

Linear modules HME, electric



Linear modules HME, electric

Key features

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Range of application

The electric linear module HME is ideal for use in automation applications where controlled end-position cushioning (gentle stopping), constant travel speed and positioning capability are important factors.

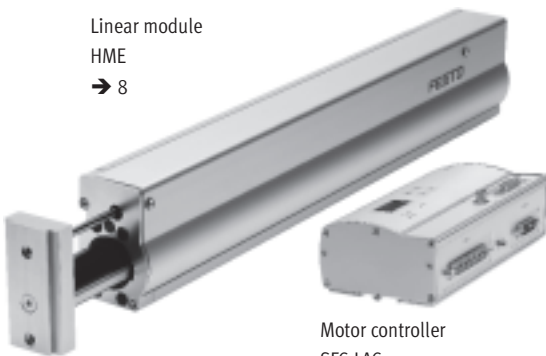
The linear module HME has the same interfaces on the yoke and basic profile as the pneumatic linear module HMP, and is fully compatible with modular handling and assembly systems including HMP adapter kits.

Special features

- With integrated linear motor
- Freely positionable
- Fast positioning times
- Extremely rigid basic profile
- Precision, backlash-free guidance
- Controlled starting and stopping (programmable ramp)
- Effective loads up to 25 kg
- No external magnetic fields
- Freely programmable travel speeds of up to 3 m/s
- High dynamic response and accuracy thanks to rotationally symmetrical linear motor
- No chain link trunking (fixed long coil system with short magnetic rotor, without moving power supply)

Everything from a single source

Linear module
HME
→ 8



Motor controller
SFC-LAC
→ Internet: sfc-lac

The linear module HME and motor controller SFC form one unit.

- Thanks to IP54 protection, the SFC can be mounted close to the HME, either:
 - via centre supports
 - via H-rail
 - Only one cable is required between the linear module HME and motor controller SFC
 - The motor controller SFC is available with or without control panel
 - Up to 31 position sets
- Parameter assignment via:
- Control panel:
 - suitable for simple position sequences

Parameter assignment via:

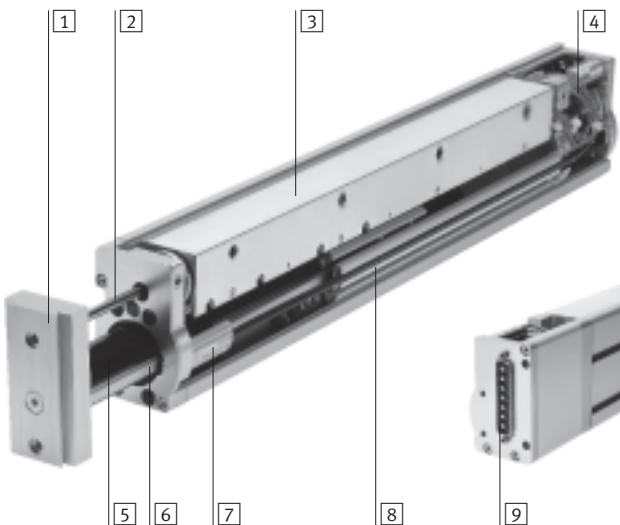
- FCT (Festo Configuration Tool) configuration package:
 - with RS 232 interface
 - Windows-based PC user interface, Festo Configuration Tool
- Easy actuation via:
 - I/O interface
 - Profibus
 - CANopen, “Interpolated position mode” included
 - DeviceNet



CANopen

DeviceNet

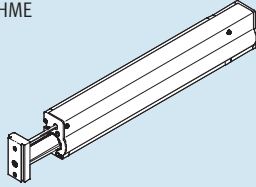
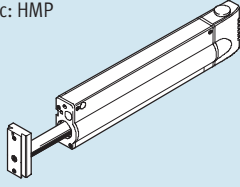
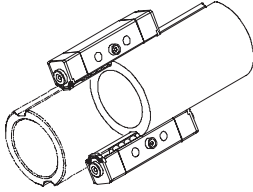
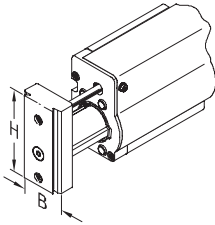
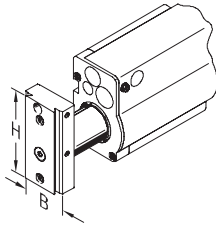
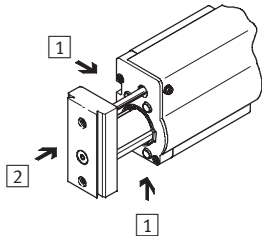
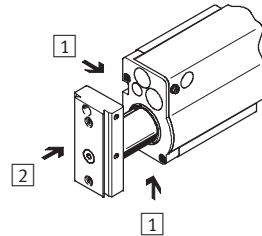
The technology in detail



- 1 Yoke plate
- 2 Drive shaft
- 3 Linear motor in aluminium housing
- 4 Electrical interface
- 5 Guide
- 6 Contactless displacement encoder
- 7 Measuring head
- 8 Integrated reference switch
- 9 Electrical interface

Linear modules HME, electric

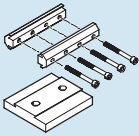


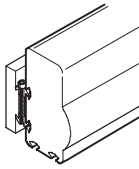
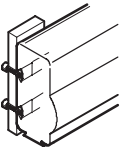
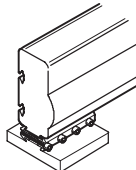
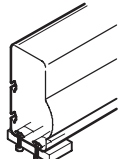
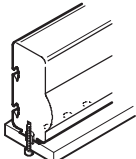
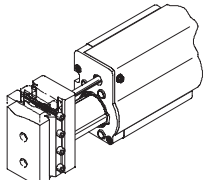
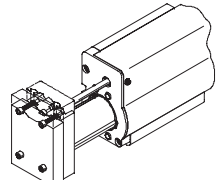
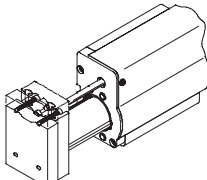
Key features


Comparison between electric linear module HME and pneumatic linear module HMP														
	Electric: HME 	Pneumatic: HMP 												
Advantages														
	<ul style="list-style-type: none"> Controlled starting and stopping Constant and precise speed of up to 3 m/s Flexible positioning without mechanical aids Programmable positioning profile 	<ul style="list-style-type: none"> High feed force 												
Guide														
<ul style="list-style-type: none"> Preloaded, backlash-free, precise and rigid recirculating ball bearing guide High load capacity (forces and torques) 														
Dimensions														
<ul style="list-style-type: none"> Identical width and height dimensions <table border="1"> <thead> <tr> <th>Type</th> <th>Width (W)</th> <th>x</th> <th>Height (H)</th> </tr> </thead> <tbody> <tr> <td>HME/HMP-16:</td> <td>34</td> <td>x</td> <td>85 mm</td> </tr> <tr> <td>HME/HMP-25:</td> <td>40</td> <td>x</td> <td>110 mm</td> </tr> </tbody> </table>	Type	Width (W)	x	Height (H)	HME/HMP-16:	34	x	85 mm	HME/HMP-25:	40	x	110 mm		
Type	Width (W)	x	Height (H)											
HME/HMP-16:	34	x	85 mm											
HME/HMP-25:	40	x	110 mm											
Interfaces														
<ul style="list-style-type: none"> Identical mounting and attachment options <ol style="list-style-type: none"> Mounting surfaces: Mounting via slot nuts or dovetail connections Mounting surfaces: Direct mounting of loads and devices via threaded holes in the yoke plate, dovetail connections or through-holes 														
Technical data														
Size	[mm]	16, 25	16, 20, 25, 32											
Stroke	[mm]	100 ... 400	50 ... 400											
Max. speed	[m/s]	3	1.2											
Repetition accuracy at end positions	[mm]	±0.015	0.01											
Intermediate positions		Any	With mid-position module, up to two positions											

