

Handling modules HSW

FESTO



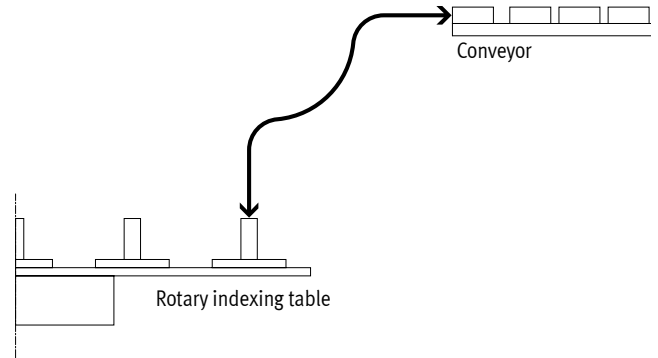
Key features at a glance

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 swivel and linear motion sequence. A backlash-free 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 within an angle of 90°.

Special features

- Compact design
- Extremely short cycle times
- Low-cost
- Easy commissioning
- For payloads up to 1.6 kg
- Angle and stroke adjustment
- Wait position modules possible
- No planning costs



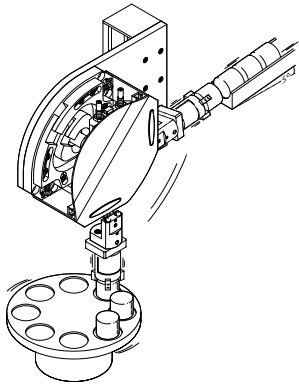
Product range overview – Three drive variants to choose from

	Pneumatic: HSW-...-AP, with semi-rotary drive DSM	Without drive: HSW-...-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		
Max. linear stroke at 90° swivel angle	[mm] 90 ... 175	
Working stroke	[mm] 9 ... 35	
Min. cycle time	[s] 0.6 ... 1.0	Dependent on drive
Payload	[g] 0 ... 1600	
Repetition accuracy at end positions	[mm] ±0.02	±0.02
Buffer	Max. 2	Dependent on drive
Function of wait position module	Can be approached dynamically (→ page 11)	Dependent on drive
Repetition accuracy in wait positions	[mm] < 1	Dependent on drive
Data sheet	→ Page 7	→ Page 17

Application examples

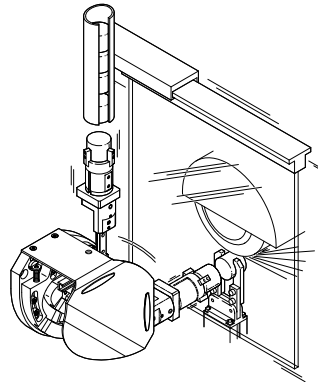
HSW-...-AP, pneumatic

Rotary indexing table



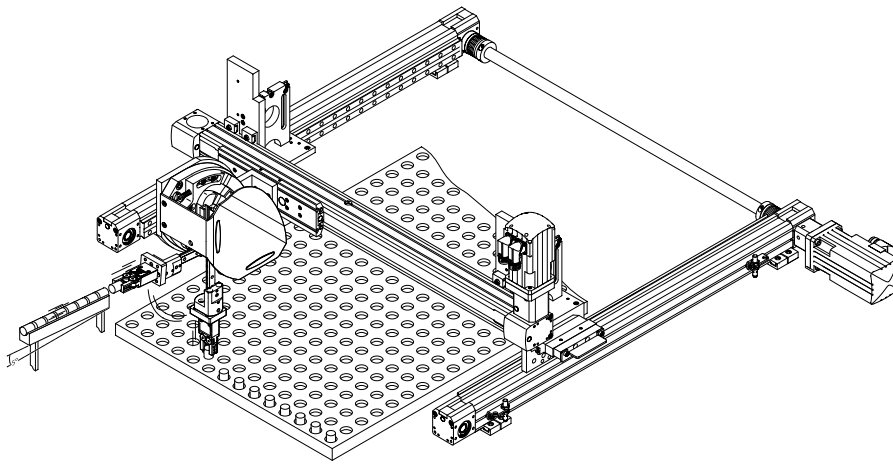
- Rapid feeding and removal, e.g. at the linear transfer or at the rotary indexing table

Machine equipment



- Loading and unloading of small parts, e.g. at a grinding or injection moulding machine

