

## Swivel/gripper units HGDS

**FESTO**



# Swivel/gripper units HGDS

Key features

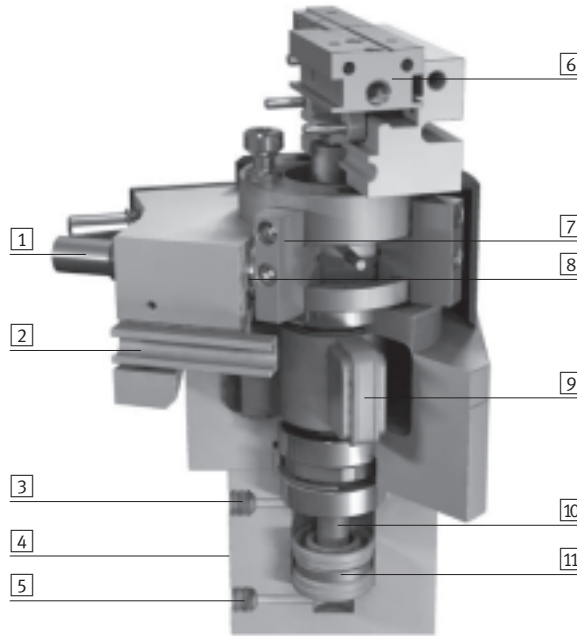
FESTO

## 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.

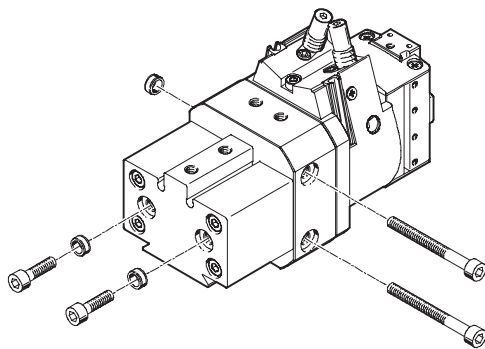
The swivel motion takes place via a swivel drive. It can be adjusted almost infinitely via 2 stops (max. 210°). The rotary motion is cushioned either via a flexible cushioning buffer or a hydraulic shock absorber. The swivel angle can be finely adjusted by means of a precision adjustment facility.



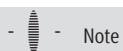
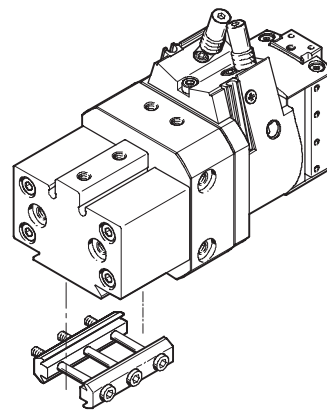
- 1 Flexible cushioning or hydraulic shock absorbers
- 2 Slot for proximity sensor SME/SMT-10 for sensing the swivel position
- 3 Gripper compressed air connection, closing
- 4 Slot for proximity sensor SME/SMT-10 for sensing the gripper position
- 5 Gripper compressed air connection, opening
- 6 Gripper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

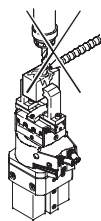


### Dovetail connection

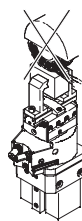


Note

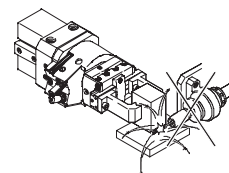
Swivel/gripper units are not suitable for the following or similar applications:



- Machining
- Aggressive media



- Grinding dust



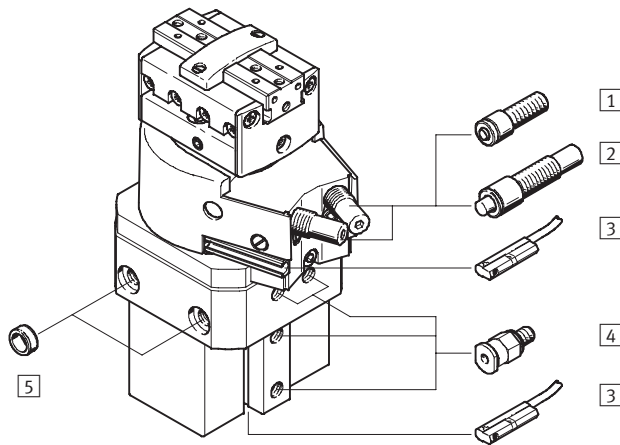
- Welding spatter

# Swivel/gripper units HGDS

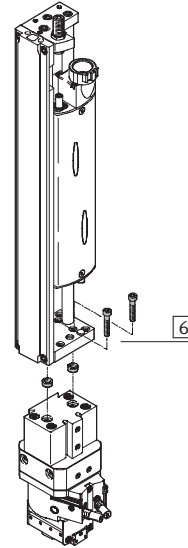
Peripherals overview and type codes

FESTO

## 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
<b>Type</b>										
HGDS	Swivel/gripper unit									
<b>Gripper function</b>										
PP	Parallel gripping									
<b>Size</b>										
<b>Cushioning</b>										
P	Flexible cushioning									
YSRT	Hydraulic cushioning									
<b>Position sensing</b>										
A	For proximity sensing									

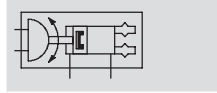
# Swivel/gripper units HGDS

Technical data

FESTO

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 <sup>1)</sup> [°C]	+5 ... +60		
Corrosion resistance class CRC <sup>2)</sup>	2		

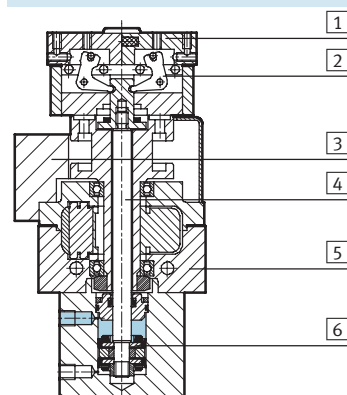
1) Note operating range of proximity sensors

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

Components 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

FESTO

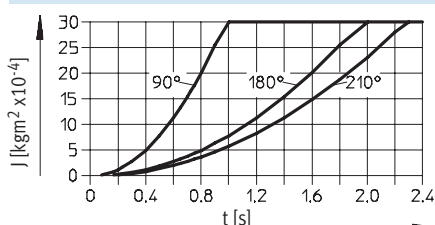
## Technical data – Swivelling

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

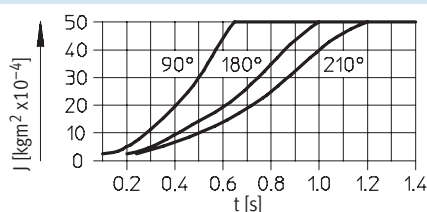
1) At 6 bar

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

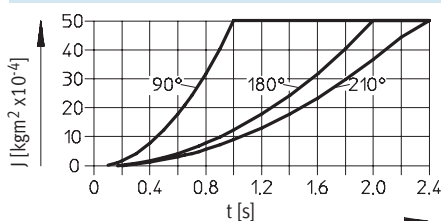
HGDS-PP-12-P-A



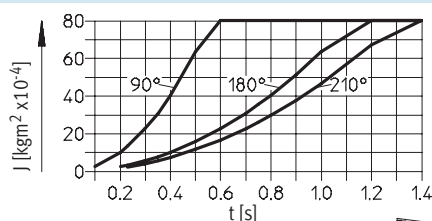
HGDS-PP-12-YSRT-A



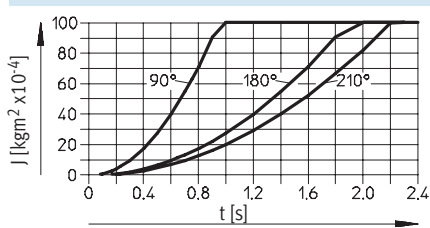
HGDS-PP-16-P-A



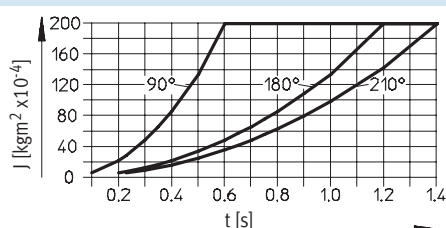
HGDS-PP-16-YSRT-A



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:

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

Operating pressure 4 bar  
(gripper drive)

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

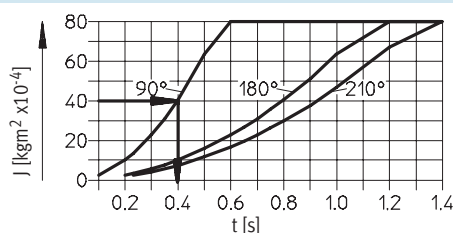
This yields a swivel time at 4 bar:

$t = 0.4 + 2 \times 15\% = 0.52 \text{ s}$

Cushioning time of the shock absorber = 0.1 s

This yields a swivel time of

$t_{\text{tot.}} = 0.52 \text{ s} + 0.1 \text{ s} = 0.62 \text{ s}$



# Swivel/gripper units HGDS

Technical data

FESTO

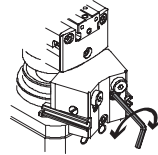
## Precision adjustment of the swivel angle

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

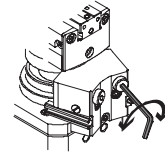
Variants P and YSRT differ in only one component. The retainer and the fine

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

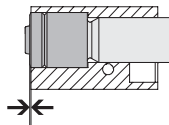


- 2) Adjust the cushioning element as required. Observe the minimum and maximum settings.

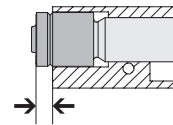


Size	12	16	20
Precision adjustment range	P cushioning [°] -6		
	YSRT cushioning [°] -2.5		
Swivel angle adjuster per revolution	3.1	2.8	2.2

Min. setting range, to the inner stop



Max. setting range, to the notch



# Swivel/gripper units HGDS

Technical data

FESTO

## Technical data – Gripping

Size	12	16	20
Gripper function	Parallel		
Number of gripper fingers	2		
Max. weight force 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		
Max. gripper jaw angular backlash [°]	0		
Repetition accuracy [mm]	< 0.02		
Max. operating frequency [Hz]	4		
Position sensing	Via proximity sensor		

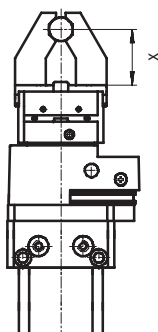
1) Valid for unthrottled operation

## 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.

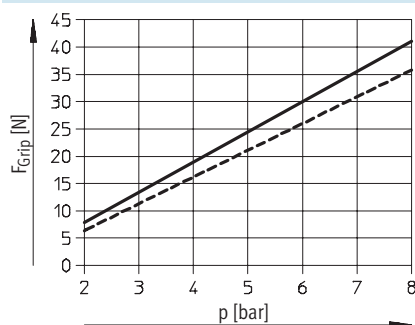


Note

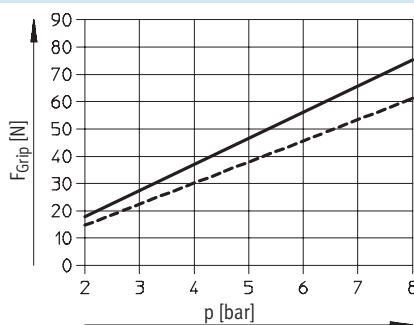
The gripping force is practically independent of the lever arm. Fluctuation at max. lever arm and max. operating pressure approx. 10%.

for unthrottled operation:

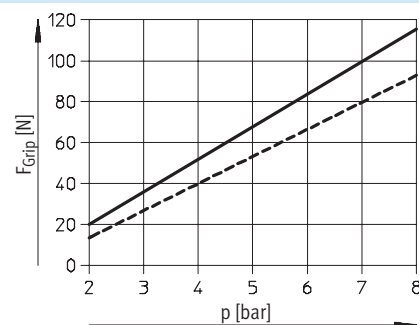
HGDS-12 (max. lever arm x 40 mm)



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



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



— Opening  
- - - Closing

# Swivel/gripper units HGDS

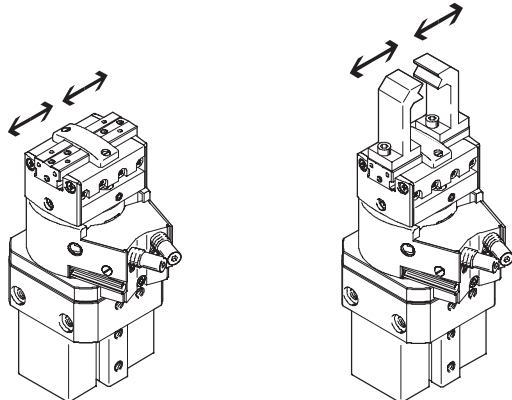
Technical data

FESTO

## 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.

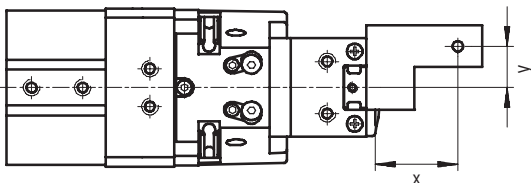
## with additional gripper fingers as a function of weight force

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.

