Parallel grippers HGPP, precision

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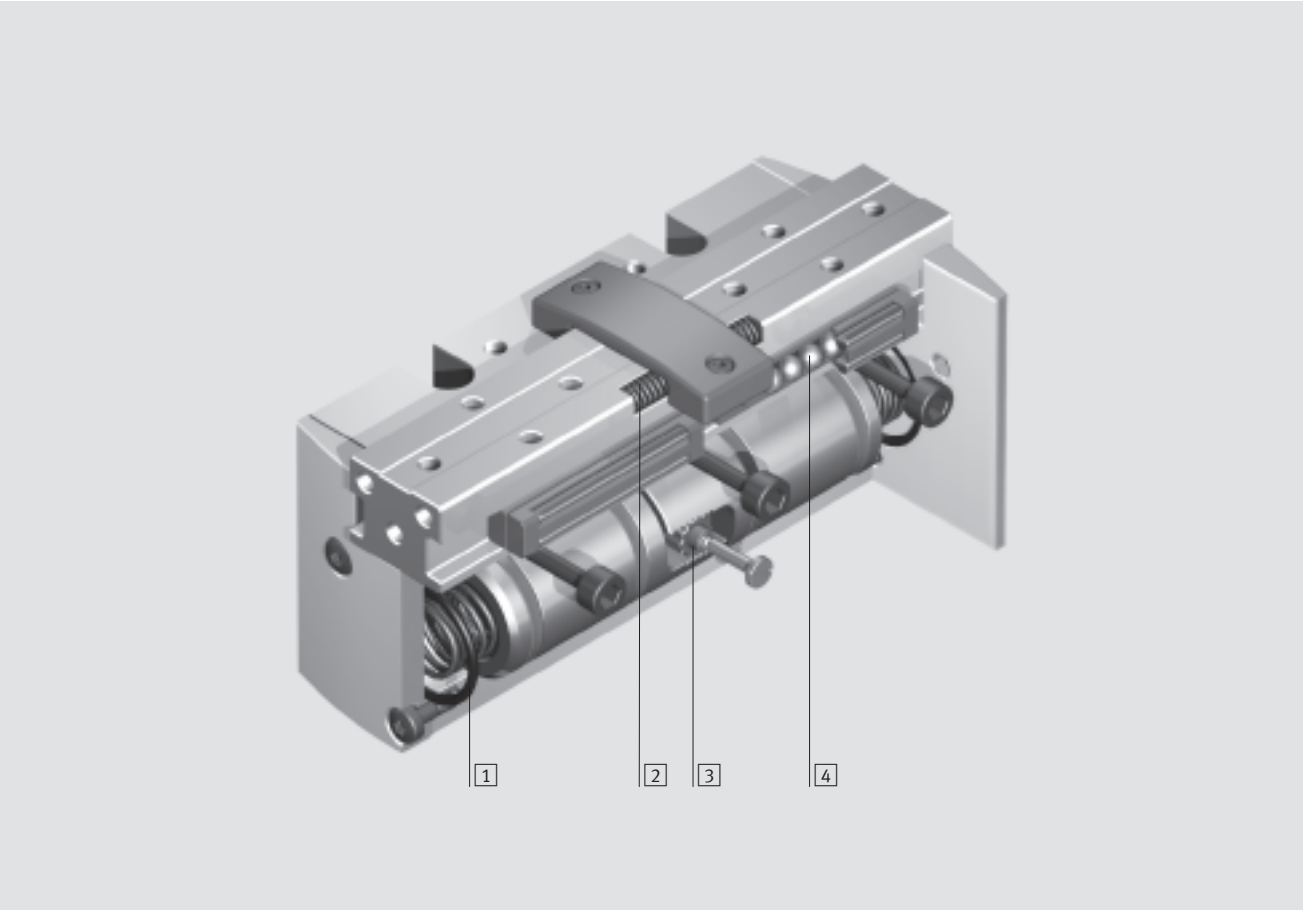
Key features



At a glance

- Wide range of variants for greater flexibility:
  - Double-acting piston drive HGPP-...-A.
  - Compression springs for supporting or retaining gripper forces, or for use as a single-acting gripper with only one compressed air connection
- High precision gripper jaw guide
- Choice of gripping action
  - External gripping
  - Internal gripping
- Multiple compressed air connections
- Integrated sensing electronics
- Adaptable proximity sensor via mounting bracket
- Highly flexible thanks to versatile attachment, mounting and applications options
  - Drives
  - Externally adaptable gripper fingers
  - Guide plate

1 Compression spring closes gripper jaws: HGPP-...-G2
2 Compression spring opens gripper jaws: HGPP-...-G1
3 Synchronisation element
4 Backlash-free guide bearing

Note

Sizing software
Gripper selection
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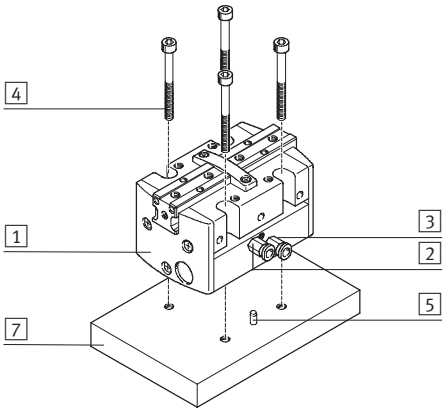
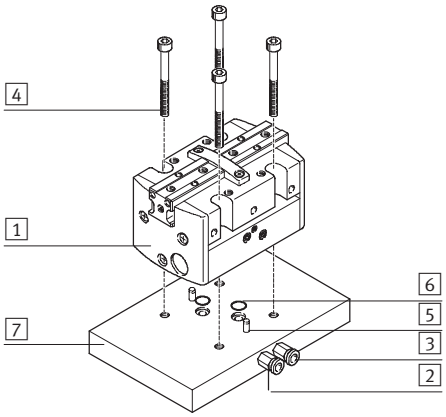
Features

