents

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

1 General

Read the entire manual before working with the product. The manual contains important information for your personal safety. The manual must be read and understood by all persons who work on the product in any of the product life phases.

This product is an option for a Güdel product. It is only sold in combination with a Güdel product.
This manual only describes work related to the option. For more information, please refer to the superordinate manual.

1.1 Further applicable documentation

All documents delivered with this manual are further applicable documentation. They must be observed in addition to this operating manual for the safe handling of the product.

1.2 Purpose of the document

This manual describes the following product life phases of the product:

- Maintenance
- Service
- Disposal

The manual contains the information required for using the product as intended. It is an essential component of the product.

The manual must be available at the product site throughout the entire service life of the product. If the product is sold, the manual must be transferred to the new owner.

27021598048035467_v3.0_EN-US

1.3 Explanation of symbols/abbreviations

The following symbols and abbreviations are used in this manual:

Symbol/Abbreviation	Use	Explanation
➲	For cross-reference	See
🗎	Possibly for cross-reference	Page
Fig.	Designation of graphics	Figure
Table	Designation of tables	Table
	In the tip	Information or tip

Table 1-1 Explanation of symbols/abbreviations

27021598048035467_v3.0_EN-US

2 Safety

2.1 General

Read the entire manual before working with the product. The manual contains important information for your personal safety. The manual must be read and understood by all persons who work on the product in any of the product life phases.

2.1.1 Product safety

Residual danger

The product is built using state-of-the-art technology. It was designed and constructed in accordance with the accepted safety regulations. However, some residual danger remains during its operation.

There is danger to the personal safety of the operator as well as for the product and other property.

Operation

When operating the product, always observe this manual and ensure that the system is always in perfect working order.

2.1.2 Personnel qualifications

⚠ WARNING

Lack of safety training

Incorrect behavior of untrained or insufficiently trained security staff can result in severe or fatal injuries!

Before technicians work on safety-related aspects of the product:

- Ensure that the technicians are trained with regard to safety
- Train and instruct the technicians specifically for their area of responsibility

Only appropriately trained and authorized technicians are allowed to work on the product.

Persons are authorized if:

- they are familiar with the relevant safety regulations for their area of responsibility
- they have read and understood this manual
- they meet the requirements for an area of responsibility
- they were assigned an area of responsibility by the operator

27021598048035467_v3.0_EN-US

The technician is responsible to third parties in his area of responsibility.

During a training session or instruction, the technician may only work on the product under the supervision of an experienced manufacturer's technician.

2.1.2.1 Operating companies

The operating company is responsible for:

- ensuring that the product is used as intended
- ensuring that all safety aspects are complied with
- ensuring that the product is put out of operation if the functioning of the safety equipment is not fully guaranteed
- ensuring that the technician working on the product is appropriately trained
- ensuring that the technician is provided with personal protective equipment
- ensuring that the operating manual is available to the technician at the product site at all times
- ensuring that the technician is kept up-to-date in regard to best practices
- ensuring that the technician is informed about technical progress, modifications etc.
- ensuring that the contracted cleaning staff only work under the supervision of a maintenance technician

2.1.2.2 Transport specialists

The transport specialist:

- is able to transport loads safely
- is able to use slings safely and properly
- is able to secure the load properly
- has experience in transportation

2.1.2.3 Fitters

The fitter:

- has very good mechanical and/or electrical knowledge
- is flexible
- has assembly experience

27021598048035467_v3.0_EN-US

2.1.2.4 Commissioning technicians

The commissioning technician:

- has good programming knowledge
- has mechanical and/or electrical knowledge
- is flexible

The commissioning technician is responsible for the following tasks:

- commissioning the product
- testing the functions of the product

2.1.2.5 Operators

The operator:

- was trained and instructed by the operating company or the manufacturer
- has very good knowledge of the user interface and the operating elements
- has process knowledge which is specifically geared to the product

The operator is responsible for the following tasks:

- switching the control system of the product on and off
- creating production readiness
- monitoring the production process
- localizing minor malfunctions

2.1.2.6 Manufacturer's technicians

The manufacturer's technician:

- is employed on site at the premises of the manufacturer or representative
- has very good mechanical and/or electrical knowledge
- has good software knowledge
- has maintenance, service and repair experience
- has experience with Güdel products

The manufacturer's technician is responsible for the following tasks:

- performing mechanical and electrical maintenance work in accordance with the manual
- performing mechanical and electrical service work in accordance with the manual
- cleaning the product
- replacing spare parts
- localizing and fixing malfunctions

27021598048035467_v3.0_EN-US

2.1.2.7 Maintenance technicians

The maintenance technician:

- was trained by the operating company or the manufacturer
- has very good mechanical and/or electrical knowledge
- has software knowledge
- has maintenance experience
- bears responsibility for the safety of the cleaning staff

The maintenance technician is responsible for the following tasks:

- performing mechanical and electrical maintenance work in accordance with the manual
- cleaning the product
- replacing spare parts
- monitoring and instructing the cleaning staff in the safety zone during the cleaning process

2.1.2.8 Service technicians

The service technician:

- was trained by the operating company or the manufacturer
- has very good mechanical and/or electrical knowledge
- has software knowledge
- has service and repair experience
- is flexible

The service technician is responsible for the following tasks:

- performing mechanical and electrical service work in accordance with the manual
- replacing spare parts

2.1.2.9 Disposal specialists

The disposal specialist:

- is able to separate waste
- is familiar with the country-specific disposal regulations
- has experience in environmentally-friendly disposal
- works carefully and safely

27021598048035467_v3.0_EN-US

2.1.3 Disregarding safety regulations

⚠ DANGER

Disregarding safety regulations

Disregarding safety regulations can result in damage to property, severe or fatal injuries.

- Always comply with the safety regulations

Liability

Güdel shall not be held liable under any of the following circumstances:

- The installation regulations were disregarded
- Included protective equipment was not installed
- Included protective equipment was modified
- Included monitoring equipment was not installed
- Included monitoring equipment was modified
- The product was not used as intended

2.1.4 Installation instructions

Protective measures

The operating company is responsible for ensuring safe conditions in the vicinity of the product. In particular, he must ensure compliance with the general safety regulations, guidelines and standards. Before commissioning the system the operating company must check whether all the protective measures have been implemented. These must cover all hazards. This is the only way to ensure that application of the product conforms to CE regulations.

As stipulated by the Machinery Directive, the protective measures must:

- Correspond to best practices
- Comply with the required safety category

Modifications

The product must never be modified or used in a manner contrary to its intended use. ➲ Chapter 3.1, 🗎 23

General rules for occupational safety

The generally accepted occupational safety rules must be observed and implemented.

27021598048035467_v3.0_EN-US

2.2 Hazard symbols in the manual

2.2.1 Hazard warnings

The hazard warnings are defined for the following four types of danger levels:

⚠ DANGER

DANGER

DANGER refers to hazards with a high risk of severe physical injury or immediate fatality.

⚠ WARNING

WARNING

WARNING refers to hazards with a moderate risk of severe physical injury or potential fatality.

⚠ CAUTION

CAUTION

CAUTION refers to hazards with a slight risk of moderate physical injury.

NOTE

NOTE

NOTE refers to hazards that can lead to property damage.

27021598048035467_v3.0_EN-US

2.2.2 Explanation of warning symbol

Hazard warnings for personal injuries contain the symbol of the corresponding hazard.

Symbol	Explanation of symbols
	Hazards due to general causes
	Hazards due to loose connecting elements
	Hazards resulting from automatic startup
	Hazards due to falling axles
	Hazards due to heat
	Hazards due to heavy components
	Hazards due to environmental pollution
	Hand injury hazards
	Hazards due to suspended loads
	Hazards due to sharp edges of the rack

27021598048035467_v3.0_EN-US

Symbol	Explanation of symbols
	Hazards due to dangerous electrical voltage
	Hazards from falling

2.3 Fundamentals of safety

2.3.1 Separating protective equipment, monitoring equipment

⚠ WARNING

Missing separating protective equipment and monitoring equipment

Missing or modified separating protective equipment and monitoring equipment may result in damage to property or serious injuries!

- Do not remove or modify separating protective equipment and monitoring equipment
- After commissioning the system, correctly attach all the separating protective equipment and monitoring equipment

For more information on separating safety and monitoring equipment, refer to the documentation on the complete system.

27021598048035467_v3.0_EN-US

2.3.2 Product-specific hazards

⚠ DANGER

Hazardous voltage

The product contains components that are energized with hazardous voltages. Touching these components will cause an electric shock. Electric shocks can be fatal!

Before working in the danger area:

- Switch off the superordinate main power supply
- Secure the superordinate power supply against being switched on again (main switch of complete system)
- Ground the equipment.

⚠ WARNING

Falling axes, workpieces

Falling axes or workpieces can cause physical damage, serious or fatal injuries!

- Set down any workpieces before working in the danger area
- Never enter the area below suspended axes and workpieces
- Secure suspended axes using the stipulated equipment
- Check the belts of the telescope axes for signs of breakage and tears

⚠ WARNING

Danger of falling

There is a risk of falling when working at greater heights. Carelessness can lead to severe or fatal injuries!

- Secure yourself with appropriate personal falling protection systems when working in the danger area.

27021598048035467_v3.0_EN-US

2.3.3 Material safety data sheets (MSDS)

Safety data sheets contain safety information about the materials. They are country-specific. Safety data sheets are issued, for example, for materials such as oils, greases, cleaning agents, etc. The operating company is responsible for obtaining safety data sheets for all materials used.

Safety data sheets can be obtained as follows:

- Suppliers of chemicals usually supply their substances together with safety data sheets
- Safety data sheets are available on the Internet.
  (Enter "msds" and the name of the material in a search engine. Safety information about the material will be displayed.)

Read the safety data sheets carefully. Follow all the instructions. We recommend that you store the safety data sheets for future reference.

The safety data sheet for Güdel H1 can be found in the download area of our company Web site http://www.gudel.com

27021598048035467_v3.0_EN-US

3 Product description

3.1 Use

3.1.1 Intended use

The product is intended exclusively for moving and positioning workpieces and tools as well as devices.

Any other or additional use is not considered to be use in the intended manner. The manufacturer assumes no liability for any resulting damage. All risks are borne solely by the user!

3.1.2 Non-intended use

The product is not intended:

- for the movement of toxic goods
- for the movement of explosive goods
- for operation in potentially explosive areas

Any use other than the specified intended use will be considered improper use and is prohibited!

Do not make any modifications to the product.

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

4 Design, function

4.1 Design

4.1.1 Size 6

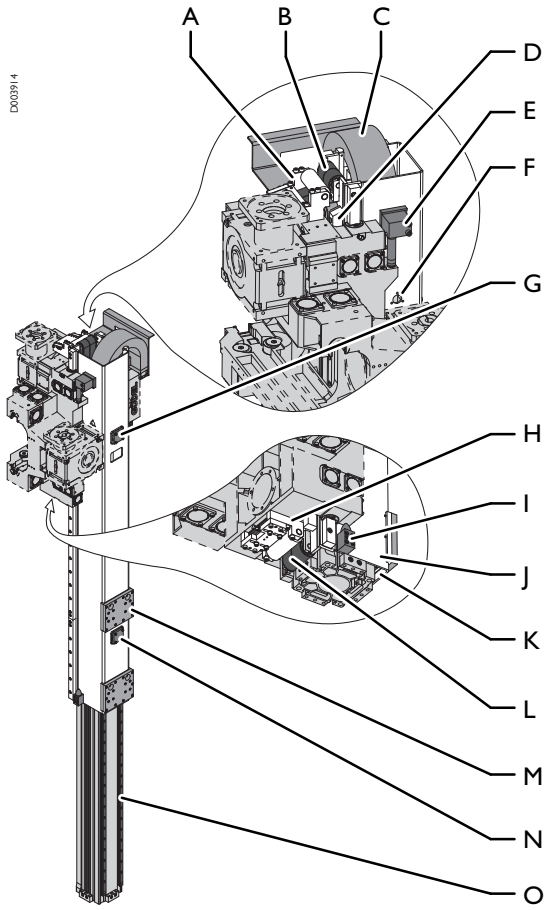


Fig. 4-1 *Design, size 6*

A	*Belt anchorage, top*	*I*	*Bumper unit (limit stop) bottom 1st level*
B	*Guide pulley top / cog belt*	*J*	*1st level*
C	*Energy chain*	*K*	*2nd level*
D	*Lubricating pinion unit*	*L*	*Guide pulley, bottom*
E	*Bumper unit (limit stop) top 1st level*	*M*	*Plate*
F	*Locking bolt*	*N*	*Bumper unit (limit stop) bottom 2nd level*
G	*Bumper unit (limit stop) top 2nd level*	*O*	*Guideway of the ball-bearing cycle*
H	*Belt anchorage, bottom*		

27021598048035467_v3.0_EN-US

4.1.2 Size 7

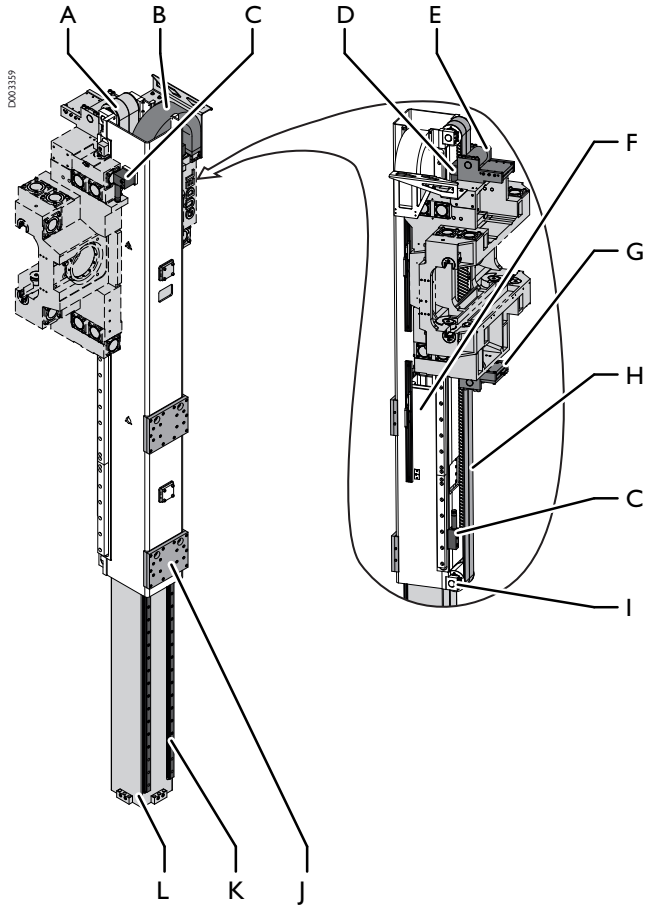


Fig. 4-2 *Size 7*

A	*Guide pulley, top*	*G*	*Belt anchorage, bottom*
B	*Energy chain*	*H*	*Cog belt*
C	*Bumper unit (limit stop)*	*I*	*Guide pulley, bottom*
D	*Lubricating pinion unit*	*J*	*Plate*
E	*Belt anchorage, top*	*K*	*Guideway of the ball-bearing cycle*
F	*1st level*	*L*	*2nd level*

27021598048035467_v3.0_EN-US

4.2 Function

The telescopic axis is driven in the first level by the rack and drive pinion. The second level is operated by a cog belt running on guide pulleys.

The telescopic axis can be moved in the following axes:

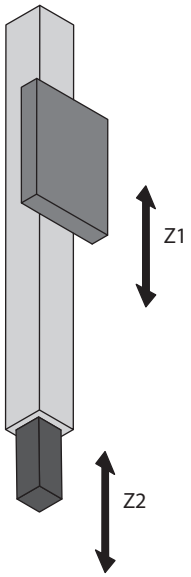


Fig. 4-3 *Axis names*

Z1 *Telescopic axis 1st level*

Z2 *Telescopic axis 2nd level*

4.2.1 Moving the axis

Incremental movements are a load on the ball-bearing cycle. We recommend moving the axis only axially. This applies to manual movements as well as during operation.

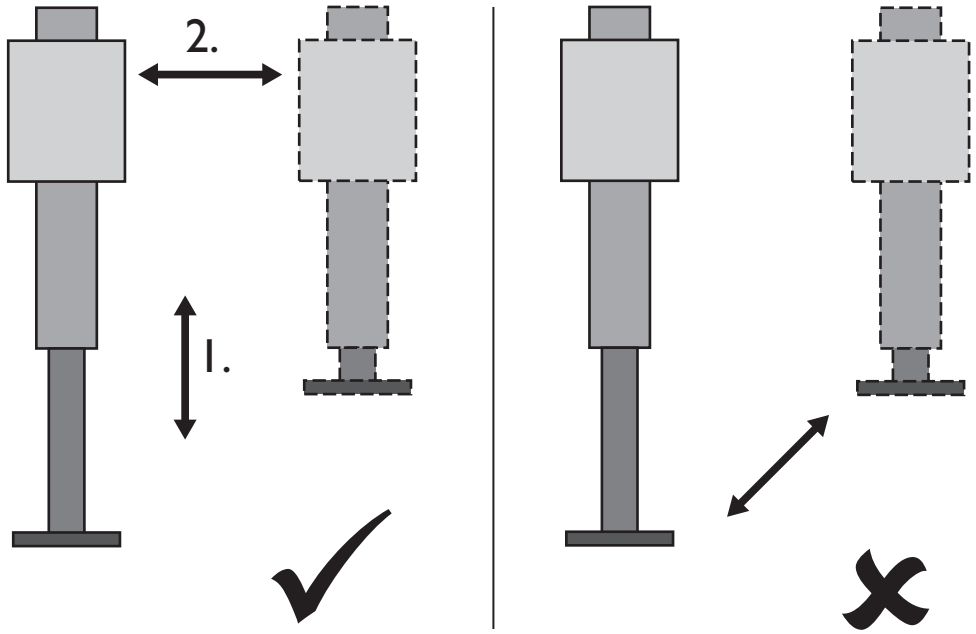


Fig. 4-4 *Moving the axis*

4.2.2 Belt monitor

The 2nd level of the telescopic axis is held only by the two upper cog belts.

⚠ DANGER

Tearing of the cog belt

There are two cog belts fitted in the product. If a cog belt tears, the payload will be carried by the intact cog belt. However the control system must be used to ensure that the axis can no longer be moved.

- Program the control system accordingly
- Take the appropriate safety measures
- Immediately replace the torn cog belt

There is belt monitoring. If the cog belt tears, the bolt of the stop screw moves. Use the signal of your initiator to warn maintenance and service personnel early. The stop screw and initiator holder are pre-assembled as shown in the following illustration:

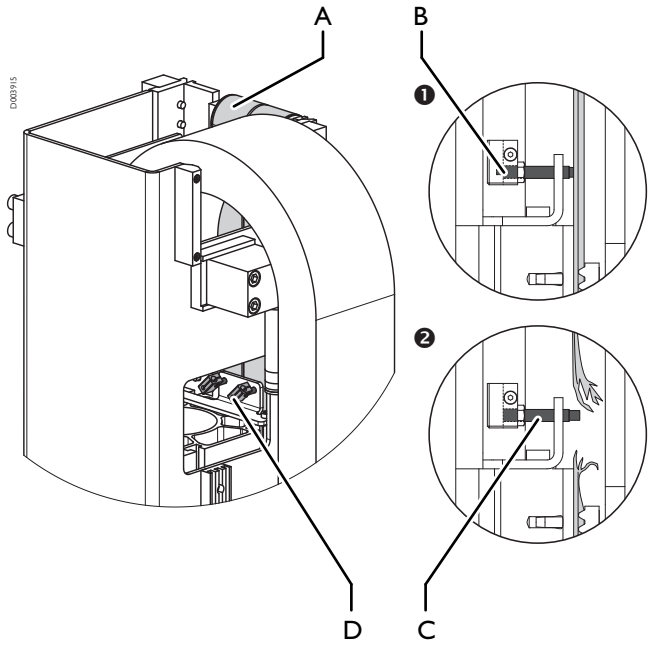


Fig. 4-5 *Belt monitor*

A	*Cog belt*	*C*	*Stop screw*
B	*Bolt*	*D*	*Initiator holder*

4.2.3 Locking bolt

Size 7 has a locking bolt. Insert the locking bolt into the upper and lower bore at the side of the 1st level. Secure the 2nd level as follows: The limit stop of the bumper unit and the belt anchorage at the middle are accessible through the gaps.

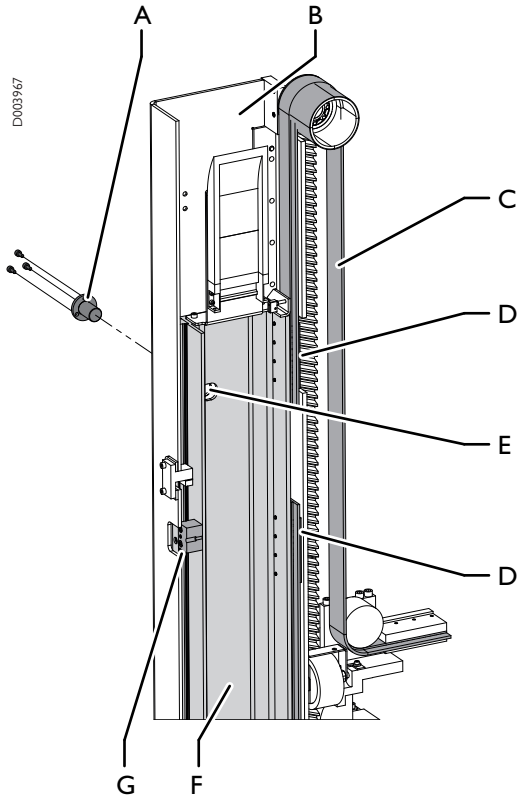


Fig. 4-6 *Locking bolt*

A	*Locking bolt*	*E*	*Drill hole*
B	*1st level*	*F*	*2nd level*
C	*Cog belt*	*G*	*Bumper unit*
D	*Belt anchorage, middle*		

27021598048035467_v3.0_EN-US

5 Transport

The product is transported by air, land, or water. The packaging depends on the mode of transport.

Truck	=	Shipped on a transport pallet
Aircraft	=	Shipped in a crate
Ship	=	Shipped in a case or container

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 13
It concerns your personal safety!

⚠ WARNING

Ripping of lifting belts

The sharp edges cut the lifting belts. This can lead to severe or fatal injuries!

