

Handling modules HSP

FESTO



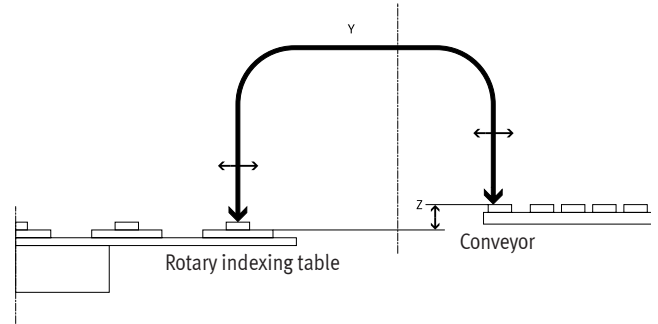
Key features at a glance

Range of application

The handling module is a new generation of function modules for the automatic transfer, feed and removal of small parts in extremely confined spaces. This is achieved via a force-guided vertical and horizontal motion sequence. A backlash-free cross guide with recirculating ball bearing elements ensures high precision and good rigidity. The combination of semi-rotary drive and slotted guide results in a compact unit for a complete pick & place cycle.

Special features

- Compact design
- Extremely short cycle times
- Low-cost
- Easy commissioning
- For payloads up to 1.6 kg
- Stroke adjustment along Y- and Z-axes
- Wait position modules possible
- No planning costs



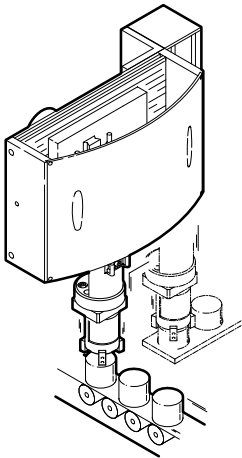
Product range overview – Three drive variants to choose from

		Pneumatic: HSP-...-AP, with semi-rotary drive DSM	Pneumatic: HSP-...-AS, with drive shaft
Advantages			
		<ul style="list-style-type: none"> • Fast • Low cost • Ready-to-install • No project engineering required • Easy commissioning 	<ul style="list-style-type: none"> • Compact • Can be used universally • Variable drive interface • On request: Drive options in combination with servo motors
Technical data			
Stroke	Y [mm]	52 ... 170	
	Z [mm]	20 ... 70	
Min. cycle time	[s]	0.6 ... 1.0	Dependent on drive
Payload	[g]	0 ... 1600	
Repetition accuracy at end positions	[mm]	±0.02	
Buffer		Max. 2	Dependent on drive
Function of wait position module		Pulling with spring-return cylinder	Dependent on drive
Repetition accuracy in wait positions	[mm]	< 1	Dependent on drive
Data sheet		→ Page 7	→ Page 16

Application examples

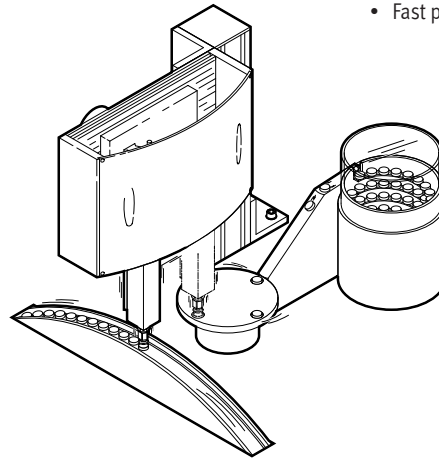
HSP...-AP, pneumatic

Linear transfer



- Rapid feeding and removal, e.g. at the linear transfer or at the rotary indexing table

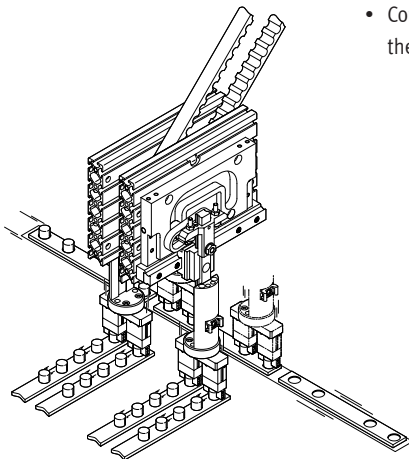
Positioning parts on a belt



- Fast positioning of parts on a belt

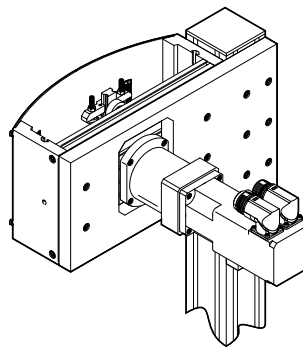
HSP...-AS, without drive

Linear transfer



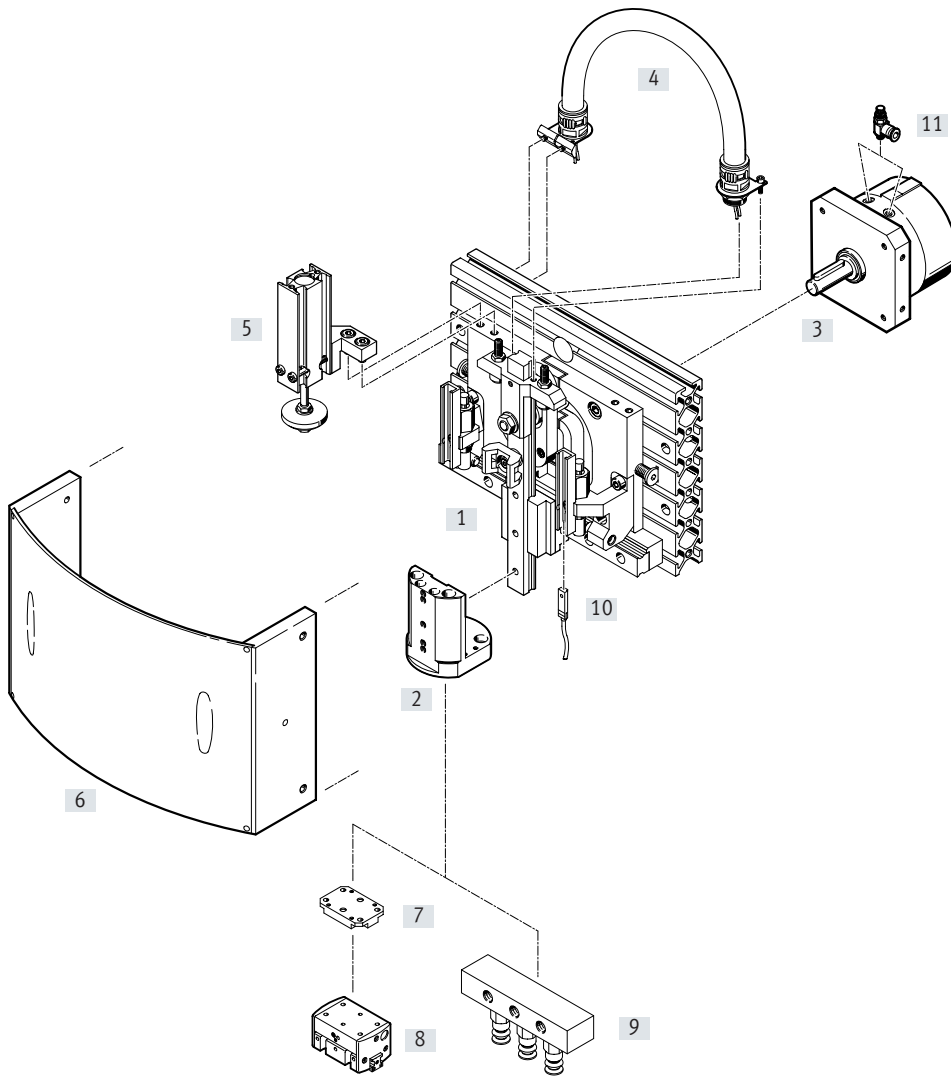
- Compact tandem pick & place at the linear transfer

