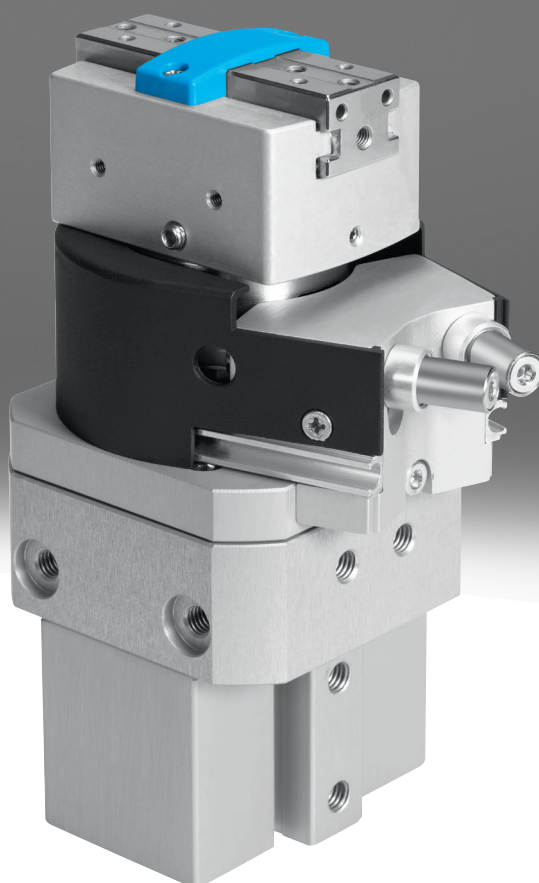


## Swivel/gripper unit HGDS

**FESTO**



## Characteristics

### At a glance

[Link](#)  hgds

- A combination of a parallel gripper with T-slot guide and a semi-rotary drive on the basis of semi-rotary drive DSM
- Infinitely adjustable swivel angle (max. 210°)
- Compressed air connections and position sensing outside the swivel range
- High performance (torque, mass moment of inertia)
- All connections are accessible from one side
- Compact design and low weight

This product is not designed for the following application examples:

- Machining
- Aggressive media
- Grinding dust
- Welding spatter

### Diagrams

[Link](#)  hgds

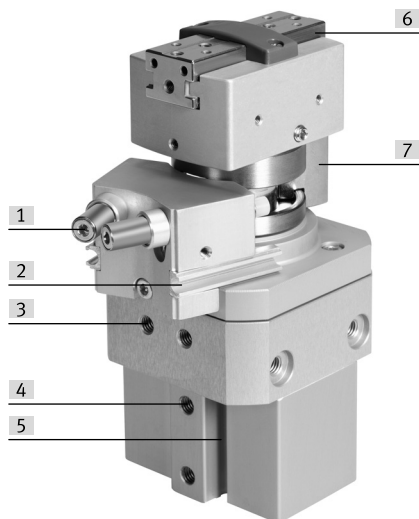

The diagrams shown in this document are also available online. These can be used to display precise values.

### Position sensing

[A] For proximity sensor

By using proximity switches, any position can be detected.

### Overview



[1] Three types of cushioning for swivel motion:

- Elastic cushioning components (P)
- Adjustable, elastic cushioning components with metal fixed stop (P1)
- Shock absorbers with metal fixed stop (YSRT)

[2] Slot for proximity switch for sensing the swivel position

[3] Supply port for swivel function

[4] Compressed air connection, gripping

[5] Slot for proximity switch for sensing the gripping position

[6] Gripper jaw with T-slot guide

[7] Adjustable stop cams for adjusting the swivel motion

## Type code

001	Series
HGDS	Swivel/gripper unit
002	Gripper version
P	Parallel gripper
003	Size [mm]
12	12
16	16
20	20

004	Cushioning
P	Elastic cushioning rings/plates on both sides
P1	Elastomer cushioning, adjustable on both sides, with fixed stop
YSRT	Linear shock absorber, self-adjusting at both ends
005	Position sensing
A	For proximity sensor
006	Generation
B	Series B

## Datasheet

General technical data			
Size	12	16	20
Stroke per gripper jaws	2.5 mm	4.5 mm	7 mm
Design	Semi-rotary drive With parallel gripper and gripper drive		
Mode of operation	Double-acting		
Pneumatic connection	M5		
Type of mounting	Either: Via female thread and centring sleeve Via through-hole and centring sleeve Via dovetail slot		
Cushioning	Elastic cushioning rings/plates on both sides Elastomer cushioning, adjustable on both sides, with fixed stop Linear shock absorber, self-adjusting at both ends		
Mounting position	optional		
Product weight	505 g	730 g	1,260 g

Technical data, swivelling									
Size	12			16			20		
Cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop
Rotation angle adjustment range	0 ... 210 deg								
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	0.85 Nm			1.25 Nm			2.5 Nm		
Repetition accuracy of swivel angle	0.2 deg	0.02 deg		0.2 deg	0.02 deg		0.2 deg	0.02 deg	
Max. swivel frequency at 0.6 MPa (6 bar, 87 psi)	2 Hz		1.5 Hz	2 Hz		1.5 Hz	2 Hz		1.5 Hz
Position detection, swivel drive	Via proximity switch								

Technical data, gripper									
Size	12			16			20		
Cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop
Gripper function	Parallel								
Number of gripper jaws	2								
Max. mass per external gripper finger <sup>1)</sup>	30 g			50 g			100 g		
Max. mass per external gripper finger, throttled	100 g		150 g	100 g		200 g	100 g		250 g
Max. gripper jaw backlash Sz	0.02 mm								
Max. angular gripper jaw backlash ax, ay	0.1 deg								
Repetition accuracy, gripper	0.01 mm						0.015 mm		
Max. operating frequency of gripper	4 Hz								
Position detection, gripper	Via proximity switch								

1) Applies to unthrottled operation

## Datasheet

### Operating and environmental conditions

Size	12	16	20
Operating pressure	3 ... 8 bar		
Operating medium	Compressed air to ISO 8573-1:2010 [7:4:4]		
Note on operating and pilot medium	Lubricated operation possible (in which case lubricated operation will always be required)		
Ambient temperature <sup>1)</sup>	5 ... 60°C		
Corrosion resistance class CRC <sup>2)</sup>	2 - Moderate corrosion stress		

