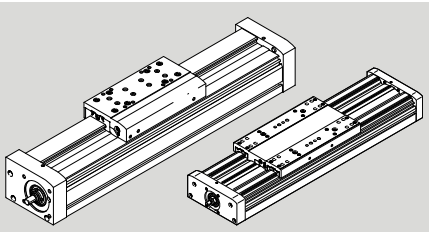
EGC-BS-KF/EGC-HD-BS
Spindle axis



Festo SE & Co. KG
Ruiter Straße 82
73734 Esslingen
Germany
+49 711 347-0

www.festo.com

Instructions | Operating

8093050
2018-04g
[8093052]

8093050

Translation of the original instructions

1 Further applicable documents
All available documents for the product ➔ www.festo.com/pk.

2 Safety
2.1 General safety instructions
- Only use the product in its original condition without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Observe product labelling.
- Take into consideration the ambient conditions at the location of use.
- Before working on the product, switch off the power supply and secure it against being switched back on. Only switch on the power supply when the product has been assembled and installation work is complete.
- Comply with the handling specifications for electrostatically sensitive devices.
- Observe tightening torques. Unless otherwise specified, the tolerance is ± 20 %.

2.2 Intended use
The spindle axes EGC-...-BS-KF and EGC-HD-...-BS are intended to be used for precise positioning of payloads (EGC-HD-...-BS for large loads). The spindle axes are approved for the slide and yoke operating modes.
A rotatable ball screw converts the rotary motion of a motor into a linear motion. This causes the internal slide to move backwards and forwards. The slide 6 is carried through a slot in the profile by means of an axially rigid connection. A cover strip 3 covers the slot in the profile.
The slide is mounted on a roller bearing. The reference position of the slide can be queried with the help of proximity sensors in the slots 12 .

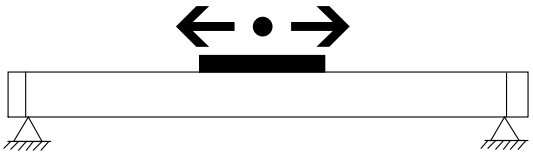


Fig. 1 Slide mode

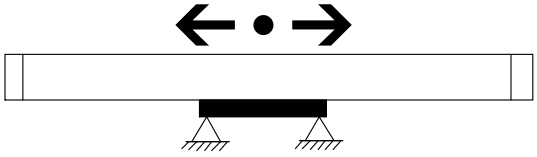


Fig. 2 Yoke mode

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The spindle-axis EGC is non-braking. If the input torque is not applied, the slide is freely movable.
Self-locking of the complete system can generally be achieved by using motors with an integrated spring-loaded holding brake or with high self-braking torque (e.g. for vertical operation).

- Select the corresponding motors from the catalogue ➔ www.festo.com/catalogue.

The two devices are perfectly harmonised with one another.
- When using other motors: observe the limit values for forces, torques and speeds ➔ 10 Technical data, mechanical, ➔ 11 Characteristic curves.

2.3 Training of skilled personnel
- Installation, commissioning, service and disassembly should only be conducted by skilled personnel.
- The skilled personnel must be familiar with the installation of electrical and pneumatic control systems.

2.4 Approvals
The product fulfils the requirements of EU directives and comes with the CE marking CE.
The product-relevant EC directives and standards are listed in the declaration of conformity ➔ www.festo.com/sp.

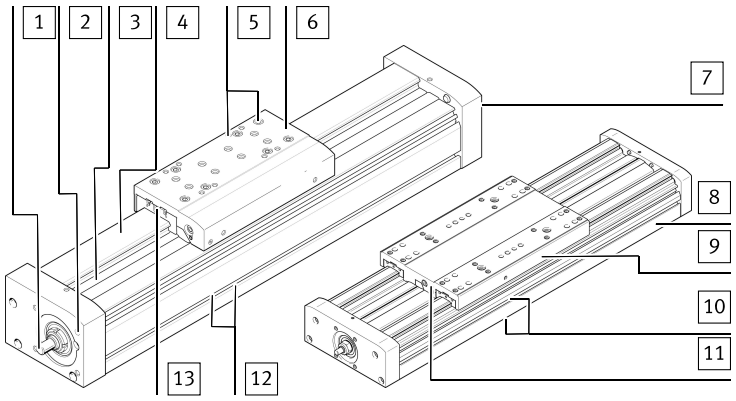
2.5 Further information
- Accessories ➔ www.festo.com/catalogue.
- Spare parts ➔ www.festo.com/spareparts.
- Documents and literature ➔ www.festo.com/sp.

