

Swivel/gripper units HGDS



Swivel/gripper units HGDS

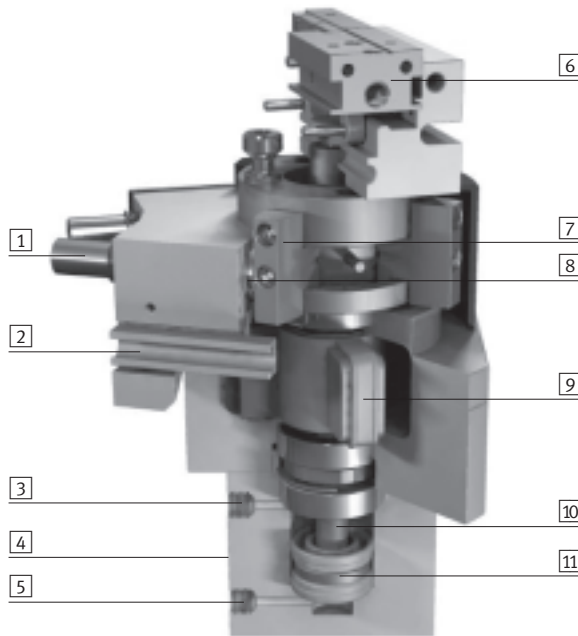
Key features

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.

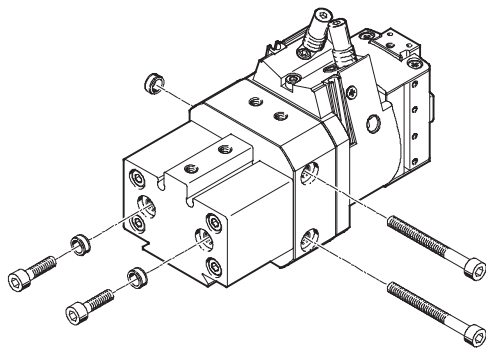
The swivel motion takes place via a swivel drive. It can be adjusted almost infinitely via 2 stops (max. 210°). The rotary motion is cushioned either via a flexible cushioning buffer or a hydraulic shock absorber. The swivel angle can be finely adjusted by means of a precision adjustment facility.



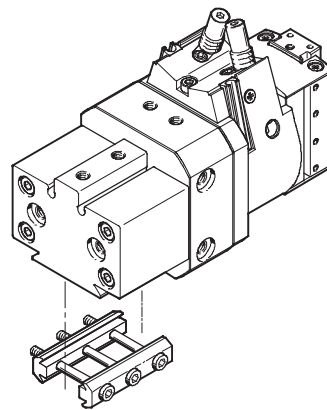
- 1 Flexible cushioning or hydraulic shock absorbers
- 2 Slot for proximity sensor SME/SMT-10 for sensing the swivel position
- 3 Gripper compressed air connection, closing
- 4 Slot for proximity sensor SME/SMT-10 for sensing the gripper position
- 5 Gripper compressed air connection, opening
- 6 Gripper 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

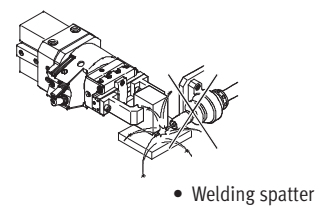
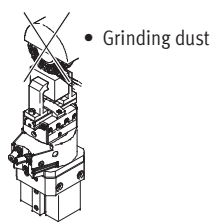
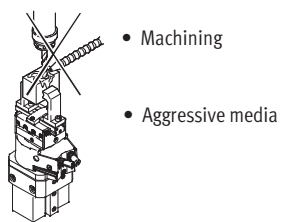
Direct mounting



Dovetail connection



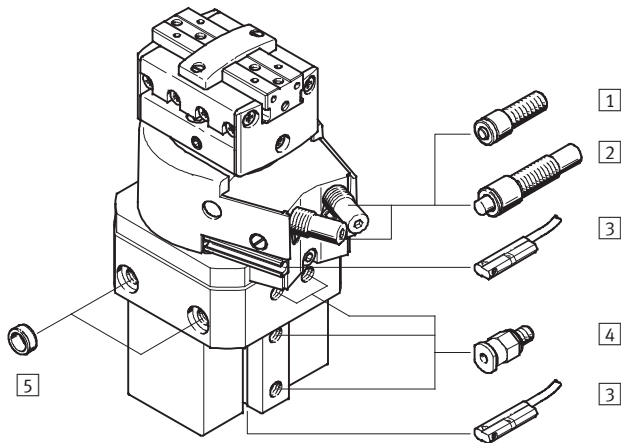
 Note
Swivel/gripper units are not suitable for the following or similar applications:



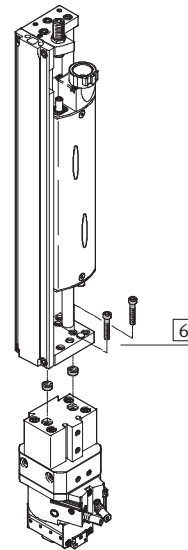
Swivel/gripper units HGDS

Peripherals overview and type codes

Peripherals overview



System product for handling and assembly technology



Accessories			
Type		Brief description	→ Page/Internet
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	12
4	Push-in fitting QS	For connecting compressed air tubing with standard external diameters	quick star
5	Centring sleeve ZBH	For centring the gripper when mounting (2 included in scope of delivery)	12
6	-	Drive/gripper connections	adapter kit

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									

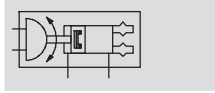
Swivel/gripper units HGDS



Technical data

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Function

Swivelling/Gripping



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

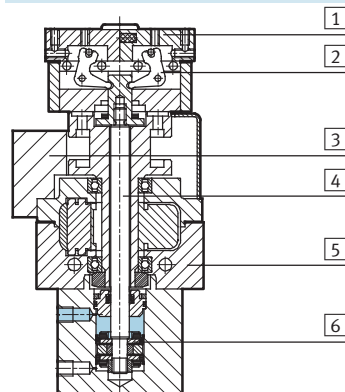
General technical data			
Size	12	16	20
Design	Semi-rotary drive Parallel gripper with drive		
Mode of operation	Double-acting		
Pneumatic connection	M5		
Type of mounting	With threaded hole and centring hole Via through-holes Clamped in dovetail slot		
Fitting position	Any		
Relubrication intervals 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

Swivel/gripper units HGDS

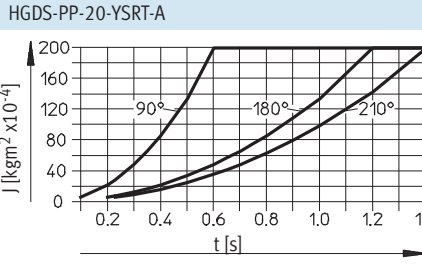
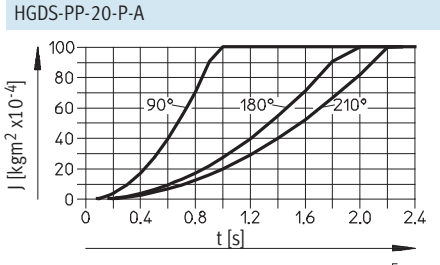
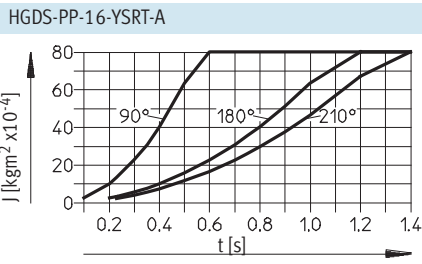
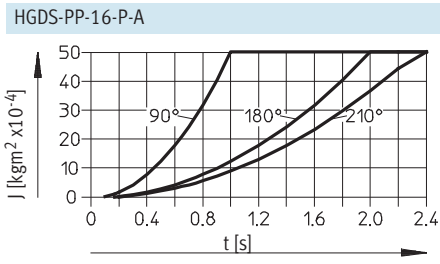
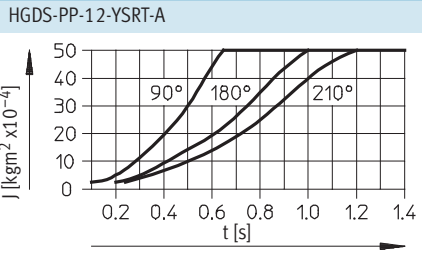
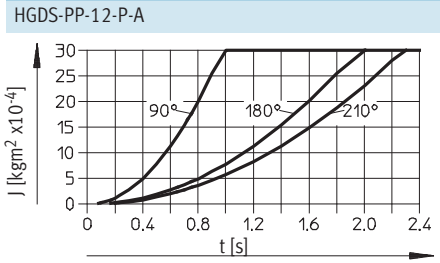
Technical data

