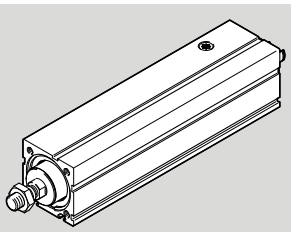
EPCC-BS
Electric cylinder



FESTO

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www.festo.com

Operating instructions

8125400
2020-01a
[8125402]

8125400

Translation of the original instructions

1 Applicable Documents

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

2 Safety

2.1 Safety instructions

– Observe labelling on the product.
– Prior to assembly, installation and maintenance work: Switch off power supply, ensure that it is off and secure it against being switched back on.
– Store the product in a cool, dry, UV-protected and corrosion-protected environment. Ensure that storage times are kept to a minimum.
– Observe tightening torques. Unless otherwise specified, the tolerance is ± 20 %.

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

Installation, commissioning, maintenance and disassembly should only be conducted by qualified personnel. The qualified personnel must be familiar with installation of electrical control systems.

3 Additional Information

– Accessories ➔ www.festo.com/catalogue.

4 Service

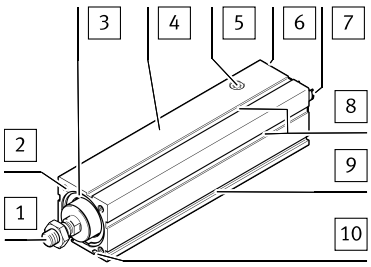
Contact your regional Festo contact person if you have technical questions ➔ www.festo.com.

5 Product overview

5.1 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.

5.2 Product design



1 Piston rod
2 Threaded hole for mounting
3 Guide ring
4 Cylinder profile
5 Sealing air connection with filter element
6 Interface for motor mounting kit
7 Drive hub
8 Slot for sensor bracket
9 Slot for profile mounting
10 Slot for slot nut

Fig. 1 Product design

6 Transport and storage

NOTICE!

Unexpected and unbraked movement of components

- Secure moving components for transport.

Transport and Storage Conditions

– Take product weight into account ➔ 14 Technical data.
– Take the product focus into consideration.
– Store and transport the product in its original packaging.
– Store product in a cool, dry, shaded and corrosion protected environment.
– Store product in ambient conditions without oils, greases and degreasing vapours.
– Ensure short storage times.

7 Assembly

7.1 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.

7.2 Unpacking

1. Open the 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 ➔ 13 Disposal.

7.3 Mount the motor

Transverse load on the drive hub

When mounting the motor and motor mounting kit, do not exceed the max. transverse load Fx, Fy of the drive shaft (e.g. toothed belt tension when mounting the parallel kit) ➔ 14.1 Technical data, mechanical.

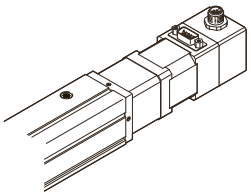


Fig. 2 Motor mounting

Requirement

– Only loosen screws or threaded pins that are described in the directions in the instruction manual.
– Provide sufficient space for connecting the sealing air ➔ Connecting sealing air.

1. Select the motor and motor mounting kit from Festo➔ www.festo.com/catalogue.
   When using other motors: observe the critical limits for forces, torques and velocities.
2. Fasten motor mounting kit, observe instructions ➔ www.festo.com/sp.
3. Fasten the motor without tension. Support large and heavy motors.

Connect motor cables only on completion of mounting.

7.4 Mounting the Cylinder

High mechanical loads on the mounting connections

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

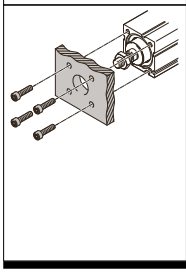
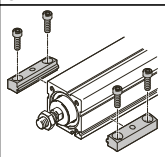
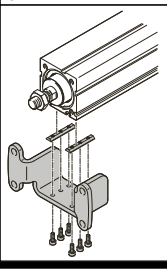
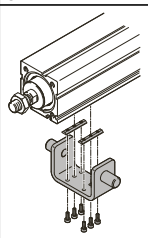
- If the mounting position is inclined or horizontal mounting position with direct mounting, the drive system requires additional support near the motor mounting.

