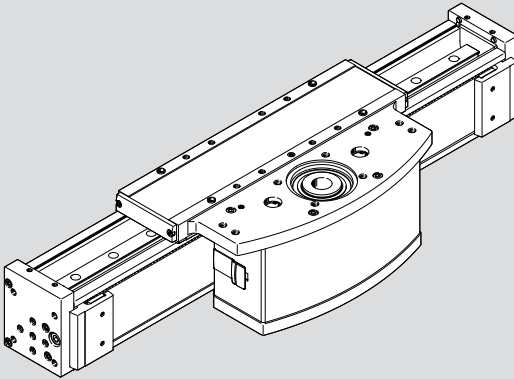


ELCC-TB

Cantilever axis

FESTO

Operating instruction



8178817

8178817
2023-05c
[8178819]

Translation of the original instructions

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1 Applicable documents



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

2 Safety

2.1 Safety instructions

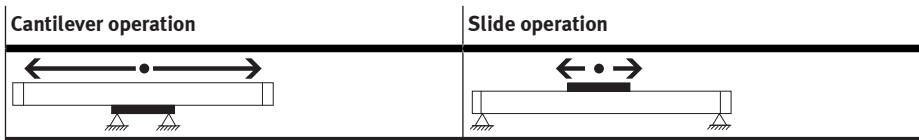
- Observe the identifications on the product.
- Only use the product if it is in perfect technical condition.
- Before working on the product: Switch off the power supply, ensure that it is off and secure it against being switched on again.
- Store the product in a cool, dry environment protected from 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 attached clamping unit ELCC-...-C holds payloads in all mounting positions.

The axis is approved for cantilever operation and slide operation.



Tab. 1: Operating modes

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

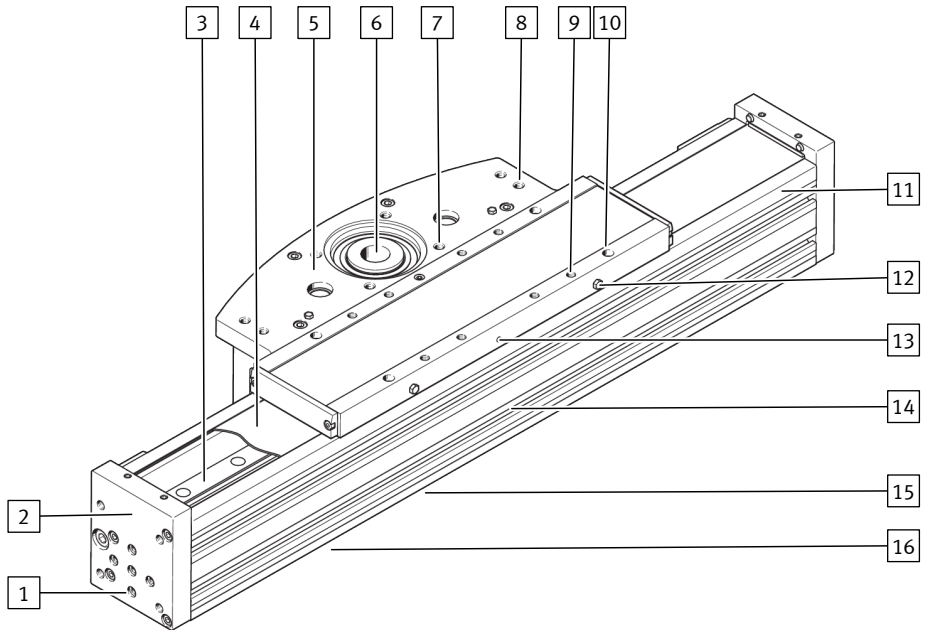


Fig. 1: Product design ELCC-TB

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

4.2 Function

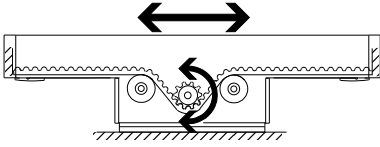


Fig. 2: Functional principle of toothed belt drive with fixed toothed belt

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 into a feed force. The linear movement of the cantilever or slide is accurately guided by the guide. The integrated cover strip prevents abraded particles from penetrating 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. Sensors and displacement encoder enable query of end positions, reference position and intermediate position.

