

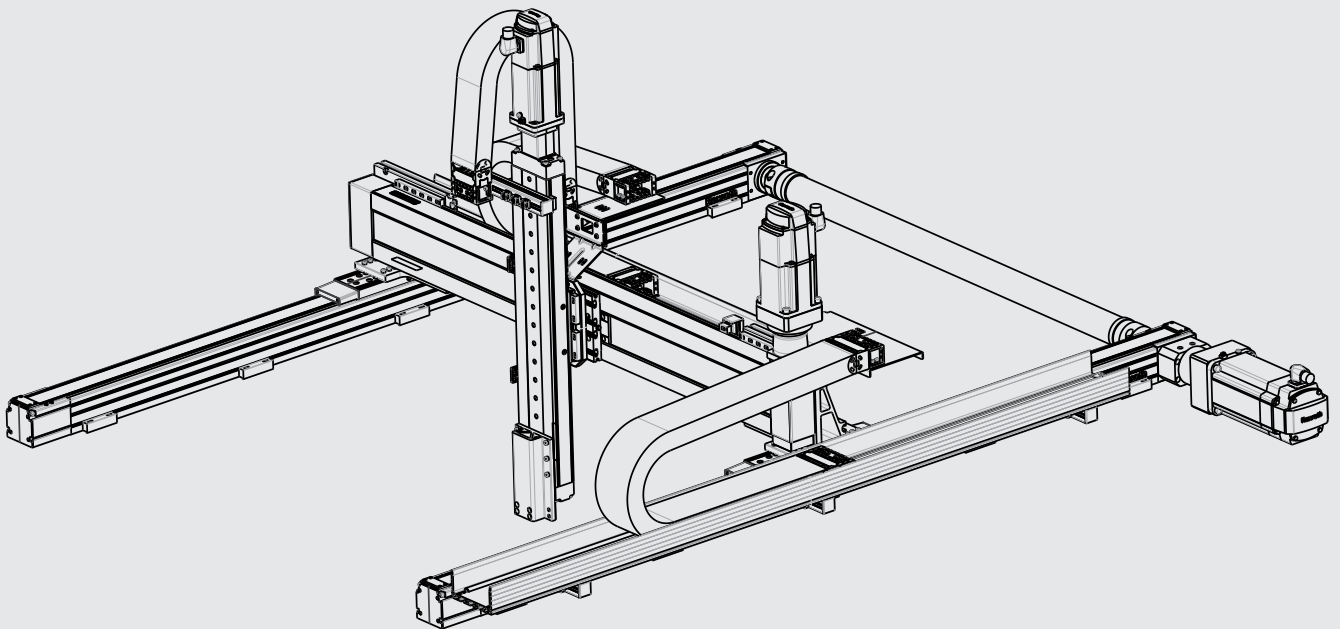
Multi-axis systems

R320103109/2021-01

EN

Instructions

EN



The information provided serves only to describe the product. No statements concerning a certain condition or suitability for a certain purpose can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It should be noted that our products are subject to a natural process of aging and wear.

© This document, as well as the data, specifications, and other information set forth in it, are the exclusive property of Bosch Rexroth AG. It may not be reproduced or given to third parties without our consent.

The title page contains an illustration of a sample configuration. The product as delivered can differ from the illustration.

The original instructions are in German.

Any dissemination of the product must include these instructions and the safety instructions for linear motion systems.

Die vorliegende Anleitung ist in folgenden Sprachen verfügbar.
These operating instructions are available in the following languages.

DE Deutsch (Originaldokumentation)

EN English

Inhalt

1	About these instructions.....	4
1.1	Validity of the documentation.....	4
1.2	Required and supplementary documentation	4
1.3	Presentation of information.....	4
2	Safety instructions	6
3	Scope of delivery	6
3.1	Delivery condition.....	6
3.2	Accessories.....	6
3.3	Overview of multi-axis systems	7
4	Product description	8
4.1	Performance description	8
4.2	Device description	8
4.3	Identification of the product.....	10
5	Transport.....	11
5.1	Transporting the product / removal from the packaging.....	11
6	Preparation for mounting.....	12
6.1	Preparing the mounting surfaces	12
6.2	Mounting conditions	13
7	Mounting	14
7.1	General instruction for mounting	14
7.2	Mounting the X axis (type 2HA / 3SA / 2VA)	14
7.3	Mounting the X axis and Y axis (type 2HB / 3SB).....	15
7.4	Mounting the cable drag chain	16
8	Energy installation.....	18
8.1	Cables or hoses	18
8.2	Energy chain distribution (for Rexroth motors).....	18
8.3	Routing.....	19
9	Electrical connection.....	20
10	Start-up	20
10.1	Grounding	20
10.2	Start-up using parameters on motor encoder memory	21
10.3	Checking the operating conditions.....	21
10.4	Test run, running in.....	22
11	Operation	23
12	Repair / Maintenance / Lubrication	23
12.1	Repair.....	23
12.2	Maintenance	23
12.3	Lubrication.....	23
13	Storing the product.....	23
14	Disposal.....	24
15	Technical data	24
16	Operating conditions	24
16.1	Tightening torques.....	24
17	Removal and replacement.....	25
18	Service and support.....	25

1 About these instructions

1.1 Validity of the documentation

This documentation applies to the following products:

- Multi-axis systems.

This documentation is intended for installers, operators and system owners.

This documentation contains important information for the proper and safe installation, operation and maintenance of the product and for troubleshooting simple errors oneself.

- Before commencing any work with the product, be sure to read these Instructions and the "Safety Instructions for linear motion systems" carefully and completely.

1.2 Required and supplementary documentation

Documentation which is indicated by the book symbol  must be obtained before handling the product and must be observed:

Table 1: Required documentation

	Title	Document number	Document type
	Safety instructions for linear motion systems	R320103152	Safety instructions
	Instructions for linear modules	R320103169	Instructions
	Instructions for compact modules	R320103178	Instructions
	Multi-axis system - angle bracket X-Y axis	R320103203	Instructions
	Multi-axis system - angle bracket X-Z axis	R320103204	Instructions
	Multi-axis system - angle bracket Y-Z axis	R320103205	Instructions
	Multi-axis system - cleated sheet for energy chain	R320103206	Instructions
	Multi-axis system - lifting the multi-axis system	R320103207	Instructions
	Multi-axis system - profil for energy chain	R320103216	Instructions
	Rexroth catalogs for drive technology		
	Product data sheet for Dynalub 510	R3102052	
	Safety data sheet for Dynalub 510	R320103160	
	Product data sheet for Dynalub 520	R310 2053	
	Safety data sheet for Dynalub 520	R320103161	
	Instructions for the other components		

The Rexroth documentation is available for download at www.boschrexroth.com/mediadirectory.

<https://www.boschrexroth.com/en/xc/myrexroth/mediadirectory?publication=NET&WT.ac=Produktdokumentation>



1.3 Presentation of information

To enable users to work rapidly and safely with the product while following these instructions, this documentation uses standardized safety instructions, symbols, terms and definitions, and abbreviations. These are explained in the following sections.

1.3.1 Safety instructions in this document

This document contains safety instructions preceding any actions that involve a risk of personal injury or damage to property. The safety precautions described must be adhered to.

Safety instructions are structured as follows:

 SIGNAL WORD
Type of hazard! Consequences if ignored. ▶ Hazard prevention measure.

- Warning sign: draws attention to the hazard
- Signal word: indicates the severity of the hazard
- Type of hazard: indicates the type or source of hazard
- Consequences: describes the consequences that may occur if precautions to avoid the hazard are not taken
- Hazard prevention measure: indicates how to avoid the hazard

The safety instructions cover the following hazard classes. The hazard class describes the risks involved if the safety instruction is not complied with.