Requirement

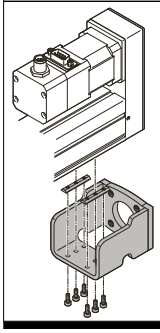
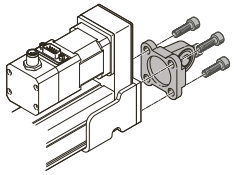
– No collision in the movement space of the attachment component with mounting and sensor components.
– Sufficient space for reaching and securing the sealing air connection.
– Flatness of the mounting surface max. 0.2 mm over the stroke length of the bearing surface.
– No distortion or bending when 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 max. tightening torque and max. screw-in depth.

For additional information, contact your local Festo Service.

Direct mounting	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. 1 Overview of mounting components for profile

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

Tab. 2 Overview of mounting components for parallel kit

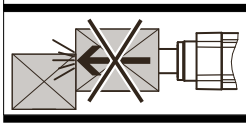
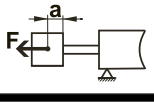
Size		25	32	45	60
Direct mounting					
Screw		–	M4	M5	M6
Max. screw-in depth t_{max}	[mm]	–	8	10	12
Max. tightening torque	[Nm]	–	3	4	5
Adapter kit EAHA Flange mounting EAHH Profile mounting EAHF-L2 Swivel mounting EAHS Swivel flange SNC...					
Screw		Instruction manual ➔ www.festo.com/sp			

Tab. 3 Information on mounting attachments

7.5 Mounting the attachment component

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.

Mounting the attachment component on the piston rod
When mounting the attachment component do not exceed the max. torque of the piston rod. The max. torque of the piston rod may only be used for a short time during mounting ➔ Tab. 6 Information on attachment components.

Collision-free	Torque-free	Centre of gravity and tilting moment
		

Tab. 4 Requirement for attachment component

Requirement
- No collision in the movement space of the attachment component with mounting and sensor components.
- No transverse load or torque on the piston rod.
  Absorb external forces and torques via an external guide.
- Position of the centre of gravity and tilting moment (force F parallel to the axis of movement) of the attachment component centrally and close to the piston rod (short lever arm a).

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.

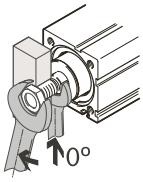
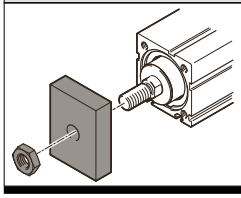
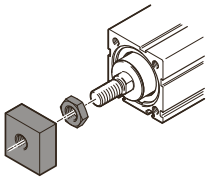


Fig. 3 Torque-free mounting

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

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

Tab. 5 Overview of attachment component

Size		25	32	45	60
Piston rod					
Width across flats ⫧	[mm]	7	9	10	13
Max. torque	[Nm]	0.5	1	2	3
Nut, lock nut		M6	M8	M10x1.25	M12x1.25

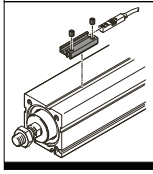
Tab. 6 Information on attachment components

7.6 Mounting accessories

Requirement
- No collision in the movement space of the attachment component with mounting and sensor components.
- Protection against uncontrolled overtravel of the end positions.
- Homing to reference switch or end position.
- Query of end positions or intermediate positions.

1. Select accessories ➔ www.festo.com/catalogue.
2. Mount the sensor (reference or query):
   - Mount the sensor rail or mounting kit (depending on the type of mounting).
   - Align sensor and fasten it to the switching position.

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 normally closed function (protection guaranteed even in case of sensor failure). Instruction manual ➔ www.festo.com/sp

Tab. 7 Overview of Sensor Mountings

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

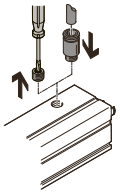


Fig. 4 Mount fitting

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	9
Max. tightening torque	[Nm]	1.4	1.4	5	8

Tab. 8 Information on sealing air connection

8 Commissioning

8.1 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.

