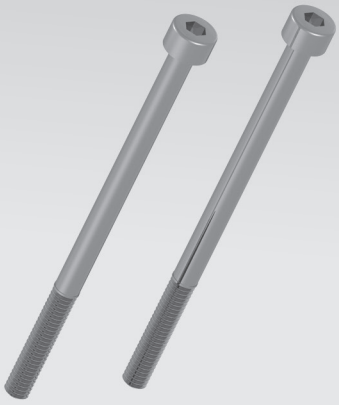
Toothed belt axis

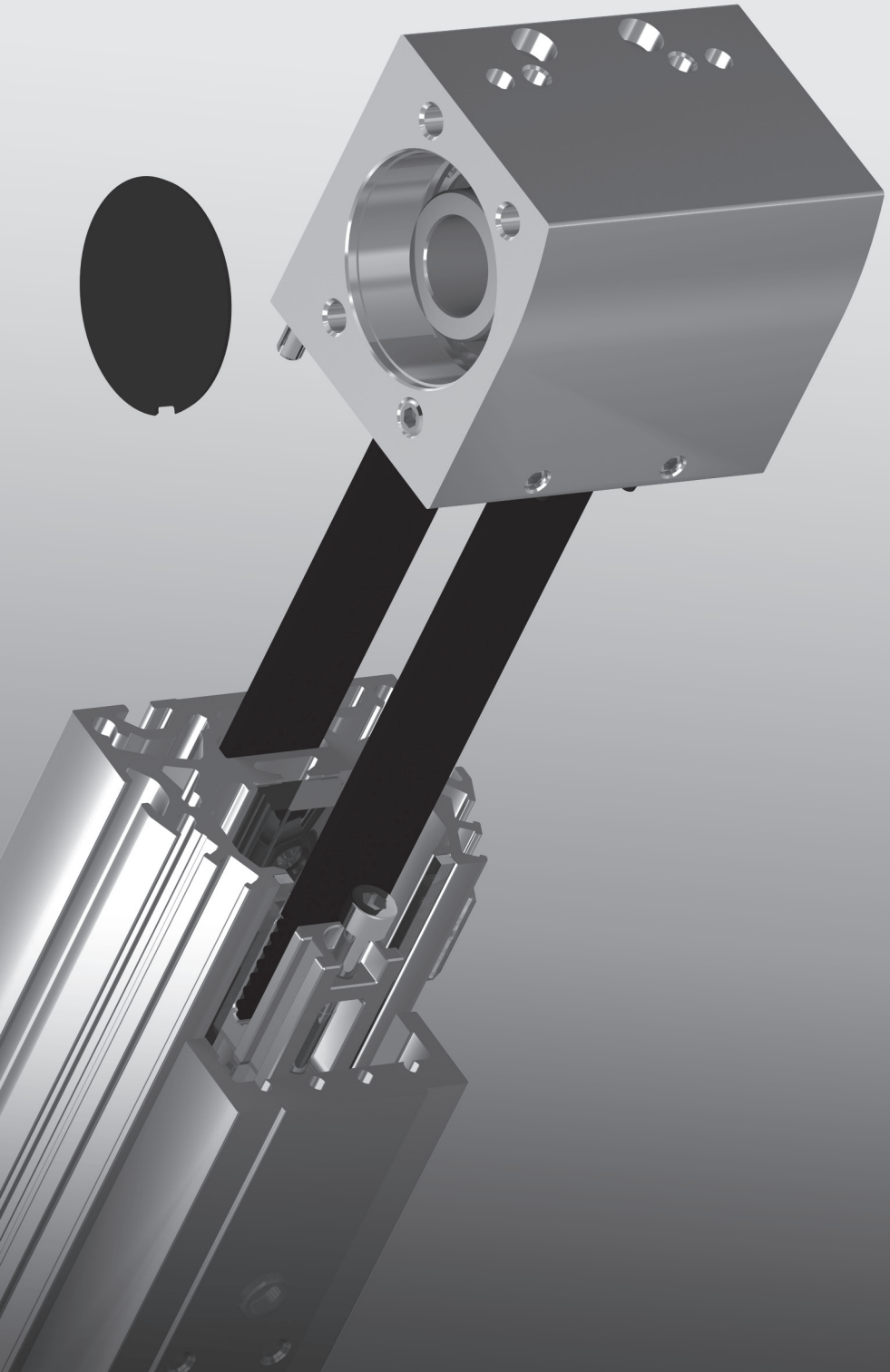
ELGA-TB-KF-70-...

ELGA-TB-KF-80-...

ELGA-TB-KF-120-...

ELGA-TB-KF-150-...





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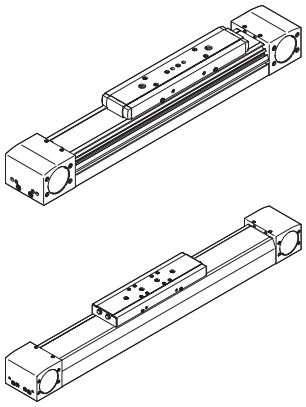
Repair instructions (en)



7ELGA_TB_KFb_en

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©Festo SE & Co. KG
Ruiter Straße 82
73734 Esslingen
Germany

Editorial team:
Spare Part Documentation and Support

Phone:
+49 / 711 / 347-0

E-mail:
service_international@festo.com

Internet:
www.festo.com

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

Foreword

These repair instructions are valid for the toothed belt axis listed on the title page to the exclusion of any liability claims.

Deviations compared to the descriptions in these repair instructions may arise depending on the version and/or modification status of the toothed belt axis. 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 71.

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

1 Important information

1.1 About these repair instructions

This document contains important information about proper repair of the products listed on the title page.

However, the costs of carrying out a repair must be considered in the case of larger defects.

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

The Toothed belt axis Type ELGA-TB-KF-... is also called the product in these repair instructions.

For reasons of clarity, these repair instructions do not contain all detailed information. The following documents should therefore also be available while carrying out repair work:

- **Toothed belt axis ELGA-TB-KF-... operating instructions**

  Contains information on the product's peripherals as well as its function, structure, application, installation, commissioning, maintenance and care, etc. (➔ www.festo.com).
- **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 equipment" information brochure**

  Contains an overview of available assembly aids (e.g. lubricants, locking agent), special tools, schematic diagrams, fixtures, measuring devices, etc. The information can be found in the online spare parts catalogue on the Festo website (➔ Tools and repair equipment.pdf).

1.2 Symbols used in these repair instructions

Danger categories

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

Warning

Caution

Marking special information

The following symbols identify text passages which contain special information.

Note

Information

Environment

1.3 Symbols 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 list
➔ 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 information

Warning

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

– The toothed belt axis must be de-energised, depressurised and reliably secured against unauthorised switching back on again before the maintenance and repair work begins.

Caution

The toothed belt axis 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 device-specific operating instructions.

Caution

Lifting large loads can lead to permanent injury.

– The toothed belt axis must be lifted by several people or with suitable lifting gear, depending on its size and weight.

Caution

Unintended switching on can trigger unexpected movements and cause bruises.

– Ensure that the plant 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

Carrying out repair work without the respective necessary technical documentation is dangerous, and therefore not permissible. 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.

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 toothed belt axis must be in perfect technical condition.
- The toothed belt axis may only be operated in its original condition and without unauthorised modifications.
- The toothed belt axis is designed for industrial use.

1.6 Standards and test values

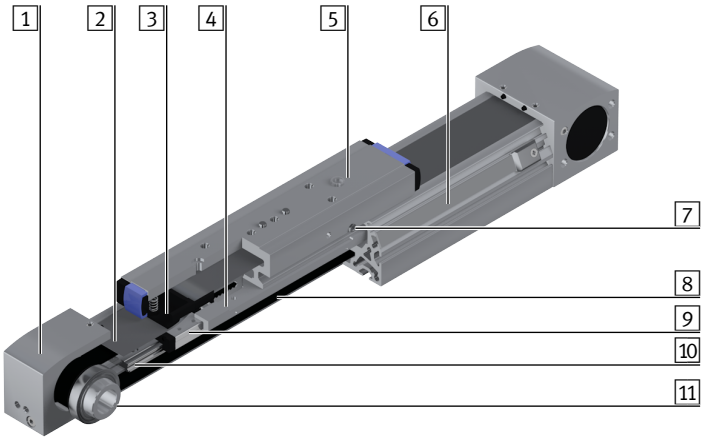
Standards and test values which products comply with and fulfil can be found in the "Technical data" sections of the enclosed documentation.

2 General product description

2.1 Functional description

The ELGA-TB-KF- is a toothed belt axis based on the operational principle of a circulating toothed belt for power transmission. The rotation of a drive motor sets a toothed belt guided around both ends of the axis into a linear motion, which is transferred onto the roller-guided slide fixed onto the toothed belt.

By minimising the moving dead weight, a high dynamic response and shorter cycle times can be achieved. The ELGA-TB-KF- is approved for slide operating mode.



1 Actuator end cap with corner pulley
2 Cover band
3 Belt reverser
4 Clamping component
5 Slide
6 Displacement encoder
7 Lubrication nipple
8 Toothed belt
9 Roller carriage
10 Roller track
11 Toothed belt pulley with deep-groove ball bearing

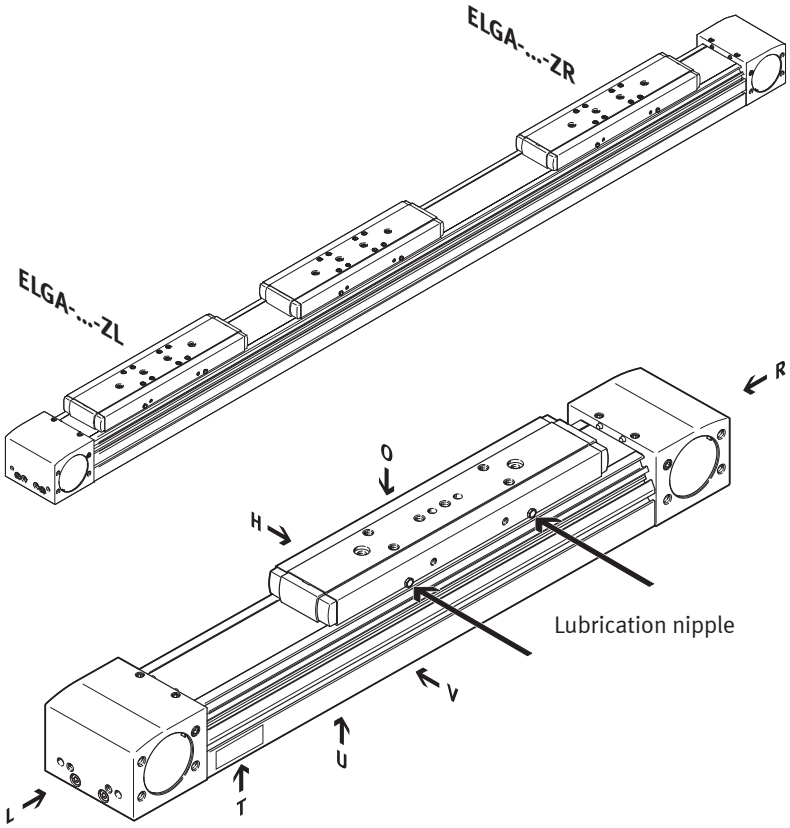
2.2 Types and part numbers

Type	Part number
ELGA-TB-KF-70-...(-F1 /-P11)	8024914
ELGA-TB-KF-80-...(-F1 /-P11)	8024915
ELGA-TB-KF-120-...(-F1 /-P11)	8024916
ELGA-TB-KF-150-...(-P11)	8024917

The complete overview of features, accessories, Type codes, technical data and dimensions for the EGC-... -TB-KF toothed belt axes can be found in the product catalogue or on the Festo website (➔ www.festo.com).

2.3 Slide variants and orientation definition

This illustration provides an overview of the orientation designations and slide variants of the toothed belt axis.



Versions:

ZL = Additional slide on left

ZR = Additional slide on right

Orientation:

Point of reference:
The side with the lubrication nipples on the slide is defined as the front.

T = Rating plate

O = top

U = bottom

R = right

L = left

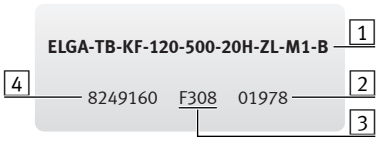
V = front

H = rear

2.4 Type code

The precise features of a toothed belt axis can be determined with the help of its nameplate. The Type designation describes the features of the toothed belt axis, separated by a hyphen (-).

Example:



1 Type designation

2 Serial number

3 Serial number

4 Part number

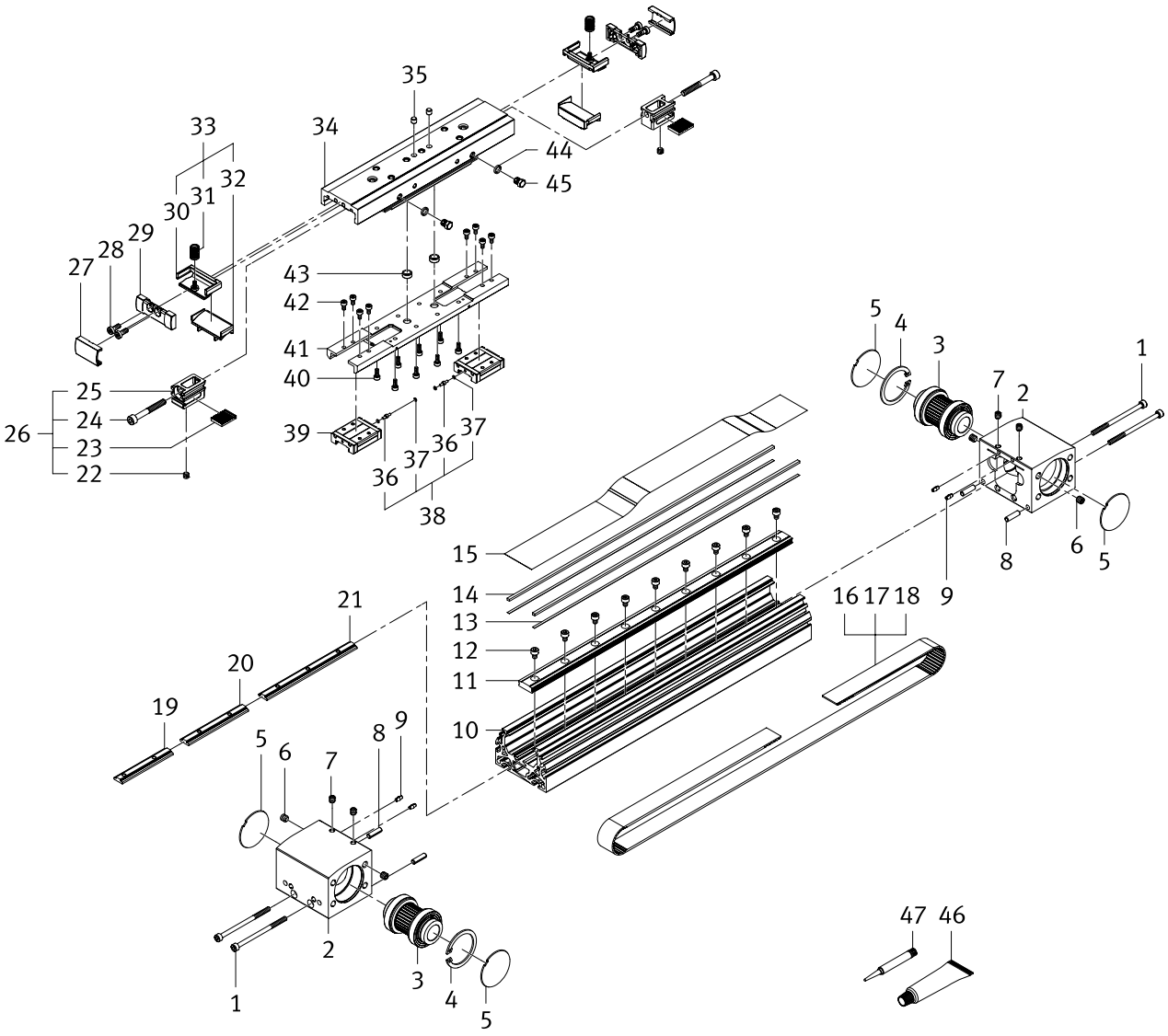
The Type designation on these rating plates provides the following information:

ELGA	Toothed belt axis of the Type ELGA
TB	Toothed belt
KF	Recirculating ball bearing guide
120	Size
500	Stroke [mm]
20H	Stroke reserve [mm]
ZL	Additional slide on left
M1	Incremental displacement encoder, resolution 2.5 µm
B	Attachment position of displacement encoder, rear

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

3 Components list

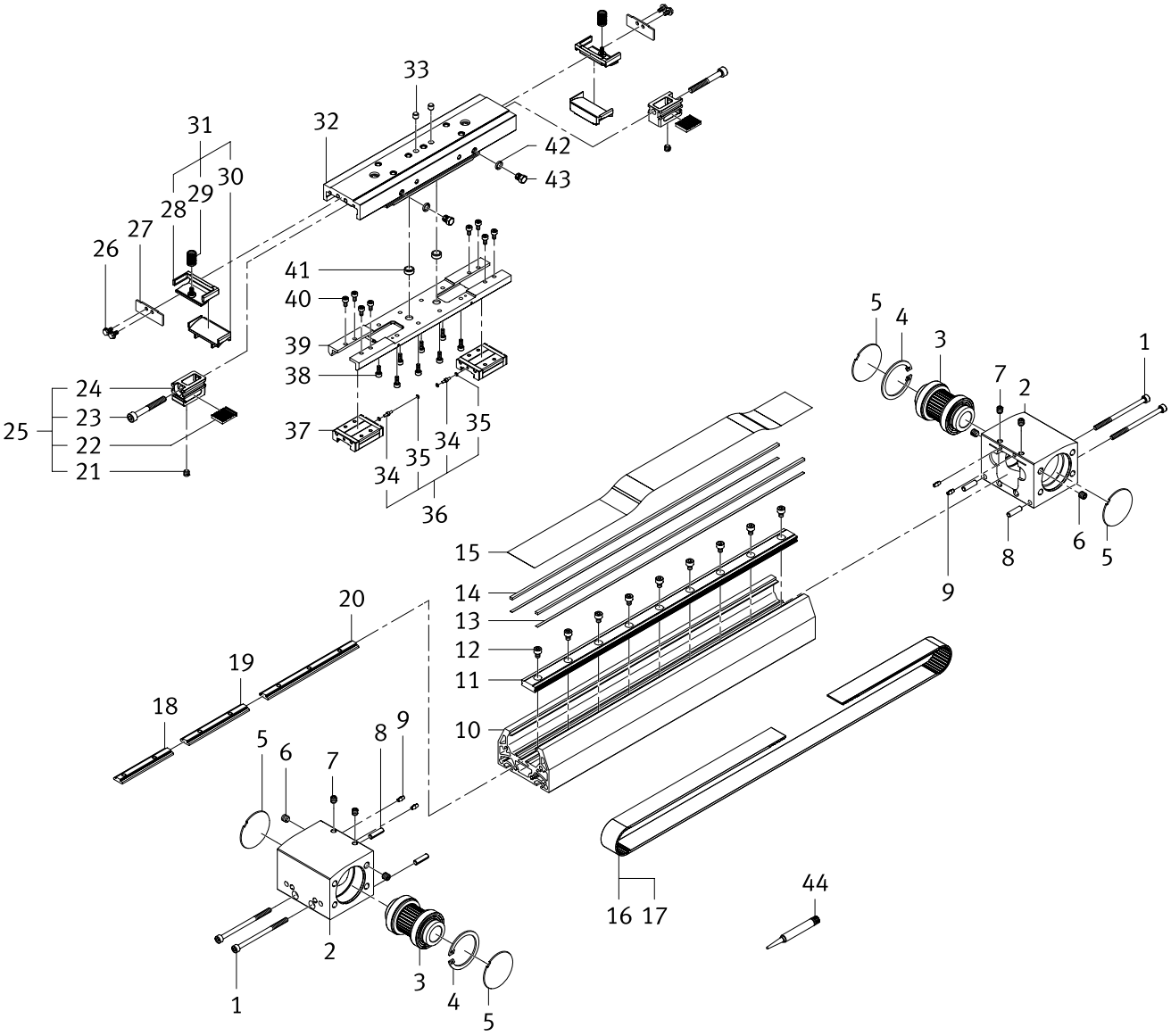
3.1 ELGA-TB-KF-70



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-70	
Product series		up to J4 (04-2017)	since J5 (05-2017)
No.	Designation	Type	Type
1	Socket head screw	ISO 4762-M4X65-8.8	ISO 4762-M4X65-8.8
2	Drive cover		
3	Toothed belt pulley module		
4	Retaining ring	DIN 472-37X1,5	DIN 472-37X1,5
5	Sealing washer		
6	Threaded pin	ISO 4028-M6X8-45H	ISO 4028-M6X8-45H
7	Threaded pin	ISO 4026-M5X6-45H	ISO 4026-M5X6-45H
8	Spring pin	DIN 7346-4,5X16	DIN 7346-4,5X16
9	Buffer element		
10	Cylinder barrel		
11	Roller track		
12	Socket head screw	F-M4X5,5-10.9	F-M4X5,5-10.9
13	Adhesive tape		
14	Magnetic tape		
15	Cover strip		
16	Toothed belt		
17	Toothed belt []	5m piece	5m piece
18	Toothed belt [PU2]	5m piece	5m piece
19	Slot nut		
20	Slot nut		
21	Slot nut		
22	Threaded pin	ISO 4026-M5X5-45H	ISO 4026-M5X5-45H
23	Clamping plate		
24	Socket head screw	ISO 4762-M5X40-10.9	ISO 4762-M5X40-10.9
25	Clamping part		
26	Clamping		
27	Clip		
28	Socket head screw	DIN 6912-M4X10-8.8	DIN 6912-M4X6-A2-70
29	Cover		
30	Belt reversal, top		
31	Compression spring		
32	Belt reversal, bottom		
33	Belt reversal		
34	Slide module		
35	Centring pin	ZBS-5	ZBS-5
36	Oil duct		
37	O-ring	B-1,5X1-N-NBR70	B-1,5X1-N-NBR70
38	Oil duct		
39	Roller carriage		
40	Socket head screw	ISO 4762-M3X8-12.9	ISO 4762-M3X8-12.9
41	Connecting plate module		
42	Socket head screw	ISO 4762-M3X6-12.9	ISO 4762-M3X6-12.9
43	Centring sleeve	ZBH-7	ZBH-7
44	Ring	**Component not present**	
45	Lubrication nipple	D1 M3	AM 6 DIN 3405
46	Lubricating grease	LUB-KC1, silicone-free	LUB-KC1, silicone-free
47	Adhesive bonding agent (Screw locking agent)		