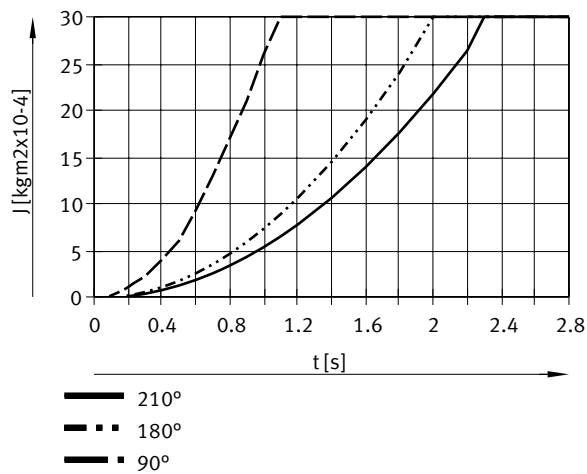
1) Note the application range of the proximity switches

2) More information [www.festo.com/x/topic/crc](http://www.festo.com/x/topic/crc)

### Materials

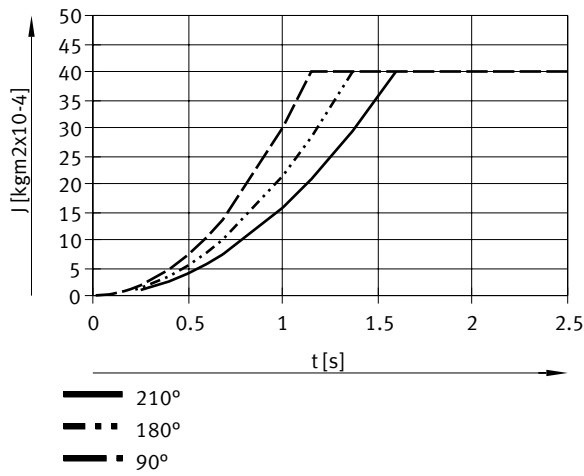
Size	12	16	20
Material housing	Wrought aluminium alloy		
Material cover	Aluminium POM		
Material gripper jaws	High-alloy stainless steel		
Material drive shaft	Steel		
Material seals	NBR		
Note on materials	RoHS-compliant		
LABS (PWIS) conformity	VDMA24364-B2-L		

### Mass moments of inertia J at 0.6 MPa (6 bar, 87 psi) as a function of swivel time t and the swivel angle – HGDS-PP-12-P-A-B

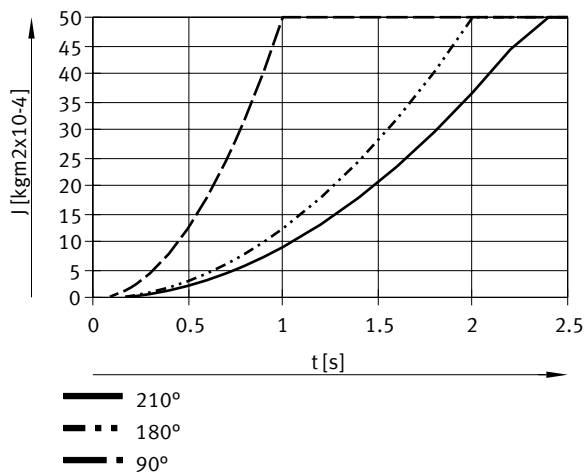


Datasheet

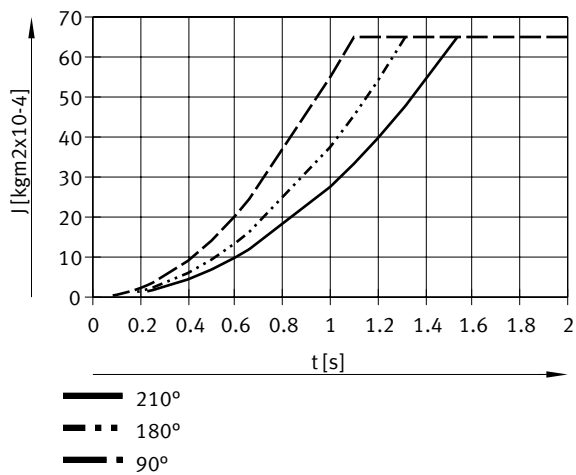
Mass moments of inertia J at 0.6 MPa (6 bar, 87 psi) as a function of swivel time t and the swivel angle – HGDS-PP-12-P1-A-B



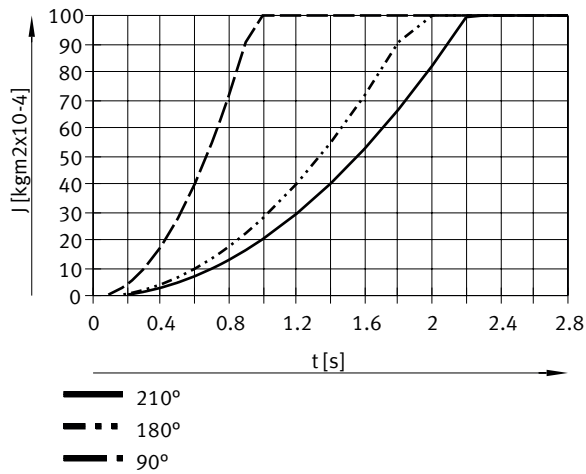
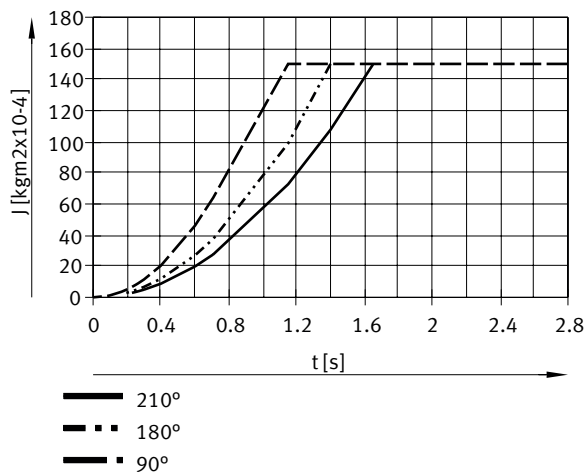
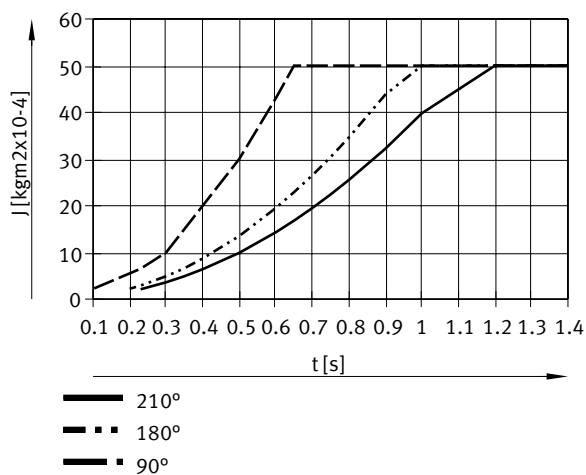
Mass moments of inertia J at 0.6 MPa (6 bar, 87 psi) as a function of the swivelling time t and the swivel angle – HGDS-PP-16-P-A-B



