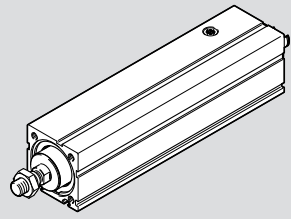


EPCC-BS

Electric cylinder



FESTO

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www.festo.com



Operating instructions

8172502
2022-03c
[8172504]

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 labelling on the product.
- Before working on the product, switch off the power supply 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 electric cylinder is intended to be used for positioning payloads in combination with tools or as a drive when external guides are used.

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 Function

The electric cylinder converts the rotary motion of the mounted motor into a linear motion of the non-rotating piston rod. The lead screw converts the torque of the motor into a feed force. The linear movement of the piston rod is guided by the guide in the guide ring. Sensors enable the monitoring of end positions, reference position and intermediate position.

4.2 Product design

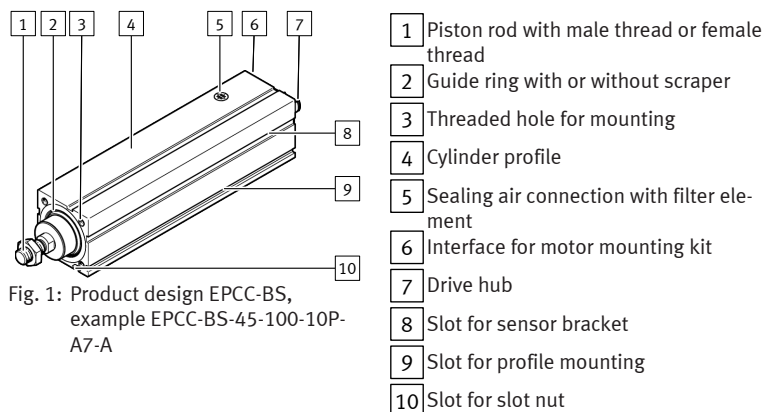


Fig. 1: Product design EPCC-BS, example EPCC-BS-45-100-10P-A7-A

5 Transport

NOTICE

Unexpected and unbraked movement of components

- Secure moving components for 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 Unpacking product

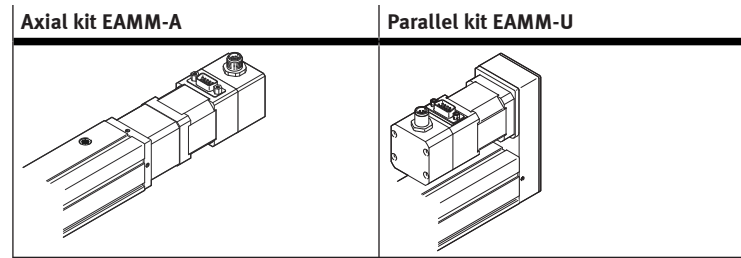
1. Open packaging.
2. Remove all transport materials, e.g. foils, caps, cardboard boxes.
3. Remove the product from the packaging and place it on the mounting surface.
4. Dispose of packaging and transport materials.

6.3 Mounting motor

i

Transverse load on the drive hub

When mounting the motor and motor mounting kit, do not exceed the maximum transverse load F_R of the drive hub, e.g. toothed belt tension when mounting the parallel kit → 12.1 Technical data, mechanical.



Tab. 1: Overview of motor mountings

Requirement

- Only loosen screws or threaded pins that are described in the directions in the instruction manuals.
 - Sufficient space for reaching and mounting the sealing air connection .
1. Select the motor and motor mounting kit from Festo → www.festo.com/catalogue.
If other motors are used: observe the critical limits for forces, torques and velocities.
 2. Fasten motor mounting kit, observe instruction manual → www.festo.com/sp.
 3. Fasten the motor without tension. Support large and heavy motors. Connect motor cables only on completion of mounting.

