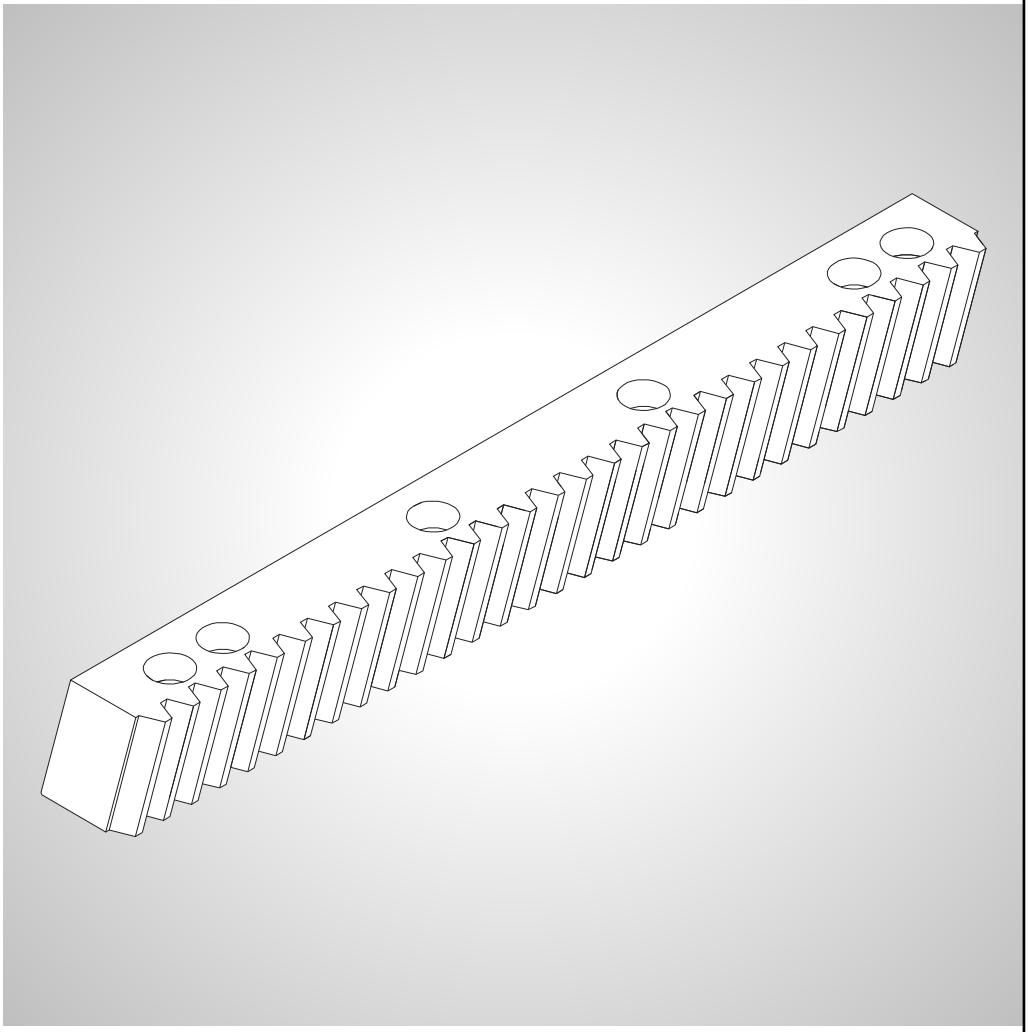
GÜDEL

SERVICE MANUAL

Racks



Project / Order:
Bill of materials:
Serial number:
Year of manufacture: 2021

GÜDEL

Translation of the original instructions

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

27021598686062859_v3.1_EN-US

Revision history

Version	Date	Description
3.0	05/31/2021	Modified: • Using the mounting aid: Installing the rack ➲ 34 • Checking rack transition ➲ 37
2.0	03/26/2021	Product type series 1570xx expanded
1.0	03/27/2019	Basic version, valid for the product type series 2461xx, 2460xx, 2460xx-Q5, 2400xx, 2400xx-Q5, 1580xx, 1550xx

Tab. -1 *Revision history*

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

Table of contents

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

1 General

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

1.1 Purpose of the document

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

- Transport
- Assembly
- Maintenance
- Disposal

1.2 Explanation of symbols/abbreviations

The following symbols and abbreviations are used in this manual:

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

Tab. 1-1 Explanation of symbols/abbreviations

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

2 Safety

2.1 Hazard symbols in the manual

2.1.1 Warning notes

The warning notes are defined for the following 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 identifies a hazard that leads to property damage.

27021598686062859_v3.1_EN-US

Fig. 2-1 *Example: Warning note structure*

2.1.2 Explanation of warning symbol

Warning notes for personal injuries contain the symbol of the corresponding hazard.

Symbol	Explanation of symbols
	Hazards due to general causes
	Hazards due to automatic startup
	Hazards due to heavy components
	Hazards due to environmental pollution
	Hazards due to suspended loads

Tab. 2-1 *Explanation of warning symbol*

2.2 Product safety

Residual danger

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

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

Use

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

The product must never be modified or used in a manner contrary to its intended use. ➲ 21

2.3 Danger areas

The danger area is the area at a product and/or in its surroundings where there is a potential of danger to the life or health of persons, or to the environment, or damage to property. The operator must secure the danger area (protective fence/sensors). No person is allowed access to the danger area. All safety provisions and hazard symbols at the product must be obeyed. The general safety provisions must be observed and complied with.

2.4 Personnel

The generally accepted occupational safety rules and local provisions must be observed and followed.

27021598686062859_v3.1_EN-US

2.4.1 Personal safety equipment

The operator is responsible for providing specialists with personal safety equipment.

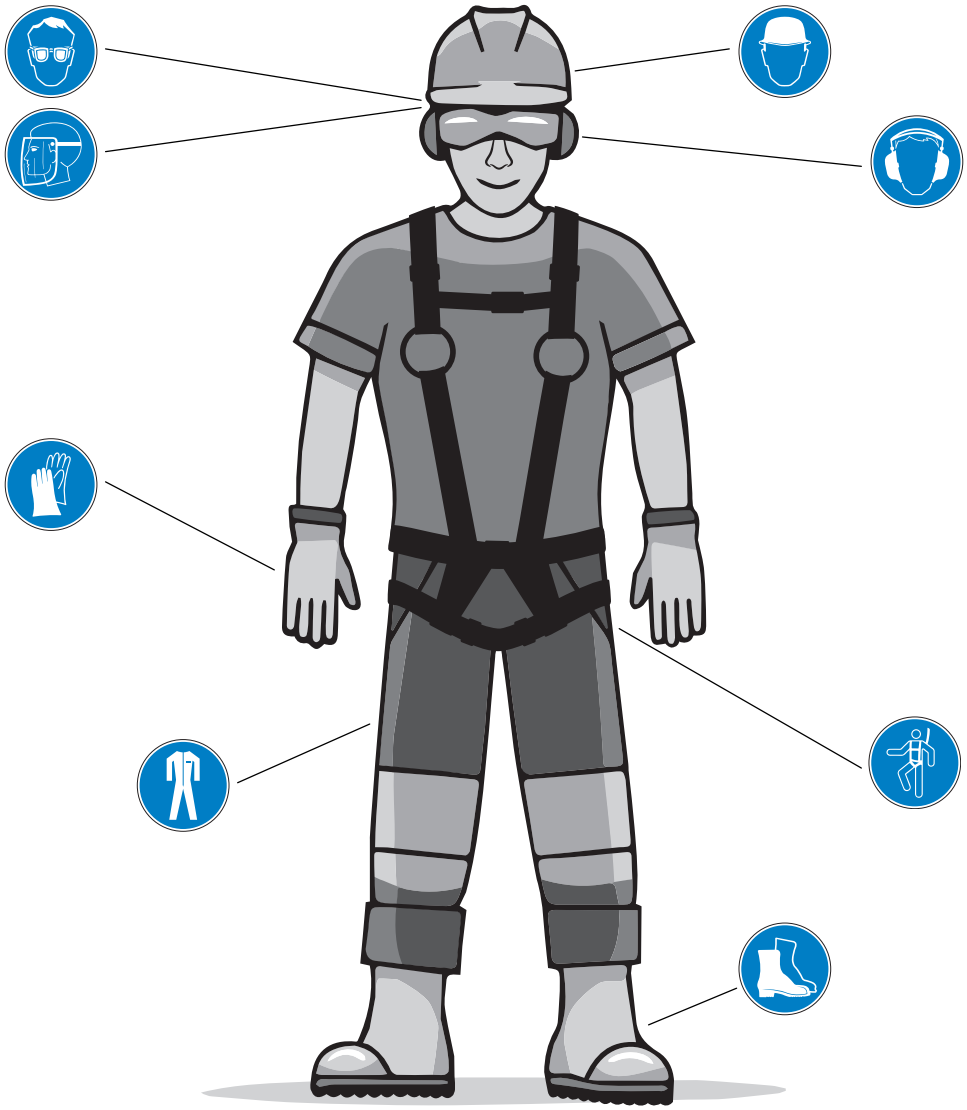


Fig. 2-2 PSA (personal safety equipment)

- *Always wear safety helmet*
- *Always wear protective goggles*
  Wear welding goggles during welding work
- *Wear hearing protection during operation and when working with compressed air*
- *Wear face protection when working with compressed air and hot oil*
- *Wear fall protection system when working from 2 m height.*
- *Always wear safety shoes*
- *Always wear protective clothing*
- *Wear safety gloves when dismantling hot parts and when working with lubricants and detergents*

27021598686062859_v3.1_EN-US

2.4.2 Personnel qualifications

⚠ DANGER

Lack of safety training

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

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

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

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

Persons are authorized if:

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

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

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

2.4.2.1 Transport specialists

The transport specialist:

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

2.4.2.2 Fitters

The fitter:

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

27021598686062859_v3.1_EN-US

2.4.2.3 Manufacturer's technicians

The manufacturer's technician:

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

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

- carrying out mechanical and electrical maintenance work according to instructions
- carrying out mechanical and electrical repair work according to instructions
- cleaning the product
- replacing spare parts
- localizing and fixing malfunctions

2.4.2.4 Maintenance technicians

The maintenance technician:

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

The maintenance technician is responsible for the following tasks:

- carrying out mechanical and electrical maintenance work according to instructions
- cleaning the product
- replacing spare parts
- monitoring and instructing the cleaning staff in the safety zone during the cleaning process

27021598686062859_v3.1_EN-US

2.4.2.5 Service technicians

The service technician:

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

The service technician is responsible for the following tasks:

- carrying out mechanical and electrical repair work according to instructions
- replacing spare parts

2.4.2.6 Disposal specialists

The disposal specialist:

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

2.5 Product-specific hazards

⚠ DANGER

Heavy components

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

- Use appropriate lifting gear
- Use suitable means to secure the parts against tipping over or falling down
- Remove the safety devices only after the product has been completely installed

27021598686062859_v3.1_EN-US

⚠ DANGER

Suspended loads

Improper handling of suspended loads and incorrect lashing of slings can lead to severe injuries or death!

