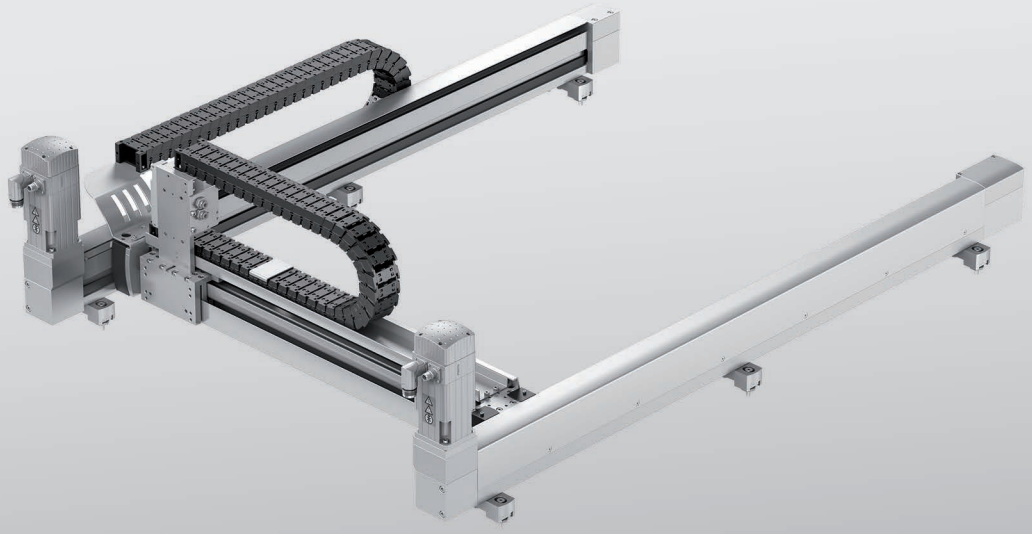
Planar surface gantry

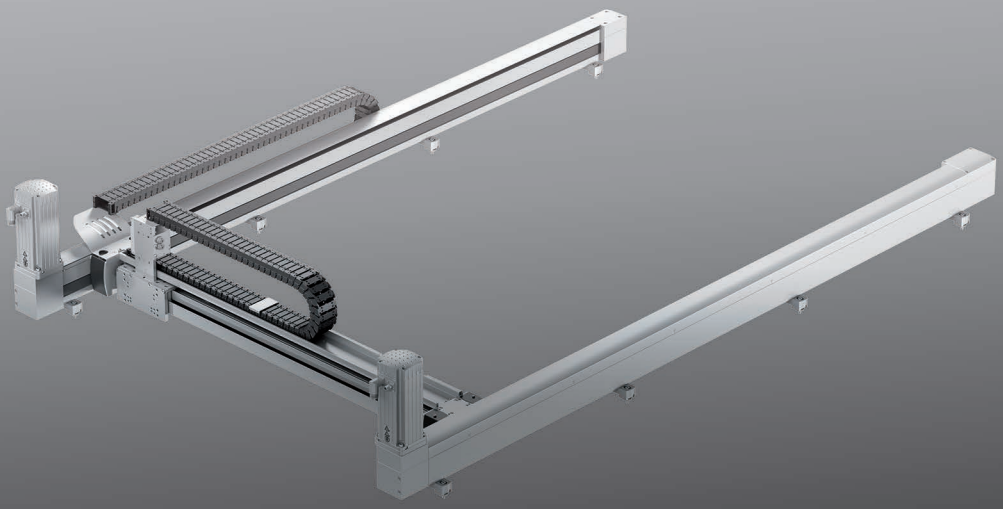
EXCH-40 / 60

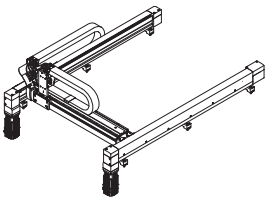
EXCM-40

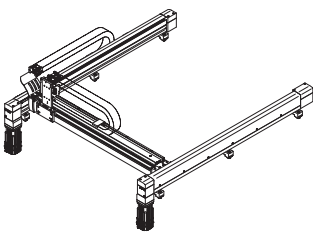
FESTO

Repair instructions (en)









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All product designations and brand names used are the property of the owners and not explicitly identified as such.

All technical data are subject to change according to technical updates.

Foreword

These repair instructions are valid for the planar surface gantries listed on the title page to the exclusion of any liability claims.

The descriptions in these repair instructions may deviate depending on the design and/or modification status of the planar surface gantries. The user must check this prior to carrying out the repair and take the deviations into consideration if necessary.

These repair instructions have been prepared with care.

Festo SE & Co. KG does not, however, accept liability for any errors in these repair instructions or their consequences. Likewise, no liability is accepted for direct or consequential damage resulting from incorrect use of the products.

Further information is given in Chapter 7 on page 79.

The relevant regulations on occupational safety, safety engineering, and interference suppression as well as the stipulations contained in these repair instructions must be observed when working on the products.

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Table of Contents

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Table of Contents

1 Important information

1.1 About these repair instructions

This document contains important information about the professional repair of the planar surface gantries, type EXCH-40 / 60 and EXCM-40.

The costs of carrying out a repair must always be considered in case of larger defects.

Before carrying out a repair, the relevant chapter in these instructions must be read in full and followed consistently.

For reasons of clarity, these repair instructions do not contain all detailed information. The following documents should therefore also be available while performing repair work on the planar surface gantry:

- **Description of "mechanical installation"**
  Describes how to mount, install and dismantle the respective planar surface gantry. It can be found on the Festo website (➔ www.festo.com/sp).
- **"Commissioning" description**
  Describes the functions, the electrical installation, the commissioning using the FCT, the operation, the control principle and the procedure for error diagnostics for planar surface gantries. It can be found on the Festo website (➔ www.festo.com/sp).
- **Spare parts documentation**
  Contains an overview of the spare and wearing parts as well as information on their installation. This can be found in the online spare parts catalogue on the Festo website (➔ www.festo.com/spareparts).
- **"Tools and repair accessories" information brochure**
  Contains an overview of available assembly tools (e.g. lubricants, locking agent), special tools, schematic diagrams, fixtures, measuring devices, etc. The information brochure can be found in the online spare parts catalogue on the Festo website (➔ Tools and repair accessories.pdf).

1.2 Symbols used in these repair instructions

Danger categories

The following symbols identify text passages which draw attention to specific hazards.

Danger

Warning

Caution

Marking special information

The following symbols identify text passages which contain special information.

Note

Information

Environment

1.3 Text designations used in these repair instructions

- Activities that can be carried out in any order.

1. Activities which should be carried out in the specified order.

– General lists.

➔ Reference to further information.

Underlined, blue text indicates a cross-reference or hyperlink that you can click on in the PDF.

1.4 General safety instructions

Danger

Risk of fatal injury due to electric shock and uncontrolled movement of components.

– The planar surface gantry must be de-energised, depressurised and reliably secured against unauthorised reactivation before the maintenance and repair work begins.

Caution

The planar surface gantry may only be repaired by authorised and trained persons in accordance with the specifications in the technical documentation and using original spare parts.

Installation and repair by unauthorised and untrained persons, repairs using non-original spare parts or without the technical documentation required for installation and/or repair are dangerous and therefore not permitted.

Repairs must only be carried out in conjunction with these repair instructions and the respective operating instructions for the device, as well as the documents listed in Chapter 1.1 on page 6.

Caution

Lifting large loads can lead to permanent injury.

– Depending on its size and weight, lift and turn the planar surface gantry with 2 to 3 persons in total. An additional person is required for the attachment to the mounting frame.

Caution

Unintended switching on can trigger unexpected movements and cause bruises.

– Ensure that the unit is protected against restarting before any modification or maintenance work or inspections are carried out. Loosened parts can make unexpected movements or fall off.

– Secure parts against accidental movements or move them into a safe end position.

Note

Observe the given tightening torques. If no special information is given the tightening torques given in the relevant standard apply to the screws, bolts and nuts used.

Note the strength class of the screws, bolts and nuts!

Festo recommends use of LOCTITE 243 threadlocker as a locking agent.

In the event of damage caused by unauthorised manipulation, improper use or use of non-original spare parts, all warranty and liability claims against the manufacturer expire.

Instead of carrying out the repair yourself, your local Festo sales office offers the option of having the repair carried out by Festo.

Components and equipment replaced during repair must be disposed of in accordance with the relevant local environmental protection regulations.

1.5 Technical requirements

Note

The following instructions for safe and proper use must be observed:

- Observe the connection and ambient conditions specified in the technical data of the products and all the connected components. The product can only be operated in compliance with the relevant safety guidelines if you comply with the limit values and load limits (➔ see enclosed documentation).
- The planar surface gantry must be in perfect technical condition.
- The planar surface gantry may only be operated in its original condition and without unauthorised modifications.
- The planar surface gantry is designed for industrial use.

1.6 Standards and test values

Standards and test values which products comply with and fulfil can be found in the "Technical data" sections of the enclosed documentation.

2 General product description

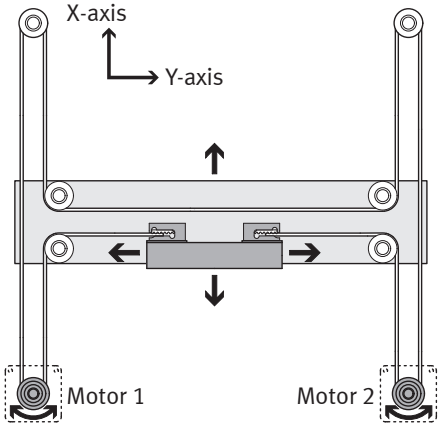
2.1 Functional description

Two fixed motors drive a toothed belt arranged in an H-shape. The rotating toothed belt moves the X-axis and the Y-traverse in 2-dimensional space. The position of the slide is calculated by a controller.

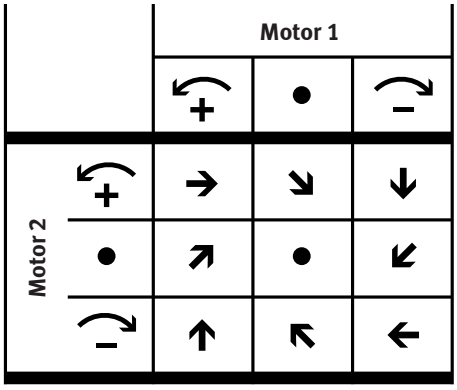
The slide movement in the direction of an axis is reached through the controlled interplay of the two motors.

This illustration provides an overview of the structure of the planar surface gantry.

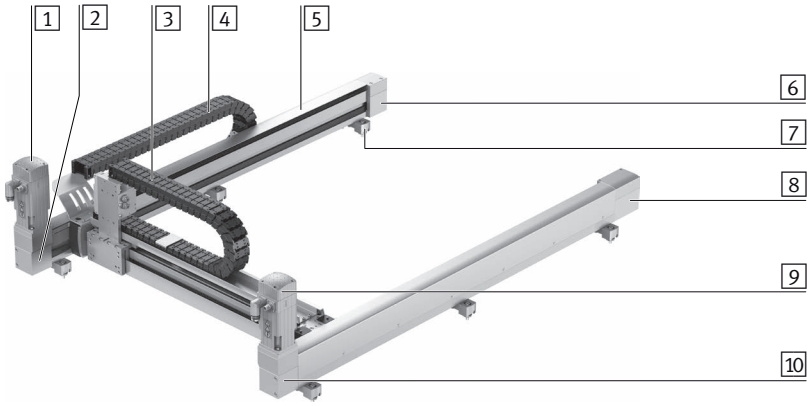
Axis movement



Interaction of the two motors



2.2 Structure of the planar surface gantry

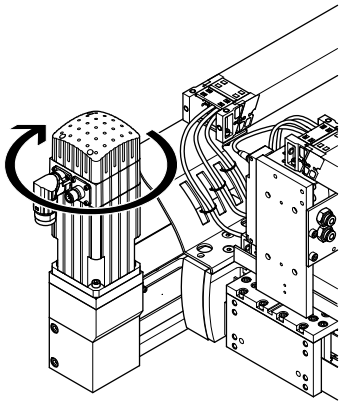


1 Motor 1
2 Actuator end cap (motor 1)
3 Y-traverse energy chain
4 X-axis energy chain
5 X-axis
6 Actuator end cap
7 Mounting component
8 End cap with bearing module for toothed belt pretension
9 Motor 2
10 Actuator end cap (motor 2)

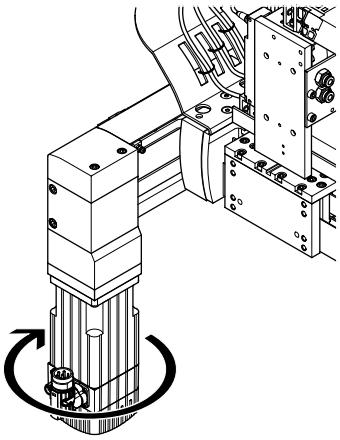
2.2.1 Motor attachment variants

The servo motors of the planar surface gantries can be mounted in a top attachment position and in a bottom attachment position. The motor cable outlets are positioned in the factory on the outside of the planar surface gantry in the extension of the X-axis. If necessary, the position can be adapted to the installation situation by turning the motor in 90°-steps.

Motor attachment position at the top (T)



Motor attachment position at the bottom (B)

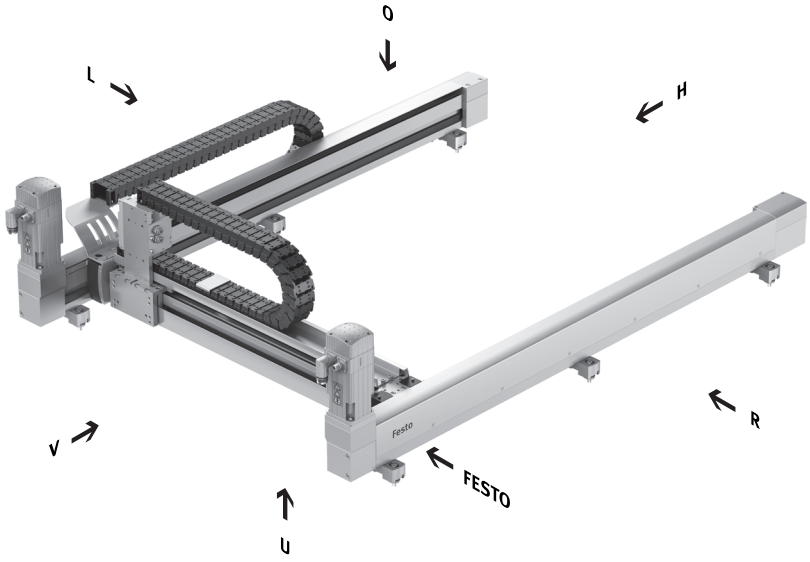


2.3 Sizes and part numbers

Size	Part number
EXCH-40-...-	1923050
EXCH-60-...-	1939785
EXCM-40-...-	3741955

2.4 Orientation designations

This illustration provides an overview of the orientation designations of the planar surface gantry.



Festo logo = reference point
O = top
U = bottom
R = right
L = left
V = front
H = rear

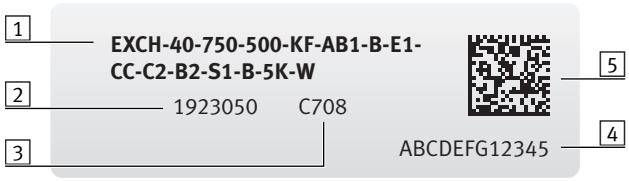
2.5 Type code

The features of a planar surface gantry can be determined with the help of the product labelling on the planar surface gantry. The Festo logo and the product labelling are attached separately to the planar surface gantry. The product labelling for both sizes is located on the actuator end cap. The order code describes the planar surface gantry's features, separated by a hyphen "-".

A list and description of all possible equipment features of the planar surface gantry can be found in the data sheet, It is available on the Festo website (➔ www.festo.com).

2.5.1 EXCH-40

Example:



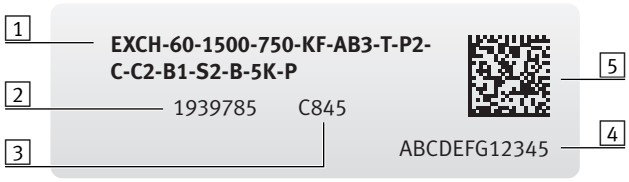
1 Order code
2 Part number
3 Serial number
4 Product Key
5 Product Key Code
Data Matrix Barcode
(http://pk.festo.com/ + Product Key)

The order code on the product labelling provides the following information:

EXCH	Electric planar surface gantry
40	Size, slide load max. 4 kg
750	750 mm stroke of the X-axis
500	500 mm stroke of the Y-axis
KF	Ball bearing guide of the X- and Y-axis
AB1	Servo motor AC, size 70, with brake
B	Motor flange mounted downwards
E1	Electric lifter, 100 mm stroke
CC	Control system in the control cabinet
C2	CMXR-C2 multi-axis controller with robotics functionality and integrated PLC
B2	2× CMMP-AS-C5-3A, 1× CMMP-AS-C2-3A, for front unit (1 electric axis)
S1	Integrated safety switching device
B	With CDSA operator unit
5K	Cable length, 5 metres
W	Without assembly mounting kit

2.5.2 EXCH-60

Example:



1 Order code
2 Part number
3 Serial number
4 Product key
5 Product Key Code
Data Matrix Barcode
(http://pk.festo.com/ + Product Key)

The order code on the product labelling provides the following information:

EXCH	Electric planar surface gantry
60	Size, slide load max. 6 kg
1500	1500 mm stroke of the X-axis
750	750 mm stroke of the Y-axis
KF	Ball bearing guide of the X- and Y-axis
AB3	Servo motor AC, size 140, with brake
T	Motor flange-mounted upwards
P2	Pneumatic lifter, 100 mm stroke
C	Control system on mounting plate
C2	CMXR-C2 multi-axis controller with robotics functionality and integrated PLC
B1	2× CMMP-AS-C5-3A, without electric front unit
S2	Integrated safety switching device with power failure detection
B	With CDSA operator unit
5K	Cable length, 5 metres
P	Assembly mounting kit on mounting plate

2.5.3 EXCM-40

Example:

1 Order code
2 Part number
3 Serial number
4 Product Key
5 Product Key Code
Data Matrix Barcode
(http://pk.festo.com/ + Product Key)

The order code on the product labelling provides the following information:

EXCM	Electric planar surface gantry
40	Size, slide load max. 4 kg
350	350 mm stroke of the X-axis
460	460 mm stroke of the Y-axis
KF	Ball bearing guide of the X- and Y-axis
SB	Stepper motor with brake
B	Motor flange mounted downwards
PF	Controller, remote, PNP (48 V)
6	Cable length, 5 metres
P2	Pneumatic lifter, 100 mm stroke
J	With adjusting kit

2.6 Features

2.6.1 EXCH-40 / 60

EXCH feature	Code	Specification
Type	EXCH	Electric planar surface gantry
Size	40	maximum slide load 4 kg
	60	maximum slide load 6 kg
Stroke of the X-axis	500	500 mm stroke in the X-axis
	750	750 mm stroke in the X-axis
	1000	1000 mm stroke in the X-axis
	1250	1250 mm stroke in the X-axis
	1500	1500 mm stroke in the X-axis
	X-stroke	X mm stroke in the X-axis
Y-axis stroke	400	400 mm stroke in the Y-axis
	500	500 mm stroke in the Y-axis
	750	750 mm stroke in the Y-axis
	1000	1000 mm stroke in the Y-axis
	1250	1250 mm stroke in the Y-axis
	1500	1500 mm stroke in the Y-axis
	X-stroke	X mm stroke in the Y-axis
Guide	KF	Recirculating ball bearing guide
Motor type	AB1	Servo motor AC, size 70, with brake
	AB2	Servo motor AC, size 100, with brake
	AB3	Servo motor AC, size 140, with brake
	AS1	Servo motor AC, size 70
	AS2	Servo motor AC, size 100
	AS3	Servo motor AC, size 140
	W	without motor
Motor attachment position	B	bottom
	T	top
Energy chain connection side	L	left
Attachment components	P1	Pneumatic lifter, 50 mm stroke
	P2	Pneumatic lifter, 100 mm stroke
	P3	Pneumatic lifter, 150 mm stroke
	P4	Pneumatic lifter, 200 mm stroke
	E1	Electric lifter, 100 mm stroke
	E2	Electric lifter, 200 mm stroke
	T0	without
Control system	CC	in the control cabinet
	C	on mounting plate
	CS	Control cabinet with base
	–	Without control system
Multi-axis controller	C1	CMXR-C1 robotic functionality
	C2	CMXR-C2 robotic functionality + integrated PLC
	–	without multi-axis controller

EXCH feature	Code	Specification
Motor controller	B1	2× CMMP-AS-C5-3A, without electric front unit
	B2	2× CMMP-AS-C5-3A, 1× CMMP-AS-C2-3A, for front unit (1 electric axis)
	B3	2× CMMP-AS-C5-3A, 2× CMMP-AS-C2-3A, for front unit (2 electric axes)
	B6	2× CMMP-AS-C5-11A, without front electrical unit
	B7	2× CMMP-AS-C5-11A, 1× CMMP-AS-C2-3A, for front unit (1 electrical axis)
	B8	2× CMMP-AS-C5-11A, 2× CMMP-AS-C2-3A, for front unit (2 electrical axes)
	–	without motor controller
Safety engineering	S1	Integrated safety switching device
	S2	Integrated safety switching device with power failure detection
	–	without safety switching device
Operator terminal	B	with operator unit CDSA
	–	without CDSA operator unit
Cable length	5K	5 metres
	10K	10 metres
	–	without
Mounting kit	P	Mounting plate
	W	without mounting kit
	–	Adjusting kit

2.6.2 EXCM-40

EXCH feature	Code	Specification
Type	EXCM	Electric planar surface gantry
Size	40	maximum slide load 4 kg
Stroke of the X-axis	200 ... 1000	200 mm ... 1000 mm variable stroke lengths in the X-axis
Y-axis stroke	210	210 mm stroke in the Y-axis
	260	260 mm stroke in the Y-axis
	310	310 mm stroke in the Y-axis
	360	360 mm stroke in the Y-axis
	410	410 mm stroke in the Y-axis
	460	460 mm stroke in the Y-axis
	510	510 mm stroke in the Y-axis
	200 ... 1000	200 mm ... 1000 mm variable stroke lengths in the Y-axis
Guide	KF	Recirculating ball bearing guide
Motor type	SB	Stepper motor with brake
	ST	Stepper motor
	W	without motor
Motor attachment position	B	bottom
	T	top
Motor controller	–	without
	PF	remote, PNP (48 V)
Cable length	–	without
	6	5 metres
	7	10 metres
Attachment components	–	without
	HE1	Electric lifter, 100 mm stroke
	P1	Pneumatic lifter, 50 mm stroke
	P2	Pneumatic lifter, 100 mm stroke
	P3	Pneumatic lifter, 150 mm stroke
Mounting kit	–	with mounting component
	J	Adjusting kit

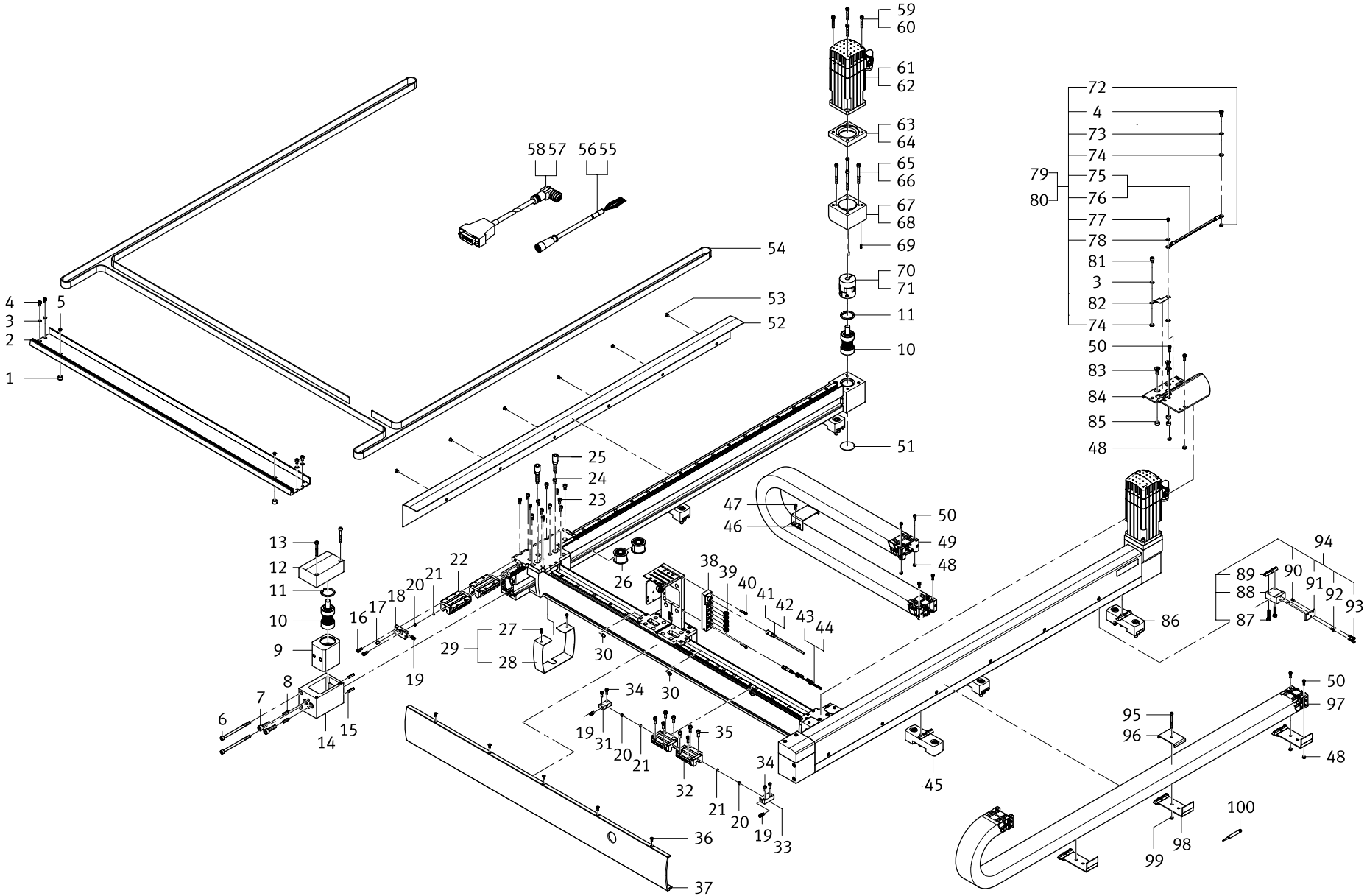
3 Component overviews with bill of materials

The component overviews with corresponding bills of materials for the following planar surface gantries are listed on the following pages:

Size	Part number	Components list	Bill of materials
EXCH-40-...-	1923050	➔ Chapter 3.1 on page 16	➔ Chapter 3.1.1 on page 17
EXCH-60-...-	1939785	➔ Chapter 3.2 on page 18	➔ Chapter 3.2.1 on page 19
EXCM-40-...-	3741955	➔ Chapter 3.3 on page 20	➔ Chapter 3.3.1 on page 21

The following diagrams are intended only to provide an overview of the individual components. To order spare and wearing parts, please use the online spare parts catalogue on the Festo website (➔ www.festo.com/spareparts).

