Swivel/gripper units HGDS

FESTO

- Swivelling and gripping in one unit
- Cushioning concepts: Elastomer cushioning or hydraulic cushioning
- Quick, precise and light

Swivel/gripper units HGDS

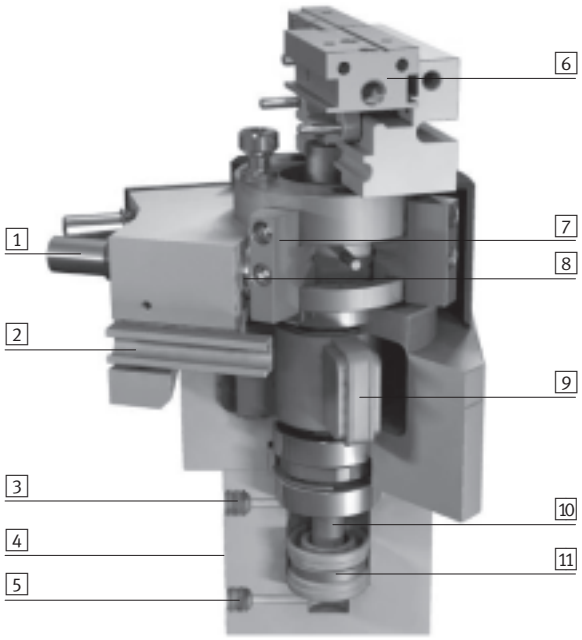
Key features

At a glance

Combination of parallel gripper and swivel module

The power transmission from the linear motion to the gripper motion takes place via the piston rod, which opens and closes the gripper jaws housed in the gripper housing via 2 reversing levers.

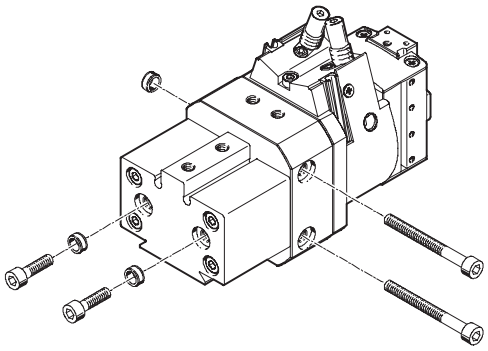
The swivel motion takes place via a swivel drive. It can be adjusted almost infinitely via 2 stops (max. 210°). The rotary motion is cushioned either via a flexible cushioning buffer or a hydraulic shock absorber. The swivel angle can be finely adjusted by means of a precision adjustment facility.



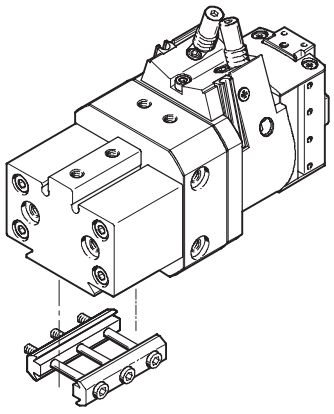
1 Flexible cushioning or hydraulic shock absorbers
2 Slot for proximity sensor SME/SMT-10 for sensing the swivel position
3 Gripper compressed air connection, closing
4 Slot for proximity sensor SME/SMT-10 for sensing the gripper position
5 Gripper compressed air connection, opening
6 Gripper jaw
7 Adjustable stop plates for the swivel motion, with magnet
8 Precise end stop with flexible cushioning or integrated shock absorber
9 Rotary vane
10 Piston rod for gripping motion
11 Piston with magnet

Mounting options

Direct mounting

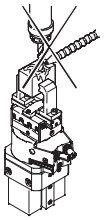


Dovetail connection

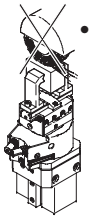


- Note

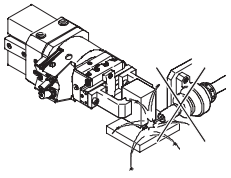
Swivel/gripper units are not suitable for the following or similar applications:



- Machining
- Aggressive media



- Grinding dust



- Welding spatter

Swivel/gripper units HGDS

Peripherals overview and type codes

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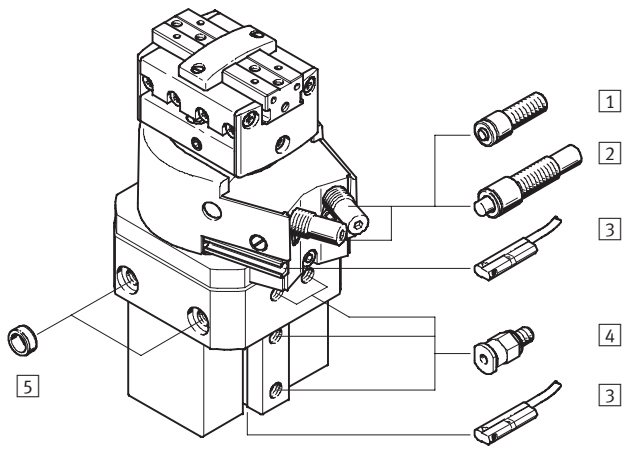
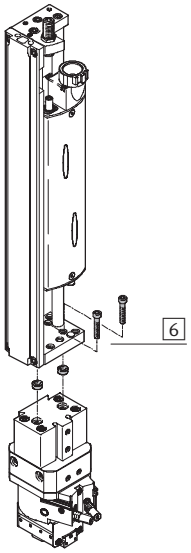
Peripherals overview



System product for handling and assembly technology



Accessories

	Type	Brief description	➔ Page
1	Cushioning P	Non-adjustable, flexible cushioning. Is used for smaller loads	–
2	Cushioning YSRT	Self-adjusting, hydraulic shock absorber	–
3	Proximity sensor SME/SMT-10	For sensing the gripper and rotary vane position	1 / 7.8-12
4	Push-in fitting QS	For connecting compressed air tubing with standard external diameters	Volume 3
5	Centring sleeve ZBH	For centring the gripper when mounting (2 included in scope of delivery)	1 / 7.8-12
6	–	Drive/gripper connections	Volume 5

Type codes

HGDS – PP – 16 – YSRT – A

Type

HGDS	Swivel/gripper unit

Gripper function

PP	Parallel gripping

Size

Cushioning

P	Flexible cushioning
YSRT	Hydraulic cushioning

Position sensing

A	For proximity sensing

Swivel/gripper units HGDS

Technical data

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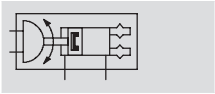
Function

Swivelling/Gripping



- Ø - Size
  12, 16, 20
- I - Stroke
  5, 9, 14 mm

General technical data				
Size		12	16	20
Design		Semi-rotary drive		
		Parallel gripper with drive		
Mode of operation		Double-acting		
Pneumatic connection		M5		
Type of mounting		With threaded hole and centring hole		
		Via through-holes		
		Clamped in dovetail slot		
Fitting position		Any		
Relubrication intervals of guide		10 million switching cycles		
Product weight	[g]	465	660	1120

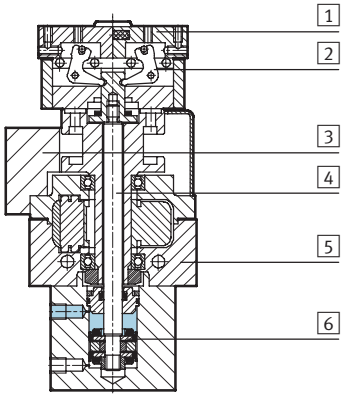
Operating and environmental conditions		
Operating pressure	[bar]	3 ... 8
Operating medium		Filtered compressed air, lubricated or unlubricated
Ambient temperature[1]	[°C]	+5 ... +60
Corrosion resistance class CRC[2]		2

1) Note operating range of proximity sensors

2) Corrosion resistance class 2 according to Festo standard 940 070
Components requiring moderate corrosion resistance. 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

Materials

Sectional view



Swivel/gripper unit		
1	Gripper jaw	Wrought aluminium alloy, nickel-plated
2	Lever	Hardened steel
3	Stop	Wrought aluminium alloy, hard-anodised
4	Piston rod	Stainless steel
5	Housing	Wrought aluminium alloy, hard-anodised
6	Piston	Nitrile rubber, polyurethane
–	Rubber buffer	Nitrile rubber