Technical data – Swivelling

Size	12	16	20
Swivel angle	[°] 0 ... 210 → 10		
Theoretical torque ¹⁾	[Nm] 0.85	1.25	2.5
Repetition accuracy ¹⁾	P cushioning	[°] < 0.2	
	YSRT cushioning	[°] < 0.02	
Cushioning	→ 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

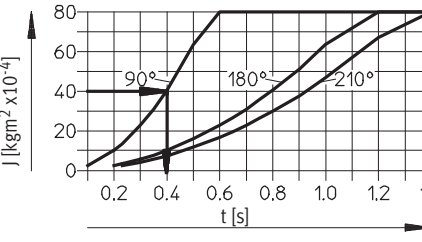


Dependency between operating pressure and swivel time

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



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Technical data

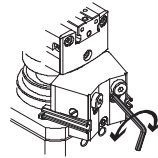
Precision adjustment of the swivel angle

The swivel angle can be adjusted roughly by means of two stop plates → 2. The precision adjustment works as follows:

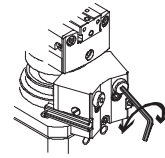
Variants P and YSRT differ in only one component. The retainer and the fine

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

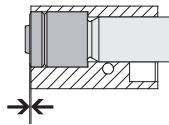


- 2) Adjust the cushioning element as required. Observe the minimum and maximum settings.

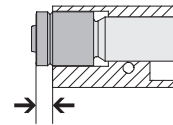


Size	12	16	20	
Precision adjustment range	P cushioning [°]	-6		
	YSRT cushioning [°]	-2.5		
Swivel angle adjuster per revolution	[°]	3.1	2.8	2.2

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. weight force 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

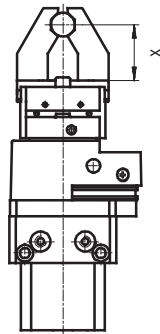
Gripping force [N] at 6 bar

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

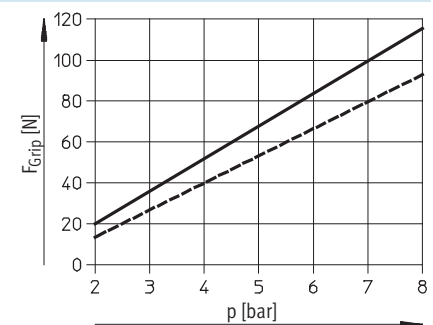
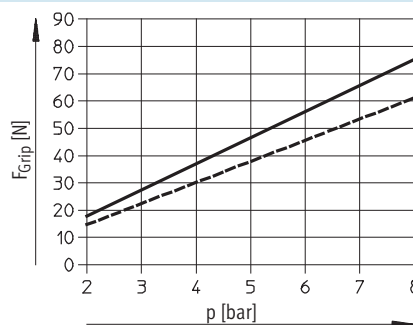
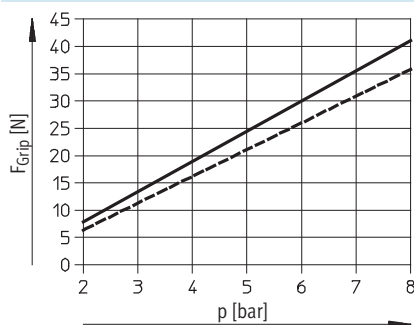
The gripping force is practically independent of the lever arm. Fluctuation at max. lever arm and max. operating pressure approx. 10%.

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

Swivel/gripper units HGDS

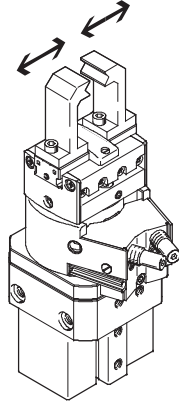
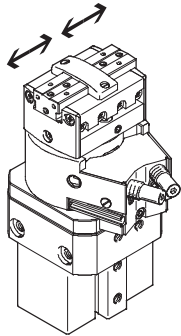
Technical data

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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.