- Use appropriate lifting gear
- Use only lifting units that are not damaged or cracked
- Always protect lifting belts with a suitable edge protection against sharp edges and racks
- Use sufficiently long lifting screws
- Only use self-locking safety load hooks or shackles
- Wear appropriate protective clothing
- Always keep a sufficient safety distance away from suspended loads
- Never enter the area below a suspended load

⚠ CAUTION

Risk of injury

There is a risk of cuts and crushing in the area of the gearbox, pinion, and racks.

- Wear appropriate protective clothing

2.6 Safety data sheets (MSDS)

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

Safety data sheets can be obtained as follows:

- Chemical suppliers usually include safety data sheets along with the substances delivered
- Safety data sheets are available on the Internet.
  (Enter "msds" and the name of the material in a search engine. Safety-relevant information about the material will be displayed to you.)

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

27021598686062859_v3.1_EN-US

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

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

3 Product description

3.1 Use

3.1.1 Intended use

The product is intended exclusively for transferring linear movements.

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

3.1.2 Non-intended use

The product is not intended:

- for operation outside the performance limits specified by Güdel

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

The permissible performance limits may not be exceeded. Güdel's design guidelines must be observed. Refer to the Güdel catalog for the performance limits. http://www.gudel.com/products/linear-guideways.

Do not make any modifications to the product.

27021598686062859_v3.1_EN-US

3.2 Technical data

This contains specific information on the product, depending on the order. Depending on the configuration, special operating conditions are to be observed.

Temperature ranges

The following ambient temperatures and air humidities apply:

Product life phase	Temperature range	Air humidity
Transport	-10 to +60°C	
Operation	+5 to +40°C	Up to and at 85 %, condensation formation is not permissible
Storage	-10 to +40°C	Up to 75 %

Tab. 3-1 *Temperature ranges*

Low temperatures

At temperatures of 6°C and lower we recommend using Duralloy-coated rails, racks, pinions and, where necessary, rollers, as well as blue zinc-plated or phosphate-coated screws.

27021598686062859_v3.1_EN-US

4 Transport

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

Truck	=	Shipped on a transport pallet or squared timbers
Aircraft	=	Shipped in wooden crate or framed pallet and packaged in VCI film
Ship	=	Shipped in crate or container or openly packaged in VCI film

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 🗎 11
It concerns your personal safety!

⚠ DANGER

Suspended loads

Improper handling of suspended loads and incorrect lashing of slings can lead to severe injuries or death!

- Use appropriate lifting gear
- Use only lifting units that are not damaged or cracked
- Always protect lifting belts with a suitable edge protection against sharp edges and racks
- Use sufficiently long lifting screws
- Only use self-locking safety load hooks or shackles
- Wear appropriate protective clothing
- Always keep a sufficient safety distance away from suspended loads
- Never enter the area below a suspended load

27021598686062859_v3.1_EN-US

NOTE

Improper transport

Improper handling of the crates can lead to transport damage!

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

4.1 Packaging

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

4.1.1 Symbols: Attaching slings

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

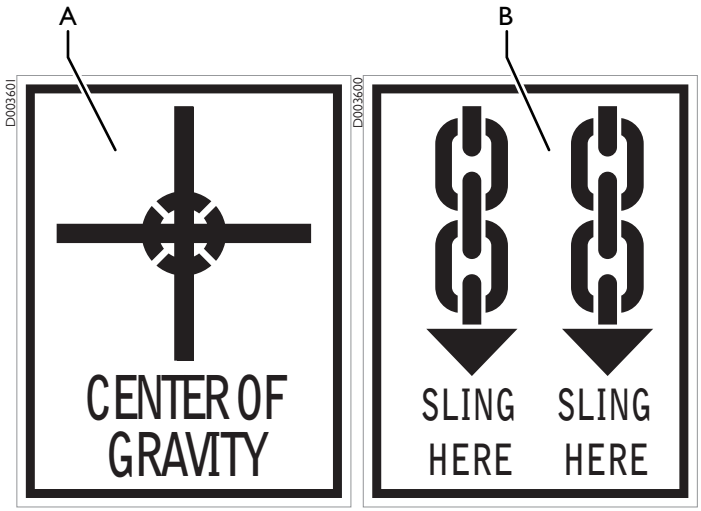


Fig. 4-1 *Attaching slings*

A *Center of gravity*

B *Fastening point*

27021598686062859_v3.1_EN-US

4.1.2 Packaging symbols

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

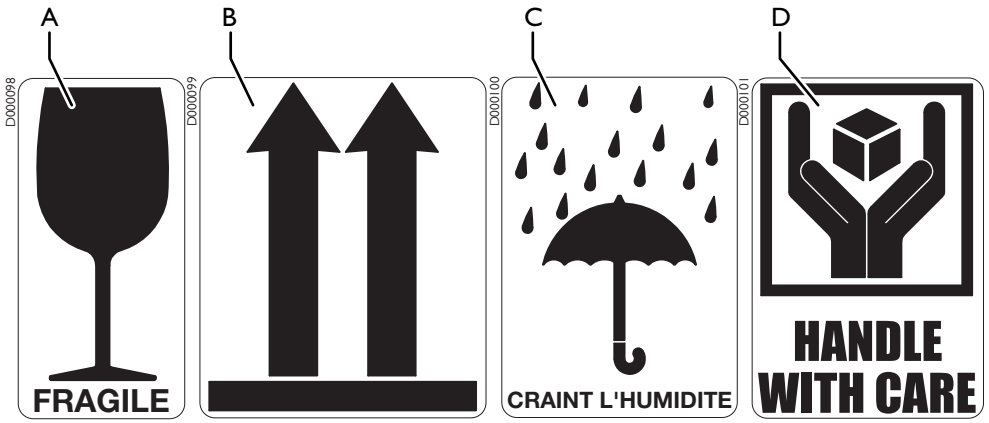


Fig. 4-2 *Packaging symbols*

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

4.2 Industrial trucks

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

4.3 Slings

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

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

5 Commissioning

5.1 Introduction

5.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 🗎 11
It concerns your personal safety!

⚠ DANGER

Suspended loads

Improper handling of suspended loads and incorrect lashing of slings can lead to severe injuries or death!

- Use appropriate lifting gear
- Use only lifting units that are not damaged or cracked
- Always protect lifting belts with a suitable edge protection against sharp edges and racks
- Use sufficiently long lifting screws
- Only use self-locking safety load hooks or shackles
- Wear appropriate protective clothing
- Always keep a sufficient safety distance away from suspended loads
- Never enter the area below a suspended load

⚠ DANGER

Heavy components

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

- Use appropriate lifting gear
- Use suitable means to secure the parts against tipping over or falling down
- Remove the safety devices only after the product has been completely installed

27021598686062859_v3.1_EN-US

⚠ CAUTION

Risk of injury

There is a risk of cuts and crushing in the area of the gearbox, pinion, and racks.

- Wear appropriate protective clothing

5.1.2 Personnel qualifications

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

5.2 Intermediate storage

Observe the storage conditions if the product needs to be stored for a certain amount of time before assembly. ➲ 81

5.3 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 oiled paper. Remove packaging carefully.

⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- 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

27021598686062859_v3.1_EN-US

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

Dispose of the packaging in accordance with the local waste regulations.

Checking the delivery

Check the content of the delivery by comparing it with the accompanying documents. Check the product for damage. Report transport damage promptly.

5.4 Special tools, testing and measuring instruments

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

Tool	Use	Item number
Sharpening stone	Rubbing reference surfaces	0503016
Test pin	Checking rack transition	
Mounting aid	Installing the rack: Module 1.5, straight toothed	902411
Mounting aid	Installing the rack: Module 2, straight toothed	902412
Mounting aid	Installing the rack: Module 2.5, straight toothed	902413
Mounting aid	Installing the rack: Module 3, straight toothed	902414
Mounting aid	Installing the rack: Module 4, straight toothed	902415
Mounting aid	Installing the rack: Module 5, straight toothed	902416
Mounting aid	Installing the rack: Module 6, straight toothed	902417

27021598686062859_v3.1_EN-US

Tool	Use	Item number
Mounting aid	Installing the rack: Module 8, straight toothed	902418
Mounting aid	Installing the rack: Module 10, straight toothed	902419
Mounting aid	Installing the rail/rack: Module 1.5, helical	902280
Mounting aid	Installing the rail/rack: Module 2, helical	902281
Mounting aid	Installing the rail/rack: Module 2.5, helical	902282
Mounting aid	Installing the rail/rack: Module 3, helical	902283
Mounting aid	Installing the rack: Module 4, helical	902284
Mounting aid	Installing the rack: Module 5, helical	902285
Mounting aid	Installing the rack: Module 6, helical	902286
Mounting aid	Installing the rack: Module 8, helical	902287
Mounting aid	Installing the rack: Module 10, helical	902288
Screw clamps	• Install the racks • Install the rail • Connect the side panels • Straighten beams	

Tab. 5-1 *Special tools, testing and measuring instruments*

27021598686062859_v3.1_EN-US

5.5 Installing

5.5.1 General

The following describes the steps for setting up and fastening the product.

Tightening torques

Unless otherwise indicated, adhere to the tightening torques of Güdel.
➲ Chapter 10, 🗎 95

Product versions

The product is available in numerous designs. Several of the available versions are described below.

5.5.2 Prerequisites

Lifting units

Lifting units are required for setting up and installing the product. Make sure that appropriately dimensioned devices (crane, etc.) are available.

Material of the adjacent construction

The material of the adjacent construction features at least the strength of steel S235.

Opposing radius and abutment shoulder

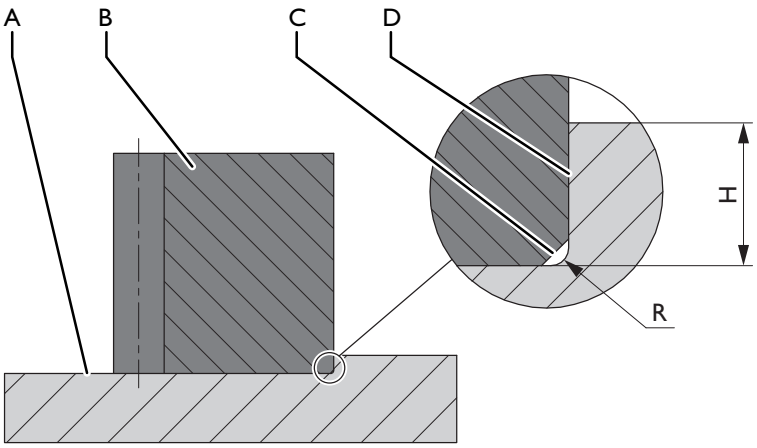


Fig. 5-1 *Opposing radius and abutment shoulder*

A	*Basal surface*	*C*	*Chamfer*
B	*Rack*	*D*	*Abutment shoulder*

27021598686062859_v3.1_EN-US

The racks have a chamfer of 0 to 3 mm. The counter radius R always has to be at least 0.2 mm smaller.