8.2 Performing commissioning

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 after every motor mounting in order to establish the absolute reference between the motor encoder and the reference mark.

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

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 electric cylinders can generate different running noises depending on the mode of operation, type of mounting, installation environment and components.

Requirement
– Mounting of the drive system checked.
– Installation and wiring of the motor checked.
– No foreign objects in the movement space of the propulsion system.
– No exceeding of the max. permissible feed force and drive torque as a function of acceleration, deceleration (e.g. stop function, quick stop), velocity, moving mass and mounting position.
– No mechanical overload of the cylinder and dynamic setpoint deviation not exceeded (e.g. overrunning the end position) due to force and torque peaks or overshoot effects.
  Limit overloads and overruns by jerk limitation, lower acceleration and deceleration setpoints or optimised controller settings.
– Control and homing travel at reduced velocity, acceleration and deceleration setpoints.
– No test drive 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	– Direction of movement of piston rod (clockwise spindle):
		  – Retracting: rotate cylinder drive shaft clockwise.
		  – Extending: rotate cylinder drive shaft anticlockwise.
		– 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 controller or controller.

2. Homing	Determination of the reference point and adjustment of the dimensional reference system – During the initial start-up procedure – After replacement of the motor	Permissible reference points: – towards reference switch: travel at reduced velocity ➔ 14 Technical data. – towards end position: do not exceed maximum values ➔ Tab. 10 Speed and energy in the end positions. Further information ➔ Instruction manual of the drive system, www.festo.com/sp.
3. Test run	Checking the operating conditions	Check application requirements: – Piston rod travels through the complete travel cycle in the specified time. – The piston rod stops travel when a limit switch or software end positions are reached.
After a successful test run, the drive system is ready for operation.		

Tab. 9 Commissioning steps

Size		25	32	45	60
Max. stop velocity	[m/s]	0.01			
Max. stop energy	[mJ]	1.2	3.6	12	24
		$E_{max} = 0{,}5 * v^2 \left(m + \frac{J_A}{J_L}\right)$ – J_A = mass moment of inertia – J_L = mass moment of inertia per kg payload			

Tab. 10 Speed and energy in the end positions

9 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.

10 Maintenance

10.1 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.

10.2 Cleaning

1. Clean the product with a soft cloth. Do not use aggressive cleaning agents.
2. If necessary, clean the piston rod with a soft lint-free cloth without detergent. Then apply the lubricant thinly to the piston rod.

10.3 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, ChemieTechnik, Vöhringen

Tab. 11 Overview of lubrication intervals and accessories

11 Malfunctions

11.1 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.
	Tensions	– Install the cylinder so it is free of tension. Note the flatness of the contact surface ➔ 7.4 Mounting the 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 oscillation of the cylinder	Change the travel velocity.
	Wear on bearing or lead screw	– Contact local Festo Service. – Replace cylinder ➔ www.festo.com/catalogue.
	Insufficient lubrication of the piston rod	Lubricate the piston rod ➔ 10.3 Lubrication.
Oscillations at the piston rod	Operation at the resonance point of the cylinder	– Change the travel velocity. – Change the acceleration. – Increase the cylinder rigidity (e.g. shorter support distances). – Change the payload geometry.
Long oscillations of the profile	The resonant frequency from the profile and useful load are too low	– Increase the cylinder rigidity (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 for the motor mounting kit, www.festo.com/sp.
	Loads too high	Reduce forces and torques. Consider dynamics.
	Threaded drive blocked	– 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	– Optimise controller data (e.g. velocity, acceleration, ...). – Use gear unit.
	Piston rod jammed at the mechanical end position	Manually releasing a jam: – 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.
Idling torque too high	Wear in the drive train	– Contact local Festo Service. – Replace cylinder ➔ www.festo.com/catalogue.