5 Transport

WARNING

Risk of injury due to falling product

If the product is lifted incorrectly, it may fall and cut, crush or separate body parts.

- Lift the product only with suitable load-bearing equipment.
-
- 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 Assembly

6.1 Safety

WARNING

Risk of Injury due to Unexpected Movement of Components

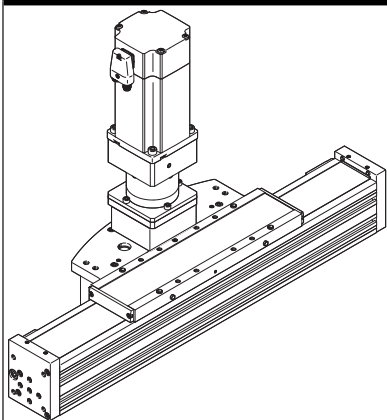
For vertical or slanted mounting position: when power is off, moving parts can travel or fall uncontrolled into the lower end position.

- 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

Unexpected movement of components.

Injury due to impacts or crushing.

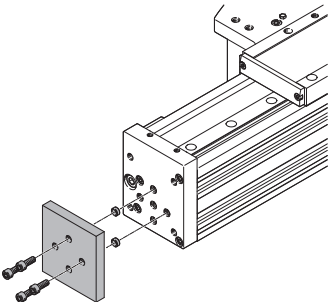
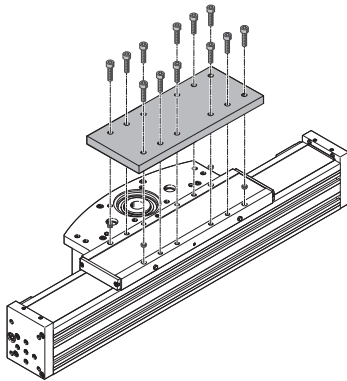
- Before working on the product, switch off the control and secure it to prevent it from being switched back on accidentally.

WARNING

Risk of Injury due to Unexpected Movement of Components

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 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 intended 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, [Nm] inside/outside	3	3/6/10	10/18	10/18
Max. screw-in depth t_{max} , [mm] inside/outside	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

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

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.

i

- 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.

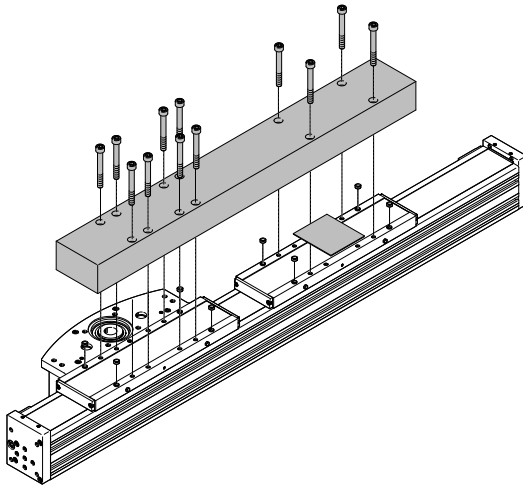


Fig. 3: Mounting payload, example "top mounting"

Requirements:

- A fixed-floating bearing for the carriage connection.
- Use a tolerance compensation in case of height deviation from the standard slide surface.
- Adequate clearance for payload 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 maximum screw-in depth.

ELCC-TB-...-Z...	-60	-70	-90	-110
Direct fastening on slide				
Thread	→ 6.3 Mounting axis			

