

## Three-point grippers DHDS

**FESTO**



## Three-point grippers DHDS

Key features

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### At a glance

#### General information

- Resilient and precise T-slot guide of the gripper jaws
- High gripping forces with compact dimensions
- Gripper jaw centring options
- Max. repetition accuracy
- Gripping force retention
- Internal fixed flow control
- Wide range of options for mounting on drive units

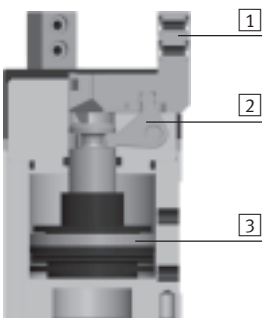
- Sensor technology:
  - Adaptable position sensor for the small gripper sizes
  - Integratable proximity sensors for the medium and large gripper sizes

#### Flexible range of applications

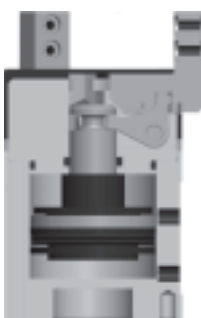
- Can be used as a double-acting and single-acting gripper
- Compression spring for supplementary or retaining gripping forces
- Suitable for external and internal gripping

### The technology in detail

#### Gripper closed



#### Gripper open



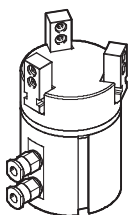
- 1 Gripper jaw
- 2 Reversing lever
- 3 Piston with magnet

#### Note

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

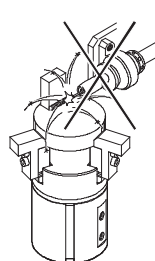
### Supply ports

#### At the side

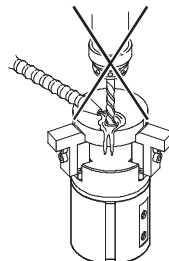


#### Note

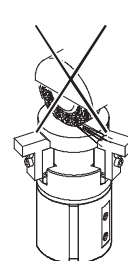
These grippers are not designed for the following or similar sample applications:



- Welding spatter



- Machining
- Aggressive media



- Grinding dust

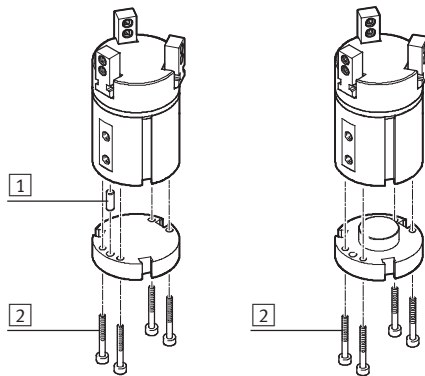
# Three-point grippers DHDS

Key features

## Mounting options

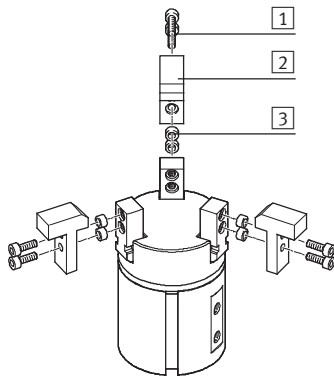
Size 16

Size 32, 50



- 1 Centring pin
- 2 Mounting screws

## Mounting options for external gripper fingers



- 1 Mounting screws
- 2 Gripper fingers
- 3 Centring sleeves

## Three-point grippers DHDS

Type codes

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		DHDS	—	32	—	A	—	NC
<b>Type</b>								
DHDS	Three-point gripper							
<b>Size</b>								
<b>Position sensing</b>								
A	Via proximity sensor							
<b>Gripping force retention</b>								
NC	Closing							