Table 2: Hazard classes as per ANSI Z535

Warning sign, signal word	Meaning
 DANGER	Indicates a hazardous situation which will result in death or serious injury if not avoided.
 WARNING	Indicates a hazardous situation which may result in death or serious injury if not avoided.
 CAUTION	Indicates a hazardous situation which may result in minor or moderate injury if not avoided.
NOTICE	Property damage: The product or surroundings may be damaged

1.3.2 Symbols

The following symbols indicate notes which are not related to safety but make the documentation easier to understand.

Table 3: Meaning of the symbols

Symbol	Meaning
	If this information is not observed, the product will not be optimally used / operated.
▶	Single, independent work step
1.	Numbered work steps
2.	
3.	The numbers indicate the sequence of the work steps.
➡	see (general reference)
➡ 7	see section 7
➡  Fig. 7.1	see figure 7.1
	Screw with strength class...
⌚	Tightening torque
μ	Friction factor for screws

1.3.3 Abbreviations

The following abbreviations are used in this documentation:

Table 4: Abbreviations and definitions

Abbreviation	Meaning
CMS	Cartesian motion systems (multi-axis systems)
CKK	Compact modules with ball rail system and ball screw assembly
CKR	Compact modules with ball rail system and toothed belt drive
MKK	Linear modules with ball rail system and ball screw assembly
MKR	Linear modules with ball rail system and toothed belt drive
BASA	Ball screw assembly

2 Safety instructions

The general safety instructions for this product can be found in the documentation "Safety instructions for linear motion systems". You must have read and understood these before handling the product.

3 Scope of delivery

Scope of delivery depending on the order.

3.1 Delivery condition

Depending on the configuration and CMS type (complete or partially assembled)

3.2 Accessories

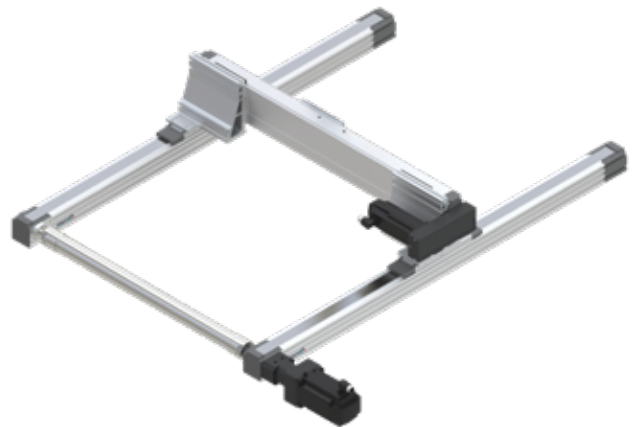
- Required fastening accessories ➡ Catalog and instructions for the individual axes
- Angle brackets and plates are partially pre-assembled
- Additional fastening and positioning elements are included
- Mounting the angle brackets and plates according to the enclosed instructions

3.3 Overview of multi-axis systems

Type 2HA



Type 2HB



Type 3SA



Type 3SB



Type 2VA



Fig. 1: CMS types

4 Product description

4.1 Performance description

The technical data depends on the configuration and are included in the technical delivery information.

4.2 Device description

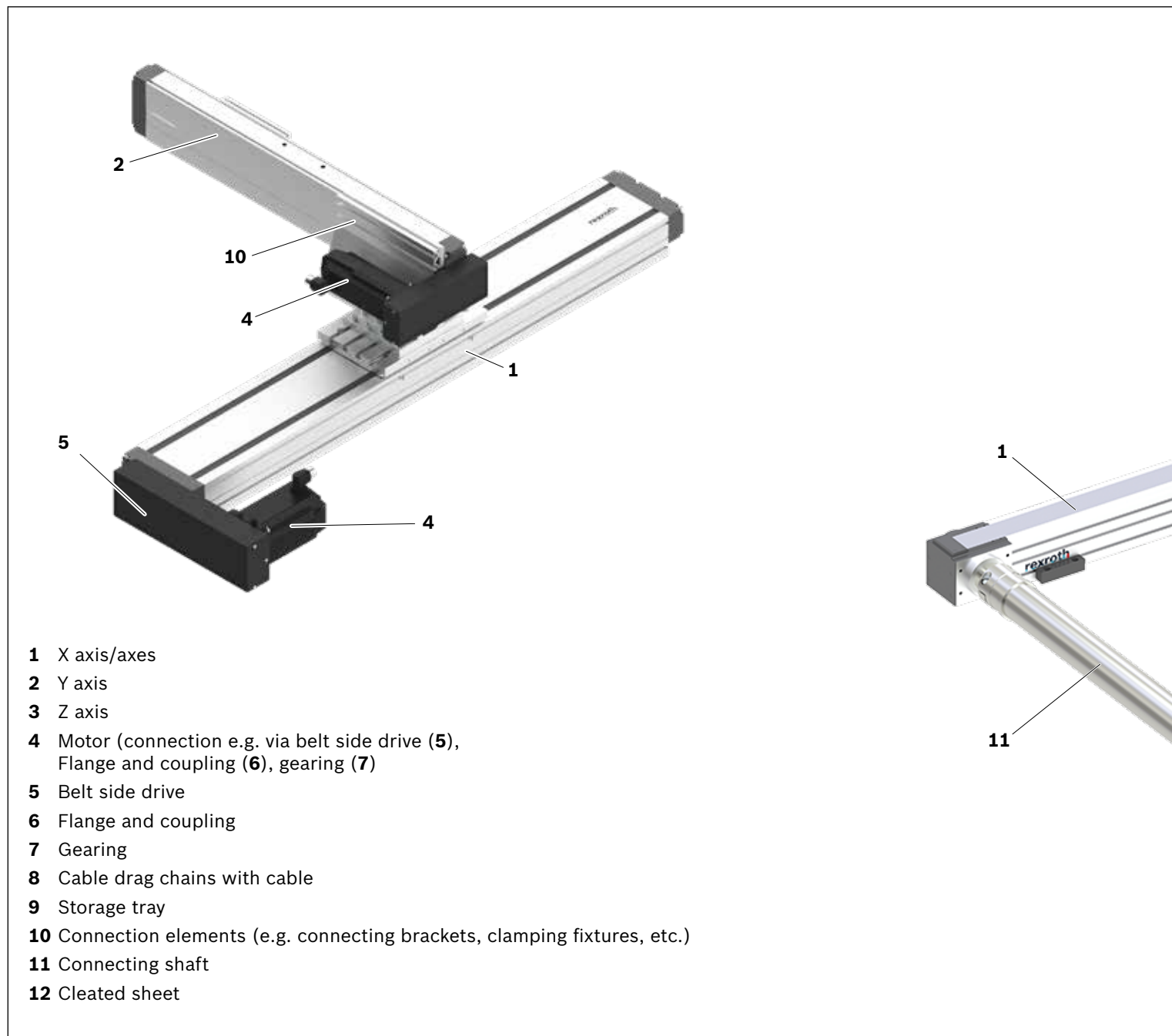
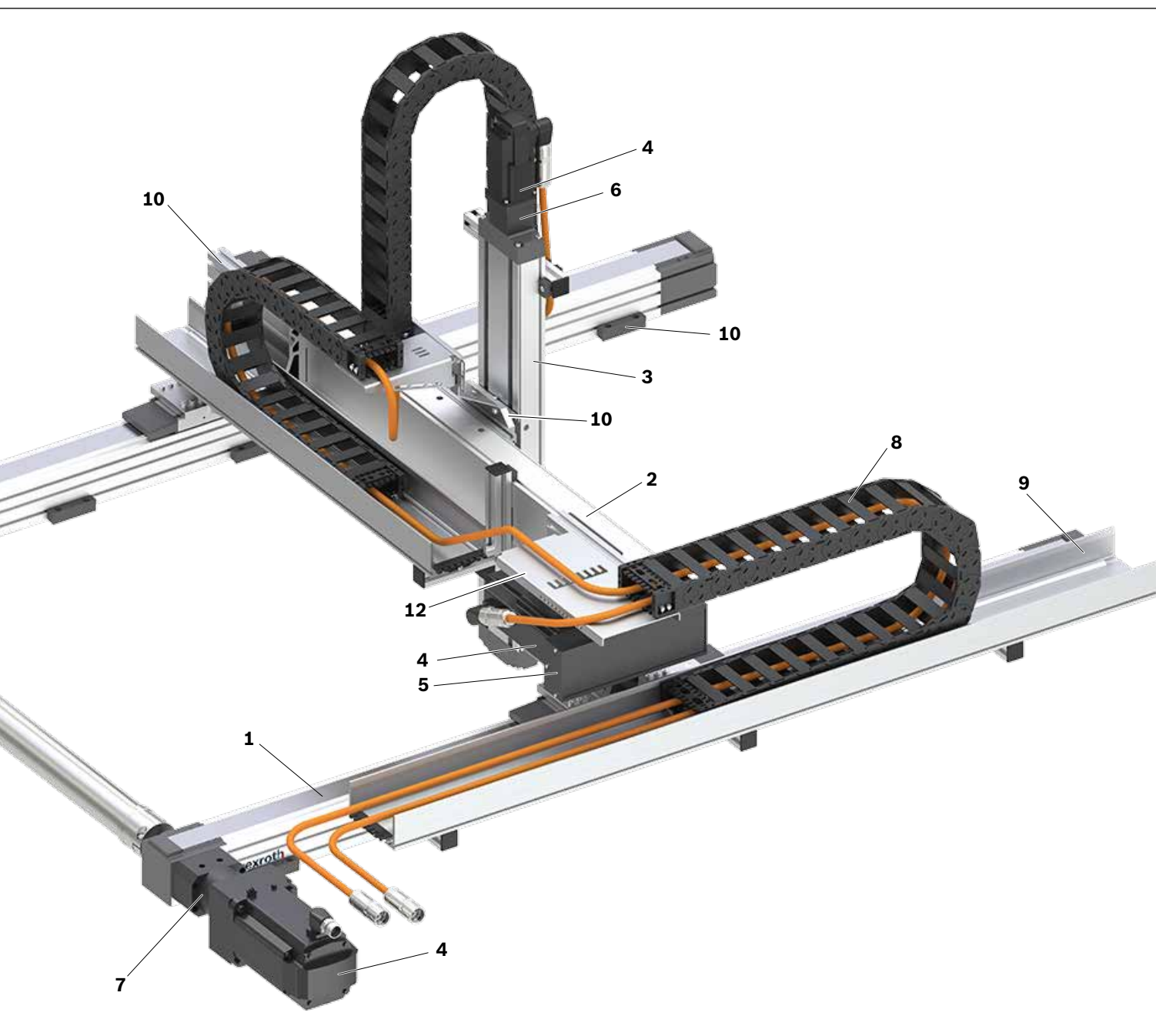