6. Check the running behaviour of the slides.

6.6 Mounting end position protection

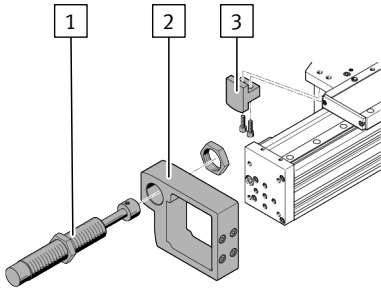


Fig. 4: Mounting shock absorber stop, shock absorber retainer and shock absorber

- 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

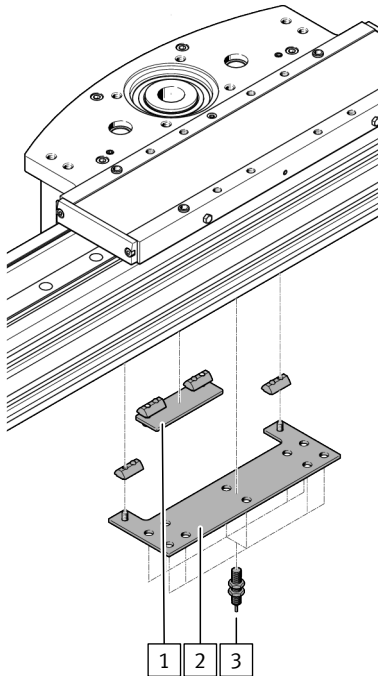


Fig. 5: Mounting switch lug, sensor and sensor bracket

- 1** Switch lug **3** Sensor
- 2** Sensor bracket

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, mount 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 supply port.

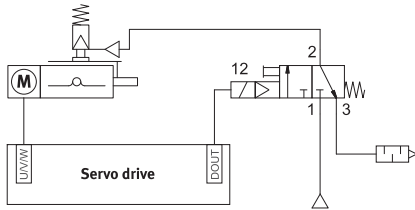


Fig. 6: Example of control of clamping unit ELCC-...-C

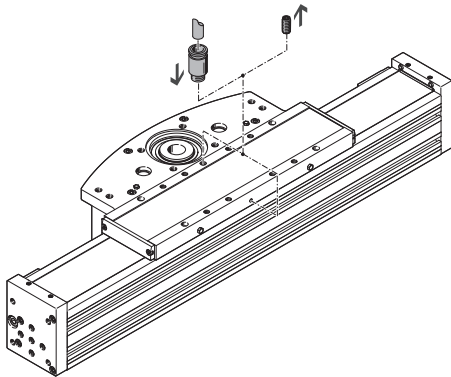


Fig. 7: Connecting sealing air or clamping unit

1. Remove one plug screw from the threaded hole of the slide or drive head.
2. Mount the fitting (M5; 0.5 Nm) and connect the tubing.

7 Commissioning

WARNING

Risk of injury due to unexpected movement of components.

- Protect the positioning range from unwanted intervention.
- 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 lead screw due to 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 in the movement space 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. Start check run.
2. Select permissible reference points "against reference switch" for the homing.
3. Start the homing run with reduced speed setpoints, acceleration setpoints and deceleration setpoints.
4. Start the test run with reduced speed setpoints, acceleration setpoints and deceleration setpoints.
5. 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-...-PU1:
 - Initial check: after 1000 km.
 - Periodic check: every 500 km.ELCC-...-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

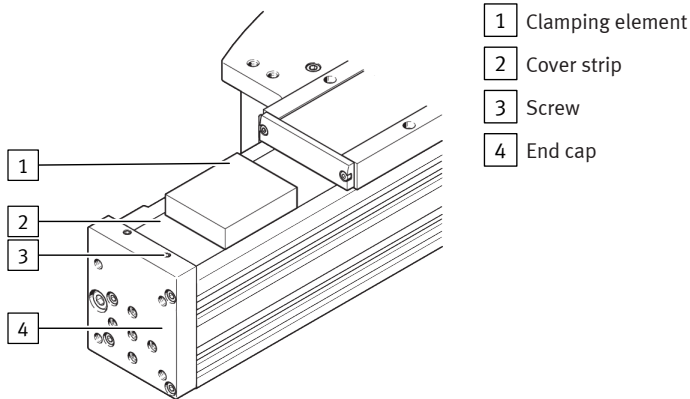


Fig. 8: Retensioning cover strip

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 $6 \text{ Nm} \pm 10\%$.

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.



The clamping unit must be replaced after 1000 emergency braking operations or after 50,000 clamping operations → Contact your local Festo service centre.

– 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.