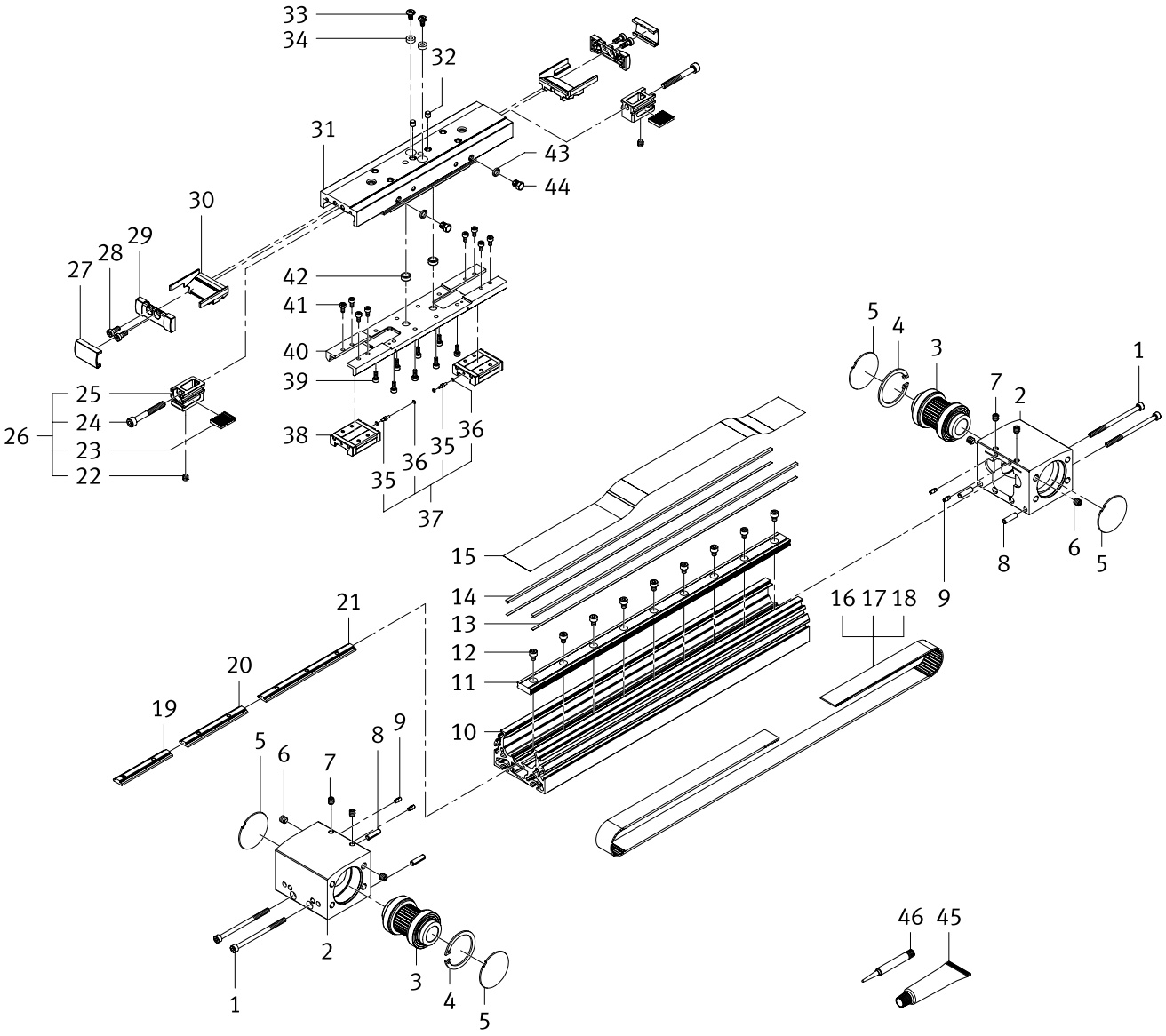
3.2 ELGA-TB-KF-70-...-F1



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-70-...-F1	
Product series		up to J4 (04-2017)	since J5 (05-2017)
No.	Designation	Type	Type
1	Socket head screw	ISO 4762-M4X65-A2-70	ISO 4762-M4X65-A2-70
2	Drive cover		
3	Toothed belt pulley module		
4	Retaining ring	DIN 472-37X1,5	DIN 472-37X1,5
5	Sealing washer		
6	Threaded pin	ISO 4028-M6X8-45H	ISO 4028-M6X8-45H
7	Threaded pin	ISO 4026-M5X6-45H	ISO 4026-M5X6-45H
8	Spring pin	DIN 7346-4,5X16	DIN 7346-4,5X16
9	Buffer element		
10	Cylinder barrel		
11	Roller track		
12	Socket head screw	F-M4X5,5-10.9	F-M4X5,5-10.9
13	Adhesive tape		
14	Magnetic tape		
15	Cover strip		
16	Toothed belt		
17	Toothed belt [PU1]	5m piece	5m piece
18	Slot nut		
19	Slot nut		
20	Slot nut		
21	Threaded pin	ISO 4026-M5X5-45H	ISO 4026-M5X5-45H
22	Clamping plate		
23	Socket head screw	ISO 4762-M5X40-10.9	ISO 4762-M5X40-10.9
24	Clamping part		
25	Clamping		
26	Hexagon head screw	F-M4X8-A2-70	F-M4X8-A2-70
27	Cover plate		
28	Belt reversal, top		
29	Compression spring		
30	Belt reversal, bottom		
31	Belt reversal		
32	Slide module		
33	Centring pin	ZBS-5	ZBS-5
34	Oil duct		
35	O-ring	B-1,5X1-N-NBR70	B-1,5X1-N-NBR70
36	Oil duct		
37	Roller carriage		
38	Socket head screw	ISO 4762-M3X8-12.9	ISO 4762-M3X8-12.9
39	Connecting plate module		
40	Socket head screw	ISO 4762-M3X6-12.9	ISO 4762-M3X6-12.9
41	Centring sleeve	ZBH-7	ZBH-7
42	Ring	**Component not present**	
43	Lubrication nipple	D1 M3	AM 6 DIN 3405
44	Adhesive bonding agent (Screw locking agent)		

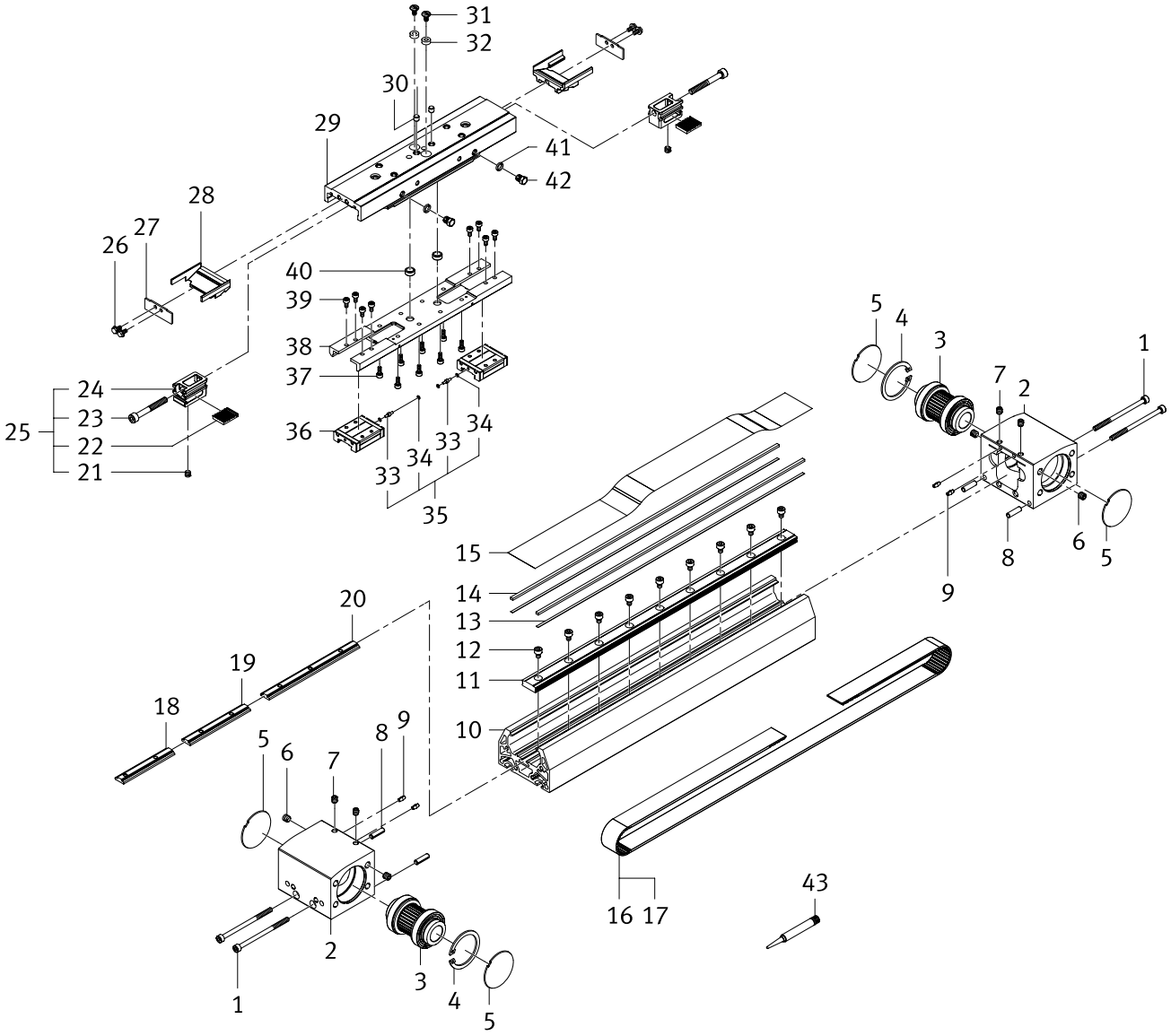
3.3 ELGA-TB-KF-70-...-P11



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-70-...-P11
No.	Designation	Type
1	Socket head screw	ISO 4762-M4X65-8.8
2	Drive cover	
3	Toothed belt pulley module	
4	Retaining ring	DIN 472-37X1,5
5	Sealing washer	
6	Threaded pin	ISO 4028-M6X8-45H
7	Threaded pin	ISO 4026-M5X6-45H
8	Spring pin	DIN 7346-4,5X16
9	Buffer element	
10	Cylinder barrel	
11	Roller track	
12	Socket head screw	F-M4X5,5-10.9
13	Adhesive tape	
14	Magnetic tape	
15	Cover strip	
16	Toothed belt	
17	Toothed belt []	5m piece
18	Toothed belt [PU2]	5m piece
19	Slot nut	
20	Slot nut	
21	Slot nut	
22	Threaded pin	ISO 4026-M5X5-45H
23	Clamping plate	
24	Socket head screw	ISO 4762-M5X40-10.9
25	Clamping part	
26	Clamping	
27	Clip	
28	Socket head screw	DIN 6912-M4X6-A2-70
29	Cover	
30	Belt reversal	
31	Slide module	
32	Centring pin	ZBH-5
33	Slide element	
34	Ring magnet	
35	Oil duct	
36	O-ring	B-1,5X1-N-NBR70
37	Oil duct	
38	Roller carriage	
39	Socket head screw	ISO 4762-M3X8-12.9
40	Connecting plate module	
41	Socket head screw	ISO 4762-M3X6-12.9
42	Centring sleeve	ZBH-7-B
43	Ring	AM 6 DIN 3405
44	Lubrication nipple	
45	Lubricating grease	LUB-KC1, silicone-free
46	Adhesive bonding agent (Screw locking agent)	

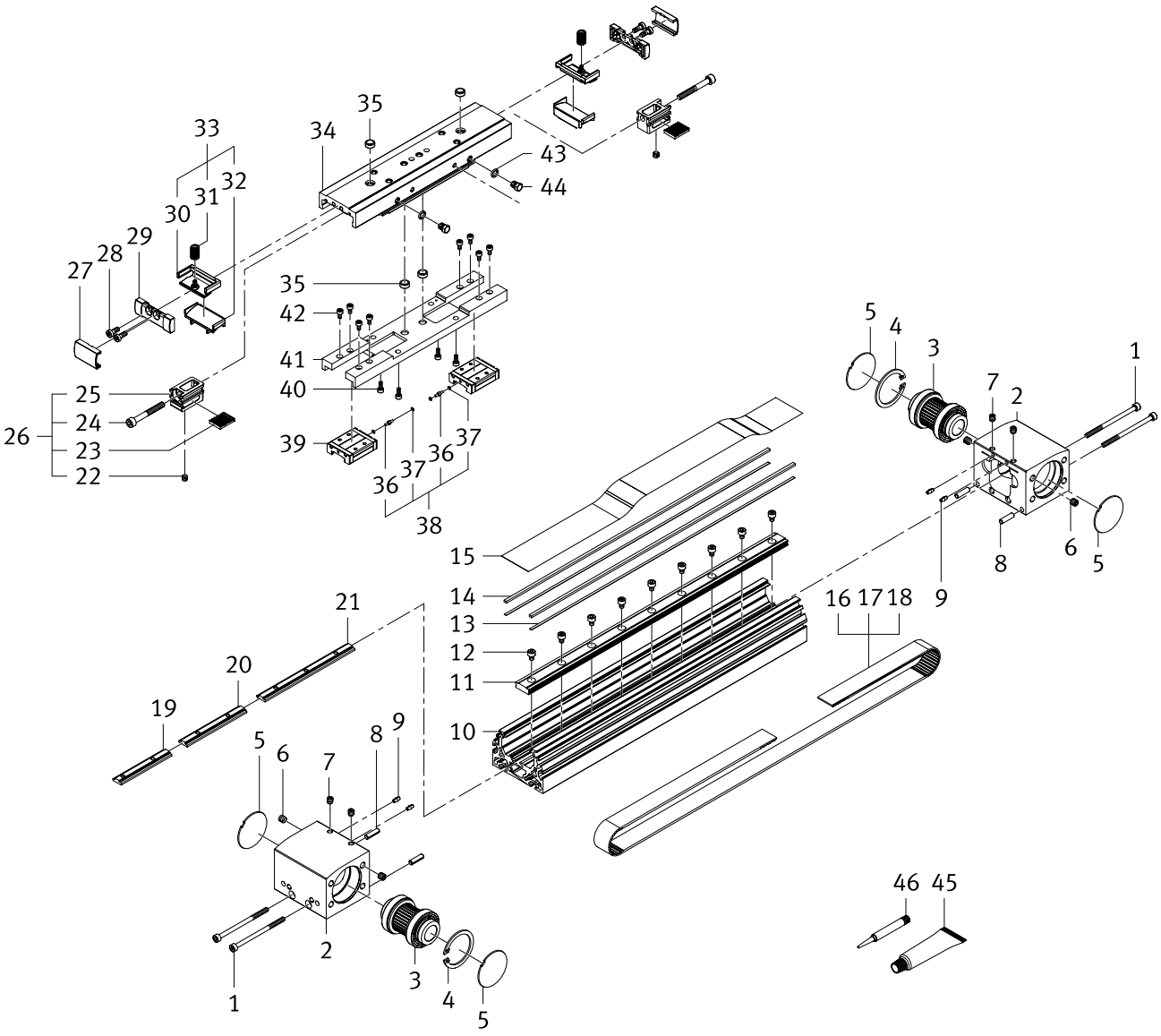
3.4 ELGA-TB-KF-70-...-P11-F1



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-70-...-P11-F1
No.	Designation	Type
1	Socket head screw	ISO 4762-M4X65-A2-70
2	Drive cover	
3	Toothed belt pulley module	
4	Retaining ring	DIN 472-37X1,5
5	Sealing washer	
6	Threaded pin	ISO 4028-M6X8-45H
7	Threaded pin	ISO 4026-M5X6-45H
8	Spring pin	DIN 7346-4,5X16
9	Buffer element	
10	Cylinder barrel	
11	Roller track	
12	Socket head screw	F-M4X5,5-10.9
13	Adhesive tape	
14	Magnetic tape	
15	Cover strip	
16	Toothed belt	
17	Toothed belt [PU1]	5m piece
18	Slot nut	
19	Slot nut	
20	Slot nut	
21	Threaded pin	ISO 4026-M5X5-45H
22	Clamping plate	
23	Socket head screw	ISO 4762-M5X40-10.9
24	Clamping part	
25	Clamping	
26	Hexagon head screw	F-M4X8-A2-70
27	Cover plate	
28	Belt reversal	
29	Slide module	
30	Centring pin	ZBS-5
31	Slide element	
32	Ring magnet	
33	Oil duct	
34	O-ring	
35	Oil duct	
36	Roller carriage	
37	Socket head screw	ISO 4762-M3X8-12.9
38	Connecting plate module	
39	Socket head screw	ISO 4762-M3X6-12.9
40	Centring sleeve	ZBH-7-B
41	Ring	
42	Lubrication nipple	AM 6 DIN 3405
43	Adhesive bonding agent (Screw locking agent)	

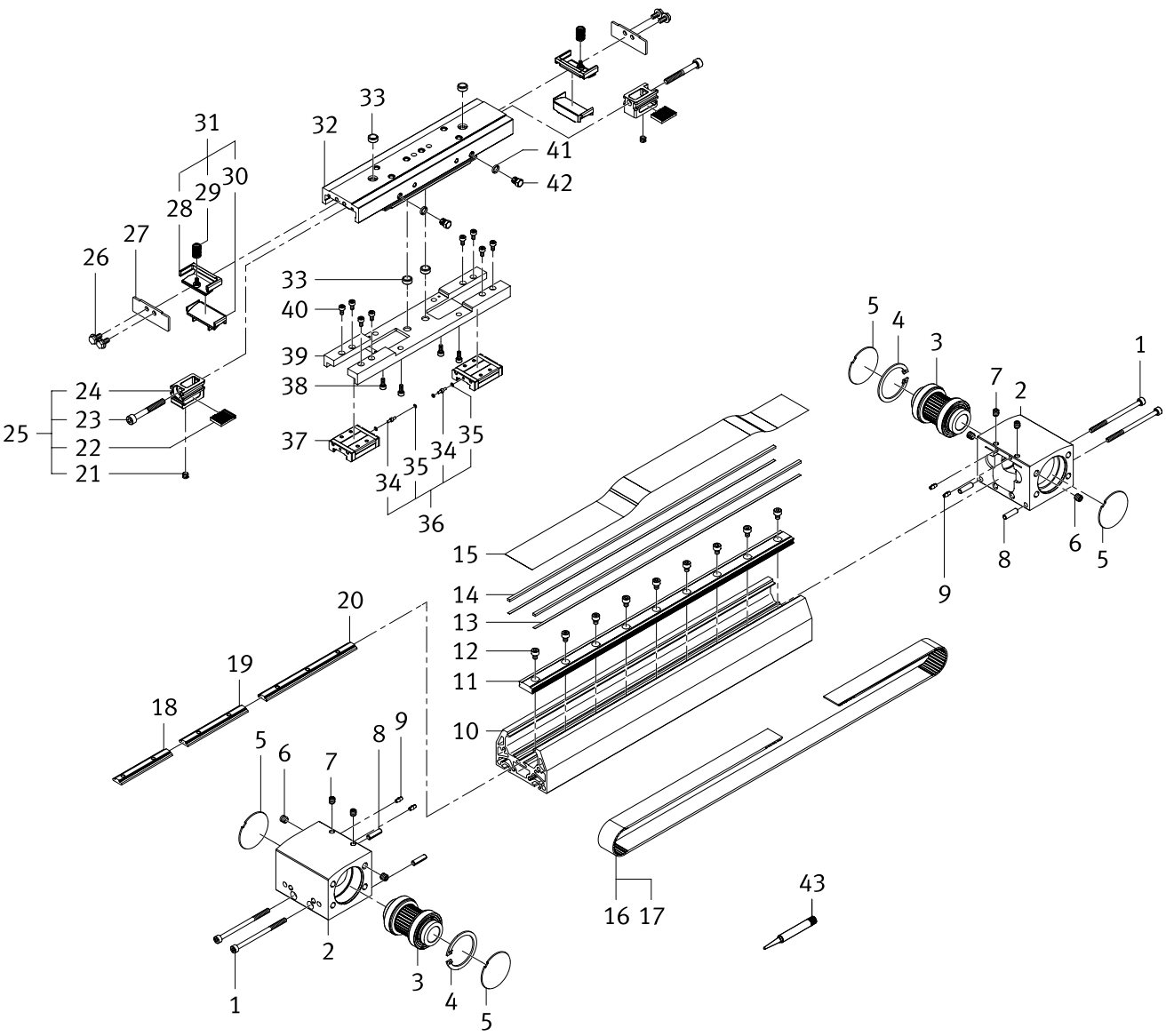
3.5 ELGA-TB-KF-80



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-80	
Product series		up to J4 (04-2017)	since J5 (05-2017)
No.	Designation	Type	Type
1	Socket head screw	ISO 4762-M5X70-8.8	ISO 4762-M5X70-8.8
2	Drive cover		
3	Toothed belt pulley module		
4	Retaining ring	DIN 472-47X1,75	DIN 472-47X1,75
5	Sealing washer		
6	Threaded pin	ISO 4028-M6X8-45H	ISO 4028-M6X8-45H
7	Threaded pin	ISO 4028-M6X8-45H	ISO 4028-M6X8-45H
8	Spring pin	DIN 7346-4,5X16	DIN 7346-4,5X16
9	Buffer element		
10	Cylinder barrel		
11	Roller track		
12	Socket head screw	ISO 4762-M4X7-12.9	ISO 4762-M4X7-12.9
13	Adhesive tape		
14	Magnetic tape		
15	Cover strip		
16	Toothed belt		
17	Toothed belt []	5m piece	5m piece
18	Toothed belt [PU2]	5m piece	5m piece
19	Slot nut		
20	Slot nut		
21	Slot nut		
22	Threaded pin	ISO 4026-M8X8-45H	ISO 4026-M8X8-45H
23	Clamping plate		
24	Socket head screw	ISO 4762-M6X55-10.9	ISO 4762-M6X55-10.9
25	Clamping part		
26	Clamping		
27	Clip		
28	Socket head screw	DIN 6912-M4X10-8.8	DIN 6912-M4X6-A2-70
29	Cover		
30	Belt reversal, top		
31	Compression spring		
32	Belt reversal, bottom		
33	Belt reversal		
34	Slide module		
35	Centring sleeve	ZBH-9-B	ZBH-9-B
36	Oil duct		
37	O-ring	B-1,5X1-N-NBR70	B-1,5X1-N-NBR70
38	Oil duct		
39	Roller carriage		
40	Socket head screw	ISO 4762-M5X10-10.9	ISO 4762-M5X10-10.9
41	Connecting plate module		
42	Socket head screw	ISO 4762-M3X8-12.9	ISO 4762-M3X6-12.9
43	Ring	**Component not present**	
44	Lubrication nipple	D1 M3	AM 6 DIN 3405
45	Lubricating grease	LUB-KC1, silicone-free	LUB-KC1, silicone-free
46	Adhesive bonding agent (Screw locking agent)		

