Adaptive shape grippers DHEF

FESTO

Key features

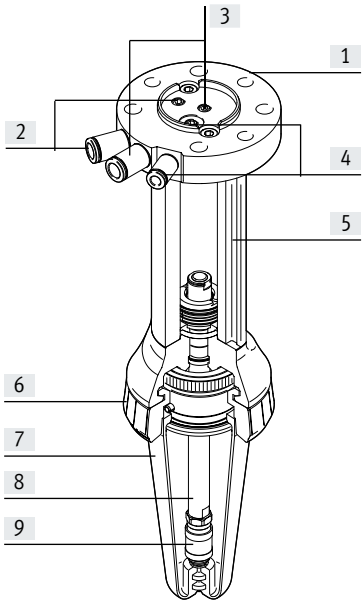
At a glance

Several gripping benefits are combined in a single model:
- Gripping parts with undefined positions and shapes
- Form-fitting gripping of products with different geometries
- Form-fitting gripping with suction cup effect
- Gentle gripping of delicate products of varying sizes

Sensor technology:
- Position sensing possible with position transmitters and proximity sensors

Applications:
- Human-robot collaboration thanks to gripper without edges
- Unpacking of boxes as well as separation and positioning of parts
- Picking parts and magazining

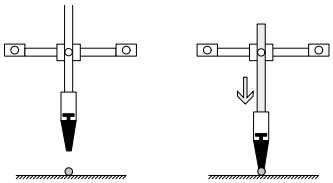
The technology in detail



[1] Direct mounting via through-hole suitable for DIN ISO 9409-1–50-4-M6 (industrial robots – mechanical interfaces)
[2] Compressed air supply port for retracting
[3] Compressed air supply port for advancing
[4] Compressed air supply port for inverting cap
[5] T-slot for mounting the sensors (both sides)
[6] Bayonet lock
[7] Inverting cap
[8] Piston rod
[9] Releasing ring for replacing the inverting cap

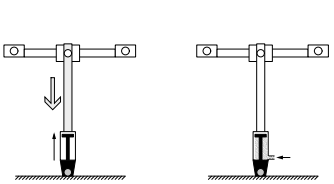
Control variant

Positioning



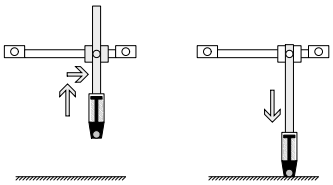
- Move the tip of the inverting cap to the object to be gripped
- The inverting cap is supplied with 0.07 ... 0.1 bar via a pressure regulator
- The drive is exhausted

Gripping



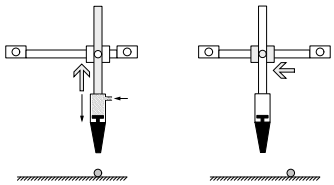
- Press the shape gripper on the object to be gripped until the inverting cap is retracted
- Pressurise the compressed air supply port for retracting in order to hold the object in place

Moving



- Move to the placement position

Placing



- Exhaust the compressed air supply port for retracting
- The object to be gripped is released
- Move the shape gripper away from the object
- If the shape gripper does not release the object it has gripped, the compressed air supply port for advancing will have to be pressurised

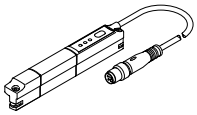
Note

The gripper variant with robot connection DHEF-...-RA1 makes it possible to integrate the gripper into the robot control system directly and easily. A software plug-in is provided for this purpose.

