

## Swivel/gripper units HGDS-B

**FESTO**



## Swivel/gripper units HGDS-B

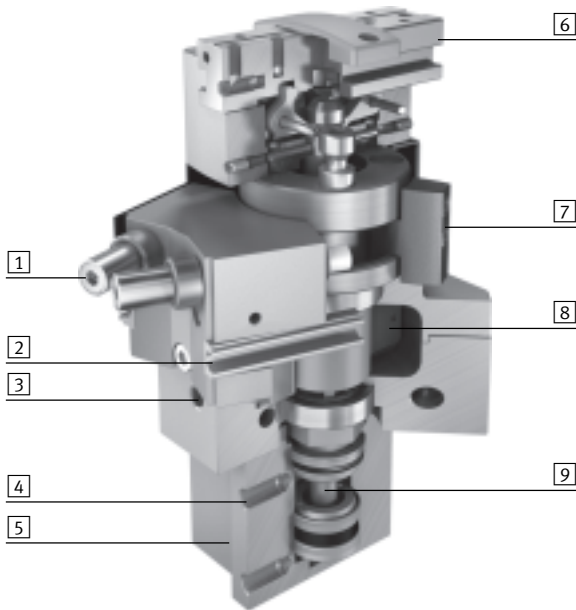
Key features

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### At a glance

- Combination of parallel gripper with T-slot guide and swivel module on the basis of swivel module DSM
- Infinitely adjustable swivel angle (max. 210°)
- Supply ports and position sensing outside the swivel range
- High performance (torque, mass moment of inertia)
- All connections accessible from one side
- Compact design and low weight

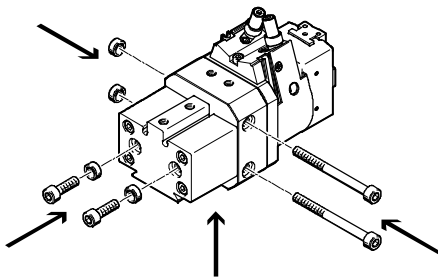
### The technology in detail



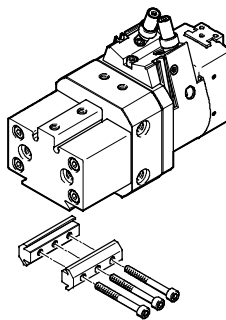
- |   |   |
|---|---|
| <p><b>1</b> Three types of cushioning for swivel motion:</p> <ul style="list-style-type: none"> <li>– Flexible cushioning elements (P)</li> <li>– Adjustable flexible cushioning components with metal fixed stop (P1)</li> <li>– Shock absorbers with metal fixed stop (YSRT)</li> </ul> <p><b>2</b> Slot for proximity sensor SME/SMT-10 for sensing the swivel position</p> <p><b>3</b> Supply port for swivelling function</p> <p><b>4</b> Supply port for gripping function</p> <p><b>5</b> Slot for proximity sensor SME/SMT-10 for sensing the gripping position</p> | <p><b>6</b> Gripper jaw with T-slot guide</p> <p><b>7</b> Adjustable stop cams for adjusting the swivel motion</p> <p><b>8</b> Rotary vane</p> <p><b>9</b> Piston rod for gripping motion</p> |
|---|---|

### Mounting options

#### Direct mounting



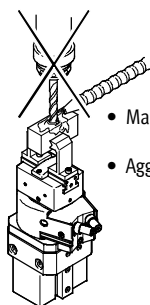
#### Dovetail connection



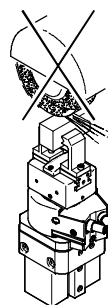
The swivel/gripper unit can be mounted on four sides.

#### Note

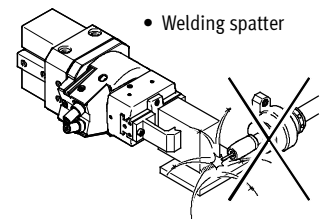
Swivel/gripper units are not suitable for the following or similar applications:



- Machining
- Aggressive media



- Grinding dust



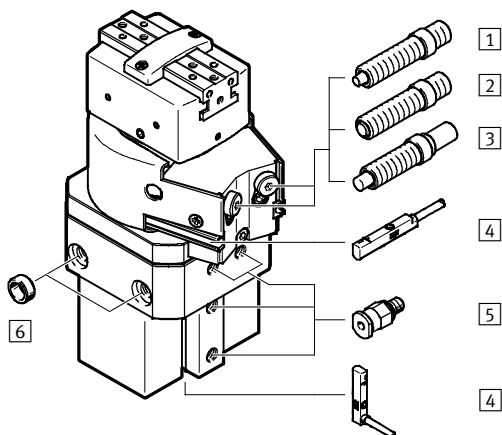
- Welding spatter

# Swivel/gripper units HGDS-B

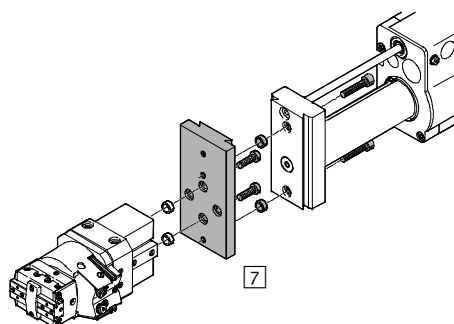
Peripherals overview and type codes

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## Peripherals overview



## System product for handling and assembly technology



Accessories			
Type	Brief description		→ Page/Internet
1 Cushioning P	Flexible cushioning components at both ends		14
2 Cushioning P1	Adjustable flexible cushioning components at both ends, with metal fixed stop		14
3 Cushioning YSRT	Self-adjusting shock absorbers at both ends, with metal fixed stop		14
4 Proximity sensor SME/SMT-10	For sensing the gripping and swivelling position		LEERER MERKER
5 Push-in fitting QS	For connecting compressed air tubing with standard O.D.		quick star
6 Centring sleeve ZBH	For centring the gripper when mounting (2 included in the scope of delivery)		LEERER MERKER
7 Adapter kit HMSV	Drive/gripper connections		15

