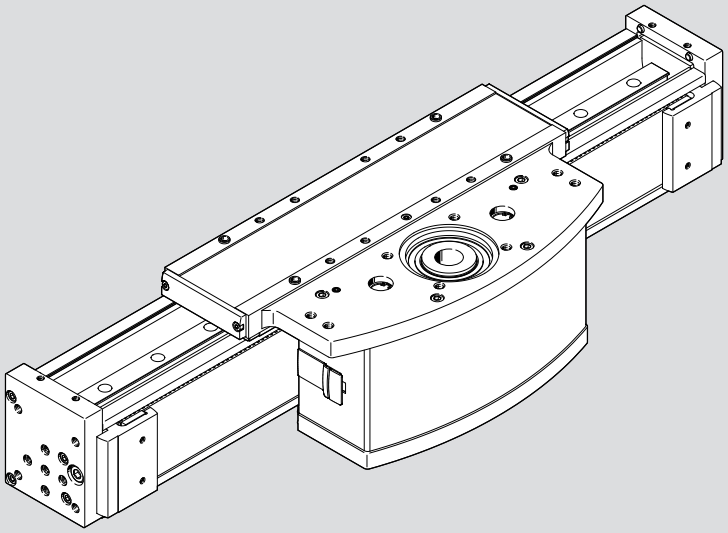
ELCC-TB
Cantilever axis



FESTO

Operating instruction

8221445

8221445
2024-08d
[8221447]

Original instructions

Table of contents

1 Applicable documents

All available documents for the product ➔ www.festo.com/sp.

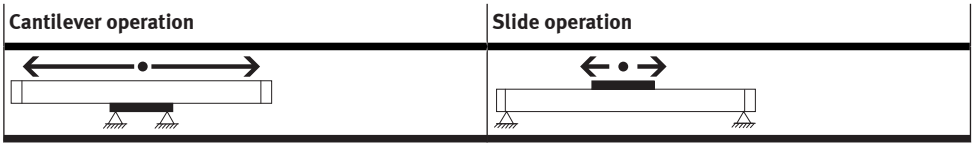
2 Safety

2.1 Safety instructions

- Observe the identifications on the product.
- Only use the product if it is in perfect technical condition.
- Before working on the product: Switch off the power supply, ensure that it is off and secure it against being switched on again.
- Store the product in a cool, dry environment protected from UV and corrosion. Keep storage times short.
- Store the product in ambient conditions without oils, greases and grease-dissolving vapours.

2.2 Intended use

The axis positions payloads or moves external guides.
The optional clamping unit holds payloads in all mounting positions.
The axis is approved for cantilever operation and slide operation.



Tab. 1: Modes of Operations

2.3 Training of qualified personnel

Work on the product may only be carried out by qualified personnel who can evaluate the work and detect dangers. The qualified personnel have knowledge and experience in dealing with electric drive systems.

3 Additional information

- Contact the regional Festo contact if you have technical problems ➔ www.festo.com.
- Accessories and spare parts ➔ www.festo.com/catalogue.

4 Product overview

4.1 Product design

Product design ELCC-TB

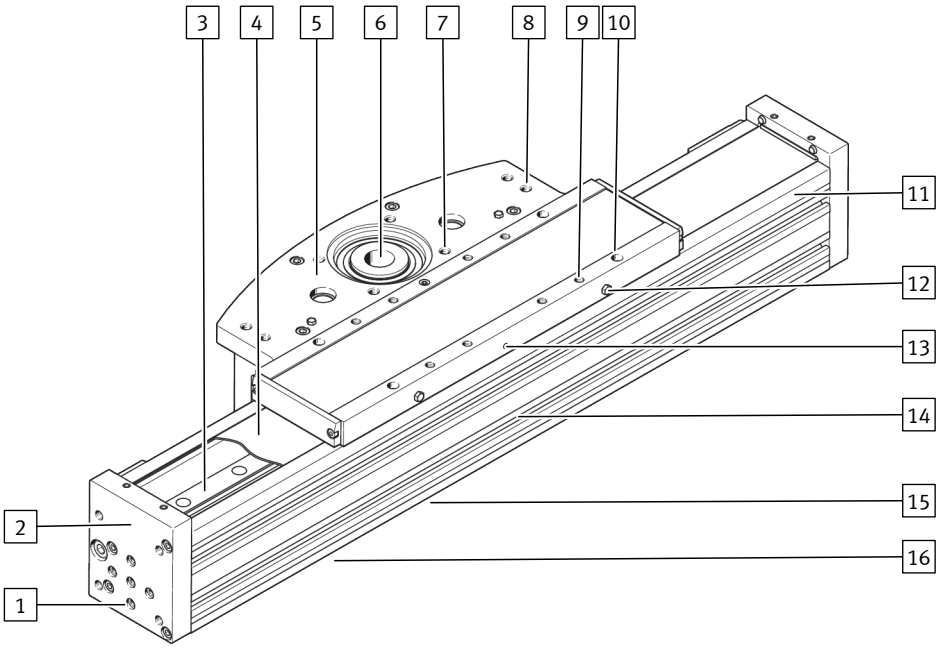


Fig. 1: Product design ELCC-TB

1 Threaded hole and centring hole for payload
2 End cap
3 Guide rail
4 Cover strip
5 Drive head
6 Hollow drive shaft
7 Threaded hole for motor mounting kit
8 Threaded hole for shock absorber stop
9 Threaded hole for direct fastening or threaded hole and centring hole for payload
10 Threaded hole and centring hole for direct fastening or payload
11 Cantilever profile
12 Guide lubrication point
13 Threaded hole for clamping unit connection or sealing air connection
14 Slot for slot nut
15 Threaded hole for sensor bracket
16 Slot for slot nut, payload and switch lug