Rotary indexing table, linear transfer



- Fast and flexible pick & place with servo motor EMMT-AS
- Electric variant using third-party motor

Peripherals overview



Peripherals overview

Accessories	Description	→ Page/Internet
[1] Handling module HSP	Standard module without accessories	7
[2] Adapter kit HAPG	Interface for grippers, semi-rotary drives, etc.	18
[3] Semi-rotary drive DSM	Pneumatic drive, adapted to each size	dsm
[4] Installation kit MKRP	Conduit to protect electrical cables and tubing	19
[5] Wait position module BWL-/BWR-HSP	With pneumatic drive: Function for pulling the swivel arm back out of the working area	19
[6] Cover kit BSD-HSP	To protect against accidental contact	19
[7] Adapter kit	Interface between HSP and gripper	gripper
[8] Gripper	Parallel/three-point/radial/angle grippers can be attached to the HSP. The appropriate gripper for every application	gripper
[9] Suction cup with connection	Appropriate suction cup for every application	suction cup
[10] Proximity switch SME-/SMT-8	Sensing option for end positions	20
[11] Non-return and flow control valve GRLA	For setting the speed of pneumatic drives	grla
– Slot nut HMBN	For mounting the handling module	20

Type codes

001	Series
HSP	Handling module

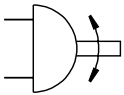
002	Size
12	12
16	16
25	25

003	Drive system
AS	Drive shaft
AP	Pneumatic semi-rotary drive

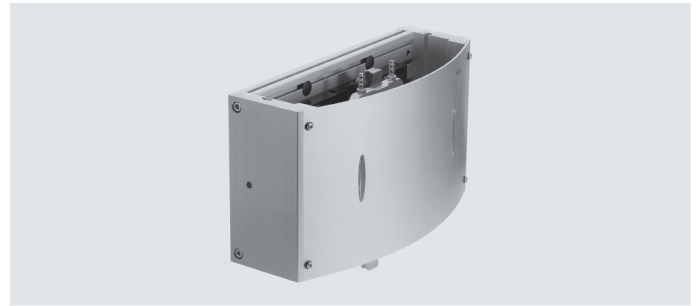
004	Protective devices
	None
SD	Protective cover




005	Wait position module
	None
WL	Left
WR	Right

Data sheet



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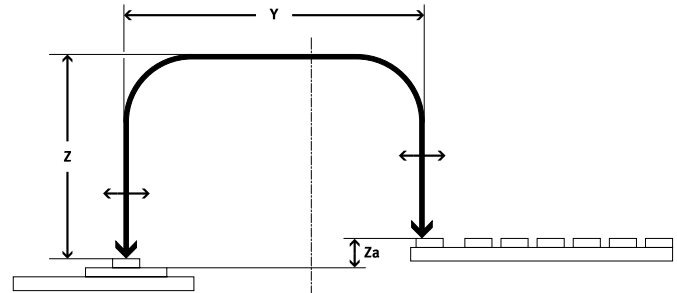


-  Size
12, 16, 25
-  Y-stroke length
52 ... 170 mm
-  Z-stroke length
20 ... 70 mm

General technical data	
Type	HSP...AP
Pneumatic connection	M5
Mode of operation	Double-acting
Design	Semi-rotary drive
	Cross guide
	Force-guided motion sequence
Cushioning	Shock absorbers at both ends, soft characteristic curve
Position sensing	Via proximity switch
Type of mounting	With through-hole
	Via slot nuts
Mounting position	Guide rail, vertical/horizontal

Operating and environmental conditions	
Type	HSP...AP
Operating medium	Compressed air to ISO 8573-1:2010 [7:-:-]
Note on operating/ pilot medium	Lubricated operation possible (in which case lubricated operation will always be required)
Operating pressure [bar]	4 ... 8
Ambient temperature [°C]	0 ... +60

Size	12	16	25
Y direction			
Stroke [mm]	52 ... 68	90 ... 110	130 ... 170
Z direction			
Stroke [mm]	Z 20 ... 30	35 ... 50	50 ... 70
Working stroke	Za 5 ... 15	5 ... 20	5 ... 25



Forces [N]			
Size	12	16	25
Z direction			
Effective force at 6 bar	40	50	65
Y direction			
Permissible process force	30	35	50

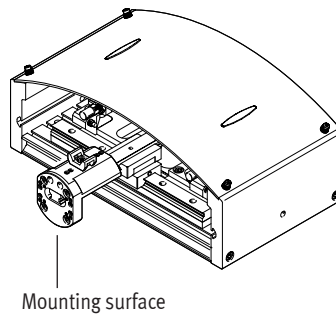
Data sheet

Weights [g]			
Size	12	16	25
HSP-...-AP	1900	3300	6400
HSP-...-AP-SD	2600	4600	7600
HSP-...-AP-SD-WR	2800	4800	8100
HSP-...-AP-SD-WL	2800	4800	8100

Repetition accuracy [mm]

For low-vibration operation, the payload should be mounted as close as possible to the guide rail of the handling module.