The minimum height H of the abutment shoulder can be found in the following table:

Module	Chamfer [mm]	R [mm]	min. height H [mm]
up to 4 mm	0	sharp-edged	5
up to 4 mm	1	< 0.8	5
up to 4 mm	2	< 1.8	5
more than 4 mm	0	sharp-edged	6
more than 4 mm	1	< 0.8	6
more than 4 mm	3	< 2.8	6

Tab. 5-2 *minimum height H of the abutment shoulder*

5.5.3 Rack

5.5.3.1 Using the mounting aid: Installing the rack

The rack beginning and rack end each form a half tooth gap. For a precise and quiet transition between two racks, the installation aid must be used. ➲ 30

Ensure that there is always a gap between two racks. The gap allows the rack to be readjusted in both directions.

After assembly, the rack transition must be checked. ➲ 37

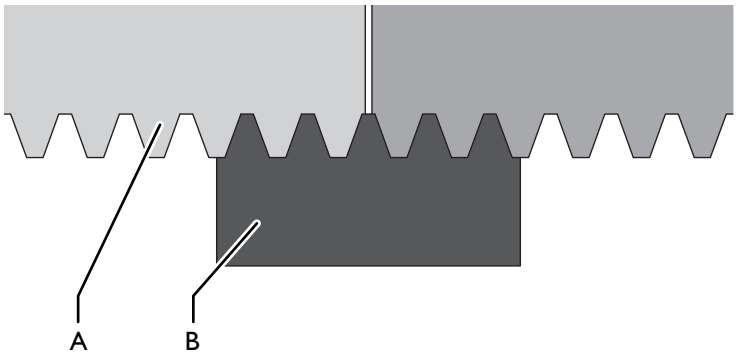


Fig. 5-2 *Installation aid for rack installation*

A *Rack*

B *Installation aid*

27021598686062859_v3.1_EN-US

5.5.3.2 Installing the rack

⚠ DANGER

Risk of injury

For statics-related reasons, the racks come partially pinned ex-factory. Missing pins can cause severe or fatal injuries.

- These racks must be pinned after being replaced

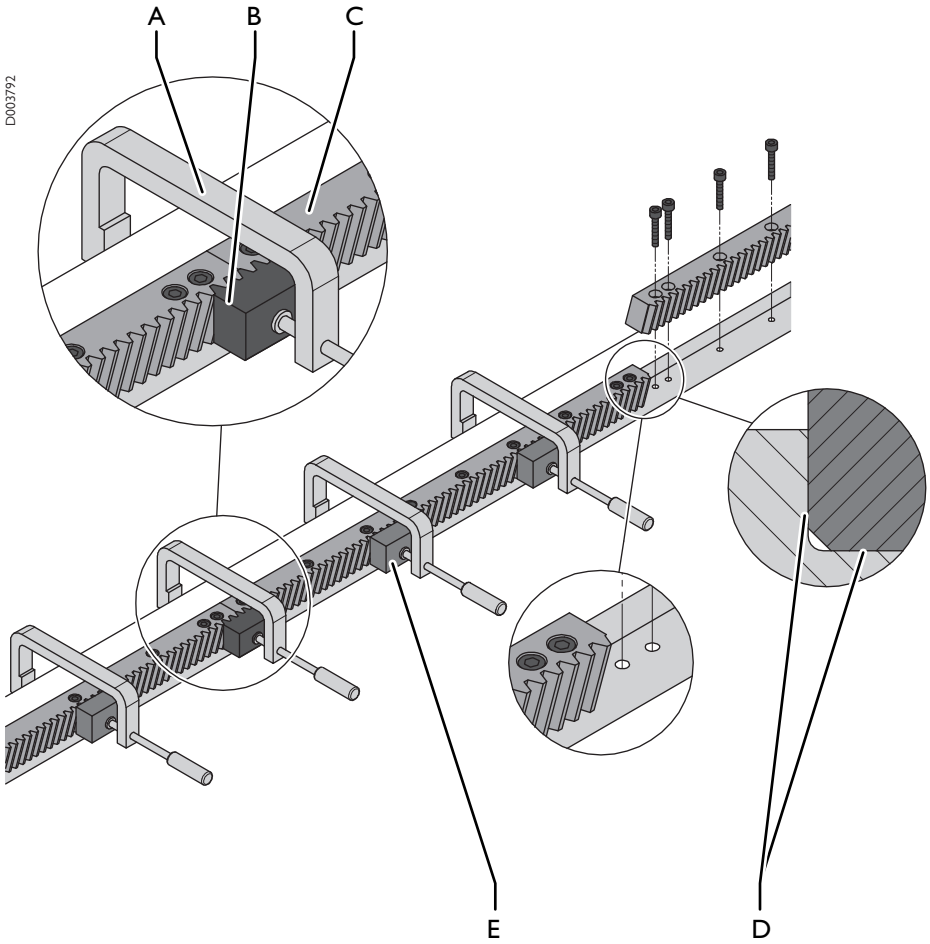


Fig. 5-3 *Installing the rack*

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

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

Tab. 5-3 *Cleaning agents: Rack*

Install the rack as follows:

Prerequisite: For combinations containing three racks or more, install the middle rack first

Prerequisite: For combinations that include a pinned rack, install the rack to be pinned first

1 Clean the reference surfaces and rack thoroughly and rub a sharpening stone across them

2 Clamp rack with screw clamps against reference surfaces
(Be sure to apply the screw clamp at the level of the screw to be tightened.

3 Tighten all screws

4 Check rack transition ➲ 37

5 If there are deviations:

5.1 Remove screws and racks

5.2 Repeat the procedure

The rack has been installed.

27021598686062859_v3.1_EN-US

5.5.3.3 Check rack transition

Rack quality and module ➲ 🗎 40

Adjusting tool for rack transition

Güdel provides an adjusting tool for simple checking of the rack transition

Case set	Material number
Adjusting tool for rack transition, module 2	10454798
Adjusting tool for rack transition, module 2.5	10460512
Adjusting tool for rack transition, module 3	10460602
Adjusting tool for rack transition, module 4	10454683

Tab. 5-4 *Adjusting tool for rack transition*

27021598686062859_v3.1_EN-US

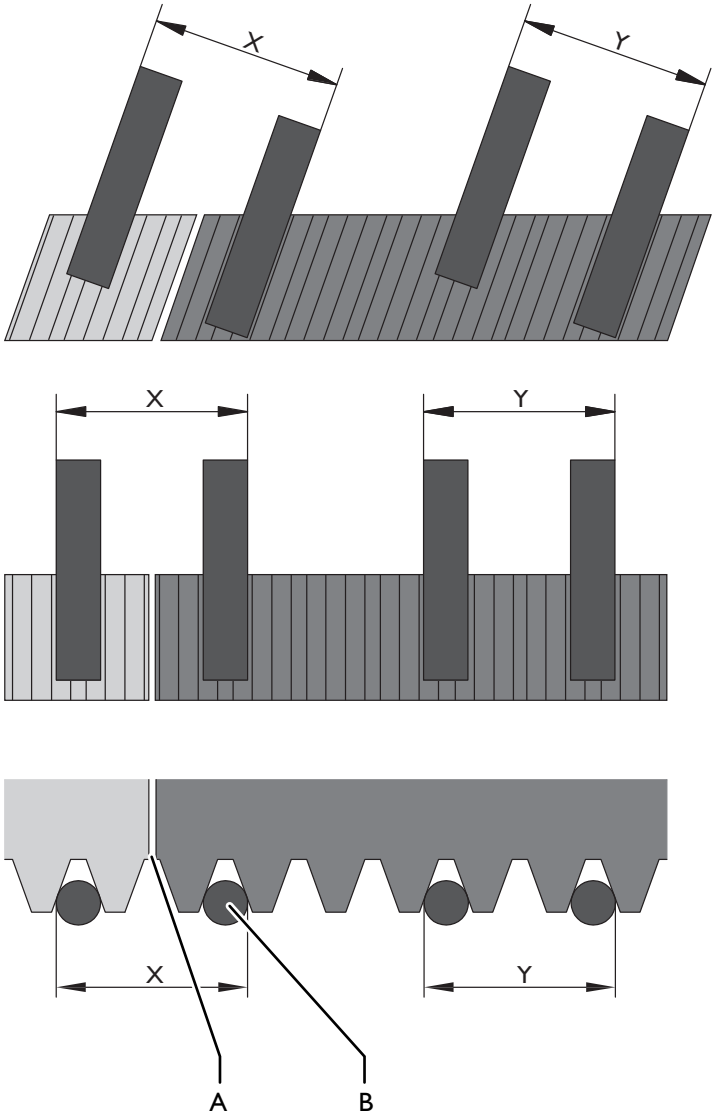


Fig. 5-4 *Checking rack transition*

A *Rack transition*

B *Gauge pin (diameter D = 2 × m ; accuracy: Tolerance class 1 in accordance with DIN 2269)*

Rack quality	Permissible deviation [mm]	
	Module m ≤ 3	Module 3 < m ≤ 8
Q4 h21	0.006	0.010
Q5 h22	0.008	0.012
Q6 h23	0.012	0.012
Q7 h25	0.016	0.016
Q8 h25	0.016	0.016
Q8 h27	0.016	0.016
Q9 h27	0.016	0.016

Tab. 5-5 *Permissible deviation of the rack transition*

Check the rack transition as follows:

1 Apply the gauge pin as shown in the illustration

2 Check dimensions X and Y
(Permissible deviation between value X and Y in accordance with preceding table)

The rack transition is checked.

Rack quality and module

The quality and module are found in the following table:

Material number	Rack quality hardened rack	Helix angle β [°]	Module [mm]	Chamfer [mm]
2461xx	6h23	19.5283	1.5; 2; 2.5; 3; 4	2
2461xx	6h23	19.5283	5; 6	3
2460xx	6h23	19.5283	1.5; 2; 2.5; 3; 4	2
2460xx	6h23	19.5283	5; 6; 8; 10	3
2460xx-Q5	5h22	19.5283	1.5; 2; 2.5; 3; 4	2
2460xx-Q5	5h22	19.5283	5; 6; 8;10	3
2400xx	6h23	-	1.5; 2; 2.5; 3; 4	2
2400xx	6h23	-	5; 6; 8; 10	3
2400xx-Q5	5h22	-	1.5; 2; 2.5; 3; 4	2
2400xx-Q5	5h22	-	5; 6; 8; 10	3
1580xx	9h27	19.5283	1.5; 2; 2.5; 3; 4	2
1580xx	9h27	19.5283	5; 6	3
1570xx	8h25	19.5283	2; 2.5; 3; 4	2
1550xx	7h25	19.5283	1.5; 2; 2.5; 3; 4	1
1550xx	7h25	19.5283	5	1

Tab. 5-6 *Rack quality and module*

27021598686062859_v3.1_EN-US

5.5.3.4 Pinning the rack

Pin all racks marked with an "X" in the following table with two straight pins. This is the only way that the feed force FN can be transferred according to the catalog.