4.2 Function

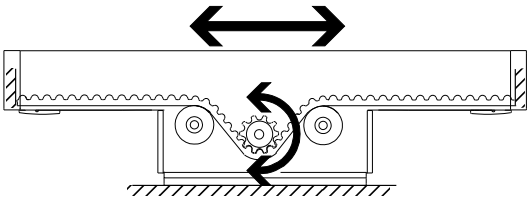


Fig. 2: Functional principle of toothed belt drive with fixed toothed belt

The axis converts the rotary motion of the mounted motor into a linear motion of the cantilever or slide. The toothed belt drive converts the torque of the motor to a feed force. The linear movement of the cantilever or slide is accurately guided by the guide.
Optional features:

The integrated cover strip reduces the release of abraded particles in the immediate vicinity of the drive. The clamping unit is used for holding loads at standstill or for emergency braking in the event of a power failure. The pre-tensioned springs are applied and the clamping is closed in the de-energised state. The clamping is released by pressurisation. Sensors and displacement encoder enable the sensing of end positions or position.

5 Transport

- Store and transport the product in its original packaging. Observe the weight, the dimensions and the ambient conditions.
- Take the centre of gravity of the product into consideration.
- Store and transport the product in a horizontal position.

6 Mounting

6.1 Safety

⚠ WARNING

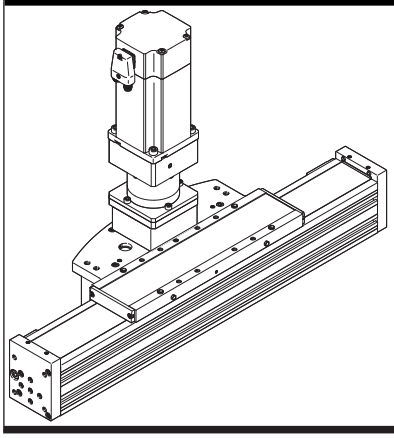
Risk of Injury due to Unexpected Movement of Components

For vertical or slanted mounting position: when power is off, moving parts can travel or fall uncontrolled into the lower end position.

- Bring moving parts of the product into a safe end position or secure them against falling.

6.2 Mounting motor

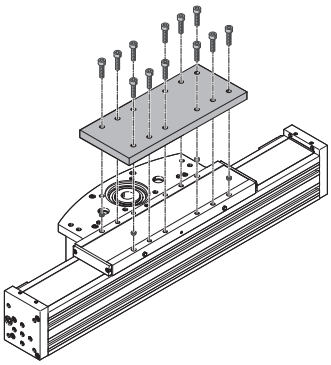
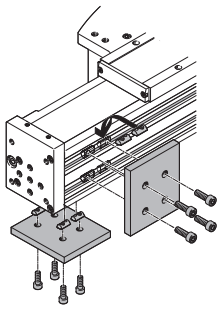
Observe the limit values for forces, torques and speeds if a non-recommended motor and motor mounting kit are used.

Axial kit EAMM-A


Tab. 2: Overview of mounting motors

- Mount the motor and motor mounting kit without tension.

6.3 Mounting axis

Cantilever operation	Slide operation
Direct fastening on slide	Slot nut NST
	

Tab. 3: Overview of mounting components

Requirements:
- Adequate clearance for payload to avoid collisions with motor, mounting components and sensor components.
- Sufficient space for maintenance work.
- A mounting surface flatness of 0.01 mm above the slide surface.

1. Place the mounting components on the support points.
2. Tighten the screws. Observe the maximum tightening torque and maximum screw-in depth.

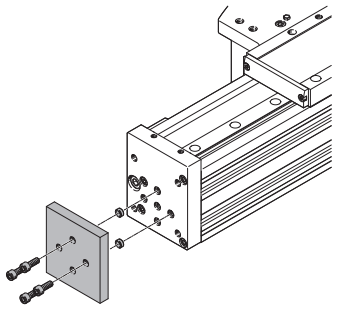
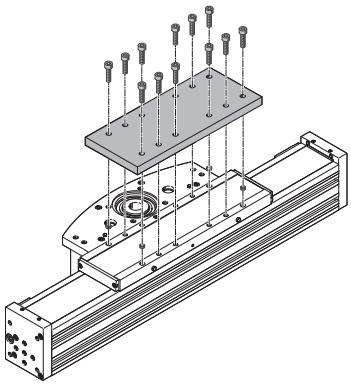
When used in multi-axis systems: align to the first axis and install without tension.

ELCC-TB-...		-60	-70	-90	-110
Direct fastening on slide					
Thread		M5	M5	M6	M6
Max. tightening torque	[Nm]	6	6	10	24
Max. screw-in depth t_{max}	[mm]	10	10	12	16.2
Centring element	[mm]	∅ 5 H7	∅ 9 H7	∅ 9 H7	∅ 12 H7
Slot nut NST					
Thread		M5	M5	M6	M6
Max. screw-in depth t_{max}	[mm]	6	6	12	12

6.4 Mounting payload on the standard slide

⚠ WARNING

Risk of Injury due to Unexpected Movement of Components
For vertical or slanted mounting position: when power is off, moving parts can travel or fall uncontrolled into the lower end position.
- Bring moving parts of the product into a safe end position or secure them against falling.

