

## Three-point gripper DHDS

**FESTO**



## Characteristics

### At a glance

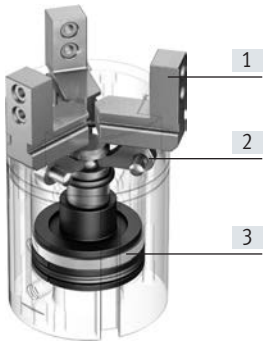
#### General

- Heavy-duty, precision T-slot guide for gripper jaws
- High gripping forces with compact dimensions
- Options for centring the gripper jaws
- Max. repetition accuracy
- Gripping force backup
- Internal fixed flow control
- Wide range of adaptation options on the drives
- Sensor technology:
  - Adaptable position sensor for the small gripper sizes
  - Integratable proximity switches for the medium and large gripper sizes

#### Flexible range of applications

- Can be used as a double-acting and single-acting gripper
- Compression spring for supporting or backing up the gripping forces
- Suitable for external and internal gripping

### The technology in detail



- [1] Gripper jaws
- [2] Reversing lever
- [3] Piston with magnet

#### Note

Engineering software  
Gripper selection  
→ [www.festo.com](http://www.festo.com)

### Position sensing/force control

#### With position transmitter SMAT-8M



- Analogue position feedback possible
- Analogue output 0 ... 10 V

#### With proportional-pressure regulator VPPM



- Infinite adjustment of the gripping force possible
- Setpoint value input
    - 0 ... 10 V
    - 4 ... 20 mA

#### With proximity switch SMT-8G

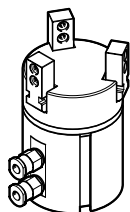


- Detecting multiple positions:
- Open
  - Closed
  - Workpiece gripped

## Key features

### Compressed air supply ports

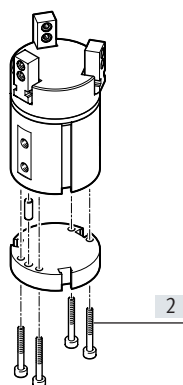
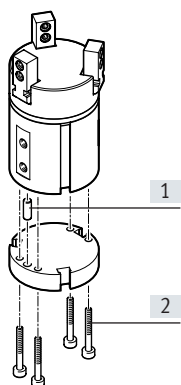
From the side



### Mounting options

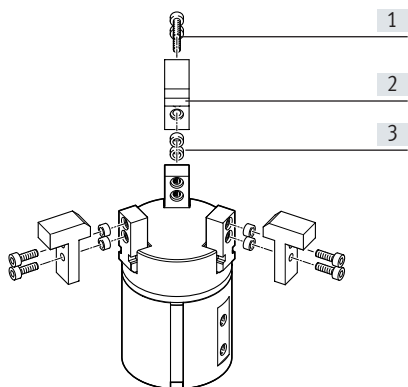
Size 16

Size 32, 50



- [1] Centring pin
- [2] Retaining screws

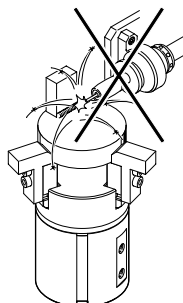
### Mounting options for external gripper fingers



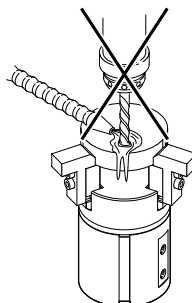
- [1] Retaining screws
- [2] Gripper finger
- [3] Centring sleeves

### Note

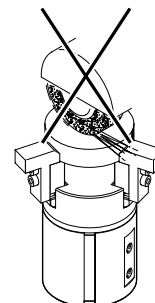
These grippers are not designed for the following or similar applications:



- Welding spatter



- Machining
- Aggressive media

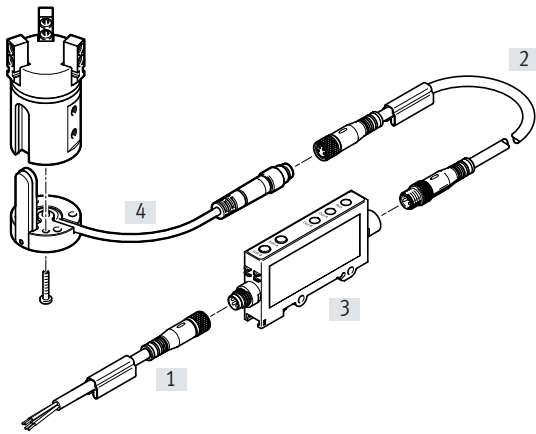


- Grinding dust

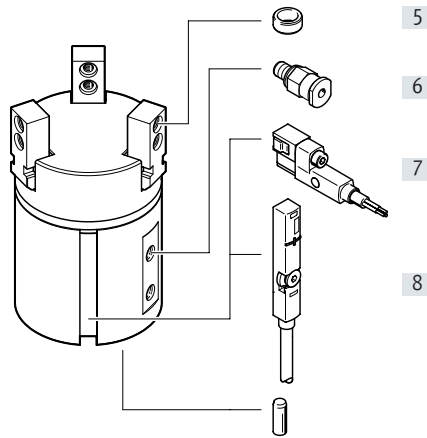
Peripherals overview

Peripherals overview

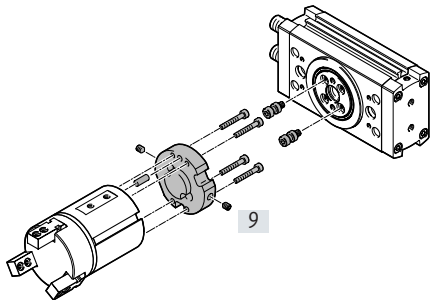
DHDS-16



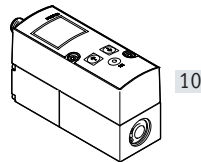
DHDS-32, 50



System product for handling and assembly technology



Proportional-pressure regulator VPPM



Accessories

Type	Size	Description	→ Page/Internet
[1] Connecting cable NEBU	16	• Connection between signal converter and controller	16
[2] Connecting cable NEBU	16	• Connection between position sensor and signal converter	16
[3] Signal converter SVE4	16	• For evaluating signals for position sensor SMH-S1	16
[4] Position sensor SMH-S1	16	• Adaptable and integratable sensor technology, for sensing the piston position	16
[5] Centring sleeve ZBH	16 ... 50	• For centring the gripper fingers on the gripper jaws • 6 centring sleeves included in the scope of delivery of the gripper	16
[6] Push-in fitting QS	16 ... 50	• For connecting tubing with standard outside diameters	qs
[7] Proximity switch SMT-8G	32, 50	• For sensing the piston position • Proximity switch does not project past the housing at the bottom	17
[8] Position transmitter SMAT-8M	32, 50	• Continuously senses the position of the piston. It has an analogue output and an output signal relative to the piston position.	17
[9] Adapter kit DHAA, HMSV, HAPG, HMVA	16 ... 50	• Connecting plate between drive and gripper	14
[10] Proportional-pressure regulator VPPM	16 ... 50	• For infinite adjustment of the gripping force	vppm

## Type codes

001	Series
DHDS	Three-point gripper

002	Size
16	16
32	32
50	50

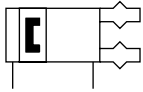
003	Position sensing
A	For proximity sensor

004	Gripping force backup
	None
NC	N/O contact

# Three-point gripper DHDS

## Data sheet

Function  
Double-acting  
DHDS-...-A



Size  
16 ... 50 mm

Stroke  
2.5 ... 6 mm

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Function – Variant  
Single-acting or with closing gripping  
force backup  
DHDS-...-NC



General technical data		16	32	50
Size		16	32	50
Design	Lever			
	Guided motion sequence			
Mode of operation	Double-acting			
Gripper function	3-point			
Gripping force backup	NC	NC	NC	NC
Number of gripper jaws	3			
Max. load per gripper finger <sup>1)</sup>	[g]	50	150	250
Stroke per gripper jaw	[mm]	2.5	3.9	6
Pneumatic connection		M3	M5	G1/8
Repetition accuracy <sup>2)</sup>	[mm]	≤ 0.04		
Max. interchangeability	[mm]	≤ ±0.2		
Max. operating frequency	[Hz]	≤ 4		
Rotational symmetry	[mm]	< ∅ 0.2		
Position sensing		Via position sensor	Via proximity switch, position transmitter	
Type of mounting		With female thread and dowel pin		
Mounting position		Any		

- 1) Applies to unthrottled operation  
2) Under constant exposure to operating conditions, end-position drift occurs, concentric to the central shaft, at 100 consecutive strokes

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

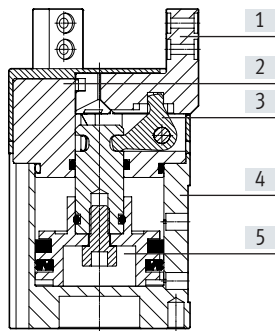
- 1) Note operating range of proximity switches  
2) Corrosion resistance class CRC 1 to Festo standard FN 940070  
Low corrosion stress. Dry internal application or transport and storage protection. Also applies to parts behind covers, in the non-visible interior area, and parts which are covered in the application (e. g. drive trunnions).

