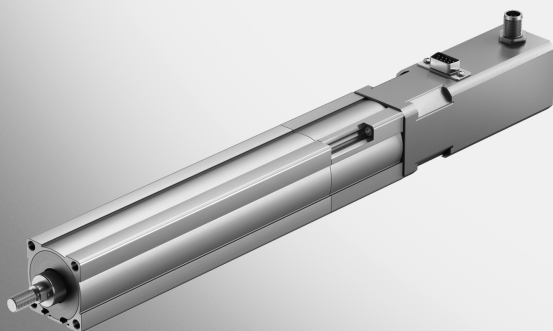


Electric cylinder

EPCO

FESTO

en **Operating
instructions**



c **FA**[®] **US**

8076277
2017-11c
[8076279]

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 – Electric cylinder EPCO

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Documentation on the product



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

1 Operating elements and connections

EPCO-16

EPCO-25/40

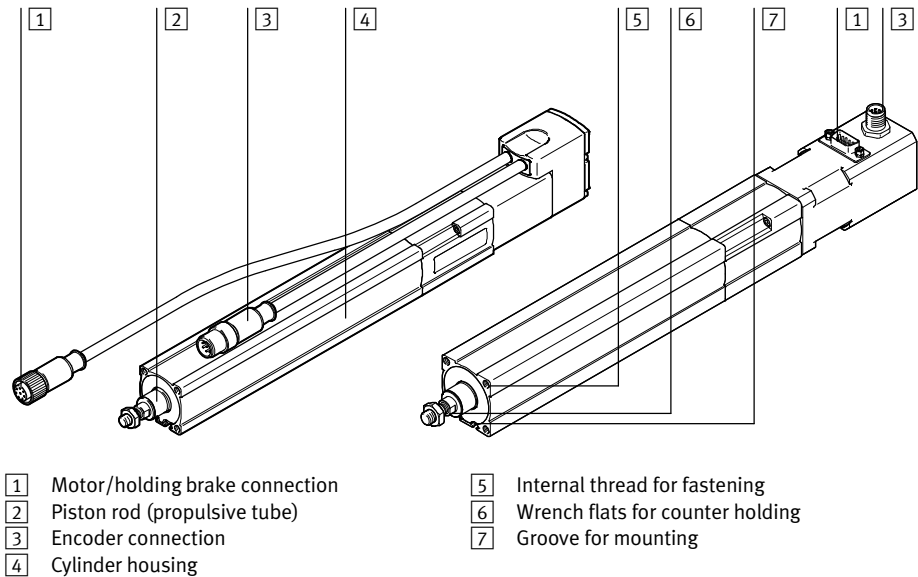


Fig. 1

2 Function and application

A rotating ball screw converts the rotary movement of a motor into a linear movement. This moves the piston rod **2** backwards and forwards.

The piston rod is guided in a non-rotating manner. The position of the piston rod can be optionally queried as follows:

- EPCO-...ST-E: by using an integrated, incremental positional transducer after a homing run
- EPCO-...ST: enables open-loop operation (without positional transducer and without positional feedback)
- EPCO-...-A: with an integrated ring magnet and optional proximity sensors.

The EPCO electric cylinder is designed for accurately positioning effective loads in combination with the CMMO-ST or CMMS-ST controller (permissible controllers → 10 Accessories).

The device is intended for use in an industrial environment. Measures may need to be implemented in residential areas for interference suppression.



Note

The EPCO is non-braking. When the supply voltage is not applied, the piston rod can be moved freely. Automatic locking of the complete system can be optionally achieved with a holding brake in the EPCO-...-ST-B.

3 Transport and storage

- Consider the weight of the electric cylinder.
Depending on the version, the EPCO can weigh up to 5 kg.
- The following should be observed with regard to storage:
 - Storage times should be kept to a minimum
 - Store in cool, dry, well-shaded locations that do not present a risk of corrosion.

4 Prerequisites for use



Warning

Unexpectedly fast-moving masses can harm people or property (risk of crushing).

- Initially, only apply limited power to the drive motor to ensure low speeds and torques.



Note

Malfunctions will occur if the device is not used correctly.

- It is vital that the stipulations contained in this section are adhered to at all times.

- Take into consideration the legal regulations applicable for the destination, as well as:
 - regulations and standards,
 - regulations of the testing organizations and insurers,
 - national specifications.
- Note the warnings and instructions on the product and in the relevant operating instructions.
- Remove all transport packaging, such as foils, caps and cardboard.
The material used in the packaging is intended for recycling ♻️(exception: oil paper = residual waste).
- Observe the local regulations for environmentally friendly waste management of electronic components.
- Take into account the material specifications (➔ Technical data chapter).
- Use the product in its original state, without any unauthorised product modifications.
- Take into consideration the ambient conditions at the location of use.
Corrosive environments reduce the service life of the product (e.g. ozone).

- Compare the limit values specified in these operating instructions with those of your application (e.g. forces, torques, temperatures, masses, speeds). The relevant safety regulations can only be adhered to by ensuring the product is operated in compliance with the load limits.
- Take the tolerance of the tightening torques into account. Unless otherwise specified, the tolerance is $\pm 20\%$.

5 Installation

5.1 Mechanical assembly

- Do not modify the screws and threaded pins if not directly requested to do so in these operating instructions.



Note

Excessive tensile loads may cause the threaded holes to be pulled out.

- In the event of high loads make sure that the EPCO is secured at other mounting points in the grooves [7] in addition to the front mounting threads [5].
- Make sure that the device is fitted free of mechanical stress and distortion (evenness of the bearing surface: $\leq 0.2\text{ mm}$).
- Position the EPCO so that all of the control sections are accessible.
- Secure the EPCO with the mounting accessories (→ 10 Accessories).
- Tighten the screws evenly.