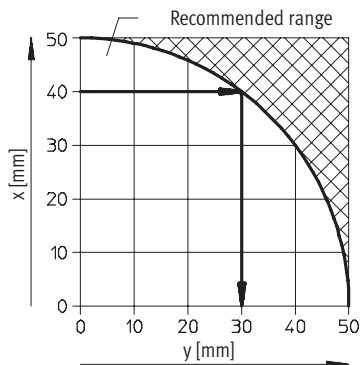
## Calculation example

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

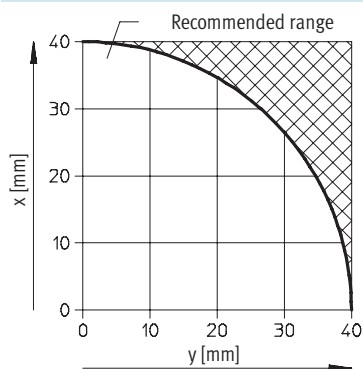
Technical data

FESTO

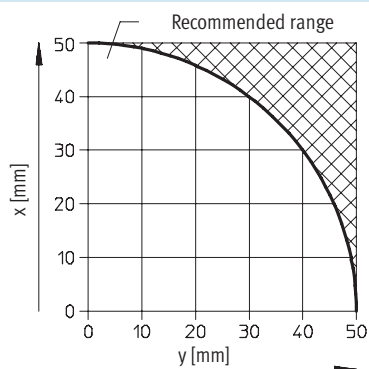
## Eccentricity $y$ as a function of lever arm $x$

for unthrottled operation:

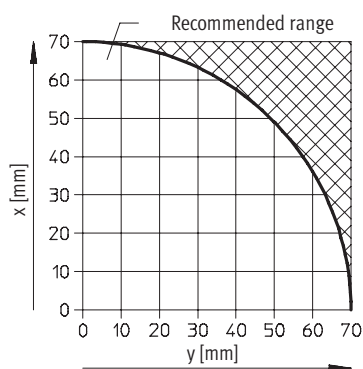
HGDS-12 (max. lever arm 40 mm)



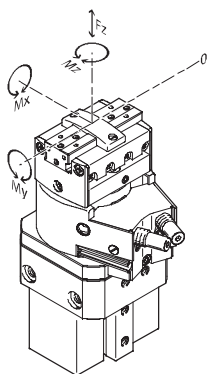
HGDS-16 (max. lever arm 50 mm)



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.

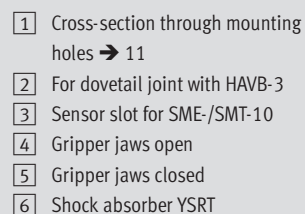
The zero coordinate line (gripper finger guide) must be taken into consideration for the calculation of torques.

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

### Technical data

**FESTO**

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



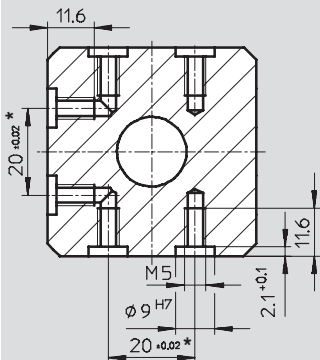
# Swivel/gripper units HGDS

Technical data

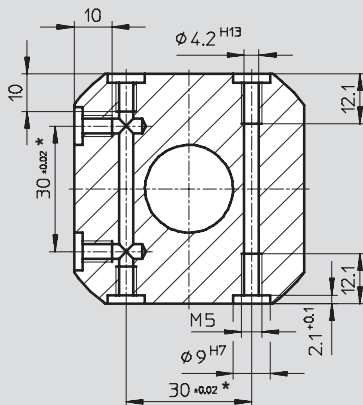
FESTO

Cross-section at 1 → 10

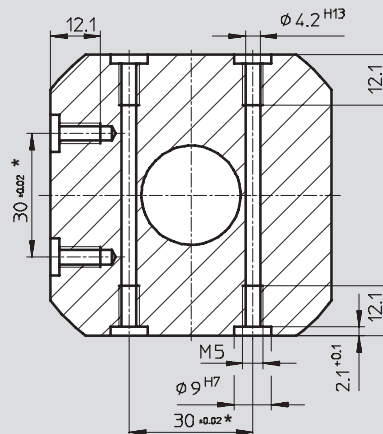
Size 12



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		Ø H13	Ø H13		Ø 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]	Ø 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

