Range of gripping power at supply pressure 0.5MPa and general jaw length

(Note) Grip applies to one jaw.
The actual value is grip x 2.

	Variation	Model no.	Action of jaw (J)	Gripping power (N)	Switch model no.	Page
Wide angle hand	Feather hand (Min-fulcrum hand)	FH500		510 (10° open -25° closed) 512 (10° open -25° closed) 516 (10° open -25° closed) 520 (10° open -25° closed)	T2H/V T3H/V	376
	Fulcrum hand	HBL		1C (15) 2CS (20) 3CS (25) 4CS (40)	T2H/V T3H/V	382
	Wide angle hand	HDL		3CS (25) 4CS (40)	T2H/V T3H/V	388
	Thin wide angle hand	HMD		16C (184° open -4° closed) 25C (184° open -4° closed)	T2H/V T3H/V	392
Parallel hand	Toggle hand	HJL		32CS (28° open -3° closed) 40CS (28° open -3° closed) 50CS (28° open -3° closed) 63CS (28° open -3° closed)	T2H/V T3H/V	396
Centering hand	Centering hand	BHE		01CS (7) 03CS (10) 04CS (14) 05CS (16) 06CS (22)	T2H/V T3H/V	402

(Example)
110 (8)
Model Gripping power Stroke length (mm) or open and close degree

Safety precautions

Always read this section before starting use.
Refer to Intro 69 for general precautions of the cylinder, and to Intro 78 for general precautions of the cylinder switch.

Hand Series

Design & Selection

1. COMMON

⚠ WARNING

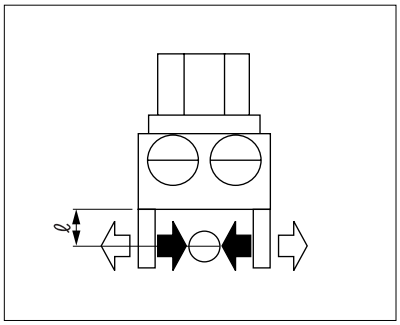
■ If the moving workpiece poses a possible risk to personnel or if fingers could be caught in the master key, etc., install a protective cover, etc.

■ If circuit pressure drops due to a service interruption or problems in the air source, gripping power drops and the workpiece could drop. Provide position locking measures, etc., so that personnel are not injured or machines damaged.

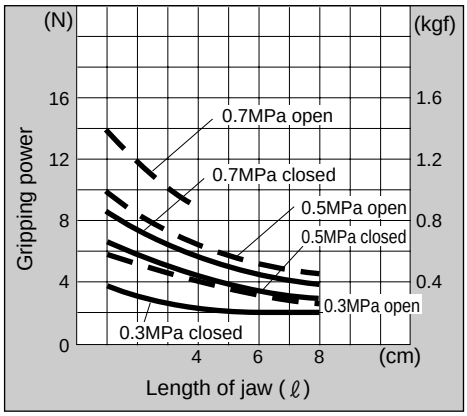
⚠ CAUTION

■ Cautions on gripping power

● The grip is for one master jaw when all master and small jaws contact the workpiece as shown below.



● Performance data indicates the gripping power at hand jaw length ℓ at a supply pressure of 0.15 to 0.7 MPa.



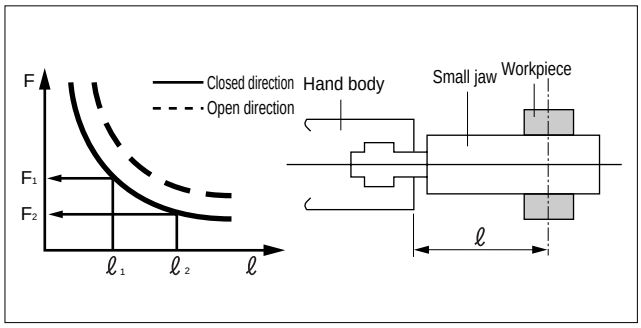
● To obtain gripping power from performance data, if the distance to the workpiece's center of gravity is ℓ when manufacturing the small jaw, gripping power F is expressed as follows

When ℓ = ℓ 1, then F = F1
When ℓ = ℓ 2, then F = F2

Refer to the drawing below.

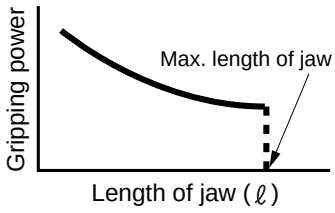
● The jaw's working max. length can be used within performance data.
When N is used to express the number of jaws as reference for the coefficient for transferring workpiece weight W_L

WL × 9.8: (F × N) = 1:5 (only gripping)
WL × 9.8: (F × N) = 1:10 (normal transfer)
WL × 9.8: (F × N) = 1:20 (sudden acceleration transfer)
WL × 9.8: Workpiece weight (kg)
F: Gripping power (N)
N: Number of jaws

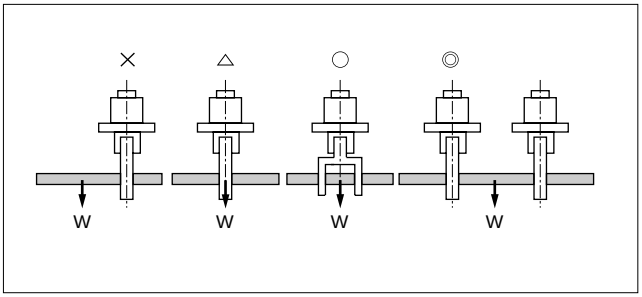


■ Use as short and light a small jaw as possible.
If the small jaw is long and heavy, inertia increases when opening and closing. This may cause play in the master key, and may adversely affect life.