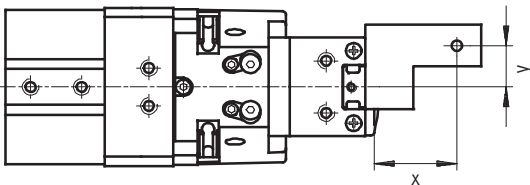
with additional gripper fingers as a function of weight force

Size	12	16	20	
Max. weight force	0.3 N	0.5 N	1.0 N	
HGDS-...-A unthrottled	Opening	20	50	70
	Closing	30	50	100

with additional gripper fingers as a function of weight force

Size	12		16		20			
	1.0 N	2.0 N	1.0 N	2.0 N	1.0 N	2.0 N		
HGDS-...-A throttled	Closing		100	150	100	200	100	250

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 $\rightarrow 5$ when making your selection.

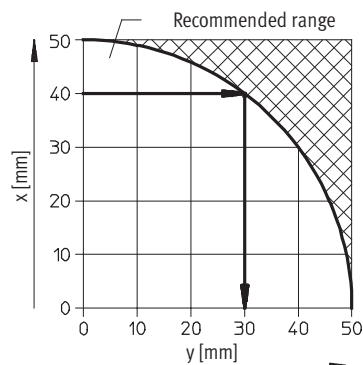
Calculation example

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



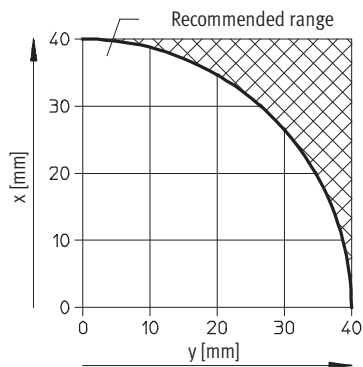
Swivel/gripper units HGDS

Technical data

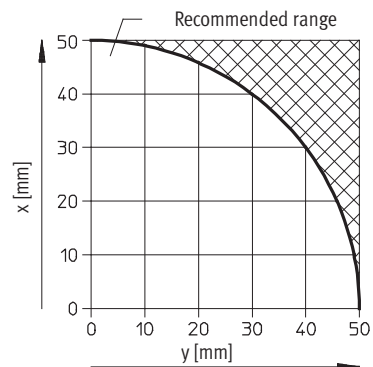
Eccentricity y as a function of lever arm x

for unthrottled operation:

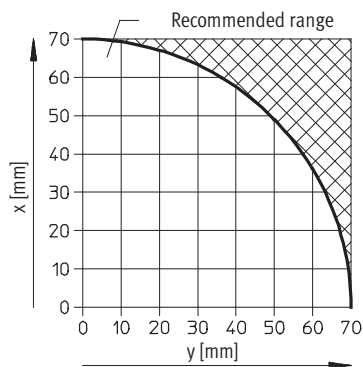
HGDS-12 (max. lever arm 40 mm)



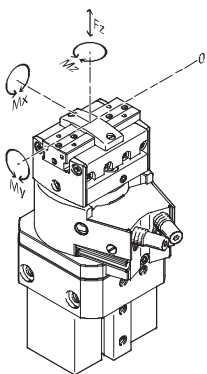
HGDS-16 (max. lever arm 50 mm)