Key features

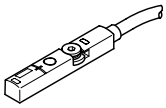
Position sensing

With position transmitter SDAT-MHS



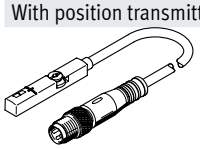
- Analogue position feedback possible
- Analogue output
  - 4 ... 20 mA

With position transmitter SDAS-MHS



Choice of two operating modes:
- Two adjustable switching outputs
- IO-Link

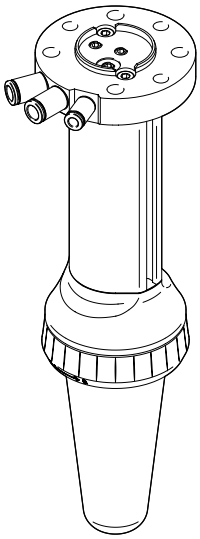
With position transmitter SMAT-8M



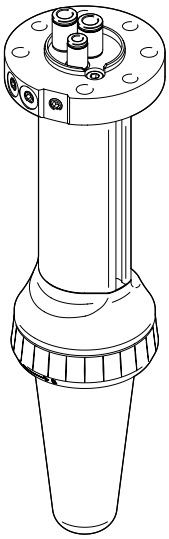
- Analogue position feedback possible
- Analogue output
  - 0 ... 10 V

Compressed air supply ports

From the side

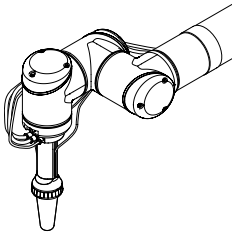


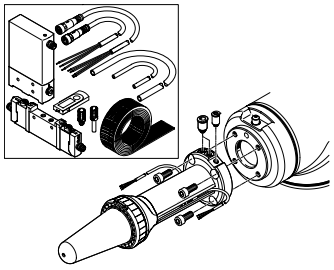
From above



Key features

Fast and intuitive integration on a robot arm





The gripper with robot connection DHEF-...-RA1 enables fast integration on a lightweight robot.
In order to mount the gripper on the robot arm, the necessary accessories are included in the kit, in addition to the gripper itself.
The plug-in is a simple means for integrating the gripper directly into the program sequence of the robot control system (➔ page 6).

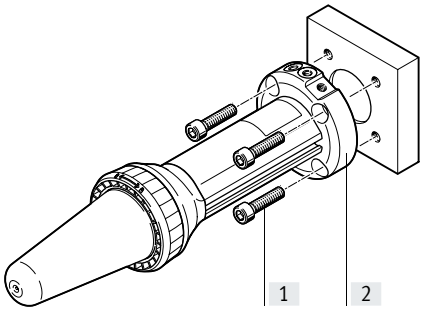
Note

The gripper with robot connection DHEF-...-RA1
is only compatible with the following robots:

- Universal Robots UR3/UR5/UR10:
  from software version PolyScope CB 3.8.0
- Universal Robots UR3e/UR5e/UR10e/UR16e:
  from software version PolyScope SW 5.2.0

For additional information ➔ www.festo.com/sp

Mounting options

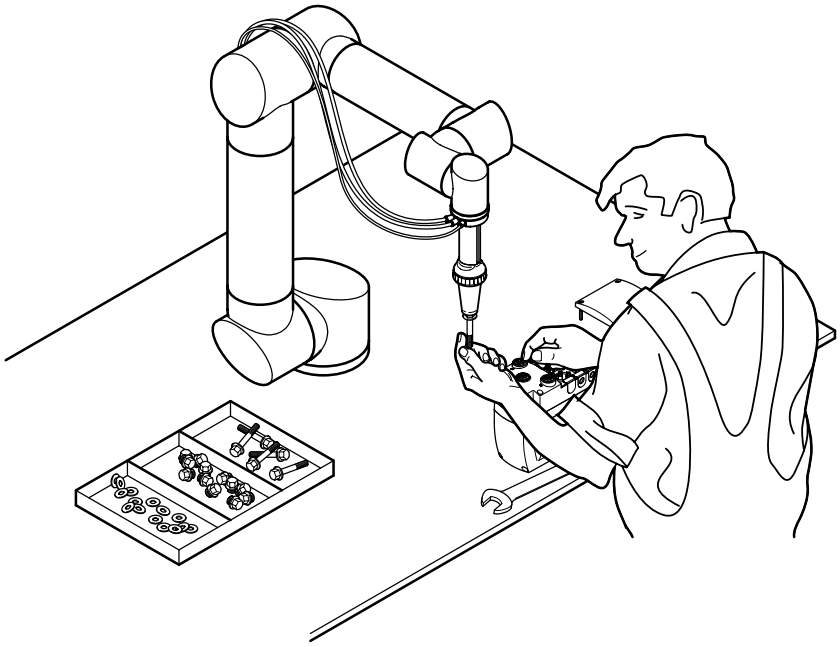


[1] Retaining screws
[2] Direct mounting via through-hole suitable for DIN ISO 9409-1 - 50-4-M6 (industrial robots – mechanical interfaces)