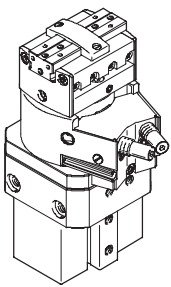
Size	L7	L8		L9	L10	T1	T4	T5	T6	T7
[mm]	±0.03	±1		±0.02			min.			min.
		P	YSRT							
12	48	59.5	69.3	8	10	4.6	5	5	4	5
16	55	68.5	80.5	8	10	–	6.5	6	5	5
20	68	85.4	96.4	12	14	–	10	8	7	7

\* Tolerance valid for centring hole Ø 9<sup>H7</sup>


# Swivel/gripper units HGDS

Technical data and accessories

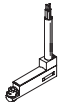
**FESTO**

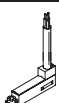
Ordering data				
	Size	With flexible P cushioning		With hydraulic YSRT cushioning
	[mm]	Part No.	Type	Shock absorber Part No. Type
	12	534 278	HGDS-PP-12-P-A <sup>1)</sup>	534 279 HGDS-PP-12-YSRT-A <sup>1)</sup>
	16	534 280	HGDS-PP-16-P-A <sup>1)</sup>	534 281 HGDS-PP-16-YSRT-A <sup>1)</sup>
	20	534 282	HGDS-PP-20-P-A <sup>1)</sup>	534 283 HGDS-PP-20-YSRT-A <sup>1)</sup>

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 <sup>1)</sup>
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, 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 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, 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

FESTO

### 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

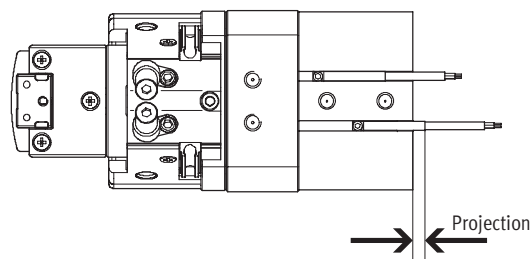
HGDS-PP-20: 4,4 mm

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, 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, 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 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, 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 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

## Product Range and Company Overview

### A Complete Suite of Automation Services

Our experienced engineers provide complete support at every stage of your development process, including: conceptualization, analysis, engineering, design, assembly, documentation, validation, and production.



**Custom Automation Components**  
Complete custom engineered solutions



**Custom Control Cabinets**  
Comprehensive engineering support and on-site services



**Complete Systems**  
Shipment, stocking and storage services

### The Broadest Range of Automation Components

With a comprehensive line of more than 30,000 automation components, Festo is capable of solving the most complex automation requirements.



**Electromechanical**  
Electromechanical actuators, motors, controllers & drives



**Pneumatics**  
Pneumatic linear and rotary actuators, valves, and air supply



**PLCs and I/O Devices**  
PLC's, operator interfaces, sensors and I/O devices

### Supporting Advanced Automation... As No One Else Can!

Festo is a leading global manufacturer of pneumatic and electromechanical systems, components and controls for industrial automation, with more than 12,000 employees in 56 national headquarters serving more than 180 countries. For more than 80 years, Festo has continuously elevated the state of manufacturing with innovations and optimized motion control solutions that deliver higher performing, more profitable automated manufacturing and processing equipment. Our dedication to the advancement of automation extends beyond technology to the education and development of current and future automation and robotics designers with simulation tools, teaching programs, and on-site services.

### Quality Assurance, ISO 9001 and ISO 14001 Certifications

Festo Corporation is committed to supply all Festo products and services that will meet or exceed our customers' requirements in product quality, delivery, customer service and satisfaction.

To meet this commitment, we strive to ensure a consistent, integrated, and systematic approach to management that will meet or exceed the requirements of the ISO 9001 standard for Quality Management and the ISO 14001 standard for Environmental Management.