Cantilever operation	Slide operation
Direct fastening on end cap	Direct fastening on slide
	

Tab. 4: Mounting payload overview

Requirements:
- Adequate clearance for payload movement to avoid collisions with motor, mounting components and sensor components.
- Sufficient space for maintenance work.
- A payload mounting surface flatness of 0.01 mm above the slide surface.
- Minimise the guide load. Short lever arms from the guide centre to the force application points and centres of gravity of the payload.

1. Place centring components in the centring holes.
2. Position the payload at the specified location.
   - For cantilever operation position the payload on the end cap or place it on the profile.
   - For slide operation position the payload on the slide. In the delivery status the centring elements are placed in centring holes.
3. Tighten the screws. Observe the maximum tightening torque and maximum screw-in depth.

ELCC-TB-...	-60	-70	-90	-110
Direct fastening on end cap				
Thread, inside/outside	M4	M4/M5/M6	M6/M8	M6/M8
Max. tightening torque, inside/outside [Nm]	3	3/6/10	10/18	10/18
Max. screw-in depth t_{max}, inside/outside [mm]	14	14/15/18	18	18
Centring element, inside/outside [mm]	∅ 7 H7	∅ 7 H7/∅ 9 H7	∅ 9 H7	∅ 9 H7
Direct fastening on slide				
Thread	→ 6.3 Mounting axis			

6.5 Mounting payload on the additional slide

⚠ WARNING

Risk of Injury due to Unexpected Movement of Components

For vertical or slanted mounting position: when power is off, moving parts can travel or fall uncontrolled into the lower end position.

- Bring moving parts of the product into a safe end position or secure them against falling.

- When using an additional external guide, ensure that the axes and guide are precisely parallel and aligned.
- Recommendation: use guide mountings with tolerance compensation.

Tension due to manufacturing tolerances may be encountered with axes with additional slides when mounting an adapter plate supplied by the customer.

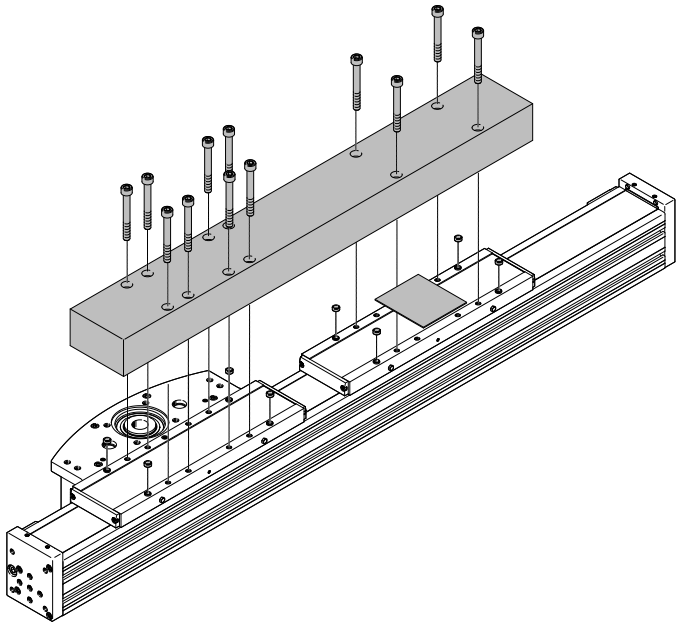


Fig. 3: Mounting payload, example "top mounting"

Requirements:
– A fixed-floating bearing for the slide connection.
– Apply a tolerance compensation in case of height deviation from the standard slide surface.
– Adequate clearance for payload movement to avoid collisions with motor, mounting components and sensor components.
– Sufficient space for maintenance work.
– A payload mounting surface flatness of 0.01 mm above the slide surfaces.
– Minimise the guide load. Short lever arms from the guide centre to the force application points and centres of gravity of the payload.

1. Place centring components in the centring holes.
2. Mount the adapter plate on the standard slide.
3. Place the tolerance compensation elements on the additional slide.
4. Align and mount the adapter plate on the additional slide.
5. Tighten the screws. Observe the maximum tightening torque and the maximum screw-in depth ➔ 6.3 Mounting axis.
6. Check the running behaviour of the slides.

