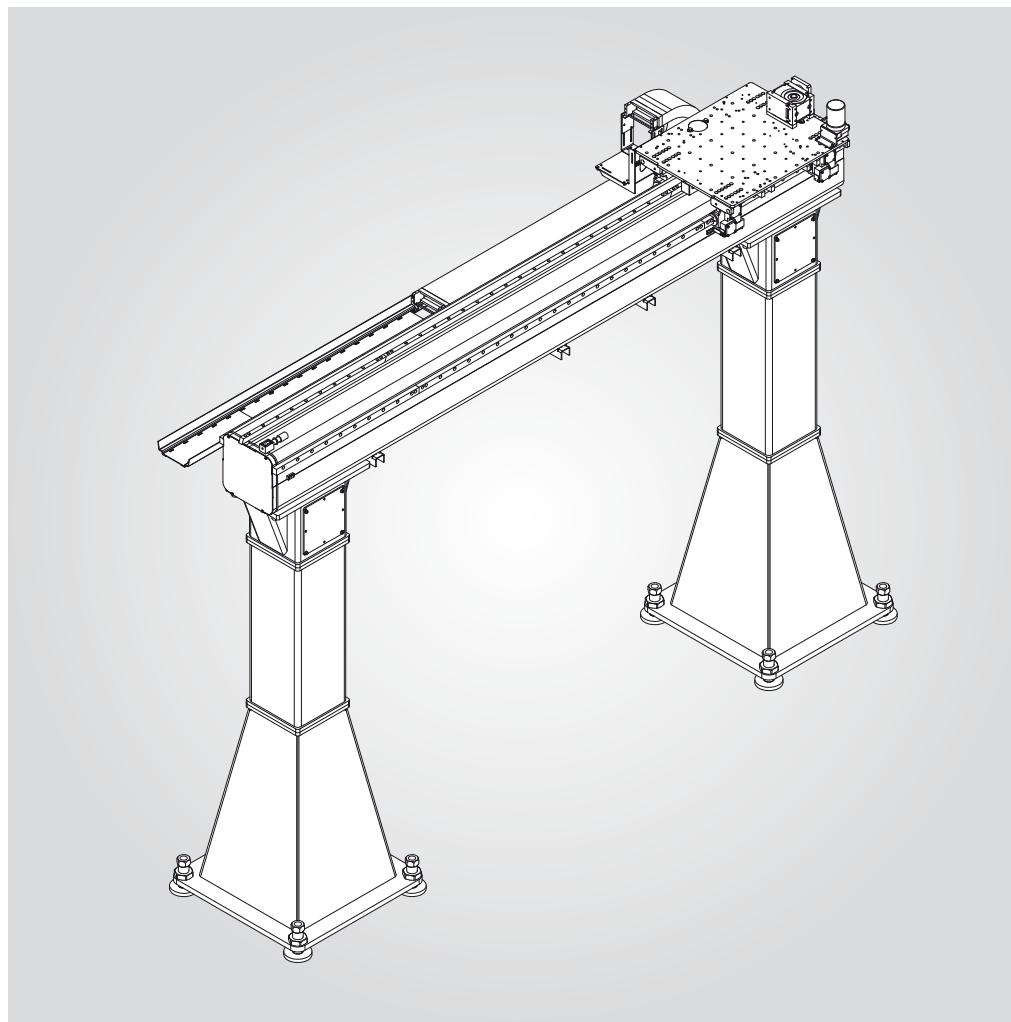


OPERATING MANUAL

TMO I-4



Project:

6xxxxxx

Bill of materials:

10xxxxxx

Year of production:

2014

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Translation of the original operating manual

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 operating manual, in whole or in part, requires our permission. Subject to change in the course of technical improvements.

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Tab. 0-1 Revision history

Table of contents

I	General information	9
1.1	Further applicable documentation	9
1.2	Purpose of the document	9
1.3	Target readership	10
1.4	Explanation of symbols/abbreviations	10
1.5	Torque tables	11
1.5.1	Tightening torques for screws	11
1.5.2	Tightening torques for HV sets	13
1.5.3	Tightening torques for roller holder	14
1.5.4	Tightening torques for clamping sets	15
1.6	Thread rolling screws	16
2	Product description	17
2.1	Use	17
2.1.1	Intended use	17
2.1.2	Non-intended use	17
2.2	Product designation	18
2.3	Technical Data	19
2.4	Options	19
3	Safety	20
3.1	General	20
3.1.1	Product safety	20
3.1.2	Operating personnel	20
3.1.3	Failure to comply with safety regulations	21
3.1.4	Installation instructions	21
3.2	Declaration of incorporation	22
3.3	Hazard symbols and instructions	23

3.3.1	Hazard symbols in the manual	23
	Hazard warnings	23
	Warning symbols.....	24
	Special symbols	26
3.3.2	Hazard symbols on the product	26
3.4	Fundamentals of safety.....	27
3.4.1	Intended use	27
3.4.2	Safety and monitoring equipment	27
3.4.3	Product-specific hazards	28
	Danger from electric current	28
	Danger from falling axes / workpieces	28
3.4.4	Safety data sheets (MSDS)	29
4	Design and function	30
4.1	Design.....	30
4.2	Functional description	32
5	Commissioning	33
5.1	Introduction	33
5.1.1	Safety	33
5.1.2	Personnel qualification	33
5.2	Transport	34
5.3	Intermediate storage	35
5.4	Setup, Installation.....	36
5.4.1	Prerequisites	36
5.4.2	Unpacking	36
5.4.3	Setup, Fastening	37
	Setting up the standard configuration.....	39
	Setting up the beam leveling kit configuration	42
	Connecting the beam	45
	Base fixing with adhesive anchor	46
	Base fixing with welded joint	48

5.4.4	Installation	49
	Installing the guideway.....	49
	Installing the rack.....	49
	Installing the motor and coupling.....	50
	Options and attaching the load.....	50
	Integrating the product.....	50
5.4.5	Transport securing devices	53
5.5	Functional check.....	55
6	Operation.....	56
6.1	General.....	56
6.2	Personnel	56
7	Maintenance	57
7.1	Introduction	57
7.1.1	Safety	57
7.1.2	Personnel qualification	59
7.2	Consumables and auxiliary agents	59
7.2.1	Cleaning agents	59
7.2.2	Lubricants.....	59
	Oils.....	60
	Greases	61
	Markings at the lubrication points	62
7.3	Maintenance tasks	63
7.3.1	General prerequisites	63
7.3.2	Maintenance tasks 100 hours after commissioning	63
7.3.3	Maintenance tasks every 150 hours	64
	Lubricating guideways, racks and pinions	64
7.3.4	Maintenance tasks every 500 hours	65
	General inspection	65
7.3.5	Maintenance tasks every 2000 hours	67
	Greasing the roller	67
	Replacing the wiper and lubricating element	68
	Replacing the lubricating pinion	71
7.3.6	Maintenance tasks every 10000 hours	72
	Oil change in type NA / NH / FA / FH / AE / HPG gearboxes ..	72
7.4	Maintenance schedule	80

8	Repairs	81
8.1	Introduction	81
8.1.1	Safety	81
8.1.2	Personnel qualification	82
8.2	Special tools, testing and measuring instruments	83
8.3	Repairs	84
8.3.1	General prerequisites	84
8.3.2	Replacing the bumper unit	84
8.3.3	Replacing the roller	85
8.3.4	Replacing the guideway	89
8.3.5	Replacing the rack	91
8.3.6	Setting the tooth flank backlash	95
8.3.7	Replacing motor and coupling	100
8.4	Service on the gearbox unit	103
8.4.1	Replacing the gearbox unit	103
8.4.2	Setting the gear backlash	107
8.5	Other documents	108
8.6	Service departments	108
9	Decommissioning, storage	109
9.1	Introduction	109
9.1.1	Safety	109
9.1.2	Personnel qualification	109
9.2	Storage conditions	109
9.3	Decommissioning	110
9.3.1	Shutdown	110
9.3.2	Cleaning / rust-proofing	111
9.3.3	Transport securing device	111
9.3.4	Labeling	111
9.4	Recommissioning	111

10	Disposal	112
10.1	Introduction	112
10.1.1	Safety	112
10.1.2	Personnel qualification	112
10.2	Disposal	112
10.3	Waste management compliant assemblies	113
10.3.1	Disassembly	113
10.3.2	Material groups	114
10.4	Disposal facilities, authorities	114
11	Spare part supply	115
11.1	Explanations regarding the spare parts list	115
11.1.1	Positioning drawings	115
11.1.2	Parts list	115
11.2	Service departments	116
12	Index	117
13	Appendix	121

I General information

1.1 Further applicable documentation

All documents in the appendix of this operating 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 operating manual describes all product life phases of the product TMO:

- Transport
- Repairs
- Commissioning
- Operation
- Maintenance
- Disposal

The operating manual contains the required information on how to operate the product in the intended manner. It is an important component of the product TMO.

The operating manual must be available at the product site throughout its entire service life. If the product is sold, it has to be transferred to the new owner with the machine.

Assembly instructions for partly completed machinery

This document serves as the "Assembly instructions for partly completed machinery" in acc. with the Machinery Directive 2006/42/EC, and is in this respect an "Operating Manual".

NOTE



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

1.3 Target readership

This operating manual is aimed at the following target readership:

- Construction
- Specialists
 - Technicians
 - Forwarding agents
- Operating companies
- Operating personnel
- Service personnel

1.4 Explanation of symbols/abbreviations

The following symbols and abbreviations are used in this operating manual:

Symbol / Abbreviation	Use	Explanation
§	For cross-reference	Page
Fig.	Description of drawings	Figure
Tab.	Description of tables	Table
TMO	In this manual	Overhead-Trackmotion Product name
TMO-C	In this manual	Overhead-Trackmotion Ceiling mounting
TMO-W	In this manual	Overhead-Trackmotion Wall mounting
TMO-E	In this manual	Overhead-Trackmotion Elevated mounting

1.5 Torque tables

1.5.1 Tightening torques for screws

NOTE



Screw connections on moving parts have to be secured with Loctite medium strength 242. The adhesive has to be applied onto the nut thread, not onto the screw!

If no other specifications have been made, the following tightening torques apply for zinced 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	1.7	2.0
M4	2.6	3.9	4.5
M5	5.2	7.6	8.9
M6	9	13	15
M8	22	32	37
M10	42	62	72
M12	74	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

If no other specifications have been made, the following tightening torques apply for black oiled and unlubricated 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

Tab. I-3 *Torque table for black oiled and unlubricated screws*

1.5.2 Tightening torques for HV sets

The following tightening torques apply to DIN6914/15/16-10.9 HV sets:

Thread size	Tightening torque [Nm]	
	Lubricated with moly grease	Slightly oiled
M12	100	120
M16	250	350
M20	450	600
M22	650	900
M24	800	1100
M27	1250	1650
M30	1650	2200
M36	2800	3800

Tab. I-4 Tightening torques: HV sets

1.5.3 Tightening torques for roller holder

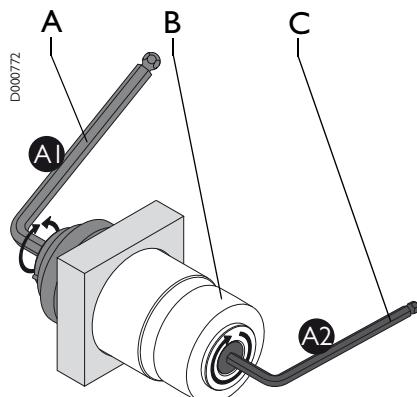


Fig. I-1 *Tightening torques for roller holders*

- A Move roller with hexagonal socket wrench (tightening torque A1)
- B Roller holder
- C Tighten screw with hexagonal socket wrench (tightening torque A2)

The following tightening torques apply to roller holders:

Size	Tightening torque [Nm]	
	A1	A2
40	1.5	4
52	2	4
62	3	15
72	4.5	15
90	7	15

Tab. I-5 *Tightening torques: Roller holders*

1.5.4 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:

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

Tab. I-6 Torque table for clamping sets

Properly tighten and loosen clamping sets

Properly tighten clamping sets. Do not remove any screws!

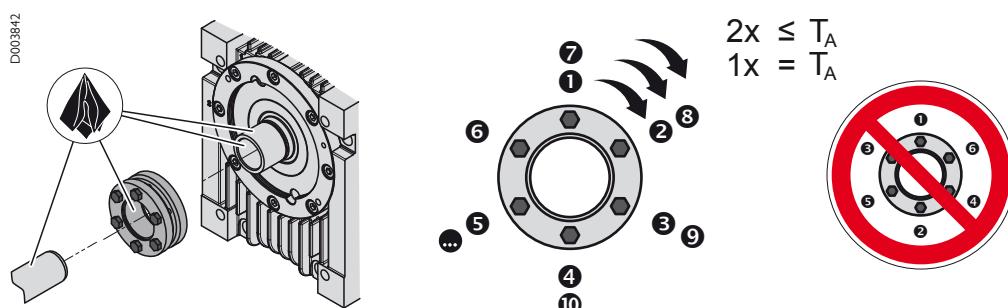


Fig. I-2 Tighten clamping set

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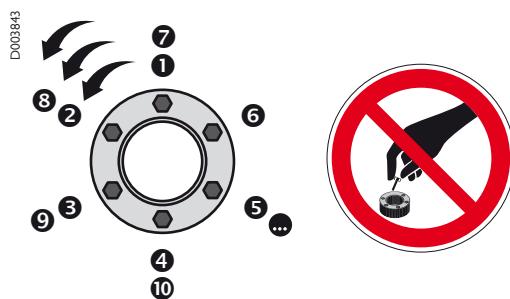


Fig. I-3 Release the clamping set

1.6 Thread rolling screws

Thread rolling screws are mainly used for guideways, mounting plates, as well as for cable tray brackets.

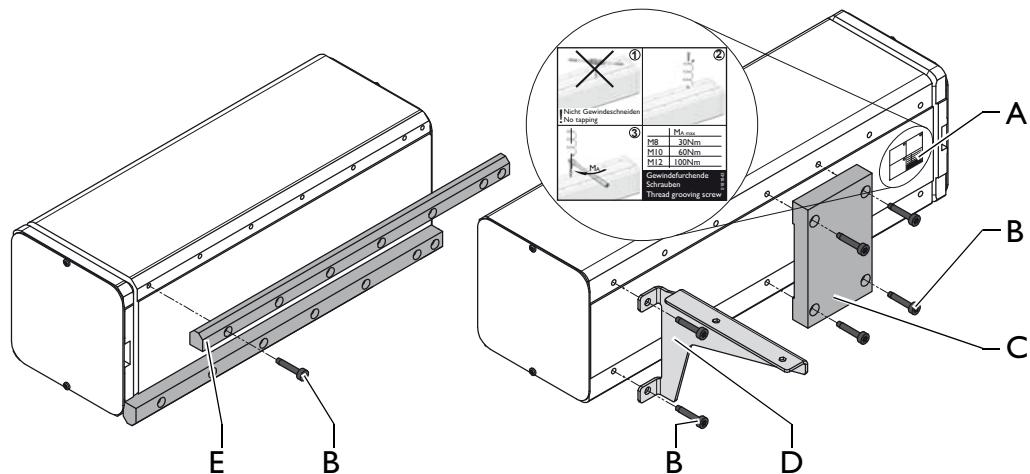


Fig. I-4 Use of thread rolling screws

- A Label
- B Thread rolling screws
- C Mounting plate
- D Cable tray bracket
- E Guideways

Thread rolling screws, recognizable with Güdel by a Torx drive, can be screwed in directly in the core hole. It is not necessary to cut the thread in advance. After the first use of a thread-cutting screw, a metric screw can also be employed.
Drill holes without thread need to be furrowed. No thread may be cut in. This can also be read on the label.

The following tightening torques apply to thread rolling screws when turned in the first time:

Size	Tightening torque [Nm]	
	Steel S355J2	Aluminum
M8x30	30	35
M10x45	63	71
M12x40	108	123

Tab. I-7 Tightening torques for thread rolling screws

2 Product description

2.1 Use

2.1.1 Intended use

The TMO product is intended exclusively for moving and positioning of robots.

Other use or use that goes beyond the described purpose does not fall under the intended use. The manufacturer assumes no liability for any resulting damages. All risks are carried solely by the user!

2.1.2 Non-intended use

The TMO product is not intended for:

- Movement of poisonous goods
- Movement of explosive goods
- Operation in explosive areas

Any other use shall be considered improper use and is forbidden!

Do not modify the product in any way.

2.2 Product designation

Each product has a type plate. It contains the following information:

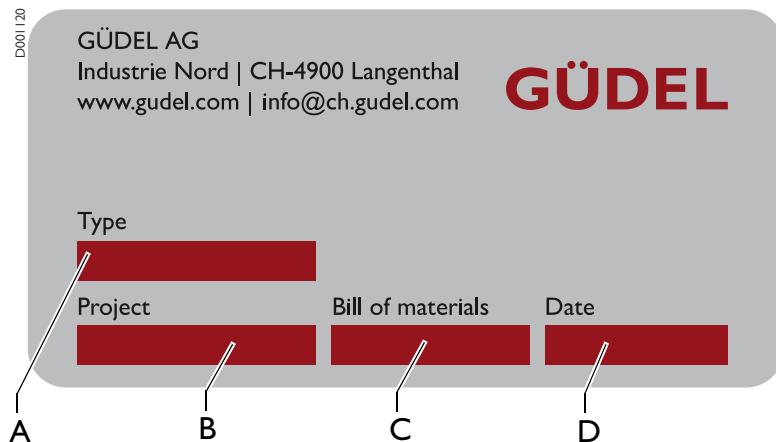


Fig. 2-1 Type plate

- A Product, type
- B Project, sales order
- C Serial number (parts list)
- D Year of manufacture

In the declaration of conformity and declaration of incorporation, the terms are used in acc. with the legend above.

Position of the type plate

The type plate is attached according to the following illustration:

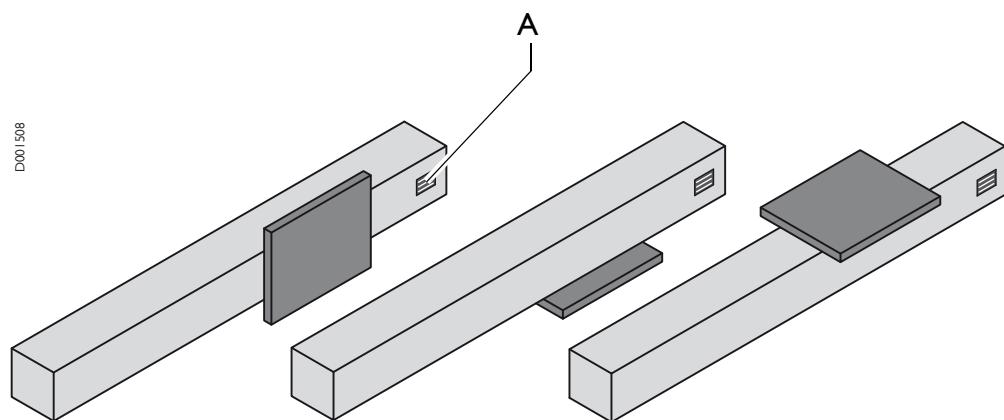


Fig. 2-2 Position of the type plate

- A Type plate

2.3 Technical Data

The technical data is valid for temperatures between +25 and +30 °C.

