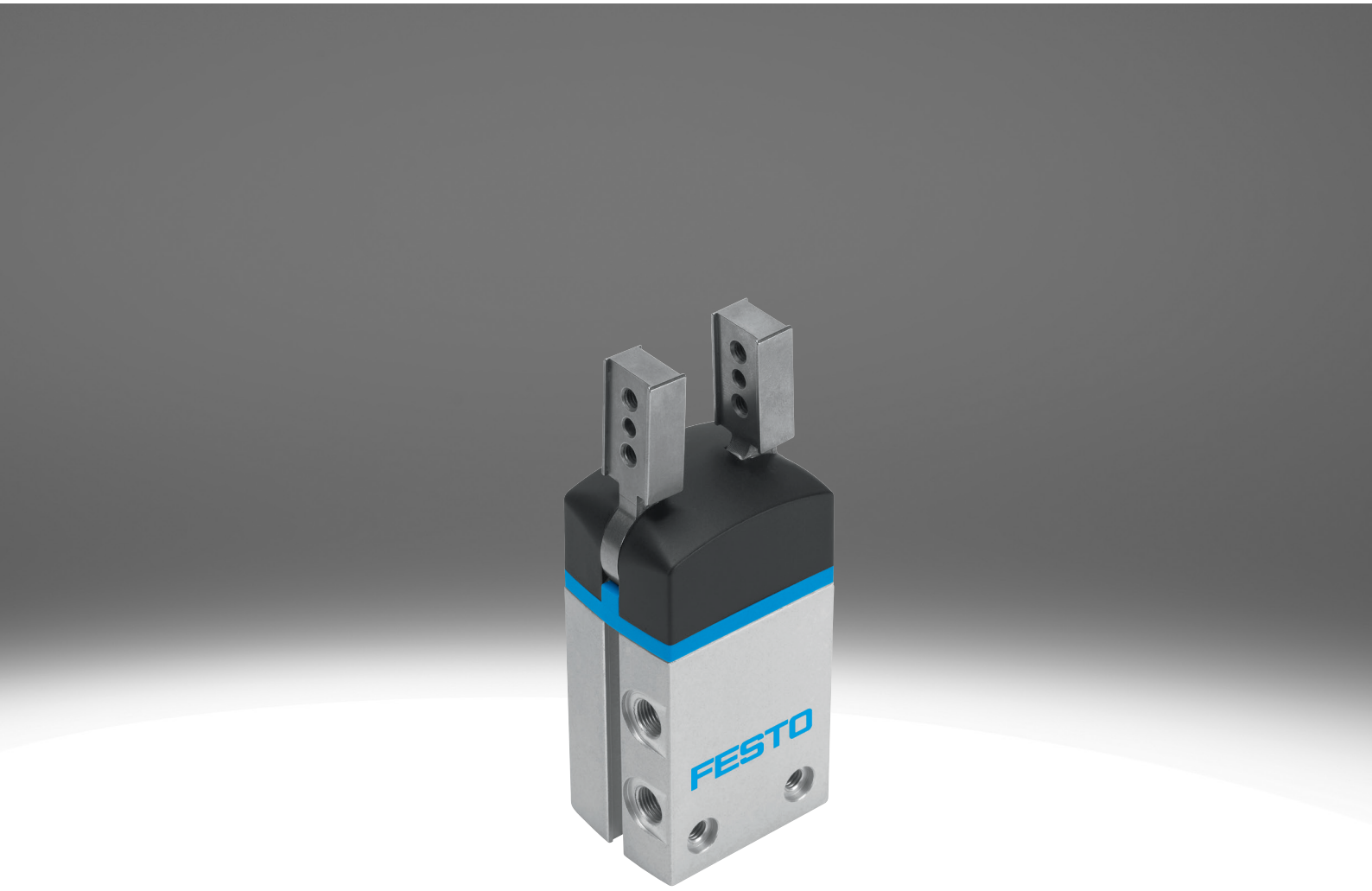
Radial gripper DHRS

FESTO



Characteristics

At a glance Further information ➔ dhrs

General information:
- Lateral gripper jaw support for high torque loads
- Self-centring
- Gripper jaw centring options
- Max. repetition accuracy
- Gripping force backup
- Internal fixed flow control
- Wide range of adaptation options on the drives

Sensors:
- Adaptable position sensor for small gripper sizes
- Integrated proximity switches for 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 retaining the gripping forces
- Suitable for external and internal gripping

These grippers are not designed for the following or similar application examples:
- Machining
- Aggressive media
- Grinding dust
- Welding spatter

Engineering tools Further information ➔ engineering tools

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Gripper selection:
- This tool helps you to select the right grippers by simply entering the exact parameters for your application

Diagrams Further information ➔ dhrs

The diagrams shown in this document are also available online. These can be used to display precise values.

Position sensing

[A]	For proximity sensor

By using proximity switches, any position can be detected.

Gripping force backup

[NC]	N/O contact

Closed by spring force in depressurised state

Type code

001	Series	
DHRS	Radial gripper	

002	Size [mm]	
10	10	
16	16	
25	25	
32	32	
40	40	

003	Position sensing	
A	For proximity sensor	

004	Gripping force backup	
	None	
NC	N/O contact	

Datasheet

General technical data					
Size	10	16	25	32	40
Design	Force pilot operated motion sequence				
Mode of operation	Double-acting				
Gripper function	Radial				
Gripping force backup	None	None N/O contact			
Number of gripper jaws	2				
Max. opening angle [1]	180 deg				
Pneumatic connection	M3		M5	G1/8	
Repetition accuracy, gripper [2]	≤0.1 mm				
Max. replacement accuracy	≤0.2 mm				
Max. operating frequency of gripper	≤4 Hz		≤3 Hz		≤2 Hz
Rotationally symmetrical	≤0.2 mm				
Position detection	Via Hall sensor	Via proximity switch			
Type of mounting	Either: Via female thread and centring sleeve Via through-hole and centring sleeve				
Mounting position	optional				

1) At an operating pressure of 0.8 MPa (8 bar, 116 psi)

2) End-position drift under constant operating conditions with 100 consecutive strokes in the direction of movement of the gripper jaws

Operating and environmental conditions								
Size	10	16		25		32		40	
Gripping force backup	None	N/O contact		None	N/O contact	None	N/O contact	None	N/O contact
Operating pressure	2 ... 8 bar	4 ... 8 bar		2 ... 8 bar	4 ... 8 bar	2 ... 8 bar	4 ... 8 bar	2 ... 8 bar	4 ... 8 bar
Operating medium	Compressed air to ISO 8573-1:2010 [7:4:4]								
Note on operating and pilot medium	Lubricated operation possible (in which case lubricated operation will always be required)								
Ambient temperature [1]	5 ... 60°C								
Corrosion resistance class CRC [2]	1 - Low corrosion stress								