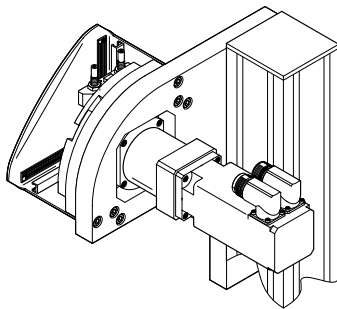
Planar surface gantry



- Rapid loading of pallets

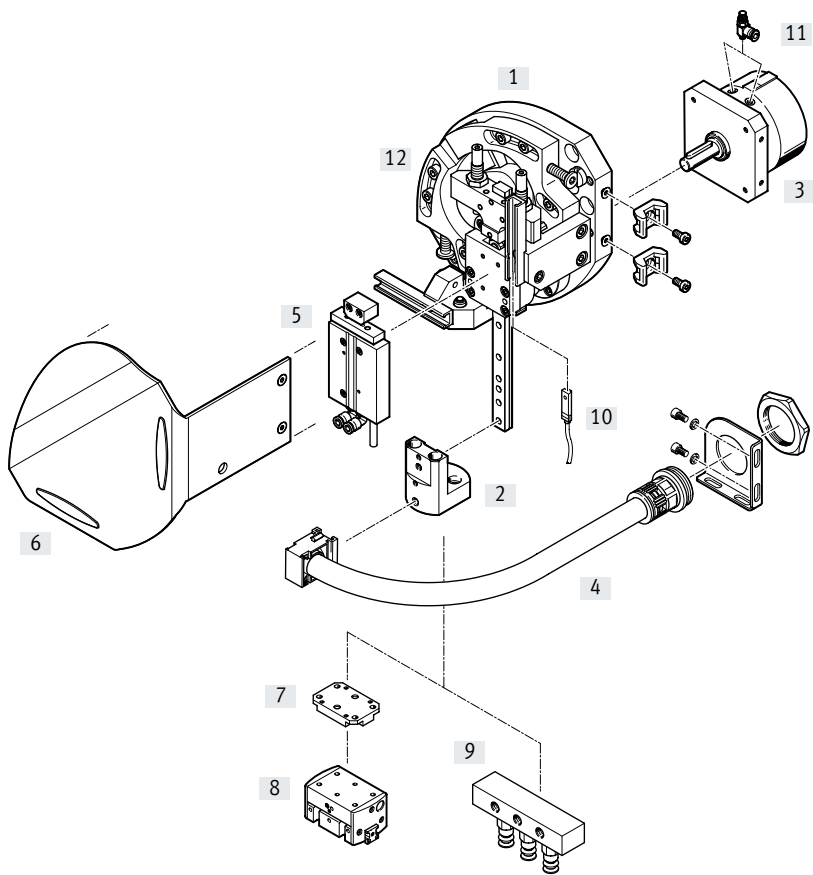
HSW-...-AS, without drive

Rotary indexing table, linear transfer



- Fast and flexible 90° pick & place with servo motor
- Electric variant using third-party motor

Peripherals overview



Peripherals overview

Accessories	Description	→ Page/Internet
[1] Handling module HSW	Standard module without accessories	7
[2] Adapter kit HAPG	Interface for grippers, semi-rotary drive, etc.	1
[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 BAW-HSW	With pneumatic drive: facilitates stopping before the end position, outside of the working area	19
[6] Cover kit BSD-HSW	To protect against accidental contact	19
[7] Adapter kit	Interface between HSW and gripper	gripper
[8] Gripper	Parallel/three-point/radial/angle grippers can be attached to the HSW. 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
[12] Shock absorber DYSW/YSRW	<ul style="list-style-type: none"> • With path-controlled flow control function • Slowly increasing cushioning force curve 	20

Type codes

001	Series	
HSW	Handling module	

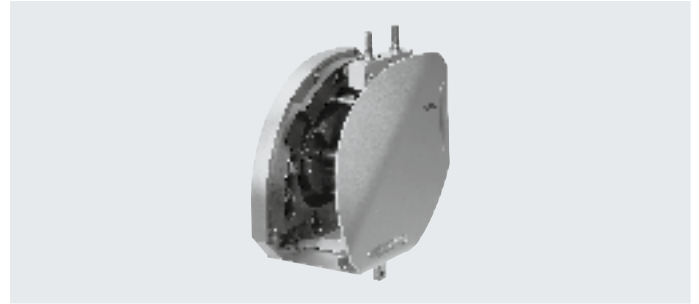
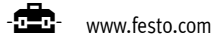
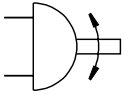
002	Size	
10	10	
12	12	
16	16	

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

004	Protective devices	
	None	
SD	Protective cover	

005	Waiting position	
	None	
AW	With	

Data sheet



- Size
10, 12, 16
- Swivel angle
80 ... 100 °
- Stroke range
90 ... 175 mm

General technical data

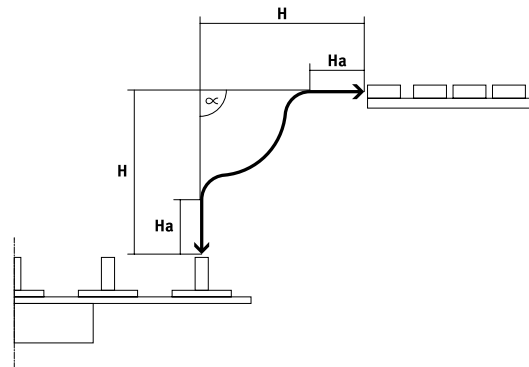
Size	10	12	16
Pneumatic connection	M3	M5	
Mode of operation	Double-acting		
Design	Semi-rotary drive		
	Linear guide plus ball bearing		
	Force-guided motion sequence		
Cushioning	Shock absorbers at both ends, soft characteristic curve		
Position sensing	Via proximity switch		
Type of mounting	With through-hole		
	Via slot nuts		
Mounting position	Any		

Operating and environmental conditions

Type	HSW-...-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		

Stroke [mm] and angular range [°]

Size		10	12	16
Max. linear stroke at 90° swivel angle	H	90/90	142/142	175/175
Working stroke	Ha	9 ... 15	15 ... 25	20 ... 35
Angular range	α	80 ... 100		


Forces [N]

Size	10	12	16
Y/Z direction (depending on lever position)			
Effective force at 6 bar	30	35	55
Y direction			
Permissible process force ¹⁾	30	35	50

1) Due to prestressing force on the guide

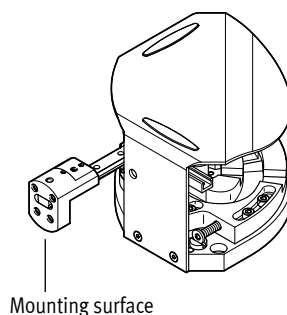
Data sheet

Weights [g]			
Size	10	12	16
HSW-...-AP	1300	3000	5100
HSW-...-AP-SD	1400	3200	5400
HSW-...-AP-AW	1370	3200	5500
HSW-...-AP-SD-AW	1470	3400	5800

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/HAPG-...-B.

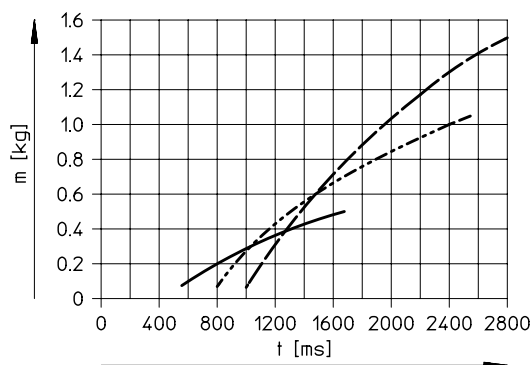


Size	10	12	16
Repetition accuracy at end positions	±0.02		

Travel times t as a function of payload m while maintaining of 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 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.

— HSW-10-AP
 ····· HSW-12-AP
 - - - HSW-16-AP

Cycle times [s]

The cycle time t_c is the sum of the travel time t and the dwell time t_d in the end positions.