● The small jaw's length must be within performance data.
● The weight of the small jaw affects life, so check that it is within the following value.
W < 1/4H (1 pc.) W: Weight of small jaw
H: Product weight of hand



■ When gripping a long object or large workpiece, the center of gravity must be gripped to provide stable prehension. It is also necessary to stabilize prehension by increasing the size or using multiple jaws.



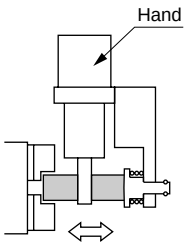
■ Select a model that has sufficient power to grip the workpiece weight.

■ Select a model that has sufficient opening/closing width for the workpiece size.

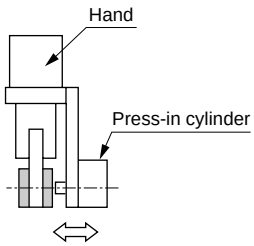
■ If directly inserting the workpiece into the jig with the hand, consider clearance during design to avoid damaging the hand.

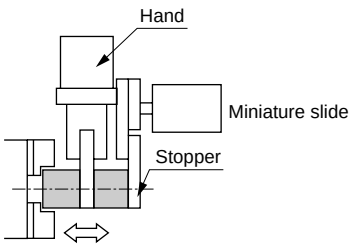
Hand

● Pushing against jig with spring



● Using a press-in cylinder





Note) The workpiece is slid along the top of the small jaw, so chuck life could drop markedly. Sufficient consideration should be made for the shape of the small jaw.

■ If the small jaw is not rigid enough, resulting deflection could cause the master jaw to twist or adversely affect operation.

■ Adjust the chuck open/close speed with the speed control valve (optional).
Play may occur quickly when used at a high speed.

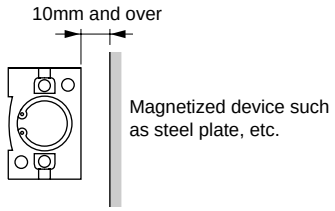
Installation & Adjustment

1. COMMON

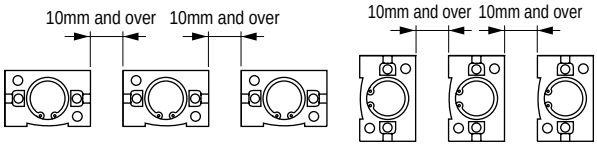
⚠ CAUTION

■ If a lateral load or load with a large impact is applied to the master key, play or damage could occur in the master key. Adjust and check that external force is not applied to the master key.

■ The cylinder switch could malfunction if there is magnetic substance, such as a steel plate, near the cylinder switch. Keep magnetic substance at least 10mm from the cylinder.



■ The cylinder switch could malfunction if cylinders are installed adjacently. Check that the following distances are provided between cylinders.

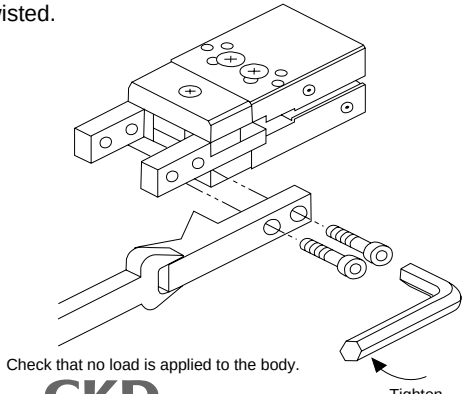


■ If the clamp is operated carefully and slowly as possible, accuracy increases. Repeatability also stabilizes.

■ Regularly grease the sliding section of the master key. Periodic replenishment of grease will extend the life of the part.

■ Installing the jaw

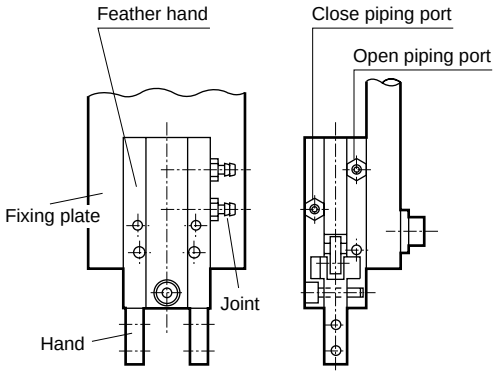
To prevent any effect onto the hand, support the master key with a wrench, etc., and tighten so that the master key is not twisted.



2. Installation

■ Do not cause dents or scratches that may worsen flatness or perpendicularity on the fixing face or master key.

