Swivel/gripper unit HGDS

Systematically more compact

FESTO

The compact, light and slim swivel/gripper unit HGDS.

Info 135 →→

Gripping and turning with one drive

Modern drives –
Systematically more economical*

Swivel/gripper unit HGDS. Following the trend towards compact machines. Simple, innovative, powerful and economical.

Systematically more compact
This ready-to-install unit with integrated gripper and swivel function is ideal for tight spaces. For the quick and easy design of small pick & place units – and for greater clarity in machine design.

Systematically faster
The HGDS permits cycle times of up to 2 Hz. This is made possible by the outstanding load capacity of the semi-rotary drive as well as the high gripping forces and safety reserves of the precision gripper.

Systematically more flexible
When it comes to access. Thanks to the large swivel angle of the swivel unit – freely adjustable up to 210°, and also the cushioning – pneumatic or hydraulic.

Systematically simpler
Installation, adjustment and maintenance. All control elements are accessible from one side even after installation; end position sensing and supply port are away from moving parts.

Systematically more versatile
Thanks to integration in the Festo modular handling system. Ideal for slim designs – direct mounting on the handling axis HMPL means the HGDS has the full range of linear, swivel and gripper motion functions.

* Representatively tested and certified with products ADVU, DGPL and DNC

Combine
Two functions in one.
Added advantages with full functionality

More compact

Faster

More flexible

Always on hand whenever swivel and gripper functions are needed in tight spaces. The clear design also makes engineering, commissioning and maintenance easier.

Not just faster – higher mass moment of inertia, higher torque and higher gripping forces are included too.

Thanks to the large swivel range of 210° and the accessibility of all connections and settings from one side.

Swivelling and access made easy

Whether its in handling technology, the electronics industry or special purpose machine design, anyone looking for a cost-effective size/force ratio can turn to HGDS.

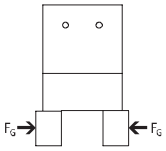
	Advantages for designs	Advantages for applications
1. A compact unit with two functions	• Replaces costly in-house constructions • Enables the design of compact and powerful machines • Ensures a high level of process reliability • Lower machine documentation costs	• A single component for different functions reduces costs for parts list management • A sturdy design principle guarantees a high level of operational reliability from a system
2. Versatile product with two cushioning variants and freely adjustable swivel angle	• Supports use in a wide range of applications	• Low acquisition and maintenance costs as well as high system availability • Simple installation, adjustment and maintenance
3. Integration in the Festo modular handling system	• Enables almost any application to be designed quickly and easily • Suitable for direct mounting • Standardised accessories such as proximity sensors and mounting components – even for individual solutions • Combination with many other Festo drive units	• Everything from a single source – only one contact • Standardisation – lower warehousing costs for proximity sensors

Forces at the gripper

Basic principles

Calculation tools for determining gripping force

What is meant by gripping force?



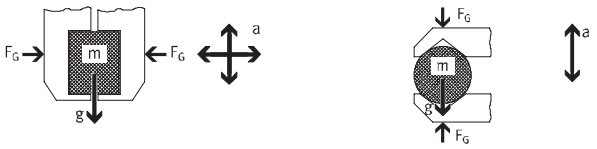
Action = Reaction
The gripping force F_G refers to the gripping force per gripper jaw.

When selecting a gripper you need to determine the gripping force required to hold a workpiece of mass m [kg] and move this workpiece at an acceleration of a [m/s²].

How does the gripping force act in the case of 2-jaw grippers?

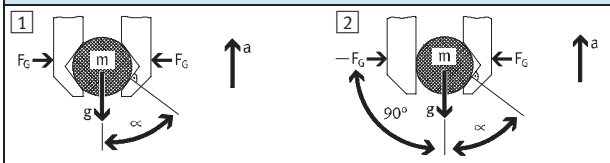
Parallel, radial and angle grippers

Mechanical locking



$$F_G = m \times (g + a) \times S$$

Mechanical locking with V-gripper



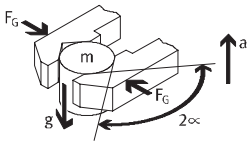
1

$$F_G = \frac{m \times (g + a)}{2} \times \tan\alpha \times S$$

2

$$F_G = m \times (g + a) \times \tan\alpha \times S$$

Frictional locking

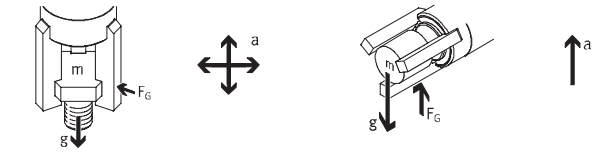


$$F_G = \frac{m \times (g + a)}{2 \times \mu} \times \sin\alpha \times S$$

How does the gripping force act in the case of 3-jaw grippers?

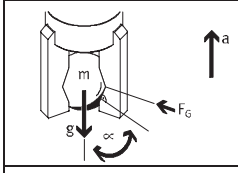
Three-point gripper

Mechanical locking



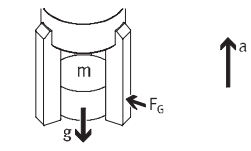
$$F_G = m \times (g + a) \times S$$

Mechanical locking with V-gripper



$$F_G = \frac{m \times (g + a)}{3} \times \tan\alpha \times S$$

Frictional locking



$$F_G = \frac{m \times (g + a)}{3 \times \mu} \times S$$

F_G Required gripping force [N] per gripper jaw

For angle and radial grippers, gripping force F_G must be converted to gripping torque M_G.

r, x Distance between the gripper zero point and the gripping point (lever arm)
➔ Catalogue specifications: "Gripping force as a function of the lever arm"

$$M_G = F_G \times r$$

m Workpiece mass [kg]

g Acceleration due to gravity (≈ 10 m/s²) is required if acting against the acceleration a

a Acceleration [m/s²] arising from the dynamic movement

S Safety factor

α Angle of V-gripper finger

μ Coefficient of friction between gripper finger and workpiece

Forces at the gripper

Basic principles

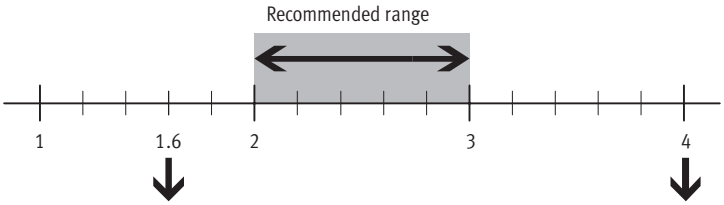
Max. acceleration values with different drive types