Fig. 2: Components of a multi-axis system (examples)



4.3 Identification of the product

The name plate of the product contains the following information:

Table 5: Information on name plate

Item	Name plate information	Meaning
1	CNR	Customer's material number
2	TYPE	Short product name
3	2HB	Type
4	CS	Customer information
5	MNR	Material number
6	FD	Date of manufacture
7	7210	Manufacturing location
8		QR-Code

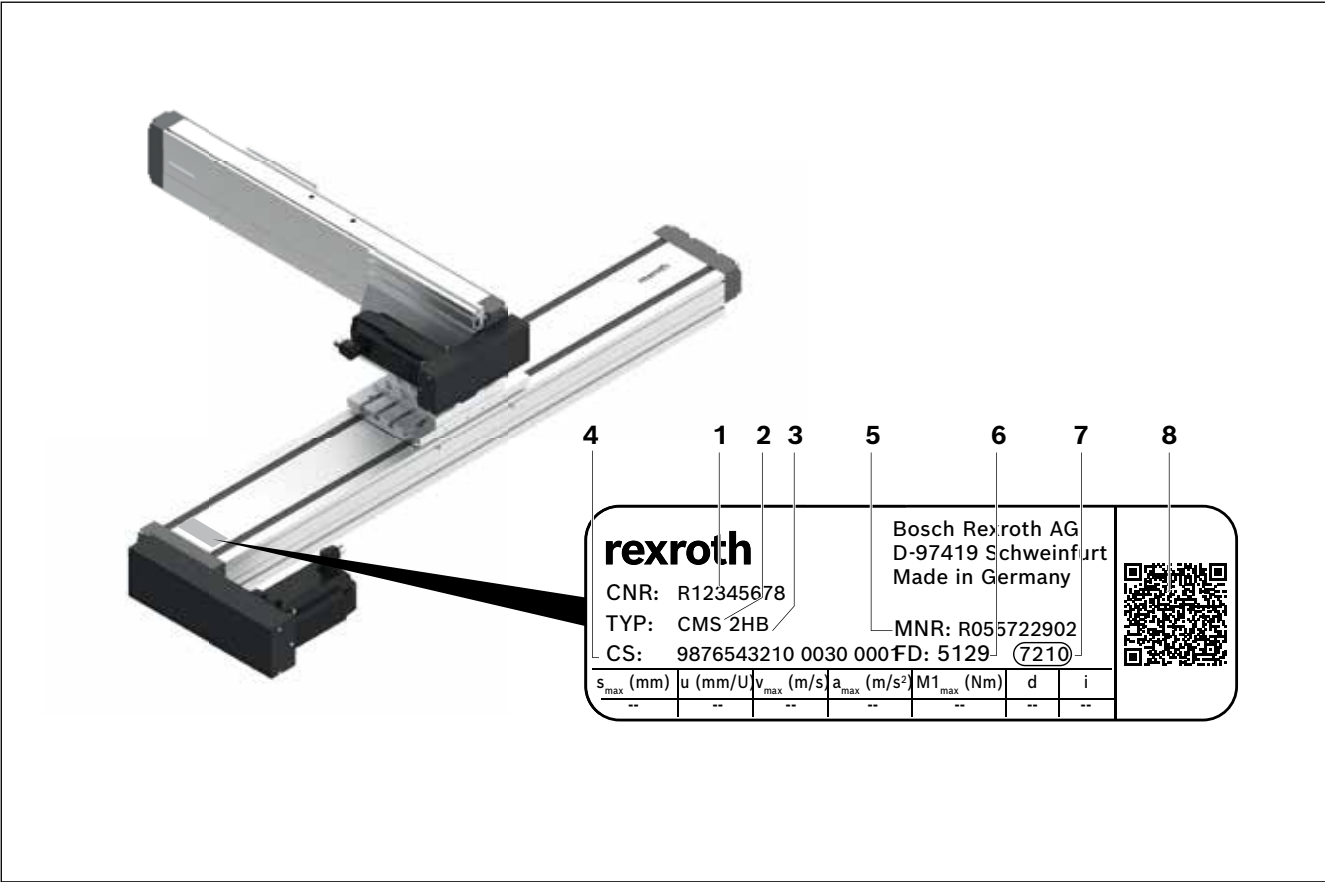


Fig. 3: Name plate

► When ordering wear parts, please always state all data given on the name plate.

