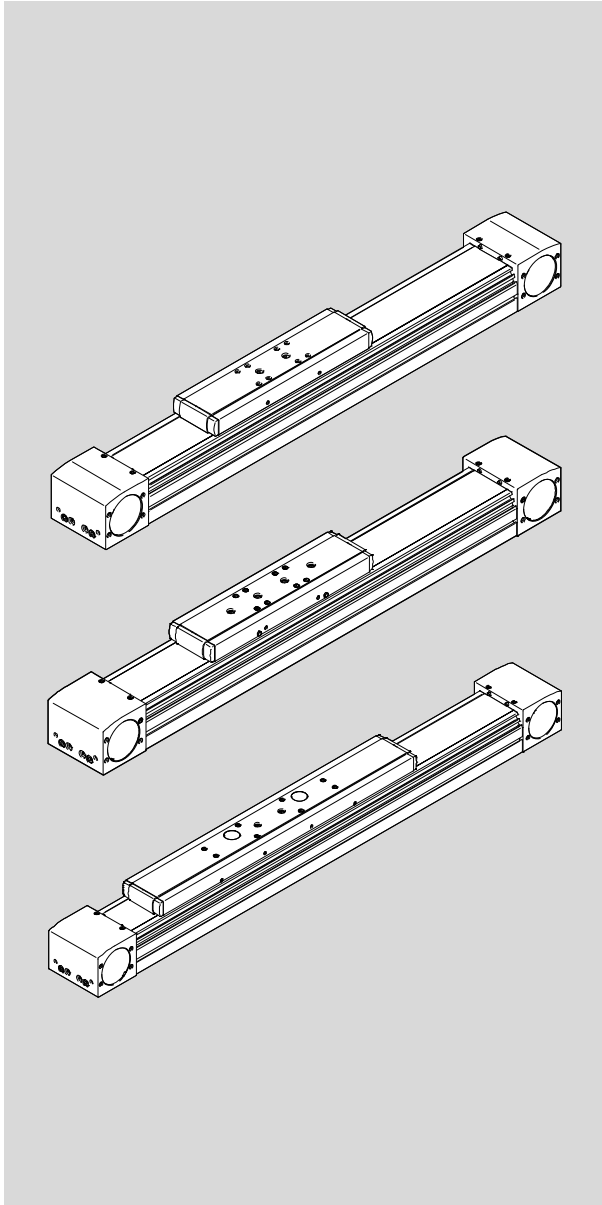


Toothed belt axis

ELGA-TB-G/-KF/-RF



FESTO

en Operating
instructions

8074803
2017-11e
[8074805]

Translation of the original instructions

Symbols:



Warning

Installation and commissioning may only be performed in accordance with these instructions by technicians with appropriate qualifications.



Caution



Note



Environment



Accessories

English – Toothed belt axis ELGA-TB-G/-KF/-RF

Table of contents

1	Configuration	4
2	Safety	7
2.1	Use for intended purpose	7
2.2	General safety information	7
2.3	Mounting and connecting	7
2.4	Training of skilled personnel	7
3	Function	8
4	Transport	8
5	Installation	8
5.1	Mechanical installation	8
5.1.1	Mounting the axis	9
5.1.2	Mount attachment components	10
5.1.3	Mount accessories	12
6	Commissioning	13
7	Maintenance and care	14
8	Disassembly and repair	16
9	Disposal	16
10	Accessories	17
11	Troubleshooting	18
12	Technical data	19
13	Characteristic curves	23

