Three-point grippers DHDS

FESTO

New

Three-point grippers DHDS

Key features

At a glance

General information

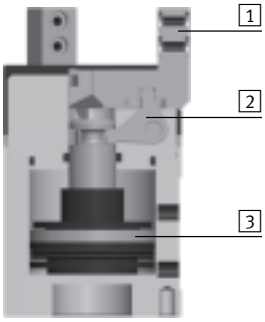
- Resilient and precise T-slot guide of the gripper jaws
- High gripping forces with compact dimensions
- Gripper jaw centring options
- Max. repetition accuracy
- Gripping force retention
- Internal fixed flow control
- Wide range of options for mounting on drive units
- Sensor technology:
  - Adaptable position sensor for the small gripper sizes
  - Integratable proximity sensors for the medium and large gripper sizes

Flexible range of applications

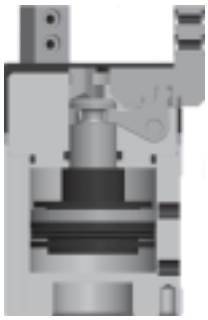
- Can be used as a double-acting and single-acting gripper
- Compression spring for supplementary or retaining gripping forces
- Suitable for external and internal gripping

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

Position sensing/force control

With position transmitter SMAT-8M

Infinite position sensing possible

- Analogue output 0 ... 10 V

With proportional pressure regulator VPPM

Infinite adjustment of the gripping force possible

- Setpoint input
  - 0 ... 10 V
  - 4 ... 20 mA

With proximity sensor SMT-8G

Multiple positions can be sensed:

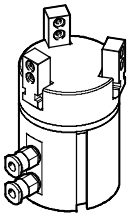
- Open
- Closed
- Workpiece gripped

Three-point grippers DHDS

Key features

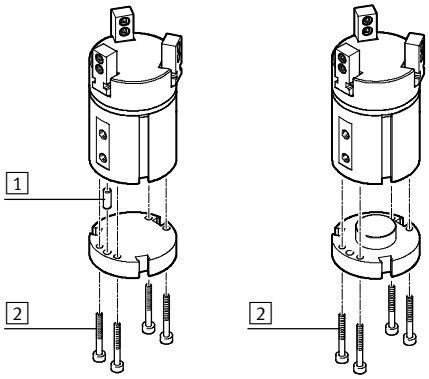
Supply ports

At the side



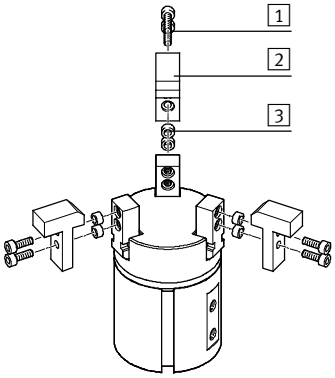
Mounting options

Size 16 Size 32, 50



1 Centring pin
2 Mounting screws

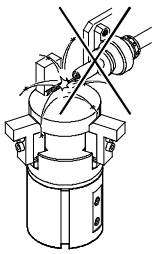
Mounting options for external gripper fingers



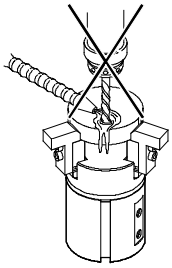
1 Mounting screws
2 Gripper fingers
3 Centring sleeves

Note

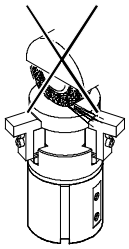
These grippers are not designed for the following or similar sample applications:



- Welding spatter



- Machining
- Aggressive media



- Grinding dust

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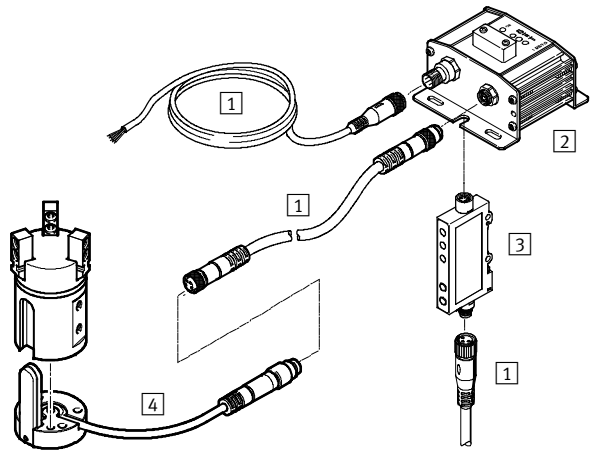
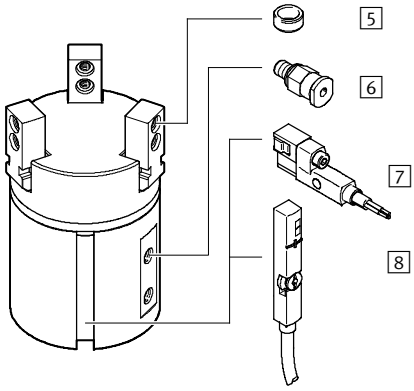
Peripherals overview