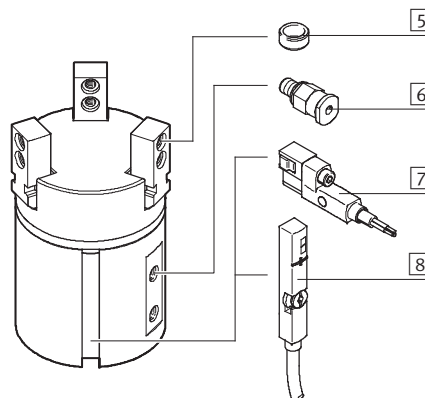
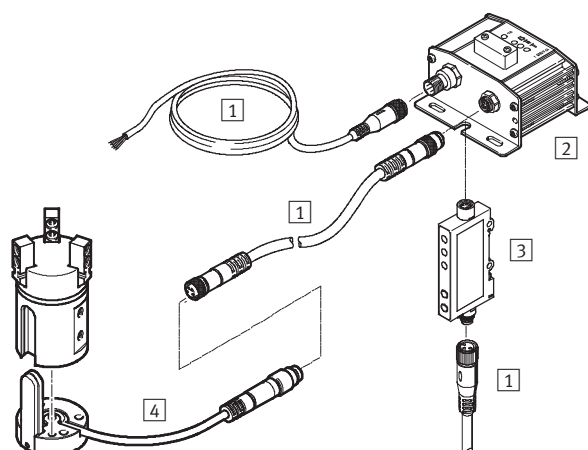
# Three-point grippers DHDS

Peripherals overview

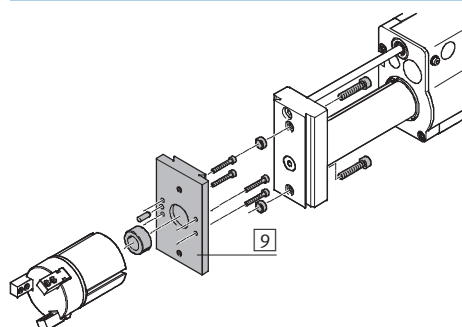
## Peripherals overview

DHDS-16

DHDS-32, 50



## System product for handling and assembly technology

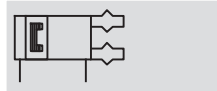


Accessories			
Type	Brief description		→ Page/Internet
[1] Connecting cable NEBU	For connecting evaluation unit and signal converter		16
[2] Evaluation unit SMH-AE1	<ul style="list-style-type: none"> <li>For evaluating signals for position sensor SMH-S1</li> <li>For size 16</li> </ul>		16
[3] Signal converter SVE4	<ul style="list-style-type: none"> <li>For evaluating signals for position sensor SMH-S1</li> <li>For size 16</li> </ul>		16
[4] Position sensor SMH-S1	<ul style="list-style-type: none"> <li>Adaptable and integratable sensor technology, for sensing the piston position</li> <li>For size 16</li> </ul>		16
[5] Centring sleeve ZBH	<ul style="list-style-type: none"> <li>For centring the gripper fingers on the gripper jaws</li> <li>The scope of delivery of the gripper includes 6 centring sleeves</li> </ul>		16
[6] Push-in fitting QS	For connecting compressed air tubing with standard O.D.		quick star
[7] Proximity sensor SMT-8G	<ul style="list-style-type: none"> <li>For sensing the piston position</li> <li>Proximity sensor does not project past the housing</li> <li>For size 32, 50</li> </ul>		17
[8] Position transmitter SMAT-8M	<ul style="list-style-type: none"> <li>Continuously senses the position of the piston. Has an analogue output with an output signal in proportion to the piston position.</li> <li>For size 32, 50</li> </ul>		17
[9] Adapter kit HMSV, HAPG, HAPS, HMVA	Connecting plate between drive and gripper		14

## Three-point grippers DHDS

Technical data

Function  
Double-acting  
DHDS-...-A



Size: 16 ... 50 mm  
Stroke: 2.5 ... 6 mm

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Spare\_parts\_service

Function – Variants  
Single-acting or  
with gripping force retention ...  
... closing DHDS-...-NC



General technical data			
Size	16	32	50
Design	Lever		
	Forced motion sequence		
Mode of operation	Double-acting		
Gripper function	Three-point		
Gripping force retention	NC	NC	NC
Number of gripper jaws	3		
Max. applied load per external gripper finger <sup>1)</sup> [N]	0.5	1.5	2.5
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]	< Ø 0.2		
Position sensing	Via position sensor		Via proximity sensor
Type of mounting	Via female thread and dowel pin		
Mounting position	Any		