Repetition accuracy is ensured if the payload (adapter plate, semi-rotary drive and/or gripper, gripper fingers, workpiece) is mounted within the mounting surface of the adapter kit HAPG.

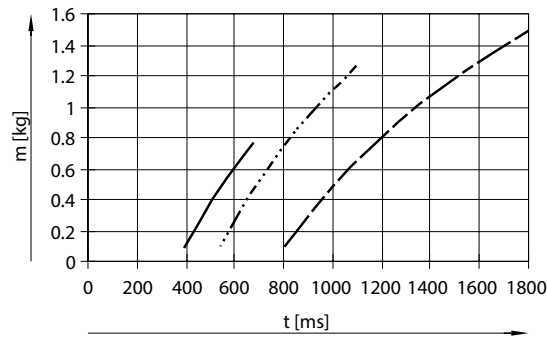


Size	12	16	25
Repetition accuracy at end positions	±0.01	±0.01	±0.02

Travel times t as a function of payload m while maintaining repetition accuracy

The travel time t is taken to be the time the handling module requires to travel from one end position to the other and back.

The payload m is taken to be the mass fastened on the vertical guide rail (e.g. adapter, gripper, semi-rotary drive and workpiece).



Note
It is possible to obtain higher speeds with the same mass by limiting repetition accuracy.

— HSP-12-AP
 HSP-16-AP
 - - - HSP-25-AP

Cycle times [s]

The cycle time t_t is the sum of the travel time t and the dwell time t_e in the end positions.

$t_t = \text{travel time } t + \text{dwell time } t_e$
 The minimum cycle time must be complied with.

Size	12	16	25
Min. cycle time	0.6	0.8	1.0

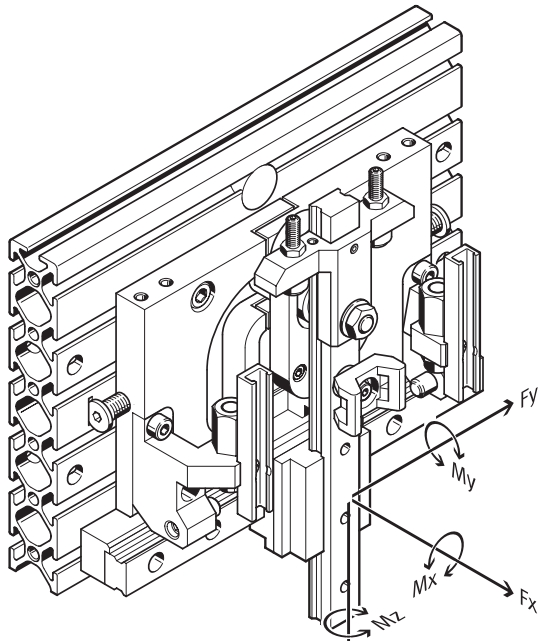
Example for HSP-12-AP

- | | | | |
|---|--|--|--|
| <p>Step 1:
The following values are assumed:
Payload $m = 0.15 \text{ kg}$
Dwell time $t_e = 2 \times 50 \text{ ms}$
(50 ms per end position)</p> | <p>Step 2:
The travel time can be determined from the graph:
$t = 400 \text{ ms}$</p> | <p>Step 3:
This gives us a cycle time:
$t_t = 400 \text{ ms} + 100 \text{ ms} = 500 \text{ ms}$</p> | <p>Step 4:
The table shows a minimum cycle time of 600 ms. This means that the movement needs to be throttled.</p> |
|---|--|--|--|

Data sheet

Permissible static/dynamic characteristic load values

Cross guide



Note
The torques apply to the centre of the guide carriage.

Combined load

The torque equation for the combined load must be satisfied:

$$\frac{|M_{x1}|}{M_{x2}} + \frac{|M_{y1}|}{M_{y2}} + \frac{|M_{z1}|}{M_{z2}} \leq 1$$

M1 = dynamic value
M2 = maximum value

Dynamic characteristic load values

Size	12	16	25
Max. torques [Nm] M _{xperm.} , M _{yperm.} , M _{zperm.}	1.1	2.4	3.2

Combined load

The torque equation for the combined load must be satisfied:

$$\frac{|M_{x1}|}{M_{x2}} + \frac{|M_{y1}|}{M_{y2}} + \frac{|M_{z1}|}{M_{z2}} \leq 1$$

M1 = static value
M2 = maximum value

Static characteristic load values

Size	12	16	25
Max. torques [Nm] M _{oxperm.} , M _{oyperm.} , M _{ozperm.}	5	10	15

Data sheet

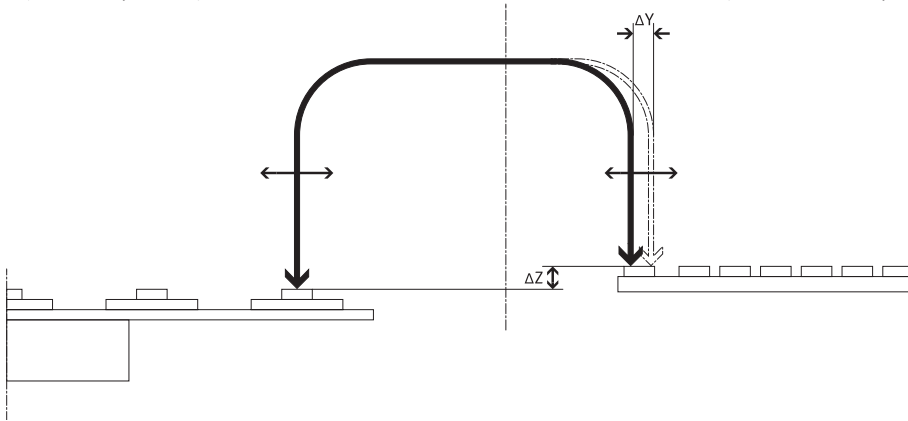
Stroke adjustment

Y stroke:

Once the HSP is mounted, the Y stroke of the pick & place position can be adjusted independently of each other.