Peripherals overview

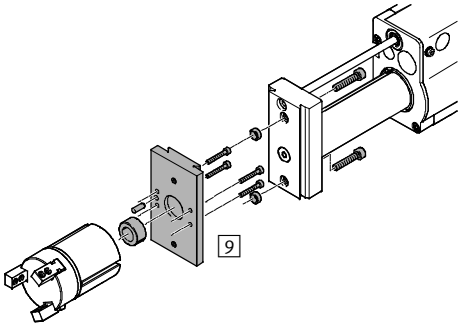
DHDS-16



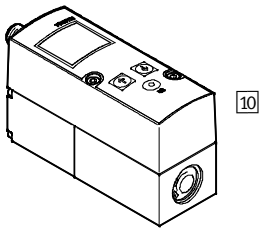
DHDS-32, 50



System product for handling and assembly technology



Proportional pressure regulator VPPM

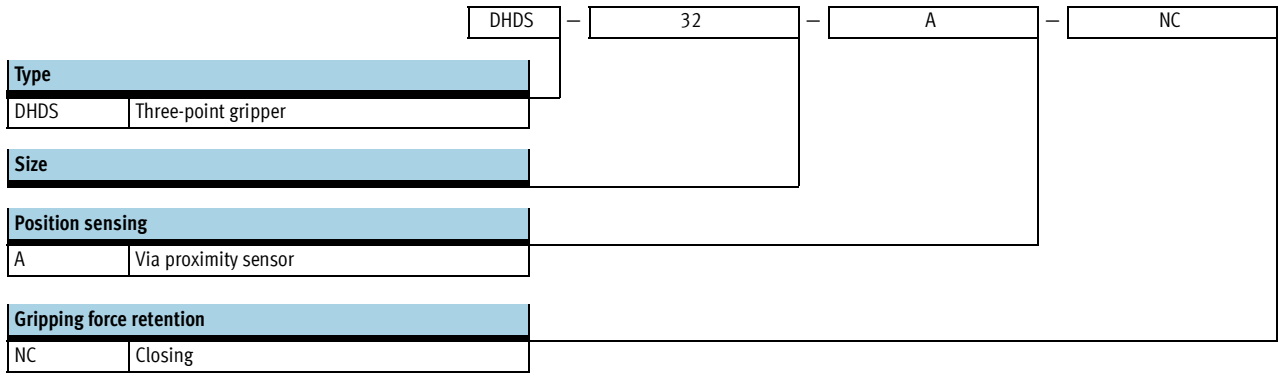


Accessories

	Type	Brief description	➔ Page/Internet
1	Connecting cable NEBU	For connecting evaluation unit and signal converter	17
2	Evaluation unit SMH-AE1	• For evaluating signals for position sensor SMH-S1 • For size 16	17
3	Signal converter SVE4	• For evaluating signals for position sensor SMH-S1 • For size 16	17
4	Position sensor SMH-S1	• Adaptable and integratable sensor technology, for sensing the piston position • For size 16	17
5	Centring sleeve ZBH	• For centring the gripper fingers on the gripper jaws • The scope of delivery of the gripper includes 6 centring sleeves	17
6	Push-in fitting QS	For connecting compressed air tubing with standard O.D.	quick star
7	Proximity sensor SMT-8G	• For sensing the piston position • Proximity sensor does not project past the housing at the bottom • For size 32, 50	18
8	Position transmitter SMAT-8M	• Continuously senses the position of the piston. Has an analogue output with an output signal in proportion to the piston position. • For size 32, 50	18
9	Adapter kit HMSV, HAPG, HAPS, HMVA	Connecting plate between drive and gripper	14
10	Proportional pressure regulator VPPM	For infinite adjustment of the gripping force	vppm

Three-point grippers DHDS

Type codes



New

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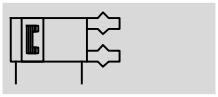
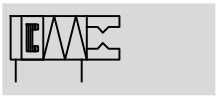
Technical data

Function
Double-acting
DHDS-...-A



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



Size
16 ... 50 mm

Stroke
2.5 ... 6 mm

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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[1]	[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[2]	[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 sensor, position transmitter	
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		Compressed air in accordance with ISO 8573-1:2010 [7:4:4]
Note on operating/pilot medium		Operation with lubricated medium possible (in which case lubricated operation will always be required)
Ambient temperature[1]	[°C]	+5 ... +60
Corrosion resistance class CRC[2]		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

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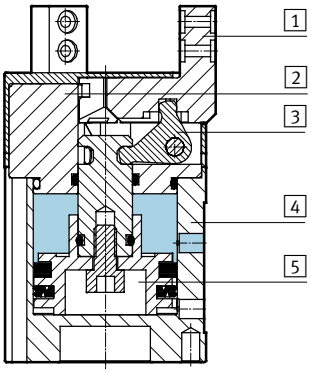
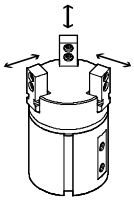
Materials

Sectional view



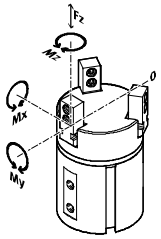
Three-point gripper		
1	Gripper jaw	High-alloy stainless steel
2	Cover cap	Polyamide
3	Reversing lever	Hardened sintered steel
4	Housing	Hard anodised wrought aluminium alloy
5	Piston	Polyacetal
–	Note on materials	Free of copper and PTFE
		RoHS-compliant

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

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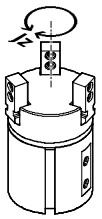
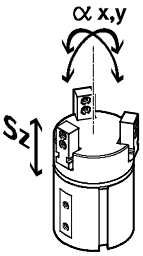
Mass moment of inertia [kgcm²]



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

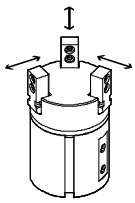


The plain-bearing guide used in the grippers means that there is backlash between the gripper jaws and the housing. The values entered in the table for the backlash were calculated in accordance with the traditional accumulative tolerance method.