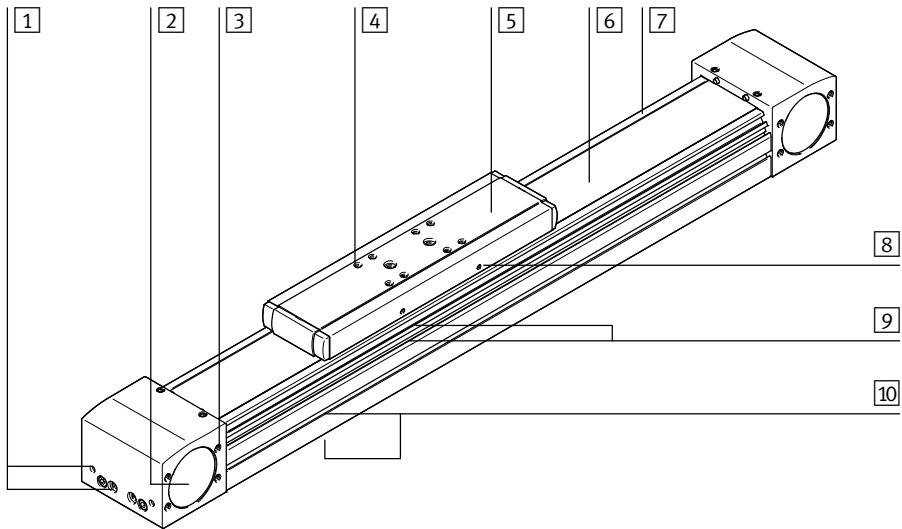
Documentation on the product



For all available product documentation → www.festo.com/pk

1 Configuration

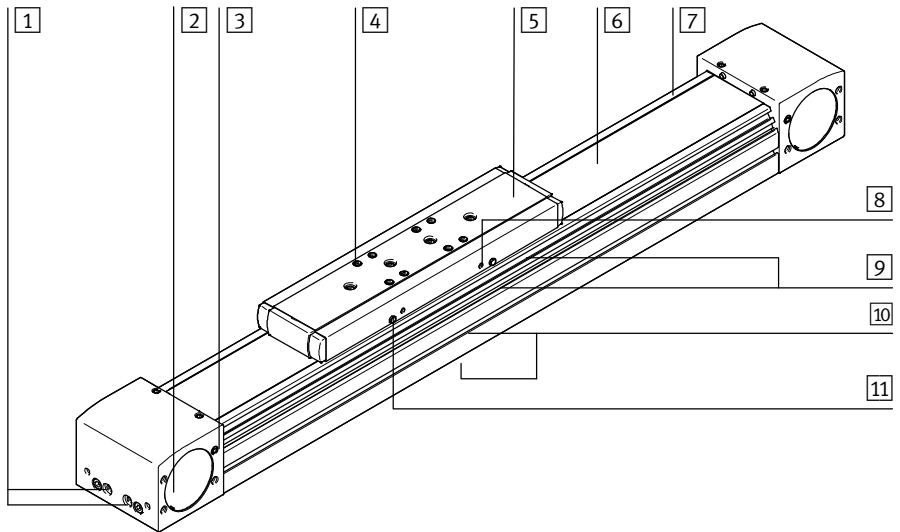
ELGA-TB-G



- | | | | |
|----------|---|-----------|--|
| 1 | Thread/centring holes for foot mounting | 6 | Cover band |
| 2 | Hollow drive shaft (concealed) | 7 | Profile housing with plain-bearing guide |
| 3 | Thread for motor mounting kit | 8 | Thread for switch tab |
| 4 | Thread/centring holes for attachment components | 9 | Slots for proximity sensor |
| 5 | Slide | 10 | Grooves for retaining/accessories |

Fig. 1

ELGA-TB-KF(-F1)



- 1 Thread/centring holes for foot mounting
- 2 Hollow drive shaft (concealed)
- 3 Thread for motor mounting kit
- 4 Thread/centring holes for attachment components
- 5 Slide

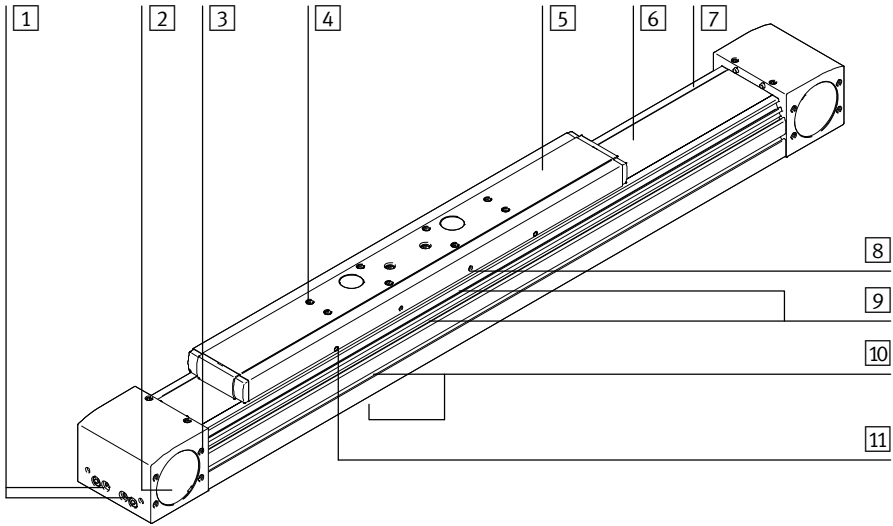
- 6 Cover band
- 7 Profile housing with ball bearing guide
- 8 Thread for switch tab
- 9 Slots for proximity sensor¹⁾
- 10 Grooves for retaining/accessories²⁾
- 11 Grease nipple

1) Not for ELGA-...-F1

2) For ELGA-...-F1, slots only on the underside

Fig. 2

ELGA-TB-RF(-F1)



- 1 Thread/centring holes for foot mounting
- 2 Hollow drive shaft (concealed)
- 3 Thread for motor mounting kit
- 4 Thread/centring holes for attachment components
- 5 Slide

- 6 Cover band
- 7 Profile housing with roller bearing guide
- 8 Thread for switch tab
- 9 Slots for proximity sensor¹⁾
- 10 Grooves for retaining/accessories²⁾
- 11 Relubrication opening

1) Not for ELGA-...-F1

2) For ELGA-...-F1, slots only on the underside

Fig. 3

2 Safety

2.1 Use for intended purpose

The axis is intended to be used for positioning payloads in combination with tools or as a drive when external guides are used.

The axis is approved for the slide operating mode (→ Fig. 4).

The axis is not approved for operating conditions in which vegetable and water-soluble greases or oils can penetrate into the axis.