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

Size	10	12	16
Min. cycle time	0.6	0.8	1.0
Min. cycle time with wait position module	0.7	1.1	1.2

Example for HSW-10-AP

Step 1:
 The following values are assumed:
 Payload $m = 0.2 \text{ kg}$
 Dwell time $t_d = 2 \times 350 \text{ ms}$
 (350 ms per end position)

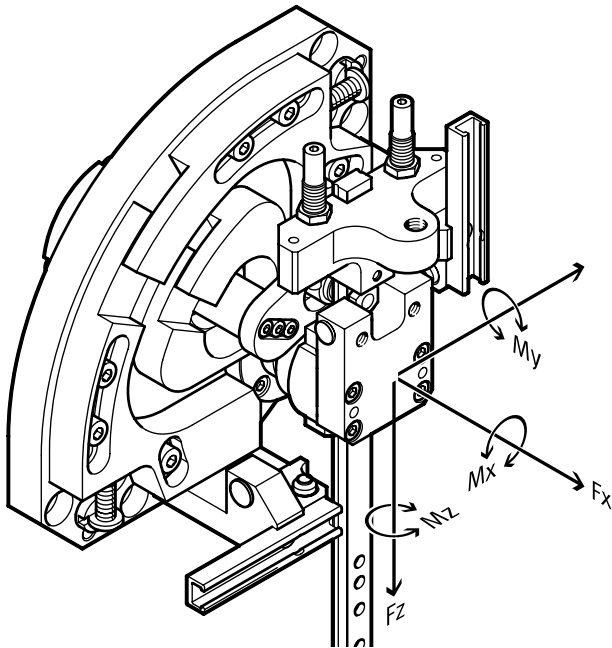
Step 2:
 The travel time can be determined from the graph:
 $t = 800 \text{ ms}$

Step 3:
 This gives us a cycle time:
 $t_c = 800 \text{ ms} + 700 \text{ ms}$
 $= 1500 \text{ ms}$

Data sheet

Permissible static/dynamic characteristic load values

Linear guide and ball bearing



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 = /static/dynamic value

M2 = maximum value

Dynamic characteristic load values		10	12	16
Size				
Max. torques	[Nm]	0.6	1.5	2.5
$M_{xperm.}$, $M_{yperm.}$, $M_{zperm.}$				

Data sheet

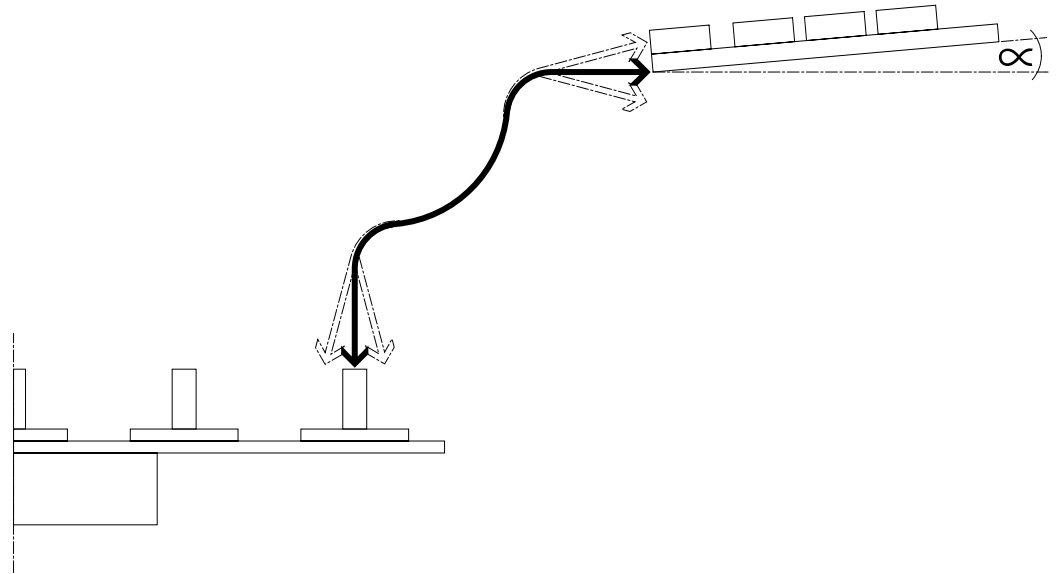
Stroke adjustment

Swivel angle:

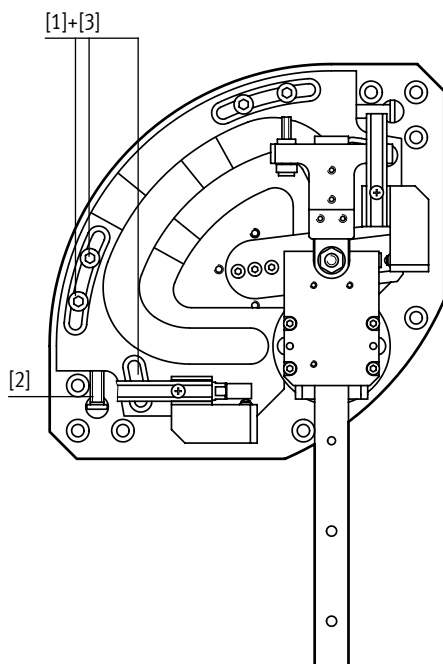
An angle offset of $\alpha=+5^\circ$ per end position can be set to adapt the handling module to the transfer system.

Linear stroke:

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



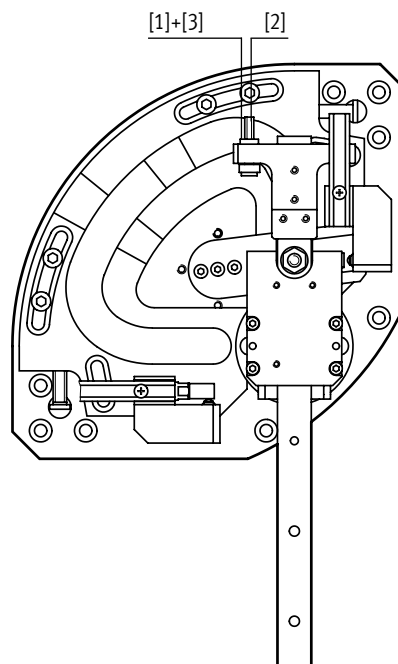
Swivel angle



Procedure:

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

Linear stroke



Procedure:

- [1] Loosen the lock nut
- [2] Set the desired linear stroke using the cushioning elements/setting screw
- [3] Tighten the lock nut

Data sheet

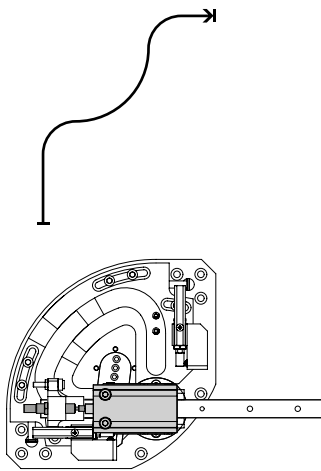
Wait position module

- Facilitates stopping before the end position, outside of the working area (→ step 2)
- The wait position module can be approached dynamically from the end position. This significantly reduces the cycle time.
- Flexible adjustment possible within the setting range (working stroke)
- Due to the high dynamic forces that occur, the wait position module must only be used with a shock absorber.
- Handling module HSW and actuating cylinder are controlled by a 5/2-way valve
- The valve for the wait position module should be switched after the valve for the handling module using a time delay

Cycle sequence

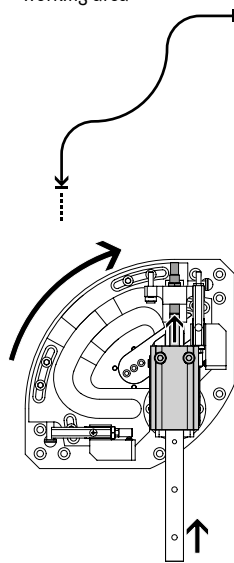
Step 1:

Handling module is in the horizontal end position. Wait position module is retracted.



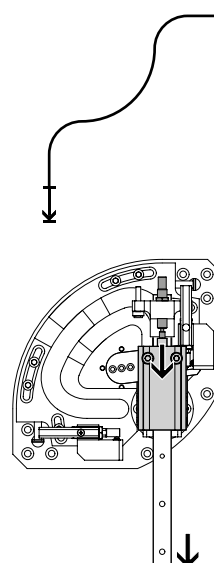
Step 2:

Handling module moves into the vertical end position. Wait position module advances with a time delay. Handling module stops outside the working area



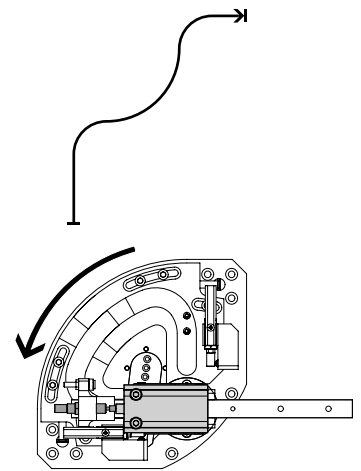
Step 3:

Wait position module retracts. Handling module moves into the working area.



Step 4:

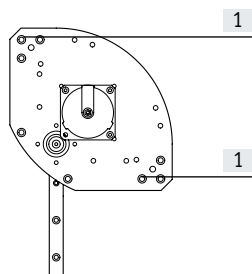
Handling module moves into the horizontal end position.



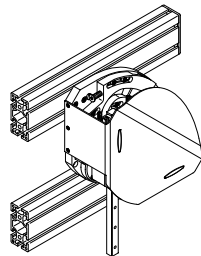
Size	10	12	16
Max. stroke of wait position module [mm]	10	15	25

Mounting options

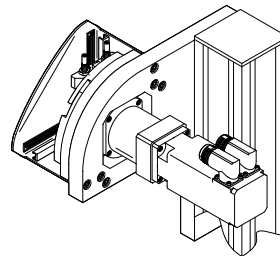
Direct mounting via through-holes



Mounting via slot nuts on profile



User-specific



Note

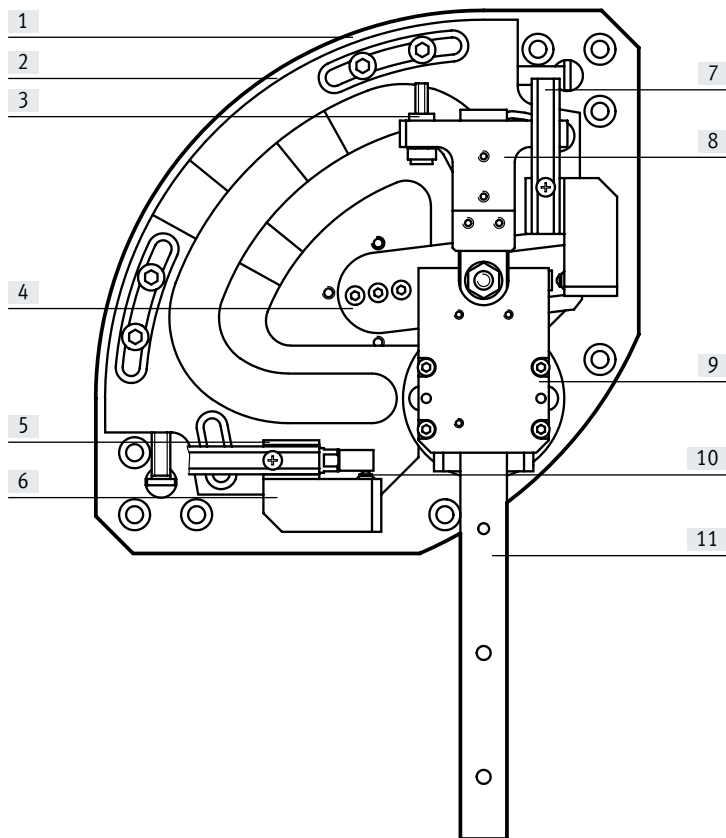
The handling module HSW-10 can also be mounted using the adjusting unit HMX-1.

[1] Optionally with or without centring rings.