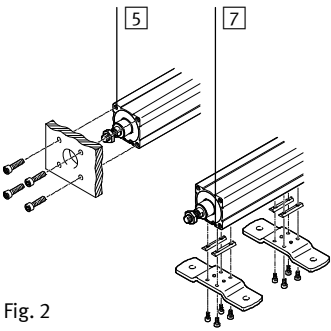


Fig. 2

Size	16	25	40
Direct mounting [5]			
Female thread front side	M4	M5	M6
Max. tightening torque [Nm]	3	4	5
Slot nut mounting [7]			
Spanner Size \approx	2.5	2.5	4
Max. tightening torque [Nm]	1.2	1.2	5.9

Tab. 1

Fitting in a vertical or sloping position:



Warning

Uncontrolled moving loads can cause personal injury and material damage (risk of crushing). If a spindle nut fracture occurs inside the EPCO, the loads will slide down.

- Check whether additional external safety measures to protect against spindle nut fracture are necessary (e.g. toothed latches or moveable bolts). In this way you can prevent the load from sliding down.

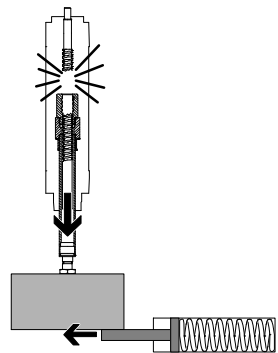


Fig. 3

Installing the effective load

- Place the centre of gravity of the effective load, if possible, centrally to the piston rod.
- When securing the effective load make sure that no torque is transferred to the piston rod.
The wrench flat 6 can be used to exert counter pressure.
- Secure the effective load to the piston rod.
The piston rod will bend depending on the effective load
(→ Appendix 13 Characteristic curves).

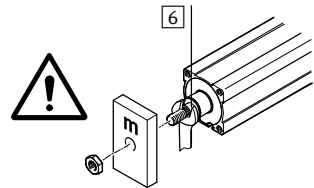


Fig. 4

Size		16	25	40
Piston rod thread				
Male thread	(EPCO-...)	M6	M8	M10x1.25
Female thread	(EPCO-...-F)	M4	M6	M8
Spanner Size 6	≈	7	9	10

Tab. 2

Installation of external accessories

To protect the end positions against uncontrolled overrunning:

- Check whether proximity sensors are necessary (as safety limit switches or hardware limit switches). This is only possible for the EPCO-....-A with integrated magnet.

If proximity switches (sensors) are used:

- Use proximity sensors with normally-closed function.
These protect the EPCO from overrunning the end position if the proximity sensor cable is fractured.
- To mount the proximity sensors use a mounting kit or a sensor rail (→ 10 Accessories). These are bonded directly to the cylinder profile (→ Assembly instructions for the accessories).
- Avoid external influences from magnetic or ferritic parts in the vicinity of the proximity sensors (minimum distance of 20 mm from ferritic parts).

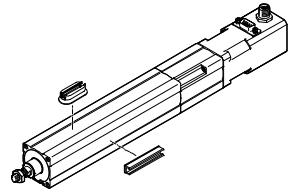


Fig. 5

5.2 Electrical installation



Warning

If the piston rod is moved externally, open, dangerous voltages may occur across the electrical connections (generator principle).

- Make sure that the piston rod is only moved with wired connections.



Note

If unused plug connectors are touched, there is a danger that damage may occur to the EPCO or to other parts of the system as a result of ESD (electrostatic discharge). Place protective caps on unused terminals to prevent such discharges.



Note

To maintain EMC security:

The maximum length of the individual connection cables must not exceed 30 m.

1. Make sure the controller is switched off and that it is prevented from being restarted. Cancelling the enable signal on the controller is not sufficient.
2. Connect the motor on the EPCO completely to the controller as shown in the following tables. The pre-assembled cables from Festo (→ 10 Accessories) offer sufficiently large cable cross sections as well as screening of the motor/encoder cable with earth contact on both sides.

Motor connection/holding brake: round plug (8-pin)/D-sub plug connector (9-pin) ¹⁾

Pin	Allocation	EPCO-16	EPCO-25/40
1	String A		
2	String A/		
3	String B		
4	String B/		
5	n.c.		
6	n.c.		
7	Holding brake +24 V ¹⁾		
8	Holding brake GND ¹⁾		
9	n.c.		

1) Only for motors with holding brake EPCO-...-ST-B

Tab. 3

Encoder connection: round plug (8-pin) ²⁾

Pin	Allocation	EPCO-16	EPCO-25/40
1	Signal trace A		
2	Signal trace A/		
3	Signal trace B		
4	Signal trace B/		
5	GND encoder		
6	Signal trace N		
7	Signal trace N/		
8	VCC auxiliary supply 5 V ³⁾		

2) Only for motors with encoder EPCO-...-ST-E

3) Short circuit proof, max. load 100 mA

Tab. 4

5.3 Installing circuitry

Note

Additional measures are necessary if used in safety relevant applications, e.g. in Europe the standards listed under the EC machinery directive must be observed. Without additional measures in accordance with statutory minimum requirements, the product is not suitable for use in safety-related sections of control systems.

6 Commissioning



Warning

Moving masses can cause personal injury and material damage (risk of crushing).

- Make sure that, in the travel range,
 - nobody can place his/her hand in the path of the moving components (e.g. through a protective guard),
 - there are no foreign objects in the path of the moving components

It should not be possible to touch the EPCO until the mass has come to a complete standstill.

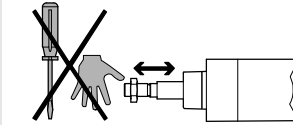


Fig. 6



Note

The motor can unexpectedly be started if the brake is released. Depending on the type of device, the controller will unlock the holding brake automatically.