- Always protect the lifting belts with an edge guard

⚠ WARNING

Suspended loads

Improper handling of suspended loads can lead to severe injuries or death!

- Use appropriate lifting units
- Wear appropriate protective clothing
- Always keep sufficient distance from suspended loads
- Never enter the area below a suspended load

NOTE

Improper transport

Improper handling of the crates can lead to transport damage!

- Do not tip over the crates
- Avoid heavy vibrations and shocks
- Observe the symbols on the packaging

27021598048035467_v3.0_EN-US

5.1 Packaging symbols

When moving the transport pallets / crates / cases, observe the following symbols:

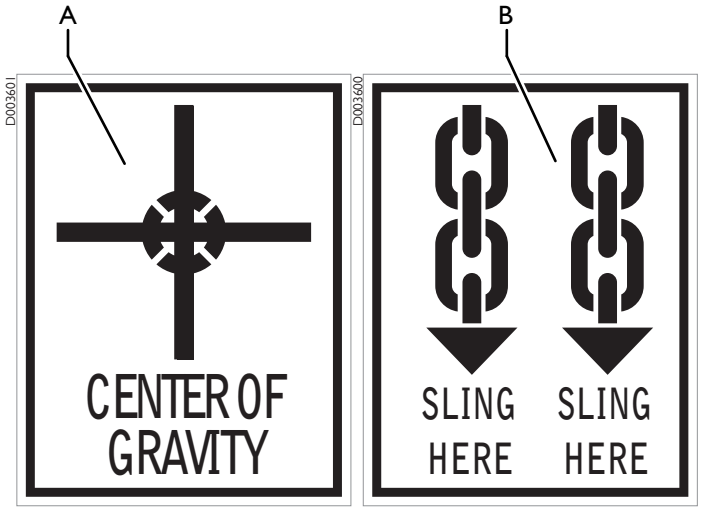


Fig. 5-1 *Attaching slings*

A *Center of gravity*

B *Fastening point*

Depending on the contents, the packaging units are marked with the symbols shown below. Observe these at all times.

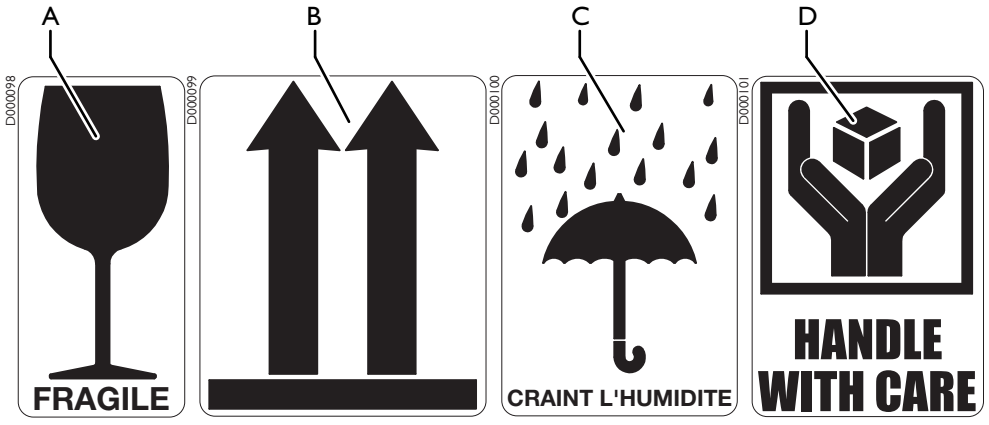


Fig. 5-2 *Packaging symbols*

A *Fragile*

B *This side up*

C *Keep dry*

D *Handle with care*

27021598048035467_v3.0_EN-US

Remove the packaging only to the degree necessary for company-internal transport.

Transport the pallet, crate, or case to the intended installation location. Use appropriate transport devices.

5.2 Industrial trucks

Industrial trucks have to be capable of handling the size and weight of the crate. The driver of the industrial truck must be authorized to drive the vehicle.

5.3 Slings

Slings, chains, ropes or belts must be suitable for the load of weight of the crate. Fasten the slings to stable parts. Secure the slings against slipping. Make sure that no attachments are damaged by the slings.

27021598048035467_v3.0_EN-US

5.3.1 Attaching the slings: Z-axis, sizes 6-7

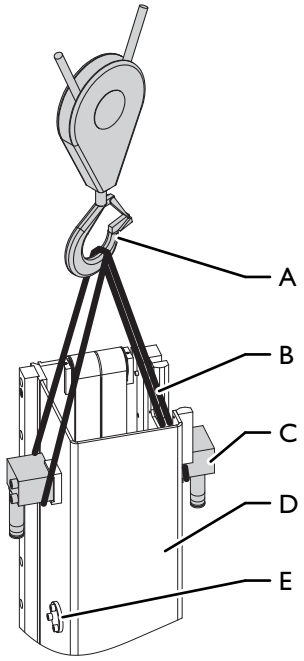


Fig. 5-3 *Attaching the slings: Z-axis, sizes 6-7*

A	*Hook*	*D*	*1st level*
B	*Lifting belt*	*E*	*Locking bolt*
C	*Bumper unit*		

Attach the slings as follows:

Prerequisite: The energy chain is removed ➲ 62

Prerequisite: The locking bolt is fitted ➲ Chapter 4.2.3, 30

1 Attach the lifting belt to the bumper units as shown in the illustration

2 Hang the lifting belts into the hooks

The slings are in place.

27021598048035467_v3.0_EN-US

5.4 Setting up the telescopic axis

⚠ WARNING

Ripping of lifting belts

The sharp edges of the rack cut the lifting belts. This can lead to severe or fatal injuries!

- Always protect the lifting belts with the guard plate

NOTE

Overloading the ball-bearing cycle

If the telescopic axis is supported on the 2nd level against the direction of the axis, the ball-bearing cycles will be overloaded. The ball-bearing cycles will be destroyed.

- Never support the telescopic axis on the 2nd level during set-up
- Never attach the sling to the 2nd level
- Use two lifting units to bring the telescopic axis from a horizontal to a vertical position
- Use two lifting units to bring the telescopic axis from a vertical to a horizontal position

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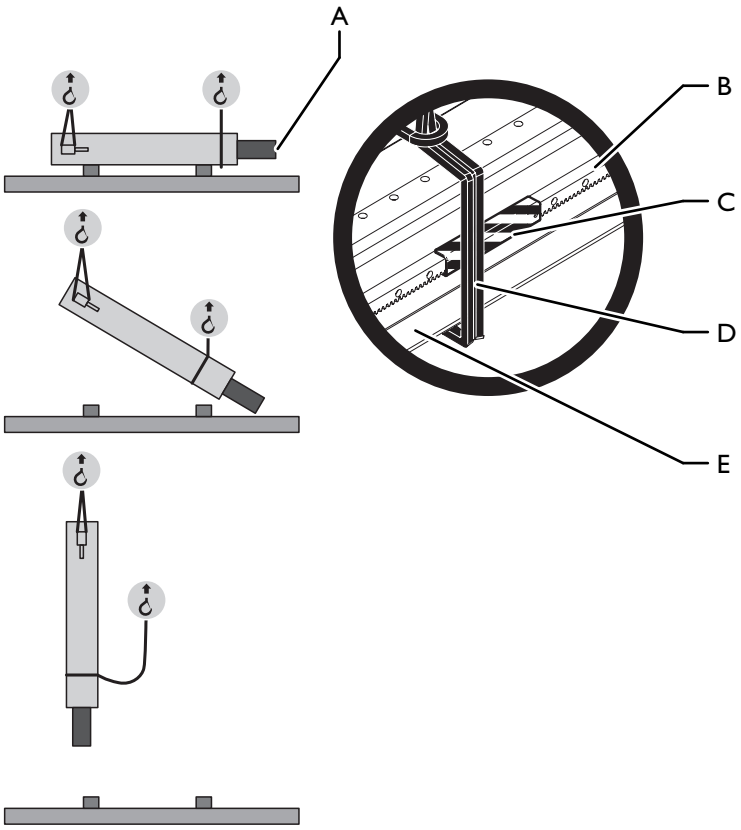

Fig. 5-4 *Setting up the telescopic axis*

A	*2nd level*	*D*	*Lifting belts*
B	*Rack*	*E*	*1st level*
C	*Guard plate*		

Size	Guard plate material number
6-7	0213768

Table 5-1 *Guard plate*

Set up the telescopic axis as follows:

Prerequisite:Sling is attached to the bumper unit ➲ Chapter 5.3.1, 🗎 34

1. Push guard plates onto rack
2. Position the lifting belts as shown in the illustration
3. Attach lifting belts to a second lifting unit
4. Set up the telescopic axis as shown in the illustration
5. Remove the guard plate and lifting belts

The telescopic axis is set up.

27021598048035467_v3.0_EN-US

6 Maintenance

6.1 Introduction

Work sequences

Perform the work sequences in the order described. Perform the described tasks at the specified times. This ensures a long service life for your product.

Original spare parts

Only use original spare parts. ➲ 148

Third-party products

For information on third-party products, read the appropriate documents in the appendix.

Tightening torques

Unless otherwise indicated, adhere to the tightening torques of Güdel.
➲ Chapter 9, 151

6.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 13
It concerns your personal safety!

⚠ WARNING

Automatic startup

During work on the product, there is danger of the machine starting up automatically. This can lead to severe or fatal injuries!

Before working in the danger area:

- Secure vertical axes (if equipped) against falling.
- Switch off the superordinate main power supply. Secure it against being switched on again (main switch for the complete system)
- Before switching on the system again, make sure that no one is in the danger area

27021598048035467_v3.0_EN-US

⚠ WARNING

Falling axes, workpieces

Falling axes or workpieces can cause physical damage, serious or fatal injuries!

- Set down any workpieces before working in the danger area
- Never enter the area below suspended axes and workpieces
- Secure suspended axes using the stipulated equipment
- Check the belts of the telescope axes for signs of breakage and tears

⚠ WARNING

Heavy components

Components can be very heavy. Improper handling can cause severe or fatal injuries!

- Use appropriate lifting units
- Use suitable means to secure the components against tipping over
- Only remove the safety devices after the product has been completely assembled

6.1.2 Personnel qualifications

Only appropriately trained and authorized technicians are allowed to work on the product.

27021598048035467_v3.0_EN-US

6.2 Consumables and auxiliary agents

6.2.1 Cleaning agents

Use a soft rag or cloth for cleaning tasks. Only use permissible cleaning agents.

6.2.1.1 Table of cleaning agents

Cleaning agents	Location of application
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)	Gearbox unit Güdel: Coupling and motor shaft
	Gearbox unit Güdel: coupling, input shaft and wedge

This table does not purport to be exhaustive.

Table 6-1 Table of cleaning agents

6.2.2 Lubricants

NOTE

Unsuitable lubricants

Using unsuitable lubricants can cause damage to the machine!

- Only use the lubricants listed
- If uncertain, please contact our service departments

For more information on the lubricants, refer to the tables below. For further information, refer to the chapter "Maintenance tasks" and the respective third party documentation.

Special Güdel lubricants

If special lubricants have been delivered ex-works at the request of the customer, you can find the relevant specifications in the spare parts list.

Alternative manufacturers

The following tables show the specifications of the lubricants. Please inform your manufacturer accordingly. They will then suggest an alternative from their product range.

Low temperatures / food grade

Observe the application range limits of lubricants according to the safety data sheet.

27021598048035467_v3.0_EN-US

6.2.2.1 Lubrication

Manual / automatic lubrication system

The guideways, racks and pinions of the product are lubricated either manually or automatically.

Guideways from the SCHÄFFLER company are used in the 2nd level. Further information on lubrication can be found in the third-party documentation.

Lubrication cycle

Güdel recommends a lubrication cycle of 150 h or 100 km, whichever occurs first. With automatic lubrication it may not be possible to set this lubrication cycle exactly. I In this case, select the nearest lubrication cycle. Perform lubrication work at soon as the first signs of tribocorrosion (reddish discoloration of the track) are visible.

6.2.2.2 Lubricant table

Lubrication ex works	Specification	Lubrication quantity	Location of application	Category
Mobil Glygoyle 460 NSF no.136467	CLP PG 460 in accordance with DIN 51502		Gearbox unit Güdel	oil
Rhenus LAN 2	cannot be found	20: 1.3g 25: 1.7g 30: 3.6g 35: 5g 55: 12g	Ball-bearing cycle	grease
Vaseline	Cannot be determined		Gearbox unit Güdel: elastomer gear rim of the coupling	Grease

This table does not purport to be exhaustive.

Table 6-2 *Lubricant table*

6.3 Maintenance tasks

6.3.1 General prerequisites

Prior to performing repair and maintenance tasks, do the following:

- If vertical axes are present, secure them against falling
- Switch off the system and padlock it to secure it against being switched on again
- Make sure that all necessary spare parts and wearing parts are at hand ➲ 148

27021598048035467_v3.0_EN-US

6.3.2 Maintenance intervals

The product is subject to natural wear and tear. When it wears out, unplanned downtimes of your system can result. Güdel specifies the service life and maintenance intervals of the product so as to ensure safe and continuous operation. The maintenance intervals relate to the effective operating hours of the product at a power-on time (POT) of 100%. Normal operating conditions are assumed. These correspond with the parameters used by Güdel when designing the product. If the conditions are rougher than assumed, products may fail earlier. Adjust the maintenance intervals to your operating conditions if necessary.

The definition is based on 5/7 working days per week.

Operating hours	1-shift operation	2-shift operation	3-shift operation
150	every 4 weeks	every 2 weeks	Weekly
2'250	yearly	every 6 months	every 4 months
6'750	every 3 years	every 1.5 years	yearly
11'250	every 5 years	every 2.5 years	every 20 months
13'500	every 6 years	every 3 years	every 2 years
22'500	every 10 years	every 5 years	every 3.3 years
31'500	every 14 years	every 7 years	every 4.5 years
54'000	every 24 years	every 12 years	every 8 years

Table 6-3 *Maintenance intervals in shift operation (5 days a week)*

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Operating hours	1-shift operation	2-shift operation	3-shift operation
150	every 18 days	every 9 days	every 6 days
2'250	every 9 months	every 4.5 months	every 3 months
6'750	every 2.5 years	every 15 months	every 10 months
11'250	every 4 years	every 2 years	every 16 months
13'500	every 4.5 years	every 3 years	every 1.5 years
22'500	every 7.75 years	every 3.8 years	every 2.5 years
31'500	every 11 years	every 5.5 years	every 3.5 years
54'000	every 18.5 years	every 9.25 years	every 6.25 years

Table 6-4 Maintenance intervals in shift operation (7 days a week)

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6.3.3 Special tools, testing and measuring instruments

Ensure that you have the following special tools, testing and measuring instruments at hand:

Tool	Use	Item number
Belt tension measuring instrument	Tensioning the cog belt	0201326
Micrometer	Inspecting rack transition	
Dial gauge	Setting the tooth flank backlash Checking the circular run-out of the motor shaft	
Screw clamps	Installing the racks	
Mounting aid	Installing the rack: Module 4, helical	902284
Mounting aid	Installing the rack: Module 6, helical	902286
Mounting aid	Installing the guideway: Sizes 15, 20	902401
Mounting aid	Installing the guideway: Size 25	902402
Mounting aid	Installing the guideway: Size 35	902403

Table 6-5 *Special tools, testing and measuring instruments*

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6.3.4 Maintenance tasks after 150 hours

6.3.4.1 Lubricating guideways, racks and pinions

Lubricate the guideways, racks, and pinions according to the superordinate operating manual.

6.3.5 Maintenance tasks after 2,250 hours

6.3.5.1 General inspection

Perform the general inspection according to superordinate operating manual.

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6.3.5.2 Lubricating the ball-bearing cycle

⚠ WARNING

Moving the axis

The work requires moving the axis. This can lead to severe or fatal injuries!

- Ensure that no persons are in the danger area while the axis is moving

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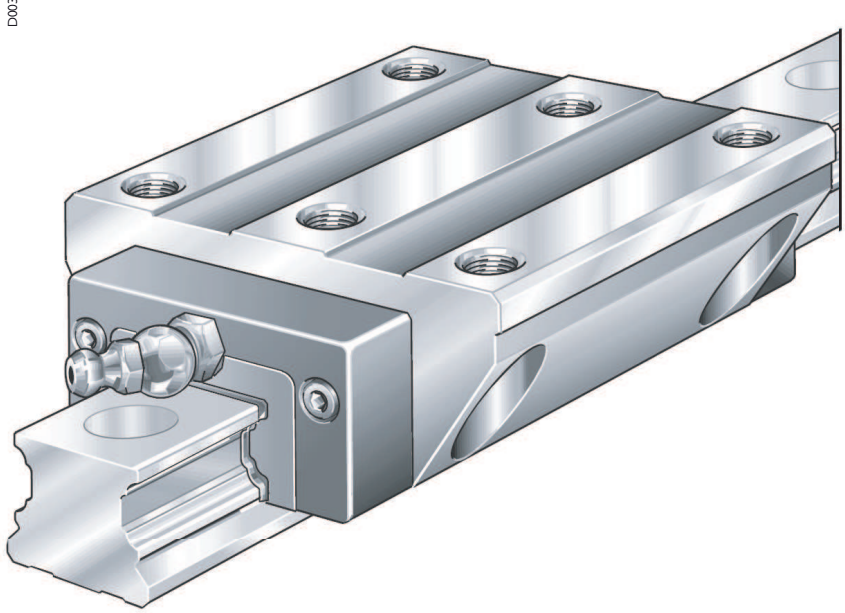

Fig. 6-1 *Ball-bearing cycle (image source: INA)*

Lubrication ex works	Specification	Lubrication quantity
Rhenus LAN 2	cannot be found	20: 1.3g 25: 1.7g 30: 3.6g 35: 5g 55: 12g

Table 6-6 *Lubricants: Ball-bearing cycle*

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Lubricate the ball-bearing cycle as follows:

1 Press lubricant into the respective lubrication point by hand using a grease gun

2 Move the axle along the entire path four times

The ball-bearing cycle has been lubricated.

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6.3.6 Maintenance tasks after 6,750 hours

6.3.6.1 Replacing the lubricating pinion

⚠ WARNING

Falling axes

The 2nd level of the telescope axis is held only by the cog belt. After removing the belt anchorage, it drops down. This can lead to severe or fatal injuries!

- Secure the 2nd level against falling before loosening the belt anchorage.

Replace the lubricating pinion according to superordinate operating manual.

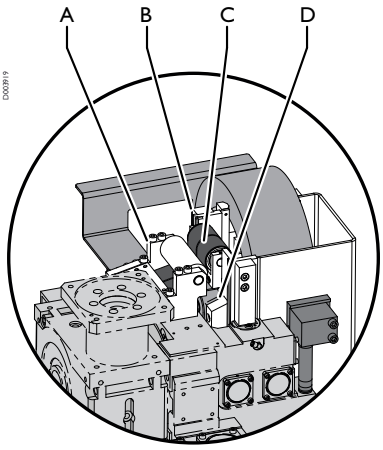

Fig. 6-2 *Replacing the lubricating pinion*

A	*Belt anchorage, top*	*C*	*Cog belt*
B	*Telescopic axis*	*D*	*Lubricating pinion unit*

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Replace the lubricating pinion as follows:

1 Switch off the system and secure it against being switched back on again with a padlock
2 Secure the telescope axis against falling
3 Remove the belt anchorage at the top from the carriage
4 Replace the lubricating pinion according to superordinate operating manual
5 Mount the belt anchorage at the top to the carriage
6 Remove the padlock
7 Set the belt tension ➲ Chapter 6.3.8, 91

The lubricating pinion has been replaced.

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6.3.7 Maintenance tasks after 22,500 hours

6.3.7.1 Replacing the cog belt

Initial position

⚠ WARNING

Moving the axis

The work requires moving the axis. This can lead to severe or fatal injuries!

- Ensure that no persons are in the danger area while the axis is moving

Setting up the initial position requires a level open surface able to bear the load. It must allow the 1st level to be subsequently moved out in downward direction.

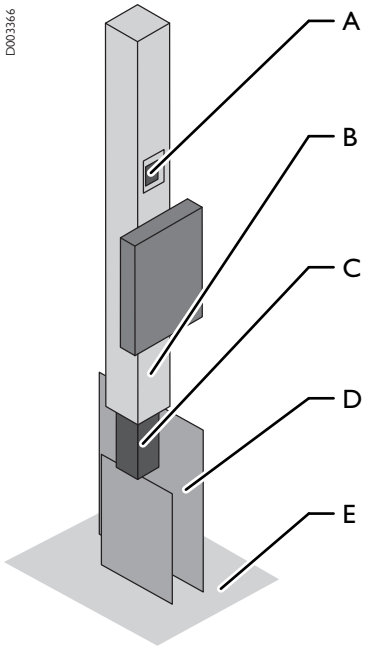

Fig. 6-3 *Initial position*

A	*Belt anchorage*	*D*	*Auxiliary agents*
B	*1st level*	*E*	*Surface*
C	*2nd level*		

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Set up the initial position as follows:

1 Position the telescope axis over the surface

2 Move the telescope axis until the belt anchorage at the middle can be reached through the gap

3 Switch off the system and secure it against being switched back on again with a padlock

4 Secure the 1st level against falling

5 Secure the 2nd level against falling

The initial position is set up.

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Removing the belt anchorage

⚠ WARNING

Falling axes

The 2nd level of the telescope axis is held only by the cog belt. After removing the belt anchorage, it drops down. This can lead to severe or fatal injuries!

- Secure the 2nd level against falling before loosening the belt anchorage.

Replace flat-head or pan-head screws with new ones. This makes loosening easier for the next repair.