Linear modules HME, electric

Key features

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Mounting and attachment options			
Mounting options	Dovetail mounting via connecting kit HAVB 	Direct mounting via screws and slot nuts NST 	Direct mounting via screws and centring sleeves ZBH 
Mounting surfaces			
On the side of the basic profile	HME-16/-25 	HME-16/-25 	
On the underside of the basic profile	HME-16/-25 	HME-25 	HME-16 
On the yoke plate	HME-16/-25 	HME-25 	HMP-16/-25 

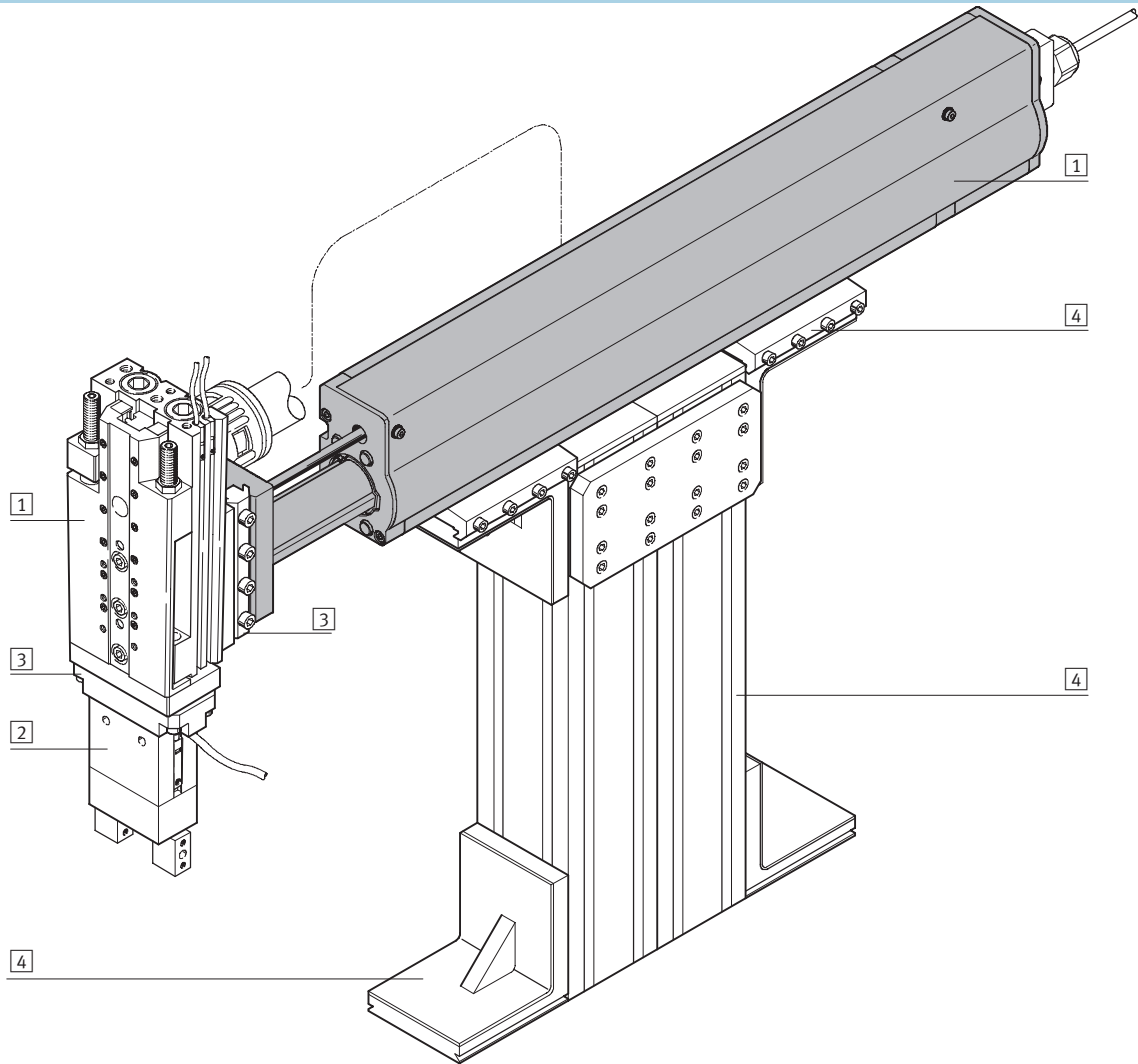
-  - Note

The dynamic response and accuracy of the linear module HME depends on the mounting (rigidity) and temperature stresses (heat concentration).

Linear modules HME, electric

System example

System product for handling and assembly technology



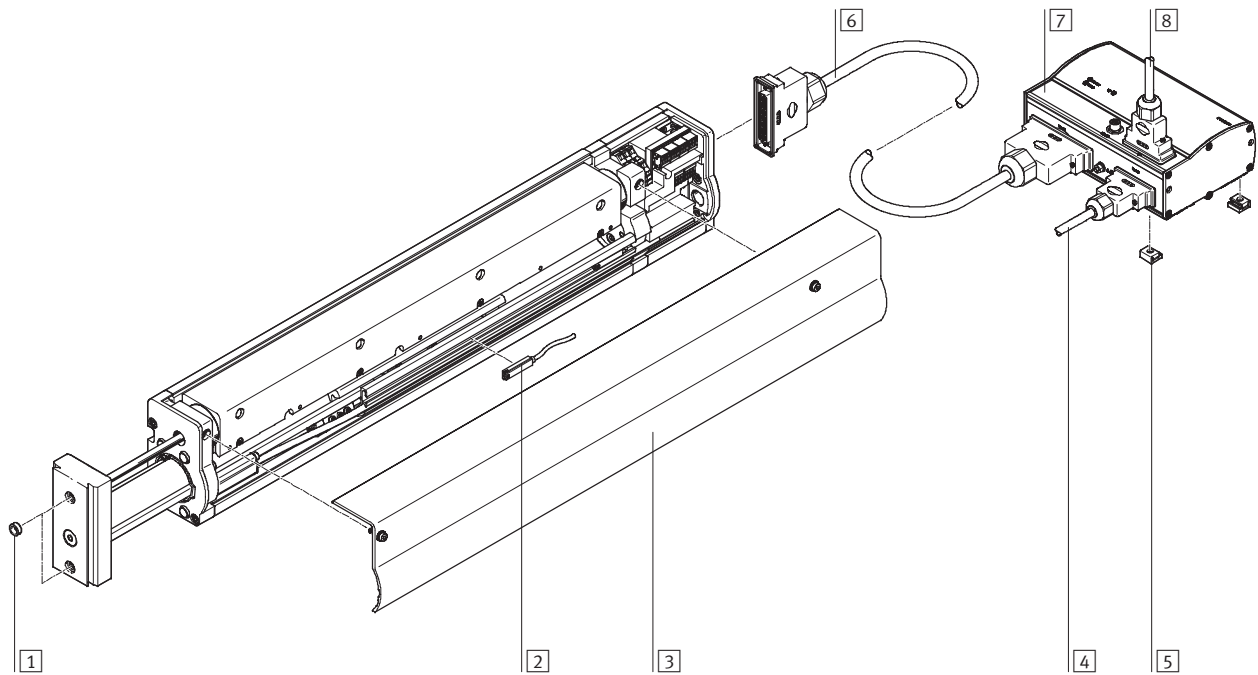
System components and accessories		
	Brief description	→ Page/Internet
1	Drives and axes	Wide range of combinations possible within handling and assembly technology drive, axes
2	Gripper	Wide range of variations possible within handling and assembly technology gripper
3	Adapters	For drive/drive and drive/gripper connections adapter kit
4	Basic components	Profiles and profile connections as well as profile/drive connections basic component
-	Installation components	For achieving a clear-cut, safe layout for electrical cables and tubing installation component
-	Motors	Servo and stepper motors, with or without gear unit motor