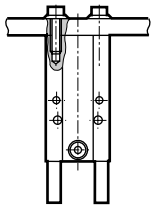
■ If there is a limit to the thickness direction of the FH series body, the available piping joint will be limited. Refer to the following joints.



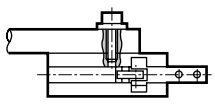
Model	FH*10	FH*12	FH*16	FH*20	FH*25
Port size	M3		M5		
Joint	Model no.	Applicable O.D. (mm)	Effective sectional area (mm²)	Model no.	Applicable O.D. (mm)	Effective sectional area (mm²)
Barbed joint — Straight FTS	FTS4-M3	φ3.2·φ4	0.4	FTS4-M5	φ3.2·φ4	2.1
	-	-	-	FTS6-M5	φ6	4.1

■ Refer to the section below for details on installing the FH series.

● Top installation



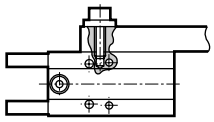
● Front installation



Note) When a switch is provided, screw the bolt into as shown below so the switch is not pressed by the end of the bolt.

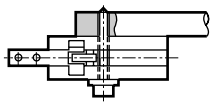
Note) Check that the fixed plate does not overlap the master jaw support.

● Side installation



Model	Applicable bolt size	Max. screw depth (mm)	Recommended tightening torque (N·cm)
FH*10	M3×0.5	4.5	70
FH*12	M3×0.5	4.5	70
FH*16	M4×0.7	6	160
FH*20	M5×0.8	7.5	330
FH*25	M5×0.8	12	330

● Use of throught hall

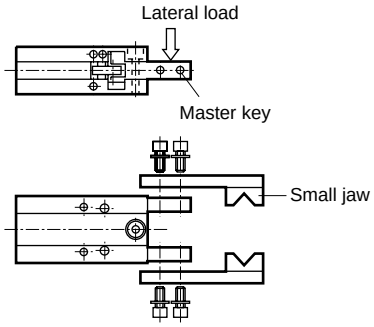


Model	Applicable bolt size	Recommended tightening torque (N·cm)
FH*10	M3 ×0.5	32
FH*12	M2.5×0.45	32
FH*16	M3 ×0.5	90
FH*20	M4 ×0.7	210
FH*25	M4 ×0.7	210

Note) A throught hall cannot be used when a switch is provided.

Note) Check that the fixed plate does not overlap the master jaw support.

■ When installing the small jaw, check that a lateral load is not applied to the master key.



■ Tighten with the following tightening torque.

Screw nominal	M3	M4	M5	M6	M8
Recommended tightening torque (N·m)	0.59	1.4	2.8	4.8	12.0

During Use & Maintenance

⚠ CAUTION

■ Do not dissemble or modify the body.

Fulcrum hand Double acting/single acting

HBL Series

● Open and close angle: -5° to 20°

RoHS CAD

Specifications

Descriptions		HBL			
Size		1C	2CS	3CS	4CS
Cylinder bore size	mm	ϕ15	ϕ20	ϕ25	ϕ40
Actuation		Double acting/single acting			
Working fluid		Compressed air			
Max. working pressure	MPa	0.7			
Min. working pressure	MPa	0.3			
Ambient temperature	℃	5 to 60			
Port size		M5			Rc1/8
Open angle	Degree	-5 to 20			
Rod diameter	mm	ϕ8	ϕ10	ϕ12	ϕ14
Capacity of reciprocating	cm^3	0.5	2.2	4.3	14.2
Repeatability	mm	±0.03			
Product weight	kg	0.09	0.22	0.39	0.82
Lubrication		Not required (when lubricating, use turbine oil Class 1 ISO VG32)			

Switch specifications

Descriptions	Proximity 2 wire	Proximity 3 wire
	T2H/T2V	T3H/T3V
Applications	Programmable controller	Programmable controller, relay
Output method	-	NPN output
Power voltage	-	10 to 28 VDC
Load voltage/current	10 to 30 VDC, 5 to 20 mA (Note 1)	30 VDC or less, 100mA or less
Light	LED (ON lighting)	
Leakage current	1mA or less	10μA or less
Maximum shock resistance	980m/s_2	
Lead wire	Standard 1m (oil resistant vinyl cabtire cable 2-conductor 0.2mm^2)	Standard 1m (oil resistant vinyl cabtire cable 2-conductor 0.2mm^2)

Note 1: Max. load current above: 20 mA at 25℃.
The current will be lower than 20mA if ambient temperature around switch is higher than 25℃. (5 to 10mA with 60℃)

How to order

Without switch

HBL - 2CS - O

With switch

HBL - 2CS - O - T2H - R

Ⓐ Size

Ⓑ Option
Note 1

Ⓒ Switch model no.

Ⓓ Switch quantity

Symbol	Descriptions
Ⓐ Size	
1C	
2CS	
3CS	
4CS	
Ⓑ Option	
Blank	Standard (double acting)
O	Single acting (normally open)
C	Single acting (normally closed)
Y1	With small jaw material (S50C)
Y2	With small jaw material (MC nylon)
Ⓒ Switch model no.	