- Before releasing the holding brake, make sure that the EPCO cannot move unexpectedly.
- Complete the commissioning of the motor in conjunction with the controller in accordance with the controller manual.



Note

Incorrect set values for the braking ramp in STOP statuses (e.g. EMERGENCY OFF, Quick Stop) result in an overloading of the spindle axis and can destroy it or drastically reduce its service life.

- Check the settings for all braking ramps in your controller or the higher-order control system (deceleration values and jerk).
- Taking the travel speed, moving mass and mounting position into account, make sure that the delay values (brake delay and time delays) are set in such a way that the maximum actuation moment or feed force of the spindle axis used is not exceeded.
- To design the spindle axis use the Festo sizing software “PositioningDrives” (→ www.festo.com).

**Note**

Block-shaped acceleration profiles (without jolt limitation) cause high peaks in the motive force that can lead to an overloading of the drive. In addition, positions outside the permissible range may occur as a result of overswing effects. A jolt-limited acceleration specification reduces vibrations in the entire system and reduces stress in the mechanical system.

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

Check travel	Homing run	Test run
Ascertaining the direction of movement of the piston rod	Comparing the real situation with the image in the controller	Checking the overall behaviour

Tab. 5 Definitions

1. Start a **Check travel** and limit it to low dynamic response.
Despite identical control, motors of the same design can turn in the opposite direction due to different wiring.
2. Start a **Homing run** up to the reference switch in accordance with the controller description and limit it to low dynamic response.
Providing the permissible impact energy is not exceeded, the homing run may be executed directly against the end position.
Maximum impact energy ($= \frac{1}{2} \text{ mass} \times \text{speed}^2$):
 - EPCO-16: max. $0.1 \times 10^{-3} \text{ J}$
 - EPCO-25: max. $0.2 \times 10^{-3} \text{ J}$
 - EPCO-40: max. $0.4 \times 10^{-3} \text{ J}$
3. Start a **Test run** and limit it to low dynamic response.
4. Check whether the EPCO fulfils the following requirements:
 - The piston rod must move through the complete intended positioning cycle.
 - The piston rod must stop as soon as it reaches a limit switch.
5. If the proximity sensors fail to respond:
(→ 11 Troubleshooting and → Proximity sensor operating instructions).

7 Operation



Warning

Hot parts of the housing can cause burning.

- Make sure that people and objects cannot come into direct contact with the motor.



Warning

Moving masses can cause personal injury and material damage (risk of crushing).

- Make sure that, in the travel range,
 - nobody can place his/her hand in the path of the moving components (e.g. through a protective guard),
 - there are no foreign objects in the path of the moving components

It should not be possible to touch the EPCO until the mass has come to a complete standstill.

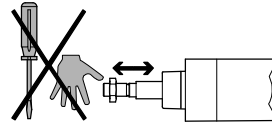


Fig. 7

Fitting in a vertical or sloping position:



Warning

Injury to people and damage to property. Excessive loads can result in slippage of the holding brake.

- Only actuate the holding brake when the motor is at a standstill.
- Only release the holding brake if the motor secures the piston rod in position in a controlled manner.

8 Maintenance and care



Warning

Layers of dust can catch fire.

- Clean the motor housing of dust regularly.

- Clean the EPCO with a soft cloth if required. The drive must have cooled down to room temperature before it is cleaned. The instructions for the cleaning agents must be observed. Only media which will not damage the material may be used as cleaning agents.
- Lubricate the piston rod with lubricating grease LUB-KC1 from Festo as soon as the grease-film is no longer visible.

9 Repair

- Send the EPCO to our repair service if required.
- Information about spare parts and accessories can be found at:
(→ www.festo.com/spareparts).

10 Accessories



Note

- Please select the appropriate accessories from our catalogue
(→ www.festo.com/catalogue).

11 Troubleshooting

Malfunction	Possible cause	Remedy
Running noises or vibrations	Tension	Install the EPCO free of tension (evenness of the bearing surface: ≤ 0.2 mm)
		Lubricate the piston rod (→ 8 Maintenance and care)
		Modify travel speed
	Incorrect regulator settings	Modify control parameters (in closed loop operating mode)
	Resonance point of the actuator	Modify travel speed or load mass
Piston rod does not move	Loads too high	<ul style="list-style-type: none"> – Reduce load mass – Reduce travel speed – Send the EPCO to Festo for repair
	Ambient temperature too low (increased breakaway torque in initial run due to increasing viscosity of the lubricants in the spindle system)	<ul style="list-style-type: none"> – Reduce load mass – Reduce travel speed – Adjust ambient temperature

Tab. 6

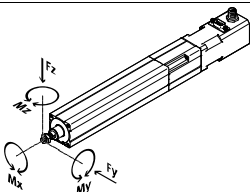
12 Technical data

12.1 Mechanical data

Size	16		25		40		
Spindle pitch	3P	8P	3P	10P	5P	12.7P	
Design	Electric cylinder with rotating spindle and stepper motor						
Mounting position	Any						
Ambient temperature	[°C]	0 ... +50					
Storage temperature	[°C]	-20 ... +60					
Relative air humidity	[%]	45 ... 80 (non-condensing)					
Protection class	IP40						
Max. speed	[mm/s]	125	300	150	500	180	460
Max. acceleration	[m/s²]	10					
Feed constant (spindle pitch) ¹⁾	[mm/rev.]	3	8	3	10	5	12.7
Repetition accuracy	[mm]	±0.02					
Axial play (new)	[mm]	≤ 0.1					
Max. torsion angle of the piston rod	[°]	≤ ±2.0		≤ ±1.5		≤ ±1.0	
Note on materials	Contains PWIS (paint-wetting impairment substances)						
Information on material							
Cylinder profile, end cap	Aluminium						
Spindle, ball bearing, piston rod	Steel						
Spindle nut	Steel						
Weight							
at 0 mm stroke ²⁾	[kg]	0.62 ... 0.68		1.04 ... 1.28		2.49 ... 2.77	
per 100 mm stroke	[kg]	0.17		0.34		0.55	