Versatile air connections and mounting options

Supply port direct at the front,
direct mounting from above



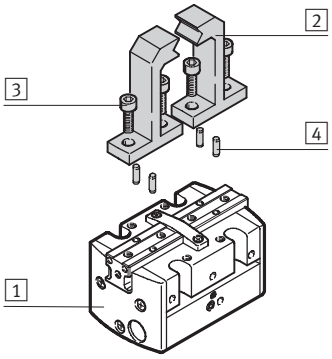
Supply port via adapter plate from underneath,
direct mounting from above



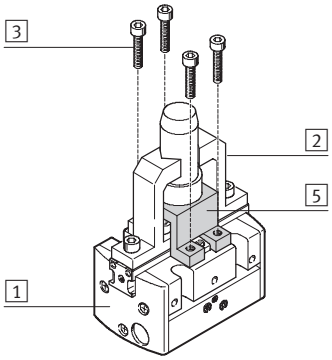
1 Parallel gripper
2 Compressed air connection, opening
3 Compressed air connection, closing
4 Mounting screws
5 Locating pins
6 O-rings
7 Plate (user-specific)

Range of applications (user-specific)

Attachment of external gripper fingers



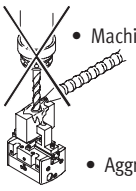
Used as guide plate



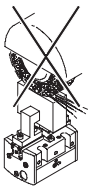
1 Parallel gripper
2 Gripper finger
3 Mounting screws
4 Locating pins
5 Guide plate

Note

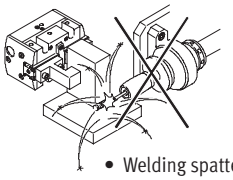
Grippers are not suitable for the following, or for similar applications:



- Machining
- Aggressive media



- Grinding dust



- Welding spatter

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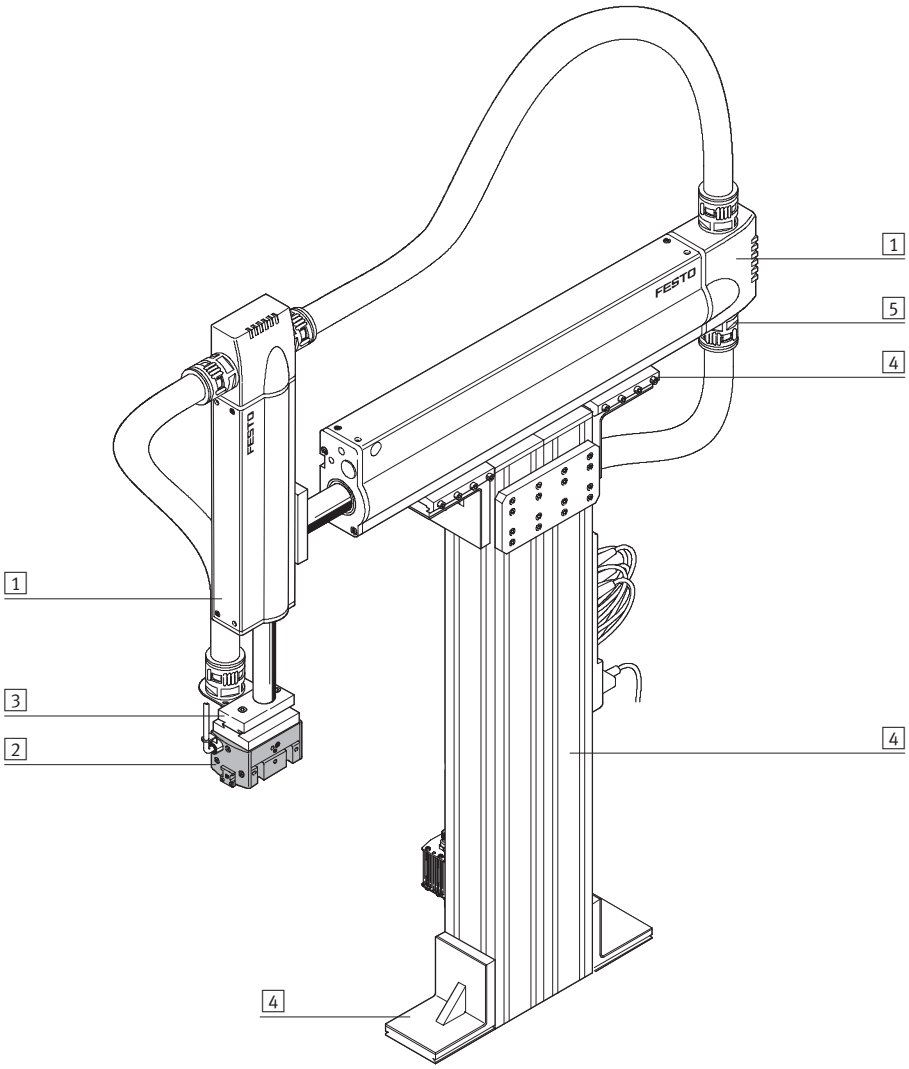
System example

System product for handling and assembly technology



System elements and accessories			
		Brief description	**➔ Page/Internet**
1	Drives	Wide range of combination options within handling and assembly technology	drive
2	Gripper	Diverse variation options in handling and assembly technology	gripper
3	Adapter	For drive/drive and drive/gripper connections	adapter kit
4	Basic mounting components	Profiles and profile connections as well as profile/drive connections	basic component
5	Installation components	For achieving a clear-cut, safe layout of electrical cables and tubing	installation component
–	Axes	Diverse possible combinations in handling and assembly technology	axes
–	Motors	Servo and stepper motors, with or without gearing	motor

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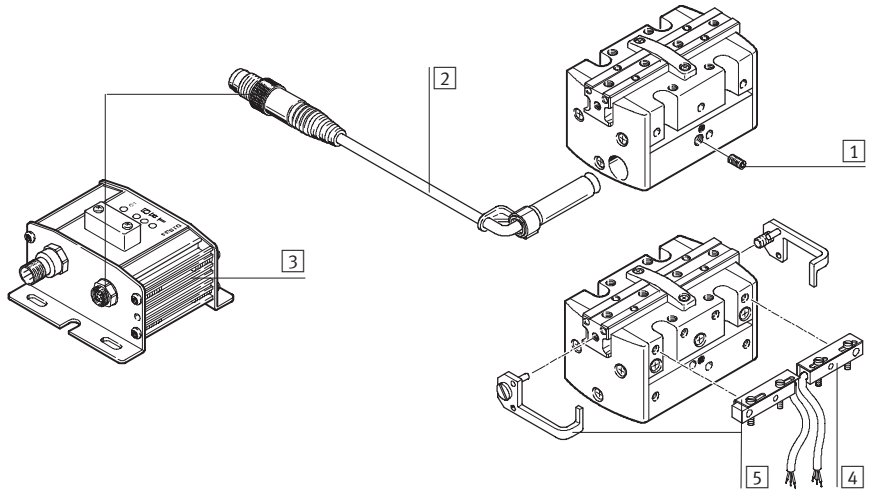
Peripherals overview and type codes