For the racks listed below, the specified pinning is insufficient for transferring the feed force FN specified in the catalog:

- Material number 246053 and 246053-Q5
- Material number 246052 and 246052-Q5
- Material number 246032 and 246032-Q5
- Material number 240052 and 240052-Q5

Rack length [mm]	Screw quality	Material number 2461xx	Material number 2460xx	Material number 2400xx
500	8.8	X	X	X
500	12.9	X	X	X
1000	8.8	X	X	X
1000	12.9		X	X
2000	8.8		X	Only rack 240054 needs to be pinned.
2000	12.9			

Tab. 5-7 *Pin the rack – material number 24xxxx*

Rack length [mm]	Screw quality	Material number 1580xx	Material number 1570xx	Material number 1550xx
500	8.8	X	X	X
500	12.9	X	X	X
1000	8.8	X	X	X

27021598686062859_v3.1_EN-US

Rack length [mm]	Screw quality	Material number 1580xx	Material number 1570xx	Material number 1550xx
1000	12.9	X	X	
2000	8.8	Only rack 158064 needs to be pinned.		
2000	12.9			

Tab. 5-8 *Pin the rack – material number 15xxxx*

Güdel recommends application of straight pins in accordance with DIN 7979:1977. The internal thread allows for a simple disassembly of the straight pin.

The maximum transferable static force (for example in case of an emergency stop) on a straight pin can be found in the following table:

Pin Ø	Force F [N]
6	12'600
8	22'500
10	35'000
12	50'000
16	90'000
20	140'000

Tab. 5-9 *Maximum transferable static force (straight pin in acc. with DIN 7979:1977)*

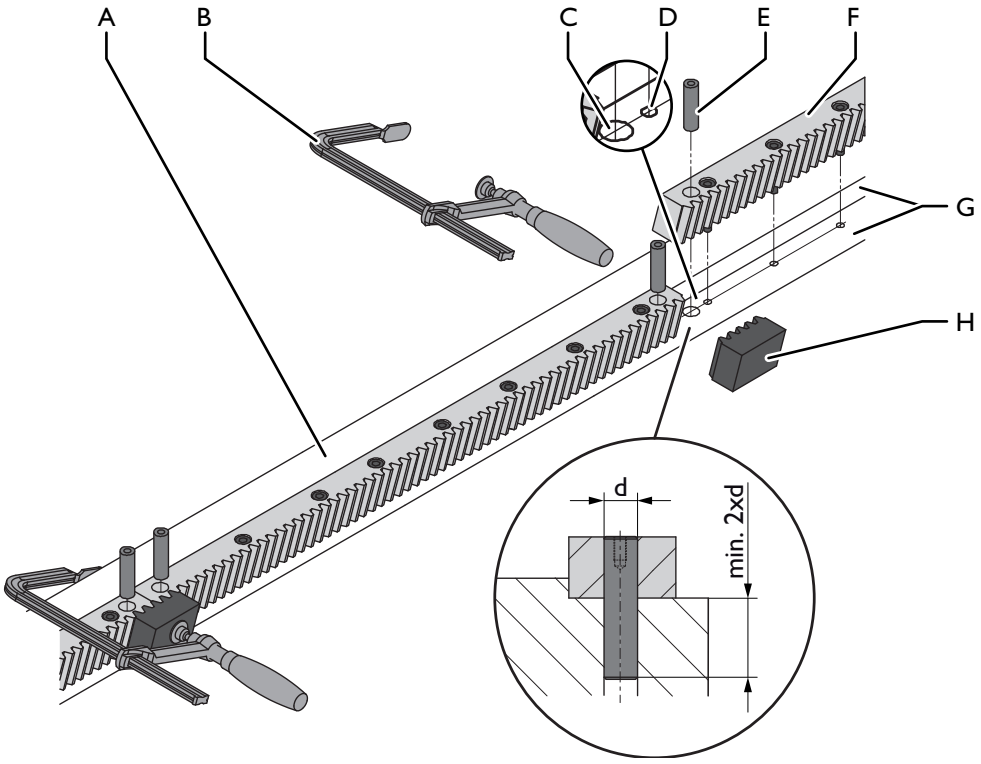


Fig. 5-5 *Pinning the rack*

A	*Adjacent construction*	*E*	*Straight pin*
B	*Screw clamp*	*F*	*Rack*
C	*Pin bore*	*G*	*Reference surface*
D	*Thread bore*	*H*	*Mounting aid*

Pin the rack as follows:

Prerequisite: Reference surface and rack have been cleaned.

Prerequisite: The material of the adjacent construction features at least the strength of steel S235.

Prerequisite: The straight pins are hardened and feature a tolerance of m6.

1 Clamp rack in the area of the bores to reference surfaces with screw clamps and mounting aids.

2 Drill the pin bores.

2.1 If there are bores in the rack: Drill pin bores according to the bores in the rack in the adjacent construction.

2.2 If bores are missing in the rack: Drill pin bores in line with the thread bores through the rack in the adjacent construction.

3 Ream pin bores and drill holes together to a tolerance of H7.

4 Suck off any swarf by vacuum cleaner.

5 Pin the rack with straight pins.

The rack has been pinned.

5.5.3.5 Setting the tooth flank backlash

NOTE

Wear of components

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

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

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

- Roller
- Rail
- Rack
- Pinion
- Gearbox

Basics

27021598686062859_v3.1_EN-US

NOTE

Wear of components

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

- The roller and pinion must run regularly along the entire run length when pushed several times.

Select the tooth flank backlash of the application in accordance with the following:

Application	Tooth flank backlash [mm]
Hardened or soft racks, not ground	0.05
Hardened racks, ground	0.02

Tab. 5-10 *Tooth flank backlash guide values*

27021598686062859_v3.1_EN-US

5.5.3.6 Checking the installed racks

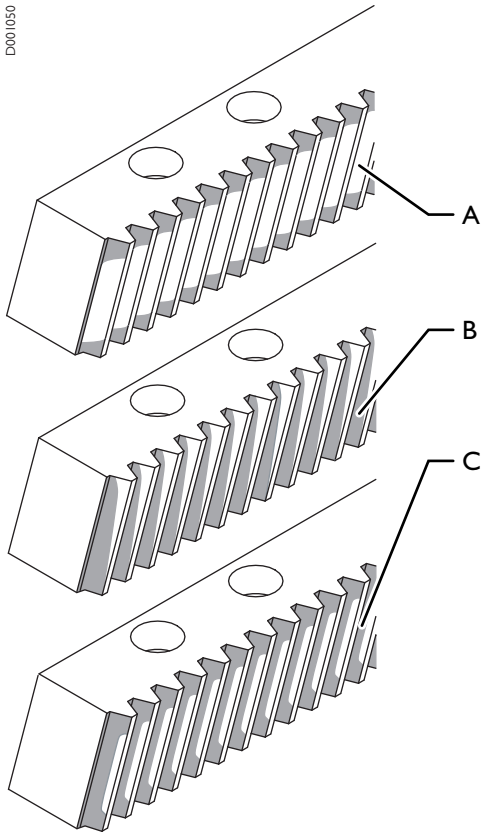


Fig. 5-6 *Checking the installed racks*

A *Correct*

B *Not parallel*

C *Wrong axle spacing*

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

Tab. 5-11 *Cleaning agents: Rack*

Check the installed racks as follows:

Prerequisite: The racks are highly loaded

1 Clean the tooth flanks of the rack thoroughly
2 Coat the tooth flanks with a paste or water-resistant felt pen
3 Move the components along the entire run length several times with the pinion
4 Evaluate the color that has been removed according to the illustration
5 If necessary, realign the components with the pinion

The installed racks have been checked.

5.6 Initial lubrication

Lubricate the rail, rack and pinion before commissioning the product for the first time.

5.6.1 Cleaning the rails and racks

⚠ DANGER

Moving the axis

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

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

⚠ CAUTION

Risk of injury

There is a risk of cuts and crushing in the area of the gearbox, pinion, and racks.

- Wear appropriate protective clothing

27021598686062859_v3.1_EN-US

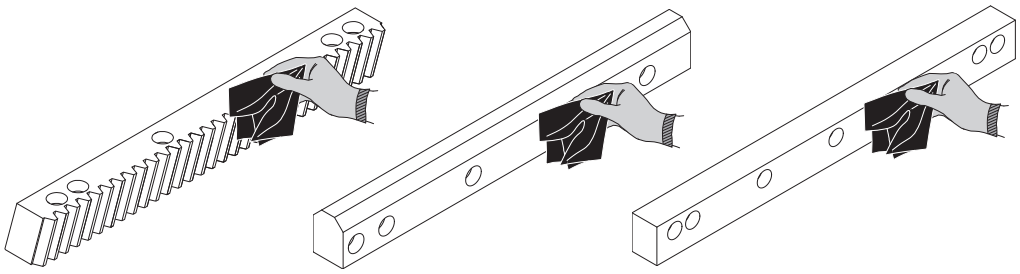


Fig. 5-7 *Cleaning rails and racks*

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

Tab. 5-12 *Cleaning agents: Rails and racks*

Clean the rails and racks as follows:

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

2 Clean the rails and racks thoroughly

The rails and racks have been cleaned.

27021598686062859_v3.1_EN-US

5.6.2 Pre-lubricating rails and racks

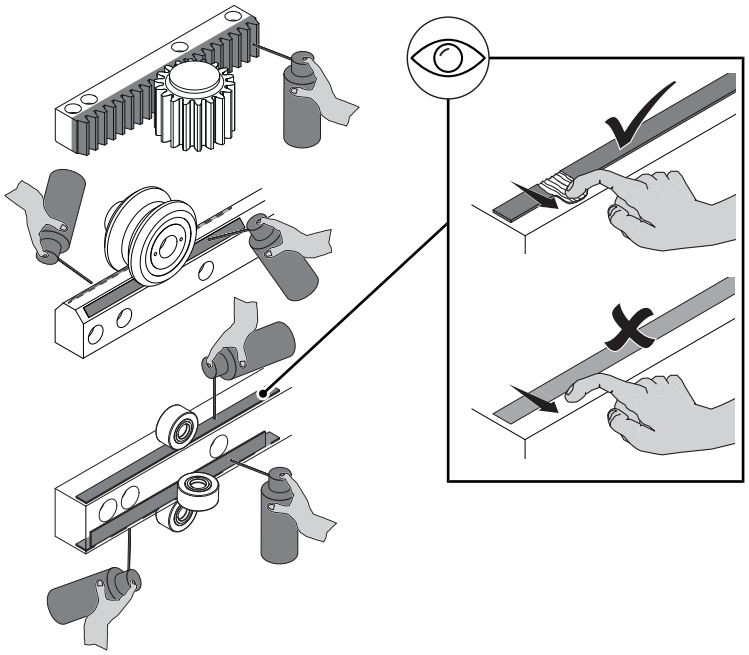


Fig. 5-8 *Pre-lubricating rails and racks*

Lubrication ex works	Specifications	Lubricant quantity
➲ Chapter 6.2.2.1, 54	➲ Chapter 6.2.2.1, 54	

Tab. 5-13 *Lubricant: Rails, racks, and pinions*

Pre-lubricate the rails and racks as follows:

Prerequisite: The rails and racks have been cleaned.