Peak acceleration values occur:

- In an emergency stop
- Shortly before the end position is reached

Drive function	Pneumatic			Servopneumatic	Electrical		
	with fixed cushioning	with adjustable cushioning	with shock absorber		Axis with toothed belt	Axis with spindle	with linear motor
Max. acceleration [m/s^2]	50 ... 300	10 ... 300	10 ... 300	5 ... 15	0 ... 15	0 ... 6	0 ... 30

Recommended safety factor



- Low dynamic response
- Controlled, static friction factor
- No fluctuation of the compressed air in the system

- High dynamic response
- Considerable variation in the friction factor
- Considerable fluctuation of the compressed air
- Considerable overlap of accelerations (linear/rotary)

Coefficient of friction μ

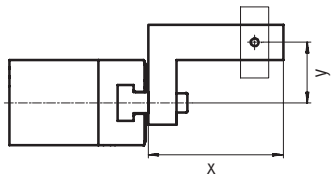
		Workpiece surface				
		ST	STl	AL	ALl	R
Gripper finger surface	ST	0.25	0.15	0.35	0.20	0.50
	STl	0.15	0.09	0.21	0.12	0.30
	AL	0.35	0.21	0.49	0.28	0.70
	ALl	0.20	0.12	0.28	0.16	0.40
	R	0.50	0.30	0.70	0.40	1.00

ST Steel
STl Lubricated steel
AL Aluminium
ALl Lubricated aluminium
R Rubber

Limits of this analysis

Eccentricity y of the centre of gravity of the mass referred to the gripping point

➔ Graphs with grippers in the catalogue
➔ In the electronic catalogue



Calculation program in the electronic catalogue on CD-ROM

Optimum entry of

- Workpiece and gripper finger geometry
- Direction of motion, dynamic response
- Coefficient of friction, pressure, temperature and safety factor

Parallel gripper

Selection aid

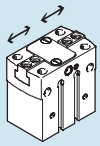
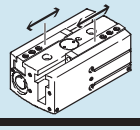
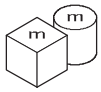
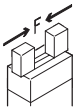
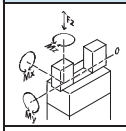
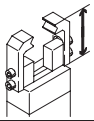
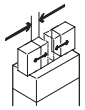
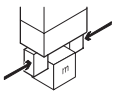
FESTO

- Note

1) The workpiece mass has been calculated based on the gripping principle "Positive locking with V-gripper" using the variable values specified below.
➔ 4:
– Parallel gripper

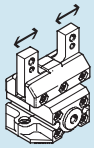
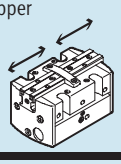
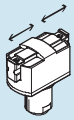
- Variable values:
  – a = 50 m/s²
  – g + a = 60 m/s²
  – α = 45 °
  – tan α = 1
  – S and x ➔ Workpiece mass

2) Possible applications:
- Workpiece retention in case of loss of compressed air
- As a single-acting gripper
- Acts to increase gripping force

Selection criteria/gripper types	Parallel gripper HGPT 	Parallel gripper HGPL 
Workpiece mass[1] [kg] 	Up to 12 kg S = 2 x = 40 mm	Up to 9.7 kg S = 2 x = 40 mm
Gripping force (external gripping) [N] at 6 bar 	F per gripper jaw	
	36 ... 770	80 ... 605
	F total	
	72 ... 1 540	160 ... 1 210
Maximum permissible characteristic load values per gripper jaw 		
Fz [N]	4 000	2 500
Mx [Nm]	140	125
My [Nm]	120	80
Mz [Nm]	80	100
Gripper finger length [mm] 	Max. 180	Max. 135
Gripper stroke per gripper jaw [mm] 	3 ... 16	40 ... 80
Repetition accuracy [mm] 	≤ 0.04	≤ 0.03
Gripping force retention[2], opening and closing	■	–
Proximity sensors/sensors for position sensing at the gripper	■	■
Advantages	– Sturdy T-slot – Sealing air – Integrated sensors	– Sturdy T-slot – Adjustable opening stroke – Integrated sensors
Technical data and dimensions		
Further information	➔ Info 139	➔ Info 139

Parallel gripper

Selection aid

Selection criteria/gripper types			
Parallel gripper HGPC 	Precision parallel gripper HGPP 	Parallel gripper HGP 	Micro-parallel gripper HGPM 
Workpiece mass[1] [kg]			
Up to 1.05 kg S = 3 x = 40 mm	Up to 6.7 kg S = 2 x = 40 mm	Up to 3.4 kg S = 3 x = 40 mm	Up to 0.17 kg S = 3 x = 10 mm
Gripping force (external gripping) [N] at 6 bar			
F per gripper jaw			
22 ... 63	40 ... 415	10 ... 350	8 ... 14
F total			
44 ... 126	80 ... 830	20 ... 700	16 ... 28
Maximum permissible characteristic load values per gripper jaw			
120	720	380	30
5	50	25	0.5
5	50	25	0.5
5	50	25	0.5
Gripper finger length [mm]			
Max. 60	Max. 160	Max. 100	Max. 30
Gripper stroke per gripper jaw [mm]			
3 ... 7 ↔↔	2 ... 12.5 ↔↔	2 ... 12.5 ↔↔	2 ... 3 ↔↔
Repetition accuracy [mm]			
≤ 0.05	≤ 0.02	≤ 0.04	≤ 0.05
Gripping force retention[2], opening and closing			
■	■	■	–
Proximity sensors/sensors for position sensing at the gripper			
■	■	■	–
Advantages			
– Cost-effective – Integrated sensors	– High precision thanks to gripper jaw with ball bearing guide – Integrated sensors – 3 positions can be sensed	– Dust-protected variant: HGP-16/-25...-SSK – Cost-effective – Integrated sensors	– Single-acting – Compact
Technical data and dimensions			
→ Info 154	→ Info 157	→ Info 116	→ Info 116

