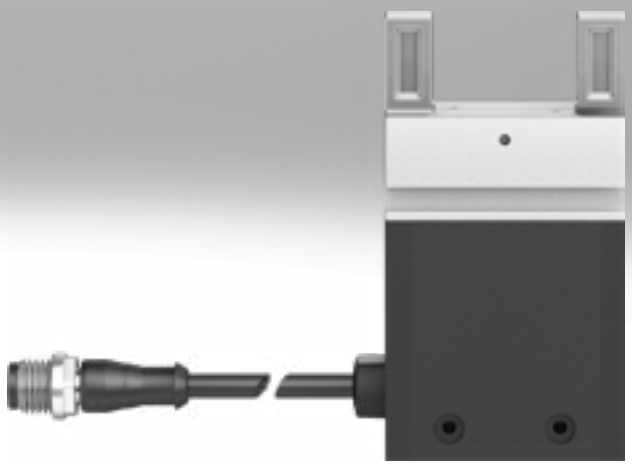
Parallel grippers EHPS, electric



Characteristics

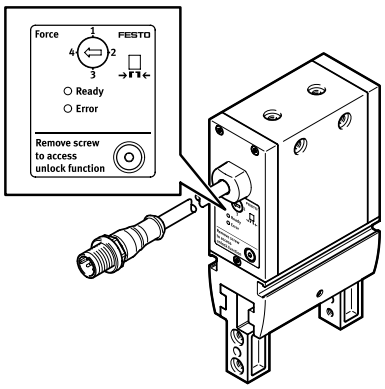
At a glance

Electrically actuated	Actuation	Adjustable gripping force (4 settings)	Sensing option of gripper jaws
• Minimal installation effort – no valves, tubing or air preparation required • Low noise pollution • Electrical safety to DIN EN 61010-1:2010	• Via digital I/O or IO-Link • No external controller required • Connection options: – For digital I/O: connection via terminal strip to terminal CPX or controller CECC – For IO-Link: plug for direct connection to an IO-Link master IO-Link	• Adaptation of the gripping force to sensitive workpieces • Simple adjustment • Very powerful	• For digital I/O: direct position sensing possible via external sensors on the gripper head • For IO-Link: integrated position sensors for sensing the gripper jaws

Adjusting the gripping force
For gripper with digital I/O

The speed for the gripping force of the gripper can be adjusted using the rotary switch. The switch has four settings and therefore four force levels, with no intermediate levels.
The speed has an effect on the gripping force and is not linearly adjustable.

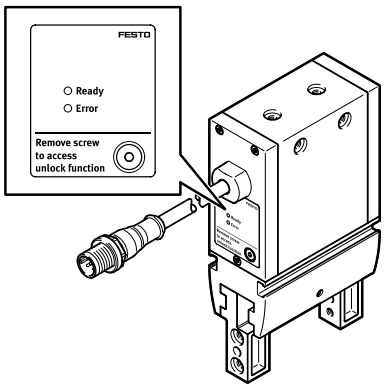
- Setting 1:
  approx. 50% of the max. force
- Setting 2:
  approx. 70% of the max. force
- Setting 3:
  approx. 85% of the max. force
- Setting 4:
  max. force



For grippers with IO-Link

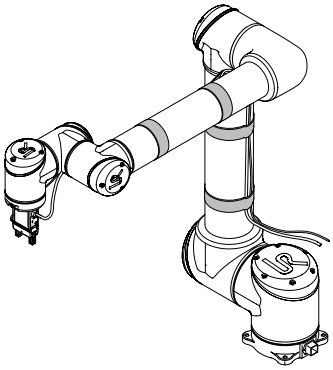
The gripping force is set via an IO-Link master. The adjustment has four settings and therefore four force levels. There are no intermediate levels. (Values for settings 1 to 4 as for I/O version).
There are also three gripping modes to choose from. This allows a shorter gripping time in the application.

- External gripping:
  The object is gripped from the outside. The gripper jaws move with the specified gripping force/speed during the gripping process. On releasing, the gripper jaws move at the maximum speed
- Internal gripping:
  The object is gripped from the inside. The gripper jaws move with the specified gripping force/speed during the gripping process. On releasing, the gripper jaws move at the maximum speed
- Universal gripping:
  The specified gripping force is used in both directions of movement during the gripping process



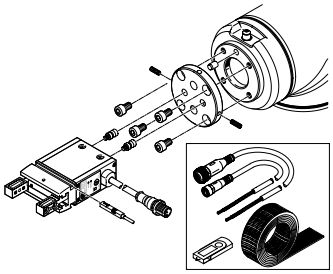
Characteristics

Fast and intuitive integration on a robot arm



The gripper with robot connection EHPS-...-RA1 enables fast integration on a lightweight robot.
In order to mount the gripper on the robot arm, an adapter plate and the necessary mounting accessories are included in the kit, in addition to the gripper itself. It also contains the required proximity switches and a software plug-in (on a USB stick).
The plug-in is a simple means for integrating the gripper directly into the program sequence of the robot control system (➔ page 5).

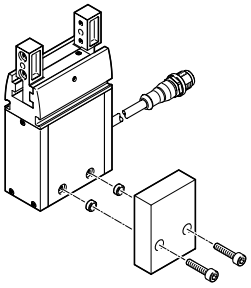
So as not to overload the internal cables of the Universal Robot, the connecting cables must be routed externally on the Universal Robot and secured using the included velcro strips.