1) Nominal value, varies due to component tolerances

2) Depending on motor version

Size/thread type	16		25		40		
Spindle pitch	3P	8P	3P	10P	5P	12.7P	
Maximum forces and torques							
Max. effective load in horizontal mounting position ³⁾	[kg]	24	8	60	20	120	40
Max. effective load in vertical mounting position	[kg]	12	4	30	10	60	20
Max. feed force F _x	[N]	125	50	350	105	650	250
Maximum permissible force on the piston rod							
F _x	[N]	125	50	350	105	650	250
F _y = F _z	[N]	→ 13 Characteristic curves (in the appendix)					
Maximum permissible torques on the piston rod							
M _x	[Nm]	0		0		0	
M _y = M _z	[Nm]	0.6		1.0		3.3	
	Condition for combined loads: $\frac{ M_y }{M_{y_{\max}}} + \frac{ M_z }{M_{z_{\max}}} + \frac{ F_y }{F_{y_{\max}}} + \frac{ F_z }{F_{z_{\max}}} \leq 1 \text{ and } F_x \leq F_{x_{\max}}, M_x \leq M_{x_{\max}}$						

1) Observe the max. lateral force, → 13 Characteristic curves (in the appendix)

Tab. 7


12.2 Electrical data

Size	16		25	40
Motor EPCO-...-ST				
Operating mode		Continuous operation (S1)		
Nominal voltage [V]		24		
Nominal current [A]		1.4	3.0	4.2
Holding torque [Nm]		0.09	0.5	1.13
Stepper angle [°]		1.8 ± 5 %		
Insulation class		B (130 °C)		
Brake EPCO-...ST-B				
Nominal voltage [V]		24 ± 10 %		
Performance [W]		8	8	8
Holding torque [Nm]		0.2	0.4	0.4
Mass moment of inertia [kgmm ²]		0.69	1.3	1.3
Encoder EPCO-...ST-E				
Pulses/revolution		500		
Zero pulse		Yes		
Line driver		RS422 protocol		
Operating voltage of encoder [V]		5		
CE mark (see declaration of conformity) ¹⁾²⁾		According to EU EMC Directive		

1) Measures may need to be implemented in residential areas for interference suppression

2) The maximum length of the individual connection cables must not exceed 30 m.

Tab. 8

UL certification information	
Product category code	PRHZ2 (USA) or PRHZ8 (Canada)
Certificate number	E342973
Standards taken into account	UL 1004-1/-6, C22.2 No.100
UL test symbol	

Tab. 9

13 Characteristic curves

Permissible lateral force F_y and F_z as a function of the cantilever load l

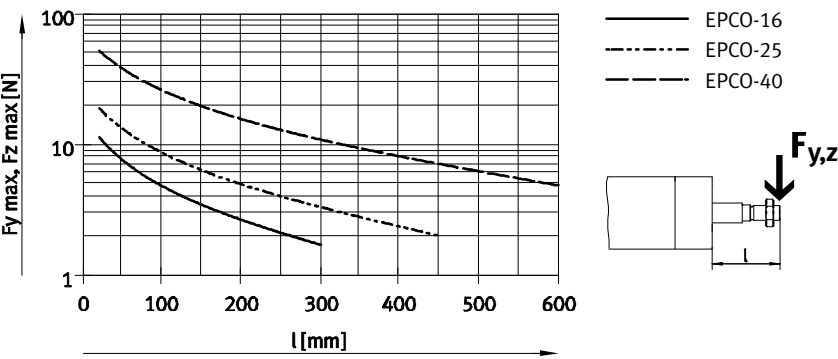


Fig. 8

Total deflection f of the piston rod as a function of the cantilever load l and lateral force F

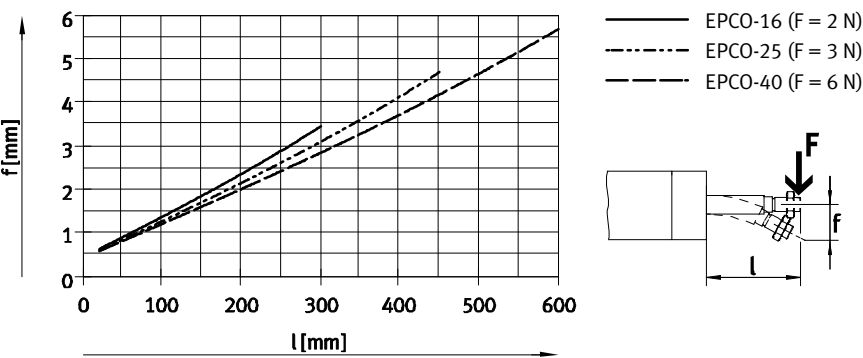
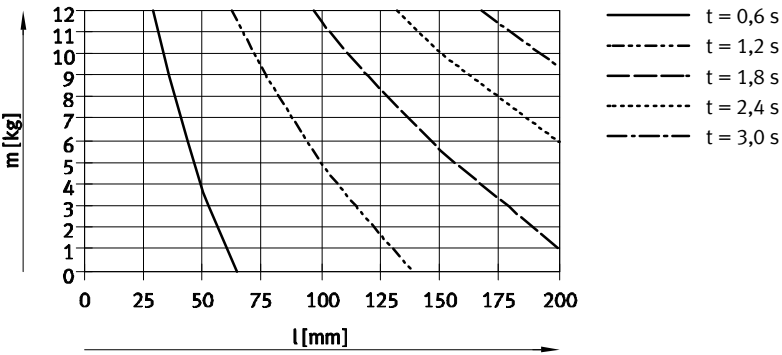