Linear modules HME, electric

Peripherals overview

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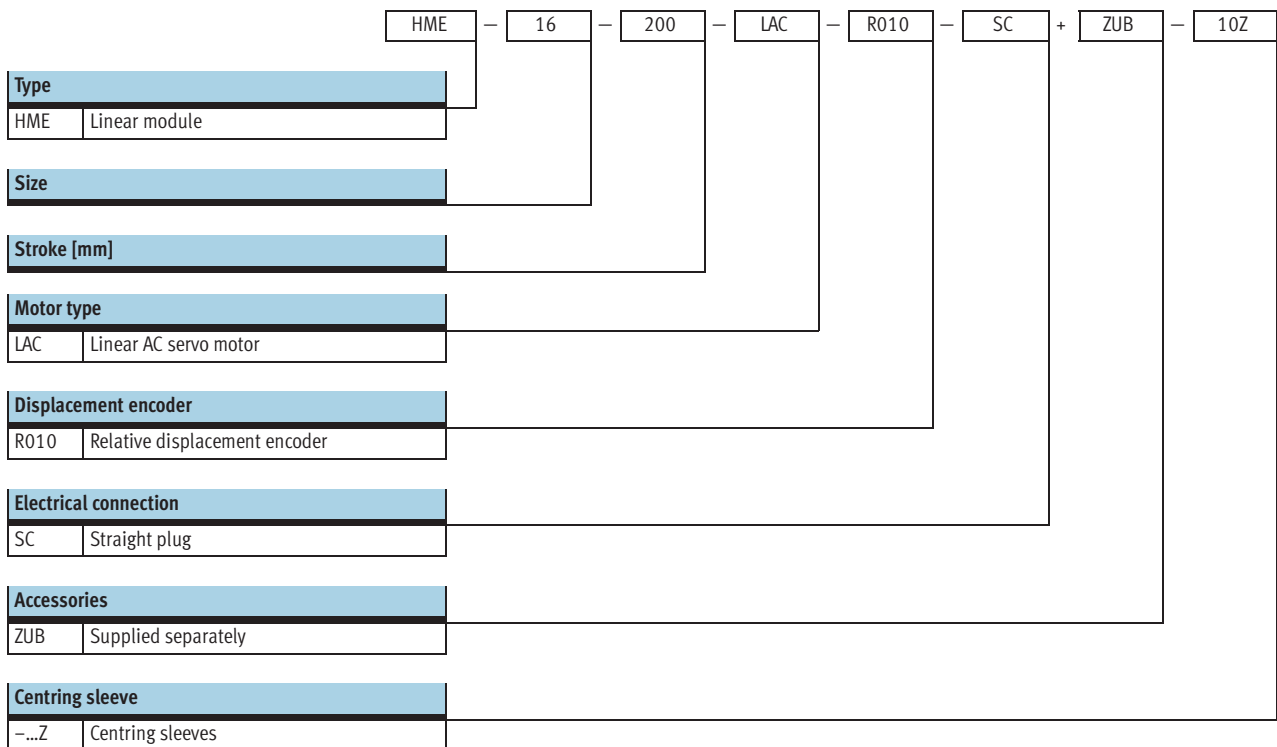
Size 16/25



Accessories		
	Brief description	→ Page/Internet
1	Centring sleeve ZBH	21
2	Proximity sensor SME-8	–
3	Housing cover	–
4	Supply cable KPWR	sfc-lac
5	Central support MUP	sfc-lac
6	Motor cable KMTR	sfc-lac
7	Motor controller SFC	sfc-lac
8	Control cable KES	sfc-lac

Linear modules HME, electric

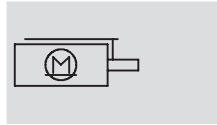
Type codes



Linear modules HME, electric

Technical data

Function



Size
16 and 25

Stroke length
100 ... 400 mm

www.festo.com

Note
All values are based on a normal temperature of 23 °C. Dynamic response and accuracy depend on the mounting (rigidity) and temperature stresses (heat concentration).



General technical data								
Size	16			25				
Stroke	100	200	320	100	200	320	400	
Mechanical								
Drive unit operating mode	Yoke							
Guide	Recirculating ball bearing guide							
Constructional design	Handling module with guide							
Mode of operation	Electric linear direct drive							
Type of mounting	Linear module	Via female thread and centring sleeve						
		Via dovetail joint						
		Via slot nut strip						
Type of mounting	Attachments on yoke plate	Via female thread and centring sleeve						
		Via dovetail joint						
		Via through-holes and centring sleeve						
		Size 25 via slot nut strip						
Mounting position	Horizontal							
Stroke	[mm]	100	200	320	100	200	320	400
Max. effective load (horizontal operation) ¹⁾	[kg]	10	8	4	25	25	22	19
Max. speed	[m/s]	3						
Repetition accuracy	[mm]	±0.015						
Electrical								
Motor type	Linear AC servo motor							
Displacement encoder	Relative measuring, magnetic, incremental							
Intermediate circuit voltage	[V]	48						
Peak feed force ²⁾	[N]	248	179	179	257	257	257	257
Continuous feed force ²⁾	[N]	42	42	45	57	73	69	74
Peak motor current	[A]	28.5	20.5	20.5	28.5	28.5	28.5	28.5
Nominal motor current	[A]	4.8	4.8	5.2	6.3	8.1	7.6	8.2
Rated motor output ²⁾	[W]	127	127	134	171	221	209	223
Magnetic radiation	None							

1) When using the maximum stroke. Higher loads on request.

2) Disregarding friction.

Linear modules HME, electric

Technical data

Operating and environmental conditions		
Ambient temperature ¹⁾	[°C]	0 ... +40
Max. motor temperature	[°C]	70
Normal temperature ²⁾	[°C]	23
Temperature monitoring		Shuts down if motor overheats
Protection class		IP40
CE mark (see declaration of conformity)		In accordance with EU EMC directive
Relubrication intervals of guide components	[km]	2,500
Corrosion resistance class CRC ³⁾		2

1) Note operating range of proximity sensors

2) Unless otherwise stated, all values are based on normal temperature

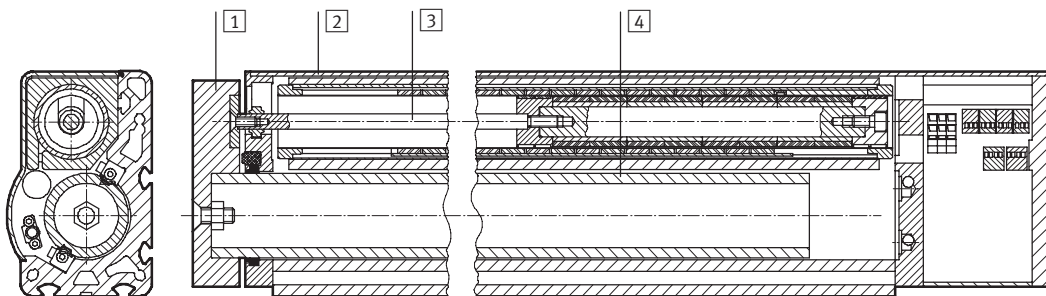
3) Corrosion resistance class 2 to Festo standard 940 070

Components subject to moderate corrosion stress. Externally visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment or media such as coolants or lubricating agents.

Weight [g]							
Size	16			25			
Stroke	100	200	320	100	200	320	400
Product weight	4,700	6,000	7,300	9,600	11,500	13,800	15,300
Moved dead weight	1,400	1,700	2,100	3,400	3,900	4,600	5,000

Materials

Sectional view



Linear module		
1	Yoke plate	Wrought aluminium alloy, anodised
2	Housing	Wrought aluminium alloy, anodised
3	Drive rod	High-alloy stainless steel
4	Guide barrel	Coated rolled steel

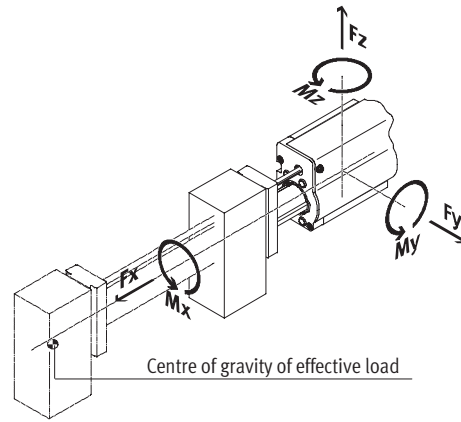
Linear modules HME, electric

Technical data

Dynamic characteristic load values of the bearing guide

The stated forces and torques are for a horizontal and vertical mounting position (see illustration). In many cases the maximum loads occur on braking and with extended axis.

