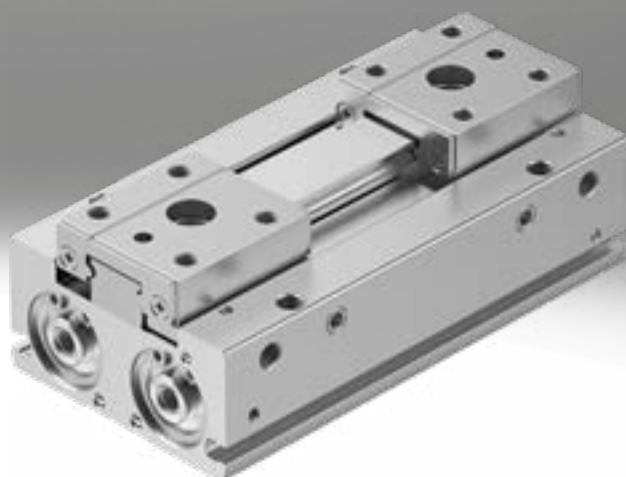


## Parallel gripper HPPF

**FESTO**



## Key features

### At a glance

- Low height, ideal for applications with limited installation space
- Double-acting piston drive
- Optionally with adjustable stroke
- Resilient and precise ball guide
- High gripping forces with compact dimensions
- Wide range of mounting and connection options
- Mounting proximity switches via C-slot

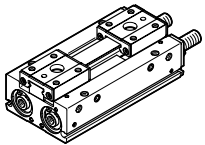
### Position sensing

[A] Via proximity switch

The position sensing function uses proximity switches to sense any required positions.

### Stroke variant

[S] Adjustable stroke



Allows the opening and closing stroke to be adjusted

### For the manufacture of Li-ion batteries

#### Product

Recommended for production systems for manufacturing lithium-ion batteries. Metals with more than 1% copper, zinc or nickel by mass are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, circuit boards, cables, electrical plug connectors and coils.

#### Accessories

Please contact your Festo representative for information on which accessories are suitable for manufacturing lithium-ion batteries

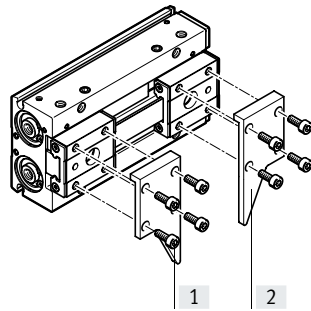
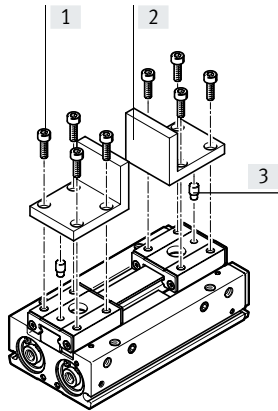
#### - - Note

Engineering software  
Gripper selection  
→ [www.festo.com](http://www.festo.com)

Key features

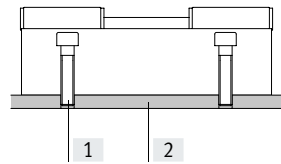
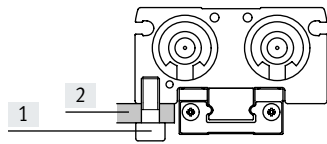
Mounting options

External gripper fingers

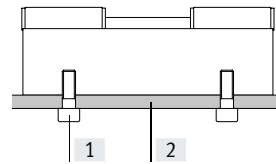


- [1] Screws
- [2] Gripper finger (produced in-house by the customer)
- [3] Centring pins (optional)

From above

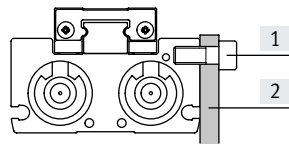
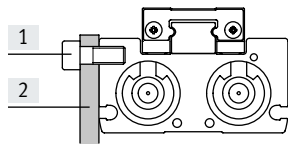


From underneath



- [1] Screws
- [2] Mounting plate (produced in-house by the customer)

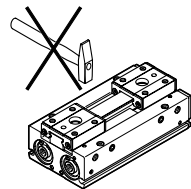
On the side



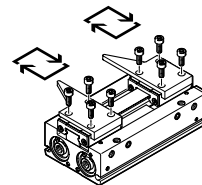
- [1] Screws
- [2] Mounting plate (produced in-house by the customer)

**Note**  
When using a gripper, note the following:

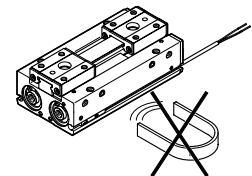
Further information  
→ User documentation