3.1 EXCH-40 components overview



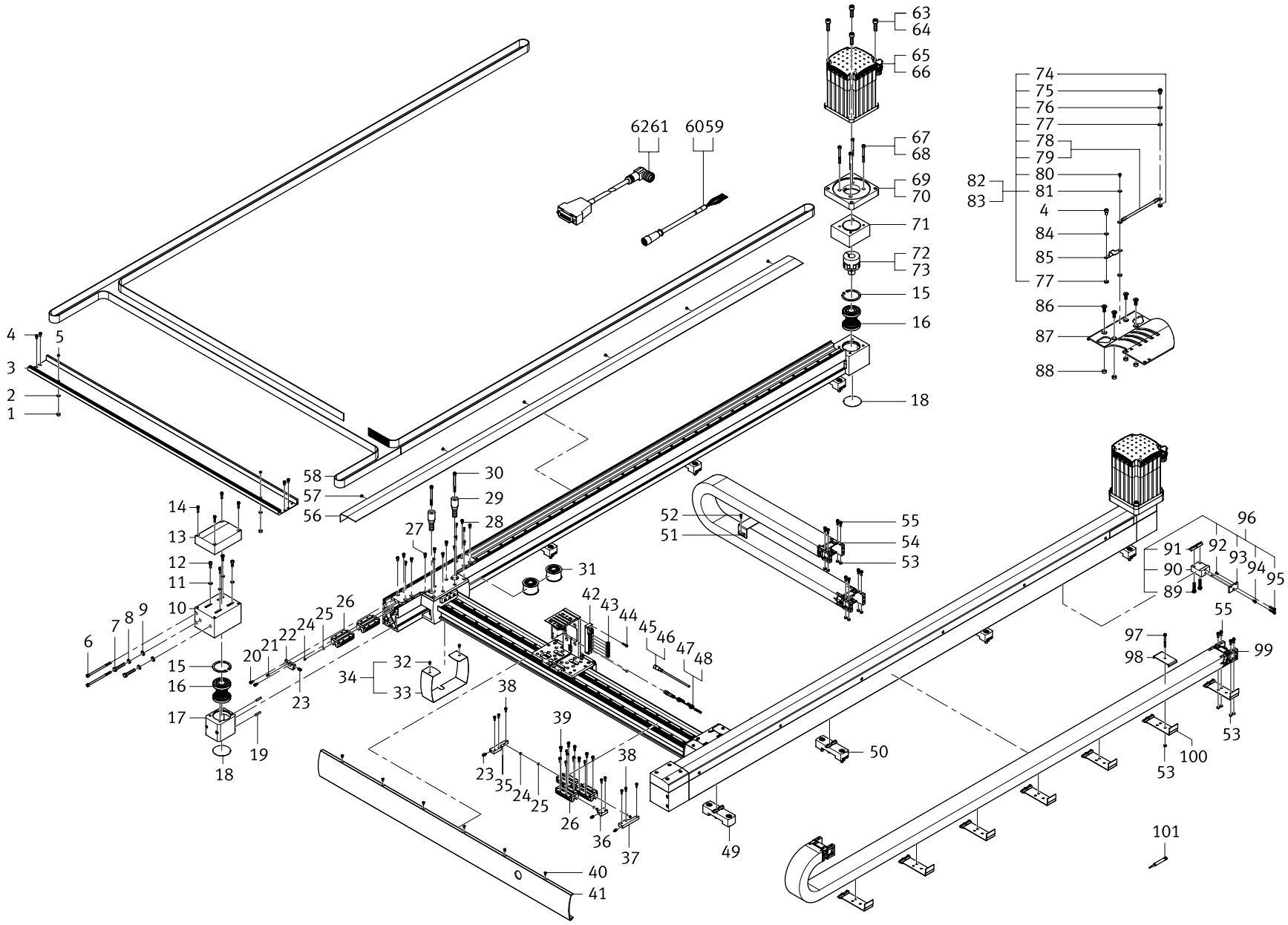
3.1.1 EXCH-40 bill of materials

No.	Designation, type
1	Switch lug
2	Support
3	Washer, DIN 433-5.3
4	Socket head screw, DIN 912-M5×8-8.8
5	Countersunk screw, DIN 7991-M4×6-8.8
6	Socket head screw, DIN 912-M6×100-10.9
7	Socket head screw, DIN 912-M8×30-12.9
8	Grub screw, DIN 915-M6×20-45H
9	Bearing
10	Pinion module
11	Retaining ring, DIN 472-35×1.5
12	End cap
13	Socket head screw, DIN 912-M5×40-10.9
14	End cap
15	Spring pin, DIN 7346-5×20
16	Socket head screw, DIN 6912-M5×12-8.8
17	Buffer
18	Lubrication adapter
19	Lubrication nipple
20	Lubrication nipple
21	O-ring, I3601 B-3×2-N-NBR70
22	Guide carriage
23	Socket head screw, DIN 912-M5×12-10.9
24	Socket head screw, DIN 912-M5×10-10.9
25	Shaft
26	Guide pulley assembly
27	Socket head screw, DIN 912-M3×10-8.8
28	Cover
29	Cover assembly
30	Buffer
31	Lubricating head
32	Guide carriage
33	Lubricating head
34	Socket head screw, DIN 912-M4×12-8.8
35	Socket head screw, DIN 912-M5×14-8.8
36	Countersunk screw, DIN 7991-M4×10-8.8
37	Cover

No.	Designation, type
38	Multi-pin plug distributor, NEDU-L6R1-M8G3L-M12G8
39	Protective cap
40	Socket head screw, DIN 6912-M4×20-8.8
41	Plug socket with cable, SIM-M12-8GD-15-PU
42	Socket cable. SIM-M12-8GD-10-PU
43	Proximity sensor, SIES-8M-PS-24V-K-0.3-M8D
44	Proximity switch, SME-10M-DS-24V-E-0.3-L-M8D
45	Mounting kit, EAHM-E12-K-40
46	Angle bracket
47	Socket head screw, DIN 912-M4×12-8.8
48	Hex nut, DIN 934-M4-10
49	Energy chain
50	Socket head screw, DIN 912-M4×12-8.8
51	Sealing disc
52	Cover
53	Countersunk screw, DIN 7991-M4×8-8.8
54	Toothed belt
55	Motor cable, NEBM-M23G8-E-5-Q9N-LE8
56	Motor cable, NEBM-M23G8-E-10-Q9N-LE8
57	Encoder cable, NEBM-M12W8-E-5-N-S1G15
58	Encoder cable, NEBM-M12W8-E-10-N-S1G15
59	Socket head screw, DIN 912-M5×30-10.9
60	Socket head screw, DIN 912-M8×25-10.9
61	Servo motor, EMMS-AS-70-M-LS-RMB
62	Servo motor, EMMS-AS-100-S-HS-RM
63	Motor flange
64	Motor flange
65	Socket head screw, DIN 912-M5×55-10.9
66	Socket head screw, DIN 912-M5×75-8.8
67	Coupling housing
68	Coupling housing
69	Cylindrical dowel pin, DIN 7-4M6×10
70	Coupling, EAMC-42-50-11-12
71	Coupling, EAMC-42-50-12-19
72	Hex nut, DIN 934-M5-6
73	Washer, DIN 125-A-5.3
74	Toothed disc, DIN 6797-A-5.3

No.	Designation, type
75	Earth cable, EXCH-40/60-M5-10.00-M5
76	Earth cable, EXCH-40/60-M5-15.00-M5
77	Socket head screw, DIN 912-M3×6-8.8
78	Washer, DIN 9021-3.2
79	Earth cable assembly, EXCH-40/60-M5-10.00-M5
80	Earth cable assembly, EXCH-40/60-M5-15.00-M5
81	Socket head screw, DIN 912-M5×10-8.8
82	Earthing component
83	Countersunk screw, DIN 7991-M6×16-8.8
84	Angle bracket
85	Spacer ring
86	Adjustment kit, EADC-E12-40
87	Hexagon head screw, DIN 933-M6×30-8.8
88	Sensor bracket
89	Slot nut
90	Socket head screw, DIN 7984-M3×8-8.8
91	Sensor bracket
92	Socket head screw, DIN 912-M4×8-8.8
93	Socket head screw, DIN 912-M4×20-8.8
94	Sensor mounting
95	Socket head screw, DIN 912-M4×45-8.8
96	Retainer
97	Energy chain
98	Support profile
99	Hex nut, DIN 934-M4-ENAW-7075-T6
100	Locking agent (threadlocker), LOCTITE 243

3.2 EXCH-60 components overview



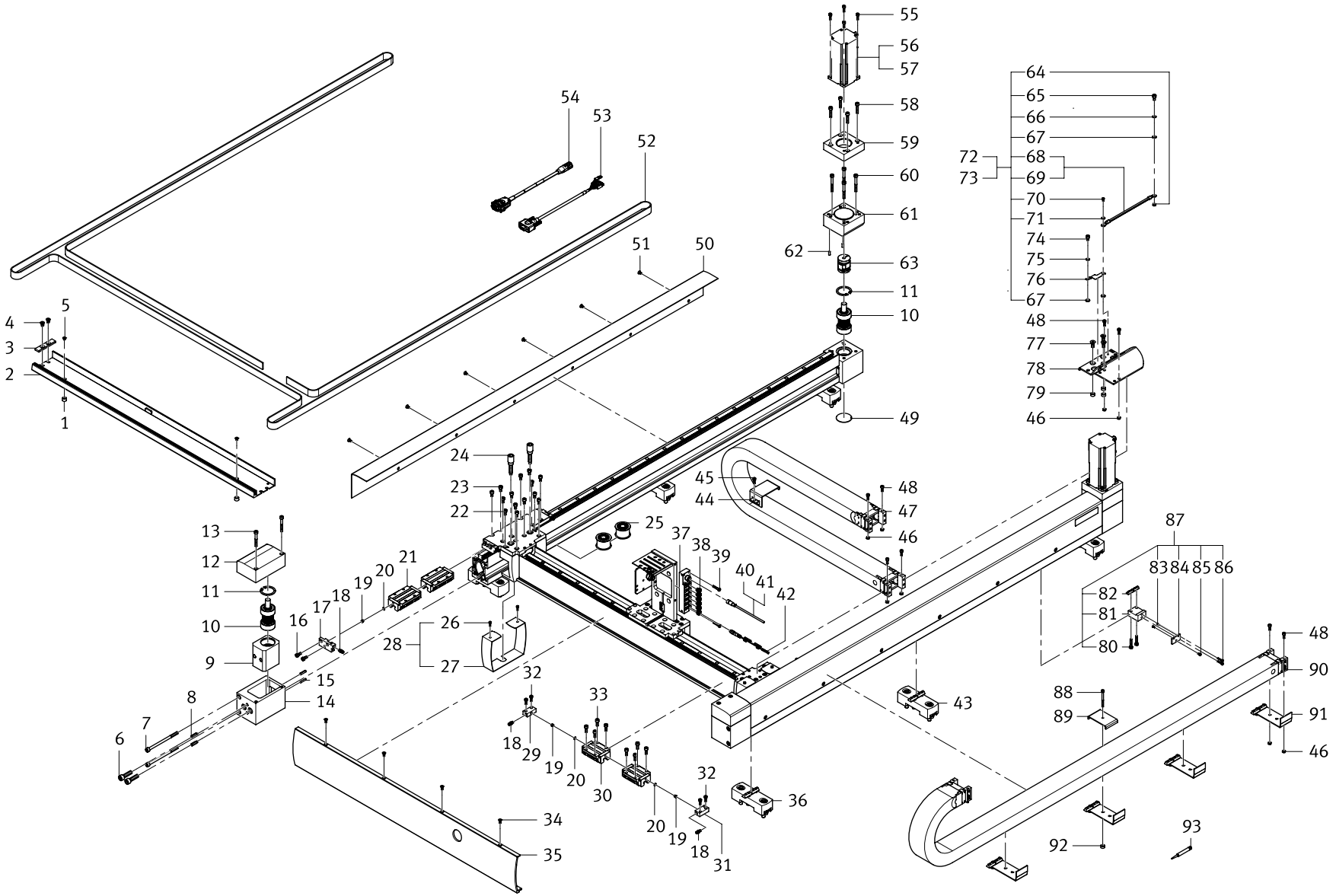
3.2.1 EXCH-60 bill of materials

No.	Designation, type
1	Switch lug
2	Shim, DIN 988-6×12×0.3
3	Support
4	Socket head screw, DIN 912-M5×10-10.9
5	Countersunk screw, DIN 7991-M4×6-8.8
6	Socket head screw, DIN 912-M6×110-8.8
7	Hexagon head screw, DIN 961-M8×1×45-8.8
8	Spring washer, DIN 127-B-8
9	Washer, DIN 125-A-8.4-A2
10	End cap
11	Washer, DIN 125-B-6.4
12	Socket head screw, DIN 912-M6×18-10.9
13	End cap
14	Socket head screw, DIN 912-M5×20-10.9
15	Retaining ring, DIN 472-62×2
16	Pinion module
17	Bearing
18	Sealing disc
19	Spring pin, DIN 7346-5×20
20	Socket head screw, DIN 6912-M5×12-8.8
21	Buffer
22	Lubrication adapter
23	Lubrication nipple
24	Lubrication nipple
25	O-ring, I3601 B-3×2-N-NBR70
26	Guide carriage
27	Socket head screw, DIN 912-M5×12-10.9
28	Socket head screw, DIN 912-M5×10-10.9
29	Shaft
30	Socket head screw, DIN 912-M6×75-A2-70
31	Guide pulley assembly
32	Flat head screw, ISO 7045-M4×8-4.8-Z
33	Cover
34	Cover assembly
35	Lubricating head
36	Lubricating head
37	Lubricating head

No.	Designation, type
38	Socket head screw, DIN 912-M4×12-8.8
39	Socket head screw, DIN 912-M5×14-8.8
40	Countersunk screw, DIN 7991-M4×10-8.8
41	Cover
42	Multi-pin plug distributor, NEDU-L6R1-M8G3L-M12G8
43	Protective cap
44	Socket head screw, DIN 6912-M4×20-8.8
45	Plug socket with cable, SIM-M12-8GD-15-PU
46	Plug socket with cable, SIM-M12-8GD-10-PU
47	Proximity sensor, SIES-8M-PS-24V-K-0.3-M8D
48	Proximity switch, SME-10M-DS-24V-E-0.3-L-&
49	Mounting kit, EAHM-E12-K-60
50	Adjustment kit, EADC-E12-60
51	Angle bracket
52	Socket head screw, DIN 912-M4×12-8.8
53	Hex nut, DIN 934-M5-6
54	Energy chain
55	Socket head screw, DIN 912-M5×14-8.8
56	Cover
57	Countersunk screw, DIN 7991-M4×8-8.8
58	Toothed belt
59	Motor cable, NEBM-M23G8-E-5-Q9N-LE8
60	Motor cable, NEBM-M23G8-E-10-Q9N-LE8
61	Encoder cable, NEBM-M12W8-E-5-N-S1G15
62	Encoder cable, NEBM-M12W8-E-10-N-S1G15
63	Socket head screw, DIN 912-M8×20-10.9
64	Socket head screw, DIN 912-M10×35-8.8
65	Servo motor, EMMS-AS-100-M-HS-RM
66	Servo motor, EMMS-AS-140-S-HV-RM
67	Socket head screw, DIN 912-M6×60-10.9
68	Socket head screw, DIN 912-M6×65-10.9
69	Motor flange, EAMF-A-62A-100A
70	Motor flange, EAMF-A-62A-140A
71	Coupling housing
72	Coupling, EAMD-56-46-19-23×27
73	Coupling, EAMD-56-46-24-23×27
74	Hex nut, DIN 934-M5-6

No.	Designation, type
75	Socket head screw, DIN 912-M5×8-8.8
76	Washer, DIN 125-A-5.3
77	Toothed disc, DIN 6797-A-5.3
78	Earth cable, EXCH-40/60-M5-10.00-M5
79	Earth cable, EXCH-40/60-M5-15.00-M5
80	Socket head screw, DIN 912-M3×6-8.8
81	Washer, DIN 9021-3.2
82	Earth cable assembly, EXCH-40/60-M5-10.00-M5
83	Earth cable assembly, EXCH-40/60-M5-15.00-M5
84	Washer, DIN 433-5.3
85	Earthing component
86	Countersunk screw, DIN 7991-M6×16-8.8
87	Angle bracket
88	Spacer ring
89	Hexagon head screw, DIN 933-M6×30-8.8
90	Sensor bracket
91	Slot nut
92	Socket head screw, DIN 7984-M3×8-8.8
93	Sensor bracket
94	Socket head screw, DIN 912-M4×8-8.8
95	Socket head screw, DIN 912-M4×20-8.8
96	Sensor mounting
97	Socket head screw, DIN 912-M5×50-8.8
98	Retainer
99	Energy chain
100	Support profile
101	Locking agent (threadlocker), LOCTITE 243

3.3 EXCM-40 components overview



3.3.1 EXCM-40 bill of materials

No.	Designation, type
1	Switch lug
2	Support
3	Plate
4	Countersunk screw, DIN 7991-M5×10-A2-70
5	Countersunk screw, DIN 7991-M4×6-8.8
6	Socket head screw, DIN 912-M8×30-12.9
7	Socket head screw, DIN 912-M6×100-10.9
8	Grub screw, DIN 915-M6×20-45H
9	Bearing
10	Pinion module
11	Retaining ring, DIN 472-35×1.5
12	End cap
13	Socket head screw, DIN 912-M5×40-10.9
14	End cap
15	Spring pin, DIN 7346-5×20
16	Socket head screw, DIN 6912-M5×12-8.8
17	Lubrication adapter
18	Lubrication nipple
19	Lubrication nipple
20	O-ring, I3601 B-3×2-N-NBR70
21	Guide carriage
22	Socket head screw, DIN 912-M5×12-10.9
23	Socket head screw, DIN 912-M5×10-10.9
24	Shaft
25	Guide pulley assembly
26	Socket head screw, DIN 912-M3×10-8.8
27	Cover
28	Cover assembly
29	Lubricating head
30	Guide carriage
31	Lubricating head
32	Socket head screw, DIN 912-M4×12-8.8
33	Socket head screw, DIN 912-M5×14-8.8
34	Countersunk screw, DIN 7991-M4×10-8.8
35	Cover
36	Mounting kit, EAHM-E12-K-40

No.	Designation, type
37	Multi-pin plug distributor, NEDU-L6R1-M8G3l-M12G8
38	Protective cap
39	Socket head screw, DIN 6912-M4×20-8.8
40	Plug socket with cable, SIM-M12-8GD-10-PU
41	Plug socket with cable, SIM-M12-8GD-15-PU
42	Proximity switch, SME-10M-DS-24V-E-0.3-L-&
43	Adjustment kit, EADC-E12-40
44	Angle bracket
45	Socket head screw, DIN 912-M4×12-8.8
46	Hex nut, DIN 934-M4-10
47	Energy chain
48	Socket head screw, DIN 912-M4×12-8.8
49	Sealing disc
50	Cover
51	Countersunk screw, DIN 7991-M4×8-8.8
52	Toothed belt
53	Motor cable, NEBM-S1G9-E-10-Q5-LE6
54	Encoder cable, NEBM-M12G8-E-5-S1G9
55	Socket head screw, DIN 912-M4×14-8.8
56	Stepper motor, EMMS-ST-57-M-SE-G2
57	Stepper motor, EMMS-ST-57-M-SEB-G2
58	Socket head screw, DIN 912-M5×25-10.9
59	Motor flange
60	Socket head screw, DIN 912-M5×45-10.9
61	Coupling housing
62	Cylindrical dowel pin, DIN 7-4M6×10
63	Coupling, EAMC-30-35-6.35-12
64	Hex nut, DIN 934-M5-6
65	Socket head screw, DIN 912-M5×8-8.8
66	Washer, DIN 125-A-5.3
67	Toothed disc, DIN 6797-A-5.3
68	Earth cable, EXCH-40/60-M5-10.00-M5
69	Earth cable, EXCH-40/60-M5-15.00-M5
70	Socket head screw, DIN 912-M3×6-8.8
71	Washer, DIN 9021-3.2

No.	Designation, type
72	Earth cable assembly, EXCH-40/60-M5-10.00-M5
73	Earth cable assembly, EXCH-40/60-M5-15.00-M5
74	Socket head screw, DIN 912-M5×10-8.8
75	Washer, DIN 433-5.3
76	Earthing component
77	Countersunk screw, DIN 7991-M6×16-8.8
78	Angle bracket
79	Spacer ring
80	Hexagon head screw, DIN 933-M6×30-8.8
81	Sensor bracket
82	Slot nut
83	Socket head screw, DIN 7984-M3×8-8.8
84	Sensor bracket
85	Socket head screw, DIN 912-M4×8-8.8
86	Socket head screw, DIN 912-M4×20-8.8
87	Sensor mounting
88	Socket head screw, DIN 912-M4×45-8.8
89	Retainer
90	Energy chain
91	Support profile
92	Hex nut, DIN 934-M4-ENAW-7075-T6
93	Locking agent (threadlocker), LOCTITE 243

4 Repair steps

Where possible, we recommend completely removing the planar surface gantry from the system before carrying out the repair.

Before starting the repair, dismantle any attachments in accordance with the instructions in the accompanying operating instructions.

Keep your working environment clean and tidy.

Before dismantling the planar surface gantry, it is imperative that the cause of the failure is investigated to prevent repeated and premature failure. A planar surface gantry that has been used as intended will not normally exhibit any premature signs of failure.

This investigation is not necessary in the case of non-premature failure (fatigue time). However, the condition of the toothed belt (general status, toothed belt pretension, etc.) must always be checked.

In case of uncertainty, we recommend replacing all the components mentioned to rule out reciprocal effects during later operation.