Data sheet

Materials

Sectional view of handling module HSW

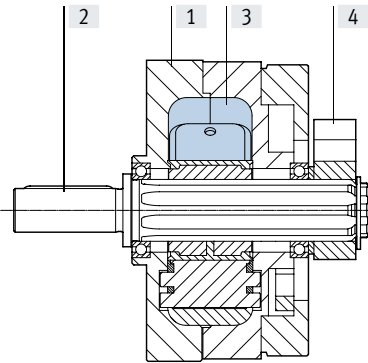


Size	10	12	16
[1] Base plate	Anodised wrought aluminium alloy		
[2] Guide	Case-hardened steel		
[3] Setting screw	-	High-alloy steel	
[4] Swivel lever	Case-hardened steel		
[5] Stop sleeve	High-alloy steel		
[6] Retaining bracket	Anodised wrought aluminium alloy		
[7] Sensor rail	Anodised wrought aluminium alloy		
[8] Flange	Anodised wrought aluminium alloy		
[9] Plate	Anodised wrought aluminium alloy		
[10] Clamping element	High-alloy steel		
[11] Guide	Tempered steel		
- 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

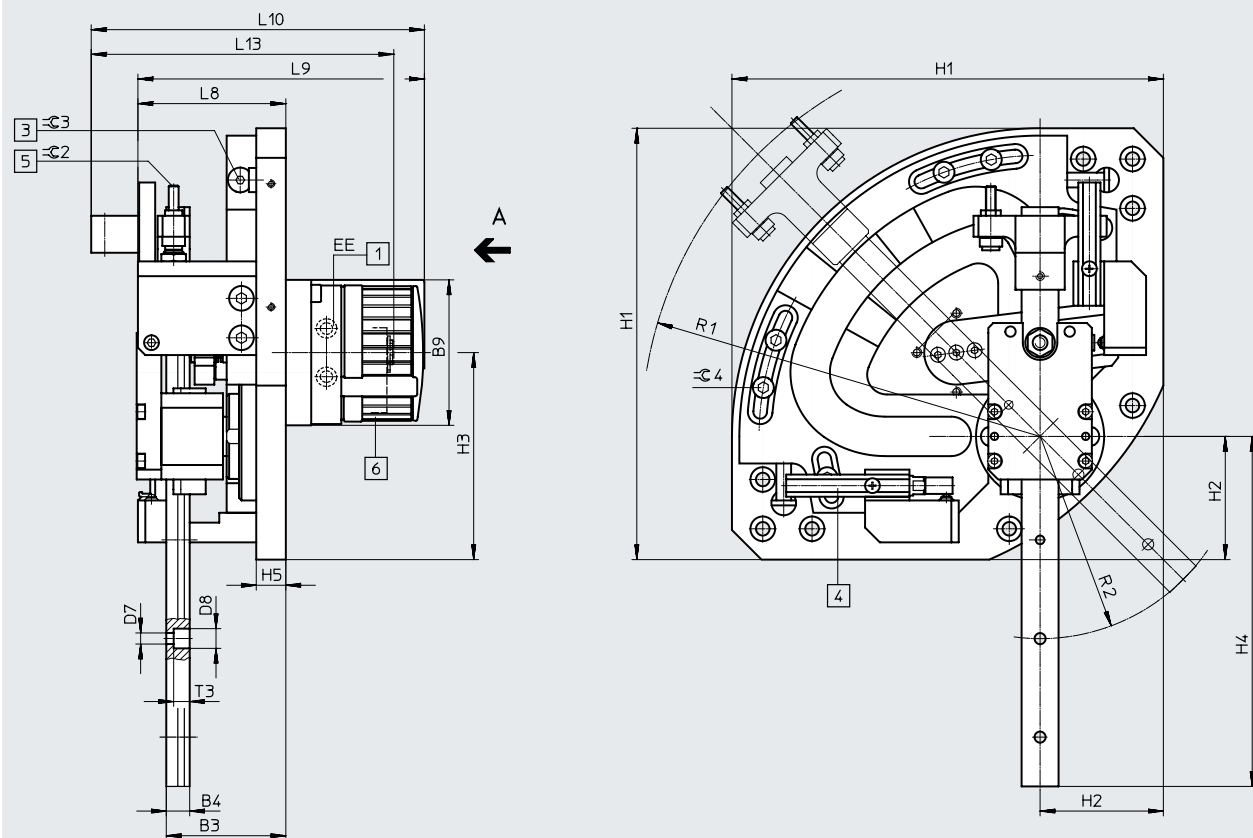
[1]	Housing	Wrought aluminium alloy
[2]	Shaft	Steel with nickel-plated surface
[3]	Vane	Glass fibre-reinforced plastic
[4]	Stop lever	Anodised aluminium
-	Cap	Glass fibre-reinforced plastic
-	Seals	TPE-U(PU)
-	Note on materials	Free of copper and PTFE

Data sheet

Dimensions

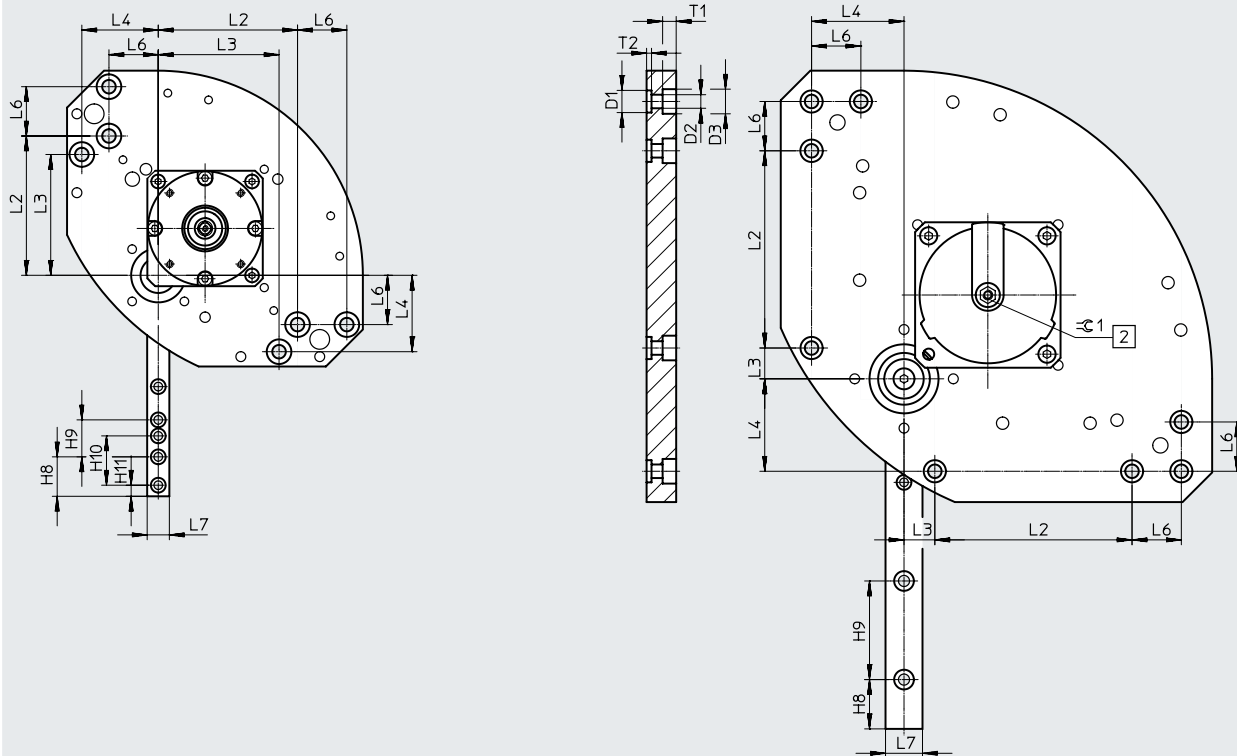
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With semi-rotary drive DSM