- Protect against vibrations

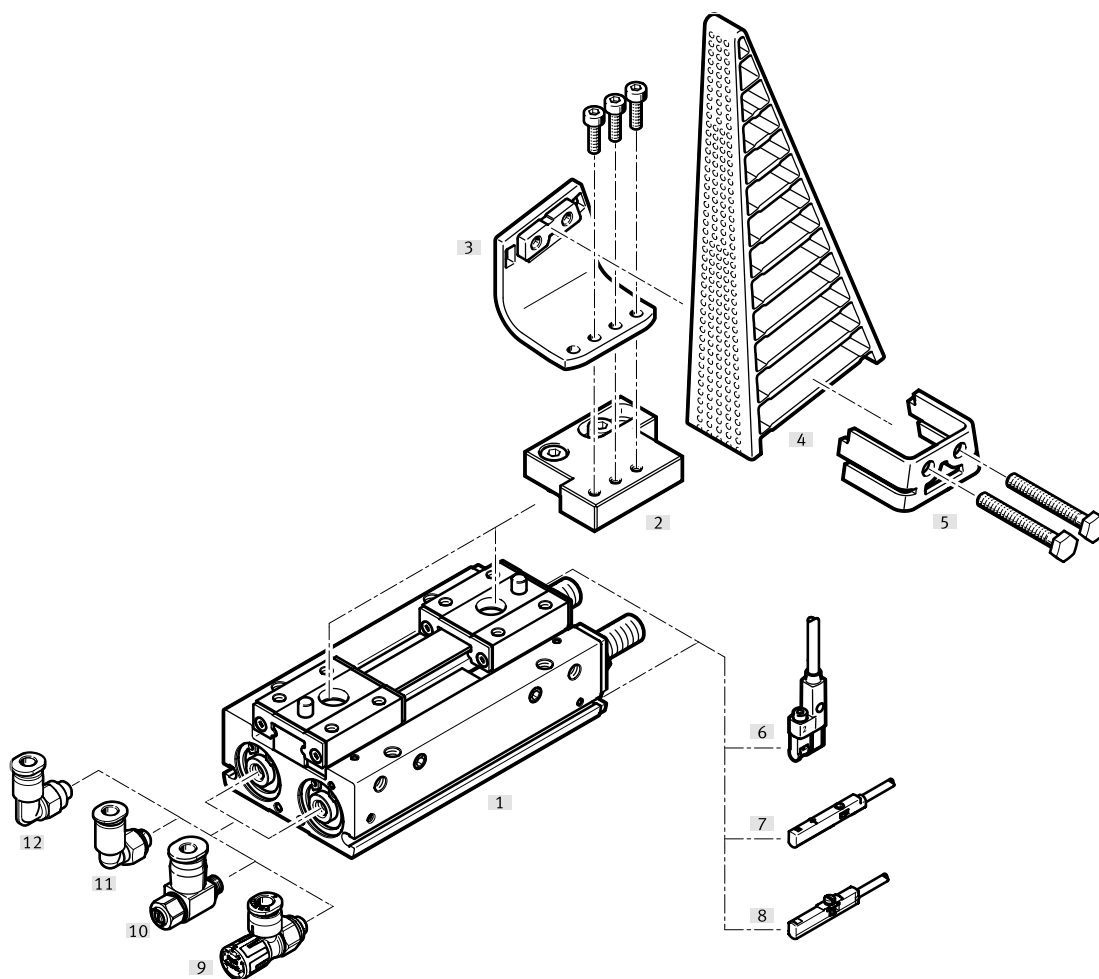


- Comply with torques



- Protect against magnetic fields

Peripherals overview



Accessories		
Type/order code	Description	→ Page/Internet
[1] Parallel gripper HPPF	Double-acting, with ball guide, optionally with adjustable stroke	6
[2] Intermediate plate HAMF-PA	<ul style="list-style-type: none"> <li>To mount the mounting bracket DHAS-MA on the gripper</li> <li>Available for sizes 16, 20</li> </ul>	16
[3] Mounting bracket DHAS-MA	To mount the adaptive gripper finger DHAS-GF on the intermediate plate HAMF-PA	17
[4] Adaptive gripper finger DHAS-GF	For flexible gripping	18
[5] Mounting kit DHAS-ME	To mount the adaptive gripper finger DHAS-GF on the mounting bracket DHAS-MA	19
[2] Proximity switch SMT-10G	For sensing the piston position at the end positions	20
[3] Proximity switch SMT-10M	For sensing the piston position at the end positions	20
[4] Proximity switch SDBC-MSB	For sensing the piston position at the end positions	20
[5] One-way flow control valve VFOE	For regulating speed	20
[6] One-way flow control valve GRLA	For regulating speed	20
[7] Push-in fitting QS	For connecting tubing with standard O.D.	qs
[8] Push-in fitting NPQE	For connecting tubing with standard O.D.	npqe

## Type codes

001	Size
HPPF	Parallel gripper

002	Size [mm]
8	8
12	12
16	16
20	20

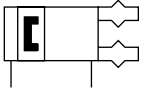
003	Complete stroke [mm]
8	8
12	12
16	16
20	20
24	24
32	32
40	40
48	48
64	64
80	80




004	Position sensing
A	For proximity sensor

005	Stroke variant
	Without
S	Adjustable stroke

## Datasheet

Function  
Double-acting  
HPPF-...A-...



-  - Size  
8 ... 20 mm
-  - Total stroke  
8 ... 80 mm
-  - [www.festo.com](http://www.festo.com)



HPPF-...-A



HPPF-...-AS

### General technical data

Size	8	12	16	20									
Total stroke	8	16	32	40	80								
Stroke per gripper jaw	4	8	16	6	12	24	8	16	32	10	20	40	
Design	Flat mounting of gripper fingers, gear rack/pinion, force-guided motion sequence												
Mode of operation	Double-acting												
Guide	Ball guide												
Gripper function	Parallel												
Cushioning	Elastic cushioning rings/plates at both ends												
Number of gripper jaws	2												
Pneumatic connection	M3						M5						
Gripper repetition accuracy <sup>1)</sup>	≤0.03 mm						≤0.02 mm						≤0.06 mm
Max. operating frequency of gripper	2 Hz						1 Hz						
Position sensing	Gripping: Slot for proximity switch												
Type of mounting	Direct mounting via through-hole, direct mounting via thread												
Mounting position	Any												

<sup>1)</sup> Under constant exposure to operating conditions, end-position drift occurs in the direction of movement of the gripper jaws, at 100 consecutive strokes

### Operating and environmental conditions

Size	8	12	16	20
Operating pressure	0.15 ... 0.7 MPa		0.1 ... 0.7 MPa	
Operating pressure	21.75 ... 101.5 psi		14.5 ... 101.5 psi	
Operating pressure	1.5 ... 7 bar		1 ... 7 bar	
Operating medium	Compressed air to ISO 8573-1:2010 [7:4:4]			
Note on the operating/pilot medium	Lubricated operation possible (in which case lubricated operation will always be required)			
Ambient temperature <sup>1)</sup>	-10 ... 60°C			
Corrosion resistance class CRC <sup>2)</sup>	0 - No corrosion stress			

<sup>1)</sup> Note operating range of proximity switches

<sup>2)</sup> More information [www.festo.com/x/topic/kbk](http://www.festo.com/x/topic/kbk)

## Datasheet

## Weights

Size	8						12					
Stroke variant	None	Adjustable stroke	None	Adjustable stroke	None	Adjustable stroke	None	Adjustable stroke	None	Adjustable stroke	None	Adjustable stroke
Product weight	68 g	78 g	83 g	95 g	122 g	135 g	157 g	182 g	205 g	233 g	305 g	339 g

## Weights

Size	16						20					
Stroke variant	None	Adjustable stroke	None	Adjustable stroke	None	Adjustable stroke	None	Adjustable stroke	None	Adjustable stroke	None	Adjustable stroke
Product weight	366 g	415 g	471 g	524 g	691 g	755 g	690 g	783 g	887 g	993 g	1326 g	1458 g