6.4 Mounting cylinder

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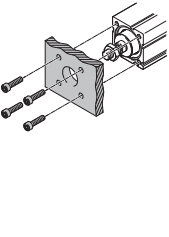
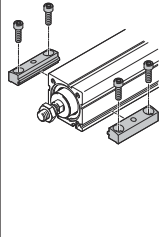
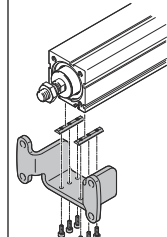
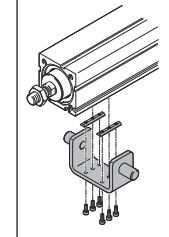
High mechanical loads on the mounting connections

If high parallel torques are applied to the drive system at the same time, this will result in high mechanical loads at the mounting interfaces.

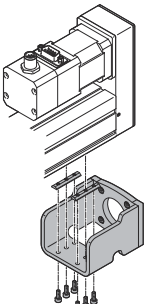
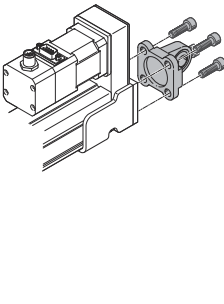
- If the mounting position is inclined or horizontal with direct fastening, the drive system will require additional support near the motor mounting.

Requirement

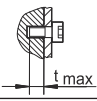
- No collision in the range of motion of the attachment component with motor, mounting components and sensor components.
 - Sufficient space to reach maintenance interfaces.
 - Sufficient space for reaching and mounting the sealing air connection.
 - Flat mounting surface maximum 0.2 mm over the stroke length of the bearing surface.
 - No distortion or bending when installing the product.
1. Select mounting attachments → www.festo.com/catalogue.
 2. Place the mounting attachments on the support points.
 3. Tighten retaining screws.
Observe the maximum tightening torque and screw-in depth.
- For additional information, contact your local Festo Service.

Direct fastening	Profile mounting EAHF-L2	Flange mounting EAHH	Swivel mounting EAHS
Mounting via thread	Mounting via profile groove	Mounting via profile groove	Mounting via profile groove
			

Tab. 2: Overview of mounting components for profile

Adapter kit EAHA	Swivel flange SNC...
Mounting via profile groove	Mounting via thread (adapter kit EAHA)
	

Tab. 3: Overview of mounting components for parallel kit

Size	25	32	45	60
Direct fastening				
Screw	–	M4	M5	M6
Max. screw-in depth t_{max} [mm]	–	8	10	12
				
Max. tightening torque [Nm]	–	3	4	5
Adapter kit EAHA Flange mounting EAHH Profile mounting EAHF-L2 Swivel mounting EAHS Swivel flange SNC...				
Screw	Instruction manual → www.festo.com/sp			

Tab. 4: Information for mounting components

6.5 Mounting attachment component

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Torque on the Piston Rod

During commissioning and operation, the piston rod may only be operated without torque.

If external torques occur, an external guide must be used.

i

Mounting the attachment component on the piston rod

When mounting the attachment component, do not exceed the maximum torque of the piston rod. The maximum torque of the piston rod may only be used for a short time during mounting → Tab. 7 Information on attachment components.

Collision-free	Torque-free	Guide load
		

Tab. 5: Requirement for attachment components

Requirement:

- No collision in the range of motion of the attachment component with motor, mounting components and sensor components.
- No transverse load or torque on the piston rod.

Absorb external forces and torques by an external guide.

- Minimise guide load. Short lever arms from the piston rod thread to the force application points and centre of gravity of the add-on elements.

1. Select accessories → www.festo.com/catalogue.
2. Screw the lock nut onto the male thread of the piston rod or attachment component.

3. Rotate or place the attachment component on the piston rod.
4. Tighten lock nut.
The tightening torque must not act on the piston rod. Counterhold with a suitable tool on the spanner flat of the piston rod.
Observe maximum tightening torque.