Parallel gripper

Selection aid

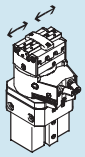
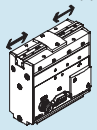
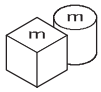
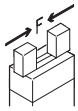
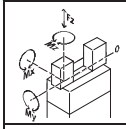
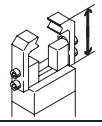
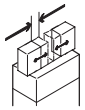
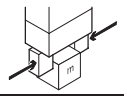
FESTO

- Note

1) The workpiece mass has been calculated based on the gripping principle "Positive locking with V-gripper" using the variable values specified below.
➔ 4:
– Parallel gripper

- Variable values:
  – a = 50 m/s²
  – g + a = 60 m/s²
  – α = 45 °
  – tan α = 1
  – S and x ➔ Workpiece mass

2) Possible applications:
- Workpiece retention in case of loss of compressed air
- As a single-acting gripper
- Acts to increase gripping force

Selection criteria/gripper types		Swivel/gripper unit HGDS 	Precision proportional parallel gripper HGPPI 
Workpiece mass[1] [kg]		Up to 1.2 kg S = 2 x = 40 mm	Up to 1 kg S = 2 x = 40 mm
Gripping force (external gripping) [N] at 6 bar		F per gripper jaw	
		26 ... 65	10 ... 60 (adjustable)
		F total	
		52 ... 130	20 ... 120 (adjustable)
Maximum permissible characteristic load values per gripper jaw		Fz [N]	60 / 70
		Mx [Nm]	8 / 3
		My [Nm]	8 / 3
		Mz [Nm]	8 / 3
Gripper finger length [mm]		Max. 70	Max. 70
Gripper stroke per gripper jaw [mm]		2.5 ... 7 ↔↔ Swivel angle 0 ... 210° 	0 ... 10 ↔↔ Can be positioned freely and independently
Repetition accuracy [mm]		≤ 0.02	≤ 0.02
Gripping force retention[2], opening and closing		–	–
Proximity sensors/sensors for position sensing at the gripper		■	Absolute displacement encoder
Advantages		– Swivelling and gripping in one unit – Compact – Integrated sensors	– Gripper jaws can be positioned freely and independently – High precision thanks to gripper jaw with ball bearing guide
Technical data and dimensions			
Further information		➔ 12	➔ Info 116

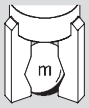
Three-point gripper

Selection aid

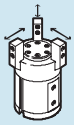
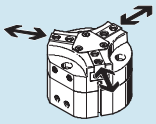
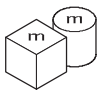
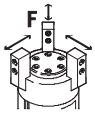
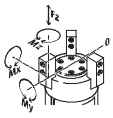
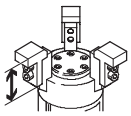
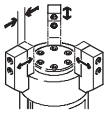
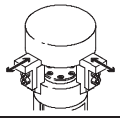
FESTO

- Note

1) The workpiece mass has been calculated based on the gripping principle "Positive locking with V-gripper" using the variable values specified below.
➔ 4:
– Three-point gripper



- Variable values:
  – a = 50 m/s²
  – g + a = 60 m/s²
  – α = 45 °
  – tan α = 1
  – S and r ➔ Workpiece mass

Selection criteria/gripper types		
	Three-point gripper HGD 	Three-point gripper HGDT 
Workpiece mass[1] [kg]		
	Up to 3.8 kg S = 3 x = 40 mm	Up to 12.7 kg S = 2 x = 40 mm
Gripping force (external gripping) [N] at 6 bar		
	F per gripper jaw	
	30 … 300	70 … 550
	F total	
	90 … 900	210 … 1 650
Maximum permissible characteristic load values at the gripper jaw		
	Fz [N]	170 / 2 500
	Mx [Nm]	5 / 80
	My [Nm]	8 / 50
	Mz [Nm]	5 / 60
Gripper finger length [mm]		
	Max. 100	Max. 140
Gripper stroke per gripper jaw [mm]		
	2.5 … 6	3 … 10
Repetition accuracy [mm]		
	≤ 0.04	≤ 0.03
Gripping force retention		
	–	■
Proximity sensors/sensors for position sensing at the gripper		
	■	■
Advantages		
	– Simple, position-centred gripping of perfectly round parts – Integrated sensors	– Sturdy T-slot – Sealing air – Integrated sensors
Technical data and dimensions		
Further information	➔ Info 116	➔ Info 139

Radial gripper

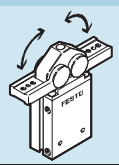
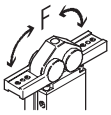
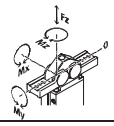
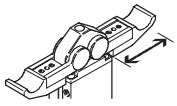
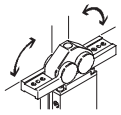
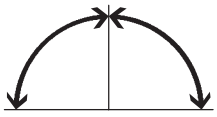
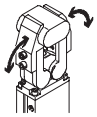
Selection aid

FESTO

- Note

1) The workpiece mass has been calculated based on the gripping principle "Positive locking with V-gripper" using the variable values specified below.
➔ 4:
– Radial grippers

- Variable values:
  – a = 50 m/s²
  – g + a = 60 m/s²
  – α = 45 °
  – tan α = 1
  – s and r ➔ Workpiece mass

Selection criteria/gripper types	
	Radial gripper HGR 
Workpiece mass[1] [kg]	
	Up to 1 kg S = 3 r = 30 mm
Total gripping torque (external gripping) [Ncm] at 6 bar	
	13 ... 500
Maximum permissible characteristic load values at the gripper jaw	
	Fz [N] 80 Mx [Nm] 2 My [Nm] 10 Mz [Nm] 7
Gripper finger length [mm]	
	Max. 120
Gripping angle per gripper jaw [°]	
	–1 ... +90 
Repetition accuracy [mm]	
	≤ 0.1
Gripping force retention	
	–
Proximity sensors/sensors for position sensing at the gripper	
	■
Advantages	
	– Linear axes can be avoided – Integrated sensors
Technical data and dimensions	
Further information	➔ Info 116

Angle gripper

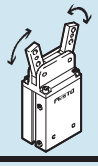
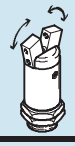
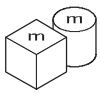
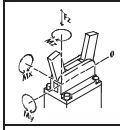
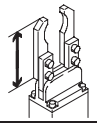
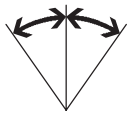
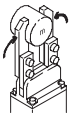
Selection aid