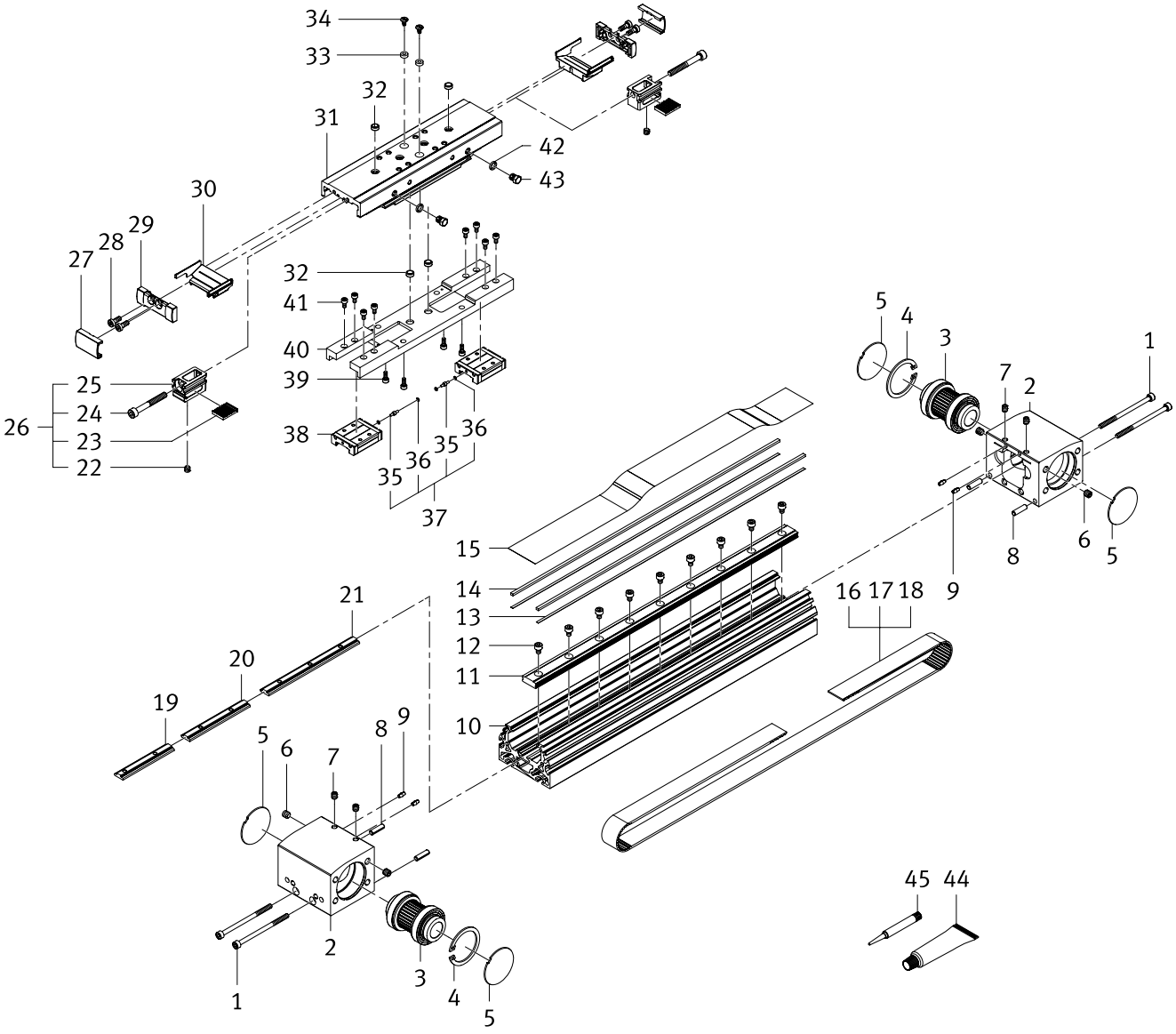
3.6 ELGA-TB-KF-80-...-F1



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-80-...-F1	
Product series		up to J4 (04-2017)	since J5 (05-2017)
No.	Designation	Type	Type
1	Socket head screw	ISO 4762-M5X70-A2-70	ISO 4762-M5X70-A2-70
2	Drive cover		
3	Toothed belt pulley module		
4	Retaining ring	DIN 472-47X1,75	DIN 472-47X1,75
5	Sealing washer		
6	Threaded pin	ISO 4028-M6X8-45H	ISO 4028-M6X8-45H
7	Threaded pin	ISO 4028-M6X8-45H	ISO 4028-M6X8-45H
8	Spring pin	DIN 7346-4,5X16	DIN 7346-4,5X16
9	Buffer element		
10	Cylinder barrel		
11	Roller track		
12	Socket head screw	ISO 4762-M4X7-12.9	ISO 4762-M4X7-12.9
13	Adhesive tape		
14	Magnetic tape		
15	Cover strip		
16	Toothed belt		
17	Toothed belt [PU1]	5m piece	5m piece
18	Slot nut		
19	Slot nut		
20	Slot nut		
21	Threaded pin	ISO 4026-M8X8-45H	ISO 4026-M8X8-45H
22	Clamping plate		
23	Socket head screw	ISO 4762-M6X55-10.9	ISO 4762-M6X55-10.9
24	Clamping part		
25	Clamping		
26	Hexagon head screw	F-M4X8-A2-70	F-M4X8-A2-70
27	Cover plate		
28	Belt reversal, top		
29	Compression spring		
30	Belt reversal, bottom		
31	Belt reversal		
32	Slide module		
33	Centring sleeve	ZBH-9-B	ZBH-9-B
34	Oil duct		
35	O-ring	B-1,5X1-N-NBR70	B-1,5X1-N-NBR70
36	Oil duct		
37	Roller carriage		
38	Socket head screw	ISO 4762-M5X10-10.9	ISO 4762-M5X10-10.9
39	Connecting plate module		
40	Socket head screw	ISO 4762-M3X6-12.9	ISO 4762-M3X6-12.9
41	Ring	**Component not present**	
42	Lubrication nipple	D1 M3	AM 6 DIN 3405
43	Adhesive bonding agent (Screw locking agent)		

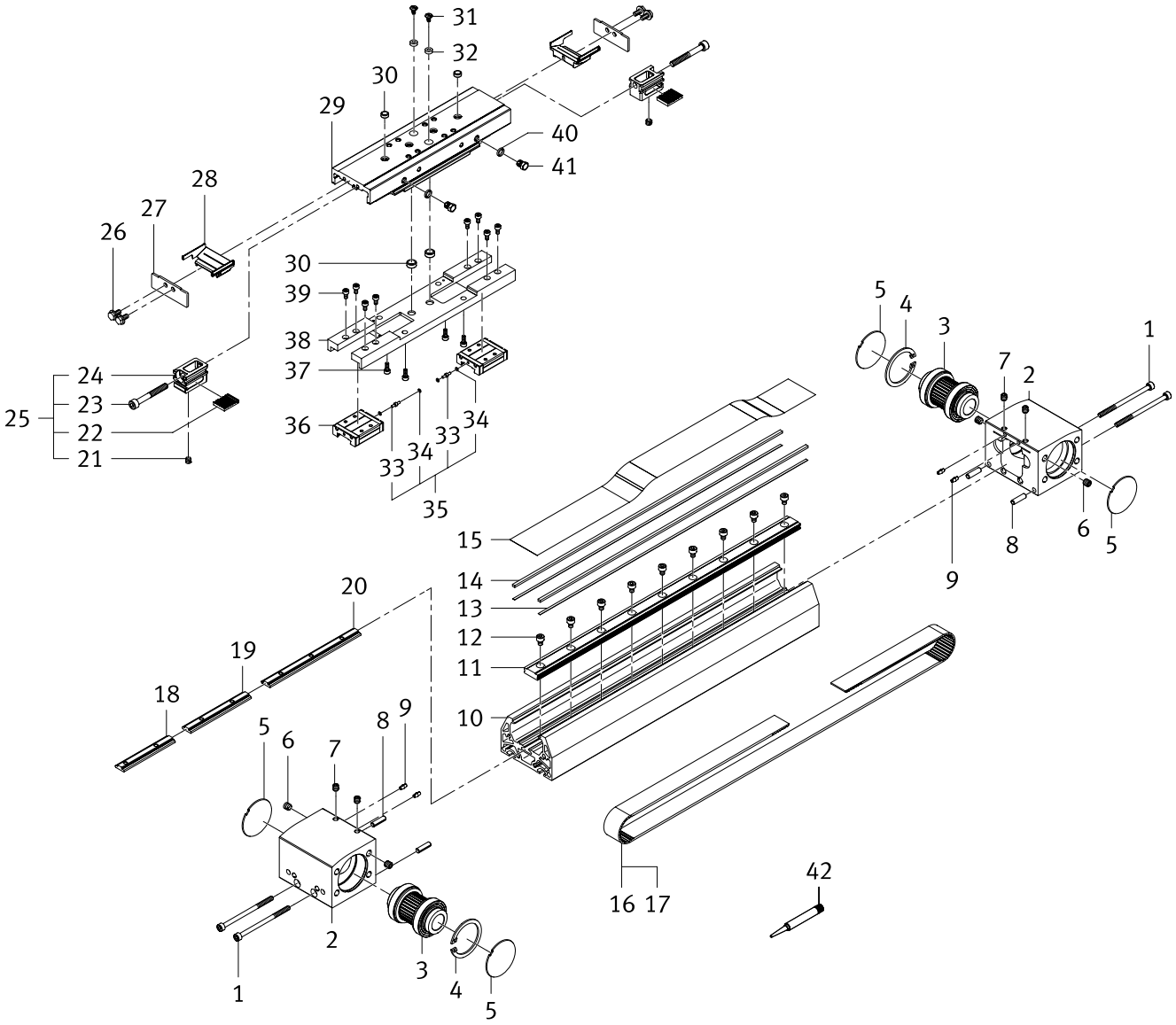
3.7 ELGA-TB-KF-80-...-P11



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-80-...-P11
No.	Designation	Type
1	Socket head screw	ISO 4762-M5X70-8.8
2	Drive cover	
3	Toothed belt pulley module	
4	Retaining ring	DIN 472-37X1,5
5	Sealing washer	
6	Threaded pin	ISO 4028-M6X8-45H
7	Threaded pin	ISO 4028-M6X8-45H
8	Spring pin	DIN 7346-4,5X16
9	Buffer element	
10	Cylinder barrel	
11	Roller track	
12	Socket head screw	ISO 4762-M4X7-12.9
13	Adhesive tape	
14	Magnetic tape	
15	Cover strip	
16	Toothed belt	
17	Toothed belt []	5m piece
18	Toothed belt [PU2]	5m piece
19	Slot nut	
20	Slot nut	
21	Slot nut	
22	Threaded pin	ISO 4026-M8X8-45H
23	Clamping plate	
24	Socket head screw	ISO 4762-M6X55-10.9
25	Clamping part	
26	Clamping	
27	Clip	
28	Socket head screw	DIN 6912-M4X6-A2-70
29	Cover	
30	Belt reversal	
31	Slide module	
32	Centring sleeve	ZBH-9-B
33	Ring magnet	
34	Slide element	
35	Oil duct	
36	O-ring	B-1,5X1-N-NBR70
37	Oil duct	
38	Roller carriage	
39	Socket head screw	ISO 4762-M5X10-10.9
40	Connecting plate module	
41	Socket head screw	ISO 4762-M3X6-12.9
42	Ring	AM 6 DIN 3405
43	Lubrication nipple	
44	Lubricating grease	LUB-KC1, silicone-free
45	Adhesive bonding agent (Screw locking agent)	

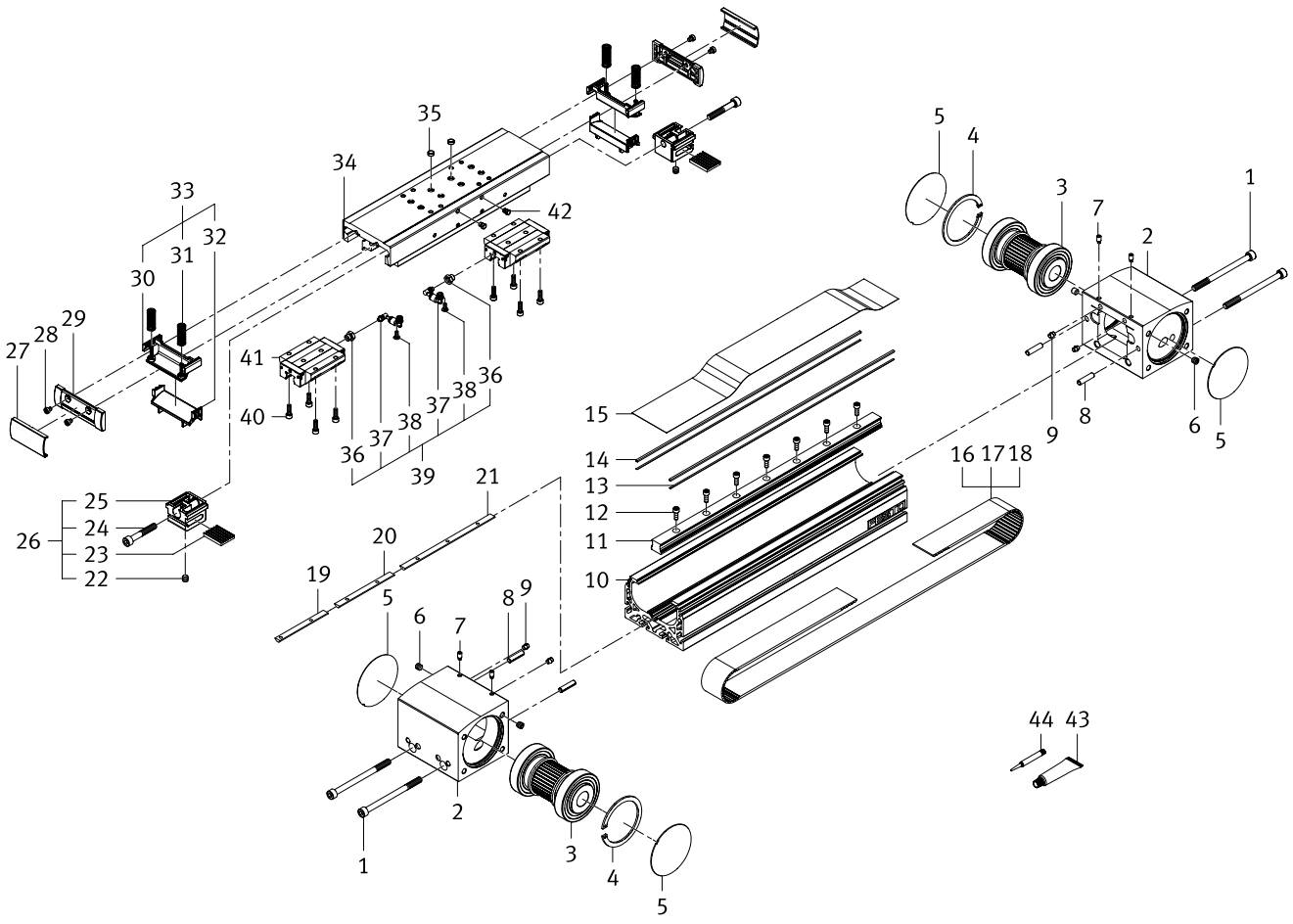
3.8 ELGA-TB-KF-80-...-P11-F1



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-80-...-P11-F1
No.	Designation	Type
1	Socket head screw	ISO 4762-M5X70-A2-70
2	Drive cover	
3	Toothed belt pulley module	
4	Retaining ring	DIN 472-47X1,75
5	Sealing washer	
6	Threaded pin	ISO 4028-M6X8-45H
7	Threaded pin	ISO 4028-M6X8-45H
8	Spring pin	DIN 7346-4,5X16
9	Buffer element	
10	Cylinder barrel	
11	Roller track	
12	Socket head screw	ISO 4762-M4X7-12.9
13	Adhesive tape	
14	Magnetic tape	
15	Cover strip	
16	Toothed belt	
17	Toothed belt [PU1]	5m piece
18	Slot nut	
19	Slot nut	
20	Slot nut	
21	Threaded pin	ISO 4026-M8X8-45H
22	Clamping plate	
23	Socket head screw	ISO 4762-M6X55-10.9
24	Clamping part	
25	Clamping	
26	Hexagon head screw	F-M4X8-A2-70
27	Cover plate	
28	Belt reversal	
29	Slide module	
30	Centring sleeve	ZBH-9-B
31	Slide element	
32	Ring magnet	
33	Oil duct	
34	O-ring	B-1,5X1-N-NBR70
35	Oil duct	
36	Roller carriage	
37	Socket head screw	ISO 4762-M5X10-10.9
38	Connecting plate module	
39	Socket head screw	ISO 4762-M3X6-12.9
40	Ring	
41	Lubrication nipple	
42	Adhesive bonding agent (Screw locking agent)	