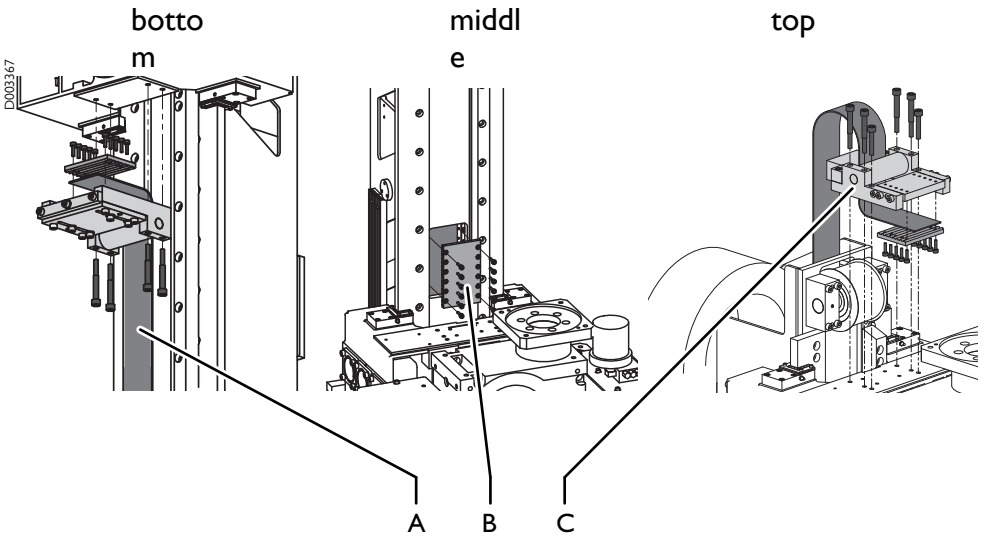

Fig. 6-4 *Removing the belt anchorage*

A *Cog belt*
B *Clamping plate*
C *Belt anchorage*

Remove the belt anchorage as follows:

1 Remove the belt anchorage from the carriage

2 Mark the position of the clamping plate on the cog belt (In case the belt is torn, count the teeth)

3 Remove the clamping plate and the belt anchorage

The belt anchorage is removed.

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Replacing the cog belt

⚠ WARNING

Moving the axis

The work requires moving the axis. This can lead to severe or fatal injuries!

- Ensure that no persons are in the danger area while the axis is moving

Replace the lower and upper cog belts in pairs only! Cog belts of different ages cause asymmetrical distribution of the load.

NOTE

The cog belts installed by Güdel are specially designed and may not be replaced by other products. This can cause damage.

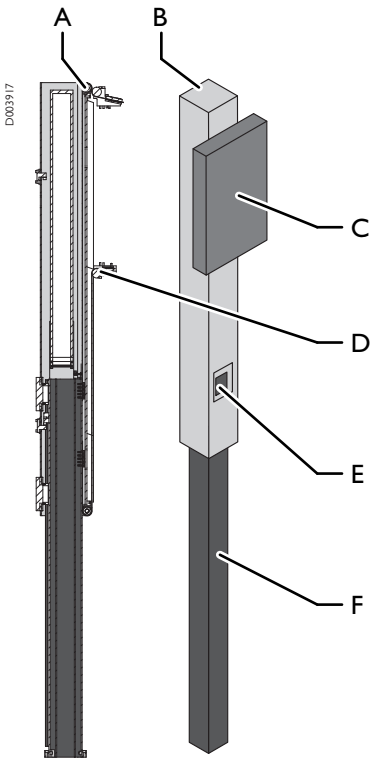

Fig. 6-5 *Replacing the cog belt*

A	*Belt anchorage, top*	*D*	*Belt anchorage, bottom*
B	*1st level*	*E*	*Belt anchorage, middle*
C	*Carriage*	*F*	*2nd level*

Replace the cog belts as follows:

1 Move the telescope axis until the belt anchorage at the middle can be reached through the gap
2 Switch off the system and secure it against being switched back on again with a padlock
3 Remove the belt anchorage at the bottom from the carriage ➲ 🗎 52
4 Mark the position of the clamping plates on the cog belts (if the belt is torn, count the cogs)
5 Remove the clamping plate and the belt anchorage
6 Prepare the initial position ➲ 🗎 50
7 Remove the top belt anchorage
8 Replace the upper cog belt
  - **8.1** Remove the old cog belt
  - **8.2** Transfer the markings of the old cog belt to the new cog belt
  - **8.3** Mount the belt anchorage at the top to the new cog belt (observe marking)
  - **8.4** Insert new cog belt
  - **8.5** Mount the clamping plate of the belt anchorage at the middle (observe marking)
  - **8.6** Mount the belt anchorage at the top to the carriage
  - **8.7** Mount the belt anchorage at the bottom to the new cog belt (observe marking)
  - **8.8** Mount the belt anchorage at the bottom to the carriage
9 Move the telescope axis until the belt anchorage at the middle can be reached through the gap
10 To install the lower cog belt, reverse the disassembly steps (observe marking)
11 Set the belt tension ➲ Chapter 6.3.8, 🗎 91

The cog belts have been replaced.

Final tasks

Perform these final tasks as follows:

1 Calibrate the axis using the synchronization mark
2 Calibrate the shaft encoder if necessary

The final tasks have been performed.

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6.3.7.2 Replacing the ball-bearing cycle

Replace the components together.

Advantages:

- You avoid repeated repairs
- You avoid unnecessary downtimes

The components are designed for continuous use. Their wear depends on the duration of operation of the product and the ambient conditions. Güdel recommends preventatively replacing components as soon as their service life has been reached. Components may fail before expiry of the service life however. Replace worn components immediately.

Distinguishing characteristics of wear
• Guideway sticks or jams • Excessive noise is audible

Table 6-7 *Distinguishing characteristics of wear: Guide unit*

The term "ball-bearing cycle" includes:

- Guideway of the ball-bearing cycle
- Guide carriage of the ball-bearing cycle

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Attaching slings

The locking bolt can be used for securing the 2nd level.

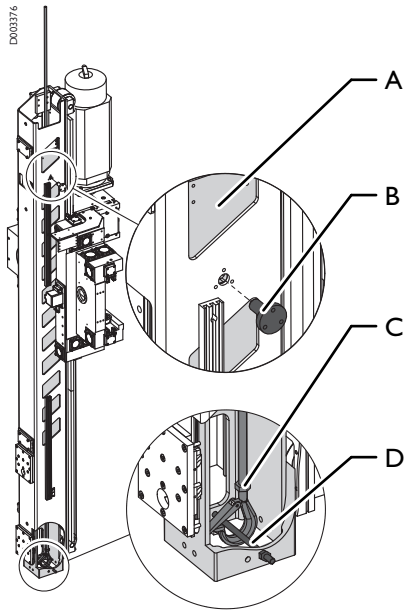

Fig. 6-6 *Attaching slings*

A	*2nd level*	*C*	*Hook*
B	*Locking bolt*	*D*	*Transport aid*

Attach the slings as follows:

1 Mount the transport aid

2 Attach hook as shown in the preceding figure

The slings are in place.

Replacing the guideway of the ball-bearing cycle

Use flat head screws or fitting screw ISO 7379 as auxiliary agents to center the holes. The fitting screws may need to be modified.

Replace the guideway as follows:

1. Remove cog belt ➲ Chapter 6.3.7.1, 🗎 50
2. Remove the cables and lines
3. Attach the slings (do not lock the 2nd level)
4. Remove the top limit stop of the 2nd level
5. Remove the 2nd level (the bearing balls of the guide carriage fall out!)
6. Replace the guideway according to INA assembly instructions in the appendix
7. Retract the 2nd level
8. Mount the top limit stop of the 2nd level

The guideways have been replaced.

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Replacing guide carriage of the ball-bearing cycle

⚠ CAUTION

Danger of being crushed by moving axes

The product is not self-locking without motors. It buckles or may turn. Extremities may be crushed. This leads to minor injuries.

Observe the following points:

- Keep extremities away from the danger area
- Ensure that no persons are in the danger area when lifting the Z-axis

If the guide carriages show signs of damage, check the guideway of the ball-bearing cycle. Remove the gripper and the load from the telescope axis before starting work.

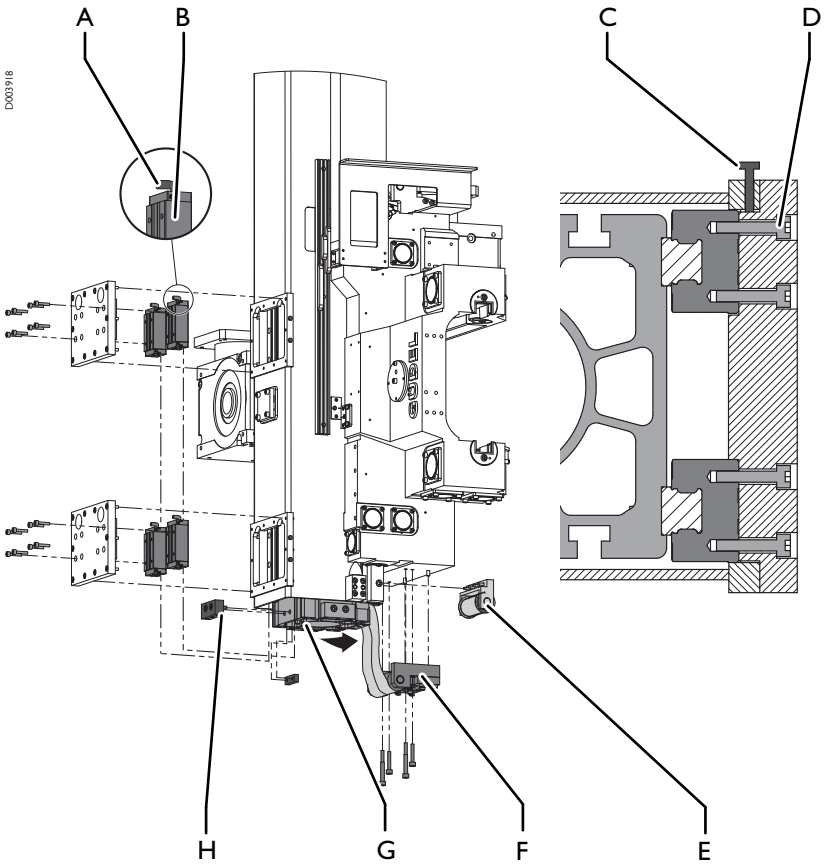

Fig. 6-7 *Replacing guide carriage*

A	*Grease nipple*	*E*	*Guide pulley, bottom*
B	*Guide carriage*	*F*	*Belt anchorage, bottom*
C	*Set screw*	*G*	*2nd level*
D	*Fastening screw*	*H*	*Reinforced connection*

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Replace the guide carriages as follows:

1 Remove the belt anchorage at the bottom
2 Remove the bottom guide pulley
3 Remove the reinforced connection
4 Loosen the set screws
5 Remove the fastening screws
6 Turn the 2nd level back in the direction of the arrow
7 Move out the old guide carriage (the bearing balls of the guide carriage fall out!)
8 Check the grease nipple (90° angular offset)
9 Insert the new guide carriage (if necessary, use a plastic aid according to INA assembly instructions in the appendix)
10 Screw the guide carriage to the plate (only lightly tighten the fastening screws)
11 Tighten the set screw
12 Tighten the fastening screws
13 To install the remaining components, reverse the disassembly steps
14 Set the belt tension ➲ Chapter 6.3.8, 🗎 91

The guide carriages have been replaced.

Final tasks

Perform these final tasks as follows:

1 Assembling the cog belt
2 Install the cables and lines if necessary
3 Set the belt tension ➲ Chapter 6.3.8, 🗎 91
4 Calibrate the axis using the synchronization mark
5 Calibrate the shaft encoder if necessary

The final tasks have been performed.

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6.3.7.3 Replacing the guideways

⚠ WARNING

Falling axes

After removing the transport securing device, brakes or motors, the vertical axes fall downwards. Carriages may run off to the side. This can lead to severe or fatal injuries!

- If necessary, secure the vertical axes and the carriages before removing transport securing devices, brakes or motors

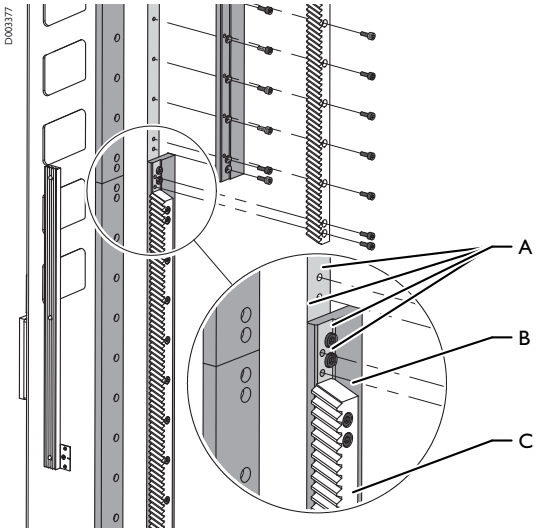

Fig. 6-8 *Replacing the guideways*

A *Reference surface*
B *Guideway*
C *Rack*

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Replace the guideways as follows:

1 Remove cog belt ➲ Chapter 6.3.7.1, 🗎 50
2 Remove the cables and lines
3 Vent the motor brake or remove the motor
4 Vent the safety brake system if necessary
5 Lift and lock the 2nd level ➲ 🗎 56
6 Remove limit stops of the 1st level
7 Remove the telescope axis
8 Replace the guideways according to chapter "Replacing the guideways" in the superordinate operating manual
9 Remove the wipers
10 To install the telescope axis, reverse the disassembly steps (Procedure from step 7)

The guideways have been replaced.

Final tasks

Perform these final tasks as follows:

1 Set the tooth flank backlash as described in the "Setting the roller and tooth flank backlash" chapter of the superordinate operating manual
2 Install the wiper
3 Set the belt tension ➲ Chapter 6.3.8, 🗎 91
4 Calibrate the axis using the synchronization mark
5 Calibrate the shaft encoder if necessary

The final tasks have been performed.

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6.3.7.4 Replacing the energy chain

Removing the energy chain

Remove the energy chain as follows:

1 Loosen the plug connections of cables and lines

2 Remove the fastening screws

3 Remove the entire energy chain

The energy chain is removed.

Laying the cables and lines

NOTE

Cable damage

Incorrectly laid cables and lines wear prematurely and will be destroyed. This results in operational failure.

- Only use highly flexible lines suitable for use with energy chains
- Only use lines whose minimum bending radius is smaller than the smallest radius of the energy chain
- Güdel shall only be liable for internal divisions which are found in spare parts lists in the appendix of this manual as a document. If you are laying your own cables and lines, ensure symmetrical load distribution. Have IGUS technicians check your own internal divisions of the energy chain
- Roll the cable off evenly. Never take the cables off in loops

Lay out cables without twisting for at least 24 hours before putting them into energy chains. Use the cable description to assist you. The wires of the cable are thus aligned without twisting and can have a positive influence on the service life of the cable

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Observe the following points:

- Cables are separated by vertical dividers; cables are not permitted to be laid next to each other
- Cables laid over each other with different jacket materials need to be separated from each other (risk of sticking)
- The vertical dividers are not allowed to be positioned in an offset manner in the roll-off direction
- The cable must have play on all sides of the cable divider. At its minimum, it should be 10% of the cable diameter. However, it should not be less than one millimeter.

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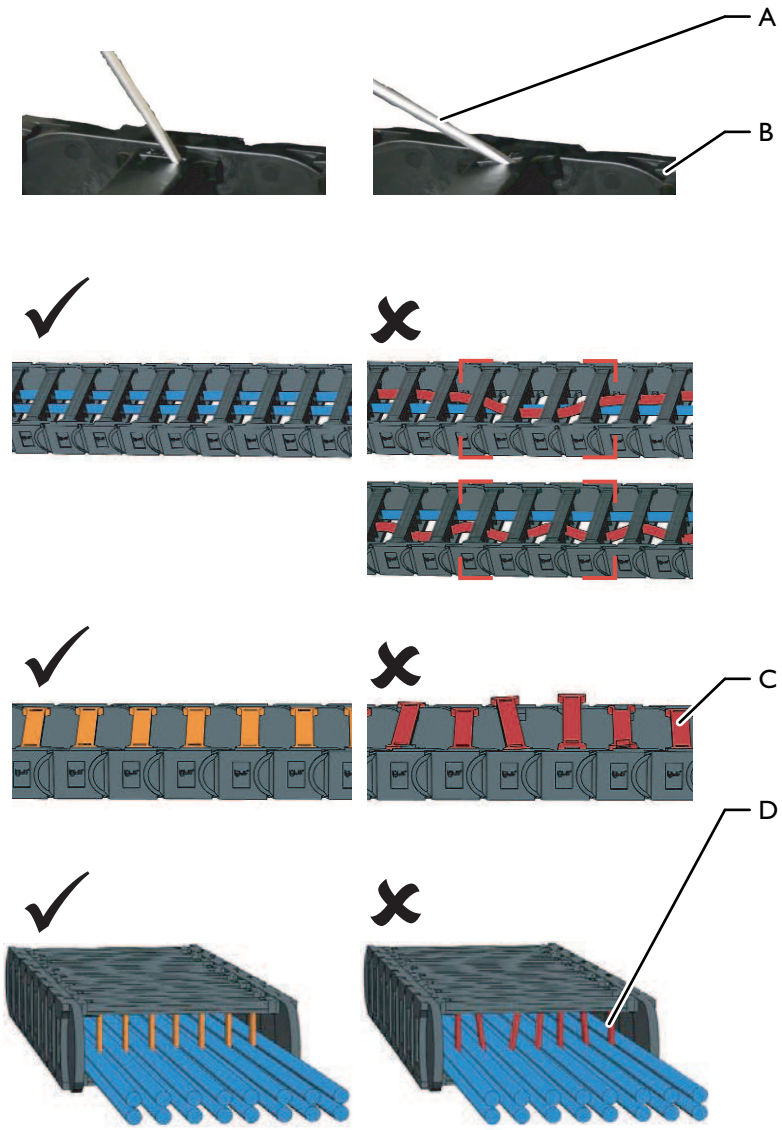

Fig. 6-9 *Laying cables and lines (image source: IGUS)*

A	*Screwdriver*	*C*	*Opening bar*
B	*Energy chain*	*D*	*Vertical divider*

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Lay the cables and lines as follows:

Prerequisite:You have read and understood the IGUS assembly instructions

1 Open the opening bar of the energy chain
   1.1 Place the screwdriver on the opening bar
   1.2 Tilt the screwdriver backwards until the opening bar is released
   1.3 Repeat the procedure for the opposite side
   1.4 Remove the opening bar manually
2 Lay the cables and lines in accordance with the IGUS internal division document
3 Close the opening bars without force in reverse order
4 Check that the position of the cables and lines is correct
5 If there are deviations: Repeat process as of step 1
6 Check opening bars: correctly latched and intact
7 If there are deviations: Repeat process as of step 1
8 Check vertical dividers: exactly positioned vertically and not installed in an offset manner in the roll-off direction of the energy chain

The cables and lines are laid.

Relieving the cables and lines of strain

NOTE

Incorrectly implemented strain relief

Lack of strain relief or incorrectly implemented strain relief on cables and lines in energy chains leads to damage. Cables and lines will be destroyed. This results in operational failure.

- Relieve the strain on every cable and every line individually. Never bunch together several cables and lines into one strain relief. (Exception: IGUS Chainfix multi-clamps)
- For traverse paths of the energy chain that are less than 50 m:
  Relieve the strain on the cables and lines on both the driver and fixed side. (Exception: Lines which extend under pressure e.g. hydraulic or pneumatic lines must only be relieved of strain on the driver side)
- For traverse paths of the energy chain longer than 50 m:
  Relieve the strain on the cables and lines on the driver side.

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NOTE

Protruding strain relief

The energy chain becomes hooked in if metal sleeves and protruding strain relief are used. The energy chain can break or become prematurely worn!

- Do not install strain relief at a higher level than the connection element
- Remove the metal sleeves on the upper side of the connection element

NOTE

Damage to the sheaths of the cables

Cable fittings which are too tight damage the sheaths of the cables.

- Do not tighten the cable fittings too firmly.

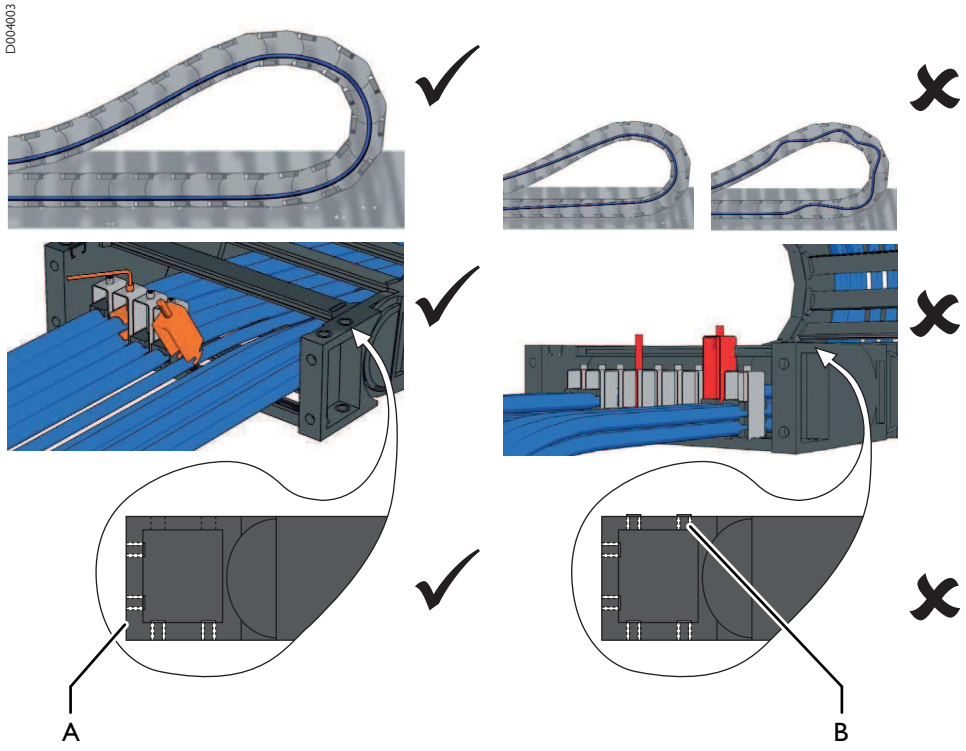

Fig. 6-10 *Relieving the strain on cables and lines (image source: IGUS)*

A *Fixed side connection element*

B *Metal sleeve*

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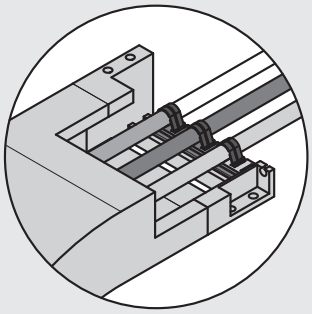
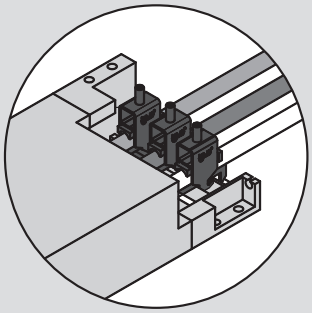
Versions	Explanation	Figure
Cable fittings	Two cable fittings 4.5 mm wide on the appropriate holders	
ChainFix	Tightening torque: 1 Nm	

Table 6-8 *Strain relief: Cable fitting / ChainFix version*

Attach the strain relief as follows:

1 Position cables and lines in the correct position in accordance with the illustration

2 For traverse paths of the energy chain that are less than 50 m:

2.1 Relieve cable strain at the driver and the fixed side.
(Distance between the end of the bending movement and strain relief of 10-30 times the diameter of the cable)

2.2 Run cable straight at least 20 cm past the strain relief

3 For traverse paths of the energy chain longer than 50 m:

3.1 Relieve cable strain at the driver.
(Distance between the end of the bending movement and strain relief of 10-30 times the diameter of the cable)

3.2 Run cable straight at least 50 cm past the strain relief

4 Check the height of the strain relief on the fixed side
If there are deviations:
Correct the strain relief

5 Check the metal sleeves on the fixed side connection element
If there are deviations:
Remove the metal sleeves on the upper side of the connection element

The cables and lines are relieved of strain.