## Type codes

		HGDS	–	PP	–	16	–	YSRT	–	A	–	B
<b>Type</b>												
HGDS	Swivel/gripper unit											
<b>Gripper function</b>												
PP	Parallel gripper											
<b>Size</b>												
<b>Cushioning</b>												
P	Flexible cushioning components at both ends											
P1	Adjustable flexible cushioning components at both ends											
YSRT	Self-adjusting shock absorbers at both ends											
<b>Position sensing</b>												
A	Via proximity sensor											
<b>Generation</b>												
B	B series											

## Swivel/gripper units HGDS-B

Technical data

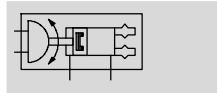
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Function

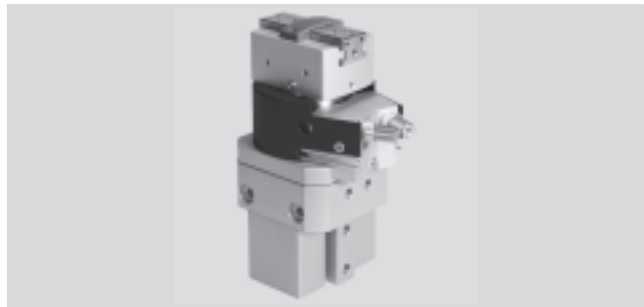
Swivelling/gripping



[www.festo.com](http://www.festo.com)



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



General technical data			
Size	12	16	20
Design	Parallel gripper		
	Swivel module		
	Gripper module		
Mode of operation	Double-acting		
Pneumatic connection	M5		
Type of mounting	Via female thread and centring sleeve		
	Via through-hole and centring sleeve		
	Via dovetail slot		
Cushioning			
P cushioning	Flexible cushioning at both ends components		
P1 cushioning	Adjustable flexible cushioning components at both ends		
YSRT cushioning	Self-adjusting shock absorbers at both ends		
Mounting position	Any		
Relubrication intervals of guide	10 million switching cycles		
Product weight [g]	505	730	1,260
Technical data – swivelling	→ 5		
Technical data – gripping	→ 8		

Operating and environmental conditions	
Operating pressure [bar]	3 ... 8
Operating medium	Compressed air in accordance with ISO 8573-1:2010 [7:4:4]
Note on operating/pilot medium	Operation with lubricated medium possible (in which case lubricated operation will always be required)
Ambient temperature <sup>1)</sup> [°C]	+5 ... +60
Corrosion resistance class CRC <sup>2)</sup>	2

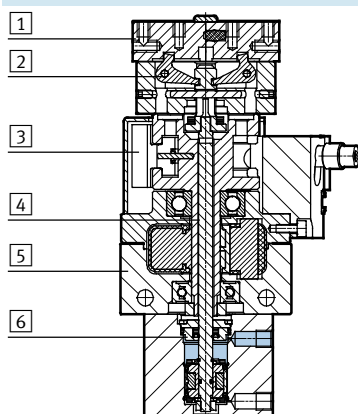
1) Note operating range of proximity sensors

2) Corrosion resistance class 2 according to Festo standard 940 070

Components subject to moderate corrosion stress. 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	Stainless steel
2	Lever	Hardened steel
3	Stop	Stainless steel
4	Piston rod	Stainless steel
5	Housing	Wrought aluminium alloy
6	Piston	Nitrile rubber, polyurethane
–	Rubber buffer	Nitrile rubber

# Swivel/gripper units HGDS-B

Technical data

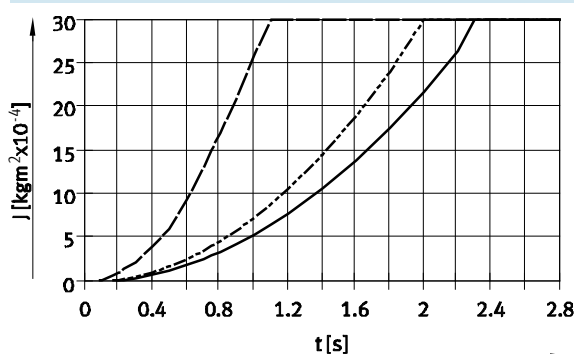
## Technical data – Swivelling

Size		12	16	20
Swivel angle	[°]	0 ... 210		
Theoretical torque <sup>1)</sup>	[Nm]	0.85	1.25	2.5
Repetition accuracy <sup>1)</sup>				
P cushioning	[°]	< 0.2		
P1 cushioning	[°]	< 0.02		
YSRT cushioning	[°]	< 0.02		
Max. swivel frequency <sup>1)</sup>				
P cushioning	[Hz]	2		
P1 cushioning	[Hz]	2		
YSRT cushioning	[Hz]	1.5		
Position sensing		Via proximity sensor		