The emitted sound pressure level depends on how the product is used.

For the following data, refer to the layout(s) in chapter 13 'Appendix', 121:

- Dimensions
- Weight
- Strokes of the individual axes
- Gearbox type
- Gearbox ratios
- Motors

Temperature ranges The following temperature and air humidity ranges apply:

Transport -10 to +60°C

Operation +5 to +40°C Up to and with 85%, condensation formation not permissible

Storage -10 to +40°C up to 75%

2.4 Options

The following options are available for the product TMO:

- Automatic lubrication system
- Planetary gearbox
- Double roller support

Information on any available options can be found in the spare parts lists and the layout in chapter 13 'Appendix', 121. You may also find relevant documentation in the same chapter under "Options".

3 Safety

3.1 General

NOTE



Read this chapter prior to working with the product! It contains important information for your personal safety. This chapter must be read and understood by all persons who work on the product in any of the product life phases.

3.1.1 Product safety

Residual danger The TMO product corresponds to the state of the art. It was designed and constructed according to the recognized safety regulations. However, some residual danger remains during its operation.

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

Operation Always adhere to the instructions in this manual when operating the TMO product, and ensure that it is always in perfect working order.

3.1.2 Operating personnel

Persons who work with the TMO product must be technically qualified and trained. They must be familiar with all hazards associated with using the TMO product.

3.1.3 Failure to comply with safety regulations

!DANGER



Disregarding safety regulations

Disregarding the safety regulations can be very hazardous for personnel and the surroundings!

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

3.1.4 Installation instructions

Protective measures The operator is responsible for ensuring safe conditions in the vicinity of the product TMO, in particular, for complying with all general safety regulations, guidelines and standards . This includes implementing all of the safety measures before commissioning the system. These must cover all hazards. This is the only way to ensure that operation of the product conforms with CE regulations.

As stipulated by the machinery directive, the protective measures must:

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

Changes The product must never be modified or used in a manner contrary to its intended use. Intended use and non-intended use is described in Chapter 2 'Product description', § 17.

General rules for occupational safety The generally accepted occupational safety rules have to be observed and followed.

3.2 Declaration of incorporation

The manufacturer: **GÜDEL AG**
Industrie Nord
CH-4900 Langenthal

herewith declares that the partly completed machinery:

Product, type	TMO
	I-4
Serial number (parts list)	10xxxxxx
Year of manufacture	2014

corresponds to the fundamental requirements of the Machinery Directive (2006/42/EC), Annex I.

The partly completed machinery may only be commissioned after it has been determined that the machinery into which the partly completed machinery is to be incorporated complies with the stipulations of the Machinery Directive (2006/42/EC).

The special technical documents as per Annex VII Part B have been drawn up. These are submitted in electronic form, depending on the respective regulations of the national bodies. Authorized representative responsible for compiling the technical documents: Martin Knuchel Tel. +41 (0)62 916 92 40

The partly completed machinery complies with the following additional EC directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

The following harmonized standards have been applied:

EN ISO 12100:2010; EN ISO 13850:2008; EN 60204-1:2006; EN 1088:2008;
EN ISO 4413:2010; EN ISO 4414:2010; EN ISO 13849-1:2008

D003806a

Langenthal, xx.xx.xxxx

Dominique Schär

Director R&D

Martin Knuchel

Director of Technologies

3.3 Hazard symbols and instructions

3.3.1 Hazard symbols in the manual

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 a hazard that can lead to property damage.



NOTE

NOTE refers to helpful information and tips for users.

Warning symbols

The hazard warnings for the levels DANGER, WARNING, and CAUTION include the corresponding symbol for the hazard. Warnings of hazards that lead to property damage always contain the symbol "Hazards due to common causes".

Symbol	Explanation of symbols
	Hazards resulting from automatic startup of the plant
	Hazards due to dangerous electrical voltage
	Hazards due to falling beams
	Hazards due to toothed wheels
	Hazards due to overpressure
	Hand injury hazards
	Hazards due to heavy components

Symbol	Explanation of symbols
	Hazards due to environmental pollution
	Hazards due to suspended loads
	Hazards due to electromagnetic fields
	Danger of crushing
	Danger of explosion
	Hazards due to heat
	Hazards due to sharp edges of the rack
	Hazards due to tipping
	Hazards due to transmission functions

Symbol	Explanation of symbols
	Hazards due to loose connecting elements
	Hazards due to common causes

Tab. 3-1 Warning symbols

Special symbols

Symbol	Explanation of symbols
	Helpful information and other tips

Tab. 3-2 Special symbols

3.3.2 Hazard symbols on the product

The following labels are attached to the product:

The "Danger sign" label warns against

- Axes falling after the transport securing device is removed
- Moving the axes before the transport securing device is removed



Fig. 3-1 Danger sign label

The danger label "tearing due to rack"

- warns against tearing apart lifting belts due to the sharp edges of the rack
- provides information on correctly attaching transport equipment

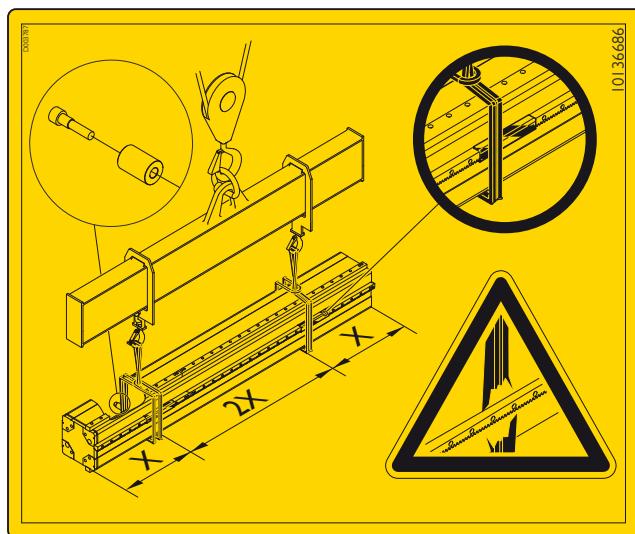


Fig. 3-2 Danger label "tearing due to rack"

3.4 Fundamentals of safety

3.4.1 Intended use

The intended use is described in chapter 2.1.1 'Intended use', § 17.

3.4.2 Safety and monitoring equipment

NOTE



Never remove or modify any of the safety and monitoring equipment! Be sure to close all of the protective equipment during operation!

For information on the safety and monitoring equipment, refer to the documentation on the complete system. More details can be found in the supplied risk analysis.

3.4.3 Product-specific hazards

Danger from electric current

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 main power supply and secure it against being switched on again (main switch of complete plant)
- Ground the equipment
- Before switching on the product again, make sure that no one is located in the danger area

Danger from falling axes / workpieces

WARNING

Falling axles/workpieces

Falling axles or workpieces can cause severe or fatal injuries!



Observe the following:

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

3.4.4 Safety data sheets (MSDS)

Safety data sheets contain safety information about the materials. The operator is responsible for obtaining safety data sheets for all materials used, such as oils, greases, cleaning agents etc.

Safety data sheets can be obtained as follows:

- Chemical vendors usually deliver their substances with safety data sheets.
- Safety data sheets are available on the Internet
Example: Enter "msds" plus the name of the material to find safety information for the material.

Read the safety data sheets closely and follow all instructions. We recommend that you store the safety data sheets for future reference.

4 Design and function

4.1 Design

The TMO product consists of the following assemblies:

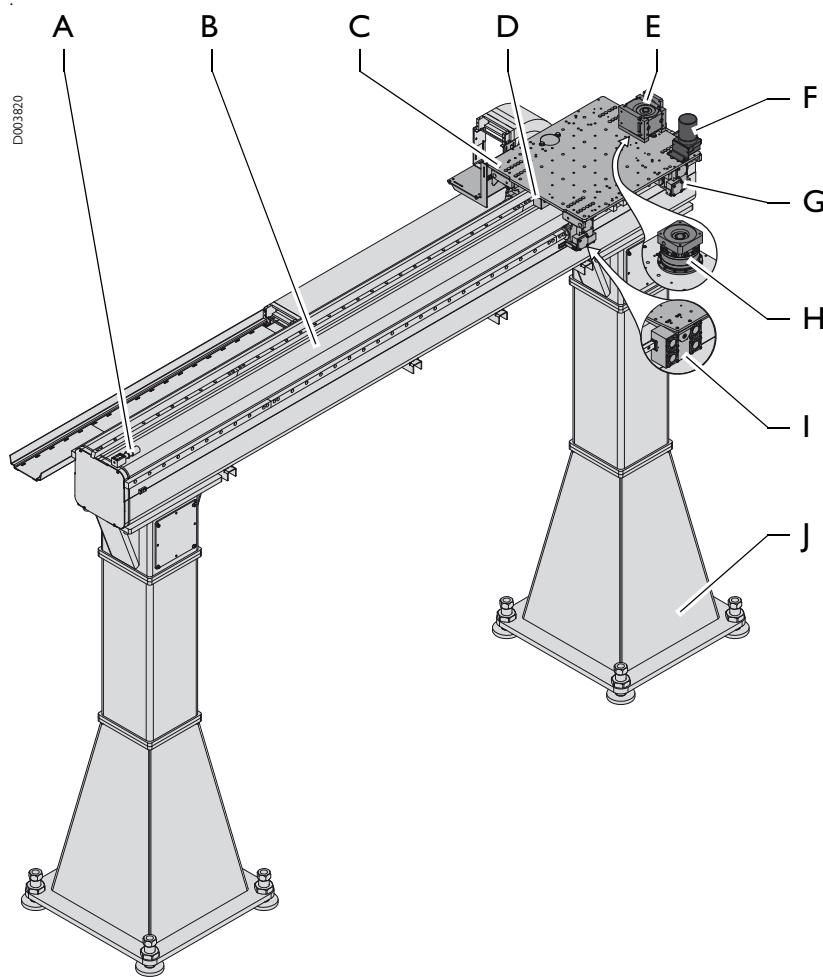


Fig. 4-1 Design

- D003806a
- A Bumper unit
 - B Y-axis
 - C Y-carriage
 - D Lubricating pinion unit
 - E Y-drive
 - F Automatic lubrication system (option)
 - G Roller support
 - H Planetary gearbox (option)
 - I Double roller support (option)
 - J Upright

The product TMO is available in the following fastening versions:

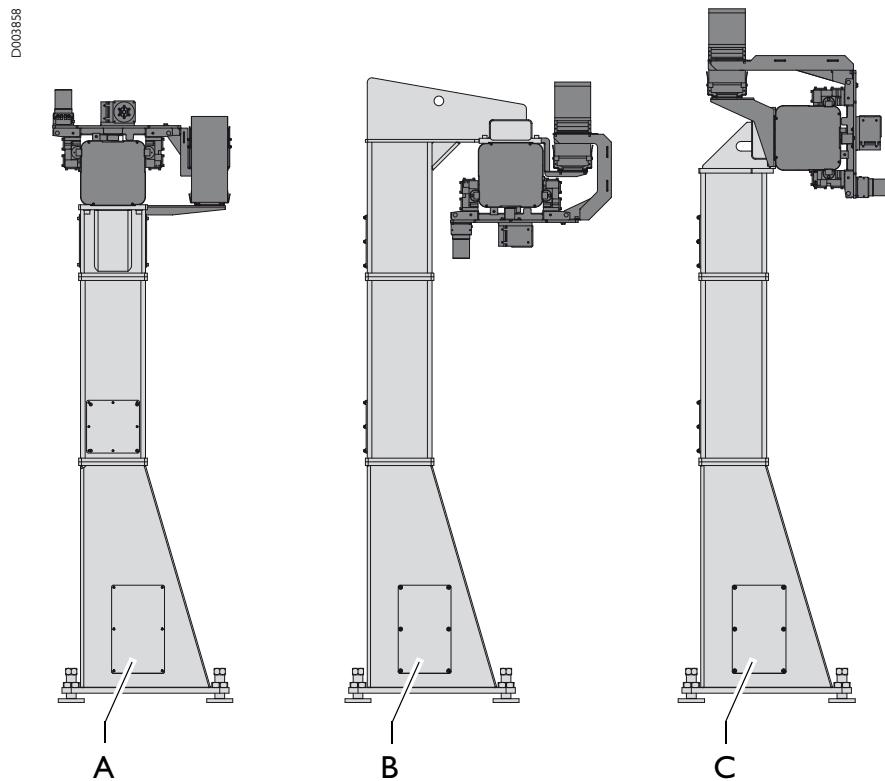


Fig. 4-2 Fastening type TMO

- A Overhead Trackmotion elevated mounting TMO-E
- B Overhead Trackmotion ceiling mounting TMO-C
- C Overhead Trackmotion wall mounting TMO-W

The illustrations in this operating manual always show the TMO-E. In some special cases, all three types are described.

4.2 Functional description

The TMO product can move along the following axes:

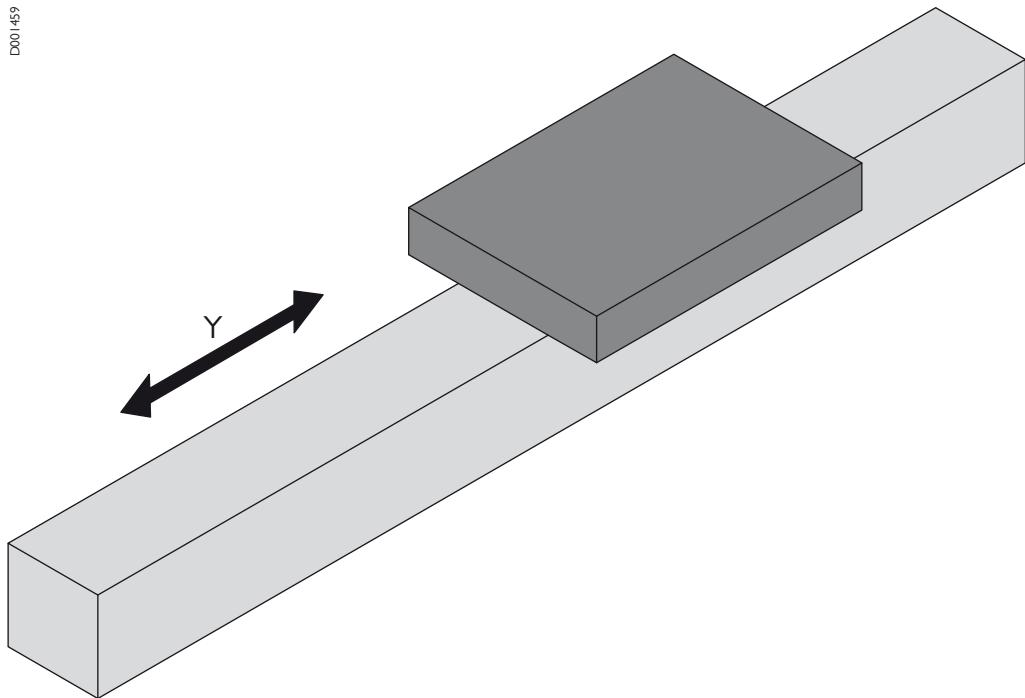


Fig. 4-3 Axis names

5 Commissioning

5.1 Introduction

5.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood chapter 3 'Safety', § 20. It concerns your personal safety!

WARNING

Suspended loads



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

Observe the following:

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

WARNING

Tearing apart the lifting belts



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

Always protect the lifting belts with the guard plate.

5.1.2 Personnel qualification

Only appropriately trained and authorized personnel are allowed to commission the TMO product.

5.2 Transport

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

Truck = Shipped on a transport pallet

Aircraft = Shipped in a crate

Ship = Shipped in a case or container

NOTE



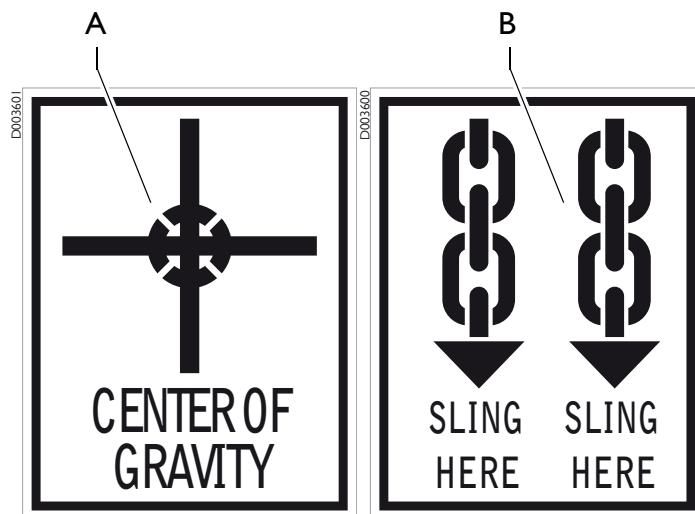
Improper transport

Improper handling of the package can lead to transport damage!

Do not tip over the package. Avoid heavy vibrations and shocks. Observe the symbols on the packaging.

Packaging symbols

Consider the following symbols while transporting transport pallets / crates / cases:



D003806a

Fig. 5-1

Attaching the slings

A Center of gravity
B fixation point

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

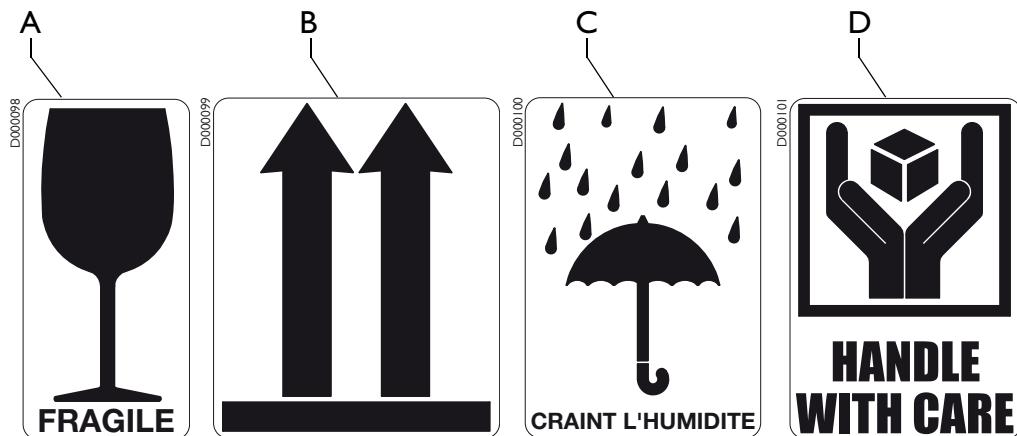


Fig. 5-2 *Packaging symbols*

- A *Fragile*
- B *This side up*
- C *Keep dry*
- D *Handle with care*

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

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

5.3 Intermediate storage

If intermediate storage is required before installing the product, refer to the storage conditions described in chapter Decommissioning, storage.