If the planar surface gantry suffers premature failure, the operating conditions should be observed more closely.

The following possibilities should be considered, among other things:

- **Overloading**
  - In case of overloading, the application parameters (load, speed) should be adjusted accordingly.
- **Ambient conditions/material resistance**
  - Check whether the ambient temperature is within the permissible range.
  - Check the chemical and physical ambient conditions for hazardous substances, such as dust, abrasive particles, cooling lubricants, solvents, ozone, radiation, water-soluble substances, greases and oils, etc.

Note

The repair should preferably be carried out on a stable and flat work surface with storage for small parts.

To prevent damage to sealing rims and toothed belt, do not use pointed or sharp-edged assembly aids.

4.1 Preparatory steps

Danger

Risk of fatal injury from electric shock.

- The control system of the planar surface gantry remains charged after the voltage has been switched off (capacitor voltage). As such, you must wait approx. 3 minutes after switching off the voltage before the motor cables can be removed. The capacitors discharge their voltage during this time.

1. Disconnect the planar surface gantry from the power and pressure supply and secure it against being switched back on again.
2. Remove the motor and encoder cables.

4.2 Visual inspection

- Check the planar surface gantry for visible damage that can impair its function, such as major defects in the roller tracks of both X-axes or the Y-traverse.

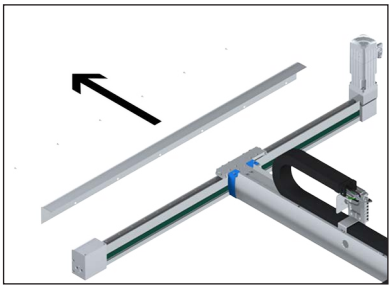
The planar surface gantry must be completely replaced if significant damage exists.

4.3 Dismantling and mounting the X-axis cover

Depending on the position of the countersunk screws of the cover, it may be necessary to dismantle the energy chain support (➔ Chapter 4.4.1 on page 23).

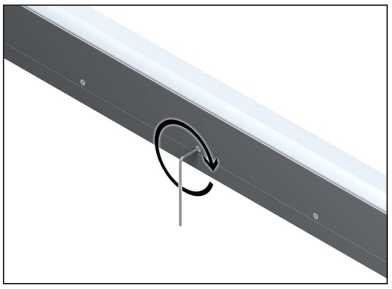
4.3.1 Dismantling

1. Unscrew the countersunk screws from the cover.
2. Remove cover carefully.



4.3.2 Assembly

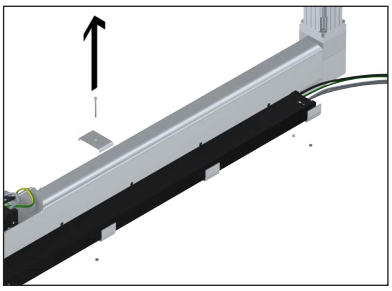
1. Position the cover on the X-axis.
2. Screw in the countersunk screws and tighten with tightening torque 0.6 Nm.



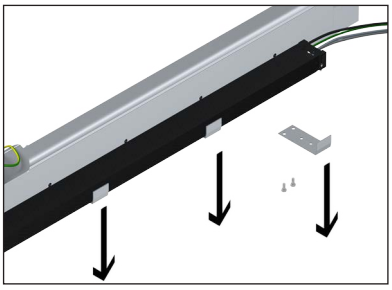
4.4 Dismantling and mounting the energy chain support

4.4.1 Dismantling

1. Unscrew the socket head screw from the top retainer, at the same time, hold against the hexagon nut.
2. Remove top retainer.
3. Unscrew both socket head screws at the end of the energy chain, at the same time, hold against the hexagon nuts.



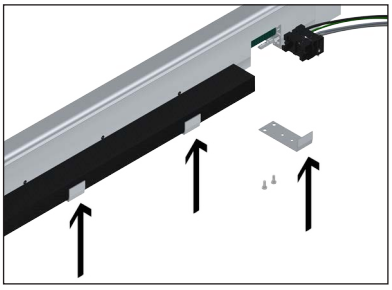
4. Support the energy chain.
5. Unscrew the hexagon screws of the support profile.
6. Remove the support profile.
7. Dismantle the other support profiles in the same way as the first.



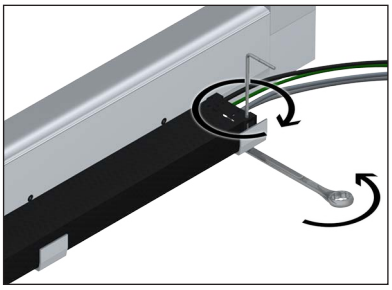
4.4.2 Assembly

Note

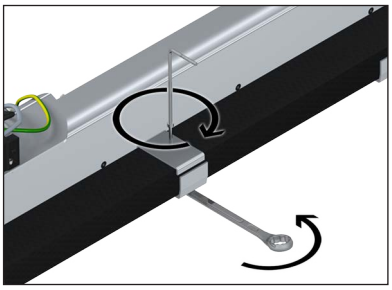
The support profiles must be mounted stress-free with the energy chain. Therefore, when installing, the slide must be moved backwards and forwards several times before the socket head screws at the end of the energy chain are tightened.



1. Clean the hexagon head screws to remove locking agent.
2. Wet the hexagon head screws with locking agent.
3. Position the support profiles on the X-axis and screw the hexagon head screws into the slot nuts and tighten with tightening torque 9.9 Nm.



4. Clean the socket head screws to remove the locking agent.
5. Wet the socket head screws with threadlocker.
6. Feed in the socket head screws at the end of the energy chain and position the hex nuts from underneath. Do not yet tighten the socket head screws and hexagon nuts.
7. Move the slide backwards and forwards along the complete stroke of the X-axis several times.
8. Tighten the socket head screws at the end of the energy chain with a tightening torque of 2.9 Nm, while at the same time holding the hex nuts in place.

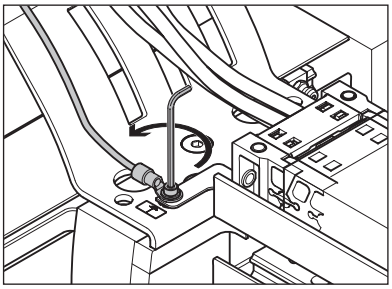


9. Clean the socket head screw to remove the locking agent.
10. Wet the socket head screw with locking agent.
11. Place the top retainer on the energy chain.
12. Guide the socket head screw through the top retainer, energy chain and support profile.
13. Put on the hex nut from underneath.
14. Tighten the socket head screws with a tightening torque of 1.5 Nm, while at the same time holding the hex nuts in place.

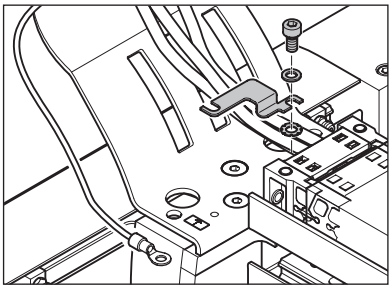
4.5 Dismantling and mounting the angle bracket

4.5.1 Dismantling

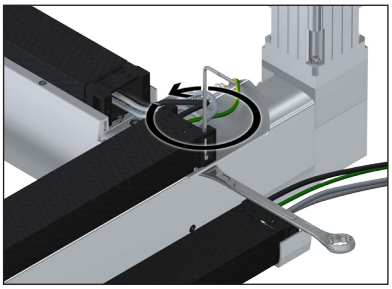
1. Unscrew the socket head screw for the earth cable.



2. Unscrew the socket head screw for the earthing component and remove the earthing component with washer and toothed disc.

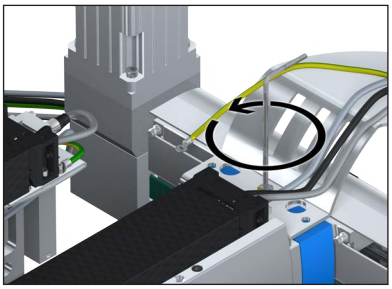


3. Unscrew the socket head screws of the energy chain from the angle bracket, while at the same time holding the hexagon nuts in place.
4. Support the energy chain so that no hoses or electric cables are bent or kinked.



Note

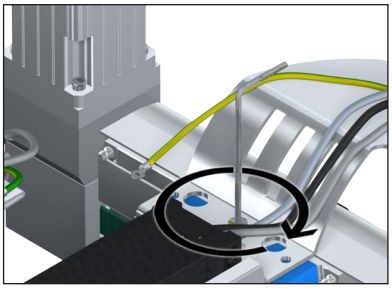
On unscrewing the countersunk screws and removing the angle bracket, ensure that the spacer rings are not lost and do not fall into the gantry.



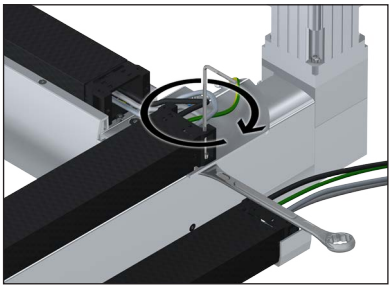
5. Unscrew the countersunk screws from the angle bracket and remove the angle bracket.
6. Remove the spacer rings.

4.5.2 Assembly

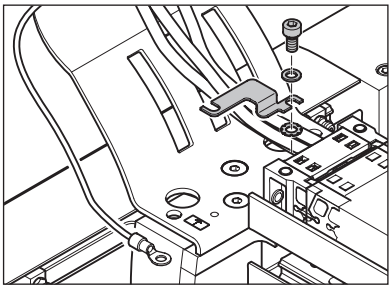
1. Place the spacer rings on the flange plate.
2. Position the angle bracket on the spacer rings and screw in the countersunk screws. Tighten the countersunk screws with a tightening torque of 9.9 Nm.



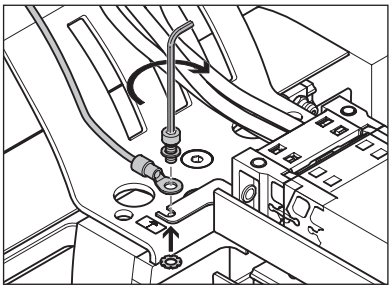
3. Place the energy chain on the angle bracket and feed the socket head screws into the mounting holes.
4. Put on the hex nuts from underneath.
5. Tighten the socket head screws with a tightening torque of 2.9 Nm, while at the same time holding the hex nuts in place.



6. Place the toothed disc on the support.
7. Push the washer onto the socket head screw.
8. Place the earthing component on the toothed disc and screw in socket head screw with washer.
9. Tighten the socket head screw with a tightening torque of 5.9 Nm ±10 %.



10. Push the toothed disc between the angle bracket and the earthing component.
11. Push the washer onto the socket head screw.
12. Push the earth cable onto the socket head screw.
13. Screw the socket head screw with washer and earth cable into the angle bracket.
14. Tighten the socket head screw with a tightening torque of 1.2 Nm.



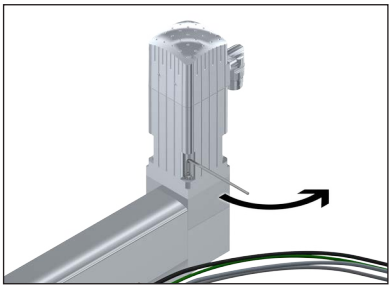
4.6 Dismantling and mounting the motors with coupling

4.6.1 Dismantling

Note

Before removing the motors the motor and encoder cables must be pulled off the motor (➔ Chapter 4.1 on page 22).

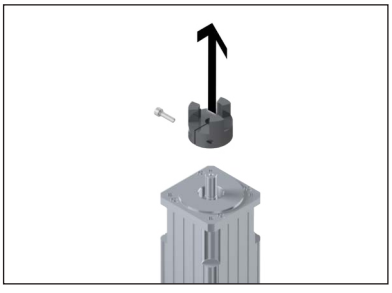
1. Unscrew the socket head screws of the motor.
2. Undo the motor from the motor flange and pull off the motor with the motor flange.



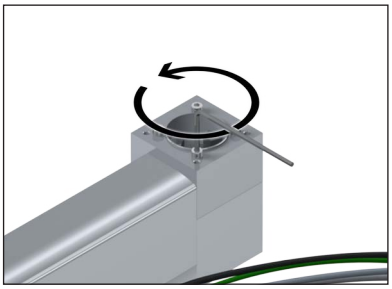
A certain amount of force is required to pull it off.

3. Dismantle the second motor in the same way as the first.

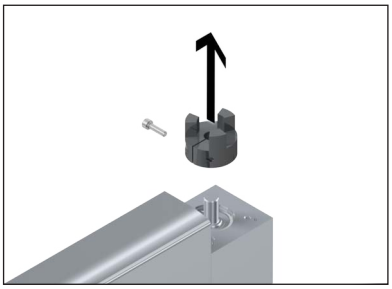
4. Undo the clamping screw of the coupling hub on the motor shaft and pull off the coupling hub.



5. Unscrew the socket head screws of the coupling housing and remove the coupling housing.



6. Undo the clamping screw of the coupling hub on the drive shaft and pull off the coupling hub.
7. Clean both coupling hubs, check for wear and if necessary replace.



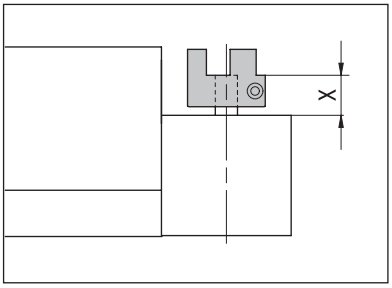
4.6.2 Assembly

Note

The motor shaft, drive shaft and coupling must be completely free from grease. Proper force transfer can only take place if the coupling grips a clean motor and axle shaft.

When mounting the coupling, the distance X between the coupling and the drive motor and the distance Y between the coupling and the actuator end cap must be met.

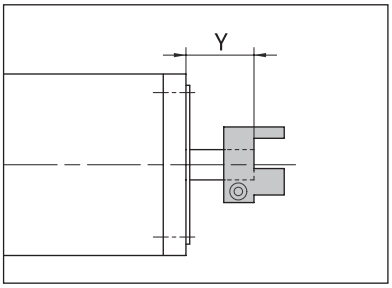
1. Push the coupling hubs onto the motor shaft and drive shaft and set the appropriate distance.



EXCH-40		
Motor variant	Distance X in mm	Distance Y in mm
AS1 / AB1	20 ±0.3	22.7 ±0.3
AS2 / AB2	20 ±0.3	41.1 ±0.3

EXCH-60		
Motor variant	Distance X in mm	Distance Y in mm
AS2 / AB2	20.5 ±0.3	40 ±0.3
AS3 / AB3	20.5 ±0.3	50 ±0.3

EXCM-40		
Motor variant	Distance X in mm	Distance Y in mm
ST / SB	20 ±0.3	20.6 ±0.3

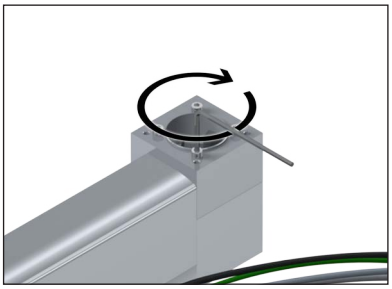


2. Tighten clamping screws of the coupling hubs with the appropriate tightening torque.

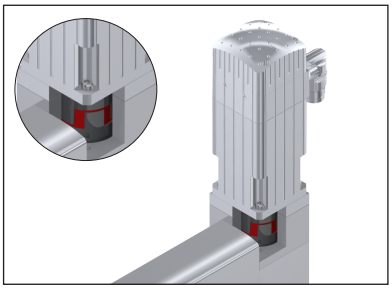
Planar surface gantry / size	Tightening torque
EXCH-40	8 Nm
EXCH-60	8 Nm
EXCM-40	2.9 Nm

3. Place the coupling housing on the axle.
4. Screw in the socket head screws of the coupling housing and tighten with the appropriate tightening torque.

Planar surface gantry / size	Tightening torque
EXCH-40	8.3 Nm
EXCH-60	8.3 Nm
EXCM-40	5.9 Nm



5. Insert the motor with premounted coupling hub in the ring gear of the coupling hub of the drive shaft. Push in the motor until the motor flange lies against the threaded flange of the X-axis.



When joining the two coupling hubs, ensure that they do not cant (tilt).

6. Tighten the socket head screws of the motor with the appropriate tightening torque.

Planar surface gantry / size	Motor type	Tightening torque
EXCH-40	AB1	8.3 Nm
	AS1	8.3 Nm
	AB2	18 Nm
	AS2	18 Nm
EXCH-60	AB2	18 Nm
	AS2	18 Nm
	AB3	30 Nm
	AS3	30 Nm
EXCM-40	ST / SB	3 Nm

4.7 Dismantling and mounting the X-axis guide carriages

Requirement

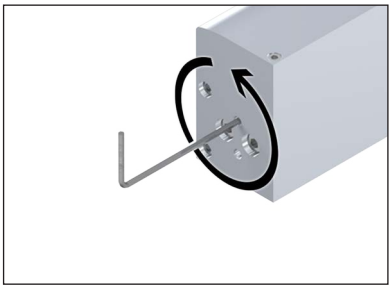
– The cover is dismantled (➔ Chapter 4.3.1 on page 23).
– Motors are dismantled (➔ Chapter 4.6.1 on page 26).

Before replacing the guide carriages, check the roller tracks for wear and damage. Defective or worn roller tracks cannot be replaced. It is the responsibility of the user to evaluate the wear and damaged condition of the roller track.

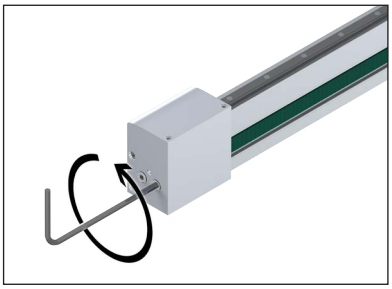
4.7.1 Dismantling

The guide carriages guide the slides of the X-axis on the roller tracks. If on guide carriage is defective, both guide carriages of a side must always be replaced together.

1. Undo the grub screws for clamping the toothed belt pretension.

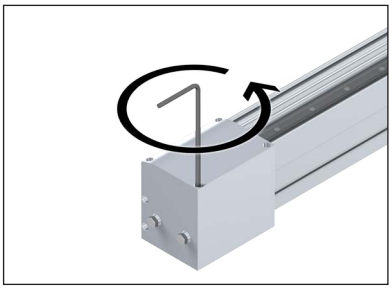


2. Unscrew the socket head screws until the toothed belt is completely slack.

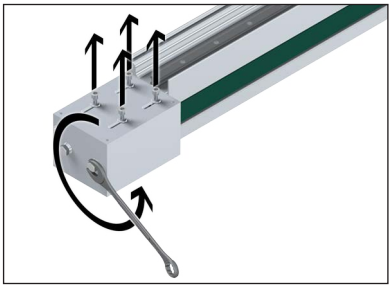


EXCH-60

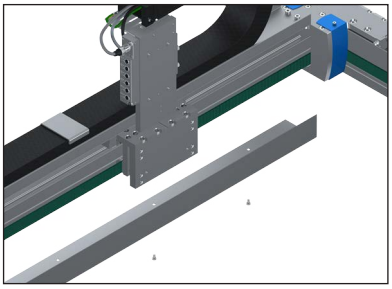
1. Unscrew all four socket head screws of the end cap and remove the end cap.



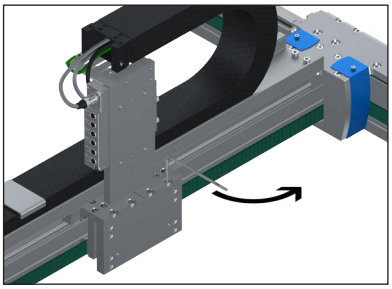
2. Undo all four socket head screws for securing the setting of the toothed belt pretensioning.
3. Unscrew the socket head screws until the toothed belt is completely slack.



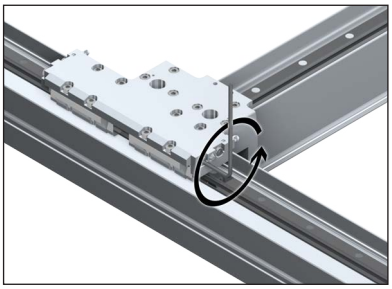
3. Unscrew the socket head screws of the cover angle on the Y-traverse and remove the cover angle.



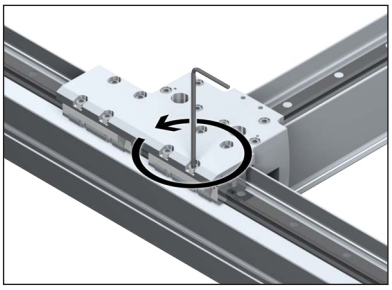
4. Unscrew the socket head screws of the plate and remove the plate.



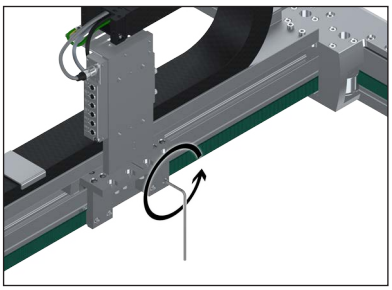
5. Unscrew the socket head screws of the lubrication adapter.



6. Unscrew the socket head screws of the guide carriages.



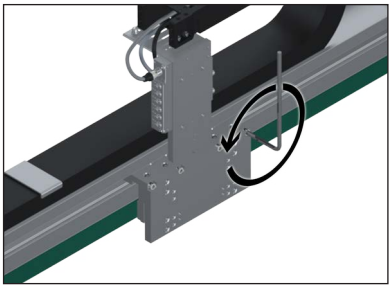
If the left-hand guide carriage is defective, only the left-hand clamping body must be dismantled; if the right-hand guide carriage is defective, only the right-hand clamping body must be dismantled.



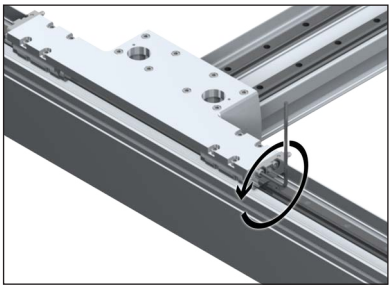
7. Unscrew and remove the socket head screws of the respective clamping body.

EXCH-60

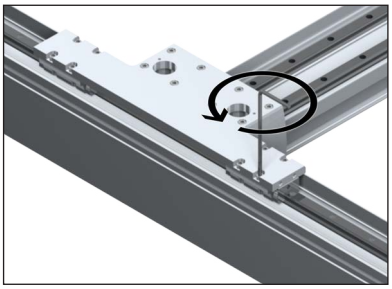
1. Unscrew the front socket head screws of the plate and remove the plate.



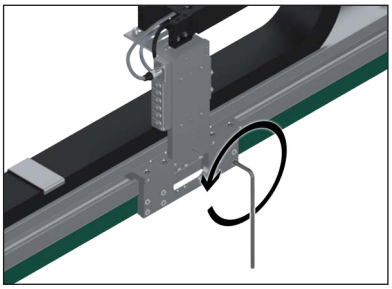
2. Unscrew the socket head screws of the lubrication adapter.



3. Unscrew the socket head screws of the guide carriages.

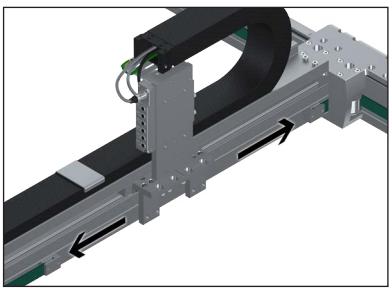


If the left-hand guide carriage is defective, only the left-hand clamping body must be dismantled; if the right-hand guide carriage is defective, only the right-hand clamping body must be dismantled.



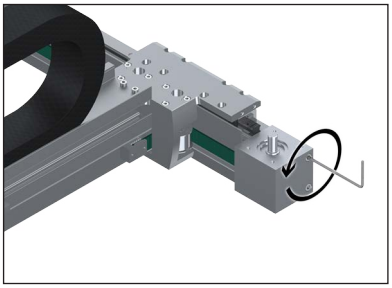
4. Unscrew all four socket head screws of the respective clamping body and remove.

8. Carefully pull back the end of the toothed belt up to the respective guide pulley.



9. Unscrew the socket head screws from the actuator end cap.

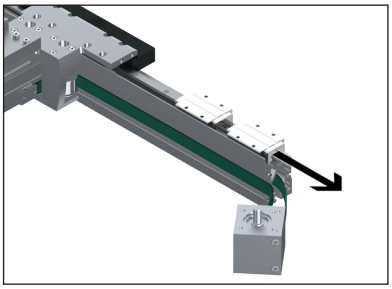
On pulling off the actuator end cap of the X-axis, the toothed belt is still in the pinion module.