FESTO

- Note

1) The workpiece mass has been calculated based on the gripping principle "Positive locking with V-gripper" using the variable values specified below. ➔ 4:
   – Angle gripper

- Variable values:
  – a = 50 m/s²
  – g + a = 60 m/s²
  – α = 45 °
  – tan α = 1
  – S and r ➔ Workpiece mass

Selection criteria/gripper types		Angle gripper HGW	Micro-angle gripper HGWM
			
Workpiece mass[1] [kg]			
		Up to 2 kg S = 3 r = 30 mm	Up to 0.2 kg S = 3 r = 20 mm
Total gripping torque (external gripping) [Ncm] at 6 bar			
		22 ... 880	22 ... 64
Maximum permissible characteristic load values at the gripper jaw			
	Fz [N]	124	20
	Mx [Nm]	5.7	0.4
	My [Nm]	2.2	0.4
	Mz [Nm]	3.6	0.4
Gripper finger length [mm]			
		Max. 120	Max. 40
Gripping angle per gripper jaw [°]			
		–3 ... +18 	–4 ... +18 
Repetition accuracy [mm]			
		≤ 0.04	≤ 0.02
Gripping force retention			
		–	–
Proximity sensors/sensors for position sensing at the gripper			
		■	–
Advantages			
		– Sturdy – Cost-effective – Integrated sensors	– Compact – Single-acting
Technical data and dimensions			
Further information		➔ Info 116	➔ Info 116

Swivel/gripper units HGDS

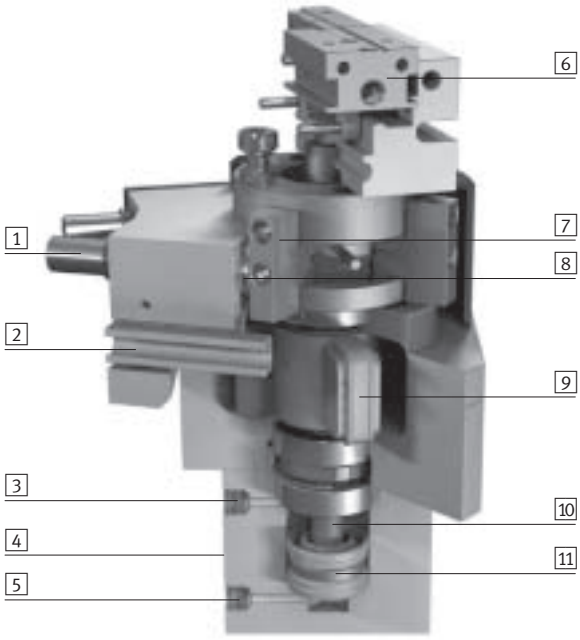
Key features

At a glance

Combination of parallel gripper and swivel module

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

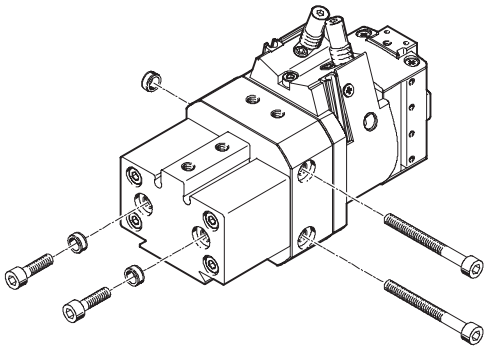
The swivel motion takes place via a swivel drive. It can be adjusted almost infinitely via 2 stops (max. 210°). The rotary motion is cushioned either via a flexible cushioning buffer or a hydraulic shock absorber. The swivel angle can be finely adjusted by means of a precision adjustment facility.



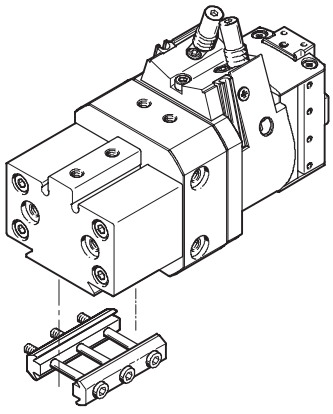
1 Flexible cushioning or hydraulic shock absorbers
2 Slot for proximity sensor SME/SMT-10 for sensing the swivel position
3 Gripper compressed air connection, closing
4 Slot for proximity sensor SME/SMT-10 for sensing the gripper position
5 Gripper compressed air connection, opening
6 Gripper jaw
7 Adjustable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

Mounting options

Direct mounting

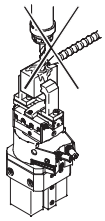


Dovetail connection

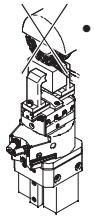


- Note

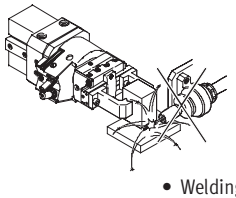
Swivel/gripper units are not suitable for the following or similar applications:



- Machining
- Aggressive media



- Grinding dust



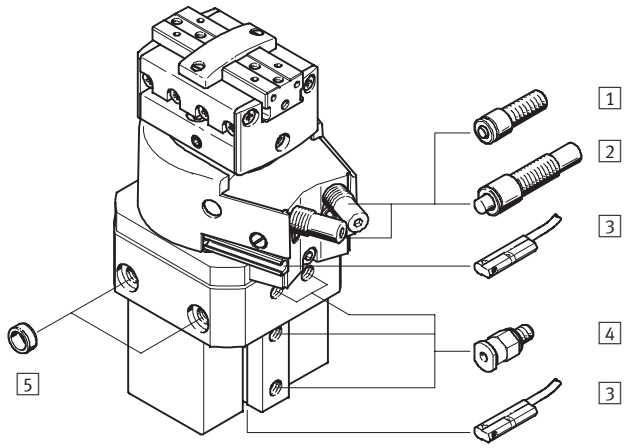
- Welding spatter

Swivel/gripper units HGDS

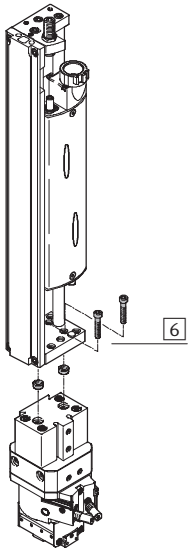
Peripherals overview and type codes

FESTO

Peripherals overview



System product for handling and assembly technology



Accessories

	Type	Brief description	➔ Page
1	Cushioning P	Non-adjustable, flexible cushioning. Is used for smaller loads	–
2	Cushioning YSRT	Self-adjusting, hydraulic shock absorber	–
3	Proximity sensor SME/SMT-10	For sensing the gripper and rotary vane position	22
4	Push-in fitting QS	For connecting compressed air tubing with standard external diameters	www.festo.com
5	Centring sleeve ZBH	For centring the gripper when mounting (2 included in scope of delivery)	22
6	–	Drive/gripper connections	www.festo.com