Weight [g]		16	32	50
Size		16	32	50
DHDS-...-A		96	276	920
DHDS-...-A-NC		99	281	932

## Data sheet

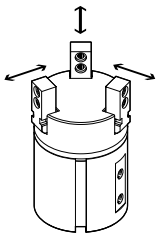
### Materials

Sectional view



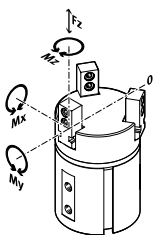
Three-point gripper		
[1]	Gripper jaws	High-alloy stainless steel
[2]	Cover cap	Polyamide
[3]	Reversing lever	Hardened sintered steel
[4]	Housing	Hard anodised wrought aluminium alloy
[5]	Piston	Polyacetal
-	Note on materials	Free of copper and PTFE RoHS-compliant

### Gripping force [N] at 6 bar



Size	16	32	50	
<b>Gripping force per gripper jaw</b>				
DHDS-...-A	Opening	40	135	280
	Closing	29	115	250
<b>Total gripping force</b>				
DHDS-...-A	Opening	120	405	840
	Closing	87	345	750

### Characteristic load values at the gripper jaws

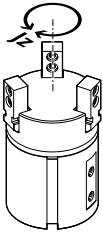


The indicated permissible forces and torques apply to a single gripper jaw. They include the lever arm, additional weight forces created by the workpiece or external gripper fingers and acceleration forces during movement. The zero coordinate line (gripper-jaw point of rotation) must be taken into consideration for the calculation of torques.

Size	16	32	50	
Max. permissible force $F_z$	[N]	50	150	250
Max. permissible torque $M_x$	[Nm]	2	9	24
Max. permissible torque $M_y$	[Nm]	2	9	24
Max. permissible torque $M_z$	[Nm]	2	9	24

Data sheet

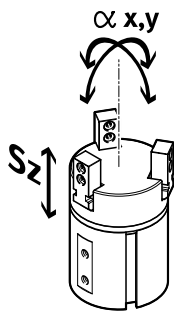
Mass moment of inertia [kgcm<sup>2</sup>]



Mass moment of inertia of the three-point gripper in relation to the central axis, without external gripper fingers, without load.

Size	16	32	50
DHDS-...	0.14	0.79	6.10
DHDS-...-NC	0.14	0.82	6.18

Gripper jaw backlash



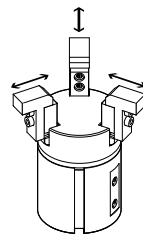
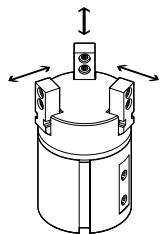
The plain-bearing guide used in the grippers means that there is backlash between the gripper jaws and the housing. The backlash values entered in the table have been calculated in accordance with the traditional accumulative tolerance method.

Size	16	32	50
Max. gripper jaw backlash Sz [mm]	≤ 0.02		
Max. gripper jaw angular backlash ax, ay [°]	≤ 0.5	≤ 0.2	

Opening and closing times [ms] at 6 bar

Without external gripper fingers

With external gripper fingers



The opening and closing times [ms] were measured at room temperature at an operating pressure of 6 bar with the gripper horizontally mounted and without additional gripper fingers. The grippers must be throttled for larger loads [g]. Opening and closing times must then be adjusted accordingly.

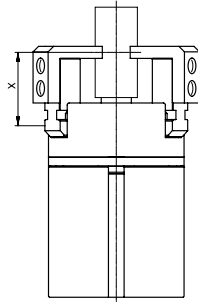
Size	16	32	50	
<b>Without external gripper fingers</b>				
DHDS-...-A	Opening	26	44	62
	Closing	42	51	55
DHDS-...-A-NC	Opening	31	55	73
	Closing	34	47	50
<b>With external gripper fingers (as a function of load per gripper finger)</b>				
DHDS-...	100 g	100	-	-
	200 g	-	100	-
	300 g	-	200	100
	400 g	-	-	200
	500 g	-	-	300



## Data sheet

### Gripping force $F_H$ per gripper jaw as a function of operating pressure and lever arm $x$

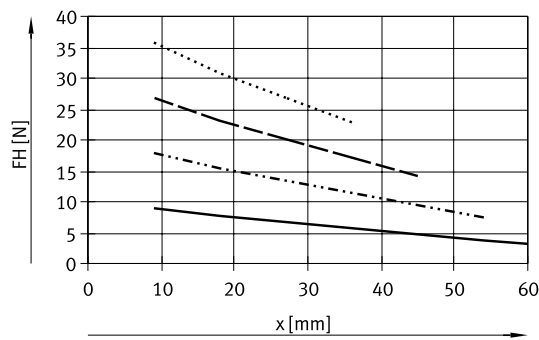
The gripping forces as a function of the operating pressure and lever arm can be determined from the following graphs.