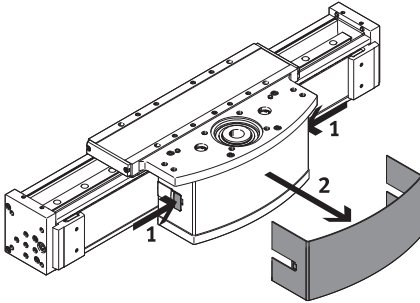
8.5 Cleaning axis

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.

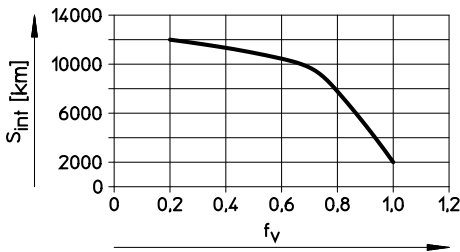
8.6 Lubricating axis

Requirements:

Recirculating ball bearing guide

- The pressure grease gun LUB-1, 647958 is available.
- For ELGA-TB-KF: the roller-bearing grease LUB-KC1, 684474 is available.
- For ELGA-TB-KF-F1: roller bearing grease Elkalub VP 874 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 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.

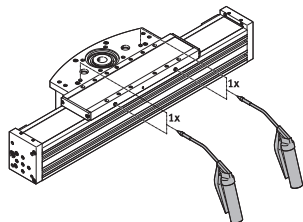
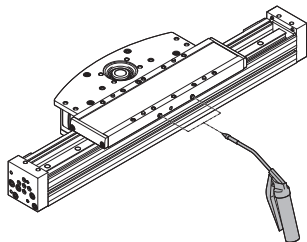


3. Determine the load factors:
 - Dusty and dirty environment.
 - Nominal stroke < 300 mm or > 2000 mm.
 - Ambient temperature > +40 °C.
 - Operating age > 3 years.
 - The travel profile matches triangular operation, e.g. frequent acceleration and braking.

Fault clearance

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, axial outlet 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

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.

⚠ WARNING

Risk of injury due to unexpected movement of components.

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

Error 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 the guide → 8.6 Lubricating axis.

Error description	Cause	Remedy
Vibrations at the cantilever.	Operation at the resonant frequency of the axis.	<ul style="list-style-type: none"> – Change travel speed. – Change the acceleration. – Increase axis stiffness, e.g. shorter support distances. – Change the payload geometry.
Long cantilever oscillation.	Resonant frequency of profile and payload too low.	<ul style="list-style-type: none"> – Change the payload geometry.
Cantilever or slide does not move.	Coupling slips.	<ul style="list-style-type: none"> – Check the mounting of the shaft-hub connection → Assembly instructions of the motor mounting kit.
	Loads are too high.	<ul style="list-style-type: none"> – Reduce forces and torques. Consider dynamics.
	Toothed belt torn.	<ul style="list-style-type: none"> – Contact local Festo Service. – Replace axis.
Overruns the end position.	Sensor does not switch.	<ul style="list-style-type: none"> – Check sensor, installation and parameterisation.
Idling torque too high.	Wear in the drivetrain.	<ul style="list-style-type: none"> – Contact local Festo Service. – Replace axis.
Toothed belt skips.	Toothed belt pretensioning too low.	<ul style="list-style-type: none"> – Contact local Festo Service. – Replace axis.
	Current controller settings.	<ul style="list-style-type: none"> – Optimise controller data, e.g. speed, acceleration, ...
	Loads are too high.	<ul style="list-style-type: none"> – Reduce travel speed.
Wave formation on the cover strip or aluminium abrasion on the axis.	Wear on belt reversals.	<ul style="list-style-type: none"> – Retension cover strip → 8.2 – Checking toothed belt wear. – Replace belt reversal and cover strip.
Clamping unit does not open.	Operating pressure too low.	<ul style="list-style-type: none"> – Increase operating pressure to the permissible pressure range.
	Clamping unit leaks.	<ul style="list-style-type: none"> – Contact local Festo Service. – Replace axis.
Holding force is not reached.	Clamping component worn or clamping mechanism defective.	<ul style="list-style-type: none"> – Contact local Festo Service. – Replace axis.