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Installing the energy chain

NOTE

Connection elements installed at an angle

If the connection elements are installed at an angle, the energy chain rolls away at an angle. The energy chain grinds on the guide channel. This results in increased wear.

- Install the connection elements in parallel

The orange flag denotes the driver side. The manufacturer turns the first three chain links on the driver side. This makes the energy chain slide better.

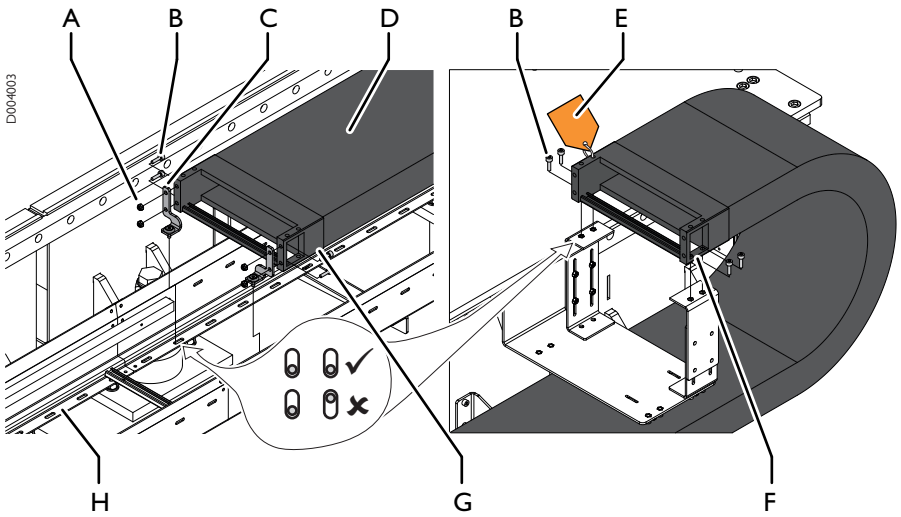

Fig. 6-11 *Installing the energy chains*

A	*Nut*	*E*	*Orange flag*
B	*Fastening screw*	*F*	*Driver's side connection element*
C	*Mounting angle*	*G*	*Fixed side connection element*
D	*Energy chain*	*H*	*Guide chute*

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Install the energy chain as follows:

Prerequisite:You have read and understood the IGUS assembly instructions

1 Install the mounting angle on the fixed side connection element using fastening screws and nuts
2 Place the energy chain in the guide chute
3 Install fixed side on the guide chute
4 Install the driver side using fastening screws
5 Remove the orange flag

The energy chain has been installed.

Final tasks

Perform the following final tasks:

1 Connect the cables and lines in accordance with the electrical diagram.
2 Relive the cables and lines of strain ➲ 65

The final tasks have been performed.

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6.3.7.5 Replacing the slide bars

Replacing and pre-assembling the slide bars

Pre-assemble the slide bars as follows:

1 Switch off the plant and secure it with a padlock against being switched on again

2 Remove all slide bars

3 Pre-assemble new slide bars

The slide bars are pre-assembled.

Installing the slide bars

Slide bars are installed on sliding energy chains. The slide bars support the energy chain where is slides over the fixed side.

NOTE

Breaking the energy chain

The energy chain becomes hooked in if the slide bar transitions do not align. The energy chain can break or become prematurely worn!

- Install slide bars without any offset

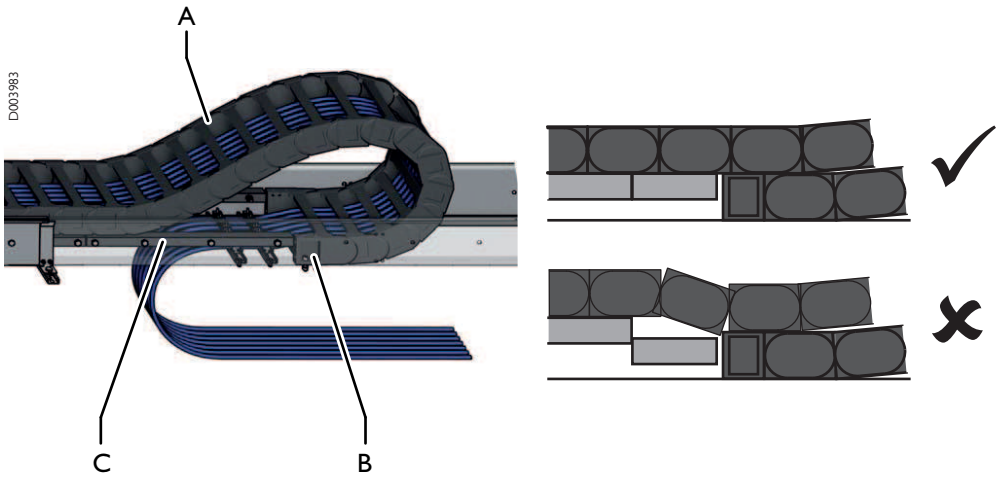

Fig. 6-12 Installing the slide bars (image source: IGUS)

A Sliding energy chain

B Fixed side

C Slide bar

Install the slide bars as follows:

1 Screw the pre-assembled slide bars tightly

2 Check the alignment of all slide bars
(Slide bars and fixed side of the energy chain align in accordance with the illustration)

3 If there are deviations:

3.1 Loosen the screws on the slide bars

3.2 Align the slide bars

3.3 Tighten the screws on the slide bars

3.4 Repeat process from step 2

The slide bars have been installed and aligned.

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6.3.7.6 Replacing the gearbox unit

This chapter describes the steps for replacing the Güdel gearbox unit. Replace the gearbox as follows:

Attaching the slings: Motor

⚠ WARNING

Suspended loads

Improper handling of suspended loads can lead to severe injuries or death!

- Use appropriate lifting units
- Wear appropriate protective clothing
- Always keep sufficient distance from suspended loads
- Never enter the area below a suspended load

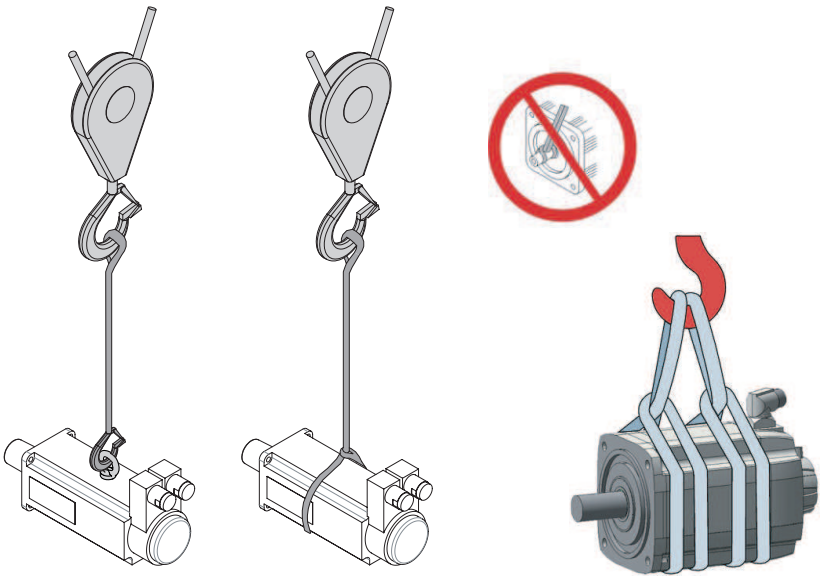

Fig. 6-13 *Attaching the slings: Motor (image source: Bosch Rexroth)*

Attach the slings as follows:

1. Remove fan from motor if necessary
2. Mount lifting screw if necessary
3. Attach the slings as shown in the illustration
4. Carefully lift the load
5. Check horizontal alignment of the load
6. If the load tilts: Repeat process from step 3

The slings are in place.

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Attaching the slings: Güdel gearbox unit

Use lifting units to transport gearbox units from size 090 upwards.

⚠ WARNING

Heavy components

Components can be very heavy. Improper handling can cause severe or fatal injuries!

- Use appropriate lifting units
- Use suitable means to secure the components against tipping over
- Only remove the safety devices after the product has been completely assembled

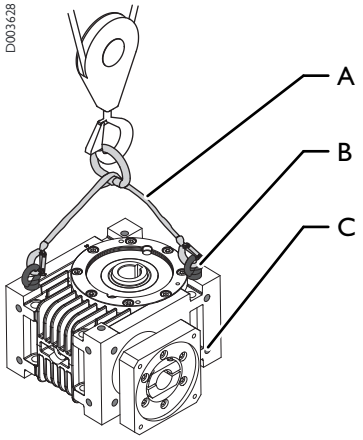

Fig. 6-14 *Attaching the slings: Güdel gearbox unit*

A *Belt harness*
B *Lifting screw*
C *Thread hole*

Size	Size of lifting screw
090	M10
120	M12
180	M16

Table 6-9 *Size of lifting screw*

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Attach the slings as follows:

1 Insert lifting screws into threaded holes on desired side (Diagonal arrangement according to illustration)

2 Attach the slings as shown in the illustration

The slings are in place.

Removing the motor and coupling

⚠ WARNING

Moving the axis

The work requires moving the axis. This can lead to severe or fatal injuries!

- Ensure that no persons are in the danger area while the axis is moving

⚠ WARNING

Falling axes

After removing the transport securing device, brakes or motors, the vertical axes fall downwards. Carriages may run off to the side. This can lead to severe or fatal injuries!

- If necessary, secure the vertical axes and the carriages before removing transport securing devices, brakes or motors

⚠ CAUTION

Hot parts/surfaces

Hot surfaces present a burn hazard during work on this product!

- Protect yourself by wearing heat-resistant gloves
- Allow the parts to cool down first

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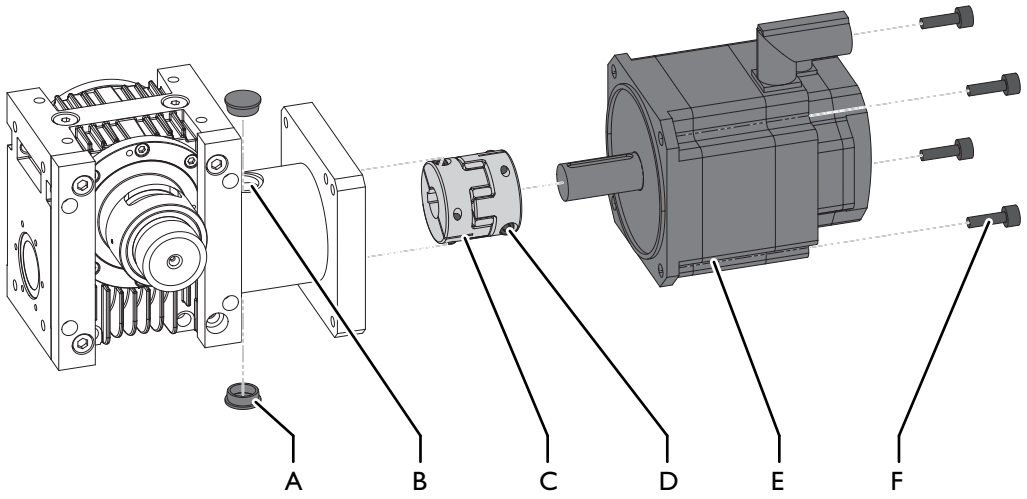

Fig. 6-15 *Remove motor and coupling*

A	*Plug*	*D*	*Coupling screw*
B	*Drill hole*	*E*	*Motor*
C	*Coupling*	*F*	*Motor screw*

Remove the motor and coupling as follows:

1 Switch off the plant and secure it with a padlock against being switched on again

2 Remove the plug

3 Check whether the coupling screws can be reached through the drill holes

4 If there are deviations: Adjust axis until the coupling screws can be reached through the drill hole

5 Switch off the plant and secure it with a padlock against being switched on again

6 Attach slings to the motor ➲ 🗎 72

7 Undoing the coupling screws on the gearbox unit side

8 Remove the motor screws

9 Remove motor and coupling

10 Undoing the coupling screws on the motor side

11 Remove the coupling from the motor shaft

12 Remove the slings

The motor and coupling have now been removed.

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Removing the gearbox unit

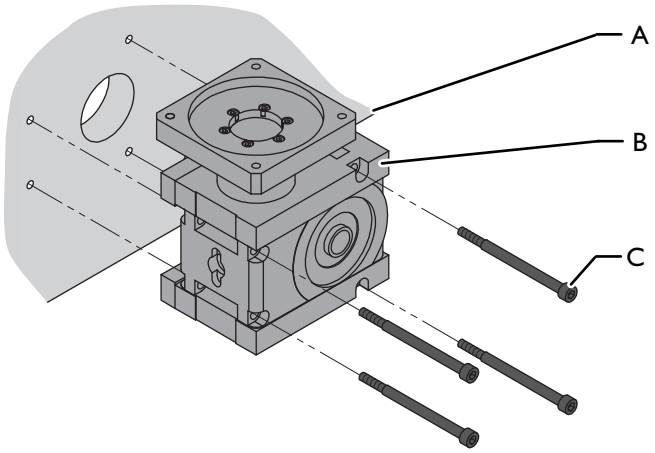

Fig. 6-16 *Removing the gearbox unit*

A *Adjacent construction*
B *Gearbox unit*
C *Gearbox screws*

Remove the gearbox unit as follows:

1 Attach slings to the gearbox unit ➲ 73
2 Remove the gearbox screws
3 Remove the gearbox unit
4 Remove the transport securing device or slings

The gearbox unit has now been removed.

Replacing the gearbox unit

Replace the gearbox unit as follows:

1 Replace the complete gearbox unit and coupling

The gearbox unit has been replaced.

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Installing the gearbox unit

NOTE

Breakage of cast casing

Excessively high tightening torques destroy the cast casing!

- Observe the tightening torques

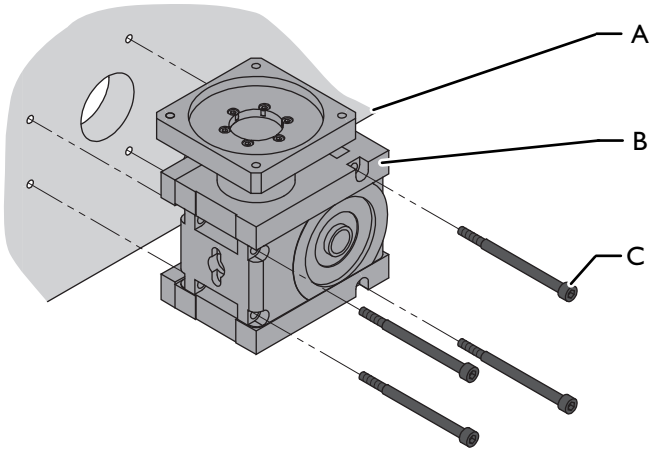

Fig. 6-17 *Installing the gearbox unit*

A *Adjacent construction*
B *Gearbox unit*
C *Gearbox screws*

Size	030	045	060	090	120	180
Thread size	M6	M8	M10	M12	M16	M20
Tightening torque [Nm]	9	22	42	50	120	240

Table 6-10 *Tightening torques for gearbox screws: Güdel gearbox unit*

Install the gearbox unit as follows:

1 Attach slings to the gearbox unit ➲ 73
2 Install the gearbox unit
3 Install and tighten the gearbox screws
4 Remove the transport securing device or slings

The gearbox unit has now been installed.

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Installing the motor

Information on initial assembly

The range of motors for the gearbox unit is very broad. The same applies to the dimensions of the motor shafts. A design solution was selected that allowed for the greatest variety of motor to be mounted on the gearbox unit. The increased expense for the initial assembly was consciously taken into account. It normally occurs only once during the entire service life of the gearbox unit. For maintenance tasks and repair, the motor is simply disassembled and remounted with one half of the elastomer coupling.

Prerequisites

Three conditions must be fulfilled simultaneously to allow you to install the motor on the gearbox unit:

- The gearbox flange is aligned to allow the coupling screws to be tightened through the drill holes of the gearbox flange with a torque wrench
- The input shaft with installed wedge must be positioned with the coupling attached to allow the coupling screws to be tightened through the drill holes of the gearbox flange
- In the event of angled motor flanges, the motor must be aligned to the motor flange to allow the motor screws to be fitted and tightened

Aligning the gearbox flange

You can align the gearbox flange. When correctly aligned, the motor and coupling can be installed.

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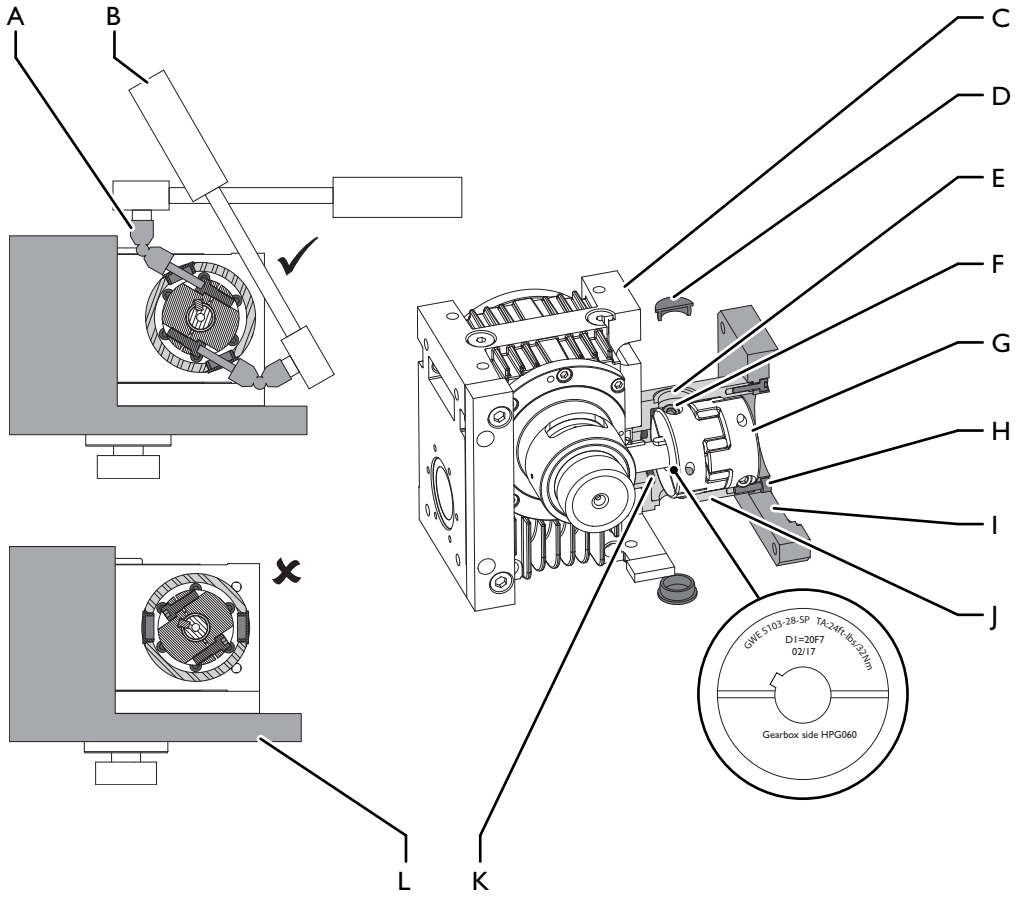

Fig. 6-18 *Aligning the gearbox flange*

A	*Articulated socket*	*G*	*Coupling*
B	*Torque wrench*	*H*	*Screw*
C	*Gearbox*	*I*	*Motor flange*
D	*Plug*	*J*	*Gearbox flange*
E	*Drill hole*	*K*	*Fastening screw*
F	*Coupling screw*	*L*	*Adjacent construction*

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Align the gearbox flange as follows:

Prerequisite: The gearbox unit is installed on the adjacent construction
➲ 77

1 Switch off the system and secure it with a padlock against being switched on again

2 Remove the plug

3 Check whether the coupling screws can be reached through the drill hole and tightened with a torque wrench

4 If there are deviations:

- **4.1** Remove the coupling
- **4.2** Remove the fastening screws, screws and motor flange
- **4.3** Align the gearbox flange
- **4.4** Install and tighten the fastening screws
- **4.5** Install the motor flange
- **4.6** Install and tighten the screws
- **4.7** Place the coupling on the input shaft

5 Install the plug

The gearbox flange has now been aligned.

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Aligning the input shaft to the gear-box flange

⚠ WARNING

Moving the axis

The work requires moving the axis. This can lead to severe or fatal injuries!