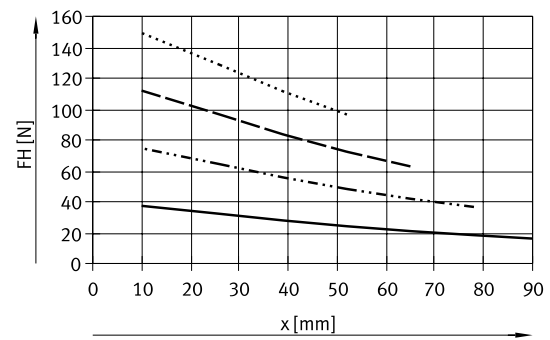
**Note**  
 Engineering software  
 Gripper selection  
 → [www.festo.com](http://www.festo.com)

### External gripping (closing)

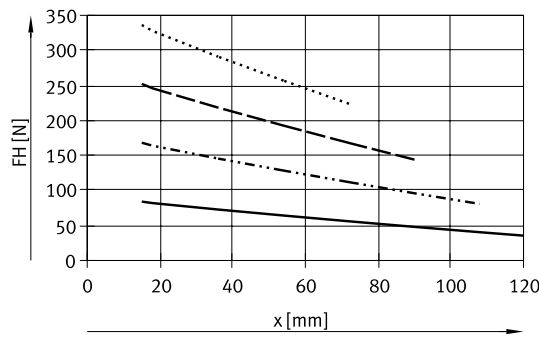
DHDS-16-A



DHDS-32-A



DHDS-50-A

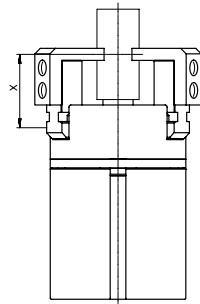


— 2 bar  
 ..... 4 bar  
 - - - 6 bar  
 - · - · 8 bar

Data sheet

Gripping force  $F_H$  per gripper jaw as a function of operating pressure and lever arm  $x$

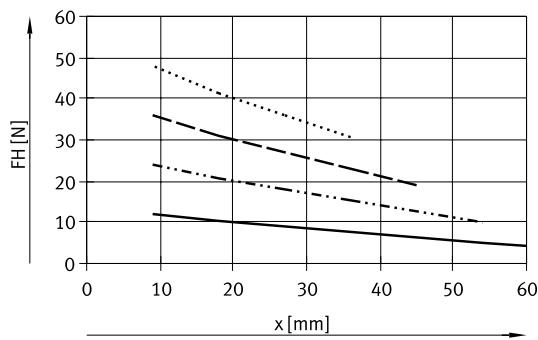
The gripping forces as a function of the operating pressure and lever arm can be determined from the following graphs.



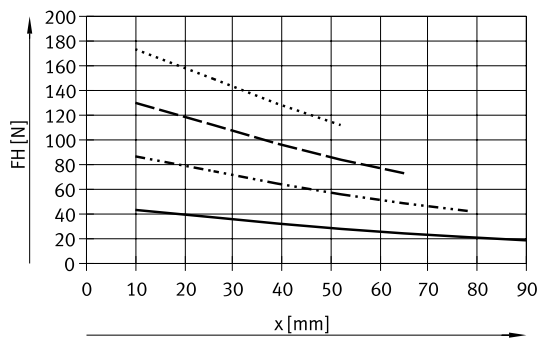
**Note**  
 Engineering software  
 Gripper selection  
 → [www.festo.com](http://www.festo.com)

Internal gripping (opening)