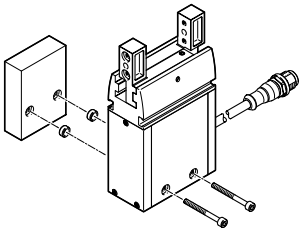
Mounting options

At the side

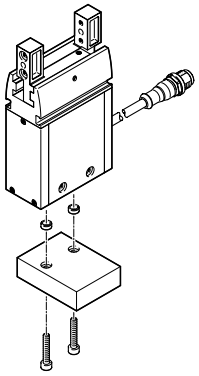
Via thread



Via through-hole

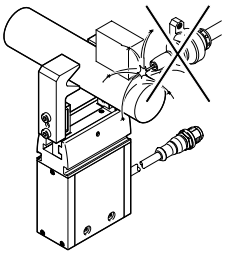


On the front

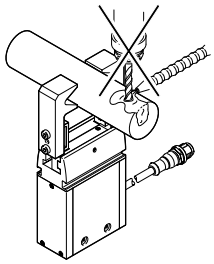


Note

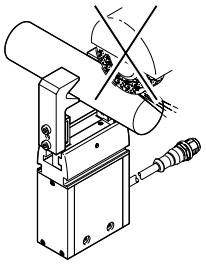
These grippers are not designed for the following or similar applications:



- Welding spatter



- Machining
- Aggressive media



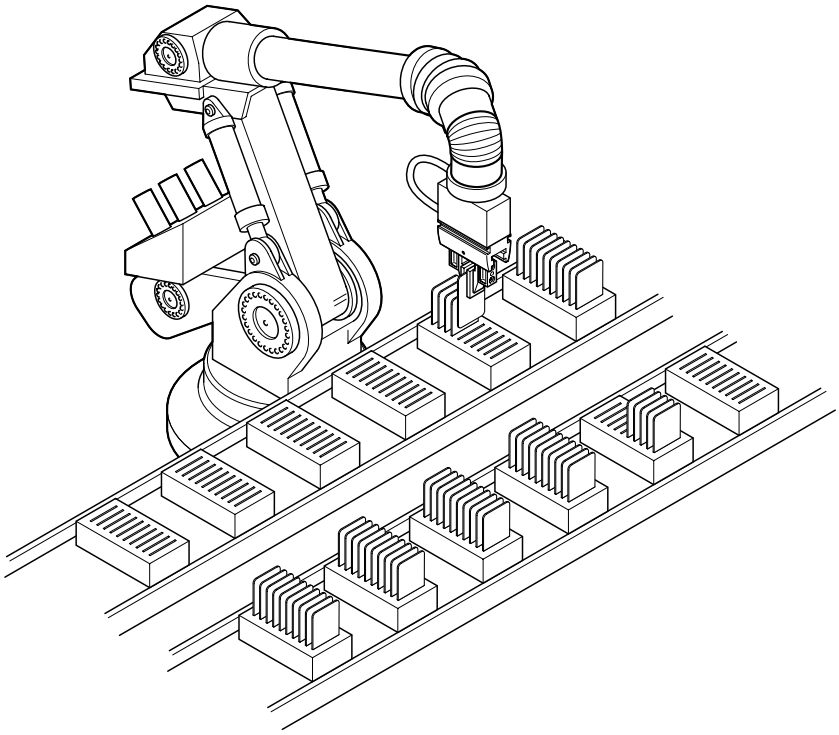
- Grinding dust

NEW

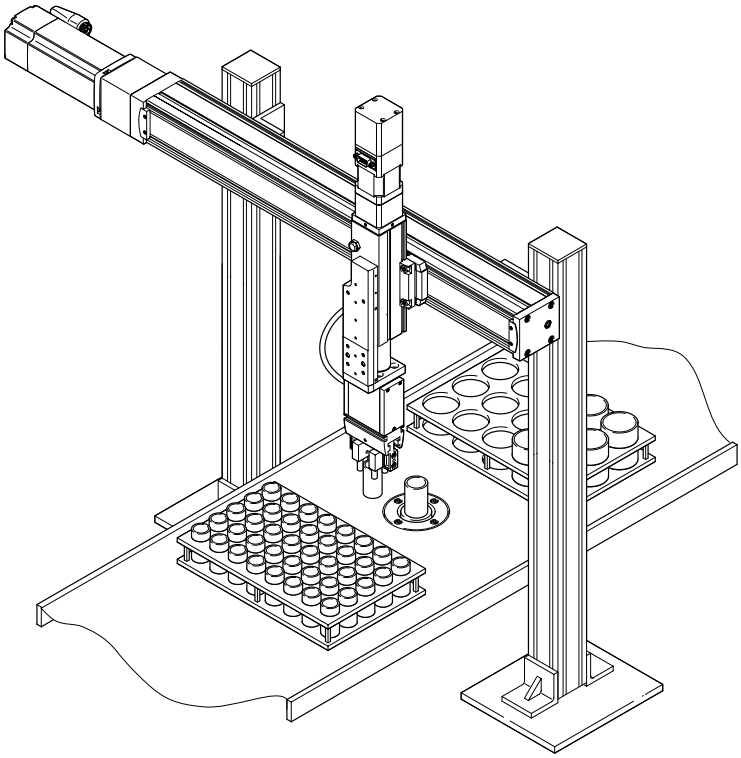
Key features

Application example

Card handling

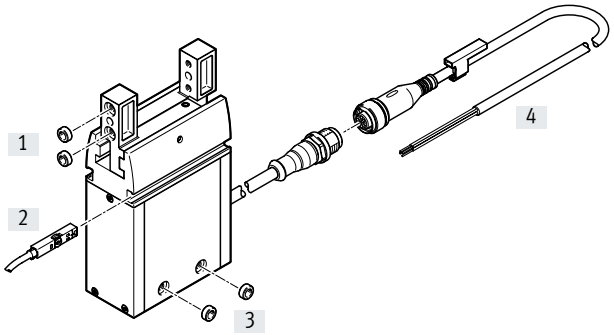


Sample preparation device with liquid dosing

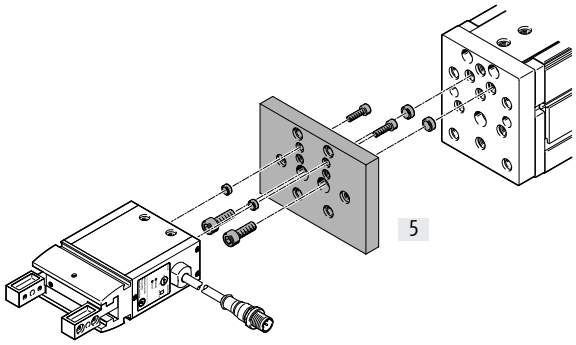


Peripherals overview

Peripherals overview



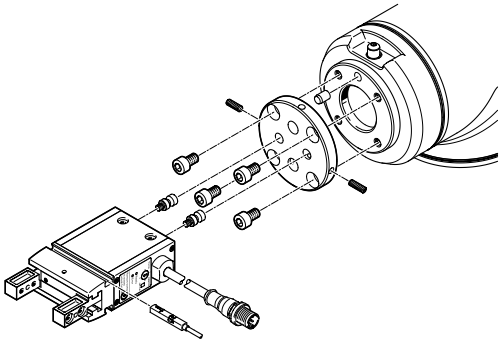
System product for handling and assembly technology