5.4 Setup, Installation

5.4.1 Prerequisites

- Base** The base has to fulfill the requirements of the application. For information on the load per surface and the surface properties, please refer to the layout or the documentation of the complete system.
- Lines** The supply lines have to meet the requirements of the application. For information on the required capacities, please consult the documentation of the complete system.
- Lifting unit** Lifting units are required for positioning and installing the product or plant. Make sure that appropriately dimensioned devices (crane etc.) are available.

5.4.2 Unpacking

Accessories and small parts are packaged in a separate case or directly with the product itself.

The components have been treated with anti-rust oil (spray) and wrapped in oil paper. Remove packaging carefully.



NOTE

The anti-rust oil protects the components. We recommend not removing the oil.

Dispose of the packaging in accordance with the local disposal regulations. For more information on disposal, refer to chapter 10 'Disposal', 112.

- DeliveryChecking** Check the content of the delivery by comparing it with the accompanying papers.
Check the product for damage. Report transport damage immediately.

5.4.3 Setup, Fastening

This chapter describes the steps for setting up and fastening the TMO product. If no other specifications have been made, the tightening torques as per chapter 1.5.1 'Tightening torques for screws', [11](#) apply.

Before you set up the product at the installation site, the requirements as per chapter 5.4.1 'Prerequisites', [36](#) must be fulfilled.

⚠ WARNING

Heavy components



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

Use suitable means to secure the components against tipping over. Only remove the tip-over protection after the product has been completely assembled.

Attaching the slings This section describes the steps for attaching the slings.

⚠ WARNING



Tearing apart the lifting belts

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

Always protect the lifting belts with the guard plate.

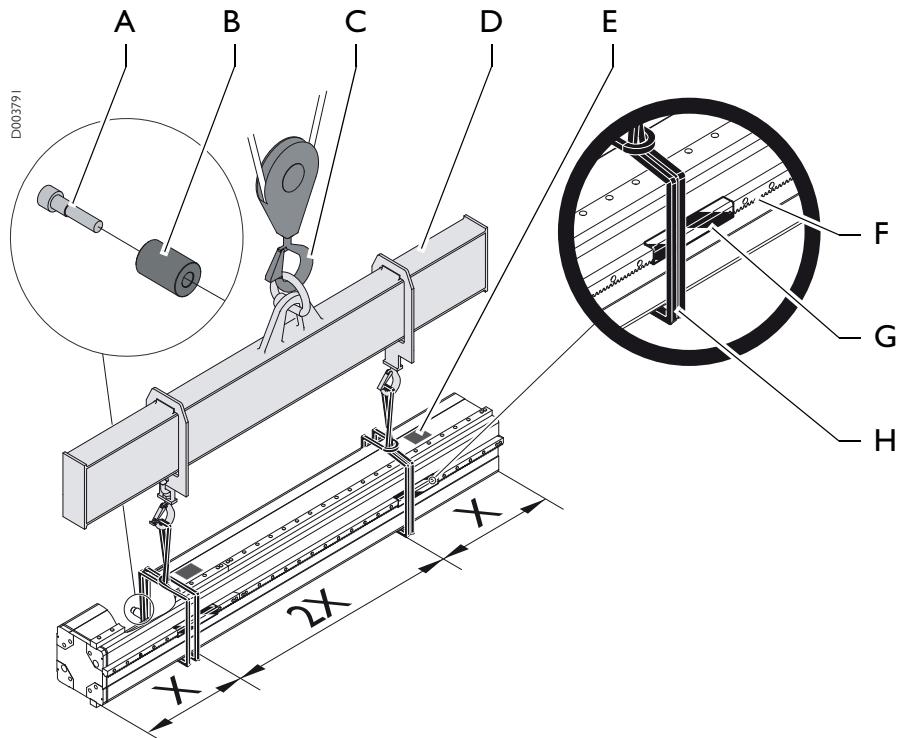


Fig. 5-3 Attaching the slings

- A Screws
- B Transport aids
- C Hook
- D Transport yoke
- E Danger label "tearing due to rack"
- F Rack
- G Guard plate
- H Lifting belts

Product	Guard plate Serial number
TMO 3-4 / AP 5-6 / CP 5-6 / ZP 6-7	0213768
TMO 1-2 / AP 3-4 / CP 3-4	10136821

Tab. 5-1 *Guard plate serial numbers*

Attach the slings as follows:

- 1 Fasten the transport aids by means of the screws
- 2 Push guard plates onto rack
- 3 Position the lifting belts as illustrated
- 4 Hang the ends of the lifting belts into the hooks of the transport yoke

The slings are in place.

Setting up the standard configuration

Set up the standard configuration as follows:

Setting up an upright For the TMO product, the following fastening methods are possible:

- Güdel uprights
- Other uprights
- Directly onto a machine
- Directly onto a steel beam construction

If you are not using Güdel uprights, contact the respective manufacturer.
For direct mounting, please observe the hole pattern according to the layout.
Fasten the product with appropriately dimensioned fastening devices.

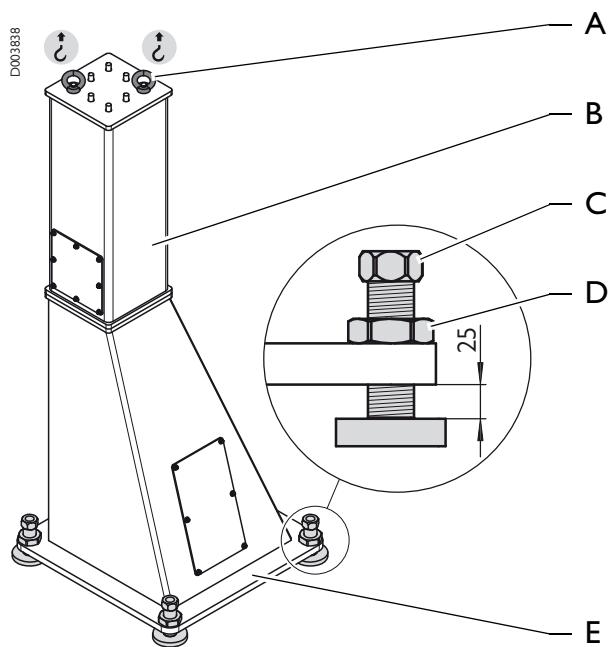


Fig. 5-4 Setting up an upright

- A Lifting screw
- B Intermediate piece
- C Floor leveling screws
- D Locknuts
- E Upright footing

Set up the upright as follows:

- 1 Set the floor leveling screws to the specified mass
- 2 Install lifting screws according to the illustration
- 3 Set up the upright as shown in the layout
- 4 Align the upright horizontally and vertically by means of floor leveling screws
- 5 Lock the floor leveling screws
- 6 Secure the upright against falling over

The upright has been completely set up and aligned.

Installing the beam

This section describes the steps for mounting a beam to Güdel uprights. For other models, please contact the respective manufacturer.
The mounting angles are installed on the beam ex works.

**NOTE**

For aligning, use the guideways as a reference.

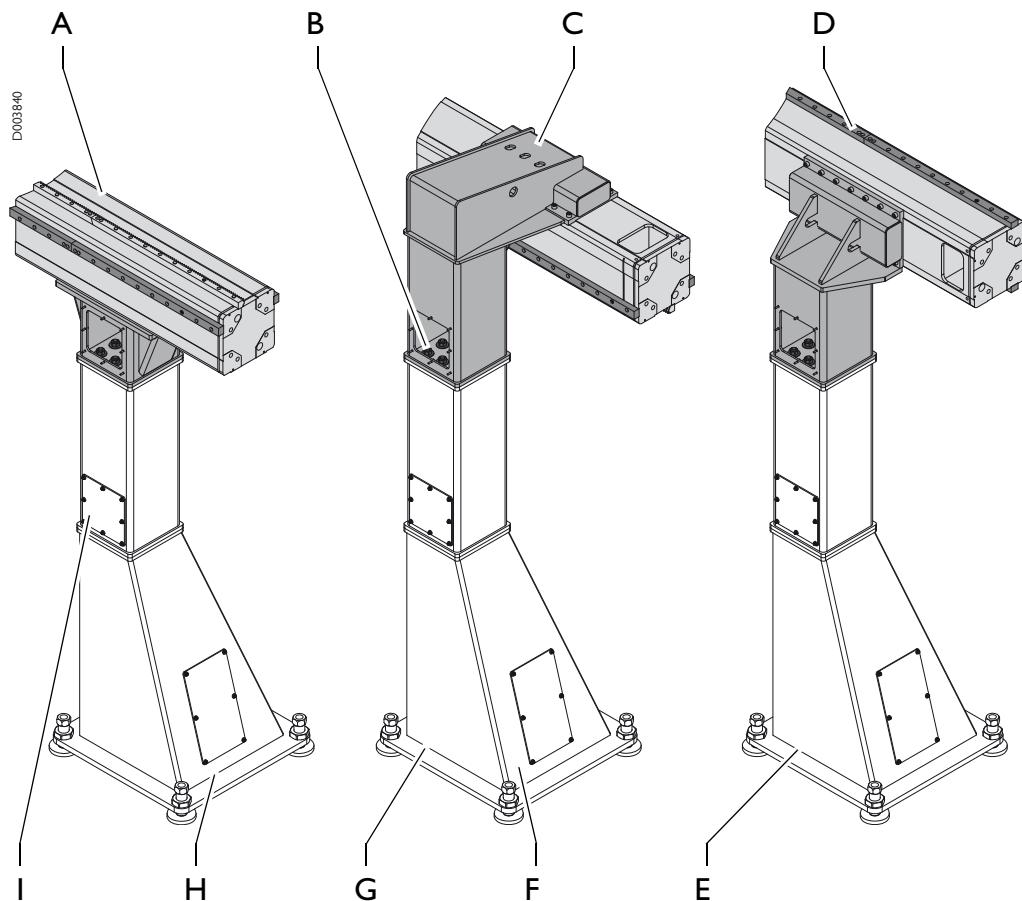


Fig. 5-5

Installing the beam

- A Beam
- B Hexagon nuts and washers
- C Mounting angle
- D Guideway
- E Wall mounting (e.g. TMO-W; ZP; EP)
- F Upright
- G Ceiling mounting (e.g. TMO-C)
- H Elevated mounting (e.g. TMO-E; CP; AP)
- I Covering

Mount the beam as follows:

- 1** Lift beam to upright height
- 2** Mount the beam to the upright by means of hexagon nuts and washers
- 3** Install the covers
- 4** Align the beam horizontally and vertically by means of floor leveling screws
- 5** Lock the beam leveling screws

The beam has been mounted and aligned.

Setting up the beam leveling kit configuration

The beam leveling kit makes it easier to align the beams.
Set up the beam leveling kit configuration as follows:

Setting up an upright For the TMO product, the following fastening methods are possible:

- Güdel uprights
- Other uprights
- Directly onto a machine
- Directly onto a steel beam construction

If you are not using Güdel uprights, contact the respective manufacturer.
For direct mounting, please observe the hole pattern according to the layout.
Fasten the product with appropriately dimensioned fastening devices.

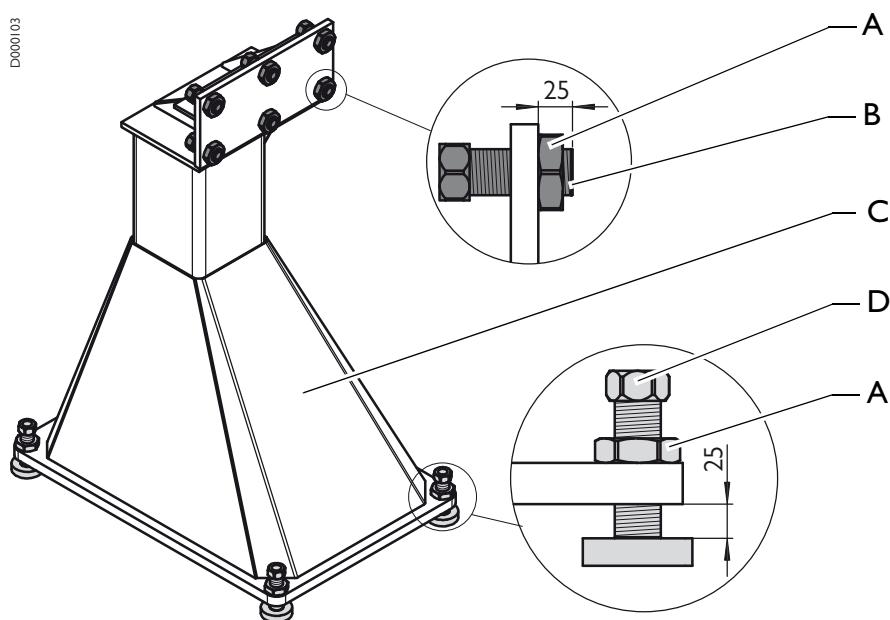


Fig. 5-6 Setting up an upright

- A Locknuts
- B Beam leveling screws
- C Upright
- D Floor leveling screws

Set up the upright as follows:

- 1 Set beam leveling screws to the specified mass
(not for sizes 1 and 2)
- 2 Set the floor leveling screws to the specified mass
- 3 Set up the upright as shown in the layout
- 4 Align the upright horizontally and vertically by means of floor leveling screws
- 5 Lock the floor leveling screws
- 6 Secure the upright against falling over

The upright has been completely set up and aligned.

Mounting beams This section describes the steps for mounting a beam to Güdel uprights. For other models, please contact the respective manufacturer.

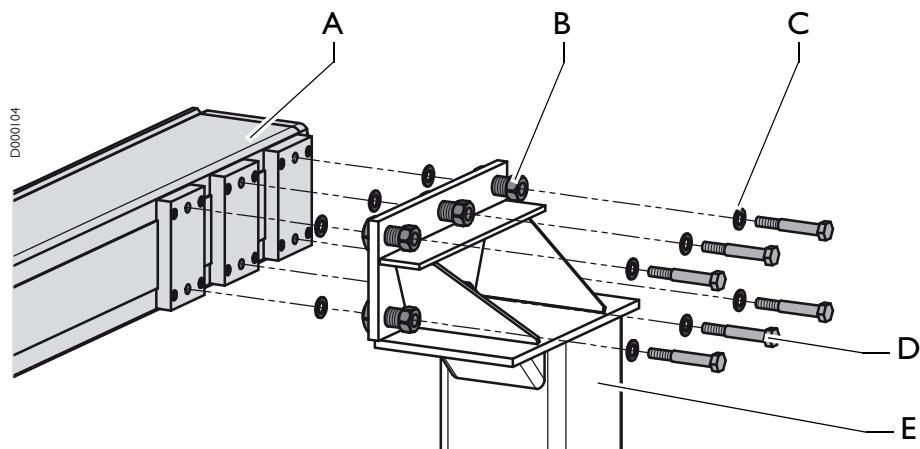


Fig. 5-7 Mounting a beam

- A Beam
- B Beam leveling screws and locknuts
- C Washers
- D Screws
- E Upright

Mount the beam as follows:

- 1 Lift beam to upright height
- 2 Mount the beam to the upright by means of screws and washers
- 3 Align the beam by means of the beam leveling screws
- 4 Lock the beam leveling screws

The beam has been mounted and aligned.

Connecting the beam

Connecting the beam

This section describes the steps for connecting and aligning the beams.

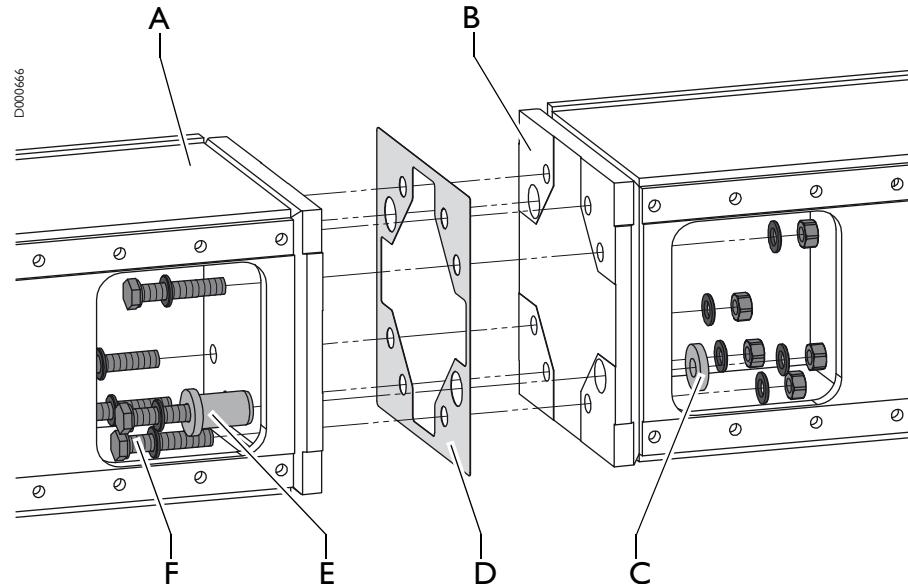


Fig. 5-8 Connecting the beam

- A Fixed beam
- B Loose beam
- C Washers
- D Spacer sheet metal
- E Center bolt
- F HV sets

Connect beams as follows:

- 1 Lift the loose beam to the height of the fixed beam
(the beams have to be flush)
- 2 Insert spacer sheet metal
- 3 Insert center bolt and washer
- 4 Connect the beam with the HV set
(For the tightening torque, refer to tab. I-4, 13)
- 5 Connect the loose beam with the upright
- 6 Realign the machine horizontally and vertically, by means of the floor leveling screws

The beams are connected and aligned.

Base fixing You can find the corresponding anchor type in the layout in chapter 13 'Appendix', § 121.

NOTE



Only anchor the product after it has been correctly positioned and aligned!

Only use anchors approved by Güdel!

Base fixing with adhesive anchor

This section describes the base fixing with adhesive anchor.