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

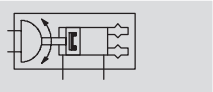
Swivel/gripper units HGDS

Technical data

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

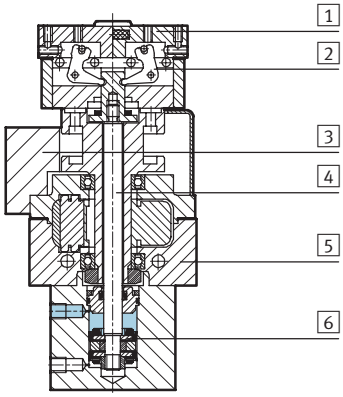
Operating and environmental conditions		
Operating pressure	[bar]	3 ... 8
Operating medium		Filtered compressed air, lubricated or unlubricated
Ambient temperature[1]	[°C]	+5 ... +60
Corrosion resistance class CRC[2]		2

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

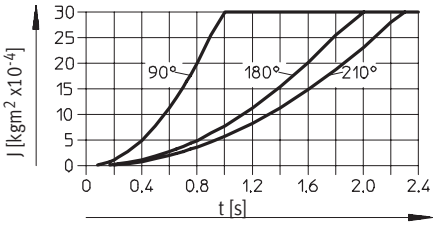
Technical data – Swivelling

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

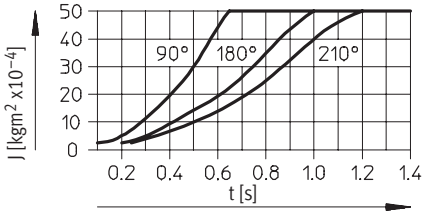
1) At 6 bar

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

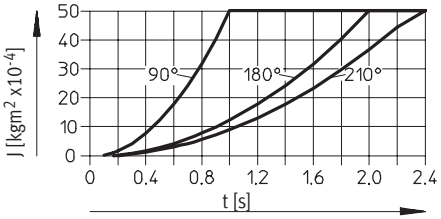
HGDS-PP-12-P-A



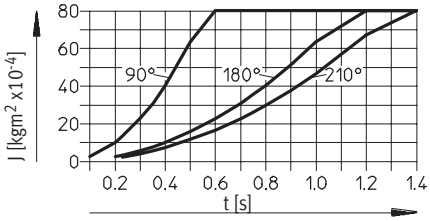
HGDS-PP-12-YSRT-A



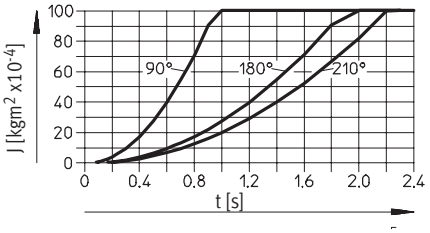
HGDS-PP-16-P-A



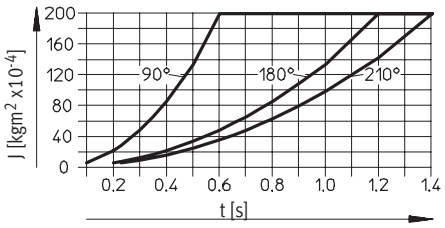
HGDS-PP-16-YSRT-A



HGDS-PP-20-P-A



HGDS-PP-20-YSRT-A



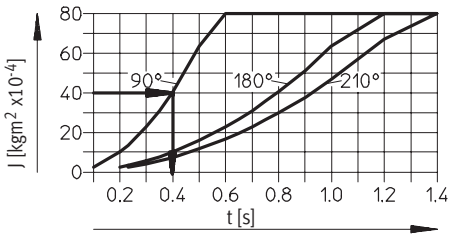
Dependency between operating pressure and swivel time

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

Example:
Given:
$J = 40\ kgm^2x10^{-4}$
Operating pressure 4 bar (gripper drive)

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

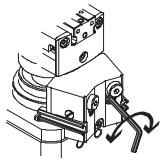
This yields a swivel time at 4 bar:
t = 0.4 + 2x 15% = 0.52 s
Cushioning time of the shock absorber = 0.1 s
This yields a swivel time of
$t_{tot.}$ = 0.52 s + 0.1 s = 0.62 s



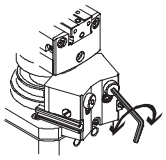
Precision adjustment of the swivel angle

The swivel angle can be adjusted roughly by means of two stop plates➔ 12. 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

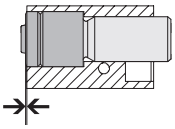


2) Adjust the cushioning element as required. Observe the minimum and maximum settings.