1) Note the operating range of the proximity switches

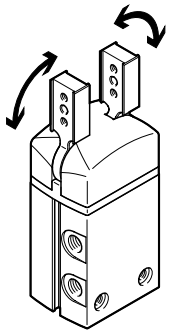
2) More information: www.festo.com/x/topic/crc

Weight									
Size	10	16		25		32		40	
Gripping force backup	None		N/O contact	None	N/O contact	None	N/O contact	None	N/O contact
Product weight	44 g	114 g	118 g	270 g	277 g	480 g	490 g	829 g	844 g

Materials	
Material housing	Hard anodised wrought aluminium alloy
Material gripper jaws	High-alloy steel
Material cover cap	PA
Note on materials	RoHS-compliant

Datasheet

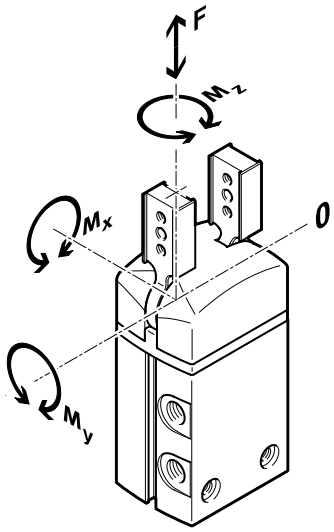
Gripping torque



The gripping torque is not constant across the opening angle.

Size	10	16	25	32	40
Total gripping torque at 0.6 MPa (6 bar, 87 psi), opening	21 Ncm	62 Ncm	233 Ncm	423 Ncm	725 Ncm
Total gripper torque, closing, 0.6 MPa (6 bar, 87 psi)	15 Ncm	55 Ncm	215 Ncm	390 Ncm	660 Ncm

Characteristic load values at the gripper jaws

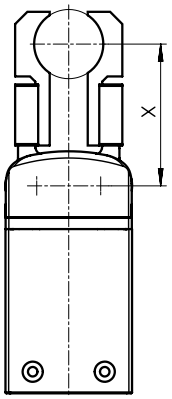


The indicated permissible forces and torques apply to one gripper jaw. They include the lever arm, additional applied loads created by the workpiece or external gripper fingers and acceleration forces occurring during the movement.
The zero coordinate line (gripper jaw guide) must be taken into consideration when calculating torques.

Size	10	16	25	32	40
Max. force on gripper jaw Fz static	30 N	40 N	75 N	120 N	200 N
Max. torque at gripper Mx static	0.8 Nm	1.3 Nm	3.2 Nm	6.2 Nm	14 Nm
Max. torque at gripper My static	0.8 Nm	1.3 Nm	3.2 Nm	6.2 Nm	14 Nm
Max. torque at gripper Mz static	0.8 Nm	1.3 Nm	3.2 Nm	6.2 Nm	14 Nm

Datasheet

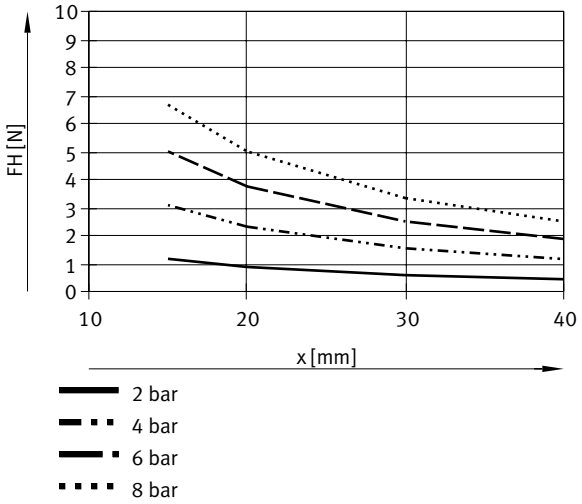
Gripping force FH per gripper jaw as a function of operating pressure and lever arm x



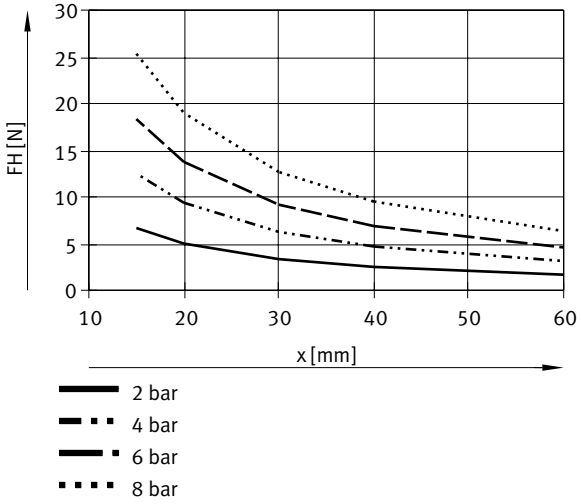
The gripping forces as a function of operating pressure and lever arm can be determined from the following graphs.
The gripping torque is not constant across the opening angle.

Sizing software for gripper selection → https://www.festo.com/x/topic/eng

Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – External gripping (closing), double-acting – DHRS-10

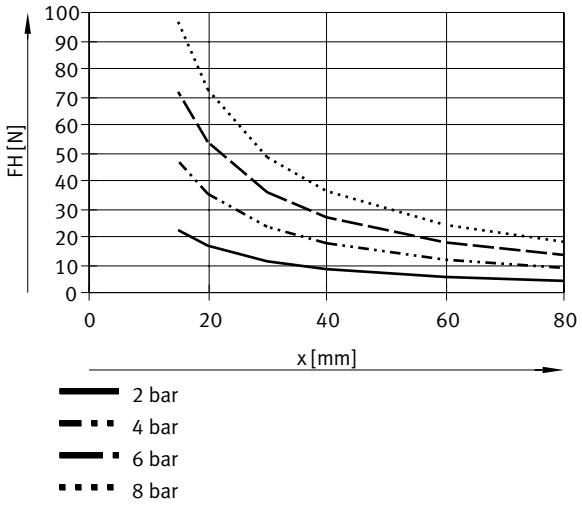


Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – External gripping (closing), double-acting – DHRS-16

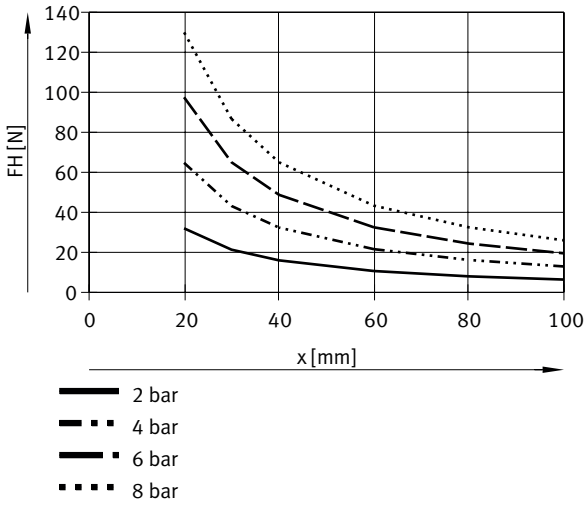


Datasheet

Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – External gripping (closing), double-acting – DHRS-25