Axial lead wire	Radial lead wire	Contact	Indicator	Lead wire
T2H*	**T2V***	Proximity	1 color indicator type	2-wire
T3H*	**T3V***			3-wire

***Lead wire length**	
Blank	1m (standard)
3	3m (option)
5	5m (option)
Ⓓ Switch quantity	
R	One on open side
H	One on closed side
D	Two

⚠ Note on model no. selection

Note 1: Refer to pages 412 to 413 for the dimensions and applicable model of the small jaw. When ordered as an option, two are included on delivery.

<Example of model number>

HBL-2CS-O-T2H-R

Model: Fulcrum hand
Ⓐ Size : 2CS
Ⓑ Option : Single acting, normally open type
Ⓒ Switch model no. : Proximity T2H switch, lead wire 1m
Ⓓ Switch quantity : One on open side

How to order switch

● For switch T*H*

· Switch body + mounting bracket

HBL - T2H

Switch model no. (Item above Ⓒ)

· Switch body

SW - T2H

Switch model no. (Item above Ⓒ)

· Mounting bracket

HBL - T

● For switch T*V*

· Switch body + mounting bracket

HBL - T2V - *

Switch model no. (Item above Ⓒ)

· Switch body

SW - T2V

Switch model no. (Item above Ⓒ)

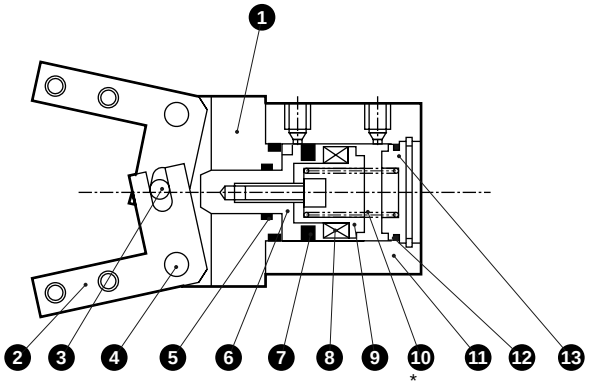
· Mounting bracket

HBL - TV - *

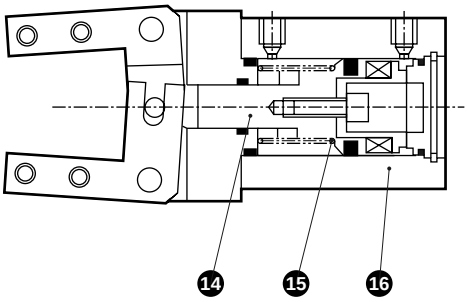
(Select either R (open) or H (closed) for sections marked with an asterisk (*).)

Internal structure and parts list

● Standard (double acting)/O (normally open) type



● C (normally closed) type



* Spring of ⑩ is not contained in standard (double acting) type.

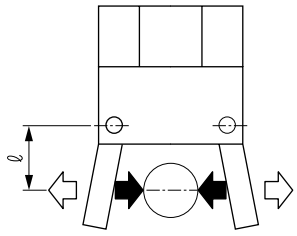
No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	Body	Aluminum alloy		9	Piston B	Stainless steel (1CS) Acetar resin (2 to 4CS)	
2	Master key	Steel		10	Spring	Stainless steel	Only O type
3	Operation axis	Steel		11	Cylinder	Aluminum alloy	
4	Fulcrum axis	Steel		12	Cylinder gasket	Nitrile rubber	
5	Rod packing seal	Nitrile rubber		13	Cylinder guard	Aluminum alloy (1CS) Acetar resin (2 to 4CS)	
6	Piston A	Stainless steel		14	Piston	Stainless steel	
7	Piston packing seal	Nitrile rubber		15	Spring	Stainless steel	
8	Magnet			16	Cylinder	Aluminum alloy	

Gripping power performance data

Gripping power that functions to open and closed directions with jaw length ℓ of hand at supply pressure 0.3, 0.5 and 0.7 MPa is shown.

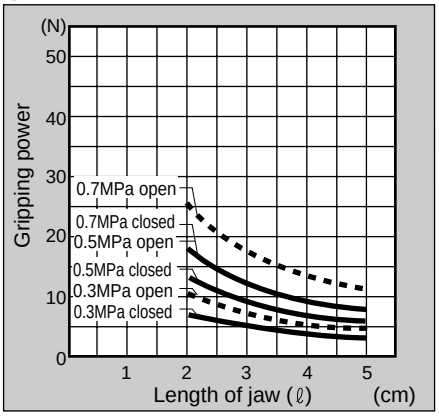
● Open direction (⇦) - - - - - (shown with broken line)

● Closed direction (➡) ——— (shown with continuous line)

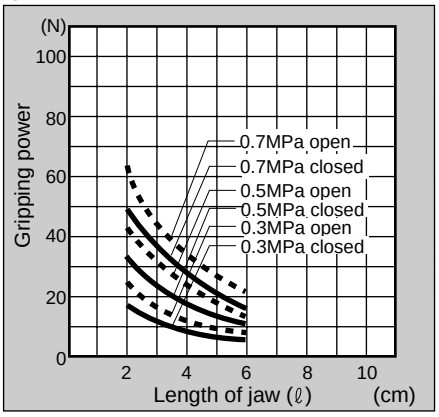


(Note) O type gripping power decreases approximate 20 to 30 % comparing to double acting type to closed direction.
C type gripping power decreases approximate 10 to 20 % comparing to double acting type to open direction.
Grip performance data indicates the grip for one jaw. Since two jaws are used, double the grip in the graph when making a selection.