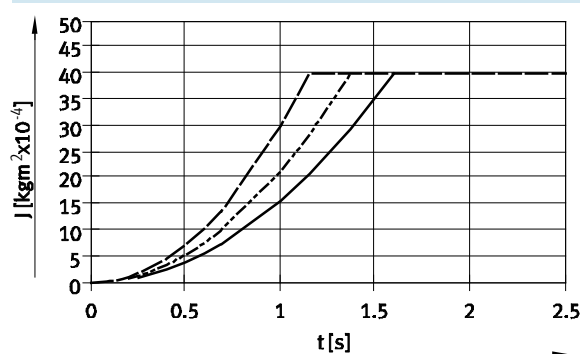
1) At an operating pressure of 6 bar

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

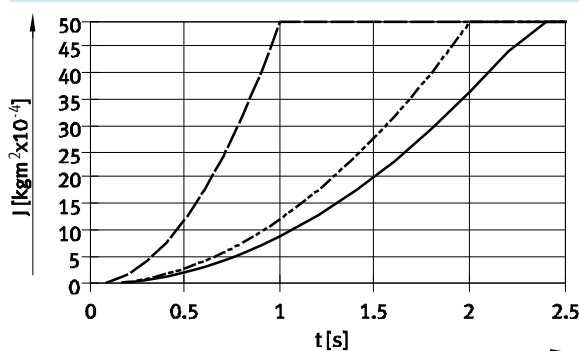
HGDS-PP-12-P-A-B



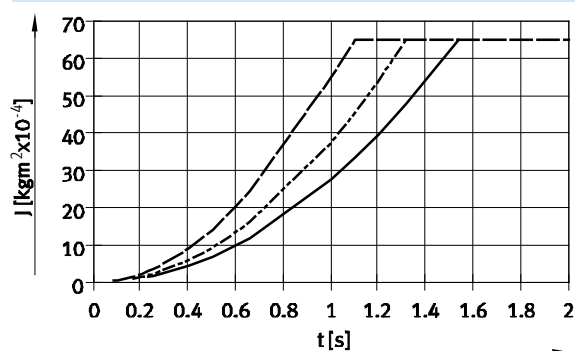
HGDS-PP-12-P1-A-B



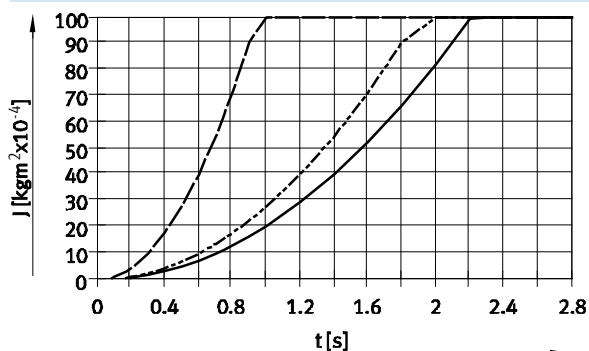
HGDS-PP-16-P-A-B



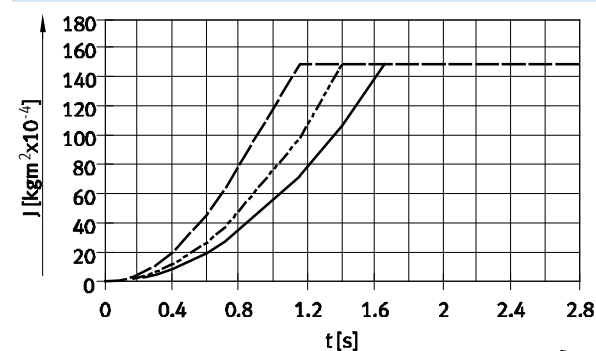
HGDS-PP-16-P1-A-B



HGDS-PP-20-P-A-B



HGDS-PP-20-P1-A-B



— Swivel angle 210°      - - - Swivel angle 90°  
 - - - - - Swivel angle 180°

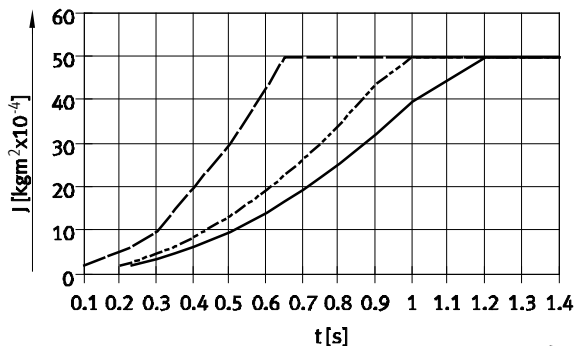
## Swivel/gripper units HGDS-B

Technical data

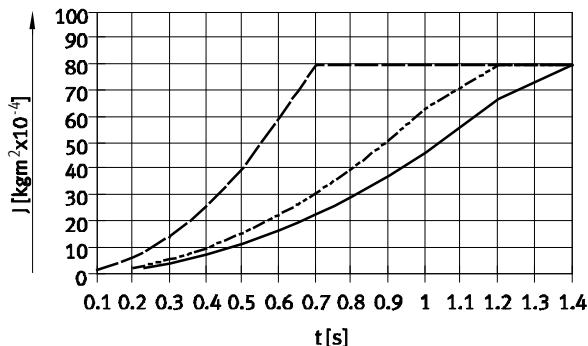
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### Mass moments of inertia $J$ at 6 bar as a function of swivel time $t$ and swivel angle