This fastening requires uncracked concrete with a quality of at least C20/25 (ENV 206) with ideal stiffness. Deviations can be found in the layout in the appendix. The minimum concrete thickness, edge distance and maximum permissible tensile and compressive loads can be found in the table below.

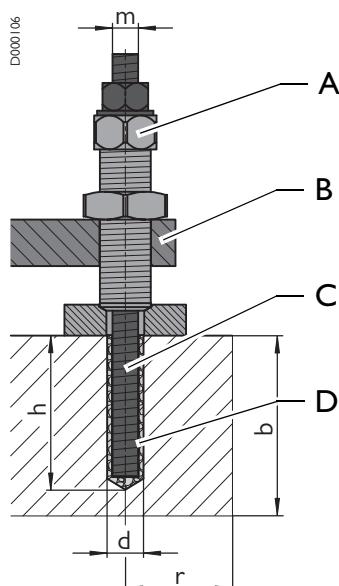


Fig. 5-9 Anchored base fixing

- A Floor levelling screw
- B Upright/frame
- C Anchor
- D Adhesive capsule

m (anchor size)	M12	M20	M27	M30
b (concrete thickness) [mm]	140	220	300	340
r (edge distance) [mm]	110	180	240	270
d (drill diameter) [mm]	ø14	ø24	ø30	ø35
h (drilling depth) [mm]	110	170	240	270
Tightening torque [Nm]	50	160	270	300
Permissible tensile load [kN]	12.8	36.5	78	101.6
Permissible compressive load [kN]	34	60	80	135

Tab. 5-2 Anchored base fixing

Anchor the upright as follows:

- 1 Make a bore hole as per the table above
- 2 Clean the bore hole
- 3 Insert the adhesive capsule
- 4 Screw in the anchor rod with the hammer drill
- 5 Wait until the hardening period specified by the manufacturer has passed
- 6 Screw the upright tight
(For the tightening torque, refer to the table above.)
- 7 Remove the safety devices

The upright is anchored.

Base fixing with welded joint

This section describes the base fixing with welded joint.

Prior to welding the joint, you have to fasten the base plate to the floor. This fastening requires cracked or uncracked concrete with a quality of at least C20/25 (ENV 206) with ideal stiffness. Deviations can be found in the layout in the appendix. The minimum concrete thickness, edge distance and maximum permissible tensile and compressive loads can be found in the table below.

NOTE



The welding work described below may only be performed by certified personnel!

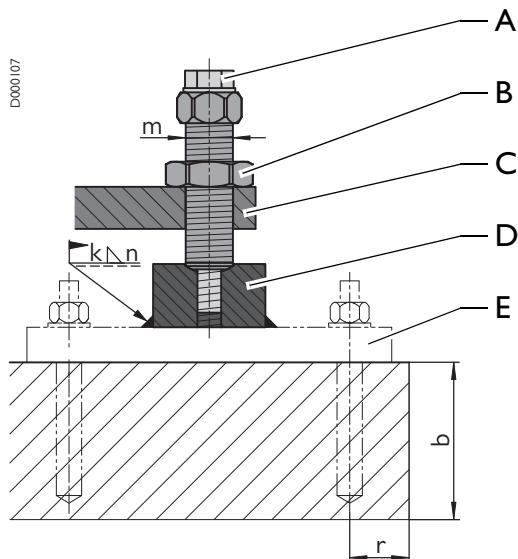


Fig. 5-10 Welded base fixing

- A Screw
- B Floor levelling screw
- C Upright/frame
- D Bottom plate
- E Base plate

m (floor levelling screw)	M24x2	M36x2	M48x3	M56x3
b (concrete thickness) [mm]	120	160	250	340
r (edge distance) [mm]	90	130	185	255
k (throat dimension) [mm]	a 4	a 4	a 5	a 5
n (joint length) [mm]	140	190	190	330
Permissible tensile load [kN]	12.8	36.5	78	101.6
Permissible compressive load [kN]	34	60	80	135

Tab. 5-3 *Welded base fixing*

Perform the weld joint as follows:

- 1 Connect the floor levelling screw and bottom plate by means of the screw
- 2 Weld the bottom plate to the base plate
(weld joint in acc. with the table above)
- 3 Tighten the screw
- 4 Remove the safety devices

The weld joint has been applied.

The product is anchored to the floor.

5.4.4 Installation

Installing the guideway

Install the guideway as described in section 'Installing the guideway',  89.

Installing the rack

Install the rack as described in section 'Installing the rack',  92.

Installing the motor and coupling

Install the motor and coupling as described in section 'Assembling the Motor and coupling', [102](#).

Options and attaching the load

Attaching optional components If equipped, attach the following optional components as per the separate documentation:

- Automatic lubrication system
- Manual lifting and safety unit: vertical axis
- Safety brake system to vertical axle
- Rotary axis
- Telescope axis
- Pneumatic load balance

Attaching the load Attach the load (gripper, robot, etc.) to the TMO product. Set the roller and tooth flank backlash again. This procedure is described in chapter 8.3.6 'Setting the tooth flank backlash', [95](#).

NOTE

Wear on the guideways!



Incorrectly adjusted roller and tooth flank backlash increase the wear on the guideways.

After attaching the load, set the roller backlash and tooth flank backlash again!

Integrating the product

Integrating product Integrate the TMO product into the complete plant. Connect the product with the supply lines for energy and consumables. For this procedure, refer to the documentation of the complete system.

Cables and Lines This section provides information on the proper handling of cables and lines.

NOTE



Improper handling of cables

The improper handling of cables leads to cable damage, unnecessary maintenance work and stopped operation.

Observe the instructions for use of cables and lines.

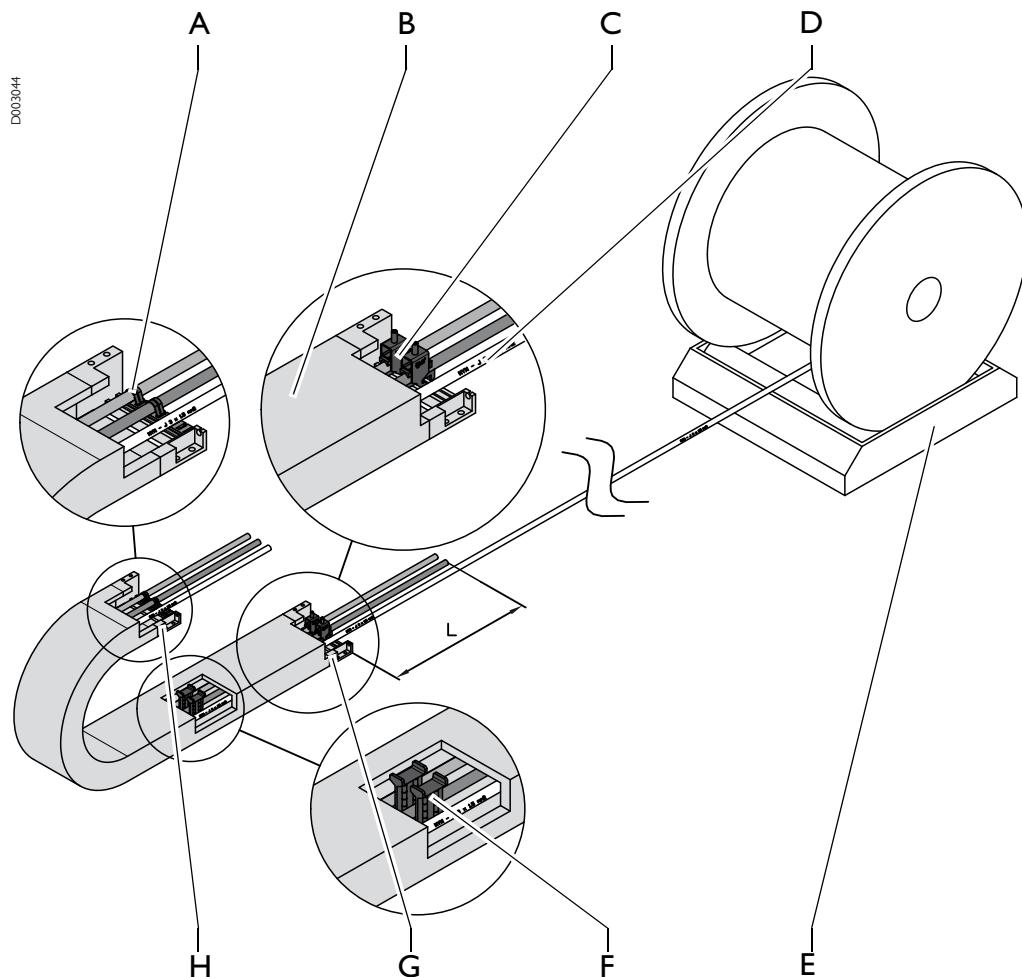


Fig. 5-11 *Cables and lines*

- A Strain relief version cable fitting
- B Energy chain
- C Strain relief version ChainFix
- D Cable description
- E Reel with dispenser
- F Vertical divider
- G Fixed side
- H Driver

Observe the following when handling cables and lines:

- Use only highly flexible, energy chain capable lines! The line's minimum bending radius must be smaller than the smallest radius of the energy chain.
- Roll the cable off evenly, never take off in loops
- Layout cables without twisting for at least 24 hours before putting them into energy chains! The cable description will aid you in doing so.
- Prepare vertical dividers:
 - Cables are separated by vertical dividers, cables are not permitted to be layed next to each other
 - Piled up cables with variant sheath materials must be separated from each other (danger 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.
- Lay cables in, never pull them in!
- If the process paths of the energy chain are less than 50m:
 - Relieve cable strain at the driver and the fixed side
 - The distance between the end of bend movement and strain relief is 10-30 times the diameter of the cable
 - Strain relief version cable fitting:
Two pieces 4.5mm wide on the appropriate holders,
Do not damage the sheaths of the cables!
 - Strain relief version ChainFix (IGUS energy chains):
Do not exceed a tightening torque of 1 Nm!
 - Run cable straight at least 20cm after the strain relief on the fixed side (length L)
- For process paths of the energy chain larger than 50m:
 - Relieve cable strain at the drive
 - The distance between the end of bend movement and strain relief is 10-30 times the diameter of the cable
 - Strain relief version cable fitting:
Two pieces 4.5mm wide on the appropriate holders,
Do not damage the sheaths of the cables!
 - Strain relief version ChainFix (IGUS energy chains):
Do not exceed a tightening torque of 1 Nm!
 - Run cable straight at least 50cm after the strain relief on the fixed side (length L)

- Pressure hoses from the hydraulic system and pneumatics have to be strain relieved at the driver and at the fixed side. Except if they expand under pressure (only fabric hoses).
- Before commissioning, label cables during strain relief so they can be readjusted during maintenance work

5.4.5 Transport securing devices

At delivery, a transport securing device is in effect at the rack or the gearbox.

Remove the transport securing device at the gearbox prior to assembling the motor. The transport securing device at the gearbox is only used for the horizontal axes.

⚠ WARNING

Falling axles



After the removal of transport securing devices, brake or motors, the vertical axles fall down, carriages can run away to the side. This can cause severe or fatal injuries!

Secure if necessary the vertical axle and the carriage before removing the transport securing devices, brake or motors!

Transport securing device at the gearbox. This section describes the removal of the transport securing device at the gearbox.

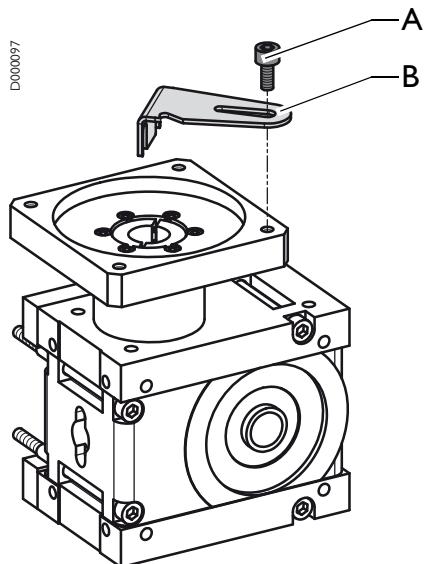


Fig. 5-12 Transport securing device at the gearbox

- A Screws
B Transport securing device

Remove the transport securing device at the gearbox as follows:

- 1** Fixate the carriage
- 2** Loosen the screw
- 3** Remove the transport securing device

Transport securing device has been removed.

5.5 Functional check

⚠ WARNING



Hazard due to tipping

Products that are incorrectly anchored can tip over. This can cause severe or fatal injuries!

Ensure that the product is anchored tightly.

Prior to the functional check, make sure that:

- The installation regulations were observed.
- The product is anchored tightly.
- The safety equipment has been attached and is closed.
- No persons are present in the danger area.

The procedure for the functional check is described in the documentation of the complete plant.

6 Operation

6.1 General

Operate the product only after the Installation instructions has been observed!

For information on how to operate the product TMO refer to the respective chapters of the documentation of the complete plant.

6.2 Personnel

WARNING

Training of operating personnel

Wrong behavior of untrained or insufficiently trained operating personnel can lead to severe personal or material damage.



Before the operating personnel begins working with the product:

- Train and instruct the operating personnel
- Point out dangers in the work area to the operating personnel
- Assess qualification of operating personnel before approving them
- Keep the operating personnel trained in best practices. Inform them also about technical progress, changes, etc.

If these measures are not complied with, you alone as operating company are liable for damages that may result!

7 Maintenance

7.1 Introduction

This chapter describes all maintenance tasks.

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

Original spare parts Use only original spare parts. For information on spare parts and wear items, refer to chapter 11 'Spare part supply', [115](#).

Tightening torques If no other specifications have been made, the tightening torques as per chapter 1.5.1 'Tightening torques for screws', [11](#) apply.

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

Third-party products For information on maintenance of third-party products, read the appropriate documentation in the appendix.

Lubrication This chapter describes the steps for manually lubricating the product. If your product has an automatic lubrication system, manual lubrication of guideways, racks, and pinions is not necessary. However, perform lubrication work when the first signs of tribocorrosion (reddish discoloration of the track) show.

7.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood chapter 3 'Safety', [20](#). It concerns your personal safety!

⚠ WARNING**Automatic startup**

When work is being performed on the product, there is danger of the machine starting up automatically. This can cause severe or fatal injuries!

Before working in the danger area:

- Secure vertical axles (if equipped) against falling
- Switch off the main power supply and secure it against being switched on again (main switch of complete plant)
- Before switching on the plant again, make sure that no one is in the danger area.

⚠ WARNING**Falling axles/workpieces**

Falling axles or workpieces can cause severe or fatal injuries!

Observe the following:

- Secure suspended axles using the stipulated equipment and deposit any workpieces before working in the danger area
- Never enter the area below suspended axles and workpieces
- 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!

**⚠ WARNING****Tearing apart the lifting belts**

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

Always protect the lifting belts with the guard plate.

7.1.2 Personnel qualification

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

7.2 Consumables and auxiliary agents

7.2.1 Cleaning agents

For cleaning tasks, have a grease-dissolving cleaning agent (e.g. acetone) at hand.

7.2.2 Lubricants

NOTE



Unsuitable lubricants

Using unsuitable lubricants can lead to machine damage!

Only use the listed lubricants. 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 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.

Low temperatures / food grade Observe the application range limits of lubricants according to the safety data sheet.

Alternative manufacturers The following tables show the specifications of the lubricants. Please inform your manufacturer accordingly. This will enable the manufacturer to suggest an alternative from his product range to you.

Oils

Component	Manufac-turer	Lubrication ex works	Specification
Automatic lubrication system FlexxPump	Güdel	Güdel HI NSF No.146621	cannot be found
Automatic lubrication system	Memolub	Mobil Glygoyle 460 NSF No.136467	CLP PD 460 in acc. with DIN 51502
Gear box unit AE, HPG, NA, etc.	Güdel		
Manual lubrication: • Guideway • Rack • Pinion	Güdel		
Planetary gearbox	Güdel-Redex	Klüber Klübersynth EG4-150	CLP HC 150 in acc. with DIN 51502
Planetary gearbox	Wittenstein	as per type plate	-
Planetary gearbox	Güdel-Sumer	Klüber Klübersynth GH 6 -150	CLP PD 150 in acc. with DIN 51502

Tab. 7-1 Oil types and specifications

Oil quantities For required oil quantities, please refer to the following table:

Component	Manufac-turer	Type	Quantity [cm³]
Gearbox unit	Güdel	HPG / AE 030	40
	Güdel	HPG / AE 045	100
	Güdel	HPG / AE 060	250
	Güdel	HPG / AE 090	700
	Güdel	HPG / AE 120	1400
	Güdel	HPG / AE 180	as per type plate

Tab. 7-2 Oil quantities

Greases

Component	Manufac-turer	Lubrication ex works	Specification
Automatic lubrication system	Memolub	Castrol Longtime PD2	KP2N-30 in acc. with DIN 51502
Automatic lubrication system	SKF-Vogel	Shell Gadus S2 V220 00	GP00G-20 in acc. with DIN 51502
Manual lubrication: • Guideway • Rack • Pinion	Güdel	Mobil Mobilux EP 2	KP2K-30 in acc. with DIN 51502
Gear teeth gearbox coupling	Güdel	Motorex Grease 218 M	KPF2K-20 in acc. with DIN 51502 MoS ₂ content minimum 3%
Clamping set of the gearbox unit	Güdel		
Bearing of the roller	INA	ARAL Arcanol LOAD 150	KP2N-20 in acc. with DIN 51825 high quality lithium soap grease
Precision drive	Nabtesco / Teijin	Virogrease RE 0	GHCF0K-40 in acc. with DIN 51825 semi-synthetic

Tab. 7-3 *Grease types and specifications*

Markings at the lubrication points

The markings apply to manual lubrication of the following Güdel components:

- Roller support
- Lubricating pinion unit
- Wiper and lubrication unit

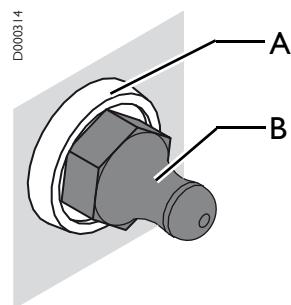


Fig. 7-1 *Markings at the lubrication points*

- A Identification disc
B Grease nipple

Yellow identification disc Grease

Red identification disc Oil

7.3 Maintenance tasks

7.3.1 General prerequisites

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

- If vertical axles are present, secure them against falling
- Switch off the plant and padlock it to secure it against being switched on again
- Make sure that all spare parts and wear items are at hand
(For information on spare parts and wear items, refer to chapter 11 'Spare part supply',  115)

7.3.2 Maintenance tasks 100 hours after commissioning

To ensure smooth operation, certain maintenance tasks have to be performed after commissioning.