Mass moments of inertia J at 0.6 MPa (6 bar, 87 psi) as a function of the swivelling time t and the swivel angle – HGDS-PP-16-P1-A-B

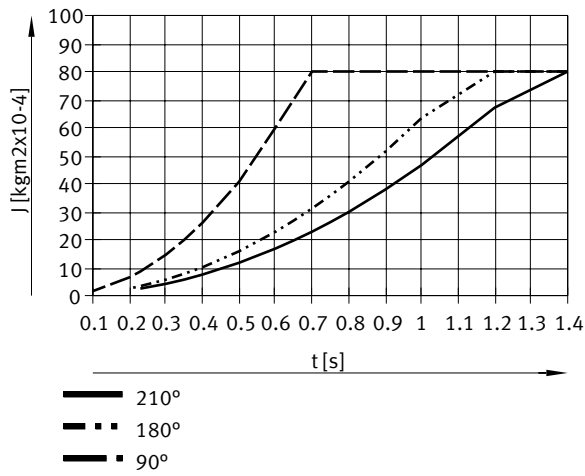


## Datasheet

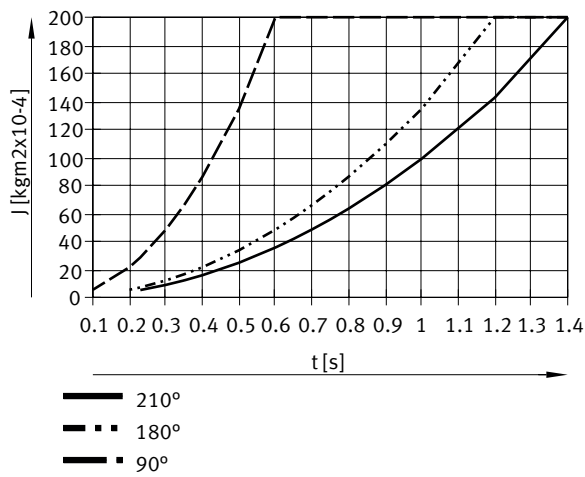
Mass moments of inertia  $J$  at 0.6 MPa (6 bar, 87 psi) as a function of swivel time  $t$  and the swivel angle – HGDS-PP-20-P-A-BMass moments of inertia  $J$  at 0.6 MPa (6 bar, 87 psi) as a function of swivel time and the swivel angle – HGDS-PP-20-P1-A-BMass moments of inertia  $J$  at 0.6 MPa (6 bar, 87 psi) as a function of swivel time  $t$  and the swivel angle – HGDS-PP-12-YSRT-A-B

Datasheet

Mass moments of inertia J at 0.6 MPa (6 bar, 87 psi) as a function of swivel time t and the swivel angle – HGDS-PP-16-YSRT-A-B



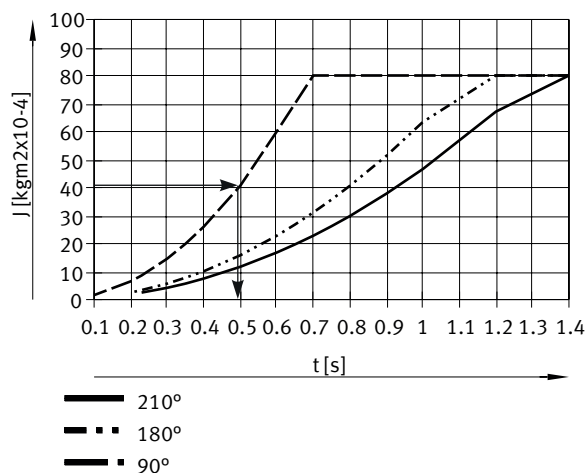
Mass moments of inertia J at 0.6 MPa (6 bar, 87 psi) as a function of the swivel time t and the swivel angle – HGDS-PP-20-YSRT-A-B





## Datasheet

### Dependence between operating pressure and swivelling time



Reducing the operating pressure reduces the gripping force.

To prevent the gripper from opening its gripper jaws when swivelling, the swivelling time must be increased by 15% per bar of operating pressure for the same mass moment of inertia.

Example:

Where:

- HGDS-PP-16-YSRT-A-B
- Operating pressure 0.6 MPa (6 bar, 87 psi)
- Swivel angle 90°
- $J = 40 \text{ kgm}^2 \times 10^{-4}$

To be determined:

- Swivelling time at an operating pressure of 4 bar

Swivelling time at 6 bar = 0.5 s (see diagram on the left)

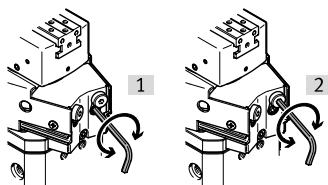
Swivelling time at 4 bar:

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

Cushioning time of the shock absorber = 0.1 s

This results in a total swivelling time of  $t_{tot.} = 0.65 \text{ s} + 0.1 \text{ s} = 0.75 \text{ s}$

### Precision adjustment of the swivel angle



[1] Loosen the counter screw underneath the cushioning component.

[2] Adjust the cushioning component as required. Observe the adjustment range.

The swivel angle can be roughly adjusted by moving the stop cams.

The fine adjustment is identical 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.