3 Product range overview
3.1 Not included in the delivery

Designation	Part number/type
Pressure grease gun with pinpoint nozzle	647958/LUB-1 ➔ www.festo.com/spareparts
Blast pipe, axial outlet	647959/LUB-1-TR-I, 744166/LUB-1-KU ➔ www.festo.com/spareparts
Blast pipe, radial outlet	647960/LUB-1-TR-L ➔ www.festo.com/spareparts
Roller bearing grease	LUB-KC1 from Festo ➔ www.festo.com/spareparts

Tab. 1 Accessories

3.2 Product design



1 Drive shaft
2 Thread for motor mounting kit
3 Cover strip
4 Guide rail (2x for EGC-HD-...-BS)
5 Thread and centring holes for payload mounting
6 Slide
7 Thread and centring holes for foot mounting (not for EGC-HD-...-BS)
8 Surface for profile mounting
9 Thread for optional switch lug (at both ends for EGC-HD-..._BS)
10 Slots for slot nut mounting and accessories
11 Relubrication opening for ball screw (threaded hole for alternative lubrication nipple: at the side for EGC-...-BS-KF, at the front for EGC-HD-...-BS)
12 Slot for proximity sensor (at both ends for EGC-HD-...-BS)
13 Relubrication opening for bearing guide (at both ends, 2x EG-...-BS-KF, 4x EGC-HD-...-BS)

Fig. 3 Product design

4 Transport and storage
- Take the product's weight into account. The spindle axis weighs up to 180 kg, depending on the design. For transport, the conveyors must be positioned at the permissible support spacings. Support spacings ➔ 11 Characteristic curves.
- Store and transport the product in its original packaging. The original packaging offers sufficient protection from typical stresses.
- Ensure short storage times.
- Choose cool, dry, well-shaded, corrosion-resistant locations.

5 Assembly
5.1 Fitting together
- Do not modify the screws and threaded pins. Exception: if immediate modification is required based on these operating instructions.
- Mount motor on the axis. Assembly instructions ➔ www.festo.com/sp.

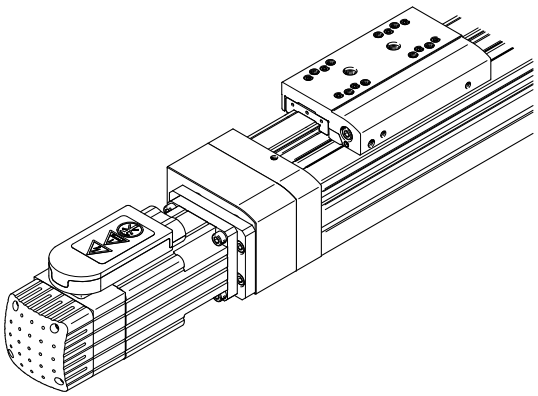


Fig. 4 Mounting the motor on the spindle axis

5.2 Installation

Mounting the axis

Prerequisites:

1. Position the spindle axis in such a way that its operating elements are accessible (e.g. relubrication openings).
2. The mounting components must be outside the travel range of the slide.
3. Install spindle axis without tension or distortion.

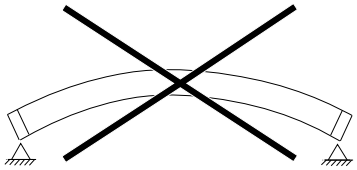
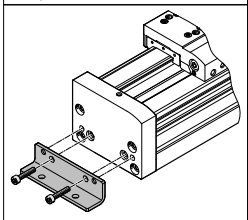
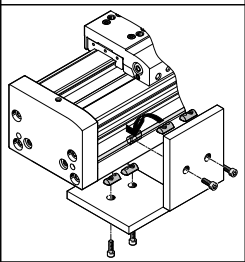
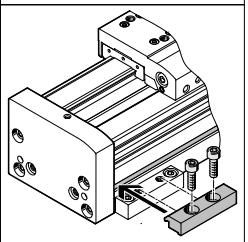


Fig. 5

4. Mount spindle axis on a mounting surface with flatness of 0.05% of the stroke length, but max. 0.5mm. For gantry applications, attention must also be paid to parallel alignment or product height when aligning the axes.
5. Take the required support spacings into consideration .
6. Mount the spindle axis ➔ Tab. 2 Interfaces for mounting components.

Interfaces for mounting components

On the cover	On the profile	
e.g. with foot mounting HPE (only for EGC-...-BS-KF)	e.g. with slot nuts NST	e.g. with profile mounting MUE
		

Tab. 2 Interfaces for mounting components

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Danger of screws being pulled out if the spindle axis is only mounted to the covers and the torque load around the longitudinal axis is too great.