10. Carefully pull the actuator end cap off the profile of the X-axis and put down at the side.

Note

On pushing out both guide carriages the Y-traverse must be supported on this side. The self-weight and tilting of the Y-traverse would otherwise damage the guide carriages of the other side (opposite).



Note

The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily jump out and become lost when the guide carriages are pushed off the roller track. Only separate the guide carriages from the roller track to replace them.

11. Push both guide carriages off the roller track. At the same time, support the Y-traverse.

4.7.2 Assembly

The new guide carriages are delivered on an assembly aid.

Note

The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily jump out and become lost when the guide carriages are pushed off the assembly aid.

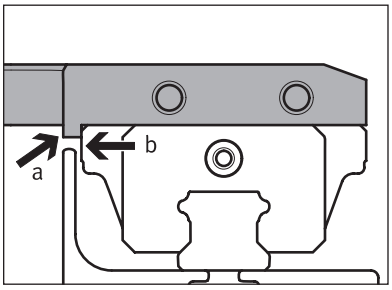
The guide carriages must remain on the assembly aids and are pushed off the assembly aids and directly onto the roller track.

The stop edge (a) and the ground surface (b) for the guide carriages must not have any surface defects such as burrs, chips, dents, etc. and no locking agent residues.

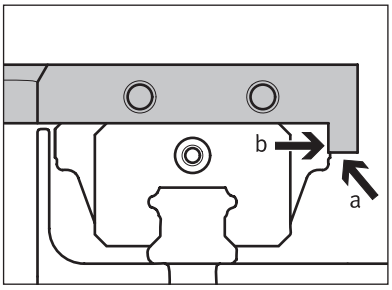
a = stop edge of the flange plate

b = ground surface on guide carriage

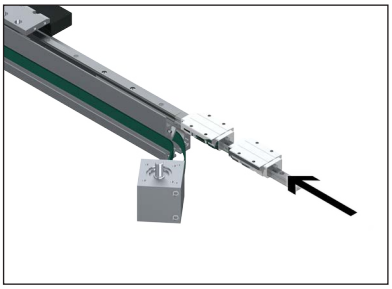
EXCH-40 / EXCM-40



EXCH-60



Pay attention to the mounting position when positioning the new guide carriages. The ground side of the guide carriages must point towards the inside of the EXCH-40/ EXCM-40 planar surface gantry, and towards the outside of the EXCH-60 planar surface gantry.



1. Position the assembly aid with new guide carriages directly on the roller track of the Y-axis.

Note

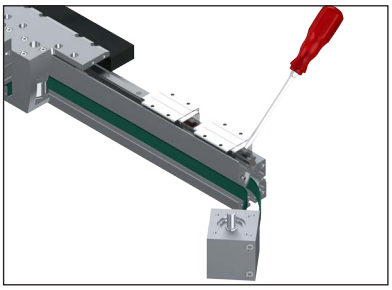
When pushing the guide carriages off the assembly aid and onto the roller track, ensure that

– the sealing lips of the guide carriages do not become damaged and
– no balls jump out of the guide carriages.

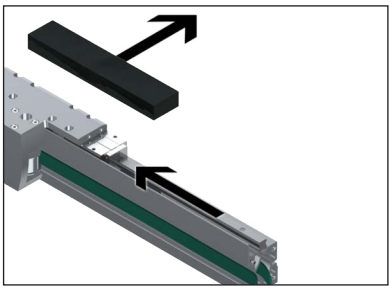
Only guide carriages with the full number of balls may be installed.

2. Slowly push the new guide carriages onto the roller track, ensuring that no balls jump out of the guide carriages.

3. Use a screwdriver to carefully lever out the cover of the lubricating hole from the guide carriage.



4. Guide the guide carriage to the slide, remove the support of the Y-traverse. Push both guide carriages under the slide at the same time.

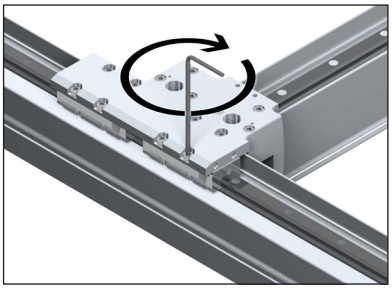


Note

Before commissioning the planar surface gantry, the new guide carriages must be relubricated (➔ Chapter 5.2.1 on page 77). Non-compliance can lead to unlubricated operation, and thus failure of the planar surface gantry before the next specified relubrication.

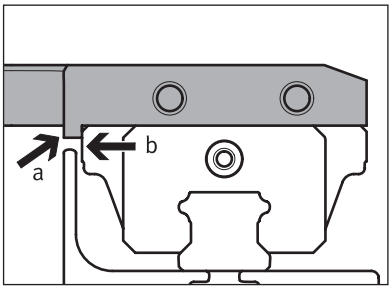
Note

On the side on which the angle bracket is mounted on the flange plate, the socket head screws must be additionally secured with locking agent (threadlocker).

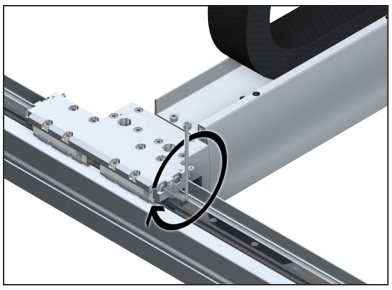


5. Clean the socket head screws to remove the locking agent.
6. Wet the socket head screws with threadlocker.
7. Place the Y-traverse, together with the flange plate, carefully on the guide carriages of the X-axis.
8. Screw the socket head screws loosely into all guide carriages.

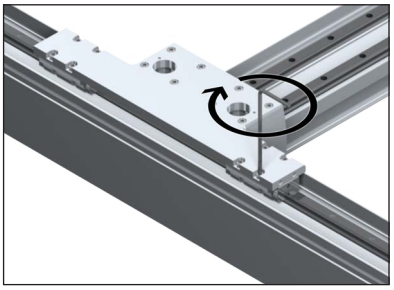
9. Move the Y-traverse along the complete stroke of the planar surface gantry in the X-direction.
10. Push the Y-traverse with stop edge (a) against the ground surface (b) and tighten the socket head screws with a tightening torque of 5.9 Nm ±10 %.



11. Clean the socket head screws of the lubrication adapter to remove locking agent.
12. Wet the socket head screws with threadlocker.
13. Position the lubrication adapter and press against the guide carriage.
14. Screw in the socket head screws and tighten them with a tightening torque of 5.9 Nm ±10 %.



EXCH-60

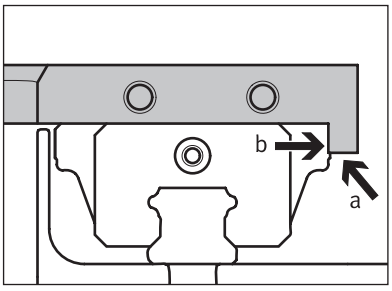


Note

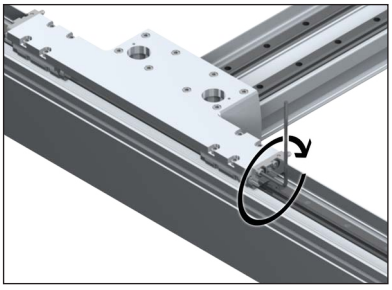
On the side on which the angle bracket is mounted on the flange plate, the socket head screws must be additionally secured with locking agent (threadlocker).

1. Clean the socket head screws to remove the locking agent.
2. Wet the socket head screws with threadlocker.
3. Place the Y-traverse, together with the flange plate, carefully on the guide carriages of the X-axis.
4. Screw the socket head screws loosely into all guide carriages.

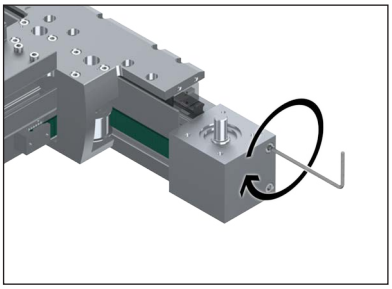
5. Move the Y-traverse along the complete stroke of the planar surface gantry in the X-direction.
6. Push the Y-traverse with stop edge (a) against the ground surface (b) and tighten the socket head screws with a tightening torque of 5.9 Nm ±10 %.



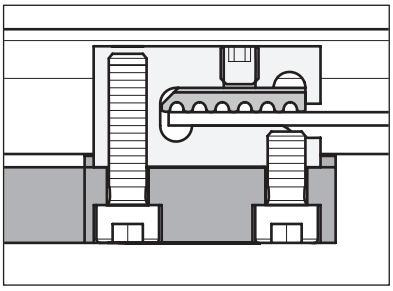
7. Clean the socket head screws of the lubrication adapter to remove locking agent.
8. Wet the socket head screws with threadlocker.
9. Position the lubrication adapter and press against the guide carriage.
10. Screw in the socket head screws and tighten them with a tightening torque of 5.9 Nm ±10 %.



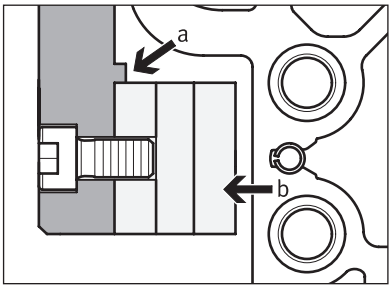
15. Position the actuator end cap on the X-axis.
16. Screw in the socket head screws and tighten with tightening torque 9.9 Nm.



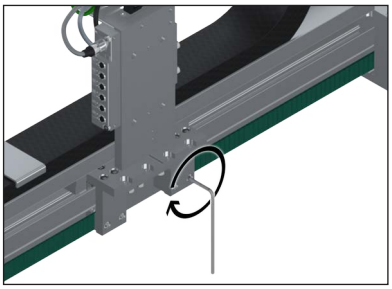
When mounting the clamping bodies, attention must be paid to the different screw length. The longer screw points inwards, the shorter screw outwards in the direction of the X axis.



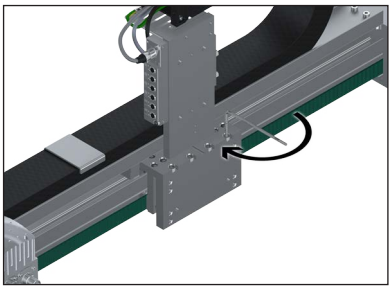
17. Clean the socket head screws of the clamping body to remove locking agent.
18. Wet the socket head screws with threadlocker.
19. Position the clamping body (b) on the plate of the Y-traverse so that is lies against the stop edge (a).



20. Screw in the socket head screws, push the clamping body against the stop edge and tighten the socket head screws with a tightening torque of 9 Nm ±10 %.
21. Mount the second clamping body in the same way as the first.

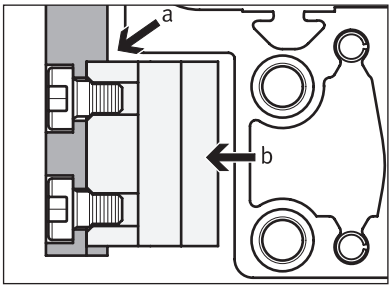


22. Clean the socket head screws of the plate to remove locking agent.
23. Wet the socket head screws with threadlocker.
24. Position the plate on the slide and align flush with it.
25. Screw in the socket head screws and tighten with tightening torque 5.9 Nm.

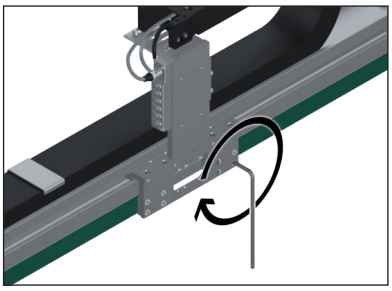


EXCH-60

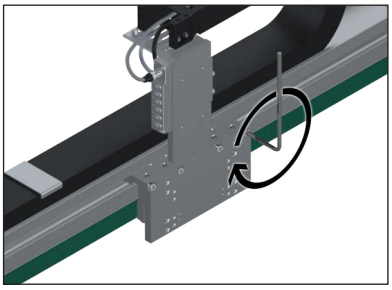
1. Clean the socket head screws of the clamping body to remove locking agent.
2. Wet the socket head screws with threadlocker.
3. Position the clamping body (b) on the plate of the Y-traverse so that is lies against the stop edge (a).



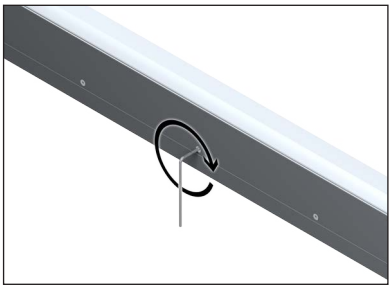
4. Screw in the socket head screws, push the clamping body against the stop edge and tighten the socket head screws with a tightening torque of 9.9 Nm ±10 %.
5. Mount the second clamping body in the same way as the first.



6. Clean the socket head screws of the plate to remove locking agent.
7. Wet the socket head screws with threadlocker.
8. Position the plate on the slide and align flush with it.
9. Screw in the socket head screws and tighten them with a tightening torque of 5.9 Nm ±10 %.



26. Position the cover on the X-axis.
27. Screw in the countersunk screws and tighten with tightening torque 0.6 Nm.



28. Check the toothed belt pretensioning (➔ Chapter 4.10.4 on page 73).

4.8 Dismantling and mounting the guide carriages of the Y-traverse EXCH-40 / EXCM-40

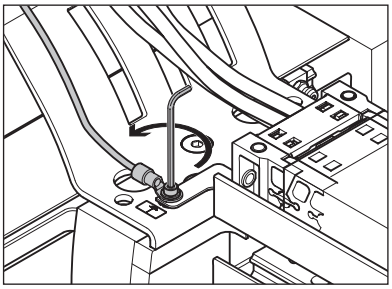
4.8.1 Dismantling

Requirement

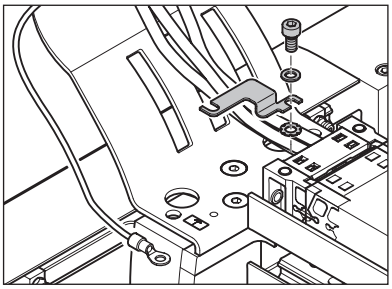
– The cover is dismantled (➔ Chapter 4.3.1 on page 23),
– Motors are dismantled (➔ Chapter 4.6.1 on page 26),
– Toothed belt is removed (➔ Chapter 4.10 on page 55).

Before replacing the guide carriages, check the roller tracks for wear and damage. Defective or worn roller tracks cannot be replaced. It is the responsibility of the user to evaluate the wear and damaged condition of the roller track.

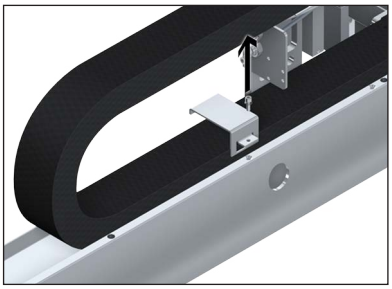
1. Unscrew and remove the socket head screw for the earth cable.



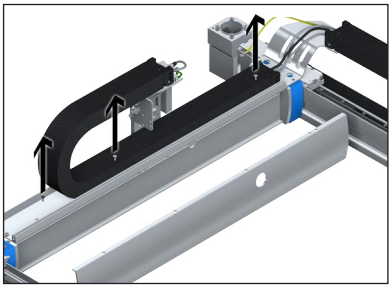
2. Unscrew the socket head screw for the earthing component and remove the earthing component with washer and toothed disc.



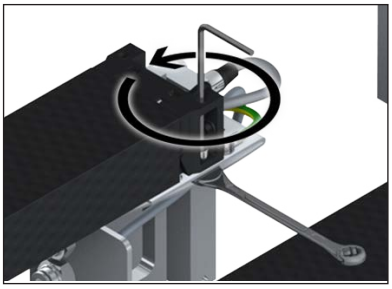
3. Unscrew the socket head screw from the angle bracket and remove the angle bracket.



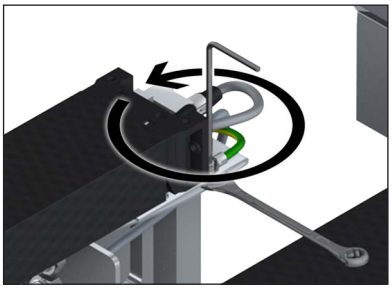
4. Unscrew the countersunk screws from the cover and remove the cover.



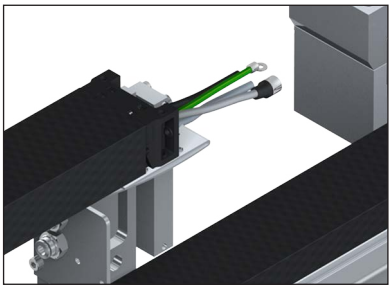
5. Unscrew the socket head screws from the fixed point of the energy chain from the angle bracket, while at the same time holding the hexagon nuts in place.
6. Remove the socket head screws and hexagon nuts.



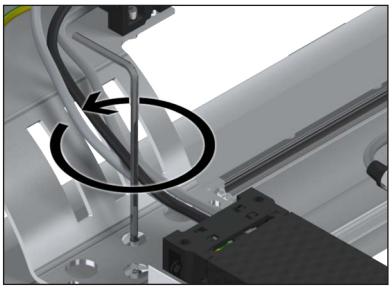
7. Unscrew the socket head screw of the earth cable, at the same time, hold against the hexagon nut.



8. Remove the hoses and cables on the Y-traverse structure.

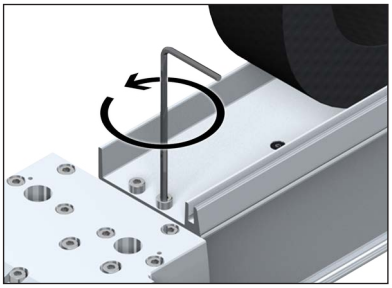


On unscrewing the countersunk screws and removing the angle bracket, ensure that the spacer rings are not lost and do not fall into the gantry.

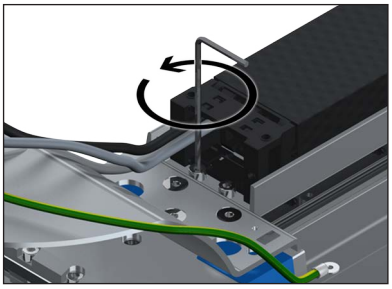


9. Unscrew the countersunk screws from the angle bracket and remove the angle bracket.
10. Remove the spacer rings.

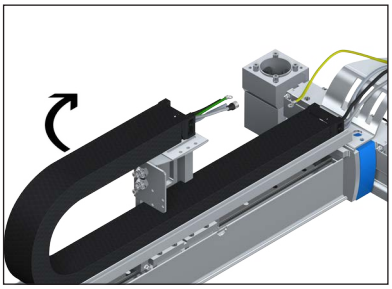
11. Unscrew and remove the socket head screws from the support.



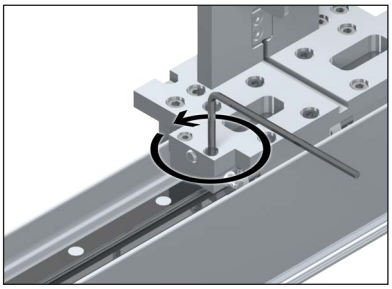
12. Unscrew the socket head screws of the support on the opposite side and remove.



13. Swing the angle bracket together with the energy chain and support to the side so that no cables and hoses are bent or kinked.

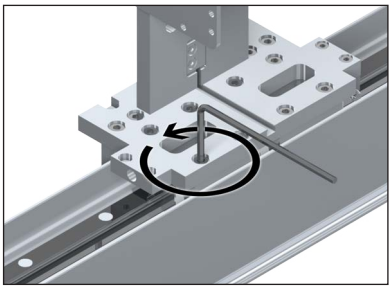


14. Unscrew and remove the socket head screws from the lubricating head.



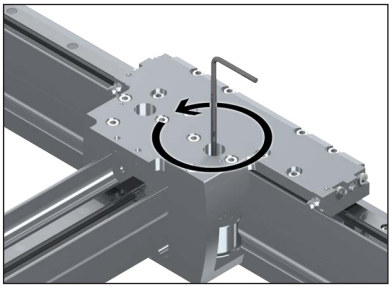
Note

On unscrewing the socket head screws from the guide carriages the structure must be secured against tilting and overturning. It could become damaged if it overturns or falls.

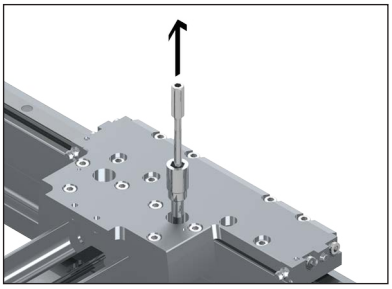


15. Unscrew the socket head screws of the two guide carriages.
16. Remove the top elements of the Y-traverse and place in a secure position.

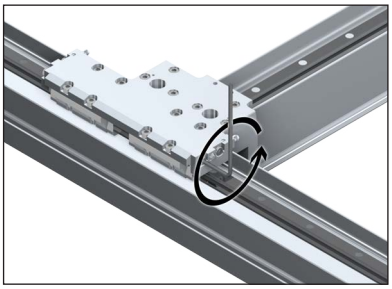
17. Unscrew the shaft of the guide pulley.



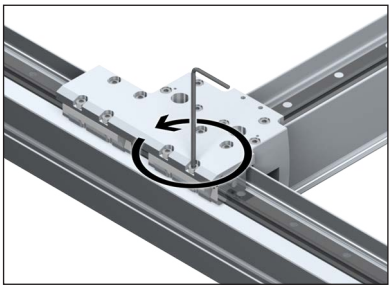
18. Screw a separate screw M6 into the hexagon of the shaft.
19. Use the screwed-in screw to pull out the shaft.
20. Remove the guide pulley from the driver.
21. Dismantle the other three shafts and guide pulleys in the same way as the first.



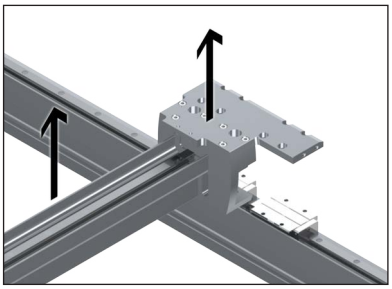
22. Unscrew the socket head screws from the lubrication adapters and remove all four lubrication adapters.



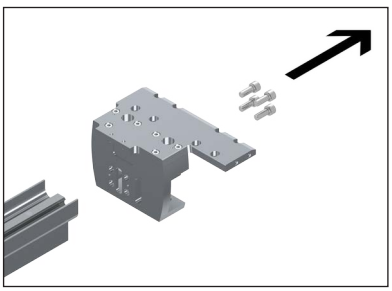
23. Unscrew the socket head screws from all four guide carriages.



24. Remove the Y-traverse carefully from above and place in a secure position.



25. Unscrew the socket head screws from the driver and pull off the driver.

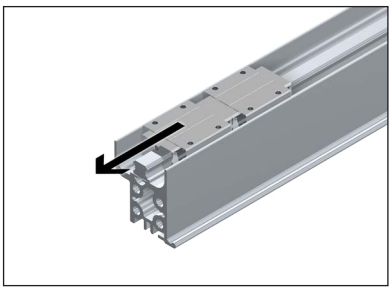


The driver is connected to the Y-traverse via spring pins. A certain amount of force is required to pull it off.

Note

The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily jump out and become lost when the guide carriages are pushed off the roller track. Only separate the guide carriages from the roller track to replace them.

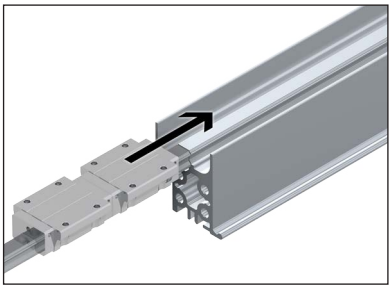
26. Push the guide carriage off the roller track.



4.8.2 Assembly

The new guide carriages are delivered on an assembly aid.

1. Position the assembly aid with new guide carriages directly on the roller track of the Y-traverse.



Note

When pushing the guide carriages off the assembly aid and onto the roller track, ensure that

– the sealing lips of the guide carriages do not become damaged and
– no balls jump out of the guide carriages.