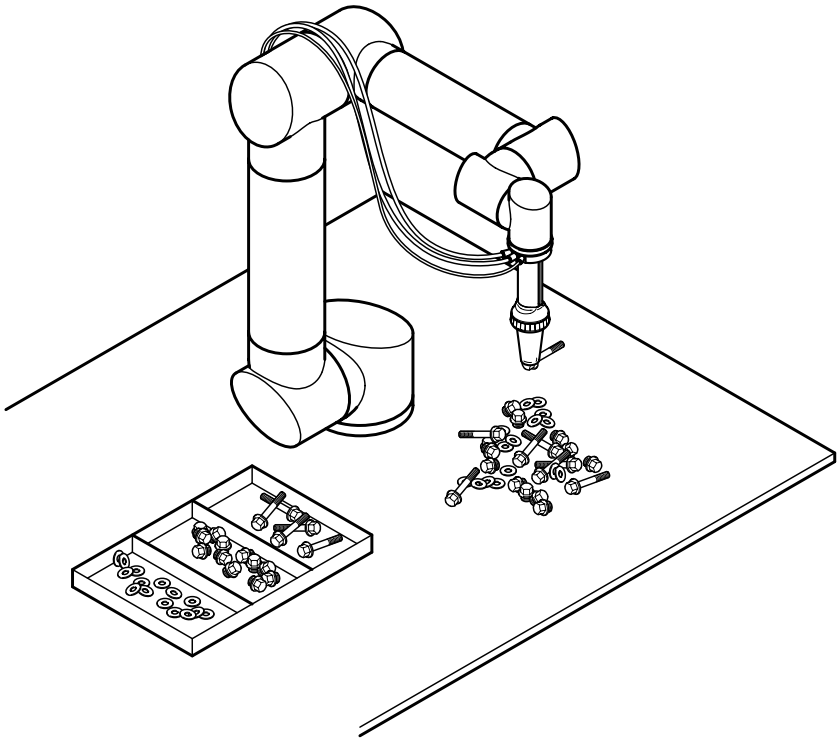
Key features

Application examples

Human-robot collaboration

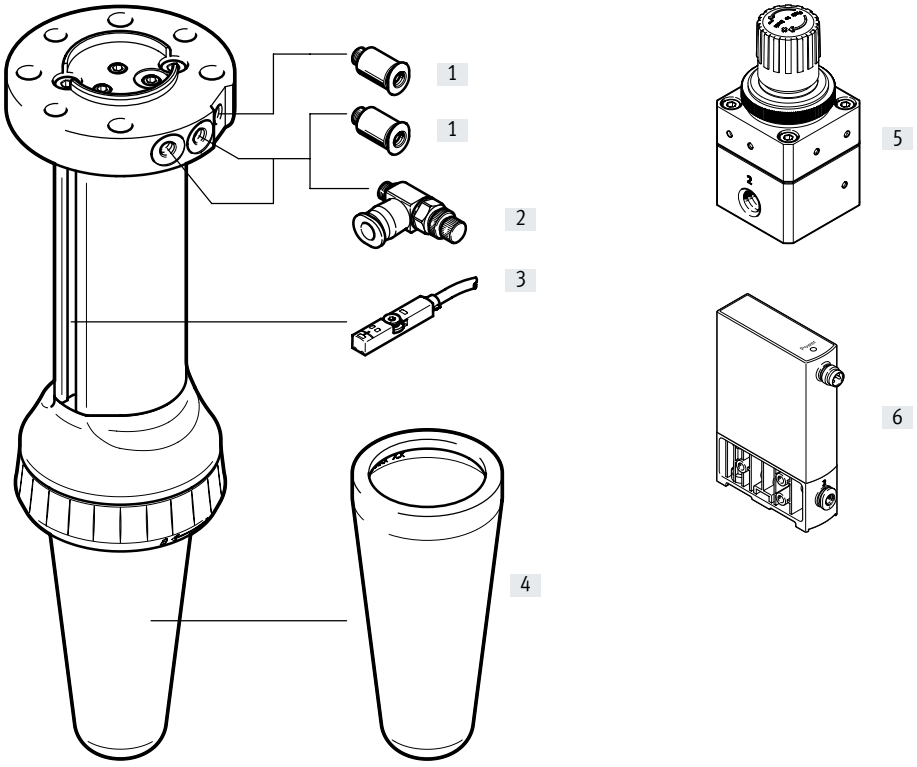


Picking parts



Peripherals overview

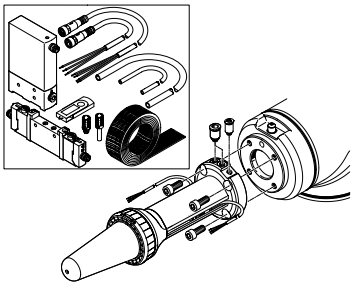
Peripherals overview



Accessories

	Type	Description	→ Page/Internet
[1]	Push-in fitting QSM, QSMLV	For connecting compressed air tubing with standard O.D.	13
[2]	One-way flow control valve GRLA	For regulating speed	12
[3]	Proximity sensor SMT-8	For position sensing	12
	Position transmitter SDAT, SMAT, SDAS	For detecting the current position	13
[4]	Inverting cap DHAS	Included in the scope of delivery of the shape gripper; can be reordered as an accessory	12
[5]	Precision pressure regulator LRP	For manually regulating the operating pressure of the inverting cap	12
[6]	Proportional-pressure regulator VEAB	For electronically regulating the operating pressure of the inverting cap	12

System product for robot connection



If the feature DHEF-...-RA1 is used, the delivery includes all the connection components in addition to the gripper:

- Proximity sensors
- Valve and pressure regulator
- Connecting cables
- Tubing for connecting the gripper
- QS fittings and silencers
- Velcro strip for fixing the connecting cables and tubing in place
- Mounting screws
- USB memory stick for software plug-in

Ordering data → page 11

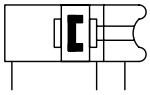
Type codes

001	Series	
DHEF	Adaptive shape gripper	

002	Size	
20	20	

003	Position sensing	
A	For proximity sensor	

Data sheet



The technical data is valid for the following conditions:
- Object to be gripped: steel ball
- Diameter: 30 mm
- Weight: 390 g
- Smooth, lathed surface