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

2 Pre-lubricate rails and racks according to illustration

The rails and racks have been pre-lubricated.

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

6 Maintenance

6.1 Introduction

Maintenance tasks

The listed tasks have to be carried out at the prescribed time intervals. If they are not carried out at the specified intervals or improperly, all warranty is voided. Observing these obligations is a significant condition so that the product performing without malfunction as well as its long service life.

Work sequences

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

Original spare parts

Only use original spare parts. ➲ 87

Tightening torques

Unless otherwise indicated, adhere to the tightening torques of Güdel.
➲ Chapter 10, 95

6.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 11
It concerns your personal safety!

27021598686062859_v3.1_EN-US

⚠ DANGER

Automatic startup

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

Before working in the danger area:

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

⚠ DANGER

Falling loads

Falling loads can cause property damage, serious injury or death!

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

⚠ DANGER

Heavy components

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

- Use appropriate lifting gear
- Use suitable means to secure the parts against tipping over or falling down
- Remove the safety devices only after the product has been completely installed

27021598686062859_v3.1_EN-US

⚠ CAUTION

Risk of injury

There is a risk of cuts and crushing in the area of the gearbox, pinion, and racks.

- Wear appropriate protective clothing

6.1.2 Personnel qualifications

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

6.2 Consumables and auxiliary agents

6.2.1 Cleaning agents

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

6.2.1.1 Table of cleaning agents

Cleaning agents	Location of application
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)	Rack
	Rails and racks

This table does not purport to be exhaustive.

Tab. 6-1 *Table of cleaning agents*

27021598686062859_v3.1_EN-US

6.2.2 Lubricants

NOTE

Unsuitable lubricants

Using unsuitable lubricants can cause damage to the machine!

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

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

Alternative manufacturers

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

Low temperatures / food grade

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

6.2.2.1 Lubrication

Lubrication

Racks are to be greased regularly with lubricant. For oil lubrication, a felt pinion is used; for grease lubrication a plastic pinion. For the automatic supply of the lubrication points, a complete set with lubricant dispenser, piston distributor, screwed connections, and hose connections can be purchased. This chapter describes the steps for manual lubrication.

Lubrication cycle

Güdel recommends a lubrication cycle of 150 h or 100 km or 400 cycles, whichever occurs first. These specifications correspond to a hypothetical case. Generally, the correct lubricant amount should be calculated using the lubricant amount calculator.
It may happen that you are not able to set the determined lubrication cycle exactly in the lubrication system. In this case select the closest lubrication cycle. Perform lubrication work at the latest when the first signs of tribocorrosion (reddish discoloration of the track) show.

27021598686062859_v3.1_EN-US

The lubrication quantity calculator will help you determine the corresponding settings and lubrication quantities for your application. The lubrication quantity calculator can be found in the download area of our company website http://www.gudel.com

Manual lubrication

The following lubrication systems and lubricants are intended for the manual lubrication of the product:

Fig. 6-1 *Lubricating manually with grease*

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Mobil Mobilux EP 2	KP2K-30 in accordance with DIN 51502	As per instructions	Rails, racks, and pinions	Grease

Tab. 6-2 *Lubricant: Rails, racks, and pinions*

Fig. 6-2 *Lubricating manually with oil*

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Güdel H1 NSF no. 146621	Cannot be determined	As per instructions	Rails, racks, and pinions	Oil

Tab. 6-3 *Lubricant: Rails, racks, and pinions*

27021598686062859_v3.1_EN-US

Fig. 6-3 *Lubricating manually with oil*

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Elkalub FLC 8 H1	Cannot be determined		Pre-lubricating rails and racks	Oil

Tab. 6-4 *Lubricant: Pre-lubricating rails and racks*

6.2.2.2 Lubricant table

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Elkalub FLC 8 H1	Cannot be determined		Pre-lubricating rails and racks	Oil
Güdel H1 NSF no. 146621	Cannot be determined	As per instructions	Rails, racks, and pinions	Oil
Mobil Mobilux EP 2	KP2K-30 in accordance with DIN 51502	As per instructions	Rails, racks, and pinions	Grease

This table does not purport to be exhaustive.

Tab. 6-5 *Lubricant table*

6.3 Maintenance tasks

6.3.1 General prerequisites

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

- If vertical axes are present, secure them against falling
- Switch off the system and secure it with a padlock against being switched on again
- Make sure that all necessary spare parts and wear items are at hand
  ➲ 87

27021598686062859_v3.1_EN-US

6.3.2 Maintenance intervals

The product is subject to natural wear and tear. When it wears out, unplanned downtimes of your system can result. Güdel defines the service life and maintenance intervals of the product to ensure safe, uninterrupted operation.

Operating time

Güdel always uses Power On as the operating time for the maintenance interval indicators. Power On shows the duration in which the drives are located in the control system.

Power-on time

The maintenance intervals refer to the effective operating hours of the product at a duty cycle (ED) of 100%. The duty cycle always refers to the entire process. This means that the duty cycle of specific axes cannot be considered individually.

Power-on time				
100%	80%	60%	40%	20%
2,000	2,500	3,300	5,000	10,000
6,000	7,500	10,000	15,000	30,000
10,000	12,500	16,500	25,000	50,000
20,000	25,000	33,000	50,000	100,000

Tab. 6-6 *Conversion table: Operating hours at the respective duty cycle*

27021598686062859_v3.1_EN-US

Operating conditions

Normal operating conditions are assumed, which correspond to the parameters defined by Güdel when designing the product. If they are rougher than assumed, products may fail earlier. Adjust the maintenance intervals to your operating conditions if necessary.

With prudent operation you can protect your product. Observe the permissible performance limits of the product.
Avoid, in particular:

- Operation near or above the permissible performance limits
- High acceleration and resulting vibrations and operating forces
- Abrasive and/or corrosive environmental conditions
- Long duty cycles
- Always the same axis positions under high load

Exclusion of seals and bearings

The maintenance interval specifications apply without seals and bearing. Seals are subject to special wear and are not considered. In the case of gearboxes, the bearings are also excluded.

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

Operating hours	1-shift operation	2-shift operation	3-shift operation
150	every 4 weeks	every 2 weeks	weekly
2,000	yearly	Every 6 months	Every 4 months
6,000	Every 3 years	Every 1.5 years	yearly
10,000	Every 5 years	Every 2.5 years	Every 20 months
20,000	Every 10 years	Every 5 years	Every 3.3 years

Tab. 6-7 *Maintenance intervals in shift operation (5 days a week)*

27021598686062859_v3.1_EN-US

Operating hours	1-shift operation	2-shift operation	3-shift operation
150	Every 18 days	Every 9 days	Every 6 days
2,000	Every 9 months	Every 4.5 months	Every 3 months
6,000	Every 2.5 years	Every 15 months	Every 10 months
10,000	Every 4 years	Every 2 years	Every 16 months
20,000	Every 7.75 years	Every 3.8 years	Every 2.5 years

Tab. 6-8 *Maintenance intervals in shift operation (7 days a week)*

6.3.3 Special tools, testing and measuring instruments

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

Tool	Use	Item number
Sharpening stone	Rubbing reference surfaces	0503016
Test pin	Checking rack transition	
Mounting aid	Installing the rack: Module 1.5, straight toothed	902411
Mounting aid	Installing the rail/rack: Module 1.5, helical	902280
Mounting aid	Installing the rack: Module 2, straight toothed	902412
Mounting aid	Installing the rail/rack: Module 2, helical	902281

27021598686062859_v3.1_EN-US

Tool	Use	Item number
Mounting aid	Installing the rack: Module 2.5, straight toothed	902413
Mounting aid	Installing the rail/rack: Module 2.5, helical	902282
Mounting aid	Installing the rack: Module 3, straight toothed	902414
Mounting aid	Installing the rail/rack: Module 3, helical	902283
Mounting aid	Installing the rack: Module 4, straight toothed	902415
Mounting aid	Installing the rack: Module 4, helical	902284
Mounting aid	Installing the rack: Module 5, straight toothed	902416
Mounting aid	Installing the rack: Module 5, helical	902285
Mounting aid	Installing the rack: Module 6, straight toothed	902417
Mounting aid	Installing the rack: Module 6, helical	902286
Mounting aid	Installing the rack: Module 8, straight toothed	902418
Mounting aid	Installing the rack: Module 8, helical	902287

27021598686062859_v3.1_EN-US

Tool	Use	Item number
Mounting aid	Installing the rack: Module 10, straight toothed	902419
Mounting aid	Installing the rack: Module 10, helical	902288
Screw clamps	• Install the racks • Install the rail • Connect the side panels • Straighten beams	
Fastening device	Blocking pinion: Worm gear unit HPG/AE030	0917452
Fastening device	Blocking pinion: HPG/ AE045 worm gear unit	0917453
Fastening device	Blocking pinion: Worm gear unit HPG/AE060	0917454
Fastening device	Blocking pinion: HPG/ AE090 worm gear unit	0917447
Fastening device	Blocking pinion: Worm gear unit HPG/AE120	0917455
Fastening device	Blocking pinion: Worm gear unit HPG/AE180	0917456
Pin-type face wrench	Setting the rollers: Sizes 10, 15, 20	999756
Pin-type face wrench	Setting the rollers: Sizes 25, 35	999758

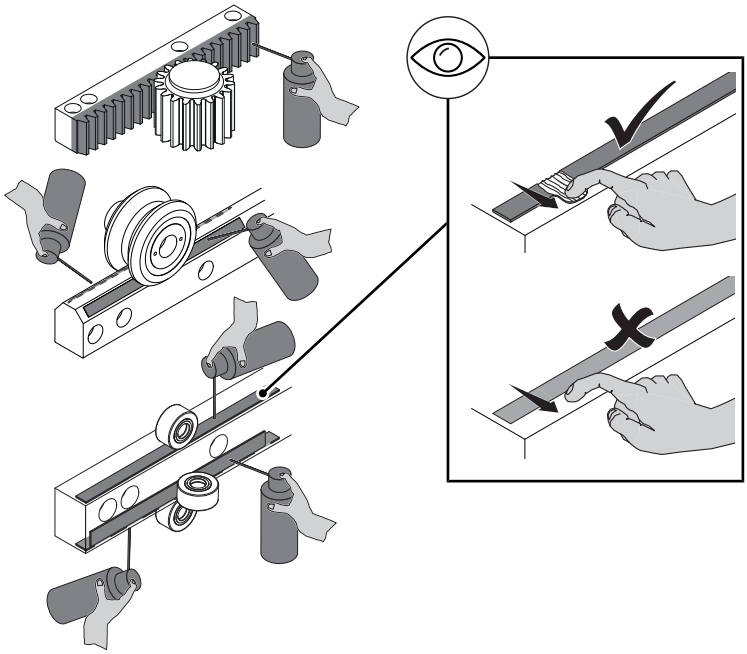
Tab. 6-9 *Special tools, testing and measuring instruments*

27021598686062859_v3.1_EN-US

6.3.4 Maintenance work after cleaning or standstill times 1 - 4 weeks

After cleaning work on the product or a downtime of one to four weeks, carry out the following jobs:

- Check lubrication film on rails and racks and pre-lubricate if necessary



6.3.5 Maintenance tasks after 150 hours

6.3.5.1 Lubricating the rack

Cleaning the rails and racks

⚠ DANGER

Moving the axis

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

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

⚠ CAUTION

Risk of injury

There is a risk of cuts and crushing in the area of the gearbox, pinion, and racks.