The calculated loads must be used in the following equation. The equation must be satisfied statically and dynamically, in any operating situation. The effective direction of the torques and forces must be observed. The torques and force directions shown are positive.



$$\frac{|-0.5 * Fy + 0.5 * \sqrt{3} * Fz|}{Fu_{max.}} + \frac{|0.5 * \sqrt{3} * Fy + 0.5 * Fz|}{Fv_{max.}} + \frac{|Mx|}{Mx_{max.}} + \frac{|-0.5 * My + 0.5 * \sqrt{3} * Mz|}{Mu_{max.}} + \frac{|0.5 * \sqrt{3} * My + 0.5 * Mz|}{Mv_{max.}} \leq 1$$

1 Loads resulting from the application: forces Fy, Fz and torques Mx, My, Mz

The forces and torques to be used in the above equation, caused by the load of the application, comprise the following:

Composition of forces:
 Fy = Fy5
 Fz = Fz2 + Fz3 + Fz5

Composition of torques:
 Mx = Mx3 + Mx5
 My = My1 + My2 + My3 + My4 + My5
 Mz = Mz1 + Mz4 + Mz5

1.1 Torques acting on the bearing guide due to maximum feed force

The stated values are maximum values resulting from the peak feed force.

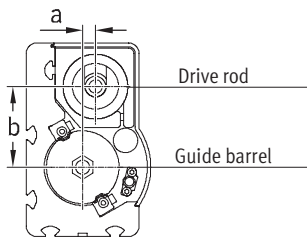
They are independent of:

- stroke position
- inertia

and dependent on:

- direction of movement
- mounting position

	Extending – Accelerating / Retracting – Braking		Retracting – Accelerating / Extending – Braking	
	My1 [Nm]	Mz1 [Nm]	My1 [Nm]	Mz1 [Nm]
HME-16-100	9.2	-1.3	-9.2	1.3
HME-16-200/-320	6.7	-1	-6.7	1
HME-25	13	-2.1	-13	2.1



Dimensions	a [mm]	b [mm]
HME-16	5.4	37.2
HME-25	8	50.2

1.2 Forces and torques acting on the bearing guide due to dead weight

The stated values are maximum values in the extended condition.

They are independent of:

- inertia of the dead weight

and dependent on:

- stroke position
- mounting position

	My2 [Nm]	Fz2 [N]
HME-16-100	0.6	-9.8
HME-16-200	1.4	-12.5
HME-16-320	2.7	-15.7
HME-25-100	1.3	-22.1
HME-25-200	3.0	-26.9
HME-25-320	5.6	-32.7
HME-25-400	7.7	-36.6

Linear modules HME, electric

Technical data

1.3 Forces and torques acting on the bearing guide due to the weight of the effective load

Values to be determined:

Formulae for calculating forces and torques:

Distances:

- X2, Y2 and Z2

Forces and torques due to weight:

- Fz3

- Mx3, My3

Due to inertia:

- My4, Mz4

$$Fz3 = m \times g$$

$$Fy3 = 0$$

$$Mx3 = Y2 \times Fz3$$

$$My3 = (X1 + \text{stroke} + X2) \times Fz3$$

$$Mz3 = 0$$

$$Mx4 = 0$$

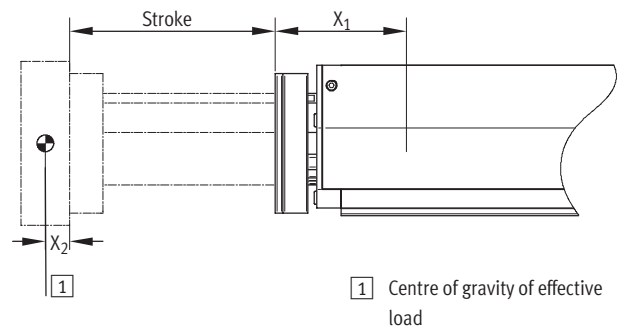
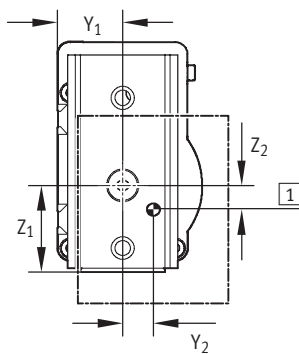
$$My4 = Z2 \times m \times a$$

$$Mz4 = Y2 \times m \times a$$

m = Mass of effective load

a = Acceleration

g = Acceleration due to gravity (9.81 m/s²)



	Y1 [mm]	Z1 [mm]
HME-16	26	34.5
HME-25	35	43

	X1 [mm]
HME-16	119.3
HME-25	154

1.4 Forces and torques acting on the bearing guide due to forces from the application (other drives)

For example:

- Mounting forces

- Forces from attached rotary drives

Fy5 = Mounting force acts at right angles to effective load

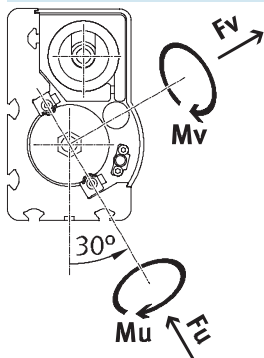
Fz5 = Mounting force presses additionally on effective load

Mx5 = Attached rotary drive causes torque on the bearing guide

My5 = Torques due to Fz5

Mz5 = Torques due to Fy5

2 Maximum permitted load capacity of bearing guide¹⁾



Size	16	25
Fu _{max.} [N]	2,456	2,456
Fv _{max.} [N]		
Mx _{max.} [Nm]	42	60
Mu _{max.} [Nm]	123	220
Mv _{max.} [Nm]	123	220

1) After 5,000 km

- Note

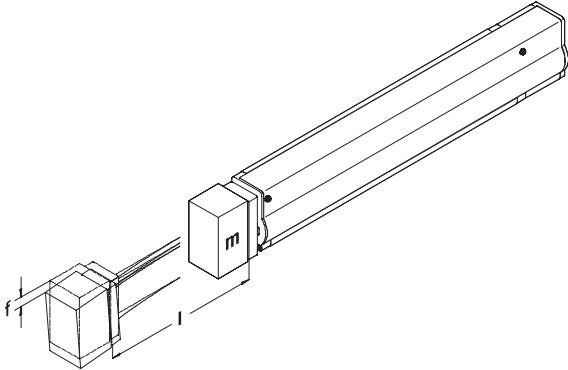
Sizing software
PositioningDrives
→ www.festo.com

Linear modules HME, electric

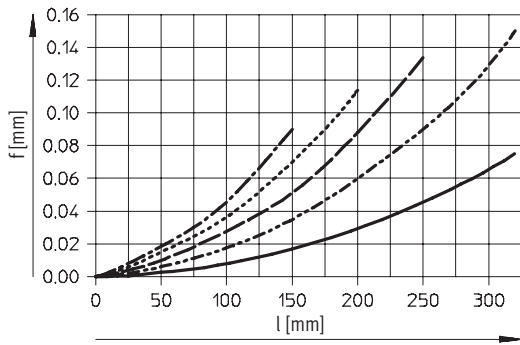
Technical data

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Deflection/deformation f as a function of the effective load m and the position l (stroke)