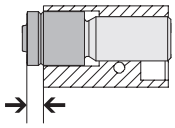


Size			12	16	20
Precision adjustment range	P cushioning	[°]	–6		
	YSRT cushioning	[°]	–2.5		
Swivel angle adjuster per revolution		[°]	3.1	2.8	2.2

Min. setting range, to the inner stop



Max. setting range, to the notch



Technical data – Gripping

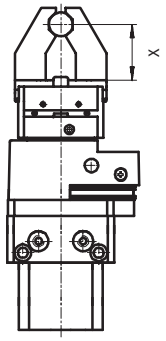
Size		12	16	20
Gripper function		Parallel		
Number of gripper fingers		2		
Max. applied load per external gripper finger[1)]	[N]	0.3	0.5	1.0
Stroke per gripper jaw	[mm]	2.5	4.5	7
Max. gripper jaw backlash	[mm]	0		
Max. gripper jaw angular backlash	[°]	0		
Repetition accuracy	[mm]	< 0.02		
Max. operating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

1) Valid for unthrottled operation

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

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

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

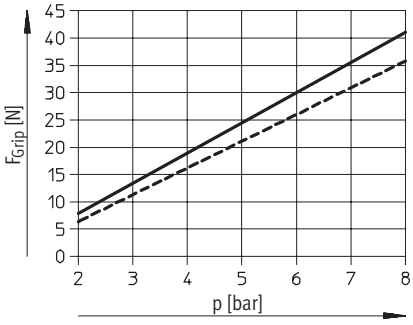


- - Note

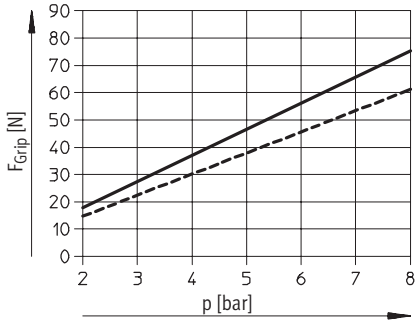
The gripping force is practically independent of the lever arm. Fluctuation at max. lever arm and max. operating pressure approx. 10%.

for unthrottled operation:

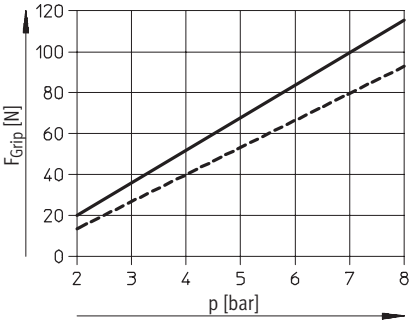
HGDS-12 (max. lever arm x 40 mm)



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



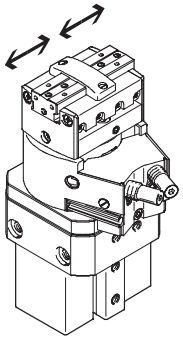
HGDS-20 (max. lever arm x 70 mm)



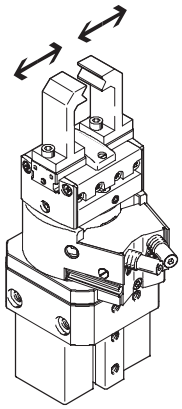
Opening
Closing

Opening and closing times [ms] at 6 bar

With gripper jaws



With additional gripper fingers

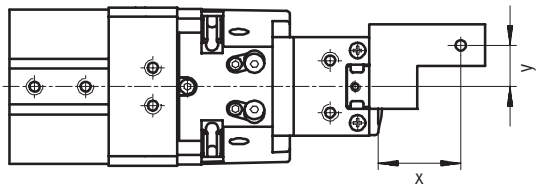


The indicated opening and closing times [ms] have been measured at room temperature and at 6 bar operating pressure with horizontally mounted gripper without external gripper fingers. The grippers must be throttled for greater applied loads. Opening and closing times must then be adjusted correspondingly.

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

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

Eccentricity y as a function of lever arm x



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

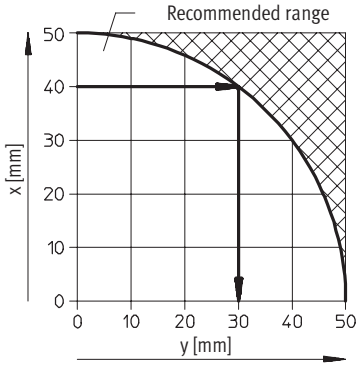
It is vital that you adhere to the mass moment of inertia ➔ 15 when making your selection.

Calculation example

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

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

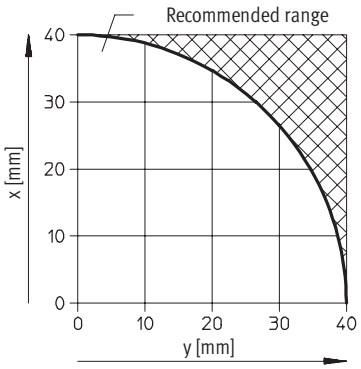
Max. eccentricity = 30 mm



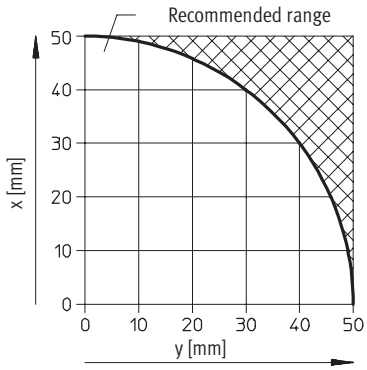
Eccentricity y as a function of lever arm x

for unthrottled operation:

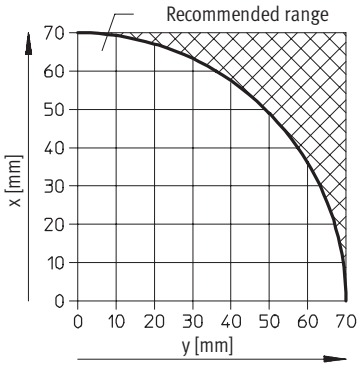
HGDS-12 (max. lever arm 40 mm)



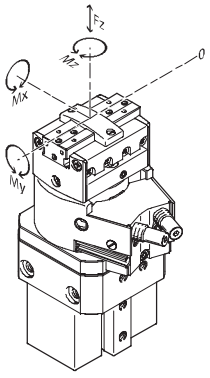
HGDS-16 (max. lever arm 50 mm)



HGDS-20 (max. lever arm 70 mm)



Characteristic load values per gripper jaw



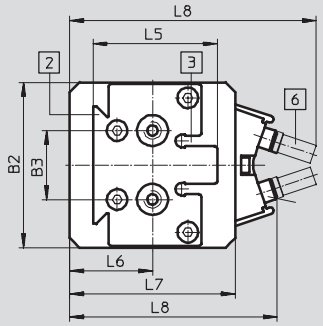
The indicated permissible forces and torques refer to a single gripper jaw. The indicated values include the lever arm, additional applied loads caused by the workpiece or external gripper fingers, as well as forces which occur during movement.