- If there is high loading, mount the spindle axis on the profile with additional mounting components.

- Tighten the retaining screws to the following tightening torques:

Size		70	80	120	185
Screw (cover)		M5	M5	M8	M10
Tightening torque	[Nm]	5.9	5.9	24	47

Tab. 3 Tightening torques of the retaining screws

For installation in a vertical or sloping position:

⚠ WARNING!

Risk of injury due to falling working loads.

In a power failure or if the spindle nut breaks, the working load may fall.

- Only use motors with integrated spring-loaded holding brakes.
- Implement external safety precautions to prevent the spindle nut from breaking (e.g. tooth clinking, moveable bolts or emergency buffers).

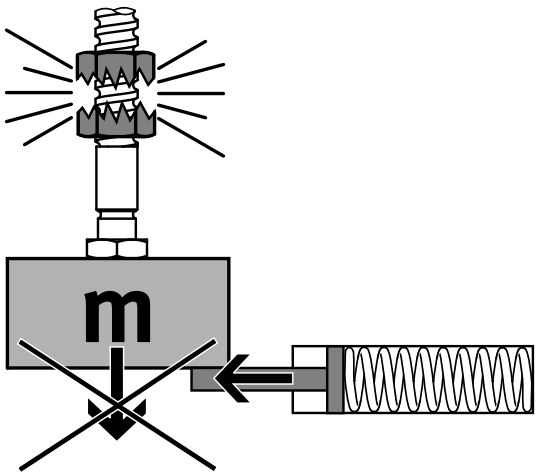


Fig. 6 Working load

Mounting the payload

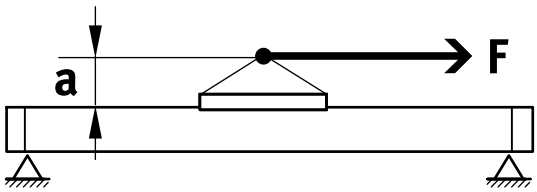


Fig. 7 Positioning the payload

1. Position the payload in such a way that the break-down torque resulting from the force F (parallel to the axis of motion) and the lever arm a remains low.
2. Mount the payload on the slide with the screws and centring sleeves.

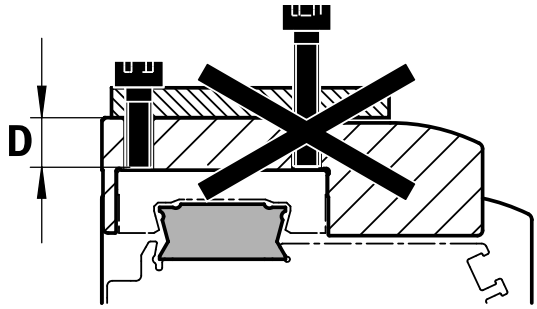


Fig. 8 Maximum screw-in depth

3. The maximum screw-in depth D must not be exceeded.

Size		70	80	120	125	160	185	220
Screw (side/top)		M5	M5/M6		M5	M6	M6/-M8	M6
Max. screw-in depth D	[mm]	8.4	9.5	10	8.4	9.5	15	10
Centring hole (H7)	[mm]	∅5	∅7/∅9		∅5/∅9	∅9	∅9	∅9
Tightening torque	[mm]	5.9	5.9/9.9		5.9	9.9	9.9/-24	9.9

Tab. 4 Mounting the payload

For payload with own guide:

- Adjust the guides of the payload and spindle axis so that they are exactly parallel. This will avoid overloading the guide and increased wear.

For hard and stiff payloads (e.g. made from steel):

i

If the aluminium slide is bent against a curved payload, the service life of the guide will be reduced.

- The mounting surface of the payload must have a flatness of t = 0.01 mm. When using additional slides, any differences in height must be compensated.

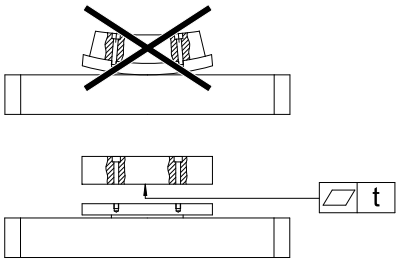


Fig. 9 Flatness of the payload

For payloads with projection in the longitudinal direction of the slide:
- The payload must not knock against the motor.