HSW-10

HSW-12
HSW-16



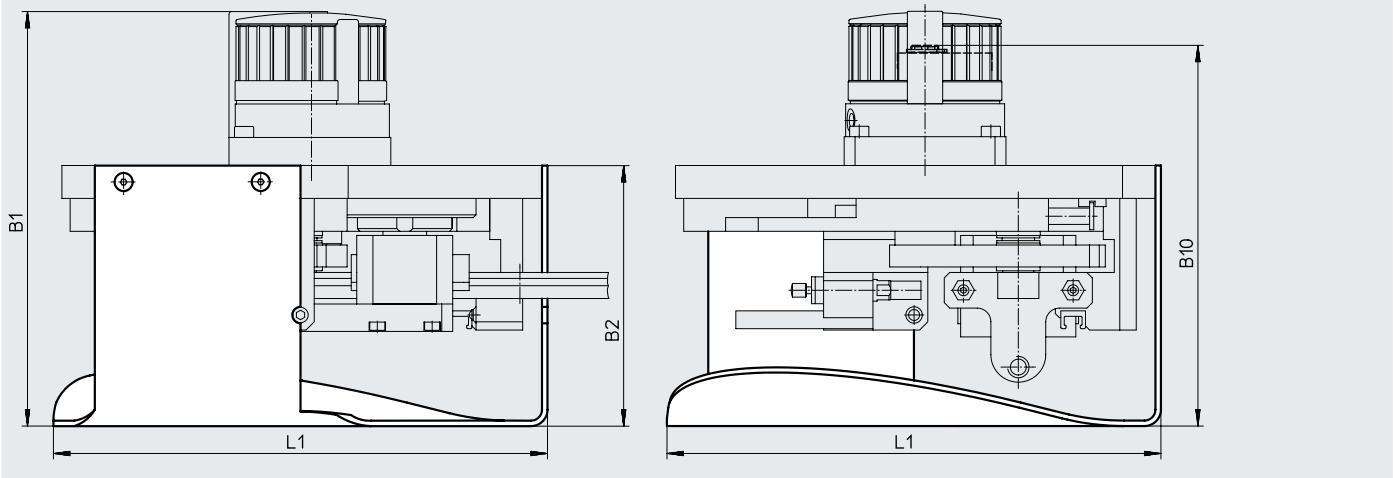
- [1] Supply ports
- [2] Manual override (internal hexagon)
- [3] Angle adjustment of guide
- [4] Sensor slot for SME-/SMT-8
- [5] Stroke adjustment
- [6] HSW-10 without cover cap

Data sheet

Dimensions

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With semi-rotary drive HSM and protective cover



Size	B1 ±2	B2 ±1	B3 ±0.5	B4	B9	B10 ±2	D1 ∅ H7	D2 ∅	D3 ∅	D7 ∅
10	-	85	45	5.5	47	126	9	5.5	10	3.5
12	157	100	48.5	9.5	59	144	9	5.5	10	4.5
16	179	110	57	12.5	70	163	9	5.5	10	4.5

Size	D8 ∅	EE	H1 ±0.3	H2 ±0.2	H3 ±0.5	H4 ¹⁾ ±1	H5	H8	H9	H10
10	6	M3	120	37	56	89.6	12	16	15	20
12	8	M5	175	50	84	142	12	20	40	-
16	7.5	M5	215	58.5	103.5	174	12	15	40	-

Size	H11	L1 ±2	L2 ±0.2	L3 ±0.2	L4	L6 ±0.2	L7	L8 ±2	L9 ±3	L10
10	4.5	123	56.5	49	31	20	9 _{-0.02}	62	-	-
12	-	180	80	12.5	37.5	20	15 _{-0.02}	60	117	136
16	-	219	100	12	50	20	15 _{±0.05}	71.5	140	158

Size	L13	R1 ¹⁾		R2 ¹⁾ ±3	T3	⊖G1	⊖G2	⊖G3	⊖G4
		±3	AW ±3						
10	113	113	116	55	3.3	4.5	2	3	3
12	123	162	177	82	6.5	6	2	3	4
16	143	200	206	100	5.3	8	2.5	4	4