Accessories

	Type/order code	Description	→ Page/Internet
[1]	Centring sleeve ZBH	• For centring the gripper fingers on the gripper jaws • 4 centring sleeves included in the scope of delivery of the gripper	18
[2]	Proximity switch SMT-8M-A, SMT-8G	• For sensing the gripper jaw position	18
	Position transmitter SMAT-8M	• Continuously senses the position of the gripper jaws. It has an analogue output with an output signal that is proportional to the gripper jaw position	19
[3]	Centring sleeve ZBH	• For centring the gripper during mounting • 2 centring sleeves included in the scope of delivery of the gripper	18
[4]	Connecting cable NEBU-M12G5	• For controlling the parallel gripper	18
[5]	Adapter kit DHAA-G-H1	• Connecting plate between drive and gripper	17

System product for robot connection



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

- Proximity switch
- Connecting cable for connecting the gripper and proximity switches
- Velcro strip for fixing the connecting cables in place
- Adapter kit for mounting on the robot arm
- USB stick for plug-in

Ordering data → page 16

NEW

Type codes

001	Series	
EHPS	Electric parallel gripper	

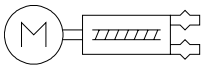
002	Size	
16	16	
20	20	
25	25	

003	Position sensing	
A	For proximity sensor	

004	Bus protocol/activation	
	None	
LK	IO-Link®	

005	Robot connection	
	None	
RA1	Universal Robots	

Data sheet



- Size
  16 ... 25
- Stroke per gripper jaw
  10 ... 16 mm

General technical data				
Size		16	20	25
Design		Worm gear		
		Gear rack/pinion		
Guide		Plain-bearing guide with T-slot		
Control elements		Latched switch		
Ready status indication		LED		
Gripper function		Parallel		
Number of gripper jaws		2		
Total gripping force	[N]	154	218	312
Stroke per gripper jaw	[mm]	10	13	16
Max. mass per gripper finger	[g]	100	150	230
Max. switching frequency[1]	[Hz]	2.2	1.7	1.3
Repetition accuracy	[mm]	≤ 0.03	≤ 0.01	≤ 0.01
Max. interchangeability	[mm]	≤ 0.2		
Rotational symmetry	[mm]	≤ 0.2		
Max. gripper jaw backlash	[mm]	≤ 0.05	≤ 0.05	≤ 0.04
Max. gripper jaw angular backlash	[°]	0.4	0.3	0.3
Minimum travel	[mm]	0.5		
Position sensing		For proximity switch and position transmitter		
		Via IO-Link		
Type of mounting		Via through-holes and centring sleeves		
		Via female thread and centring sleeves		
Electrical connection		M12x1, 5-pin		
		Cable with plug		
Mounting position		Any		
Bending radius, fixed cable installation	[mm]	25		
Bending radius, flexible cable installation	[mm]	50		
Product weight	[g]	296	532	904

1) At the maximum switching frequency, the gripper heats up to above 60°C.

Note

The maximum gripping force is only achieved if the gripper jaws are moved through the minimum travel (see above) with no load.

Data sheet

Electrical data				
Size		16	20	25
Motor type		DC servo motor		
Nominal operating voltage	[V DC]	24 ±10%		
Max. current consumption[1)]	[A]	1	2	2
Quiescent current	[mA]	30		

1) During the movement.

Operating and environmental conditions		
Ambient temperature	[°C]	+5 ... +60
Degree of protection		IP40
Noise level	[dB(A)]	70
Corrosion resistance CRC[1)]		1
CE marking (see declaration of conformity)[3)]		To EU EMC Directive[2)]
		To EU RoHS Directive
UKCA marking (see declaration of conformity)		To UK instructions for EMC
		To UK RoHS instructions
KC mark		KC EMC
Certification		RCM compliance mark

1) Corrosion resistance class CRC 1 to Festo standard FN 940070
Low corrosion stress. Dry internal application or transport and storage protection. Also applies to parts behind coverings, in the non-visible interior area, and parts which are covered in the application (e.g. drive trunnions).
2) The product is suitable for industrial purposes only (Class A). Measures to suppress radio interference may be required in residential areas (Class B).
3) Additional information www.festo.com/sp → Certificates.

Technical data – IO-Link		
SIO-mode support		No
Communication mode		COM3 (230.4 kBaud)
Port class		Device B
Number of ports		Device 1
Process data width OUT	[bytes]	8
Process data content OUT	[bit]	16 (ControlWord)
	[bit]	16 (GrippingPosition)
	[bit]	8 (GrippingForce)
	[bit]	8 (GrippingMode)
	[bit]	8 (GrippingTolerance)
	[bit]	8 (WorkpieceNo)
Process data width IN	[bytes]	6
Process data content IN	[bit]	16 (ActualPosition)
	[bit]	16 (ErrorNumber)
	[bit]	16 (StatusWord)
Minimum cycle time	[ms]	5
Data memory required	[Kilobyte]	0.5
Protocol version		Device V 1.1

Data sheet

Opening and closing times [ms] as a function of setting 1 ... 4

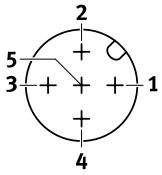
The opening and closing times stated have been measured with vertically mounted gripper, gripper jaws pointing up and without gripper fingers.

Size Setting	16	20	25
1	337	470	580
2	291	408	507
3	271	362	449
4	245	295	404

Materials	
Housing	Anodised aluminium
Gripper jaw	High-alloy stainless steel
O-ring	NBR

Pin allocation of the connector plug

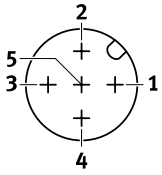
For digital I/O



Plug M12, 5 pin

Pin	Connection	Function
1	+24 V DC	Supply voltage
2	Input 1	Gripper jaw opening (with external gripping)
3	0 V	–
4	Input 2	Gripper jaw closing (with external gripping)
5	n.c.	Not connected

For IO-Link



Plug M12, 5 pin

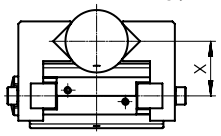
Pin	Connection	Function
1	+24 V DC sensor	Sensor: Supply voltage for IO-Link communication
2	+24 V DC actuator	Actuator: supply voltage
3	GND sensor	Sensor: Supply voltage for IO-Link communication
4	C/Q	IO-Link communication
5	GND actuator	Actuator: supply voltage

Deviation from the specification IO-Link port class B, without galvanic isolation between primary and secondary power supply. This can lead to malfunction or damage of the IO-Link master and the connected IO-Link devices.