Peripherals overview



Accessories

	Brief description	➔ Page/Internet
1 Threaded pin	For securing position sensors SMH-S1	–
2 Position sensor SMH-S1	Can be integrated in the gripper	14
3 Evaluation unit SMH-AE1	For position sensor SMH-S1, for sensing 3 positions	14
4 Proximity sensor SIES-Q5B	Can be assembled with mounting bracket HGPP-HWS-Q5	14
5 Mounting bracket HGPP-HWS-Q5	For mounting proximity sensors SIES-Q5B, comprising 1 bracket and 1 switch lug with mounting screws	quick star

Type codes

HGPP – 16 – A – G1

Type	
HGPP	Parallel gripper

Size

Position sensing	
A	For proximity sensing

Gripping force retention	
G1	Open
G2	Closed

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Technical data

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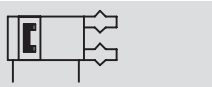
Function
Double-acting
HGPP-...-A



Single-acting or
with gripping force retention ...
... open HGPP-...-G1

... closed HGPP-...-G2

Size
10 ... 32 mm

Stroke
4 ... 25 mm

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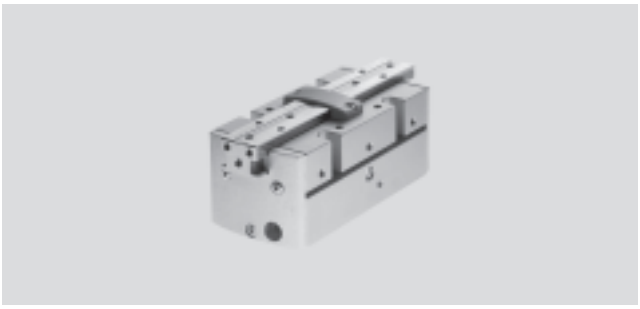
Wearing parts kits
➔ 14



General technical data							
Size		10	12	16	20	25	32
Design		Rack and pinion					
Mode of operation		Double-acting					
Gripper function		Parallel					
Number of gripper jaws		2					
Max. applied load per external gripper finger[1]	[N]	< 0.5	< 1	< 1.5	< 2	< 2.5	< 3
Stroke per gripper jaws	[mm]	2	2.5	5	7.5	10	12.5
Pneumatic connection		M3		M5			G1⁄8/M5[2]
Repetition accuracy[3]	[mm]	< 0.02	< 0.015		< 0.01	< 0.02	
Max. interchangeability	[mm]	0.2					
Max. gripper jaw backlash	[mm]	0					
Max. gripper jaw angular lash	[°]	0					
Max. operating frequency	[Hz]	4					
Centring precision	[mm]	< ∅ 0.05					
Position sensing		For proximity sensing					
Type of mounting		With through-hole and locating pin					
		With female thread and locating pin					

1) Valid for unthrottled operation
2) Supply port on side G1⁄8; supply port on ground M5
3) End-position drift under constant conditions of use with 100 consecutive strokes in the direction of movement of the gripper jaws
Note: This product conforms with the ISO 1179-1 standard and the ISO 228-1 standard.

Operating and environmental conditions			
Min. operating pressure	HGPP-...-A	[bar]	2
	HGPP-...-G...		5
Max. operating pressure		[bar]	8
Operating medium			Filtered compressed air, lubricated or unlubricated
Ambient temperature[1]		[°C]	+5 ... +60
Corrosion resistance class CRC[2]			2

1) Note operating range of proximity sensors
2) Corrosion resistance class 2 according to Festo standard 940 070
Components requiring moderate corrosion resistance. Externally visible parts with primarily decorative surface requirements which are in direct contact with a surrounding industrial atmosphere or media such as cooling or lubricating agents

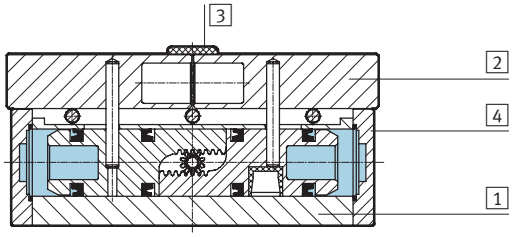
Parallel grippers HGPP, precision

Technical data

Weights [g]						
Size	10	12	16	20	25	32
HGPP-...-A	126	172	315	604	884	1,408
HGPP-...-G1	127	173	316	611	910	1,438
HGPP-...-G2	127	173	317	615	898	1,427

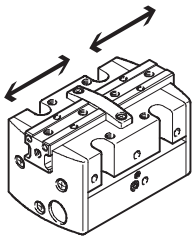
Materials

Sectional view



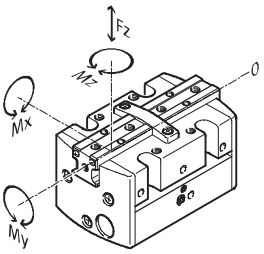
Parallel gripper		
1	Housing	Anodised aluminium
2	Gripper jaw	Nickel-plated aluminium
3	Cover cap	Polyacetate
4	Plug cap	Anodised aluminium
–	Note on material	Free of copper, PTFE and silicone
		Conforms to RoHS

Gripping force [N] at 6 bar



Size	10	12	16	20	25	32
Gripping force per gripper jaw						
Opening	40	58	102	170	250	415
Closing	40	58	102	170	250	415
Total gripping force						
Opening	80	116	204	340	500	830
Closing	80	116	204	340	500	830

Characteristic load values at the gripper jaws



Indicated permissible forces and torques apply to a single gripper jaw. Static forces and torques relate to additional applied loads caused by the workpiece or external gripper fingers, as well as forces which occur during handling. The zero co-ordinate line (gripper jaws point of rotation) must be taken into consideration for the calculation of torques. Additionally, max. permissible forces which may be applied to the housing have been entered as well, which, for example, can be absorbed by a guide plate during pressing-in operations.