5 Transport

5.1 Transporting the product / removal from the packaging

WARNING

Risk of product falling due to inadequate load handling equipment!

Death or severe injury.

- ▶ Use only inspected and suitable load handling equipment. Observe the weight  Packaging !
- ▶ Observe the center of gravity
- ▶ Do not stand under suspended loads.

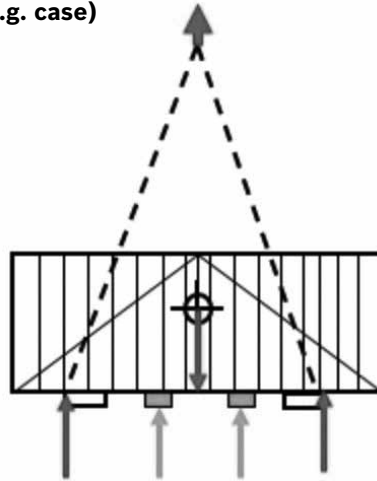


Transport locks and fastenings in the packaging prevent movements of the product during transport

- ▶ Hoist the product using suitable lifting accessories. Attach load hoisting equipment carefully at the designated points only. Observe the instructions R320103207.

EN

CMS transport in a single package (e.g. case)



CMS removal from the packaging. Observe the instructions R320103207.

rexroth
A Bosch Company

R320103207/2021-01

Produkt transportieren / heben

Schäden am Produkt
Schwere Verletzungen
bis hin zum Tod

- Nur zugelassenes Lasthandhabungsgerät zum Heben und Transportieren des Produkts verwenden.
- Bei der Auswahl der Lasthandhabungsgeräte beachten:
- Lastkapazität nur an den dafür vorgesehenen Aufhängestellen (1) anbringen und auf der Lasthandhabungsanlage (2) sicherstellen.
- Aufhängestellen (1) nur vertikal belasten.
- Lasten und Spindelzapfen nicht belasten.
- Beim Transport und Heben des Produkts mit verstelltem Gelenk, das Motor immer einseitig, oder vor dem Transport das Motor drehen.

Transport / lift the product

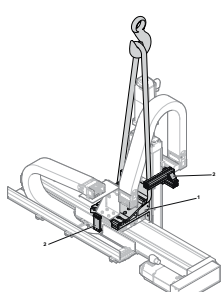
Damage to the product
Death or severe injury

- Use only inspected load handling equipment to transport and lift the product. Pay attention to the weight when selecting the load handling equipment.
- Only attach the load handling equipment carefully at the only designated lifting points (1) and ensure that the load is secured at the designated lifting points (2) in the following manner:
- Load eye bolts (1) only vertically.
- Do not put pressure on end mechanisms and screw joints.
- When transporting and lifting the product with extended joints, always operate the motor on one side or rotate the motor prior to transport.

Ringschrauben (1) Last eye bolts (1)

Beispiele / Examples

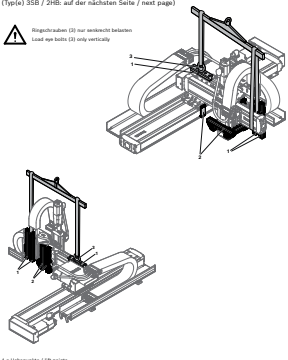
Typ(e) 20A



1 = Aufhängestelle / lift points
2 = Transportvorrichtung (Tragig, gekennzeichnet) / transport safety device (marked in color)

Beispiele / Examples

Typ(e) 35A / 20A
Typ(e) 35B / 20B auf der nächsten Seite / next page



1 = Aufhängestelle / lift points
2 = Transportvorrichtungen (Tragig, gekennzeichnet) / transport safety devices (marked in color)

Fig. 4: Transporting the product / removal from the packaging

6 Preparation for mounting

- ▶ Remove the transport kit (transport locks/ring bolts/transport braces).
 - ➡ Instructions R320103207.

WARNING

Uncontrolled movements due to lack of self-locking of the product/carriage after removal of the transport locks!

Death or severe injury.

- ▶ Secure the product/carriage against dropping.
- ▶ Do not stand in the fall direction.

6.1 Preparing the mounting surfaces

- ▶ The mounting surface must be free of oil, grease and dust.



The transport braces do not substitute an alignment of the X axes.

NOTICE

Risk of damage due to faulty mounting surface!

Damage to the product.

- ▶ Ensure evenness and height offset and sufficient rigidity of the mounting surface

6.1.1 Evenness of mounting surfaces

Table 6: Evenness of mounting surface

X axis Type	Evenness (mm)		
	Stroke (mm)		
	up to 1000	1001-2000	2001-3000
2HA-020 – 2HA-023 2HA-030 – 2HA-033 3SA-020 – 3SA-023 3SA-030, 3SA-031 2VA-020 – 2VA-023 2VA-030 – 2VA-033	0.2	0.4	0.6
2HB-020, 2HB-021 2HB-030, 2HB-031 2HB-040, 2HB-041 3SB-020 – 3SB-023 3SB-030, 3SB-031 3SB-040, 3SB-041	0.3	0.5	0.8

6.1.2 Height offset of mounting surfaces

Table 7: Height offset of mounting surfaces

X axis Type	Height offset (mm)		
	Stroke (mm)		
	up to 1000	1001-2000	2001-3000
2HB-020, 2HB-021 2HB-030, 2HB-031 3SB-020, 3SB-021 3SB-022, 3SB-023 3SB-030, 3SB-031	0.2	0.3	0.4
2HB-040, 2HB-041 3SB-040, 3SB-041	0.3	0.4	0.5

6.1.3 Sufficient rigidity

NOTICE

Risk of damage due to faulty mounting base!

Damage to the product.

- ▶ The mounting base must have sufficient rigidity and mass

6.2 Mounting conditions

- ▶ Note the operating conditions ➡ 16.1 on page 24.
- ▶ For special operating conditions, please contact us.
- ▶ The installation position of the X axes is only permitted horizontally (position of the carriage at the top)

NOTICE

Risk of damage due to improper loads!

Damage to the product.

- ▶ Do not attach any projecting loads.

EN

! WARNING

Danger of uncontrolled movements of the carriage due to lack of protection!

Death or severe injury.

- ▶ Secure the carriage against dropping.
- ▶ Do not stand in the fall direction of the carriage.

7 Mounting

7.1 General instruction for mounting

- Observe mounting conditions 6.2

! WARNING

Risk of product falling/toppling due to lack of protection!

Damage to the product/injuries

- Mounting of the axes must be performed by two persons.