Tab. 5: Overview of fault clearance

10 Technical data

10.1 Technical data, mechanical

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			
Max. permissible forces and torques on the slide					
F _y	[N]	4200	9600	13900	20600
F _z	[N]	4100	9400	13500	20000
M _x	[Nm]	35	105	165	315
M _y	[Nm]	290	825	1300	2365
M _z	[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
f_v	$f_v = \frac{ F_{y,dyn} }{F_{y,max}} + \frac{ F_{z,dyn} }{F_{z,max}} + \frac{ M_{x,dyn} }{M_{x,max}} + \frac{ M_{y,dyn} }{M_{y,max}} + \frac{ M_{z,dyn} }{M_{z,max}} \leq 1$			
	<p>The diagram shows a perspective view of a clamping unit. A vertical force vector F_z is applied downwards at the top. A horizontal force vector F_y is applied to the right at the bottom. Two moment vectors, M_x and M_y, are shown as curved arrows around the horizontal axes.</p>			

Tab. 6: Technical data, mechanical

Technical data for clamping unit ELCC-...-C

ELCC-TB-...-C	-70	-90	-110
Clamping unit			
Design	clamping unit integrated in the drive		
Clamping type	Clamping by spring force, releasing by compressed air		
Effective direction	at both ends		
Well-ried component	in accordance with EN ISO 13849-1:2015		
Permissible operating pressure for releasing the clamping unit [bar]	4 ... 6.5		
Operating medium	Compressed air in accordance with ISO 8573-1:2010 [7:4:4]		
Response time [ms]	<100		
Ambient temperature [°C]	-10 ... +60		
Clamping ¹⁾			
Static holding force [N]	450	550	850
Max. axial movement caused by clamping of the clamping unit [mm]	0.2		
Service-life value B10 with load ²⁾ [million switching cycles]	0.05		

ELCC-TB-...-C	-70	-90	-110
Emergency braking ³⁾			
Max. number of emergency braking operations	1000		
with energy per emergency braking [J]	30		

1) Clamping means that the clamping unit fixes the stationary cantilever at its current position.

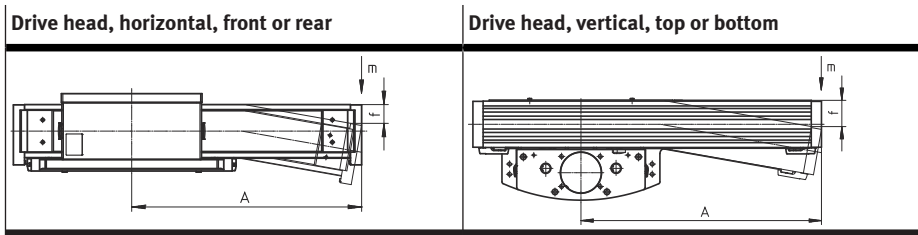
2) The general assumption $B10d = 2 \times B10$ is not permissible.

3) Emergency braking means braking of the moving mass, e.g. in case of power failure of the system.