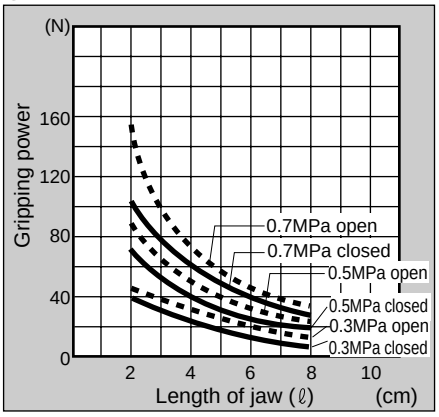
● HBL-1C



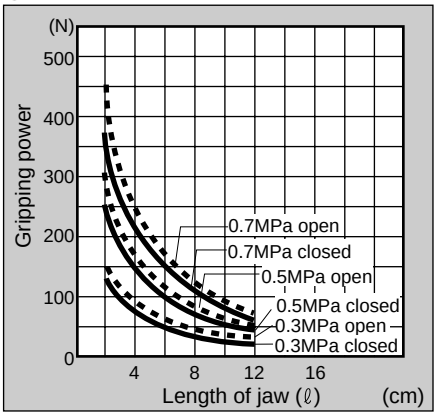
● HBL-2CS



● HBL-3CS

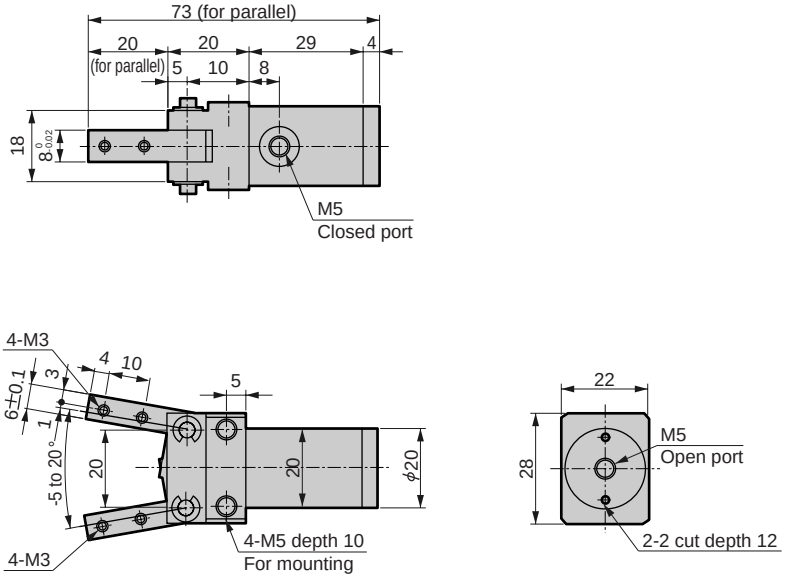


● HBL-4CS



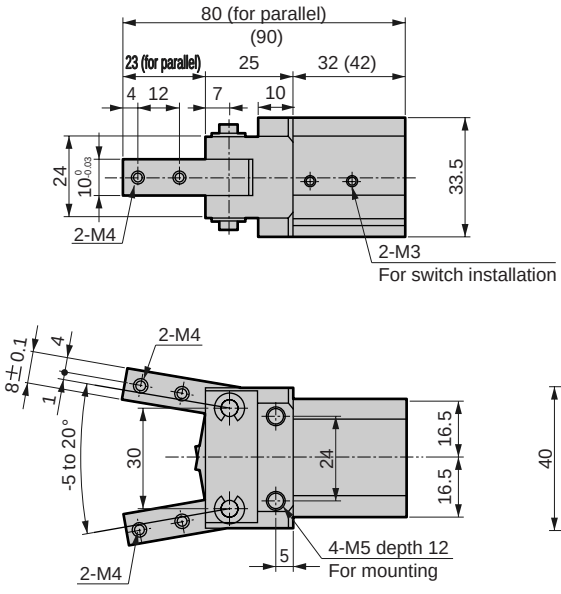
Dimensions

● HBL-1C standard/O/C

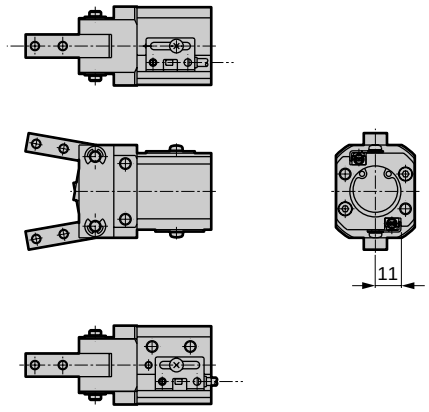


● HBL-2CS standard/O/C

● Dimension in ( ) for C (normally closed) specifications.