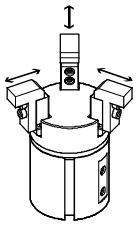
Size		16	32	50
Max. gripper jaw backlash Sz	[mm]	≤ 0.02		
Max. gripper jaw angular backlash ax, ay	[°]	≤ 0.5	≤ 0.2	

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

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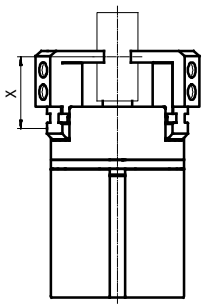
Gripping force F_H per gripper jaw as a function of operating pressure and lever arm x

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



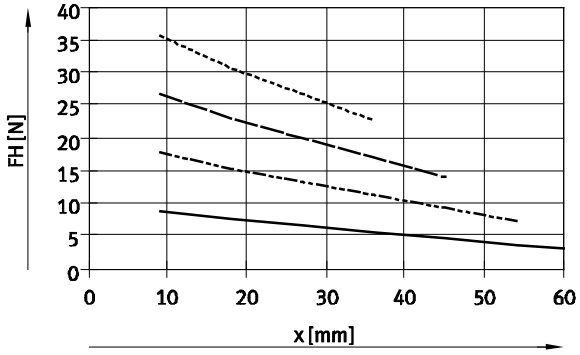
2 bar
4 bar
6 bar
8 bar

Note

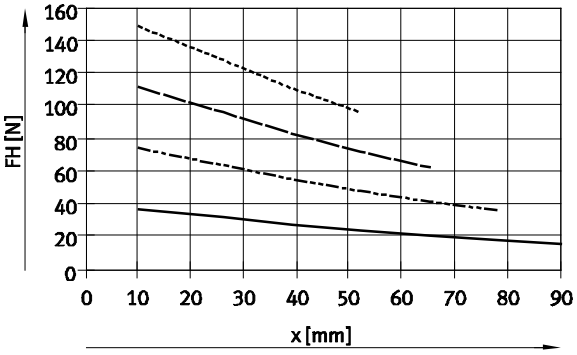
Gripper selection sizing software
➔ www.festo.com

External gripping (closing)

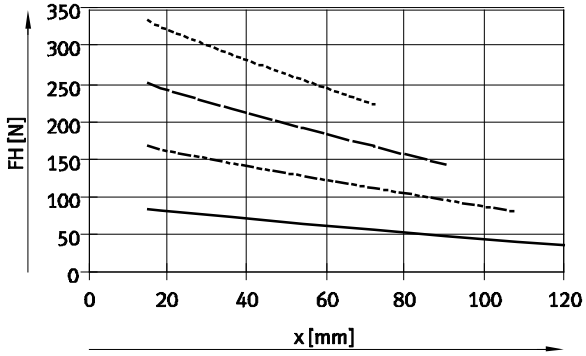
DHDS-16-A



DHDS-32-A



DHDS-50-A

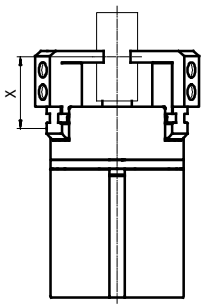


Three-point grippers DHDS

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.



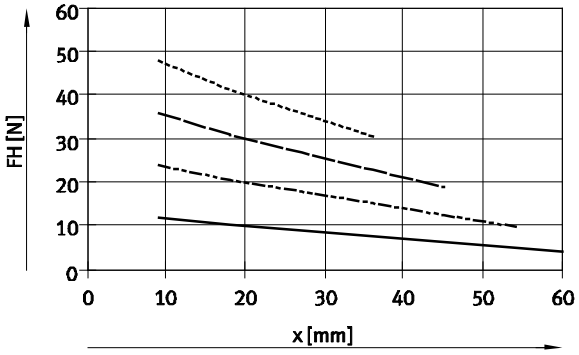
2 bar
4 bar
6 bar
8 bar

Note

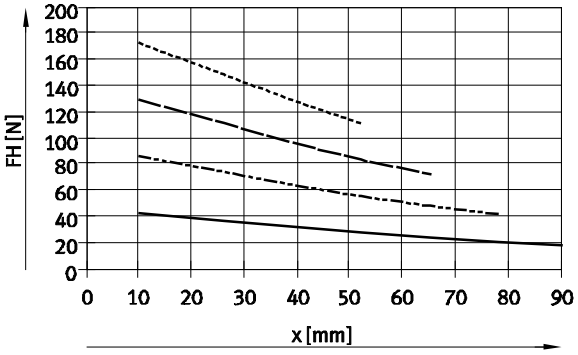
Gripper selection sizing software
➔ www.festo.com