## Materials

Size	8	12	16	20
Housing material	Anodised wrought aluminium alloy			
Cover material	Anodised wrought aluminium alloy			
Cover cap material	Anodised wrought aluminium alloy			
End plate material	High-alloy stainless steel			
Gripper jaw material	High-alloy steel			
Piston seal material	TPE-U(PU)			
Gear rack material	High-alloy stainless steel			
Material of screws	Coated steel			
O-ring material	NBR			
Note on materials	RoHS-compliant			
PWIS conformity	VDMA24364 zone III			
Cleanroom class	Class 7 to ISO 14644-1			
Suitable for the production of lithium-ion batteries	Metals with more than 1% copper, zinc or nickel by mass are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, circuit boards, cables, electrical plug connectors and coils			

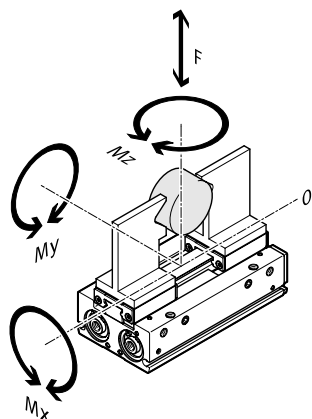
## Measured gripping force

Size <sup>1)</sup>	8	12	16	20
Total gripping force at 0.6 MPa (6 bar, 87 psi), closing	60.32 N	135.72 N	241.28 N	377 N
Total gripping force at 0.6 MPa (6 bar, 87 psi), opening	60.32 N	135.72 N	241.28 N	377 N
Gripping force per gripper jaw at 0.6 MPa (6 bar, 87 psi) closing	30.16 N	67.86 N	120.64 N	188.5 N
Gripping force per gripper jaw at 0.6 MPa (6 bar, 87 psi) opening	30.16 N	67.86 N	120.64 N	188.5 N

1) Graphs relating to this are on the following pages.

## Datasheet

### Characteristic load values at the gripper jaws



The indicated permissible forces and torques apply to a single gripper jaw. The indicated values include the lever arm, additional weight forces caused by the workpiece or external gripper fingers, as well as forces which occur during movement. The zero coordinate line (gripper jaw guide) must be taken into consideration when calculating torques.

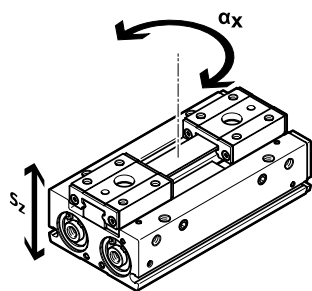
Size	8	12	16	20
Max. force on gripper jaw $F_z$ , static	58 N	98 N	176 N	294 N
Max. torque $M_x$	0.6 Nm	1.4 Nm	2.8 Nm	4 Nm
Max. torque $M_y$	0.3 Nm	0.7 Nm	1.4 Nm	2 Nm
Max. torque $M_z$	0.3 Nm	0.7 Nm	1.4 Nm	2 Nm

**Note**

Collisions of the slides must be avoided. In the event of a collision, the slides may be damaged.

Additional information  
 → User documentation

### Gripper jaw backlash



The gripper has a ball guide, which eliminates any possible backlash between the gripper jaws and the housing. The backlash values listed in the table have been calculated based on the traditional accumulative tolerance method.

Size <sup>1)</sup>	8	12	16	20
Max. gripper jaw backlash $S_z$	0 mm			
Max. gripper jaw angular backlash $\alpha_x, \alpha_y$	0 deg			

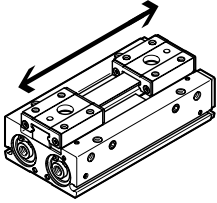
<sup>1)</sup> The values apply only when the gripper is open.



## Datasheet

## Opening and closing times

Without external gripper fingers



The indicated opening and closing times [ms] were measured at room temperature with a horizontally mounted gripper without additional gripper fingers. The grippers must be throttled for larger masses [g]. Opening and closing times must then be adjusted accordingly.

Size <sup>1)</sup>	8		16		32		12		24		48	
	Total stroke	8	16	32	12	24	48	Without	Adjustable stroke	Without	Adjustable stroke	Without
Min. opening time at 0.6 MPa (6 bar, 87 psi)	15 ms		32 ms		46 ms		44 ms		75 ms		121 ms	
Min. closing time at 0.6 MPa (6 bar, 87 psi)	12 ms		31 ms		44 ms		43 ms		73 ms		105 ms	

<sup>1)</sup> The indicated opening and closing times [ms] were measured at room temperature at an operating pressure of 6 bar with a horizontally mounted gripper without additional gripper fingers. The grippers must be throttled for larger masses [g]. Opening and closing times must then be adjusted accordingly.

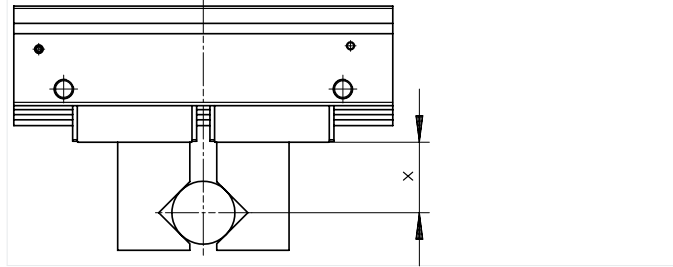
Size <sup>1)</sup>	16		32		64		20		40		80	
	Total stroke	16	32	64	20	40	80	Without	Adjustable stroke	Without	Adjustable stroke	Without
Min. opening time at 0.6 MPa (6 bar, 87 psi)	55 ms		93 ms		189 ms		90 ms		120 ms		240 ms	
Min. closing time at 0.6 MPa (6 bar, 87 psi)	47 ms		91 ms		181 ms		70 ms		110 ms		225 ms	

<sup>1)</sup> The indicated opening and closing times [ms] were measured at room temperature at an operating pressure of 6 bar with a horizontally mounted gripper without additional gripper fingers. The grippers must be throttled for larger masses [g]. Opening and closing times must then be adjusted accordingly.

Datasheet

**Gripping force  $F_{Gr}$  per gripper jaw as a function of the operating pressure and lever arm  $x$**

The gripping forces as a function of the operating pressure and lever arm can be determined from the following graphs.