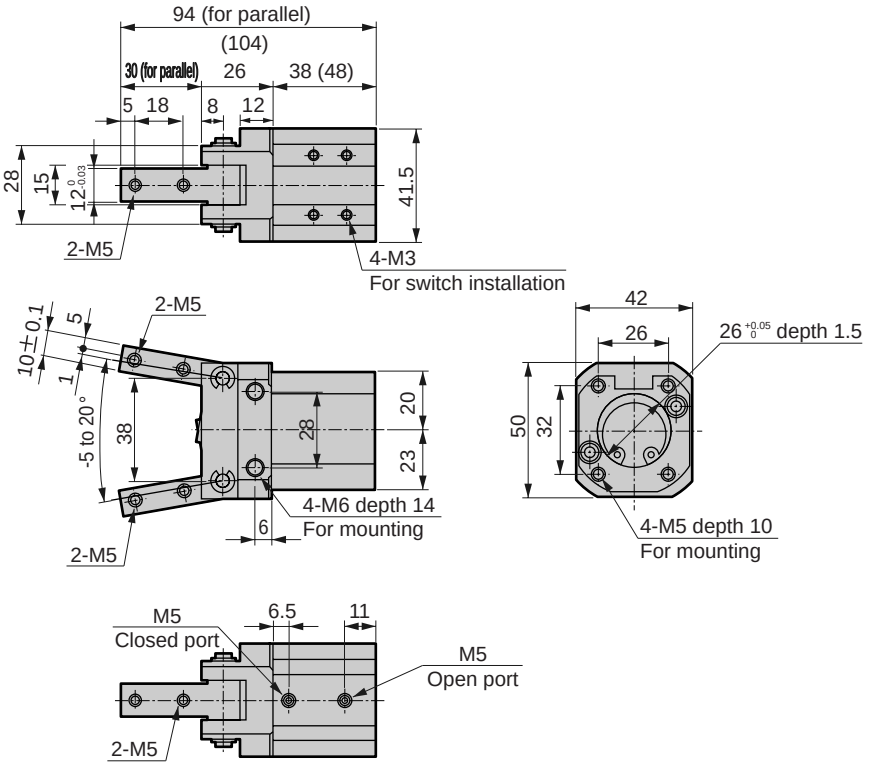
● With switch



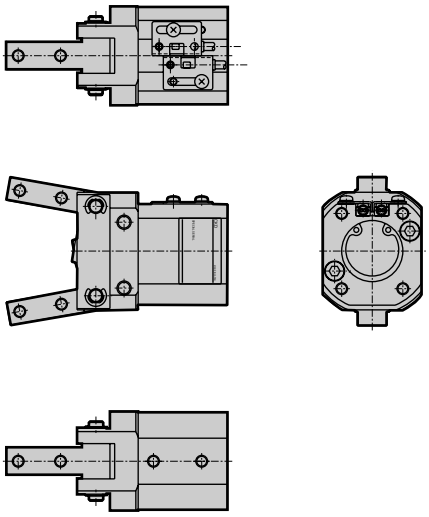
Dimensions

● HBL-3CS standard/O/C

● Dimension in ( ) for C (normally closed) specifications.