Internal gripping (opening)

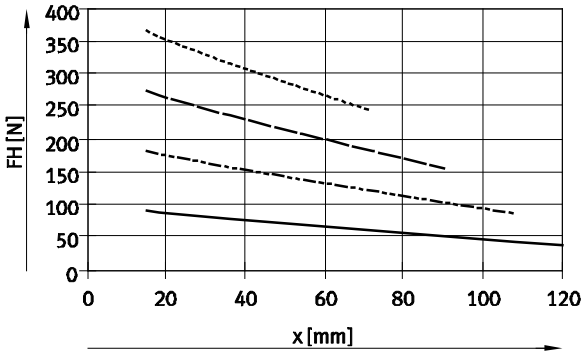
DHDS-16-A



DHDS-32-A



DHDS-50-A



Three-point grippers DHDS

Technical data

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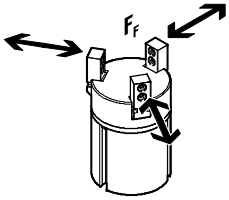
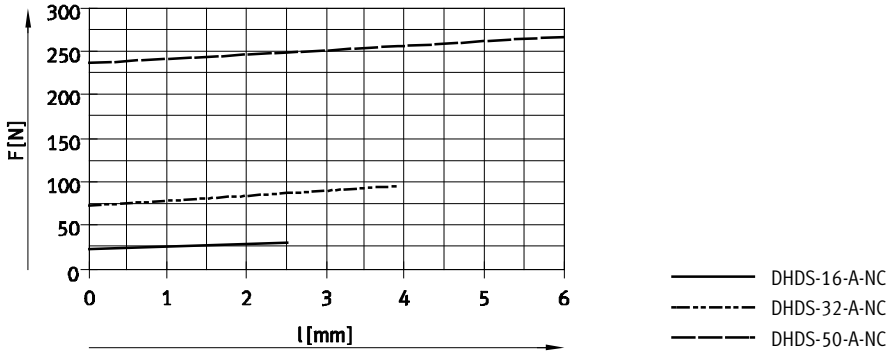
Spring force F_F as a function of size and gripper jaw stroke l

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	$-0.1 * x + 0.33 * F_F$
	32	$-0.2 * x + 0.33 * F_F$
	50	$-0.3 * x + 0.33 * F_F$

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
• Gripping with spring force: $F_{Gr} = F_{Ftotal}$	• Gripping with pressure and spring force: $F_{Gr} = F_H + F_{Ftotal}$	• Gripping with spring force: $F_{Gr} = F_{Ftotal}$
• Gripping with pressure force: $F_{Gr} = F_H - F_{Ftotal}$		