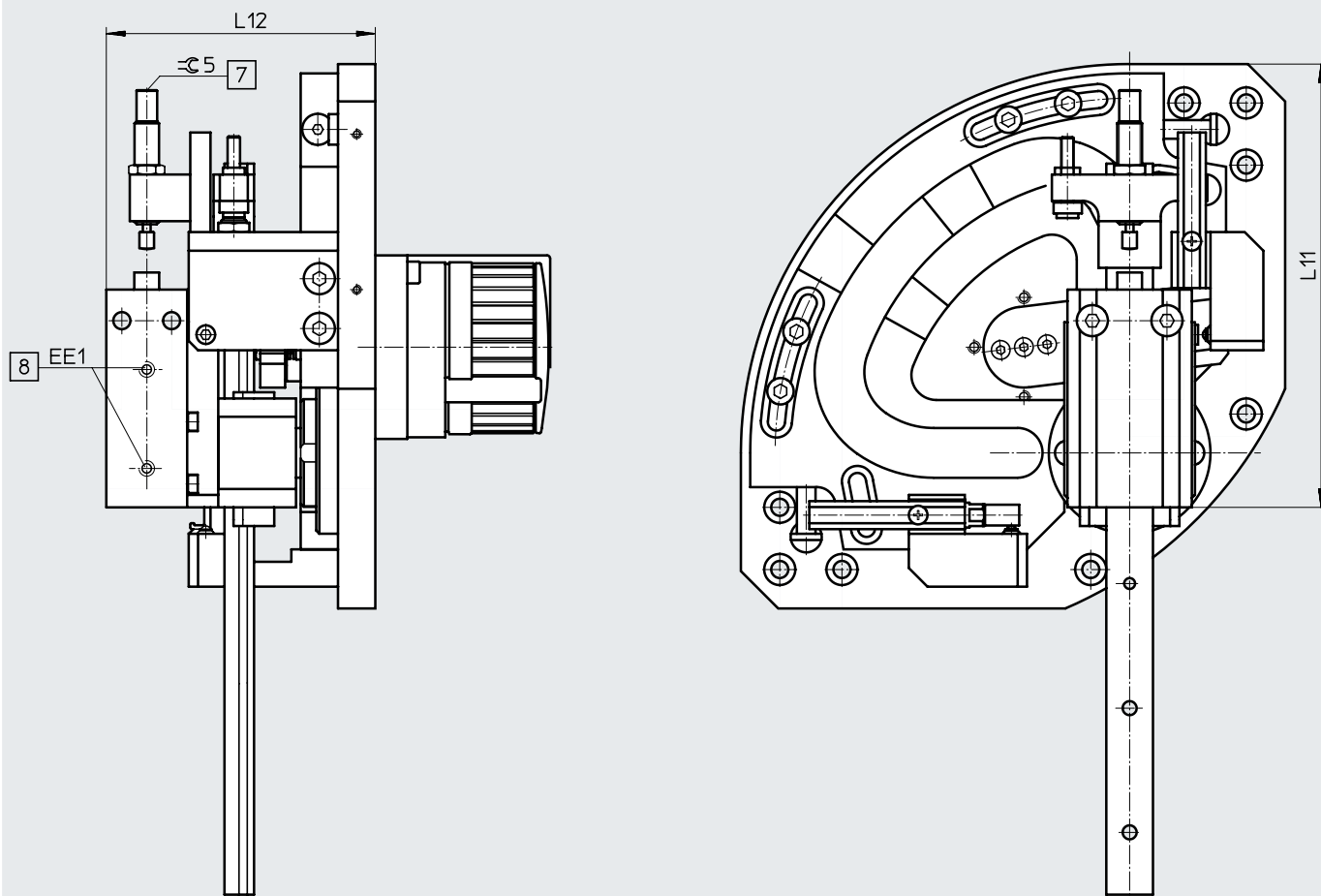
1) Maximum stroke and 90° angle

Data sheet

Dimensions

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With wait position module



[7] Shock absorber for wait position module

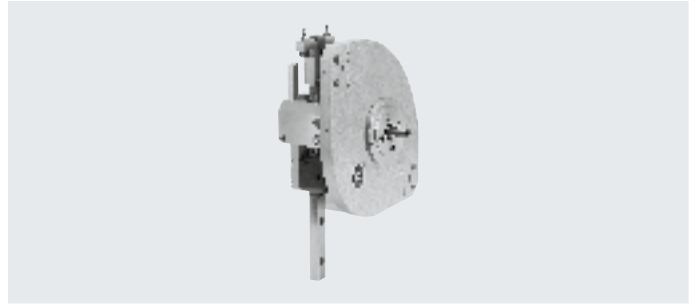
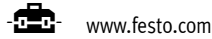
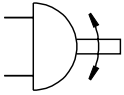
[8] Supply ports for wait position module

Size	EE1	L11	L12	±5
		max.	±2	
10	M5	115	75.5	2
12	M5	142.5	86.5	2.5
16	M5	190.5	98	13

Ordering data – HSW-...-AP

Size	10		12		16	
	Part no.	Type	Part no.	Type	Part no.	Type
Without protective cover						
–	540222	HSW-10-AP	540228	HSW-12-AP	540234	HSW-16-AP
Wait position module	562559	HSW-10-AP-AW	562560	HSW-12-AP-AW	562561	HSW-16-AP-AW
With protective cover						
–	540223	HSW-10-AP-SD	540229	HSW-12-AP-SD	540235	HSW-16-AP-SD
Wait position module	562562	HSW-10-AP-SD-AW	562563	HSW-12-AP-SD-AW	562564	HSW-16-AP-SD-AW

Data sheet



- Size
10, 12, 16
- Swivel angle
80 ... 100 °
- Stroke range
90 ... 175 mm

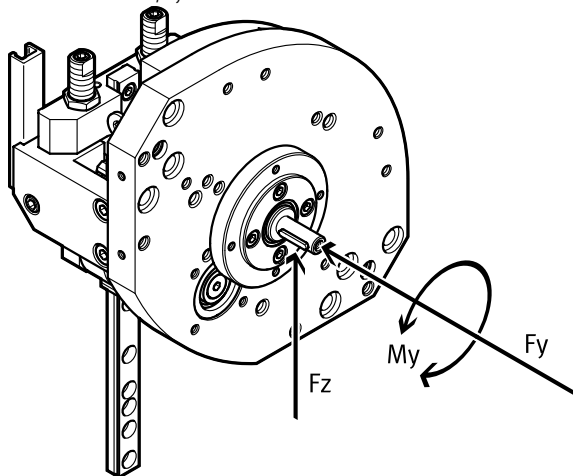
General technical data

Type	HSW-...-AS
Design	Drive shaft
	Linear guide plus ball bearing
	Force-guided motion sequence
Cushioning	Noise reduction via buffers
Type of mounting	With through-hole
	Via centring sleeves
Mounting position	Any

Weights [g]