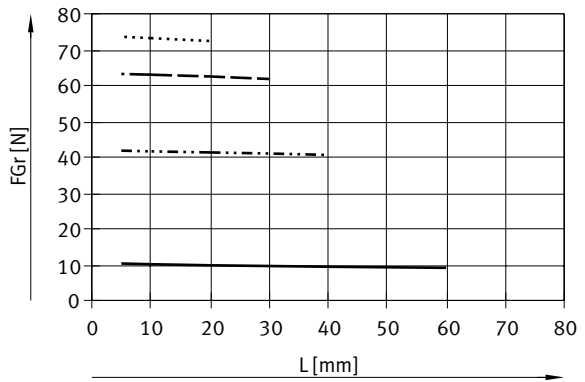
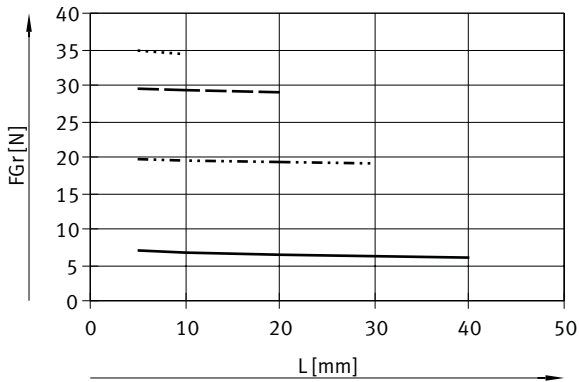


**Note**  
 Engineering software  
 Gripper selection  
 → [www.festo.com](http://www.festo.com)

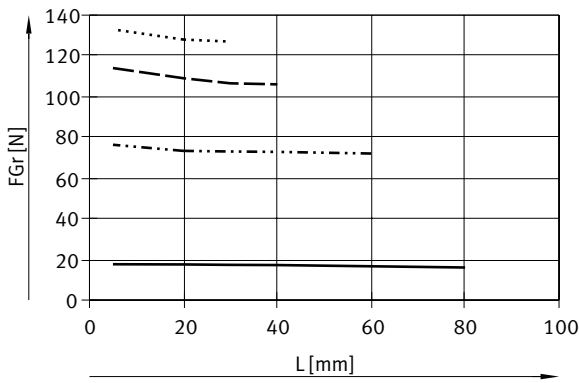
- 1 bar
- · - · - 4 bar
- - - - 6 bar
- · · · · 7 bar

**External gripping (closing)**  
**Double-acting**

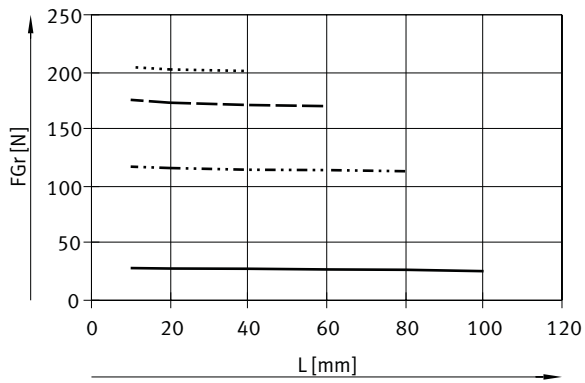
HPPF-8 HPPF-12



HPPF-16



HPPF-20



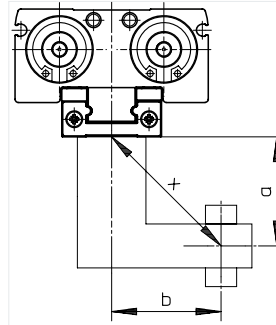
## Datasheet

**Gripping force  $F_{Gr}$  per gripper jaw at 0.6 MPa (6 bar, 87 psi) as a function of lever arm  $x$  and eccentricity  $a$  and  $b$** 

The following formula must be used to calculate the lever arm  $x$  with eccentric gripping:

$$x = \sqrt{a^2 + b^2}$$

The gripping force  $F_{Gr}$  can be read from the graphs (→ page 10) using the calculated value  $x$ .

**Calculation example**

Assuming:

Distance  $a = 20$  mm

Distance  $b = 25$  mm

To be determined:

The gripping force at 0.6 MPa (6 bar, 87 psi), with an HPPF-16, used as an external gripper

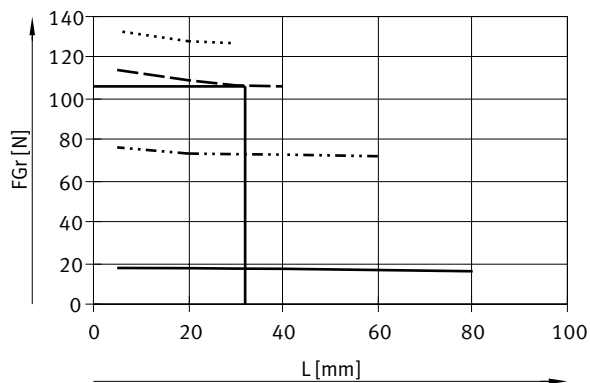
Procedure:

Calculating the lever arm  $x$

$$x = \sqrt{20^2 + 25^2}$$

$x = 32$  mm

The graph (→ page 10) gives a value of  $F_{Gr} = 106$  N for the gripping force.