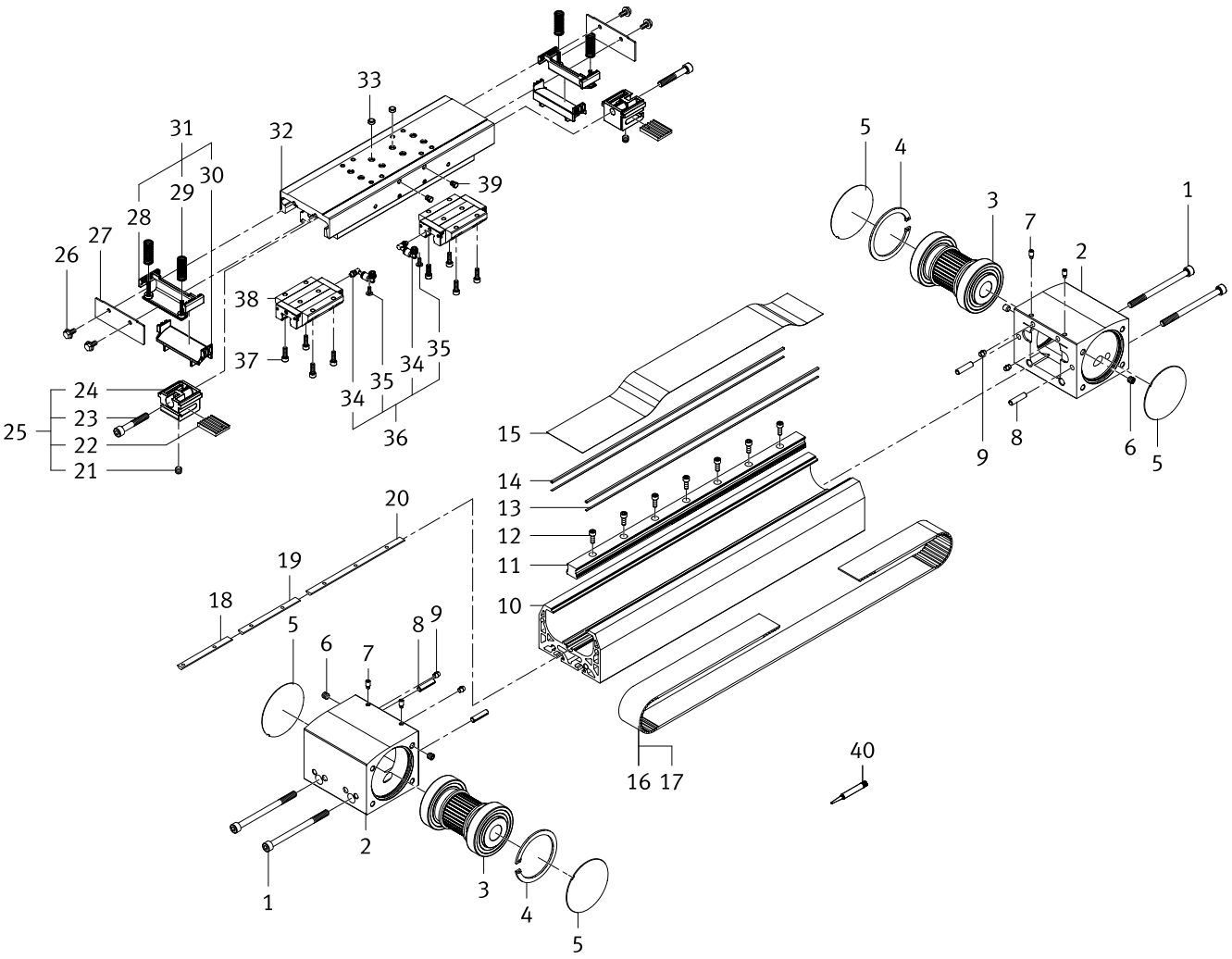
3.9 ELGA-TB-KF-120 / 150



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-120	ELGA-TB-KF-150
No.	Designation	Type	Type
1	Socket head screw	ISO 4762-M8X110-8.8	ISO 4762-M8X150-8.8
2	Drive cover		
3	Toothed belt pulley module		
4	Retaining ring	DIN 472-75X2,5	DIN 472-95X3
5	Sealing washer		
6	Threaded pin	ISO 4026-M8X8-45H	ISO 4026-M8X8-45H
7	Threaded pin	ISO 4028-M6X12-45H	ISO 4028-M6X12-45H
8	Spring pin	DIN 7346-7X28	DIN 7346-7X28
9	Buffer element		
10	Cylinder barrel		
11	Roller track		
12	Socket head screw	ISO 4762-M5X14-12.9	ISO 4762-M6X20-12.9
13	Adhesive tape		
14	Magnetic tape		
15	Cover strip		
16	Toothed belt		
17	Toothed belt[]	5m piece	5m piece
18	Toothed belt [PU2]	5m piece	5m piece
19	Slot nut		
20	Slot nut		
21	Slot nut		
22	Threaded pin	ISO 4026-M8X8-45H	ISO 4026-M12X12-45H
23	Clamping plate		
24	Socket head screw	ISO 4762-M8X50-10.9	ISO 4762-M8X40-10.9
25	Clamping part		
26	Clamping		
27	Clip		
28	Socket head screw	DIN 6912-M5X6-A2-70	DIN 6912-M5X6-A2-70
29	Cover		
30	Belt reversal, top		
31	Compression spring		
32	Belt reversal, bottom		
33	Belt reversal		
34	Slide module		
35	Centring sleeve	ZBH-9-B	ZBH-9-B
36	Reducer	**Component not present**	
37	Barbed elbow fitting		
38	Flange screw	F-M4X10-A-70	F-M4X10-A-70
39	Fittings kit		
40	Socket head screw	ISO 4762-M5X16-10.9	ISO 4762-M6X20-12.9
41	Roller carriage		
42	Lubrication nipple	AM 6 DIN 3405	AM 6 DIN 3405
43	Lubricating grease	LUB-KC1, silicone-free	LUB-KC1, silicone-free
44	Adhesive bonding agent (Screw locking agent)		

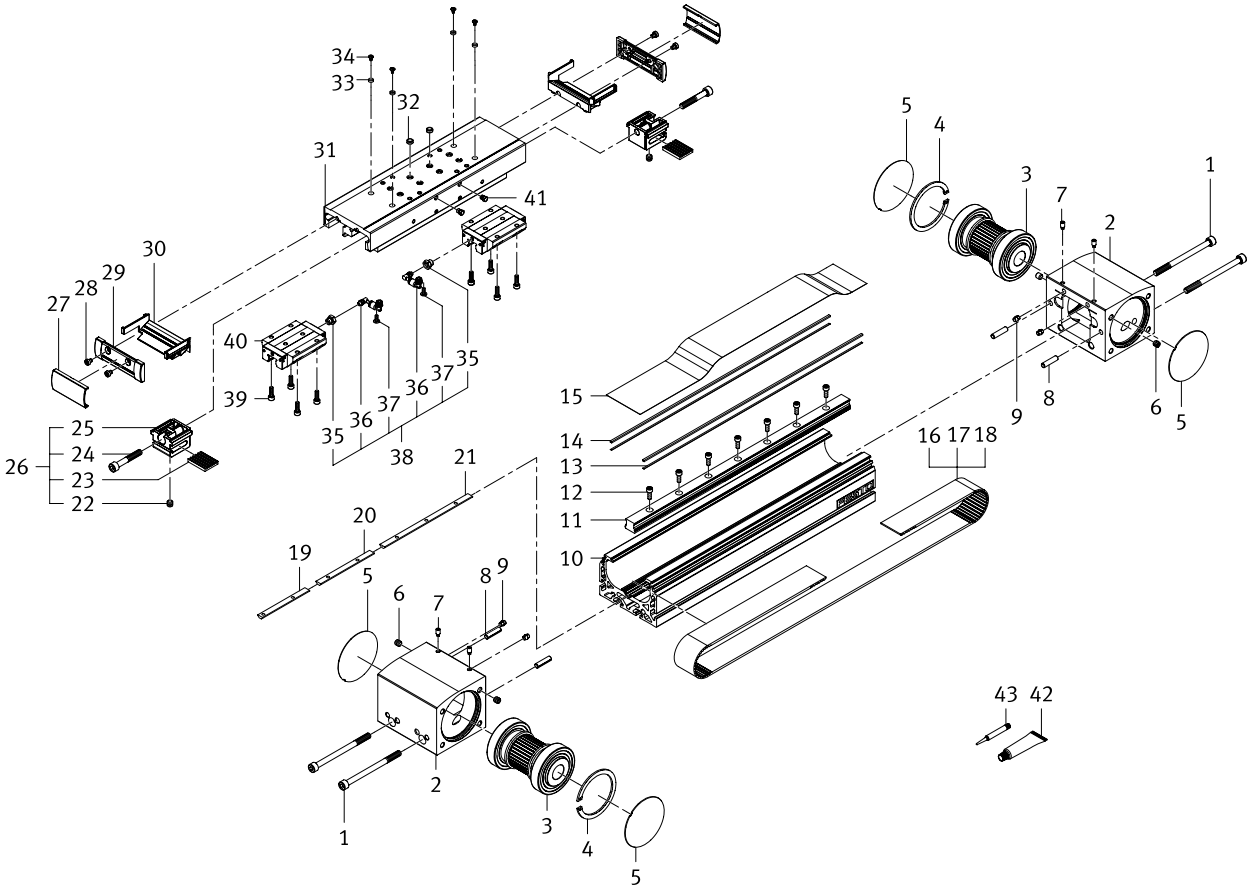
3.10 ELGA-TB-KF-120-...-F1



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-120-...-F1
No.	Designation	Type
1	Socket head screw	ISO 4762-M8X110-A2-70
2	Drive cover	
3	Toothed belt pulley module	
4	Retaining ring	DIN 472-75X2,5
5	Sealing washer	
6	Threaded pin	ISO 4026-M8X8-45H
7	Threaded pin	ISO 4028-M6X12-45H
8	Spring pin	DIN 7346-7X28
9	Buffer element	
10	Cylinder barrel	
11	Roller track	
12	Socket head screw	ISO 4762-M5X14-12.9
13	Adhesive tape	
14	Magnetic tape	
15	Cover strip	
16	Toothed belt	
17	Toothed belt [PU1]	5m piece
18	Slot nut	
19	Slot nut	
20	Slot nut	
21	Threaded pin	ISO 4026-M8X8-45H
22	Clamping plate	
23	Socket head screw	ISO 4762-M8X50-10.9
24	Clamping part	
25	Clamping	
26	Hexagon head screw	CR-M5X10-A2-70
27	Cover plate	
28	Belt reversal, top	
29	Compression spring	
30	Belt reversal, bottom	
31	Belt reversal	
32	Slide module	
33	Reducing sleeve	ZBH-9-B
34	Barbed elbow fitting	
35	Flange screw	F-M4X10-A-70
36	Fittings kit	
37	Socket head screw	ISO 4762-M5X16-10.9
38	Roller carriage	
39	Lubrication nipple	AM 6 DIN 3405
40	Adhesive bonding agent (Screw locking agent)	

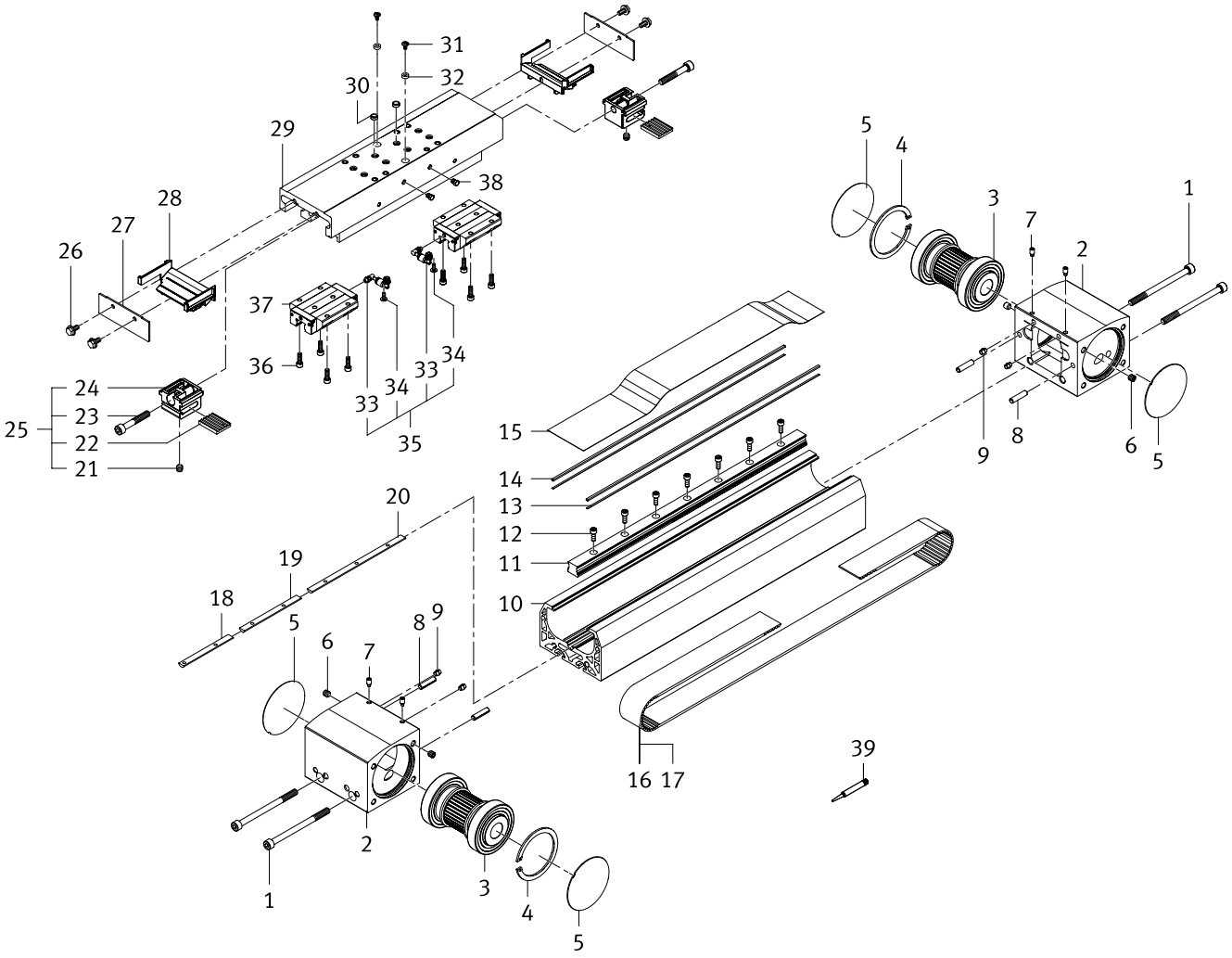
3.11 ELGA-TB-KF-120 / 150-...-P11



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-120-...-P11	ELGA-TB-KF-150-...-P11
No.	Designation	Type	Type
1	Socket head screw	ISO 4762-M8X110-8.8	ISO 4762-M8X150-8.8
2	Drive cover		
3	Toothed belt pulley module		
4	Retaining ring	DIN 472-75X2,5	DIN 472-95X3
5	Sealing washer		
6	Threaded pin	ISO 4026-M8X8-45H	ISO 4026-M8X8-45H
7	Threaded pin	ISO 4028-M6X12-45H	ISO 4028-M6X12-45H
8	Spring pin	DIN 7346-7X28	DIN 7346-7X28
9	Buffer element		
10	Cylinder barrel		
11	Roller track		
12	Socket head screw	ISO 4762-M5X14-12.9	ISO 4762-M6X20-12.9
13	Adhesive tape		
14	Magnetic tape		
15	Cover strip		
16	Toothed belt		
17	Toothed belt []	5m piece	5m piece
18	Toothed belt [PU2]	5m piece	5m piece
19	Slot nut		
20	Slot nut		
21	Slot nut		
22	Threaded pin	ISO 4026-M8X8-45H	ISO 4026-M12X12-45H
23	Clamping plate		
24	Socket head screw	ISO 4762-M8X50-10.9	ISO 4762-M8X40-10.9
25	Clamping part		
26	Clamping		
27	Clip		
28	Socket head screw	DIN 6912-M5X6-A2-70	DIN 6912-M5X6-A2-70
29	Cover		
30	Belt reversal		
31	Slide module		
32	Centring sleeve	ZBH-9-B	ZBH-9-B
33	Ring magnet		
34	Slide element		
35	Reducer	**Component not present**	
36	Barbed elbow fitting		
37	Flange screw	F-M4X10-A-70	F-M4X10-A-70
38	Fittings kit		
39	Socket head screw	ISO 4762-M5X16-10.9	ISO 4762-M6X20-12.9
40	Roller carriage		
41	Lubrication nipple	AM 6 DIN 3405	AM 6 DIN 3405
42	Lubricating grease	LUB-KC1, silicone-free	LUB-KC1, silicone-free
43	Adhesive bonding agent (Screw locking agent)		

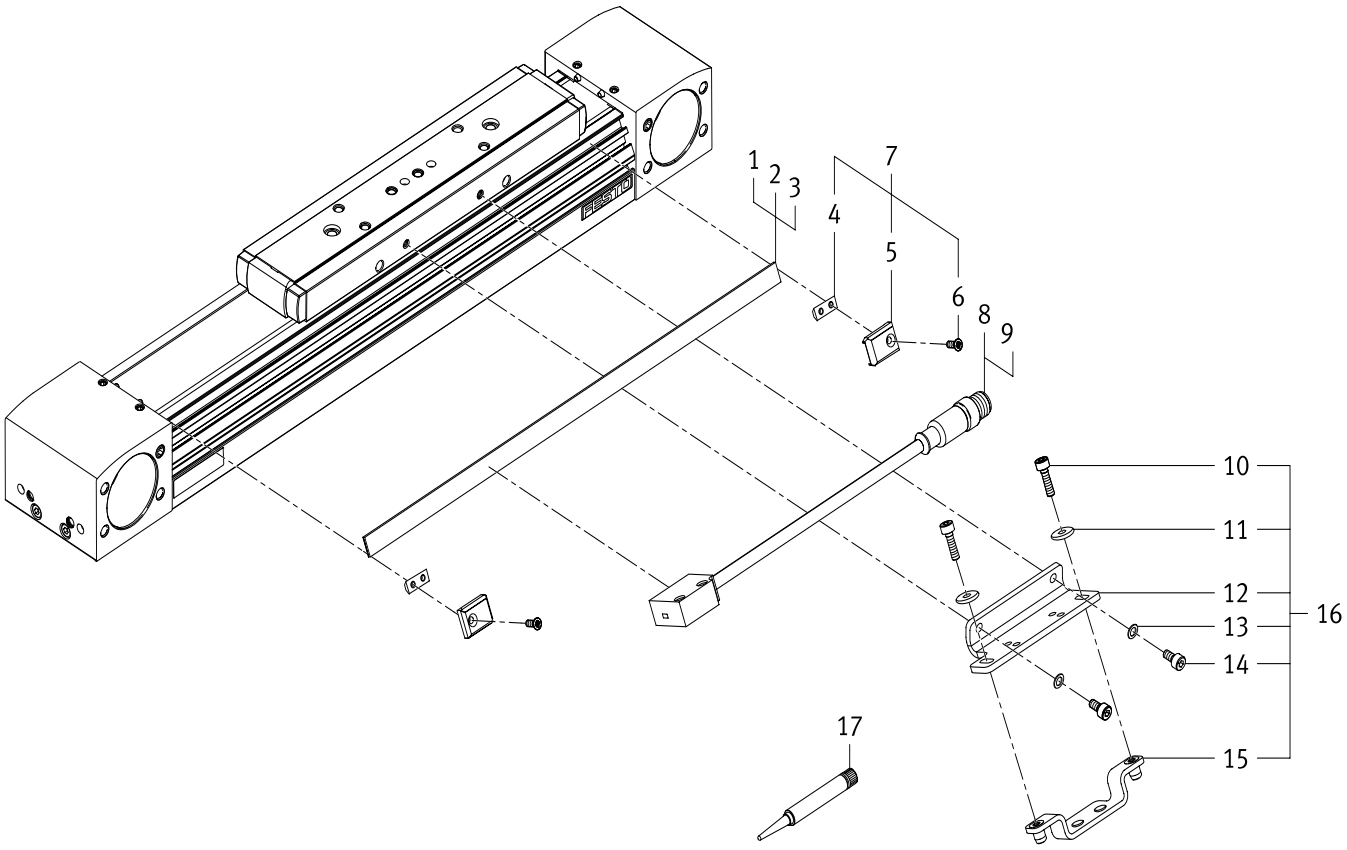
3.12 ELGA-TB-KF-120-...-P11-F1



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-120-...-P11-F1
No.	Designation	Type
1	Socket head screw	ISO 4762-M8X110-A2-70
2	Drive cover	
3	Toothed belt pulley module	
4	Retaining ring	DIN 472-75X2,5
5	Sealing washer	
6	Threaded pin	ISO 4026-M8X8-45H
7	Threaded pin	ISO 4028-M6X12-45H
8	Spring pin	DIN 7346-7X28
9	Buffer element	
10	Cylinder barrel	
11	Roller track	
12	Socket head screw	ISO 4762-M5X14-12.9
13	Adhesive tape	
14	Magnetic tape	
15	Cover strip	
16	Toothed belt	
17	Toothed belt [PU1]	5m piece
18	Slot nut	
19	Slot nut	
20	Slot nut	
21	Threaded pin	ISO 4026-M8X8-45H
22	Clamping plate	
23	Socket head screw	ISO 4762-M8X50-10.9
24	Clamping part	
25	Clamping	
26	Hexagon head screw	CR-M5X10-A2-70
27	Cover plate	
28	Belt reversal	
29	Slide module	
30	Centring sleeve	ZBH-9-B
31	Slide element	
32	Ring magnet	
33	Barbed elbow fitting	
34	Flange screw	F-M4X10-A-70
35	Fittings kit	
36	Socket head screw	ISO 4762-M5X16-10.9
37	Roller carriage	
38	Lubrication nipple	AM 6 DIN 3405
39	Adhesive bonding agent (Screw locking agent)	

3.13 ELGA-TB-KF-...-M...-



This illustration serves as an order overview as well as an overview of the individual components. Use the online spare parts catalog on the Festo website for a detailed overview of assemblies (➔ www.festo.com/spareparts).

Toothed belt axis		ELGA-TB-KF-70-...-M...-	ELGA-TB-KF-80-...-M...-
No.	Designation	Type	Type
1	Tape measure	2m piece	2m piece
2	Tape measure	5m piece	5m piece
3	Tape measure	10m piece	10m piece
4	Slot nut		
5	Cap		
6	Countersunk screw	DIN 965-M3X8-4.8-H	DIN 965-M3X8-4.8-H
7	Cap		
8	Measuring unit	M1	M1
9	Measuring unit	M2	M2
10	Socket head screw	ISO 4762-M4X14-10.9	ISO 4762-M4X14-10.9
11	Disc	DIN 7349-4,3	DIN 7349-4,3
12	Sensor bracket		
13	Retaining washer	S-4	S-4
14	Socket head screw	ISO 4762-M4X8-8.8	ISO 4762-M4X8-8.8
15	Sensor mounting		
16	Sensor bracket		
17	Adhesive bonding agent (Screw locking agent)		

Toothed belt axis		ELGA-TB-KF-120-...-M...-	ELGA-TB-KF-150-...-M...-
No.	Designation	Type	Type
1	Tape measure	2m piece	2m piece
2	Tape measure	5m piece	5m piece
3	Tape measure	10m piece	10m piece
4	Slot nut		
5	Cap		
6	Countersunk screw	DIN 965-M3X8-4.8-H	DIN 965-M3X8-4.8-H
7	Cap		
8	Measuring unit	M1	M1
9	Measuring unit	M2	M2
10	Socket head screw	ISO 4762-M4X14-10.9	ISO 4762-M4X14-10.9
11	Disc	DIN 7349-4,3	DIN 7349-4,3
12	Sensor bracket		
13	Retaining washer	S-5	S-5
14	Socket head screw	ISO 4762-M5X10-10.9	ISO 4762-M5X10-10.9
15	Sensor mounting		
16	Sensor bracket		
17	Adhesive bonding agent (Screw locking agent)		

4 Repair steps

This chapter describes how to dismantle, repair and assemble the toothed belt axis ELGA-TB-KF-.... Note that the axis does not need to be completely dismantled for all repair work.

Where possible, it is advisable to dismantle the toothed belt axis from the system entirely 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.

Depending on the cause of the defect to be eliminated, it may be necessary to replace several components. The cause of a defect must therefore always be determined before starting a repair.

Note

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

To prevent damage to the guide rail and other components, do not use pointed or sharp-edged assembly tools.