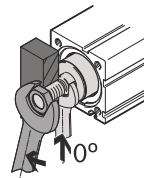
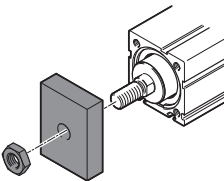
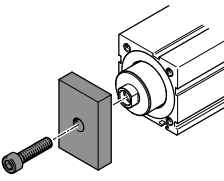
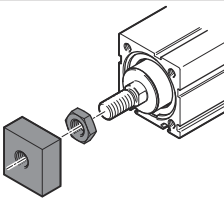
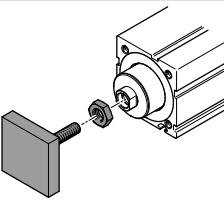



Fig. 2: Torque-free mounting

When using an additional external guide, ensure that the electric cylinder and piston rod are aligned exactly parallel.

EPCC-BS-...	EPCC-BS-...-F
Mounting via male thread	Mounting via female thread
with nut	with screw
	
with lock nut	
	
– Rod eye SGS, CRSGS – Rod clevis SG, CRSG – Coupling piece KSG – Self-aligning rod coupler FK; CRFK	

Tab. 6: Overview of attachment components

Size	25	32	45	60
Piston rod				
Spanner size $\approx \varnothing$ [mm]	7	9	10	13
Max. torque [Nm]	0.5	1	2	3
Piston rod with male thread EPCC-BS-...				
Nut, lock nut	M6	M8	M10x1.25	M12x1.25
Piston rod with female thread EPCC-BS-...-F				
Screw, lock nut	M4	M6	M8	M10
Max. screw-in depth t_{max} [mm]	10	12	14	16
				

Tab. 7: Information on attachment components

6.6 Mounting accessories

Requirement

- No collision with mounting and sensor components in the movement space of the attachment component.

Function

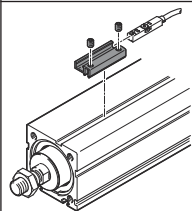
- Protection against uncontrolled overtravel of the end positions.
- Referencing to reference switch or end position.
- Query of end positions or intermediate positions.
- Prevention of hard impacts at the end positions.
- Prevention of contamination in the slots.

1. Select accessories → www.festo.com/catalogue.
2. Mount the sensor (reference or query):
 - Mount sensor rail or mounting kit.
 - Align sensor and mount it at the switching position.
 - Fasten cable.

Instruction manuals → www.festo.com/sp.

Sensor bracket EAPM

Mounting via profile groove



- Protect the sensor from external magnetic or ferritic influences, e.g. min. 10 mm distance to slot nuts.
 - Preferably use hardware limit switches with N/C contact function to guarantee protection in the event of a sensor failure.
- Instruction manual → www.festo.com/sp

Tab. 8: Overview of sensor mountings

Connecting sealing air

The use of sealing air at approx. ± 0.02 MPa (± 0.2 bar, ± 2.9 psi) reduces or prevents subsequent 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 drivetrain.

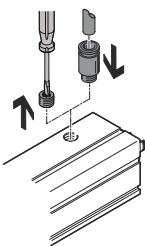


Fig. 3: Mounting fitting

1. Remove the filter element from the threaded hole.
2. Mount the screw fitting and connect the hose.

Size	25	32	45	60
Thread	M5	M5	G1/8	G1/4
Max. screw-in depth [mm]	4	5	7	7
Max. tightening torque [Nm]	1.4	1.4	5	8

Tab. 9: Information on sealing air connection

7 Commissioning

7.1 Safety

⚠ 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.

7.2 Commissioning procedure

i

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.

i

When the motor is removed, the motor encoder loses its absolute reference to the reference mark, e.g. by turning the motor drive shaft.

- Carry out a homing run every time the motor is mounted in order to establish the absolute reference between the motor encoder and the reference mark.

i

Torque on the Piston Rod

During commissioning and operation, the piston rod may only be operated without torque.

If external torques occur, an external guide must be used.

i

Running noises during operation

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

i

For use with reduced particle emission

Clean product → 9.2 Cleaning.