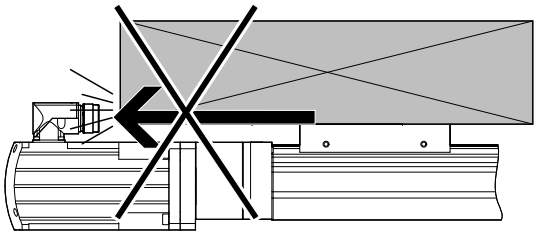
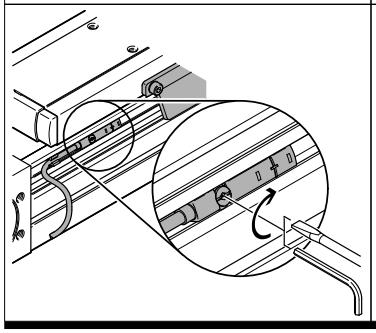
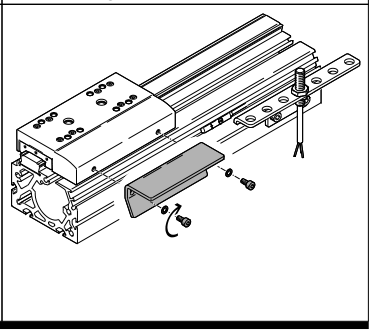


Fig. 10 Projecting payload

Mounting accessories
To protect the end positions against uncontrolled overtravel:
- Check whether proximity sensors are necessary (hardware limit switches).

If proximity sensors are used as limit switches:
- Preferably use proximity sensors with normally-closed function. These will protect a spindle axis against overtravel of the end position in case of a broken proximity sensor cable.

If proximity sensors are used as reference switches:
- Use proximity sensors that correspond to the input of the controller being used.
- Use inductive proximity sensors with switch lug. Assembly instructions ➔ www.festo.com/sp.

Mounting	
In the slots	With mounting bracket
	

Tab. 5 Mounting

- Avoid external influence caused by magnetic or ferritic parts in the vicinity of the proximity sensors (spacing min. 10 mm from slot nuts).

To protect the end positions:
- Use emergency buffer. Assembly instructions ➔ www.festo.com/sp.

To avoid contamination:
- Use slot covers in all unused slots.

6 Commissioning

⚠ WARNING!

Danger of crushing as a result of moving loads
- Do not reach into the path of the moving components.
- Install the corresponding protective devices (e.g. protective grille).

i

Incorrect specification 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 service life.
- Check the settings for all braking ramps in the controller or the higher-order controller (deceleration values and jerk).
- Taking the travel speed, moving load and mounting position into account, set the deceleration values (brake deceleration and deceleration times) in such a way that the maximum drive torque or feed force of the spindle axis used is not exceeded.
- When designing the spindle axis, use the Festo engineering software PositioningDrives ➔ www.festo.com.

i

Block-shaped acceleration profiles (without jerk limitation) cause high peaks in the drive force that can lead to an overloading of the drive. Due to overshooting effects, positions outside of the permissible range may also occur. A jerk-limited acceleration specification reduces vibrations in the entire system and has a positive effect on stress in the mechanical system.
- Check adjustments to controller settings (e.g. jerk limitation, smoothing of the acceleration profile).

Control travel	Homing	Test run
Determining the approach direction of the motor	Comparison of real situation to the image in the controller	Checking the overall behaviour

Tab. 6

1. Start control travel with low dynamic response.
   Even with identical control, motors of the same design turn in opposite directions due to different wiring. The spindle of the EGC turns in a clockwise direction. When the drive trunnion is turned clockwise, the slide moves in the direction of the motor.
2. Start homing in accordance with the operating instructions for your motor drive system with low dynamic response to the reference switch.
   – The homing run may only be performed towards the reference switch.
3. Start a test run with low dynamic response
4. Check whether the spindle axis fulfils the following requirements:
   – The slide can move through the complete intended positioning cycle.
   – The slide stops as soon as it reaches a limit switch.

7 Operation

⚠ WARNING!

Movement of components
Risk of injury caused by rotating components.
- Protective devices must be in place before commissioning the drive.
- Do not reach into the swivel angle of the drive.

For installation in a vertical or sloping position:

i

The reference position is lost when the motor is dismounted (e.g. when turning the motor around).
- Start homing in order to determine the reference position once more ➔ 6 Commissioning.

8 Service

Perform the following actions during each service:
- Check the reversing backlash of the slide for wear to the spindle nut. The wear on the ball screw will lead to increased noise in the long term and thus cause the ball screw to block or the spindle nut to break.