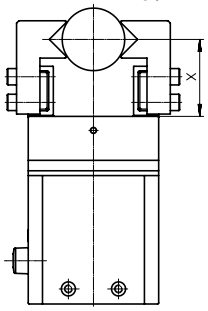
Data sheet

Total gripping force F_H as a function of lever arm x, mounting position, external/internal gripping and setting 1 ... 4

Horizontal mounting position



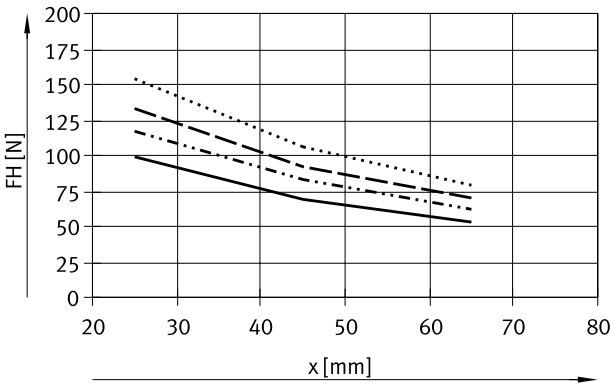
Vertical mounting position



The max. achievable forces refer solely to central gripping of non-elastic components.
The gripping position and gripping force is not readjusted.
The design of the gripper jaw has a significant influence on the forces to be achieved.
For particular gripping situations, it may be necessary to transmit a further gripping signal (max. 3 in one direction).

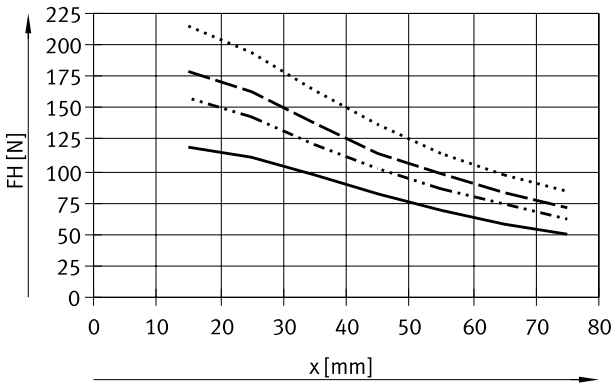
EHPS-16

External gripping, horizontal



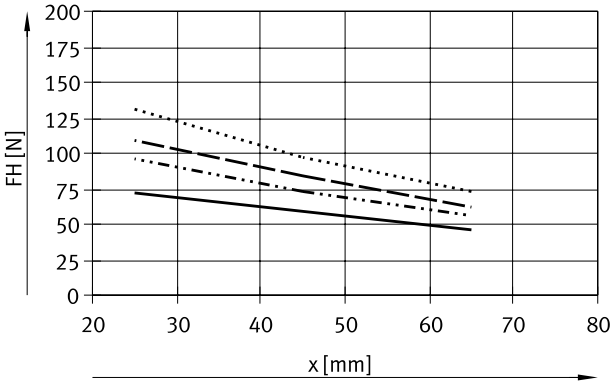
Lever arm [mm]	F_H [N] at setting 1	2	3	4
25	98	116	132	154
45	68	84	92	106
65	54	62	70	78

External gripping, vertical



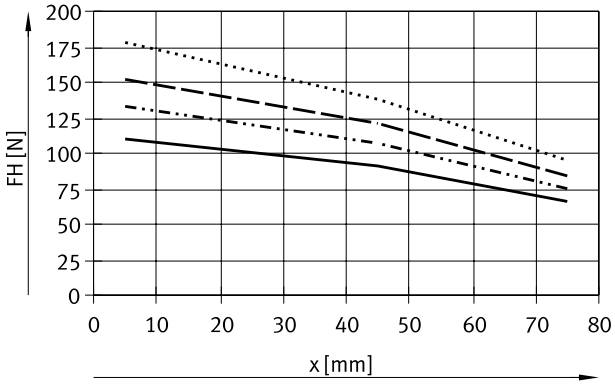
Lever arm [mm]	F_H [N] at setting 1	2	3	4
15	118	158	178	214
45	82	102	114	138
75	50	62	72	84

Internal gripping, horizontal



Lever arm [mm]	F_H [N] at setting 1	2	3	4
25	72	96	108	130
45	58	72	84	96
65	46	56	62	74

Internal gripping, vertical



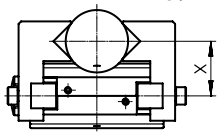
Lever arm [mm]	F_H [N] at setting 1	2	3	4
15	110	134	152	178
45	90	108	122	138
75	66	74	84	94

Setting 1
Setting 2
Setting 3
Setting 4

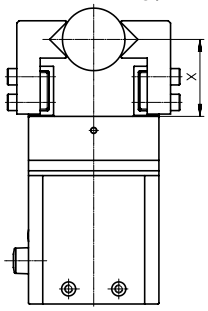
Data sheet

Total gripping force F_H as a function of lever arm x, mounting position, external/internal gripping and setting 1 ... 4

Horizontal mounting position



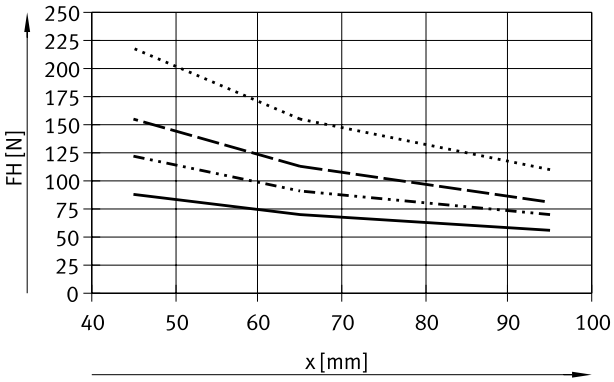
Vertical mounting position



The max. achievable forces refer solely to central gripping of non-elastic components.
The gripping position and gripping force is not readjusted.
The design of the gripper jaw has a significant influence on the forces to be achieved.
For particular gripping situations, it may be necessary to transmit a further gripping signal (max. 3 in one direction).