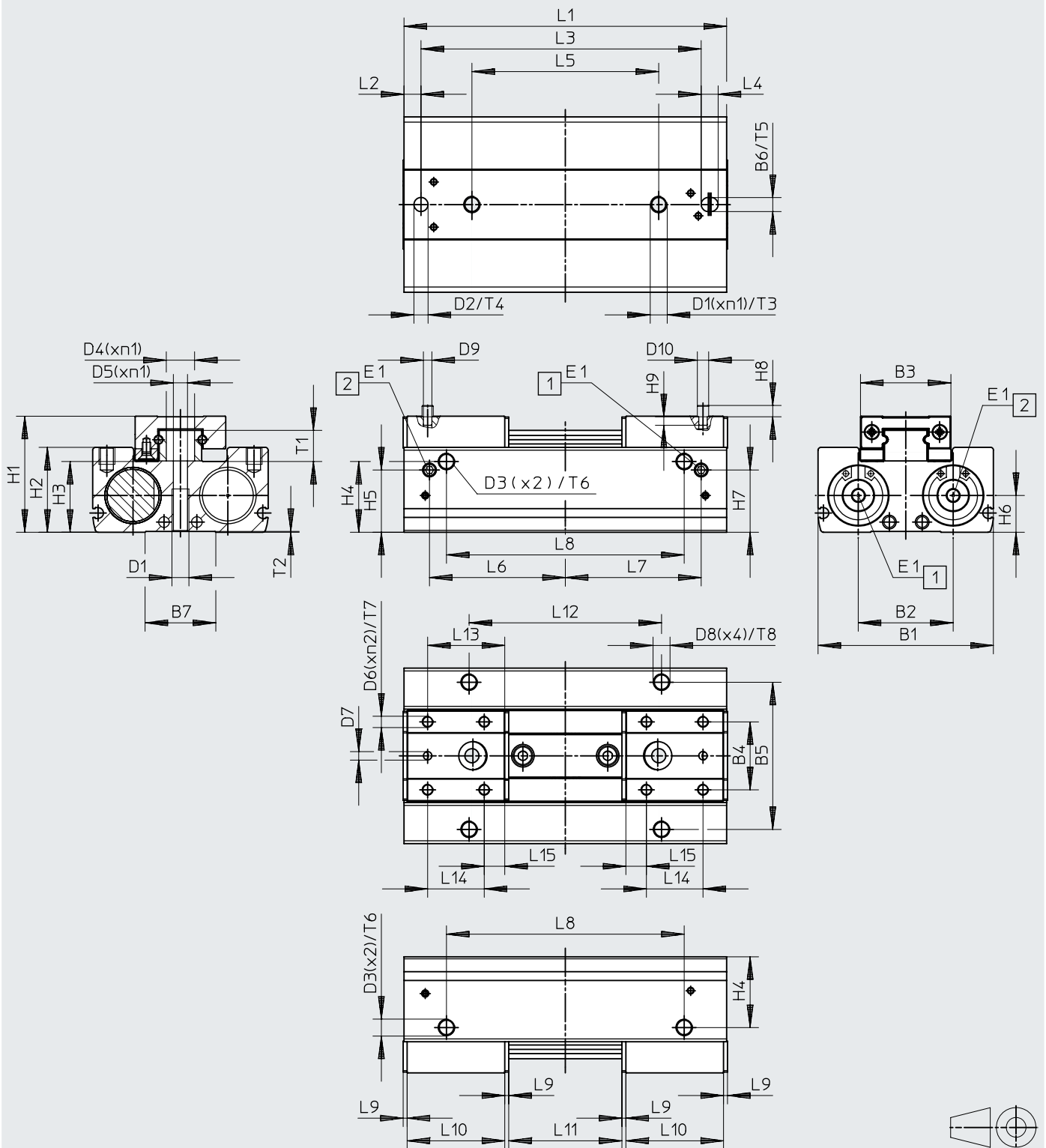


Datasheet

Dimensions

Download CAD data → [www.festo.com](http://www.festo.com)

HPPF...-A



- [1] Pneumatic port, opening
- [2] Pneumatic port, closing

## Datasheet

Size	Stroke	B1	B2	B3	B4	B5	B6	B7	D1	D2 ∅	D3	D4 ∅	D5 ∅	D6	D7	D8	D9 ∅	D10 ∅
[mm]	[mm]	-0.4		-0.1	±0.05	±0.1	H9			H9					H9			
8	8	32	15.7	17	12	26	2.5	16	M3	2.5	M3	4.4	2.5	M2.5	2	M3	2	2.5
	16																	
	32																	
12	12	40	20.3	20	15	33	3	16.6	M4	3	M4	5.5	3.5	M3	2.5	M4	2.5	3
	24																	
	48																	
16	16	50	24	27	20	43	4	15.6	M5	4	M5	8	4.2	M4	3	M5	3	4
	32																	
	64																	
20	20	62	33.5	32	24	52	5	25	M6	5	M6	10	5	M6	3	M6	3	4
	40																	
	80																	

Size	Stroke	E1	H1	H2	H3	H4	H5	H6	H7	H8	H9	L1	L2	L3	L4	L5	L6	L7
[mm]	[mm]		±0.1	±0.2	±0.05	±0.05						-0.1	±0.05	±0.05	±0.1	±0.1		
8	8	M3	19	14	11.2	11	7.6	5.9	7.6	2	2.5	38.5	3	31.1	3.4	16	13.8	13.5
	48											40.3		28		18.5	17.7	
	72											64.3		17		29.9	29.7	
12	12	M5	25	19	15.2	15	14.7	7.7	14.7	2.5	3	52	4	42	4	26	8.2	8.2
	69											58		42		16.7	16.7	
	104											94		26		34.2	34.2	
16	16	M5	33	25	21	20	20	10.5	20	3	4	72	6	60	5	38	11	11
	94											81		60		22	22	
	142											129.5		36		46	46	
20	20	M5	41	30	25.2	25	22	13	22	3	4	87	6	71	6	38	34.5	34.5
	114											99		66		48	48	
	174											159		42		78	78	