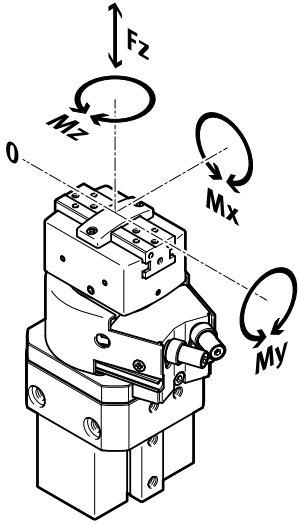
Size	12			16			20		
Cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends with fixed stop	Shock absorber at both ends, self-adjusting, with metal fixed stop
Fine adjustment of swivel drive	-6 deg		-2.5 deg	-6 deg		-2.5 deg	-6 deg		-2.5 deg
Cushioning adjustment range	2 mm		1 mm	2.6 mm		1.3 mm	2.8 mm		1.4 mm

### Measured gripping force with a lever arm of 25 mm

Size	12	16	20
Total gripping force, closing, 0.6 MPa (6 bar, 87 psi)	74 N	102 N	168 N
Total gripping force, opening, 0.6 MPa (6 bar, 87 psi)	84 N	116 N	192 N
Gripper force per gripper jaw, closing, 0.6 MPa (6 bar, 87 psi)	37 N	51 N	84 N
Gripper force per gripper jaw, opening, 0.6 MPa (6 bar, 87 psi)	42 N	58 N	96 N

## Datasheet

### Characteristic load values on the gripper jaws



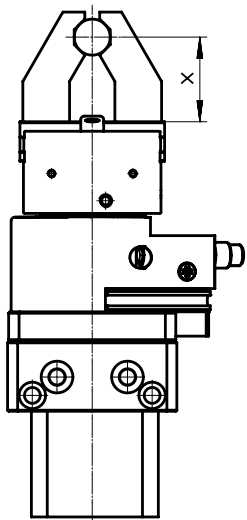
The indicated permissible forces and torques refer to one gripper jaw. They include the lever arm, additional applied loads created by the workpiece or by external gripper fingers and acceleration forces occurring during the movement. The zero coordinate line (guide of the gripper jaws) must be taken into account when calculating the torques.

Collisions of the slides must be avoided. In the event of a collision, the slides can get damaged.

More information → User documentation

Size	12	16	20
Max. force on gripper jaw $F_z$ static	90 N	150 N	250 N
Max. torque at gripper $M_x$ static	6 Nm	11 Nm	22 Nm
Max. torque at gripper $M_y$ static	6 Nm	11 Nm	22 Nm
Max. torque at gripper $M_z$ static	6 Nm	11 Nm	22 Nm

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

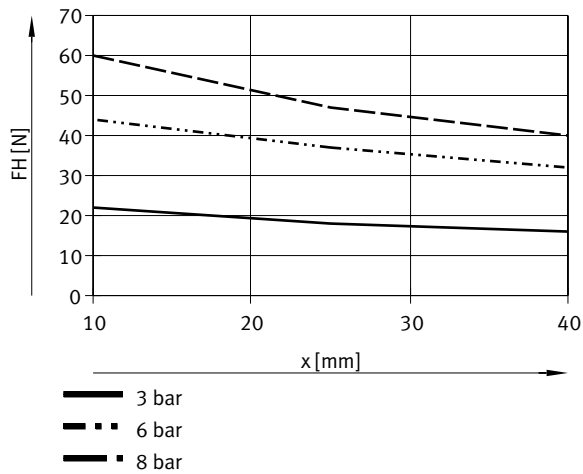


The gripping forces as a function of operating pressure and lever arm can be determined using the following graphs.

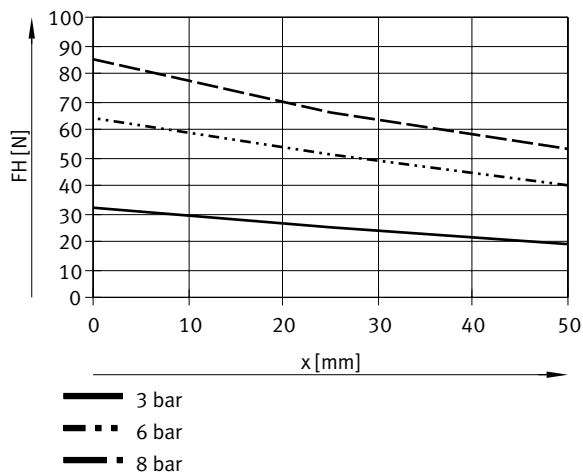
The gripping torque is not constant across the opening angle.

## Datasheet

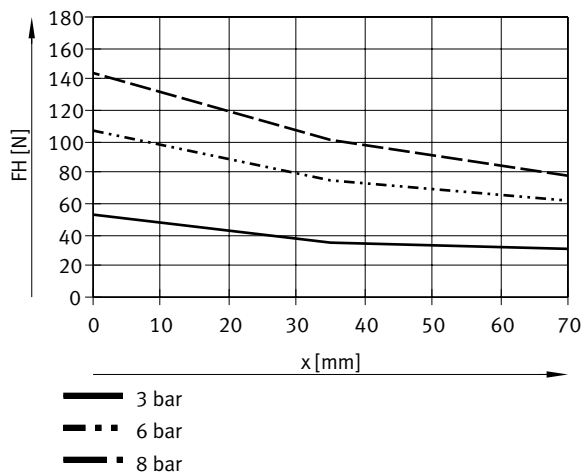
Gripping force FH per gripper jaw as a function of operating pressure p (closing) – HGDS-12



Gripping force FH per gripper jaw as a function of operating pressure p (closing) – HGDS-16

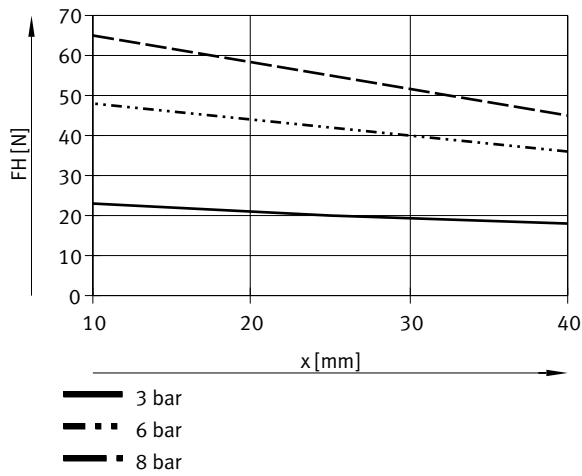


Gripping force FH per gripper jaw as a function of operating pressure p (closing) – HGDS-20