Perform the following tasks 100h after commissioning the product:

- General inspection as per chapter 'General inspection',  65
- Check the base fixing:
 - Check the tightening torques of the screws and nuts, retighten if required
 - Check the anchor connection, place new anchor if required

7.3.3 Maintenance tasks every 150 hours

For more information on the lubricants, refer to chapter 7.2 'Consumables and auxiliary agents', [59](#).

Lubricating guideways, racks and pinions

Lubricate all guideways, racks and pinions every 150 hours.

NOTE

Incompatible lubricant!



Mixing different lubricants affects their properties.

Never mix different types of lubricant!

Before using another type of lubricant, exchange the wiper and lubrication units and the lubricating pinions! Rinse the lines with fresh lubricant!

Product size	Roller size	Number of shots with the grease gun (1 shot = 1.5 cm ³)
TMO 1	40	5-6
TMO 2	52	5-6
TMO 3	72	8-10
TMO 4	90	8-10

Tab. 7-4 Number of shots with the grease gun

Lubricate the guideways, racks and pinions as follows:

- 1 Switch off the system and padlock it to secure it against being switched on again
- 2 Use a grease gun to manually inject full shots of lubricant at the lubricating point of all wiper and lubrication units and all lubricating pinions
(Number of shots according to table above)

The guideways, racks and pinions are lubricated.

7.3.4 Maintenance tasks every 500 hours

General inspection

During the general inspection, the entire product is subjected to an overall check.

Performing a general inspection Perform the general inspection as follows:

- 1 Switch off the plant and padlock it to secure it against being switched on again
- 2 Check the inspection points as described in the inspection table
- 3 Take measures as described in the inspection table

The general inspection has been performed.

Inspection table

Inspection criterion	Specification / Description	Measures
Dirt	Check the components for dirt: <ul style="list-style-type: none"> • Wipers • Rollers • Guideways 	Immediately clean away any dirt
Damage	Check the plant for damage: <ul style="list-style-type: none"> • Paint damage • Bent attachments (e.g. cover plates) • Cracks in the cast parts • Cracks at welding seams 	Immediately remedy all discovered damage
Loose components	Check the seating of the components: <ul style="list-style-type: none"> • Screws • Nuts • Attachments 	<ul style="list-style-type: none"> • Immediately tighten loose screws to the required torque • Align and fasten loose attachments

Inspection criterion	Specification / Description	Measures
Loss of oil	<p>Check the plant and its surroundings for signs of the following:</p> <ul style="list-style-type: none"> • Puddles of oil and oil spills on the floor or in the drip sheets • Leaks, torn or pinched lines • Leakage at the gearbox 	<ul style="list-style-type: none"> • Replace defective and pinched lines • Repair or replace the gearbox • Remove puddles of oil and oil spills on the floor or in the drip sheets
Components	<p>Check the condition of the components:</p> <ul style="list-style-type: none"> • Carriage • Rollers • Guideways • Racks • Cog belt 	Replace worn components
Backlash	<p>Check for correct amount of backlash in the components:</p> <ul style="list-style-type: none"> • Pinions • Rollers 	Correct the backlash
Tension	Correct cog belts for correct tension	Correct the tension
Energy chain and cable	<p>Check the energy chain:</p> <ul style="list-style-type: none"> • Mobility • Wear • Damage • Position of the cables and lines • Condition of the cables and lines • Tightening torques, strain relief (e.g. 1 Nm at IGUS Chainfix) 	<ul style="list-style-type: none"> • Look for cause • Replace defective or worn energy chains • Correct the position of cables and lines • Replace worn or defective cables • Correct the tightening torque

Tab. 7-5 *Inspection table*

7.3.5 Maintenance tasks every 2000 hours

Greasing the roller

This section describes the steps for greasing the roller.

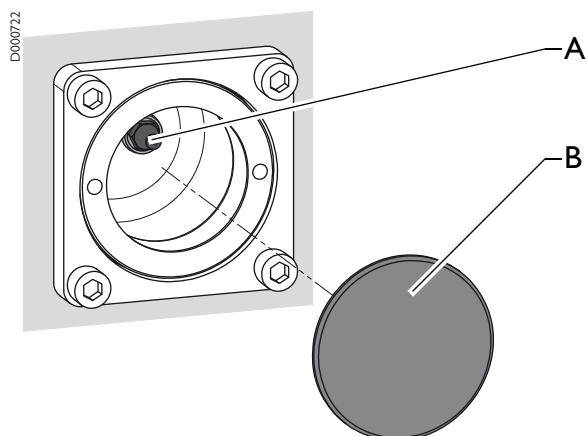


Fig. 7-2 Greasing the roller

- A Grease nipple
B Covering

Product size	Roller size	Relubrication quantity [g]
TMO 1	40	1.1
TMO 2	52	2.4
TMO 3	72	7.3
TMO 4	90	7.3

Tab. 7-6 Roller relubrication quantity

Grease the roller as follows:

- 1 Switch off the system and padlock it to secure it against being switched on again
- 2 Remove the covering
- 3 Use a grease gun to press in the grease
(Relubrication quantity according to table above)

The roller has been greased.

Replacing the wiper and lubricating element

Continuous lubrication of the guideways at operating temperatures below 0 °C or with grease requires a modification to the lubricating position.

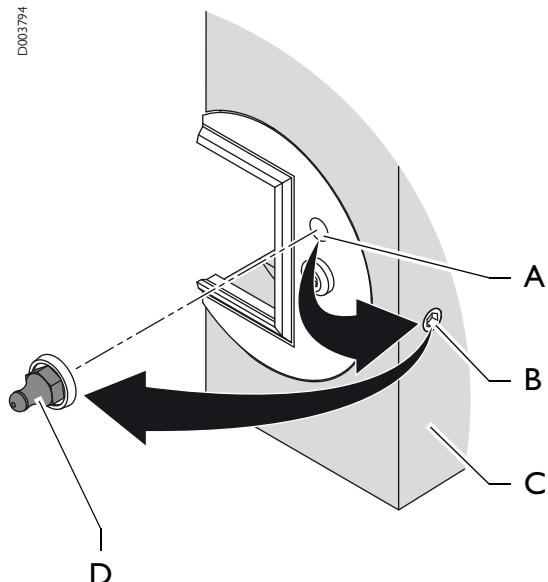


Fig. 7-3 *Changing the lubricating position*

- A Lubricating position of wiper
- B Headless set screw
- C Roller holder
- D Grease nipple / lubrication connection

Change the lubricating position as follows:

- 1 Remove grease nipple or lubrication connection from the roller holder
- 2 Remove headless set screw from wiper
- 3 Secure headless set screw with Loctite and install in roller holder
- 4 Install grease nipple or lubrication connection in lubricating position of wiper

The lubricating position has been changed.

This section describes the steps for replacing the wiper and the lubricating element.

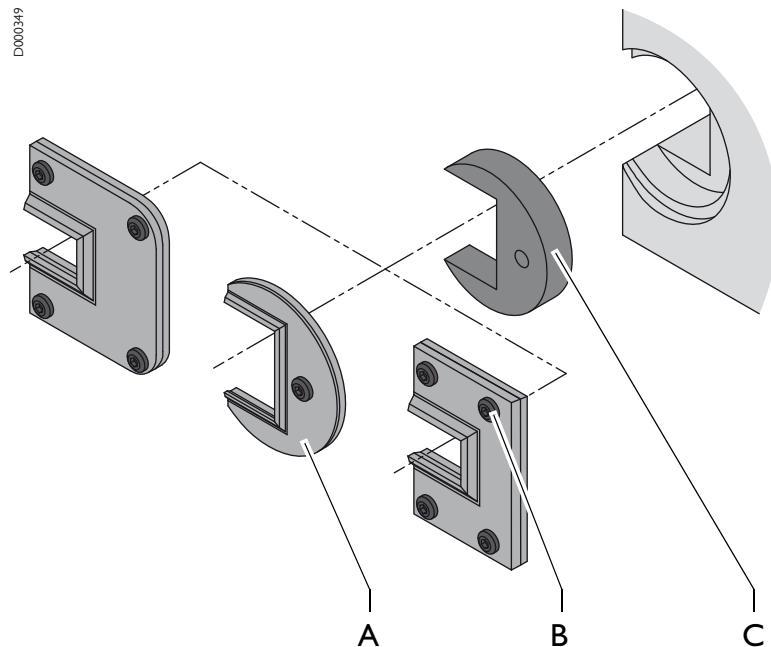


Fig. 7-4 Wiper and lubricating element

- A Wiper
- B Screws
- C Lubricating element

Replace the wiper and lubricating element as follows:

- 1** Switch off the plant and padlock it to secure it against being switched on again
- 2** If there is an automatic lubrication, disconnect the supply
- 3** Remove the screws
- 4** Replace the wiper
- 5** Replacing the lubricating element
6 Only for oil lubrication:
Submerge the new lubricating element in the oil for several minutes
(Oil quality, see chapter 7.2 'Consumables and auxiliary agents',  59)
- 7** To install the wiper and lubricating element, reverse the removal steps
- 8** Only for manual lubrication: Lubricating guideways
(see chapter 'Lubricating guideways, racks and pinions',  64)
- 9** Only for automatic lubrication:
(See separate operating manual on automatic lubrication)
 - 9.1** Connect lubrication line
 - 9.2** Start lubrication procedure
(See separate operating manual on automatic lubrication)

The wiper and lubricating element have been replaced.

Replacing the lubricating pinion

A pinion soaked in lubrication runs along next to the drive pinion. It ensures a continuous lubrication of the rack and the drive pinions.

Replace the lubricating pinion to ensure uniform lubrication.

This section describes the steps for replacing the lubricating pinion.

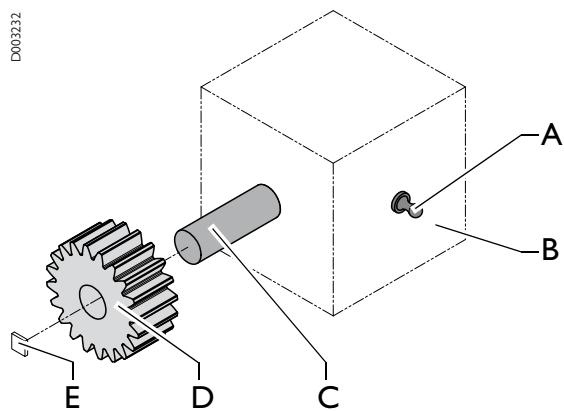


Fig. 7-5 *Replacing the lubricating pinion*

- A Lubrication point
- B Holder of the axle to the lubricating pinion
- C Axle to the lubricating pinion
- D Lubricating pinion
- E Gasket

Replace the lubricating pinion as follows:

- 1** Switch off the system and padlock it to secure it against being switched on again
- 2** If there is an automatic lubrication, disconnect the supply
- 3** Remove the entire lubricating pinion unit
- 4** Replace the lubricating pinion:
For oil lubrication, submerge the new lubricating pinion in oil for several minutes
(Oil quality, see chapter 7.2 'Consumables and auxiliary agents', [59](#))
- 5** If necessary, replace the gasket
- 6** To install the entire lubricating pinion unit, reverse the removal steps
- 7** Lubricate the lubricating pinion at the lubrication point
 - 7.1** For manual lubrication:
Lubricate the lubricating pinion according to the chapter "Lubricating the rack and pinion"
 - 7.2** For automatic lubrication:
Connect supply line, start lubrication procedure
(See separate operating manual on automatic lubrication)

The lubricating pinion has been replaced.

7.3.6 Maintenance tasks every 10000 hours

Oil change in type **NA / NH / FA / FH / AE / HPG gearboxes**

Always replace the gearbox oil within the specified intervals.

For more information on the oil qualities, refer to chapter 7.2 'Consumables and auxiliary agents', [59](#).

Perform the oil change as follows:

Attaching the slings 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!

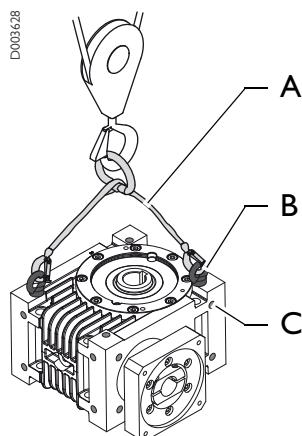


Fig. 7-6 *Attaching the slings*

- A Belt harness
- B Lifting screw
- C Threaded holes

Size	Size of lifting screw
090	M10
120	M12
180	M16

Tab. 7-7 *Size of lifting screw*

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.

Disassembling a drive with pinion This section describes the steps for disassembling the drive.

⚠ WARNING**Falling axles**

After the removal of transport securing devices, brake or motors, the vertical axles fall down, carriages can run away to the side. This can cause severe or fatal injuries!

Secure if necessary the vertical axle and the carriage before removing the transport securing devices, brake or motors!

⚠ CAUTION**Hot parts/surfaces**

Hot surfaces present a burn hazard during work on the product.

Observe the following:

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

**NOTE**

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

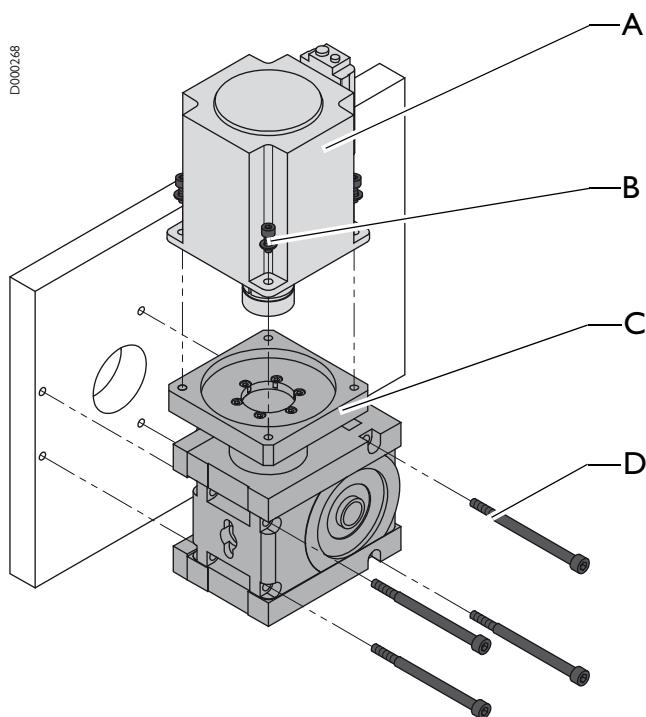


Fig. 7-7 Disassembling the drive

- A Motor
- B Motor screws
- C Gearbox
- D Gearbox screws

Disassemble the drive as follows:

- 1 Switch off the system and padlock it to secure it against being switched on again
- 2 Secure carriage or axis with transport securing device or lifting device
- 3 Remove the motor screws
- 4 Pull the motor, together with the coupling, off the gearbox
- 5 Remove the gearbox screws
- 6 Remove the gearbox

The drive has been disassembled.

Changing the gearbox oil This section describes the steps for changing the gearbox oil.

⚠ 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

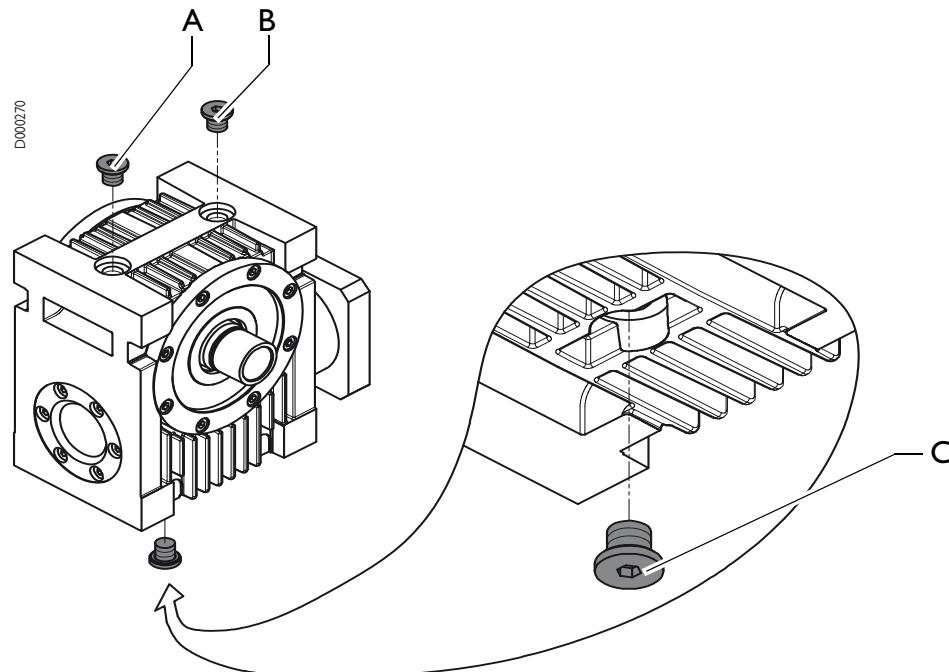


Oils/greases

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. 7-8 Oil change

- A Bleed screw
- B Filler screw
- C Drain screw

Change the gearbox oil 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 oil
- 5** Rinse the gearbox with fresh oil
(for oil types, see the Oils chapter)
- 6** Allow the gearbox to drain
- 7** Screw in the drain screw
- 8** Fill up the gearbox through the filler screw
(for oil types and quantity, see the Oils chapter)
- 9** Screw in the bleed and filler screws

The gearbox oil has been changed.

Tighten the gearbox screws This section describes the steps for tightening the gearbox screws.



NOTE

**Observe the tightening torques.
You will otherwise destroy the cast casing!**



NOTE

Observe, without exception, the agreed installation position for the size 180!

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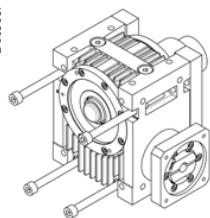


Fig. 7-9 *Mounting the gearbox unit*

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

Tab. 7-8 *Tightening torques for gearbox screws*

Installing the drive This section describes the steps for installing the drive.

NOTE

Calibrate the measurement reference plane after each drive assembly.

This procedure is described in the documentation of the complete system or of the motor!

Install the drive as follows:

- 1** To install the drive, reverse the disassembly steps as described in section 'Disassembling a drive with pinion', 74 and "Tighten the gearbox screws"
- 2** Set the tooth flank backlash according to chapter 8.3.6, 95
- 3** Calibrate the reference plane of the motor (this procedure is described in the documentation of the complete system or of the motor)

The drive has been installed.

The oil change has been completed.