- Wear appropriate protective clothing

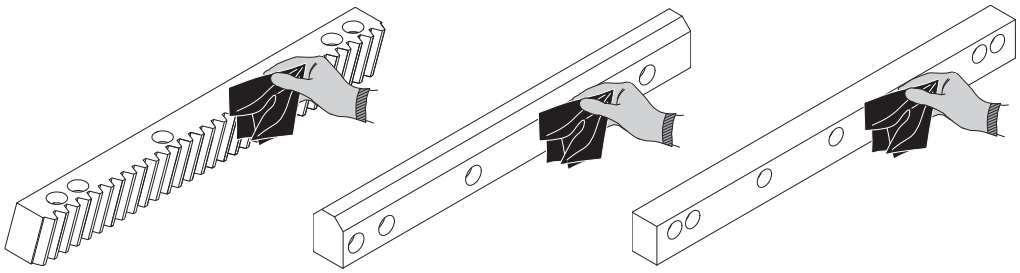


Fig. 6-4 *Cleaning rails and racks*

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

Tab. 6-10 *Cleaning agents: Rails and racks*

Clean the rails and racks as follows:

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

2 Clean the rails and racks thoroughly

The rails and racks have been cleaned.

27021598686062859_v3.1_EN-US

Pre-lubricating rails and racks

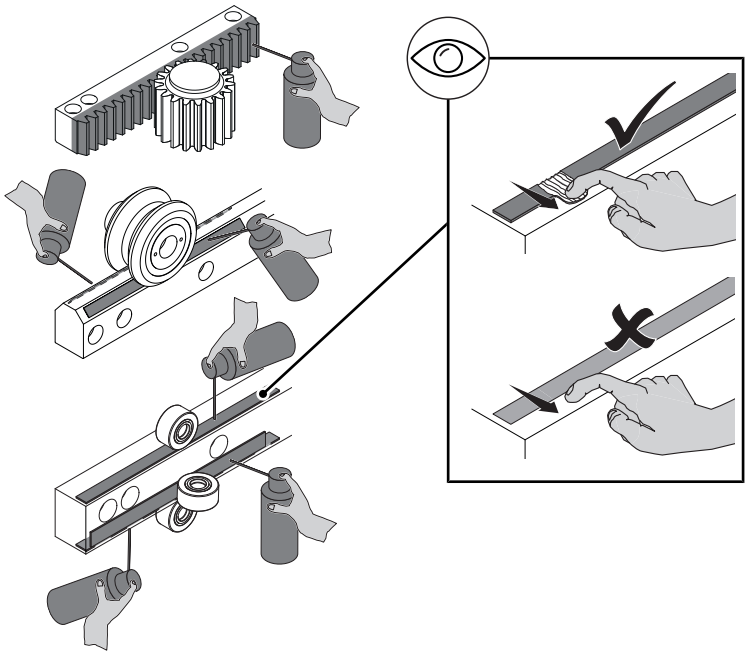


Fig. 6-5 *Pre-lubricating rails and racks*

Lubrication ex works	Specifications	Lubricant quantity
➲ Chapter 6.2.2.1, 54	➲ Chapter 6.2.2.1, 54	

Tab. 6-11 *Lubricant: Rails, racks, and pinions*

Pre-lubricate the rails and racks as follows:

Prerequisite: The rails and racks have been cleaned.

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

2 Pre-lubricate rails and racks according to illustration

The rails and racks have been pre-lubricated.

6.3.6 Maintenance tasks after 20,000 hours

6.3.6.1 Replacing the rack

Replace the component every 20,000 operating hours or after 1,000,000 load changes at the latest.

Disassembling the rack

Disassemble the rack as follows:

1. Switch off the system and padlock it to secure it against being switched on again
2. Attach the slings to the carriage or axis
3. Expose 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 necessary
4. Remove all screws
5. Remove the rack

The rack has been disassembled.

27021598686062859_v3.1_EN-US

Using the mounting aid: Installing the rack

The rack beginning and rack end each form a half tooth gap. For a precise and quiet transition between two racks, the installation aid must be used. ➲ 59

Ensure that there is always a gap between two racks. The gap allows the rack to be readjusted in both directions.

After assembly, the rack transition must be checked. ➲ 68

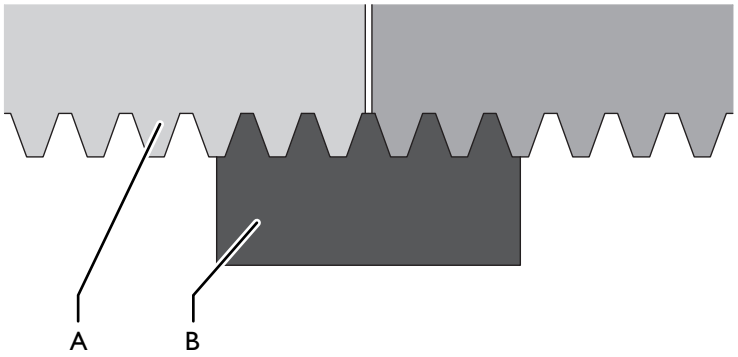


Fig. 6-6 *Installation aid for rack installation*

A *Rack*

B *Installation aid*

27021598686062859_v3.1_EN-US

Installing the rack

⚠ DANGER

Risk of injury

For statics-related reasons, the racks come partially pinned ex-factory. Missing pins can cause severe or fatal injuries.

- These racks must be pinned after being replaced

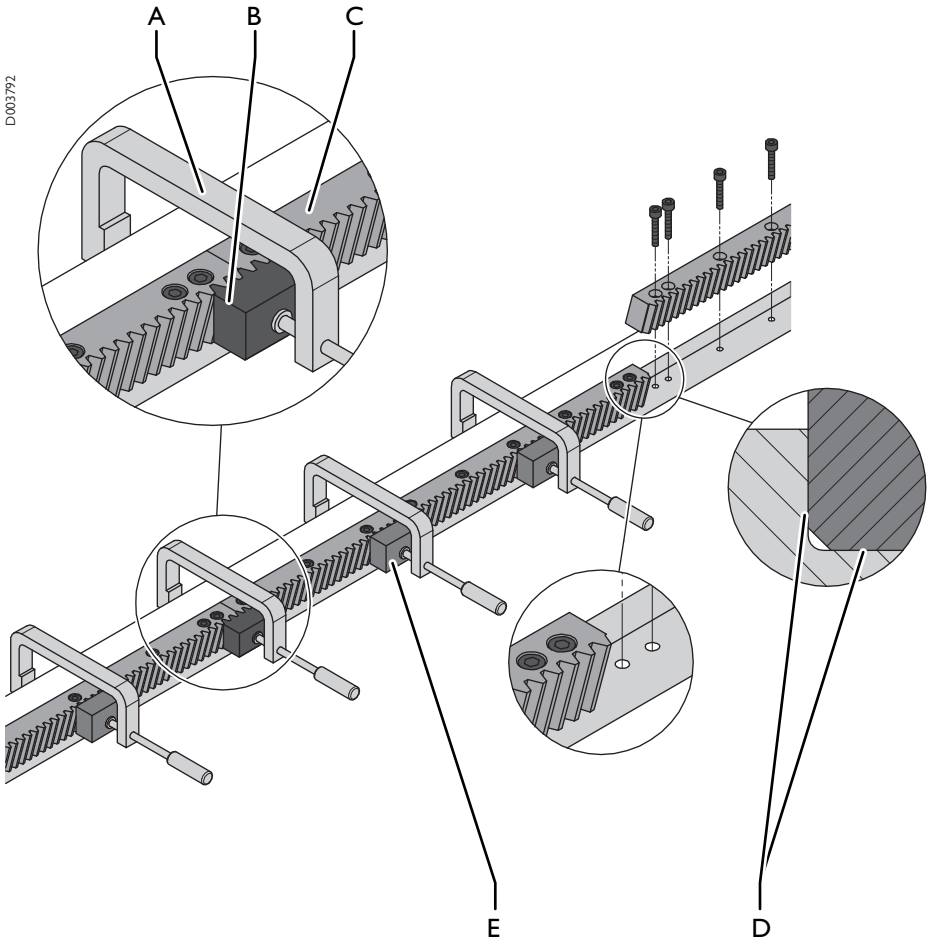


Fig. 6-7 *Installing the rack*

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

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

Tab. 6-12 *Cleaning agents: Rack*

Install the rack as follows:

Prerequisite: For combinations containing three racks or more, install the middle rack first

Prerequisite: For combinations that include a pinned rack, install the rack to be pinned first

1 Clean the reference surfaces and rack thoroughly and rub a sharpening stone across them

2 Clamp rack with screw clamps against reference surfaces
(Be sure to apply the screw clamp at the level of the screw to be tightened.

3 Tighten all screws

4 Check rack transition ➲ 68

5 If there are deviations:

5.1 Remove screws and racks

5.2 Repeat the procedure

The rack has been installed.