6.6 Mounting end position protection

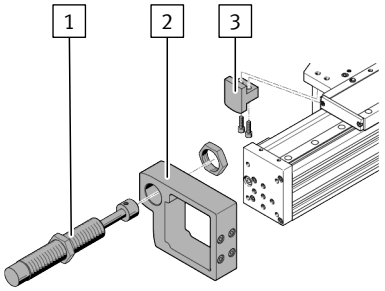


Fig. 4: Mounting shock absorber stop, shock absorber retainer and shock absorber

1 Shock absorber
2 Shock absorber retainer
3 Shock absorber stop

1. Mount the shock absorber stop.
2. Mount the shock absorber retainer.
3. Mount the shock absorber.

6.7 Mounting sensor

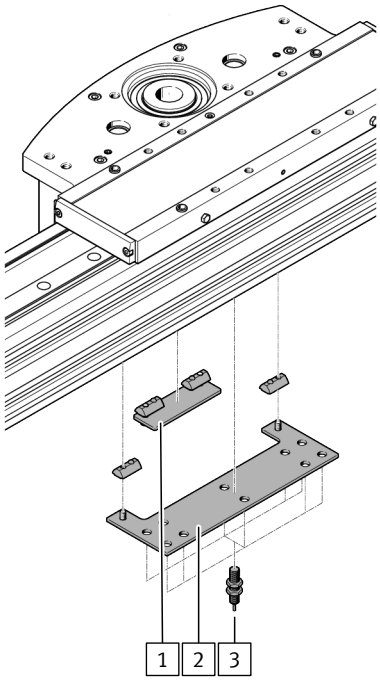


Fig. 5: Mounting switch lug, sensor and sensor bracket

1 Switch lug
2 Sensor bracket
3 Sensor

Requirements:
- Protect the sensor from external magnetic or ferritic influences with min. 10 mm distance from slot nuts.
- Use a hardware limit switch with N/C contact function to guarantee protection in the event of a sensor failure.
- Use an inductive sensor.

1. Mount the switch lug.
2. If necessary, mount the sensor bracket.
3. Mount the sensor.
4. If necessary, fasten the cable with clips.
5. If necessary, mount the slot cover.

6.8 Connecting sealing air or clamping unit

The supply ports of the axis can be used as follows, depending on the product variant:
- Sealing air connection: for axes with strip cover ELCC-...-70/90/110-...-P9.
- Clamping unit connection: for axes with attached clamping unit ELCC-...-70/90/110-...-C.

The use of sealing air at approx. ± 0.02 MPa (± 0.2 bar, ± 2.9 psi) reduces or prevents the following contamination:
- The application of negative pressure minimises the release of abraded particles into the environment.
- The application of overpressure reduces the penetration of dirt into the drive train.

Always use Loctite 222 to seal an open compressed air connection.

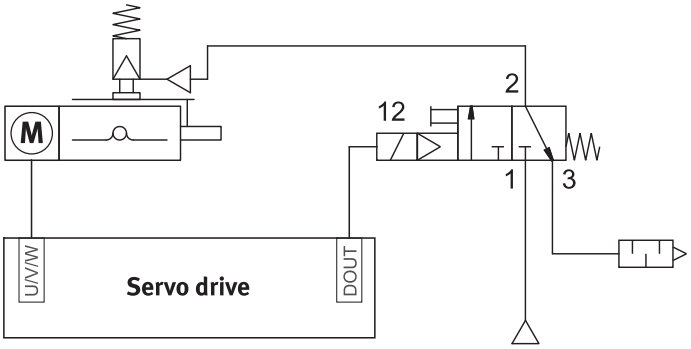


Fig. 6: Example of control of clamping unit ELCC-...-C

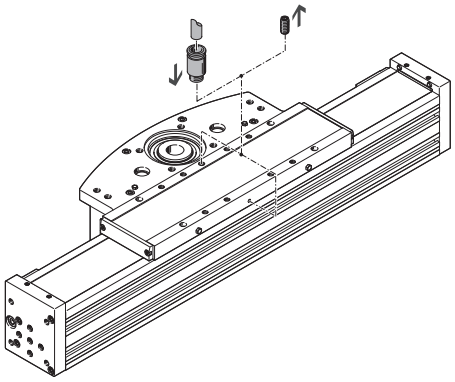


Fig. 7: Connecting sealing air or clamping unit

1. Remove a plug screw from the threaded hole on the slide or drive head.
2. Tighten the fitting with M5 thread to the nominal torque of 0.5 Nm.
3. Connect the hose.

7 Commissioning

⚠ WARNING

Risk of injury due to unexpected movement of components.

- Protect the positioning range from unwanted access.
- Keep foreign objects out of the positioning range.
- Perform commissioning with low dynamic response.

NOTICE

Elasticity of the toothed belt

The elasticity of the toothed belt generates an additional spring effect at high acceleration and deceleration, which can lead to an inadmissible nominal/actual deviation when the slide is moved or when the end position is reached.

- Consider the setpoint deviation determined during the test run during parameterisation of position setpoint values.

Block-shaped acceleration profiles without jerk limitation can have the following effects:
- High mechanical loads on the drive due resulting from high force peaks.
- Overshooting effects during positioning.
- Rise of the entire system.

Recommendation: reduce high force peaks in the acceleration and deceleration phases by using the jerk limitation.

Identical axes can generate different running noises depending on the parameterisation, mode of operation, type of mounting, installation environment and components.

Requirements:
– The motor encoder is referenced to the reference mark by a homing run.
– The motor encoder has the absolute reference to the reference mark.
– The direction of movement of the slide is determined by the direction of rotation of the motor.
– The mounting of the drive system has been checked.
– The protective cover of the cover strip is removed.
– The installation on the motor has been checked.
– There are no foreign objects within the range of motion of the drive system.
– Maximum permissible feed force and drive torque as a function of acceleration, deceleration, e.g. with stop function or quick stop, speed, moving mass and mounting position, are not exceeded.
– Axis is not mechanically overloaded and dynamic setpoint deviation is not exceeded as a result of force peaks, torque peaks or overshoot effects, e.g. overrunning the end position.
  Overloads and overruns as a result of jerk limitation must be restricted by reduced acceleration and deceleration setpoints or optimised controller settings.
– The software end positions are not within the effective range of the mechanical stops.
– No homing or test run to mechanical end stops.