Size		10	12	16	20	25	32
Max. permissible force $F_{ZGripper\ jaws}$	[N]	40	70	130	220	380	720
Max. permissible force $F_{ZHousing}$	[N]	200	400	600	800	1,000	1,200
Max. permissible torque M_X	[Nm]	1.5	3	7	14	21	30
Max. permissible torque M_Y	[Nm]	1.5	3	7	14	21	30
Max. permissible torque M_Z	[Nm]	1.5	3	7	14	21	30

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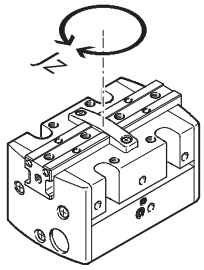
Technical data

Mass moment of inertia [kgm²x10⁻⁴]

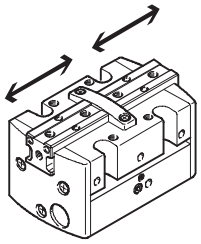


Mass moment of inertia [kgm²x10⁻⁴] for parallel grippers in relation to the central axis, without load.

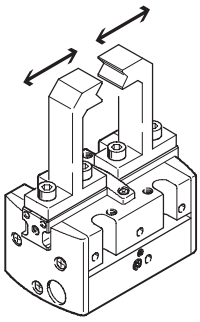
Size	10	12	16	20	25	32
HGPP-...-A	0.43	0.73	2.39	6.22	16.68	38.34
HGPP-...-G1	0.45	0.76	2.58	6.71	17.45	39.21
HGPP-...-G2	0.43	0.74	2.45	6.27	16.85	38.63

Opening and closing times [ms] at 6 bar

without external gripper fingers



with external gripper fingers

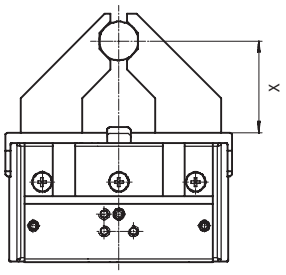


The indicated opening and closing times [ms] have been measured at room temperature and 6 bar operating pressure with vertically mounted gripper and without external gripper fingers. Load is increased if external gripper fingers are attached. This means that kinetic energy is also increased, as this is determined by gripper finger weight and velocity. If permissible kinetic energy is exceeded, various parts of the gripper may be damaged. This occurs when the applied load reaches the end-position and the cushioning is only able to partially convert the kinetic energy into potential energy and heat energy. It thus becomes apparent that the indicated max. permissible applied load due to the external gripper fingers must be checked and maintained. The grippers must be throttled for greater applied loads. Opening and closing times must then be adjusted accordingly.

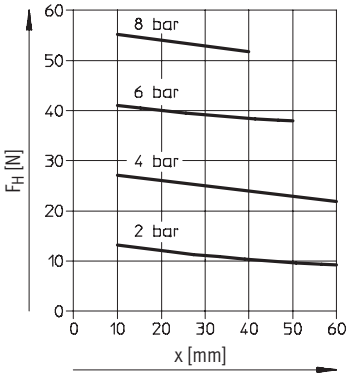
Size		10	12	16	20	25	32
Without external gripper fingers							
HGPP-...-A	Opening	22	27	40	44	64	76
	Closing	34	40	53	59	92	110
HGPP-...-G1	Opening	24	30	34	45	58	64
	Closing	95	70	70	92	164	173
HGPP-...-G2	Opening	26	37	57	62	105	103
	Closing	32	40	46	58	90	101
With external gripper fingers as a function of the applied load							
HGPP	1 N	100	–	–	–	–	–
	2 N	200	100	50	–	–	–
	3 N	300	200	100	50	100	–
	4 N	–	300	200	100	150	100
	5 N	–	–	300	200	200	150
	6 N	–	–	–	–	300	250

Gripping force F_H as a function of operating pressure and the lever arm x

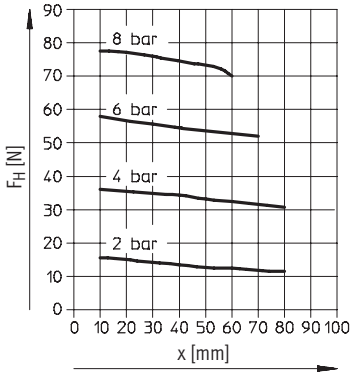
Gripping forces related to operating pressure and lever arm can be determined for the various sizes with the following graphs.