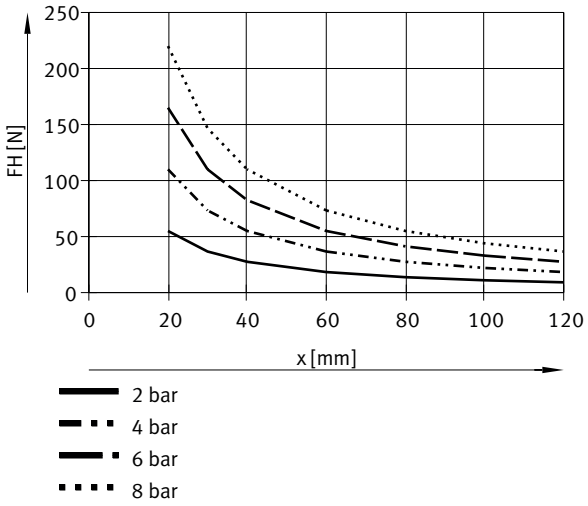


Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – External gripping (closing), double-acting – DHRS-32

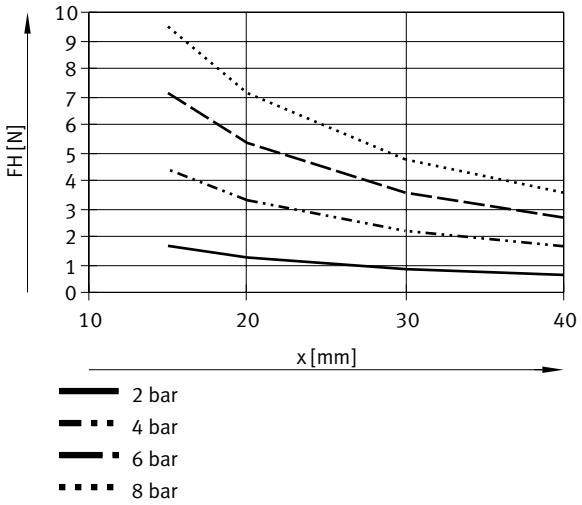


Datasheet

Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – External gripping (closing), double-acting – DHRS-40

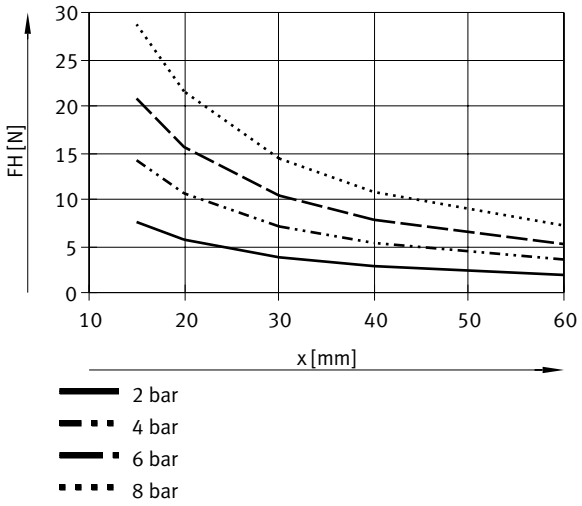


Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – Internal gripping (opening), double-acting – DHRS-10

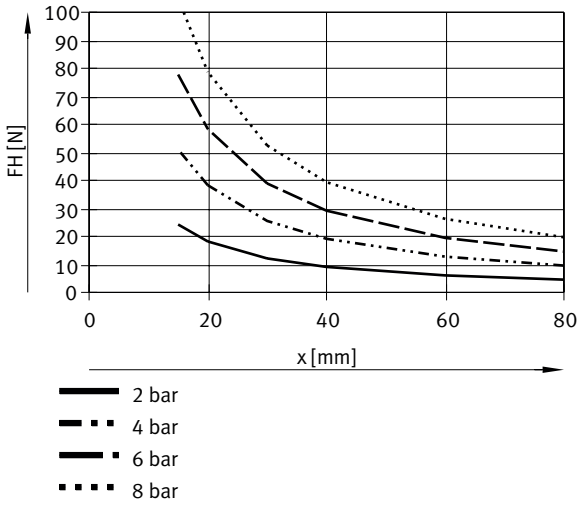


Datasheet

Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – Internal gripping (opening), double-acting – DHRS-16

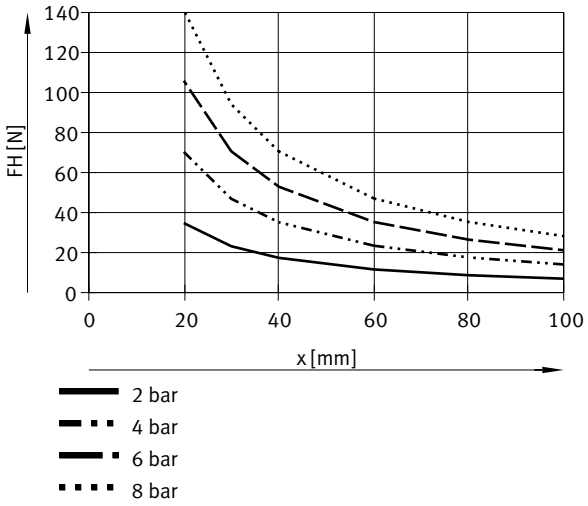


Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – Internal gripping (opening), double-acting – DHRS-25

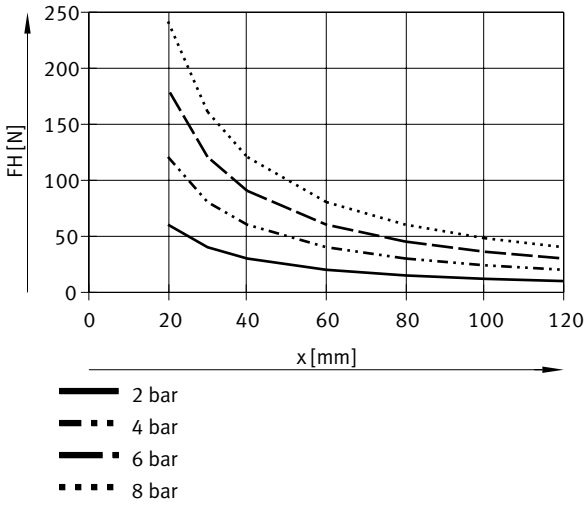


Datasheet

Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – Internal gripping (opening), double-acting – DHRS-32