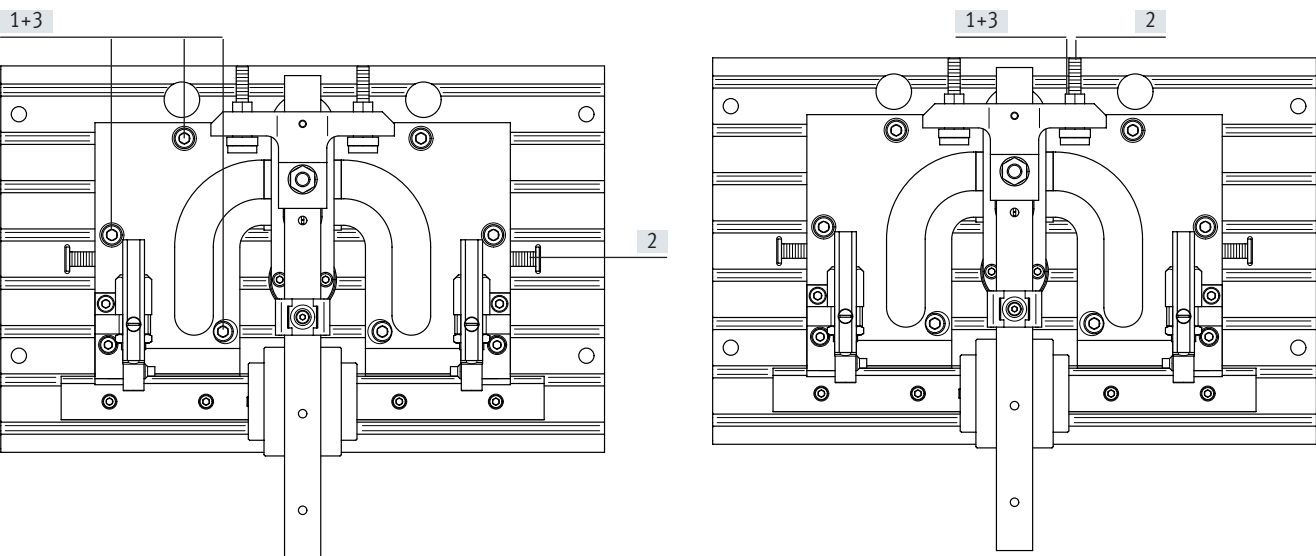
Z stroke:

Differences in height, for example between a rotary indexing table and a transfer system, can be compensated even after mounting.



Y-axis (horizontal)

Z-axis (vertical)



Procedure:

- [1] Loosen the screws
- [2] Adjust the guide using the adjusting screw (guide must always rest against the guide rail)
- [3] Tighten the screws

Procedure:

- [1] Loosen the lock nut
- [2] Set the desired Z stroke using the set screw
- [3] Tighten the lock nut

Data sheet

Wait position module

Application and mode of operation

Figure 1

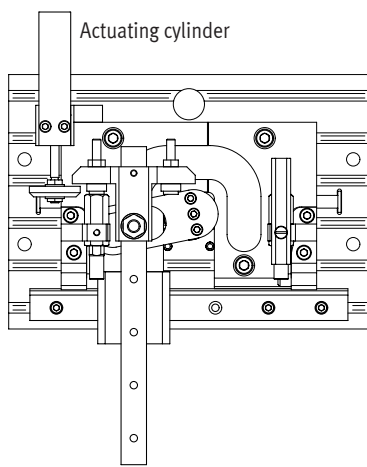
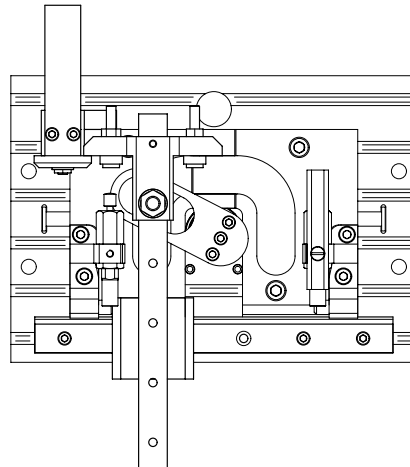
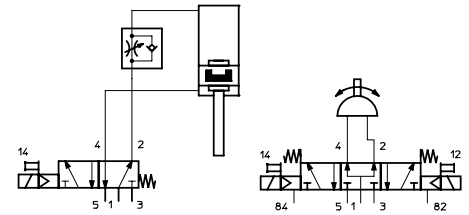



Figure 2



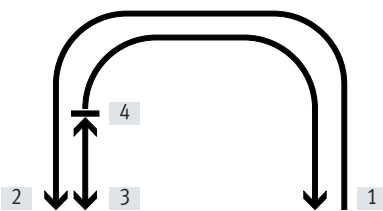
Circuit diagram for HSP with wait position module



- [1] The handling module HSP is in the right-hand end position. The actuating cylinder is advanced in its initial position.
- [2] When the handling module reaches the left-hand end position, the 5/3-way valve is reset. (Figure 1)
- [3] When retracting, the actuating cylinder pulls the handling module upward into its wait position. The operating area is then free. (Figure 2)
- [4] From the wait position, it can be swivelled either into the initial position or into the other end position.

 **Note**

In combination with the wait position module, the handling module HSP must be controlled using a 5/3-way valve (normally open). The actuating cylinder is controlled using a 5/2-way valve. The actuating cylinder can only be used for pulling.

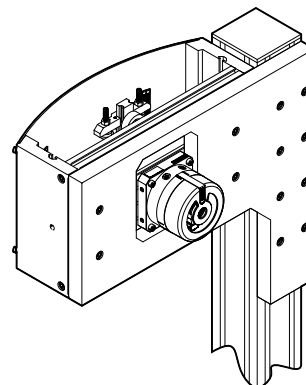
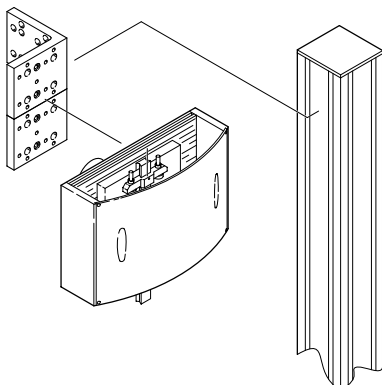