7.1.1 Angle bracket and plates

- Angle brackets and plates are pre-assembled
- Additional fastening and positioning elements are included in the scope of delivery
- Mounting the angle brackets and plates ➡ relevant instructions ➡ Table 1

7.2 Mounting the X axis (type 2HA / 3SA / 2VA)

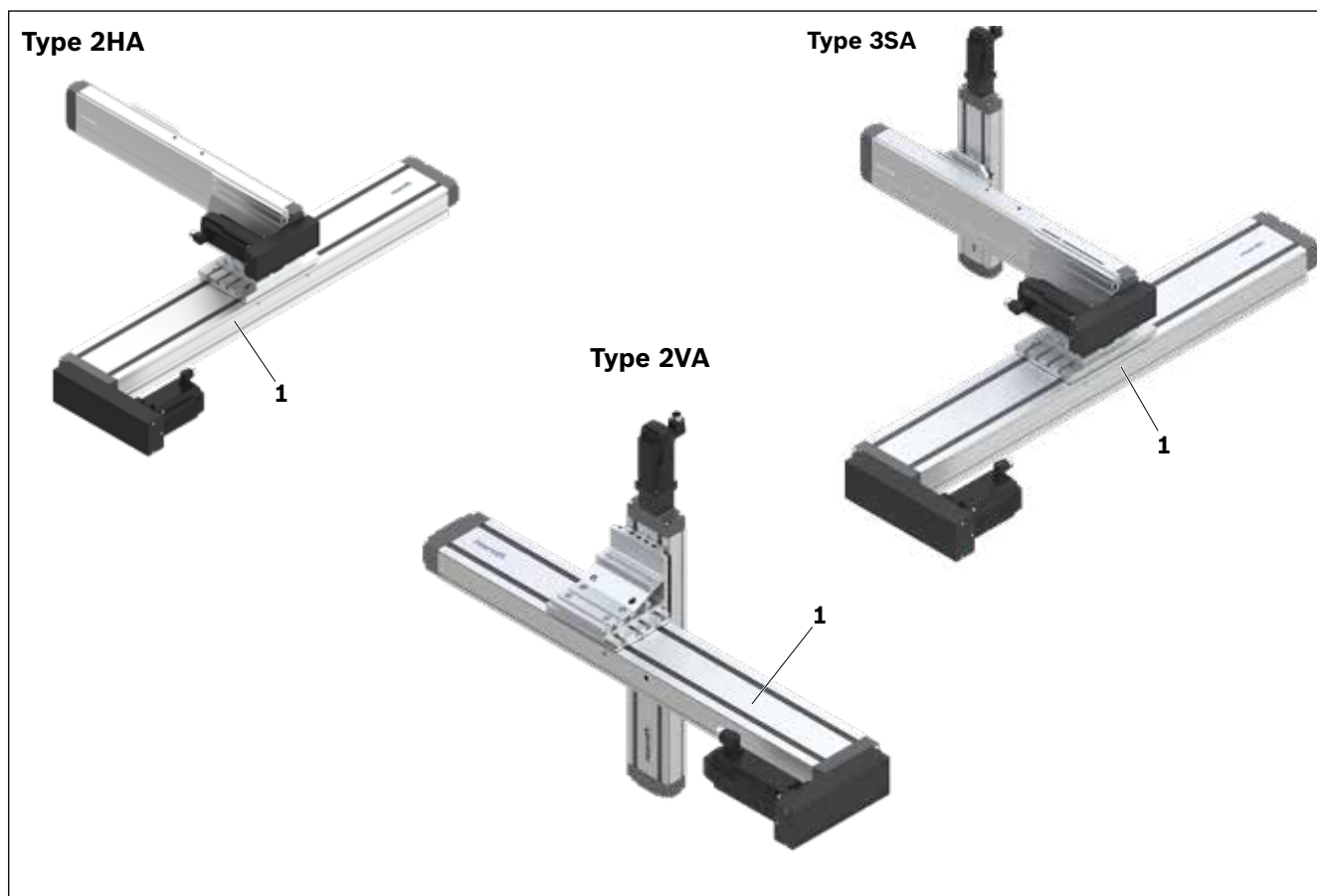


Fig. 5: Fastening type 2HA / 3SA / 2VA to the adjoining structure

- X axis (1): Fastening the compact module with clamping fixtures. ➡ Compact module instructions

7.3 Mounting the X axis and Y axis (type 2HB / 3SB)

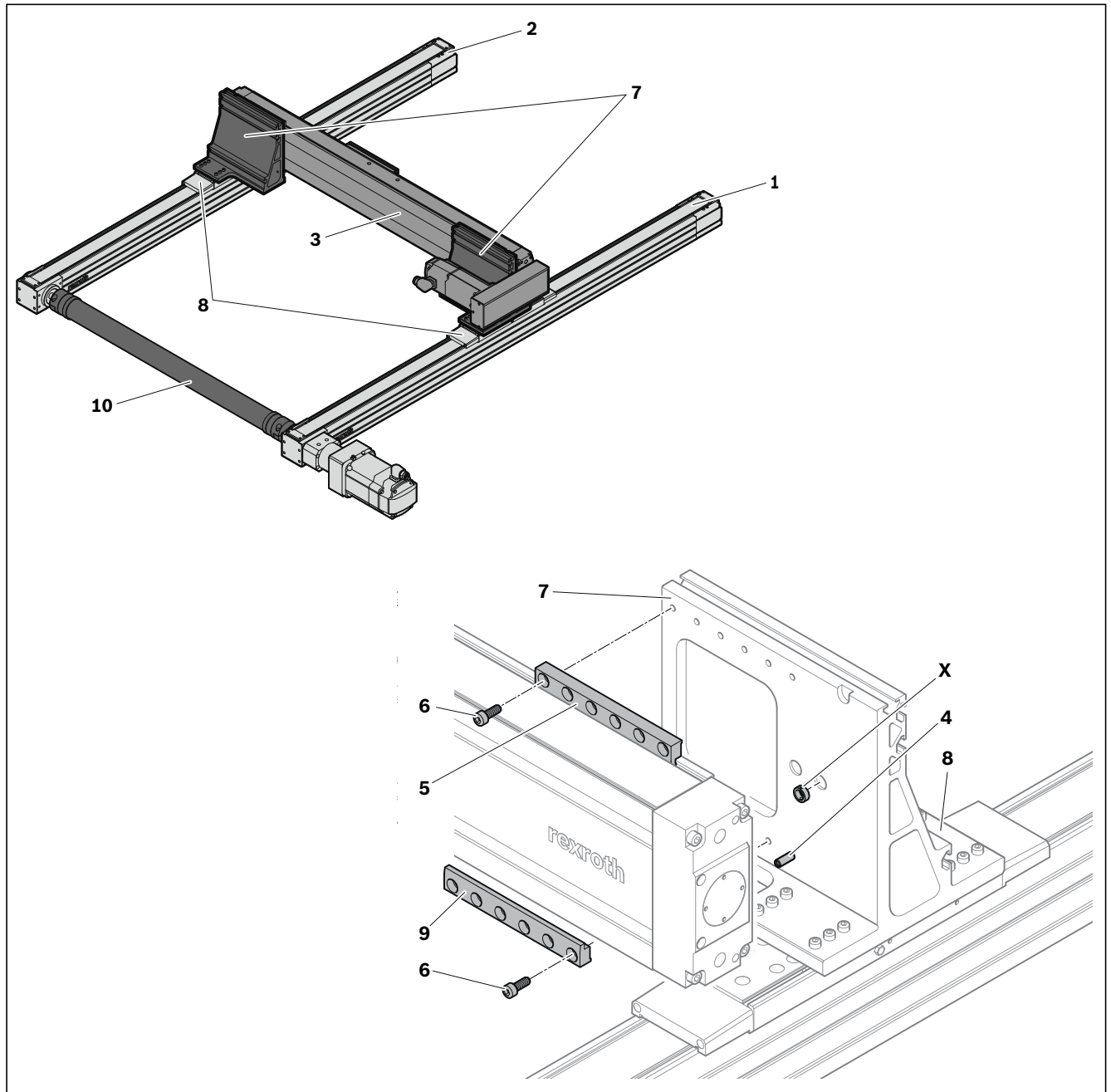


Fig. 6: Mounting of X / Y axis

1. Fastening the X axis (1) to the adjoining structure using clamping fixtures.
➡ Instructions for linear modules.
2. Aligning the X axis (2) parallel to the X axis (1) and pre-assembling with clamping fixtures at the adjoining structure with center-to-center distance (length of Y axis).
3. Aligning the position of the carriages (8) of the X axes (1) (2) to each other.
4. Positioning the Y axis (3) onto the angle brackets (7) on both sides with mounting pins (4) and staking out with centering rings. Fastening the Y axis (3) to the angle bracket (7) using the clamping fixture (5) and socket head cap screws (6). Installing the clamping fixture (9) analogously.
5. Moving the Y axis (3) over the entire travel path of the X axes. In this way, the pre-assembled X axis (2) is aligned parallel to the X axis (1).
6. Fastening the X axis (2). ➡ Instructions for linear modules.
7. Assembling the connecting shaft (10) according to the manufacturer's specifications.