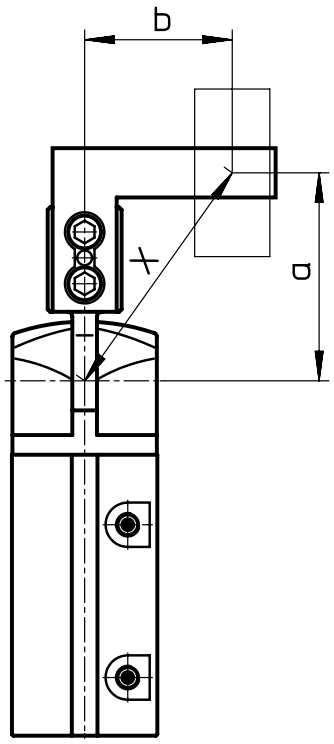


Gripping force FH per gripper jaw as a function of operating pressure and lever arm x – Internal gripping (opening), double-acting – DHRS-40



Datasheet

Gripping force FH per gripper jaw at 0.6 MPa (6 bar, 87 psi) as a function of lever arm x and eccentricity a and b



Gripping force FH per gripper jaw at 0.6 MPa (6 bar, 87 psi) as a function of lever arm x and eccentricity a and b

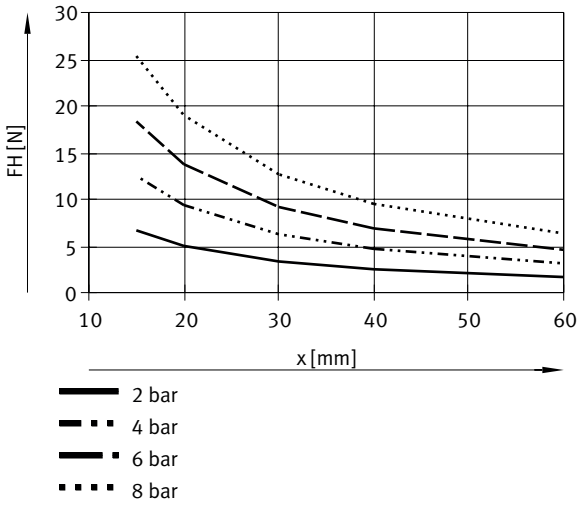
$x = \sqrt{a^2 + b^2} = \sqrt{25^2 + 20^2} = 32$ mm

The formula (on the left) must be used to calculate the lever arm x with eccentric gripping.
The gripping force FH can then be read from the graphs using the calculated value x.

Calculation example:
Assuming:
Distance a = 25 mm
Distance b = 20 mm
To be determined:
The gripping force at 6 bar with a DHRS-16, used as an external gripper.

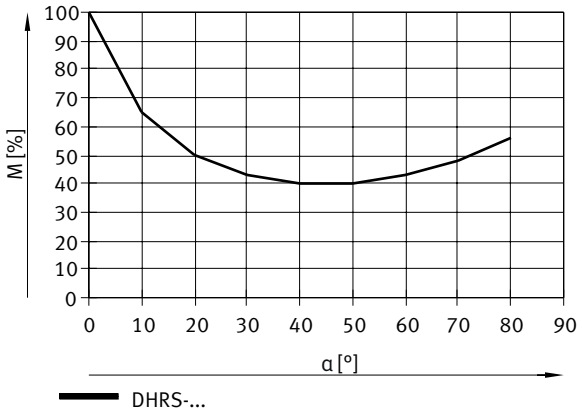
Datasheet

Gripping force FH per gripper jaw at 0.6 MPa (6 bar, 87 psi) as a function of lever arm x and eccentricity a and b



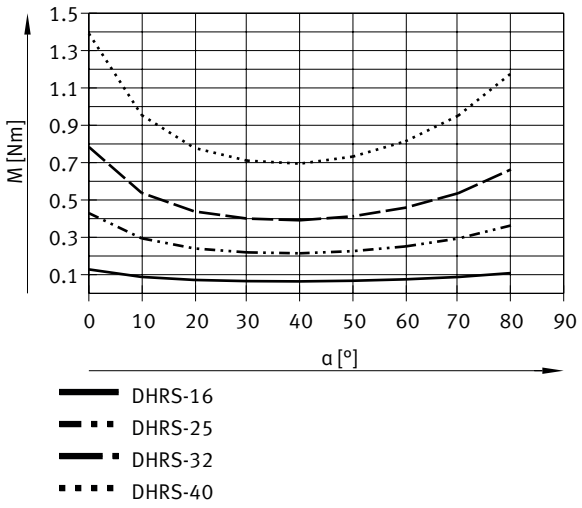
The graph gives a value of FH = 8 N for the gripping force.

Torque curve M as a function of opening angle



The drive principle of the gripper jaws means that the torque is not constant across the opening angle. The percentage available in each case can be calculated in the graph.
Opening angle of 0° means: parallel gripper jaw position

Spring torque MF as a function of opening angle



Datasheet

Determining the actual gripping torques MGrtotal for DHRS-...-NC as a function of application

Depending on the requirements, the radial gripper with integrated spring, type DHRS-...-NC (closing gripping force backup), can be used as a:
- Single-acting gripper
- Gripper with gripping force backup and
- Gripper with gripping force retention

.

To calculate the available gripping torque MGrtotal (per gripper jaw), the gripping force FH, the torque curve M and the spring torque MF must be combined accordingly.

MGr = FH * x * M [%]

MGr = Gripping torque
FH = Gripping force
x = Lever arm
M = Torque curve

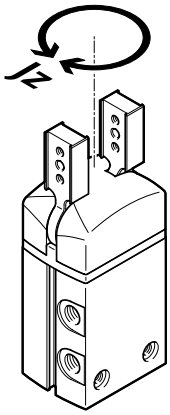
Determining the actual gripping torques MGrtotal for DHRS-...-NC as a function of the application – application

Single-acting:
- Gripping with spring force: MGrtotal = MF
- Gripping with pressure force: MGrtotal = MGr – MF

Gripping force backup:
- Gripping with pressure and spring force: MGrtotal = MGr + MF

Gripping force retention
- Gripping with spring force: MGrtotal = MF

Mass moments of inertia

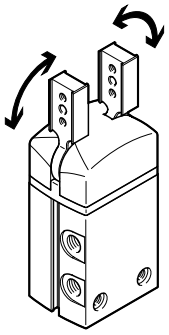


Mass moment of inertia of the radial gripper in relation to the central axis, without external gripper fingers, with no load.