Check rack transition

Rack quality and module ➲ 40

Adjusting tool for rack transition

Güdel provides an adjusting tool for simple checking of the rack transition

Case set	Material number
Adjusting tool for rack transition, module 2	10454798
Adjusting tool for rack transition, module 2.5	10460512
Adjusting tool for rack transition, module 3	10460602
Adjusting tool for rack transition, module 4	10454683

Tab. 6-13 *Adjusting tool for rack transition*

27021598686062859_v3.1_EN-US

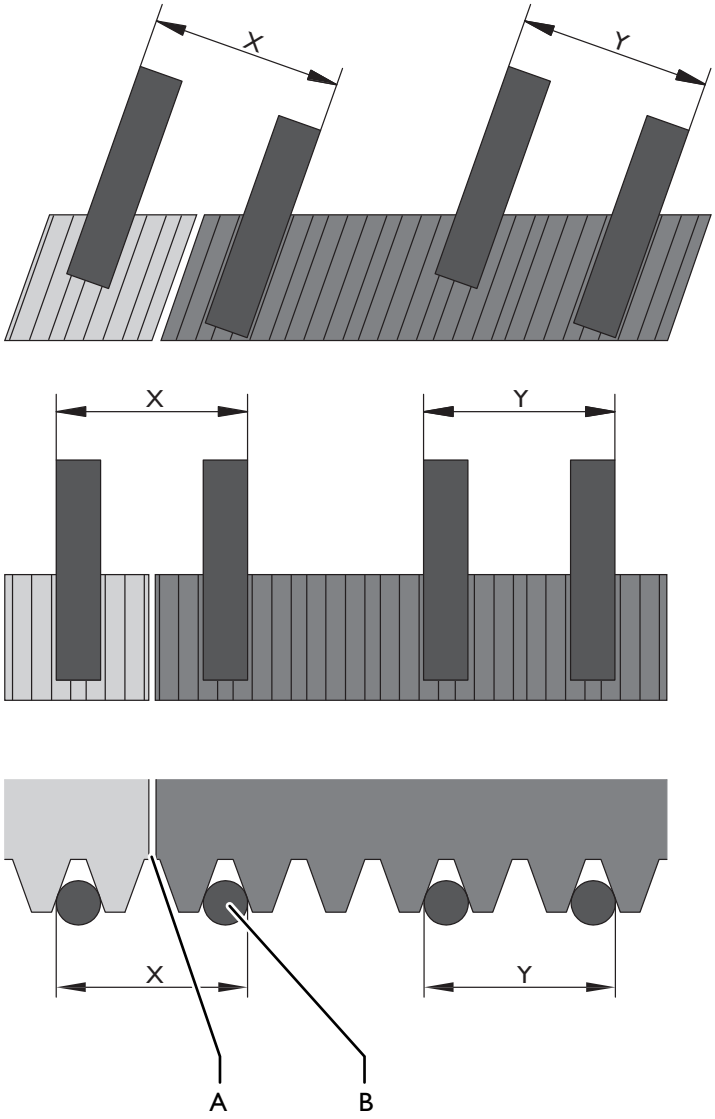


Fig. 6-8 *Checking rack transition*

A *Rack transition*

B *Gauge pin (diameter D = 2 × m ; accuracy: Tolerance class 1 in accordance with DIN 2269)*

Rack quality	Permissible deviation [mm]	
	Module m ≤ 3	Module 3 < m ≤ 8
Q4 h21	0.006	0.010
Q5 h22	0.008	0.012
Q6 h23	0.012	0.012
Q7 h25	0.016	0.016
Q8 h25	0.016	0.016
Q8 h27	0.016	0.016
Q9 h27	0.016	0.016

Tab. 6-14 *Permissible deviation of the rack transition*

Check the rack transition as follows:

1 Apply the gauge pin as shown in the illustration

2 Check dimensions X and Y
(Permissible deviation between value X and Y in accordance with preceding table)

The rack transition is checked.

27021598686062859_v3.1_EN-US

Pinning the rack

Pin all racks marked with an "X" in the following table with two straight pins. This is the only way that the feed force FN can be transferred according to the catalog.

For the racks listed below, the specified pinning is insufficient for transferring the feed force FN specified in the catalog:

- Material number 246053 and 246053-Q5
- Material number 246052 and 246052-Q5
- Material number 246032 and 246032-Q5
- Material number 240052 and 240052-Q5

Rack length [mm]	Screw quality	Material number 2461xx	Material number 2460xx	Material number 2400xx
500	8.8	X	X	X
500	12.9	X	X	X
1000	8.8	X	X	X
1000	12.9		X	X
2000	8.8		X	Only rack 240054 needs to be pinned.
2000	12.9			

Tab. 6-15 *Pin the rack – material number 24xxxx*

Rack length [mm]	Screw quality	Material number 1580xx	Material number 1570xx	Material number 1550xx
500	8.8	X	X	X
500	12.9	X	X	X
1000	8.8	X	X	X

27021598686062859_v3.1_EN-US

Rack length [mm]	Screw quality	Material number 1580xx	Material number 1570xx	Material number 1550xx
1000	12.9	X	X	
2000	8.8	Only rack 158064 needs to be pinned.		
2000	12.9			

Tab. 6-16 *Pin the rack – material number 15xxxx*

Güdel recommends application of straight pins in accordance with DIN 7979:1977. The internal thread allows for a simple disassembly of the straight pin.

The maximum transferable static force (for example in case of an emergency stop) on a straight pin can be found in the following table:

Pin Ø	Force F [N]
6	12'600
8	22'500
10	35'000
12	50'000
16	90'000
20	140'000

Tab. 6-17 *Maximum transferable static force (straight pin in acc. with DIN 7979:1977)*

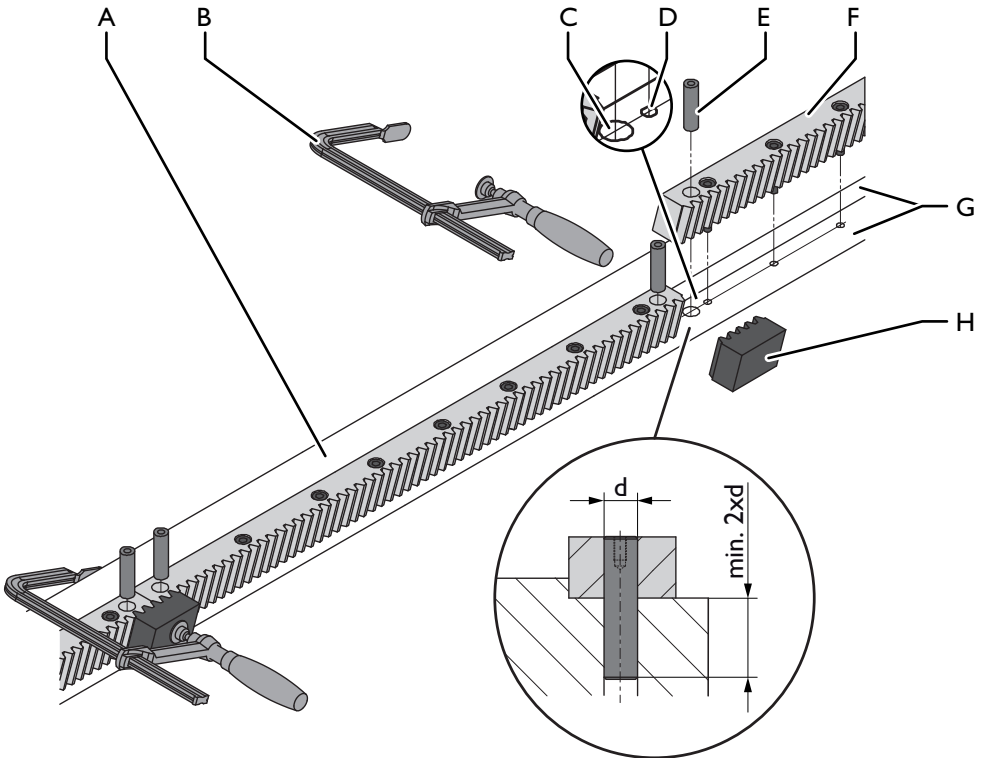


Fig. 6-9 *Pinning the rack*

A	*Adjacent construction*	*E*	*Straight pin*
B	*Screw clamp*	*F*	*Rack*
C	*Pin bore*	*G*	*Reference surface*
D	*Thread bore*	*H*	*Mounting aid*

27021598686062859_v3.1_EN-US

Pin the rack as follows:

Prerequisite: Reference surface and rack have been cleaned.

Prerequisite: The material of the adjacent construction features at least the strength of steel S235.

Prerequisite: The straight pins are hardened and feature a tolerance of m6.

1 Clamp rack in the area of the bores to reference surfaces with screw clamps and mounting aids.

2 Drill the pin bores.

2.1 If there are bores in the rack: Drill pin bores according to the bores in the rack in the adjacent construction.

2.2 If bores are missing in the rack: Drill pin bores in line with the thread bores through the rack in the adjacent construction.

3 Ream pin bores and drill holes together to a tolerance of H7.

4 Suck off any swarf by vacuum cleaner.

5 Pin the rack with straight pins.

The rack has been pinned.

27021598686062859_v3.1_EN-US

Setting the tooth flank backlash

NOTE

Wear of components

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

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

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

- Roller
- Rail
- Rack
- Pinion
- Gearbox

Basics

NOTE

Wear of components

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

- The roller and pinion must run regularly along the entire run length when pushed several times.

Select the tooth flank backlash of the application in accordance with the following:

Application	Tooth flank backlash [mm]
Hardened or soft racks, not ground	0.05
Hardened racks, ground	0.02

Tab. 6-18 *Tooth flank backlash guide values*

27021598686062859_v3.1_EN-US

Checking the installed racks

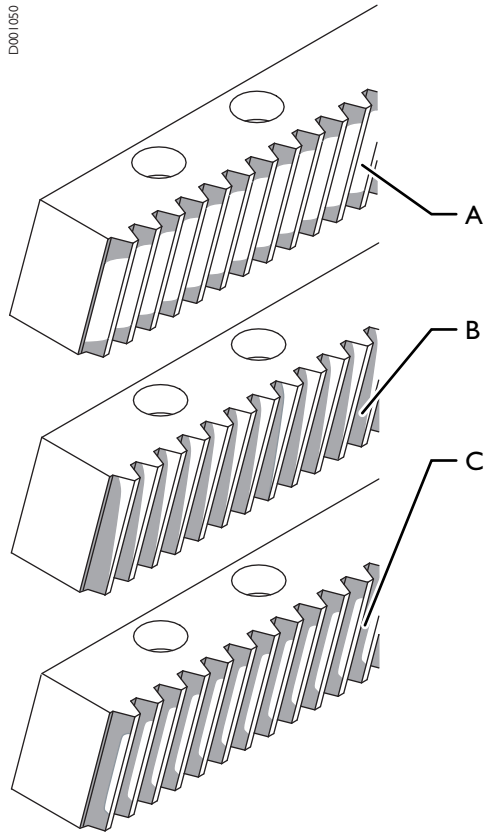


Fig. 6-10 *Checking the installed racks*

- *A* *Correct*
- *B* *Not parallel*
- *C* *Wrong axle spacing*

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

Tab. 6-19 *Cleaning agents: Rack*

27021598686062859_v3.1_EN-US

Check the installed racks as follows:

Prerequisite: The racks are highly loaded

1 Clean the tooth flanks of the rack thoroughly
2 Coat the tooth flanks with a paste or water-resistant felt pen
3 Move the components along the entire run length several times with the pinion
4 Evaluate the color that has been removed according to the illustration
5 If necessary, realign the components with the pinion

The installed racks have been checked.