The values may differ if another type of object needs to be gripped.
Sharp-edged objects can affect the service life of the inverting cap.

General technical data		
Design		Inverting cap
		Force-guided motion sequence
Inverting cap version		Standard
Mode of operation		Double-acting
Gripper function		Adaptive
Guide		Basic guide
Stroke	[mm]	66
Pneumatic connection		M5
Max. operating frequency	[Hz]	1
Position sensing		Via proximity sensor and position transmitter
Type of mounting		To ISO 9409
Mounting position		Any
Diameter to be gripped	[mm]	12 ... 38
Permissible dynamic transverse load with max. cantilever	[N]	2.3
Mass moment of inertia	[kgcm^2]	1.29
Guide value for payload	[kg]	1

Operating and environmental conditions		
Operating pressure of drive	[bar]	1 ... 8
Operating medium		Compressed air to ISO 8573-1:2010 [7:4:4]
Note on operating/pilot medium		Operation with lubricated medium not possible
Ambient temperature[1]	[°C]	0 ... +60
Corrosion resistance class CRC[2]		2
Operating pressure of cap	[bar]	0.07 ... 0.1
Nominal pressure of cap	[bar]	0.08
Burst pressure of cap	[bar]	0.3
Recommended min. flow rate for pressure regulator[3]	[l/min]	10
Robot compatibility with variant DHEF-...-RA1		Universal Robots UR3/UR5/UR10: from software version PolyScope CB 3.8.0
		Universal Robots UR3e/UR5e/UR10e/UR16e: from software version PolyScope SW 5.2.0

1) Note operating range of proximity sensors
2) 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.
3) Theoretical guide value during operation of the drive at nominal pressure (6 bar) without an object being gripped.
The inverting cap must not be overstretched during gripping and has to be checked for every gripping application.
It may be necessary to restrict the speeds.