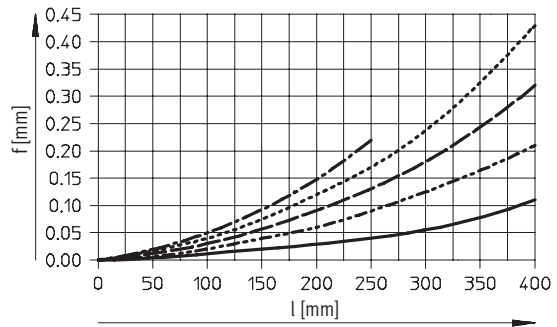


Size 16



- 2 kg
- - - 4 kg
- - - - 6 kg
- · · · 8 kg
- · - · 10 kg

Size 25



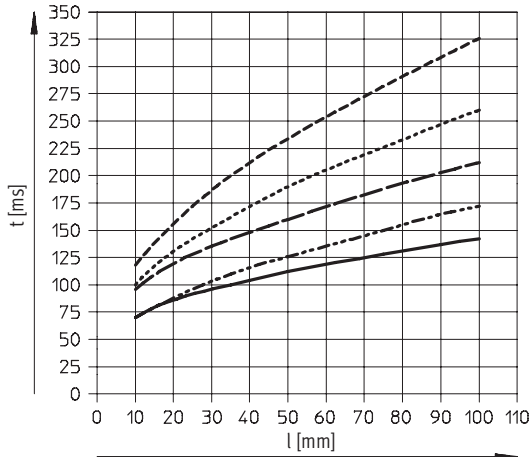
- 5 kg
- - - 10 kg
- - - - 15 kg
- · · · 20 kg
- · - · 25 kg

Linear modules HME, electric

Technical data

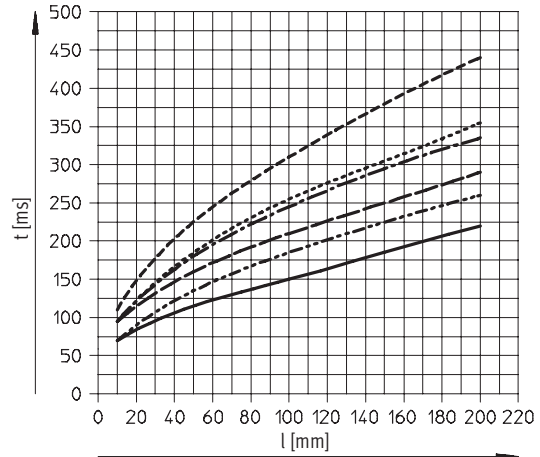
Positioning time t as a function of stroke l , effective load M and duty cycle ED

HME-16-100



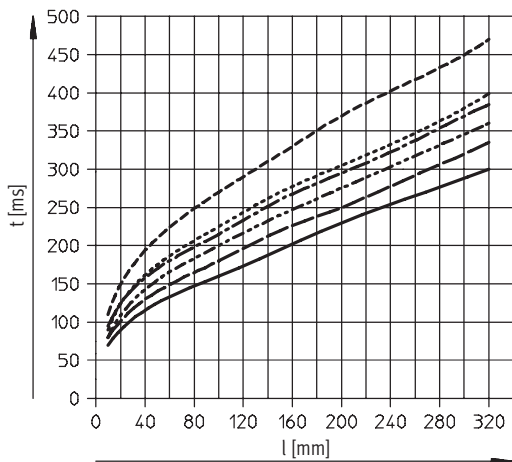
- M 1kg, ED 25%
- - - M 1kg, ED 75%
- · - M 5kg, ED 25%
- · · M 5kg, ED 75%
- - - M 10kg, ED 25%
- · · M 10kg, ED 75%

HME-16-200



- M 1kg, ED 25%
- - - M 1kg, ED 75%
- · - M 4kg, ED 25%
- · · M 4kg, ED 75%
- - - M 8kg, ED 25%
- · · M 8kg, ED 75%

HME-16-320



- M 1kg, ED 25%
- - - M 1kg, ED 75%
- · - M 2kg, ED 25%
- · · M 2kg, ED 75%
- - - M 4kg, ED 25%
- · · M 4kg, ED 75%

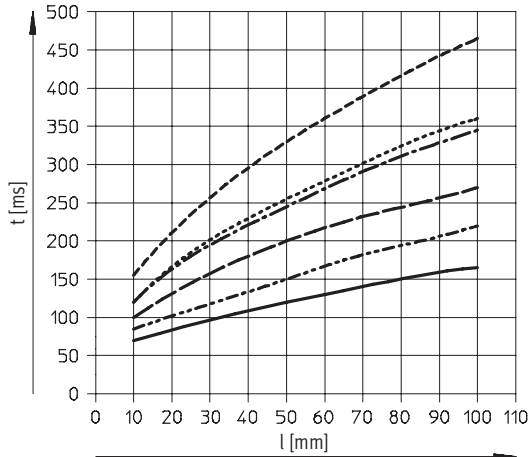
Linear modules HME, electric

Technical data

FESTO

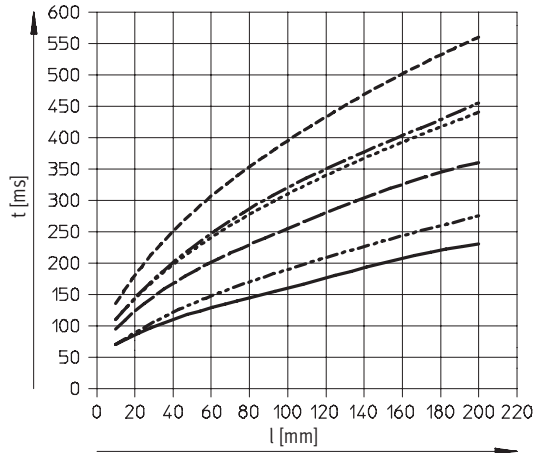
Positioning time t as a function of stroke l , effective load M and duty cycle ED

HME-25-100



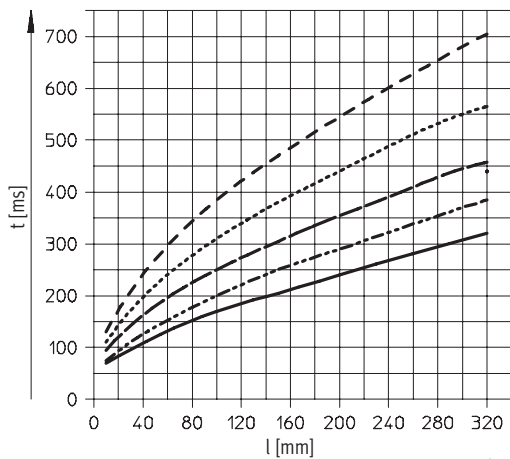
— M 1kg, ED 25%	····· M 12.5kg, ED 75%
- - - M 1kg, ED 75%	- - - - M 25kg, ED 25%
- · - · M 12.5kg, ED 25%	- · - · M 25kg, ED 75%

HME-25-200



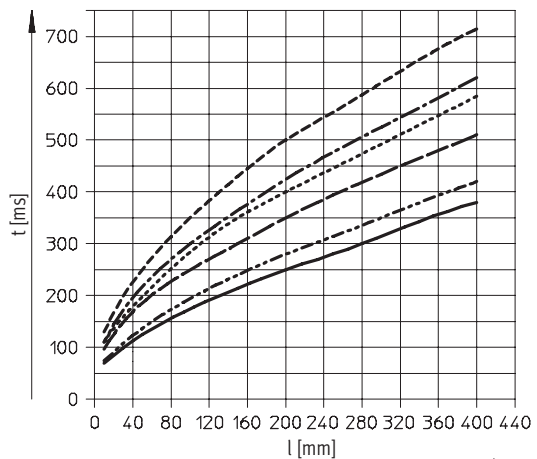
— M 1kg, ED 25%	····· M 12.5kg, ED 75%
- - - M 1kg, ED 75%	- - - - M 25kg, ED 25%
- · - · M 12.5kg, ED 25%	- · - · M 25kg, ED 75%

HME-25-320



— M 1kg, ED 25%	····· M 11kg, ED 75%
- - - M 1kg, ED 75%	- · - · M 22kg, ED 25%
- · - · M 11kg, ED 25%	- - - - M 22kg, ED 75%

HME-25-400



— M 1kg, ED 25%	····· M 9.5kg, ED 75%
- - - M 1kg, ED 75%	- · - · M 19kg, ED 25%
- · - · M 9.5kg, ED 25%	- - - - M 19kg, ED 75%

Linear modules HME, electric

Technical data

Feed force F as a function of stroke l

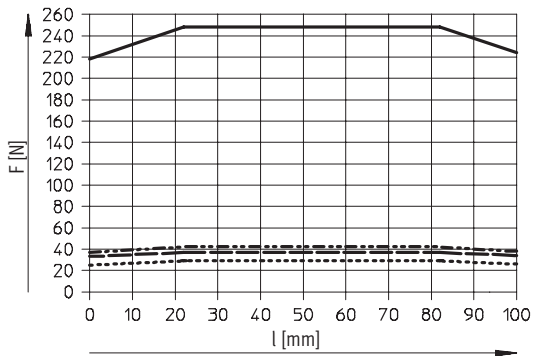
The graphs are based on theoretically determined values, without friction.