Size		70	80	120	125	160	185	220
Max. permissible reversing backlash	[mm]	0.1	0.1	0.2	0.1	0.1	0.2	0.2

Tab. 7 Max. permissible reversing backlash

i

The lubrication interval S_{int} is dependent on the load acting on the product.
Cut the lubrication interval S_{int} ➔ Fig.11 by half if any of the following situations apply:
- Dusty and dirty environment
- Nominal strokes > 2000 mm
- Speeds > 2 m/s
- Travel profile ≙ triangular operation (frequent acceleration and braking)
- Ambient temperatures > 40°C
- Service age of product > 3 years

We recommend lubricating the ball screw and the bearing guide at the same time. The shorter lubrication interval should be used here. If several of these factors apply at the same time, the lubrication interval should be quartered.

Lubrication	Ball screw	Bearing guide	Cover strip	Guide rail
Lubricating point	Relubrication opening (lubrication nipple)	Relubrication opening (lubrication hole)	Interface	
Lubrication interval	➔ Fig.11		If required[1)]	
Grease[2)]	Roller bearing grease			

1) or if the component no longer has a layer of grease

2) Pressure grease gun, Blast pipes and grease

Tab. 8 Lubrication

Grease the ball screw:

1. Calculate the load comparison factor f_v with the help of the formula for combined loads (➔ 10 Technical data, mechanical).

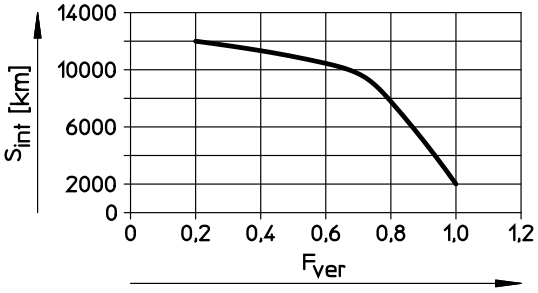


Fig. 11 Lubrication interval

2. Determine the lubrication interval S_{int} from ➔ Fig.11.

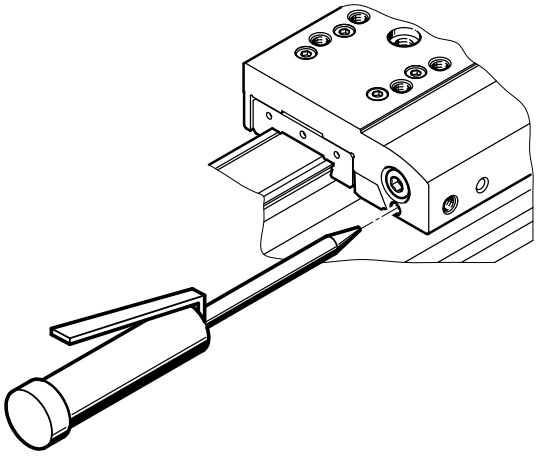


Fig. 12 Relubrication opening in spindle axis

3. Grease the spindle axis at the relubrication opening (lubrication nipple) ➔ Fig.12.
4. Move the slide the complete travel distance during greasing in order to distribute the grease evenly inside.

Grease the bearing guide (not possible for EGC-...-GP/GQ):

1. Calculate the load comparison factor f_v with the help of the formula for combined loads ➔ 10 Technical data, mechanical.
2. Determine the lubrication interval S_{int} from ➔ Fig.11.

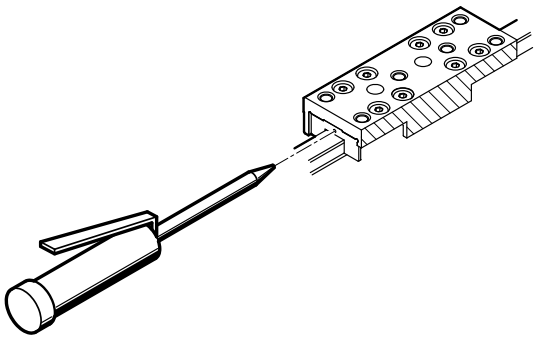


Fig. 13 Greasing the bearing guide

3. Grease the bearing guide on both sides at all relubrication openings (lubrication holes) ➔ Fig.13.
4. Move the slide the complete travel distance during greasing in order to distribute the grease evenly inside.

8.1 Cleaning and maintenance

- Clean the guide rail with a soft cloth as required. Cleaning agents include all non-abrasive media.