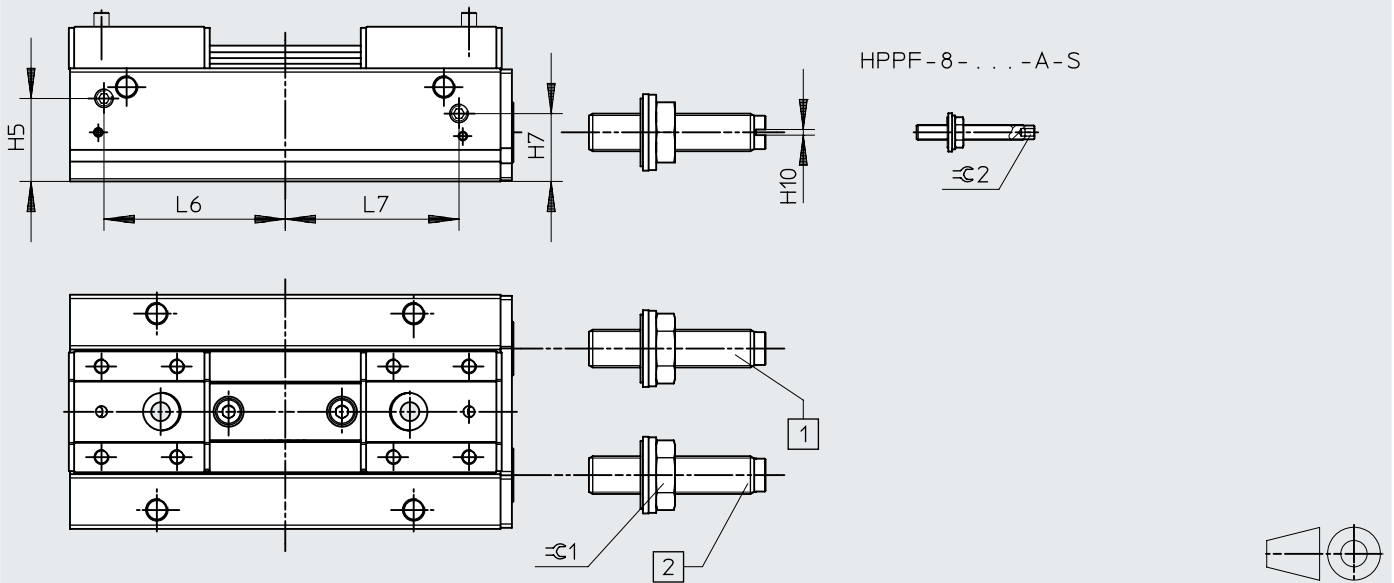
Size	Stroke	L8	L9	L10	L11	L12	L13	L14	L15	n1	n2	T1	T2	T3	T4	T5	T6	T7	T8						
[mm]	[mm]	±0,1		-0.1	±1	±0.1	±0.05	±0.05																	
8	8	22	0.9	12	8	14	10	0	6	2	2	5.2	0.2	4	2.5	2.5	4	3	4						
	16	34		14	16	26	11		7																
	32	58		18	32	50	13		8											5					
12	12	38	1	20.5	24	44	16.3	12	4.3	2	2	6.6	10	3	3	5	5	5	5						
	24	54																		27	48	80	22.5	18	4.5
	48	90																		37	64	106	31.5	26	5.5
16	16	52	1.2	29	32	58	23.5	18	7.5	2	4	8.2	0.3	12	4	4	6	4	5.5						
	32	74																		31	20	40	23.5	16	
	64	122																		34.5	40	68	27.3	20	
20	20	56	1.4	44.5	80	128	37.3	30	7.3	4	4	10.8	15	4	4	6	6	6	6						
	40	84																		31	20	40	23.5	16	
	80	144																		34.5	40	68	27.3	20	

Datasheet

Dimensions

Download CAD data → [www.festo.com](http://www.festo.com)

HPPF...-A-S



- [1] For adjusting the stroke, opening
- [2] For adjusting the stroke, closing

Size	Stroke	H5	H7	H10	L6	L7	≈C1	≈C2
[mm]	[mm]							
8	8	7.6	7.6	-	13.8	13.5	7	2
	16				18.5	17.7		
	32				29.9	29.7		
12	12	14.7	14.7	0.8	8.2	8.2	10	
	24				16.7	16.7		
	48				34.2	34.2		
16	16	20	20	1.5	11	11	13	-
	32				22	22		
	64				46	46		
20	20	22.5	18	1.5	35.5	32.5	16	
	40	22			48	46		
	80				78	76		

## Datasheet

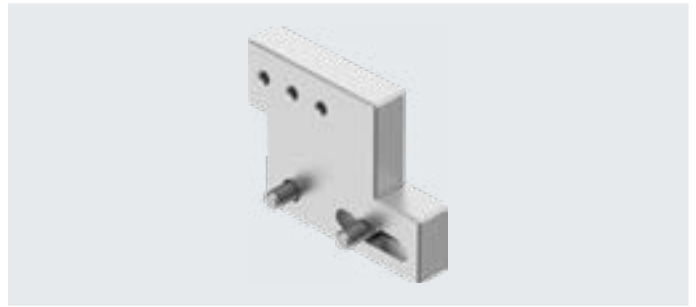
Ordering data			
Size	Total stroke	Part no.	Type
8	8 mm	8133724	HPPF-8-8-A
		8134368	HPPF-8-8-A-S
	16 mm	8133731	HPPF-8-16-A
		8134375	HPPF-8-16-A-S
	32 mm	8134364	HPPF-8-32-A-S
8128415		HPPF-8-32-A	
12	12 mm	8139790	HPPF-12-12-A
		8141587	HPPF-12-12-A-S
	24 mm	8139791	HPPF-12-24-A
		8141588	HPPF-12-24-A-S
	48 mm	8139792	HPPF-12-48-A
		8141589	HPPF-12-48-A-S
16	16 mm	8105829	HPPF-16-16-A
		8143712	HPPF-16-16-A-S
	32 mm	8143713	HPPF-16-32-A-S
		8143243	HPPF-16-32-A
	64 mm	8143714	HPPF-16-64-A-S
8143246		HPPF-16-64-A	
20	20 mm	8141226	HPPF-20-20-A
		8143425	HPPF-20-20-A-S
	40 mm	8143408	HPPF-20-40-A
		8143426	HPPF-20-40-A-S
	80 mm	8143409	HPPF-20-80-A
		8143427	HPPF-20-80-A-S

Accessories

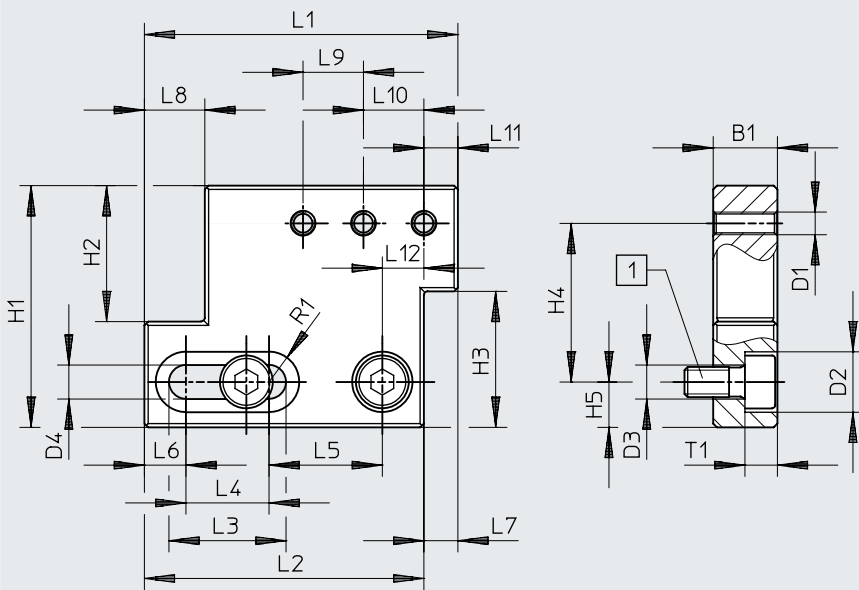
Intermediate plate HAMF-PA

Material: Aluminium

RoHS-compliant



Dimensions and ordering data



[1] HAMF-PA-B30-16: Screw M4x8-10.9  
 HAMF-PA-B30-20: Screw M4x10-10.9  
 (in the scope of delivery)