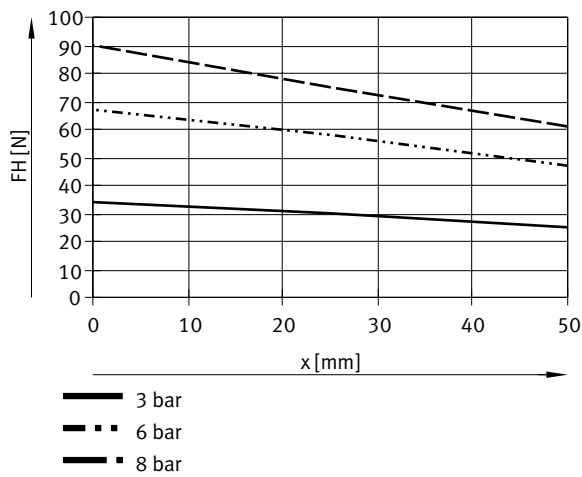


Datasheet

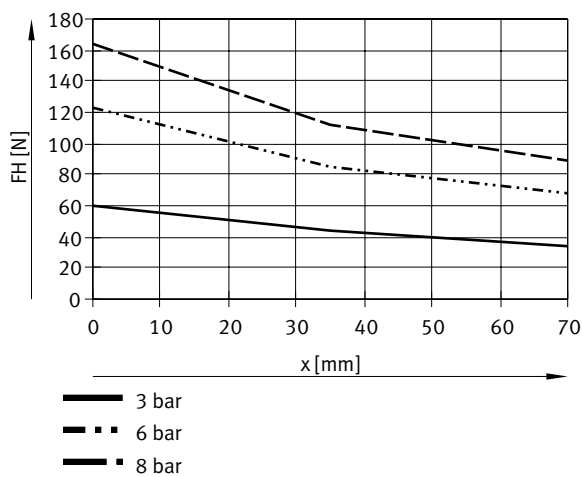
Gripping force FH per gripper jaw as a function of operating pressure p (opening) – HGDS-12



Gripping force FH per gripper jaw as a function of operating pressure p (opening) – HGDS-16

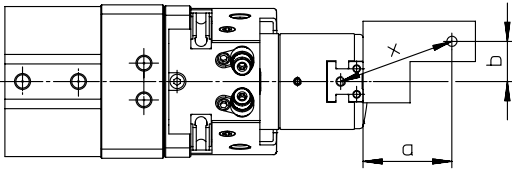


Gripping force FH per gripper jaw as a function of operating pressure p (opening) – HGDS-20



## Datasheet

## Gripping force FH per gripper jaw at 0.6 MPa (6 bar, 87 psi) as a function of lever arm x and eccentricity a and b



## Gripping force FH per gripper jaw at 0.6 MPa (6 bar, 87 psi) as a function of lever arm x and eccentricity a and b

$$x = \sqrt{a^2 + b^2} = \sqrt{25^2 + 20^2} = 32 \text{ mm}$$

The formula (on the left) must be used to calculate the lever arm  $x$  for eccentric gripping.

The gripping force  $F_H$  can then be read from the graphs using the calculated value  $x$ .

Calculation example:

Where:

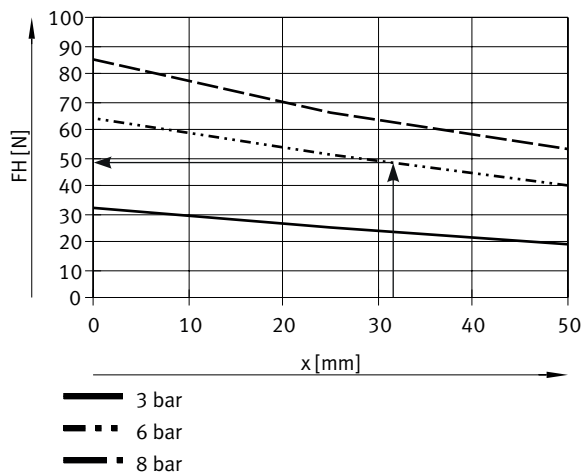
Distance  $a = 25 \text{ mm}$

Distance  $b = 20 \text{ mm}$

To be determined:

The gripping force at 0.6 MPa (6 bar, 87 psi), with an HGDS-16, used as an external gripper.

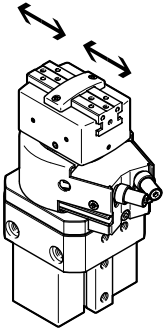
## Gripping force FH per gripper jaw at 0.6 MPa (6 bar, 87 psi) as a function of lever arm x and eccentricity a and b



The graph gives a value of  $F_H = 47 \text{ N}$  for the gripping force.