Size	10	16		25		32		40	
Gripping force backup	None		N/O contact	None	N/O contact	None	N/O contact	None	N/O contact
Mass moment of inertia	0.03 kgcm²	0.14 kgcm²	0.15 kgcm²	0.69 kgcm²	0.71 kgcm²	1.66 kgcm²	1.69 kgcm²	4.18 kgcm²	4.24 kgcm²

Datasheet

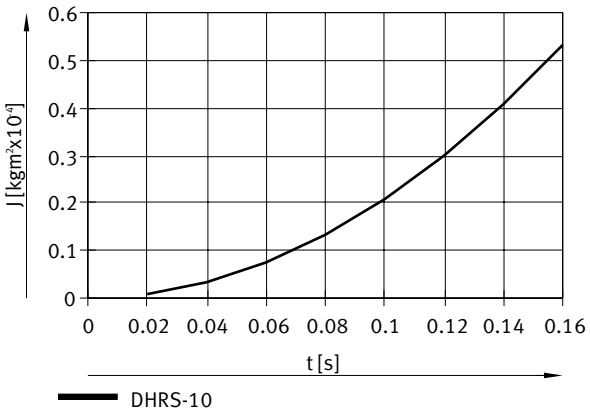
Opening and closing times



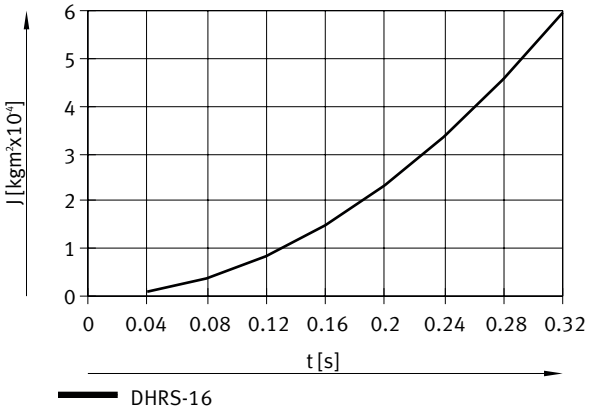
The indicated opening and closing times [ms] were measured at room temperature, at an operating pressure of 0.6 MPa (6 bar, 87 psi) and with the gripper installed horizontally without additional gripper fingers (mean values shown). The grippers must be throttled for larger weights. Opening and closing times must then be adjusted accordingly.

Size	10	16		25		32		40	
Gripping force backup	None		N/O contact	None	N/O contact	None	N/O contact	None	N/O contact
Min. opening time at 0.6 MPa (6 bar, 87 psi)	35 ms	61 ms	75 ms	102 ms	150 ms	111 ms	131 ms	113 ms	151 ms
Min. closing time at 0.6 MPa (6 bar, 87 psi)	91 ms	63 ms	43 ms	105 ms	96 ms	119 ms	88 ms	142 ms	110 ms

Opening and closing times t to be set at 0.6 MPa (6 bar, 87 psi) as a function of mass moment of inertia of the gripper fingers – DHRS-10

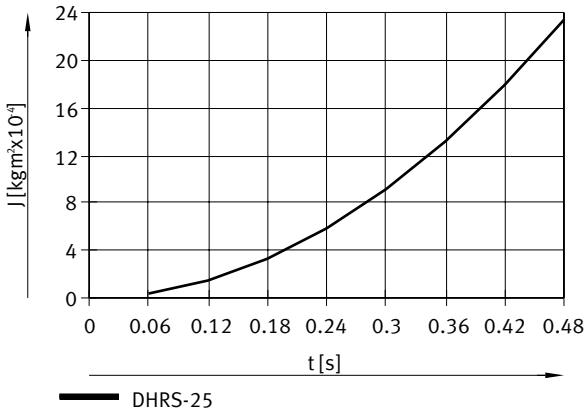


Opening and closing times t to be set at 0.6 MPa (6 bar, 87 psi) as a function of mass moment of inertia of the gripper fingers – DHRS-16

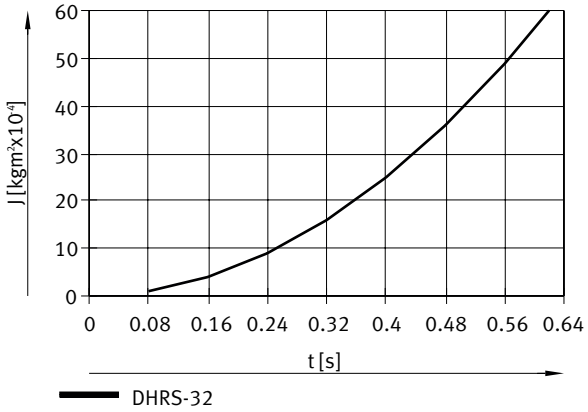


Datasheet

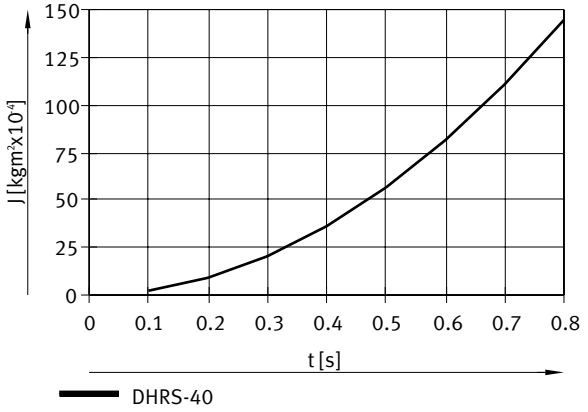
Opening and closing times t to be set at 0.6 MPa (6 bar, 87 psi) as a function of mass moment of inertia of the gripper fingers – DHRS-25



Opening and closing times t to be set at 0.6 MPa (6 bar, 87 psi) as a function of mass moment of inertia of the gripper fingers – DHRS-32