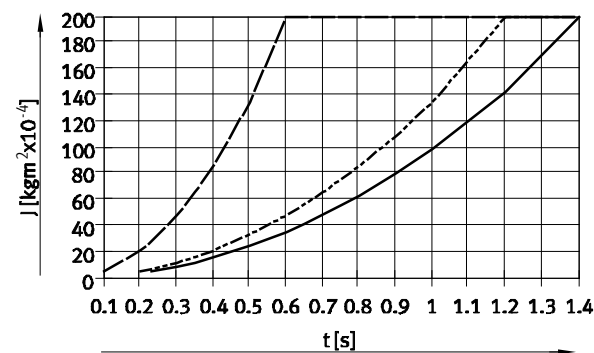
HGDS-PP-12-YSRT-A-B



HGDS-PP-16-YSRT-A-B



HGDS-PP-20-YSRT-A-B



— Swivel angle 210°  
 - - - Swivel angle 180°  
 - · - Swivel angle 90°

### Dependency between operating pressure and swivel time

Reducing the operating pressure reduces the gripping force.

To ensure that the gripper's jaws do not open during swivelling, the swivel time must be increased by 15% per bar of operating pressure (same mass moment of inertia).

Example:

Given:

HGDS-PP-16-YSRT-A-B

Operating pressure 6 bar

Swivel angle 90°

$J = 40 \text{ kgm}^2 \times 10^{-4}$

To be calculated:

Swivel time at an operating pressure of 4 bar

Swivel time at 6 bar = 0.5 s, see graph opposite

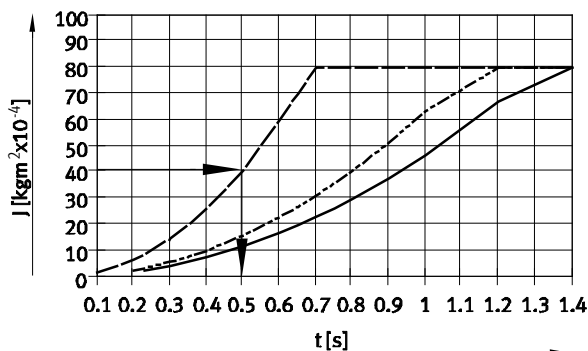
Swivel time at 4 bar:

$t = 0.5 + 2 \times 15\% = 0.65 \text{ s}$

Cushioning time of the shock absorber = 0.1 s

This yields a total swivel time of

$t_{\text{tot.}} = 0.65 \text{ s} + 0.1 \text{ s} = 0.75 \text{ s}$



# Swivel/gripper units HGDS-B

Technical data

## Precision adjustment of the swivel angle

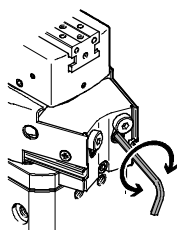
The swivel angle can be roughly adjusted by moving the cam stops  
→ LEERER MERKER.

The procedure for precision adjustment is the same for all cushioning variants (P, P1 and YSRT).

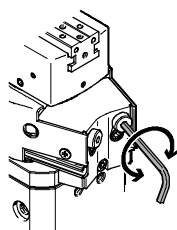
The swivel angle can be precisely adjusted by unscrewing or screwing in the cushioning component.

Swivelling to a metal stop enables high repetition accuracy.

- 1) Loosen the locking screw underneath the cushioning component.



- 2) Adjust the cushioning component as required. Note the adjustment range.



Size	12	16	20
Precision adjustment range			
P cushioning [°]	-6		
P1 cushioning [°]	-6		
YSRT cushioning [°]	-2.5		
Adjustment range of the cushioning component			
P cushioning [mm]	2	2.6	2.8
P1 cushioning [mm]	2	2.6	2.8
YSRT cushioning [mm]	1	1.3	1.4

## Swivel/gripper units HGDS-B

Technical data

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### Technical data – Gripping

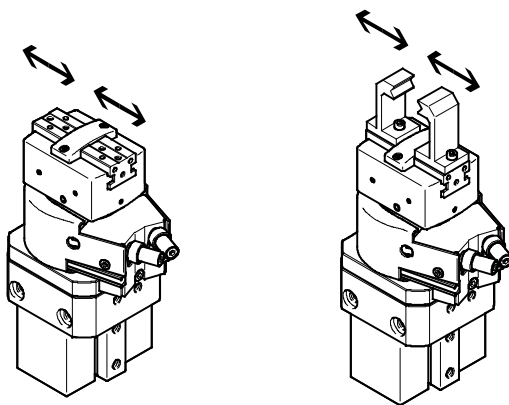
Size	12	16	20
Gripper function	Parallel		
Number of gripper jaws	2		
Max. applied load per external gripper finger <sup>1)</sup> [N]	0.3	0.5	1.0
Stroke per gripper jaw [mm]	2.5	4.5	7
Max. gripper jaw backlash [mm]	0.02		
Max. gripper jaw angular play [°]	0.1		
Repetition accuracy [mm]	±0.01		±0.015
Max. operating frequency [Hz]	4		
Position sensing	Via proximity sensor		

1) Valid for unthrottled operation

### Opening and closing times [ms] at 6 bar

Without external gripper fingers

With external gripper fingers



The indicated opening and closing times [ms] have been measured at room temperature and 6 bar operating pressure with vertically mounted swivel/gripper unit without additional

gripper fingers. The grippers must be throttled for greater applied loads. Opening and closing times must then be adjusted accordingly.