## Datasheet

### Opening and closing times



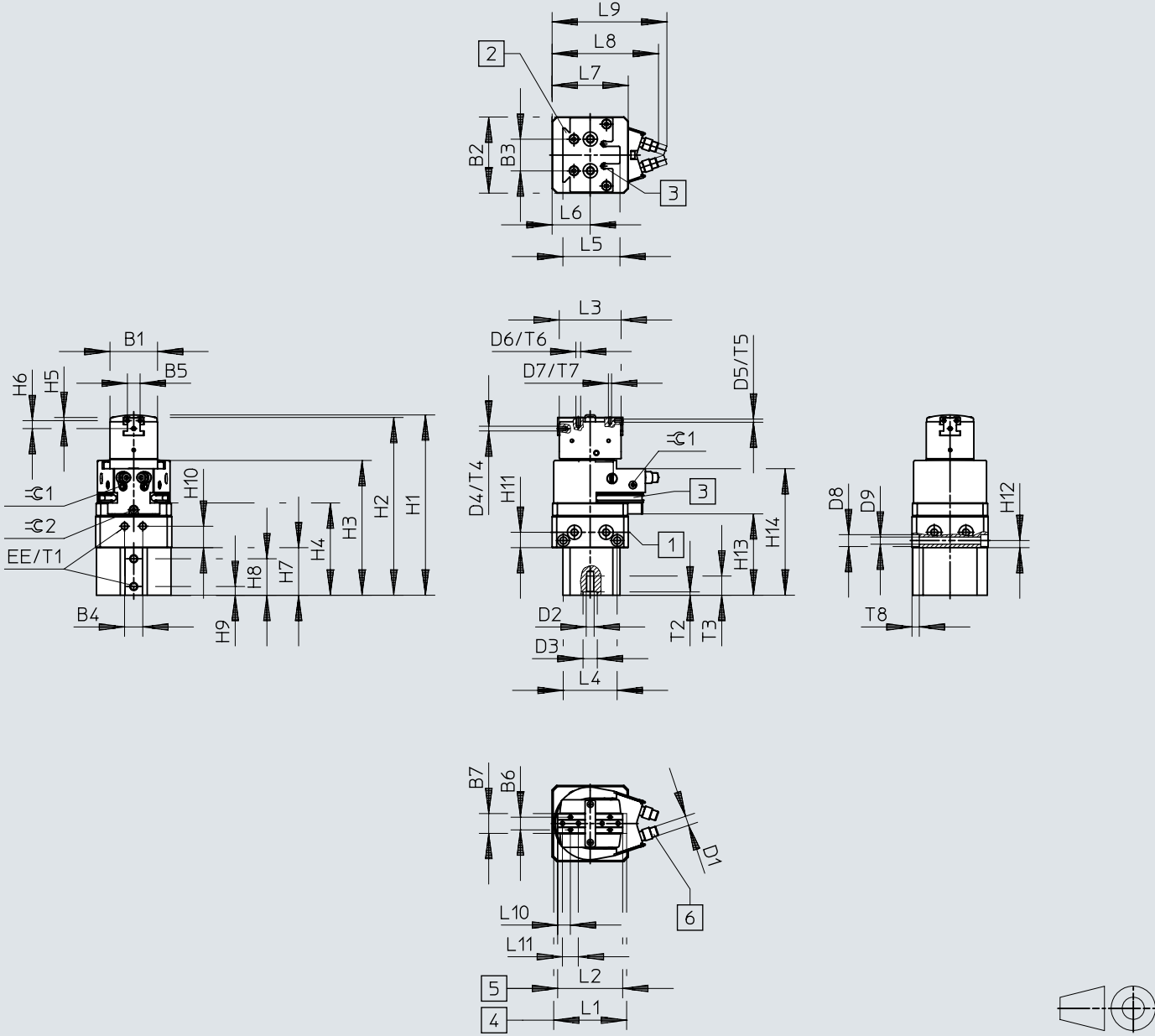
The indicated opening and closing times [ms] were measured at room temperature, 0.6 MPa (6 bar, 87 psi) operating pressure and with the gripper installed horizontally without additional gripper fingers. The grippers must be throttled for higher masses [g]. Opening and closing times must then be adjusted accordingly.

Size	12	16	20
Min. opening time at 0.6 MPa (6 bar, 87 psi)	40 ms		60 ms
Min. closing time at 0.6 MPa (6 bar, 87 psi)	60 ms		70 ms

Dimensions

Dimensions – Swivel/gripper units HGDS

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



- [1] Cross-section through mounting holes
- [2] For dovetail connection with HAVB-3
- [3] Sensor slot for SME-/SMT-10
- [4] Gripper jaws open
- [5] Gripper jaws closed
- [6] Cushioning



## Dimensions

	B1	B2 ±0,03	B3 ±0,02	B4	B5 ±0,02	B6 ±0,02	B7 ±0,1	D1	D2	D3 ∅ H7	D4
HGDS-B-12	30	48	20	11,5	8	8	12,5	M6x0,5	M5	9	M3
HGDS-B-16	34	55	30	13	10	10	16	M8x1	M5	9	M3
HGDS-B-20	40	67,4	30	16	12	12	20	M10x1	M5	9	M4

	D5 ∅ H8	D6	D7 ∅ H8	D8 ∅ H13	D9 ∅ H13	EE	H1 +1/-0,6	H2 +0,8/-0,4	H3 +1,3/-0,2	H4 +0,8/-0,2	H5 ±0,02
HGDS-B-12	2	M3	2	7,5	4,5	M5	113,4	111,9	85	58,2	2
HGDS-B-16	2	M3	2	-	4,2	M5	121,7	120,1	92,3	64,3	3
HGDS-B-20	2,5	M4	2,5	-	4,2	M5	154,8	152,8	112,3	81,7	3

	H6 ±0,12	H7 ±0,1	H8 ±0,1	H9	H10	H11 -0,1	H12	H13 +1/-0,2	H14 +1/-0,2	L1 ±0,5	L2 ±0,5
HGDS-B-12	5	30	23	7,5	13,5	9,7	4,5	51,3	79,8	46	41
HGDS-B-16	5	34,5	26	6,3	14	8	-	58,2	86,7	58	49
HGDS-B-20	7	43	34,6	5,3	19	9	-	73,1	105,6	78	64

	L3 ±0,5	L4 ±0,1	L5	L6 ±0,05	L7 ±0,03	L8 ±1 P	L9 ±1		L10 ±0,02	L11
							P1	YSRT		
HGDS-B-12	39	34	36	24	48	67	72,4	72,4	8	10
HGDS-B-16	47	-	40,5	27,5	55	80,2	81,6	81,6	8	10
HGDS-B-20	61	-	40,5	34	67,4	93,3	97	97	12	14

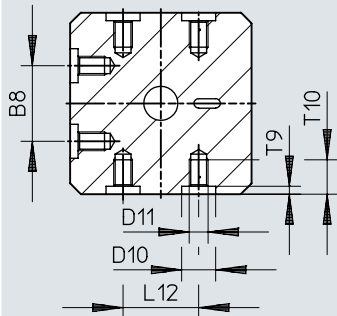
  

	T1 min.	T2 +0,1	T3	T4 ±0,4	T5 max.	T6 min.	T7 max.	T8	∅ 1	∅ 2
HGDS-B-12	5,3	2,1	12,1	6	5	3,5	6	4,6	2	2
HGDS-B-16	5	2,1	12,1	6	6	4,5	6	-	2,5	2,5
HGDS-B-20	6	2,1	12,1	9	8	6	7,5	-	3	2,5