Fig. 9

EPCO-16-3P
Vertical installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

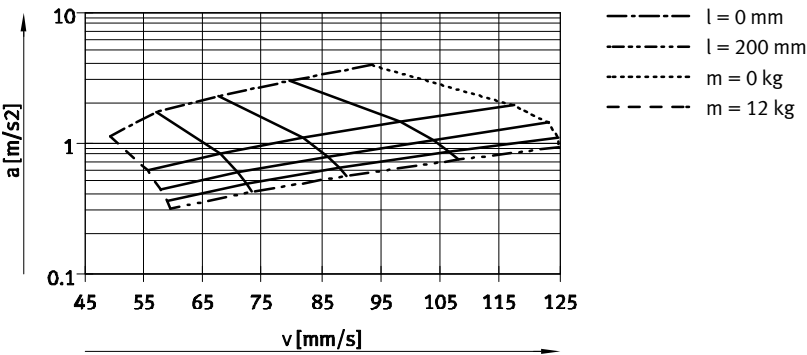
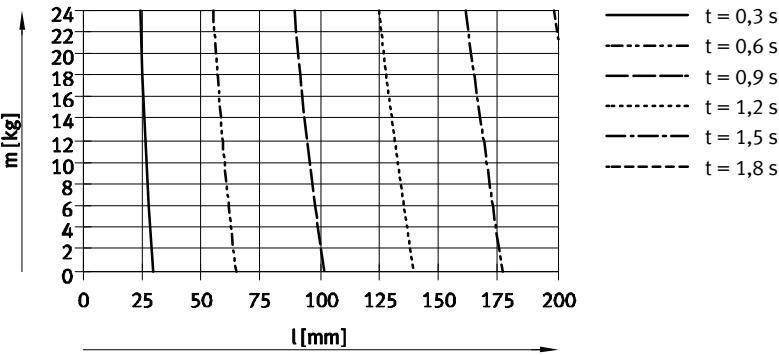


Fig. 10

EPCO-16-3P
Horizontal installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

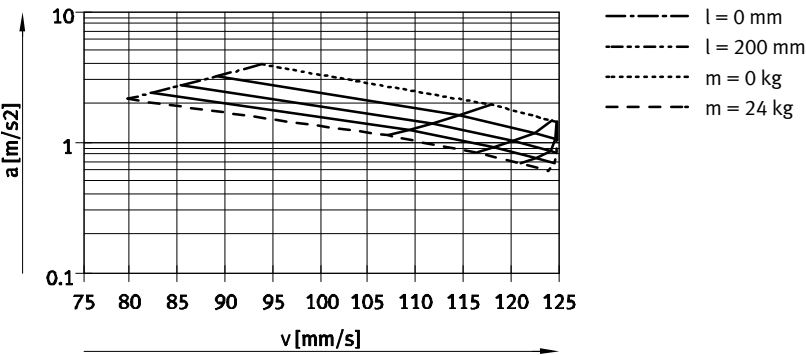
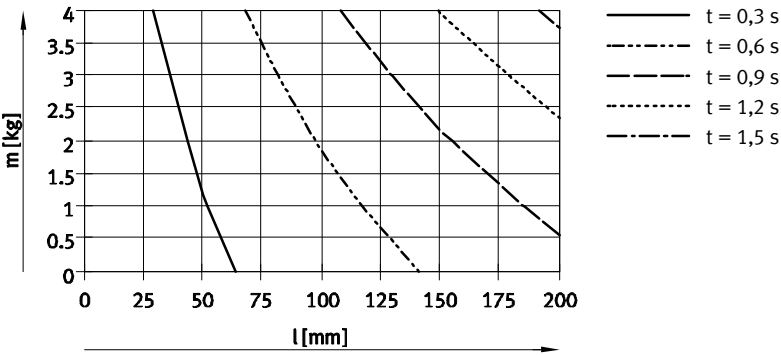


Fig. 11

EPCO-16-8P
Vertical installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

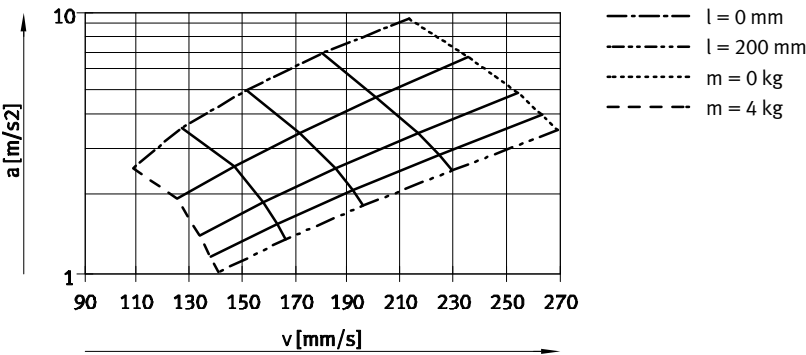
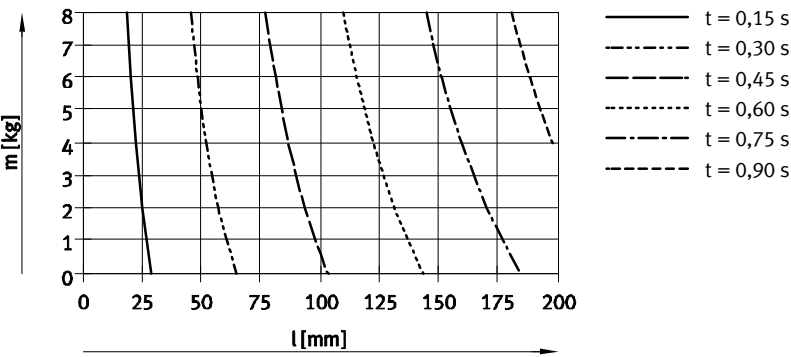