- Ensure that no persons are in the danger area while the axis is moving

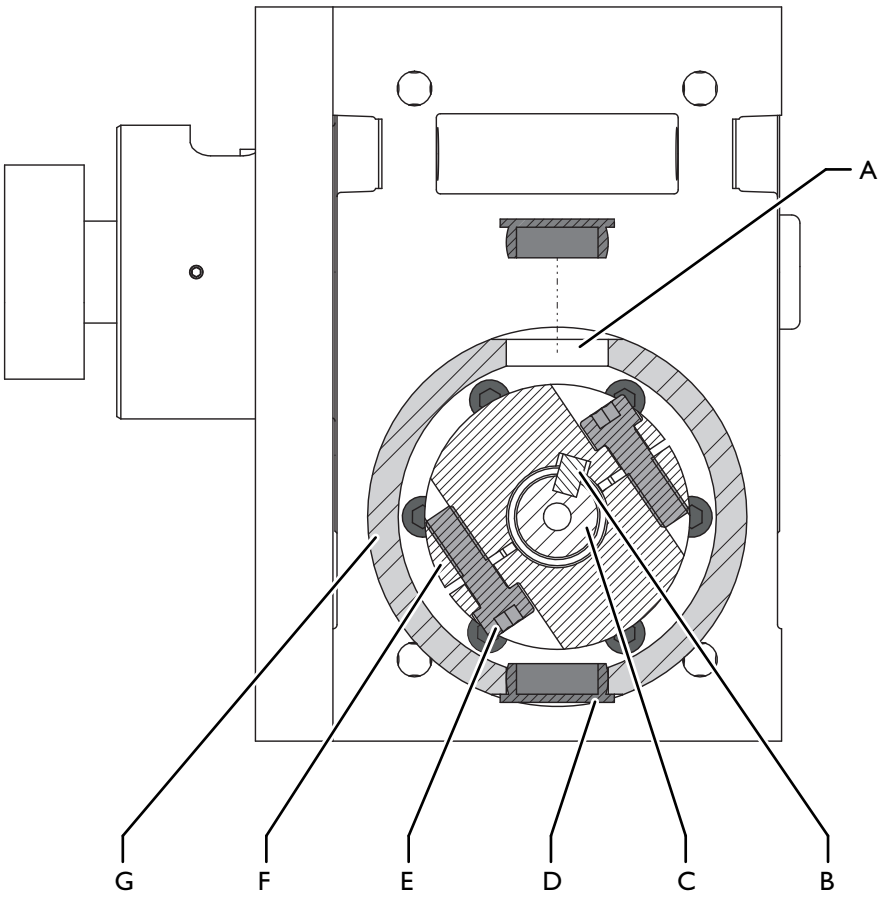

Fig. 6-19 *Aligning the input shaft to the gearbox flange*

A	*Drill hole*	*E*	*Coupling screw*
B	*Wedge*	*F*	*Coupling*
C	*Input shaft*	*G*	*Gearbox flange*
D	*Plug*		

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Align the input shaft to the gearbox flange as follows:

Prerequisite: The gearbox unit is installed on the adjacent construction ➲ 77

Prerequisite: The gearbox flange has been aligned correctly ➲ 78

Prerequisite: The wedge has been installed on the gearbox side

Prerequisite: The coupling has been placed correctly on the input shaft

1. Check whether the coupling screws can be reached through the drill holes
2. If there are deviations: Adjust the axis until the coupling screws can be reached through the drill holes
3. Switch off the system and secure it with a padlock against being switched on again

The input shaft has been aligned to the gearbox flange.

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Positioning the coupling on the motor shaft

NOTE

Defective coupling

The coupling is destroyed if the coupling screws are tightened and the coupling is not installed on the shaft.

- Tighten the coupling screws only when the coupling is installed on the shaft.

The tightening torque TA and the type of couping are engraved on the motor and gearbox sides in the couping.

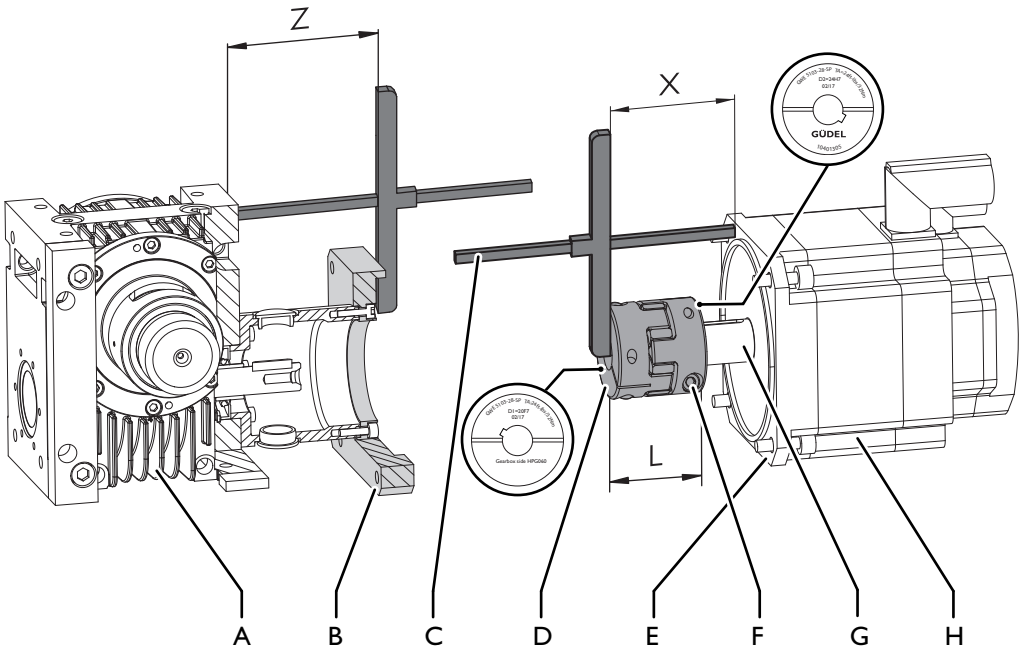

Fig. 6-20 *Positioning the coupling on the motor shaft: Elastomer coupling*

A	*Gearbox*	*E*	*Installation surface*
B	*Motor flange*	*F*	*Coupling screw*
C	*Measuring instrument*	*G*	*Motor shaft*
D	*Coupling*	*H*	*Motor*

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$$X = Z - Y$$

Fig. 6-21 *X dimension calculation formula*

Güdel HPG gearbox unit size	Coupling type	L dimension [mm]	L dimension tolerance [mm]	Y dimension [mm]	X dimension tolerance [mm]
030	GWE 5103-19-SP	50	+1	8.5	+0.5
			+0.5		-1
	GWE 5103-14-SP	32	+1	15.5	+0.5
			+0.5		0
045	GWE 5103-24-SP	54	+1	11	+0.5
			+0.5		0
	GWE 5103-19-SP	50	+1	10	+0.5
			+0.5		0
060	GWE 5103-28-SP	62	+1	16.5	+1
			+0.5		-3
	GWE 5103-24-SP	54	+1	18.5	+1
			+0.5		-2
090	GWE 5103-38-SP	76	+1.2	25	+1
			+0.5		-2
	GWE 5103-28-SP	62	+1	29	+1
			+0.5		-2

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Güdel HPG gearbox unit size	Coupling type	L dimension [mm]	L dimension tolerance [mm]	Y dimension [mm]	X dimension tolerance [mm]
120	GWE 5103-42-SP	102	+1.2	24	+1
			+0.5		-3
	GWE 5103-38-SP	76	+1.2	36	+1
			+0.5		-1

Table 6-12 Weight and tolerances for the elastomer coupling

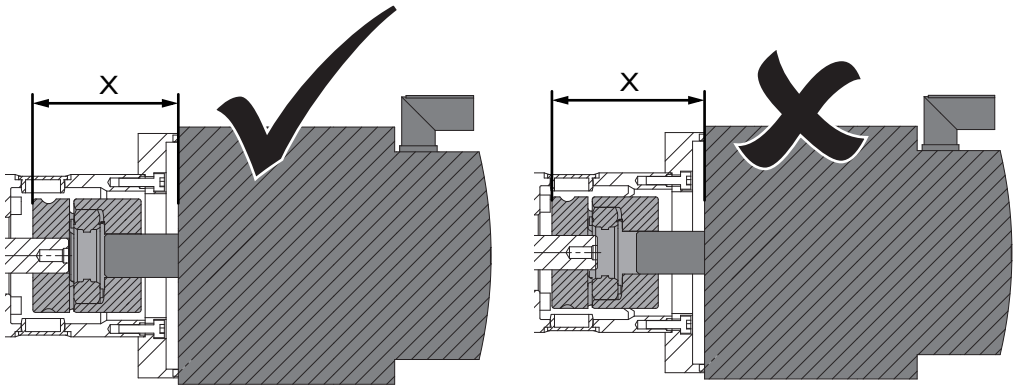

Fig. 6-22 Position the coupling on the motor shaft: Make use of X dimension tolerance

Cleaning agents
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)

Table 6-12 Cleaning agents: Gearbox unit Güdel: Coupling and motor shaft

Tool	Use	Item number
Corrosion protection agent MOTOREX Intact XD 20	Installing the coupling Applying corrosion protection to the product	0502037

Table 6-13 Special tools, testing and measuring instruments

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Position the coupling on the motor shaft as follows:

Prerequisite: The transport securing device in effect at the gearbox is disassembled

1 Clean the coupling and motor shaft to ensure that they are free of grease

2 If desired by the customer, mount the wedge on the motor shaft (wedge on motor shaft not essentially necessary)

3 Apply corrosion protection agent to the motor shaft with a brush

4 Measure the distance Z

5 Push the coupling onto the motor shaft
(set L dimension according to table)

6 Position the coupling on the motor shaft:

6.1 Calculate dimension X and position coupling according to the calculated dimension

6.2 Coupling rest a little on the motor shaft: Make use of X dimension tolerance

7 Tighten the coupling screws:

7.1 Tighten alternately to 50% of the tightening torque TA

7.2 Tighten alternately with 100% of the tightening torque TA

The coupling is positioned.

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Installing the motor and coupling

⚠ WARNING

Heavy components

Components can be very heavy. Improper handling can cause severe or fatal injuries!

- Use appropriate lifting units
- Use suitable means to secure the components against tipping over
- Only remove the safety devices after the product has been completely assembled

Vent the motor brake according to the specifications of the motor manufacturer

The tightening torque TA and the type of couping are engraved on the motor and gearbox sides in the couping.

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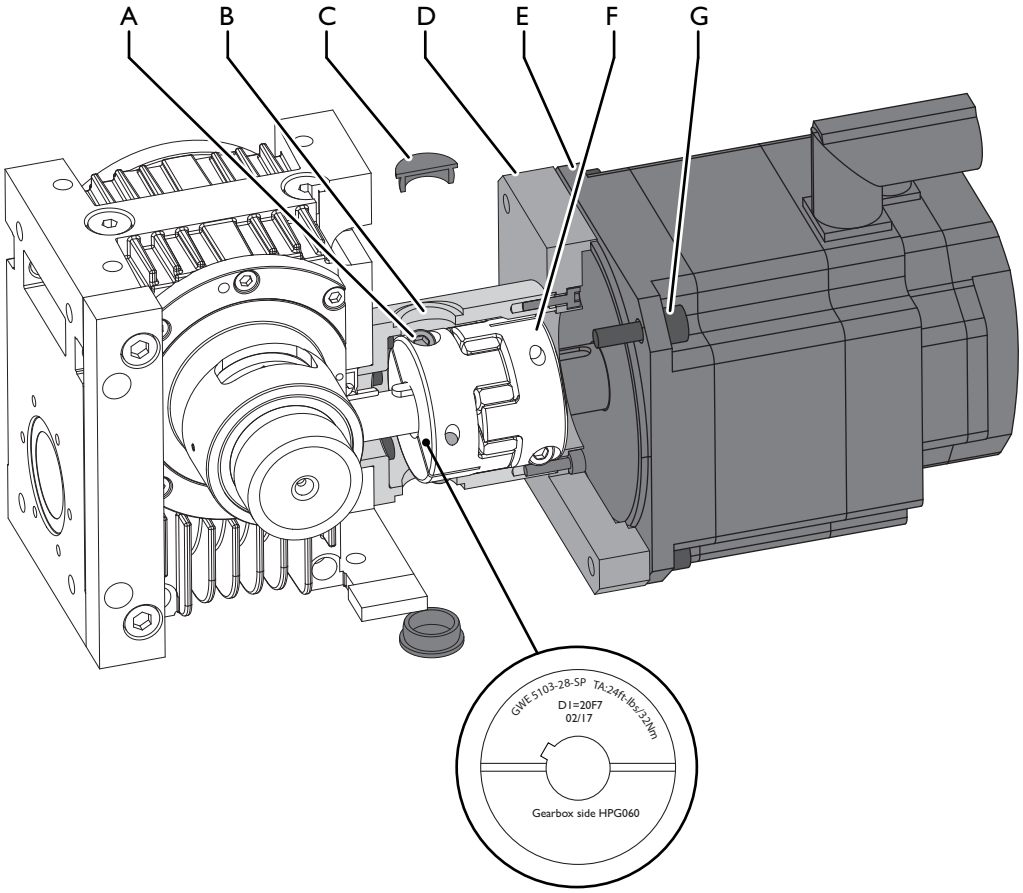

Fig. 6-23 *Installing the motor and coupling*

A	*Coupling screw*	*E*	*Motor*
B	*Drill hole*	*F*	*Coupling*
C	*Plug*	*G*	*Motor screw*
D	*Motor flange*		

Cleaning agents
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)

Table 6-14 *Cleaning agents: Gearbox unit Güdel: coupling, input shaft and wedge*

Tool	Use	Item number
Corrosion protection agent MOTOREX Intact XD 20	Installing the coupling Applying corrosion protection to the product	0502037

Table 6-15 *Special tools, testing and measuring instruments*

Install the motor and coupling as follows:

Prerequisite: The gearbox unit is installed on the adjacent construction ➲ 77

Prerequisite: The gearbox flange has been aligned correctly ➲ 78

Prerequisite: The input shaft has been aligned correctly to the gearbox flange ➲ 81

Prerequisite: The couping has been positioned correctly on the motor shaft ➲ 83

1 Switch off the plant and padlock it to prevent it from being switched on again

2 Attach slings to the motor if necessary ➲ 72

3 Clean the coupling, input shaft and wedge to remove any grease

4 Installing the wedge on the input shaft

5 Apply corrosion protection agent to the wedge and input shaft with a brush

6 Push the motor, with the mounted coupling, onto the gearbox unit

7 Install and tighten motor screws

8 If the motor screws cannot be fitted:

8.1 Ventilate the motor brake if necessary

8.2 Turning the motor into correct installation position

8.3 Repeat process from step 7

9 Tighten the coupling screws:

9.1 Tighten alternately to 50% of the tightening torque TA

9.2 Tighten alternately with 100% of the tightening torque TA

10 Mount plug

The motor and the coupling have been installed.

Final tasks

Perform the following final tasks:

1 Set the tooth flank backlash ➲ 94

2 Calibrate the reference plane of the motor (this procedure is described in the documentation for the complete system or the motor)

The final tasks have been performed.

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6.3.7.7 Final tasks

Perform these final tasks as follows:

1 Calibrate the axis using the synchronization mark

2 Calibrate the shaft encoder if necessary

The final tasks have been performed.

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6.3.8 Set the belt tension

⚠ WARNING

Moving the axis

The work requires moving the axis. This can lead to severe or fatal injuries!

- Ensure that no persons are in the danger area while the axis is moving

Wrong belt tension or wrong calibration of the telescopic axis causes damage to the cog belt.

If the specified oscillating span length l_T cannot be reached, then the frequency needs to be calculated using the formula.

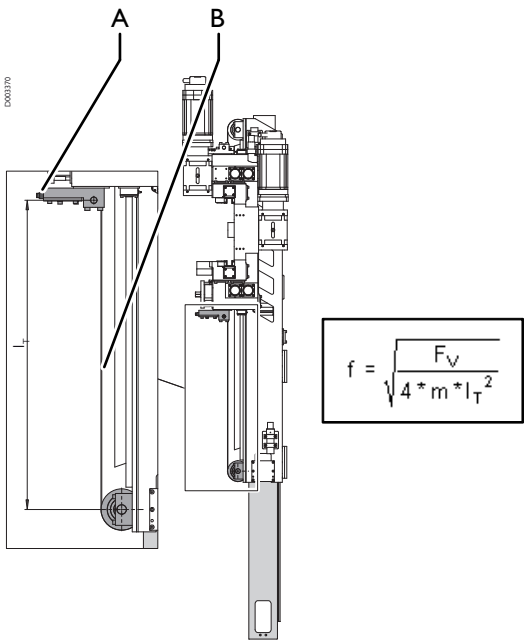

Fig. 6-24 *Set the belt tension*

A *Straining screw*

B *Oscillating span length*

Size	6	7
Belt type	**PCC** 8MGT	**PCC** 14MGT
Belt width [mm]	50	68
Belt mass m [kg/m]	0.235	0.537
Pre-tension force Fv [N]	600	1800
Oscillating span length l_T [m]	1	1
Frequency f [Hz]	25	29

Table 6-16 *Cog belt natural frequency*

Set the belt tension as follows:

1. Position the telescopic axis on oscillating span length
2. Switch off the system and secure it against being switched back on again with a padlock
3. Position the belt tension measuring instrument at a distance of 1...20 mm to the cog belt in the middle of the frequency length L
4. Strike the cog belt to set it in vibration
5. Interpret the measurement result according to the preceding table
6. If there are deviations:
   - **6.1** Set the belt tension using straining screw
   - **6.2** Repeat procedure starting from point 3

The belt tension is set.

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6.3.9 Setting the tooth flank backlash

NOTE

Wear of components

Incorrectly set rollers and tooth flank backlash increase the wear on the guideway, roller, rack and pinion.

- Always set the rollers and the tooth flank backlash with load attached and at operating temperature

Reset the rollers and the tooth flank backlash after each replacement of the following components:

- Roller
- Guideway
- Rack
- Pinion
- Gearbox

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6.3.9.1 Check the tooth flank backlash

If the axis is not driven with Güdel gearbox type, then use the procedure described in the operating manual of the relevant gearbox.

Blocking the drive pinions

Block the drive pinion to check the tooth flank backlash. Remove the block once you have completed the check. For this purpose, remove the fastening device and place the plug back onto the gearbox unit.

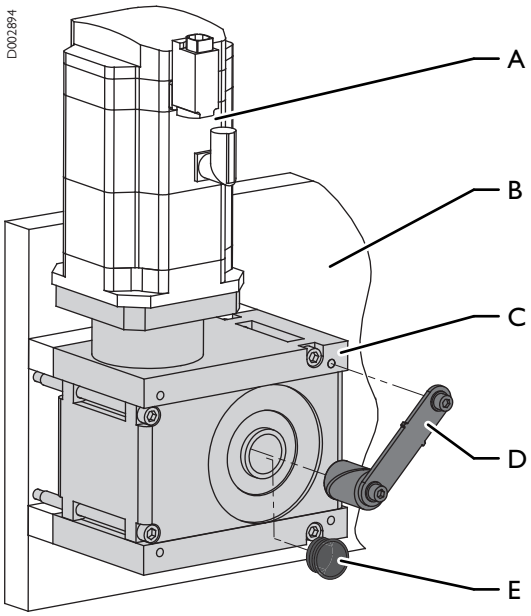

Fig. 6-25 *Blocking the drive pinions: Güdel gearbox unit*

A	*Motor*	*D*	*Fastening device*
B	*Carriage*	*E*	*Plug*
C	*Gearbox unit*		

Block the drive pinion as follows:

1. Switch off the system and padlock it to secure it against being switched on again
2. Remove the plug
3. Attach fastening device to gearbox unit

The drive pinion is blocked.

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Rack quality and module

The quality and module are found in the following table:

Exact measuring method

Rack quality and module ➲ 96

Rack quality	Tooth flank backlash [mm]		
	Module m ≤ 3	Module 3 < m ≤ 8	Module 8 < m ≤ 12
Q4 h21	0.010	0.012	0.016
Q5 h22	0.016	0.019	0.025
Q6 h23	0.025	0.03	0.04
Q7 h25	0.059	0.079	0.099
Q8 h27	0.158	0.198	0.247
Q9 h27	0.158	0.198	0.247

Table 6-17 Tooth flank backlash: Güdel gearbox unit

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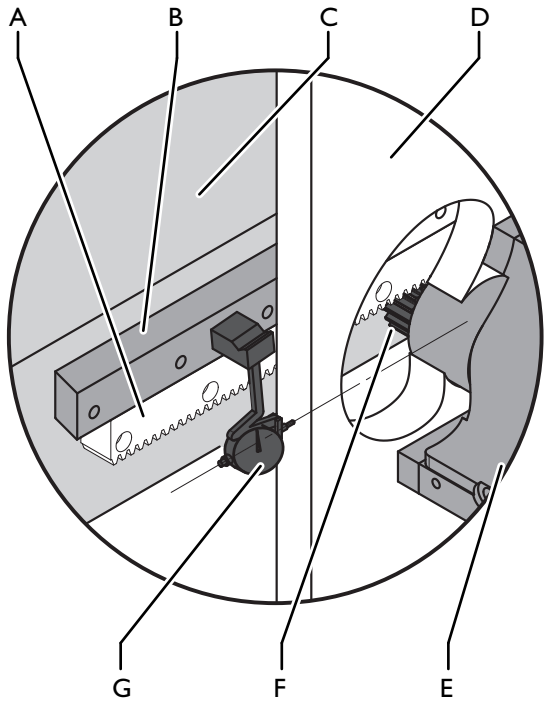

Fig. 6-26 *Checking the tooth flank backlash: Dial gauge (exact method)*

A	*Rack*	*E*	*Gearbox*
B	*Guideway*	*F*	*Drive pinion*
C	*Axle*	*G*	*Dial gauge*
D	*Carriage*		

Check the tooth flank backlash as follows:

Prerequisite:The drive pinion is blocked. ➲ 95

1. Switch off the system and padlock it to secure it against being switched on again
2. Mount the dial gauge to the guideway
3. Mount dial gauge in the direction of travel aligned with the center of the drive pinion
4. Zero the dial gauge
5. Move the carriage or axis in the direction of travel
6. Read tooth flank backlash on the dial gauge
7. Interpret tooth flank backlash according to the previous table

The tooth flank backlash has been checked.

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Inexact measuring method

NOTE

Damage resulting from inexact measuring method

The inexact measurement method described here can lead to incorrect interpretations and subsequent damage of every kind!