Size	HSP-12	HSP-16	HSP-25
Max. Z stroke of wait position module	15	25	25

Mounting options

With adapter kit HMBV

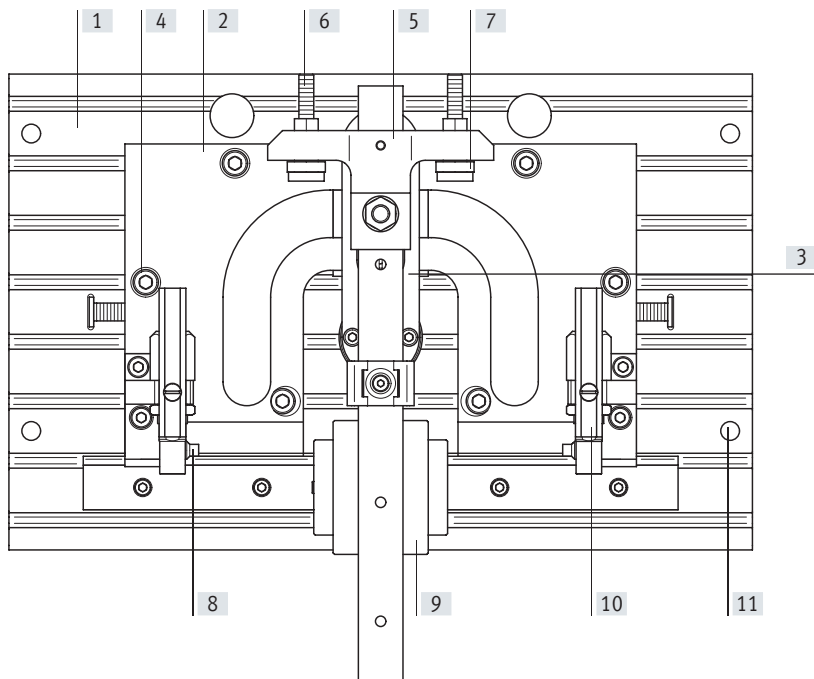
User-specific



Data sheet

Materials

Sectional view of handling module HSP

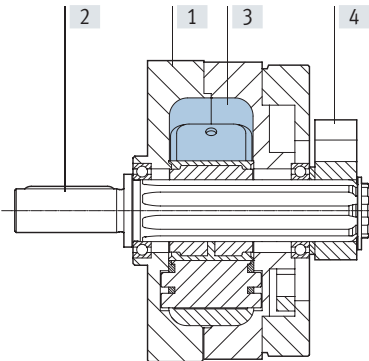


Handling module		
[1]	Base plate	Anodised wrought aluminium alloy
[2]	Guide	Burnished case-hardened steel
[3]	Swivel lever	Burnished case-hardened steel
[4]	Retaining bracket	Anodised wrought aluminium alloy
[5]	Flange	Anodised wrought aluminium alloy
[6]	Setting screw	High-alloy steel
[7]	Stop sleeve	High-alloy steel
[8]	Clamping element	High-alloy steel
[9]	Cross guide	Tempered steel
[10]	Sensor rail	Anodised wrought aluminium alloy
[11]	Housing	Anodised wrought aluminium alloy
	Note on materials	Free of copper and PTFE

Data sheet

Materials

Sectional view of semi-rotary drive DSM



Semi-rotary drive

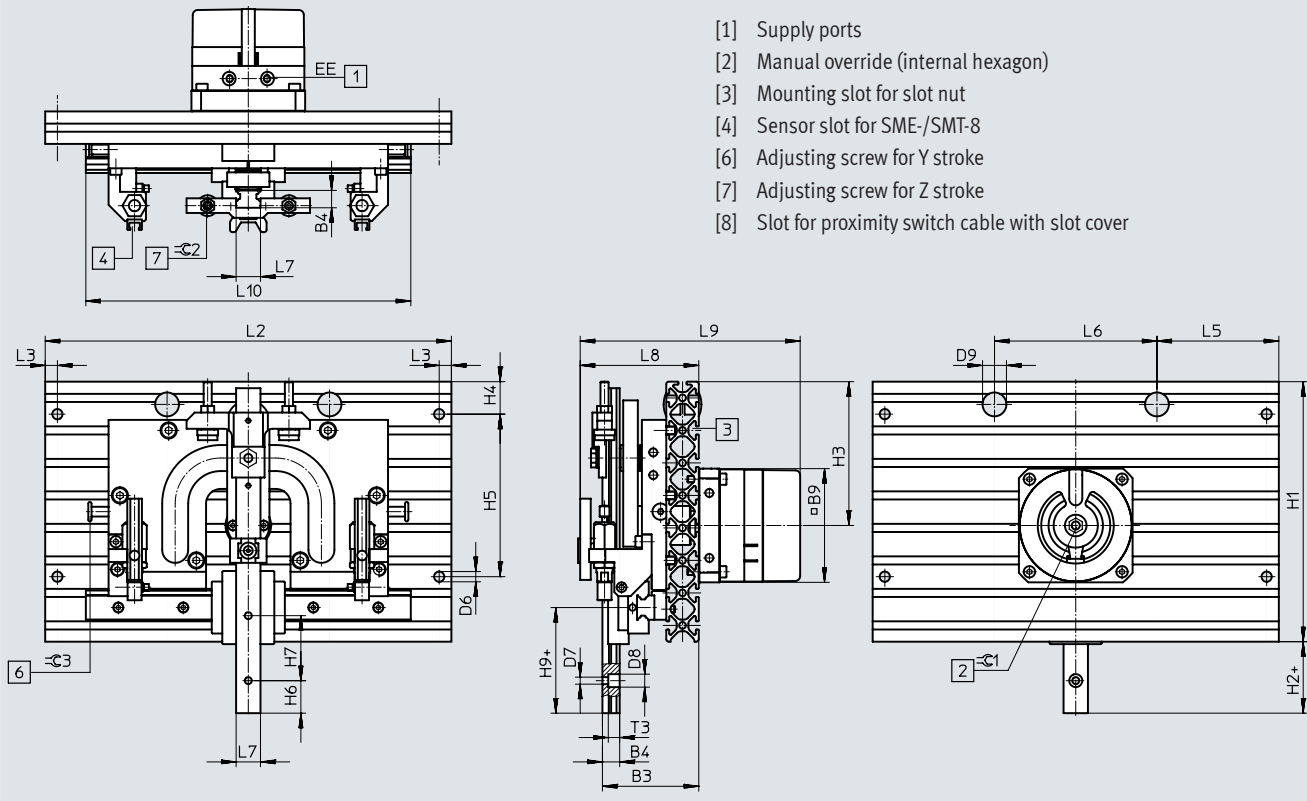
[1]	Housing	Wrought aluminium alloy
[2]	Shaft	Steel with nickel-plated surface
[3]	Vane	Glass fibre-reinforced plastic
[4]	Stop lever	Anodised aluminium
-	Cap	Glass fibre-reinforced plastic
-	Seals	Polyurethane
	Note on materials	Free of copper and PTFE