### With external gripper fingers as a function of applied load

Size	12	16	20
Max. applied load	0.3 N	0.5 N	1.0 N
Unthrottled	Opening	40	40
	Closing	60	60

### With external gripper fingers as a function of applied load

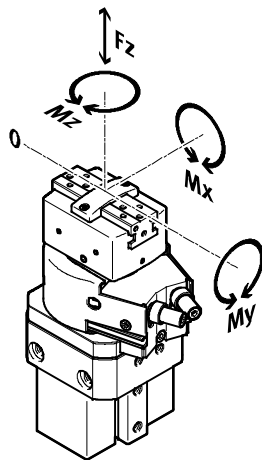
Size	12	16	20
Applied load	1.0 N	2.0 N	1.0 N
	2.0 N	2.0 N	2.0 N
Throttled	Closing	100	150
		100	200
		100	250



# Swivel/gripper units HGDS-B

Technical data

## Static characteristic load values per gripper jaw



The indicated permissible forces and torques apply 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]	90	150	250
Max. permissible torque $M_x$ [Nm]	6	11	22
Max. permissible torque $M_y$ [Nm]	6	11	22
Max. permissible torque $M_z$ [Nm]	6	11	22

## Gripping force [N] at 6 bar with a lever arm of 25 mm

Size	12	16	20
Gripping force per gripper jaw			
Opening	42	58	96
Closing	37	51	84
Total gripping force			
Opening	84	116	192
Closing	74	102	168

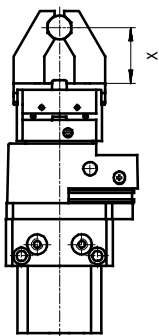
## Swivel/gripper units HGDS-B

Technical data

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### Gripping force $F_H$ per gripper jaw as a function of operating pressure $p$

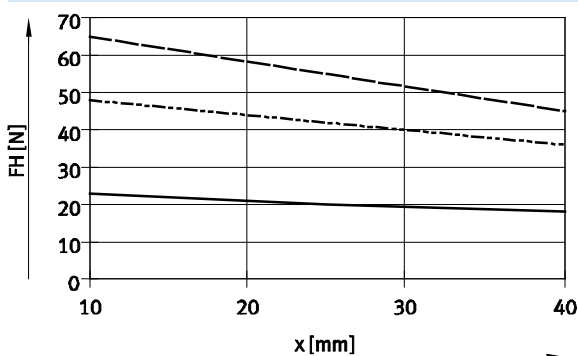
Gripping forces as a function of operating pressure and lever arm can be determined for the various sizes using the following graphs.