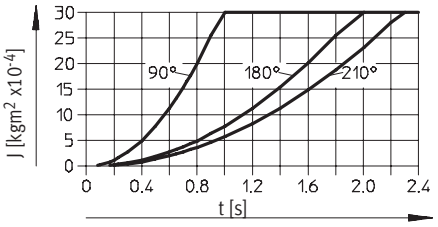
Technical data – Swivelling

Size			12	16	20
Swivel angle		[°]	0 ... 210 ➔ 1 / 7.8-10		
Theoretical torque[1)]		[Nm]	0.85	1.25	2.5
Repetition accuracy[1)]	P cushioning	[°]	< 0.2		
	YSRT cushioning	[°]	< 0.02		
Cushioning			➔ 1 / 7.8-6		
Max. swivelling frequency[1)]	P cushioning	[Hz]	2		
	YSRT cushioning	[Hz]	1.5		
Position sensing			For proximity sensing		

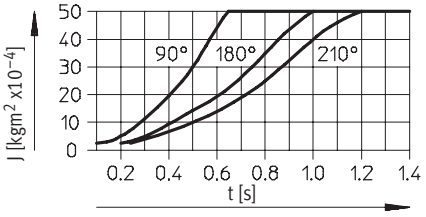
1) At 6 bar

Mass moments of inertia J at 6 bar as a function of swivel time t and swivel angle

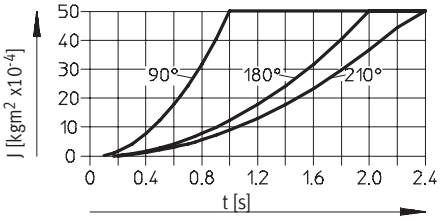
HGDS-PP-12-P-A



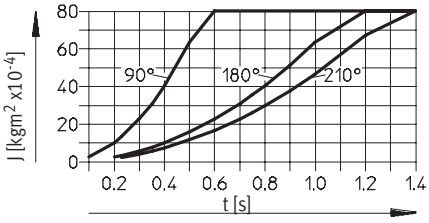
HGDS-PP-12-YSRT-A



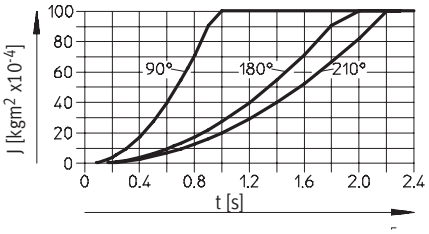
HGDS-PP-16-P-A



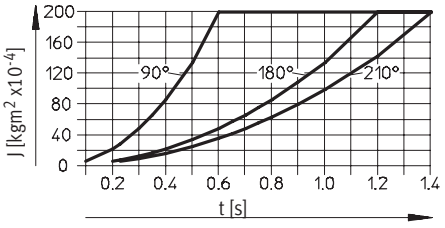
HGDS-PP-16-YSRT-A



HGDS-PP-20-P-A



HGDS-PP-20-YSRT-A



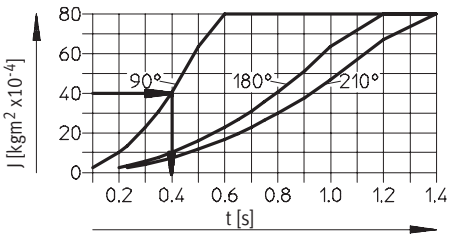
Dependency between operating pressure and swivel time

When the operating pressure of the gripper drive is reduced, the permissible swivel time at the same mass moment of inertia must be increased by 15% per bar of operating pressure.

Example:
Given:
J = 40 kgm²x10⁻⁴
Operating pressure 4 bar (gripper drive)

Swivel time at 6 bar = 0.4 s, see graph opposite

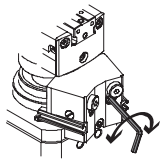
This yields a swivel time at 4 bar:
t = 0.4 + 2x 15% = 0.52 s
Cushioning time of the shock absorber = 0.1 s
This yields a swivel time of
$t_{tot.}$ = 0.52 s + 0.1 s = 0.62 s



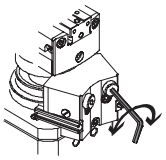
Precision adjustment of the swivel angle

The swivel angle can be adjusted roughly by means of two stop plates➔ 1 / 7.8-2. The precision adjustment works as follows:
Variants P and YSRT differ in only one component. The retainer and the fine adjustment are identical. In both variants, the rotary vane travels to a metallic stop, which can be adjusted with great accuracy via the adjustable sleeve for P cushioning or the shock absorber for YSRT cushioning.