- 1) Valid for unthrottled operation  
2) End-position drift under constant conditions of use with 100 consecutive strokes, concentric to the central shaft

Operating and environmental conditions		
Min. operating pressure		
DHDS-...-A [bar]	2	
DHDS-...-A-NC [bar]	4	
Max. operating pressure [bar]	8	
Operating medium	Filtered compressed air, lubricated or unlubricated	
Ambient temperature <sup>1)</sup> [°C]	+5 ... +60	
Corrosion resistance class CRC <sup>2)</sup>	1	

- 1) Note operating range of proximity sensors  
2) Corrosion resistance class 1 according to Festo standard 940 070  
Components subject to low corrosion stress. Transport and storage protection. Parts that do not have primarily decorative surface requirements, e.g. in internal areas that are not visible or behind covers.

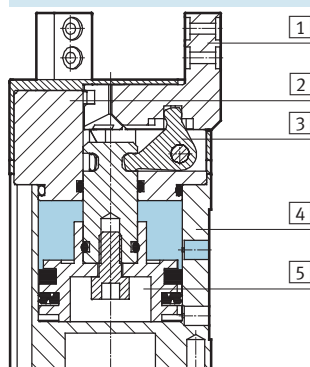
Weight [g]			
Size	16	32	50
DHDS-...-A	96	276	920
DHDS-...-A-NC	99	281	932

# Three-point grippers DHDS

Technical data

## Materials

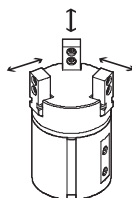
Sectional view



### Three-point gripper

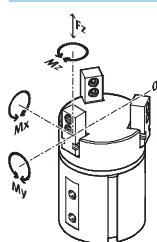
1	Gripper jaw	High-alloy stainless steel
2	Cover cap	Polyamide
3	Reversing lever	Hardened sintered steel
4	Housing	Hard anodised wrought aluminium alloy
5	Piston	Polyacetal
-	Note on materials	Free of copper and PTFE
-		RoHS-compliant

## Gripping force [N] at 6 bar



Size		16	32	50
Gripping force per gripper jaw				
DHDS-....A	Opening	40	135	280
	Closing	29	115	250
Total gripping force				
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 applied loads due to the workpiece or external gripper fingers and acceleration forces occurring during movement.

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

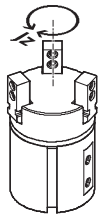
Size	16	32	50
Max. permissible force $F_z$ [N]	50	150	250
Max. permissible torque $M_x$ [Nm]	2	9	24
Max. permissible torque $M_y$ [Nm]	2	9	24
Max. permissible torque $M_z$ [Nm]	2	9	24

## Three-point grippers DHDS

Technical data

**FESTO**

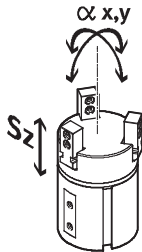
### Mass moment of inertia [kgcm<sup>2</sup>]



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



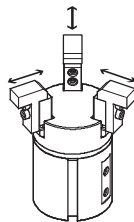
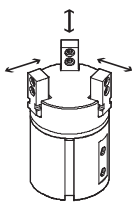
The plain-bearing guide used in the grippers means that there is backlash between the gripper jaws and the housing. The values entered in the table for the backlash were calculated in accordance with the traditional accumulative tolerance method.