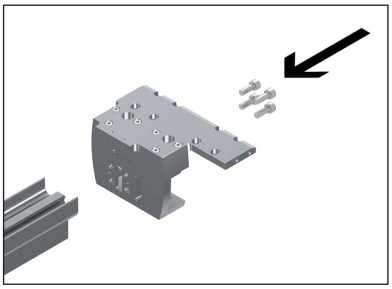
Only guide carriages with the full number of balls may be installed.

2. Slowly push the new guide carriages onto the roller track, ensuring that no balls jump out of the guide carriages.

Note

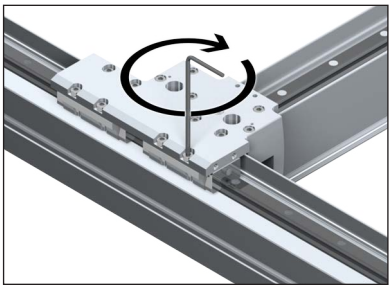
Before commissioning the planar surface gantry, the new guide carriages must be relubricated (➔ Chapter 5.2.1 on page 77). Non-compliance can lead to unlubricated operation, and thus failure of the planar surface gantry before the next specified relubrication.

3. Position the driver on the Y-traverse.



The driver is connected to the Y-traverse via spring pins. The mounting therefore requires a certain amount of force.

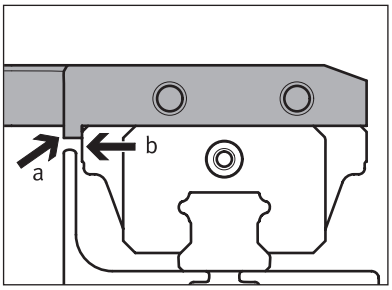
4. Clean the socket head screws to remove the locking agent.
5. Wet the socket head screws with threadlocker.
6. Screw in the socket head screws and tighten with tightening torque 34 Nm.



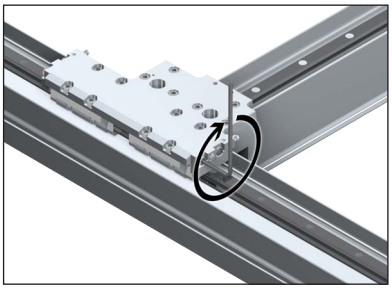
Note

On the side on which the angle bracket is mounted on the flange plate, the socket head screws must be additionally secured with locking agent (threadlocker).

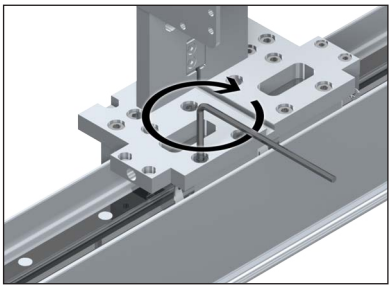
7. Clean the socket head screws to remove the locking agent.
8. Wet the socket head screws with threadlocker.
9. Place the Y-traverse, together with the flange plates, carefully on the guide carriages of the X-axis.
10. Screw the socket head screws loosely into all guide carriages.
11. Move the Y-traverse along the complete stroke of the planar surface gantry in the X-direction.
12. Push the Y-traverse with stop edge (a) against the ground surface (b) and tighten the socket head screws with a tightening torque of 5.9 Nm ±10 %.



13. Clean the socket head screws of the lubrication adapter to remove locking agent.
14. Wet the socket head screws with threadlocker.
15. Position the lubrication adapter and press against the guide carriage.
16. Screw in the socket head screws and tighten them with a tightening torque of 5.9 Nm ±10 %.

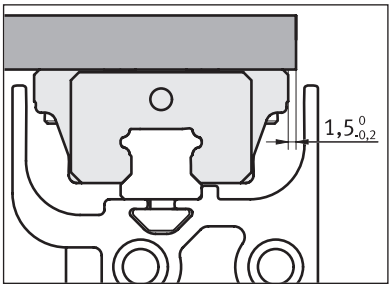


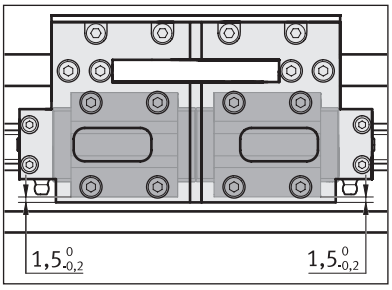
17. Clean the socket head screws of the guide carriages to remove locking agent.
18. Wet the socket head screws with threadlocker.
19. Place the slide plate with top elements of the Y-traverse on the guide carriages.
20. Screw the socket head screws loosely into the guide carriages.



21. Set the distance from the slide plate to the guide carriage and tighten the socket head screws with tightening torque 5.9 Nm.

The most precise alignment of the slide plate with the guide carriage is achieved if the dimension is measured at the outside corners of the guide carriage.



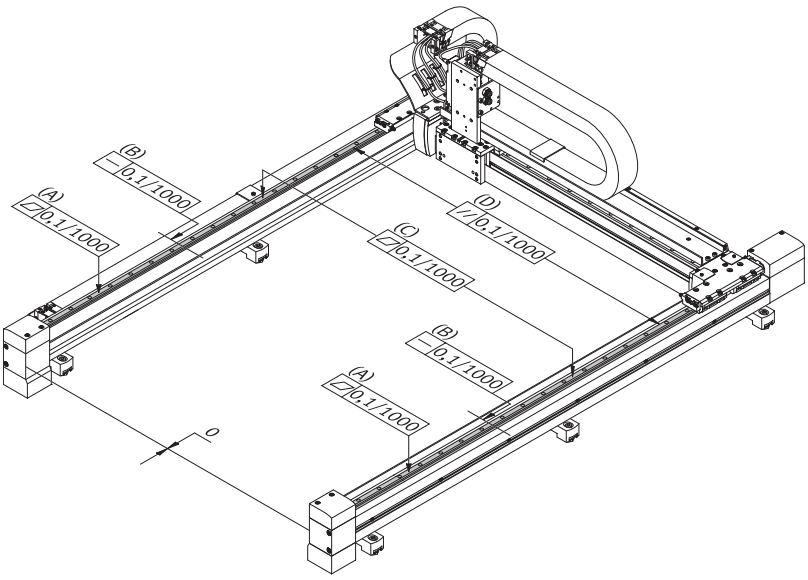


Aligning the planar surface gantry

Note

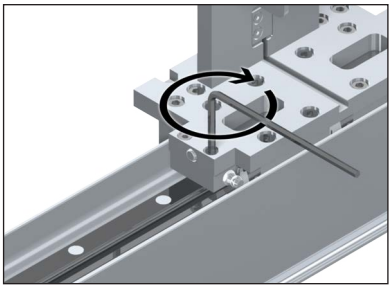
To avoid premature failure of the planar surface gantry, the relevant tolerances must be met. Non-compliance will result in reduction of the life of the planar surface gantry. The final alignment cannot be set until the planar surface gantry is fixed onto the mounting surface. On assembling the Y-traverse for the two X-axes however, they should be roughly aligned.

Align the planar surface gantry as described in the description of the EXCH “Mechanical installation” (➔ www.festo.com/sp).

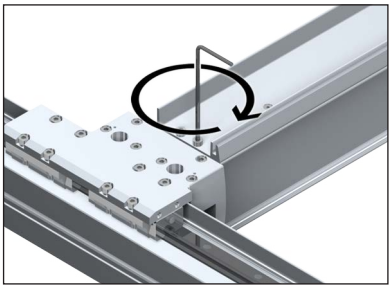


(A) Evenness [mm / m]
(B) Lateral tilt [mm / m]
(C) Height offset [mm / m]
(D) Parallelism [mm / m]

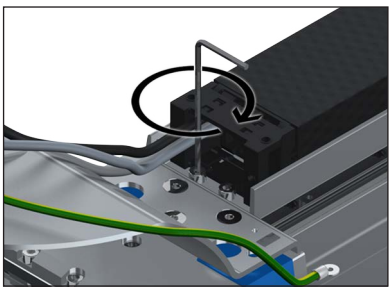
22. Clean the socket head screws of the lubricating head to remove locking agent.
23. Wet the socket head screws with threadlocker.
24. Position the lubricating head and press against the guide carriage.
25. Screw in the socket head screws and tighten them with a tightening torque of 2.5 Nm ±10 %.



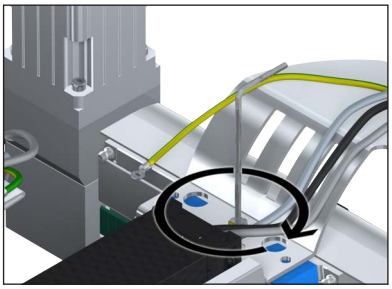
26. Swing the support with energy chain and angle bracket onto the Y-traverse.
27. Clean the socket head screws of the support to remove locking agent.
28. Wet the socket head screws with threadlocker.
29. Screw in the socket head screws and tighten them with a tightening torque of 5.9 Nm ±10 %.



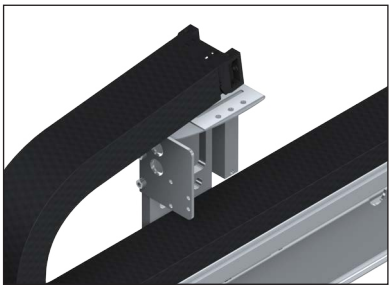
30. Clean the socket head screws of the support to remove locking agent.
31. Wet the socket head screws with threadlocker.
32. Screw the socket head screws into the opposite side of the support and tighten with a tightening torque of 5.9 Nm ±10 %.



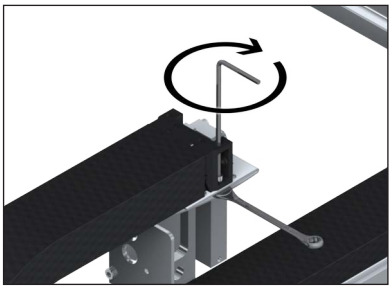
33. Clean the countersunk screws of the angle bracket to remove locking agent.
34. Wet the countersunk screws with locking agent.
35. Place the spacer rings on the flange plate.
36. Position the angle bracket on the spacer rings and screw in the countersunk screws. Tighten the countersunk screws with a tightening torque of 9.9 Nm.



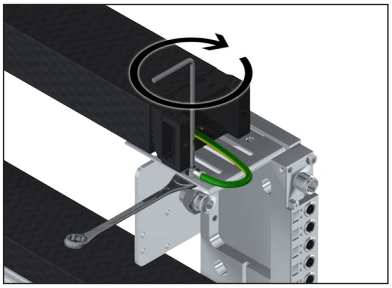
37. Clean the socket head screws of the energy chain to remove locking agent.
38. Wet the socket head screws with threadlocker.
39. Place the energy chain on the angle bracket of the Y-traverse.



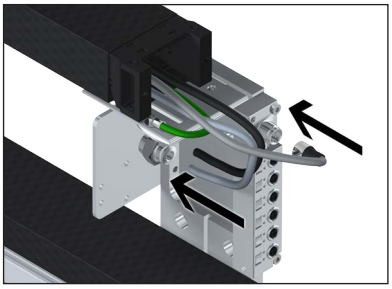
40. Guide the socket head screws through the fixed point of the energy chain and angle bracket.
41. Put on the hex nuts from underneath.
42. Tighten the socket head screws with a tightening torque of 2.9 Nm, while at the same time holding the hex nuts in place.



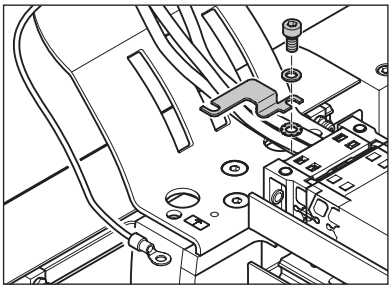
43. Place the toothed disc on the angle bracket.
44. Push the washer onto the socket head screw
45. Place the earthing component on the toothed disc and screw in socket head screw with washer.
46. Tighten the socket head screw with a tightening torque of 5.9 Nm ±10 %, while at the same time holding the hex nuts in place.
47. Install the hoses and cables.



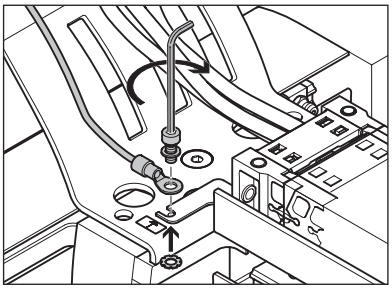
48. Reconnect the electrical cables and compressed air hoses.



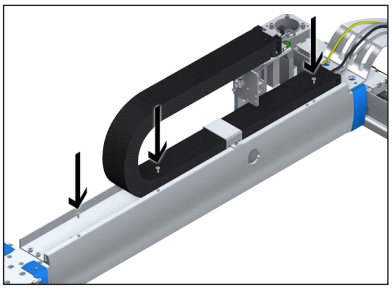
49. Place the toothed disc on the support.
50. Push the washer onto the socket head screw.
51. Place the earthing component on the toothed disc and screw in socket head screw with washer.
52. Tighten the socket head screw with a tightening torque of 5.9 Nm ±10 %.



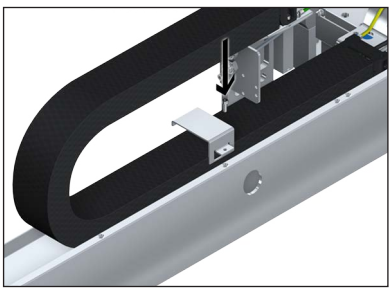
53. Push the toothed disc between the angle bracket and the earthing component.
54. Push the washer onto the socket head screw.
55. Push the earth cable onto the socket head screw.
56. Screw the socket head screw with washer and earth cable into the angle bracket.
57. Tighten the socket head screw with a tightening torque of 1.2 Nm.



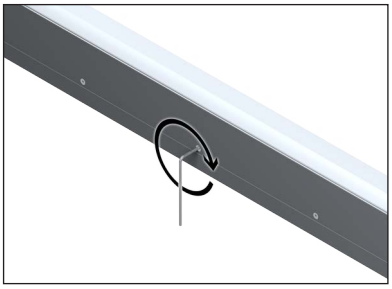
58. Place the cover on the Y-traverse.
59. Screw in the socket head screws and tighten with tightening torque 1.0 Nm.



60. Position the angle bracket on the energy chain.
61. Screw in the socket head screw and tighten with tightening torque 1.0 Nm.



62. Position the cover on the X-axis.
63. Screw in the countersunk screws and tighten with tightening torque 0.6 Nm.
64. Mount the second cover in the same way as the first.



4.9 Dismantling and mounting the EXCH-60 Y-Traverse guide carriage

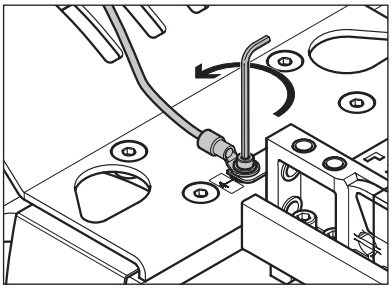
4.9.1 Dismantling

Requirement

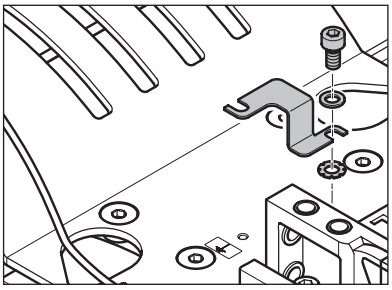
– The cover is dismantled (➔ Chapter 4.3.1 on page 23),
– Motors are dismantled (➔ Chapter 4.6.1 on page 26),
– Toothed belt is removed (➔ Chapter 4.10 on page 55).

Before replacing the guide carriages, check the roller tracks for wear and damage. Defective or worn roller tracks cannot be replaced. It is the responsibility of the user to evaluate the wear and damaged condition of the roller track.

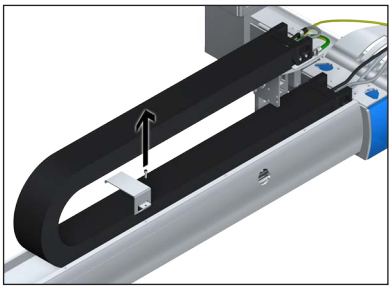
1. Unscrew and remove the socket head screw for the earth cable.



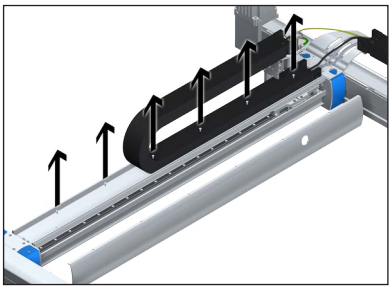
2. Unscrew the socket head screw for the earthing component and remove the earthing component with washer and toothed disc.



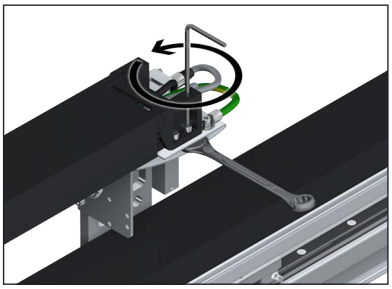
3. Unscrew the socket head screw from the angle bracket and remove the angle bracket.



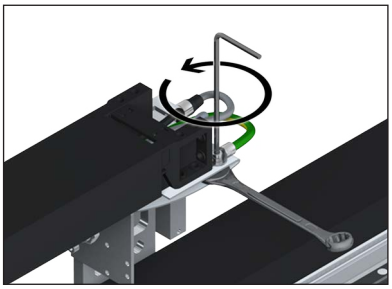
4. Unscrew the countersunk screws from the cover and remove the cover.



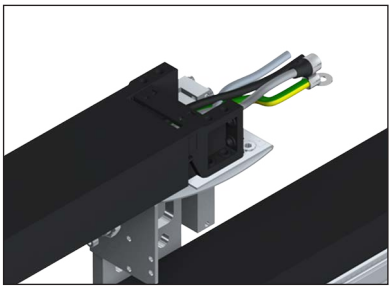
5. Unscrew the socket head screws from the fixed point of the energy chain and angle bracket and remove, while at the same time holding the hexagon nuts in place.



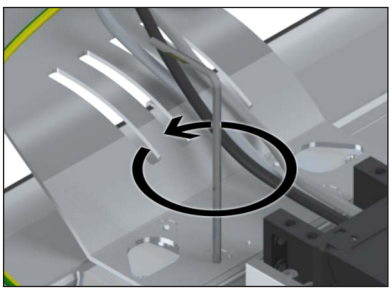
6. Unscrew the socket head screw of the earth cable, at the same time, hold against the hexagon nut.



7. Remove the hoses and cables on the Y-traverse structure.

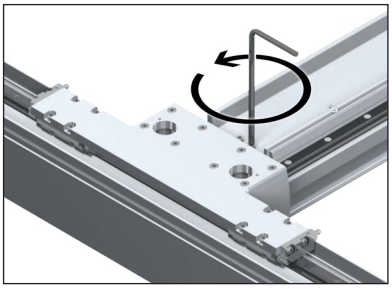


On unscrewing the countersunk screws and removing the angle bracket, ensure that the spacer rings are not lost and do not fall into the gantry.

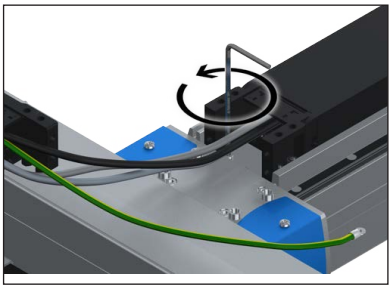


8. Unscrew the countersunk screws from the angle bracket and remove the angle bracket.
9. Remove the spacer rings.

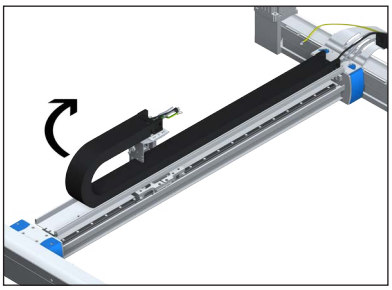
10. Unscrew and remove the socket head screws from the support.



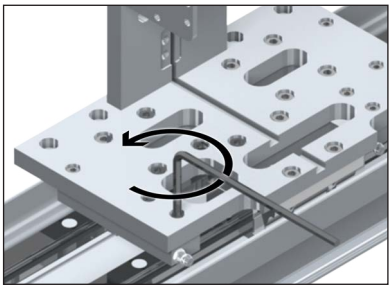
11. Unscrew the socket head screws of the support on the opposite side and remove.



12. Swing the angle bracket together with the energy chain and support to the side so that no cables and hoses are bent or kinked.

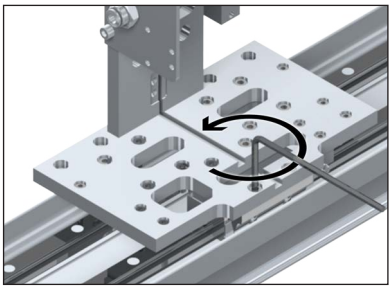


13. Unscrew and remove the socket head screws from the lubricating head.



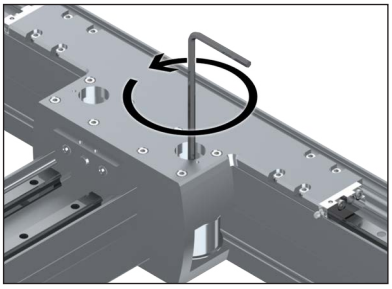
Note

On unscrewing the socket head screws from the guide carriages the structure must be secured against tilting and overturning. It could become damaged if it overturns or falls.

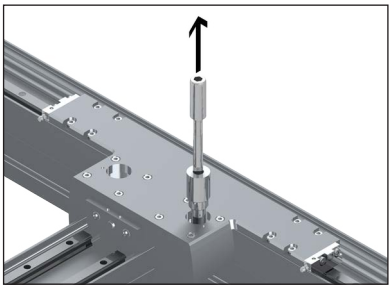


14. Unscrew the socket head screws of the guide carriages.
15. Remove the top elements of the Y-traverse and place in a secure position.

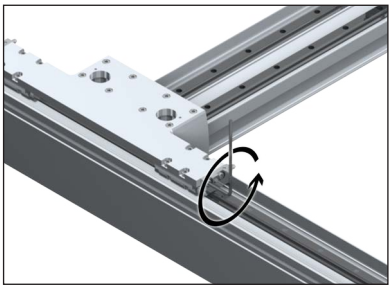
16. Unscrew and remove the socket head screw of the guide pulley.



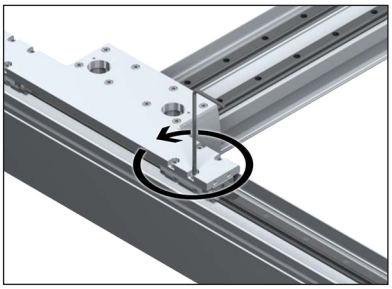
17. Screw separate screw M8 into the shaft.
18. Use the screwed-in screw to pull out the shaft.
19. Remove the guide pulley from the driver.
20. Dismantle the other three shafts in the same way as the first.



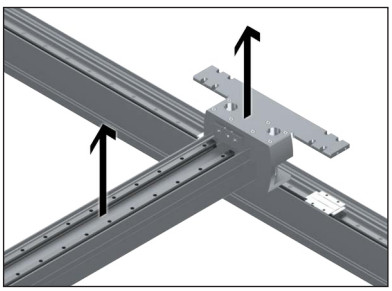
21. Unscrew the socket head screws from the lubrication adapters and remove all four lubrication adapters.



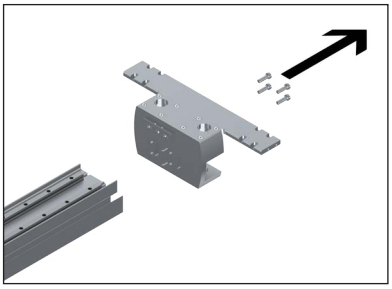
22. Unscrew the socket head screws from all four guide carriages.



23. Remove the Y-traverse carefully from above and place in a secure position.



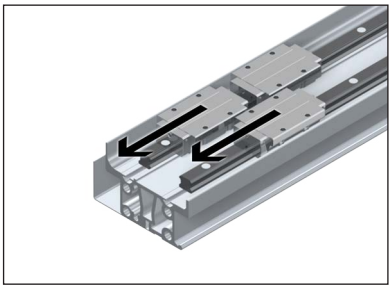
24. Unscrew the socket head screws from the driver and pull off the driver.



The driver is connected to the Y-traverse via spring pins. A certain amount of force is required to pull it off.

The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily jump out and become lost when the guide carriages are pushed off the roller track. Only separate the guide carriages from the roller track to replace them.