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

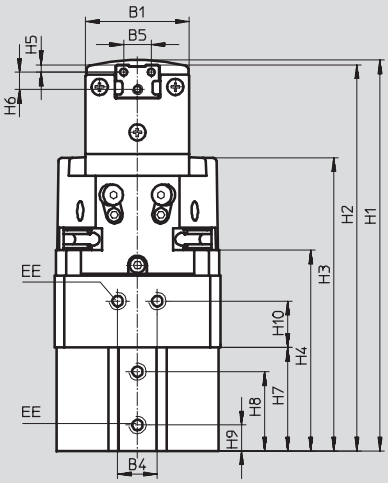
Size		12	16	20
Max. permissible force F_z	[N]	20	30	60
Max. permissible torque M_x	[Nm]	1.5	4	8
Max. permissible torque M_y	[Nm]	1.5	4	8
Max. permissible torque M_z	[Nm]	1.5	4	8

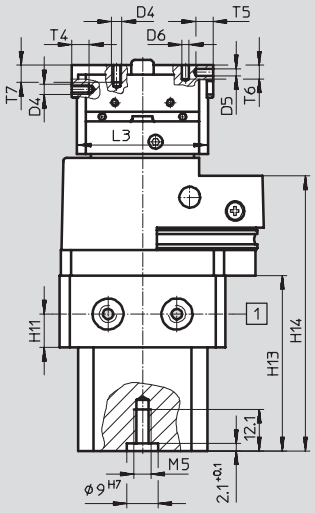
Dimensions

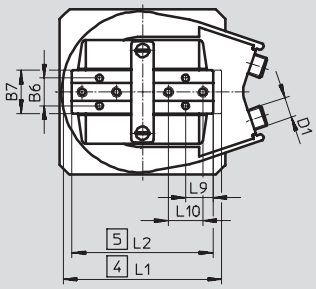
Download CAD data ➔ **www.festo.com/en/engineering**



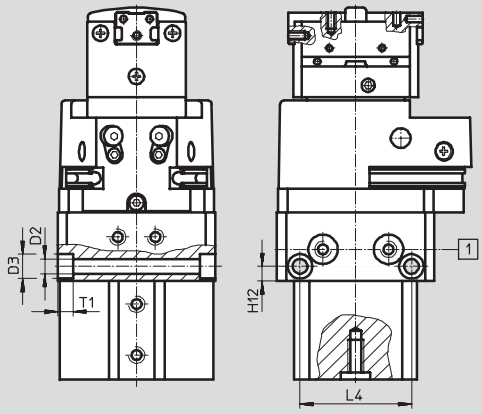
Size 16/20





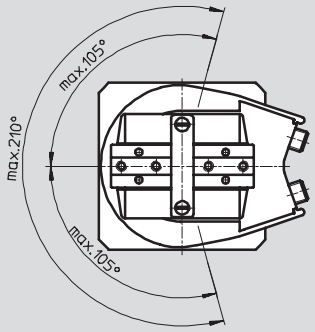


Size 12



1 Cross-section through mounting holes ➔ 21
2 For dovetail joint with HAVB-3
3 Sensor slot for SME-/SMT-10
4 Gripper jaws open
5 Gripper jaws closed
6 Shock absorber YSRT

Swivel angle

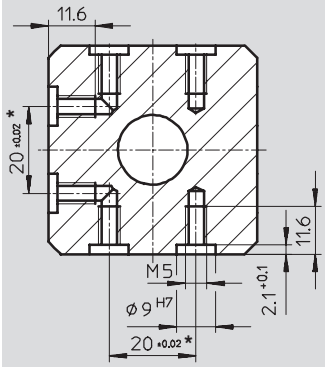


Swivel/gripper units HGDS

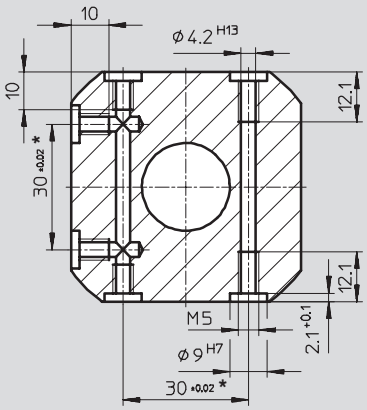
Technical data

Cross-section at 1 ➔ 20

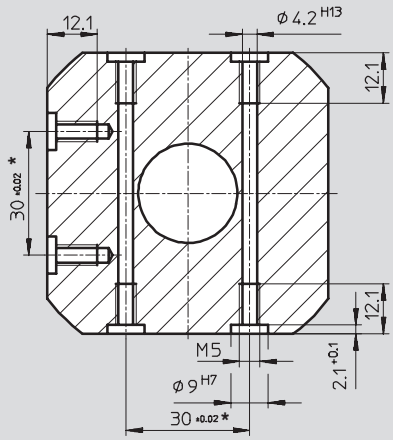
Size 12



Size 16



Size 20



Size [mm]	B1	B2 ±0.03	B3 ±0.02*	B4	B5 ±0.02	B6 ±0.02	B7 ±0.1	D1	D2 ∅ H13	D3 ∅ H13	D4	D5 ∅ 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 [mm]	D6 ∅ H8	EE	H1 +1/–0.6	H2 +0.8/–0.4	H3 +1.3/–0.2	H4 +0.8/–0.2	H5 ±0.02	H6 ±0.12	H7 ±0.1	H8 ±0.1	H9
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 [mm]	H10	H11 –0.1	H12	H13 +1/–0.2	H14 +1/–0.2	L1 ±0.5	L2 ±0.5	L3 ±0.5	L4 ±0.1	L5	L6 ±0.05
12	13.5	9.7	4.5	51.3	79.8	46	41	38	34	36	24
16	14	8	–	58.2	86.7	58	49	47	–	40.5	27.5
20	19	9	–	73.1	105.6	78	64	61	–	40.5	34

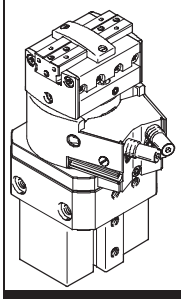
Size	L7	L8 ±1		L9	L10	T1	T4	T5	T6	T7
[mm]	±0.03	P	YSRT	±0.02			min.			min.
12	48	59.5	69.3	8	10	4.6	5	5	4	5
16	55	68.5	80.5	8	10	–	6.5	6	5	5
20	68	85.4	96.4	12	14	–	10	8	7	7