1) Loosen the locking screw underneath the cushioning element

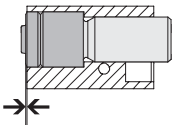


2) Adjust the cushioning element as required. Observe the minimum and maximum settings.

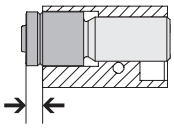


Size			12	16	20
Precision adjustment range	P cushioning	[°]	–6		
	YSRT cushioning	[°]	–2.5		
Swivel angle adjuster per revolution		[°]	3.1	2.8	2.2

Min. setting range, to the inner stop



Max. setting range, to the notch



Swivel/gripper units HGDS

Technical data

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Technical data – Gripping

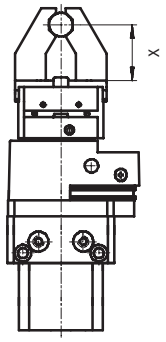
Size		12	16	20
Gripper function		Parallel		
Number of gripper fingers		2		
Max. applied load per external gripper finger[1)]	[N]	0.3	0.5	1.0
Stroke per gripper jaw	[mm]	2.5	4.5	7
Max. gripper jaw backlash	[mm]	0		
Max. gripper jaw angular backlash	[°]	0		
Repetition accuracy	[mm]	< 0.02		
Max. operating frequency	[Hz]	4		
Position sensing		Via proximity sensor		

1) Valid for unthrottled operation

Gripping force [N] at 6 bar			
Size	12	16	20
Gripping force per gripper jaw			
Opening	29	56.5	85
Closing	26	45	65
Total gripping force			
Opening	58	113	170
Closing	52	90	130

Gripping force F_{Grip} per gripper jaw as a function of operating pressure p

Gripping forces related to operating pressure and lever arm can be determined for the various sizes using the following graphs.
The characteristic curves apply for external and internal gripping.

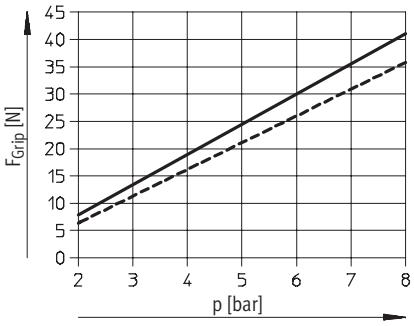


Note

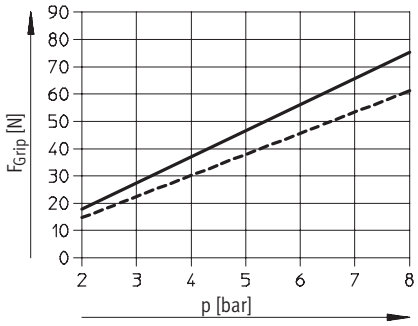
The gripping force is practically independent of the lever arm. Fluctuation at max. lever arm and max. operating pressure approx. 10%.

for unthrottled operation:

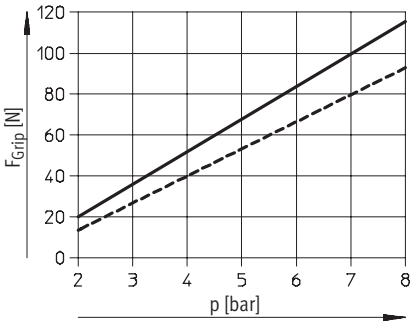
HGDS-12 (max. lever arm x 40 mm)



HGDS-16 (max. lever arm x 50 mm)



HGDS-20 (max. lever arm x 70 mm)