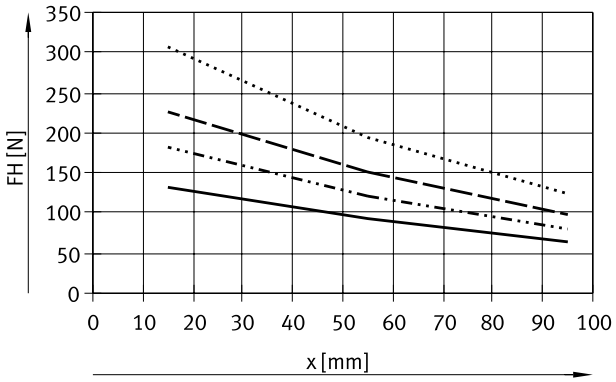
EHPS-20

External gripping, horizontal



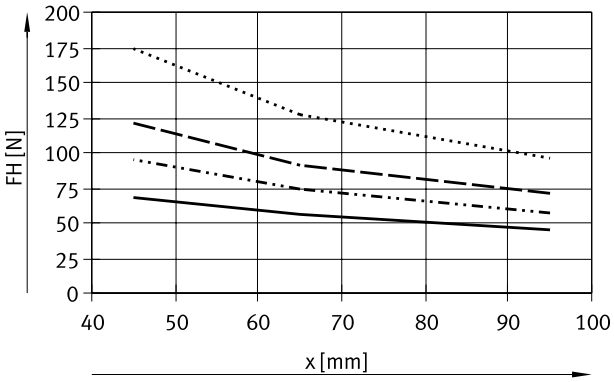
Lever arm [mm]	F_H [N] at setting			
	1	2	3	4
45	88	122	156	218
65	70	90	114	154
95	56	70	82	110

External gripping, vertical



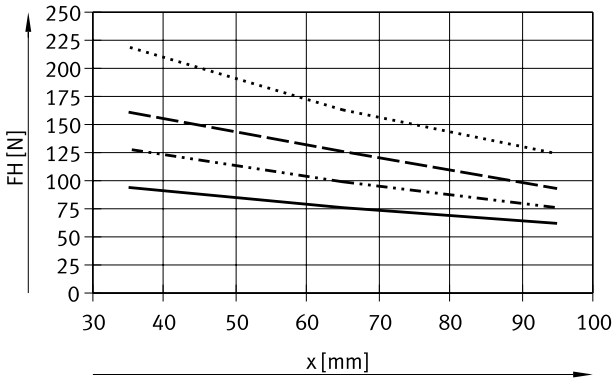
Lever arm [mm]	F_H [N] at setting			
	1	2	3	4
15	132	182	226	306
55	94	120	150	194
95	64	80	98	124

Internal gripping, horizontal



Lever arm [mm]	F_H [N] at setting			
	1	2	3	4
45	68	96	120	174
65	56	74	92	128
95	46	58	72	96

Internal gripping, vertical



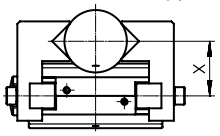
Lever arm [mm]	F_H [N] at setting			
	1	2	3	4
35	94	128	160	220
65	76	100	126	162
95	62	76	92	124

Setting 1
Setting 2
Setting 3
Setting 4

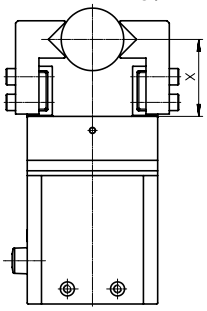
Data sheet

Total gripping force F_H as a function of lever arm x, mounting position, external/internal gripping and setting 1 ... 4

Horizontal mounting position



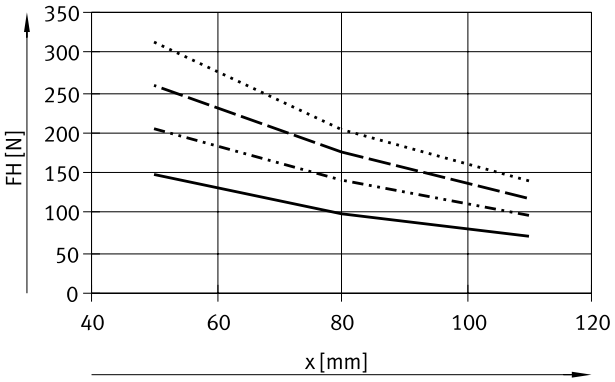
Vertical mounting position



The max. achievable forces refer solely to central gripping of non-elastic components.
The gripping position and gripping force is not readjusted.
The design of the gripper jaw has a significant influence on the forces to be achieved.
For particular gripping situations, it may be necessary to transmit a further gripping signal (max. 3 in one direction).

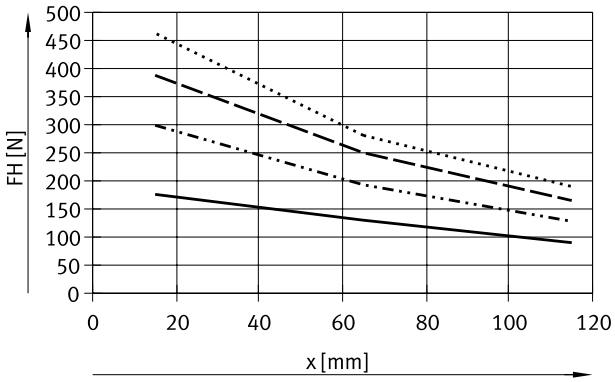
EHPS-25

External gripping, horizontal



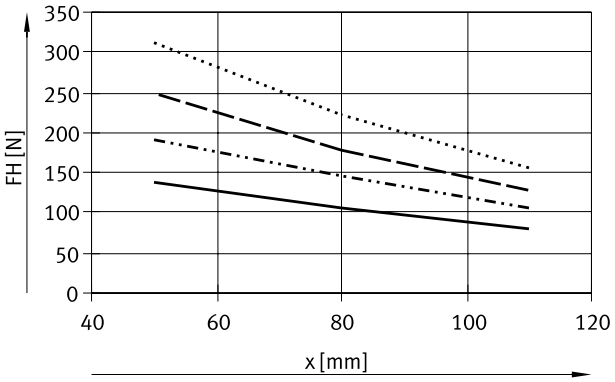
Lever arm [mm]	F_H [N] at setting 1	2	3	4
50	148	204	260	312
80	98	140	176	204
110	70	96	118	140