1. Pressurise the clamping of the clamping unit ELCC-TB-...-C to release it.
2. Start check run.
3. Select permissible reference points "against reference switch" for the homing.
4. Start the homing with reduced speed setpoints, acceleration setpoints and deceleration setpoints.
5. Start the test run with reduced speed setpoints, acceleration setpoints and deceleration setpoints.
6. Check that the slide completes the entire travel cycle within the specified time.
   ⇨ The slide stops its travel when it reaches a limit switch and the drive system is ready for operation.

8 Maintenance

8.1 Safety

⚠ WARNING

Unexpected movement of components.
Injury due to impacts or crushing.
- Before working on the product, switch off the control and secure it to prevent it from being switched back on accidentally.

8.2 Checking toothed belt wear

Checking toothed belt wear

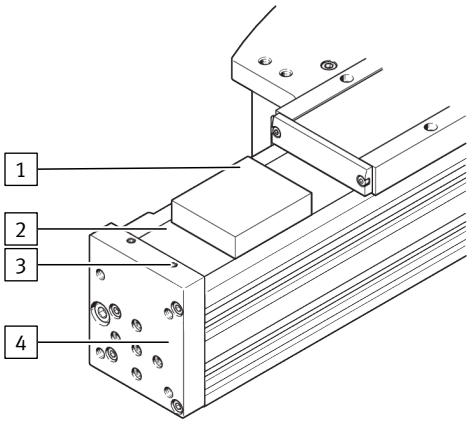
The toothed belt is tensioned for its entire service life.
The toothed belt must not be retensioned.

1. ELCC-TB-...-PU1:
   – Initial check: after 1000 km.
   – Periodic check: every 500 km.
   ELCC-TB-...-CR/-PU2:
   – Initial check: after 5000 km.
   – Periodic check: every 1000 km.
2. If the toothed belt shows visible wear: send the axis to Festo or contact Festo Service ➔ www.festo.com.

8.3 Checking cover strip

1. Check the cover strip for wave formation every 2000 km.
2. Retension the cover strip as follows if waves are detected.
3. Replace the belt reversals and the cover strip if retension is no longer possible.

Retensioning cover strip on both sides with ELCC-...-P9



1 Clamping element
2 Cover strip
3 Screw
4 End cap

Fig. 8: Retension cover strip

1. Unscrew the screws 3.
2. Push the cover strip 2 into the cover 4.
3. Tighten the cover strip with a clamping element 1.
4. Tighten the screws to 6 Nm ±10 %.

8.4 Checking clamping unit

Clamping unit ELCC-...-C

Check the holding force of the clamping unit at every maintenance interval or after every emergency braking in the event of a power failure.

– Check holding function as follows:

1. Move the cantilever or slide to an end position.
2. Exhaust the clamping unit connection.
3. Allow the test force (the test pressure) to act on the drive for at least 5 s. During this time, the cantilever or the slide must not move. The test force and the tolerance window can be taken from the risk assessment of the application.

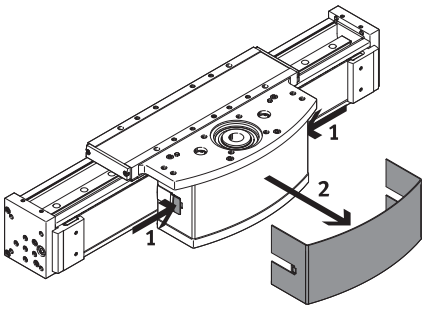
8.5 Cleaning axis

- Clean the product with a clean, soft cloth and non-abrasive cleaning agents.

Removing abraded particles in the drive head

At every maintenance interval remove the particles from the toothed belt and cover strip wear on the axis or in the drive head as required.

1. Press both interlocks (1) simultaneously up to the stop.



2. With the interlocks (1) pressed, pull the housing (2) off the drive head.
3. Remove abraded particles in the drive head if necessary.
4. Insert the housing into the guide of the interlock and push it onto the drive head until the interlocks engage.

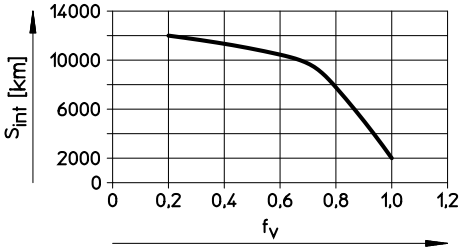
8.6 Lubricating axis

Requirements:

Recirculating ball bearing guide

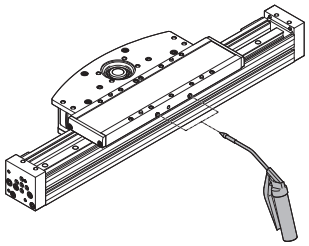
– The pressure grease gun LUB-1, 647958 is available.
– For ELCC-TB-...: the LUB-KC1, 684474 roller bearing grease is available.
– For ELCC-TB-...-F1: the Elkalub VP 922 roller bearing grease, supplied by Chemie-Technik, Vöhringen, is available.
– The lubrication adapter LUB-1-TR-I, 647959 or LUB-1-TR-L, 647960 is available.