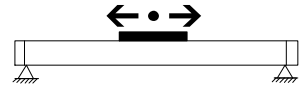


Fig. 4

2.2 General safety information

- Take due account of legislative provisions for each intended location.
- Only use the product if it is in its original status and in an excellent technical status.
- Use the product only within the defined values (→ 12 Technical data and 13 Characteristic curves).
- Take into account labelling on the product.
- Do not make any unauthorised modifications to the product.
- Observe other applicable documents.
- Take into consideration the ambient conditions at the location of use.

Protect product from the following:

- Wetness or moisture
- Corrosive coolant or other materials (e.g. ozone)
- UV radiation
- Oils, greases and grease-solvent vapours
- Grinding dust
- Glowing chips or sparks

2.3 Mounting and connecting

- Observe tightening torques. Unless otherwise specified, the tolerance is $\pm 20\%$.
- For ELGA-TB-...-P0: Check the cavity between the guide and toothed belt for foreign objects and remove these if present.

2.4 Training of skilled personnel

Only qualified personnel may perform installation, commissioning, maintenance and disassembly of the axis. The qualified personnel must be familiar with installation and operation of electrical and pneumatic control systems.

3 Function

The toothed belt on a drive hollow shaft converts the rotation of the motor into a linear motion. As a result, the slide moves backwards and forwards. The carriage is on anti-friction bearings (ELGA-TB-G), ball-guided (ELGA-TB-KF) or roller-guided (ELGA-TB-RF). The reference position of the carriage can be queried with the help of proximity switches (→ 5.1.3 Mount accessories).

4 Transport



Note

Unexpected movement of components. The axis is unbraked and the carriage can move freely.

- Secure slide during transport.

- Take product weight into account (→ 12 Technical data).
- Comply with maximum permitted support spacing when attaching transportation aids (→ 13 Characteristic curves).

5 Installation

5.1 Mechanical installation

Prerequisites

- Do not modify the screws and threaded pins.
Exception: immediate requirement for change in these operating instructions
- Select the motor and motor attachment kit from the Festo catalogue (→ www.festo.com/catalogue).
When using other motors, observe the limit values for forces, torques and speeds (→ 12 Technical data).
- When mounting the motor: Follow the assembly instructions for the mounting attachment kit.
- Connect motor cables only after the axis is mounted.
- Assembly of the motor: Removed threaded dowel from thread on assembly side 3 (→ Fig. 2).

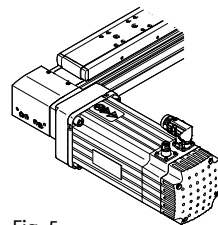


Fig. 5



Note

The reference position is lost when the motor is dismantled (e.g. when turning the motor around).

- Start homing (→ 6 Commissioning).

Mounting position vertical or diagonal



WARNING

Uncontrolled payload if there is a power failure or the toothed belt breaks.

Injury due to impacts or pinching.

With vertical or diagonal mounting position:

- Use motors with spring-loaded holding brakes.
- Take appropriate precautionary measures against damage resulting from belt failure (e.g. toothed pawls, pins or emergency buffers).

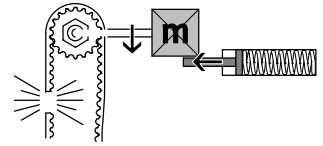


Fig. 6

5.1.1 Mounting the axis

Prerequisites

- Position the product in such a way that its control sections are accessible (e.g. relubrication openings).
- Install product without tension or distortions.
- Fasten product to a mounting surface with flatness of 0.05 % of the stroke length, but max. 0.5 mm.
- In the case of gantry structures, attention must also be paid to parallel alignment or product height in the alignment of the axes. Further requests contact your local Festo Service centre.
- Take the required support clearances into consideration (→ 13 Characteristic curves).

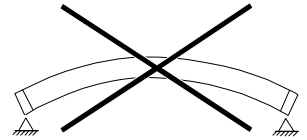
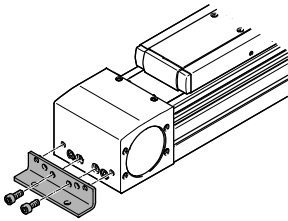


Fig. 7

Interfaces for mounting components

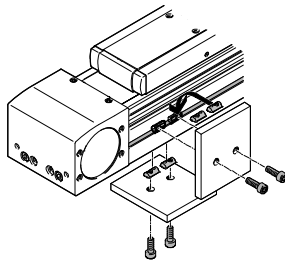
On the cover

e.g. with foot mounting HPE¹⁾



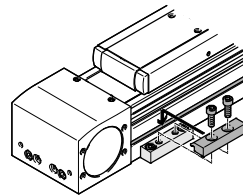
On the profile

e.g. with slot nuts NST¹⁾



On the profile

e.g. with profile mounting MUE¹⁾



1) → www.festo.com/catalogue

Fig. 8



Note

Danger of screws being pulled out, if the axis is only mounted to the covers and the torque load around the longitudinal axis is too great.

- If there is high loading, mount the axis on the profile with additional mounting components.

- Select mounting components or accessories (→ www.festo.com/catalogue).
- Mount the mounting components outside the positioning range (avoid collisions).
- Tighten screw down firmly on cover.