Requirement

- Mounting of the drive system is checked.
 - Installation and wiring of the motor is checked.
 - No foreign objects in the movement space of the drive system.
 - Maximum permissible feed force and drive torque not exceeded as a function of acceleration, deceleration (e.g. stop function, quick stop), velocity, moving mass and mounting position.
 - Cylinder not mechanically overloaded and dynamic setpoint deviation not exceeded due to force peaks and torque peaks or overshoot effects, e.g. overrunning the end position.
- Limit overloads and overruns by jerk limitation, reduced acceleration and deceleration setpoints or optimised controller settings.
- Control run and homing with reduced setpoint values for speed, acceleration and deceleration.
 - No test run to mechanical end stops.
 - Software end positions ≥ 0.25 mm away from the mechanical stops.

Steps	Purpose	Note
1. Check travel	Determine the direction of travel of the piston rod	<ul style="list-style-type: none"> – Direction of movement of piston rod, clockwise spindle: <ul style="list-style-type: none"> – Retracting: rotate drive shaft clockwise. – Advancing: rotate drive shaft anti-clockwise. – The direction of movement of the piston rod for positive and negative position values depends on the mounting position of the motor on the cylinder, e.g. parallel or axial kit. – Set a required reversal of direction of rotation via parameters in the servo drive or controller.
2. Homing	Determination of the reference point and adjustment of the dimensional reference system <ul style="list-style-type: none"> – during the initial start-up procedure – after replacement of the motor 	Permissible reference points: <ul style="list-style-type: none"> – towards reference switch: <ul style="list-style-type: none"> Travel at reduced velocity → 12 Technical data. – towards end position: <ul style="list-style-type: none"> do not exceed maximum values → Tab. 11 Speed and energy at the end positions. Additional information → Instruction manual of the drive system, → www.festo.com/sp .
3. Test run	Checking the operating conditions	Check application requirements: <ul style="list-style-type: none"> – Piston rod runs through the complete travel cycle in the specified time. – The piston rod stops travel when a limit switch or software end position is reached.

After a successful test run, the drive system is ready for operation.

Tab. 10: Commissioning steps

Size	25	32	45	60
Max. stop velocity [m/s]	0.01			
Max. stop energy [mJ]	1.2	3.6	12	24
Calculation of the maximum stop energy				
$E_{max} = \frac{v^2}{2} \left(m + \frac{J_R}{J_L} \right)$		<ul style="list-style-type: none"> – v = max. stop velocity – m = mass of all linear moving components – J_R = mass moment of inertia of all rotating components – J_L = mass moment of inertia per kg payload Additional information → www.festo.com/catalogue .		

Tab. 11: Speed and energy at the end positions

8 Operation

⚠ 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.

i

Torque on the Piston Rod

During commissioning and operation, the piston rod may only be operated without torque.

If external torques occur, an external guide must be used.

i

Lubrication run during operation

Observe the following lubrication travel intervals.

- With working stroke less than 2 x spindle pitch... P:
 - Perform a lubrication run within 10 travel cycles with a minimum stroke of ≥ 2 x spindle pitch.

9 Maintenance

9.1 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.

9.2 Cleaning

- If the piston rod is dirty, clean it with a clean, soft and lint-free cloth without cleaning agents and then apply the lubricant thinly to the piston rod.
- Clean the other product components with a clean, soft cloth and non-abrasive cleaning agents.

For use with reduced particle emission:

- Remove abrasion and contamination from the product on the following schedule:
 - Prior to initial commissioning.
 - Regularly during operation.

9.3 Lubrication

Lubrication interval and accessories

Lubrication	Lead screw	Piston rod
Lubrication interval	Lubrication for life	If required, e.g. if the grease layer is too low.
Accessories		
Lubrication point	—	Surface
Lubricant	—	ELKALUB VP 922, Chemie-Technik, Vöhringen