## Dimensions

## Dimensions – Swivel/gripper units HGDS-12 – cut at [1]

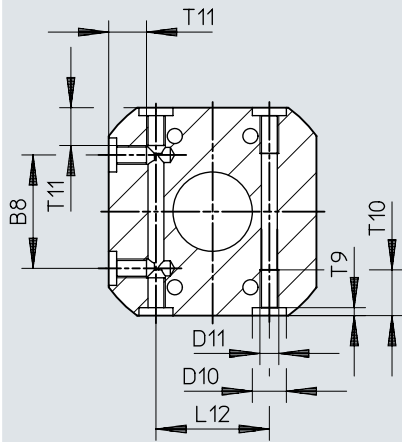
Download CAD data [www.festo.com](http://www.festo.com)

	B8 <sup>1)</sup>	D10 ∅ H7	D11	L12 <sup>1)</sup>	T9 +0,1	T10
HGDS-B-12	20	9	M5	20	2,1	10

1) Tolerance for centring hole ∅9 H7, tolerance for thread M5 ±0.1 mm

## Dimensions

Dimensions – Swivel/gripper units HGDS-16 – cut at [1]

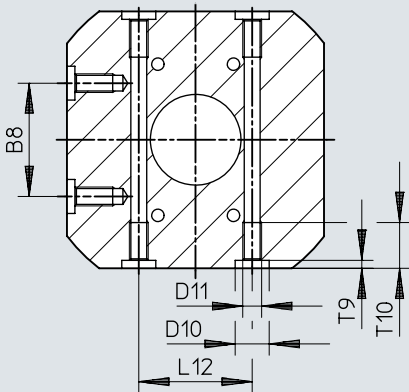
Download CAD data [www.festo.com](http://www.festo.com)

	B8 <sup>1)</sup>	D10 ∅ H7	D11	L12 <sup>1)</sup>	T9 +0,1	T10	T11
HGDS-B-16	30	9	M5	30	2,1	12,1	10

1) Tolerance for centring hole  $\varnothing 9$  H7, tolerance for thread M5  $\pm 0.1$  mm

## Dimensions

Dimensions – Swivel/gripper units HGDS-20 – cut at [1]

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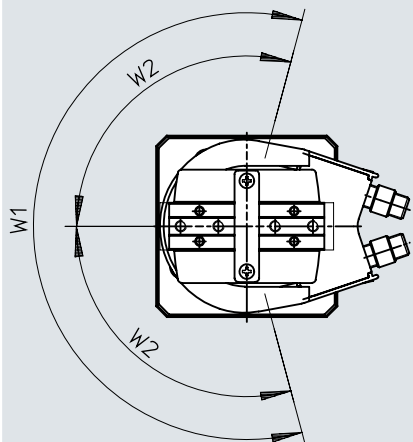
	B8 <sup>1)</sup>	D10 ∅ H7	D11	L12 <sup>1)</sup>	T9 +0,1	T10
HGDS-B-20	30	9	M5	30	2,1	12,1

1) Tolerance for centring hole  $\varnothing 9$  H7, tolerance for thread M5  $\pm 0.1$  mm

## Dimensions

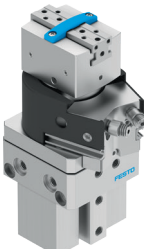
Dimensions – Swivel/gripper units HGDS – swivel angle

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

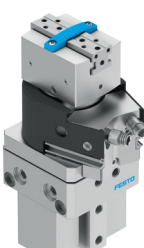


	W1	W2
HGDS-B-12	210°	105°
HGDS-B-16	210°	105°
HGDS-B-20	210°	105°

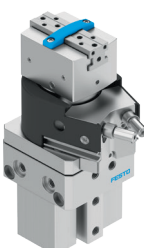
## Ordering data

With cushioning P						
	Cushioning	Size <sup>1)</sup>	Stroke per gripper jaws	Product weight	Part no.	Type
	Elastic cushioning rings/plates on both sides	12	2.5 mm	505 g	<b>1187955</b>	<b>HGDS-PP-12-P-A-B</b>
		16	4.5 mm	730 g	<b>1187958</b>	<b>HGDS-PP-16-P-A-B</b>
		20	7 mm	1,260 g	<b>1187961</b>	<b>HGDS-PP-20-P-A-B</b>

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

With cushioning P1						
	Cushioning	Size <sup>1)</sup>	Stroke per gripper jaws	Product weight	Part no.	Type
	Elastomer cushioning, adjustable on both sides, with fixed stop	12	2.5 mm	505 g	<b>1187956</b>	<b>HGDS-PP-12-P1-A-B</b>
		16	4.5 mm	730 g	<b>1187959</b>	<b>HGDS-PP-16-P1-A-B</b>
		20	7 mm	1,260 g	<b>1187962</b>	<b>HGDS-PP-20-P1-A-B</b>