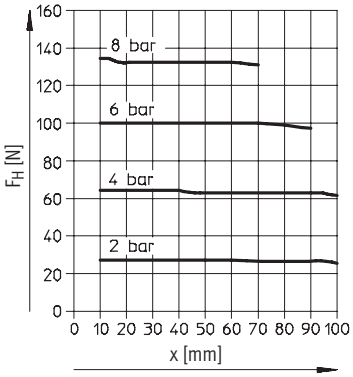
HGPP-10-A



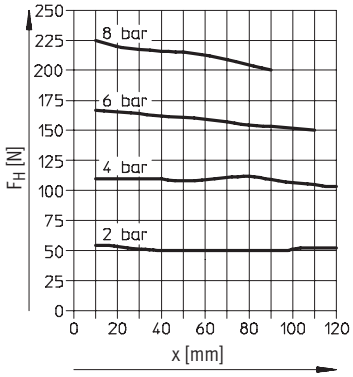
HGPP-12-A



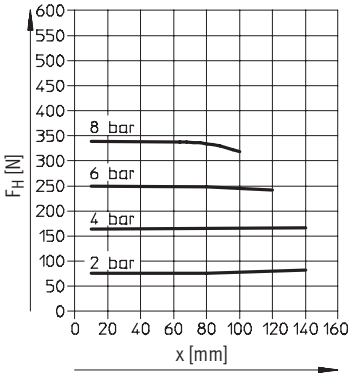
HGPP-16-A



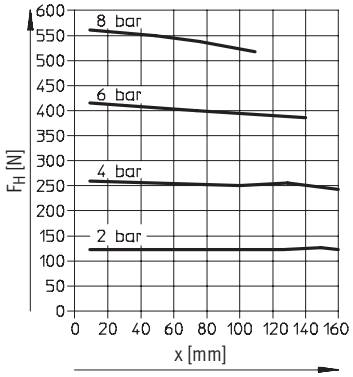
HGPP-20-A



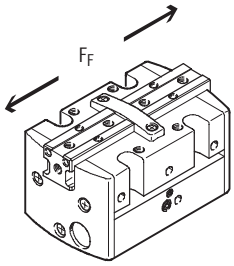
HGPP-25-A



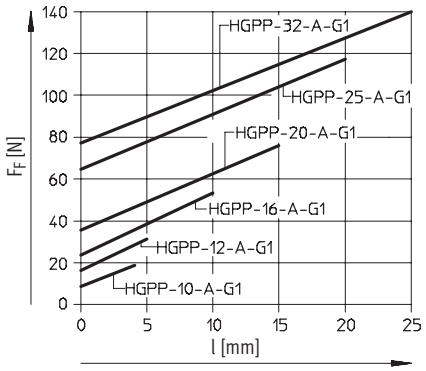
HGPP-32-A

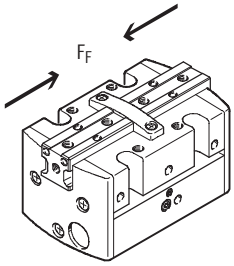


Spring force F_F as a function of the gripper size and overall stroke length l

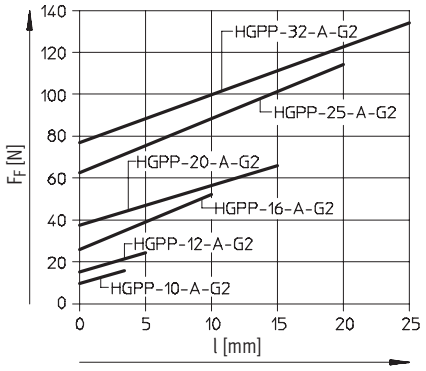


Gripper retention force, opening: the spring forces F_F of the parallel gripper HGPP-...-G1 can be determined from the following graphs.





Gripper retention force, closing: the spring forces F_F of the parallel gripper HGPP-...-G2 can be determined from the following graphs.



Determination of actual gripping forces for HGPP-...-G1 and HGPP-...-G2 depending upon the application

The parallel grippers with integrated spring can be used as:

- single-acting grippers
- grippers with supplementary gripping force and
- grippers with gripping force retention

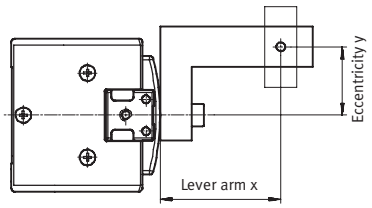
In order to calculate available gripping forces F_{Gr} (per gripper jaw), gripping force (F_H) and spring force (F_F) must be combined accordingly.

Application

	Single-acting	Supplementary gripping force	Gripping force retention
The resulting gripping force F_{Gr}, conditional on the application, depends on the gripping action (external/internal gripping) and the gripper design (with/without spring return). The spring force is supplemented in accordance with the design and gripping action.	• Gripping with spring force: $F_{Gr} = F_F$ • Gripping with pressure force: $F_{Gr} = F_H - F_F$	• Gripping with pressure and spring force: $F_{Gr} = F_H + F_F$	• Gripping with spring force: $F_{Gr} = F_F$

		Pressurised (in gripping action)	Unpressurised
HGPP-...-A	Internal gripping	$F_{Gr} = F_H$	$F_{Gr} = 0$
	External gripping	$F_{Gr} = F_H$	$F_{Gr} = 0$
HGPP-...-G1	Internal gripping	$F_{Gr} = F_H + F_F$	$F_{Gr} = F_F$
	External gripping	$F_{Gr} = F_H - F_F$	$F_{Gr} = 0$
HGPP-...-G2	Internal gripping	$F_{Gr} = F_H - F_F$	$F_{Gr} = 0$
	External gripping	$F_{Gr} = F_H + F_F$	$F_{Gr} = F_F$

Gripping force F_H at 6 bar as a function of lever arm x and eccentricity y



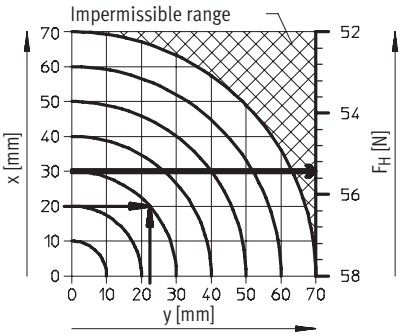
Gripping forces at 6 bar dependent upon eccentric application of force and the maximum permissible off-centre point of force application can be determined for the various sizes using the following graphs.

Calculation example

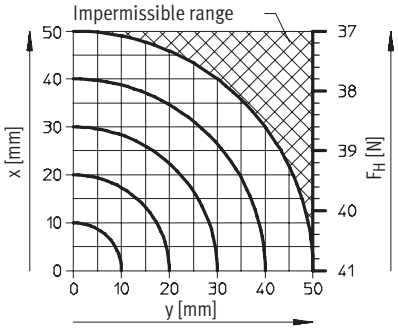
Given:
Gripper HGPP-12-A
Lever arm x = 20 mm
Eccentricity y = 22 mm
To be found:
Gripping force at 6 bar

Procedure:
- Determine the intersection xy between lever arm x and eccentricity y in the graph for HGPP-12-A
- Draw an arc (with centre at origin) through intersection xy
- Determine the intersection between the arc and the X axis
- Read gripping force