7.4 Mounting the cable drag chain

- The energy chain for the X / Y axis is partially pre-assembled or included in the scope of delivery
- Reasonable pre-assignment of the cables ➔ 8.2
- Fastening elements included in the scope of delivery

7.4.1 Fastening kit for cable drag chain on the Z axis

1. Fastening the fastening kit (1) to the Z axis (3) using the fastening elements provided (2).
 2. Screwing the first connector (4) of the energy chain (5) via sliding blocks (6), support (7) and socket head cap screw (8) to the fastening kit (1).
 3. Fastening the second connector (11) analogously to the first connector on the cleated sheet (9).
- The cable holder (10) is used to fasten the cables by means of a cable ties (not included in the scope of delivery)

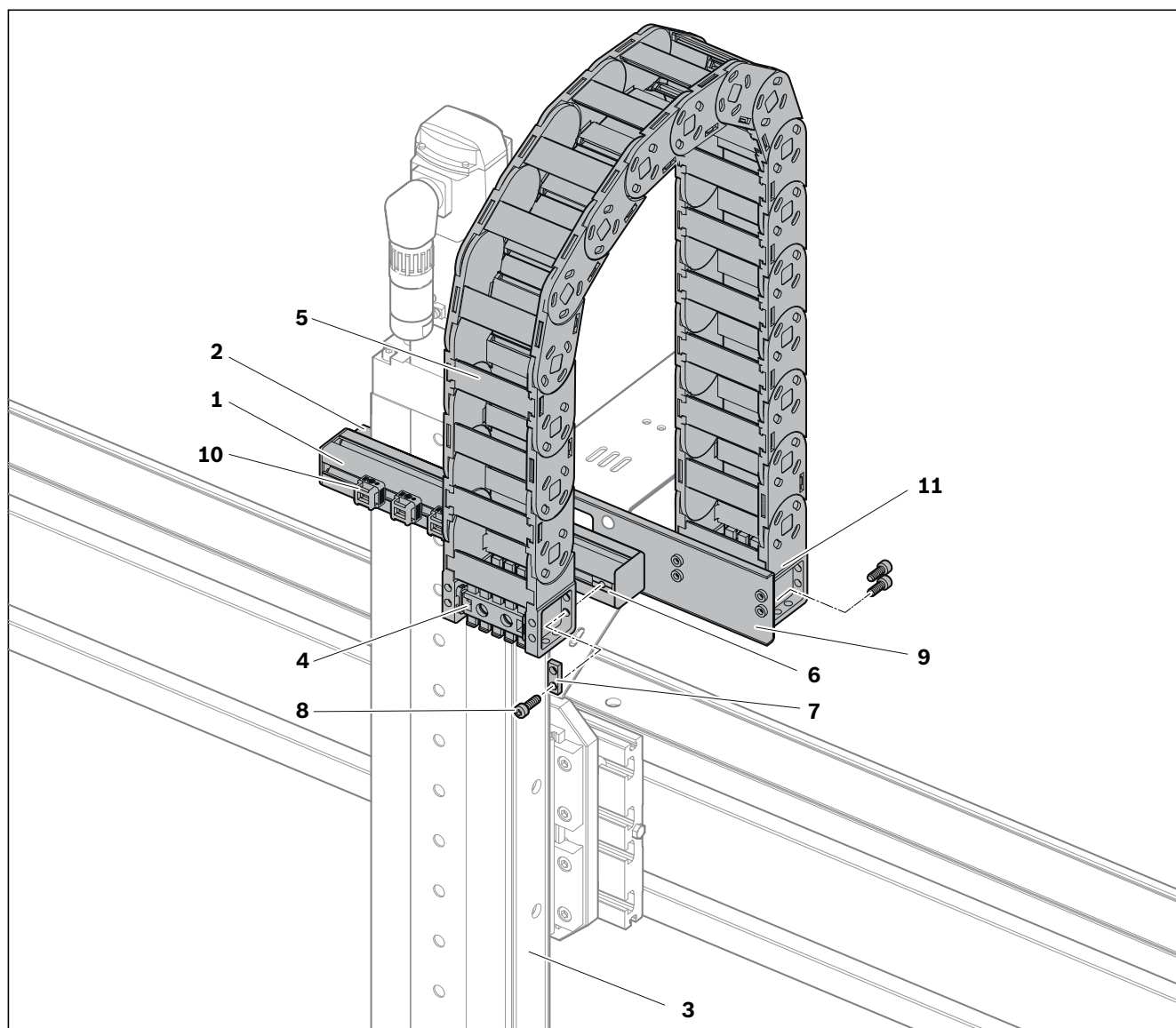


Fig. 7: Mounting the cable drag chain on the Z axis

8 Energy installation

8.1 Cables or hoses

8.1.1 Notes

- ▶ Both cables and hoses can be routed in the energy chains. These must be laid separately from each other. If necessary, insert additional separators.
- ▶ Lay cables and hoses free of twists and without mechanical load (ensure strain relief). Cables and hoses must be able to move freely in the bending radius of the energy chain.
Minimum bending radius:
 - Rexroth cable: Static: 5 x cable Ø; dynamic: 10 x cable Ø
 - Customer cables or hoses: Observe the manufacturer's specifications
- ▶ Due to the construction, different spaces have already been pre-assigned by cables (e.g. motor cables). ➡ 8.2