Fig. 12

EPCO-16-8P
Horizontal installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

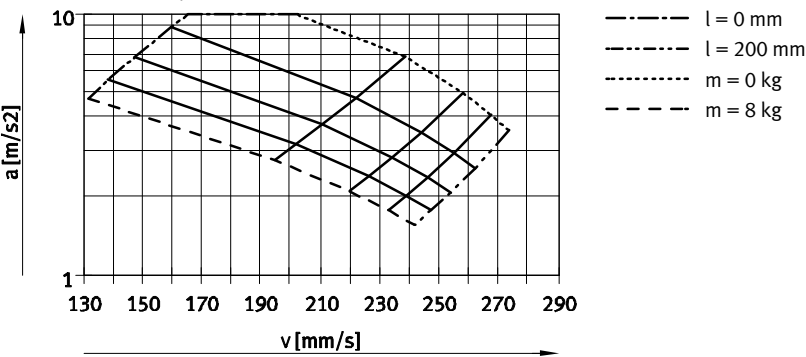
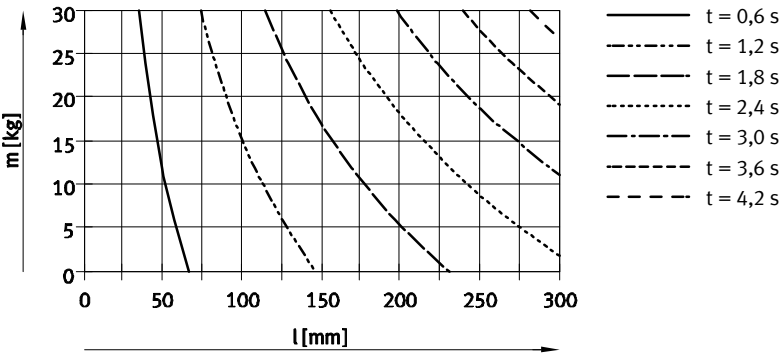


Fig. 13

EPCO-25-3P
Vertical installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

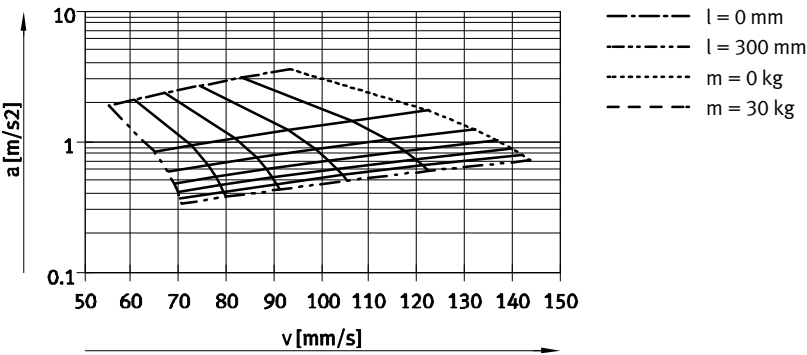
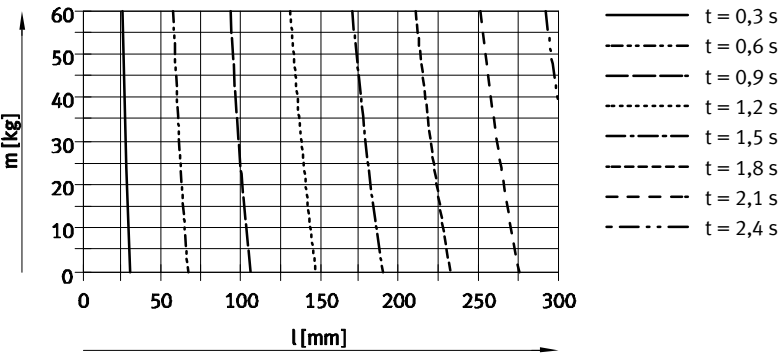


Fig. 14

EPCO-25-3P
Horizontal installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

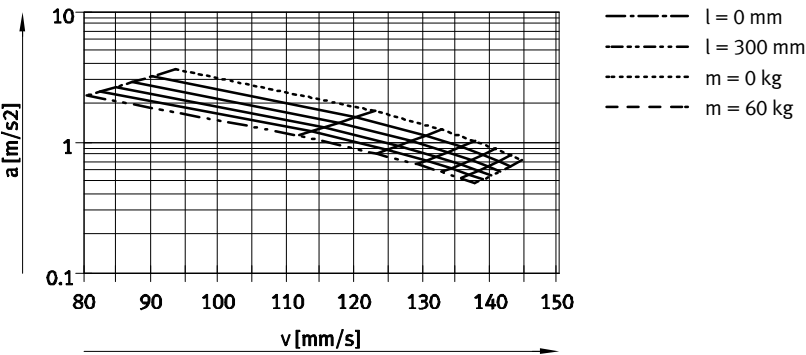
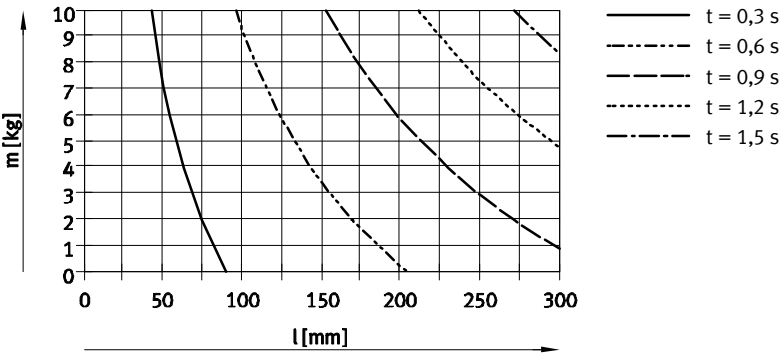