Tab. 12 Overview of Fault Clearance

11.2 Repair

– Observe the instructions for dismantling ➔ 12 Disassembly.
– Send the electric cylinder to the Festo repair service.

12 Disassembly

⚠ 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 attached accessories.
3. Remove the mounted attachment component.
4. Remove the mounting attachments.
5. Observe transport information ➔ 6 Transport and storage.

13 Disposal

Dispose of the product and packaging according to the valid provisions of environmentally sound recycling.

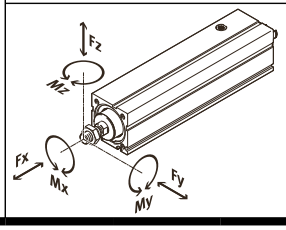
14 Technical data

14.1 Technical data, mechanical

i

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

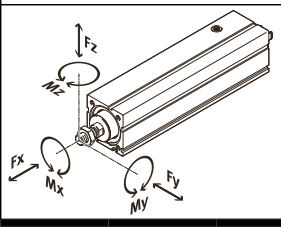
EPCC-BS-25/32

Size		25		32	
Spindle pitch ...P		2	6	3	8
Design		Electric cylinder with ball screw drive			
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
		➔ 14.2 Characteristic curves			
Max. acceleration	[m/s²]	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 forces on the drive hub					
Max. transverse load Fx, Fy	[N]	30		75	
Max. permitted forces, torques and torsional backlash on the piston rod					
Max. torsional backlash	[°]	± 1			
Fx	[N]	75		150	
Fy	[N]	➔ 14.2 Characteristic curves			
Fz	[N]	➔ 14.2 Characteristic curves			
Mx	[Nm]	0		0	
My	[Nm]	0.6		1.5	
Mz	[Nm]	0.6		1.5	
Calculating the load comparison factor					
fv		$f_v = \frac{\lvert F_{y,dyn}\rvert}{F_{y,max}} + \frac{\lvert F_{z,dyn}\rvert}{F_{z,max}} + \frac{\lvert M_{x,dyn}\rvert}{M_{x,max}} + \frac{\lvert M_{y,dyn}\rvert}{M_{y,max}} + \frac{\lvert M_{z,dyn}\rvert}{M_{z,max}} \leq 1$			
					

Tab. 13 General data, EPCC-BS-25/32

EPCC-BS-45/60

Size		45		60	
Spindle pitch ...P		3	10	5	12
Design		Electric cylinder with ball screw drive			
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/s²]	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	[°C]	0 ... +60			
Storage temperature	[°C]	–20 ... +60			
Degree of protection		IP40			
Max. permissible forces on the drive hub					
Max. transverse load Fx, Fy	[N]	180		230	

Size		45		60	
Spindle pitch ...P		3	10	5	12
Max. permitted forces, torques and torsional backlash on the piston rod					
Max. rotation angle	[°]	± 1			
Fx	[N]	450		1000	
Fy	[N]	➔ 14.2 Characteristic curves			
Fz	[N]	➔ 14.2 Characteristic curves			
Mx	[Nm]	0		0	
My	[Nm]	2.9		6.4	
Mz	[Nm]	2.9		6.4	
Calculating the load comparison factor					
fv		$f_v = \frac{\lvert F_{y,dyn}\rvert}{F_{y,max}} + \frac{\lvert F_{z,dyn}\rvert}{F_{z,max}} + \frac{\lvert M_{x,dyn}\rvert}{M_{x,max}} + \frac{\lvert M_{y,dyn}\rvert}{M_{y,max}} + \frac{\lvert M_{z,dyn}\rvert}{M_{z,max}} \leq 1$			
					

Tab. 14 General data, EPCC-BS-45/60

EPCC-BS-25/32/45/60

Size		25	32	45	60
Materials					
Note on materials		RoHS-compliant Contains PWIS			
Cylinder barrel		Anodised aluminium			
Piston rod		High-alloy steel			
Spindle		Rolling bearing steel			
Spindle nut		Rolling bearing steel			
Weight					
Basic weight at 0 mm stroke	[kg]	0.132	0.225	0.555	1.114
Additional weight per 10 mm stroke	[kg]	0.013	0.024	0.041	0.069