Size	70	80	120/150	
Screw (cover)	M5	M5	M6	M8
tightening torque [Nm]	5.9	5.9	9.9	24

Tab. 1

- In the case of mounting accessories, comply with the tightening torque specified in the associated product information.

5.1.2 Mount attachment components

Prerequisites



Note

A warped attachment component bends the slide and shortens the service life of the guide.

- Use an attachment component with an even surface.

Flatness:

- ELGA-TB-G: t = 0.03 mm
- ELGA-TB-KF: t = 0.01 mm
- ELGA-TB-RF: t = 0.01 mm.

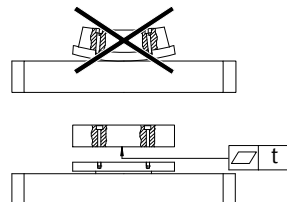


Fig. 9

- Set down nominal load in such a way that the tilt moment resulting from force F (parallel to the axis of movement) and lever arm are kept as small as possible.

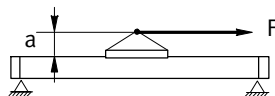


Fig. 10

- Avoid collisions of tool and payload with attachments.

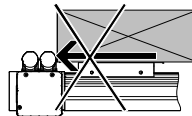


Fig. 11

For attachment components with their own guide:

- Adjust the guides of the tool and axis so that they are exactly parallel, or use a connection that permits tolerance compensation. In this way, you will avoid overloading the guide.

Mounting

- Fasten the attachment to the slide with screws and centring sleeves.
- Maintain maximum screw-in depth D and tightening torque (→ Tab. 2).

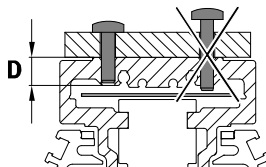


Fig. 12

Size		70	80		120		150	
Screw		M5	M5	M6	M5	M6	M6	M8
tightening torque	[Nm]	5.9	5.9	9.9	5.9	9.9	9.9	24
Max. screw-in depth D	[mm]	7.5	9.5		12.5		14	
Centring H7	G, KF [mm]	ø 5		ø 9				
	KF, RF [mm]	ø 9						

Tab. 2

5.1.3 Mount accessories

To protect the end positions against uncontrolled excess travel:

- Check the necessity of proximity sensors (hardware limit switches).

If proximity sensors are used as limit switches:

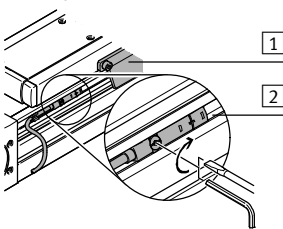
- Preferably use proximity sensors with normally-closed function.
This protects against excess travel beyond the end position, if the proximity sensor cable is broken.

If proximity switches are used as reference switches:

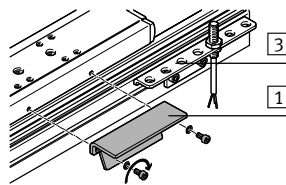
- Use proximity sensors that correspond to the input of the controller being used.
- Use proximity sensors with switch lug (→ Assembly instructions of the accessory).

Mounting options of the proximity sensor

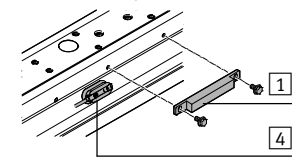
in the grooves¹⁾²⁾



with sensor bracket¹⁾



with mounting kit³⁾



- 1 Switch lug
- 2 Slot for proximity sensor

- 3 Sensor bracket
- 4 Mounting kit

- 1) Not for ELGA-...-F1
- 2) When ELGA-TB-KF-M1/M2 securing the switch tab / proximity switch, this is only possible on the side opposite the measuring system.
- 3) only with ELGA-...-F1

Fig. 13

- Avoid external influences from magnetic or ferritic parts in the vicinity of the proximity sensors (minimum distance of 10 mm from the slot nuts).
- Use groove covers on all unused grooves to prevent contamination (→ www.festo.com/catalogue).

Connection option for sealing air

- Connect sealing air. For this, remove threaded dowel (5) → Fig. 14) from drive cover and connect up compressed air / vacuum extraction. For additional protection, use other sealing air connections. This is possible on both drive covers on both sides.

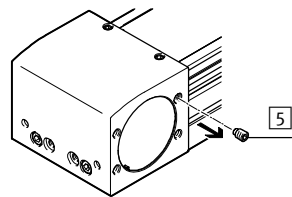


Fig. 14

6 Commissioning



WARNING

Unexpected movement of components.
Injury due to impacts or pinching.

- Protect movement area from interventions (e.g. with protective grille).
- Ensure that no foreign objects are in the movement area.
- Carry out commissioning with low speeds and torques.

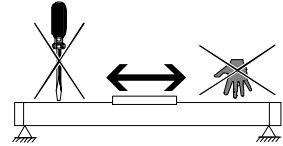


Fig. 15



Note

The toothed-belt elasticity changes acceleration of the axis through the spring effect. This might result in deviations from the acceleration set at the controller.

- Take deviations into account accordingly.