Fig. 15

EPCO-25-10P
Vertical installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

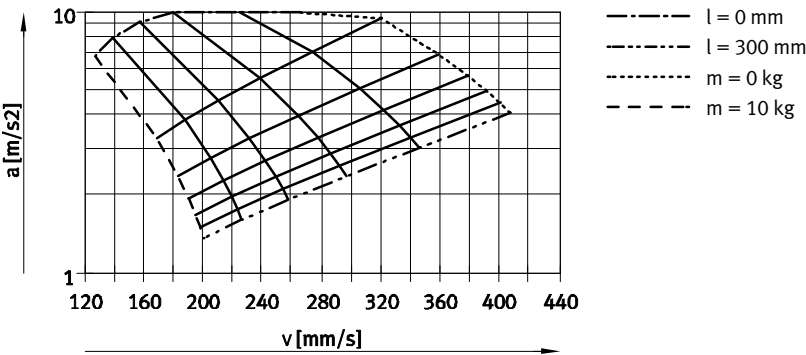
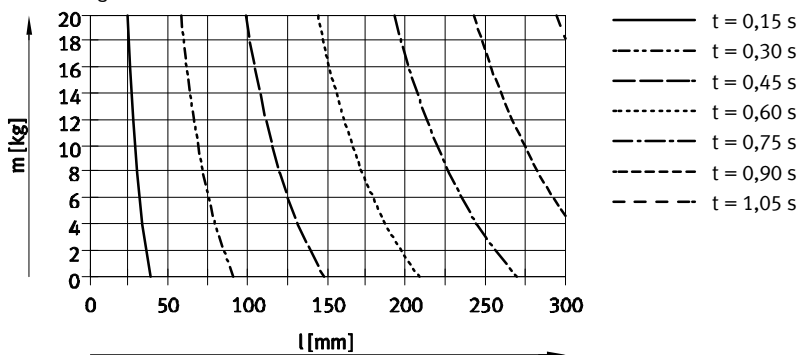


Fig. 16

EPCO-25-10P**Horizontal installation**

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

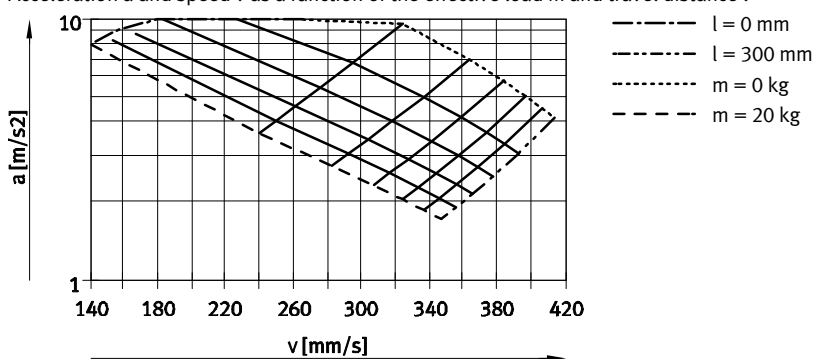
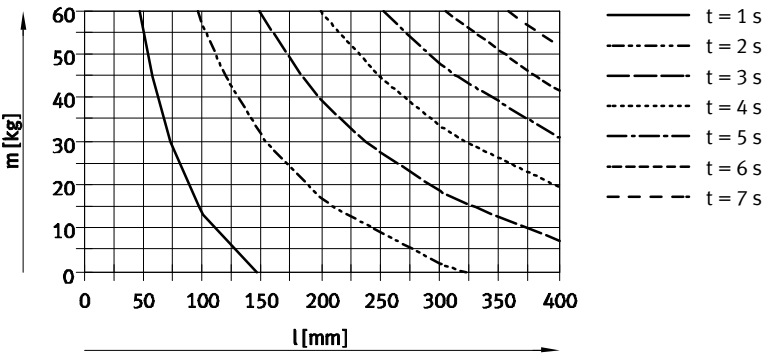


Fig. 17

EPCO-40-5P
Vertical installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

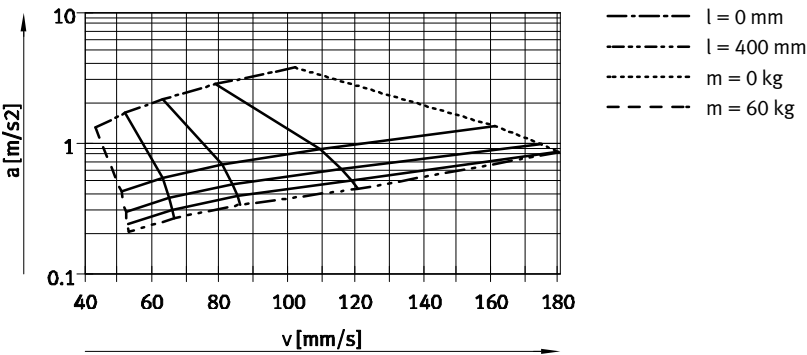
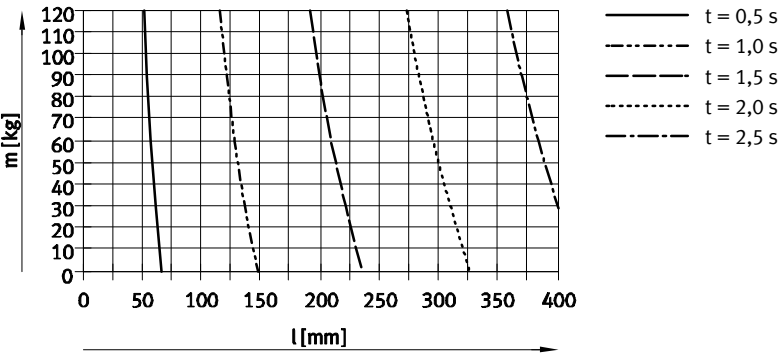