Tab. 7: Technical data for clamping unit ELCC-...-C

10.2 Characteristic curves of deflection

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



Tab. 8: Alignment of the drive head

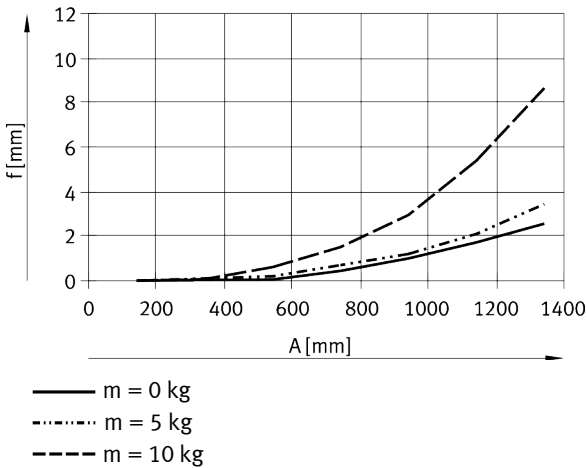


Fig. 9: ELCC-TB-60, horizontal

Technical data

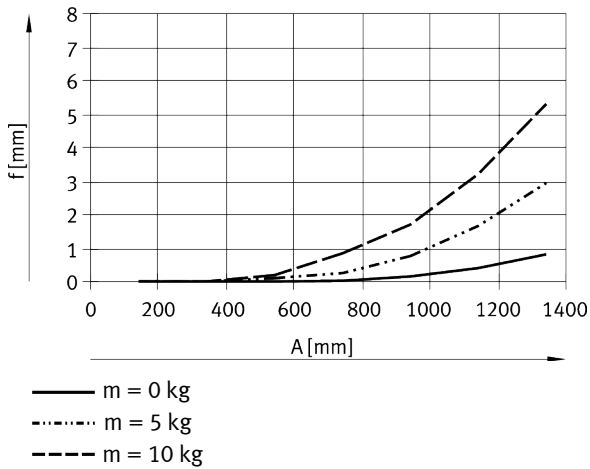


Fig. 10: ELCC-TB-60, vertical

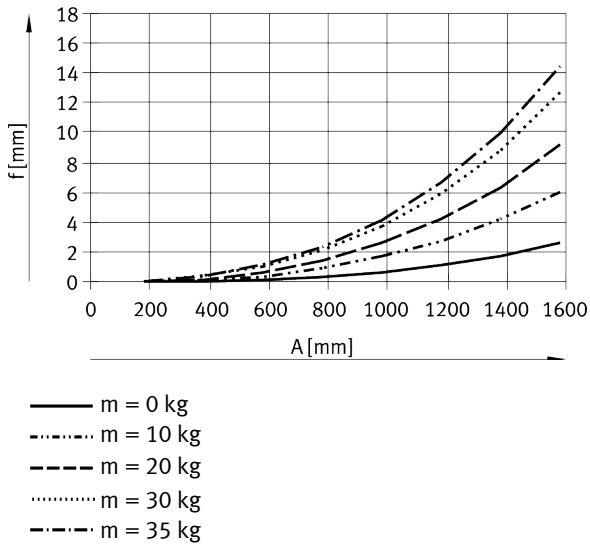


Fig. 11: ELCC-TB-70, horizontal

Technical data