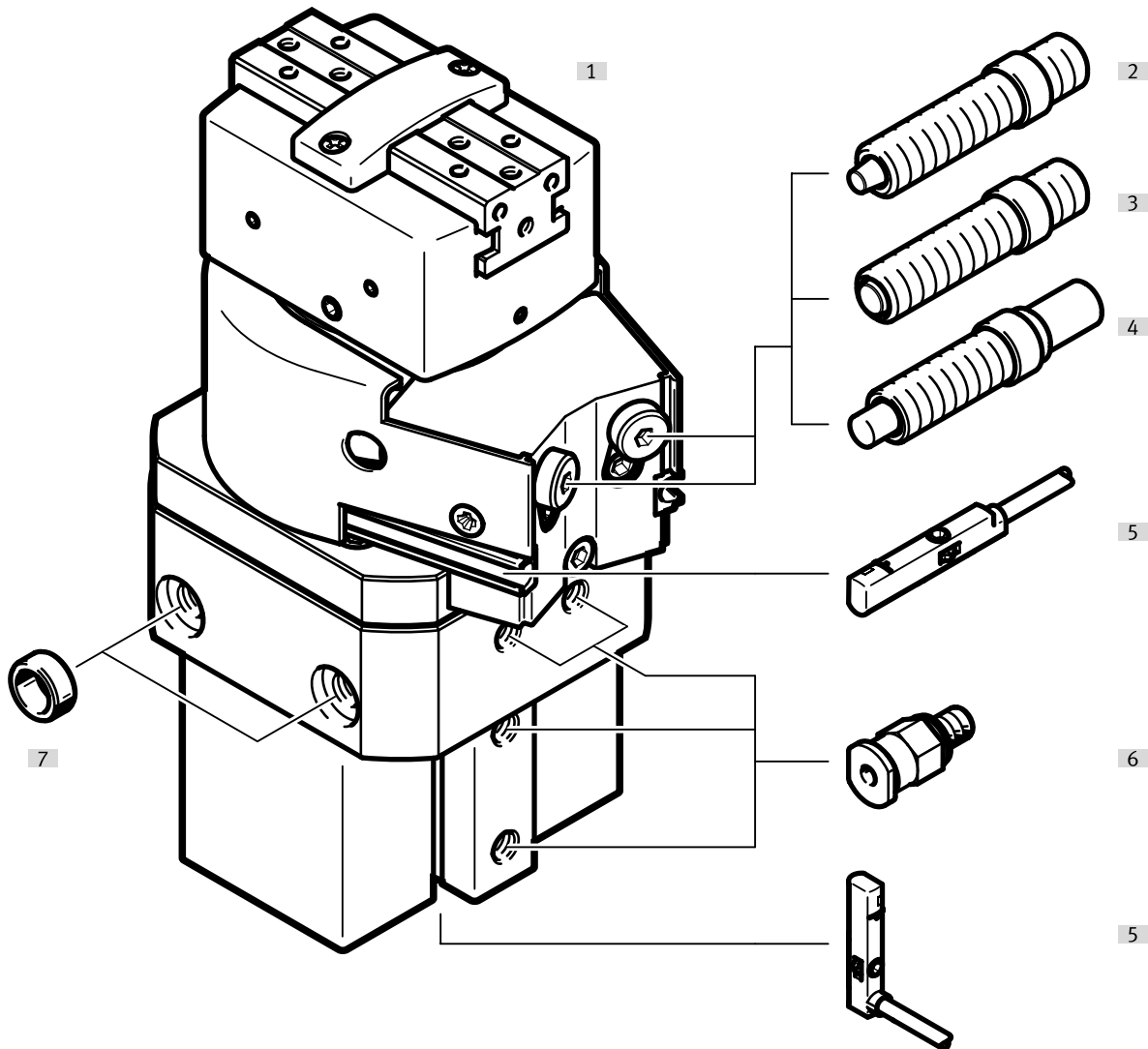
1) Two centring sleeves are included in the scope of delivery of the swivel/gripper unit.

With cushioning YSRT						
	Cushioning	Size <sup>1)</sup>	Stroke per gripper jaws	Product weight	Part no.	Type
	Linear shock absorber, self-adjusting at both ends	12	2.5 mm	505 g	<b>1187957</b>	<b>HGDS-PP-12-YSRT-A-B</b>
		16	4.5 mm	730 g	<b>1187960</b>	<b>HGDS-PP-16-YSRT-A-B</b>
		20	7 mm	1,260 g	<b>1187963</b>	<b>HGDS-PP-20-YSRT-A-B</b>

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


Peripherals

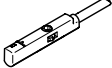
Peripherals overview

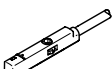


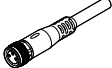
Accessories			→ Link
Type/order code	Description		
[1] Swivel/gripper unit HGDS	A combination of a parallel gripper with T-slot guide and a swivel module on the basis of the swivel module DSM		<a href="#">hgds</a>
[2] Cushioning P	Elastic cushioning components on both sides		<a href="#">hgds</a>
[3] Cushioning P1	Elastic cushioning components on both sides, adjustable, with metal fixed stop		<a href="#">hgds</a>
[4] Cushioning YSRT	Shock absorber on both sides, self-adjusting, with metal fixed stop		<a href="#">hgds</a>
[5] Proximity switch SME/SMT-10	For sensing the gripping and swivel position		<a href="#">23</a>
[6] Push-in fitting QS	For connecting tubing with standard O.D.		<a href="#">qs</a>
[7] Centring sleeve ZBH	For centring the gripper while mounting (2 are included in the scope of delivery)		<a href="#">23</a>
[8] Adapter kit HMSV	Drive/gripper connections		<a href="#">hmsv</a>

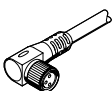
## Accessories

Centring sleeve ZBH-9						
	Description	Material sleeve	Size of pack	Product weight	Part no.	Type
	For sizes 12, 16, 20	Steel	10	2 g	8137184	ZBH-9-B

Proximity switch SMT-10M for round slot, magneto-resistive <span style="float: right;">Link <a href="#">smt</a></span>						
	Type of mounting	Switching output	Electrical connection	Cable length	Part no.	Type
	Screw-clamped, Insertable in the slot from above	3-wire PNP N/O contact	Open end	2.5 m	551374	SMT-10M-PS-24V-E-2,5-Q-OE
					★ 551373	SMT-10M-PS-24V-E-2,5-L-OE
		Plug M8, A-coded	0.3 m	★ 551375	SMT-10M-PS-24V-E-0,3-L-M8D	
				551376	SMT-10M-PS-24V-E-0,3-Q-M8D	

Proximity switch SME-10M for round slot, magnetic reed <span style="float: right;">Link <a href="#">sme</a></span>						
	Type of mounting	Switching output	Electrical connection	Cable length	Part no.	Type
	Screw-clamped, Insertable in the slot from above	3-wire N/O contact	Open end	2.5 m	551365	SME-10M-DS-24V-E-2,5-L-OE
					551366	SME-10M-DS-24V-E-2,5-Q-OE
		Plug M8, A-coded	0.3 m	551367	SME-10M-DS-24V-E-0,3-L-M8D	
				551368	SME-10M-DS-24V-E-0,3-Q-M8D	
		2-wire PNP N/O contact	Open end	2.5 m	551369	SME-10M-ZS-24V-E-2,5-L-OE
				551370	SME-10M-ZS-24V-E-2,5-Q-OE	

Connecting cables NEBU, straight						
	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	3	2.5 m	541333	NEBU-M8G3-K-2.5-LE3
				5 m	541334	NEBU-M8G3-K-5-LE3

Connecting cables NEBU, angled						
	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	3	2.5 m	541338	NEBU-M8W3-K-2.5-LE3
				5 m	541341	NEBU-M8W3-K-5-LE3