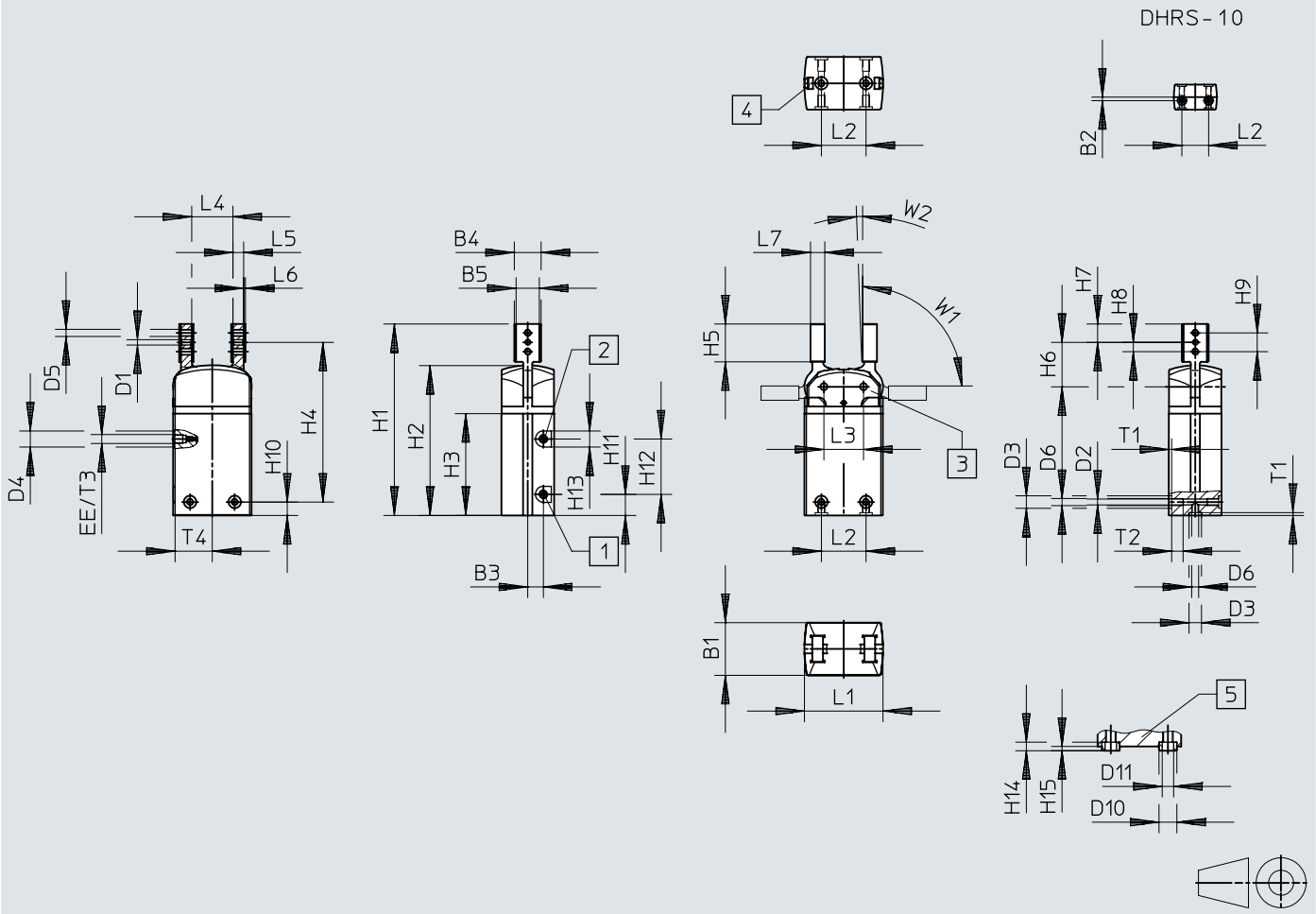


Opening and closing times t to be set at 0.6 MPa (6 bar, 87 psi) as a function of mass moment of inertia of the gripper fingers – DHRS-40



Dimensions

Dimensions – Radial gripper DHRS Download CAD data ➔ www.festo.com



[1] Open compressed air supply port
[2] Close compressed air supply port
[3] View shown without cover
[4] Slot for proximity switch
[5] Mounting interface: centring sleeves ZBH for mounting the gripper (2 pieces included in the scope of delivery)

Dimensions

	B1 ±0,05	B2[1]	B3	B4	B5 +0,03/ +0,01	D1 ø H8	D2 ø +0,1	D3 ø H8/h7	D4 ø	D5	D6
DHRS-10	14	2	2	8,5	6,5	2	2,4	5	7	M2,5	M3
DHRS-16	19	–	5,8	14	10	2	2,5	5	–	M3	M3
DHRS-25	29,5	–	8,75	15	13	3	3,3	7	9	M4	M4
DHRS-32	38	–	11	16	14	4	5,1	9	15	M5	M6
DHRS-40	49	–	11	24	20	5	6,4	12	15	M6	M8

	D10 ø h7	D11 ø	EE	H1	H2	H3	H4 ±0,25	H5 ±0,2	H6 ±0,05	H7 –0,1
DHRS-10	5	3,2	M3	60,8	46	30,8	42,25	13,8	14,95	6,25
DHRS-16	5	3,2	M3	88,2	70,5	49	73,7	16,5	19,7	7
DHRS-25	7	5,3	M5	107,2	84	57	89,45	21,2	24,95	10,25
DHRS-32	9	6,4	G1/8	128,5	96,2	65	103,5	29,5	32	14
DHRS-40	12	10,3	G1/8	140	108,4	71,5	108,7	29,5	33,7	13,8

	H8	H9	H10[2]	H11	H12	H13	H14 –0,2	H15 –0,3	L1 ±0,05	L2[1]	L3 ±0,02
DHRS-10	4	8	12,3	8,8	16	7	2,4	1,2	24	15	12,4
DHRS-16	4	8	7,5	12,25	23	7	2,4	1,2	33,4	16	17
DHRS-25	5,25	10,5	7,5	11,8	31	9	3	1,4	44	25	22,2
DHRS-32	7	14	11	20	25	15	4	1,9	51	29	25,8
DHRS-40	8	16	17,5	9	46	15	5	2,4	59	33	30

	L4	L5 ±0,05	L6	L7	T1 +0,1	T2 +1	T3 +0,5	T4	W1 ±2°	W2 +3°
DHRS-10	12	4	0,5	5	1,2	durch	3,5	11,6	90	2
DHRS-16	21	4	1	6	1,2	5,8	4,5	16	90	2
DHRS-25	23,2	6	1	8	1,6	6,4	4,5	21	90	2
DHRS-32	24,8	8	1	10	2,1	12,9	6,5	24	90	2
DHRS-40	29,6	10	1	12	2,6	13,4	6	28,4	90	2

1) Tolerance for centring hole ±0.02 mm Tolerance for thread ±0.1 mm
2) Tolerance for centring hole –0.05 mm/tolerance for thread ±0.1 mm