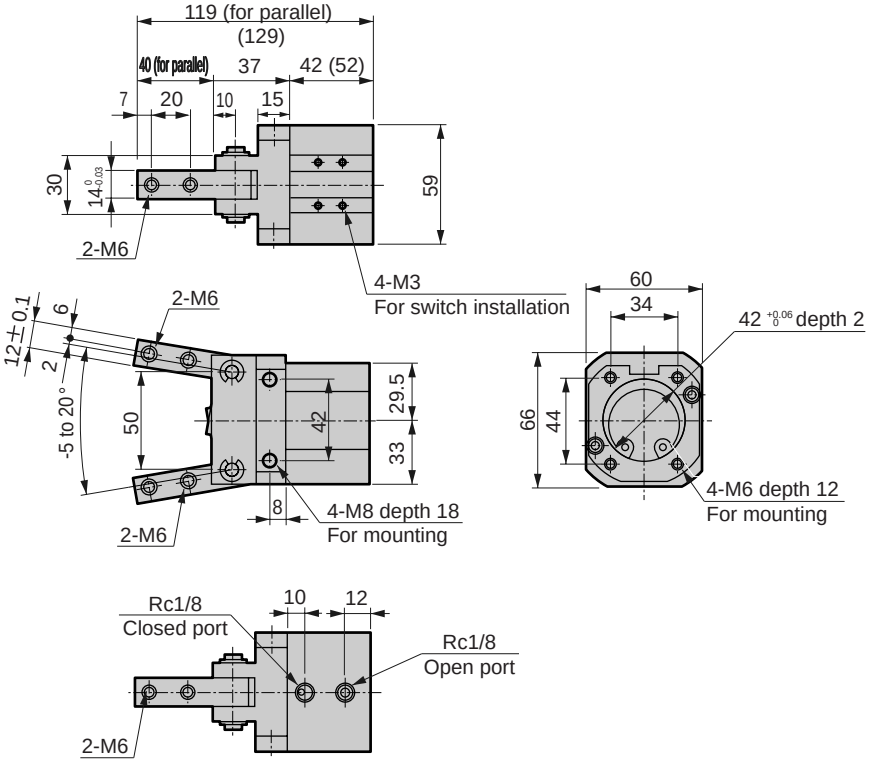


● With switch

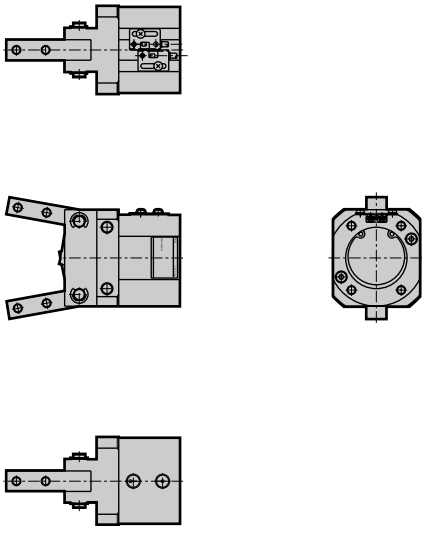


● HBL-4CS standard/O/C

● Dimension in ( ) for C (normally closed) specifications.



● With switch



Small jaw

● Material: Iron, engineering plastic

RoHS CAD

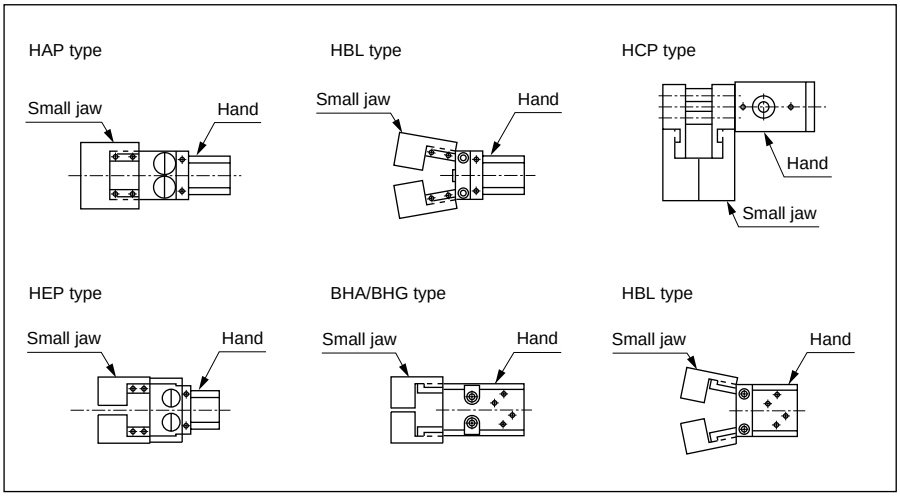
Features

A variety of small jaws is available to match user machining needs.

● **Socket and spigot section machined**
Standard section (socket and spigot section) machined.
Wide series variation to select according to workpiece shape and dimension.

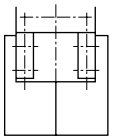
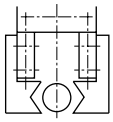
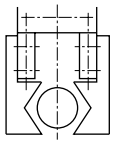
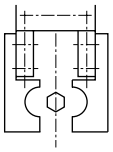
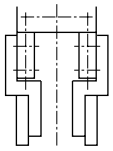
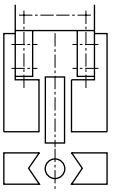
● **2 types of materials for small jaw**
Iron (S50C) and engineering plastic (MC nylon) are available according to material and working conditions of workpiece.

Applicable model for standard small jaw



Small jaw applications

Hand type applications

Raw jaw 	Compact workpiece 	Large workpiece 
Miscellaneous shape workpieces 	Vertical grasp (inside tensile workpiece) 	Vertical grasp 

How to order

(Note: When ordering repair parts, 1 pc. is provided.)

BHA - **Y1** - **110**

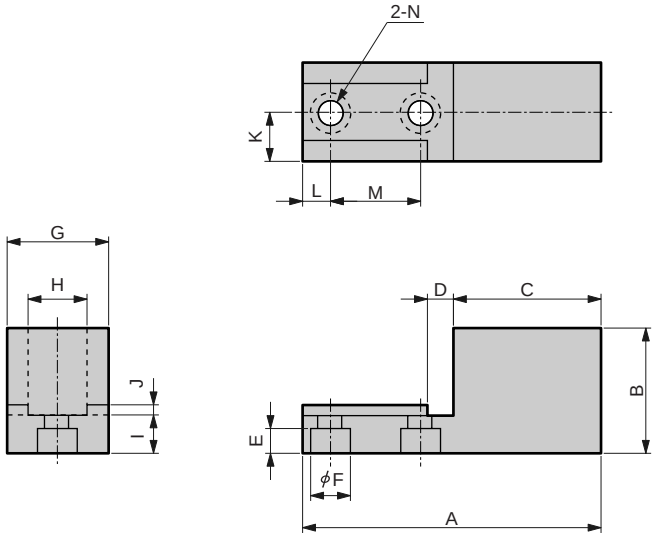
Ⓐ Model Ⓑ Material Ⓒ Small jaw no.