- Use it only when the exact method is not possible

Rack quality and module ➲ 96

Rack quality	Tooth flank backlash [mm]		
	Module m ≤ 3	Module 3 < m ≤ 8	Module 8 < m ≤ 12
Q4 h21	0.010	0.012	0.016
Q5 h22	0.016	0.019	0.025
Q6 h23	0.025	0.03	0.04
Q7 h25	0.059	0.079	0.099
Q8 h27	0.158	0.198	0.247
Q9 h27	0.158	0.198	0.247

Table 6-18 *Tooth flank backlash: Paper strip (inexact method)*

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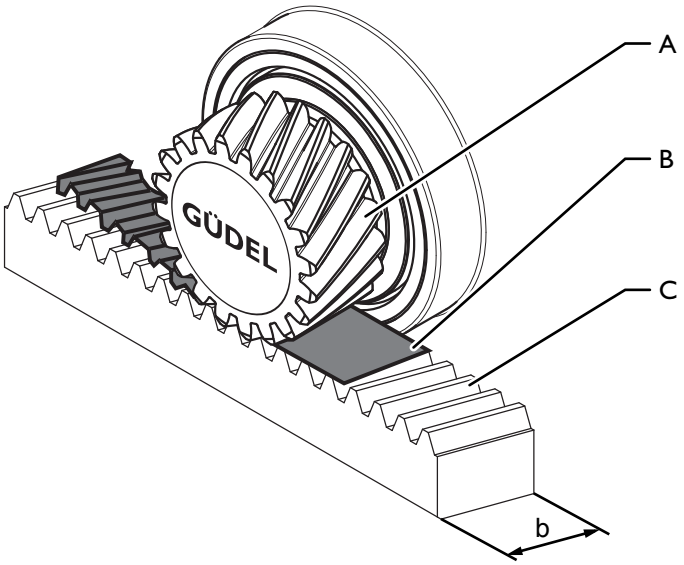

Fig. 6-27 Checking the tooth flank backlash: Paper strip (inexact method)

A Drive pinion
B Paper strip
C Rack

Check the tooth flank backlash as follows:

1 Switch off the system and padlock it to secure it against being switched on again

2 Insert paper strip of 0.08 mm thickness and width b between drive pinion and rack
(e.g. DIN A4 80 gsm paper).

3 Move carriage or axis
(Paper strip is "turned through")

4 Interpreting the result:

4.1 Paper strip worn:
Tooth flank backlash <0.05 mm

4.2 Paper strip cut, partially disconnected pieces:
Tooth flank backlash ~ 0.05 mm

4.3 Paper strips mildly cut, no disconnected pieces:
Tooth flank backlash ~ 0.07 mm

4.4 Paper strip wavy:
Tooth flank backlash ~ 0.1 mm

4.5 Paper strip undamaged:
Tooth flank backlash >0.1 mm

5 Interpret tooth flank backlash according to the previous table

The tooth flank backlash has been checked.

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6.4 Maintenance schedules

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6.4.1 Maintenance schedule

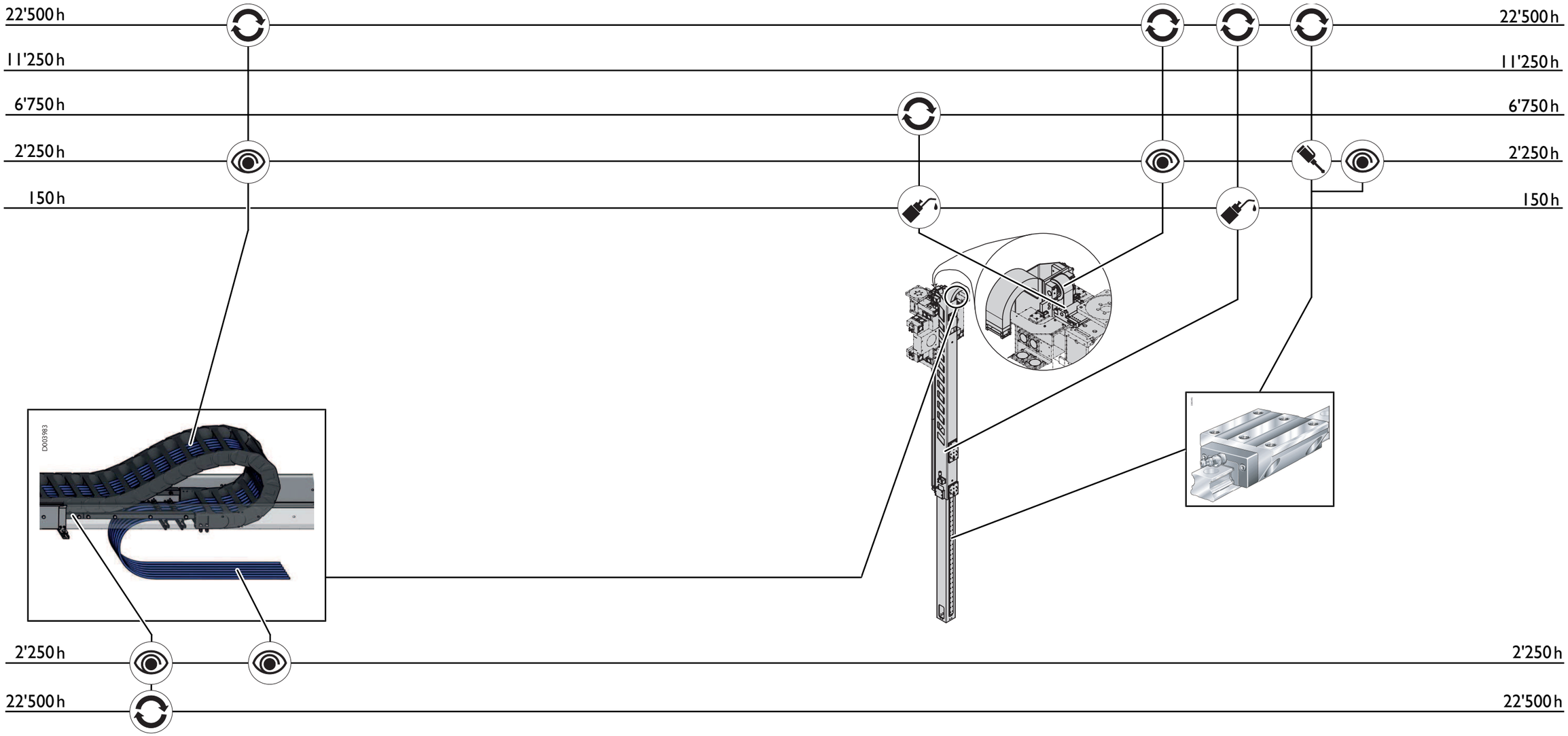

Fig. 6-28 Telescopic axis maintenance schedule

Grease
Oil
Replacing
Clean
Replacing lubricant
Visual inspection

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6.4.2 Güdel gearbox unit maintenance schedule

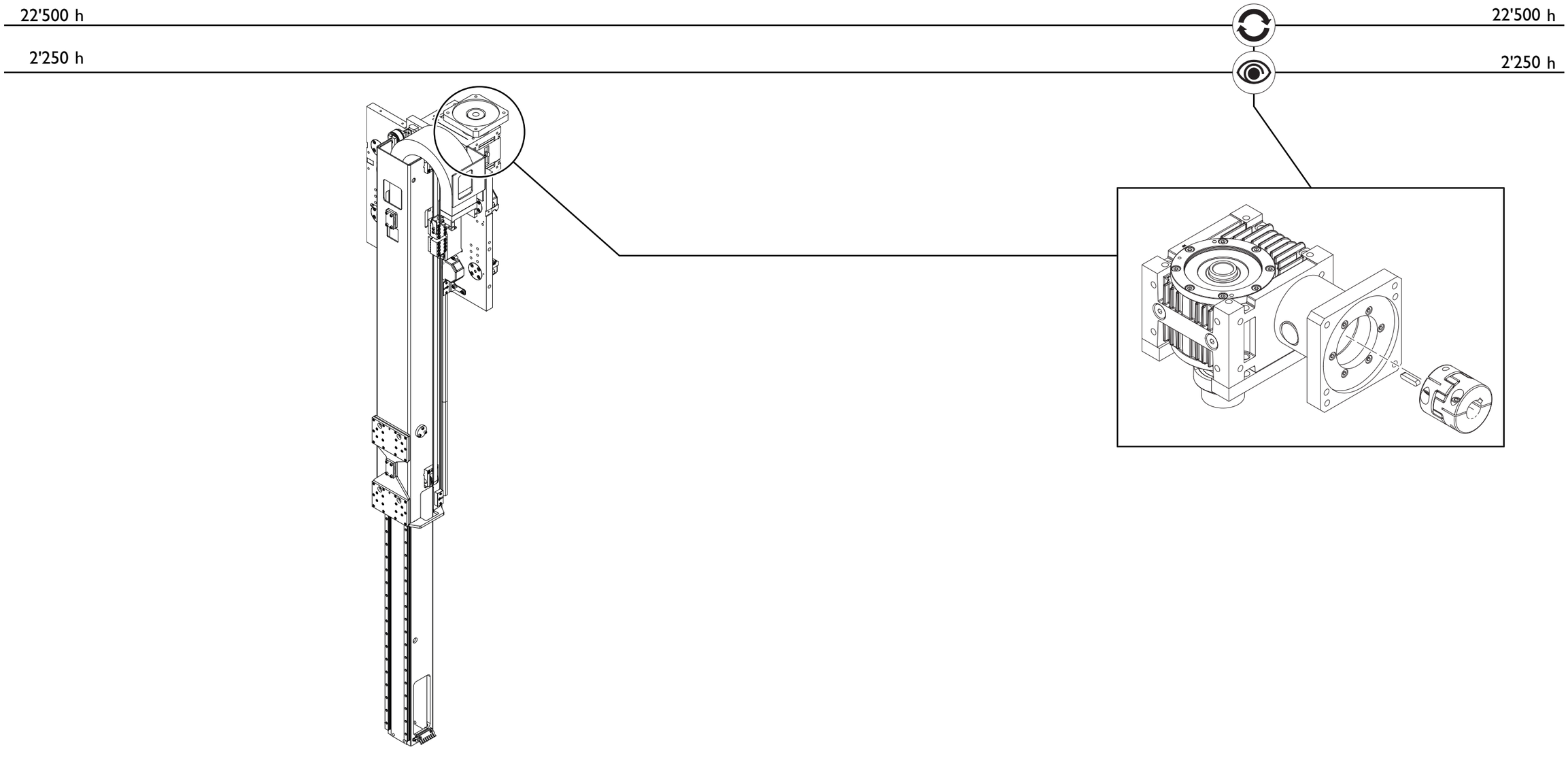

Fig. 6-29 Maintenance schedule for Güdel gearbox unit

Grease
Oil
Replacing
Clean
Replacing lubricant
Visual inspection

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6.5 Maintenance table

Maintenance work	Maintenance cycle [h]	Duration [min]	Target readership	Lubricants Cleaning agents	Further information
Lubricating guideways, racks and pinions	150		Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.4.1, 🗎 45
General inspection	2,250		Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.5.1, 🗎 45
Lubricating the ball-bearing cycle			The manufacturer's technicians Maintenance technicians Service technicians	Rhenus LAN 2	➲ Chapter 6.3.5.2, 🗎 46
Replacing the lubricating pinion	6,750		Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.6.1, 🗎 48
Replacing the slide bars	22,500	20	Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.7.5, 🗎 70
Replacing the energy chain		30	Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.7.4, 🗎 62
Replacing the gearbox unit		60	Service technicians The manufacturer's technicians Maintenance technicians		➲ Chapter 6.3.7.6, 🗎 72
Replacing the cog belt			Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.7.1, 🗎 50
Replacing the ball-bearing cycle			Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.7.2, 🗎 55
Replacing the guideways			Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.7.3, 🗎 60

This table does not purport to be exhaustive.

Table 6-19 Maintenance table

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

6.6 Intervention protocol: Maintenance

SERVICE MANUAL Telescopic axis size 6-7
27021598048035467_V3.0_EN-US

Project / Order: B1M.1xxxxxxx-xxxx
Bill of materials: 10xxxxxxxx
Serial number:
Year of manufacture: 201x

Company :
Address :
Location :
Country :

Send

Complete the intervention report after every intervention. You can overwrite the data each time you complete the report. Send the intervention report to Güdel electronically. Use the "Send" button. Sending only works if you have completed the operator details in the intervention report as specified in the Maintenance chapter. Save the generated XML file as a backup. Copy the empty intervention report and scan it in after completing it if you are not working electronically. Send it to service@ch.gudel.com after every intervention.

Maintenance work	Maintenance cycle [h]	effective operating hours[1]	Name[2]	Comments[3]	Date
Lubricating guideways, racks and pinions	150				

effective operating hours[1] : Service hours [h] of the entire plant according to service hour counter in the switch cabinet / Service hours [h] or kilometers [km] of the corresponding axis
Name[2] : First and last names of the service or maintenance technician
Comments[3] : Amount of contamination, anomalies, defects, replaced components

27021598048035467_v3.0_EN-US

Intervention protocol: Maintenance

SERVICE MANUAL Telescopic axis size 6-7
27021598048035467_V3.0_EN-US

Project / Order: B1M.1xxxxxxx-xxxx
Bill of materials: 10xxxxxxxx
Serial number:
Year of manufacture: 201x

Complete the intervention report after every intervention. You can overwrite the data each time you complete the report. Send the intervention report to Güdel electronically. Use the "Send" button. Sending only works if you have completed the operator details in the intervention report as specified in the Maintenance chapter. Save the generated XML file as a backup. Copy the empty intervention report and scan it in after completing it if you are not working electronically. Send it to service@ch.gudel.com after every intervention.

Maintenance work	Maintenance cycle [h]	effective operating hours[1]	Name[2]	Comments[3]	Date
General inspection	2,250				
Lubricating the ball-bearing cycle					

effective operating hours[1] : Service hours [h] of the entire plant according to service hour counter in the switch cabinet / Service hours [h] or kilometers [km] of the corresponding axis
Name[2] : First and last names of the service or maintenance technician
Comments[3] : Amount of contamination, anomalies, defects, replaced components

27021598048035467_v3.0_EN-US

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Intervention protocol: Maintenance

SERVICE MANUAL Telescopic axis size 6-7
27021598048035467_V3.0_EN-US

Project / Order: B1M.1xxxxxxx-xxxx
Bill of materials: 10xxxxxxxx
Serial number:
Year of manufacture: 201x

Complete the intervention report after every intervention. You can overwrite the data each time you complete the report. Send the intervention report to Güdel electronically. Use the "Send" button. Sending only works if you have completed the operator details in the intervention report as specified in the Maintenance chapter. Save the generated XML file as a backup. Copy the empty intervention report and scan it in after completing it if you are not working electronically. Send it to service@ch.gudel.com after every intervention.

Maintenance work	Maintenance cycle [h]	effective operating hours[1]	Name[2]	Comments[3]	Date
Replacing the lubricating pinion	6,750				

effective operating hours[1] : Service hours [h] of the entire plant according to service hour counter in the switch cabinet / Service hours [h] or kilometers [km] of the corresponding axis
Name[2] : First and last names of the service or maintenance technician
Comments[3] : Amount of contamination, anomalies, defects, replaced components

27021598048035467_v3.0_EN-US

Intervention protocol: Maintenance

SERVICE MANUAL Telescopic axis size 6-7
27021598048035467_V3.0_EN-US

Project / Order: B1M.1xxxxxxx-xxxx
Bill of materials: 10xxxxxxxx
Serial number:
Year of manufacture: 201x

Send

Complete the intervention report after every intervention. You can overwrite the data each time you complete the report. Send the intervention report to Güdel electronically. Use the "Send" button. Sending only works if you have completed the operator details in the intervention report as specified in the Maintenance chapter. Save the generated XML file as a backup. Copy the empty intervention report and scan it in after completing it if you are not working electronically. Send it to service@ch.gudel.com after every intervention.

Maintenance work	Maintenance cycle [h]	effective operating hours[1]	Name[2]	Comments[3]	Date
Replacing the slide bars	22,500				
Replacing the energy chain					
Replacing the gearbox unit					
Replacing the cog belt					
Replacing the ball-bearing cycle					
Replacing the guideways					

This table does not purport to be exhaustive.

effective operating hours[1] : Service hours [h] of the entire plant according to service hour counter in the switch cabinet / Service hours [h] or kilometers [km] of the corresponding axis
Name[2] : First and last names of the service or maintenance technician
Comments[3] : Amount of contamination, anomalies, defects, replaced components

27021598048035467_v3.0_EN-US

6.7 Feedback on the instructions

Your feedback helps us to keep improving these instructions. Thank you!

mailto: docufeedback@ch.gudel.com

Please provide the following information with your feedback:

- Identification number of the instructions
- Product, type
- Project number, order number
- Material number / serial number
- Year of manufacture
- Location of the product (country, ambient conditions, etc.)
- Photos, comments, feedback with clear reference to the section in the instructions
- Your contact data for clarifications if necessary

You can find most of the information on the type plate or the title page of the instructions. The identification number of the instructions is given on each page, as shown here:

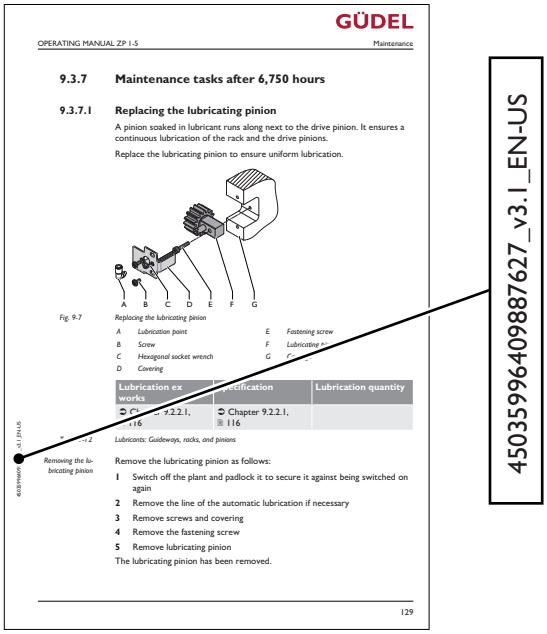

Fig. 6-30 *Identification number of the instructions*

27021598048035467_v3.0_EN-US

7 Repairs

7.1 Introduction

Work sequences

Perform the work sequences in the order described. Perform the described tasks at the specified times. This ensures a long service life for your product.

Original spare parts

Only use original spare parts. ➲ 148

Options

For information on the available options, read the corresponding documentation in the appendix.

Third-party products

For information on third-party products, read the appropriate documents in the appendix.

Tightening torques

Unless otherwise indicated, adhere to the tightening torques of Güdel.
➲ Chapter 9, 151

7.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 13
It concerns your personal safety!

⚠ WARNING

Automatic startup

During work on the product, there is danger of the machine starting up automatically. This can lead to severe or fatal injuries!

Before working in the danger area:

- Secure vertical axes (if equipped) against falling.
- Switch off the superordinate main power supply. Secure it against being switched on again (main switch for the complete system)
- Before switching on the system again, make sure that no one is in the danger area

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⚠ WARNING

Falling axes, workpieces

Falling axes or workpieces can cause physical damage, serious or fatal injuries!

- Set down any workpieces before working in the danger area
- Never enter the area below suspended axes and workpieces
- Secure suspended axes using the stipulated equipment
- Check the belts of the telescope axes for signs of breakage and tears

⚠ WARNING

Heavy components

Components can be very heavy. Improper handling can cause severe or fatal injuries!

- Use appropriate lifting units
- Use suitable means to secure the components against tipping over
- Only remove the safety devices after the product has been completely assembled

7.1.2 Personnel qualifications

Only appropriately trained and authorized technicians are allowed to work on the product.

27021598048035467_v3.0_EN-US

7.2 Repairs

7.2.1 General prerequisites

Prior to performing repair and maintenance tasks, do the following:

- If vertical axes are present, secure them against falling
- Switch off the system and padlock it to secure it against being switched on again
- Make sure that all necessary spare parts and wearing parts are at hand
➲ 148

7.2.2 Replacing lubricant

7.2.2.1 Attaching the slings: Motor

⚠ WARNING

Suspended loads

Improper handling of suspended loads can lead to severe injuries or death!

- Use appropriate lifting units
- Wear appropriate protective clothing
- Always keep sufficient distance from suspended loads
- Never enter the area below a suspended load

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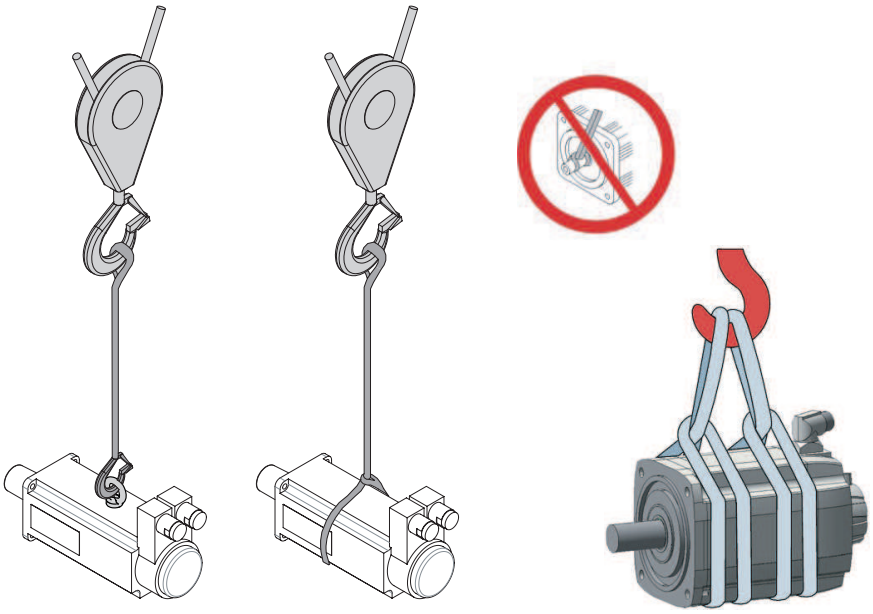

Fig. 7-1 *Attaching the slings: Motor (image source: Bosch Rexroth)*

Attach the slings as follows:

1. Remove fan from motor if necessary
2. Mount lifting screw if necessary
3. Attach the slings as shown in the illustration
4. Carefully lift the load
5. Check horizontal alignment of the load
6. If the load tilts: Repeat process from step 3

The slings are in place.

27021598048035467_v3.0_EN-US

7.2.2.2 Attaching the slings: Güdel gearbox unit

Use lifting units to transport gearbox units from size 090 upwards.

⚠ WARNING

Heavy components

Components can be very heavy. Improper handling can cause severe or fatal injuries!