Ordering data

Double-acting, without compression spring

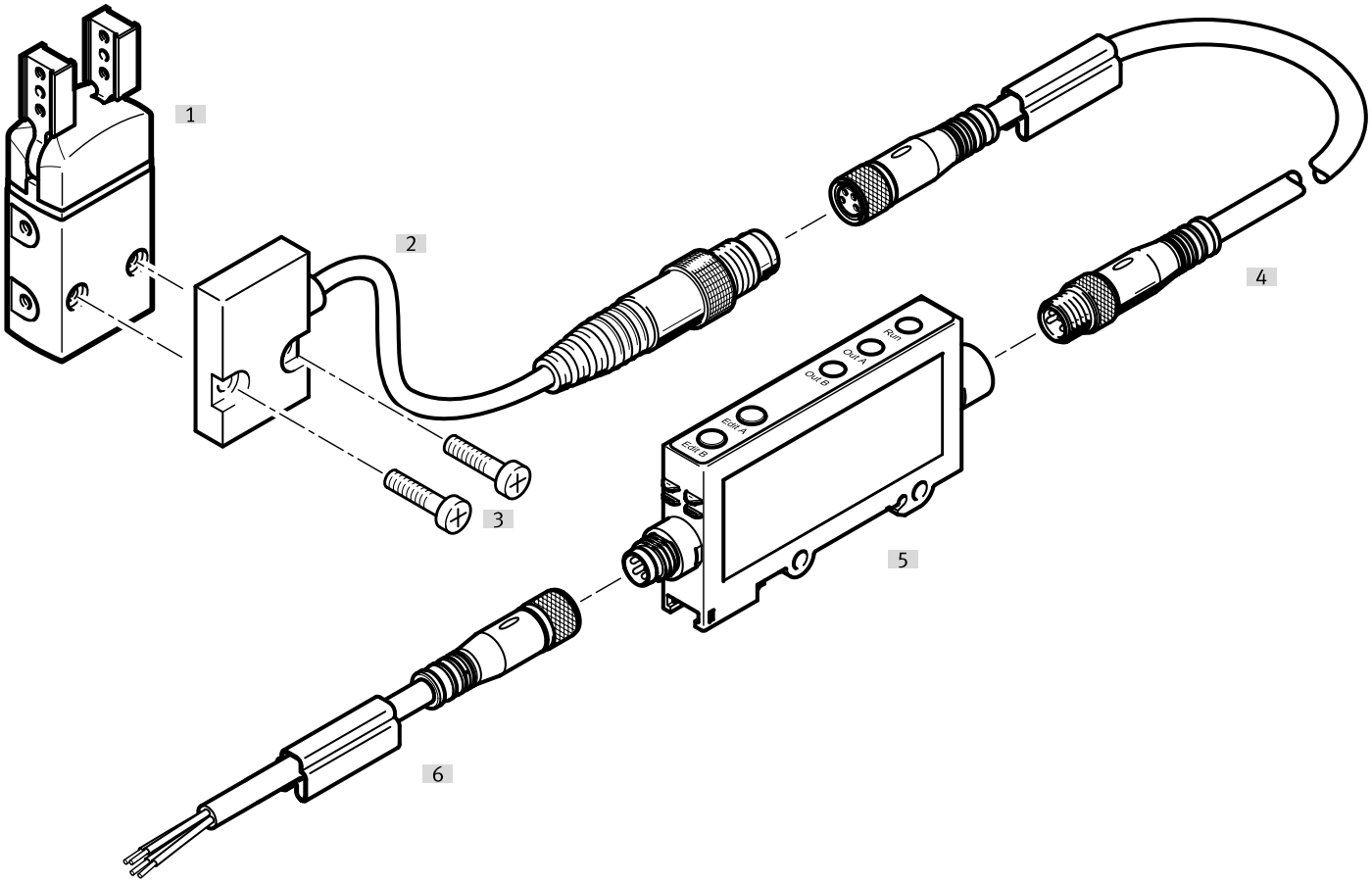
	Size	Max. opening angle	Product weight	Part no.	Type
	10	180 deg	44 g	**1310159**	**DHRS-10-A**
	16		114 g	**1310160**	**DHRS-16-A**
	25		270 g	**1310162**	**DHRS-25-A**
	32		480 g	**1310164**	**DHRS-32-A**
	40		829 g	**1310166**	**DHRS-40-A**

Single-acting or with gripping force backup, closing

	Size	Max. opening angle	Product weight	Part no.	Type
	16	180 deg	118 g	**1310161**	**DHRS-16-A-NC**
	25		277 g	**1310163**	**DHRS-25-A-NC**
	32		490 g	**1310165**	**DHRS-32-A-NC**
	40		844 g	**1310167**	**DHRS-40-A-NC**

Peripherals

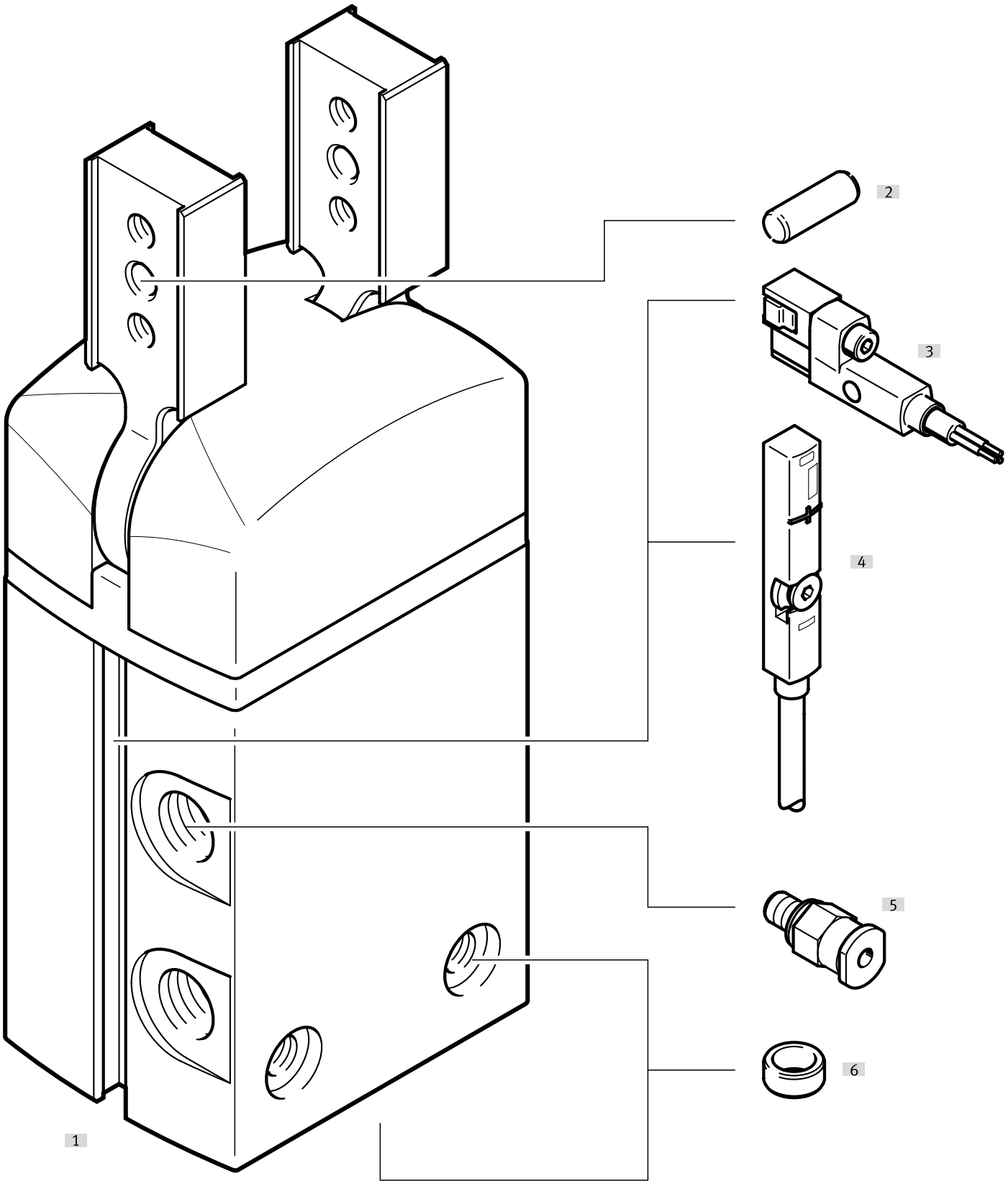
DHRS-10



Accessories			→ Link
	Type/order code	Description	
[1]	Radial gripper DHRS	Double-acting	dhrs
[2]	Position sensor SMH-S1	Adaptable and integrable sensors for detecting the piston position	22
[3]	Screws	For mounting the SMH-S1 position sensor on the gripper	dhrs
[4]	Connecting cable NEBU	Connection between position sensor and signal converter	24
[5]	Signal converter SVE4	For evaluating signals for position sensor SMH-S1	22
[6]	Connecting cable NEBU	Connection between signal converter and controller	24
[7]	Adapter kit DHAA, HMSV, HMVA, HAPG	Connecting plate between drive and gripper	adapter
[8]	Proportional-pressure regulator VPPM	For stepless adjustment of the gripping force	vppm