Peak feed force

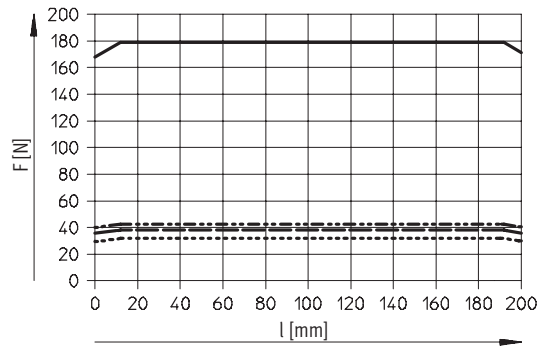
Continuous feed force at ambient temperature:

- from 23°C
- from 30°C
- from 40°C

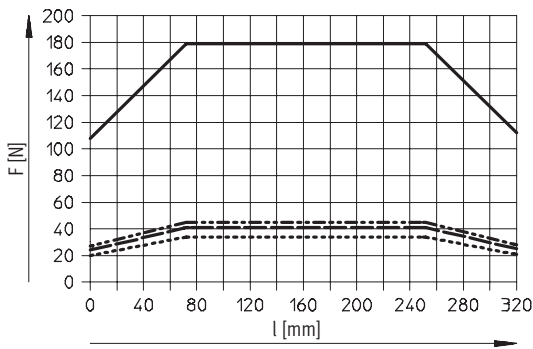
HME-16-100



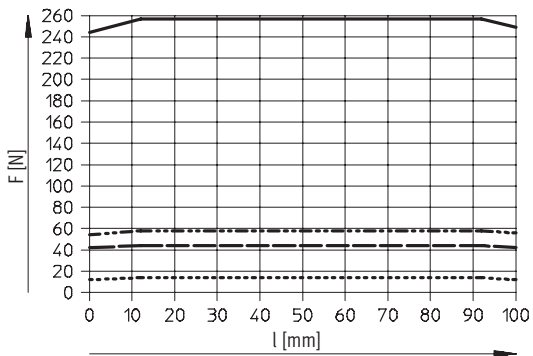
HME-16-200



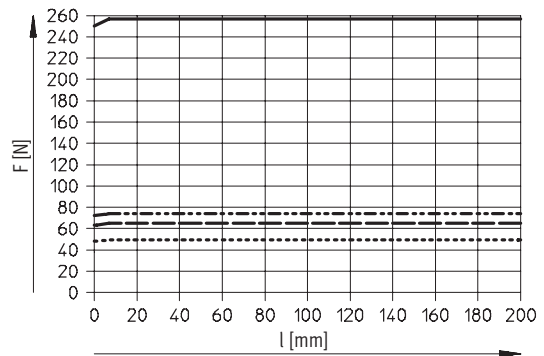
HME-16-320



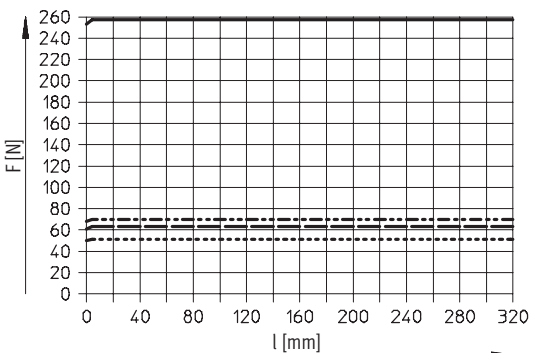
HME-25-100



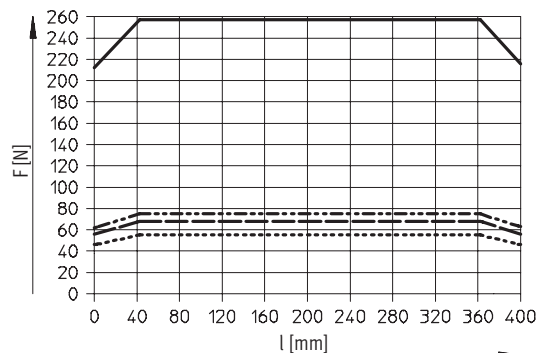
HME-25-200



HME-25-320



HME-25-400



Linear modules HME, electric

Technical data



Feed force F as a function of velocity v

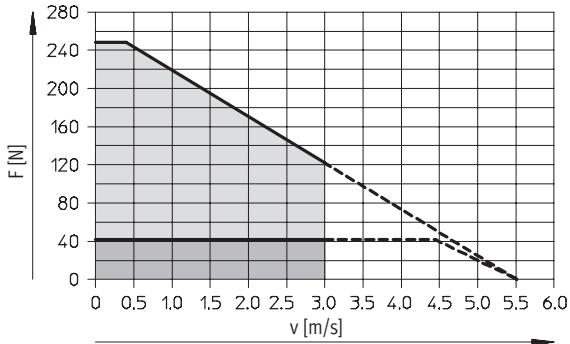
The graphs are based on theoretically determined values under the following conditions:

- Stroke centre of the linear module
- Friction disregarded

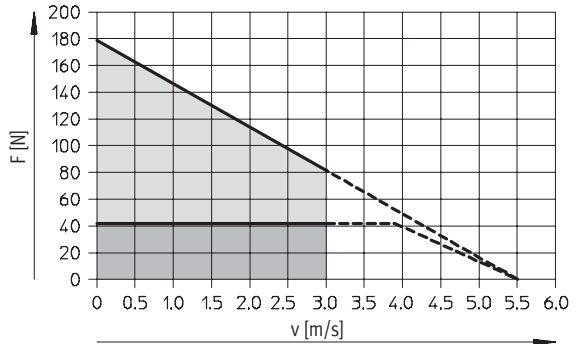
- Normal temperature of 23 °C
- Max. motor temperature of 70 °C