7.4 Maintenance schedule

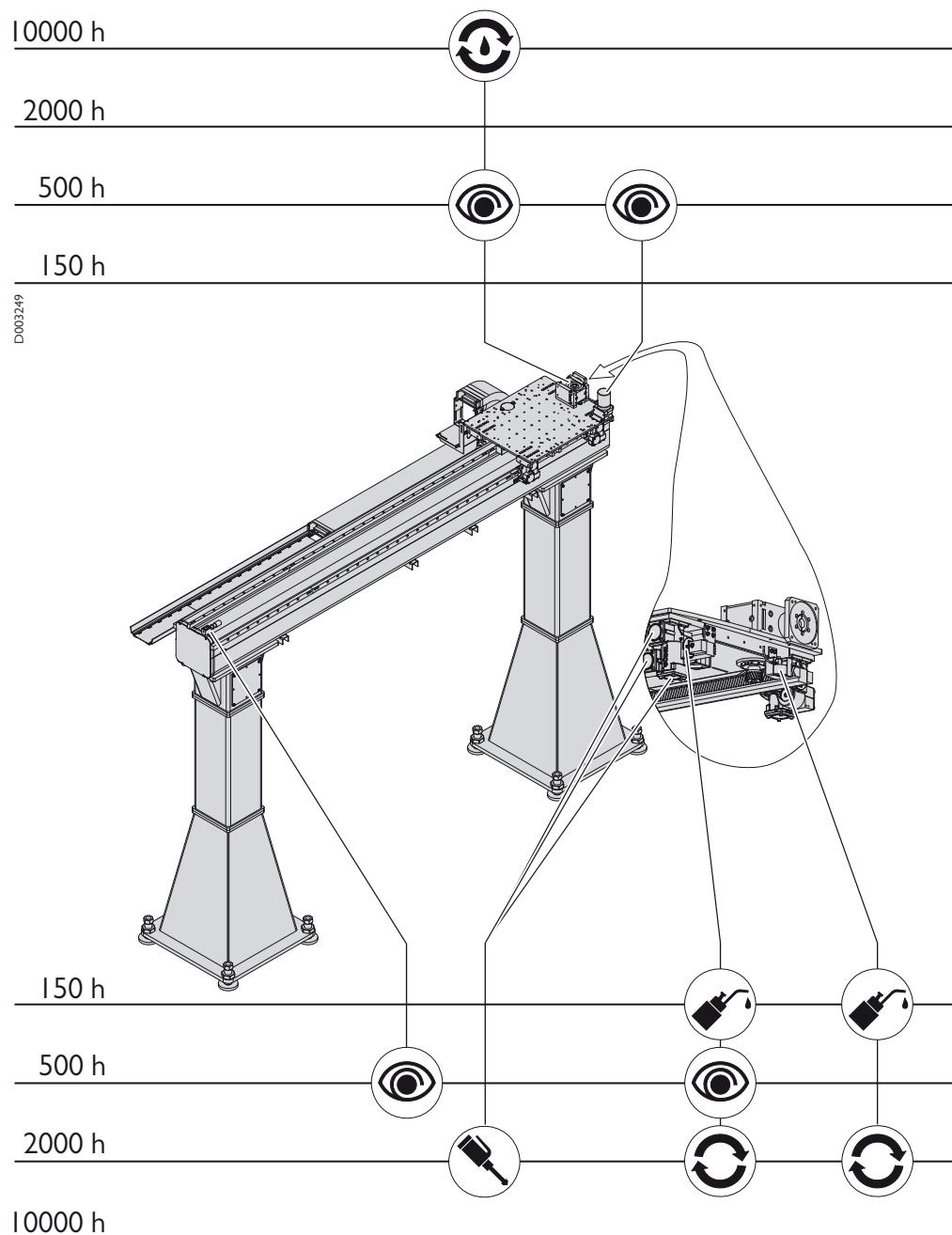


Fig. 7-10 Maintenance schedule

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Greasing



Replacing



Oil change



Oil



Cleaning



Visual inspection

8 Repairs

8.1 Introduction

This chapter describes all service tasks.

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

Original spare parts Use only original spare parts. For information on spare parts and wear items, refer to chapter 11 'Spare part supply', [115](#).

Tightening torques If no other specifications have been made, the tightening torques as per chapter 1.5.1 'Tightening torques for screws', [11](#) apply.

8.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood chapter 3 'Safety', [20](#). It concerns your personal safety!

WARNING

Automatic startup

When work is being performed on the product, there is danger of the machine starting up automatically. This can cause severe or fatal injuries!



Before working in the danger area:

- Secure vertical axles (if equipped) against falling
- Switch off the main power supply and secure it against being switched on again (main switch of complete plant)
- Before switching on the plant again, make sure that no one is in the danger area.

⚠ WARNING**Falling axles/workpieces**

Falling axles or workpieces can cause severe or fatal injuries!

Observe the following:

- Secure suspended axles using the stipulated equipment and deposit any workpieces before working in the danger area
- Never enter the area below suspended axles and workpieces
- 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!

⚠ WARNING**Tearing apart the lifting belts**

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

Always protect the lifting belts with the guard plate.

8.1.2 Personnel qualification

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

8.2 Special tools, testing and measuring instruments

For repairs, make sure that you have the following special tools, testing and measuring instruments at hand:

Tool	Use	Item number
Dial gauge	Setting the tooth flank backlash	
Micrometer	Checking the rack transition	
Screw clamps	Installing the racks	
Mounting aid	Installation of rack module 3 helical	902283
	Installation of rack module 4 helical	902284
Fastening device	Blocking the drive pinion AE060	0917454
	Blocking the drive pinion AE090	0917447
	Blocking the drive pinion AE120	0917455
Adjusting tool	Adjusting the rollers Size 40/52	0919690
	Adjusting the rollers Size 72/90	0915289

Tab. 8-1 *Special tools, testing and measuring instruments*

8.3 Repairs

8.3.1 General prerequisites

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

- If vertical axles are present, secure them against falling
- Switch off the plant and padlock it to secure it against being switched on again
- Make sure that all spare parts and wear items are at hand
(For information on spare parts and wear items, refer to chapter 11 'Spare part supply',  115)

8.3.2 Replacing the bumper unit

The bumper unit is a safety component.

Replace the entire bumper unit after a crash has occurred.

WARNING

Weak safety component



After a crash, it is not immediately apparent whether bumper unit elements have been weakened or are defective. Another crash can cause severe or fatal injuries.

Always replace the entire bumper unit!

The buffer unit consists of the following components:

- Bumper
- Bumper block or bumper bracket
- Screws
- Sleeves and/or heavy-duty spring tension pins

8.3.3 Replacing the roller

The rollers, guideways, and racks are designed for continuous use. Certain ambient conditions can increase the wear on these components.

Always replace rollers, guideways and racks at the same time.

The roller holders are to be arranged according to the following figure. The installation types are shown for the various models of the product TMO.

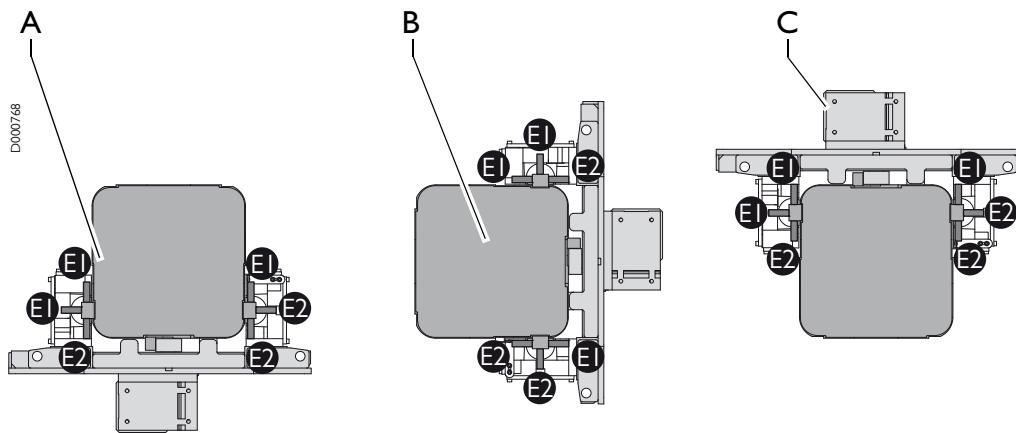


Fig. 8-1 *Roller holder arrangement*

- A *Ceiling mounting*
- B *Wall mounting*
- C *Elevated mounting*

Replacing the roller This chapter describes the steps for replacing the roller.

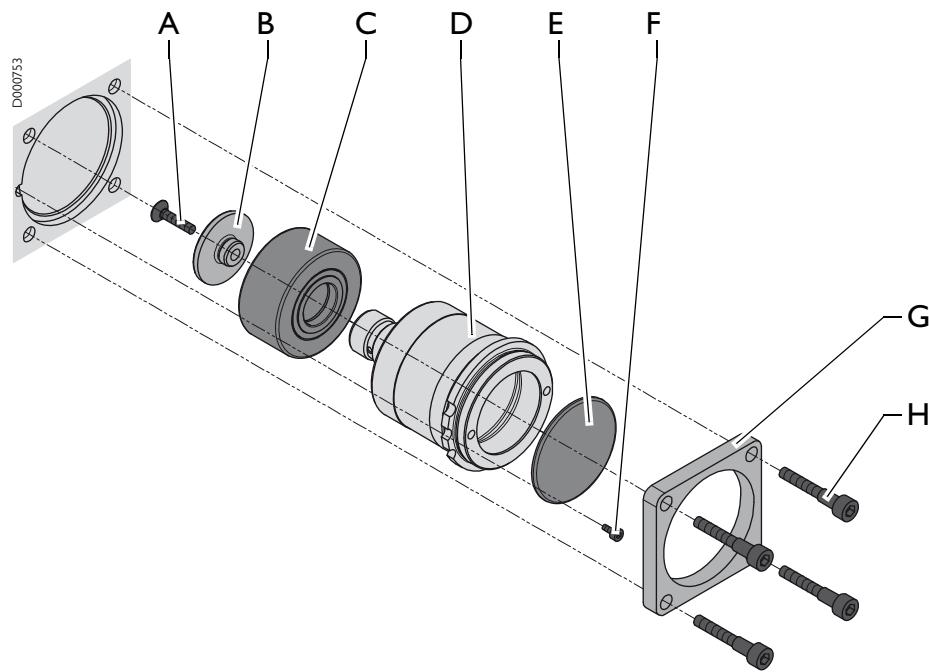


Fig. 8-2 *Replacing the roller*

- A Screw
- B Peg
- C Supporting roller
- D Roller holder
- E Covering
- F Positioning screw
- G Flange
- H Fastening screws

Replace the roller as follows:

- 1** Switch off the plant and padlock it to secure it against being switched on again
- 2** Secure vertical axis, if equipped
- 3** Support the carriage or secure it to a lifting device
- 4** Remove fastening screws and flange
- 5** If there is a positioning screw, remove it
- 6** Remove the covering
- 7** Remove the entire roller holder
 - 7.1** Remove screw and peg
 - 7.2** Replace the roller
 - 7.3** Install screw and peg
- 8** Install and set the rollers as described in the following section

The roller has been replaced.

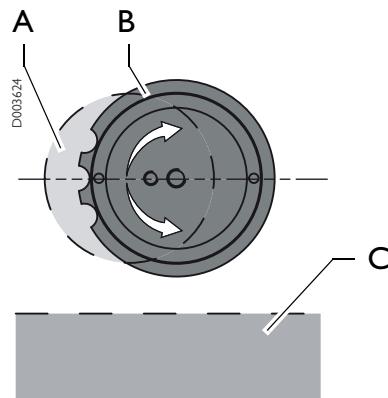
Setting the roller

This chapter describes the steps for setting the roller.

NOTE



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



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Fig. 8-3

Zero position of eccentric

- A Roller
- B Roller holder
- C Guideway

Adjust the rollers as follows:

- 1** Switch off the plant and padlock it to secure it against being switched on again
- 2** Remove coverings if necessary
- 3** Move eccentric ring of the gearbox unit into zero position according to chapter 8.3.6, [95](#)
- 4** Install or check E1 and E3 roller holders:
(See Fig. 8-1 'Roller holder arrangement', [85](#))
 - 4.1** Fix roller holder in eccentric zero position with positioning screw
(Secure screw with Loctite 242)
 - 4.2** Installing the flange
 - 4.3** Tighten fastening screws
- 5** Install or check E2 roller holder:
 - 5.1** Position roller holder in eccentric zero position
 - 5.2** Installing the flange
 - 5.3** Only lightly tighten fastening screws
- 6** If necessary, remove the securing element, support, or lifting device
- 7** E2 roller holder:
 - 7.1** Tighten roller holder towards the guideway
(For the tightening torque, refer to tab. I-5, [14](#))
 - 7.2** Tighten fastening screws
- 8** Set the tooth flank backlash as per chapter 8.3.6, [95](#)

The rollers have been set.

8.3.4 Replacing the guideway

Disassembling the guideway

Disassemble the guideway as follows:

- 1 Switch off the plant and padlock it to secure it against being switched on again
- 2 Attach the carriage or axis to a lifting device
- 3 Expose guideway:
 - 3.1 Move the carriage off the guideway or axis to be replaced, if necessary
 - 3.2 Move out the vertical axis, if required
- 4 Remove all screws
- 5 Remove the guideway

The guideway has been removed.

Installing the guideway

This section describes the steps for installing the guideway.

For axes over 20 meters, the assembly of the guideways must be performed from the middle.

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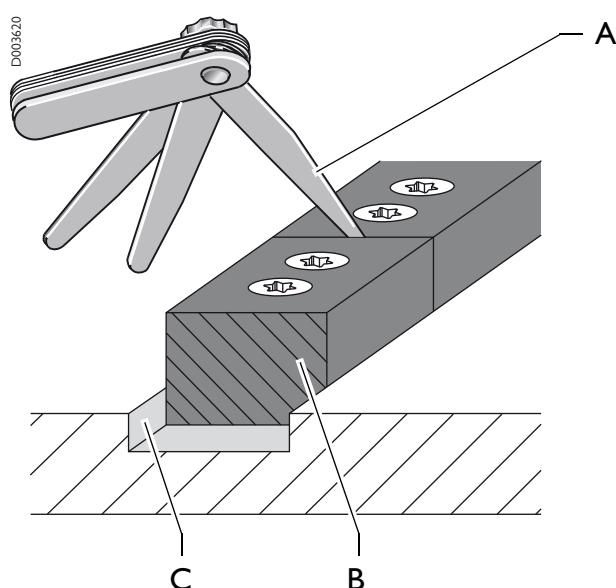


Fig. 8-4 *Installing the guideway*

- A Feeler gauge
- B Guideway
- C Reference surfaces

Install the guideway as follows:

- 1** Clean the reference surfaces and guideways thoroughly and rub an oil stone across them
- 2** Tighten all screws
- 3** Inspecting the transition
(gap dimension < 0.02 mm)
- 4** If there are deviations:
 - 4.1** Remove screws and guideway
 - 4.2** Repeat the procedure

The guideway has been installed.

Final tasks The following tasks must be performed after assembly of the guideway.

Perform these final tasks as follows:

- 1** Move the carriage onto the axle if necessary
- 2** Retract the vertical axis, if required
- 3** Remove the lifting device
- 4** If necessary, adjust the rollers

The final tasks have been performed.

The guideway has been replaced.

8.3.5 Replacing the rack

Disassembling the rack

Dismantle the rack as follows:

- 1 Switch off the plant and padlock it to secure it against being switched on again
- 2 Attach the carriage or axis to a lifting device
- 3 Exposing the rack:
 - 3.1 Move the carriage off the rack or axis to be replaced, if necessary
 - 3.2 Move out the vertical axis, if required
- 4 Remove all screws
- 5 Remove the rack

The rack is dismantled.

Mounting aid

The start and end of the rack form a half tooth gap. For precise and low-noise transition, we recommend using a mounting aid geared in the opposite direction (see chapter 8.2 'Special tools, testing and measuring instruments', § 83).

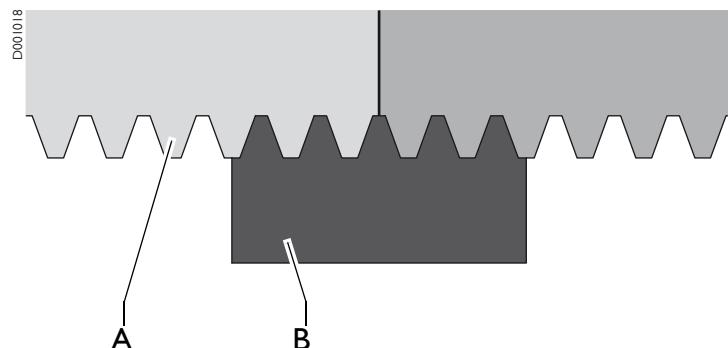


Fig. 8-5

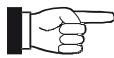
Mounting aid for rack assembly

A Rack

B Mounting aid

Installing the rack This section describes the steps for assembling the racks.

NOTE



For statics-related reasons, the racks come partially pinned ex-works.