Final tasks

Perform the final tasks as follows:

1 Move the carriage along the axis if necessary
2 Retract the vertical axis if necessary
3 Remove the slings
4 Set the rollers
5 Set the tooth flank backlash

The final tasks have been performed.

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

6.4 Maintenance table

Maintenance work	Maintenance cycle [h]	Duration [min]	Target group	Lubricant Cleaning agents	Further information
Lubricating the rack	150		Service technicians The manufacturer's technicians Maintenance technicians		➲ Chapter 6.3.5.1, 🗎 63
Replacing the rack	20,000	30	Service technicians Maintenance technicians The manufacturer's technicians		➲ Chapter 6.3.6.1, 🗎 65

This table does not purport to be exhaustive.

Tab. 6-20 Maintenance table

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

7 Decommissioning, storage

7.1 Introduction

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 11
It concerns your personal safety!

7.1.1 Personnel qualifications

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

7.2 Storage conditions

⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- 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

Room

Store the product in a dry location. For information on the required space and the floor capacity, refer to the layout. Use a covering to protect the product against dust and dirt.

27021598686062859_v3.1_EN-US

Temperature The ambient temperature has to be between -10 and +40 °C. Make sure that the product is not subjected to great temperature fluctuations.

Air humidity The air humidity has to be below 75 %.

7.3 Cleaning, rust-proofing

Clean away any dirt and dust from the product. Clean the product thoroughly. Dispose of any cloths soaked in oil or grease in an environmentally friendly manner. ➲ 83
Apply corrosion protection to all bright parts.

27021598686062859_v3.1_EN-US

8 Disposal

8.1 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

8.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 11
It concerns your personal safety!

⚠ DANGER

Suspended loads

Improper handling of suspended loads and incorrect lashing of slings can lead to severe injuries or death!

- Use appropriate lifting gear
- Use only lifting units that are not damaged or cracked
- Always protect lifting belts with a suitable edge protection against sharp edges and racks
- Use sufficiently long lifting screws
- Only use self-locking safety load hooks or shackles
- Wear appropriate protective clothing
- Always keep a sufficient safety distance away from suspended loads
- Never enter the area below a suspended load

27021598686062859_v3.1_EN-US

⚠ DANGER

Heavy components

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

- Use appropriate lifting gear
- Use suitable means to secure the parts against tipping over or falling down
- Remove the safety devices only after the product has been completely installed

8.1.2 Personnel qualifications

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

8.2 Waste management compliant assemblies

8.2.1 Material groups

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

Material	Disposal method
Contaminated materials / auxiliary agents	Hazardous waste
Wood	Municipal waste
Plastic	Collecting point or municipal waste
Lubricant	Collecting point disposal in accordance with the safety data sheets ➲ 🗎 18
Batteries	Battery collection
Metals	Scrap metal collection
Electrical material	Electrical waste

Tab. 8-1 *Disposal: material groups*

27021598686062859_v3.1_EN-US

8.3 Disposal facilities, authorities

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

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

9 Spare parts supply

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

9.1 Service departments

Have the following information available for service inquiries:

- Product, type (as per type plate)
- Project number, order number (as per type plate)
- Serial number (as per type plate)
- Material number (as per type plate)
- Location of the system
- Contact person at the operating company
- Description of the issue
- Drawing number (if applicable)

Regular inquiries

If you have questions relating to service, please use the service form at www.gudel.com or contact the responsible service department:

For all other countries not included in the following list, please contact the service department in Switzerland.

Customer with special agreements should contact the service department specified in the contract.

Americas

Country	Relevant service department	Phone	E-mail
Brazil	Güdel Lineartec Comércio de Automção Ltda. Rua Américo Brasiliense n° 2170, cj. 506 Chácara Santo Antonio CEP 04715-005 São Paulo Brazil	+55 11 99590 8223	info@br.gudel.com
Argentina Mexico	Güdel TSC S.A. de C.V. Gustavo M. Garcia 308 Col. Buenos Aires N.L. 64800 Monterrey Mexico	+52 81 8374 2500 107	service@mx.gudel.com

27021598686062859_v3.1_EN-US

Country	Relevant service department	Phone	E-mail
Canada	Güdel Inc. 4881 Runway Blvd. Ann Arbor, Michigan 48108 United States	+1 855 483 3587	service@us.gudel.com
United States			

Tab. 9-1 *Service departments Americas*

Asia

Country	Relevant service department	Phone	E-mail
China	Güdel International Trading Co. Ltd. Block A, 8 Floor, C2 BLDG, No. 1599 New Jin Qiao Road Pudong 201206 Shanghai China	+86 21 5055 0012	info@cn.gudel.com
China press automation	Güdel Jier Automation Ltd. A Zone 16th Floor JIER Building 21th Xinxi Road 250022 Jinan China	+86 531 81 61 6465	service@gudeljier.com
India	Güdel India Pvt. Ltd. Gat No. 458/459 Mauje Kasar Amboli Pirangut, Tal. Mulshi 412 111 Pune India	+91 20 679 10200	service@in.gudel.com
Korea	Güdel Lineartec Inc. 11-22 Songdo-dong Yeonsu-Ku Post no. 406-840 Incheon City South Korea	+82 32 858 05 41	gkr.service@gudel.co.kr
Taiwan, China	Güdel Lineartec Co. Ltd. No. 99, An-Chai 8th St. Hsin-Chu Industrial Park TW-Hu-Ko 30373 Hsin-Chu Taiwan, China	+88 635 97 8808	info@tw.gudel.com

27021598686062859_v3.1_EN-US

Country	Relevant service department	Phone	E-mail
Thailand	Güdel Lineartec Co. Ltd. 19/28 Private Ville Hua Mak Road Hua Mak Bang Kapi 10240 Bangkok Thailand	+66 2 374 0709	service@th.gudel.com

Tab. 9-2 *Service departments in Asia*

Europe

Country	Relevant service department	Phone	E-mail
Denmark	Güdel AG Gaswerkstrasse 26 Industrie Nord 4900 Langenthal Switzerland	+41 62 916 91 70	service@ch.gudel.com
Finland			
Greece			
Norway			
Sweden			
Switzerland			
Turkey			
Bosnia and Herzegovina	Güdel GmbH Schöneringer Strasse 48 4073 Wilhering Austria	+43 7226 20690 0	service@at.gudel.com
Croatia			
Austria			
Romania			
Serbia			
Slovenia			
Hungary			
Slovakia	Güdel a.s. Holandská 4 63900 Brno Czech Republic	+420 602 309 593	info@cz.gudel.com
Czech Republic			

27021598686062859_v3.1_EN-US

Country	Relevant service department	Phone	E-mail
Portugal Spain	Güdel Spain C/Sant Francesc, 4 1º 12ª 08290 Cerdanyola del Vallés Spain	+34 644 347 058	info@es.gudel.com
France	Güdel SAS Tour de l'Europe 213 3 Bd de l'Europe 68100 Mulhouse France	+33 1 6989 80 16	info@fr.gudel.com
Germany	Güdel Germany GmbH Industriepark 107 74706 Osterburken Germany	+49 6291 6446 792	service@de.gudel.com
Germany intralogistics	Güdel Intralogistics GmbH Gewerbegebiet Salzhub 11 83737 Irschenberg Germany	+49 8062 7075 0	service-intralogistics@de.gudel.com
Italy	Güdel S.r.l. Via per Cernusco, 7 20060 Bussero (Mi) Italy	+39 02 92 17 021	info@it.gudel.com
Belgium Luxembourg The Netherlands	Güdel Benelux Eertmansweg 30 7595 PA Weerselo The Netherlands	+31 541 66 22 50	info@nl.gudel.com
Estonia Latvia Lithuania Poland Ukraine	Gudel Sp. z o.o. ul. Legionów 26/28 43-300 Bielsko-Biała Poland	+48 33 819 01 25	serwis@pl.gudel.com

27021598686062859_v3.1_EN-US

Country	Relevant service department	Phone	E-mail
Russia	Gudel Russia Yubileynaya 40 Office 1902 445057 Togliatti Russia	+7 848 273 5544	info@ru.gudel.com
Belarus			
Ireland	Güdel Lineartec (U.K.) Ltd. Unit 5 Wickmans Drive, Banner Lane Coventry CV4 9XA West Midlands United Kingdom	+44 24 7669 5444	service@uk.gudel.com
United Kingdom			

Tab. 9-3 *Service departments in Europe*

All other countries

Country	Relevant service department	Phone	E-mail
All other countries	Güdel AG Gaswerkstrasse 26 Industrie Nord 4900 Langenthal Switzerland	+41 62 916 91 70	service@ch.gudel.com

Tab. 9-4 *Service departments for all other countries*

Inquiries outside of business hours

If you have service inquiries outside of business hours, please contact the following service departments:

Europe	Güdel AG Gaswerkstrasse 26 Industrie Nord 4900 Langenthal Switzerland	+41 62 916 91 70	service@ch.gudel.com
Americas	Güdel Inc. 4881 Runway Blvd. Ann Arbor, Michigan 48108 United States	+1 855 483 3587	service@us.gudel.com

Tab. 9-5 *Service departments outside of business hours*

27021598686062859_v3.1_EN-US

2702159868062859_v3.1_EN-US

10 Torque tables

10.1 Tightening torques for screws

NOTE

Vibrations

Screws without screw lock can come loose.

- Secure screw connections on moving parts with Loctite medium strength 243.
- Apply the adhesive on the nut thread, not on the screw!

27021598686062859_v3.1_EN-US

10.1.1 Zinc plated screws

Unless otherwise specified, the following tightening torques apply for zinc-plated screws lubricated with Molykote (MoS2) grease or secured with Loctite 243:

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

Tab. 10-1 *Torque table for zinc-plated screws lubricated with Molykote (MoS2) grease*

27021598686062859_v3.1_EN-US

10.1.2 Black screws

Unless otherwise specified, the following tightening torques apply for black oiled and non-lubricated screws, or screws secured with Loctite 243:

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. 10-2 *Torque table for black oiled and non-lubricated screws*

27021598686062859_v3.1_EN-US

10.1.3 Stainless steel screws

Unless otherwise specified, the following tightening torques apply for stainless steel screws lubricated with Molykote (MoS2) grease or secured with Loctite 243:

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

Tab. 10-3 *Torque table for stainless steel screws lubricated with Molykote (MoS2) grease*

27021598686062859_v3.1_EN-US

List of illustrations

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

List of tables

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

Index

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

U

W

Z

27021598686062859_v3.1_EN-US

27021598686062859_v3.1_EN-US

Version	3.1
Author	juesti
Date	16.06.2021

GÜDEL AG
Industrie Nord
CH-4900 Langenthal
Switzerland

Fax	+41 62 916 91 50
E-mail	info@ch.gudel.com

www.gudel.com

27021598686062859_v3.1_EN-US

GÜDEL

GÜDEL AG
Industrie Nord
CH-4900 Langenthal
Switzerland
info@ch.gudel.com
www.gudel.com