Data sheet

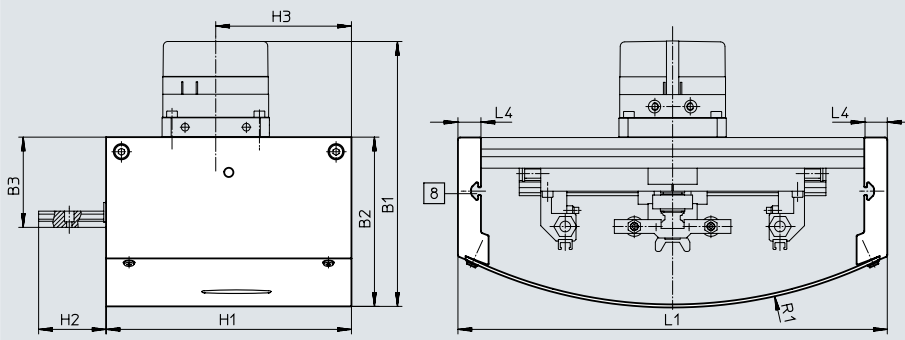
Dimensions

Download CAD data → www.festo.com

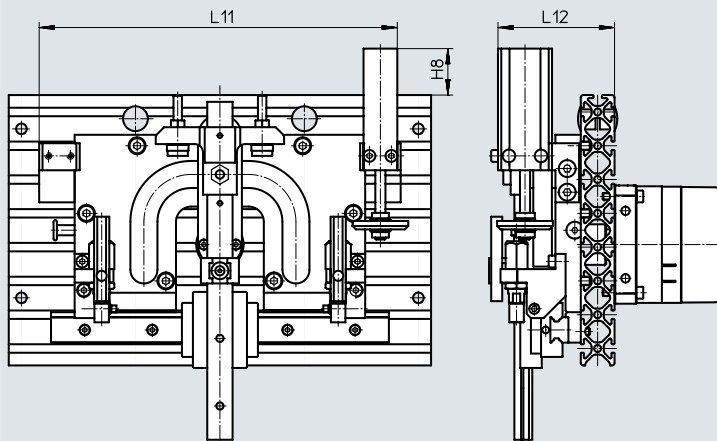
With semi-rotary drive DSM



With semi-rotary drive DSM and cover kit



With wait position module on the right



Data sheet

Size	B1	B2	B3	B4	B9	D6 ∅	D7 ∅	D8 ∅	D9 ∅
	±3	±2	±0.5						
12	150	93	56	9 -0.03	56	6.3	3.5	6.2	13
16	179	111	60	10.6 -0.03	70	6.3	4.3	8	13
25	188	115	62	10 ±0.05	83	6.3	4.5	10	13

Size	EE	H1	H2	H3	H4	H5	H6	H7	H8
			±0.2			±0.2			
12	M5	120	34	66	40	40	12.5	25	30
16	M5	160	44	88.5	20	100	20	40	33
25	M5	200	75	110	40	100	20	30	13

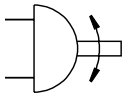
Size	H9	L1	L2	L3	L4	L5	L6	L7	L8
		±0.6	±0.2						±1.2
12	44	200	170	7.5	15	85	-	12 -0.01/-0.05	65
16	65	280	250	7.5	15	75	100	15 -0.01/-0.05	73
25	101	370	340	7.5	15	30	280	23.2 ±0.05	80

Size	L9	L10	L11 ¹⁾	L12	R1	T3	≈C1	≈C2	≈C3
	±2.8								
12	122	150	141.5	64	200	6	6	2	3
16	142	200	210	69	306	6.5	8	2.5	3
25	153	250	277	79	484	6.3	8	2.5	4

1) If the Y-stroke is increased, the change in stroke should be added to the dimension.




Ordering data for HSP-...-AP									
Size	12			16			25		
	Part no.	Type		Part no.	Type		Part no.	Type	
Without protective cover									
-	533599	HSP-12-AP		533607	HSP-16-AP		533615	HSP-25-AP	
Wait position module on right	533603	HSP-12-AP-WR		533611	HSP-16-AP-WR		533619	HSP-25-AP-WR	
Wait position module on left	533604	HSP-12-AP-WL		533612	HSP-16-AP-WL		533620	HSP-25-AP-WL	
With protective cover									
-	533600	HSP-12-AP-SD		533608	HSP-16-AP-SD		533616	HSP-25-AP-SD	
Wait position module on right	533601	HSP-12-AP-SD-WR		533609	HSP-16-AP-SD-WR		533617	HSP-25-AP-SD-WR	
Wait position module on left	533602	HSP-12-AP-SD-WL		533610	HSP-16-AP-SD-WL		533618	HSP-25-AP-SD-WL	

Data sheet



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-  Size
12, 16, 25
-  Y-stroke length
52 ... 170 mm
-  Z-stroke length
20 ... 70 mm

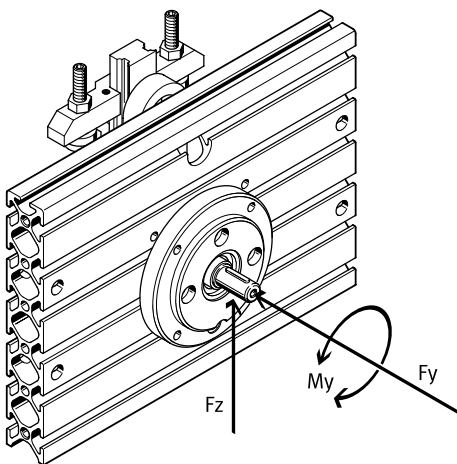
General technical data


Type	HSP...AS
Design	Drive shaft
	Cross guide
	Force-guided motion sequence
Cushioning	Noise reduction via buffers
Type of mounting	With through-hole
	Via slot nuts
Mounting position	Guide rail, vertical/horizontal

Weights [g]