- Use appropriate lifting units
- Use suitable means to secure the components against tipping over
- Only remove the safety devices after the product has been completely assembled

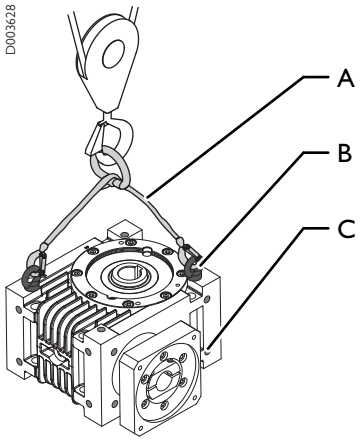

Fig. 7-2 *Attaching the slings: Güdel gearbox unit*

A *Belt harness*
B *Lifting screw*
C *Thread hole*

Size	Size of lifting screw
090	M10
120	M12
180	M16

Table 7-1 *Size of lifting screw*

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Attach the slings as follows:

1 Insert lifting screws into threaded holes on desired side (Diagonal arrangement according to illustration)

2 Attach the slings as shown in the illustration

The slings are in place.

7.2.2.3 Remove the motor

⚠ WARNING

Falling axes

After removing the transport securing device, brakes or motors, the vertical axes fall downwards. Carriages may run off to the side. This can lead to severe or fatal injuries!

- If necessary, secure the vertical axes and the carriages before removing transport securing devices, brakes or motors

⚠ CAUTION

Hot parts/surfaces

Hot surfaces present a burn hazard during work on this product!

- Protect yourself by wearing heat-resistant gloves
- Allow the parts to cool down first

If the elastomer gear rim remains stuck on the gearbox side, remove it manually. This is necessary only if you wish to replace the elastomer gear rim.

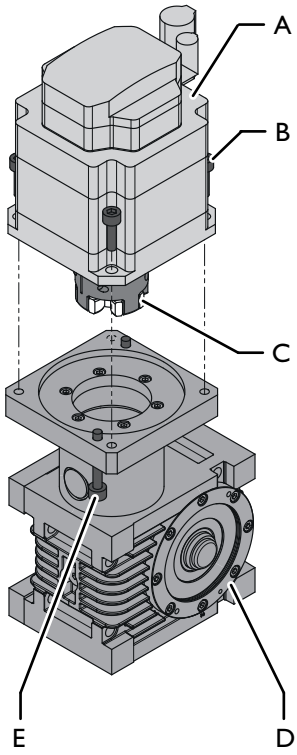

Fig. 7-3 *Removing the motor: Güdel gearbox unit*

A	*Motor*	*D*	*Gearbox unit*
B	*Motor screw*	*E*	*Forcing screw*
C	*Elastomer gear rim*		

Remove the motor as follows:

1. Switch off the system and secure it with a padlock against being switched on again
2. Secure the carriage or axis with the transport securing device or lifting equipment
3. Attach slings to the motor ➲ 🗎 118
4. Remove the motor screws
5. Force the motor off the gearbox unit with the forcing screws
6. Remove the motor, together with the elastomer gear rim, from the gearbox unit

The motor has now been removed.

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7.2.2.4 Removing the gearbox unit

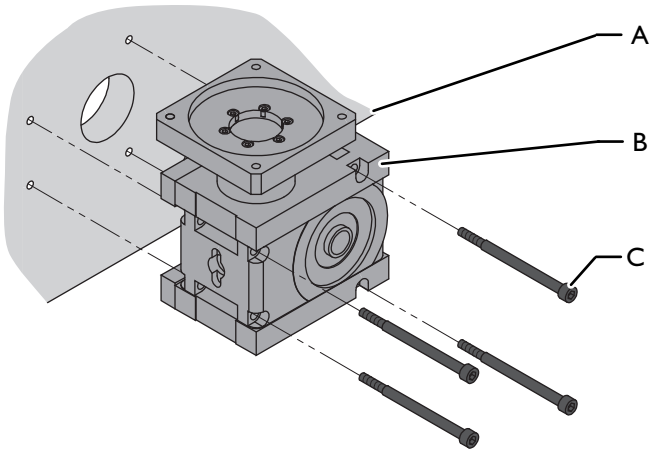

Fig. 7-4 *Removing the gearbox unit*

A *Adjacent construction*
B *Gearbox unit*
C *Gearbox screws*

Remove the gearbox unit as follows:

1 Attach slings to the gearbox unit ➲ 120
2 Remove the gearbox screws
3 Remove the gearbox unit
4 Remove the transport securing device or slings

The gearbox unit has now been removed.

27021598048035467_v3.0_EN-US

7.2.2.5 Replacing lubricant

⚠ WARNING

Hot gearbox oil

Working on the gearbox carries the risk of severe injury due to burns!

- Let the gearbox cool before commencing any work

⚠ CAUTION

Oil, greases

Oils and greases are harmful to the environment!

- The oils and greases must not get into the drinking water supply. Take appropriate measures
- Observe the country-specific safety data sheets
- Oils and greases must be disposed of as hazardous waste, even if the total quantity is small

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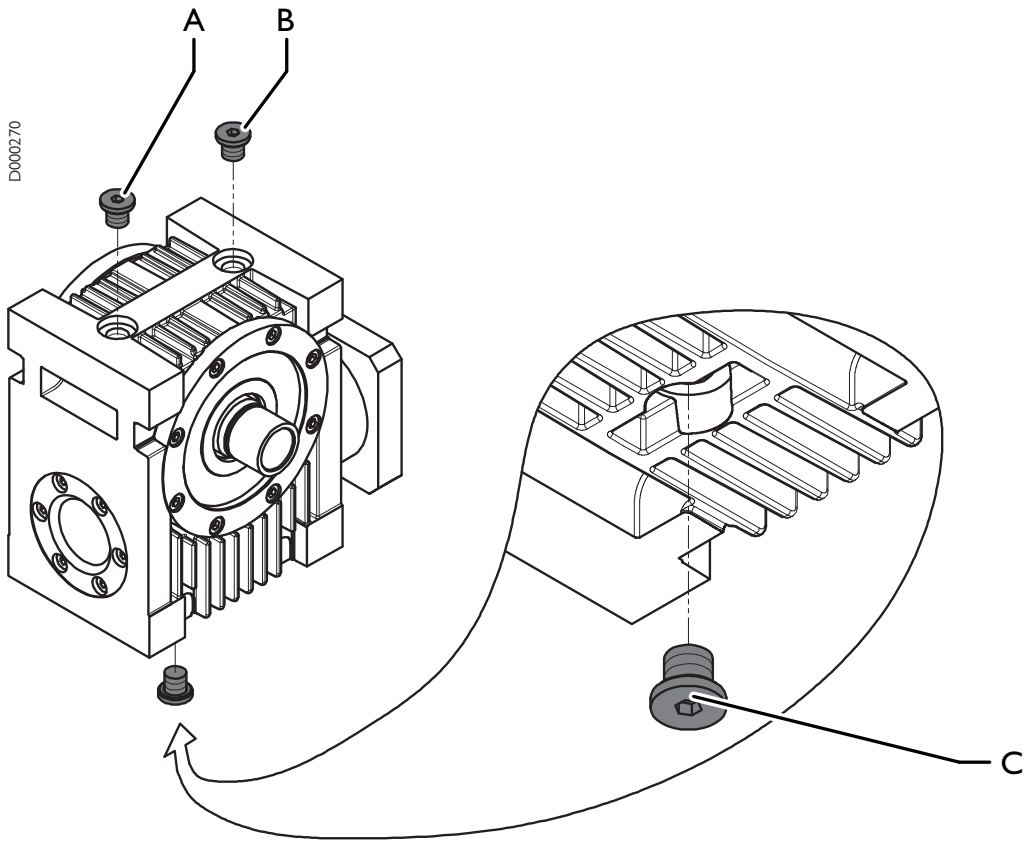

Fig. 7-5 *Replacing lubricant: Güdel gearbox unit*

A *Bleed screw*

B *Filler screw*

C *Drain screw*

Lubrication ex works	Specification	Lubrication quantity
Mobil Glygoyle 460 NSF no.136467	CLP PG 460 in accordance with DIN 51502	AE/HPG030: 40cm3 AE/HPG045: 100cm3 AE/HPG060: 250cm3 AE/HPG090: 700cm3 AE/HPG120: 1400cm3 AE/HPG180: as per type plate

Table 7-2 *Lubricants: Gearbox unit Güdel*

Replace the lubricant as follows:

1 Position the gearbox:
Drain screw at the bottom
Filler and bleed screw at the top

2 Position a suitable container below the drain screw

3 Remove the bleed, filler, and drain screws

4 Drain the lubricant

5 Rinse the gearbox with fresh lubricant

6 Allow the gearbox to drain

7 Screw in the drain screw

8 Fill up the gearbox through the filler screw

9 Screw in the bleed and filler screws

The lubricant is replaced.

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7.2.2.6 Installing the gearbox unit

NOTE

Breakage of cast casing

Excessively high tightening torques destroy the cast casing!

- Observe the tightening torques

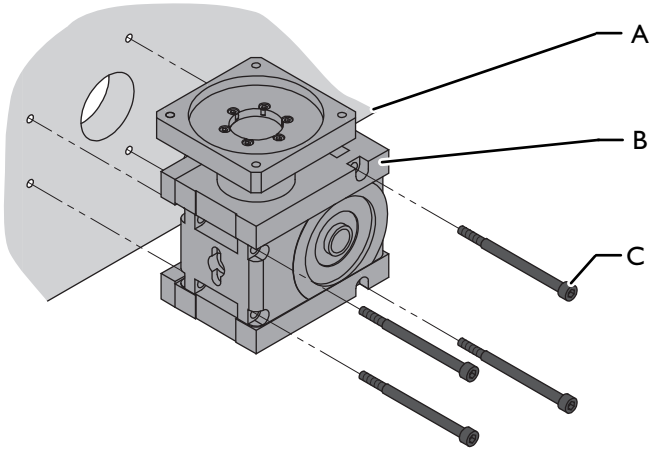

Fig. 7-6 *Installing the gearbox unit*

A *Adjacent construction*
B *Gearbox unit*
C *Gearbox screws*

Size	030	045	060	090	120	180
Thread size	M6	M8	M10	M12	M16	M20
Tightening torque [Nm]	9	22	42	50	120	240

Table 7-3 *Tightening torques for gearbox screws: Güdel gearbox unit*

Install the gearbox unit as follows:

1 Attach slings to the gearbox unit ➲ 120
2 Install the gearbox unit
3 Install and tighten the gearbox screws
4 Remove the transport securing device or slings

The gearbox unit has now been installed.

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7.2.2.7 Installing the motor

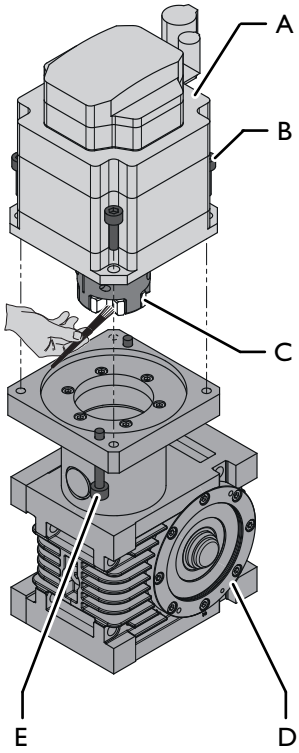

Fig. 7-7 *Installing the motor: Güdel gearbox unit*

A	*Motor*	*D*	*Gearbox unit*
B	*Motor screw*	*E*	*Forcing screw*
C	*Elastomer gear rim*		

Lubrication ex works	Specification	Lubrication quantity
Vaseline	Cannot be determined	

Table 7-4 *Lubricants: Gearbox unit Güdel: elastomer gear rim of the coupling*

27021598048035467_v3.0_EN-US

Install the motor as follows:

1 Switch off the system and secure it with a padlock against being switched on again
2 Remove the forcing screws if necessary
3 Lubricate the elastomer gear rim
4 Attach slings to the motor ➲ 🗎 118
5 Install the motor, together with the elastomer gear rim, on the gearbox unit
6 Install and tighten the motor screws

The motor has now been installed.

7.2.2.8 Final tasks

Perform the following final tasks:

1 Set the tooth flank backlash ➲ 🗎 94
2 Calibrate the reference plane of the motor (this procedure is described in the documentation for the complete system or the motor)

The final tasks have been performed.

27021598048035467_v3.0_EN-US

7.2.3 Replacing the motor

⚠ CAUTION

Hot parts/surfaces

Hot surfaces present a burn hazard during work on this product!

- Protect yourself by wearing heat-resistant gloves
- Allow the parts to cool down first

Mark the position of the coupling on the motor shaft. The marking makes it easier for you to re-install the coupling.

The tightening torque TA and the type of couping are engraved on the motor and gearbox sides in the couping.

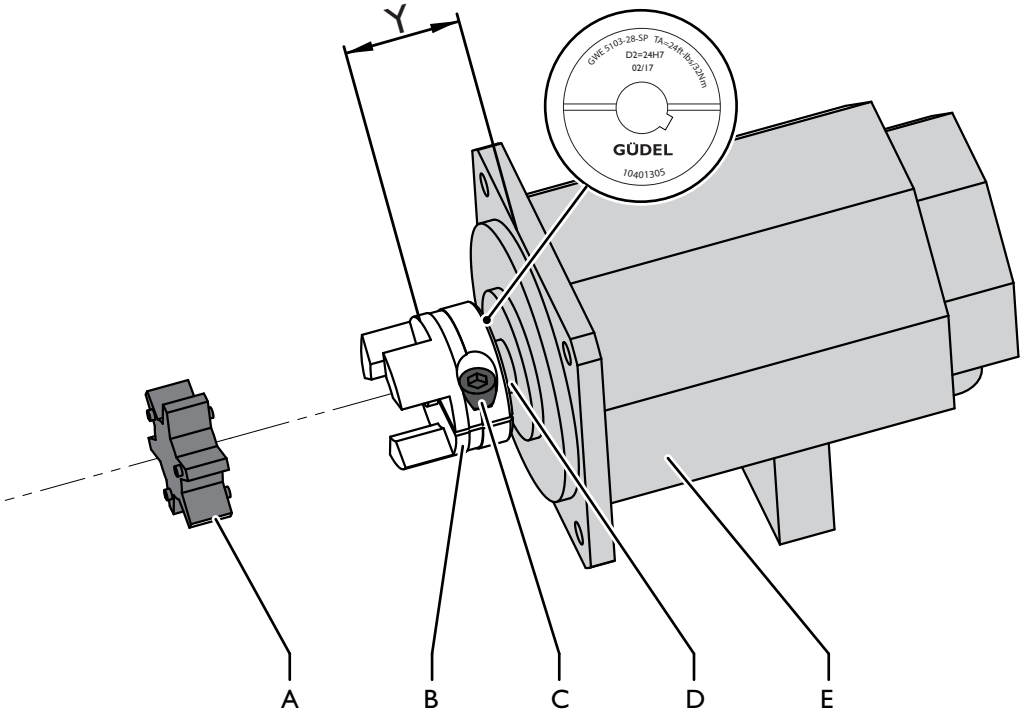

Fig. 7-8 *Replacing the motor: Positioning the coupling half on the motor shaft*

A	*Elastomer gear rim*	*D*	*Motor shaft*
B	*Coupling half*	*E*	*Motor*
C	*Coupling screw*		

27021598048035467_v3.0_EN-US

Tool	Use	Item number
Corrosion protection agent MOTOREX Intact XD 20	Installing the coupling Applying corrosion protection to the product	0502037

Table 7-5 Special tools, testing and measuring instruments

Replace the motor as follows:

1 Switch off the plant and padlock it to prevent it from being switched on again
2 Remove the cables and lines
3 Remove motor ➲ Chapter 7.2.2.3, 🗎 121
4 Remove the elastomer gear rim if necessary
5 Measuring the Y distance
6 Release the coupling screws
7 Remove the coupling half
8 Replacing the motor
9 Apply corrosion protection agent to the motor shaft with a brush
10 Push the coupling half onto the motor shaft
11 Set the Y distance
12 Tighten the coupling screws:
  12.1 Tighten alternately to 50% of the tightening torque TA
  12.2 Tighten alternately with 100% of the tightening torque TA
13 Installing the motor and coupling ➲ Chapter 7.2.2.7, 🗎 128
14 Connect the cables and lines in accordance with the electrical diagram
15 Calibrate the reference plane of the motor (this procedure is described in the documentation for the complete system or the motor)

The motor has been replaced.

27021598048035467_v3.0_EN-US

7.2.4 Replacing the motor flange and gearbox flange

Mark the position of the drill holes of the gearbox flange. Install the new gearbox flange identically

Do not change the position of the input shaft

Do not change the position of the coupling on the motor shaft!

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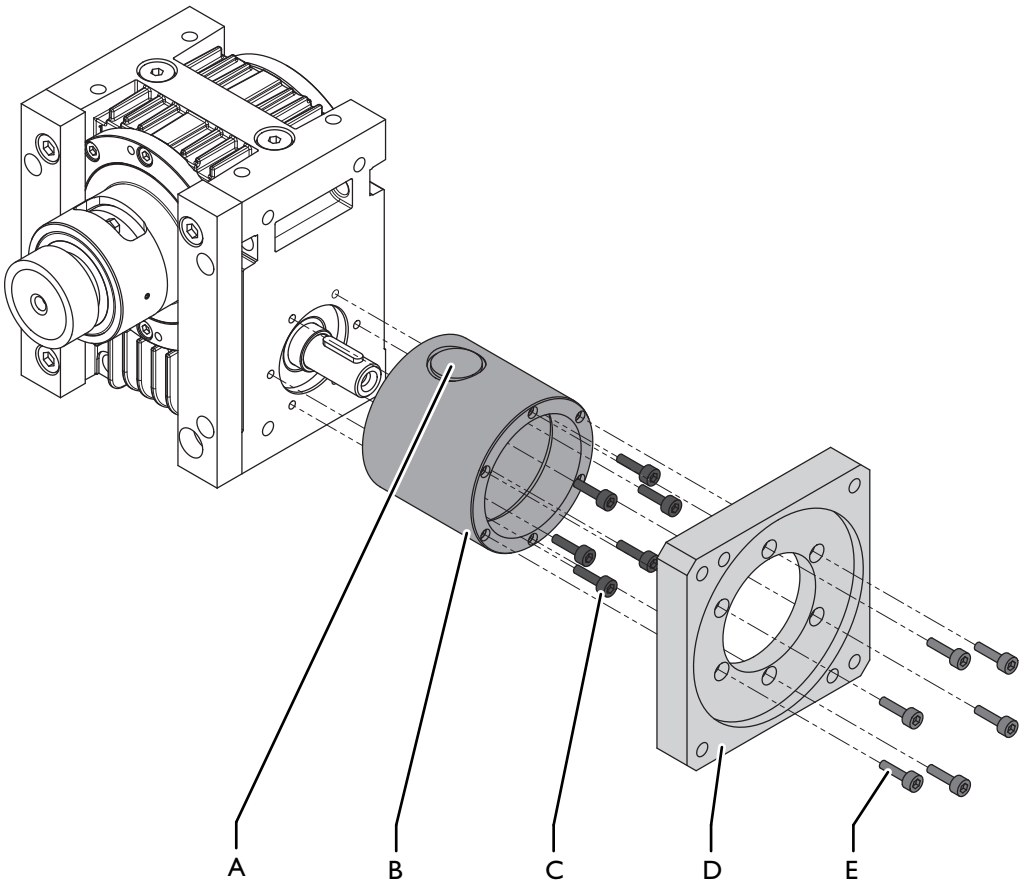

Fig. 7-9 *Replacing the motor flange and gearbox flange*

A	*Drill hole*	*D*	*Motor flange*
B	*Gearbox flange*	*E*	*Screw*
C	*Fastening screw*		

Replace the motor flange and gearbox flange as follows:

1. Switch off the system and secure it with a padlock against being switched on again
2. Remove the motor and coupling ➲ 74
3. Remove the fastening screws, screws and motor flange
4. Remove the gearbox flange
5. Replacing the motor flange and gearbox flange
6. Install the components in the reverse order
7. Install the motor ➲ 78

The motor flange and gearbox flange have now been replaced.

27021598048035467_v3.0_EN-US

7.2.5 Replacing pinion, bearing, and clamping set

The components are designed for continuous use. Their wear depends on the duration of operation of the product and the ambient conditions. Güdel recommends preventatively replacing components as soon as their service life has been reached. Components may fail before expiry of the service life however. Replace worn components immediately.

Distinguishing characteristics of pinion wear
• Defective teeth • Process inaccuracies • Discoloration due to heat present

Table 7-6 Distinguishing characteristics of wear: Pinion

Distinguishing characteristics of bearing wear
• Excessive noise audible • Discoloration due to heat • Uneven running due to vibrations perceptible

Table 7-7 Distinguishing characteristics of wear: Bearing

Distinguishing characteristics of clamping set wear
• Defective screws • Process inaccuracies • Slippage

Table 7-8 Distinguishing characteristics of wear: Clamping set

⚠ WARNING

Loose components

Vibrations can loosen connecting elements. Persons are surprised by unexpected situations and seriously injured as a result.

Observe the following points:

- Secure the connection elements by appropriate means
- Check the tightening torques regularly

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The O-ring will be destroyed if you remove the centering flange. Always replace the O-ring when you have removed the centering flange.