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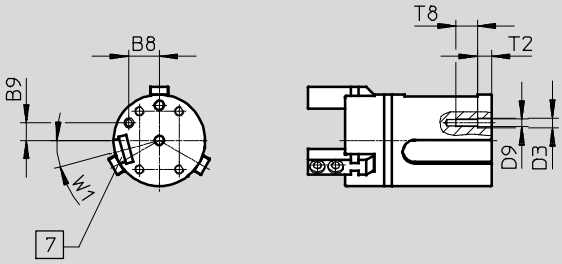
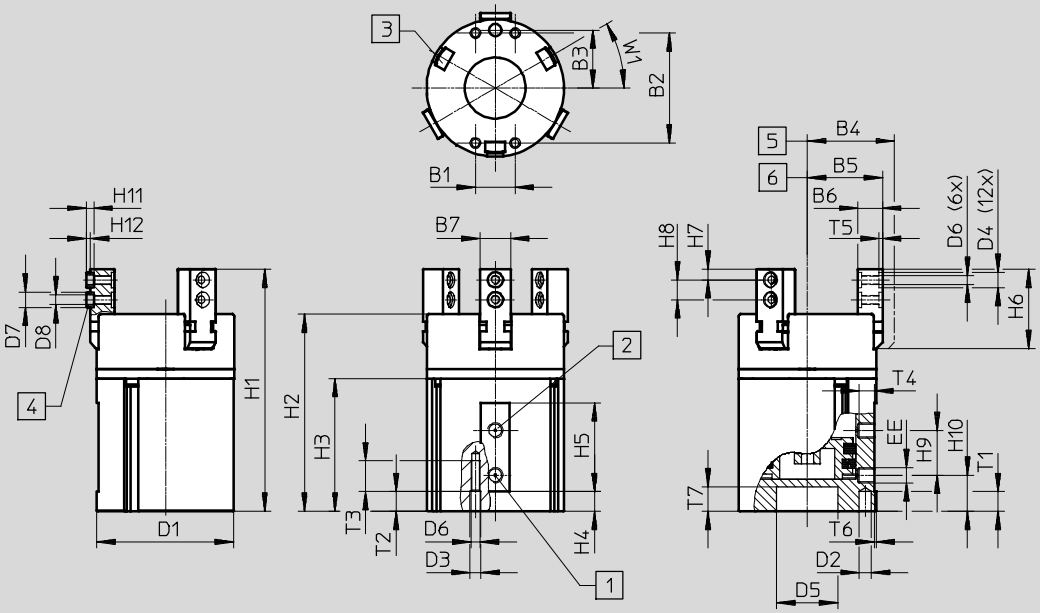
Technical data

Dimensions Download CAD data ➔ **www.festo.com**

DHDS-16



DHDS-32, 50



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

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Technical data

Size [mm]	B1	B2	B3 ±0.02	B4 ±0.5	B5 ±0.5	B6 –0.02/–0.05	B7 –0.02	B8 –0.1	B9 –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 [mm]	D1 ∅	D2 ∅ H8	D3 ∅ H8	D4 ∅ H8	D5 ∅ +0.05/+0.02	D6	D7 ∅ h7	D8 ∅	D9
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 [mm]	EE	H1	H2	H3	H4	H5	H6	H7	H8[1)]	H9
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 [mm]	H10	T1 min.	T2 min.	T3 +1	T4 –0.5	T5 +0.1	T6 ±0.2	T7	T8 ±1	W1
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 retention Closing	
[mm]	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**

Three-point grippers DHDS

Accessories

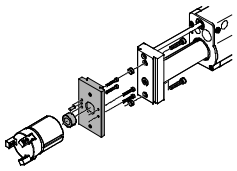
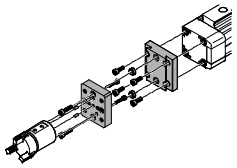
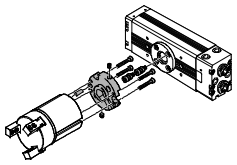
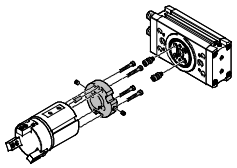
FESTO

Adapter kit
HMSV, HAPG, HMVA, DHAA

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**

Combination	Drive	Gripper	Adapter kit		
	Size	Size	CRC[1]	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[2], 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		**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**
DRRD/DHDS	DRRD	DHDS	DHAA		
	16	16	2	**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**