For size	Stroke	B1 ±0.1	D1	D2 ∅	D3 ∅	D4 +0.1	H1	H2	H3	H4
16	32, 64	8.5	M3	8	4.5	4.5	32	18	18	21
20	40, 80	8.5	M3	8	4.5	4.5	36	21	21	23

For size	Stroke	H5	L1	L2	L3 +0.2	L4	L5	L6	L7	L8
16	32, 64	6	41.5	37	15.5	11	15	5.5	4.5	8
20	40, 80	6	47.5	42.8	19.5	15	15	5.3	4.8	12

For size	Stroke	L9	L10	L11	L12	R1	T1	Weight [g]	Part no.	Type
16	32, 64	8	8	4.5	5.5	4	4.3	25	8175319	HAMF-PA-B30-16
20	40, 80	8	8	4.5	7.5	4	4.3	31	8175321	HAMF-PA-B30-20



Accessories

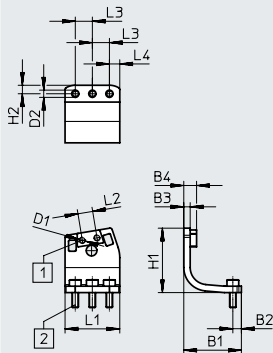
Mounting bracket DHAS-MA

Material: High-alloy stainless steel

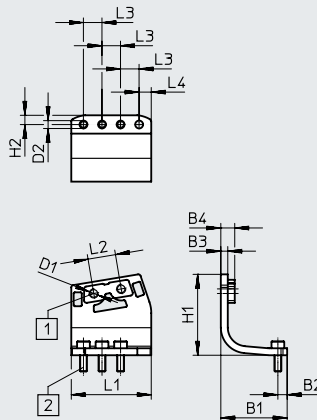


Dimensions and ordering data

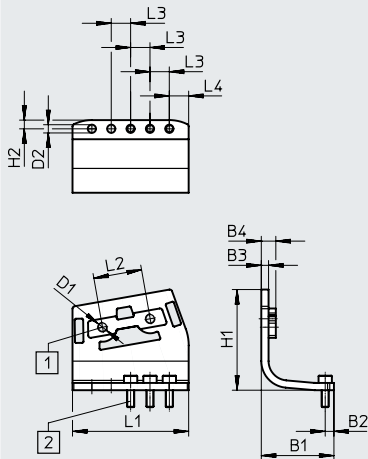
DHAS-MA-B6-60



DHAS-MA-B6-80



DHAS-MA-B6-120



- [1] Mounting thread
- [2] Screw M3x8-8.8  
(in the scope of delivery)

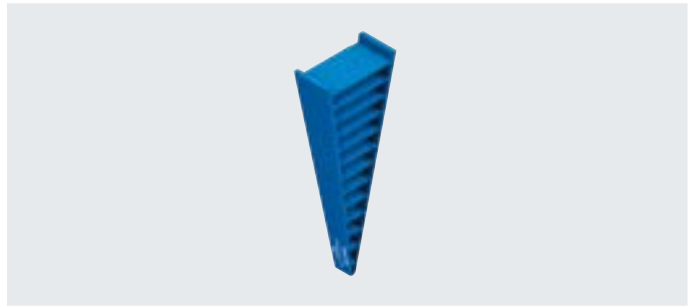
For intermediate plate	B1	B2	B3 ±0.2	B4 ±0.1	D1	D2 ∅	H1
HAMF-PA-B30-...	27	4	3	6	M3	3.4	30.3
	28.6	4	3	6	M4	3.3	35
	30	3.6	3	6	M4	3.4	41.7

For intermediate plate	H2	L1	L2 ±0.1	L3 ±0.1	L4	Weight [g]	Part no.	Type
HAMF-PA-B30-...	4	25.7	7	8	4.85	23	3920696	DHAS-MA-B6-60
	4	34.5	12	8	5.25	38	3899099	DHAS-MA-B6-80
	3.6	48	20	8	7.9	59	3889257	DHAS-MA-B6-120

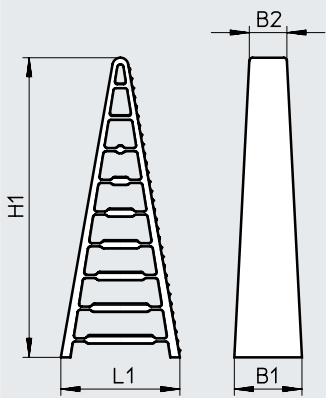
Accessories

Adaptive gripper finger DHAS-GF

Material: TPE-U(PU)



Dimensions and ordering data

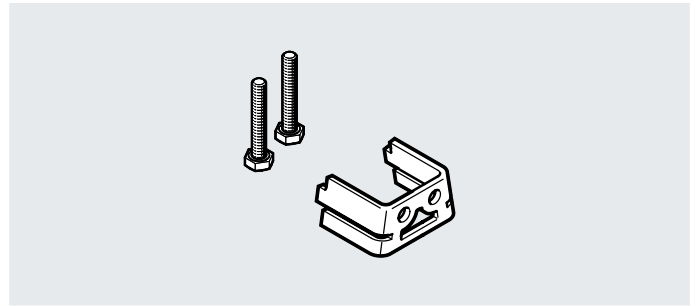


For mounting bracket	B1	B2	H1	L1	Weight [g]	Part no.	Type
DHAS-MA-B6-60	18	11.8	61.5	26	7	3998967	DHAS-GF-60-U-BU
DHAS-MA-B6-80	21.3	11.8	94.5	37.5	13	3998964	DHAS-GF-80-U-BU
DHAS-MA-B6-120	25	11.8	134.5	50	29	3998959	DHAS-GF-120-U-BU