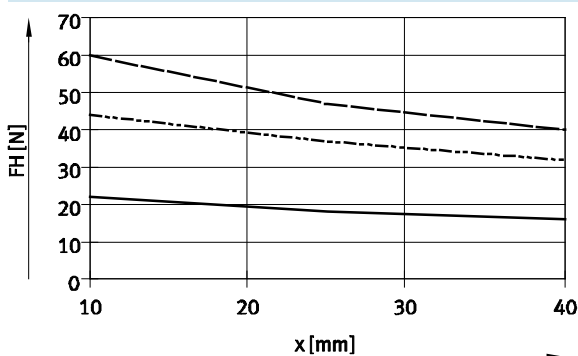
— 3 bar  
- - - 6 bar  
- · - 8 bar

#### HGDS-12

Opening

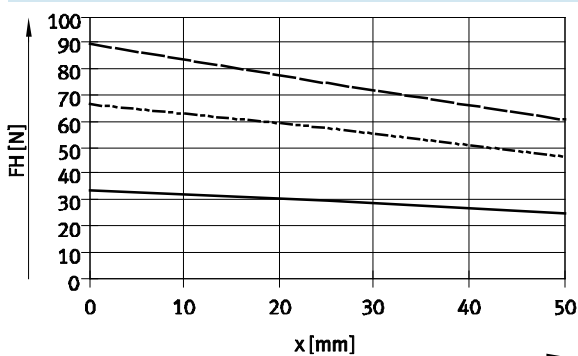


Closing

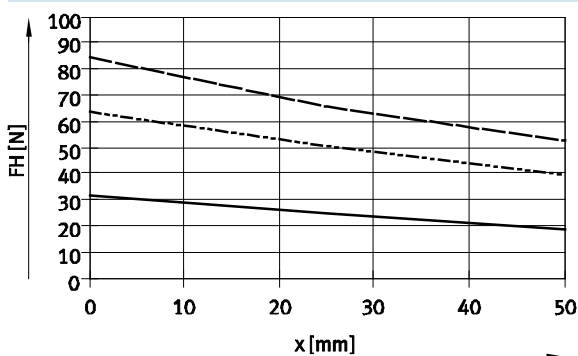


#### HGDS-16

Opening

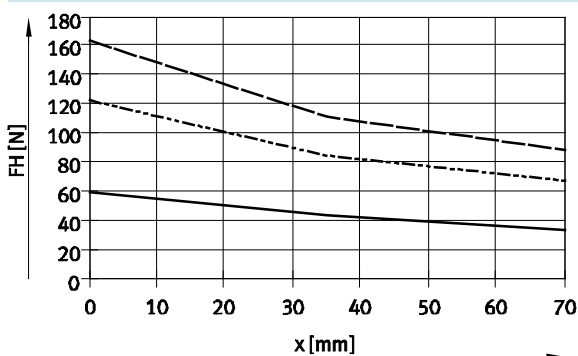


Closing

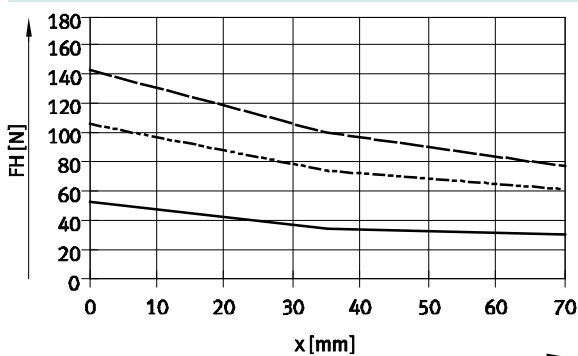


#### HGDS-20

Opening



Closing



## Swivel/gripper units HGDS-B

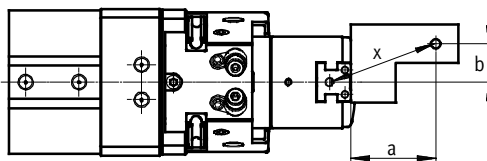
Technical data

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### Gripping force $F_H$ per gripper jaw at 6 bar as a function of lever arm $x$ and eccentricity $a$ and $b$

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

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



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

### Calculation example

Given:

Distance  $a = 25$  mm

Distance  $b = 20$  mm

To be calculated:

The gripping force at 6 bar,  
with an HGDS-16,  
used as an external gripper

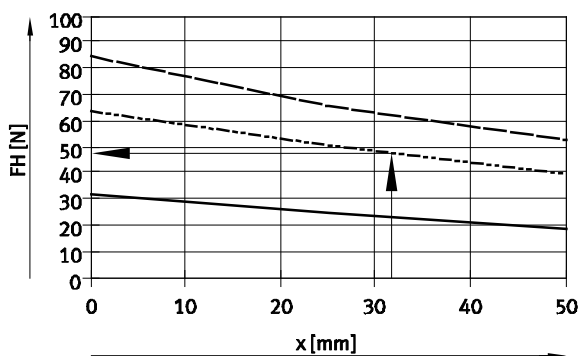
Procedure:

Calculating the lever arm  $x$

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

$$x = 32$$
 mm

The graph (→ 10) gives a value of  $F_H$   
= 47 N for the gripping force.