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 indicated opening and closing times [ms] were measured at room temperature at an operating pressure of 6 bar with horizontally mounted grippers without additional gripper

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

Size		16	32	50
Without external gripper fingers				
DHDS-...-A	Opening	26	44	62
	Closing	42	51	55
DHDS-...-A-NC	Opening	31	55	73
	Closing	34	47	50
With external gripper fingers per gripper finger (as a function of applied load)				
DHDS-...	1 N	100	–	–
	2 N	–	100	–
	3 N	–	200	100
	4 N	–	–	200
	5 N	–	–	300

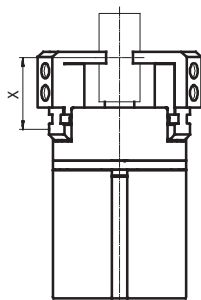


## Three-point grippers DHDS

Technical data

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

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



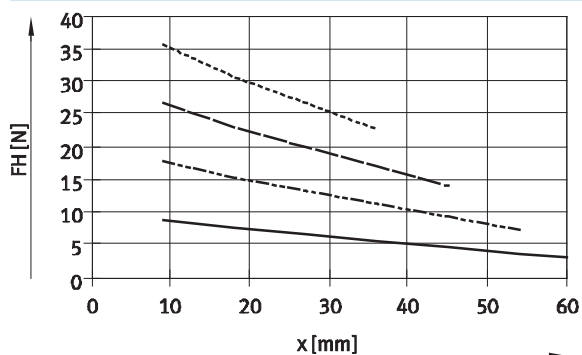
— 2 bar  
- - - 4 bar  
- · - · 6 bar  
· · · · 8 bar

#### Note

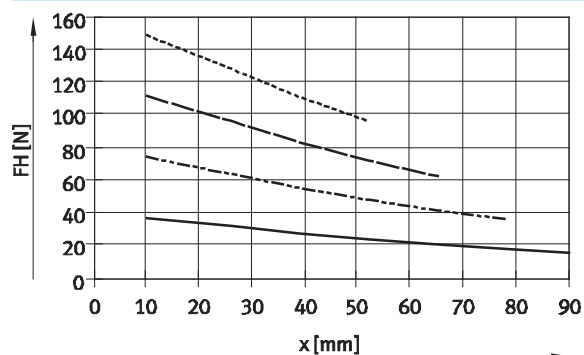
Gripper selection  
sizing software  
→ [www.festo.com](http://www.festo.com)

### External gripping (closing)

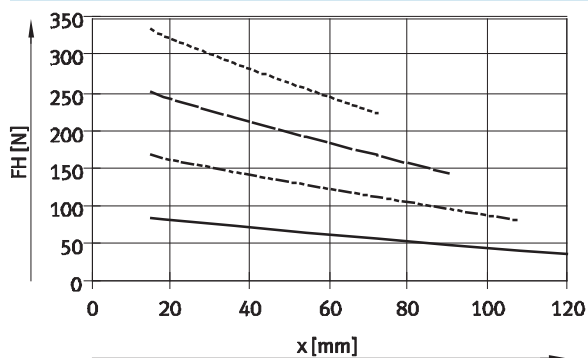
DHDS-16-A



DHDS-32-A



DHDS-50-A



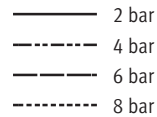
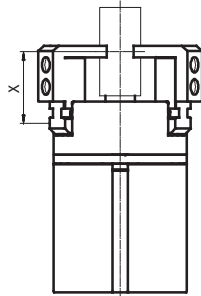
## Three-point grippers DHDS

Technical data

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

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

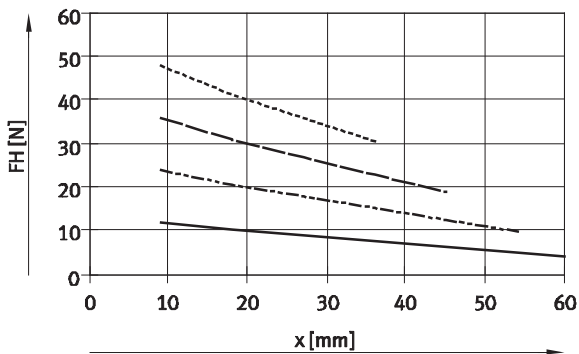


#### Note

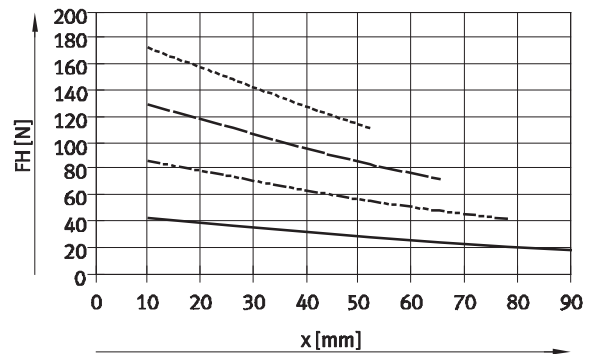
Gripper selection  
sizing software  
→ [www.festo.com](http://www.festo.com)