Data sheet

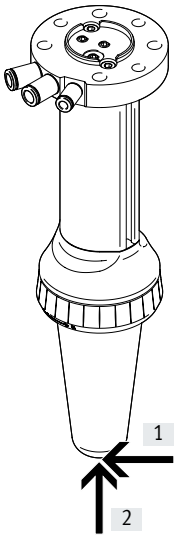
Weight [g]	
Product weight	475
Inverting cap	18
Moving mass without inverting cap	60

Materials	
Housing	Anodised aluminium
Inverting cap	VMQ (silicone)
Locking cover	Polyamide
Note on materials	Contains paint-wetting impairment substances RoHS-compliant
Suitability for use in the food industry	See supplementary material information

Forces and impact energy		
Drive force at 6 bar		
Retracting	[N]	158
Advancing	[N]	189
Contact force on object to be gripped[1)]	[N]	20
Max. holding forces		
Parallel to the gripper axis	[N]	26
Perpendicular to the gripper axis	[N]	45
Max. impact energy at the end positions	[J]	0.1

1) In unpressurised state

Holding force



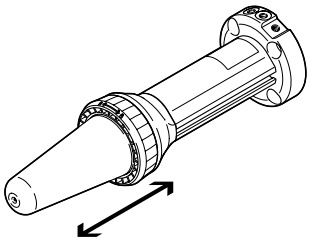
[1] Holding force perpendicular to the gripper axis
[2] Holding force parallel to the gripper axis

Data sheet

Max. speeds [mm/s]	
Without object	290
For picking up object	120[1)]

1) The shape gripper must be throttled

Retracting and advancing times [ms]

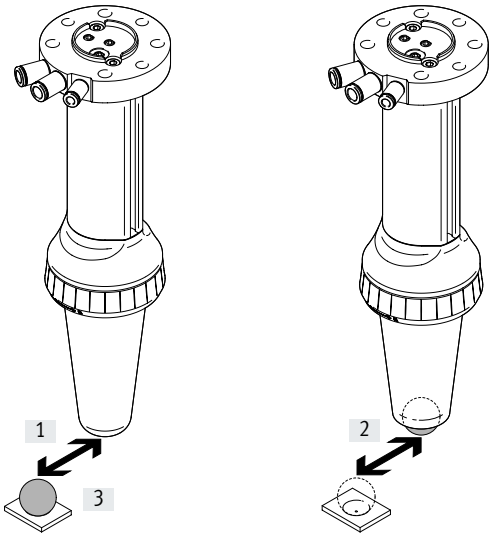


The specified retracting and advancing times [ms] are valid for the following conditions:

- Operating pressure of 6 bar
- Horizontal mounting position
- Without gripped object

Retracting	290
Advancing	270

Pick-up and placement tolerances [mm]