- █ Peak feed force
- █ Continuous feed force
- - - Impermissible range

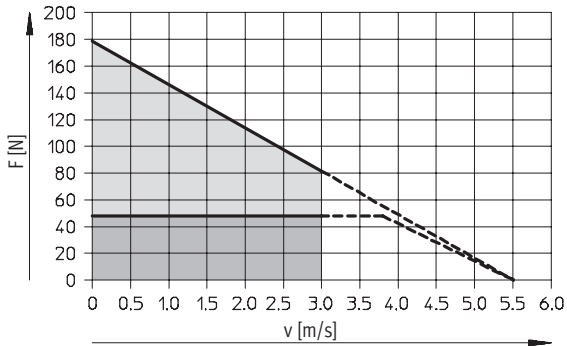
HME-16-100



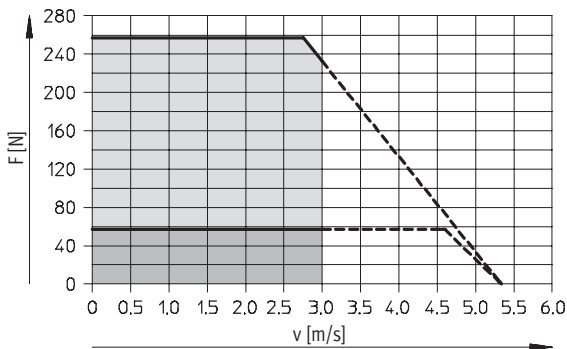
HME-16-200



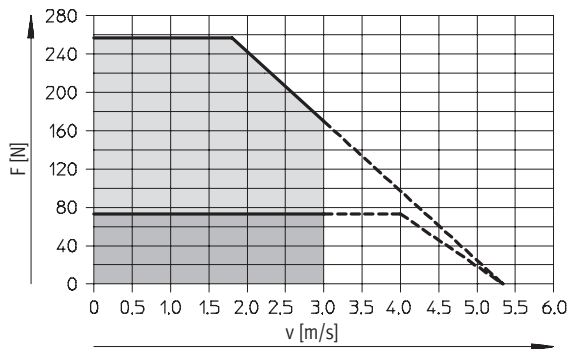
HME-16-320



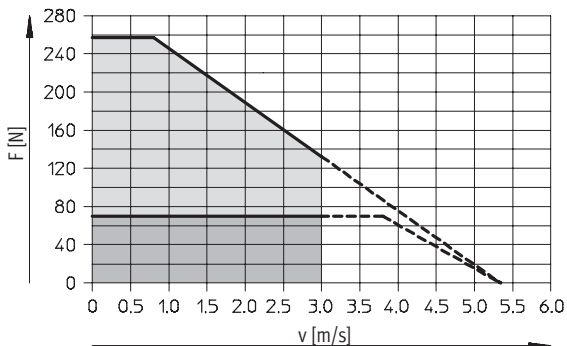
HME-25-100



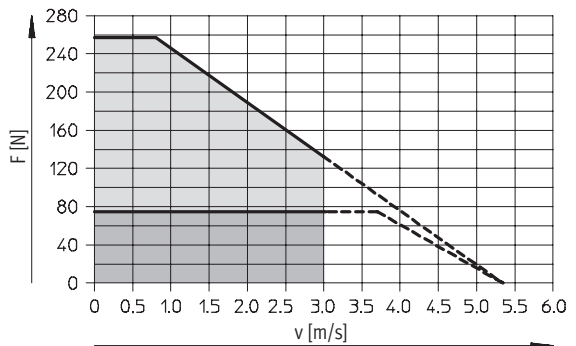
HME-25-200



HME-25-320



HME-25-400



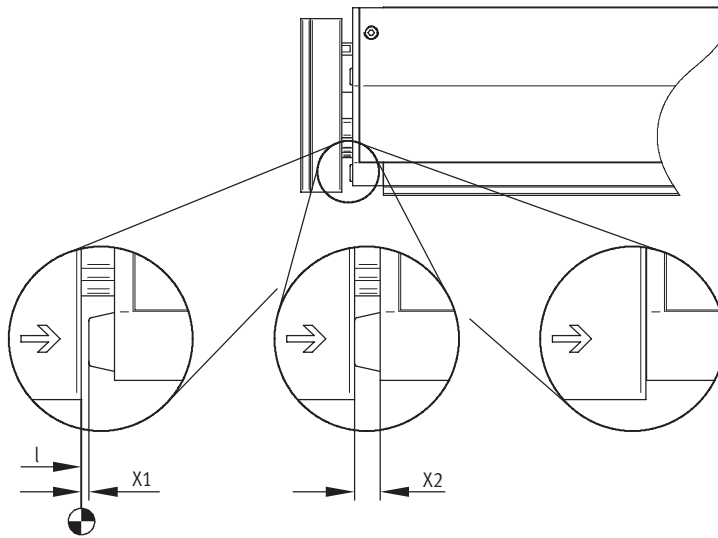
Linear modules HME, electric

Technical data

Stroke reserve and cushioning length

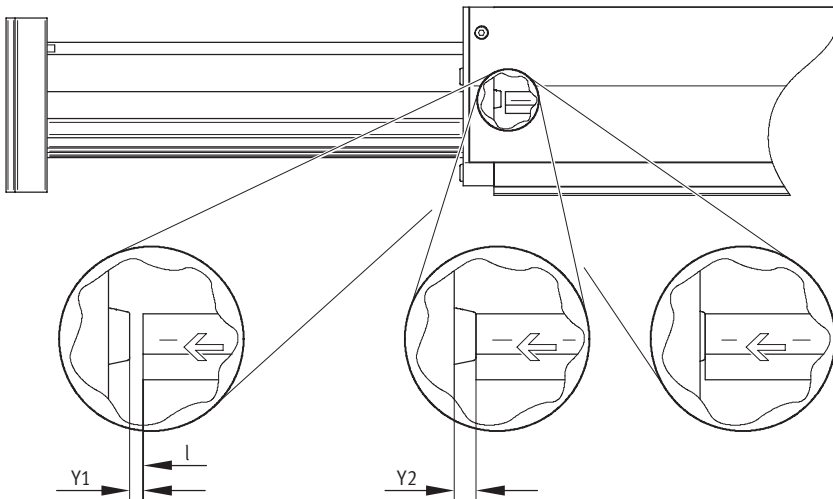
Working stroke:	Stroke reserve:	Cushioning length:
The recommended, available operating range	The distance from the end positions of the working stroke to the buffers	Distance from buffer surface to mechanical end position

Linear module retracted



- l = Working stroke
- X1 = Stroke reserve
- X2 = Cushioning length

Linear module extended



- l = Working stroke
- Y1 = Stroke reserve
- Y2 = Cushioning length

Size	Retracted		Extended	
	X1	X2	Y1	Y2
16	1 mm	1.8 mm	1 mm	3.5 mm
25	0.7 mm	1.8 mm	0.7 mm	4 mm