### Internal gripping (opening)

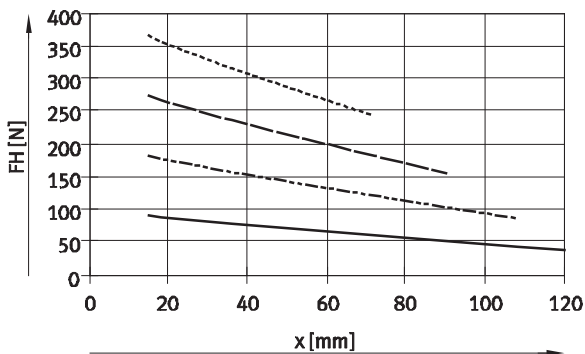
DHDS-16-A



DHDS-32-A



DHDS-50-A



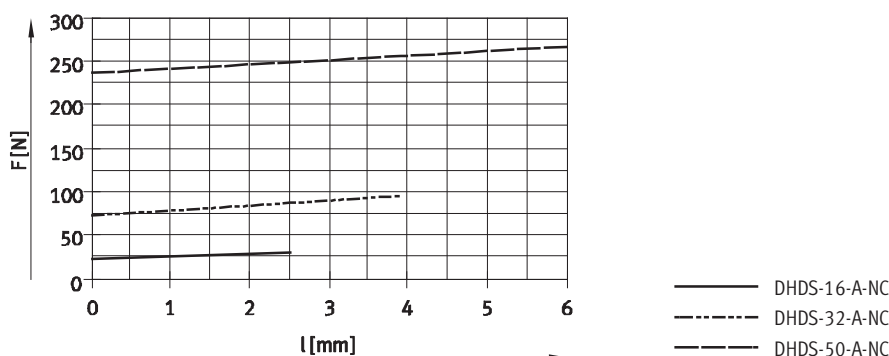
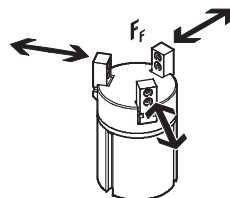
## Three-point grippers DHDS

Technical data

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

Gripping force retention for DHDS-...-NC

The spring forces  $F_F$  as a function of 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  $F_{Ftotal}$ . The formulae for calculating the spring force are provided in the table below.

Gripping force retention	Size	$F_{Ftotal}$ 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	$-0.3 \cdot x + 0.33 \cdot F_F$

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

The three-point grippers with integrated spring type DHDS-...-NC (closing gripping force retention) can be used as:

- single-acting grippers

- grippers with supplementary gripping force and
- grippers with gripping force retention depending on requirements.