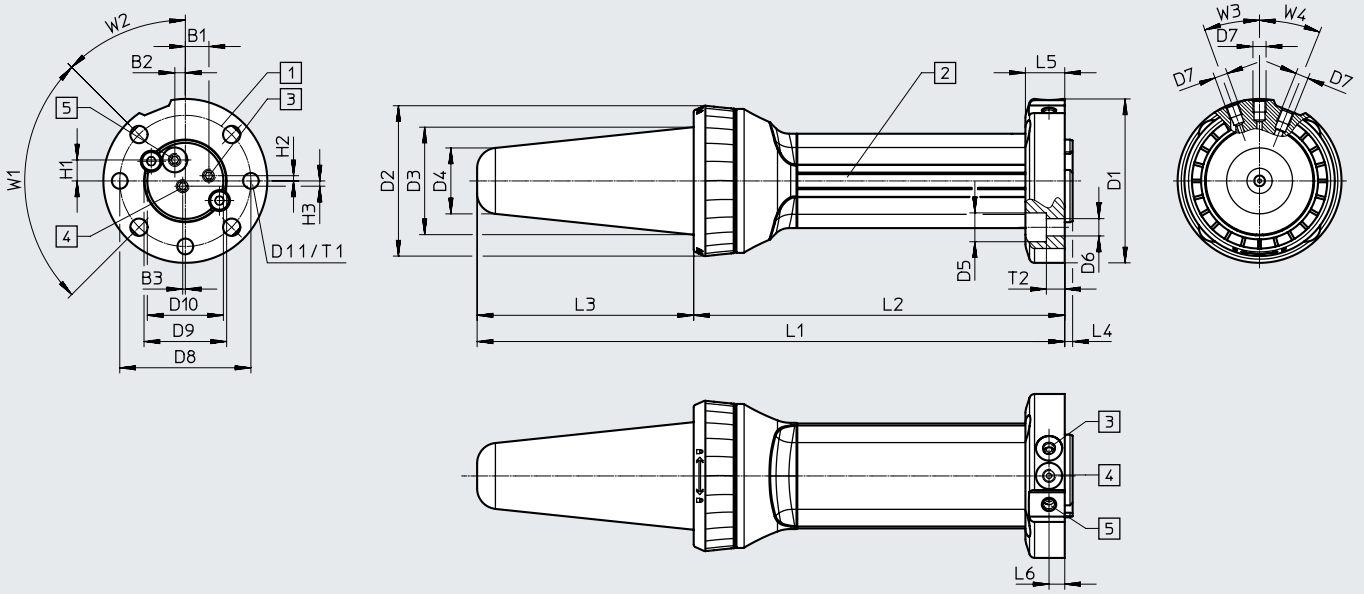


[1] Pick-up tolerance
[2] Placement tolerance
[3] Object to be gripped

Pick-up tolerance	±4
Placement tolerance	±2

Data sheet

Dimensions Download CAD data ➔ www.festo.com



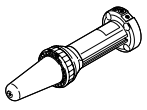
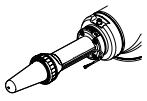
[1] Mechanical interface/mounting flange suitable for DIN ISO 9409-1–50-4-M6 (industrial robots – mechanical interfaces)
[2] T-slot for mounting the sensors (both sides)
[3] Compressed air supply port for retracting
[4] Compressed air supply port for advancing
[5] Compressed air supply port for inverting cap

Size [mm]	B1	B2	B3	D1 ø	D2 ø	D3 ø	D4 ø	D5 ø	D6 ø	D7 ø
20	9	4	1	62.5	57.5	41	25	11	6.6	M5

Size [mm]	D8 ø	D9 ø f9	D10 ø	D11 ø H8	H1	H2	H3	L1	L2	L3
20	50	31.5	29	6	8	2	2	224	141.5	82.5

Size [mm]	L4	L5	L6	T1	T2	W1	W2	W3	W4
20	3	15	6	8.5	7	90°	45°	20°	22°

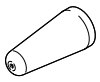
Ordering data

	Part no.	Type
	Gripper	
	8092533	**DHEF-20-A**
	Gripper with robot connection[1)]	
	8119114	**DHEF-20-A-RA1**

1) Only the gripper and the necessary accessories are included in the scope of delivery ➔ p. 6
Compatible robots ➔ p. 4

Accessories

Ordering data – Inverting caps

	Description	Weight [g]	Material	Part no.	Type
	Spare part for the adaptive shape gripper	18	VMQ (silicone)	**8097634**	**DHAS-GA-B22-S**

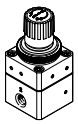
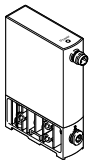
Ordering data – One-way flow control valves

Data sheets → Internet: grla

	Connection thread	For tubing O.D.	Material	Part no.	Type
	M5	3	Metal	**193137**	**GRLA-M5-QS-3-D**
		4		**193138**	**GRLA-M5-QS-4-D**