8.2 Energy chain distribution (for Rexroth motors)

8.2.1 Energy chain width 60 mm

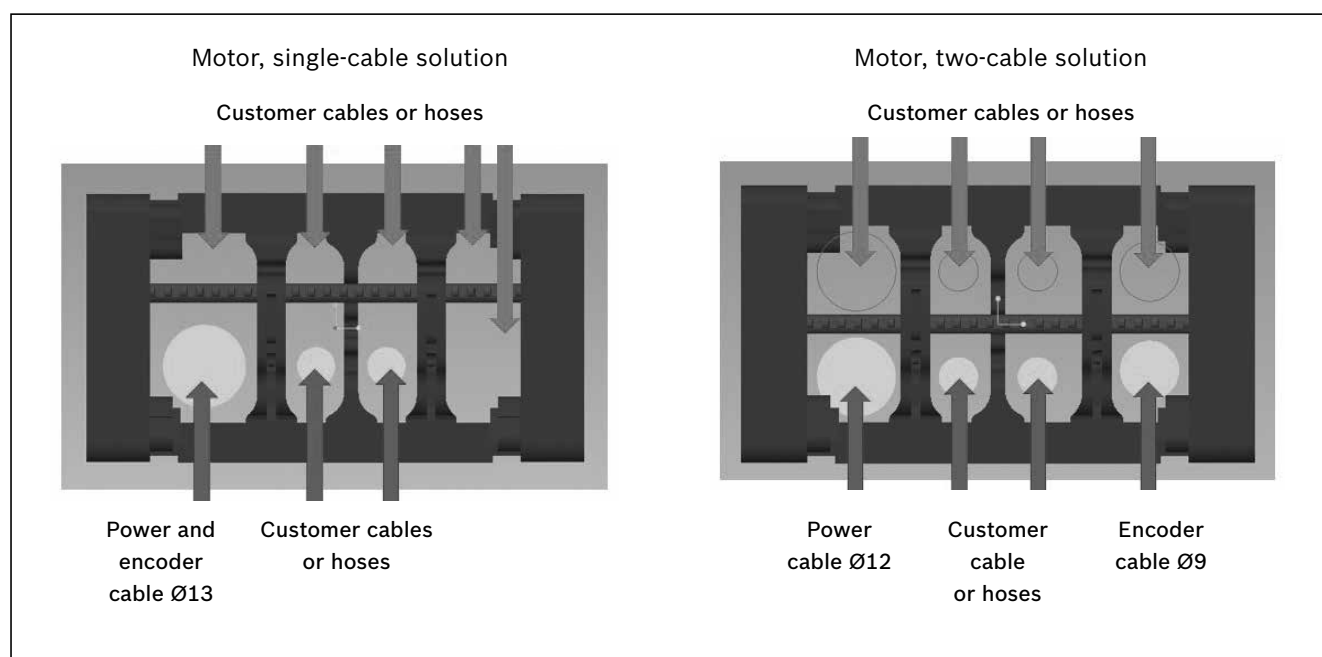


Fig. 8: Cable drag chain 60 mm

8.2.2 Energy chain width 85 mm

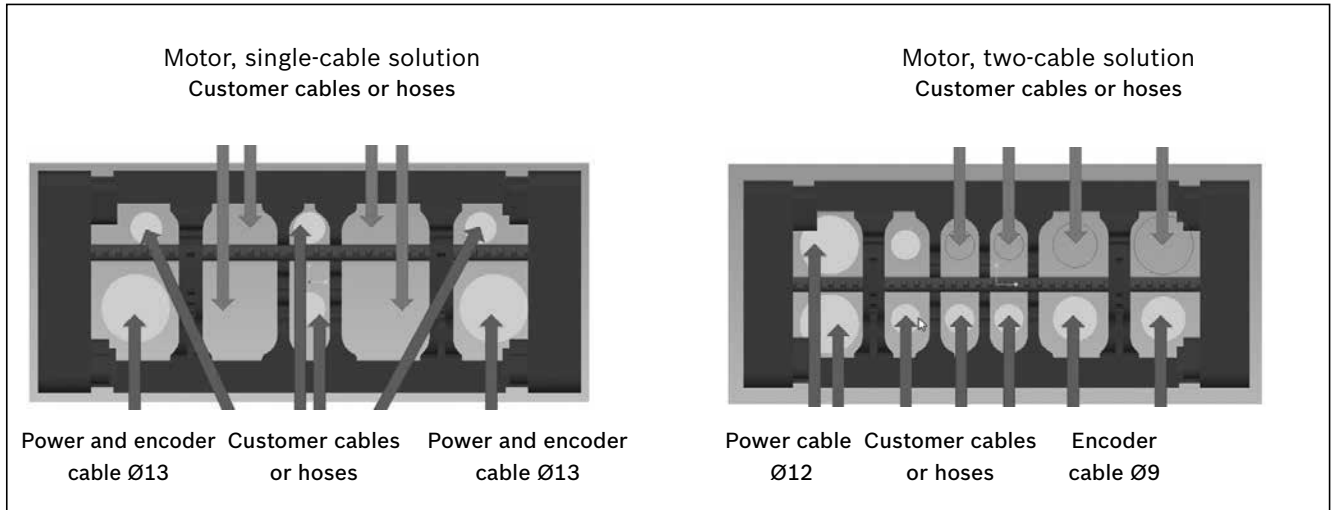


Fig. 9: Cable drag chain 85 mm

EN

8.3 Routing

8.3.1 Energy chain of the Z axis:

- Laying customer-specific cables and hoses of the attachments in the corresponding chambers of the energy chain of the Z axis.

8.3.2 Energy chain of the Y axis:

- Moving the carriage of the Y axis into the end position so that the maximum possible length of the energy chain is positioned flatly.
- Laying cables and hoses from the energy chain of the Z axis into the energy chain of the Y axis.

9 Electrical connection



Fig. 10: Connecting the product electrically

WARNING

Risk of electric shock due to contact with live parts!

Death or severe injury.

- ▶ Before working on the electrical equipment, switch off the power supply and secure it against being switched on again.
- ▶ Follow the safety instructions given in the documentation for the controller used.
- ▶ Observe the safety regulations for working with high-voltage equipment!

- ▶ Keep the documentation for the motor/controller at hand.

10 Start-up

- ▶ Do not start up the product until it has been verified that the end product (for example a machine or system) into which the Rexroth product has been installed complies with the country-specific requirements, safety regulations and standards for the application.

10.1 Grounding

- ▶ Separate grounding of the individual axes is not necessary when using Rexroth motors.
- ▶ If motors of other manufacturers are used, this must be checked and implemented separately.

10.2 Start-up using parameters on motor encoder memory

- Only in combination with Rexroth motors and Rexroth drive controllers

Predefined and coordinated combinations of motor and controller (electric drive package) perfectly complement the mechanical system solution to form a functional subsystem.

Easy start-up is made possible by automatic reading of the mechanical and drive parameters stored in the motor encoder memory. Thanks to the automatic parameterization of the Rexroth drive controller, your system can be used faster than ever before.

Less engineering: With the plug-and-play encoder data memory for faster start-up, the motor becomes a data source for intelligent machines or i 4.0 applications.

After connecting the servo motor to the drive, it automatically reads the feedback memory with the kinematics parameters stored. This eliminates the need to manually enter the parameters, which significantly speeds up start-up.

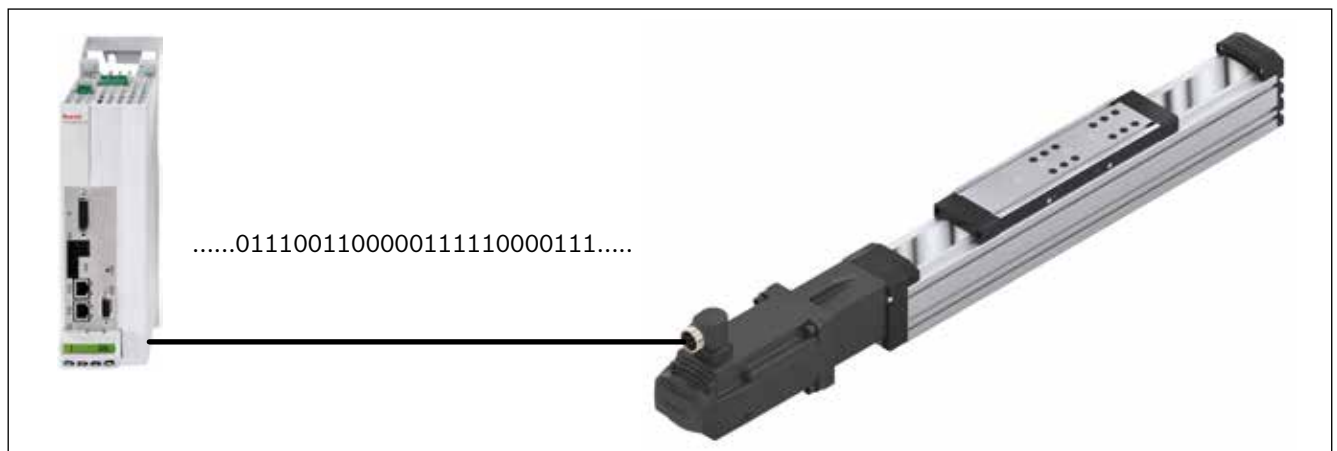


Fig. 11: Start-up

10.3 Checking the operating conditions

- Observe ambient temperature, load, travel speed and stroke ➡ Section "Operating conditions" on page 24.
- For special operating conditions, please contact us.