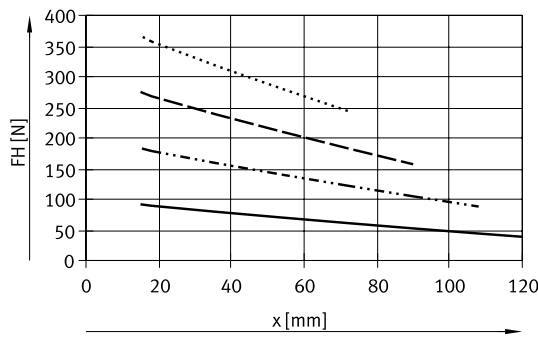
DHDS-16-A



DHDS-32-A



DHDS-50-A



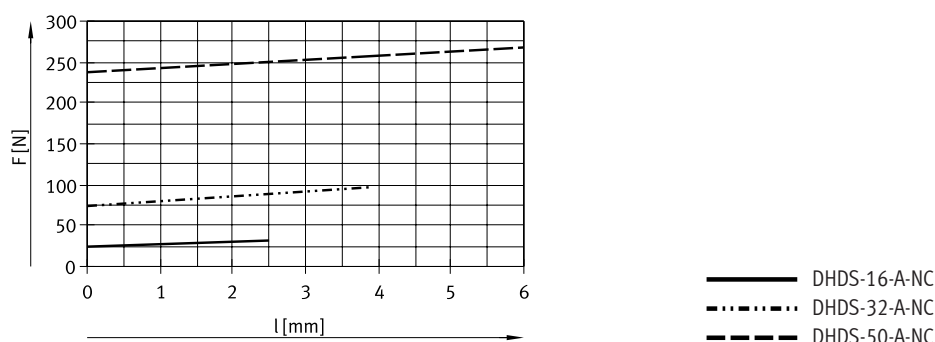
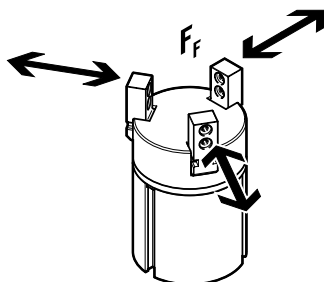
- 2 bar
- 4 bar
- - - 6 bar
- · - · 8 bar

## Data sheet

### Spring force $F_F$ as a function of size and gripper jaw stroke $l$

Gripping force backup for DHDS-...-NC

The spring forces  $F_F$  as a function of the gripper jaw stroke can be determined from the following graph.



### Spring force $F_F$ as a function of size, gripper jaw stroke $l$ and lever arm $x$ per gripper finger

The lever arm  $x$  must be taken into consideration when determining the actual spring force  $F_{\text{total}}$ .

The formulae for calculating the spring force are provided in the table below.

Gripping force backup	Size	$F_{\text{total}}$ per gripper finger
NC	16	$-0.1 \cdot x + 0.33 \cdot F_F$
	32	$-0.2 \cdot x + 0.33 \cdot F_F$
	50	$-0.3 \cdot x + 0.33 \cdot F_F$

### Determining the actual gripping forces $F_{\text{Gr}}$ for DHDS-...-NC as a function of application per gripper finger

Depending on requirement, the three-point grippers with integrated spring, type DHDS-...-NC (closing gripping force backup), can be used as:

- single-acting grippers
- grippers with supplementary gripping force and
- grippers with gripping force backup

In order to calculate the available gripping forces  $F_{\text{Gr}}$  (per gripper finger), the gripping force  $F_H$  and spring force  $F_{\text{total}}$  must be combined accordingly.

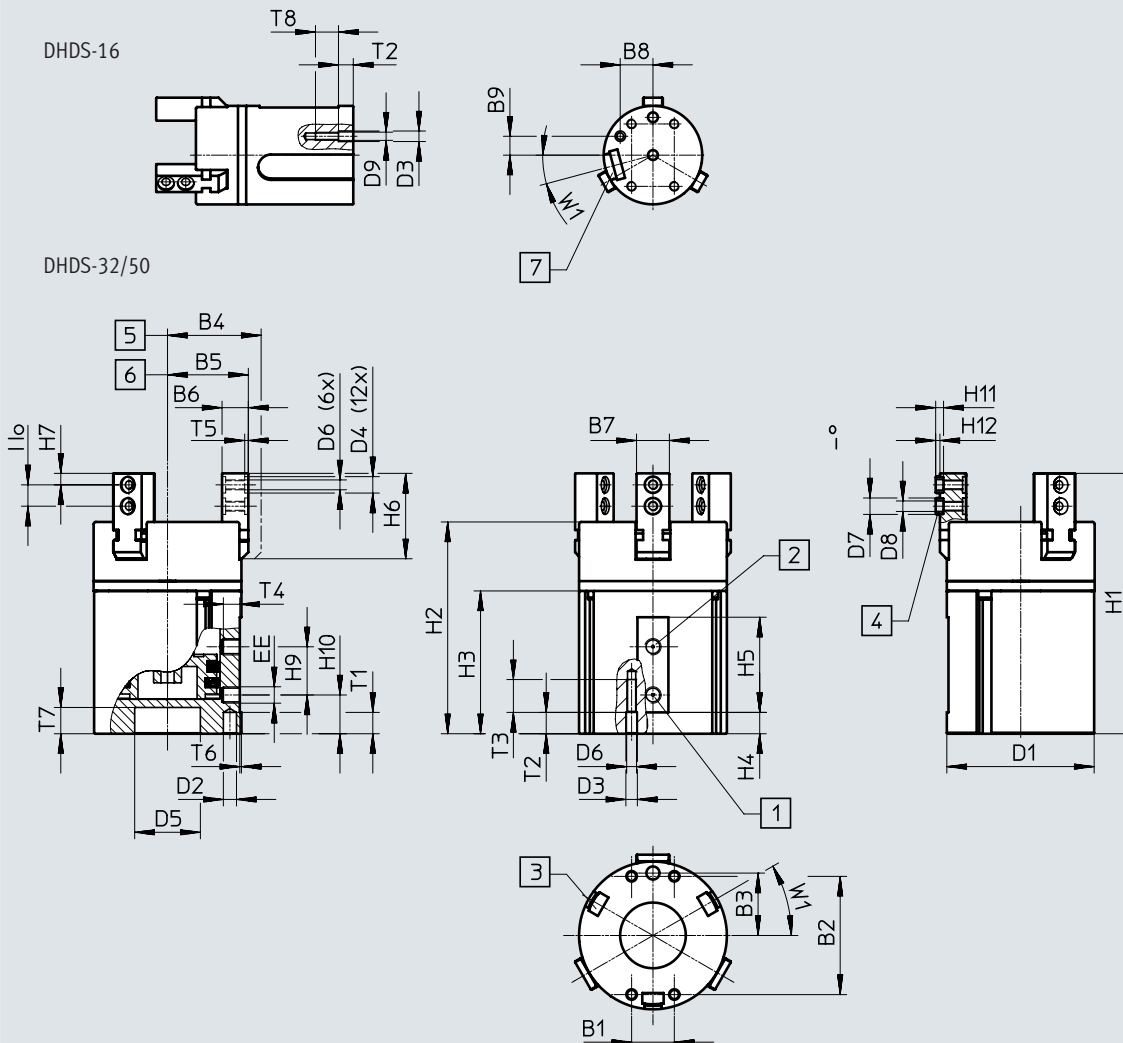
### Application forces per gripper finger