* Tolerance valid for centring hole ∅ 9H7

Swivel/gripper units HGDS

Technical data and accessories

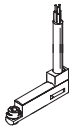
FESTO

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

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

Ordering data – Accessories					Technical data ➔ www.festo.com
	For size [mm]	Weight [g]	Part No.	Type	PU[1]
Centring sleeve					
	12, 16, 20	1	**150 927**	**ZBH-9**	10

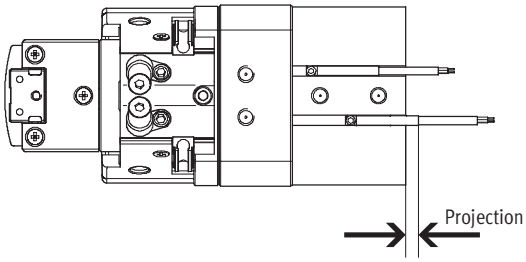
1) Packaging unit quantity

Ordering data – Proximity sensors for C-slot, connecting cable at right angles					Technical data ➔ www.festo.com
	Electrical connection		Cable length [m]	Part No.	Type
	Cable	Plug M8			
	NO contact, magneto-resistive				
	3-core	–	2.5	**526 674**	**SMT-10F-PS-24V-K2,5Q-OE**
	–	3-pin	0.3	**526 675**	**SMT-10F-PS-24V-K0,3Q-M8D**
	NO contact, magnetic reed				
	3-core	–	2.5	**526 670**	**SME-10F-DS-24V-K2,5Q-OE**
	–	3-pin	0.3	**526 671**	**SME-10F-DS-24V-K0,3Q-M8D**

Swivel/gripper units HGDS

Accessories

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



Ordering data – Proximity sensors for C-slot, in-line connecting cable — Technical data ➔ www.festo.com

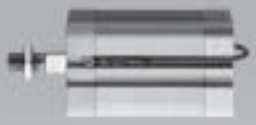
	Electrical connection		Cable length	Projection at HGDS in [mm]			Part No.	Type
	Cable	Plug M8	[m]	∅ 12	∅ 16	∅ 20		
	NO contact, magneto-resistive							
	3-core	–	2.5	8.3	7.1	4.4	**525 915**	**SMT-10F-PS-24V-K2,5L-OE**
	2-core						**526 677**	**SMT-10F-ZS-24V-K2,5L-OE**
	–	3-pin	0.3				**525 916**	**SMT-10F-PS-24V-K0,3L-M8D**
	NO contact, magnetic reed							
	3-core	–	2.5	2.7	2.1	–	**525 913**	**SME-10F-DS-24V-K2,5L-OE**
	2-core						**526 672**	**SME-10F-ZS-24V-K2,5L-OE**
	–	3-pin	0.3				**525 914**	**SME-10F-DS-24V-K0,3L-M8D**

Ordering data – Plug sockets with cable — Technical data ➔ www.festo.com

	Assembly	Switch output		Connection	Cable length	Part No.	Type
		PNP	NPN		[m]		
Straight socket							
	Union nut M8	■	■	3-pin	2.5	**159 420**	**SIM-M8-3GD-2,5-PU**
					5	**159 421**	**SIM-M8-3GD-5-PU**
Angled socket							
	Union nut M8	■	■	3-pin	2.5	**159 422**	**SIM-M8-3WD-2,5-PU**
					5	**159 423**	**SIM-M8-3WD-5-PU**

Products and services – everything from a single source

Products incorporating new ideas are created when enthusiasm for technology and efficiency come together. Tailor-made service goes without saying when the customer is the focus of attention.



Pneumatic and electrical drives

- Pneumatic cylinders
- Semi-rotary drives
- Handling modules
- Servopneumatic positioning systems
- Electromechanical drives
- Positioning controllers and controllers

Valves and valve terminals

- Standard valves
- Universal and application-optimised valves
- Manually and mechanically actuated valves
- Shut-off, pressure control and flow control valves
- Proportional valves
- Safety valves

Fieldbus systems/ electrical peripherals

- Fieldbus Direct
- Installation system CP/CPI
- Modular electrical terminal CPX

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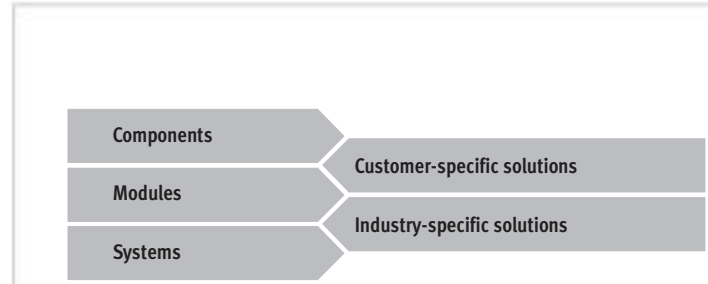
- Service unit combinations
- Filter regulators
- Filters
- Pressure regulators
- Lubricators
- On-off and soft-start valves
- Dryers
- Pressure amplifiers
- Accessories for compressed air preparation



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- Precision grippers
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- Pressure and flow sensors
- Display and operating units
- Inductive and optical proximity sensors
- Displacement encoders for positioning cylinders
- Optical orientation detection and quality inspection

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- Programmable logic controllers
- Fieldbus systems and accessories
- Timers/counters
- Software for visualisation and data acquisition
- Display and operating units

Accessories

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- Tubing
- Pipe connectors and fittings
- Electrical connection technology
- Silencers
- Reservoirs
- Air guns

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- Preassembly
- Turnkey pneumatics
- Handling solutions

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- Energy saving service
- Compressed air consumption analysis
- Compressed air quality analysis
- Customer service

What must be observed when using Festo components?

Specified limit values for technical data and any specific instructions must be adhered to by the user in order to ensure recommended operating conditions.
When pneumatic components are used, the user shall ensure that they are operated using correctly prepared compressed air without aggressive media.
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You should contact Festo's advisors if one of the following apply to your application:

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- The product is to perform a safety function.
- A risk or safety analysis is required.
- You are unsure about the product's suitability for use in the planned application.
- You are unsure about the product's suitability for use in safety-oriented applications.