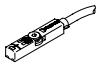
Ordering data – Pressure regulators

Data sheets → Internet: pressure regulators

			Pressure regulation range [bar]	Part no.	Type
Precision pressure regulator					
	• For regulating the operating pressure of the inverting cap • Manual		0.05 ... 0.7	**159500**	**LRP-1/4-0.7**
Proportional-pressure regulator					
	• For regulating the operating pressure of the inverting cap • Electronic	Voltage type, 0 ... 10 V	0.001 ... 0.2	**8046301**	**VEAB-L-26-D12-Q4-V1-1R1**
		Current type, 4 ... 20 mA	0.001 ... 0.2	**8046302**	**VEAB-L-26-D12-Q4-A4-1R1**

Ordering data – Proximity sensor for T-slot, magneto-resistive

Data sheets → Internet: smt

	Type of mounting	Switching output	Electrical connection	Cable length [m]	Part no.	Type
N/O contact						
	Insertable in the slot from above, flush with the cylinder profile, short design	PNP	Cable, 3-wire	2.5	**574335**	**SMT-8M-A-PS-24V-E-2.5-OE**
			Plug M8x1, 3-pin	0.3	**574334**	**SMT-8M-A-PS-24V-E-0.3-M8D**
		NPN	Cable, 3-wire	2.5	**574338**	**SMT-8M-A-NS-24V-E-2.5-OE**
			Plug M8x1, 3-pin	0.3	**574339**	**SMT-8M-A-NS-24V-E-0.3-M8D**

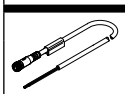
Ordering data – Connecting cables

Data sheets → 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**

Ordering data – Connecting cables for the gripper's connector plugs

Data sheets → Internet: nebu

	Electrical connection, left	Electrical connection, right	Cable length [m]	Part no.	Type
	Straight socket, M8x1, 3-pin	Cable, open end, 3-wire	5	**569846**	**NEBU-M8G3-R-5-LE3**

Accessories

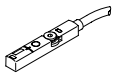
Ordering data – Position transmitters for T-slot

Data sheets → Internet: position transmitters

	Position measuring range	Analogue output [V]	Analogue output [mA]	Type of mounting	Electrical connection	Cable length [m]	Part no.	Type
	0 ... 50	–	4 ... 20	Insertable in the slot from above	Plug M8x1, 4-pin, in-line	0.3	**1531265**	**SDAT-MHS-M50-1L-SA-E-0.3-M8**
	0 ... 40	0 ... 10	–	Insertable in the slot from above	Plug M8x1, 4-pin, in-line	0.3	**553744**	**SMAT-8M-U-E-0.3-M8D**

Ordering data – Position transmitters for T-slot

Data sheets → Internet: sdas

	Position measuring range	Description	Type of mounting	Electrical connection	Cable length [m]	Part no.	Type
	≤ 33	Choice of two operating modes: • Two adjustable switching outputs • IO-Link	Insertable in the slot from above	Plug M8x1, 4-pin, in-line	0.3	**8063974**	**SDAS-MHS-M40-1L-PNLK-PN-E-0.3-M8**
				Cable, open end	2.5	**8063975**	**SDAS-MHS-M40-1L-PNLK-PN-E-2.5-LE**

Ordering data – Connecting cables

Data sheets → Internet: nebu

	Electrical connection, left	Electrical connection, right	Cable length [m]	Part no.	Type
	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**

Ordering data – Push-in fittings

Data sheets → Internet: push-in fittings

	Connection	Nominal width [mm]	Tubing O.D. [mm]	Weight/piece [g]	Part no.	Type	PU[1]
Male thread with internal hexagon							
	M5	1.9	3	3.2	**153313**	**QSM-M5-3-I**	**10**
		2.5	4	3	**153315**	**QSM-M5-4-I**	
		2.6	6	4.4	**153317**	**QSM-M5-6-I**	
Male thread with internal hexagon, rotatable							
	M5	1.7	3	5.1	**130830**	**QSMLV-M5-3-I**	**10**
		1.8	4	5.0	**130831**	**QSMLV-M5-4-I**	

1) Packaging unit