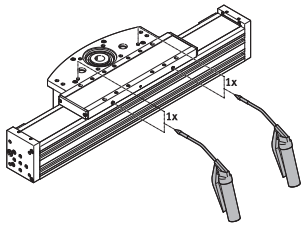
1. Calculate the load comparison factor f_v with the formula for combined loads ➔ 10.1 Technical data, mechanical.
2. Take the lubrication interval S_{int} as a function of the load comparison factor f_v from the characteristic curve.



3. Determine the load factors:
   - Dusty and dirty environment.
   - Nominal stroke < 300 mm or > 2000 mm.
   - Ambient temperature > +40 °C.
   - Service age > 3 years.
   - The travel profile matches triangular operation, e.g. frequent acceleration and braking.
4. If there is a load factor, halve the lubrication interval S_{int}. If there are multiple load factors, reduce the lubrication interval S_{int} to a quarter of the standard interval.
5. If necessary, replace the needle point of the pressure grease gun with the lubrication adapter with axial or radial outlet.
6. Press the pressure grease gun on the lubrication nipple of the recirculating ball bearing guide. Press in the roller bearing grease at the front or left and right.

ELCC-TB-...		-60	-70	-90	-110
Grease volume per lubricating hole	[g]	1.7	5	7.5	11.2





7. Move along the complete travel distance during the lubrication process to distribute the grease evenly in the interior.
8. If necessary, grease other components with roller bearing grease, e.g. the guide rail.

9 Fault clearance

⚠ WARNING

Unexpected movement of components.
Injury due to impacts or crushing.
- Before working on the product, switch off the control and secure it to prevent it from being switched back on accidentally.

⚠ WARNING

Risk of injury due to unexpected movement of components.

- Protect the positioning range from unwanted access.
- Keep foreign objects out of the positioning range.
- Perform commissioning with low dynamic response.

Fault description	Cause	Remedy
Loud running noises, vibrations or rough running of the axis.	Coupling distance too short.	– Observe the permissible coupling spacings ➔ Assembly instructions of the motor mounting kit.
	Torsional stresses.	– Install axis without tension. Make sure that the contact surface is flat ➔ 6.3 Mounting axis. – Change the layout of the attachment component, e.g. payload. – Align axes parallel to each another.
	Current controller settings.	– Optimise controller data, e.g. speed, acceleration.
	Resonance oscillation of the axis.	– Change travel speed.
	Wear on bearing or guide.	– Contact local Festo Service. – Replace axis.
	Toothed belt wear.	– Contact local Festo Service. – Replace toothed belt.
	Insufficient lubrication of the guide.	– Lubricate guide ➔ 8.6 Lubricating axis.
Vibrations at the cantilever.	Operation at the resonant frequency of the axis.	– Change travel speed. – Change acceleration. – Increase axis stiffness, e.g. shorter support distances. – Change the payload geometry.
Long cantilever oscillation.	Resonant frequency of profile and payload too low.	– Change the payload geometry.
Cantilever or slide does not move.	Coupling slips.	– Check the mounting of the shaft-hub connection ➔ Assembly instructions of the motor mounting kit.
	Loads are too high.	– Reduce forces and torques. Consider dynamics.
	Toothed belt torn.	– Contact local Festo Service. – Replace axis.
Overruns the end position.	Sensor does not switch.	– Check sensor, installation and parameterisation.
Idling torque too high.	Wear in the drivetrain.	– Contact local Festo Service. – Replace axis.
Toothed belt skips.	Toothed belt pretensioning too low.	– Contact local Festo Service. – Replace axis.
	Current controller settings.	– Optimise controller data, e.g. speed, acceleration.

Fault description	Cause	Remedy
Toothed belt skips.	Loads too high.	– Reduce travel speed.
Wave formation on the cover strip or aluminium abrasion on the axis.	Wear on belt reversals.	– Retension cover strip ➔ 8.2 Checking toothed belt wear. – Replace belt reversal and cover strip.

Tab. 5: Overview of axis fault clearance

Fault description	Cause	Remedy
Pressurised clamping unit does not open.	Operating pressure too low.	– Increase operating pressure to the permissible pressure range.
	Clamping mechanism defective.	– Contact local Festo Service. – Replace axis.
Cantilever or slide moves when clamping unit is not pressurised.	Clamping component worn or clamping mechanism defective.	– Contact local Festo Service. – Replace axis.
	Payload too high.	– Reduce payload.

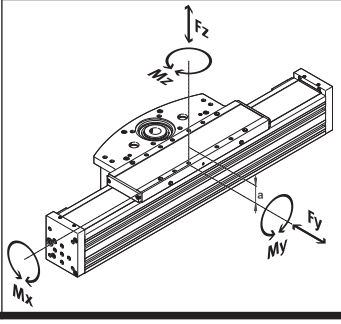
Tab. 6: Overview of clamping unit fault clearance

10 Technical data

10.1 Technical data, mechanical

Cantilever axis ELCC-TB-...