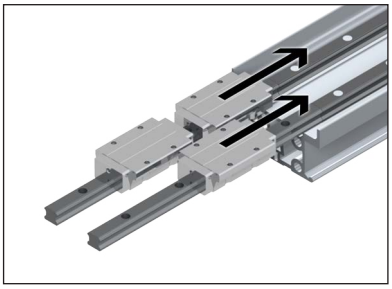
25. Push the guide carriage carefully off the roller track.



4.9.2 Assembly

The new guide carriages are delivered on an assembly aid.

1. Position the assembly aid with the new guide carriages directly on the roller track of the Y-traverse.



Note

When pushing the guide carriages off the assembly aid and onto the roller track, ensure that

- the sealing lips of the guide carriages do not become damaged and
- no balls jump out of the guide carriages.

Only guide carriages with the full number of balls may be installed.

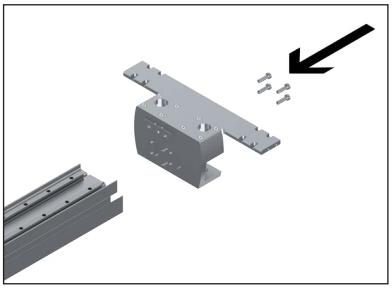
2. Slowly push the new guide carriages onto the roller track, ensuring that no balls jump out of the guide carriages.

Note

Before commissioning the planar surface gantry, the new guide carriages must be relubricated (➔ Chapter 5.2.1 on page 77). Non-compliance can lead to unlubricated operation, and thus failure of the planar surface gantry before the next specified relubrication.

3. Position the driver on the Y-traverse.

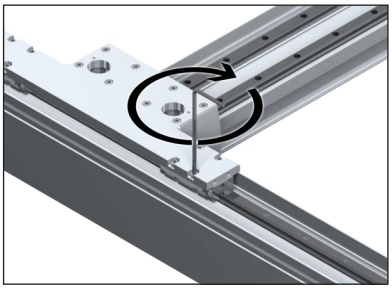
The driver is connected to the Y-traverse via spring pins. The mounting therefore requires a certain amount of force.



4. Clean the socket head screws to remove the locking agent.
5. Wet the socket head screws with threadlocker.
6. Screw in the socket head screws and tighten with tightening torque 25 Nm.

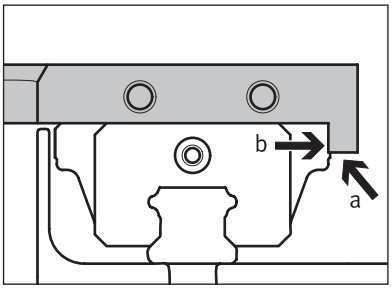
Note

On the side on which the angle bracket is mounted on the flange plate, the socket head screws must be additionally secured with locking agent (threadlocker).

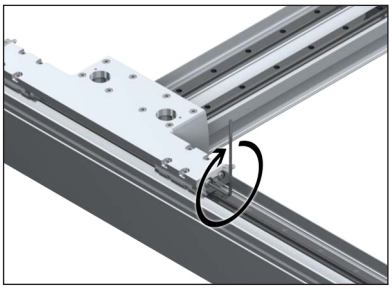


7. Clean the socket head screw to remove the locking agent.
8. Wet the socket head screw with threadlocker.
9. Place the Y-traverse, together with the flange plate, carefully on the guide carriages of the X-axis.
10. Screw the socket head screws loosely into the guide carriage.

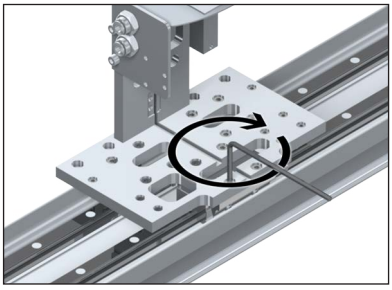
11. Move the Y-traverse along the complete stroke of the planar surface gantry in the X-direction.
12. Push the Y-traverse with stop edge (a) against the ground surface (b) and tighten the socket head screws with a tightening torque of 5.9 Nm ±10 %.



13. Clean the socket head screws of the lubrication adapter to remove locking agent.
14. Wet the socket head screws with threadlocker.
15. Position the lubrication adapter and press against the guide carriage.
16. Screw in the socket head screws and tighten them with a tightening torque of 5.9 Nm ±10 %.

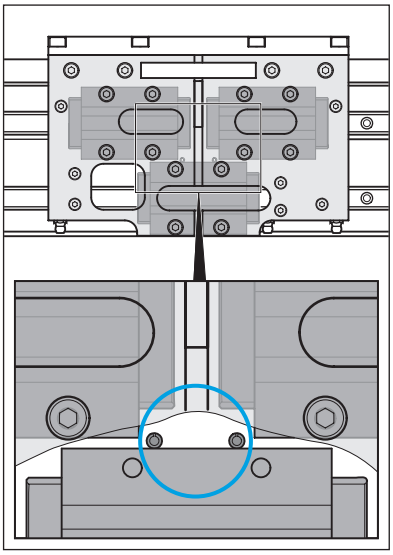


17. Clean the socket head screws of the guide carriages to remove locking agent.
18. Wet the socket head screws with threadlocker.
19. Place the slide plate with top elements of the Y-traverse on the guide carriages.
20. Screw the socket head screws loosely into the guide carriages.



Two cylindrical dowel pins are mounted in the slide plate. These are used to align the slide plate with the three guide carriages.

21. Press the cylindrical dowel pins through the slide plate on the guide carriage and tighten the socket head screws with tightening torque of 5.9 Nm.

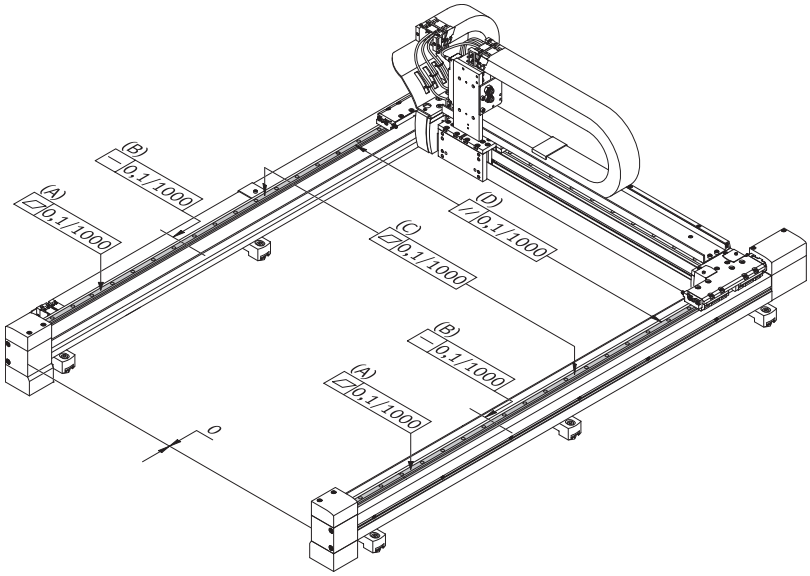


Aligning the planar surface gantry

Note

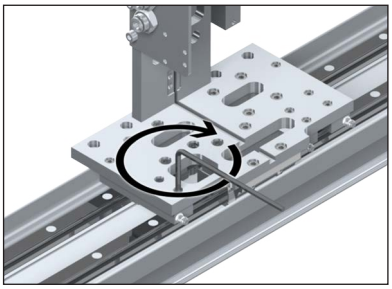
To avoid premature failure of the planar surface gantry, the relevant tolerances must be met. Non-compliance will result in reduction of the life of the planar surface gantry. The final alignment cannot be set until the planar surface gantry is fixed onto the mounting surface. On assembling the Y-traverse for the two X-axes however, they should be roughly aligned.

Align the planar surface gantry as described in the description of the EXCH “Mechanical installation” (➔ www.festo.com/sp).

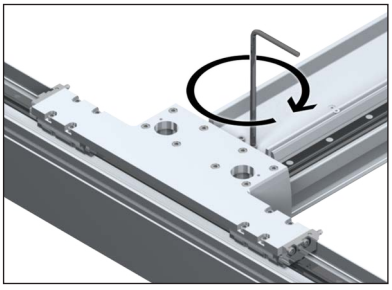


(A) Evenness [mm / m]
(B) Lateral tilt [mm / m]
(C) Height offset [mm / m]
(D) Parallelism [mm / m]

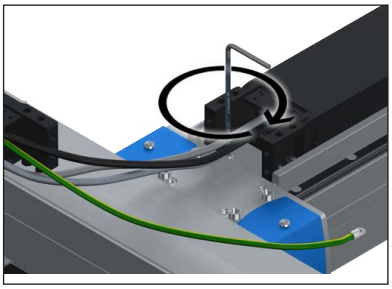
22. Clean the socket head screws of the lubricating head to remove locking agent.
23. Wet the socket head screws with threadlocker.
24. Position the lubricating head and press against the guide carriage.
25. Screw in the socket head screws and tighten them with a tightening torque of 2.5 Nm ±10 %.



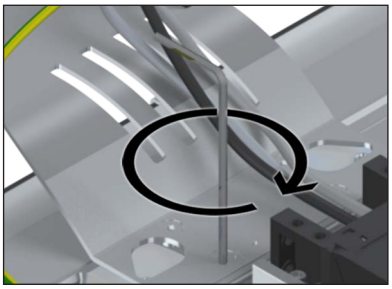
26. Swing the support with energy chain and angle bracket onto the Y-traverse.
27. Clean the socket head screws of the support to remove locking agent.
28. Wet the socket head screws with threadlocker.
29. Screw in the socket head screws and tighten them with a tightening torque of 5.9 Nm ±10 %.



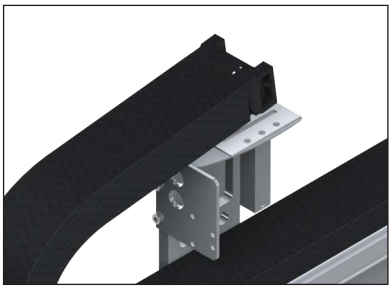
30. Clean the socket head screws of the support to remove locking agent.
31. Wet the socket head screws with threadlocker.
32. Screw the socket head screws into the opposite side of the support and tighten with a tightening torque of 5.9 Nm ±10 %.



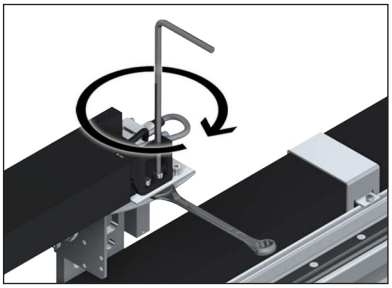
33. Clean the countersunk screws of the angle bracket to remove locking agent.
34. Wet the countersunk screws with locking agent.
35. Place the spacer rings on the flange plate.
36. Position the angle bracket on the spacer rings and screw in the countersunk screws. Tighten the countersunk screws with a tightening torque of 9.9 Nm.



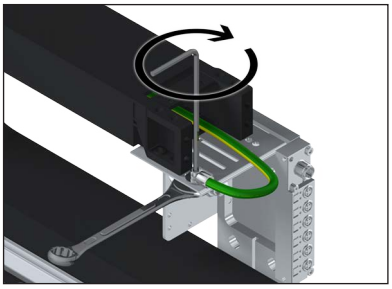
37. Clean the socket head screws of the energy chain to remove locking agent.
38. Wet the socket head screws with threadlocker.
39. Place the energy chain on the angle bracket of the Y-traverse.



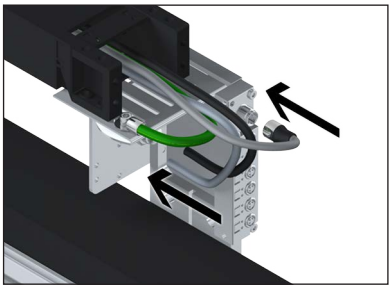
40. Guide the socket head screws through the fixed point of the energy chain and angle bracket.
41. Put on the hex nuts from underneath.
42. Tighten the socket head screws with tightening torque 2.9 Nm, while at the same time holding the hex nut in place.



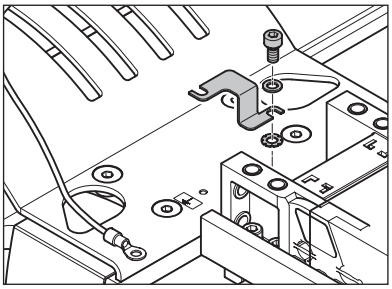
43. Place the toothed disc on the angle bracket.
44. Push the washer onto the socket head screw
45. Place the earthing component on the toothed disc and screw in socket head screw with washer, while at the same time holding the hex nut in place.
46. Install the hoses and cables.



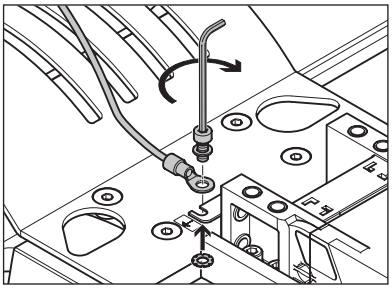
47. Reconnect the electrical cables and compressed air hoses.



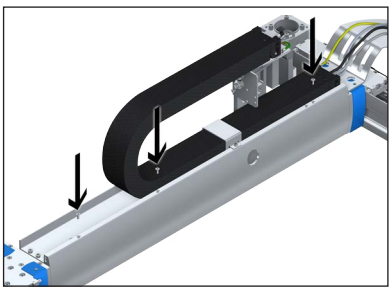
48. Lay the toothed disc on the flange plate.
49. Push the washer onto the socket head screw.
50. Place the earthing component on the toothed disc and screw in socket head screw with washer.
51. Tighten the socket head screw with a tightening torque of 5.9 Nm ±10 %.



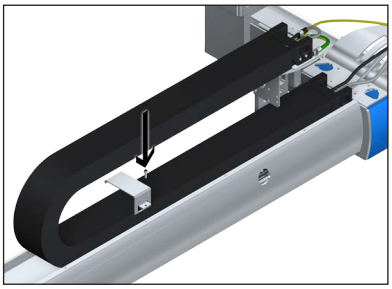
52. Push the toothed disc between the angle bracket and the earthing component.
53. Push the washer onto the socket head screw.
54. Push the earth cable onto the socket head screw.
55. Screw the socket head screw with washer and earth cable into the angle bracket.
56. Tighten the socket head screw with a tightening torque of 1.2 Nm.



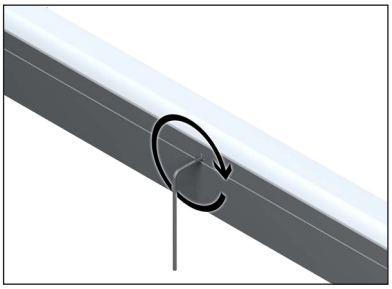
65. Place the cover on the Y-traverse.
66. Screw in the socket head screws and tighten with tightening torque 1.0 Nm.



67. Position the angle bracket on the energy chain.
68. Screw in the socket head screw and tighten with tightening torque 1.0 Nm.



57. Position the cover on the X-axis.
58. Screw in the countersunk screws and tighten with tightening torque 0.6 Nm.
59. Mount the second cover in the same way as the first.



4.10 Replacing the toothed belt

The toothed belt is ordered from the online spare parts catalogue using the appropriate part number (dependent on the size and version of the planar surface gantry) (➔ www.festo.com/spareparts).

The part number is a module number and is dependent on the size of the planar surface gantry. In addition to the part number, you must also specify the stroke and the planar surface gantry when ordering. The necessary information is given in the product labelling of the planar surface gantry (➔ Chapter 2.5 on page 11). You can use this information to calculate the necessary toothed belt length.

Note

Do not bend or fold the toothed belt, as this can result in damage to the tensile members and shorten its service life by cracking it. Note the minimum bending radius for assembly and storage:

Planar surface gantry / size	Minimum bending radius R_{min}
EXCH-40	30 mm
EXCH-60	50 mm
EXCM-40	30 mm

If it is necessary to change the toothed belt, always investigate the cause of the failure in order to prevent premature and repeated failure. A planar surface gantry used as intended and designed correctly will not normally show any premature signs of failure.

This investigation is not necessary in the case of non-premature failure (fatigue time). However, the condition of the toothed belt pulley assembly (wear of the tooth surface/geometry, radial play of the bearing inner raceway with respect to the bearing seat: when new, it should fit tightly) and also the condition of the deep-groove ball bearings (e.g. perceptible bearing clearance, impaired roll-off behaviour and increased operating noise, etc.) should always be checked. In case of uncertainty, we recommend replacing all the components mentioned to rule out reciprocal effects during later operation.

Possible visible signs of wear of the toothed belt:

- Cracks on the back of the toothed belt indicate wear, for example, due to operation outside the allowed temperature range, impermissible chemical effects or possibly by reaching the end of the fatigue life.
- Wear of the nylon fabric (fabric cover) on the tooth side of the belt. This is indicated by lint formation and bobbling, for example, and constitutes primary wear (abrasion of the fabric).
- Visible individual glass fibre cords in the tooth gullet are secondary signs of wear due to primary wear of the nylon fabric. In this case, the toothed belt pulley module must be examined very carefully for wear, as visible glass fibre cords may have caused severe abrasive damage to the sides of the tooth tip of the toothed belt pulleys.

If the toothed belt suffers premature failure, the operating conditions should be observed more closely.

The following possibilities should be considered, among other things:

- **Overloading**

  Incorrect set values of the braking ramp in STOP status (e.g. EMERGENCY STOP, quick stop) result in overloading of the planar surface gantry and can irreparably damage it or reduce its life drastically.

  The elasticity of the toothed belt delays the acceleration and braking performance of the planar surface gantry and results in greater acceleration and deceleration than set at the controller (spring effect).

  Block-shaped acceleration and deceleration profiles (no jerk limitation) cause high peaks in the drive force that can lead to overloading of the drive. Positions outside of the permissible range can also occur. An acceleration and deceleration specification with jerk limitation reduces oscillations in the entire system and has a positive effect on the stresses to which the mechanical system is subjected.

- Check which controller settings can be adjusted (e.g. jerk limitation, smoothing of the acceleration profile).
- Check the settings for all braking ramps in your controller or the higher-order control system (deceleration values and jerk).
- Make sure that the deceleration values (braking deceleration, deceleration times) for the speed, the load to be moved and the mounting position (horizontal / vertical) and the specified maximum drive torque or the feed force correspond to the allowable values of the planar surface gantry used.
- Use the Festo "PositioningDrives" design software, available via the Festo website (➔ www.festo.com), to design the planar surface gantry.

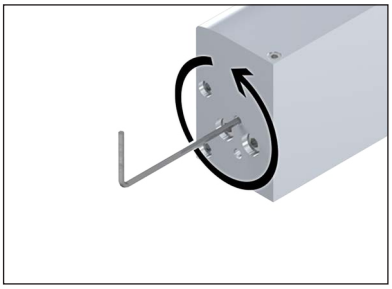
– **Ambient conditions/material resistance**
  - Check whether the ambient temperature is within the permissible range.
  - Check the chemical and physical ambient conditions for hazardous substances, such as dust, abrasive particles, cooling lubricants, solvents, ozone, radiation, water-soluble substances, greases and oils, etc.

4.10.1 Removing the toothed belt

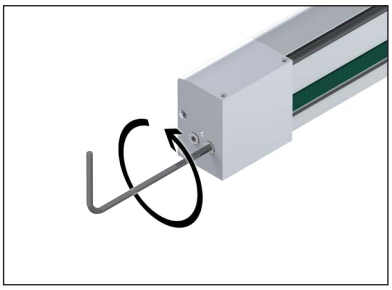
Requirement

Motors are dismantled (➔ Chapter 4.6.1 on page 26).

1. Undo the grub screws for clamping the toothed belt pretension.

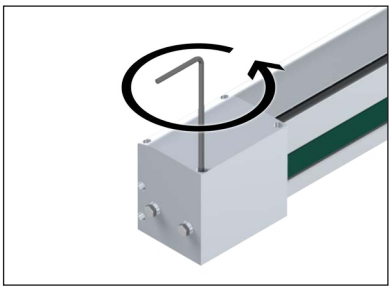


2. Unscrew the socket head screws until the toothed belt is completely slack.

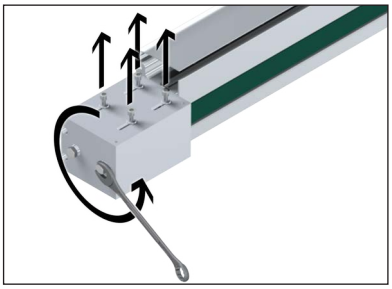


EXCH-60

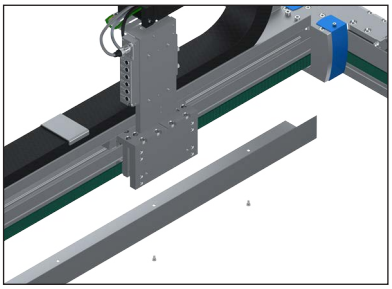
1. Unscrew all four socket head screws of the end cap and remove the end cap.



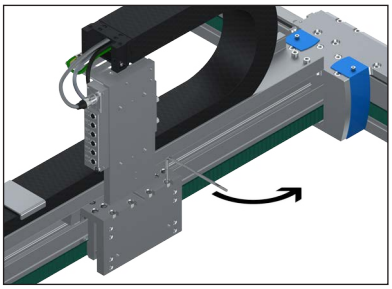
2. Undo all four socket head screws for securing the setting of the toothed belt pretensioning.
3. Unscrew the socket head screws until the toothed belt is completely slack.



3. Unscrew the socket head screws from the cover on the Y-traverse and remove the cover.

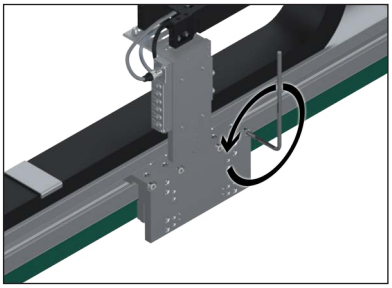


4. Unscrew the socket head screws of the plate and remove the plate.

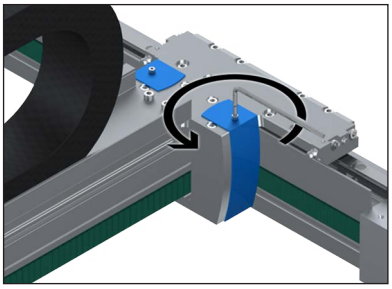


EXCH-60

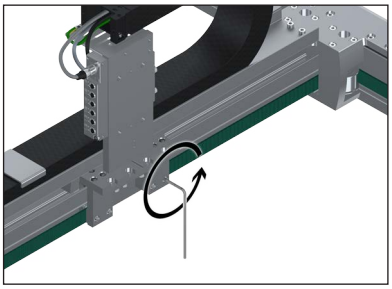
1. Unscrew the front socket head screws of the plate and remove the plate.



5. Unscrew the socket head screws from both covers and remove the covers.

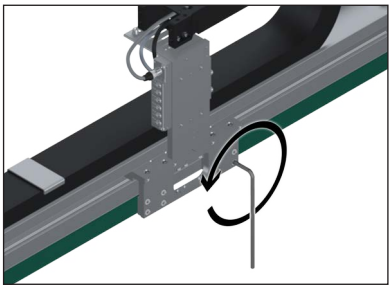


6. Unscrew and remove both socket head screws of the clamping body.
7. Dismantle the second clamping body in the same way as the first and remove.

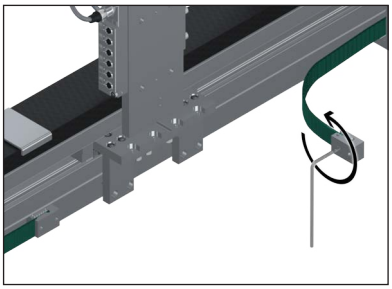


EXCH-60

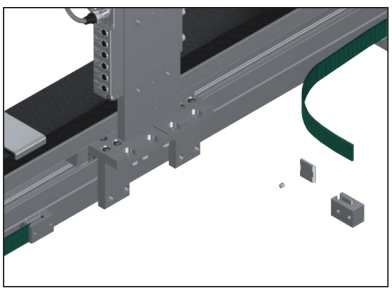
1. Unscrew and remove all four socket head screws of the clamping body.
2. Dismantle the second clamping body in the same way as the first and remove.



8. Unscrew the grub screws from the clamping body.



9. Pull the clamping components sideways off the toothed belt.
10. Remove the clamping plates from the toothed belt.
11. Dismantle the second clamping body in the same way as the first.
12. Carefully pull the toothed belt out of the planar surface gantry.