4.1 Preparatory steps

Warning

Risk of fatal injury from electric shock.

The control of the drive motors is still 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.

4.2 Visual inspection

Check the toothed belt axis for visible damage that can impair its function, such as major defects in the guide rail. The complete toothed belt axis must be replaced if significant damage exists.

4.3 Replacing the toothed belt

The toothed belt is ordered from the online spare parts catalogue using the appropriate part number (depending on the size and version of the product) or it is ordered by the metre (5 m roll). (➔ www.festo.com/spareparts)

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:

Type	Toothed belt material	Minimum bending radius R_{min}
ELGA-TB-KF-70	Neoprene NP	11 mm
ELGA-TB-KF-80 / 120	Neoprene NP	23 mm
ELGA-TB-KF-150	Neoprene NP	56 mm
ELGA-TB-KF-70-...-F1	Polyurethane PU1	25 mm
ELGA-TB-KF-80 / 120-...-F1	Polyurethane PU1	32 mm
ELGA-TB-KF-70-...-PU2	Polyurethane PU2, coated	25 mm
ELGA-TB-KF-80 / 120-...-PU2	Polyurethane PU2, coated	32 mm

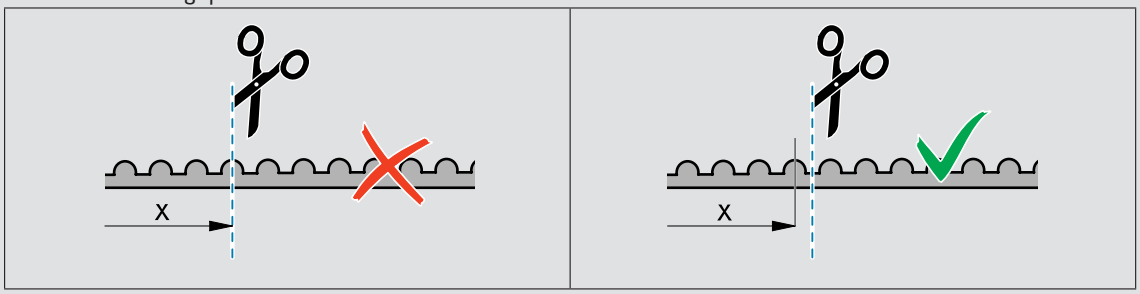
Ordering a precise fitting toothed belt:

The part number of the toothed belt axis is a module number and is dependent on the size of the product. When ordering the toothed belt, in addition to the part number, the stroke and stroke reserve of the product must also be stated. The necessary information is given in the order code in the product labelling (➔ Chapter 2.4 on page 10).

Cutting the toothed belt to size if ordered by the metre

Note

- Use sturdy general-purpose scissors or metal shears to cut through the toothed belt.
- Round down the cut length (L) to an integer multiple of the pitch “C” (➔ table) to ensure that the belt can always be cut to size in a gap.



The precise length of the toothed belt is calculated as follows:

L (length of toothed belt in mm) = Multiplier “A” × (stroke + 2 × stroke reserve + value “B”)

Values for multiplier “A” and value “B” ➔ table

Type	Multiplier “A”, depending on the stroke		Value “B”	Pitch “C”
ELGA-70	all strokes	1,996	296	3
ELGA-70-...-F1[1)]		2,0		
ELGA-70-...-PU2				
ELGA-80	all strokes	1,996	347	5
ELGA-80-...-F1[1)]		2,0		
ELGA-80-...-PU2				
ELGA-120	all strokes	1,996	452,5	
ELGA-120-...-F1[1)]		2,0		
ELGA-120-...-PU2				
ELGA-150	≤1500	1,996	599	8
ELGA-150	>1500	1,994		
ELGA-150-...-PU2	all strokes	2,0		

[1)] F1 = PU1 toothed belt

Example: **ELGA - TB - KF -** ↓ **80** Size **-** ↓ **375** Stroke **-** ↓ **30H** Stroke reserve **- P11**

L (length of toothed belt in mm) = Multiplier “A” × (stroke + 2 × stroke reserve + value “B”)

L = 1.996 × (375 + 2 × 30 + 347) mm

L = 1560,87 mm

rounded down to an integer multiple of the pitch “C” (in this example: 5)

L = 1560 mm

The toothed belt can be renewed with the toothed belt axis still installed if it is not torn or if the location of the tear is visible, as it is not necessary to remove the slide unit and drive cover in such cases (➔ Chapter 4.3.3 on page 42). If the location of the tear is in the drive covers or the cylinder barrel, then the drive covers must be removed (➔ Chapter 4.4.1 on page 49).

If the toothed belt is not cracked, or if the crack location is underneath the cover strip, it can be replaced with the toothed belt axis installed, as the actuator end caps then do not have to be dismantled (➔ Chapter 4.3.3 on page 42). If the location of the crack is in the actuator end caps or in the bottom part of the cylinder barrel, then the actuator end caps must be dismantled (➔ Chapter 4.4.1 on page 49).

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 toothed belt axis that has been used as intended and designed correctly 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 pulley module (wear of the tooth surface/tooth geometry, radial clearance between bearing inner raceway and the bearing seat: interference fit when new) and also the condition of the deep-groove ball bearings (e.g. perceptible bearing clearance, disrupted (not smooth) rolling behaviour and increased running noise, etc.) should always be evaluated too. 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 are signs of wear. For example, these can be caused by operation outside the permitted temperature range, impermissible chemical effects or possibly reaching the end of its fatigue life.
- Wear of the nylon fabric (fabric cover) on the tooth side of the belt. This is indicated by lint and pilling, 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.

A description of how to replace the toothed belt pulley module together with the corresponding deep-groove ball bearings can be found in Chapter 4.4.2 on page 50.

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 for STOP statuses (e.g. EMERGENCY OFF, quick stop) result in overloading of the toothed belt axis and can irreparably damage it or reduce its service life drastically.

  The elasticity of the toothed belt delays the acceleration and braking behaviour of the toothed belt axis and results in greater acceleration and deceleration than set in 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.

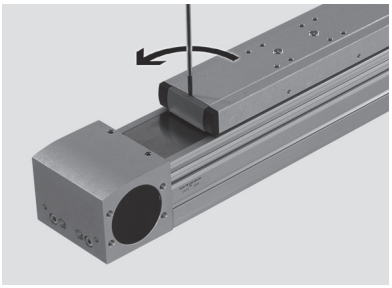
  - Check which closed-loop controller settings can be adjusted (e.g. jerk limitation, smoothing of the acceleration profile).
  - Check the settings for all braking ramps in your controller or the higher-order control system (deceleration values and jerk).
  - Make sure that the deceleration values (braking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

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

4.3.1 Removing the cover strip

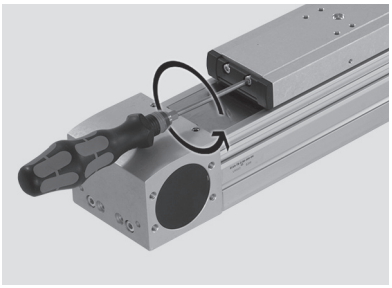
ELGA-TB-KF-...- not F1

1. Lever off the cover at both ends of the slide.



After the covers have been removed, the top belt reversal can come out of the slide when the slide is moved. If this happens, the compression springs of the belt reversal may be lost.

ELGA-TB-KF-...-**P11** does **not have** the top belt reversal and the compression spring.



2. Unscrew the socket head screws at both ends of the slide and remove the covers.

ELGA-TB-KF-...-F1 (PU1 toothed belt)

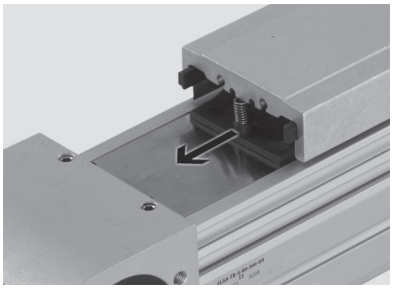
After the covers have been removed, the top belt reversal can come out of the slide when the slide is moved. If this happens, the compression springs of the belt reversal may be lost.

ELGA-TB-KF-...-**P11**-F1 does **not have** the **top belt reversal** and the **compression spring**.

- Unscrew the hexagon head screws at both ends of the slide and remove the cover plates.

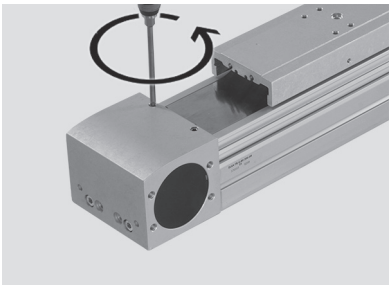
Secure the compression springs against springing out to the side on pulling out the top belt reversal.

– The ELGA-TB-KF-70 / 80 has **one** compression spring mounted on each upper belt reversal.
– The ELGA-TB-KF-120 / 150 has **two** compression springs mounted on each upper belt reversal.

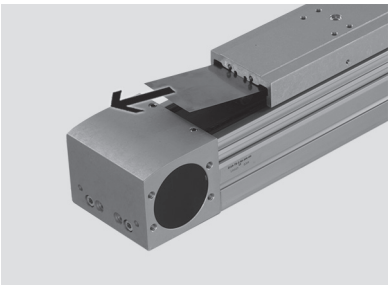


1. Pull out the top belt reversals on both sides of the slide (**not -P11**).

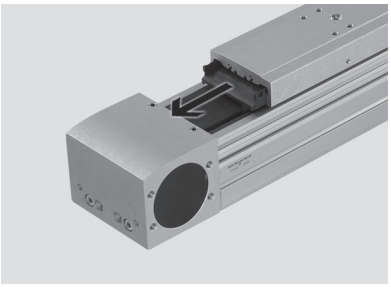
2. Unscrew the grub screws on both actuator end caps.



3. Pull the cover strip out of the actuator end caps and slide.

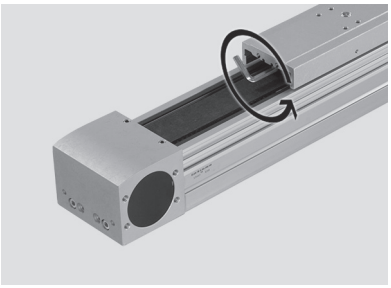


4. Pull out the bottom belt reversals on both sides of the slide.



4.3.2 Removing clamping components

1. Loosen the socket head screws in the clamping components on both sides of the slide and unscrew them.



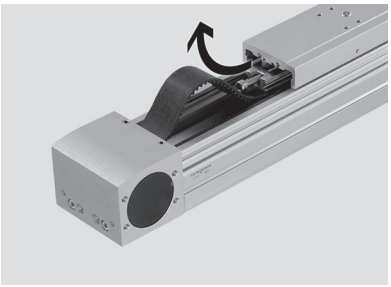
The heads of the socket head screws are filled with threadlocker. This can make it difficult to fully insert an Allen key. Remove the threadlocker, for example, by positioning an Allen key on it and tapping the key gently with a hammer.

The use of threaded inserts with SCREWLOCK makes unscrewing the socket head screws difficult. Screwdriver bits (long Type) with an extension piece and ratchet can be used to achieve the appropriate loosening torque.

Note

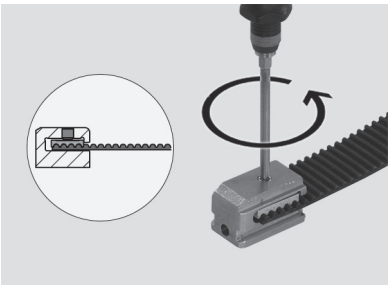
Do not bend or fold the toothed belt, as this can result in damage to the tensile members and shorten its service life by cracking it.

Note the minimum bending radius for assembly and storage. (➔ Chapter 4.3 on page 37)



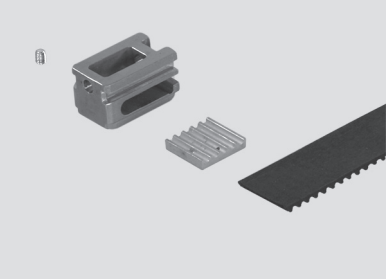
2. Pull the clamping components out of the slide using the toothed belt.

After the grub screw has been loosened, the clamping plate sits loosely in the clamping component and can fall out.



3. Loosen the grub screws in the clamping components at both ends of the toothed belt and unscrew them.
4. Remove any locking agent residue from the thread.

5. Pull the clamping components sideways off the toothed belt.
6. Remove the clamping plates from the toothed belt.

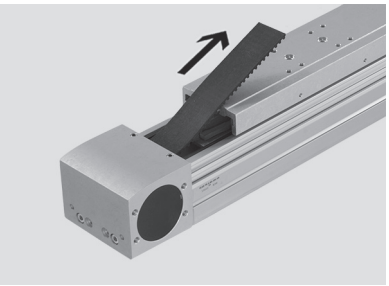


4.3.3 Replacing the toothed belt

Do not pull the old toothed belt out of the axis before you have joined it to the new toothed belt. Otherwise the actuator end caps must be removed.

A description of how to determine the correct toothed belt length can be found in Chapter 4.3.10 on page 47.

1. Use adhesive tape to join the old and new toothed belts at one end.
2. Pull the old toothed belt carefully out of the axis until the new toothed belt is pulled through the axis.
3. Separate the old toothed belt from the new one.



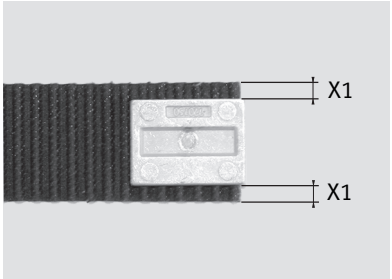
4.3.4 Attaching clamping components

1. Place the clamping plates on the ends of the new toothed belt.

Note

The clamping plate must be positioned centrally widthways on the toothed belt to prevent damage to the toothed belt during operation.

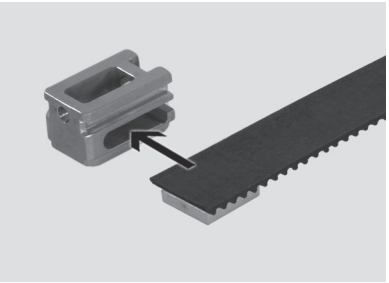
2. Position the clamping plates centrally widthways on the toothed belt.



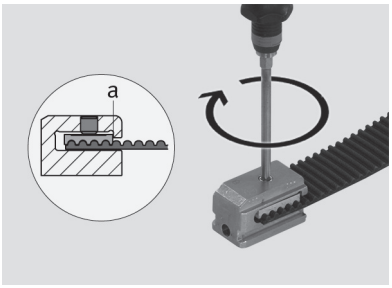
Note

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

3. Insert the ends of the toothed belt together with the clamping plates into the clamping components.
4. Align the toothed belt widthways with the centre of the clamping body.



5. Wet the grub screws with locking agent screw them into the clamping components.
6. Push the clamping plates against the stop (a) on the clamping component.



Note

The clamping plates must make contact with the stop as otherwise the toothed belt pretension will diminish during operation.

7. Tighten the grub screws to the appropriate torque.

Note

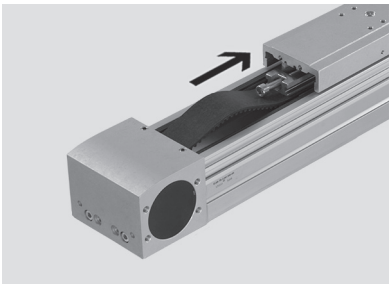
It is critical that the tightening torques be observed. Excessive tightening torques will bend the clamping component.

Type	Tightening torque
ELGA-TB-KF-70	0.5 Nm
ELGA-TB-KF-80	4.0 Nm
ELGA-TB-KF-120	4.0 Nm
ELGA-TB-KF-150	5.0 Nm

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. (➔ Chapter 4.3 on page 37)

8. Insert the clamping components into the slide.



Threaded inserts with SCREWLOCK® are screwed into the slides. These have an incorporated screw-clamping area that serves as a screw lock. Multiple windings have a clamping effect on the edges of the screwed-in adjusting screws for the toothed belt pretension. The result is flexible frictional locking. This stops the adjusting screw from becoming loose and prevents adjustment of the set toothed belt pretension during operation.

Note

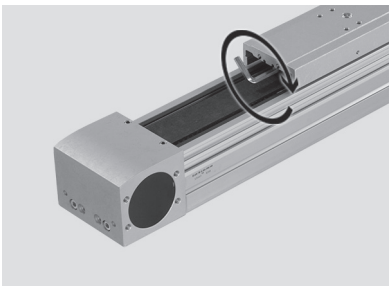
Overstretching the toothed belt shortens its service life. Slowly increase the toothed belt pretension up to the correct value.

If the toothed belt is cut to the correct length, the clamping components should be at least flush with the cut-out in the slide.

If the clamping components protrude, the socket head screws will not reach the minimum length of engagement and could be pulled out. In addition, the belt reversal cannot be correctly mounted.

Set the toothed belt pretension as described in Chapter 4.3.9 on page 46.

9. Insert the socket head screw into the clamping component and screw it a few turns into the slide.
10. Repeat the steps at the other end of the axis to insert the second clamping component.
11. Screw the socket head screws uniformly through the clamping components and into the slide.
12. Pretension the toothed belt by uniformly tightening the socket head screws by feel.



4.3.5 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

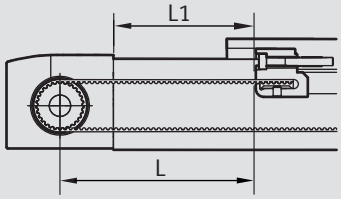
Correct toothed belt pretension is essential for the service life of the toothed belt as well as the positioning accuracy and operating performance of the toothed belt axis. The toothed belt pretension must therefore be checked extremely carefully.

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 between the clamping component and one of the actuator end caps (L1) is set alternatively by moving 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).



The frequency value is calculated using the specified values for strand force (pretension force), belt mass and length of the free belt strand according to the following formula:

$$f = \frac{1}{2 \cdot L} \cdot \sqrt{\frac{F_V}{m}}$$

f	Natural frequency of the freely oscillating strand [Hz]
L	Strand length [m]
F_V	Pretension force (N)
m	Weight per metre of the toothed belt [kg / m]

The frequency that needs to be set can be calculated using the data from the following table:

Type	Weight per metre m	Freely oscillating strand length L	Pretension force F_P
ELGA-TB-KF-70	0,0459 kg / m	30 mm + L1[2)]	358 - 390 N
ELGA-TB-KF-70-...-F1[1)]	0,0567 kg / m	30 mm + L1[2)]	357 - 393 N
ELGA-TB-KF-70-...-PU2	0,0567 kg / m	30 mm + L1[2]	357 - 393 N
ELGA-TB-KF-80	0,1140 kg / m	34 mm + L1[2)]	809 - 885 N
ELGA-TB-KF-80-...-F1[1)]	0,1384 kg / m	34 mm + L1[2)]	823 - 908 N
ELGA-TB-KF-80-...-PU2	0,1384 kg / m	34 mm + L1[2)]	823 - 908 N
ELGA-TB-KF-120	0,1500 kg / m	50 mm + L1[2)]	1321 - 1438 N
ELGA-TB-KF-120-...-F1[1)]	0,1917 kg / m	50 mm + L1[2)]	1341 - 1475 N
ELGA-TB-KF-120-...-PU2	0,1917 kg / m	50 mm + L1[2)]	1341 - 1475 N
ELGA-TB-KF-150	0,2160 kg / m	70 mm + L1[2)]	2041 - 2226 N
ELGA-TB-KF-150-...-PU2	0,3160 kg / m	70 mm + L1[2)]	2055 - 2281 N

[1)] Feature F1 = PU1 toothed belt

[2)] ➔ Chapter 4.3.6 on page 45.

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.

4.3.6 Checking the toothed belt pretension

Before the toothed belt pretension can be measured, the slide must be moved back and forth several times so that the toothed belt can fully settle and differences in tension can be levelled out.

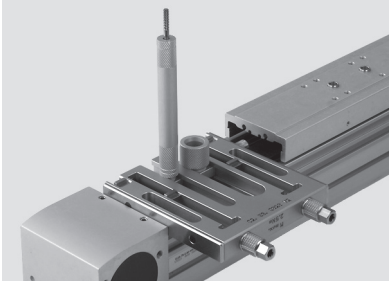
The easiest way to check the toothed belt pretension is to use a test device. (➔ Chapter 6.3 on page 70)

The TB-TE-EQ4 adaptation kit **cannot** be used for ELGA-TB-KF-150. Measure for the ELGA-TB-KF-150 without equipment. The procedure is described in the repair instructions.

4.3.7 Measuring the toothed belt pretension using a test device

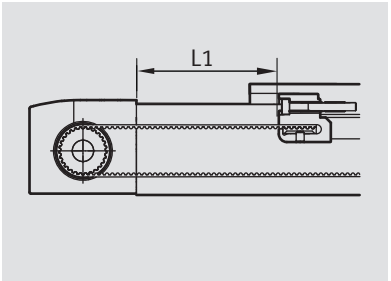
If the toothed belt pretension is to be measured using one of the test devices (➔ Chapter 6.3 on page 70), the distance between the actuator end cap and clamping components does not have to be set. The correct strand length is achieved using the supplied spacers.

The precise procedure for checking the toothed belt pretension of the ELGA-TB-KF-70 / 80 / 120 is given in the operating instructions "**Test Device for Toothed Belt Pretention TB-TE-EQ12**" (➔ TB-TE-EQ12_en.pdf) or "**Test Device for Toothed Belt Pretension TB-TE-EQ02**" (➔ TB-TE-EQ02_en.pdf).