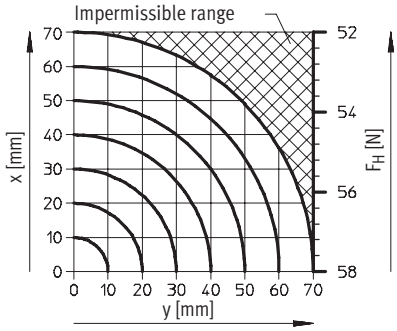
Result:
Gripping force = approx. 55 N



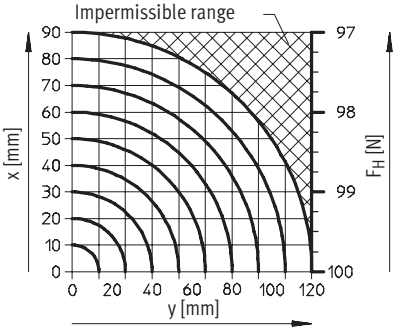
HGPP-10-A



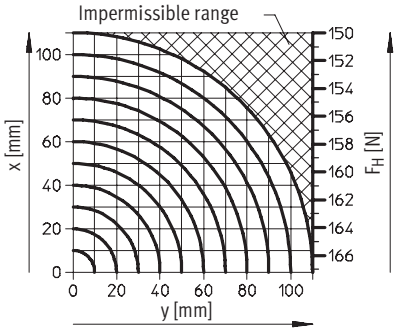
HGPP-12-A



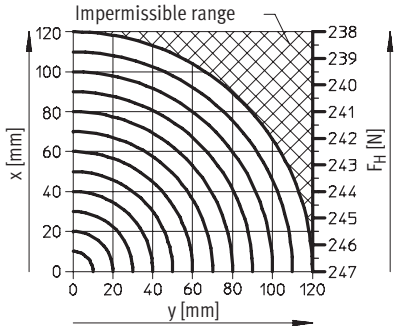
HGPP-16-A



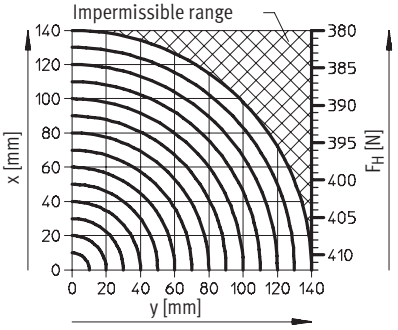
HGPP-20-A



HGPP-25-A



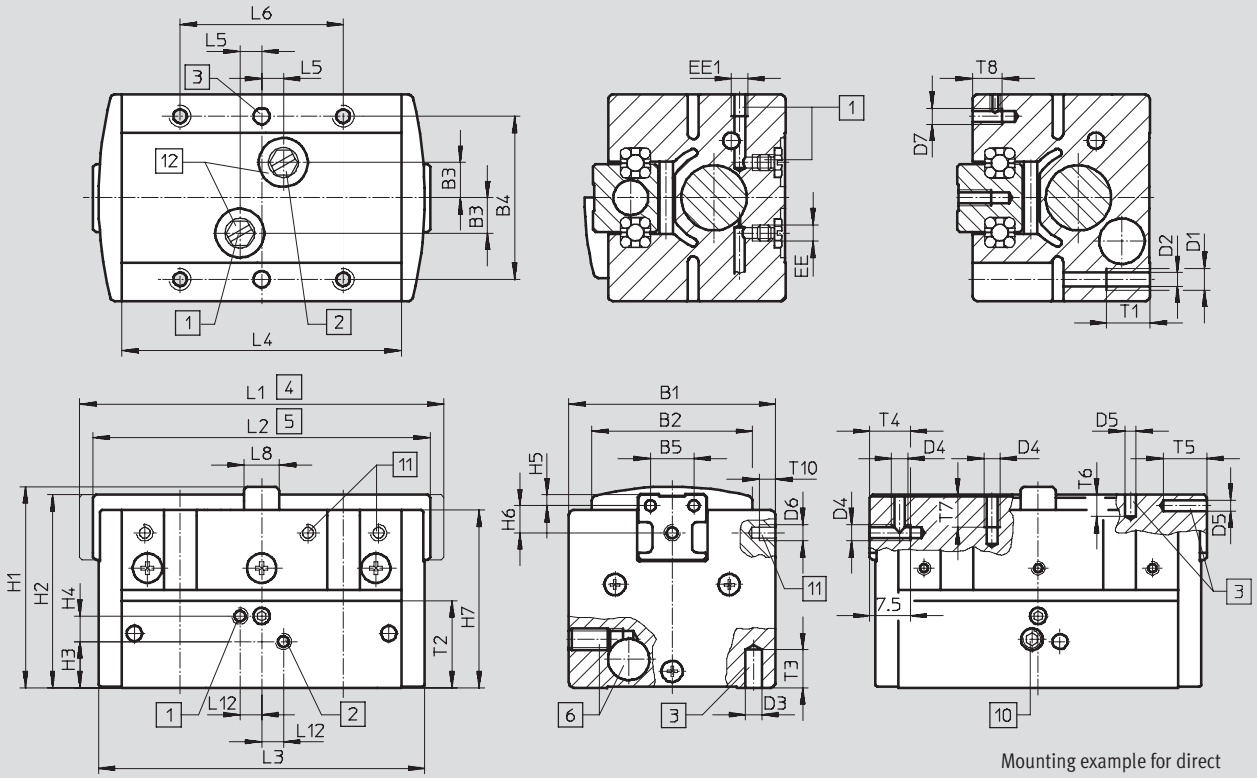
HGPP-32-A



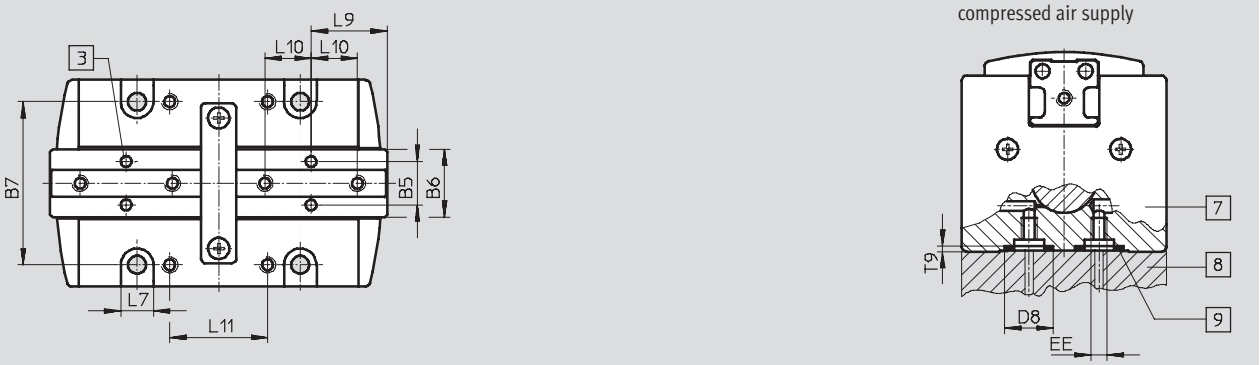
Parallel grippers HGPP, precision

Technical data

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



Mounting example for direct compressed air supply



1 Compressed air connection, opening
2 Compressed air connection, closing
3 Hole for locating pin (Locating pins are not included in scope of delivery.)
4 Gripper jaws open
5 Gripper jaws closed
6 Hole for sensor kit
7 Parallel gripper
8 Adapter (e. g. customer-specific)
9 O-ring for parallel grippers:
HGPP-10: ∅ 5.5x1.5
HGPP-12: ∅ 5.5x1.5
HGPP-16: ∅ 8.13x1.78
HGPP-20: ∅ 8.13x1.78
HGPP-25: ∅ 8.13x1.78
HGPP-32: ∅ 8.13x1.78
(Not included in scope of delivery)
10 Set screw for mounting position sensor SMH-S1
11 Thread for securing the mounting bracket HGPP-HWS-Q5
12 Supply ports on base sealed on delivery

Parallel grippers HGPP, precision

Technical data

Size [mm]	B1 +0.3	B2 ±0.1	B3 ±0.05	B4 ±0.02[1] ±0.1[2]	B5 ±0.02	B6 ±0.1	B7 ±0.1	D1	D2 ∅ +0.1
10	33	26	6.5	27	8	12.5	27	M4	3.3
12	38	29.5	6.5	30	8	12.5	30	M4	3.3