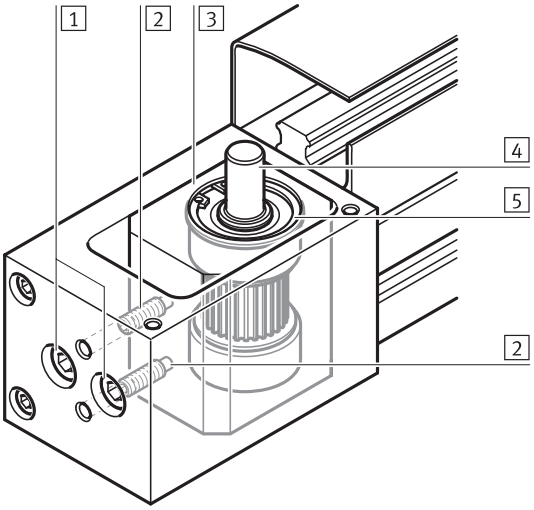
4.10.2 Dismantling and mounting the bearing module / actuator end cap

With each toothed belt change, check the pinion modules for damage and dirt and replace if necessary. The pinion module sits with two pressed on deep-groove ball bearings in a clearance fit of the bearing module and the actuator end cap. The pinion module is fixed axially by a retaining ring.

4.10.2.1 Dismantling the bearing module

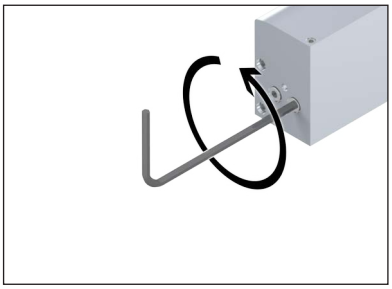
Requirement

Toothed belt is removed (➔ Chapter 4.10.1 on page 56).

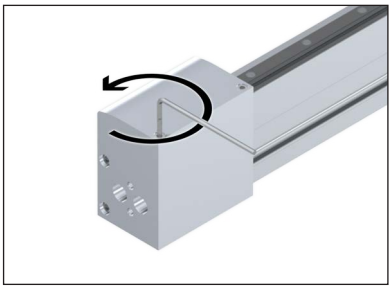


1 Socket head screws
2 Grub screw
3 Bearing module
4 Pinion module
5 Retaining ring

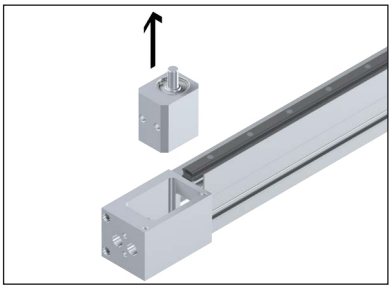
1. Completely unscrew and remove both socket head screws of the toothed belt prestressing.



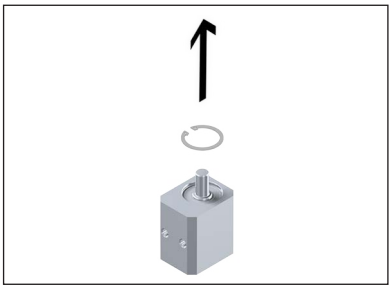
2. Unscrew and remove both socket head screws from the end cap.



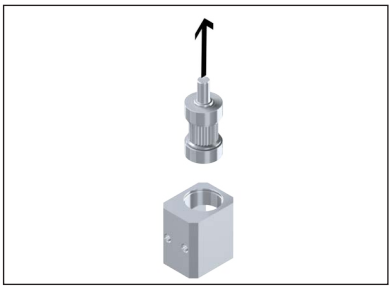
3. Remove the bearing module from the end cap.



4. Remove the retaining ring.



5. Remove the pinion module.



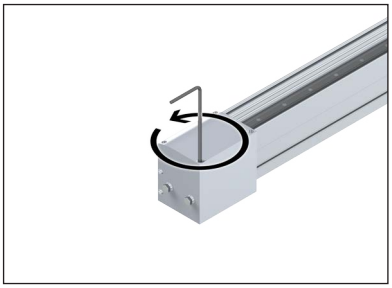
It is not necessary to pull off the deep-groove ball bearings, as the spare part includes both bearings and the shaft.

6. If the deep-groove ball bearing
   - does not fit tightly on the pinion module
   - the rolling behaviour is not uniform
   - the pinion is damaged

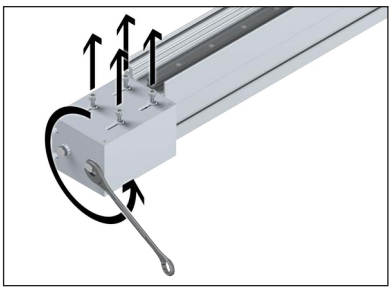
   the pinion module must be replaced.
7. Clean the components with compressed air and a cloth.

EXCH-60

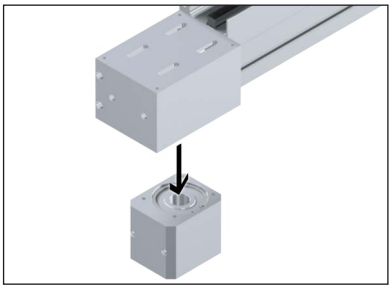
1. Unscrew all four socket head screws from the end cap and remove.



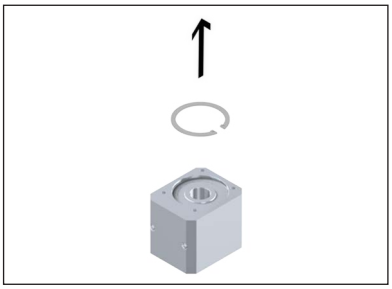
2. Completely unscrew all four socket head screws for securing the setting of the toothed belt pretension.
3. Before adjusting the toothed belt pretension, completely unscrew the hexagon head screws.



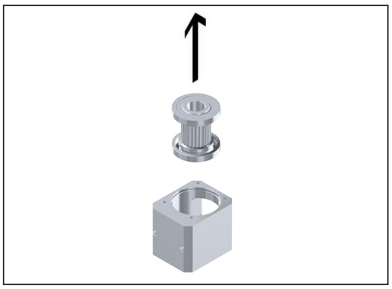
4. Remove the bearing module.



5. Remove the retaining ring.



6. Remove the pinion module.



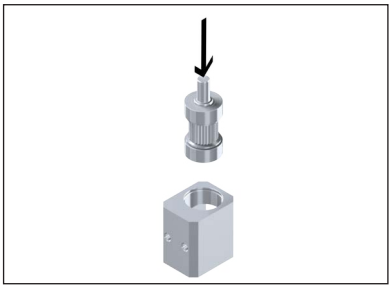
It is not necessary to pull off the deep-groove ball bearings, as the spare part includes both bearings and the shaft.

7. If the deep-groove ball bearing
   - does not fit tightly on the pinion module
   - the rolling behaviour is not uniform
   - the pinion is damaged

   the pinion module must be replaced.
8. Clean the components with compressed air and a cloth.

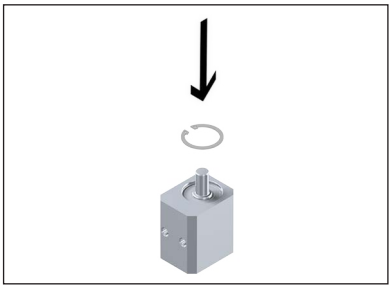
4.10.2.2 Mounting the bearing module

1. Apply a light coating of grease to the outside of the deep-groove ball bearings.
2. Push in the pinion module with the journal pointing upwards.



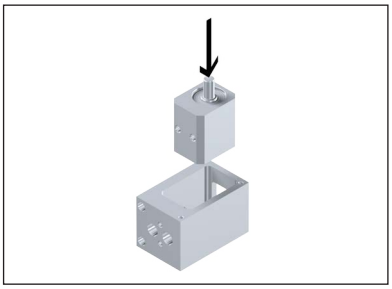
If necessary, use a plastic hammer to carefully drive into the bearing.

3. Insert the retaining ring.



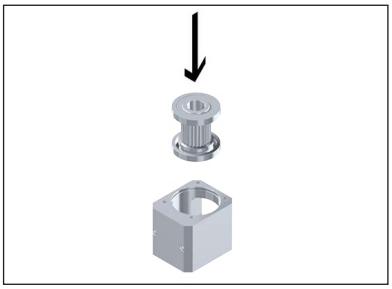
Check that the retaining ring is positioned correctly.

4. Insert the bearing module in the end cap.



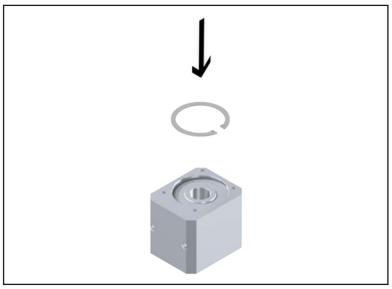
EXCH-60

1. Apply a light coating of grease to the outside of the deep-groove ball bearings.
2. Push in the pinion module with the journal pointing upwards.



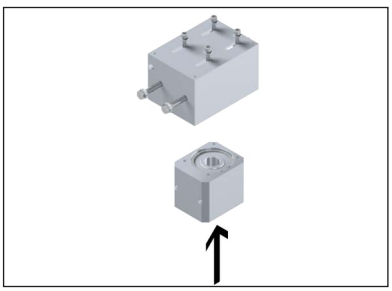
If necessary, use a plastic hammer to carefully drive into the bearing.

3. Insert the retaining ring.



Check that the retaining ring is positioned correctly.

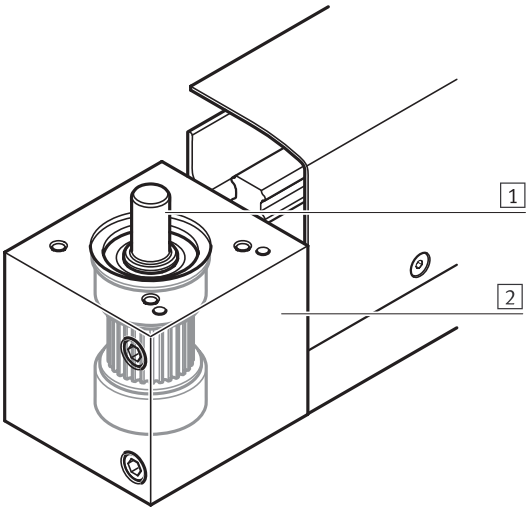
4. Insert the bearing module in the end cap from underneath and loosely screw in the socket head screws to secure the toothed belt pretension setting.
5. Loosely screw in the hexagon head screws for adjusting the toothed belt pretension.



4.10.2.3 Dismantling the actuator end cap

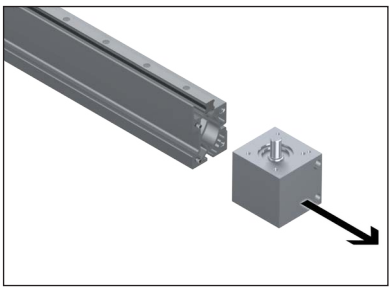
Requirement

Toothed belt is removed (➔ Chapter 4.10.1 on page 56).



1 Pinion module
2 Actuator end cap

1. Unscrew both socket head screws from the actuator end cap.
2. Pull the actuator end cap off the X-axis.



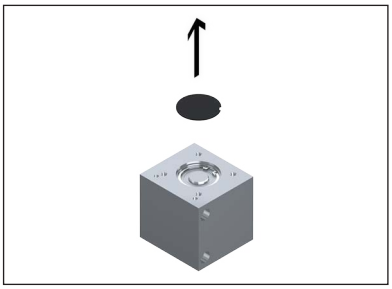
The actuator end caps are connected to the X-axis by spring pins. A certain amount of force is required to pull it off.

3. Check the pinion module and replace if necessary.

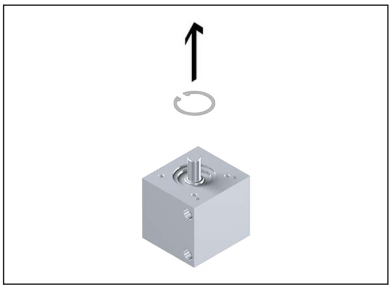
Check the pinion module (➔ Chapter on page 63).

Removing the pinion module from the actuator end cap

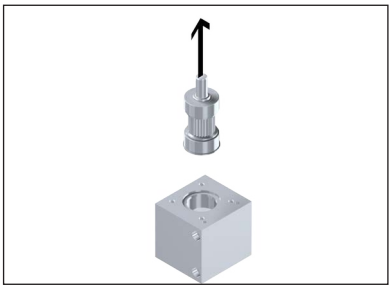
1. Lever the sealing discs out of the actuator end cap.



2. Remove the retaining ring.



3. Remove the pinion module.



It is not necessary to pull off the deep-groove ball bearings, as the spare part includes both bearings and the shaft.

4. If the deep-groove ball bearing
   - does not fit tightly on the pinion module
   - the rolling behaviour is not uniform
   - the pinion is damaged

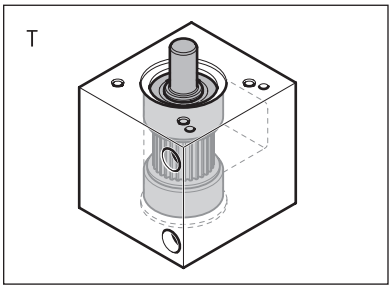
   the pinion module must be replaced.
5. Clean the actuator end cap and X-axis with compressed air and a cloth.

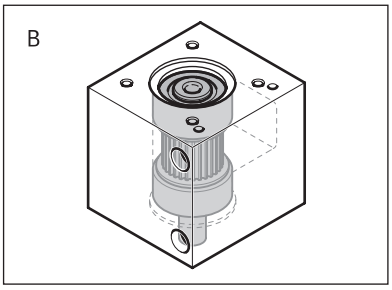
Installing the pinion module in the actuator end cap

Depending on the attachment position of the motor, the mounting position must be noted when mounting the pinion module.

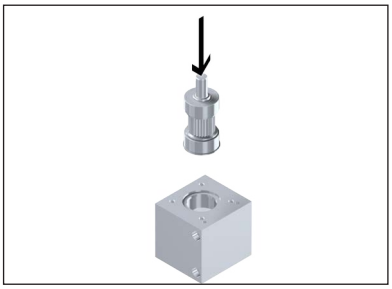
T Attachment position of the motor at the top

B Attachment position of the motor at the bottom



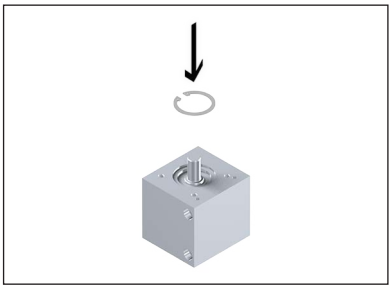


1. Apply a light coating of grease to the outside of the deep-groove ball bearings.
2. Carefully push in the pinion module according to the mounting position of the motor.



If necessary, use a plastic hammer to drive in carefully.

3. Insert the retaining ring.

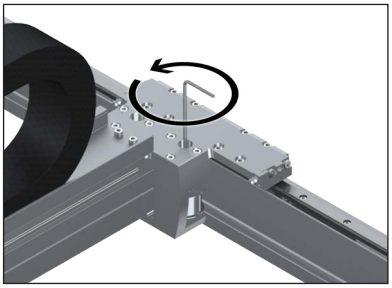


Check that the retaining ring is positioned correctly.

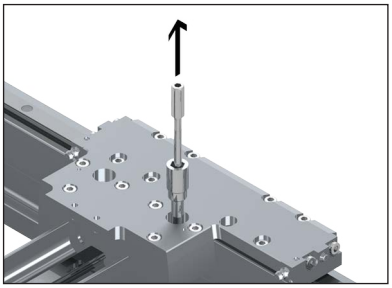
4. Press sealing discs into the actuator end cap to protect from dirt.

4.10.3 Installing the toothed belt

1. Unscrew the shaft of the guide pulley.

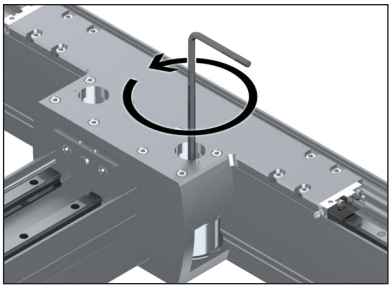


2. Screw separate screw M8 into the shaft.
3. Use the screwed-in screw to pull out the shaft.
4. Remove the guide pulley from the driver.
5. Dismantle the other three shafts in the same way as the first.

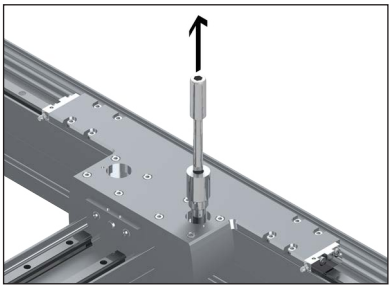


EXCH-60

1. Unscrew and remove the socket head screw of the shaft.

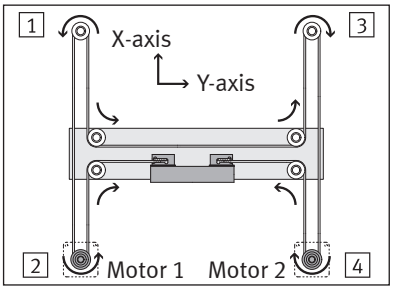


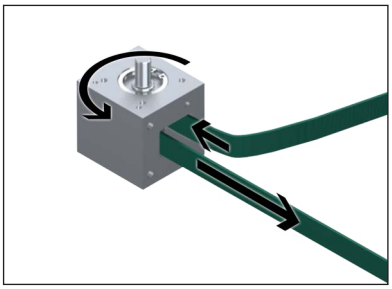
2. Screw a separate screw M6 into the hexagon of the shaft.
3. Use the screwed-in screw to pull out the shaft.
4. Remove the guide pulley from the driver.
5. Dismantle the other three shafts in the same way as the first.



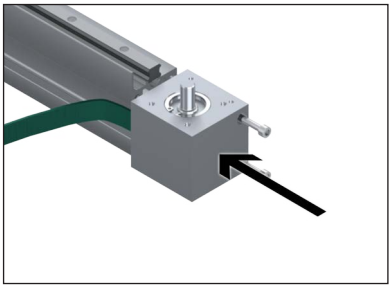
The actuator end caps are connected to the X-axis by spring pins. A certain amount of force is required for the mounting.

6. Push the end of the toothed belt through the actuator end cap (mounting position 1).
7. Push the toothed belt completely through the profile tube of the X-axis so that it peeps out of the end.

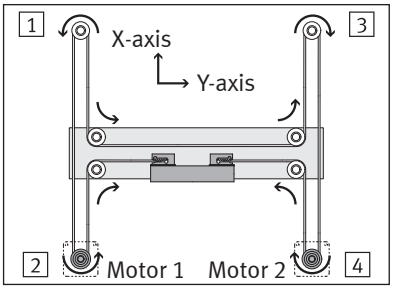


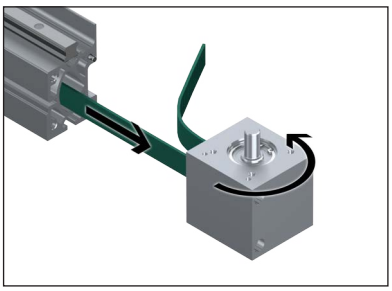


8. Place the actuator end cap with pushed-in toothed belt on the X-axis.
9. Screw in the socket head screws of the actuator end cap and tighten with tightening torque 9.9 Nm.

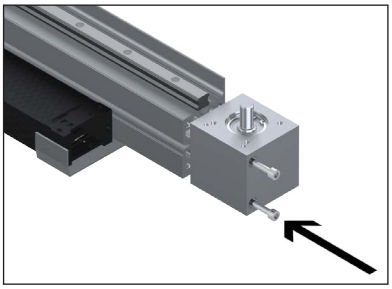


10. Pull the toothed belt out of the end of the X-axis so that it can be guided through the actuator end cap (Motor 1) (mounting position 2).
11. Push the end of the toothed belt through the actuator end cap (Motor 1) (mounted position 2).

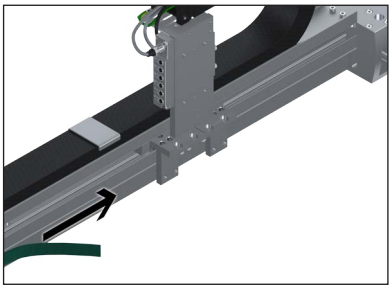




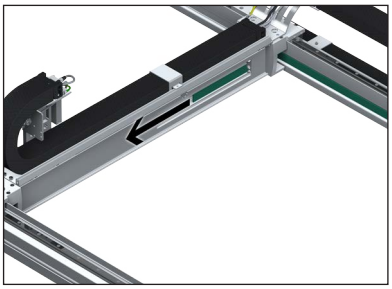
12. Place the actuator end cap (Motor 1) with pushed-in tooth belt on the X-axis.
13. Screw in the socket head screws of the actuator end cap (Motor 1) and tighten with tightening torque 9.9 Nm.



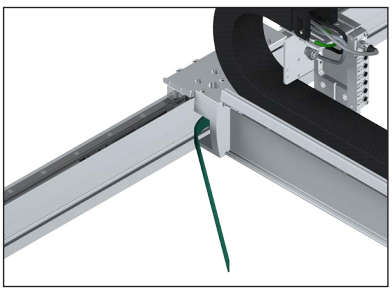
14. Guide the toothed belt up to the Y-traverse.
15. Guide the toothed belt through the driver up to the slide plate of the clamping body.



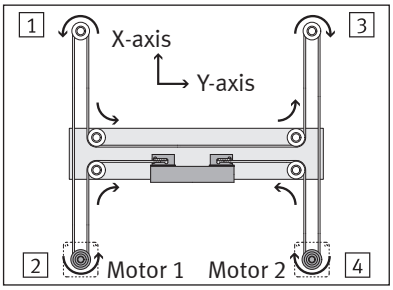
16. Guide the other end of the toothed belt through the driver in the Y-traverse.
17. Push the toothed belt completely through the profile of the Y-traverse.

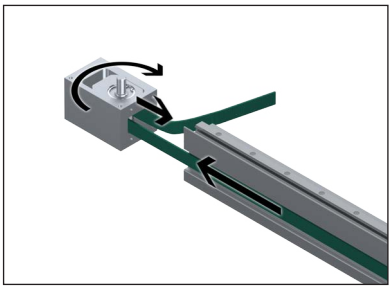


18. Guide the toothed belt through the driver on the X-axis to the end cap with bearing module.



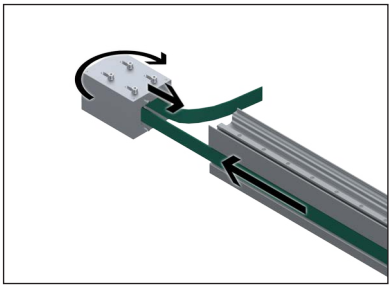
19. Push the toothed belt through the end cap with bearing module (mounting position 3).
20. Push the toothed belt completely through the profile tube of the X-axis so that it protrudes from the end.
21. Position the end cap with pushed-in toothed belt on the X-axis.
22. Screw in both socket head screws of the end cap and tighten with tightening torque 9.9 Nm.



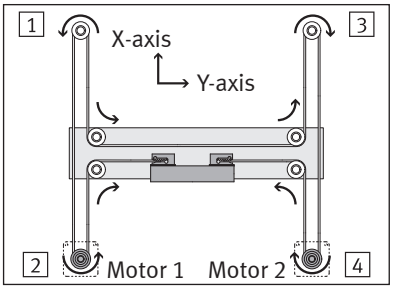


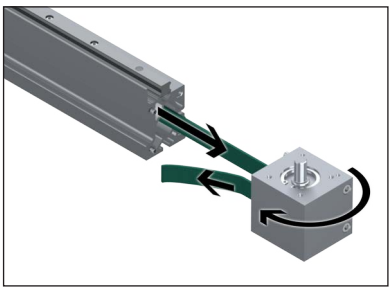
EXCH-60

1. Push the toothed belt through the end cap with bearing module.
2. Push the toothed belt completely through the profile tube of the X-axis so that it protrudes from the end.
3. Position the end cap with pushed-in toothed belt on the X-axis.
4. Screw in both socket head screws of the end cap and tighten with tightening torque 9.9 Nm.