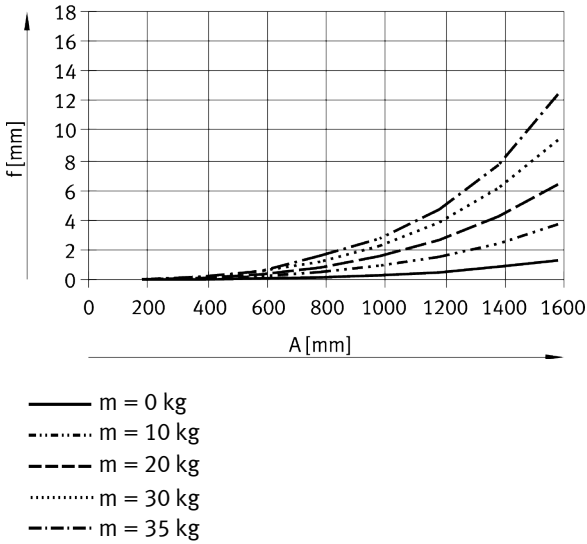


Fig. 12: ELCC-TB-70, vertical

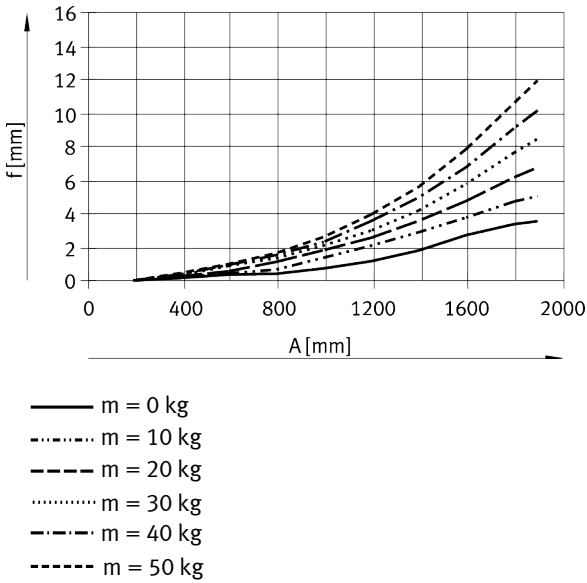


Fig. 13: ELCC-TB-90, horizontal

Technical data

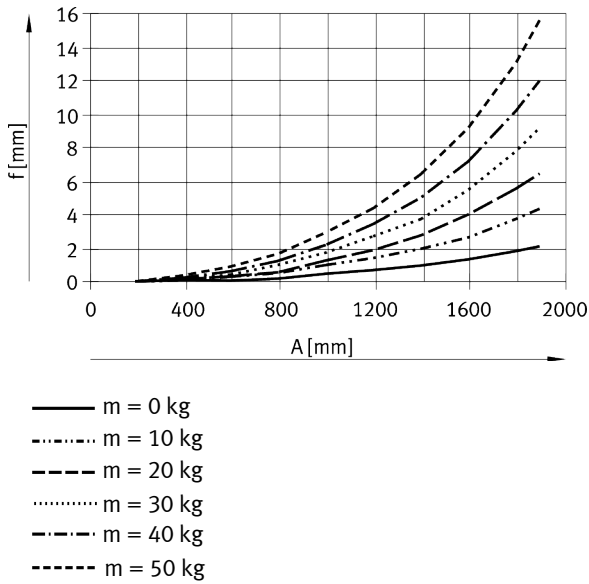


Fig. 14: ELCC-TB-90, vertical

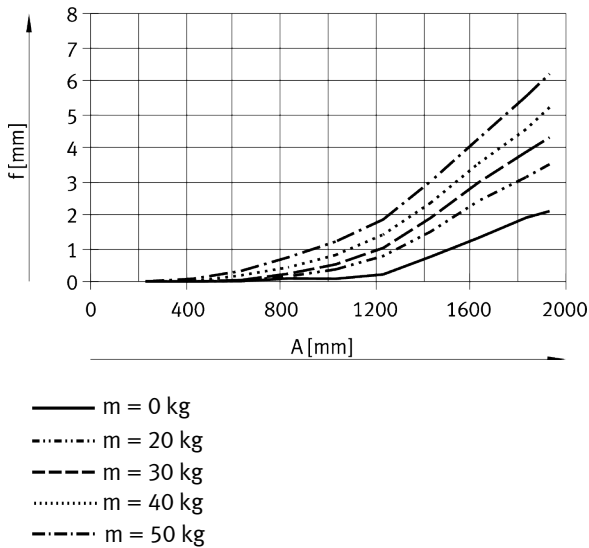


Fig. 15: ELCC-TB-110, horizontal

Technical data

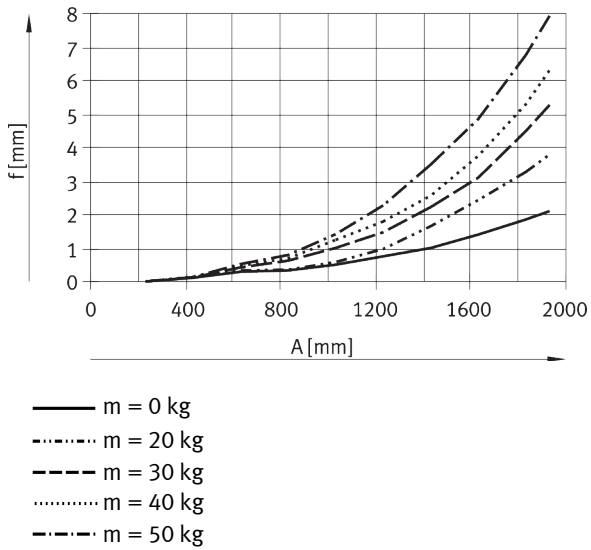


Fig. 16: ELCC-TB-110, vertical

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