Procedure	Purpose	Note
1. Check travel	Determining the approach direction of the motor	Even with identical control, motors of the same design can turn in the opposite direction due to different wiring.
2. Homing to reference switch	Comparison of real situation against the image of the control unit	The homing run may only be performed towards the reference switch (→ Operating instructions of the drive system).
3. Test run	Checking the overall behaviour	Check the following requirements: <ul style="list-style-type: none"> – The slide moves through the intended positioning cycle completely. – Slide stops as soon as a limit switch is reached. After a successful test run, the axis is ready for operation.

Tab. 3

7 Maintenance and care



WARNING

Unexpected movement of components.
Injury due to impacts or pinching.

- When working on the axis, switch off the controller and secure it to prevent it from being switched back on unintentionally.

- For ELGA-TB-...-P0: Check the cavity between the guide and toothed belt for foreign objects and remove these if present.
- Clean the axis as required with a soft cloth. Do not use aggressive cleaning agents.

Checking toothed belt with ELGA-...-F1



WARNING

Uncontrolled payload if the toothed belt breaks.
Injury due to impacts or pinching.

- Check the toothed belt for wear (e.g. toothed-belt friction) after 1000 km of operating distance and then after every 500 km of operating distance.
- If there are signs of toothed belt wear, send the axis to Festo or contact Festo service (→ 8 Disassembly and repair).



Note

Retensioning shortens the service life of the toothed belt.

- Do not retension toothed belt.

Checking cover band

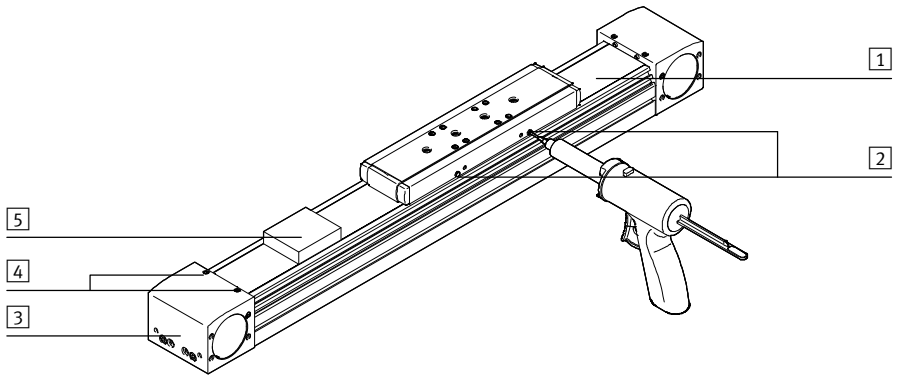
- Check the cover band after every 2000 km of operating distance.
Waves on the cover band are a sign for wear of the band reverser.
- Whenever waves form, retighten cover band on both sides:
 1. Unfasten threaded dowels (→ Fig. 16).
 2. Push the cover band into the cover. The cover band must not make contact with the inside top surface of the carriage.
 3. Tighten cover band with a tensioning element 5 (→ Fig. 16).
 4. Tighten down the threaded dowels (tightening torque: 2 Nm).

If the cover band can no longer be retensioned:

- Replace band reversal points and cover band (→ www.festo.com/spareparts).

Lubricating the guide (ELGA-TB-KF/-RF)

Lubrication of the ELGA-TB-G axis with plain-bearing guide is not necessary.



- | | |
|--|--|
| <p>1 Cover band</p> <p>2 Relubrication openings</p> <p>3 Cover</p> | <p>4 Threaded pin</p> <p>5 Tensioning element (→ 10 Accessories)</p> |
|--|--|

Fig. 16

1. Calculate load comparison factor f_v with the help of the formula for combined loads (→ 12 Technical data).
2. Read off lube interval S_{int} (→ Fig. 17).

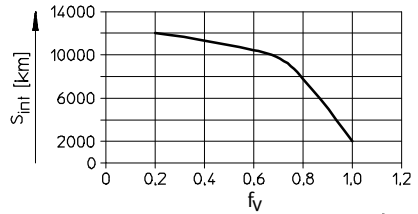


Fig. 17



Note

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

Load factors:

- Dusty and dirty environment
 - Nominal stroke > 2000 mm or < 300 mm
 - Speed > 2 m/s
 - Travel profile $\hat{=}$ triangular operation (frequent acceleration and braking)
 - Ambient temperature > +40 °C
 - Service age of product > 3 years
- If **one** of these factors is present, half the lube interval S_{int} .
 - If **several** of these factors are present at the same time, divide the lube interval by four.

3. Oil or grease the guide at all relubrication openings (→ Fig. 16).
Accessories and permitted lubricant (→ 10 Accessories).

Amount of lubricant at each relubrication opening:

Size		70	80	120	150
Amount of lubricant					
Grease for ELGA-KF	[g]	0.4	0.8	2.0	3.4
Oil for ELGA-RF	[ml]	1.0 ... 1.5	1.5 ... 2.5	2.5 ... 4.5	–

Tab. 4

8 Disassembly and repair



WARNING

Unexpected movement of components.

Injury due to impacts or pinching.

- When working on the axis, switch off the control unit and secure it to prevent it from being switched back on accidentally.
- Observe notes on transport (→ 4 Transport).