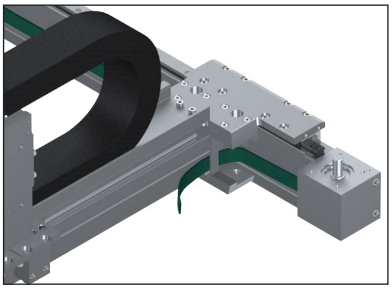


23. Push the end of the toothed belt through the actuator end cap (Motor 2) (mounted position 4).
24. Place the actuator end cap (Motor 2) with pushed-in tooth belt on the X-axis.
25. Screw both socket head screws of the actuator end cap (Motor 2) and tighten with tightening torque 9.9 Nm.

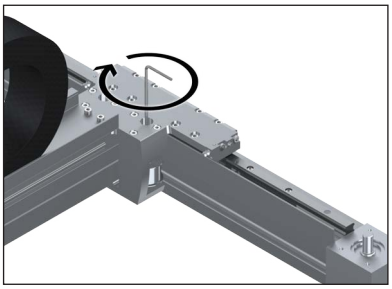




26. Guide the toothed belt up to the Y-traverse.
27. Guide the toothed belt through the driver up to the slide plate.

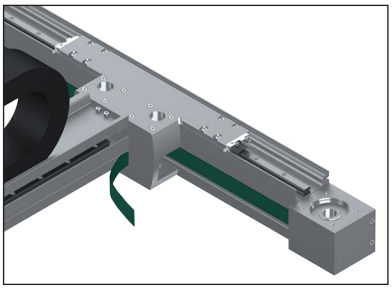


28. Clean the shaft to remove locking agent.
29. Wet the shaft with locking agent.
30. Insert the guide pulley into the driver.
31. Screw in the shaft of the guide pulleys and tighten with tightening torque 5.9 Nm.
32. Mount the other three guide pulleys in the same way as the first.

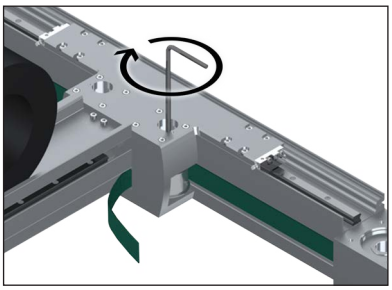


EXCH-60

1. Guide the toothed belt through the driver up to the slide plate.
2. Clean the socket head screw of the shaft to remove locking agent.
3. Wet the socket head screw of the shaft with locking agent.



4. Insert the guide pulley into the driver.
5. Feed the shaft through the driver in the guide pulley.
6. Screw in the socket head screw of the shaft and tighten with tightening torque 5.9 Nm.
7. Mount the other three guide pulleys in the same way as the first.

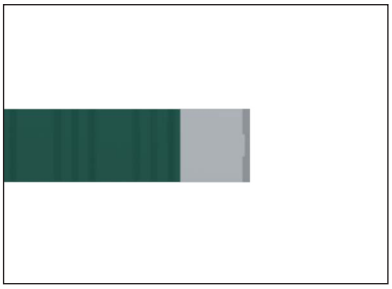


33. Place the clamping plate on the left-hand end of the toothed belt.

Note

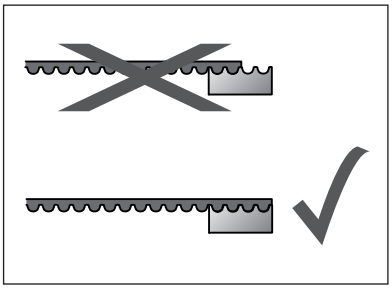
The clamping plate must be positioned axially with the middle of the toothed belt to prevent damage to the toothed belt during operation.

34. Align the clamping plate axially with the middle of the toothed belt.



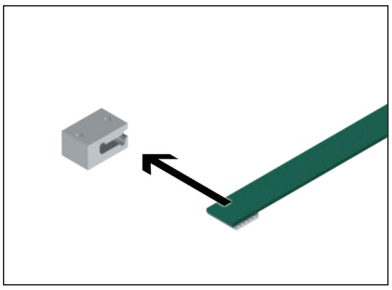
Note

The toothed belt must be placed on the clamping plate so that it fits and must not protrude.



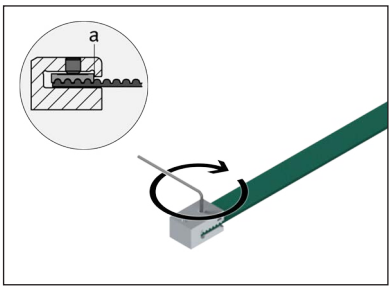
Note

The threads of the clamping components must be recut before the grub screws are screwed in. Residues of old locking agent in the threads result in non-uniform and increased tightening torques of the grub screws, and correct tightening is thus not ensured.



35. Insert the left-hand end of the toothed belt together with the clamping plate into the clamping body.
36. Align the toothed belt axially with the middle of the clamping body.

37. Wet the grub screw with locking agent.
38. Screw the grub screw into the clamping body.
39. Push the clamping plate against the stop (a) on the clamping body.



Note

The clamping plate must touch the stop as otherwise the toothed belt pre-tension will reduce during operation.

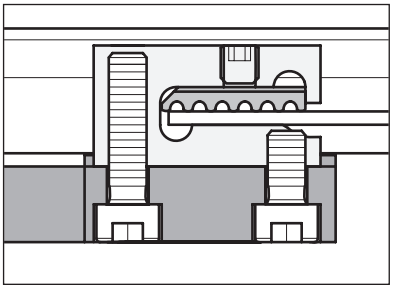
Note

The tightening torques must always be observed. Excessive tightening torques will bend the clamping component.

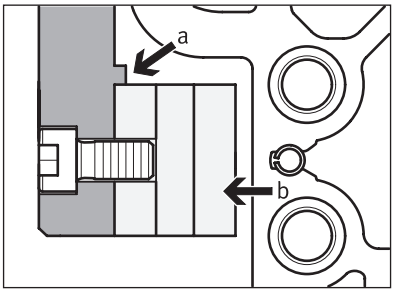
40. Screw in the grub screw and tighten with the appropriate tightening torque.

Planar surface gantry / size	Tightening torque
EXCH-40	1.5 Nm
EXCH-60	2.9 Nm
EXCM-40	1.5 Nm

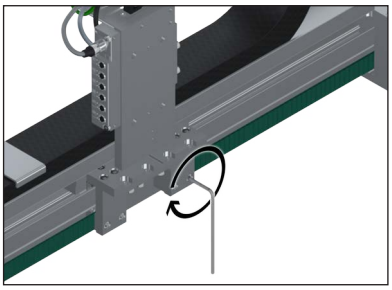
When mounting the clamping bodies, attention must be paid to the different screw length. The longer screw points inwards, the shorter screw outwards in the direction of the X axis.



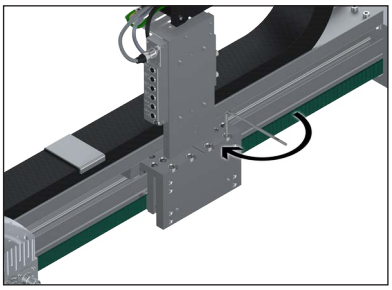
29. Clean the socket head screws of the clamping body to remove locking agent.
30. Wet the socket head screws with threadlocker.
31. Position the clamping body (b) on the plate of the Y-traverse so that is lies against the stop edge (a).



1. Screw in the socket head screws, push the clamping body against the stop edge and tighten the socket head screws with a tightening torque of 9 Nm ±10 %.
2. Mount the second clamping body in the same way as the first.

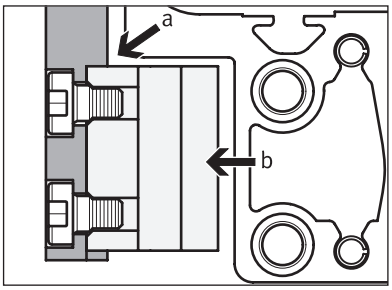


3. Clean the socket head screws of the plate to remove locking agent.
4. Wet the socket head screws with threadlocker.
5. Screw in the socket head screws and tighten with tightening torque 5.9 Nm.
6. Mount the second clamping body in the same way as the first.

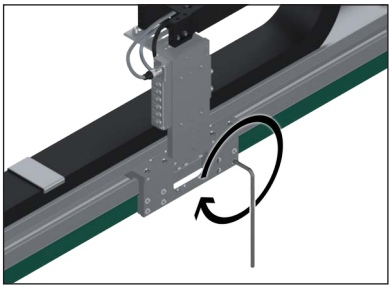


EXCH-60

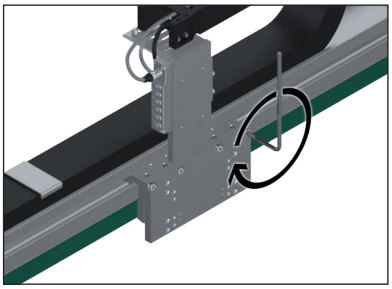
1. Clean the socket head screws of the clamping body to remove locking agent.
2. Wet the socket head screws with threadlocker.
3. Position the clamping body (b) on the plate of the Y-traverse so that is lies against the stop edge (a).



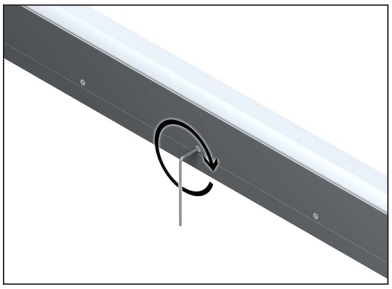
4. Screw in the socket head screws, push the clamping body against the stop edge and tighten the socket head screws with a tightening torque of 9.9 Nm ±10 %.
5. Mount the second clamping body in the same way as the first.



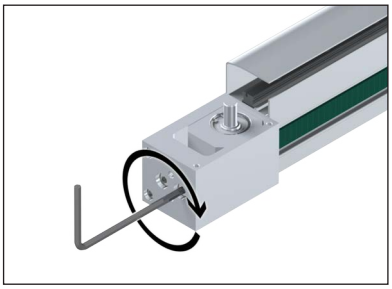
6. Clean the socket head screws of the plate to remove locking agent.
7. Wet the socket head screws with threadlocker.
8. Position the plate on the slide and align flush with it.
9. Screw in the socket head screws and tighten them with a tightening torque of 5.9 Nm ±10 %.



7. Position the cover on the X-axis.
8. Screw in the countersunk screws and tighten with tightening torque 0.6 Nm.

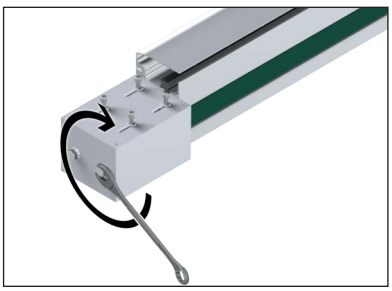


9. Screw both socket head screws into the bearing module. At the same time, pretension the toothed belt slightly.



EXCH-60

1. Screw in both hexagon head screws and slightly pretension the toothed belt.



General information on the toothed belt pretension

A pulse is applied to the toothed belt to make it oscillate. The resulting natural frequency of the toothed belt is recorded using a measuring device and displayed as a frequency value in hertz.

Note

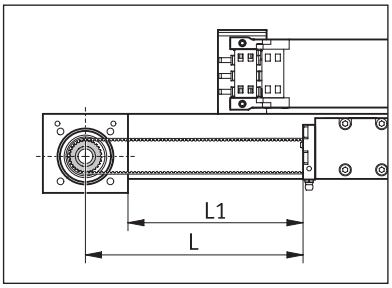
Correct toothed belt pretension is essential for the life of the toothed belt and the positioning accuracy and operating performance of the planar surface gantry. The toothed belt pretension must therefore be checked extremely carefully.

A conventional method for measuring the toothed belt pretension using the deflection force is too inaccurate, and therefore cannot be used. Accurate results are achieved by measuring the oscillation frequency. The natural frequency of a belt is based on its tension (strand force), mass and strand length.

The strand length is the oscillating length of a belt.

As the freely oscillating strand length (L) cannot be measured directly, the distance (L1) between the actuator end cap and the lubrication adapter of the Y-traverse (b) is set by pushing the slide.

The toothed belt pretension is therefore determined by measuring the fundamental component (natural frequency) of the toothed belt with a fixed and freely oscillating strand length (L).



Note on measurement using the acoustic frequency measuring device:

If the toothed belt is excited by means of a force pulse, the strand oscillates with its natural frequency; this decays more or less quickly depending on damping.

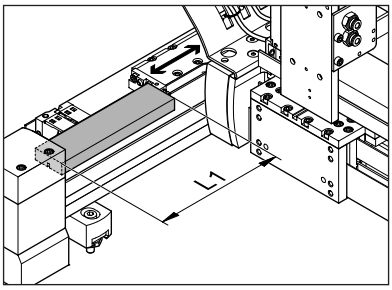
The frequency measuring device measures the natural frequency generated (transverse oscillation) using the acoustic operating principle. In addition to the fundamental frequency (natural frequency), harmonics can also occur. From experience it is always the 1st harmonic. In other words, a further node is generated and therefore, in addition to the fundamental frequency, values that are twice the natural frequency can also be measured.

For this reason, several measurements should always be taken in order to differentiate between the necessary fundamental (natural frequency) and the harmonic. Only this frequency can be used to conclude the force acting in the strand.

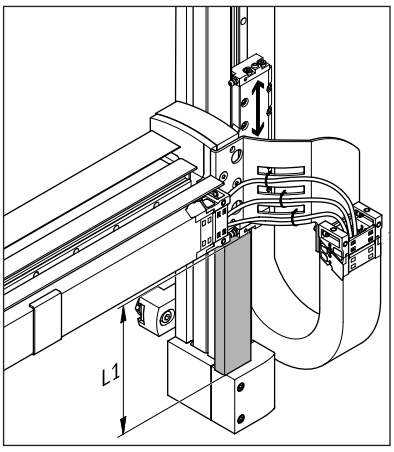
4.10.4 Checking the toothed belt pretension

For horizontal mounting position

- Use the setting piece to set the distance (L1) between the **actuator end cap** and the Y-traverse to 144.4.



For vertical mounting position



Warning

If the setting piece falls out, the traverse (Y-axis) falls downward.

Danger of severe crushing and amputation of limbs!

- Make sure that no one is standing underneath the traverse.

- Use the setting piece to set the distance (L1) between the **corner pulley** and the Y-traverse to 144.4 mm.

The slot of the setting piece is intended for hanging and locking onto the profile of the X-axis.

Note

The pretension of the toothed belt is not an indicator of wear!

The values specified here are relate to a new toothed belt.

The toothed belt is set to the specified value in the factory, and is thus maintenance-free for its entire service life.

The pretension of the toothed belt reduces due to storage time and operation. This is not an indication of wear; it is a normal process that must not be changed by retensioning the toothed belt.

The toothed belt pretension must therefore only be set after renewing the toothed belt.

Note

The toothed belt must be able to oscillate freely. The acoustic frequency meter must not touch the oscillating toothed belt.

To assess the toothed belt pre-tension, several measurements should be taken to balance out any measurement tolerances.

Note

For EXCH-40 – vertical mounting position only

The toothed belt pretension may only be measured at the corner pulley **without** adjusting option for toothed belt pretension **opposite** the motor side.

1. Hold the acoustic frequency meter – as described in the corresponding operating instructions – with distance and centrally with the toothed belt.
2. Make the toothed belt oscillate by striking it with a narrow, heavy object, such as an Allen key or pin punch.
3. Compare the measured natural frequency with the corresponding allowable frequency range (f).

Size	Mounting position	Minimum frequency (f)	Maximum frequency (f)
EXCH-40	vertical	212 Hz	222 Hz
	horizontal	173 Hz	183 Hz
EXCH-60	vertical	117 Hz	127 Hz
	horizontal	117 Hz	127 Hz
EXCM-40	horizontal	150 Hz	160 Hz

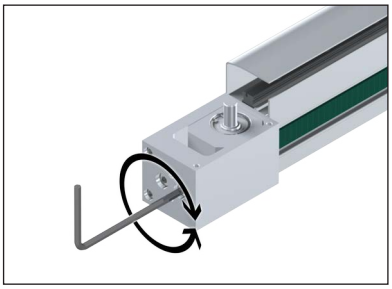
Example representation

Setting the toothed belt pretension

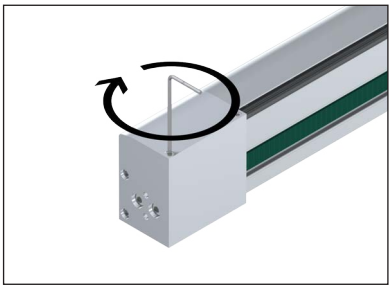
If the measured natural frequency of the toothed belt is outside the specified range, the toothed belt pretension must be adjusted as follows.

Turning the socket head screws clockwise increases the tension of the toothed belt, and thus its oscillation frequency. Turning the socket head screws anticlockwise decreases the tension of the toothed belt, and thus its oscillation frequency.

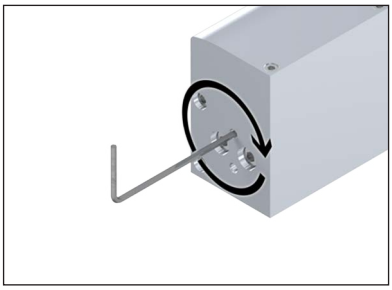
1. Adjust the toothed belt pretension by turning both socket head screws uniformly.
2. Before remeasuring the toothed belt pretension, the Y-traverse must be moved back and forth a number of times so that the toothed belt can fully settle and differences in tension are equalised.



3. If the measured natural frequency lies within the allowable range, put on the end cap, screw in the socket head screws and tighten with tightening torque 5.9 Nm.

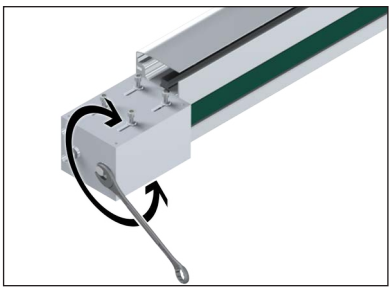


4. Tighten the grub screws with tightening torque 1.0 Nm.



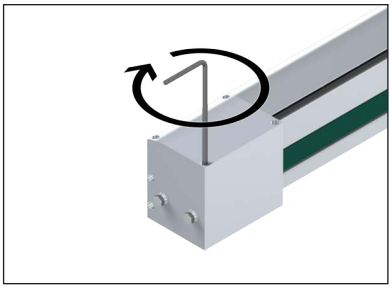
EXCH-60

1. Adjust the toothed belt pretension by turning the hexagon head screws uniformly.
2. Before remeasuring the toothed belt pretension, the Y-traverse must be moved back and forth a number of times so that the toothed belt can fully settle and differences in tension are equalised.



3. If the measured natural frequency lies within the allowable range, tighten all 4 socket head screws with tightening torque 9.9 Nm ± 10 %.

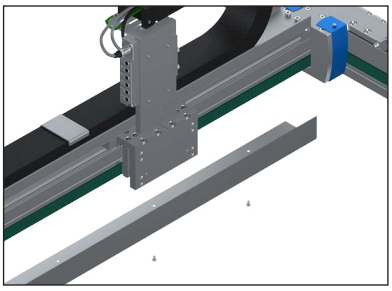
4. Put on the end cap, screw in the socket head screws and tighten with tightening torque 5.9 Nm.



4.11 Final repair steps

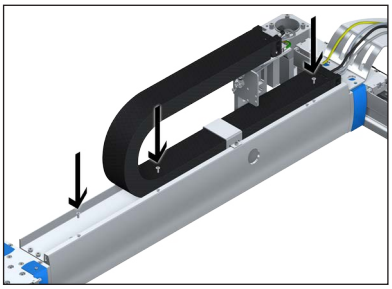
4.11.1 Mounting the cover angle of the Y-traverse

1. Place the cover angle on the Y-traverse.
2. Screw in the socket head screws and tighten with tightening torque 1.0 Nm.

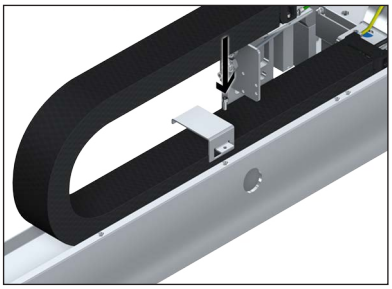


4.11.2 Mounting the Y-traverse cover

1. Place the cover on the Y-traverse.
2. Screw in the socket head screws and tighten with tightening torque 1.0 Nm.



3. Position the angle bracket on the energy chain.
4. Screw in the socket head screw and tighten with tightening torque 1.0 Nm.



5 Cleaning and greasing

5.1 Cleaning

Note

The planar surface gantry normally does not need cleaning. It should only be cleaned in exceptional cases and taking the following points into consideration.

Do **not** clean the guide elements (e.g. roller tracks).

– Festo recommends LOCTITE 7061 or an alternative suitable cleaning product for cleaning.

When using other cleaning agents, make sure that they do not corrode the non-metal parts of the planar surface gantry. If in doubt, check the resistance of the non-metal parts with the help of the information on the Festo website (➔ www.festo.com).

- Clean the planar surface gantry as required with a soft cloth.
- Avoid cleaning media that can damage the plastic components. Rubbing too hard or use of grease-dissolving cleaning media (e.g. soap suds) damages the grease layer (e.g. on the roller tracks).

5.2 Relubricating

Note

The planar surface gantry is lubricated initially during production.

The recirculating ball bearing guides of the guide carriages must be relubricated at intervals of 2500 km via the two lubrication nipples on the front of the slide.

Relubricate with the same lubricant used to lubricate on delivery.

- Grease the components as described in Chapter 5.2.1 on page 77.

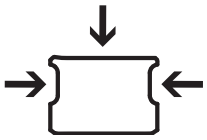
5.2.1 Lubrication

Note

At **each** lubrication nipple, insert a total grease quantity of 1.0 gram (in two doses of 2 × 0.5 gram) with the help of a suitable grease gun.

1. At the same time, lubricate each with half the specified quantity of lubricant.
2. Travel traverse and slide unit of the Y-axis 1 time over the entire stroke.
3. Perform steps 1 and 2 again.

Additional information on lubrication is given in the description of the **"Mechanical installation"**.
The description can be found on the Festo website (➔ www.festo.com/sp).

Component	Lubricant	Lubrication
Roller track of the X-axis Roller track of the Y-axis	ISOFLEX TOPAS NB 52	 Apply a thin layer of grease all around the roller tracks of the X- and Y-axes.
Guide carriage of the X-axis	ISOFLEX TOPAS NB 52	Quantity of grease: 1.0 gram per lubrication nipple Number of lubrication nipples: – EXCH-40: 4 – EXCH-60: 4 – EXCM-40: 4 Grease gun ➔ Chapter 6.2 on page 78
Guide carriage in the Y-traverse	ISOFLEX TOPAS NB 52	Move the Y-axis slide until the lubrication nipples are successively accessible in the maintenance opening. Quantity of grease: 1.0 gram per lubrication nipple Number of lubrication nipples: – EXCH-40: 2 – EXCH-60: 3 – EXCM-40: 2 Grease gun ➔ Chapter 6.2 on page 78

6 Tools

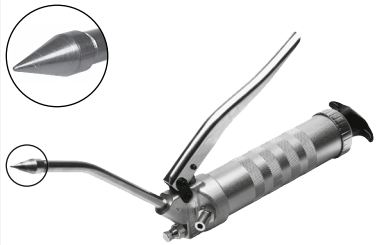
This chapter provides you with an overview of the tools and aids required to repair and maintain the EXCH planar surface gantry.

6.1 Standard tools

- Allen key
- Screwdriver
- Torque wrench
- Retaining ring pliers
- Spanner

6.2 Special tools

The following special tools are required for repair and maintenance of the planar surface gantry:

Designation	Additional information	Festo order no.	Figure
One-hand grease gun LUB-1	Pinpoint nozzle for miniature, funnel-shaped lubrication nipples and lubricating holes	647958	
Lubrication adapter LUB-1-TR-I	Lubrication adapter (nozzle pipe Ø 6x200 axial)	647959	
Lubrication adapter LUB-1-TR-L	Lubrication adapter (nozzle pipe Ø 6x200 lateral)	647960	
Lubrication adapter LUB-1-TR-W	Lubrication adapter (nozzle pipe Ø 6×200 lateral, 45° angled)	8073388	

Designation	Additional information	Festo order no.	Figure
Lubrication adapter LUB-1-KE	Suitable for tapered lubrication nipple DIN 71412	744167	

Additional information on the fixtures and measuring devices can be found in the **“Tools and repair accessories”**. It can be found in the online spare parts catalogue on the Festo website (➔ Tools and repair accessories.pdf).

6.3 Acoustic frequency meter

Designation	Description	Figure
TB-TE-EQ13	Acoustic frequency meter for measurement with and without a test device.	

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