External gripping, vertical



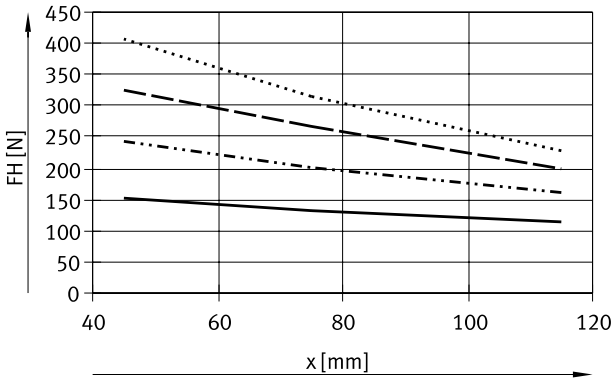
Lever arm [mm]	F_H [N] at setting 1	2	3	4
15	176	298	388	462
65	130	194	250	280
115	90	128	166	190

Internal gripping, horizontal



Lever arm [mm]	F_H [N] at setting 1	2	3	4
50	138	192	250	312
80	106	146	178	222
110	80	106	128	156

Internal gripping, vertical

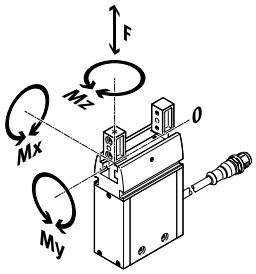


Lever arm [mm]	F_H [N] at setting 1	2	3	4
45	152	242	326	406
75	132	200	266	314
115	114	162	198	228

Setting 1
Setting 2
Setting 3
Setting 4

Data sheet

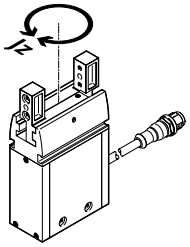
Static characteristic load values at the gripper jaws



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 jaw guide slot) must be taken into consideration when calculating the torques.

Size		16	20	25
Max. permissible force F_z	[N]	200	325	450
Max. permissible torque M_x	[Nm]	7	13	28
Max. permissible torque M_y	[Nm]	4.4	8	16
Max. permissible torque M_z	[Nm]	7	13	28

Mass moment of inertia



Under the following conditions:

- The reference point is the central axis
- Without external gripper fingers
- In a load-free state

Size		16	20	25
Mass moment of inertia	[kgcm^2]	0.78	2.02	5.24

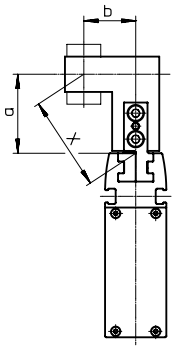
Data sheet

Gripping force F_H per gripper jaw as a function of lever arm x and eccentricity a and b

The following formula must be used to calculate the lever arm x with eccentric gripping:

$$x=\sqrt{a^2+b^2}$$

The gripping force F_H can be read from the graphs (➔ page 10) using the calculated value x.



Calculation example

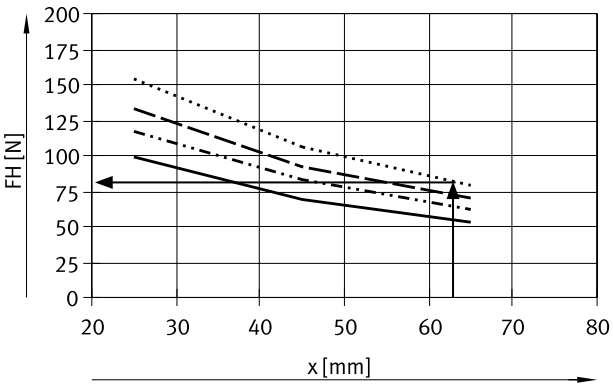
Given:
Distance a = 40 mm
Distance b = 50 mm
To be calculated:
The gripping force in setting 4, with an EHPS-16-A, used as an external gripper and in horizontal mounting position.