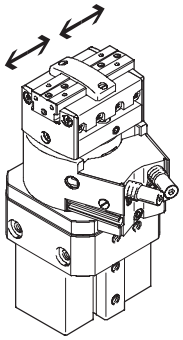


Opening

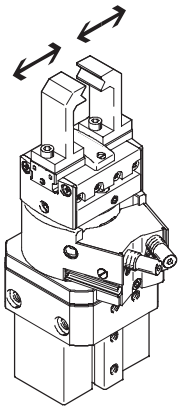
Closing

Opening and closing times [ms] at 6 bar

With gripper jaws



With additional gripper fingers

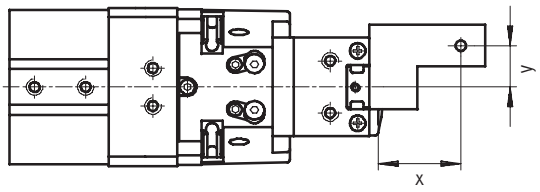


The indicated opening and closing times [ms] have been measured at room temperature and at 6 bar operating pressure with horizontally mounted gripper without external gripper fingers. The grippers must be throttled for greater applied loads. Opening and closing times must then be adjusted correspondingly.

with additional gripper fingers as a function of applied load				
Size		12	16	20
Max. applied load		0.3 N	0.5 N	1.0 N
HGDS-...-A	Opening	20	50	70
unthrottled	Closing	30	50	100

with additional gripper fingers as a function of applied load							
Size		12		16		20	
Applied load		1.0 N	2.0 N	1.0 N	2.0 N	1.0 N	2.0 N
HGDS-...-A	Closing	100	150	100	200	100	250
throttled							

Eccentricity y as a function of lever arm x



The dependency on the lever arm and the maximum permissible off-centre point of force application can be determined for the various sizes using the following graphs.
The gripping forces apply, see above.

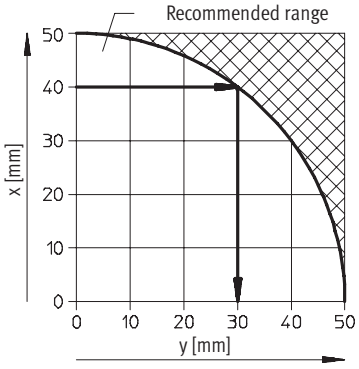
It is vital that you adhere to the mass moment of inertia ➔ 1 / 7.8-5 when making your selection.

Calculation example

Lever arm x = 40 mm
To be found: Eccentricity y

- Move along the horizontal axis to the point of intersection
- Then move vertically downwards until you intersect the scale
- Read the eccentricity

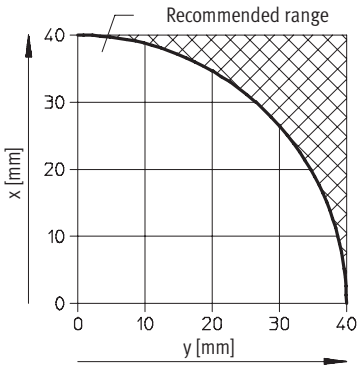
Max. eccentricity = 30 mm



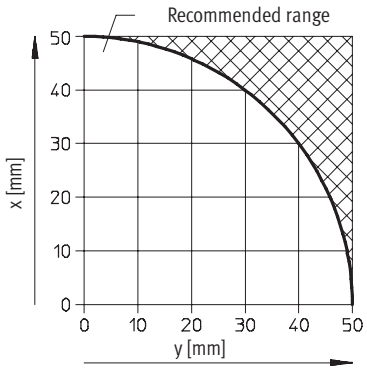
Eccentricity y as a function of lever arm x

for unthrottled operation:

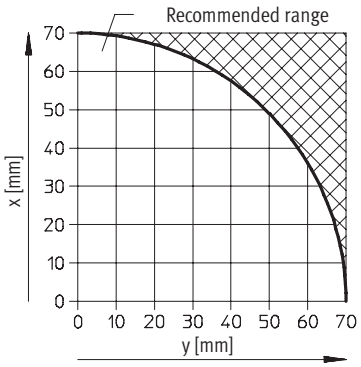
HGDS-12 (max. lever arm 40 mm)



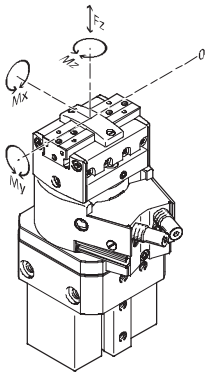
HGDS-16 (max. lever arm 50 mm)



HGDS-20 (max. lever arm 70 mm)



Characteristic load values per gripper jaw



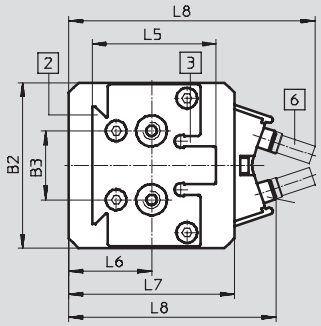
The indicated permissible forces and torques refer to a single gripper jaw. The indicated values include the lever arm, additional applied loads caused by the workpiece or external gripper fingers, as well as forces which occur during movement.