If repairs are required:

- Send axis to Festo or contact your local Festo service centre (→ www.festo.com).
- Festo carries out the required repairs, fine adjustments and checks.
- Information about spare parts and accessories (→ www.festo.com/spareparts).

9 Disposal

- At the end of the product service life, package up and send the axis away for environmentally appropriate disposal.

10 Accessories

→ www.festo.com/catalogue

Maintenance accessories:

Description	Part number/type
ELGA-TB-KF(-F1)	
Grease gun with needle-pointed nozzle	647958/LUB-1 ¹⁾
Nozzle pipe, axial outlet port	647959/LUB-1-TR-1 ¹⁾
Nozzle pipe, radial outlet port	647960/LUB-1-TR-L ¹⁾
Roller bearing grease, ELGA-TB-KF	LUB-KC1 from Festo ¹⁾
Rolling bearing grease, ELGA-TB-KF-F1	Elkalub VP 874, Chemie-Technik Co., Vöhringen
ELGA-TB-RF(-F1)	
Oil gun	8041022/AZTP-S-L ¹⁾
Oil cartridge	8041024/AZLO-H1-C-10 ¹⁾
Oil, ELGA-TB-RF(-F1)	Elkalub VP 916, Chemie-Technik Co., Vöhringen

1) (→ Spare parts catalogue at www.festo.com/spareparts)

Tab. 5

11 Troubleshooting

Malfunction	Possible cause	Remedy
Squeaking noises, vibrations or the axis is not running smoothly.	Coupling spacing is wrong.	Comply with permissible coupling distances (→ Assembly instructions, motor mounting kit).
	Tensions	Install axis without tension, Observe evenness of bearing surface (→ 5.1 Mechanical installation).
		Change arrangement of the tool/payload.
		Align axis so it is exactly parallel to the second axis.
		Change travel speed.
	Controller is set incorrectly.	Change parameters.
	Insufficient lubrication at guide.	Lubricate axis (→ 7 Maintenance and care).
	Guide unit is defective.	Send axis to Festo or contact the local Festo service.
Wear on toothed belt/guide or belt reversal point.		
Slide does not move.	Coupling spins.	Check mounting of motor attachment kit (→ Assembly instructions, motor attachment kit).
	Load levels are too high.	Reduce load mass/torques.
	Retaining screws on tool are too long.	Observe max. screw-in depth (→ 5.1.2 Mount attachment components).
Slide travels over end position.	Proximity switch does not switch.	Check proximity switch, connections and controller.
Toothed belt jumps off.	Toothed belt tension is too low.	Send axis to Festo or contact the local Festo service.
	Controller is set incorrectly.	Change parameters.
Cover band has waves.	Wear on band diverter.	Retension cover band (→ 7 Maintenance and care).
Aluminium wear on axis.		Replace belt reversal point and cover band (→ www.festo.com/spareparts).
Toothed belt wear.	Wear	Send axis to Festo or contact the local Festo service.
Oil leak between profile housing and cover.	Suction oil container on ELGA-TB-RF is full.	Replace oil container.

Tab. 6

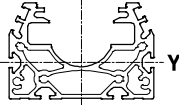
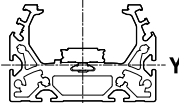
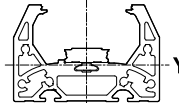
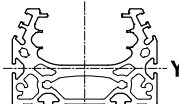
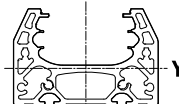
12 Technical data

Size ¹⁾		70	80	120	150
Design		Electromechanical axis with toothed belt			
Guidance	G	Plain bearing			–
	KF	Recirculating ball bearing			
	rec.	Roller bearing			–
Assembly position		any			
Max. feed force F_v	G/RF [N]	350	800	1300	–
	KF [N]	350	800	1300	2000
	KF-F1 [N]	260	600	1000	–
	RF-F1 [N]	260	600	1000	–
Max. driving torque	G/RF [Nm]	5	15.9	34.1	–
	KF [Nm]	5	15.9	34.1	73.9
	KF-F1 [Nm]	3.7	11.9	26.2	–
	RF-F1 [Nm]	3.7	11.9	26.2	–
Max. no-load driving torque ²⁾	G [Nm]	0.5	1	3	–
	KF [Nm]	0.6	1	2.8	4
	KF-F1 [Nm]	0.8	1.5	3.5	–
	rec. [Nm]	0.66	1.35	3	–
	RF-F1 [Nm]	1.03	1.93	5.67	–
Max. speed	G [m/s]	5			–
	KF [m/s]	5			
	RF [m/s]	10			–
Max. acceleration	[m/s ²]	50			
Repetition accuracy	[mm]	±0.08			
Feed constant	[mm/rev]	90	125	165	232
Ambient temperature	[°C]	–10 ... +60			
Degree of protection	P0	IP00			
	–	IP40			

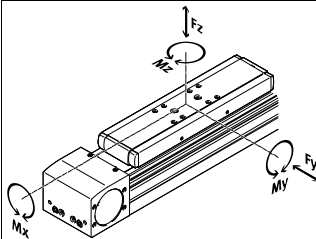
1) The PositioningDrives engineering software is available for sizing (→ www.festo.com/sp).