Approach:
Calculating the lever arm x

$$x=\sqrt{40^2+50^2}$$

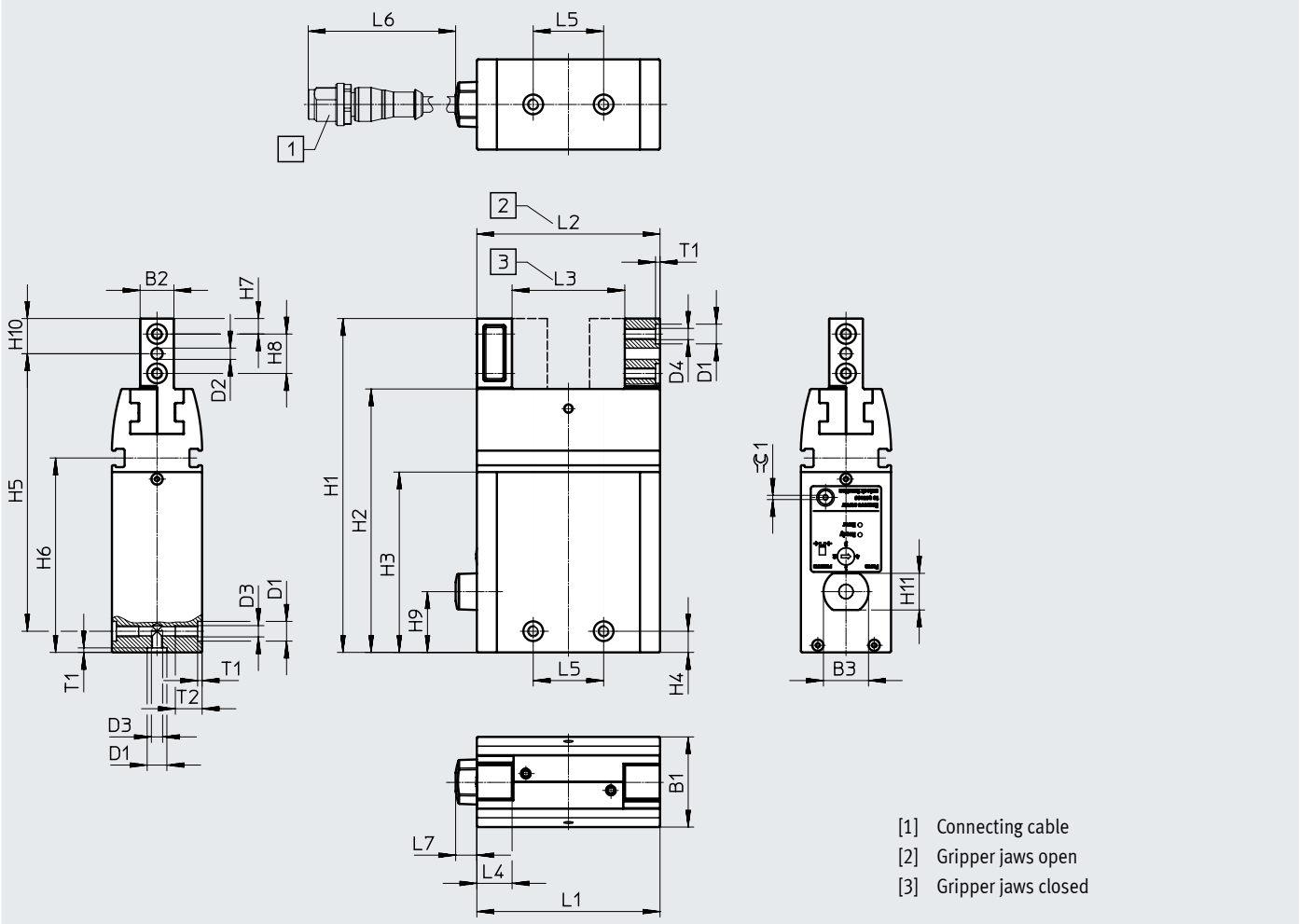
x = 64 mm

The graph (➔ page 10) gives a value of F_H = approx. 77 N for the gripping force.



Data sheet

Dimensions Download CAD data ➔ www.festo.com



Size	B1 ±0.03	B2 ±0.05	B3	D1 ø H8	D2 ø H8	D3	D4	H1 ±0.1	H2
16	26	10	16	7	3	M4	M4	99.5	78
20	32	12	16	7	4	M4	M4	118.5	93.5
25	39	15	16	9	4	M6	M5	139.5	110

Size	H3	H4[1)]	H5 ±0.2	H6	H7[1)]	H8[1)]	H9	H10	H11
16	55	7.5	82	59.8	4.5	11	14.5	10	13
20	64	7.5	98.5	69	5.5	14	21.6	12.5	32
25	75	12.5	112	80	7	16	28.6	15	39

Size	L1 ±0.3	L2 +1	L3 ±0.5	L4 ±0.05	L5[1)]	L6	L7	T1 +0.1	T2 min.	⫹1
16	53.8	53.8	33.8	10.5	25	300	7.5	1.6	9.5	1.5
20	65	65	39	12.5	25	300	7.5	1.6	9.5	1.5
25	79.4	79.4	47.4	15	29	300	7.5	2.1	12	2

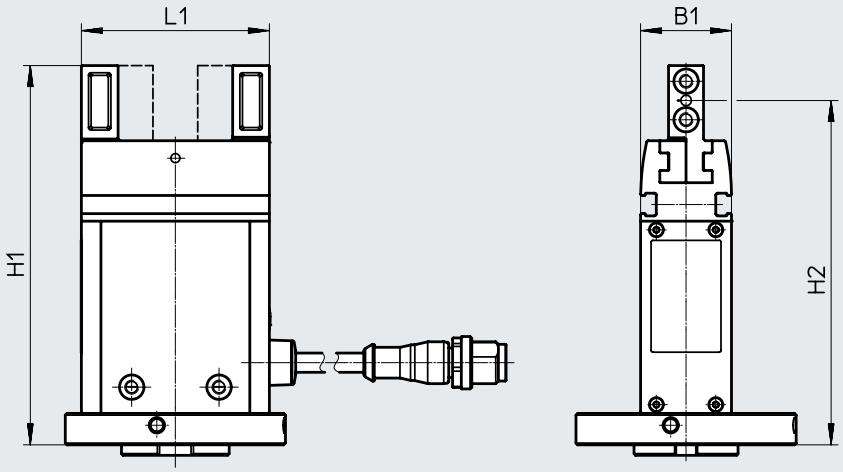
1) Tolerance for centring hole ±0.02 mm
Tolerance for thread ±0.1 mm

NEW

Data sheet

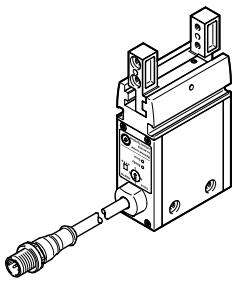
Dimensions Download CAD data ➔ www.festo.com

With robot connection



Size	B1	H1	H2	L1
16	26	108.5	98.5	53.8
20	32	127.5	115	65
25	39	148.5	133.5	79.4

Ordering data



Size	Part no.	Type
With I/O interface		
16	**8070832**	**EHPS-16-A**
20	**8070831**	**EHPS-20-A**
25	**8070830**	**EHPS-25-A**
With IO-Link		
16	**8103809**	**EHPS-16-A-LK**
20	**8103810**	**EHPS-20-A-LK**
25	**8103811**	**EHPS-25-A-LK**
With robot connection		
16	**8119111**	**EHPS-16-A-RA1**
20	**8119112**	**EHPS-20-A-RA1**
25	**8119113**	**EHPS-25-A-RA1**