9 Malfunctions

9.1 Fault clearance

Malfunction	Possible cause	Remedy
Squeaking noises, vibrations, axis not running smoothly.	Coupling mounted too close	Observe the permissible coupling spacings ➔ www.festo.com/sp.
	Tensions	Install spindle axis without tension ➔ 5.1 Fitting together.
		Align the spindle axis so that it is exactly parallel to the second axis.
		Grease the spindle axis ➔ 8 Service.
		Alter the travel speed.
	Incorrect controller settings	Change controller parameters.
Squeaking noises, vibrations, axis not running smoothly.	Bearing guide is faulty.	Return spindle axis to Festo for repair.
Slide does not move.	Coupling hub spins freely.	Check mounting of the motor mounting kit ➔ www.festo.com/sp.
	Loads too high.	Reduce payload/travel speed.
	Retaining screws for the payload are too long.	Observe the maximum screw-in depth ➔ 5.2 Installation.
The reversing backlash is too large ➔ 8 Service.	Wear	Return spindle axis to Festo for repair ➔ 9.2 Repair.
Slide travels beyond end position.	Proximity sensors do not switch.	Check proximity sensor, connections and controller.
The idling torque increases.	Wear	Return spindle axis to Festo for repair ➔ 9.2 Repair.

Tab. 9 Fault clearance

9.2 Repair

– Send the spindle axis to the Festo repair service.
– Information about spare parts and accessories ➔ www.festo.com/spareparts.

10 Technical data, mechanical

Size[1]		70	80		120		125
Spindle pitch		10	10	20	10	25	10
Design		Electromechanical linear axis with ball screw					
Guide		Recirculating ball bearing guide					
Mounting position		Any					
Max. feed force Fx	[N]	400	650		1500		400
Max. no-load driving torque[2]	[Nm]	0.45	0.75		2.25		0.45
Max. rotational speed	[rpm]	3000			3600		3000
Max. speed	[m/s]	0.5		1	0.6	1.5	0.5
Max. acceleration	[m/s²]	15					
Repetition accuracy	[mm]	± 0.02					
Reversing backlash (new)	[mm]	< 0.01					
Reversing backlash (faulty)		➔ 8 Service					
Feed constant	[mm/rev]	10	10	20	10	25	10
Ambient temperature	[°C]	–10 ... +60					
Degree of protection		IP40					

1) The PositioningDrives engineering software is available for sizing tasks.

2) measured at max. speed.

Tab. 10 Technical data, mechanical, size 70...125

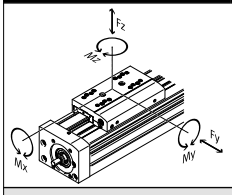
Size[1]		160		185	220	
Spindle pitch		10	20	40	10	25
Design		Electromechanical linear axis with ball screw				
Guide		Recirculating ball bearing guide				
Mounting position		Any				
Max. feed force Fx	[N]	650		3000	1500	
Max. no-load driving torque[2]	[Nm]	0.75		6.5	2.25	
Max. rotational speed	[rpm]	3000			3600	
Max. speed	[m/s]	0.5	1	2	0.6	1.5
Max. acceleration	[m/s²]	15				
Repetition accuracy	[mm]	± 0.02				
Reversing backlash (new)	[mm]	< 0.01				
Reversing backlash (faulty)		➔ 8 Service				
Feed constant	[mm/rev]	10	20	40	10	25
Ambient temperature	[°C]	–10 ... +60				
Degree of protection		IP40				

1) The following tool is available for sizing tasks: PositioningDrives engineering software.

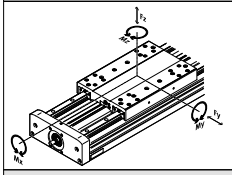
2) measured at max. speed.

Tab. 11 Technical data, mechanical, size 160...220

Size		70	80	120	185
Permissible lateral forces on the drive shaft	[N]	220	250	500	4000
Max. permissible forces on the slide					
Fy = Fz	[N]	1850	3050	6890	15200
Max. permissible torques on the slide					
Mx	[Nm]	16	36	144	529
My = Mz (EGC-GK, EGC-GP)	[Nm]	51	97	380	1157
My = Mz (EGC-GV, EGC-GQ)	[Nm]	132	228	680	1820

Size		70	80	120	185
		Condition for combined loads: $fv=\frac{Fy}{Fymax}+\frac{Fz}{Fzmax}+\frac{Mx}{Mxmax}+\frac{My}{Mymax}+\frac{Mz}{Mzmax}\leq 1$			
Materials					
Profile, cover, slide		Anodised aluminium			
Ball bearing, ball screw, guide, screws		Steel			
Cover strip		Polyurethane			
Cover caps		Polyacetal			
Buffer		Nitrile rubber			
Weight					
0 stroke	[kg]	1.5	2.7	12.5	30
Per 100 mm stroke	[kg]	0.5	0.8	1.9	3.9