© Copyright 2008, Festo Corporation. While every effort is made to ensure that all dimensions and specifications are correct, Festo cannot guarantee that publications are completely free of any error, in particular typing or printing errors. Accordingly, Festo cannot be held responsible for the same. For Liability and Warranty conditions, refer to our "Terms and Conditions of Sale", available from your local Festo office. All rights reserved. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, electronic, mechanical, photocopying or otherwise, without the prior written permission of Festo. All technical data subject to change according to technical update.



Printed on recycled paper at New Horizon Graphic, Inc., FSC certified as an environmentally friendly printing plant.

# Festo North America

## Festo Regional Contact Center

5300 Explorer Drive  
Mississauga, Ontario L4W 5G4  
Canada

### USA Customers:

For ordering assistance,

**Call:** 1.800.99.FESTO (1.800.993.3786)

**Fax:** 1.800.96.FESTO (1.800.963.3786)

**Email:** [customer.service@us.festo.com](mailto:customer.service@us.festo.com)

For technical support,

**Call:** 1.866.GO.FESTO (1.866.463.3786)

**Fax:** 1.800.96.FESTO (1.800.963.3786)

**Email:** [product.support@us.festo.com](mailto:product.support@us.festo.com)

### Canadian Customers:

**Call:** 1.877.GO.FESTO (1.877.463.3786)

**Fax:** 1.877.FX.FESTO (1.877.393.3786)

**Email:** [festo.canada@ca.festo.com](mailto:festo.canada@ca.festo.com)

## USA Headquarters

Festo Corporation  
395 Moreland Road  
P.O. Box 18023  
Hauppauge, NY 11788, USA  
[www.festo.com/us](http://www.festo.com/us)

## USA Sales Offices

### Appleton

North 922 Tower View Drive, Suite N  
Greenville, WI 54942, USA

### Boston

120 Presidential Way, Suite 330  
Woburn, MA 01801, USA

### Chicago

1441 East Business Center Drive  
Mt. Prospect, IL 60056, USA

### Dallas

1825 Lakeway Drive, Suite 600  
Lewisville, TX 75057, USA

### Detroit – Automotive Engineering Center

2601 Cambridge Court, Suite 320  
Auburn Hills, MI 48326, USA

### New York

395 Moreland Road  
Hauppauge, NY 11788, USA

### Silicon Valley

4935 Southfront Road, Suite F  
Livermore, CA 94550, USA

## United States



**USA Headquarters, East:** Festo Corp., 395 Moreland Road, Hauppauge, NY 11788

Phone: 1.631.435.0800; Fax: 1.631.435.8026;

Email: [info@festo-usa.com](mailto:info@festo-usa.com)

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

## Canada



**Headquarters:** Festo Inc., 5300 Explorer Drive, Mississauga, Ontario L4W 5G4

Phone: 1.905.624.9000; Fax: 1.905.624.9001;

Email: [festo.canada@ca.festo.com](mailto:festo.canada@ca.festo.com)

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

## Mexico



**Headquarters:** Festo Pneumatic, S.A., Av. Ceylán 3, Col. Tequesquahuac,  
54020 Tlalneapantla, Edo. de México

Phone: 011 52 [55] 53 21 66 00; Fax: 011 52 [55] 53 21 66 65;

Email: [festo.mexico@mx.festo.com](mailto:festo.mexico@mx.festo.com)

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

## Central USA

Festo Corporation  
1441 East Business  
Center Drive  
Mt. Prospect, IL 60056, USA  
Phone: 1.847.759.2600  
Fax: 1.847.768.9480



## Western USA

Festo Corporation  
4935 Southfront Road,  
Suite F  
Livermore, CA 94550, USA  
Phone: 1.925.371.1099  
Fax: 1.925.245.1286



## Festo Worldwide

Argentina Australia Austria Belarus Belgium Brazil Bulgaria Canada Chile China Colombia Croatia Czech Republic Denmark  
Estonia Finland France Germany Great Britain Greece Hong Kong Hungary India Indonesia Iran Ireland Israel Italy Japan Latvia  
Lithuania Malaysia Mexico Netherlands New Zealand Norway Peru Philippines Poland Romania Russia Serbia Singapore  
Slovakia Slovenia South Africa South Korea Spain Sweden Switzerland Taiwan Thailand Turkey Ukraine United States Venezuela

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