- **These racks must be pinned after being replaced!**
- **For combinations of three or more racks, always start at the middle.**

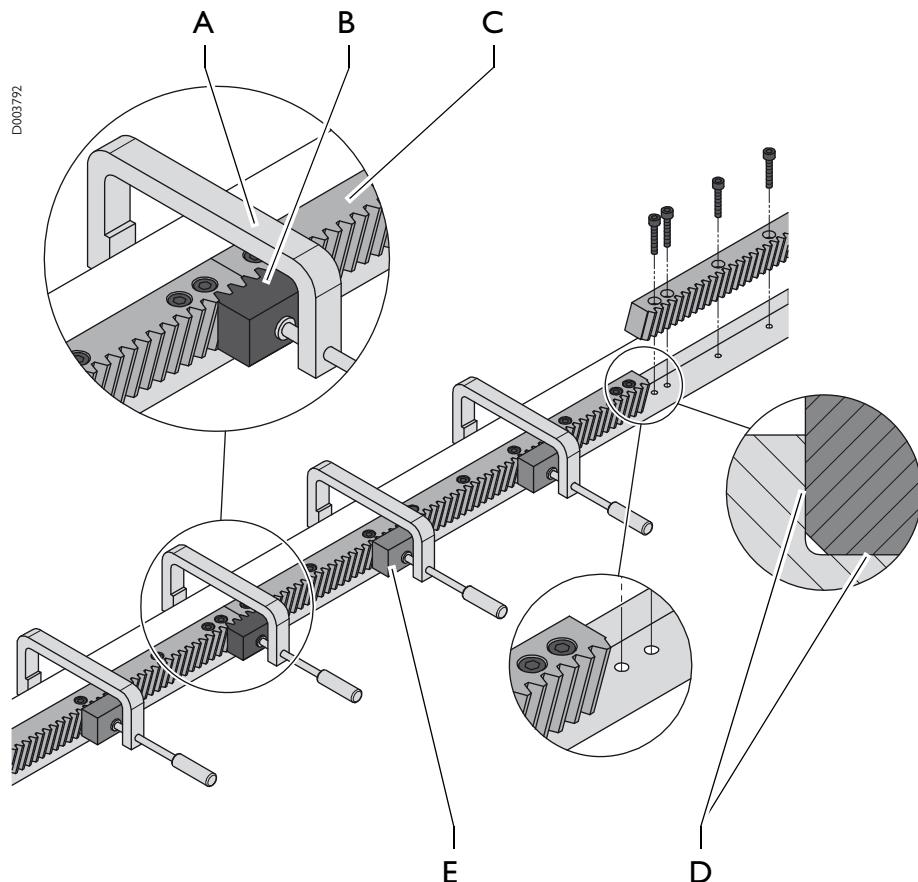


Fig. 8-6 *Installing the rack*

- A Screw clamp
B Mounting aid
C Rack
D Reference surface
E Wood block

Install the racks as follows:

- 1** Clean the reference surfaces and racks thoroughly and rub an oil stone across them
- 2** Clamp rack to reference surfaces with screw clamps
(Be sure to apply the screw clamp at the level of the screw to be tightened.)
- 3** Tighten all screws
- 4** Inspect rack transition according to Section 'Inspecting rack transition',
§ 93
- 5** If there are deviations:
 - 5.1** Remove screws and racks
 - 5.2** Repeat the procedure

The rack has been installed.

Inspecting rack transition

This section describes the inspection of the rack transition.

The racks correspond to the qualities in the following table:

Axis	Rack quality		Module
	Hardened rack	Soft Rack	
Y	9h27	-	3 (TMO 1-2) 4 (TMO 3-4)

Tab. 8-2 *Rack quality*

Hardened racks can be recognized by the engraved Güdel logo.

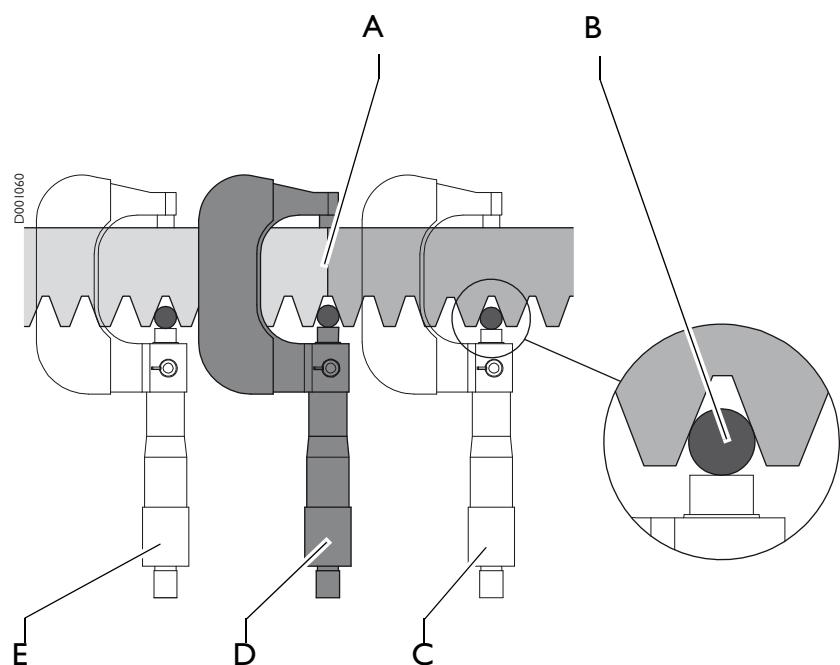


Fig. 8-7 *Inspect rack transition with micrometer*

- A Rack transition
- B Measurement bolt
- C Micrometer position C
- D Micrometer position D
- E Micrometer position E

Rack quality	Permissible deviation [mm]		
	Module $m \leq 3$	Module $3 < m \leq 8$	Module $8 < m \leq 12$
Q4 h21	0.014	0.016	0.022
Q5 h22	0.022	0.027	0.034
Q6 h23	0.034	0.041	0.055
Q7 h25	0.082	0.110	0.137
Q8 h27	0.220	0.275	0.343
Q9 h27	0.220	0.275	0.343

Tab. 8-3 *Deviation method I*

Inspect the rack transition as follows:

- 1 Position the measurement bolt as shown in the illustration
- 2 Inspect the deviations in the height of positions C and E to position D via micrometer
(Permissible deviation of position C and E to D, refer to table above)

The rack transition has been inspected.

Final tasks The following tasks must be performed after assembly of the guideway.

Perform these final tasks as follows:

- 1 Move the carriage onto the axis, if necessary
- 2 Retract the vertical axis, if necessary
- 3 Remove the lifting device
- 4 Adjusting the rollers

The final tasks have been performed.

The guideway has been replaced.

8.3.6 Setting the tooth flank backlash

Set the tooth flank backlash after each roller, guideway or gearbox change.



NOTE

Always set the roller backlash and tooth flank backlash with load attached and at operating temperature!

Blocking the drive pinion

This section describes the steps for blocking the drive pinion.

Block the drive pinion in order to check the tooth flank backlash.

Unblock the drive pinion after repair work has been finished. For this purpose, remove the fastening device and place the plug back onto the gearbox.

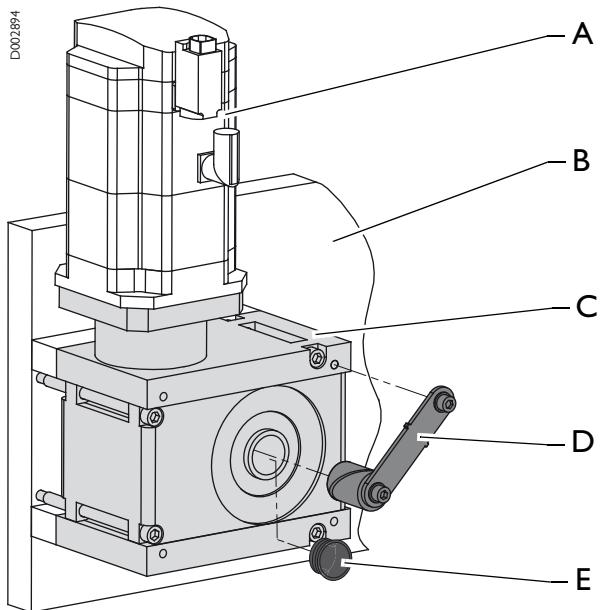


Fig. 8-8 *Blocking the drive pinion*

- A Motor
- B Carriage
- C Gearbox
- D Fastening device
- E Plug

Block the drive pinion as follows:

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

The drive pinion is blocked.

This section describes the steps for setting the tooth flank backlash.

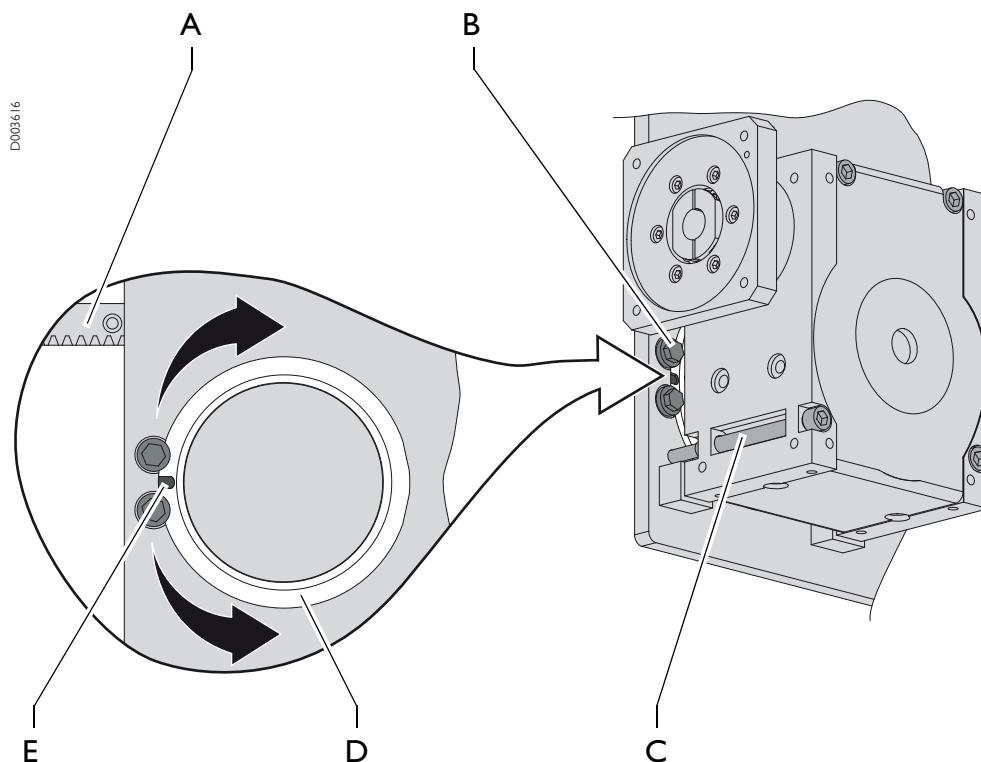


Fig. 8-9 Setting the tooth flank backlash

- A Rack
- B Screw
- C Gearbox screws
- D Eccentric ring
- E Slot (eccentric ring in zero position)

Set the tooth flank backlash as follows:

- 1** Switch off the plant and padlock it to secure it against being switched on again
- 2** Check tooth flank backlash according to section 'Checking the tooth flank backlash', [§ 98](#)
- 3** If there are deviations:
 - 3.1** Slightly loosen the gearbox screws and screws
 - 3.2** Backlash too large: Turn eccentric ring towards the rack
 - 3.3** Backlash too small: Turn the eccentric ring away from the rack
- 4** Tighten the gearbox screws and screws
- 5** Repeat process as of step 2.

The tooth flank backlash has been set.

**Checking the tooth
flank backlash**

This section describes the inspection of the tooth flank backlash.

If the axis is not driven with Güdel gearbox type NA / NH / FA / FH / AE / HPG, then use the procedure described in the operating manual of the gearbox!

NOTE

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

Only use it when the exact method is not possible!

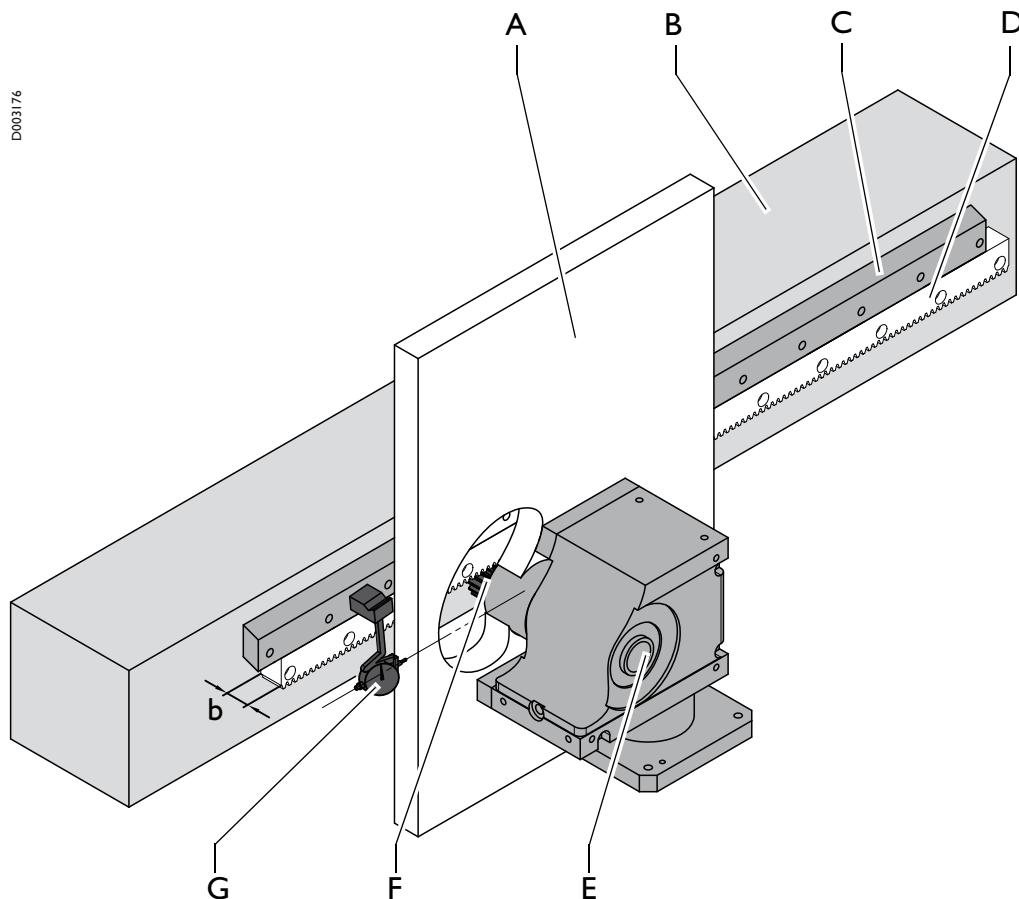


Fig. 8-10 Checking the tooth flank backlash

- A Carriage
- B Axis
- C Guideway
- D Rack
- E Gearbox
- F Drive pinions
- G Dial gauge

Rack quality and module can be found in tab. 8-2, § 93.

Rack quality	Tooth flank backlash [mm]		
	Module $m \leq 3$	Module $3 < m \leq 8$	Module $8 < m \leq 12$
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

Tab. 8-4 *Tooth flank backlash*

Check the tooth flank backlash as follows:

I Measurement method I
(exact measurement method):

- I.1** Block the drive pinion according to the section "Blocking the drive pinion"
- I.2** Mount the dial gauge to the guideway
- I.3** Mount dial gauge in the direction of travel aligned with the center of the drive pinion
- I.4** Zero the dial gauge
- I.5** Move the carriage or axis in the direction of travel
- I.6** Read the tooth flank backlash on the dial gauge

- 2** Measurement method 2
(inexact measurement method only when necessary due to weight reasons):
 - 2.1** Insert paper strip from DIN A4 80 g/m² with width b between drive pinion and rack
 - 2.2** Move carriage or axis with auxiliary agents
(Paper strip is “turned through”)
 - 2.3** Paper strip worn:
Tooth flank backlash <0.05 mm
 - 2.4** Paper strip cut, partially disconnected pieces:
Tooth flank backlash ~ 0.05 mm
 - 2.5** Paper strips mildly cut, no disconnected pieces:
Tooth flank backlash ~ 0.07 mm
 - 2.6** Paper strip wavy:
Tooth flank backlash ~ 0.1 mm
 - 2.7** Paper strip undamaged:
Tooth flank backlash >0.1 mm
- 3** Interpret tooth flank backlash according to the previous table

The tooth flank backlash has been checked.

8.3.7 Replacing motor and coupling

This chapter describes the steps for replacing the motor and the coupling.

NOTE



Calibrate the measurement reference plane after each drive assembly.

This procedure is described in the documentation of the complete system or of the motor!

⚠ WARNING**Falling axles**

After the removal of transport securing devices, brake or motors, the vertical axles fall down, carriages can run away to the side. This can cause severe or fatal injuries!

Secure if necessary the vertical axle and the carriage before removing the transport securing devices, brake or motors!

Replace the motor and coupling as follows (for descriptions, see fig. 8-11, [fig. 102](#)):

***Disassembling
motor and coupling***

This section describes the steps for removing the coupling and the motor.

Remove the motor and the coupling as follows:

- 1** Switch off the system and padlock it to secure it against being switched on again
- 2** Loosen the motor screws
- 3** Pull the motor, together with the coupling, off the gearbox
- 4** Loosen the coupling screws
- 5** Pull the coupling off the motor shaft

The motor and the coupling have been removed

Assembling the Motor and coupling This section describes the steps for assembly of the coupling and the motor.

Depending on the type of transport securing device used, you have to remove the device before installing the motor for the first time (see Section 'Transport securing device at the gearbox', § 54).

⚠ WARNING

Falling axes / workpieces



Incorrect tightening torques can lead to falling axes or workpieces. This can cause severe or fatal injuries!

Observe the following:

- Calibrate and check the torque wrench periodically
- Tighten all screws with a torque wrench to the specified tightening torques

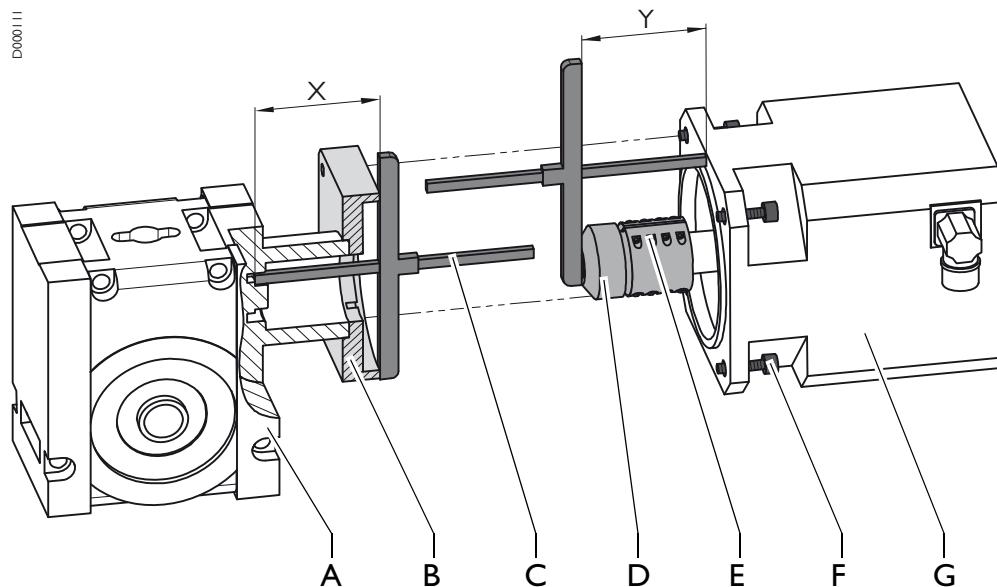


Fig. 8-11 *Installing the motor and coupling*

- A Gearbox
- B Motor flange
- C Measuring instrument
- D Coupling
- E Coupling screws
- F Motor screws
- G Motor

Install the motor and the coupling as follows:

- 1 Clean the coupling and motor shaft to ensure that they are free of grease
- 2 Measure distance X
- 3 Push the coupling onto the motor shaft
(Dimension Y has to match dimension X, tolerance -0.2 to -0.4 mm)
- 4 Tighten the coupling screws
For the tightening torque, refer to tab. I-2, [11](#)
- 5 Grease the gear rim of the coupling
(For grease types, see 7.2.2 'Lubricants', [59](#))
- 6 Push the motor, with the mounted coupling, onto the gearbox
- 7 Tighten the motor screws

The motor and the coupling have been installed.