Tab. 12 Technical data, mechanical, EGC-...-BS-KF

Size		125	160	220
Permissible lateral forces on the drive shaft	[N]	220	250	500
Max. permissible forces on the slide				
Fy = Fz	[N]	3650	5600	13000
Max. permissible torques on the slide				
Mx	[Nm]	140	300	900
My = Mz	[Nm]	275	500	1450
		Condition for combined loads: $fv=\frac{Fy}{Fymax}+\frac{Fz}{Fzmax}+\frac{Mx}{Mxmax}+\frac{My}{Mymax}+\frac{Mz}{Mzmax}\leq 1$		
Materials				
Profile, cover, slide		Anodised aluminium		
Ball bearing, ball screw, guide, screws		Steel		
Cover strip		Polyurethane		
Cover caps		Polyacetal		
Buffer		Nitrile rubber		
Weight				
0 stroke	[kg]	4.12	7.21	19.14
Per 100 mm stroke	[kg]	0.9	1.39	2.5

Tab. 13 Technical data, mechanical, EGC-HD-...-BS

11 Characteristic curves

Max. permissible support spacing L as a function of the force F for EGC-...-BS-KF:

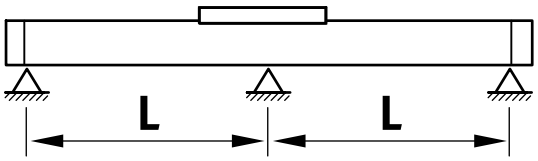


Fig. 14 Support spacing

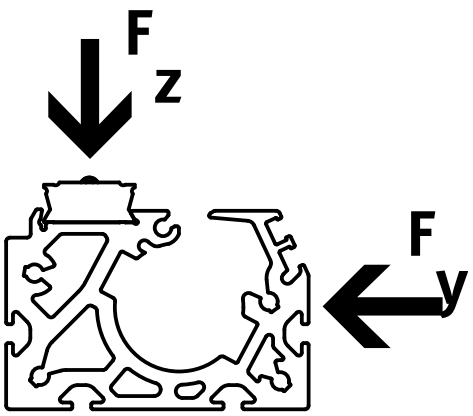


Fig. 15 Force distribution

EGC-...-BS-KF

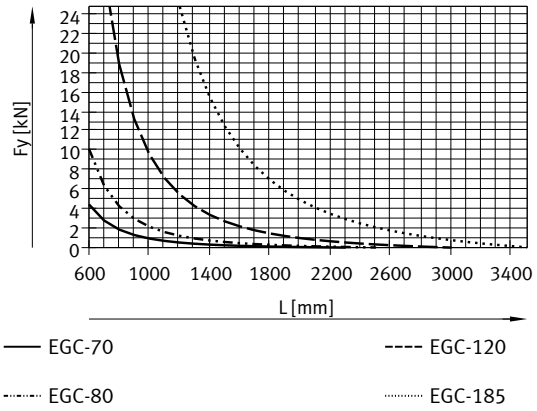


Fig. 16

EGC-...-BS-KF

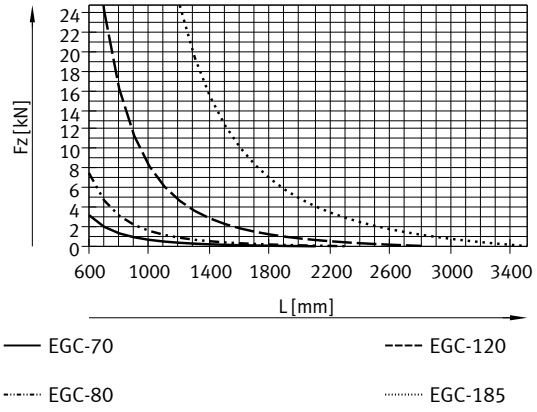


Fig. 17

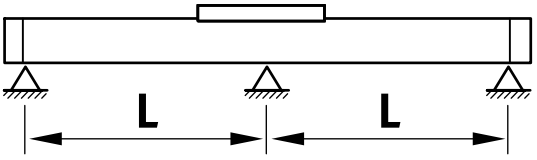


Fig. 18

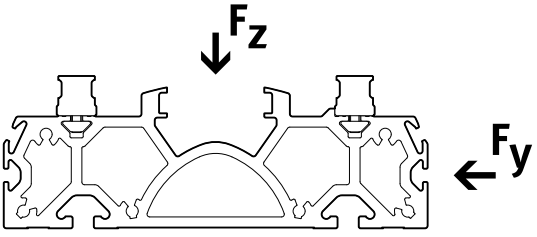
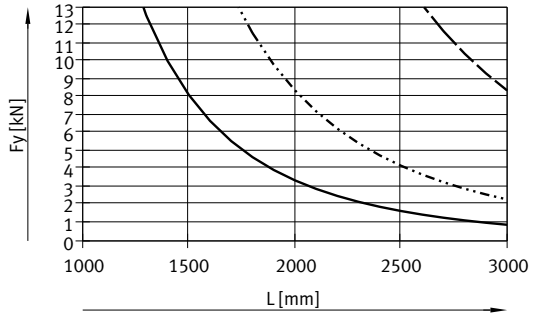