Peripherals

DHRS-16 ... 40



Accessories			→ Link
	Type/order code	Description	
[1]	Radial gripper DHRS	Double-acting	dhrs
[2]	Centring pin	For centring the gripper fingers on the gripper jaws	dhrs

Peripherals

Accessories			→ Link
	Type/order code	Description	
[3]	Proximity switch SMT	• For sensing the piston position • Proximity switch does not project past the housing at the bottom	23
[4]	Position transmitter SMAT/SDAT	Continuously detects the position of the piston. It has an analogue output with an output signal that is proportional to the piston position.	24
[5]	Push-in fitting QS	For connecting tubing with standard O.D	qs
[6]	Centring sleeve ZBH	• For centring the gripper when mounting • 2 centring sleeves included in the scope of delivery of the gripper	22
[7]	Adapter kit DHAA, HMSV, HMVA, HAPG	Connecting plate between drive and gripper	adapter
[8]	Proportional-pressure regulator VPPM	For stepless adjustment of the gripping force	vppm

Accessories

Centring sleeve ZBH-5

	Description	Material sleeve	Size of pack	Product weight	Part no.	Type
	For sizes 10, 16	Steel	10	1 g	**8146543**	**ZBH-5-B**

Centring sleeve ZBH-7

	Description	Material sleeve	Size of pack	Product weight	Part no.	Type
	For size 25	Steel	10	1 g	**8146544**	**ZBH-7-B**

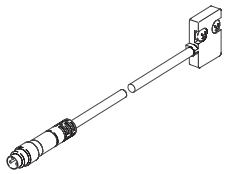
Centring sleeve ZBH-9

	Description	Material sleeve	Size of pack	Product weight	Part no.	Type
	For size 32	Steel	10	2 g	**8137184**	**ZBH-9-B**

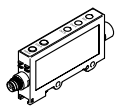
Centring sleeve ZBH-12

	Description	Material sleeve	Size of pack	Product weight	Part no.	Type
	For size 40	Steel	10	1 g	**8137185**	**ZBH-12-B**

Position sensor SMH-S1 – for size 10

	Type of mounting	Output signal	Electrical connection	Cable length	Part no.	Type
	Screwed to gripper	Analogue	Plug M8, A-coded	0.5 m	**175712**	**SMH-S1-HGR10**

Signal converter SVE4 – for size 10

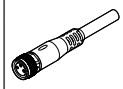
	analog input	Electrical connection (signal input)	Electrical connection (switching output)	Switching output	Part no.	Type
	Adapted for position sensors SMH-S1-HG	Socket M8x1, 4-pin	Plug M8x1, 4-pin	2xNPN	**544219**	**SVE4-HS-R-HM8-2N-M8**
				2xPNP	**544216**	**SVE4-HS-R-HM8-2P-M8**

Connecting cables NEBU, straight – Connection between position sensor and signal converter

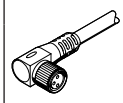
	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/ cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	M8x1, A-coded to EN 61076-2-104	4	2.5 m	**554035**	**NEBU-M8G4-K-2.5-M8G4**

Accessories

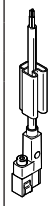
Connecting cables NEBU, straight – Connection between signal converter and controller

	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/ cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	4	2.5 m	**541342**	**NEBU-M8G4-K-2.5-LE4**
				5 m	**541343**	**NEBU-M8G4-K-5-LE4**

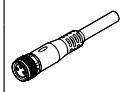
Connecting cables NEBU, angled – connection between signal converter and controller

	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/ cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	4	2.5 m	**541344**	**NEBU-M8W4-K-2.5-LE4**
				5 m	**541345**	**NEBU-M8W4-K-5-LE4**

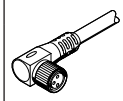
Proximity switch SMT-8G for T-slot, magneto-resistive – for sizes 10 ... 32

	Type of mounting	Switching output	Electrical connection	Cable length	Part no.	Type
	Clamped in T-slot, Insertable in the slot lengthwise	3-wire NPN N/O contact	Open end	2.5 m	**8065028**	**SMT-8G-NS-24V-E-2,5Q-OE**
			Plug M8, A-coded	0.3 m	**8065027**	**SMT-8G-NS-24V-E-0,3Q-M8D**
		3-wire PNP N/O contact	Open end	2.5 m	**547859**	**SMT-8G-PS-24V-E-2,5Q-OE**
			Plug M8, A-coded	0.3 m	**547860**	**SMT-8G-PS-24V-E-0,3Q-M8D**

Connecting cable NEBU, straight, connection M8

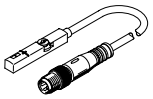
	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/ cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	3	2.5 m	**541333**	**NEBU-M8G3-K-2.5-LE3**
				5 m	**541334**	**NEBU-M8G3-K-5-LE3**

Connecting cable NEBU, angled, connection M8

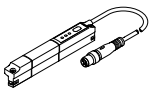
	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/ cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	3	2.5 m	**541338**	**NEBU-M8W3-K-2.5-LE3**
				5 m	**541341**	**NEBU-M8W3-K-5-LE3**

Accessories

Position transmitter SMAT-8M for T-slot, plug M8, A-coded – For size 16 ... 40

	Sensing range	Analogue output	Electrical connection 1, number of connections/ cores	Cable length	Part no.	Type
	52 mm	0 - 10 V	4	0.3 m	**553744**	**SMAT-8M-U-E-0,3-M8D**

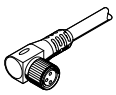
Position transmitter SDAT for T-slot, M8 plug, A-coded – For size 32 ... 40

	Sensing range	Analogue output	Electrical connection 1, number of connections/ cores	Cable length	Part no.	Type
	0 ... 50.000 mm	4 - 20 mA	4	0.3 m	**1531265**	**SDAT-MHS-M50-1L-SA-E-0.3-M8**

Connecting cables NEBU, straight

	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/ cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	4	2.5 m	**541342**	**NEBU-M8G4-K-2.5-LE4**
				5 m	**541343**	**NEBU-M8G4-K-5-LE4**

Connecting cables NEBU, angled

	Electrical connection 1, connector system	Electrical connection 2, connector system	Electrical connection 2, number of connections/ cores	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	4	2.5 m	**541344**	**NEBU-M8W4-K-2.5-LE4**
				5 m	**541345**	**NEBU-M8W4-K-5-LE4**