Size	12	16	25
HSP...-AS	1800	3100	6200
HSP...-AS-SD	2500	4300	7400

Permissible static/dynamic characteristic load values



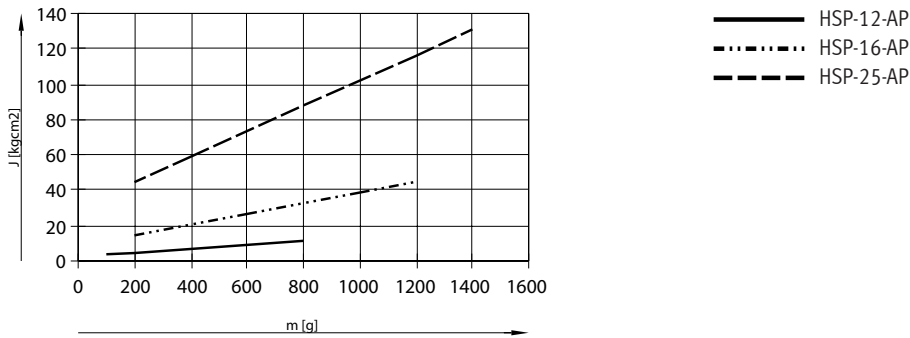
 **Note**
Technical data for mechanical components → page 9

Characteristic load values

Size	12	16	25
Max. axial force F_{yperm}	[N] 18	30	50
Max. radial force F_{zperm}	[N] 45	75	120
Max. drive torque M_{yperm}	[Nm] 1.25	2.5	5

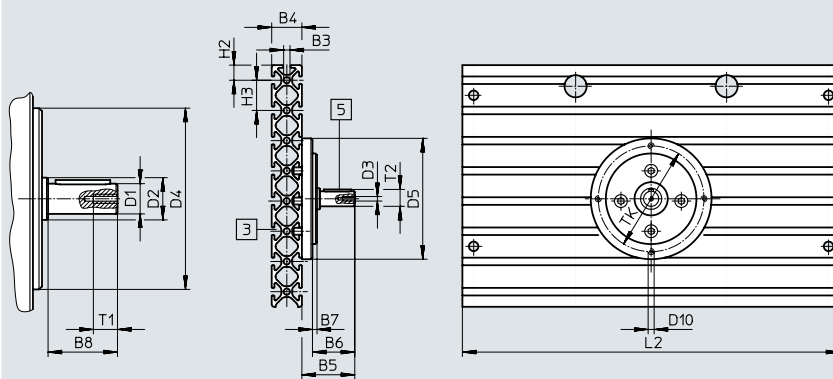
Data sheet

Mass moment of inertia J_0 as a function of payload m (for sizing drive)



Dimensions

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Basic dimensions

→ Page 14

[3] Mounting slot for slot nut

[5] Featherkey

Size	B5	B6	B7	B8	D1 ∅ g7	D2 ∅	D3
12	29	22	3	17.5	8	12.5	M3
16	35	28	3	23	10	14	M3
25	44	36	4	30	12	17	M4

Size	D4 ∅ f8	D5 ∅	D10	L2 ±0.2	T1	T2 max.	TK ±0.1
12	45	65	M4	170	9	8.8	55
16	60	80	M4	250	9	11.2	70
25	70	95	M5	340	10	13.5	82

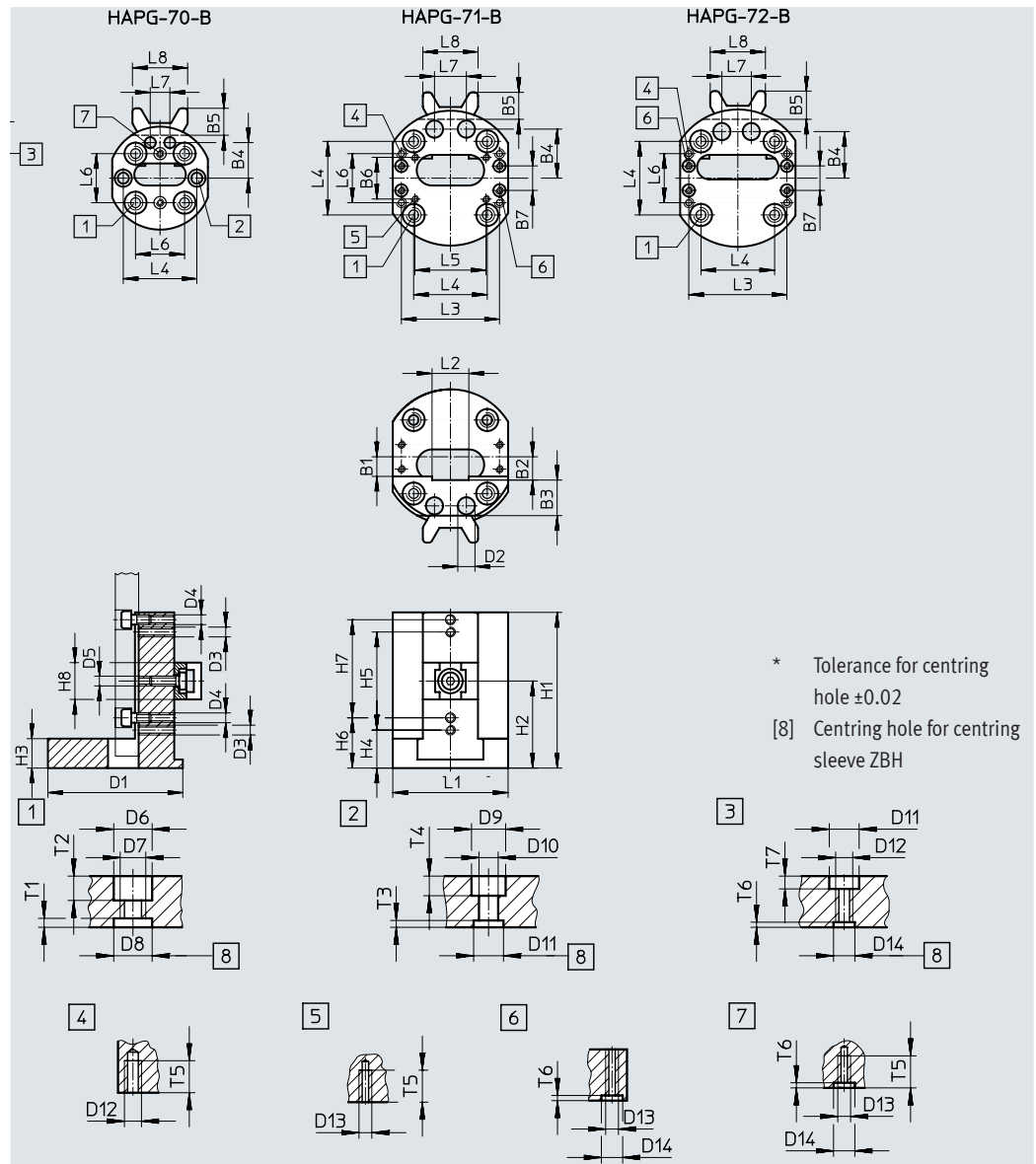
Ordering data for HSP-...-AS

Size	12		16		25	
	Part no.	Type	Part no.	Type	Part no.	Type
Without protective cover	533 605	HSP-12-AS	533 613	HSP-16-AS	533 621	HSP-25-AS
With protective cover	533 606	HSP-12-AS-SD	533 614	HSP-16-AS-SD	533 622	HSP-25-AS-SD