Tab. 12: Overview of lubrication intervals and accessories

10 Malfunctions

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

Malfunction	Possible cause	Remedy
Loud running noises or vibrations or rough running of the cylinder	Coupling distance too short	Observe permissible coupling spacings → Instruction manual for motor mounting kit, → www.festo.com/sp .
	Torsional stresses	<ul style="list-style-type: none"> - Install the cylinder free of tension. Make sure that the contact surface is flat → 6.4 Mounting cylinder. - Change the layout of the attachment component, e.g. payload. - Align cylinder and attached guide element parallel to each other. - Use external guide.
	Current controller settings	Optimise controller values, e.g. velocity, acceleration, etc.
	Resonant vibration of the cylinder	Change the travel velocity.
	Wear on bearing or drive screw	<ul style="list-style-type: none"> - Contact local Festo Service. - Replace cylinder → www.festo.com/catalogue.
	Insufficient lubrication of the piston rod	Lubricate piston rod → 9.3 Lubrication.
Vibration at the piston rod	Operation at the resonance point of the cylinder	<ul style="list-style-type: none"> - Change the travel velocity. - Change the acceleration. - Increase cylinder stiffness, e.g. shorter support distances. - Change the payload geometry.
Long oscillations of the profile	Resonant frequency of profile and payload too low.	<ul style="list-style-type: none"> - Increase cylinder stiffness, e.g. shorter support distances. - Change the payload geometry.
Piston rod does not move	Coupling slips	Check the mounting of the shaft-hub connection → Instruction manual of the motor mounting kit, → www.festo.com/sp .
	Loads too high	Reduce forces and torques. Consider dynamics.
	Threaded drive blocked	<ul style="list-style-type: none"> - Contact local Festo Service. - Replace cylinder → www.festo.com/catalogue.
	Pre-tension of toothed belt too high in parallel kit	Reduce the pre-tension of the toothed belt → Instruction manual for parallel kit, → www.festo.com/sp .
	Operation at the lower ambient temperature limit	<ul style="list-style-type: none"> - Optimise controller data, e.g. velocity, acceleration, ... - Use gear unit.
	Piston rod jammed at the mechanical end position	Manually releasing a jam: <ul style="list-style-type: none"> - Switch off the controller and lock it to prevent it from being switched on again unintentionally. - Remove motor and motor mounting kit. - Rotate drive shaft freely.
Overruns the end position	Sensor does not switch	Check sensor, installation and parameterisation.

Malfunction	Possible cause	Remedy
Position sensing not reproducible	Sensor switches several times	- Contact local Festo Service.
Idling torque too high	Wear in the drivetrain	- Contact local Festo Service. - Replace cylinder → www.festo.com/catalogue .

Tab. 13: Overview of fault clearance

11 Demounting

⚠ WARNING

Unexpected movement of components

Injury due to impact or crushing.

- Before working on the product: secure the slide to prevent unintentional movement.

⚠ 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.

1. Disconnect electrical installations.
2. Remove the mounted attachment component.
3. Remove the mounted accessories.
4. Remove motor and mounting kit.
5. Remove mounting attachments.
6. Observe transport information → 5 Transport.

12 Technical data

12.1 Technical data, mechanical

i

Use the Festo sizing software for sizing the drive → www.festo.com/sp.

Additional information → www.festo.com/catalogue.

EPCC-BS-25/32

Size	25		32		
Spindle pitch	2P	6P	3P	8P	
Design	Electric cylinder with ball screw				
Guide	Plain-bearing guide				
Mounting position	any				
Max. feed force F_x	[N]	75	150		
Max. driving torque	[Nm]	0.05	0.1	0.15	0.3
No-load driving torque	[Nm]	0.02	0.055	0.065	0.095
Max. rotational speed	[rpm]	4000		3750	
Max. velocity	[m/s]	0.133	0.4	0.188	0.5
		→ 12.2 Characteristic curves			
Max. acceleration	[m/s ²]	5	15	5	15
Repetition accuracy	[mm]	± 0.02			
Feed constant	[mm/rev]	2	6	3	8
Duty cycle	[%]	100			
Relative humidity	[%]	0 ... 95 (non-condensing)			
Ambient temperature	[°C]	0 ... +60			
Storage temperature	[°C]	-20 ... +60			
Degree of protection		IP40			
Max. permissible force on the drive hub					
Max. transverse load F_R	[N]	30		75	
Max. permitted forces, torques and torsional backlash on the piston rod					
Max. torsional backlash	[°]	± 1			
F_x	[N]	75		150	
F_y	[N]	→ 12.2 Characteristic curves			
F_z	[N]	→ 12.2 Characteristic curves			
M_x	[Nm]	0		0	
M_y	[Nm]	0.6		1.5	
M_z	[Nm]	0.6		1.5	
Calculating the load comparison factor					