2) Measured at a speed of 0.2 m/s (with cover band)

Tab. 7

Size			70	80	120	150
2nd moment of area	G					
	KF					
	rec.					
I_y	G	[mm ⁴]	147 x 10 ³	277 x 10 ³	1230 x 10 ³	–
	KF	[mm ⁴]	146 x 10 ³	257 x 10 ³	1260 x 10 ³	4620 x 10 ³
	KF-F1	[mm ⁴]	169 x 10 ³	295 x 10 ³	1350 x 10 ³	–
	rec.	[mm ⁴]	139 x 10 ³	270 x 10 ³	1420 x 10 ³	–
	RF-F1	[mm ⁴]	148 x 10 ³	276 x 10 ³	1320 x 10 ³	–
I_z	G	[mm ⁴]	425 x 10 ³	907 x 10 ³	4030 x 10 ³	–
	KF	[mm ⁴]	459 x 10 ³	914 x 10 ³	4370 x 10 ³	12320 x 10 ³
	KF-F1	[mm ⁴]	484 x 10 ³	978 x 10 ³	4510 x 10 ³	–
	rec.	[mm ⁴]	433 x 10 ³	1020 x 10 ³	5020 x 10 ³	–
	RF-F1	[mm ⁴]	452 x 10 ³	1000 x 10 ³	4740 x 10 ³	–

Tab. 8

Size				70	80	120	150
Max. perm. forces							
F _y	G	[N]	80	200	380	-	
F _z	G	[N]	400	800	1600	-	
F _y	KF(-F1)	[N]	1500	2500	5500	11000	
F _z	KF(-F1)	[N]	1850	3050	6890	11000	
F _y = F _z	rec.	[N]	500	800	2000	-	
F _y = F _z	RF-F1	[N]	400	640	1600	-	
Max. perm. moments							
M _x	G	[Nm]	5	10	20	-	
M _y	G	[Nm]	30	60	120	-	
M _z	G	[Nm]	10	20	40	-	
M _x	KF(-F1)	[Nm]	16	36	104	167	
M _y = M _z	KF(-F1)	[Nm]	132	228	680	1150	
M _x ³⁾	RF(-L)	[Nm]	11 (11)	30 (30)	100 (100)	-	
M _y = M _z ³⁾	RF(-L)	[Nm]	20 (40)	90 (180)	320 (640)	-	
M _x ³⁾	RF-F1(-L)	[Nm]	8.8 (8.8)	24 (24)	80 (80)	-	
M _y = M _z ³⁾	RF-F1(-L)	[Nm]	16 (32)	72 (144)	256 (512)	-	
			Determination of the load compensation factor for combined loads:				
			$fv = \frac{ M_x }{M_{x_{max}}} + \frac{ M_y }{M_{y_{max}}} + \frac{ M_z }{M_{z_{max}}} + \frac{ F_y }{F_{y_{max}}} + \frac{ F_z }{F_{z_{max}}} \leq 1$				

3) Data for RF-...-S conform to RF data.

Tab. 9

Size			70	80	120	150
Note on materials			LABS ⁴⁾ -containing substances			
Materials						
Cover, profile, slide			Anodised aluminium			
Guidance		G	Anodised aluminium, POM			–
		KF, RF	Steel			
Pulley, clamping body, screws, ball bearing, track rollers, cover band			Steel			
Covers			PA, POM, PE, steel			
Band reverser			POM			–
Toothed belt			CR (glass-fibre reinforced)			
		KF-F1, RF-F1	PUR			–
Cushioning boss			Nitrile rubber			
Sealing disc			POM			
Weight (standard slide, with cover band)						
Zero stroke length	G	[kg]	2.16	4	11.8	–
Per metre of stroke	G	[kg]	2.64	3.56	7.45	
Zero stroke length	KF	[kg]	2.97	4.7	15.7	32.83
Per metre of stroke	KF	[kg]	3.94	5.13	10.6	17.22
Zero stroke length	rec.	[kg]	2.78	6.25	17.4	–
Per metre of stroke	RF	[kg]	3.29	5.17	10.8	

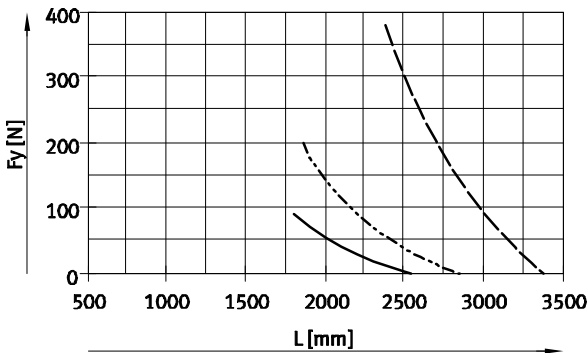
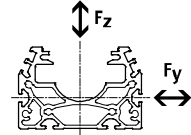
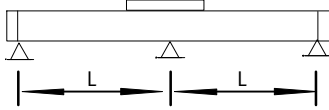
4) PWIS = paint-wetting impairment substances