Single-acting	Supplementary gripping force	Gripping force backup
<ul style="list-style-type: none"> <li>• Gripping with spring force: <math>F_{\text{Gr}} = F_{\text{total}}</math></li> <li>• Gripping with pressure force: <math>F_{\text{Gr}} = F_H - F_{\text{total}}</math></li> </ul>	<ul style="list-style-type: none"> <li>• Gripping with pressure and spring force: <math>F_{\text{Gr}} = F_H + F_{\text{total}}</math></li> </ul>	<ul style="list-style-type: none"> <li>• Gripping with spring force: <math>F_{\text{Gr}} = F_{\text{total}}</math></li> </ul>

Data sheet

Dimensions

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



- [1] Supply port, opening
- [2] Supply port, closing
- [3] Slot for proximity switch
- [4] Centring sleeve ZBH (6 included in the scope of delivery)
- [5] Gripper jaws open
- [6] Gripper jaws closed
- [7] Slot for position sensor

## Data sheet

Size	B1	B2	B3	B4	B5	B6	B7	B8	B9
[mm]			±0.02	±0.5	±0.5	-0.02/-0.05	-0.02	-0.1	-0.1
16	13	19	11.5	20	17.5	7	6	9.96	5.75
32	13	36	19	28.5	24.6	8	10	-	-
50	25	54	30	43	37	12	14	-	-

Size	D1	D2	D3	D4	D5	D6	D7	D8	D9
[mm]	∅	∅	∅	∅	∅		∅	∅	
		H8	H8	H8	+0.05/+0.02		h7		
16	30	3	3.2	5	-	M3	5	3.2	M2.5
32	45	4	3.5	5	20	M3	5	3.2	-
50	70	5	6	7	30	M5	7	5.3	-

Size	EE	H1	H2	H3	H4	H5	H6	H7	H8 <sup>1)</sup>	H9
[mm]										
16	M3	60	47.9	32.6	4.5	24	21.5	3	6	12
32	M5	78	63.2	42.2	5.2	29	26	3.5	6.5	14.7
50	G1/8	107.5	86.5	56	6.7	40	37	5	10	22

Size	H10	T1	T2	T3	T4	T5	T6	T7	T8	W1
[mm]		min.	min.	+1	-0.5	+0.1	±0.2		±1	
16	11	4.5	4.5	8	4	1.2	1	-	7	15°
32	10.5	6.5	6.5	10	4	1.1	0.5	8	-	30°
50	16	7	7	18	6	1.6	1	9	-	30°

1) Tolerance for centring hole ±0.02 mm; tolerance for thread ±0.1 mm


## Ordering data

Size	Double-acting without compression spring		Single-acting or with gripping force backup closing	
	Part no.	Type	Part no.	Type
16	1259491	DHDS-16-A	1259492	DHDS-16-A-NC
32	1259493	DHDS-32-A	1259494	DHDS-32-A-NC
50	1259495	DHDS-50-A	1259496	DHDS-50-A-NC