The zero coordinate line (gripper finger guide) must be taken into consideration for the calculation of torques.

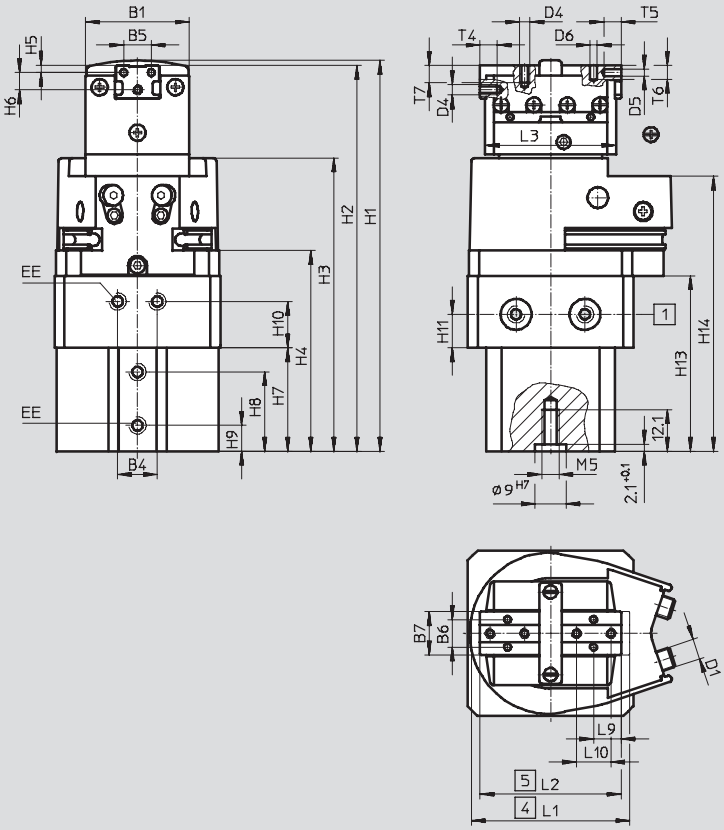
Size		12	16	20
Max. permissible force F_z	[N]	20	30	60
Max. permissible torque M_x	[Nm]	1.5	4	8
Max. permissible torque M_y	[Nm]	1.5	4	8
Max. permissible torque M_z	[Nm]	1.5	4	8

Dimensions

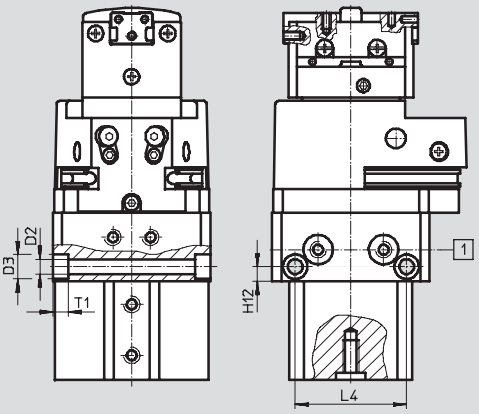
Download CAD data ➔ **www.festo.com/en/engineering**



Size 16/20

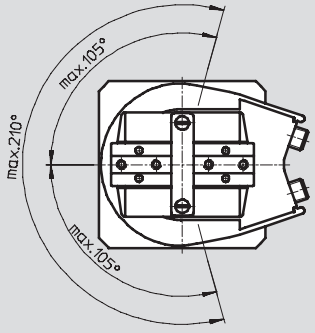


Size 12



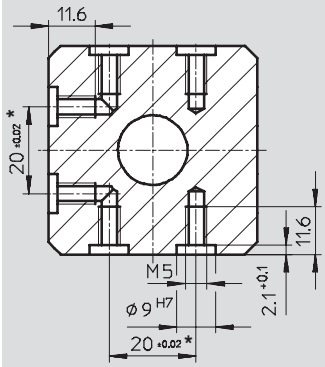
1 Cross-section through mounting holes ➔ 1 / 7.8-11
2 For dovetail joint with HAVB-3
3 Sensor slot for SME-/SMT-10
4 Gripper jaws open
5 Gripper jaws closed
6 Shock absorber YSRT