Accessories

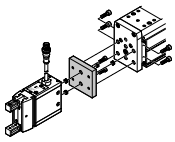
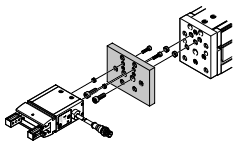
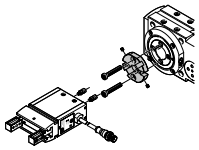
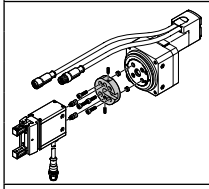
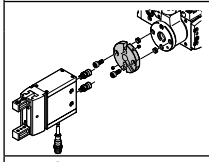
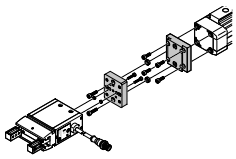
Adapter kit
DHAA, HAPG, HMSV

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	Mounting option		CRC[1]	Part no.	Type
							
EGSC/EHPS	**EGSC**	**EHPS**			**HMSV**		
	60	16, 20	■	■	2	**8106581**	**DHAA-G-E8-60-B18-16**
EGSL/EHPS	**EGSL**	**EHPS**			**HMSV**		
	45, 55	16	■	■	2	**548785**	**HMSV-55**
	75	20, 25	■	■		**548786**	**HMSV-56**
ERMB/EHPS	**ERMB**	**EHPS**			**HAPG**		
	20	16, 20	■	■	2	**184479**	**HAPG-SD2-3**
	25	16, 20	■	■		**184482**	**HAPG-SD2-6**
	20	25	■	■		**184480**	**HAPG-SD2-4**
	25	25	■	■		**184483**	**HAPG-SD2-7**
	32	25	■	■		**184485**	**HAPG-SD2-9**
ERMO/EHPS	**ERMO**	**EHPS**			**DHAA**		
	16	16	■	■	2	**8079173**	**DHAA-G-R3-16-B18-16**
	25	16, 20	■	■		**8071956**	**DHAA-G-R3-25-B18-16**
	32	20	■	■		**8079214**	**DHAA-G-R3-32-B18-20**
	32	25	■	■		**8079208**	**DHAA-G-R3-32-B18-25**
EHMB/EHPS	**EHMB**	**EHPS**			**HAPG**		
	20	25	■	■	2	**184485**	**HAPG-SD2-9**
	25, 32	25	■	■		**8078739**	**DHAA-G-H1-25-B18-25**
DGPL/EHPS	**DGPL**	**EHPS**			**HMVA, HAPG, HMSV**		
	**Direct mounting**						
	25, 32	16	■	■	2	**196788**	**HMVA-DLA18/25**
						193922	**HAPG-37-S4**
	40	16	■	■		**196790**	**HMVA-DLA40**
						193922	**HAPG-37-S4**
	Dovetail mounting						
	25	16	■	■	2	**196788**	**HMVA-DLA18/25**
						177768	**HMSV-28**
	40	16, 20	■	■		**196790**	**HMVA-DLA40**
						177768	**HMSV-28**
	40	25	■	■		**196790**	**HMVA-DLA40**
						177769	**HMSV-29**

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

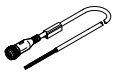
Accessories

Ordering data

	For size [mm]	Description	Weight [g]	Part no.	Type	PU[1]
Centring sleeve ZBH						Data sheets → Internet: zbh
	16, 20	Included in the scope of delivery of the gripper: 4 centring sleeves for the gripper jaws and 2 for mounting the gripper	1	**8146544**	**ZBH-7-B**	10
	25		1	**150927**	**ZBH-9**	

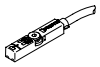
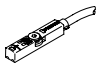
1) Packaging unit

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

	Electrical connection, left	Electrical connection, right	Cable length [m]	Part no.	Type
	Straight socket, M12x1, 5-pin	Cable, open end, 4-wire	2.5	**550326**	**NEBU-M12G5-K-2.5-LE4**
			5	**541328**	**NEBU-M12G5-K-5-LE4**
	Angled socket, M12x1, 5-pin	Cable, open end, 4-wire	2.5	**550325**	**NEBU-M12W5-K-2.5-LE4**
			5	**541329**	**NEBU-M12W5-K-5-LE4**
	Straight socket, M12x1, 5-pin	Straight socket, M12x1, 5-pin	5	**574321**	**NEBU-M12G5-E-5-Q8N-M12G5**
			7.5	**574322**	**NEBU-M12G5-E-7.5-Q8N-M12G5**
	Straight socket, M12x1, 5-pin	Angled socket, M12x1, 5-pin	0.5	**8003617**	**NEBU-M12G5-K-0.5-M12W5**
			2	**8003618**	**NEBU-M12G5-K-2-M12W5**

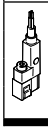
Ordering data – Proximity switches for T-slot, magneto-resistive

Data sheets → Internet: smt

	Type of mounting	Switching output	Electrical connection	Cable length [m]	Part no.	Type
N/O contact						
	Inserted in the slot from above, 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**
N/C contact						
	Inserted in the slot from above, short design	PNP	Cable, 3-wire	7.5	**574340**	**SMT-8M-A-PO-24V-E-7,5-OE**

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

Data sheets → Internet: smt

	Type of mounting	Switching output	Electrical connection, outlet direction of connection	Cable length [m]	Part no.	Type
N/O contact						
	Insertable in the slot length-wise	PNP	Cable, 3-wire, lateral	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**
		NPN	Cable, 3-wire, lateral	2.5	**8065028**	**SMT-8G-NS-24V-E-2,5Q-OE**
			Plug M8x1, 3-pin, lateral	0.3	**8065027**	**SMT-8G-NS-24V-E-0,3Q-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**

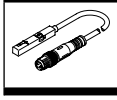
Accessories

Position transmitter

The position transmitter continuously senses the position of the gripper jaws. It has an analogue output with an output signal that is proportional to the gripper jaw position.

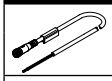
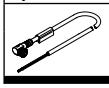
Ordering data – Position transmitters for T-slot

Data sheets → Internet: position transmitter

	For size	Position measuring range	Analogue output [V]	Type of mounting	Electrical connection	Cable length [m]	Part no.	Type
	10 ... 35	0 ... 40	0 ... 10	Inserted in slot from above	Plug M8x1, 4-pin, in-line	0.3	**553744**	**SMAT-8M-U-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, 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**