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

### Application forces per gripper finger

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

## Three-point grippers DHDS

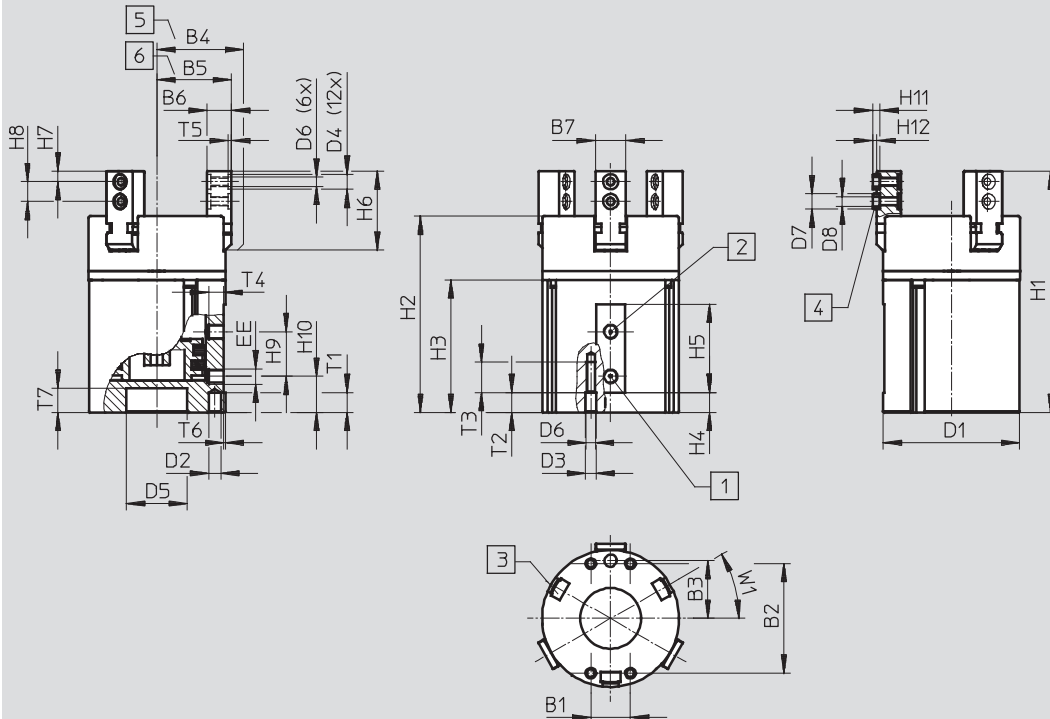
Technical data

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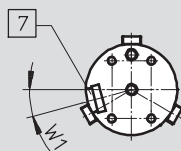
### Dimensions

Download CAD Data → [www.festo.com/us/cad](http://www.festo.com/us/cad)

#### DHDS-32, 50



#### DHDS-16



- |   |                            |
|---|----------------------------|
| 1 Supply port, opening  | 5 Gripper jaw open         |
| 2 Supply port, closing  | 6 Gripper jaw closed       |
| 3 Slot for proximity sensor                                       | 7 Slot for position sensor |
| 4 Centring sleeve ZBH<br>(6 included in the scope of<br>delivery) |                            |

# Three-point grippers DHDS

Technical data

Size [mm]	B1	B2	B3 ±0.02	B4 ±0.5	B5 ±0.5	B6 −0.02/−0.05	B7 −0.02	D1 ∅
16	13	19	11.5	20	17.5	7	6	30
32	13	36	19	28.5	24.6	8	10	45
50	25	54	30	43	37	12	14	70

Size [mm]	D2 ∅ H8	D3 ∅ H8	D4 ∅ H8	D5 ∅ +0.05/+0.02	D6	D7 ∅ h7	D8 ∅	EE
16	3	3.2	5	–	M3	5	3.2	M3
32	4	3.5	5	20	M3	5	3.2	M5
50	5	6	7	30	M5	7	5.3	G $\frac{1}{8}$

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

Size [mm]	H10	T1 min.	T2 min.	T3 +1	T4 −0.5	T5 +0.1	T6 ±0.2	T7	W1
16	11	4.5	4.5	8	5	1.2	1	–	15°
32	10.5	6.5	6.5	10	5	1.1	0.5	8	30°
50	16	7	7	18	7.5	1.6	1	9	30°

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

Ordering data									
Size [mm]	Double-acting without compression spring				Single-acting or with gripping force retention				
	Part No.	Type			Closing 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			

## Three-point grippers DHDS

Accessories

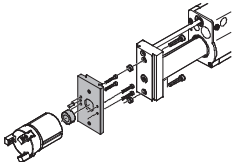
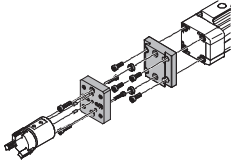
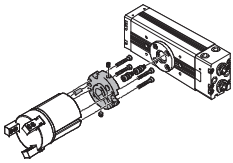
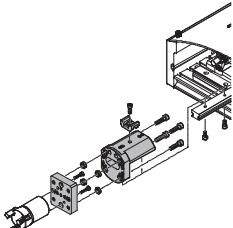
**FESTO**