4.3.8 Measuring the toothed belt pre-tension without a test device

1. Set the distance between the actuator end cap and clamping component (L1) as given in the table.

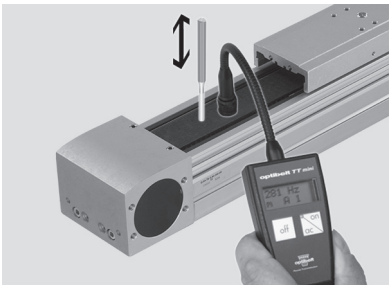


Type	Distance L1
ELGA-TB-KF-70	290 mm / 70 mm[2)]
ELGA-TB-KF-70-...-F1[1)]	290 mm / 70 mm[2)]
ELGA-TB-KF-70-...-PU2	290 mm / 70 mm[2)]
ELGA-TB-KF-80	290 mm / 70 mm[2)]
ELGA-TB-KF-80-...-F1[1)]	290 mm / 70 mm[2)]
ELGA-TB-KF-80-...-PU2	290 mm / 70 mm[2)]
ELGA-TB-KF-120	290 mm / 70 mm[2)]
ELGA-TB-KF-120-...-F1[1)]	290 mm / 70 mm[2)]
ELGA-TB-KF-120-...-PU2	290 mm / 70 mm[2)]
ELGA-TB-KF-150	290 mm / 70 mm[2)]
ELGA-TB-KF-150-...-PU2	290 mm / 70 mm[2)]

[1)] Feature F1 = PU1 toothed belt

[2)] Alternatives for toothed belt axes with short strokes.

2. Align the acoustic frequency measuring device towards the centre of the toothed belt as described in the corresponding operating instructions.
3. Make the toothed belt oscillate by hitting it, for example, with an Allen key or punch.



Several measurements should be taken to compensate for measurement tolerances.

The belt must be able to oscillate freely.

4. Compare the measurement with the specified value (➔ tables).

For strokes ≥290mm

Type	Minimum frequency (f)	Maximum frequency (f)
ELGA-TB-KF-70	138 Hz	144 Hz
ELGA-TB-KF-70-...-F1[1)]	124 Hz	130 Hz
ELGA-TB-KF-70-...-PU2	124 Hz	130 Hz
ELGA-TB-KF-80	130 Hz	136 Hz
ELGA-TB-KF-80-...-F1[1)]	119 Hz	125 Hz
ELGA-TB-KF-80-...-PU2	119 Hz	125 Hz
ELGA-TB-KF-120	138 Hz	144 Hz
ELGA-TB-KF-120-...-F1[1)]	123 Hz	129 Hz
ELGA-TB-KF-120-...-PU2	123 Hz	129 Hz
ELGA-TB-KF-150	135 Hz	141 Hz
ELGA-TB-KF-150-...-PU2	112 Hz	118 Hz

[1)] Feature F1 = PU1 toothed belt

For short strokes ‹290mm

Type	Minimum frequency (f)	Maximum frequency (f)
ELGA-TB-KF-70	441 Hz	453 Hz
ELGA-TB-KF-70-...-F1[1)]	397 Hz	409 Hz
ELGA-TB-KF-70-...-PU2	397 Hz	409 Hz
ELGA-TB-KF-80	407 Hz	419 Hz
ELGA-TB-KF-80-...-F1[1)]	370 Hz	382 Hz
ELGA-TB-KF-80-...-PU2	370 Hz	382 Hz
ELGA-TB-KF-120	392 Hz	402 Hz
ELGA-TB-KF-120-...-F1[1)]	348 Hz	358 Hz
ELGA-TB-KF-120-...-PU2	348 Hz	358 Hz
ELGA-TB-KF-150	348 Hz	358 Hz
ELGA-TB-KF-150-...-PU2	288 Hz	298 Hz

[1)] Feature F1 = PU1 toothed belt

4.3.9 Setting the toothed belt pretension

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.

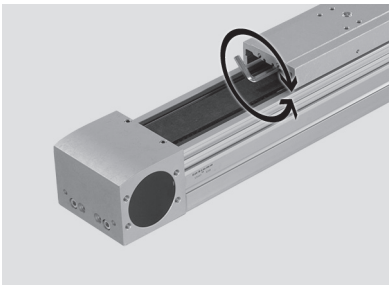
The toothed belt pretension must therefore only be set after renewing the toothed belt.

The socket head screws must be screwed in at least far enough that the clamping components are flush with the cut-outs in the slide.

If both clamping components are touching the inside of the slide but the measured frequency is still below the setpoint frequency, the toothed belt must be shortened by one tooth on one side. Sturdy general purpose scissors or metal shears are best for cutting the toothed belt. This process must be repeated until the setpoint frequency can be set.

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

1. Adjust the toothed belt pretension by turning the socket head screws.
2. Before you measure the toothed belt pretension again, the slide must be moved back and forth a number of times so that the toothed belt can fully settle and differences in tension are equalised.

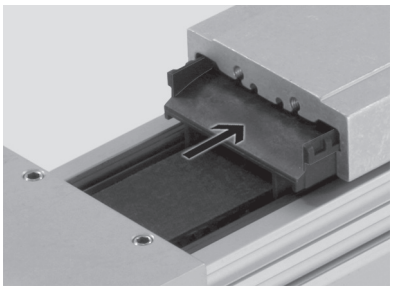


Turning the socket head screw clockwise increases the tension of the toothed belt, and thus its oscillation frequency.

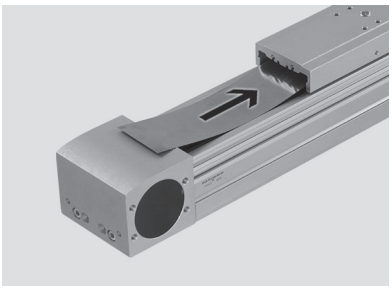
Turning the socket head screw anticlockwise decreases the tension of the toothed belt, and thus its oscillation frequency.

4.3.10 Installing the cover strip

1. Place the bottom belt reversals in the correct position on both sides of the slide.



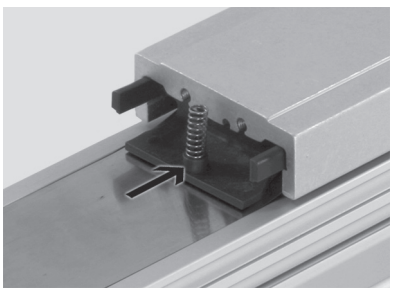
2. Guide the cover strip through the slide over the belt reversals.



At the top belt reversals:

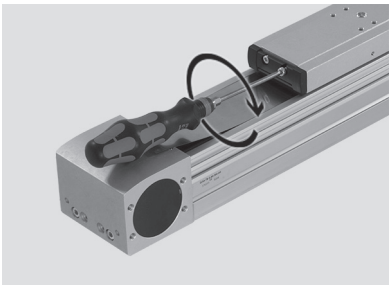
- the ELGA-TB-KF-70 / 80 has **one** compression spring mounted on each.
- the ELGA-TB-KF-120 / 150 has **two** compression springs mounted on each.

ELGA-TB-KF-...-**P11**-(F1) does **not have** the **top belt reversal** and the **compression spring**.



3. Insert the top band reversals together with the compression springs on both sides of the slide.

ELGA-TB-KF-...- not F1



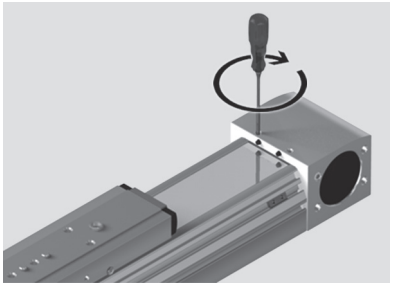
1. Place the cover on both sides of the slide.
2. Wet the socket head screws for the cover with locking agent.
3. Screw the socket head screws into the slide through the cover on both sides of the slide and tighten using the appropriate torque (➔ table).

Type	Tightening torque
ELGA-TB-KF-70	1.2 Nm
ELGA-TB-KF-80	1.2 Nm
ELGA-TB-KF-120	2.0 Nm
ELGA-TB-KF-150	2.0 Nm

ELGA-TB-KF-...-F1 (PU1 toothed belt)

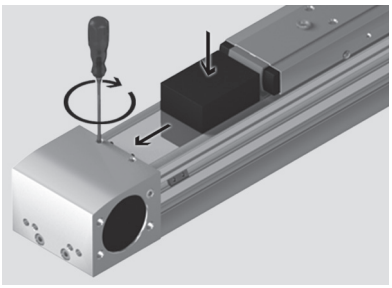
1. Position the cover plates on both sides of the slide.
2. Screw the hexagon head screws through the cover plate and into the slide on both sides of the slide and tighten using the appropriate tightening torque. (➔ table).

Type	Tightening torque
ELGA-TB-KF-70-...-F1	1.2 Nm
ELGA-TB-KF-80-...-F1	1.2 Nm
ELGA-TB-KF-120-...-F1	2.0 Nm



4. Push the cover strip into the slots of the two actuator end caps.
5. Screw the grub screws into the right-hand actuator end cap and tighten them to the appropriate tightening torque (➔ table).

Type	Tightening torque
ELGA-TB-KF-70	2.0 Nm
ELGA-TB-KF-80	2.0 Nm
ELGA-TB-KF-120	2.0 Nm
ELGA-TB-KF-150	2.0 Nm



6. Screw grub screws loosely into the left-hand actuator end cap - do not tighten yet. The cover strip must not be fixed in place.
7. Select suitable clamping element depending on the axis size (➔ table and Chapter 6.2 on page 69).

Type	Clamping element
ELGA-TB-KF-70	EADT-S-L5-70 (use lengthwise)
ELGA-TB-KF-80	EADT-S-L5-70 (use crosswise)
ELGA-TB-KF-120	EADT-S-L5-120 (use lengthwise)
ELGA-TB-KF-150	EADT-S-L5-120 (use crosswise)

8. Place the clamping element on the cover strip.
9. Press the clamping element onto the cover strip and at the same time push the cover strip into the slot in the actuator end cap.

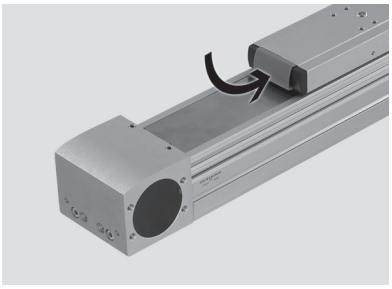
For ELGA-TB-KF-...-**P11**, tighten the cover strip less tightly. Ensure that the cover strip does not touch the upper surface and both end covers in the slide.

10. Tighten the grub screws to the appropriate tightening torque (➔ table).

Type	Tightening torque
ELGA-TB-KF-70	2.0 Nm
ELGA-TB-KF-80	2.0 Nm
ELGA-TB-KF-120	2.0 Nm
ELGA-TB-KF-150	2.0 Nm

11. Check whether the cover strip is firmly in place by moving the slide. If the cover strip ripples, it must be pushed further into the actuator end caps.

12. Clip the cover caps onto the covers on both ends of the slide.



This step is omitted for the ELGA-TB-KF-...-**F1** (PU1 toothed belt).

4.4 Dismantling the toothed belt axis

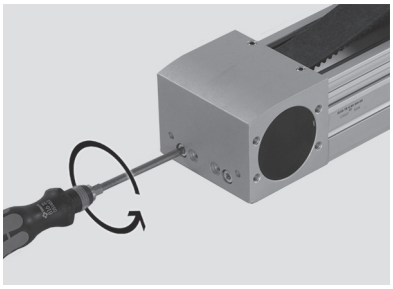
The toothed belt axis ELGA-TB-KF-... is made up of the following modules:

- Cylinder barrel with integrated roller track and glued on magnetic strip for fixing the cover strip.
- Actuator end cap with toothed belt pulley and drive as well as clamp for the cover strip.
- Slide with recirculating ball bearing guide and cover strip guide, driven by clamping components on the toothed belt.
- Incremental displacement encoder for checking the slide position in relation to the cylinder barrel (optional).

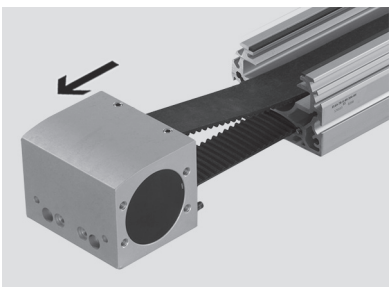
4.4.1 Removing the actuator end caps

The steps described in Chapter 4.3.1 on page 40 and Chapter 4.3.2 on page 41 must be carried out before dismantling the actuator end caps.

1. Loosen the socket head screws in both actuator end caps and unscrew them.



The actuator end caps are connected to the cylinder barrel by spring pins. A certain amount of force is required to pull them off.

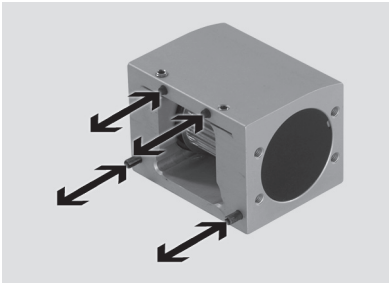


2. Pull the actuator end caps off the cylinder barrel.
3. Pull the toothed belt out of the cylinder barrel.

4.4.2 Repairing the actuator end caps

Spring pins and elastomer buffers

The spring pins and elastomer buffers are inserted into the actuator end caps. However, the spring pins may also be located in the cylinder barrel after dismantling the actuator end caps. Pull out the parts and replace them.

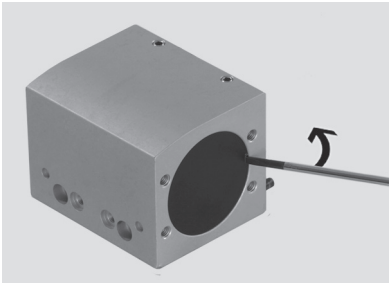


Toothed belt pulley module

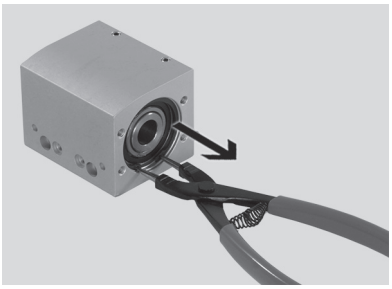
The toothed belt pulley module sits with clearance fit of the actuator end cap with two pressed-on deep-groove ball bearings, and is clamped axially by a retaining ring.

Removing the toothed belt pulley module

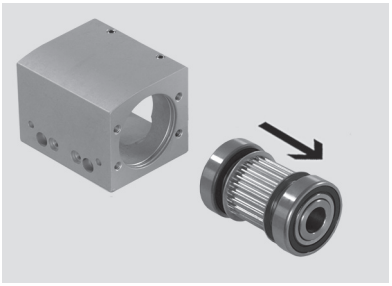
1. Lever the sealing discs, if present, out of the actuator end cap.



2. Remove the retaining ring.



3. Push the toothed belt pulley module with the two deep-groove ball bearings out of the actuator end cap.
4. Clean the components by removing any abraded particles.

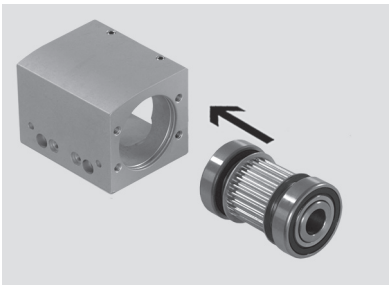


You do not need to pull off the deep-groove ball bearings, as the spare part includes both bearings and the shaft.

5. Check the inner raceways of the deep-groove ball bearings for secure fit on the toothed belt pulley module. If a bearing does not fit tightly, replace the module.
6. Check the tooth geometry for damage. If there is any damage, replace the module.

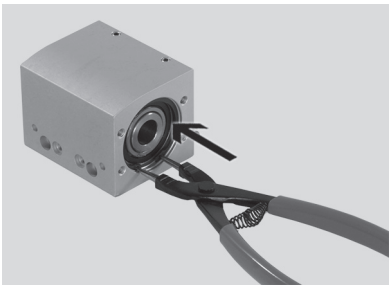
Installing the toothed belt pulley module

7. Apply a light coating of grease to the outside of the deep-groove ball bearings.
8. Push the toothed belt pulley module into the actuator end cap.



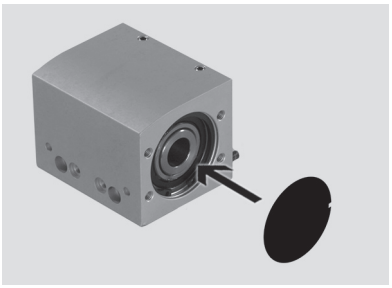
If necessary, use a plastic hammer to carefully drive it into the actuator end cap.

9. Insert the retaining ring.



Check that the retaining ring is positioned correctly.

10. Insert the sealing discs into the actuator end cap so that the deep-groove ball bearings have extra protection against contamination.



4.5 Linear recirculating ball bearing guide system

The linear recirculating ball bearing guide system consists of a roller track and the corresponding recirculating ball bearing units (roller carriages) with caged ball guide. The guiding system is set based on the ball bearing size and cannot be changed.

The roller track is part of the cylinder barrel module and cannot be renewed. If a roller track defect occurs, the entire toothed belt axis must be replaced.

Replacement of the toothed belt axis may be necessary under the following circumstances, for example:

The end of the linear recirculating ball bearing guide system's useful life has been reached as a result of material fatigue and wear. Signs of fatigue appear on the areas of material that are rolled over. Fine cracks, pores and pits (depending on the level of wear) and deformation of the roller bodies occur. Pitting on the bearing surface of the roller track can be observed visually, as the bearing surface is noticeably uneven. This can result in perceptible bearing clearance, impaired rolling and increased operating noise, etc.

The application must be checked for the following causes in the event of premature failure due to increased wear:

- Poor lubrication; lubrication intervals not adhered to (unlubricated operation).
- Use of a lubricating grease not contained in the specification.
- Dirty and corrosive ambient conditions (dust, etc.).
- Impact and vibration.
- Technical limit data exceeded (torques, forces, speed, temperature range, etc.).
- Flatness of the attachments screwed onto the slide, setpoint value < 0.01 mm (strain).
- When using parallel axes, the following must be checked:
  - Parallelism between the roller tracks.
  - Vertical offset between the slides.

  Deviations can lead to strain in the recirculating ball bearing guide, thus overloading of the guiding system. It is not possible to evaluate the parallelism and vertical offset using the displacement force. The alignment should be performed based on measurement. If necessary, install an additional adjusting device to align the axes constructively.

Note

Incorrect set values of the braking ramp for STOP statuses (e.g. EMERGENCY OFF, quick stop) result in overloading of the toothed belt axis and can irreparably damage it or reduce its service life drastically.

- 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 installation position (horizontal/vertical) as well as the specified maximum drive torque or the feed force correspond to the permissible values for the toothed belt axis used.
- Use the Festo "PositioningDrives" design software, available via the Festo website (➔ www.festo.com), to design the toothed belt axis.

Note

Block-shaped acceleration profiles (without 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 specification with jerk limitation reduces vibrations in the entire system and has a positive effect on the stresses in the mechanical system.

- Check which closed-loop controller settings can be adjusted (e.g. jerk limitation, smoothing of the acceleration profile).

4.5.1 Dismantling the slide with roller carriage

Note

Before replacing the roller carriages, check the guide rail for wear and damage. Defective or worn guide rails cannot be replaced. It is the responsibility of the user to assess the wear and damage to the guide rail.

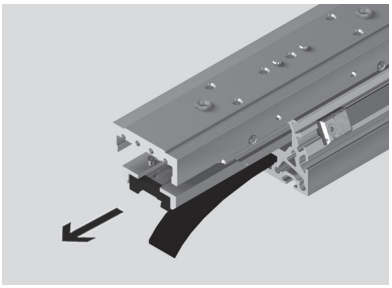
Festo recommends, as a basic principle, that you always replace the entire drive if a defect occurs in the linear recirculating ball bearing guide system.

Replacement of the roller carriages is undertaken by users at their own risk.

Requirement for all work on the roller carriage:

1. the cover strip must be dismantled (➔ Chapter 4.3.1 on page 40),
2. the two clamping components must be unscrewed out of the slide (➔ Chapter 4.3.2 on page 41) and
3. one actuator end cap must be dismantled (➔ Chapter 4.4.1 on page 49).

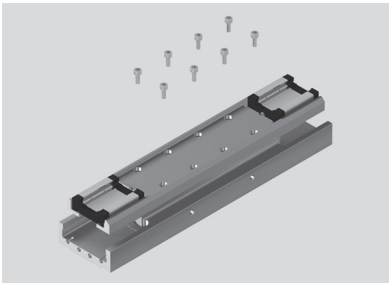
ELGA-TB-KF-70 / 80



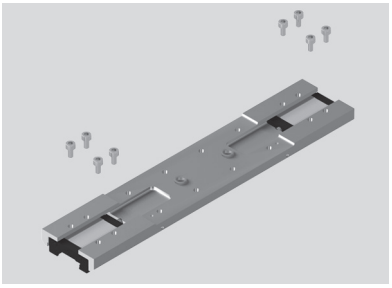
Note

The recirculating ball bearing guide system is pretensioned. Individual bearings can therefore easily fall out and get lost when pushing the roller carriage from the guide rail. Only separate the roller carriages from the guide rail when replacing them.

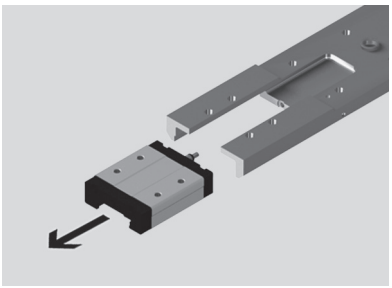
1. Push slide, together with the roller carriage, carefully out of the cylinder barrel and off the roller track.



2. Place the slide on the top.
3. Unscrew all mounting screws from the connecting plate.
4. Clean the thread of the mounting screws to remove any locking agent residue.