ELCC-TB-...		-60	-70	-90	-110
Design		Electromechanical axis with toothed belt			
Guide		Recirculating ball bearing guide			
Mounting position		Any			
Max. feed force	[N]	300	600	1200	2500
Max. driving torque	[Nm]	5.2	10.4	33	90
Max. idling torque at speed = 0.2 m/s	[Nm]	0.6	1.2	2.5	4
Max. speed	[m/s]	5			
Max. acceleration	[m/s ^{2}]	50		30	
Repetition accuracy	[mm]	± 0.05			
Feed constant	[mm/rev]	96	96	160	216
Ambient temperature	[°C]	–10 ... +60			
Storage temperature	[°C]	–20 ... +80			
Degree of protection		IP20			
Certificates, declaration of conformity		➔ www.festo.com/sp			
Max. permissible forces and torques on the slide					
Fy	[N]	4200	9600	13900	20600
Fz	[N]	4100	9400	13500	20000
Mx	[Nm]	35	105	165	315
My	[Nm]	290	825	1300	2365
Mz	[Nm]	285	795	1230	2285
Distance to guide centre					
a	[mm]	29.9	39.1	43.8	54
Calculating the load comparison factor					

ELCC-TB-...	-60	-70	-90	-110
fv	$fv = \frac{\lvert Fy,dyn\rvert}{Fy,max} + \frac{\lvert Fz,dyn\rvert}{Fz,max} + \frac{\lvert Mx,dyn\rvert}{Mx,max} + \frac{\lvert My,dyn\rvert}{My,max} + \frac{\lvert Mz,dyn\rvert}{Mz,max} \leq 1$			
				

Tab. 7: Technical data, cantilever axis ELCC-TB-...

Clamping unit ELCC-TB-...-C

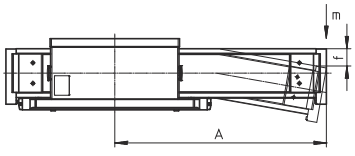
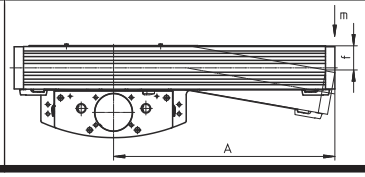
ELCC-TB-...-C		-70	-90	-110
Design		Clamping unit		
Well-tried component		In accordance with EN ISO 13849-1:2023		
Clamping type		Clamping by spring force, releasing by compressed air		
Effective direction		Both sides		
Operating medium		Compressed air in accordance with ISO 8573-1:2010 [7:4:4]		
Ambient temperature	[°C]	–10 ... +60		
Clamping[1)]				
Activation Delay	[ms]	<100		
Static holding force, load	[N]	450	550	850
Opening pressure	[MPa]	0.4 ... 0.65		
	[bar]	4 ... 6.5		
	[psi]	58.01 ... 94.27		
Max. axial movement caused by clamping of the clamping unit	[mm]	0.2		
Service life characteristics B10[2)] with load	[million switching cycles]	0.04	0.03	0.03
Emergency braking[3)]				
Max. number of emergency braking operations	[switching cycles]	1000		
Energy per emergency braking	[J]	30		

1) Fixing the stationary cantilever in the current position.
2) The general assumption B10d = 2 x B10 is not permitted.
3) Braking of the moving mass, e.g. in the event of a power failure of the system.

Tab. 8: Technical data, clamping unit ELCC-TB-...-C

10.2 Characteristic curves of deflection

The maximum deflection f of the cantilever as a function of cantilever length A and payload m

Drive head, horizontal, front or rear.	Drive head, vertical, top or bottom.
	