The motor and the coupling have been replaced.

8.4 Service on the gearbox unit

8.4.1 Replacing the gearbox unit

This chapter describes the steps for replacing the gearbox unit.

Disassemble the drive to replace the gearbox unit.

Disassembling a drive with pinion

This section describes the steps for disassembling the drive.



WARNING

Falling axles

After the removal of transport securing devices, brake or motors, the vertical axles fall down, carriages can run away to the side. This can cause severe or fatal injuries!

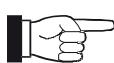
Secure if necessary the vertical axle and the carriage before removing the transport securing devices, brake or motors!

CAUTION**Hot parts/surfaces**

Hot surfaces present a burn hazard during work on the product.

Observe the following:

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

**NOTE**

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

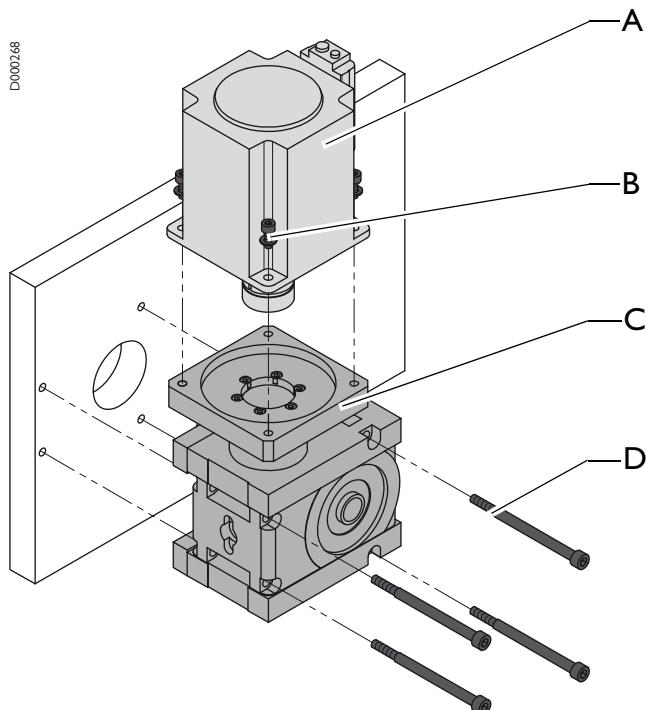


Fig. 8-12 Disassembling the drive

- A Motor
- B Motor screws
- C Gearbox
- D Gearbox screws

Disassemble the drive as follows:

- 1** Switch off the system and padlock it to secure it against being switched on again
- 2** Secure carriage or axis with transport securing device or lifting device
- 3** Remove the motor screws
- 4** Pull the motor, together with the coupling, off the gearbox
- 5** Remove the gearbox screws
- 6** Remove the gearbox

The drive has been disassembled.

Tighten the gearbox screws

This section describes the steps for tightening the gearbox screws.



NOTE

**Observe the tightening torques.
You will otherwise destroy the cast casing!**



NOTE

Observe, without exception, the agreed installation position for the size 180!

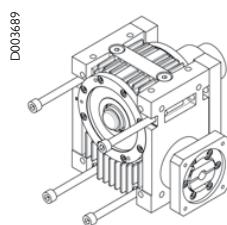


Fig. 8-13 *Mounting the gearbox unit*

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

Tab. 8-5 *Tightening torques for gearbox screws*

Installing the drive This section describes the steps for installing the drive.

NOTE



Calibrate the measurement reference plane after each drive assembly.

This procedure is described in the documentation of the complete system or of the motor!

Install the drive as follows:

- 1** To install the drive, reverse the disassembly steps as described in section 'Disassembling a drive with pinion', 103 and "Tighten the gearbox screws"
- 2** Set the tooth flank backlash according to chapter 8.3.6, 95
- 3** Calibrate the reference plane of the motor (this procedure is described in the documentation of the complete system or of the motor)

The drive has been installed.

The gearbox unit has been replaced.

8.4.2 Setting the gear backlash

Ex works, the gear backlash is set to a value of less than 6'. If the backlash increases, it has to be readjusted.

NOTE



- **Do not remove the casing cover, else the gearbox oil will leak out!**
- **Always align both casing covers in the identical position!**

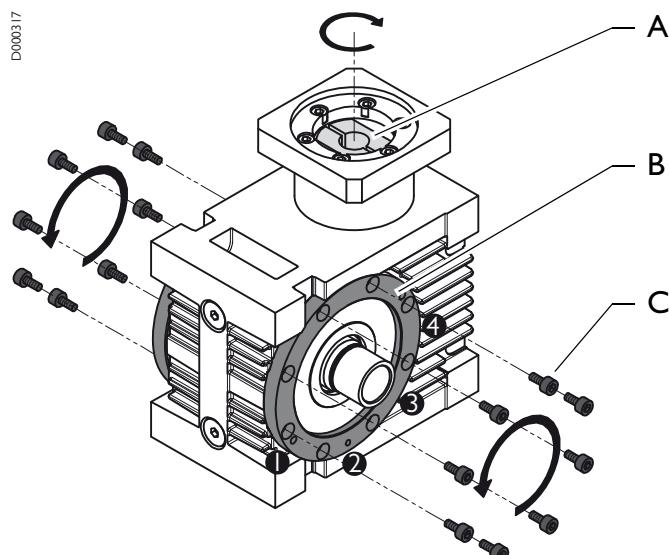


Fig. 8-14 Setting the gear backlash

- A Worm shaft
B Casing cover
C Screws

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

Tab. 8-6 Tightening torques

Set the gear backlash as follows:

- 1** Switch off the plant and padlock it to secure it against being switched on again
- 2** Disassemble the drive according to section 'Disassembling a drive with pinion', [103](#)
- 3** Remove all screws on both sides
- 4** Rotate both covers toward the next higher, cast-in number
- 5** Tighten two screws on each of the two sides
- 6** Check 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
- 7** Insert all screws on both sides and tighten crosswise
- 8** Check the gear backlash:
Rotate the worm shaft 360° by hand
 - 8.1** The shaft resists rotation:
Repeat from step 3

The gear backlash has been set.

8.5 Other documents

For information on the available options, read the appropriate documents in the appendix.

8.6 Service departments

If you have questions, please contact the service departments. For a list with their contact information, see chapter 11.2 'Service departments', [116](#).

9 Decommissioning, storage

9.1 Introduction

9.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood chapter 3 'Safety', § 20. It concerns your personal safety!

9.1.2 Personnel qualification

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

9.2 Storage conditions

⚠ CAUTION

Leaking fluids



During storage, substances that are hazardous to the environment could leak!

Hazardous substances must not get into the drinking water supply:

- Take appropriate measures.
- Observe the country-specific safety data sheets.
- Fluids must be disposed of as hazardous waste, even if the total quantity is small.

Room Store the product in a dry location. For information on the required space and the floor capacity, refer to the machine layout or general layout.

Use a covering to protect the product against dust and dirt.

Temperature The ambient storage temperature must remain between -10 and +40°C. Make sure that the product is not subjected to large temperature fluctuations.

Air humidity The air humidity must be below 75%.

9.3 Decommissioning

9.3.1 Shutdown

This chapter provides information on shutting down the product.

⚠ WARNING

Falling axles/workpieces



Falling axles or workpieces can cause severe or fatal injuries!

Observe the following:

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

NOTE



Do not empty the lubrication lines and the gearbox when shutting down the product!

To shut down the product, proceed as follows:

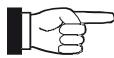
- 1 Fixate the axles
- 2 Shut down the plant
(main switch of complete system)
- 3 Disconnect the supply lines for energy and consumables
- 4 Automatic lubrication system (optional): Unscrew the lubricator and remove the batteries

The product has been decommissioned.

9.3.2 Cleaning / rust-proofing

Prior to performing rust-proofing, clean away any dirt and dust from the product. Clean the product thoroughly.

NOTE



Dispose of any cloths soaked in oils and/or greases in an environmentally friendly manner! For more information on disposal, refer to chapter 10 'Disposal', § 112.

Apply corrosion protection to all parts.

9.3.3 Transport securing device

On unbraked motors, mount the transport securing devices.

9.3.4 Labeling

Label the product with the following data:

- Date of decommissioning
- Internal machine number/name
- Further data as per internal guidelines

9.4 Recommissioning

For recommissioning, follow the steps described for commissioning.

Prior to recommissioning, perform the general inspection as set out in chapter 7.3 'Maintenance tasks', § 63. Perform the required maintenance tasks and repairs.

If the machine has been standing still for more than one year, perform the following tasks:

- Change the gearbox oil
- Rinse the lubrication lines with fresh lubricant
- Replace the felt inserts and lubricating pinions
- Check the gaskets and replace if necessary

10 Disposal

10.1 Introduction

Observe the following during disposal:

- Adhere to the country-specific regulations
- Separate the material groups
- Dispose of the materials in an environmentally friendly way
- Recycle waste if possible

10.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood chapter 3 'Safety', 20. It concerns your personal safety!

10.1.2 Personnel qualification

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

10.2 Disposal

Your product consists of the following units:

- Packaging
 - Contaminated materials /auxiliary agents (oil paper)
 - Wood
 - Plastic (film)
- Consumables
 - Lubricants (oils/greases)
 - Batteries
- Base unit
 - Metals (steel/aluminum)
 - Plastics (thermoplasts/duroplasts)
 - Contaminated materials/auxiliary agents (felt/cleaning cloths)
 - Electrical material (cables)

10.3 Waste management compliant assemblies

10.3.1 Disassembly

This chapter describes how to disassemble the product.

Prior to disassembly, shut down the product as described in chapter 9.3.1 'Shutdown', [110](#).

⚠ WARNING

Suspended loads



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

Observe the following:

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

⚠ WARNING



Tearing apart the lifting belts

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

Always protect the lifting belts with the guard plate.

⚠ CAUTION

Oils/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.

Disassemble the product as follows:

- 1** Remove connecting elements
(cables / energy chains)
- 2** Disassemble moving axes
- 3** Remove the gearbox and drain the oil
- 4** Disassemble the carriage
- 5** Disassemble fixed assemblies
(axes / uprights)
- 6** Take the assemblies apart and separate the different materials

The product has been disassembled.

10.3.2 Material groups

Dispose of the material groups in accordance with the following table.

Material	Disposal route
Contaminated materials/auxiliary agents	Hazardous waste
Wood	Municipal waste
Plastic	Collecting point or municipal waste
Lubricants	Collecting point Disposal in accordance with the safety data sheets 3.4.4 'Safety data sheets (MSDS)', 29
Batteries	Battery collection
Metals	Scrap metal collection
Electrical material	Electrical rubbish

Tab. 10-1 Disposal: material groups

10.4 Disposal facilities, authorities

The disposal facilities and authorities differ from country to country. Observe the local laws and regulations on disposal.

II Spare part supply

III.1 Explanations regarding the spare parts list

The spare parts list can be found in chapter 13 'Appendix', 121. It contains position drawings and the complete parts list of your product.

III.1.1 Positioning drawings

The positions of the spare parts can be seen on the drawings. These are standard drawings. Individual positions or images might differ from your product.

III.1.2 Parts list

The parts list contains all parts of your product. The spare parts and wear items are indicated as described in the explanation of symbols.

Explanation of symbols

D00094

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fax +41 62 916 95 29
info@ch.gudel.com

14.07.2008 / Page 1 of 1

VS0035 2-Amod ZP-4 M MO mec 3.10 10947-001A

Position	Item number	Text	Drawing	Quantity	Unit	E
300	V000134	Y-Axis LP220/220-25 V L=9200	8523-032	1	Stk	E
302	0141004	Energy chain 390.17.200.0 IGUS	390.17.200.0	77	Stk	E
400	0916667	Y-Carriage ZP-4	8523-030	2	Stk	E
900	406015-10.00	Worm gear unit AE060/L left Ratio i=10.00	AE060	2	Stk	E
910	406089	Motor flange 060 18x116x116 ø130/110	8030-018a	2	Stk	E
1000	0910499	Mechanical multi limit switch accessories 750 Y	8523-024	2	Stk	E
1100	230803	Felt pinion for lubrication ø40.6x20, Modul m=2.387 pitch P=7.5, Z=15	8102-039d	1	Stk	V

D003806a

Fig. II-1 *Explanation of symbols*

A *Spare part status*

Spare part status (column E): E = Spare part
V = Wear item

11.2 Service departments

If you have questions on service, please use the service form at www.gudel.com or contact the offices in the appropriate country:

Germany: +49 6291 6446 41

Great Britain: +44 24 7669 5444

India: +91 20 5622 7165

Italy: +39 02 9217021

South Korea: +82 2168 98 00

Taiwan: +88 635 97 8808

USA: +1 734 214 0000

All other countries and Switzerland: +41 62 916 91 91

For urgent service requests, our Helpdesk provides after-hour assistance (24-hour support):

Europe/Asia: +41 62 916 9170 service@ch.gudel.com

USA: +1 248 456 0440

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

- Serial no.
- Part list no.
- Drawing number (if applicable)

I2 Index

A

Appendix	121
Assembly	
Beams	41, 44
Coupling	102
Assembly instructions for partly completed machinery	9
Attaching	
Optional components	50
Slings	38, 73
Authorities	114
Auxiliary agents	59
Axis names	32

B

Base fixing	46
Adhesive anchor	46
Welded joint	48
Beams	
Connecting	45
Installation	41
Mounting	44
Blocking	
Drive pinion	96
Bumper unit	
Replacing	84

C

Cables and lines	51
Changes	21
Changing	
Gearbox oil	76
Checking	
Delivery	36
Cleaning	111
Cleaning agents	59
Commissioning	33
Connecting	
Beams	45
Consumables	59

Coupling

Assembling	102
Disassembly	101
Replacing	100

D

Declaration of incorporation	22
Decommissioning	109, 110
Delivery	
Checking	36
Design	30
Disassembling the guideway	89
Disassembling the rack	91
Disassembly	113
Coupling	101
Drive with pinion	74, 103
Motor	101
Disposal	112
Disposal facilities	114
Drive	
Disassembly with pinion	74, 103
Installation	79, 106
Drive pinion	
Blocking	96

E

Explanation	
Abbreviation	10
Symbols	10
Explanation of abbreviations	10
Explanation of symbols	10

F

Fastening	37
Final tasks	90
Function	30
Functional check	55
Functional description	32
Fundamentals of safety	27

G**Gearbox**

- Changing the oil 76
- Setting the backlash 107

Gearbox unit

- Replacing 103

General inspection

- 65

General rules for occupational

- safety 21

Greases

- 61

Guideway

- Lubricating 64

H**Hazard symbols**

- Manual 23
- Product 26

I**Improper handling of cables**

- 51

Inspecting

- Rack transition 93

Installation

- 36, 49

- Drive 79, 106

Installation instructions

- 21

Installing

- Guideway 89

- Rack 92

Installing the guideway

- 89

Installing the rack

- 92

L**Labeling**

- 111

Liability

- 21

Load

- Attaching 50

Lubricants

- 59

Lubricating

- Guideways 64

- Pinions 64

- Racks 64

Lubricating element

- Replacing 68

Lubricating pinion

- Replacing 71

M**Maintenance**

- 57, 81

- 10000 hours 72

- 150 hours 64

- 2000 hours 67

- 500 hours 65

- Schedule 80

- Tasks 63

Maintenance schedule

- 80

Maintenance tasks 100 hours after

- commissioning 63

Marking

- Lubrication points 62

Material groups

- 114

Measuring instruments

- 83

Monitoring equipment

- 27

Motor

- Assembling 102

- Disassembly 101

- Replacing 100

Mounting aid

- 91

O**Oil change**

- Gearbox 72

Oils

- 60

Operating personnel

- 20

Operation

- 56

Optional components

- Attaching 50

Options

- 19

Other documents

- 108

P**Packing symbols**

- 34

Parts list

- 115

Personnel qualifications

- 33, 59, 82, 109, 112

Pinion

- Lubricating 64

Position drawings

- 115

Prerequisites	36
Base	36
Lifting unit	36
Lines	36
Maintenance, repair	63, 84
Setup	36
Product	
Description	17
Designation	18
Integrating	50
Safety	20
Product-specific hazards	28
Protective measures	21
Purpose of the document	9
R	
Rack	
Inspection transition	93
Lubricating	64
Recommissioning	111
Repairs	84
Replacing	
Bumper unit	84
Coupling	100
Gearbox unit	103
Guideway	89
Lubricating element	68
Lubricating pinion	71
Motor	100
Rack	91
Roller	86
Wiper	68
Residual danger	20
Roller	
Setting	87
Roller holder	
Arrangement	85
Roller holder arrangement	85
Rollers	
Replacing	86
Rust-proofing	111
S	
Safety	20, 33, 57, 81, 109, 112
Safety data sheets	29
Safety equipment	27
safety regulations	
disregarding	21
Screw locked	11
Service departments	116
Setting	
Gear backlash	107
Roller	87
Tooth flank backlash	95, 97
Setup	36, 37
Shutdown	110
Slings	
Attaching	38, 73, 78, 105
Spare part supply	115
Spare parts list	115
Explanation of symbols	115
Explanations	115
Special symbols	26
Special tools	83
Storage	109
Storage conditions	109
Symbols	
Special symbols	26
Warning symbols	24
T	
Target readership	10
Technical data	19
Temperature ranges	19
Testing instruments	83
Thread rolling screws	16
Tightening torques	
Clamping sets	15
Gearbox screws	78, 105
HV sets	13
Roller holders	14
Screws	11
Tooth flank backlash	
Checking	98
Setting	95, 97
Torque tables	11
Training of operating personnel	56
Transport	34
Transport securing devices	53, 111
Type plate	18

U

Unpacking	36
Upright	
Setting up	39, 42
Use	
Improper	17
Intended	17
Purpose	17

W

Warning symbols	24
Waste management compliant	
assemblies	113
Wiper	
Replacing	68

I3 Appendix

The appendix of this operating manual contains the following documents:

- Hazard analysis / Risk analysis
- Layout
- Options
- Third-party products
- Spare parts list

Hazard analysis / Risk analysis

Layout

Options

Third-party products

Spare parts list