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

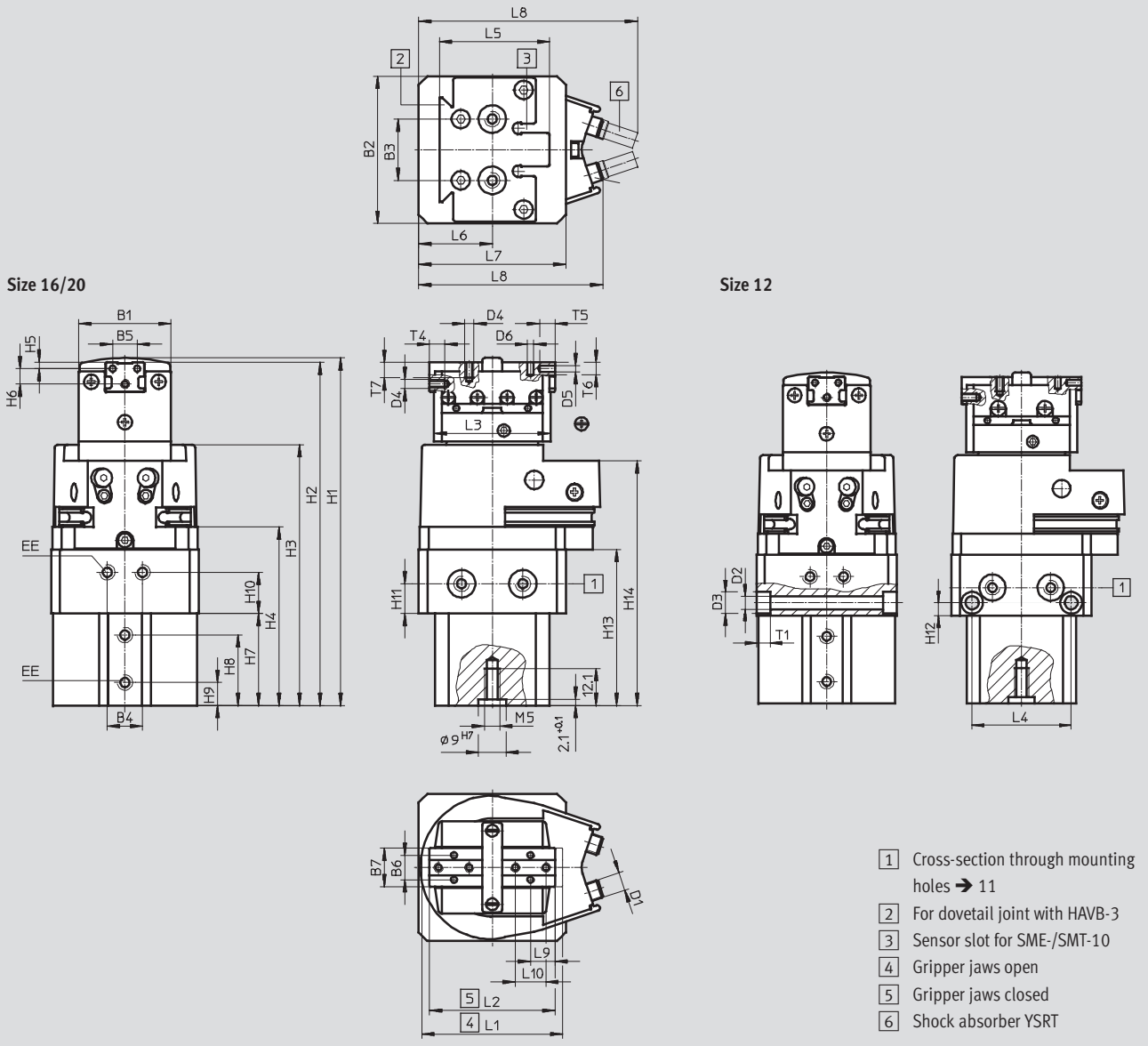
Swivel/gripper units HGDS

Technical data

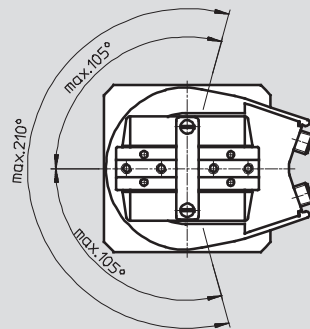
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Dimensions

Download CAD data → www.festo.com



Swivel angle



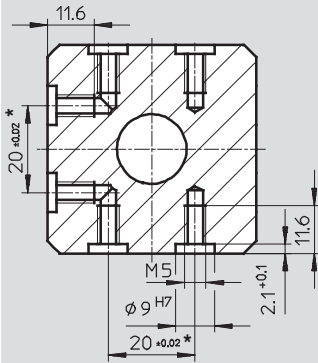
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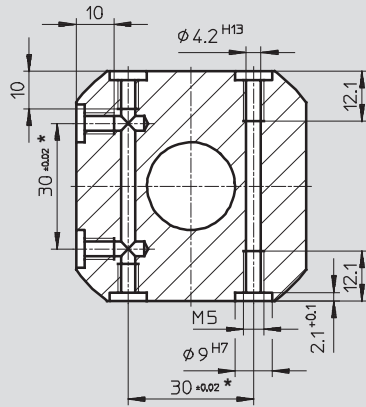