16	42	30.5	8.5	32	10	16	32	M4	3.3
20	48	36.5	10	40	12	20	40	M5	4.2
25	55	42	12	45	15	25	45	M6	5.1
32	62	45	14	52	18	30	52	M6	5.1

Size [mm]	D3 ∅ H8	D4	D5 ∅ H8	D6	D7	D8 ∅ H11	EE	EE1	H1
10	3	M3	2	M2	M3	9	M3	M3	32.7 ±0.15
12	3	M3	2	M2	M3	9	M3	M3	37 +0.3/–0.1
16	3	M3	2.5	M2	M3	12.1	M5	M5	42.5 +0.4/–0.1
20	3	M4	3	M2	M3	12.1	M5	M5	55.5 +0.4/–0.1
25	5	M5	4	M2	M3	12.1	M5	M5	57.5 ±0.15
32	5	M6	5	M2	M4	12.1	M5	G1⁄8	68.6 ±0.15

Size [mm]	H2 ±0.1	H3	H4 ±0.1	H5 ±0.02	H6 ±0.12	H7 –0.3	L1 ±0.5	L2 ±0.5	L3 ±0.25	L4 ±0.05
10	31.4	8.9 ±0.25	3.7	2	2.6	28.7	62	58	56	47.4
12	35.5	8.5 ±0.3	4.7	2	5	32.7	67	62	60	51.4
16	40.9	8.3 ±0.2	6.8	3	5	37.1	98	88	86	76
20	53.48	15.5 ±0.2	8	3	7	48.5	120	105	103	92
25	56	12.5 ±0.25	7.5	4	8	51	163	143	139.4	127.4
32	67	12.5 ±0.25	11	5	9	60.5	197.4	172.4	169.4	155.4

Size [mm]	L5 ±0.05	L6 ±0.1	L7	L8 ±0.1	L9 ±0.02	L10 ±0.05	L11 ±0.1	L12 ±0.05	T1
10	5	27	6	6	13.5	7.5	15	4	8
12	4	30	6	6.5	14	8.5	18	4	8
16	6.5	40	6	12	17.5	11.5	24	6.5	10
20	7.5	40	8	18	21	13.5	26	7.5	12
25	12	45	9	22	29.8	17	28	12	12
32	15	52	9	27	33.5	20	35	15	12

Size [mm]	T2	T3	T4	T5	T6	T7	T8	T9 +0.1	T10
10	14.85	6	8	5	4	6	3.8	1	3
12	16	6	7.5	5	4	6	5.5	1	3
16	19.5	7	8	6	4.5	6	5	1.3	4
20	28.5	7	10	8	7	8	6	1.3	7
25	27	10	10	8	8	10	6	1.3	8
32	34.5	10	10	10	10	10	8	1.3	8

1) For locating hole
2) For thread and through-holes

Note: This product conforms with the ISO 1179-1 standard and the ISO 228-1 standard.