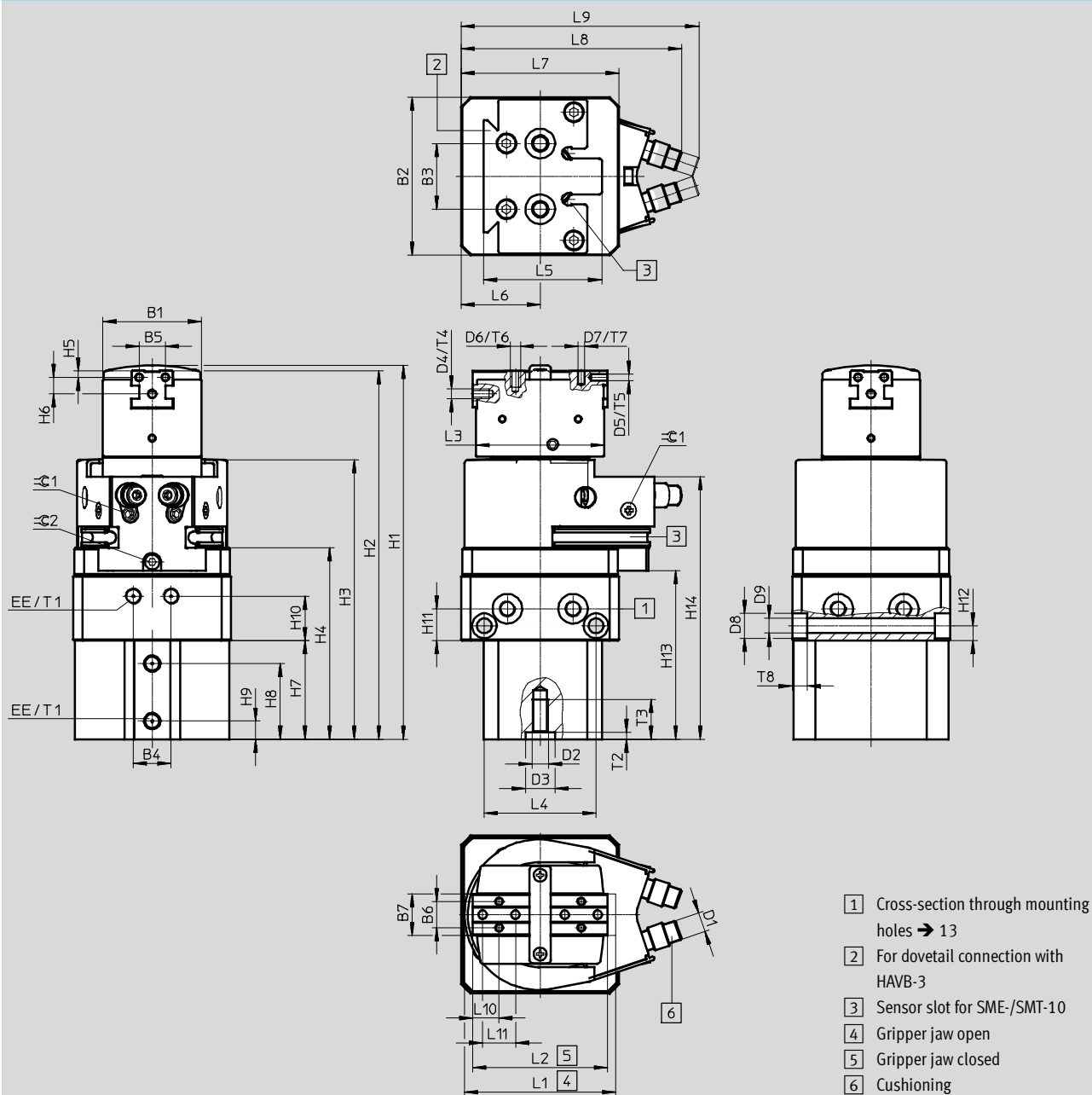
## Swivel/gripper units HGDS-B

Technical data

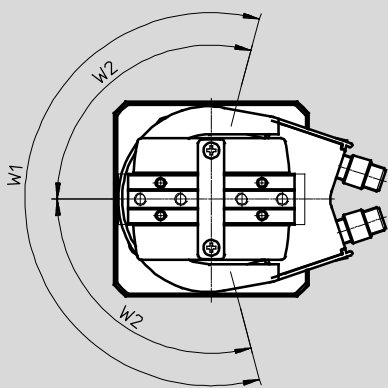
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### Dimensions

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



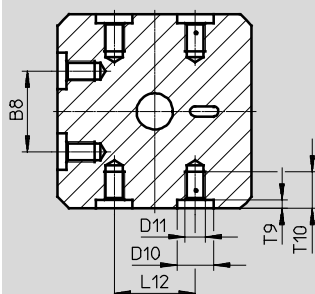
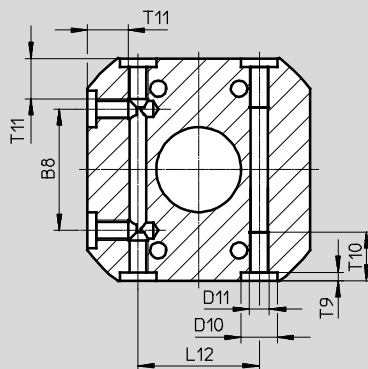
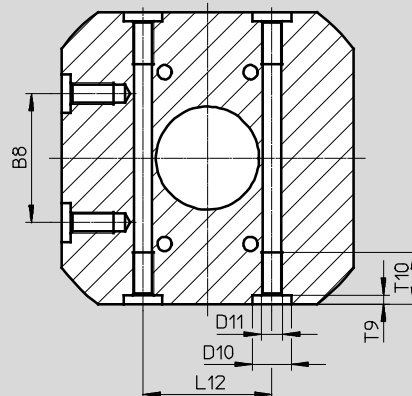
### Swivel angle



# Swivel/gripper units HGDS-B

Technical data

Cross-section at 1 → 12

**Size 12**

**Size 16**

**Size 20**


Size	B1	B2	B3	B4	B5	B6	B7	B8 <sup>1)</sup>	D1	D2	D3 Ø H7	D4
[mm]		±0.03	±0.02		±0.02	±0.02	±0.1					
12	30	48	20	11.5	8	8	12.5	20	M6x0.5	M5	9	M3
16	34	55	30	13	10	10	16	30	M8x1	M5	9	M3
20	40	68	30	16	12	12	20	30	M10x1	M5	9	M4

Size	D5 Ø H8	D6	D7 Ø H8	D8 Ø H13	D9 Ø H13	D10 Ø H7	D11	EE	H1	H2	H3	H4
[mm]									+1/-0.6	+0.8/-0.4	+1.3/-0.2	+0.8/-0.2
12	2	M3	2	7.5	4.5	9	M5	M5	113.4	111.9	85	58.2
16	2	M3	2	–	4.2	9	M5	M5	121.7	120.1	92.3	64.3
20	2.5	M4	2.5	–	4.2	9	M5	M5	154.8	152.8	112.3	81.7

Size	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	L1	L2
[mm]	±0.02	±0.12	±0.1	±0.1			-0.1		+1/-0.2	+1/-0.2	±0.5	±0.5
12	2	5	30	23	7.5	13.5	9.7	4.5	51.3	79.8	46	41
16	3	5	34.5	26	6.3	14	8	–	58.2	86.7	58	49
20	3	7	43	34.6	5.3	19	9	–	73.1	105.6	78	64

Size	L3	L4	L5	L6	L7	L8 ±1 P	L9 ±1		L10	L11	L12 <sup>1)</sup>	T1
[mm]	±0.5	±0.1		±0.05	±0.03		P1	YSRT	±0.02			min.
12	39	34	36	24	48	67	72.4	72.4	8	10	20	5.3
16	47	–	40.5	27.5	55	80.2	81.6	81.6	8	10	30	5
20	61	–	40.5	34	68	93.3	97	97	12	14	30	6

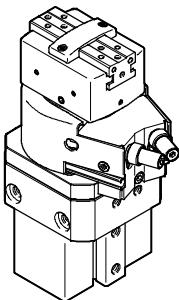
Size	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	W1	W2	≈ 1	≈ 2
[mm]	+0.1		±0.4	max.	min.	max.		+0.1						
12	2.1	12.1	6	5	3.5	6	4.6	2.1	10	–	210°	105°	2	2
16	2.1	12.1	6	6	4.5	6	–	2.1	12.1	10	210°	105°	2.5	2.5
20	2.1	12.1	9	8	6	7.5	–	2.1	12.1	–	210°	105°	3	2.5

1) Tolerance for centring holes Ø9 H7,  
tolerance for thread M5 ±0.1 mm

## Swivel/gripper units HGDS-B

Technical data

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Ordering data			
	Size [mm]	Part No.	Type
	With cushioning P		
	12 <sup>1)</sup>	1187955	HGDS-PP-12-P-A-B
	16 <sup>1)</sup>	1187958	HGDS-PP-16-P-A-B
	20 <sup>1)</sup>	1187961	HGDS-PP-20-P-A-B
	With cushioning P1		
	12 <sup>1)</sup>	1187956	HGDS-PP-12-P1-A-B
	16 <sup>1)</sup>	1187959	HGDS-PP-16-P1-A-B
	20 <sup>1)</sup>	1187962	HGDS-PP-20-P1-A-B
	With cushioning YSRT		
	12 <sup>1)</sup>	1187957	HGDS-PP-12-YSRT-A-B
	16 <sup>1)</sup>	1187960	HGDS-PP-16-YSRT-A-B
	20 <sup>1)</sup>	1187963	HGDS-PP-20-YSRT-A-B

1) Two centring sleeves are included in the scope of delivery of the swivel/gripper unit.