Accessories

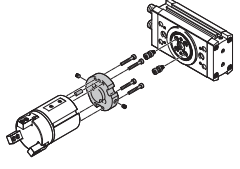
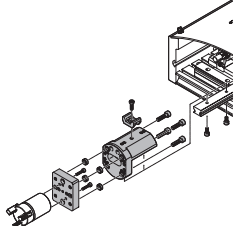
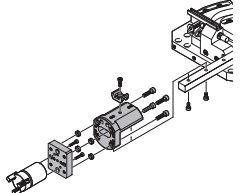
Adapter kit  
DHAA, HAPG, HMSV, HMVA

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

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

Permissible drive/gripper combinations with adapter kit

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

Combination	Actuator Size	Gripper Size	Adapter kit		
			KBK <sup>1)</sup>	Part no.	Type
	<b>DRRD</b>	<b>DHDS</b>	2	<b>DHAA</b>	
	12	16		2823512	DHAA-G-Q11-12-B4-16
	16	16		2136626	DHAA-G-Q11-16-B4-16
	16	32		2151381	DHAA-G-Q11-16-B4-32
	20	32		2136339	DHAA-G-Q11-20-B4-32
	25	32		1471583	DHAA-G-Q11-25-B4-32
	25	50		1731165	DHAA-G-Q11-25-B4-50
	32	50		1907040	DHAA-G-Q11-32-B4-50
	35	50	2135899	DHAA-G-Q11-35-B4-50	
	<b>HSP</b>	<b>DHDS</b>	2	<b>HAPG</b>	
	16	16		192705	HAPG-36-S1
				540882	HAPG-71-B
	25	16		192705	HAPG-36-S1
			540883	HAPG-72-B	
	<b>HSW</b>	<b>DHDS</b>	2	<b>HAPG</b>	
	16	16		192705	HAPG-36-S1
				540882	HAPG-71-B

1) Corrosion resistance class CRC 2 to Festo standard FN 940070  
Moderate corrosion stress. Indoor applications in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.  
2) For DGEA-... only

## Accessories

Adapter kit  
DHAA, HAPG

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

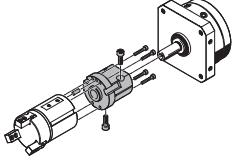
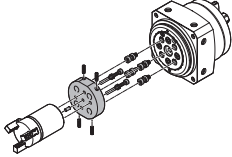
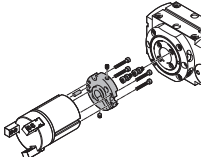
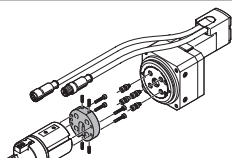
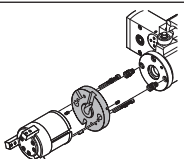


**Note**

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

**Permissible drive/gripper combinations with adapter kit**


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

Combination	Actuator Size	Gripper Size	Adapter kit		
			KBK <sup>1)</sup>	Part no.	Type
<b>DSM/DHDS</b>	<b>DSM</b>	<b>DHDS</b>	<b>HAPG</b>		
	8, 10	16	2	187569	HAPG-35
	25	32		163272	HAPG-23
<b>DSM-...-HD/DHDS</b>	<b>DSM-...-HD</b>	<b>DHDS</b>	<b>DHAA</b>		
	12	16	2	8072232	DHAA-G-R3-12-B19-16
	16	16		8079175	DHAA-G-R3-16-B19-16
	16	32		8079191	DHAA-G-R3-16-B19-32
	25	32		8079196	DHAA-G-R3-25-B19-32
	25	50		8079199	DHAA-G-R3-25-B19-50
	32	50		8079210	DHAA-G-R3-32-B19-50
<b>ERMB/DHDS</b>	<b>ERMB</b>	<b>DHDS</b>	<b>HAPG</b>		
	20	32	2	184481	HAPG-SD2-5
	25	50		184484	HAPG-SD2-8
	32	50		184487	HAPG-SD2-11
<b>ERMO/DHDS</b>	<b>ERMO</b>	<b>DHDS</b>	<b>DHAA</b>		
	12	16	2	8072232	DHAA-G-R3-12-B19-16
	16	16		8079175	DHAA-G-R3-16-B19-16
	16	32		8079191	DHAA-G-R3-16-B19-32
	25	32		8079196	DHAA-G-R3-25-B19-32
	25	50		8079199	DHAA-G-R3-25-B19-50
	32	50		8079210	DHAA-G-R3-32-B19-50
<b>EHMB/DHDS</b>	<b>EHMB</b>	<b>DHDS</b>	<b>HAPG</b>		
	20	50	2	184487	HAPG-SD2-11
	25, 32	50		526026	HAPG-SD2-20

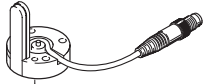
1) Corrosion resistance class CRC 2 to Festo standard FN 940070

Moderate corrosion stress. Indoor applications in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.