Tab. 10

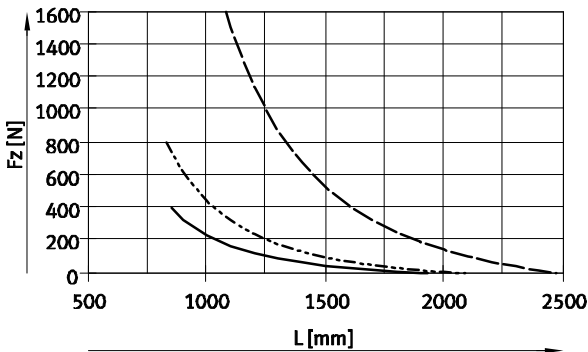
13 Characteristic curves

ELGA-TB-G

Force F_y/F_z and support spacing L at a maximum deflection of 0.5 mm



— ELGA-TB-G-70
 - - - ELGA-TB-G-80
 - · - ELGA-TB-G-120

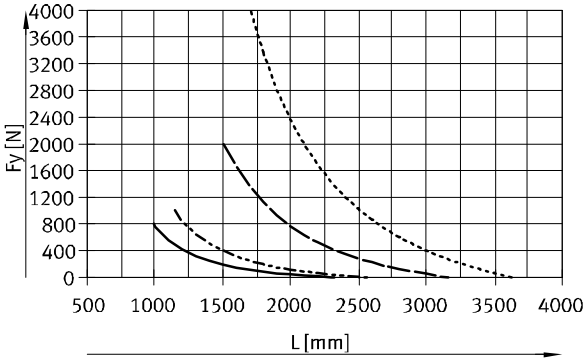
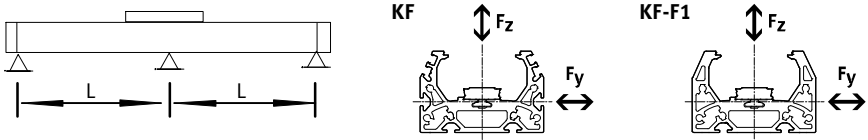


— ELGA-TB-G-70
 - - - ELGA-TB-G-80
 - · - ELGA-TB-G-120

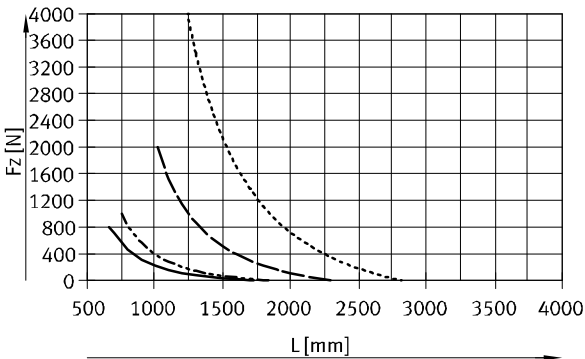
Fig. 18

ELGA-TB-KF(-F1)

Force F_y/F_z and support spacing L at a maximum deflection of 0.5 mm



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

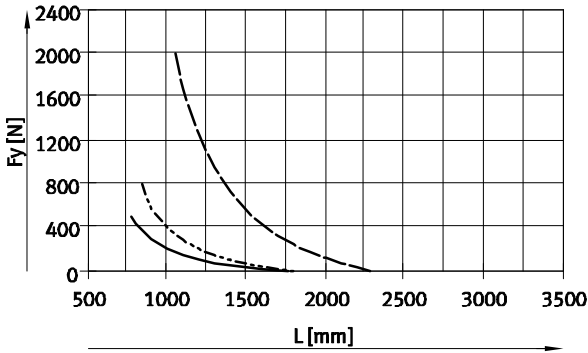
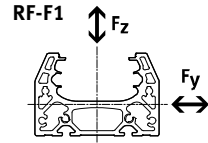
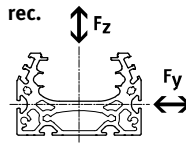
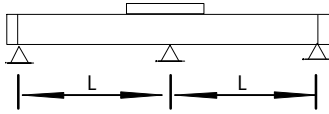


- ELGA-TB-KF-70
- - - ELGA-TB-KF-80
- · - ELGA-TB-KF-120
- · · ELGA-TB-KF-150

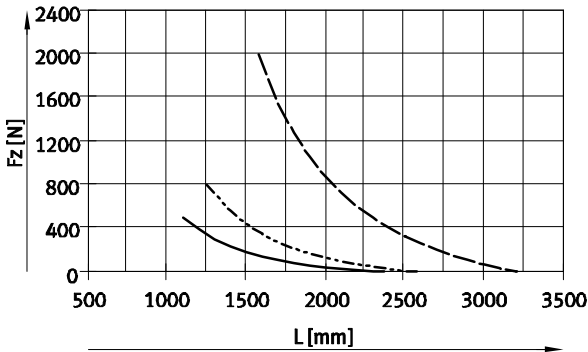
Fig. 19

ELGA-TB-RF(-F1)

Force F_y/F_z and support spacing L at a maximum deflection of 0.5 mm



- ELGA-TB-RF-70
- - - ELGA-TB-RF-80
- · - ELGA-TB-RF-120



- ELGA-TB-RF-70
- - - ELGA-TB-RF-80
- · - ELGA-TB-RF-120

Fig. 20

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