**Adapter kit**  
HMSV, HAPG, HAPS, 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 → <a href="http://www.festo.com/us/cad">www.festo.com/us/cad</a>	
Combination	Drive	Gripper	Adapter kit		
	Size	Size	CRC <sup>1)</sup>	Part No.	Type
HMP/DHDS	HMP	DHDS	HMSV		
	Direct mounting				
	16, 20, 25	32	2	177765	HMSV-25
	25, 32	50		177766	HMSV-26
	Dovetail mounting				
	16, 20, 25	32	2	178212	HMSV-32
	25, 32	50		178213	HMSV-33
DGP..., DGE-..., DGEA/DHDS	DG...	DHDS	HMVA, HAPG, HMSV		
	Direct mounting				
	18 <sup>2)</sup> , 25	16	2	196788	HMVA-DLA18/25
				193921	HAPG-36-S3
	40	16		196790	HMVA-DLA40
			193921	HAPG-36-S3	
	Dovetail mounting				
	40	32	2	196790	HMVA-DLA40
		178212		HMSV-32	
40	50	2	196790	HMVA-DLA40	
			178213	HMSV-33	
DRQD/DHDS	DRQD	DHDS	HAPG		
	8, 12	16	2	187569	HAPG-35
	16	16		187567	HAPG-SD2-13
	20	32		184481	HAPG-SD2-5
	25	50		184484	HAPG-SD2-8
	32	50		184487	HAPG-SD2-11
	40, 50	50		526026	HAPG-SD2-20
HSP/DHDS	HSP	DHDS	HAPG		
	16	16	2	192705	HAPG-36-S1
				540882	HAPG-71-B
	25	16		192705	HAPG-36-S1
				540883	HAPG-72-B

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

Components subject to moderate corrosion stress. Externally visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment or media such as coolants or lubricating agents.

2) Only for DGEA-...

# Three-point grippers DHDS

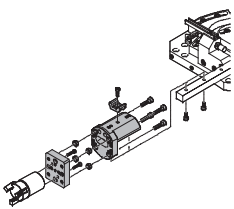
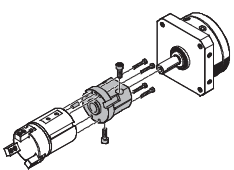
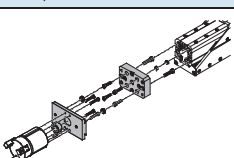
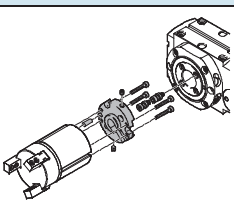
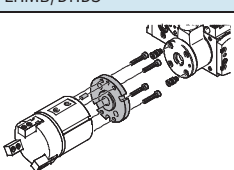
Accessories

**Adapter kit**  
HMSV, HAPG, HAPS, 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 → <a href="http://www.festo.com/us/cad">www.festo.com/us/cad</a>	
Combination	Drive Size	Gripper Size	Adapter kit CRC <sup>1)</sup>	Part No.	Type
	HSW	DHDS	HAPG		
	16	16	2	192705	HAPG-36-S1
				540882	HAPG-71-B
	DSM	DHDS	HAPG		
	8, 10	16	2	187569	HAPG-35
	25	32		163272	HAPG-23
	EGSA	DHDS	HMSV		
	60	32	2	560019	HMSV-63
				177765	HMSV-25
	ERMB	DHDS	HAPG		
	20	32	2	184481	HAPG-SD2-5
	25	50		184484	HAPG-SD2-8
	32	50		184487	HAPG-SD2-11
	EHMB	DHDS	HAPG		
	20	50	2	184487	HAPG-SD2-11
	25, 32	50		526026	HAPG-SD2-20


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

Components subject to moderate corrosion stress. Externally visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment or media such as coolants or lubricating agents.