Accessories


Ordering data		Comment	Weight [g]	Part no.	Type	PU <sup>1)</sup>
For size [mm]						
Centring sleeve ZBH						
	16, 32	For centring the gripper fingers on the gripper jaws	1	8146543	ZBH-5-B	10
	50		1	8146544	ZBH-7-B	


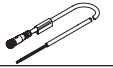
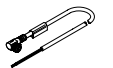
1) Packaging unit

Ordering data		For size	Weight [g]	Part no.	Type
Type					
Position sensor SMH-S1					
		16	30	175713	SMH-S1-HGD16

Signal converter SVE4 for position sensor SMH-S1


- Converts analogue signals into switching points
- Switching function freely programmable with teach-in
- Threshold value, hysteresis or window comparator



Ordering data		Input connection	Output connection	Switching output	Weight [g]	Part no.	Type
Type	For size						
Signal converter SVE4							
	16	Socket M8x1, 4-pin	Plug M8x1, 4-pin	2x PNP	19	544216	SVE4-HS-R-HM8-2P-M8
				2x NPN		544219	SVE4-HS-R-HM8-2N-M8

Ordering data – Connecting cables		Electrical connection, left	Electrical connection, right	Cable length [m]	Part no.	Type
Connection between position sensor and signal converter						
		Straight socket, M8x1, 4-pin	Straight plug M8x1, 4-pin	2.5	554035	NEBU-M8G4-K-2.5-M8G4
Connection between signal converter and controller						
		Straight socket, M8x1, 4-pin	Cable, open end, 4-wire	2.5	541342	NEBU-M8G4-K-2.5-LE4
				5	541343	NEBU-M8G4-K-5-LE4
		Angled socket, M8x1, 4-pin	Cable, open end, 4-wire	2.5	541344	NEBU-M8W4-K-2.5-LE4
				5	541345	NEBU-M8W4-K-5-LE4



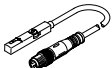
## Accessories


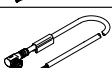
Proximity switch for size 32, 50						
Ordering data – Proximity switch for T-slot, magneto-resistive						
	Type of mounting	Electrical connection, outlet direction of connection	Switching output	Cable length [m]	Part no.	Type
Data sheets → Internet: smt						
<b>N/O contact</b>						
	Inserted in the slot lengthwise	Cable, 3-wire, crosswise	PNP	2.5	547859	SMT-8G-PS-24V-E-2,5Q-OE
		Plug M8x1, 3-pin, crosswise		0.3	547860	SMT-8G-PS-24V-E-0,3Q-M8D
		Cable, 3-wire, crosswise	NPN	2.5	8065028	SMT-8G-NS-24V-E-2,5Q-OE
		Plug M8x1, 3-pin, crosswise		0.3	8065027	SMT-8G-NS-24V-E-0,3Q-M8D

Ordering data – Connecting cables					
	Electrical connection, left	Electrical connection, right	Cable length [m]	Part no.	Type
Data sheets → Internet: nebu					
	Straight socket, M8x1, 3-pin	Cable, open end, 3-wire	2.5	541333	NEBU-M8G3-K-2.5-LE3
			5	541334	NEBU-M8G3-K-5-LE3
	Angled socket, M8x1, 3-pin	Cable, open end, 3-wire	2.5	541338	NEBU-M8W3-K-2.5-LE3
			5	541341	NEBU-M8W3-K-5-LE3

## Position transmitter

The position transmitter continuously senses the position of the piston.  
It has an analogue output and an output signal relative to the piston position.

Ordering data – Position transmitter for T-slot								
	For size	Position measuring range	Analogue output [V]	Type of mounting	Electrical connection	Cable length [m]	Part no.	Type
Data sheets → Internet: position transmitter								
	32, 50	0 ... 40	0 ... 10	Inserted in the slot from above	Plug M8x1, 4-pin, in-line	0.3	553744	SMAT-8M-U-E-0,3-M8D

Ordering data – Connecting cables					
	Electrical connection, left	Electrical connection, right	Cable length [m]	Part no.	Type
Data sheets → Internet: nebu					
	Straight socket, M8x1, 4-pin	Cable, open end, 4-wire	2.5	541342	NEBU-M8G4-K-2.5-LE4
			5	541343	NEBU-M8G4-K-5-LE4
	Angled socket, M8x1, 4-pin	Cable, open end, 4-wire	2.5	541344	NEBU-M8W4-K-2.5-LE4
			5	541345	NEBU-M8W4-K-5-LE4

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