Accessories

Adapter kit HAPG-B

Material:
Anodised wrought aluminium alloy



Dimensions and ordering data

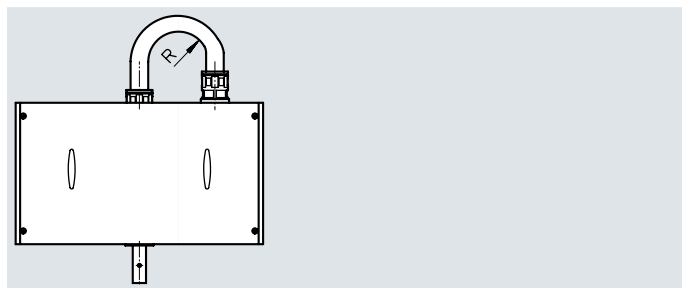
Type	B1	B2	B3	D1	D2	D3	D4	D5	H1	H2
		+0.2		\varnothing	\varnothing					
HAPG-70-B	5	6	11.5	42	4.5	-	M3	M4	50	28.5
HAPG-71-B	8	9.5	14.5	56	7	M4	M4	M4	63.5	35.5
HAPG-72-B	8	9.5	15	56	7	-	M4	M4	60	41.5

Type	H3	H4	H5	H6	H7	L1	L2	Weight	Part no.	Type
		+0.2	± 0.2	+0.2	± 0.2		+0.1	[g]		
HAPG-70-B	12	-	-	15	25	39	12	55	540881	HAPG-70-B
HAPG-71-B	12	15.5	40	20.5	40	47	15	110	540882	HAPG-71-B
HAPG-72-B	12	-	-	20.5	30	47	23.2	115	540883	HAPG-72-B

Accessories

Installation kit MKRP

Material:
 Conduit/fitting: Polyamide
 Reducer/lock nut:
 Nickel-plated brass
 Adapter bracket/retaining bracket:
 Powder-coated steel



Ordering data					
For size	Max. bending radius for conduit ¹⁾ R	Tubing I.D. [mm]	Weight [g]	Part no.	Type
12	55	12	150	533632	MKRP-1
16	75	16.5	160	533633	MKRP-2
25	75	16.5	160	533634	MKRP-3

1) The conduit can be filled to max. 70%.

Cover kit BSD-HSP

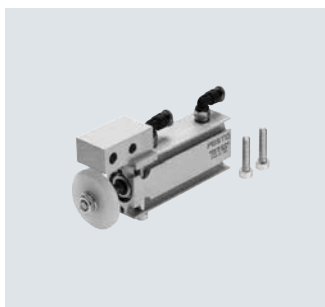
Material:
 Anodised wrought aluminium alloy



Ordering data			
For size	Weight [g]	Part no.	Type
12	825	533635	BSD-HSP-12
16	1350	533636	BSD-HSP-16
25	1770	533637	BSD-HSP-25

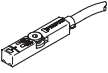
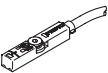
Wait position module BWL-/BWR-HSP For HSP-...-AP

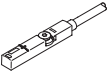
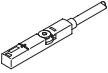
Material:
 Anodised wrought aluminium alloy

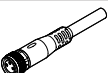





Ordering data				
For size	Position of wait position module	Weight [g]	Part no.	Type
12	Right	75	533623	BWR-HSP-12
	Left	75	533624	BWL-HSP-12
16	Right	135	533625	BWR-HSP-16
	Left	135	533626	BWL-HSP-16
25	Right	275	533627	BWR-HSP-25
	Left	275	533628	BWL-HSP-25

Accessories

Ordering data – Proximity switch for T-slot, magneto-resistive						Data sheets → Internet: smt
Type of mounting	Switching output	Electrical connection	Cable length [m]	Part no.	Type	
N/O contact						
	Inserted in the slot from above, flush with the cylinder profile, short design	PNP	Cable, 3-wire	2.5	574335	SMT-8M-A-PS-24V-E-2.5-OE
			Plug M8x1, 3-pin	0.3	574334	SMT-8M-A-PS-24V-E-0.3-M8D
			Plug M12x1, 3-pin	0.3	574337	SMT-8M-A-PS-24V-E-0.3-M12
		NPN	Cable, 3-wire	2.5	574338	SMT-8M-A-NS-24V-E-2.5-OE
			Plug M8x1, 3-pin	0.3	574339	SMT-8M-A-NS-24V-E-0.3-M8D
N/C contact						
	Inserted in the slot from above, flush with the cylinder profile, short design	PNP	Cable, 3-wire	7.5	574340	SMT-8M-A-PO-24V-E-7.5-OE

Ordering data – Proximity switch for T-slot, magnetic reed						Data sheets → Internet: sme
Type of mounting	Switching output	Electrical connection	Cable length [m]	Part no.	Type	
N/O contact						
	Inserted in the slot from above, flush with the cylinder profile	Contacting	Cable, 3-wire	2.5	543862	SME-8M-DS-24V-K-2.5-OE
				5.0	543863	SME-8M-DS-24V-K-5.0-OE
			Cable, 2-wire	2.5	543872	SME-8M-ZS-24V-K-2.5-OE
			Plug M8x1, 3-pin	0.3	543861	SME-8M-DS-24V-K-0.3-M8D
N/C contact						
	Inserted in the slot lengthwise, flush with the cylinder profile	Contacting	Cable, 3-wire	7.5	160251	SME-8-O-K-LED-24

Ordering data – Connecting cables					Data sheets → 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		Part no.	Type	Data sheets → Internet: abp, hmbn
Description				
Slot cover for T-slot				
	For protecting against contamination and securing the proximity switch cable. Scope of delivery: 2x 0.5 m	151680	ABP-5-S	
Slot nut for back plate				
	Inserted from above	189654	HMBN-5-M5	

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