Size	25		32	
Spindle pitch	2P	6P	3P	8P
f_v	$f_v = \frac{ F_{y,dyn} }{F_{y,max}} + \frac{ F_{z,dyn} }{F_{z,max}} + \frac{ M_{x,dyn} }{M_{x,max}} + \frac{ M_{y,dyn} }{M_{y,max}} + \frac{ M_{z,dyn} }{M_{z,max}} \leq 1$			

Tab. 14: General data, EPCC-BS-25/32

EPCC-BS-45/60

Size	45		60	
Spindle pitch	3P	10P	5P	12P
Design	Electric cylinder with ball screw			
Guide	Plain-bearing guide			
Mounting position	any			
Max. feed force F_x [N]	450		1000	
Max. driving torque [Nm]	0.4	0.9	1.2	2.4
No-load driving torque [Nm]	0.08	0.16	0.235	0.325
Max. rotational speed [rpm]	3600		3000	
Max. velocity [m/s]	0.18	0.6	0.25	0.6
Max. acceleration [m/s^2]	5	15	5	15
Repetition accuracy [mm]	± 0.02			
Feed constant [mm/rev]	3	10	5	12
Duty cycle [%]	100			
Relative humidity [%]	0 ... 95 (non-condensing)			
Ambient temperature [$^{\circ}C$]	0 ... +60			
Storage temperature [$^{\circ}C$]	-20 ... +60			
Degree of protection	IP40			
Max. permissible force on the drive hub				
Max. transverse load F_R [N]	180		230	
Max. permitted forces, torques and torsional backlash on the piston rod				
Max. rotation angle [$^{\circ}$]	± 1			
F_x [N]	450		1000	
F_y [N]	\rightarrow 12.2 Characteristic curves			
F_z [N]	\rightarrow 12.2 Characteristic curves			
M_x [Nm]	0		0	
M_y [Nm]	2.9		6.4	
M_z [Nm]	2.9		6.4	
Calculating the load comparison factor				
f_v	$f_v = \frac{ F_{y,dyn} }{F_{y,max}} + \frac{ F_{z,dyn} }{F_{z,max}} + \frac{ M_{x,dyn} }{M_{x,max}} + \frac{ M_{y,dyn} }{M_{y,max}} + \frac{ M_{z,dyn} }{M_{z,max}} \leq 1$			

Tab. 15: General data, EPCC-BS-45/60

EPCC-BS-25/32/45/60

Size	25	32	45	60
Materials				
Cylinder barrel	Anodised aluminium			
Piston rod	High-alloy steel			
Spindle	Bearing steel			
Spindle nut	Bearing steel			
Weight				
Basic weight at 0 mm stroke [kg]	0.132	0.225	0.555	1.114
Added weight per 10 mm stroke [kg]	0.013	0.024	0.041	0.069

Tab. 16: Materials and weight

12.2 Characteristic curves

Additional information \rightarrow www.festo.com/catalogue.