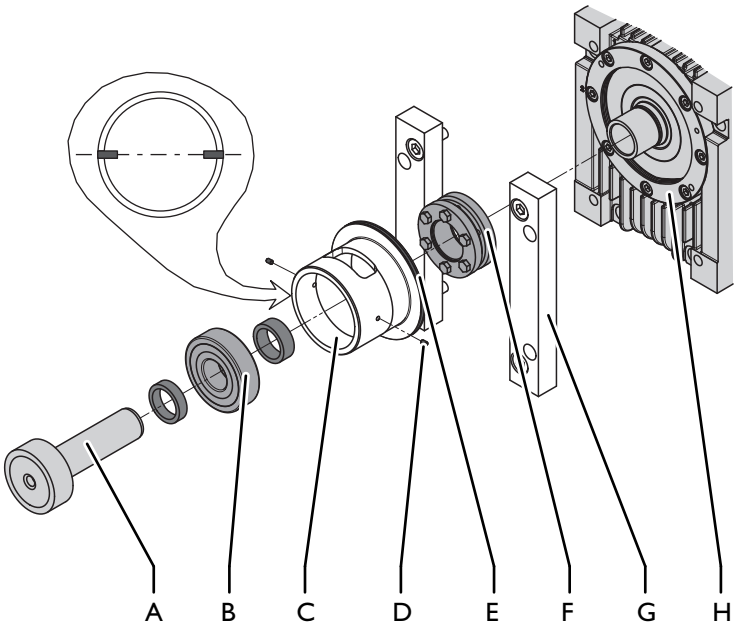

Fig. 7-10 *Replacing pinion, bearing, and clamping set: Güdel gearbox unit*

A	*Pinion*	*E*	*O-ring*
B	*Bearing*	*F*	*Clamping set*
C	*Centering flange*	*G*	*Spacing strip*
D	*Headless set screw*		

27021598048035467_v3.0_EN-US

Replace the pinion, bearing, and clamping set as follows:

1 Switch off the system and padlock it to secure it against being switched on again
2 Remove the drive if necessary
3 Remove the spacing strips
4 Remove the headless set screws
5 Remove the centering flange in axis direction
6 Loosen the clamping set screws
7 Replace pinion, bearing, O-ring and clamping set
8 Install the pinion, bearing, O-ring and clamping set in reverse order
   - **8.1** Tightening torque of clamping set ➲ Chapter 9.2, 155
   - **8.2** Install headless set screws according to the illustration (secure with Loctite)
   - **8.3** Check the tooth flank backlash

Pinion, bearing, and clamping set have been replaced.

27021598048035467_v3.0_EN-US

7.2.6 Setting the gear backlash

The gear backlash is set ex works. Reset the gear backlash to ensure reliable function.

NOTE

Incorrect assembly of the casing cover

The gearbox oil runs out. The worm shaft engages incorrectly with the worm gear.

- Do not remove the casing cover
- Align both casing covers in the identical position

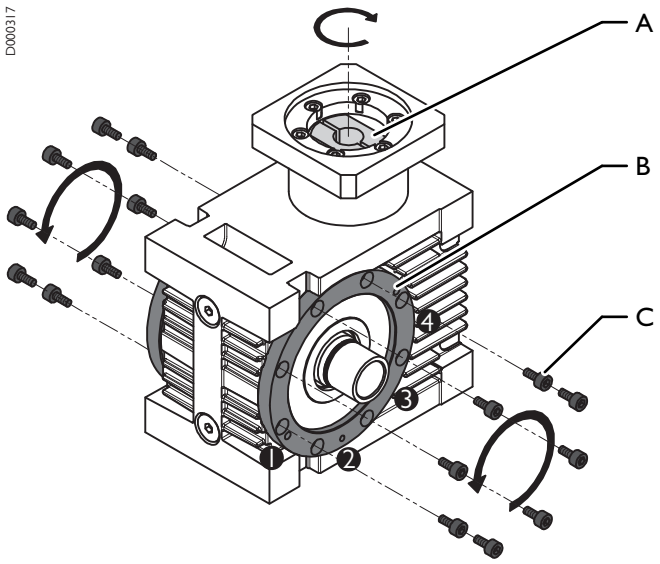

Fig. 7-11 *Setting the gear backlash: Güdel gearbox unit*

A *Worm shaft*
B *Casing cover*
C *Screw*

Size	030	045	060	090	120	180
Tightening torque [Nm]	6	7	8	19	36	36

Table 7-9 *Tightening torques of screws of casing cover*

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Set the gear backlash as follows:

1 Switch off the system and padlock it to secure it against being switched on again

2 Disassemble the drive

3 Remove all screws on both sides

4 Rotate both covers toward the next higher, cast-in number

5 Tighten four screws on each of the two sides

6 Checking the gear backlash: Rotate the worm shaft 360° by hand

- **6.1** The shaft does not resist rotation: Repeat from step 3
- **6.2** The shaft resists rotation: Remove the screws, set both gearbox covers one level lower
- **6.3** The shaft always resists rotation: Replace gearbox unit immediately

7 Insert all screws on both sides and tighten crosswise

8 Checking the gear backlash: Rotate the worm shaft 360° by hand
The shaft resists rotation: Repeat from step 3

The gear backlash has been set.

27021598048035467_v3.0_EN-US

7.2.7 Replacing the elastomer gear rim

The elastomer gear rim is designed for a service life of 3 years or 22,500 operating hours. The wear depends on the duration of operation of the product and the ambient conditions. However, components may fail before expiry of the service life. Replace worn components immediately.

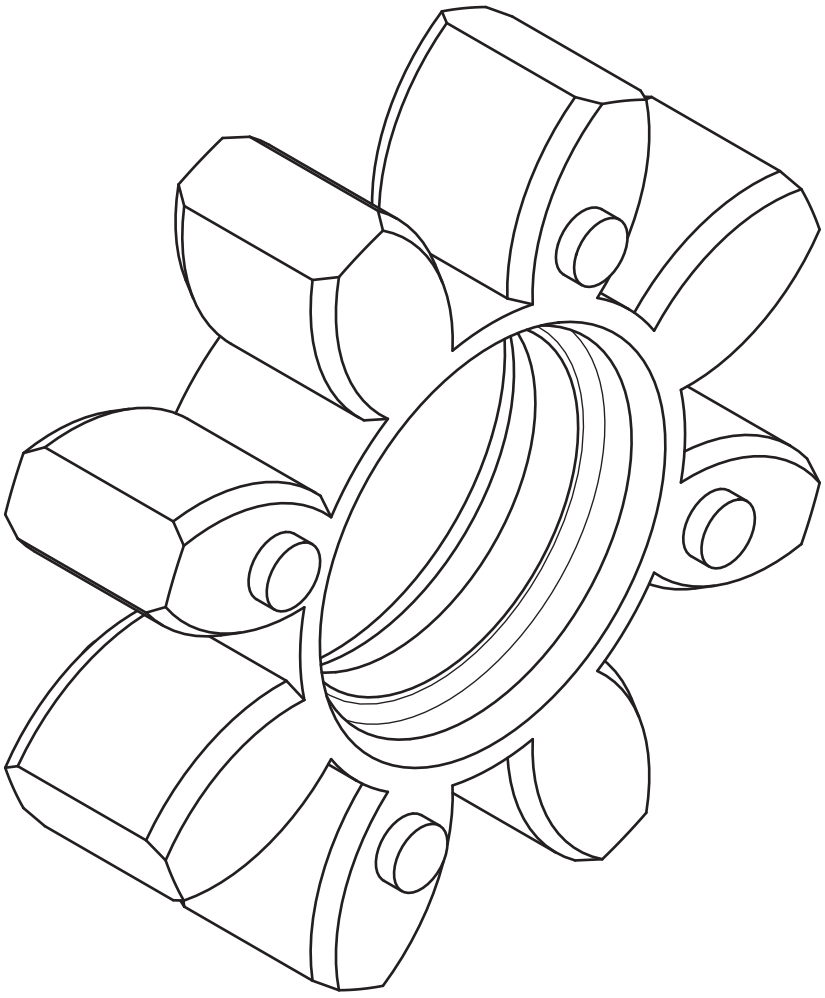

Fig. 7-12 *Elastomer gear rim*

Distinguishing characteristics of wear
• Teeth broken out • Teeth frayed • Material brittle

Table 7-10 *Distinguishing characteristics of wear: Elastomer gear rim*

27021598048035467_v3.0_EN-US

7.3 Tasks to perform after a crash

Güdel strongly recommends that the work be performed by Güdel technicians. Damage to the product can often only be found by experience. For this reason, the following tasks should not be regarded as conclusive.

Carry out the following tasks after a crash:

1 Perform a general inspection in the form of a fine check, in accordance with the Maintenance chapter

The tasks have been performed.

7.3.1 Replacing the bumper unit

The bumper unit is a safety component. Replace the entire bumper unit after a crash has occurred.

⚠ WARNING

Weakened safety component

After a crash, it is not immediately apparent whether bumper unit components have been weakened or are defective. A further crash can lead to severe or fatal injuries!

- Replace the entire bumper unit after a crash has occurred.

The bumper unit consists of the following components:

- Bumper
- Bumper block or bumper bracket
- Screws
- Shearing sleeves and/or pins

27021598048035467_v3.0_EN-US

7.3.1.1 Bumper unit with shearing sleeves

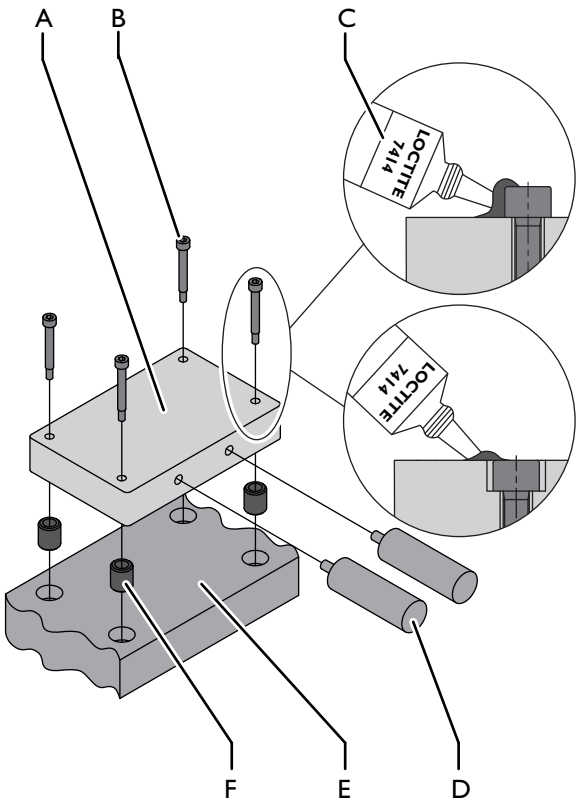

Fig. 7-13 *Bumper unit with shearing sleeves*

A	*Bumper block / bumper bracket*	*D*	*Bumper*
B	*Screw*	*E*	*Mating part*
C	*Loctite Blue Threadlocker 7414*	*F*	*Shearing sleeve*

Assemble the bumper unit with shearing sleeves as follows:

1. Assemble the bumper on the bumper block / bumper bracket
2. Remove the danger label from the assembly site if necessary
3. Install the shearing sleeves at the assembly site
4. Check if the shearing sleeves have been fully and correctly installed
5. Assemble the pre-assembled bumper unit
6. Seal all screws with Loctite Blue Threadlocker 7414

The bumper unit with shearing sleeves has been assembled.

27021598048035467_v3.0_EN-US

7.3.1.2 Bumper unit with pins

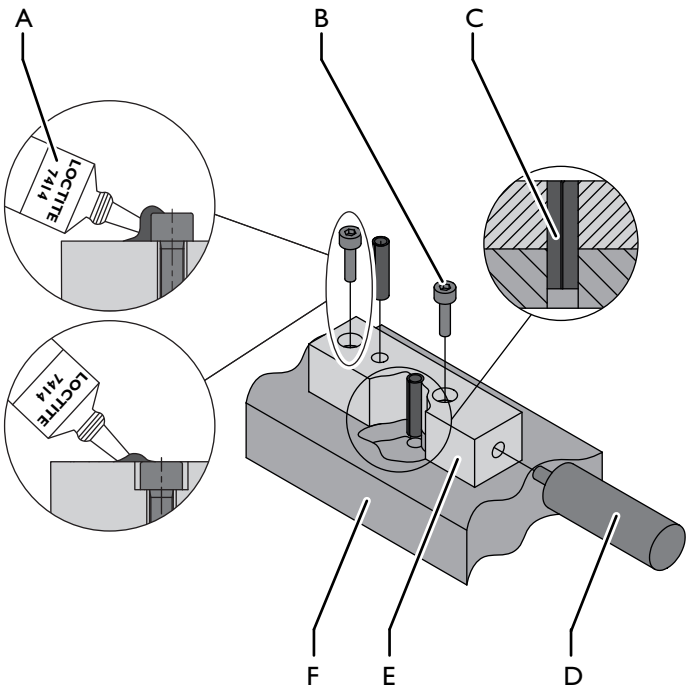

Fig. 7-14 *Bumper unit with pins*

A	*Loctite Blue Threadlocker 7414*	*D*	*Bumper*
B	*Screw*	*E*	*Bumper block / bumper bracket*
C	*Pin*	*F*	*Mating part*

Assemble the bumper unit with pins as follows:

1. Assemble the bumper on the bumper block / bumper bracket
2. Remove the danger label from the assembly site if necessary
3. Install pre-assembled bumper unit along with the mating part using pins
4. Tighten the screws
5. Check if the pins have been fully and correctly installed
6. Seal all screws with Loctite Blue Threadlocker 7414

The bumper unit with pins has been assembled.

27021598048035467_v3.0_EN-US

7.3.1.3 Bumper unit with limit stops

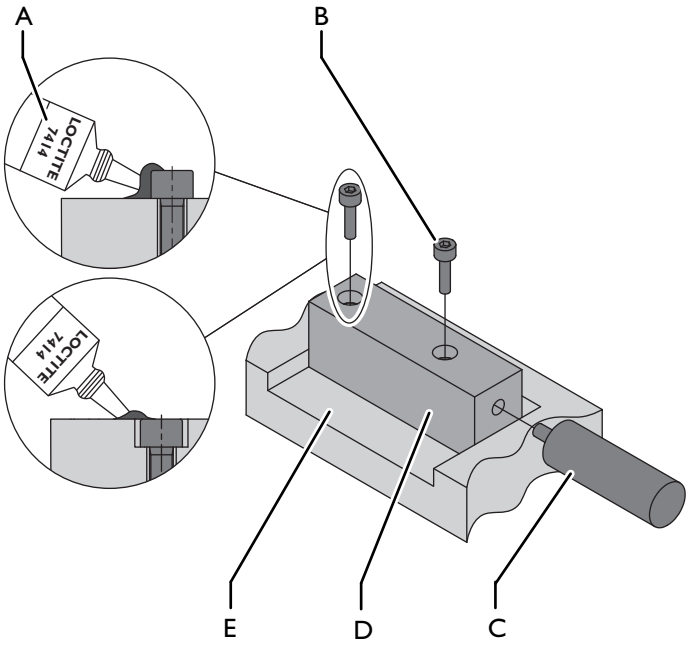

Fig. 7-15 *Bumper unit with mechanical limit stops*

A	*Loctite Blue Threadlocker 7414*	*D*	*Bumper block / bumper bracket*
B	*Screw*	*E*	*Mating part*
C	*Bumper*		

Assemble the bumper unit as follows:

1. Assemble the bumper on the bumper block / bumper bracket
2. Remove the danger label from the assembly site if necessary
3. Clean the contact surface of the mating part meticulously
4. Position the pre-assembled bumper unit on the mating part
5. Tighten the screws
6. Check the bumper unit for correct fit
7. Seal all screws with Loctite Blue Threadlocker 7414

The bumper unit is now installed.

7.3.2 Referencing the axes

Reference the axes in accordance with the documentation for the complete system.

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

7.4 Intervention report: Repairs

SERVICE MANUAL Telescopic axis size 6-7
27021598048035467_V3.0_EN-US

Project / Order: B1M.1xxxxxxx-xxxx
Bill of materials: 10xxxxxxxx
Serial number:
Year of manufacture: 201x

Complete the intervention report after every intervention. You can overwrite the data each time you complete the report. Send the intervention report to Güdel electronically. Use the "Send" button. Sending only works if you have completed the operator details in the intervention report as specified in the Maintenance chapter. Save the generated XML file as a backup. Copy the empty intervention report and scan it in after completing it if you are not working electronically. Send it to service@ch.gudel.com after every intervention.

Jobs[1]	Component[2]	effective operating hours[3]	Name[4]	Comments[5]	Date

Jobs[1] : Work carried out during the unplanned maintenance
Component[2] : Affected component/assembly
effective operating hours[3] : Service hours [h] of the entire plant according to service hour counter in the switch cabinet / Service hours [h] or kilometers [km] of the corresponding axis
Name[4] : First and last names of the service or maintenance technician
Comments[5] : Amount of contamination, anomalies, defects, replaced components

27021598048035467_v3.0_EN-US

7.5 Other documentation

For information on the available options, read the corresponding documentation in the appendix.

7.6 Service departments

If you have questions, please contact the service departments. ➲ 148

27021598048035467_v3.0_EN-US

8 Spare parts supply

8.1 Service departments

For service queries, please use the service form at www.gudel.com or contact the offices in the appropriate country:

Austria:	+43 7226 20690-0
China:	+86 21 5055 0012
Czech Republic:	+420 602 309 593
Germany:	+49 6291 6446 792
France:	+33 1 30091545
India:	+91 20 6791 0221
Italy:	+39 02 9217021
South Korea:	+82 32 858 05 41
Mexico:	+52 81 8374 2500 x-103
Poland:	+48 33 819 01 25
Thailand:	+66 2 374 0709
United Kingdom:	+44 2476 695 444
USA:	+1 734 214 0000
Spain:	+34 93 476 0380
The Netherlands:	+31 541 66 22 50
Turkey:	+90 532 316 94 44
Russia:	+7 8482 735544
All other countries and Switzerland:	+41 62 916 91 70

Table 8-1 National agencies

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For urgent service inquiries, our help desk provides after-hour assistance (24-hour support)

Europe/Asia:	+41 62 916 91 70	service@ch.gudel.com
USA:	+1 734 214 0000	service@us.gudel.com

Table 8-2 *24-hour Hotline*

Please have the following information at hand, as labeled on the type plate

- Product, type
- Project, sales order
- Serial number (parts list)
- Drawing number, if applicable

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

9 Torque tables

9.1 Tightening torques for screws

NOTE

Vibrations

Screws without screw lock become loose.

- Secure screw connections on moving parts Loctite medium strength 242.
- Apply the adhesive on the nut thread, not on the screw!

27021598048035467_v3.0_EN-US

9.1.1 Zinc plated screws

Unless otherwise specified, the following tightening torques apply for zinc-plated screws lubricated with Molykote (MoS2) grease or secured with Loctite 242:

Thread size	Tightening torque [Nm]		
	8.8	10.9	12.9
M3	1.1	1.58	1.9
M4	2.6	3.9	4.5
M5	5.2	7.6	8.9
M6	9	13.2	15.4
M8	21.6	31.8	37.2
M10	43	63	73
M12	73	108	126
M14	117	172	201
M16	180	264	309
M20	363	517	605
M22	495	704	824
M24	625	890	1041
M27	915	1304	1526
M30	1246	1775	2077
M36	2164	3082	3607

Table 9-1 *Torque table for zinc-plated screws lubricated with Molykote (MoS2) grease*

27021598048035467_v3.0_EN-US

9.1.2 Black screws

Unless otherwise specified, the following tightening torques apply for black oiled and non-lubricated screws, or screws secured with Loctite 242:

Thread size	Tightening torque [Nm]		
	8.8	10.9	12.9
M4	3	4.6	5.1
M5	5.9	8.6	10
M6	10.1	14.9	17.4
M8	24.6	36.1	42.2
M10	48	71	83
M12	84	123	144
M14	133	195	229
M16	206	302	354
M20	415	592	692
M22	567	804	945
M24	714	1017	1190
M27	1050	1496	1750
M30	1420	2033	2380
M36	2482	3535	4136

Table 9-2 *Torque table for black oiled and non-lubricated screws*

27021598048035467_v3.0_EN-US

9.1.3 Stainless steel screws

Unless otherwise specified, the following tightening torques apply for stainless steel screws lubricated with Molykote (MoS2) grease or secured with Loctite 242:

Thread size	Tightening torque [Nm]		
	50	70	80
M3	0.37	0.8	1.1
M4	0.86	1.85	2.4
M5	1.6	3.6	4.8
M6	2.9	6.3	8.4
M8	7.1	15.2	20.3
M10	14	30	39
M12	24	51	68
M14	38	82	109
M16	58	126	168
M20	115	247	330
M22	157	337	450
M24	198	426	568
M27	292	—	—
M30	397	—	—
M36	690	—	—

Table 9-3 *Torque table for stainless steel screws lubricated with Molykote (MoS2) grease*

27021598048035467_v3.0_EN-US

9.2 Tightening torques for clamping sets

Normally, the tightening torque will be stamped onto the clamping set by the manufacturer. If you have conflicting values, always use the manufacturer's information.
The following tightening torques are applicable for clamping sets on Güdel gearbox units:

Gearbox unit size	Tightening torque T_A [Nm]
030	5
045 / 060	6.5
090 / 120	12
180	59

Table 9-4 *Torque table for clamping sets*

Properly tighten and loosen clamping sets

Properly tighten clamping sets. Do not remove any screws!

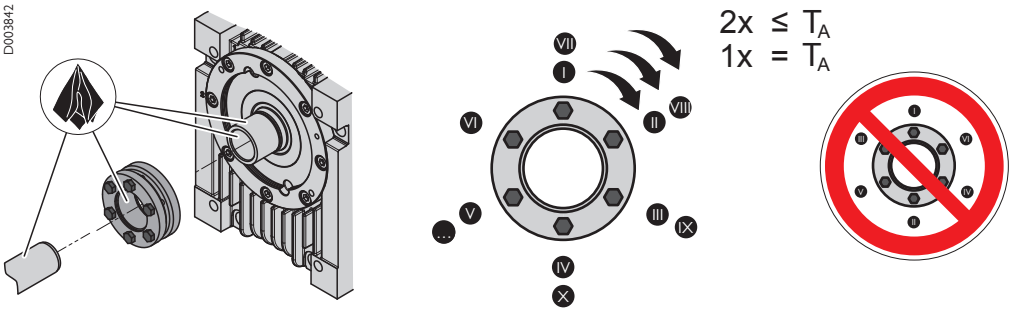

Fig. 9-1 *Tightening the clamping set*

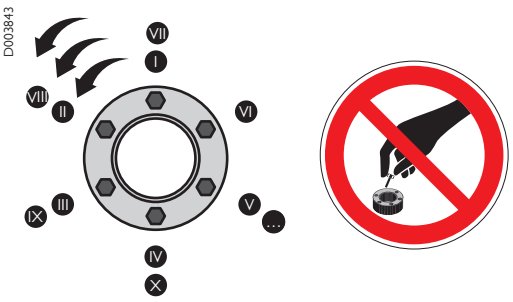

Fig. 9-2 *Releasing the clamping set*

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

List of illustrations

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

List of tables

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

Index

27021598048035467_v3.0_EN-US

27021598048035467_v3.0_EN-US

M

O

P

R

27021598048035467_v3.0_EN-US

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27021598048035467_v3.0_EN-US

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