Fig. 19 Force distribution

Y-Richtung

EGC-HD-...-BS



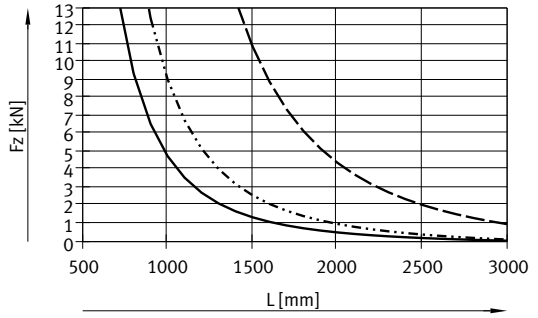
—— EGC-HD-125 ---- EGC-HD-220

-·-·- EGC-HD-160

Fig. 20

Z-Richtung

EGC-HD-...-BS



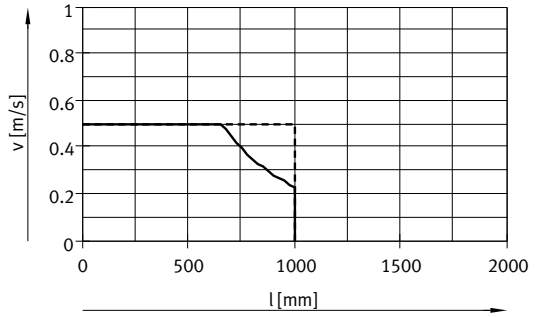
—— EGC-HD-125 ---- EGC-HD-220

-·-·- EGC-HD-160

Fig. 21

Speed v as a function of working stroke l:

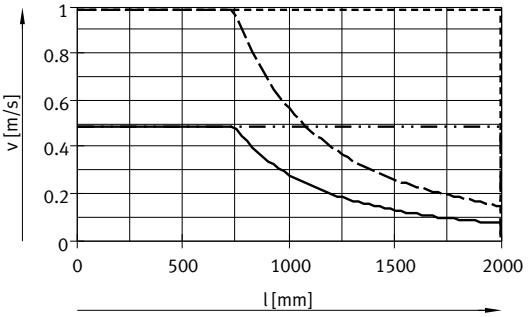
EGC-70-BS-KF



—— EGC-70-10P without S ------ EGC-70-10P with S

Fig. 22

EGC-80-BS-KF

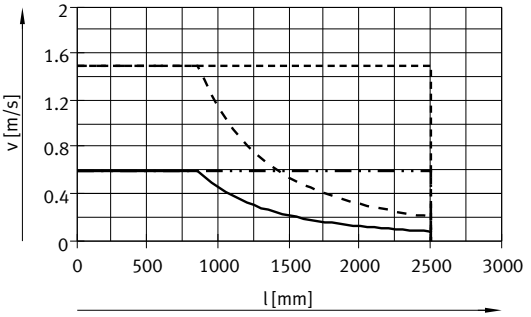


—— EGC-80-10P without S ---- EGC-80-20P without S

-·-·- EGC-80-10P with S ------ EGC-80-20P with S

Fig. 23

EGC-...-BS-KF

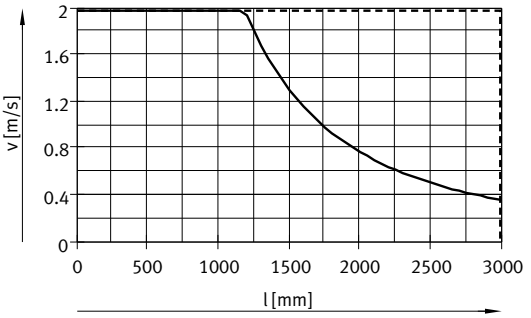


—— EGC-120-10P without S ---- EGC-120-25P without S

-·-·- EGC-120-10P with S ------ EGC-120-25P with S

Fig. 24

EGC-185-BS-KF



—— EGC-185-40P without S ------ EGC-185-40P with S

Fig. 25

- Graphs of maximum feed force (N) for all sizes ➔ www.festo.com/catalogue