Parallel grippers HGPP, precision

Ordering data and accessories

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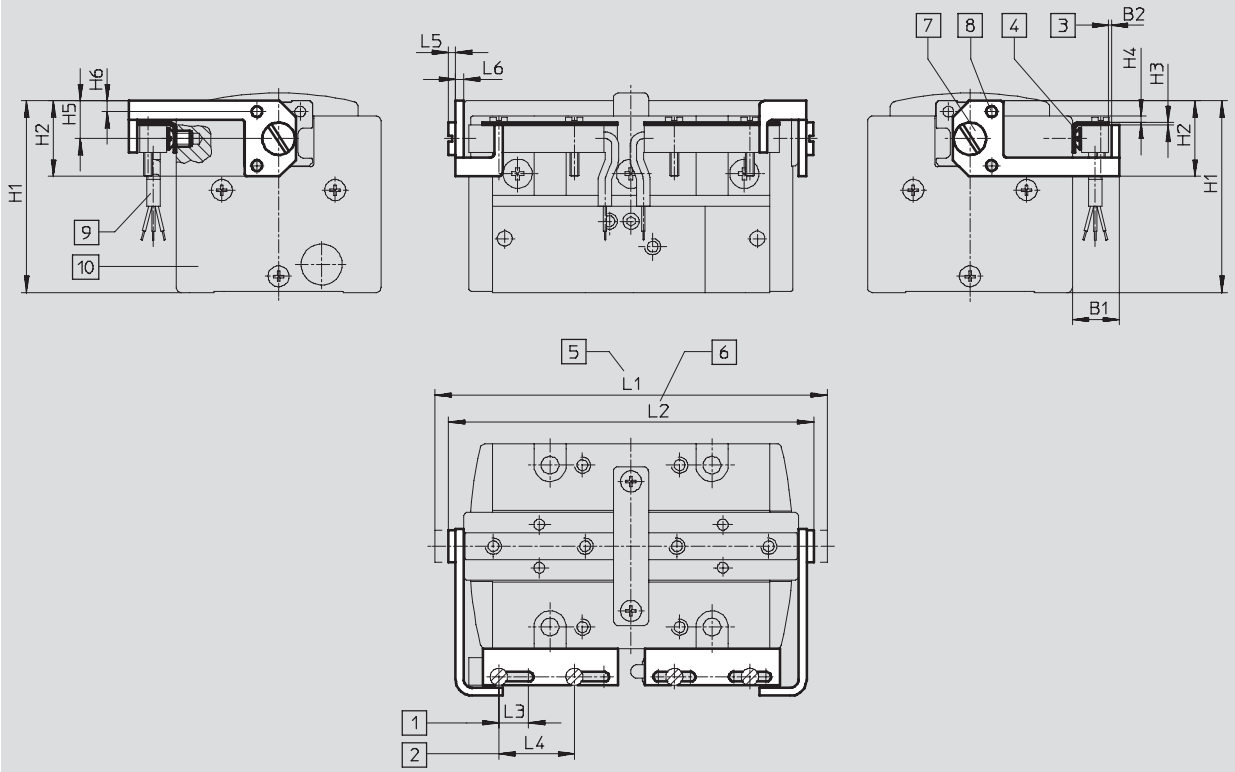
Ordering data						
Size	Double-acting		Single-acting or with gripping force retention			
	Without compression spring		open		closed	
[mm]	Part No.	Type	Part No.	Type	Part No.	Type
10	**525 658**	**HGPP-10-A**	**525 659**	**HGPP-10-A-G1**	**525 660**	**HGPP-10-A-G2**
12	**187 867**	**HGPP-12-A**	**187 868**	**HGPP-12-A-G1**	**187 869**	**HGPP-12-A-G2**
16	**187 870**	**HGPP-16-A**	**187 871**	**HGPP-16-A-G1**	**187 872**	**HGPP-16-A-G2**
20	**187 873**	**HGPP-20-A**	**187 874**	**HGPP-20-A-G1**	**187 875**	**HGPP-20-A-G2**
25	**525 661**	**HGPP-25-A**	**525 662**	**HGPP-25-A-G1**	**525 663**	**HGPP-25-A-G2**
32	**525 664**	**HGPP-32-A**	**525 665**	**HGPP-32-A-G1**	**525 666**	**HGPP-32-A-G2**

Ordering data – Wearing parts kits		
Size		
[mm]	Part No.	Type
10	**673 172**	**HGPP-10**
12	**673 173**	**HGPP-12**
16	**673 174**	**HGPP-16**
20	**673 175**	**HGPP-20**
25	**673 176**	**HGPP-25**
32	**673 177**	**HGPP-32**

Ordering data – Accessories				
	Size [mm]	Weight [g]	Part No.	Type
Position sensor SMH-S1			Technical data ➔ Internet: smh-s1	
	10, 12	20	**189 040**	**SMH-S1-HGPP10/12**
	16	20	**189 041**	**SMH-S1-HGPP16**
	20, 25	20	**189 042**	**SMH-S1-HGPP20/25**
	32	20	**526 895**	**SMH-S1-HGPP32**
Evaluation unit SMH-AE1			Technical data ➔ Internet: smh-ae1	
	10 ... 32	170	**175 708**	**SMH-AE1-PS3-M12**
		170	**175 709**	**SMH-AE1-NS3-M12**
Proximity sensor SIES-Q5B			Technical data ➔ Internet: sies	
	10 ... 32	22	**178 291**	**SIES-Q5B-PS-K-L**
		22	**174 549**	**SIES-Q5B-PO-K-L**
		22	**178 290**	**SIES-Q5B-NS-K-K-L**
		22	**174 548**	**SIES-Q5B-NO-K-L**

Dimensions – Mounting bracket Download CAD data ➔ **www.festo.com**

HGPP-HWS-Q5



1 Adjusting range for position sensing
2 Mounting space for proximity sensor SIES-Q5B
3 Switching distance
4 Mounting for sensor bracket
5 Gripper jaws position, open
6 Gripper jaws position, closed
7 Fixing screw for mounting bracket
8 Locating pin
9 Proximity sensor SIES-Q5B (to be ordered separately)
10 Parallel grippers HGPP

For size [mm]	B1	B2	H1	H2	H3	H4	H5	H6
10	8.7	0.5	35.5	14	0.5	1.2	7	2
12	8.7	0.5	35.5	14	0.5	1.2	7	2
16	8.5	0.5	35.4	16	0.5	1.2	8	3
20	8.5	0.5	36	20	0.5	2	10	3
25	9.5	0.55	46.3	24	1	3.7	12	4
32	9.5	0.55	55.5	28	1	4	14	5

For size [mm]	L1	L2	L3	L4	L5	L6	Weight [g]	Part No.	Type
10	67.6	63.6	5.5	14	1.8	1.5	4.2	**532 272**	**HGPP-HWS-Q5-1**
12	73.6	68.6	5.5	14	1.8	1.5	5.6	**532 273**	**HGPP-HWS-Q5-2**
16	105.6	95.6	8.5	14	1.8	2	8.3	**532 274**	**HGPP-HWS-Q5-3**
20	126.8	111.8	8.5	14	2.4	2	11.4	**532 275**	**HGPP-HWS-Q5-4**
25	171	151	28	14	3	2	17.6	**532 276**	**HGPP-HWS-Q5-5**
32	206.6	181.6	28	14	3.6	2	24.6	**532 277**	**HGPP-HWS-Q5-6**