Accessories

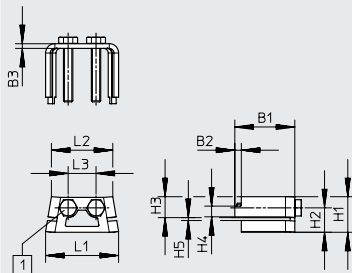
Mounting kit DHAS-ME

Material: High-alloy stainless steel

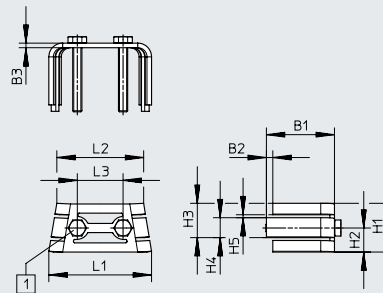


Dimensions and ordering data

DHAS-ME-H9-60/80



DHAS-ME-H9-120



- [1] Screw (in the scope of delivery)
- DHAS-ME-H9-60: ISO 4017-M3x22-A2-70
- DHAS-ME-H9-80: ISO 4017-M4x25-A2-70
- DHAS-ME-H9-120: ISO 4017-M4x30-A2-70


For adaptive gripper finger	B1	B2	B3 ±0.1	H1	H2	H3	H4
DHAS-GF-60-U-BU	22.8	2.8	2	10.3	6.7	7	3.6
DHAS-GF-80-U-BU	25.8	2.8	2	15.3	10.5	9	4.6
DHAS-GF-120-U-BU	29.8	2.8	2	21.3	10.5	15	8.7

For adaptive gripper finger	H5 +0.1	L1	L2	L3 ±0.1	Weight [g]	Part no.	Type
DHAS-GF-60-U-BU	1.3	20.7	17.4	7	7	4464306	DHAS-ME-H9-60
DHAS-GF-80-U-BU	1.3	31.4	26.4	12	13	4463570	DHAS-ME-H9-80
DHAS-GF-120-U-BU	1.3	44.9	38	20	23	4461433	DHAS-ME-H9-120

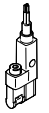
Accessories

Proximity switch


Ordering data – Proximity switches for C-slot, magneto-resistive Datasheets → Internet: smt

	Type of mounting	Electrical connection, outlet direction of connection	Switching output	Cable length [m]	Part no.	Type
N/O						
	Inserted in the slot from above	Cable, 3-wire, lengthwise	PNP	2.5	551373	SMT-10M-PS-24V-E-2.5-L-OE
		Plug M8x1, 3-pin, in-line		0.3	551375	SMT-10M-PS-24V-E-0.3-L-M8D
		Cable, 3-wire, crosswise	NPN	2.5	551374	SMT-10M-PS-24V-E-2.5-Q-OE
		Plug M8x1, 3-pin, crosswise		0.3	551376	SMT-10M-PS-24V-E-0.3-Q-M8D



Ordering data – Proximity switches for C-slot, magneto-resistive Datasheets → Internet: smt

	Type of mounting	Electrical connection, outlet direction of connection	Switching output	Cable length [m]	Part no.	Type
N/O						
	Inserted into the slot length-wise	Cable, 3-wire, crosswise	PNP	2.5	547862	SMT-10G-PS-24V-E-2.5Q-OE
		Plug M8x1, 3-pin, crosswise		0.3	547863	SMT-10G-PS-24V-E-0.3Q-M8D
		Cable, 3-wire, crosswise	NPN	2.5	8065030	SMT-10G-NS-24V-E-2.5Q-OE
		Plug M8x1, 3-pin, crosswise		0.3	8065029	SMT-10G-NS-24V-E-0.3Q-M8D


Ordering data – Proximity switches for C-slot, magneto-resistive Datasheets → Internet: sdbc

	Type of mounting	Electrical connection, outlet direction of connection	Switching output	Cable length [m]	Part no.	Type
N/O						
	Inserted in the slot from above	Cable, 3-wire, lengthwise	PNP	2	8139723	SDBC-MSB-1L-PU-K-2-LE
		Plug M8x1, 3-pin, in-line		0.3	8139726	SDBC-MSB-1L-PU-K-0.3-M8
		Cable, 3-wire, lengthwise	NPN	2	8139724	SDBC-MSB-1L-NU-K-2-LE
		Plug M8x1, 3-pin, in-line		0.3	8139727	SDBC-MSB-1L-NU-K-0.3-M8
		Cable, 2-wire, lengthwise	Non-contacting, 2-wire	2	8139725	SDBC-MSB-1L-ZU-K-2-LE


Ordering data – Connecting cables Datasheets → Internet: nebu

	Electrical connection, left	Electrical connection, right	Cable length [m]	Part no.	Type
	Straight socket, M8x1, 3-pin	Cable, open end, 3-wire	2.5	541333	NEBU-M8G3-K-2.5-LE3
			5	541334	NEBU-M8G3-K-5-LE3
	Straight socket, M12x1, 5-pin	Cable, open end, 3-wire	2.5	541363	NEBU-M12G5-K-2.5-LE3
			5	541364	NEBU-M12G5-K-5-LE3
	Angled socket, M8x1, 3-pin	Cable, open end, 3-wire	2.5	541338	NEBU-M8W3-K-2.5-LE3
			5	541341	NEBU-M8W3-K-5-LE3
	Angled socket, M12x1, 5-pin	Cable, open end, 3-wire	2.5	541367	NEBU-M12W5-K-2.5-LE3
			5	541370	NEBU-M12W5-K-5-LE3

Ordering data – One-way flow control valves Datasheets → Internet: grla

	Connection		Material	Part no.	Type
	Thread	For tubing O.D.			
For exhaust air					
	M3	–	Metal design	175038	GRLA-M3
		3		175041	GRLA-M3-QS-3
		3		193137	GRLA-M5-QS-3-D
	M5	4		193138	GRLA-M5-QS-4-D
		6		193139	GRLA-M5-QS-6-D

Ordering data – One-way flow control valves Datasheets → Internet: u

	Connection	Material	Part no.	Type
	Thread			
For exhaust air				
	M5	4	8068723	VFOE-LE-T-M5-Q4
		4	8095432	VFOE-LE-T-M5-Q4-P50
		6	8068724	VFOE-LE-T-M5-Q6