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

FESTO

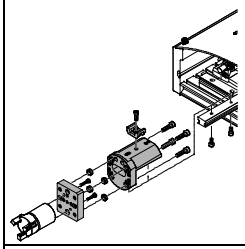
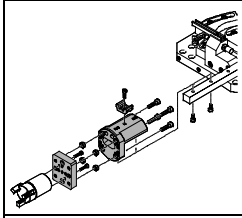
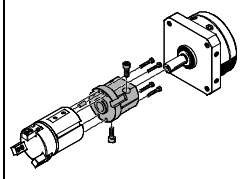
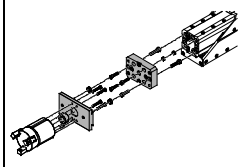
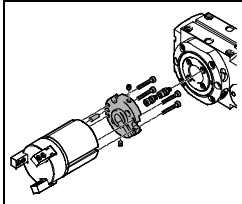
Adapter kit
HMSV, HAPG, HMVA, DHAA

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**

Combination	Drive	Gripper	Adapter kit		
	Size	Size	CRC[1]	Part No.	Type
HSP/DHDS	HSP	DHDS	HAPG		
	16	16	2	**192705**	**HAPG-36-S1**
				540882	**HAPG-71-B**
	25	16	2	**192705**	**HAPG-36-S1**
				540883	**HAPG-72-B**
HSW/DHDS	HSW	DHDS	HAPG		
	16	16	2	**192705**	**HAPG-36-S1**
				540882	**HAPG-71-B**
DSM/DHDS	DSM	DHDS	HAPG		
	8, 10	16	2	**187569**	**HAPG-35**
	25	32	2	**163272**	**HAPG-23**
EGSA/DHDS	EGSA	DHDS	HMSV		
	60	32	2	**560019**	**HMSV-63**
				177765	**HMSV-25**
ERMB/DHDS	ERMB	DHDS	HAPG		
	20	32	2	**184481**	**HAPG-SD2-5**
	25	50	2	**184484**	**HAPG-SD2-8**
	32	50	2	**184487**	**HAPG-SD2-11**

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.

Three-point grippers DHDS

Accessories

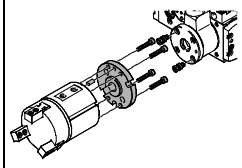
Adapter kit
HMSV, HAPG, HMVA, DHAA

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**

Combination	Drive	Gripper	Adapter kit		
	Size	Size	CRC[1]	Part No.	Type
EHMB/DHDS	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.

Three-point grippers DHDS

Accessories

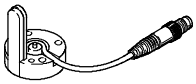
FESTO

Ordering data

	For size [mm]	Comment	Weight [g]	Part No.	Type	PU[1]
Centring sleeve ZBH						Technical data ➔ Internet: zbh
	16, 32	For centring the gripper fingers on the gripper jaws	1	**189652**	**ZBH-5**	10
	50		1	**186717**	**ZBH-7**	

1) Packaging unit

Ordering data

Type	For size	Weight [g]	Part No.	Type
Position sensor SMH-S1				Technical data ➔ Internet: smh-s1
	16	30	**175713**	**SMH-S1-HGD16**

Signal converter/evaluation unit for position sensor SMH-S1

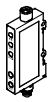
Signal converter SVE4

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

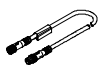
Evaluation unit SMH-AE1

- Converts analogue signals into switching points
- With 3 potentiometers for setting 3 switching points

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

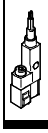
	Electrical connection, left	Electrical connection, right	Cable length [m]	Part No.	Type
Connection between position sensor and signal converter/evaluation unit					
	Straight socket, M8x1, 4-pin	Straight plug, M8x1, 4-pin	2.5	**554035**	**NEBU-M8G4-K-2.5-M8G4**
Connection between evaluation unit and controller					
	Straight socket, M12x1, 5-pin	Cable, open end, 5-wire	2.5	**541330**	**NEBU-M12G5-K-2.5-LE5**
			5	**541331**	**NEBU-M12G5-K-5-LE5**
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**

Three-point grippers DHDS

Accessories

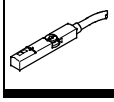
Proximity sensor for size 32, 50

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, in-line	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**