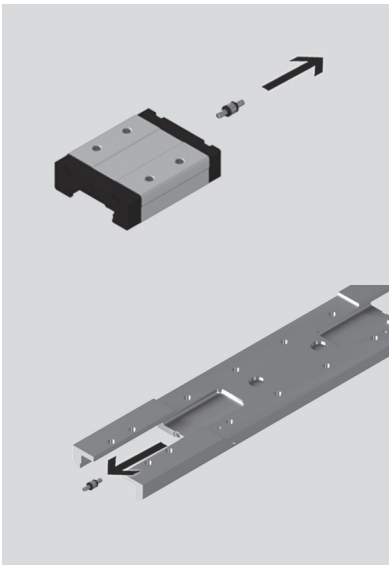


5. Remove the connecting plate together with the roller carriage out of the slide. There are two centring sleeves between the connecting plate and the slide.
6. Clean the slide.
7. Turn over the connecting plate with the roller carriage.
8. Unscrew all mounting screws from the two roller carriages.
9. Clean the thread of the mounting screws to remove any locking agent residue.

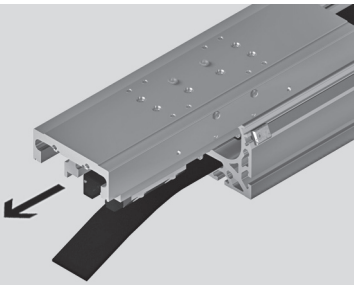


10. Push the roller carriages to the right and left and off the connecting plate.

11. Pull the lubricating channel together with the two O-rings out of the roller carriage or rather out of the connecting plate.
12. Clean the connecting plate.
13. Check the lubricating channel and O-rings for wear and replace if necessary.



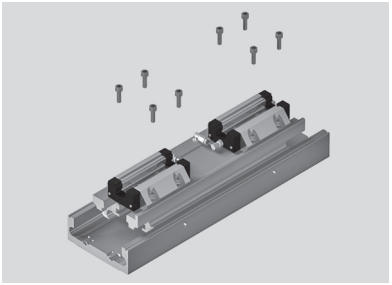
ELGA-TB-KF-120 / 150



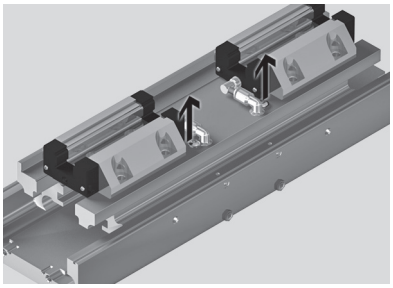
Note

The recirculating ball bearing guide system is pretensioned. Individual bearings can therefore easily fall out and get lost when pushing the roller carriage from the guide rail. Only separate the roller carriages from the guide rail when replacing them.

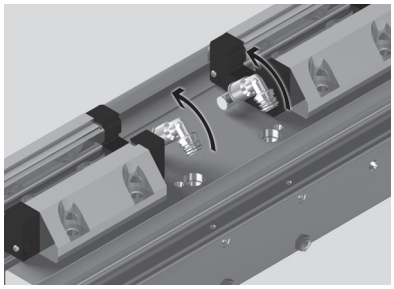
1. Push slide, together with the roller carriage, carefully out of the cylinder barrel and off the roller track.
2. Place the slide on the top.
3. Unscrew all mounting screws from the roller carriages.
4. Clean the thread of the mounting screws to remove any locking agent residue.



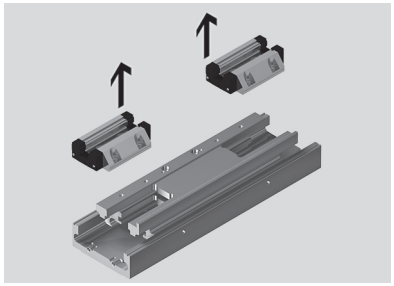
5. Unscrew the flange screws in the two cartridges of the lubrication.



6. Pull the cartridges out of the drill holes.

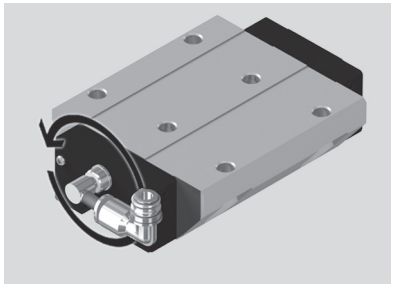


7. Remove the roller carriage from the slide.
8. Clean the slide.



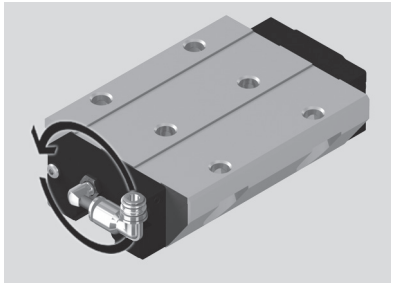
ELGA-TB-KF-120

1. Unscrew the threaded nipple with mounted tubing and cartridge.
2. Check the lubricating unit for wear and replace if necessary.



ELGA-TB-KF- 150

1. Unscrew the adapter with mounted threaded nipple, tubing and cartridge from the roller carriage.
2. Check the lubricating unit for wear and replace if necessary.



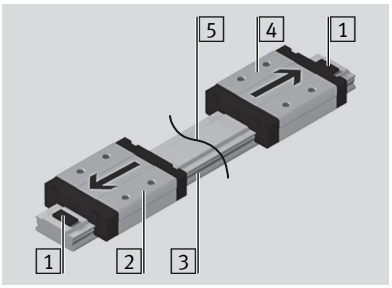
4.5.2 Mounting the roller carriages on the slides

Note

New roller carriages must be greased before commissioning the toothed belt axis (➔ Chapter 5.2 on page 67). Non-compliance can lead to unlubricated operation, and thus failure of the toothed belt axis before the next specified lubrication.

ELGA-TB-KF-70 / 80

The new roller carriages are supplied in pairs on an assembly aid.



Note

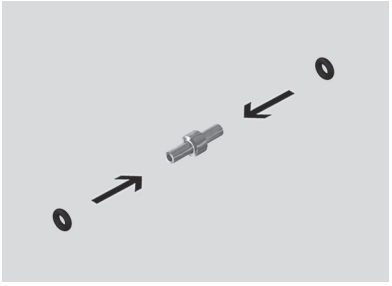
The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily slip out and become lost when pushing the roller carriage off the assembly aid.

During assembly the roller carriages must remain on the assembly aid and are pushed directly from the assembly aid and onto the roller track in the cylinder barrel.

1. Push one roller carriage [2] all the way to the left and the other roller carriage [4] all the way to the right on the assembly aid [3], up to the respective stopper [1].
2. Use adhesive tape or similar to fix the assembly aid [3] between the roller carriages [2] and [4] so that the roller carriages cannot slide downwards after cutting the assembly aid.
3. Cut the assembly aid [3] in the middle [5].

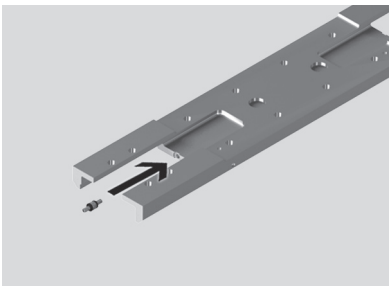
   In this way the roller carriages together with the assembly aid can be screwed onto the connecting plate and the slides can be mounted.

4. Push the O-rings right and left onto the lubricating channels.



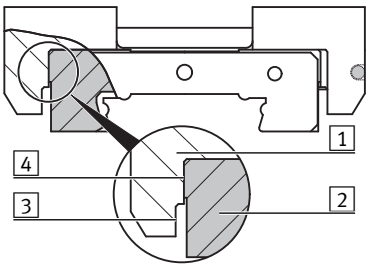
5. Insert the lubricating channels into the lubrication holes of the connecting plate.

   The O-ring must lie flush on the connecting plate.
6. Clean the connecting plate with compressed air and a cloth.

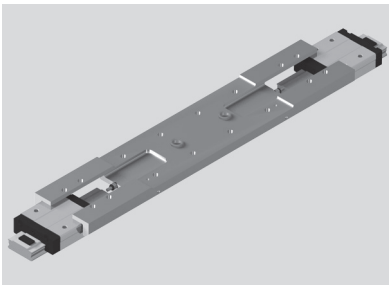


7. Note the alignment of the roller carriage [2] on assembling!

   The ground side of the roller carriage [4] must be installed towards the set-in recess [3] of the connecting plate [1].



8. Remove stoppers and adhesive tape from the side of the assembly aid facing the lubricating channel.

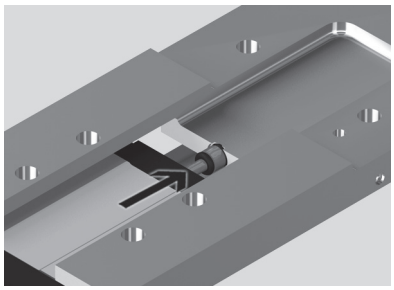


Note

The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily slip out and become lost when pushing the roller carriage off the assembly aid.

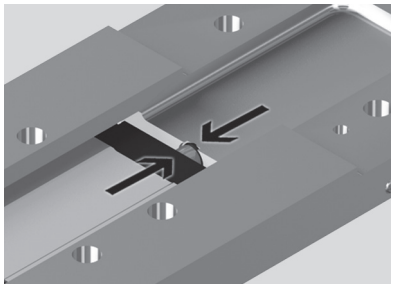
The roller carriages must remain on the assembly aid during assembly.

9. Push the roller carriage to the unsecured end of the assembly aid, far enough to allow the lubricating channel to be inserted into the roller carriage.
10. Place the connecting plate on the roller carriages.
11. Push the roller carriages onto the free ends of the lubricating channels, without allowing the roller carriages to slide off the assembly aid, not even partially.

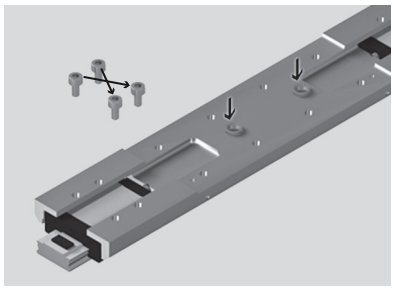


Note

During assembly the roller carriages must lie tightly against the lubricating channels.

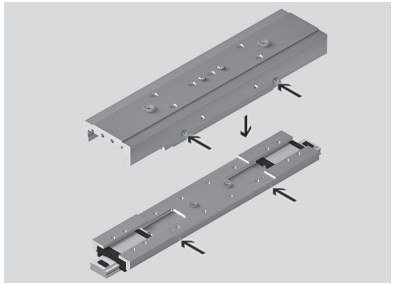


12. Wet the mounting screws with locking agent.
13. Screw the mounting screws through the connecting plate and into the two roller carriages and tighten **cross-wise** with the appropriate tightening torque (➔ table).



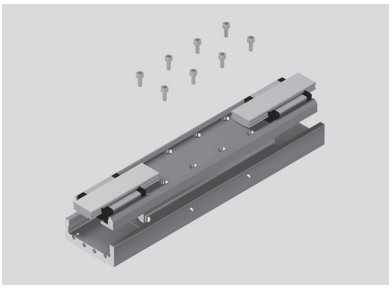
Type	Tightening torque
ELGA-TB-KF-70	2.0 Nm
ELGA-TB-KF-80	2.0 Nm

14. Insert two centring sleeves into the connecting plate.
15. Position the slides on the connecting plate with the roller carriages, so that the end face (front) of the connecting plate with the two ball bearings (= plug of the lubricating channel drill holes) points towards the side of the slide with the lubrication nipples.



16. Place the slide with connecting plate on the top.
17. Wet the mounting screws with locking agent.
18. Screw the mounting screws through the connecting plate and into the slide and tighten using the appropriate tightening torque (➔ table).

Type	Tightening torque
ELGA-TB-KF-70	2.0 Nm
ELGA-TB-KF-80	5.5 Nm



ELGA-TB-KF-120 / 150

The new roller carriages are supplied individually on an assembly aid.

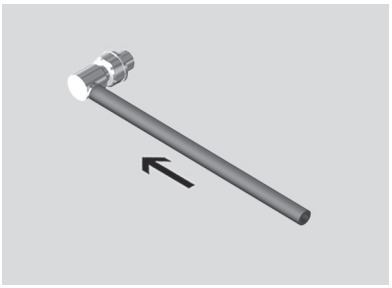
Note

The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily slip out and become lost when pushing the roller carriage off the assembly aid.

During assembly the roller carriages must remain on the assembly aid and are pushed directly from the assembly aid and onto the roller track in the cylinder barrel.

ELGA-TB-KF-120

1. Push a piece of plastic tubing (Type: PUN-4×0,75-BL) onto the threaded nipple.



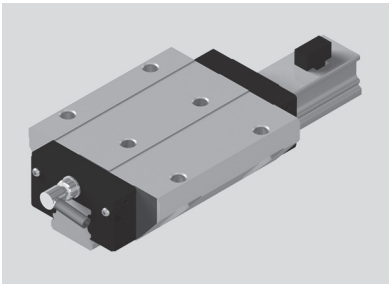
Choose a length for the piece of tubing which can be easily handled and is longer than 18.5 mm.

As the elbow of the LCN fitting is pivot-mounted, it can swerve to the side when the tubing is fitted.

- It is therefore useful to hold the elbow firmly with your free hand.
- Hold the tubing as close to the end as possible.
- Rotate the tubing (approx. 90°) around the nipple axis while pushing it on.
- Connecting pliers ZMS-PK-3/4 No. 9341 can be used for 3 and 4 mm tubing to simplify assembly further.
- Furthermore, it is possible to immerse the hose ends in approx. 80 °C hot water for a short time, to make them easier to install.

2. Shorten the hose to 18.5 mm length.

3. Remove the stopper of the assembly aid from the side of the roller carriage into which the threaded nipple with mounted tubing is screwed.



Note

The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily slip out and become lost when pushing the roller carriage off the assembly aid.

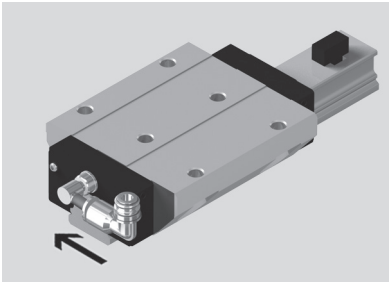
The roller carriages must remain on the assembly aid during assembly.

4. Push the roller carriage to the unsecured end of the assembly aid, far enough to allow the threaded nipple with mounted tubing to be mounted.

5. Screw the threaded nipple with mounted tubing into the roller carriage and tighten with the appropriate tightening torque.

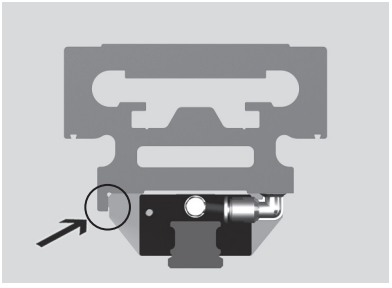
Type	Tightening torque
ELGA-TB-KF-120	0.5 Nm

6. Push the cartridge onto the free end of the hose.



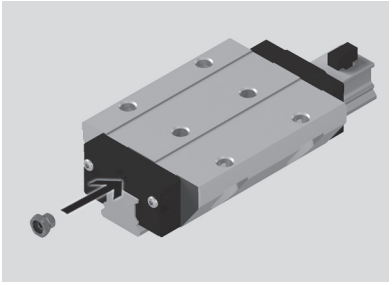
Note the alignment of the roller carriages for the subsequent assembly!

The ground side of the roller carriage must touch the ground profile surface of the slide.



ELGA-TB-KF- 150

1. Remove the stopper of the assembly aid from the side of the roller carriage into which the adapter is screwed.



Note

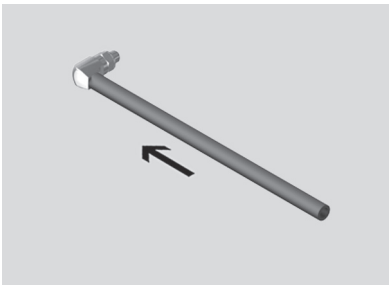
The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily slip out and become lost when pushing the roller carriage off the assembly aid.

The roller carriages must remain on the assembly aid during assembly.

2. Push the roller carriage to the unsecured end of the assembly aid, far enough to allow the adapter to be mounted.
3. Screw the adapter into the roller carriage and tighten with the appropriate tightening torque.

Type	Tightening torque
ELGA-TB-KF-150	0.5 Nm

4. Push a piece of plastic tubing (Type: PUN-4×0,75-BL) onto the threaded nipple.



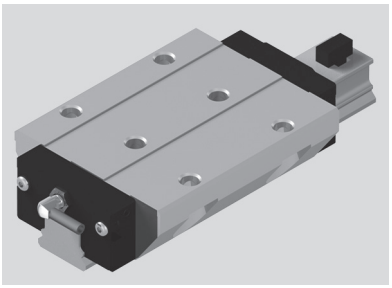
Choose a length for the piece of tubing which can be easily handled and is longer than 18.5 mm.

As the elbow of the LCN fitting is pivot-mounted, it can swerve to the side when the tubing is fitted.

- It is therefore useful to hold the elbow firmly with your free hand.
- Hold the tubing as close to the end as possible.
- Rotate the tubing (approx. 90°) around the nipple axis while pushing it on.
- Connecting pliers ZMS-PK-3/4 No. 9341 can be used for 3 and 4 mm tubing to simplify assembly further.
- Furthermore, it is possible to immerse the hose ends in approx. 80 °C hot water for a short time, to make them easier to install.

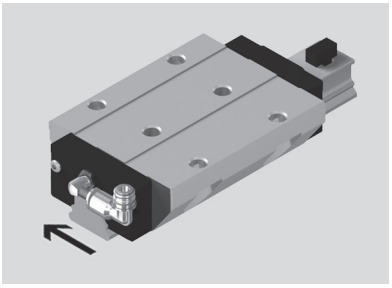
5. Shorten the hose to 18.5 mm length.

6. Screw the threaded nipple with mounted tubing into the adapter and tighten with the appropriate tightening torque.



Type	Tightening torque
ELGA-TB-KF-120	0.5 Nm

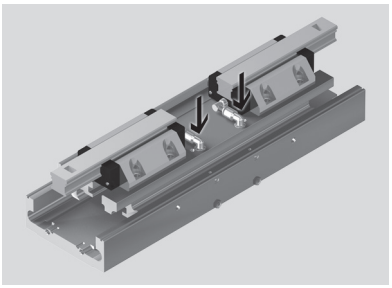
7. Push the cartridge onto the free end of the hose.



ELGA-TB-KF-120 / 150

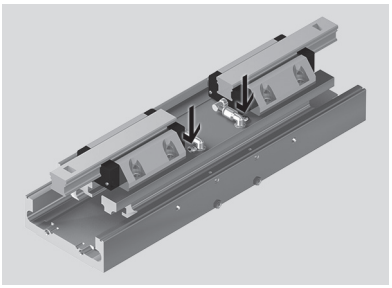
1. Clean the slide.
2. Place the slide on the top.
3. Insert the cartridge into the drill hole and at the same time insert the roller carriage into the slots.

   The ground side of the roller carriage must touch the ground profile surface of the slide.



4. Screw in the flange screws for mounting the two carriages and tighten with the appropriate tightening torque.

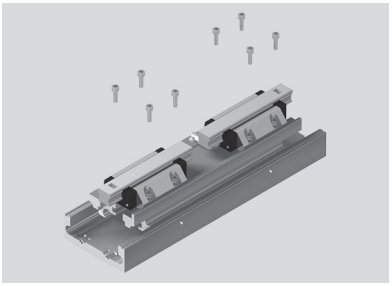
Type	Tightening torque
ELGA-TB-KF-120	0.5 Nm
ELGA-TB-KF-150	0.5 Nm



5. Wet the mounting screws of the roller carriages with screw locking agent.

Screw the mounting screws into the slide and tighten with the appropriate tightening torque (➔ table).

Type	Tightening torque
ELGA-TB-KF-120	7.5 Nm
ELGA-TB-KF-150	15.5 Nm



4.6 Assembling the toothed belt axis

4.6.1 Preparing the cylinder barrel

- Clean the cylinder barrel with compressed air and a soft cloth.

4.6.2 Inserting the slide

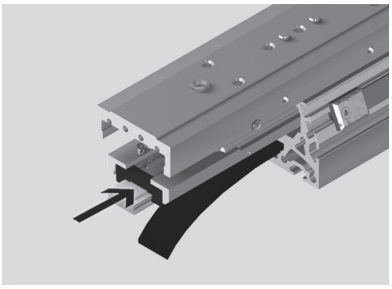
Note

The recirculating ball bearing guide system is pretensioned. Individual balls can therefore easily slip out and become lost when pushing the roller carriage off the assembly aid.

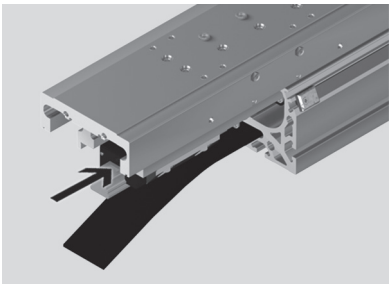
The roller carriages must remain on the assembly aids and are pushed from the assembly aids and directly onto the roller track in the cylinder barrel.

ELGA-TB-KF-70 / 80 / 120 / 150

- Remove the second stopper from the assembly aid.
- Carefully push the slides with the roller carriages, one after the other, from the assembly aids and onto the roller track in the cylinder barrel.



ELGA-TB-KF-70 / 80



ELGA-TB-KF-120 / 150

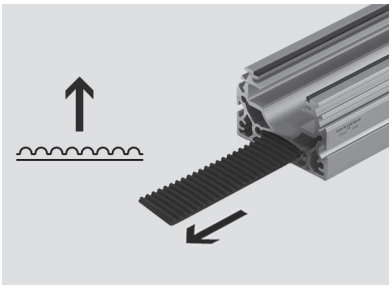
4.6.3 Installing the actuator end caps

Note

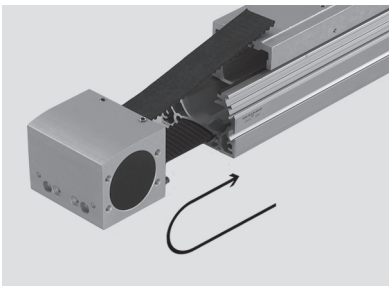
Do not bend or fold the toothed belt, as this can result in damage to the tensile members and shorten its service life by cracking it.