Swivel angle

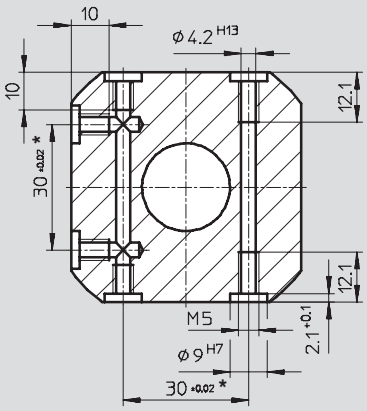


Cross-section at 1 ➔ 1 / 7.8-10

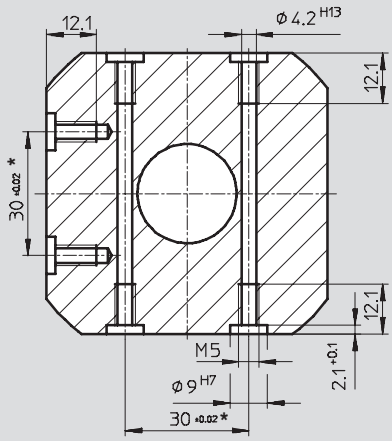
Size 12



Size 16



Size 20



Size	B1	B2	B3	B4	B5	B6	B7	D1	D2	D3	D4	D5
									∅	∅		∅
[mm]		±0.03	±0.02*		±0.02	±0.02	±0.1		H13	H13		H8
12	30	48	20	11.5	8	8	12.5	M6x0.5	4.5	7.5	M3	2
16	34	55	30	13	10	10	16	M8x1	–	–	M3	2
20	40	68	30	16	12	12	20	M10x1	–	–	M4	2.5

Size	D6	EE	H1	H2	H3	H4	H5	H6	H7	H8	H9
	∅										
[mm]	H8		+1/–0.6	+0.8/–0.4	+1.3/–0.2	+0.8/–0.2	±0.02	±0.12	±0.1	±0.1	
12	2	M5	113.4	111.9	85.1	58.2	2	5	30	23	7.5
16	2	M5	121.7	120.1	92.1	64.3	3	5	34.5	26	8.3
20	2.5	M5	154.8	152.8	112.3	81.7	3	7	43	34.6	8.3

Size	H10	H11	H12	H13	H14	L1	L2	L3	L4	L5	L6
[mm]		–0.1		+1/–0.2	+1/–0.2	±0.5	±0.5	±0.5	±0.1		±0.05
12	13.5	9.7	4.5	51.3	79.8	46	41	38	34	36	24
16	14	8	–	58.2	86.7	58	49	47	–	40.5	27.5
20	19	9	–	73.1	105.6	78	64	61	–	40.5	34

Size	L7	L8 ±1		L9	L10	T1	T4	T5	T6	T7
[mm]	±0.03	P	YSRT	±0.02			min.			min.
12	48	59.5	69.3	8	10	4.6	5	5	4	5
16	55	68.5	80.5	8	10	–	6.5	6	5	5
20	68	85.4	96.4	12	14	–	10	8	7	7

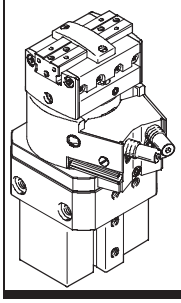
* Tolerance valid for centring hole ∅ 9H7

Swivel/gripper units HGDS

Technical data and accessories

FESTO

Ordering data

	Size [mm]	With flexible P cushioning Cushioning element Part No.	Type	With hydraulic YSRT cushioning Shock absorber Part No.	Type
	12	**534 278**	**HGDS-PP-12-P-A**[1]	**534 279**	**HGDS-PP-12-YSRT-A**[1]
	16	**534 280**	**HGDS-PP-16-P-A**[1]	**534 281**	**HGDS-PP-16-YSRT-A**[1]
	20	**534 282**	**HGDS-PP-20-P-A**[1]	**534 283**	**HGDS-PP-20-YSRT-A**[1]

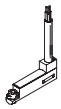
1) Two centring sleeves are included in the scope of delivery