Ⓐ Model		Ⓑ Material	
Symbol	Descriptions	Symbol	Descriptions
FH	Feather hand (FH100/FH500)	**Y1**	Material S50C
HAP	Parallel hand	**Y2**	Material MC nylon
BHA	Compact cross roller parallel hand		
BHG	Compact cross roller parallel hand with rubber cover		
HEP	Bearing parallel hand		
HCP	Lateral parallel hand		
HBL	Fulcrum hand		

Ⓒ Small jaw no.			
Symbol	Applicable model	Symbol	Applicable model
110	HAP-1C	**210**	HEP-5CS
120	HAP-2CS, HBL-2CS	**310**	FH110, FH510
130	HAP-3CS, HBL-3CS	**320**	FH112, FH512
140	HAP-4CS, HBL-4CS	**330**	FH116, FH516
150	HBL-1CS	**340**	FH120,FH520
160	HCP-2CS	**350**	FH125
170	HCP-3CS	**260**	BHA-01CS1, BHG-01CS
180	HCP-4CS	**270**	BHA-03CS1, BHG-03CS
190	HEP-3.5CS	**280**	BHA-04CS1, BHG-04CS
200	HEP-4CS	**290**	BHA-05CS1, BHG-05CS

Dimensions

● 110 to 350



*Material
Y1: S50C
Y2: MC nylon

Small jaw no.	Applicable model	*Material	Dimension (mm)														Weight (g)
			A	B	C	D	E	ϕF	G	$H_0^{+0.02}$	I	J	K	L	M	ϕN	
110	HAP-1C	Y1	40	17	24.5	4.5	3	6	10	8	5	1.5	5	3.5	8	3.5	39
		Y2		21							9						8
120	HAP-2CS	Y1	50	26	28	5.5	4	8	20	10	6	2	10	5	12	4.5	135
	HBL-2CS	Y2		30							10						25
130	HAP-3CS	Y1	60	33	30.5	6.5	5	9.5	20	12	8	2	10	5.5	18	5.5	194
	HBL-3CS	Y2															29
140	HAP-4CS	Y1	80	43	44	7.5	6	11	20	14	10	2	10	8	20	6.5	352
	HBL-4CS	Y2		50							17						53
150	HBL-1C	Y1	40	19	19	4.5	3	6	12	8	5	1.5	6	4	10	3.5	44
		Y2			21												7
160	HCP-2CS	Y1	60	29	33	9.5	5	9.5	22	$18^{+0.2}_{+0.1}$	9	2	11	11	10	5.5	206
		Y2															31
170	HCP-3CS	Y1	70	35	34	11.5	6	11	25	$20^{+0.2}_{+0.1}$	10	2	12.5	8	20	6.5	303
		Y2															45
180	HCP-4CS	Y1	80	40	42	13	6	11	35	$25^{+0.2}_{+0.1}$	10	2	17.5	10	20	6.5	563
		Y2	78	44						25	14			8			97
190	HEP-3.5CS	Y1	80	41	50	7.5	5	9.5	20	14	10	2	10	6	18	5.5	360
		Y2		49							18						70
200	HEP-4CS	Y1	120	60	81	11.5	6	11	30	22	13	2	15	8	20	6.5	1245
		Y2		77					32		30		16				270
210	HEP-5CS	Y1	135	60	91	14.5	8	14	30	28	16	2	15	10	25	8.5	1443
		Y2		79					38		35		19				382
310	FH110	Y1	29.5	15	14	4.5	3	6	12	7	4	1.5	6	3.5	8	3.5	22
	FH510	Y2															4
320	FH112	Y1	29.5	16.5	14	4.5	3	6	12	7	4	1.5	6	3.5	8	3.5	23
	FH512	Y2															4
330	FH116	Y1	39	20	20.5	5.5	4	8	12	10	5	1.5	6	3.5	10	4.5	48
	FH516	Y2															8
340	FH120	Y1	39	22.5	20.5	5.5	4	8	12	10	5	1.5	6	3.5	10	4.5	53
	FH520	Y2		25.5							8						10
350	FH125	Y1	48.5	22.5	28.5	6.5	5	9.5	14	12	8	2	7	4.5	10	5.5	105
		Y2		25.5							14						17
260	BHA-01CS1	Y1	30	17.5	14.5	4.5	3	6	14	10	5	1.5	7	4	8	3.5	38
	BHG-01CS	Y2															6
270	BHA-03CS1	Y1	40	21	21	5.5	4	8	14	10	6	1.5	7	4.5	10	4.5	61
	BHG-03CS	Y2		23							8						11
280	BHA-04CS1	Y1	40	26.5	21	5.5	4	8	14	10	6	1.5	7	4.5	10	4.5	76
	BHG-04CS	Y2		29.5							9						12
290	BHA-05CS1	Y1	50	33	28.5	6.5	5	9.5	14	10	8	2	7	6	10	5.5	123
	BHG-05CS	Y2		39							14						23