Size	10	12	16
HSW-...-AS	1200	2800	4900
HSW-...-AS-SD	1300	3000	5200

Permissible static/dynamic characteristic load values



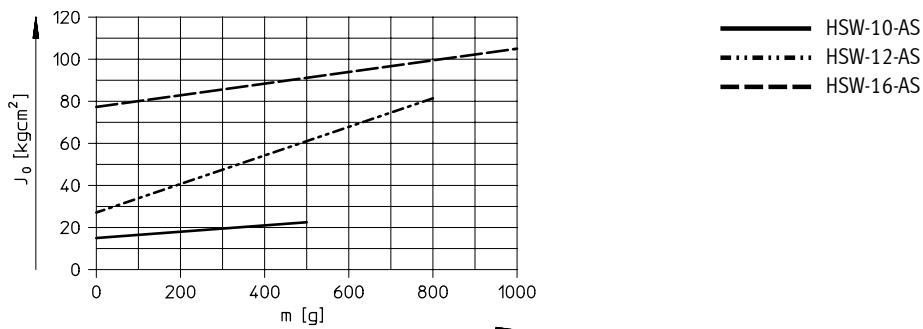
Note
Technical data for mechanical components → page 9

Characteristic load values

Size		10	12	16
Max. axial force F_{yperm}	[Nm]	10	18	30
Max. radial force F_{zperm}	[Nm]	30	45	75
Max. drive torque M_{yperm}	[Nm]	0.85	1.25	2.5

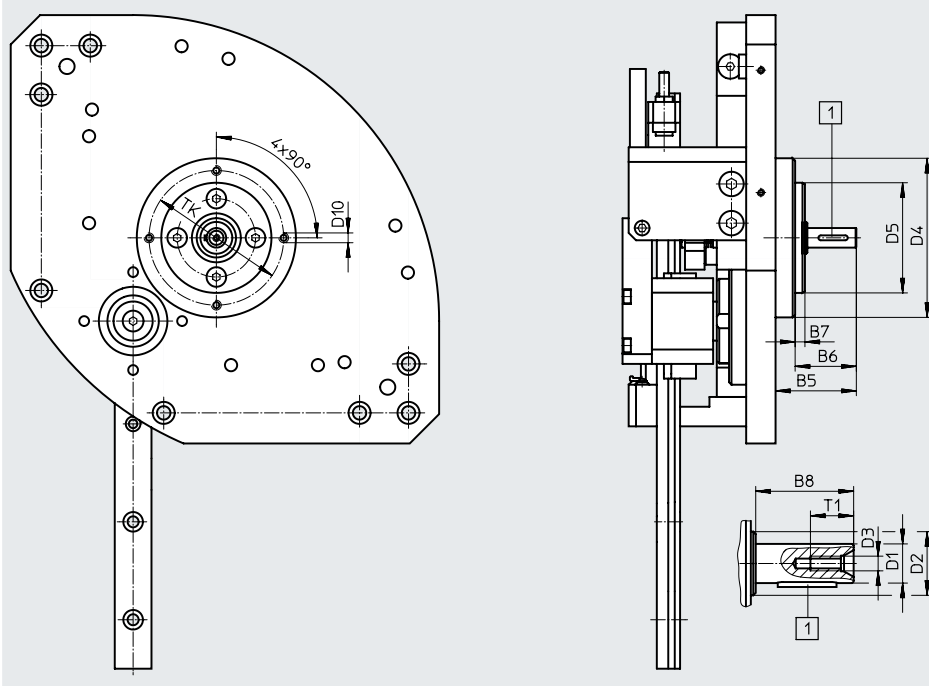
Data sheet

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



Dimensions

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Basic dimensions

→ page 14

[6] Featherkey

Size	B5	B6	B7	B8	D1 ø g7	D2 ø	D3	D4 ø	D5 ø f8	D10	T1	TK ±0.1
10	25	19	2	16	6	12	M2.5	46	32	M3	6.8	39
12	33	25	4	20	8	13	M3	65	45	M4	8.8	55
16	36.5	28.5	4	23	10	16	M3	70	50	M4	10.6	60

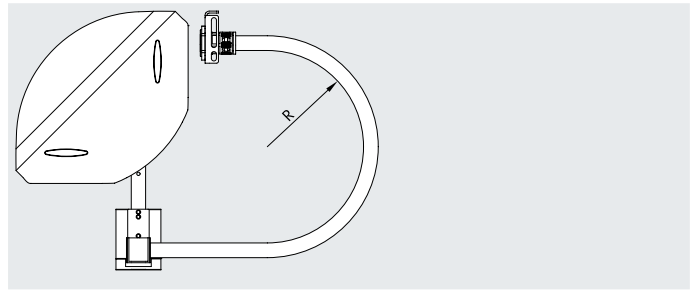
Ordering data – HSW-...-AS

Size	10		12		16	
	Part no.	Type	Part no.	Type	Part no.	Type
Without protective cover	540226	HSW-10-AS	540232	HSW-12-AS	540238	HSW-16-AS
With protective cover	540227	HSW-10-AS-SD	540233	HSW-12-AS-SD	540239	HSW-16-AS-SD

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 [mm]	Tubing I.D. [mm]	Weight [g]	Part no.	Type
10, 12	55	12	140	540247	MKRP-5
12, 16	75	16.5	150	540248	MKRP-6

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

Cover kit BSD-HSW

Material:
 Anodised wrought aluminium alloy



Ordering data				
For size	Weight [g]	Part no.	Type	
10	100	540240	BSD-HSW-10	
12	200	540241	BSD-HSW-12	
16	300	540242	BSD-HSW-16	

Wait position module BAW-HSW For HSW-...-AP

Material:
 Anodised wrought aluminium alloy



Ordering data				
For size	Weight [g]	Part no.	Type	
10	110	562589	BAW-HSW-10	
12	220	562590	BAW-HSW-12	
16	400	562591	BAW-HSW-16	


Adapter kit HAPG


Material:
 Anodised wrought aluminium alloy





Ordering data				
For size	Weight [g]	Part no.	Type	
10	25	540249	HAPG-69	
12, 16	110	540882	HAPG-71-B	


Accessories



Ordering data – Shock absorbers			Data sheets → Internet: dysw; ysrw	
	For size	Weight [g]	Part no.	Type
	10	6	548070	DYSW-4-6-Y1F
	12	11	548071	DYSW-5-8-Y1F
	16	18	191193	YSRW-7-10

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

N/C contact						
	Inserted in the slot lengthwise, flush with the cylinder profile	Contacting	Cable, 3-wire	7.5	160251	SME-8-0-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	