Tab. 15 Materials and weight

14.2 Characteristic curves

Transverse load of piston rod EPCC-BS

Max. lateral force Fy, Fz on the piston rod as a function of the piston rod length l

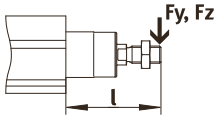
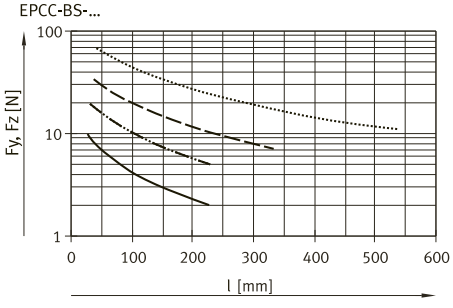


Fig. 5 Max. transverse load Fy, Fz and piston rod length l



EPCC-BS-25 ---- EPCC-BS-45

EPCC-BS-32 ..... EPCC-BS-60

Fig. 6 EPCC, max. transverse load Fy, Fz as a function of the piston rod length l

Feed speed – piston rod length EPCC-BS

Max. feed speed v as a function of the stroke length l

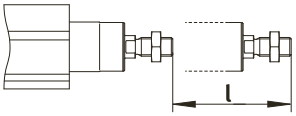
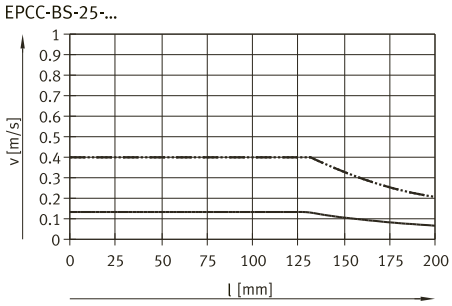
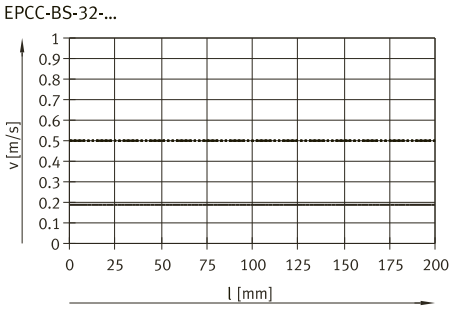


Fig. 7 Stroke length l



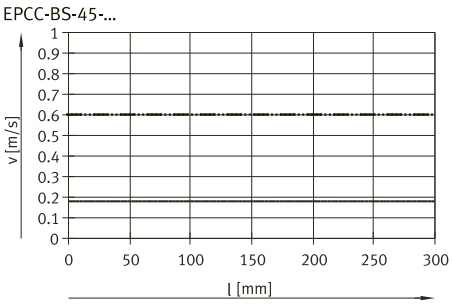
EPCC-BS-25-2P EPCC-BS-25-6P

Fig. 8 EPCC-25, feed speed v as a function of stroke length l



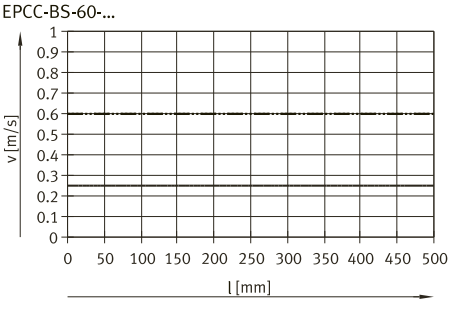
EPCC-BS-32-3P EPCC-BS-32-8P

Fig. 9 EPCC-32, feed speed v as a function of the stroke length l



EPCC-BS-45-3P EPCC-BS-45-10P

Fig. 10 EPCC-45, feed speed v as a function of stroke length l



EPCC-BS-60-5P EPCC-BS-60-12P

Fig. 11 EPCC-60, feed speed v as a function of stroke length l