10.4 Test run, running in



WARNING

Dangerous movements! Risk of death, injury, serious physical injury or property damage!

Do not stand in the product's range of movement.

Do not allow persons to inadvertently enter the danger area.

Never perform maintenance on running machines.

Secure the system against restart and unauthorized use during maintenance.

Securely fasten the product in the system or machine.

The product is not self-locking; this means that if it is used vertically or at an angle, it can drop or move uncontrollably.

To prevent this, the manufacturer/vendor must take precautions when installing in this manner. The Division Information Sheet on "Gravity-Loaded Axes" of DGUV Fachbereich Holz und Metall, the Woodworking and Metalworking Division of the German statutory accident assurance association (DGUV), and other sources offer further information on this topic.

Risk of burns due to hot surfaces! Temperatures above 60°C possible

- ▶ Avoid touching the hot surface of, e.g., the motor.
- ▶ After switching off the product, let hot surfaces cool down before touching them.
- ▶ Pay attention to the clearance of the connecting cables from other components.

- ▶ Only start up the product after running successful tests under simulated production conditions.
- ▶ Move at low speed over the entire stroke.
- ▶ If necessary, optimize the interaction of the mechanical equipment and the electronics.

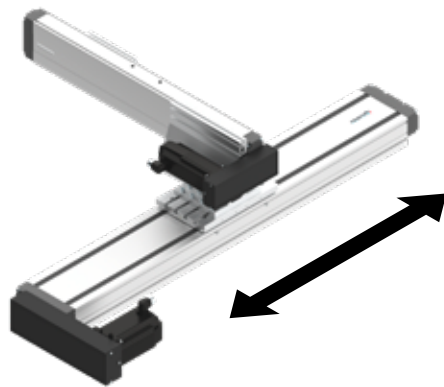


Fig. 12: Moving the carriage

11 Operation

NOTICE

Lubricant may escape!

Environmental contamination.

- ▶ Take suitable precautions to collect any leaking lubricant and dispose of it properly.

Risk of motor overheating when overloaded!

Risk of fire.

- ▶ During operation, be sure to comply with technical data such as load capacities, torques, maximum rotary speeds, motor data, etc.

12 Repair / Maintenance / Lubrication

EN

12.1 Repair

- ▶ Repairs to the linear axis should only be performed by Bosch Rexroth.

12.2 Maintenance

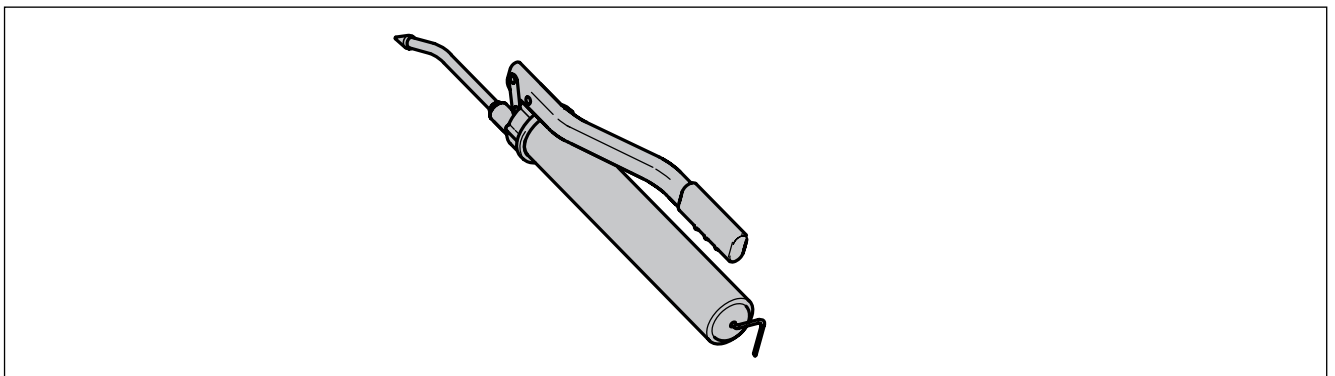


Fig. 13: Maintenance

- ▶ Maintenance is limited to re-lubrication. ➡ Notes in the instructions for the individual axes.

12.3 Lubrication

- ▶ The system comes with initial greasing.

13 Storing the product

NOTICE

Risk of damage due to improper storage!

Potential corrosion of product parts.

- ▶ Store the product only in dry, covered areas.
- ▶ Protect the product from humidity and corrosive agents.

14 Disposal

The product contains a number of different materials: aluminum, steel, plastics, grease and possibly electronic components.

NOTICE

Environmentally hazardous materials can pollute the environment if not disposed of properly.

Environmental pollution.

- ▶ Collect any leaking lubricant and recycle it correctly.
- ▶ The product and its components must be recycled correctly and in compliance with all applicable national and international guidelines and regulations.

15 Technical data

The technical data depends on the configuration and are included in the technical delivery information.

16 Operating conditions

Table 8: Operating conditions

Operating conditions	Value
Ambient temperature with Bosch Rexroth servo motor	0 °C ... 40 °C, above 40 °C loss of performance
Ambient temperature for mechanical system (without dropping below dew point)	-10 °C ... 50 °C
Soiling	Not permissible

¹⁾ Minimum travel to ensure a reliable lubrication distribution.

16.1 Tightening torques

We use screws in the 8.8 strength class as standard. Any deviations are marked accordingly.

Table 9: Tightening torques

 $\mu = 0.125$	Socket head cap screws according to ISO 4762, DIN 6912 and DIN 7984													
	M1.6	M2	M2.5	M3	M4	M5	M6	M8	M10	M12	M14	M16	M20	M24
8.8 $\varnothing$ M_A max (Nm)	0.17	0.4	0.70	1.3	2.8	5.5	9.6	23	46	80	127	194	392	675
10.9 $\varnothing$ M_A max (Nm)	0.24	0.5	1.00	1.8	4.0	8.1	14.0	34	68	116	186	285	558	960
12.9 $\varnothing$ M_A max (Nm)	0.29	0.6	1.25	2.1	4.8	9.5	16.5	40	80	137	218	333	653	1125

17 Removal and replacement

To ensure the accuracy of the product after replacement of assemblies (e.g. toothed belt, ball guide rail, carriage, frame, ball screw assembly, etc.), such assemblies and individual axes may only be removed and replaced by Bosch Rexroth. This does not apply to the activities described in the instructions for the individual axes.

18 Service and support

- ▶ When ordering spare parts, please specify all the data on the nameplate.
- ▶ To order spare parts, please contact your local Bosch Rexroth sales partner. You can find this on the Internet under www.boschrexroth.com/contact

In urgent cases, our Bosch Rexroth Customer Service help desk and hotline staff will be happy to assist you in any way they can.

Phone: +49 (0) 9352 40 50 60

E-mail: servicelt@boschrexroth.de

Return address:

Bosch Rexroth AG

SERVICE

Röntgenstraße 5

97424 Schweinfurt

Bosch Rexroth AG
Ernst-Sachs-Straße 100
97424 Schweinfurt, Germany
Tel. +49 9721 937-0
Fax +49 9721 937-275
www.boschrexroth.com

Subject to technical modifications

Printed in Germany
R320103109/2021-01