Transverse load of piston rod EPCC-BS

Maximum transverse load F_y, F_z on the piston rod as a function of the piston rod length l

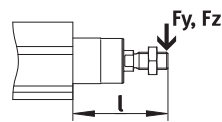


Fig. 4: Maximum transverse load F_y, F_z and piston rod length l

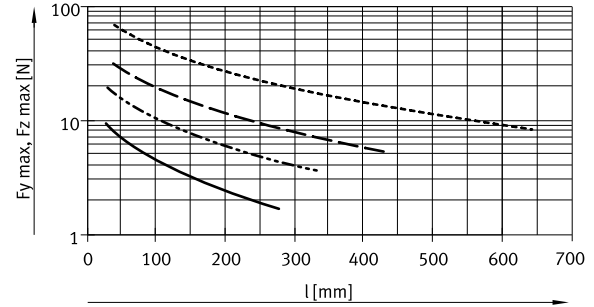


Fig. 5: EPCC, Maximum lateral force F_y, F_z as a function of piston rod length l

— EPCC-BS-25 - - - EPCC-BS-45
 - - - EPCC-BS-32 EPCC-BS-60

Feed speed – piston rod length EPCC-BS

Maximum feed velocity v as a function of stroke length l

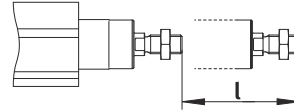


Fig. 6: Stroke length l

EPCC-BS-25-...

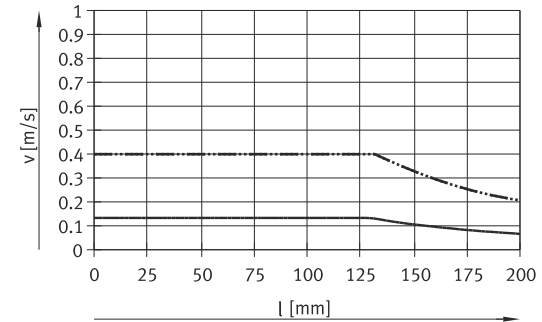


Fig. 7: EPCC-25, feed velocity v as a function of stroke length l

— EPCC-BS-25-2P - - - EPCC-BS-25-6P

EPCC-BS-32-...

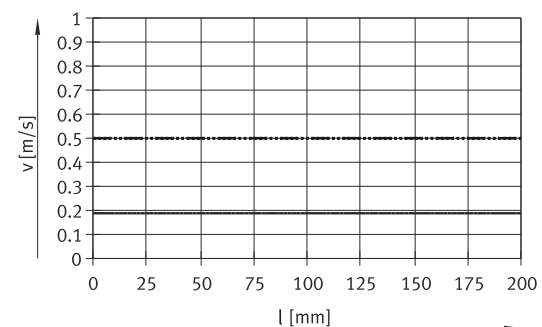


Fig. 8: EPCC-32, feed velocity v as a function of stroke length l

— EPCC-BS-32-3P - - - EPCC-BS-32-8P

EPCC-BS-45-...

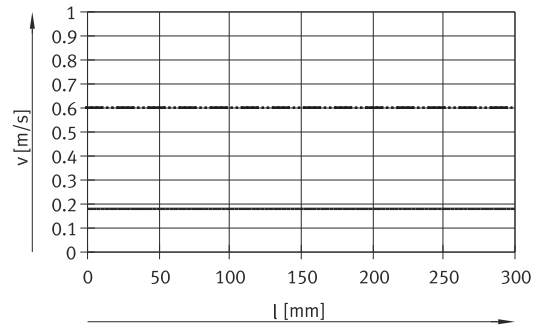


Fig. 9: EPCC-45, feed velocity v as a function of stroke length l

— EPCC-BS-45-3P -.- EPCC-BS-45-10P

EPCC-BS-60-...

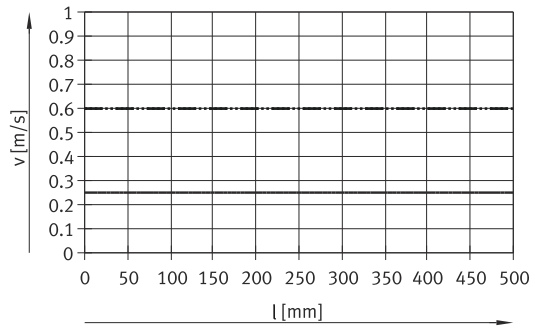


Fig. 10: EPCC-60, feed velocity v as a function of stroke length l

— EPCC-BS-60-5P -.- EPCC-BS-60-12P