Tab. 9: Alignment of the drive head

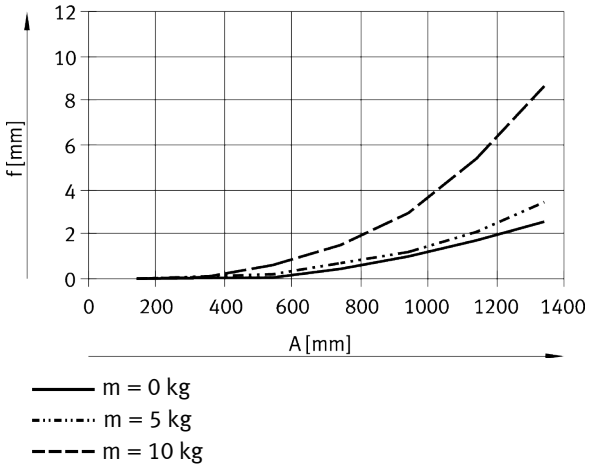


Fig. 9: ELCC-TB-60, horizontal

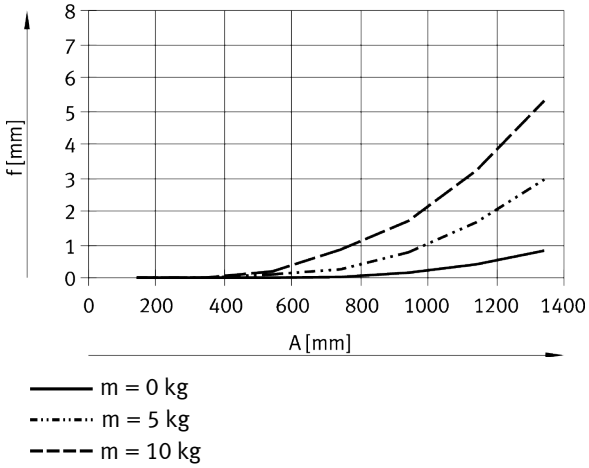


Fig. 10: ELCC-TB-60, vertical

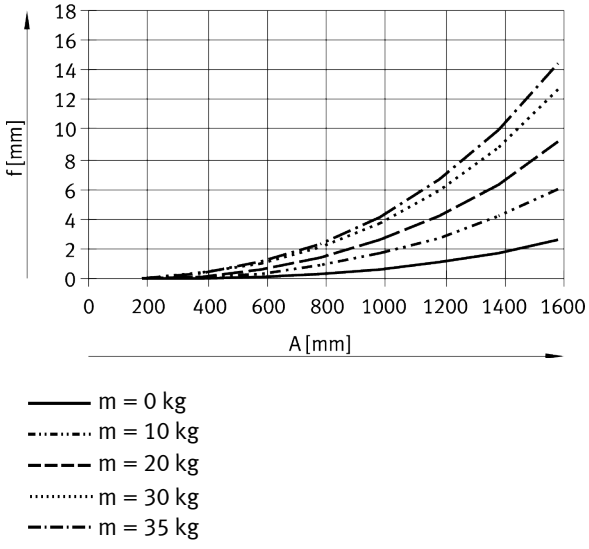


Fig. 11: ELCC-TB-70, horizontal

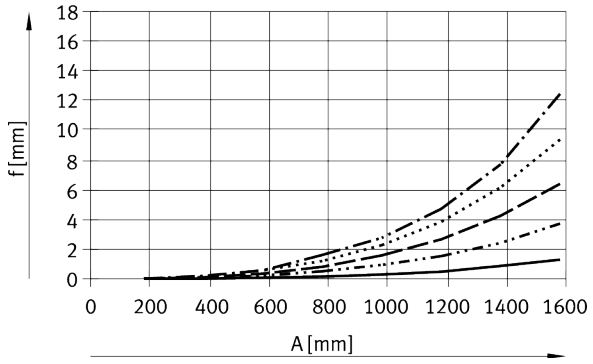


Fig. 12: ELCC-TB-70, vertical

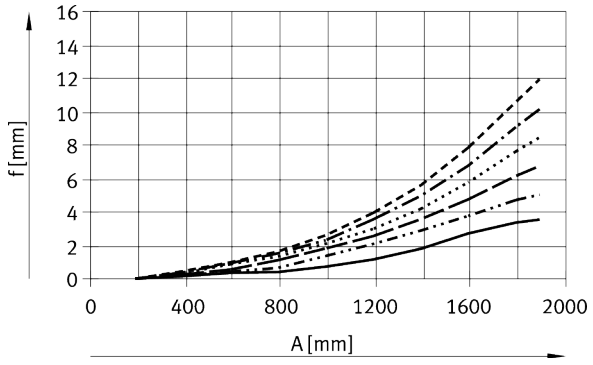


Fig. 13: ELCC-TB-90, horizontal

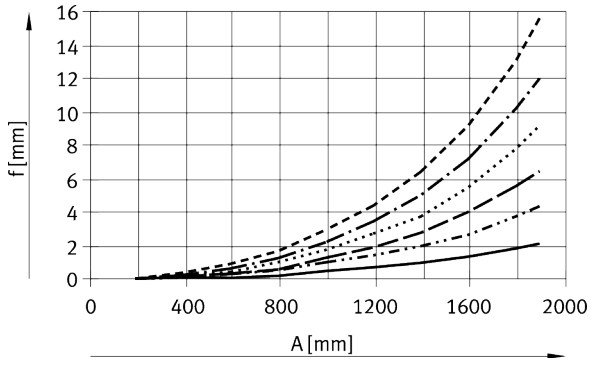


Fig. 14: ELCC-TB-90, vertical

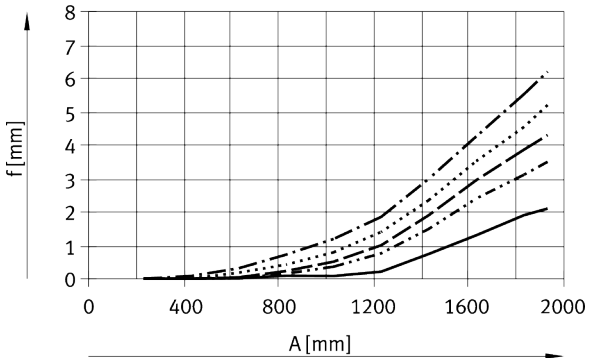


Fig. 15: ELCC-TB-110, horizontal

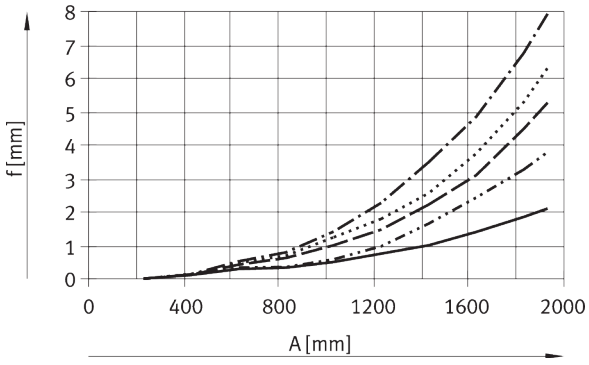


Fig. 16: ELCC-TB-110, vertical

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