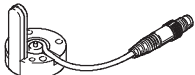
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Accessories



**FESTO**





Ordering data						
	For size [mm]	Comment	Weight [g]	Part No.	Type	PU <sup>1)</sup>
Centring sleeve ZBH <span style="float: right;">Technical data → Internet: zbh</span>						
	16, 32	For centring the gripper fingers on the gripper jaws	1	<b>189652</b>	<b>ZBH-5</b>	10
	50		1	<b>186717</b>	<b>ZBH-7</b>	

1) Packaging unit

Ordering data				
Type	For size	Weight [g]	Part No.	Type
Position sensor SMH-S1 <span style="float: right;">Technical data → Internet: smh-s1</span>				
	16	30	<b>175713</b>	<b>SMH-S1-HGD16</b>

Signal converter/evaluation unit for position sensor SMH-S1	
Signal converter SVE4	Evaluation unit SMH-AE1
<ul style="list-style-type: none"> <li>Converts analogue signals into switching points</li> <li>Switching function freely programmable with teach-in</li> <li>Threshold value, hysteresis or window comparator</li> </ul>	<ul style="list-style-type: none"> <li>Converts analogue signals into switching points</li> <li>With 3 potentiometers for setting 3 switching points</li> </ul>


Ordering data							
Type	For size	Input connection	Output connection	Switching output	Weight [g]	Part No.	Type
Signal converter SVE4						Technical data ➔ Internet: 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
Evaluation unit SMH-AE1						Technical data ➔ Internet: smh-ae	
	16	Socket M8x1, 4-pin	Plug M12x1, 5-pin	3x PNP	170	175708	SMH-AE1-PS3-M12
				3x NPN		175709	SMH-AE1-NS3-M12


Ordering data – Connecting cables				Technical data ➔ Internet: nebu	
	Electrical connection, left	Electrical connection, right	Cable length [m]	Part No.	Type
Connection between position sensor and signal converter/evaluation unit					
	Straight socket, M8x1, 4-pin	Straight plug, M8x1, 4-pin	2.5	<b>554035</b>	<b>NEBU-M8G4-K-2.5-M8G4</b>
Connection between evaluation unit and controller					
	Straight socket, M12x1, 5-pin	Cable, open end, 5-wire	2.5	<b>541330</b>	<b>NEBU-M12G5-K-2.5-LE5</b>
			5	<b>541331</b>	<b>NEBU-M12G5-K-5-LE5</b>
Connection between signal converter and controller					
	Straight socket, M8x1, 4-pin	Cable, open end, 4-wire	2.5	<b>541342</b>	<b>NEBU-M8G4-K-2.5-LE4</b>
			5	<b>541343</b>	<b>NEBU-M8G4-K-5-LE4</b>
	Angled socket, M8x1, 4-pin	Cable, open end, 4-wire	2.5	<b>541344</b>	<b>NEBU-M8W4-K-2.5-LE4</b>
			5	<b>541345</b>	<b>NEBU-M8W4-K-5-LE4</b>



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Accessories



Proximity sensor for size 32, 50						
Ordering data – Proximity sensors for T-slot, magneto-resistive					Technical data → Internet: smt	
	Type of mounting	Electrical connection, connection direction	Switching output	Cable length [m]	Part No.	Type
N/O contact						
	Insertable in the slot lengthwise	Cable, 3-wire, lateral	PNP	2.5	547859	SMT-8G-PS-24V-E-2,5Q-OE
		Plug M8x1, 3-pin, lateral		0.3	547860	SMT-8G-PS-24V-E-0,3Q-M8D

Proximity sensor for size 32, 50						
Ordering data – Position transmitters for T-slot					Technical data → Internet: smat	
	Type of mounting	Electrical connection, connection direction	Analogue output [V]	Cable length [m]	Part No.	Type
	Insertable in the slot from above	Plug M8x1, 3-pin, lateral	0 ... 10	0.3	553744	SMAT-8M-U-E-0,3-M8D

### Note

#### Mode of operation:

The position transmitter continuously senses the position of the piston. It has an analogue output with an output signal in proportion to the piston position.

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	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	

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