Note the minimum bending radius for assembly and storage (➔ Chapter 4.3 on page 37).

1. Guide the toothed belt through the toothed belt guide in the cylinder barrel as shown. The toothed profile must be facing upwards.

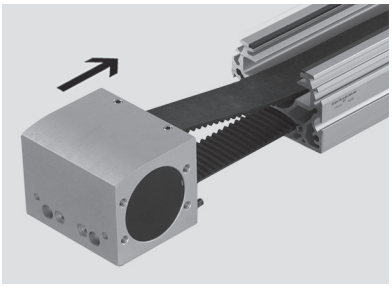


2. Guide the ends of the toothed belt through both of the prepared actuator end caps as shown.



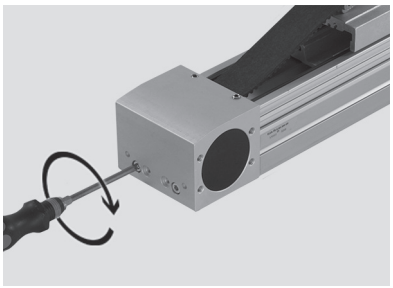
The actuator end cap is centred by means of two spring pins. A certain amount of force may need to be applied for assembly.

3. Place the two actuator end caps on the cylinder barrel and press them against the cylinder barrel.



If necessary, tap the actuator end caps gently with a plastic hammer to insert the spring pins into the drill holes.

4. Wet the socket head screws with threadlocker.
5. Screw the socket head screws through the actuator end cap and into the cylinder barrel and tighten with the appropriate tightening torque.



Type	Tightening torque
ELGA-TB-KF-70	2.5 Nm
ELGA-TB-KF-80	5 Nm
ELGA-TB-KF-120	11 Nm
ELGA-TB-KF-150	15 Nm

4.6.4 Attaching clamping components

➔ Chapter 4.3.4 on page 42.

4.6.5 Checking and adjusting the toothed belt presstressing

➔ Chapter 4.3.6 on page 45 and Chapter 4.3.9 on page 46.

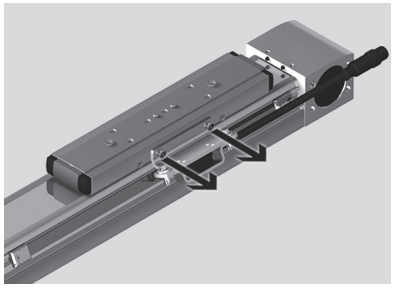
4.6.6 Installing the cover strip

➔ Chapter 4.3.10 on page 47.

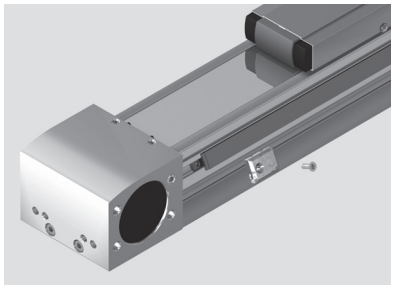
4.7 Replacing the measuring tape of the incremental displacement encoder

4.7.1 Remove the old measuring tape

1. Dismantle the sensor bracket the measuring unit.



2. Unscrew the countersunk screws of the caps at both ends of the magnetic strip.
3. Remove the caps.



4. Remove the measuring tape carefully from the cylinder barrel, do **not** use any sharp-edged auxiliary means.
5. Clean the cylinder barrel to remove adhesive residues.

Festo recommends LOCTITE 7063 and LOCTITE 7070 for cleaning.

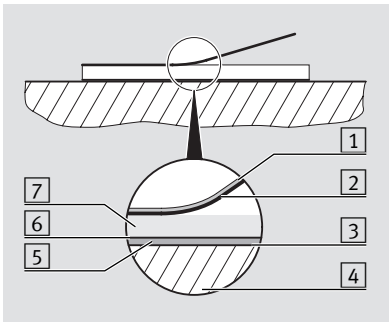
4.7.2 Sticking on the new measuring tape

Note

To prevent stresses in the magnetic strip, it must not be pinned, twisted or supported or handled with the magnetised plastic strip facing inwards (min. radius of curvature 150 mm).

When sticking on the magnetic strip note the markings on the magnetic strip and on the sensor head. Incorrect assembly produces incorrect values. A magnetic strip that is already stuck on is irreparably damaged on removal and cannot be reused.

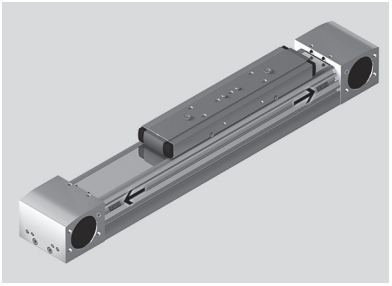
Structure of the measuring tape



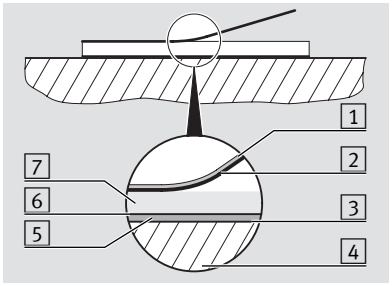
1 Cover strip
2 Adhesive tape
3 Adhesive tape
4 Cylinder barrel
5 Steel strip
6 Adhesive tape
7 Magnetic strip

5, 6 and 7 are connected to each other in the factory

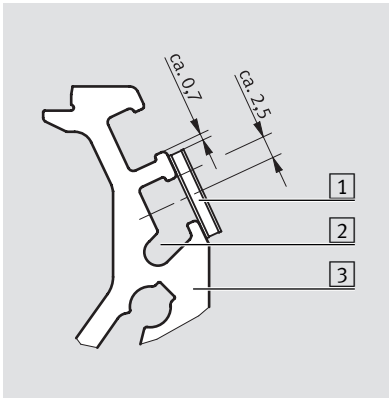
1. Push the slot nuts onto the two actuator end caps.



The magnetic strip [7] is joined with a steel strip [5] and adhesive tape [3] (= carrier side) in the factory.



2. Adjust the magnetic strip with the steel strip [1] so that it is centred with the middle of the cylinder barrel. A distance of 20 mm from each actuator end cap must be maintained.
3. Stick the magnetic strip with the steel strip [1] over the slot [2] on the cylinder barrel [3].

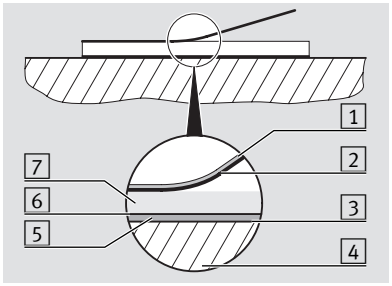


The easiest way is to stick on the magnetic strip in two steps:

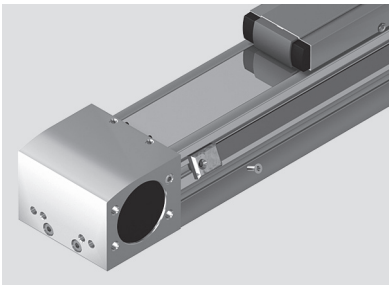
1. Remove half the protective film of the adhesive film.
2. Stick on the magnetic strip corresponding to the removed film.
3. Remove the remaining length of protective film from the adhesive film.
4. Stick on the whole length of magnetic strip.

The cover strip [1] is joined with a adhesive tape [2] in the factory.

4. Stick the cover strip [1] with adhesive tape [2] onto the magnetic strip [7].

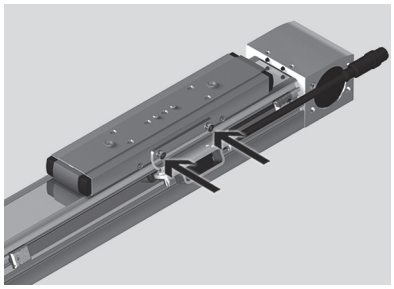


5. Place the caps on both ends of the measuring tape. A distance of 5 mm from each actuator end cap must be maintained.
6. Wet the countersunk screws locking agent.
7. Screw countersunk screws through the caps and into the slot nuts and tighten with a tightening torque of 0.15 Nm.



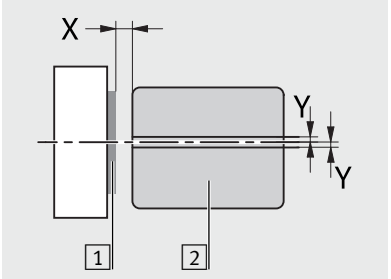
8. Use two cheesehead screws to screw the sensor bracket with measuring unit on to the slide and tighten with the appropriate tightening torque.

Type	Tightening torque
ELGA-TB-KF-70	5 Nm
ELGA-TB-KF-80	5 Nm
ELGA-TB-KF-120	5.9 Nm
ELGA-TB-KF-150	5.9 Nm

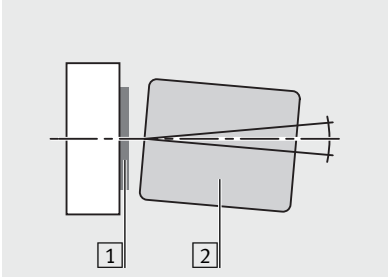


9. To obtain precise position information, the measuring unit must comply with the tolerances listed in the following for the distance and angle between the measuring unit and the measuring tape:

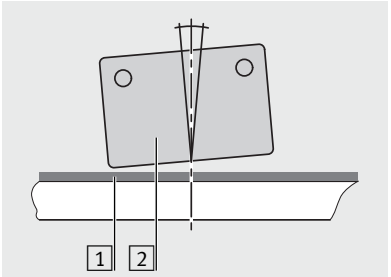
– The measuring unit [2] must be set on attachment with a distance **X** of 0.1 mm to 2 mm from the magnetic strip [1].
– The offset between the measuring unit and the horizontal middle axis of the magnetic strip [1] must not exceed Y = 2.5 mm.



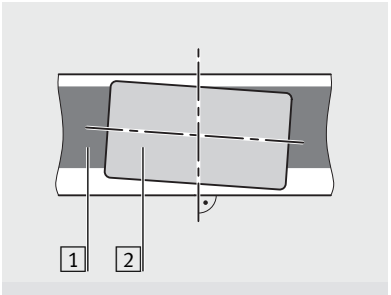
– The inclination between the measuring unit [2] and the magnetic strip [1] must not exceed ±5°.



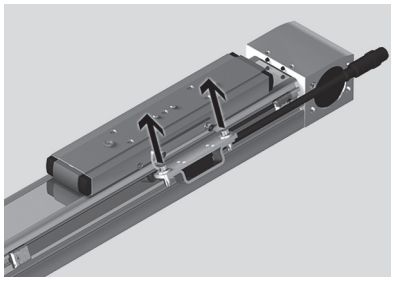
– The deviation in the parallelism between the measuring unit [2] and the magnetic strip [1] must not exceed ±5°.



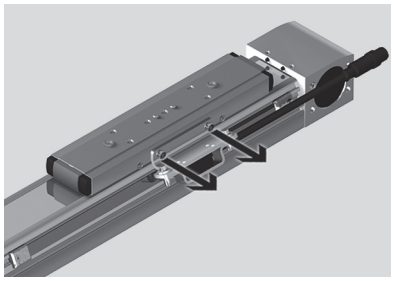
– The deviation in the parallelism between the measuring unit [2] and the magnetic strip [1] must not exceed ± 1.5°.



10. If these tolerances are not complied with, the measuring unit must be readjusted.
11. Undo the cheesehead screws of the sensor mounting.
12. Align measuring unit correctly.

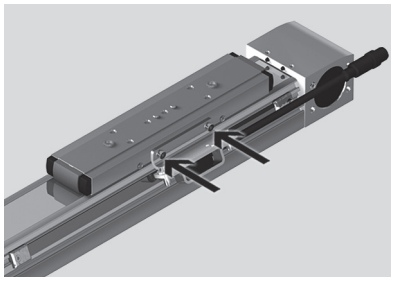


13. Undo the cheesehead screws of the sensor bracket.
14. Align measuring unit correctly.

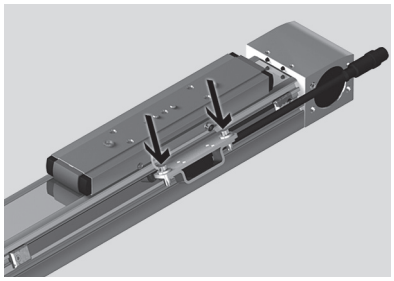


15. Use two cheesehead screws to screw the sensor bracket with measuring unit on to the slide and tighten with the appropriate tightening torque.

Type	Tightening torque
ELGA-TB-KF-70	5 Nm
ELGA-TB-KF-80	5 Nm
ELGA-TB-KF-120	5.9 Nm
ELGA-TB-KF-150	5.9 Nm



16. Tighten the socket head screws of the sensor mounting with a tightening torque of 3.5 Nm.



4.8 Assembly and functional test

After completing the assembly work on the toothed belt axis, check that it function correctly.

4.8.1 No-load torque

It must be possible to move the slide in idling mode, without drive (motor) attached and without a coupled load without any large resistance and without jerking.

The following values can be used for the quantitative check. The no-load torque and displacement resistance are dependent on the speed. The following values are based on a speed of v=0.2 m/s.

	ELGA-TB-KF-70	ELGA-TB-KF-80	ELGA-TB-KF-120	ELGA-TB-KF-150
Max. no-load torque with cover strip	0.6 Nm	1.0 Nm	2.8 Nm	4.0 Nm
Max. displacement resistance with cover strip	41.9 N	50.3 N	76.2 N	108.3 N

4.8.2 Start-up

Start-up the repaired toothed belt axis as described in the operating instructions (enclosed with the toothed belt axis or available on the Festo website (➔ www.festo.com).

5 Maintenance

This chapter contains the most important technical information about the maintenance work to be carried out on the toothed belt axis. A precise description of the care and maintenance steps is given in the operating instructions (➔ www.festo.com). Further information on the assembly aids and lubricants is given on the Festo website (➔ Tools and repair equipment.pdf).

5.1 Cleaning and greasing the toothed belt axis

Clean the toothed belt axis if necessary using a soft cloth and a gentle cleaning product.

Lubricants for assembly and maintenance of the toothed belt axis

Application	Designation
Assembly	Festo LUB-KC1[1)]
Maintenance	Festo LUB-KC1[1)]

[1)] See the information brochure "Tools and repair equipment". (➔ Tools and repair equipment.pdf)

5.2 Lubricating the recirculating ball bearing guide

The recirculating ball bearing guide of the roller carriages must be relubricated at certain intervals using a grease gun to apply the grease via the two lubrication nipples on the front of the slide. Relubricate with the same lubricant used to lubricate the roller carriages for delivery.

Type	Lubricant
ELGA-TB-KF (-PU2)	Festo LUB-KC1
ELGA-TB-KF-...-**F1** (PU1 toothed belt)	ELKALUB-VP 874

The roller carriages should be relubricated after 3 years or a corresponding operating distance (load-dependent). To determine the lubrication interval S_{int} the load comparison factor f_v must be calculated using the formula for combined loads, see operating instructions **Toothed belt axis ELGA-TB-G / -KF / -RF** (➔ www.festo.com).

Note

The lubrication interval S_{int} depends on the load acting on the product.

Load factors:

- dusty and contaminated environment
- Nominal stroke > 2000 mm or < 3000 mm
- Speed > 2 m/s
- Travel profile Z triangular operation (frequent acceleration and braking)
- Ambient temperature > 40 °C
- Product's time in operation > 3 years

- If **one** of these factors applies, halve the lubrication interval S_{int}.
- If **several** factors apply at the same time, divide the lubrication interval by four.

Note

The slide must be moved forwards and backwards on the guide rail during lubrication so that the grease penetrates all the spaces in the roller carriages.

The lubricant must always be inserted in **both** lubrication nipples, as the two roller carriages do not have a lubricant connection. Half the quantity of grease (➔ table) is to be inserted in each lubrication nipple, in different slide positions, whose distance apart is equal to twice the slide length.

	ELGA-TB-KF-70	ELGA-TB-KF-80	ELGA-TB-KF-120	ELGA-TB-KF-150
Grease quantity	0.45 g	0.8 g	1.4 g	2.3 g

Festo offers a one-hand, high-pressure grease gun with a suitable pointed nozzle for greasing the lubrication holes. (➔ Chapter 6.2 on page 69)

5.3 Toothed belt pretensioning

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 a normal process and not an indication of wear.**

6 Tools and equipment

This chapter provides an overview of the tools and aids required to repair and maintain the toothed belt axis.

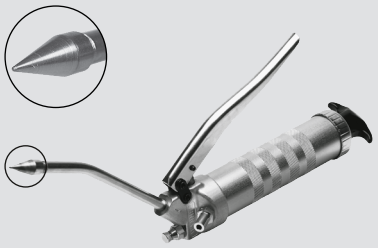
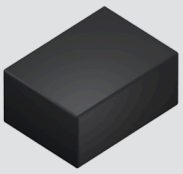
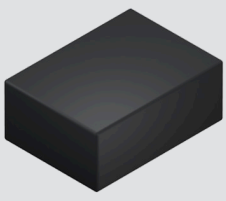
6.1 Standard tools

The following standard tools are required for repair and maintenance of the toothed belt axis:

- Plastic hammer
- Pliers for retaining rings (inner retainer for bore)
- Internal hexagon socket screwdriver (allen key)
- Open-end wrench (for ELGA-TB-KF-...-F1)
- Torque spanner/torque screwdriver
- Screwdriver set
- Thread cutter
- Flat pliers
- Ruler
- Sturdy general purpose scissors or metal shears

6.2 Special tools

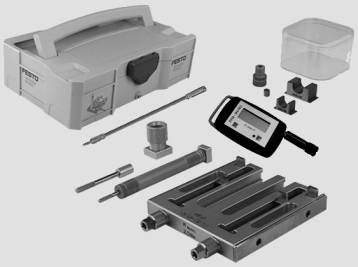
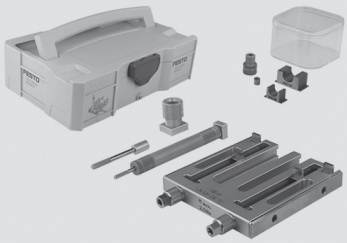
The following special tools are required for repair and maintenance of the toothed belt axis:

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	
Clamping element EADT-S-L5-70	suitable for ELGA-TB-70 / 80-...(-F1)	8058451	
Clamping element EADT-S-L5-120	suitable for ELGA-TB-120-...(-F1) ELGA-TB-150	8058450	

For further information on the fixtures and measuring devices, refer to the **"Tools and repair "** information brochure. It can be found in the online spare parts catalogue on the Festo internet site (➔ Tools and repair equipment.pdf).

6.3 Equipment and measuring devices

The following test devices and measuring devices can be used to check checking the toothed belt pretension:

Designation Order No.	Description	Figure
TB-TE-EQ10	Content: – Test device for checking the toothed belt pretension in the Systainer with foam insert. Suitable for the following toothed belt axes: – DGE-25 / 40 / 63-ZR(-KF) – DGE-25 / 40 / 63-ZR-RF – EGC-50 / 70 / 80 / 120 / 185-TB-KF – EGC-HD-125 / 160 / 220-...-TB-...(-GP) – ELGA-TB-G-70 / 80 / 120 – ELGA-TB-RF / KF-70 / 80 / 120-...(-F1) – ELGA-TB-KF-150 – DGEA-18 / 25 / 40-ZR – Acoustic frequency meter Type TB-TE-EQ13 – Extension cable for acoustic frequency meter TB-TE-EQ13 – Clamping component for DGE-25-ZR-RF – Clamping component for DGE-40-ZR-RF – Round magnet (L = 6 mm) for DGE-63 – Plastic box for small parts The exact procedure for checking the toothed belt pretension can be found in the operating instructions **"Test device for toothed belt pretension TB-TE-EQ12"** (➔ TB-TE-EQ12_en.pdf).	
TB-TE-EQ12	Content: – Test device for checking the toothed belt pretension in the Systainer with foam insert. Suitable for the following toothed belt axes: – DGE-25 / 40 / 63-ZR(-KF) – DGE-25 / 40 / 63-ZR-RF – EGC-50 / 70 / 80 / 120 / 185-TB-KF – EGC-HD-125 / 160 / 220-...-TB-...(-GP) – ELGA-TB-G-70 / 80 / 120 – ELGA-TB-RF / KF-70 / 80 / 120-...(-F1) – ELGA-TB-KF-150 – DGEA-18 / 25 / 40-ZR – Clamping component for DGE-25-ZR-RF – Clamping component for DGE-40-ZR-RF – Round magnet (L = 6 mm) for DGE-63 – Plastic box for small parts The exact procedure for checking the toothed belt pretension can be found in the operating instructions **"Test device for toothed belt pretension TB-TE-EQ12"** (➔ TB-TE-EQ12_en.pdf).	

Designation Order No.	Description	Figure
TB-TE-EQ13	Acoustic frequency meter for measurement with and without a test device. An extension cable that can be installed between the frecuency meter and the acoustic test probe is included in the scope of delivery.	
O-ring 10x1 Order No. 200926	Mounting of the acoustic test probe of the frequency meter TB-TE-EQ13 in the test equipment by means of clamping friction. Included in the scope of delivery of the frequency meter TB-TE-EQ13.	

For further information on the fixtures and measuring devices, refer to the **“Tools and repair equipment”** information brochure. It can be found in the online spare parts catalogue on the Festo internet site (➔ Tools and repair equipment.pdf).

To order the Test device TB-TE-EQ10 / -EQ12, Frequency meter TB-TE-EQ13, please **contact** your **local support**.

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