Linear modules HME, electric

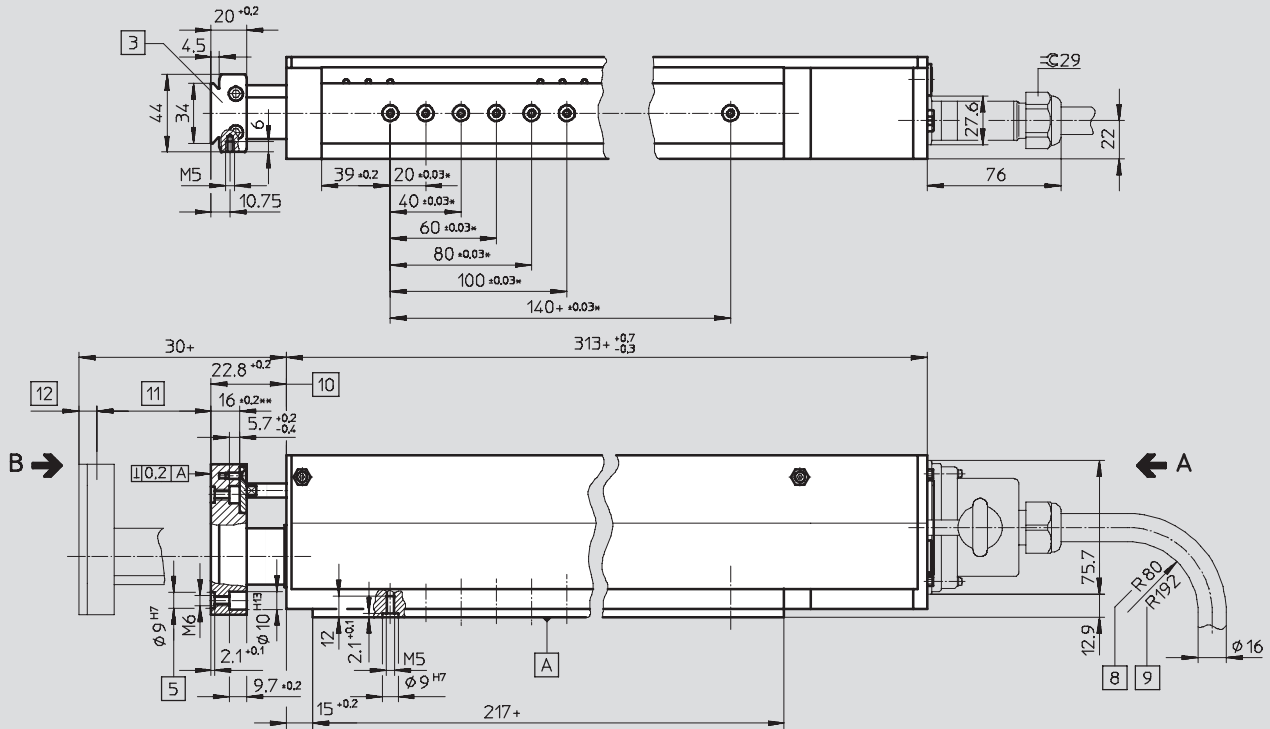
Technical data

FESTO

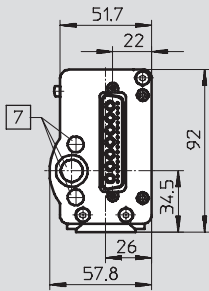
Dimensions

Download CAD data → www.festo.com

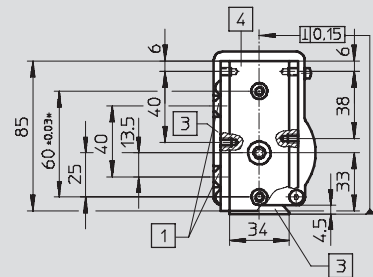
Size 16



View A



View B



1 2 mounting slots for slot nuts HMBN-5-2M5

3 Dovetail mounting option

4 The yoke plate must not be turned

5 Thread and centring hole for load attachment with centring sleeves ZBH-9. The adapter plate must be detached from the yoke plate in order to mount the effective load

7 Cover

8 Static radius

9 Dynamic radius

10 Start of working stroke (zero point)

11 Working stroke

12 Stroke reserve Y1 + cushioning length Y2

→ 17

* Tolerance for countersink

∅ 9 H7, for threaded hole ±0.2

** Max. screw-in depth

+ = plus stroke length

Linear modules HME, electric

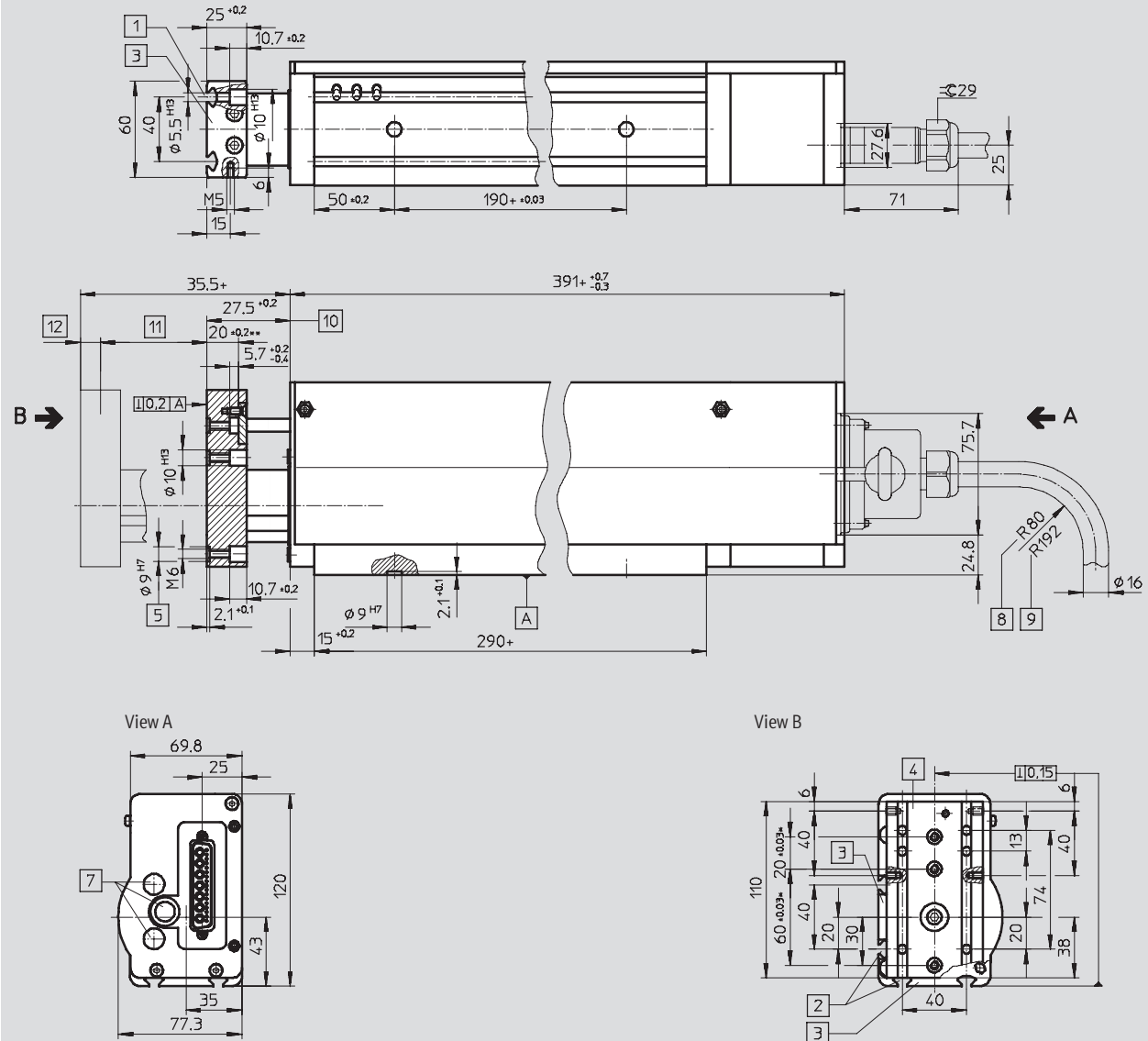
Technical data

FESTO

Dimensions

Download CAD data → www.festo.com

Size 25



- | | | | |
|--|--|--|---|
| <p>1 2 mounting slots for slot nuts HMBN-5-2M5</p> <p>2 4 mounting slots for slot nuts HMBN-5-2M5</p> <p>3 Dovetail mounting option</p> <p>4 The yoke plate must not be turned</p> | <p>5 Thread and centring hole for load attachment with centring sleeves ZBH-9. The adapter plate must be detached from the yoke plate in order to mount the effective load</p> | <p>7 Cover</p> <p>8 Static radius</p> <p>9 Dynamic radius</p> <p>10 Start of working stroke (zero point)</p> <p>11 Working stroke</p> <p>12 Stroke reserve Y1 + cushioning length Y2</p> <p>→ 17</p> | <p>* Tolerance for countersink
∅ 9 H7, for threaded hole ±0.2</p> <p>** Max. screw-in depth</p> <p>+ = plus stroke length</p> |
|--|--|--|---|

Linear modules HME, electric

Ordering data – Modular products



M Mandatory data							O Options	
Module No.	Function	Size	Stroke	Motor type	Measuring principle of displacement encoder	Electrical connection	Accessories	Centring sleeves
539 981 539 982	HME	16 25	100 200 320 400	LAC	R010	SC		...Z
Ordering example								
539 982	HME	- 25	- 400	- LAC	- R010	- SC	ZUB	- 10Z

Ordering table								
Size	16	25	Condi- tions		Code		Enter code	
M	Module No.	539 981	539 982					
	Function	Electrical linear direct drive/handling module/guide			HME		HME	
	Size	16	25		-...			
	Stroke [mm]	100	100		-100			
		200	200		-200			
		320	320		-320			
		-	400		-400			
	Motor type	Linear AC servo motor			-LAC		-LAC	
	Measuring principle of displacement encoder	Relative measurement/magnetic/incremental/contactless			-R010		-R010	
	Electrical connection	Straight plug			-SC		-SC	
O	Accessories	Supplied separately			ZUB-		ZUB-	
	Centring sleeves	10, 20 ... 90			...Z			


Transfer order code

	HME	-		-		-	LAC	-	R010	-	SC		ZUB	-	
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Linear modules HME, electric

Accessories



Ordering data						
	For size [mm]	Remarks	Order code	Part No.	Type	PU ¹⁾
Centring sleeve ZBH				Technical data → Internet: zbh		
	16, 25	For yoke plate	Z	150 927	ZBH-9	10

1) Packaging unit quantity