Ordering data – Accessories Technical data ➔ 1 / 10.1-3

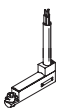
	For size [mm]	Weight [g]	Part No.	Type	PU[1]
Centring sleeve					
	12, 16, 20	1	**150 927**	**ZBH-9**	10

1) Packaging unit quantity

Ordering data – Proximity switches for C-slot, magneto-resistive Technical data ➔ www.festo.com/catalogue/sm

	Type of mounting	Switch output	Electrical connection, connection direction	Cable length [m]	Part No.	Type
N/O contact						
	Insertable in the slot from above, flush with cylinder profile	PNP	Cable, 3-wire, lateral	2,5	**526 674**	**SMT-10F-PS-24V-K2,5Q-OE**
			Plug M8x1, 3-pin, lateral	0,3	**526 675**	**SMT-10F-PS-24V-K0,3Q-M8D**

Ordering data – Proximity switches for C-slot, magnetic reed Technical data ➔ www.festo.com/catalogue/sm

	Type of mounting	Switch output	Electrical connection, connection direction	Cable length [m]	Part No.	Type
N/O contact						
	Insertable in the slot from above, flush with cylinder profile	Contacting	Plug M8x1, 3-pin, lateral	0,3	**526 671**	**SME-10F-DS-24V-K0,3Q-M8D**
			Cable, 3-wire, lateral	2,5	**526 670**	**SME-10F-DS-24V-K2,5Q-OE**

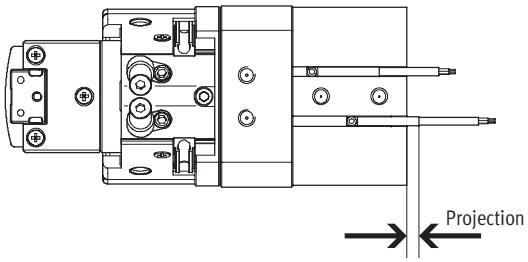
Swivel/gripper units HGDS

Accessories

If the swivel/gripper unit is mounted **on the front,** proximity sensors with the connecting cable **at right angles** should be used.
When proximity sensors with in-line connecting cables are used, the sensors project beyond the swivel/gripper unit after the switching point has been set.

Projection:
With proximity switch SMT-...:
HGDS-PP-12: 8,3 mm
HGDS-PP-16: 7,1 mm
HGDS-PP-20: 4,4 mm

With proximity switch SME-...:
HGDS-PP-12: 2,7 mm
HGDS-PP-16: 2,1 mm
HGDS-PP-20: 0 mm



Ordering data – Proximity switches for C-slot, magnetic reed — Technical data ➔ www.festo.com/catalogue/sm

	Type of mounting	Switch output	Electrical connection, connection direction	Cable length [m]	Part No.	Type
N/O contact						
	Insertable in the slot from above, flush with cylinder profile	Contacting	Plug M8x1, 3-pin, in-line	0,3	**525 914**	**SME-10F-DS-24V-K0,3L-M8D**
			Cable, 3-wire, in-line	2,5	**525 913**	**SME-10F-DS-24V-K2,5L-OE**
			Cable, 2-wire, in-line	2,5	**526 672**	**SME-10F-ZS-24V-K2,5L-OE**

Ordering data – Proximity switches for C-slot, magneto-resistive — Technical data ➔ www.festo.com/catalogue/sm

	Type of mounting	Switch output	Electrical connection, connection direction	Cable length [m]	Part No.	Type
N/O contact						
	Insertable in the slot from above, flush with cylinder profile	PNP	Cable, 3-wire, in-line	2,5	**525 915**	**SMT-10F-PS-24V-K2,5L-OE**
			Plug M8x1, 3-pin, in-line	0,3	**525 916**	**SMT-10F-PS-24V-K0,3L-M8D**

Ordering data – Connecting cable — Technical data ➔ www.festo.com/catalogue/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	**541 333**	**NEBU-M8G3-K-2.5-LE3**
			5	**541 334**	**NEBU-M8G3-K-5-LE3**
	Angled socket, M8x1, 3-pin	Cable, open end, 3-wire	2,5	**541 338**	**NEBU-M8W3-K-2.5-LE3**
			5	**541 341**	**NEBU-M8W3-K-5-LE3**