# Swivel/gripper units HGDS-B

Accessories



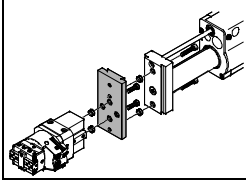
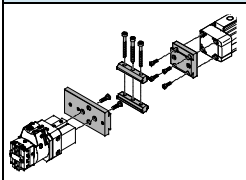
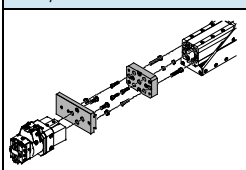
**Adapter kit**  
**HMVA, HMSV**

Material:  
Wrought aluminium alloy  
Free of copper and PTFE  
RoHS-compliant



Note

The kit includes the individual mounting interface as well as the necessary mounting material.

Permissible drive/gripper combinations with adapter kit						Download CAD data → <a href="http://www.festo.com">www.festo.com</a>	
Combination	Drive	Gripper			Adapter kit		
	Size	Size	Mounting option		CRC <sup>1)</sup>	Part No.	Type
							
HMP/HGDS	HMP	HGDS			HAVB, HMSV		
	Direct mounting						
	16, 20, 25, 32	16, 20	–	■	2	534290	HMSV-38
	Dovetail mounting						
	16, 20, 25, 32	16, 20	–	■	2	163239	HAVB-3
						534290	HMSV-38
DGP..., DGE-..., DGEA/HGDS	DG...	HGDS			HMSV, HMVA		
	DGP...-25	12, 16, 20	■	■	2	177653	HMSV-7
	DGE-25		■	■		534290	HMSV-38
	DGEA-18					196788	HMVA-DLA18/25
	DGP...-40	12, 16, 20	■	■		177653	HMSV-7
	DGE-40		■	■		534290	HMSV-38
					196790	HMVA-DLA40	
EGSA/HGDS	EGSA	HGDS			HMSV		
	60	16, 20	■	■	2	560019	HMSV-63
						534290	HMSV-38




1) Corrosion resistance class 2 according to Festo standard 940 070

Components subject to moderate corrosion stress. 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.

## Swivel/gripper units HGDS-B

Accessories



**FESTO**



Ordering data					
	For size	Brief description	Part No.	Type	PU <sup>1)</sup>
Cushioning kit for P/P1/YSRT cushioning					
	12	P cushioning: – Flexible cushioning component	1731537	HGDS-12-P-B	1
	16		1731540	HGDS-16-P-B	
	20		1731544	HGDS-20-P-B	
	12	P1 cushioning: – Flexible cushioning component – Adjustable – With metal fixed stop	1731536	HGDS-12-P1-B	1
	16		1731539	HGDS-16-P1-B	
	20		1731542	HGDS-20-P1-B	
	12	YSRT cushioning: – Shock absorber – Self-adjusting – With metal fixed stop	1731538	HGDS-12-YSRT-B	1
	16		1731541	HGDS-16-YSRT-B	
	20		1731545	HGDS-20-YSRT-B	



1) Packaging unit

Ordering data			Technical data → Internet: zbh		
	For size	Weight [g]	Part No.	Type	PU <sup>1)</sup>
Centring sleeve ZBH					
	12, 16, 20	1	150927	ZBH-9	10

1) Packaging unit

Ordering data – Proximity sensors for C-slot, magneto-resistive					Technical data → Internet: smt	
	Type of mounting	Switching 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	551373	SMT-10M-PS-24V-E-2,5-L-OE
			Plug M8x1, 3-pin, in-line	0.3	551375	SMT-10M-PS-24V-E-0,3-L-M8D
	Insertable in the slot from above	PNP	Cable, 3-wire, lateral	2.5	551374	SMT-10M-PS-24V-E-2,5-Q-OE
			Plug M8x1, 3-pin, lateral	0.3	551376	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	Switching output	Electrical connection, connection direction	Cable length [m]	Part No.	Type
N/O contact						
	Insertable in the slot from above	Contacting	Cable, 3-wire, in-line	2.5	551365	SME-10M-DS-24V-E-2,5-L-OE
			Cable, 2-wire, in-line	2.5	551369	SME-10M-ZS-24V-E-2,5-L-OE
			Plug M8x1, 3-pin, in-line	0.3	551367	SME-10M-DS-24V-E-0,3-L-M8D
	Insertable in the slot from above	Contacting	Cable, 3-wire, lateral	2.5	551366	SME-10M-DS-24V-E-2,5-Q-OE
			Cable, 2-wire, lateral	2.5	551370	SME-10M-ZS-24V-E-2,5-Q-OE
			Plug M8x1, 3-pin, lateral	0.3	551368	SME-10M-DS-24V-E-0,3-Q-M8D

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