Cross-section at 1 → 10

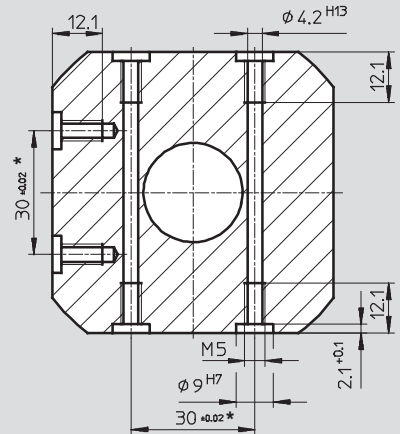
Size 12



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

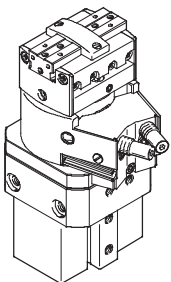
Size	L7	L8		L9	L10	T1	T4	T5	T6	T7
[mm]	±0.03	±1		±0.02			min.			min.
		P	YSRT							
12	48	59.5	69.3	8	10	4.6	5	5	4	5
16	55	68.5	80.5	8	10	-	6.5	6	5	5
20	68	85.4	96.4	12	14	-	10	8	7	7

* Tolerance valid for centring hole ∅ 9^{H7}


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Technical data and accessories


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
Ordering data					
	Size [mm]	With flexible P cushioning Cushioning element		With hydraulic YSRT cushioning Shock absorber	
		Part No.	Type	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 → Internet: zbh	
	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 sensors for C-slot, magneto-resistive						Technical data → Internet: smt	
	Type of mounting	Switch output	Electrical connection, connection direction	Cable length [m]	Part No.	Type	
N/O contact							
	insertable in the slot from above	PNP	Cable, 3-wire, lateral	2.5	551 374	SMT-10M-PS-24V-E-2,5-Q-OE	
			Plug M8x1, 3-pin, lateral	0.3	551 376	SMT-10M-PS-24V-E-0,3-Q-M8D	

Ordering data – Proximity sensors for C-slot, magnetic reed						Technical data → Internet: sme	
	Type of mounting	Switch output	Electrical connection, connection direction	Cable length [m]	Part No.	Type	
N/O contact							
	insertable in the slot from above	Contacting	Plug M8x1, 3-pin, lateral	0.3	551 368	SME-10M-DS-24V-E-0,3-Q-M8D	
			Cable, 3-wire, lateral	2.5	551 366	SME-10M-DS-24V-E-2,5-Q-OE	

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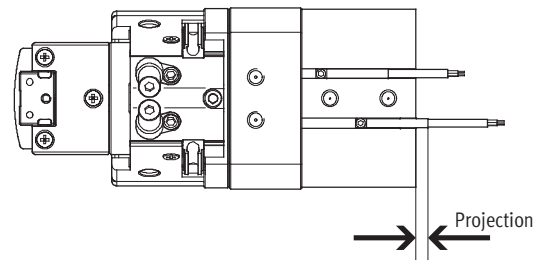
Accessories

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 sensors for C-slot, magneto-resistive					Technical data → Internet: smt	
	Type of mounting	Switch output	Electrical connection, connection direction	Cable length [m]	Part No.	Type
N/O contact						
	Insertable in the slot from above	PNP	Cable, 3-wire, in-line	2.5	551 373	SMT-10M-PS-24V-E-2,5-L-OE
			Plug M8x1, 3-pin, in-line	0.3	551 375	SMT-10M-PS-24V-E-0,3-L-M8D

Ordering data – Proximity sensors for C-slot, magnetic reed					Technical data → Internet: sme	
	Type of mounting	Switch output	Electrical connection, connection direction	Cable length [m]	Part No.	Type
N/O contact						
	Insertable in the slot from above	Contacting	Plug M8x1, 3-pin, in-line	0.3	551 367	SME-10M-DS-24V-E-0,3-L-M8D
			Cable, 3-wire, in-line	2.5	551 365	SME-10M-DS-24V-E-2,5-L-OE
			Cable, 2-wire, in-line	2.5	551 369	SME-10M-ZS-24V-E-2,5-L-OE

Ordering data – Connecting cables				Technical data → 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	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