Fig. 18

EPCO-40-5P
Horizontal installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

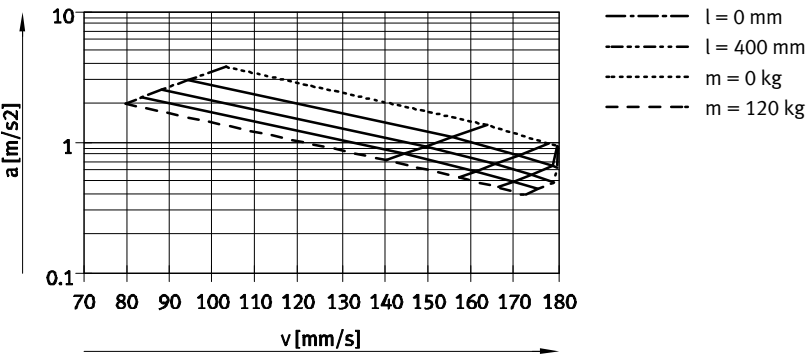
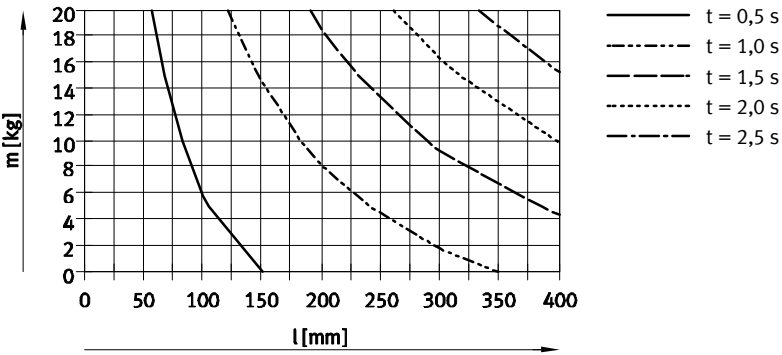


Fig. 19

EPCO-40-12,7P
Vertical installation

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

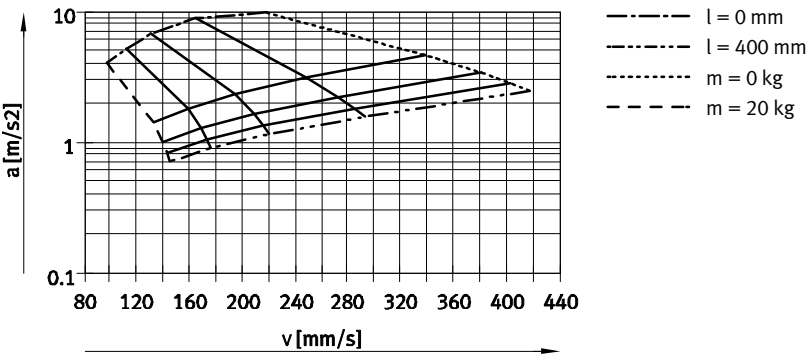
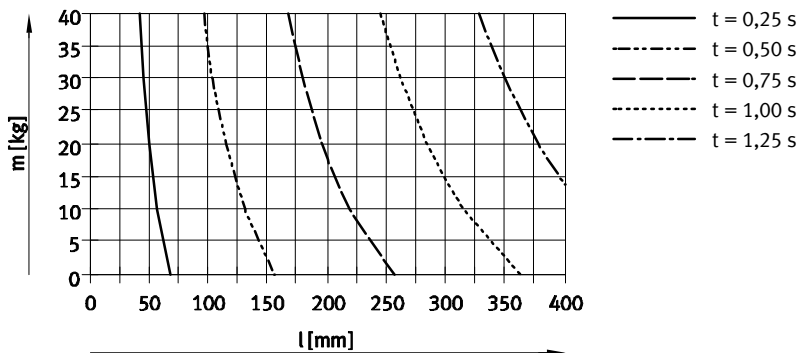


Fig. 20

EPCO-40-12,7P**Horizontal installation**

Positioning time t as a function of the travel distance l and effective load m



Acceleration a and speed v as a function of the effective load m and travel distance l

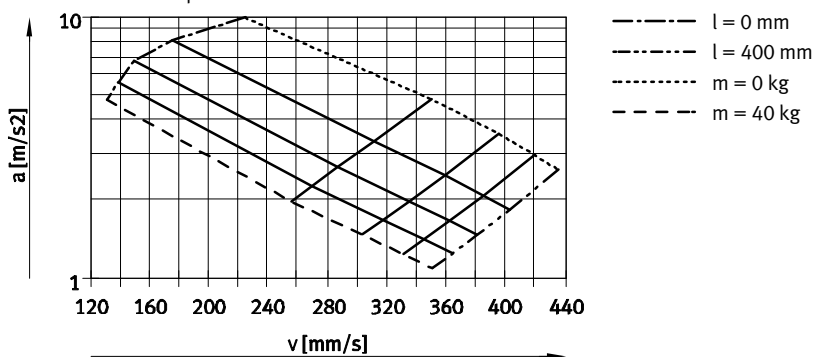


Fig. 21

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Copyright:
Festo AG & Co. KG
Ruiter Straße 82
73734 Esslingen
Germany

Phone:
+49 711 347-0

Fax:
+49 711 347-2144

E-mail:
service_international@festo.com

Internet:
www.festo.com