

Low Profile Air Gripper Series *MHF2*



MHZ

MHF

MHL

MHR

MHK

MHS

MHC

MHT

MHY

MHW

MRHQ

Misc.

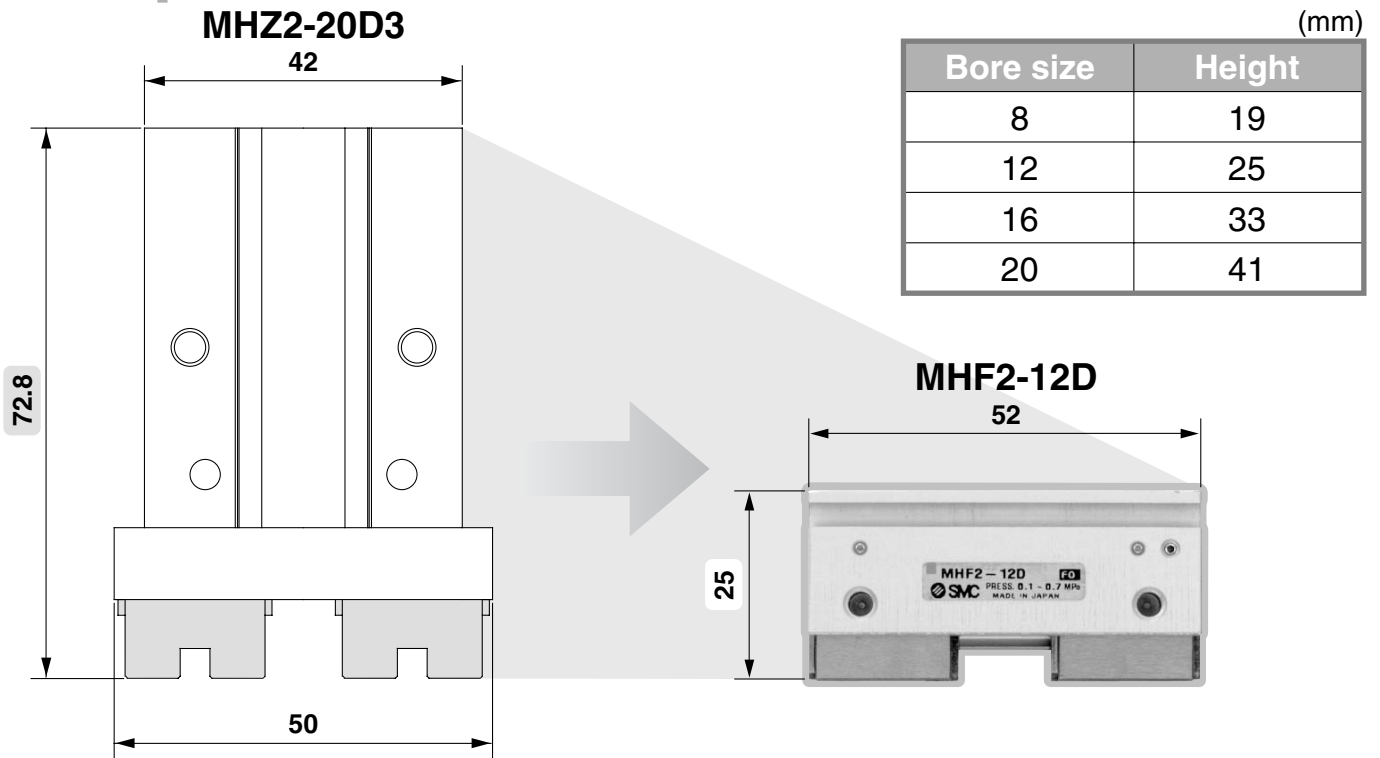
D-

20-

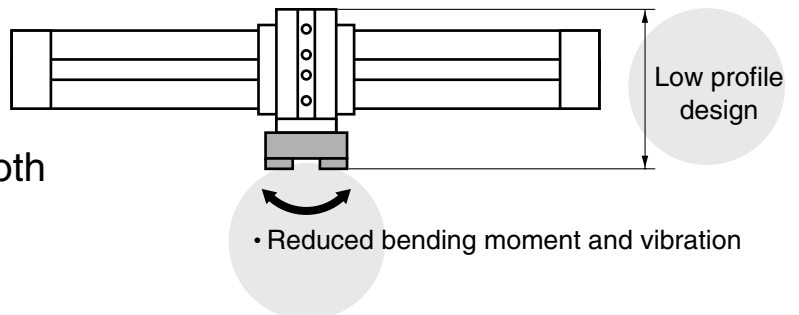
Low profile air gripper with space-saving design is newly released.

Low Profile Air Gripper Series *MHF2*

Height is approximately 1/3 the size of an equivalent Series MHZ2.

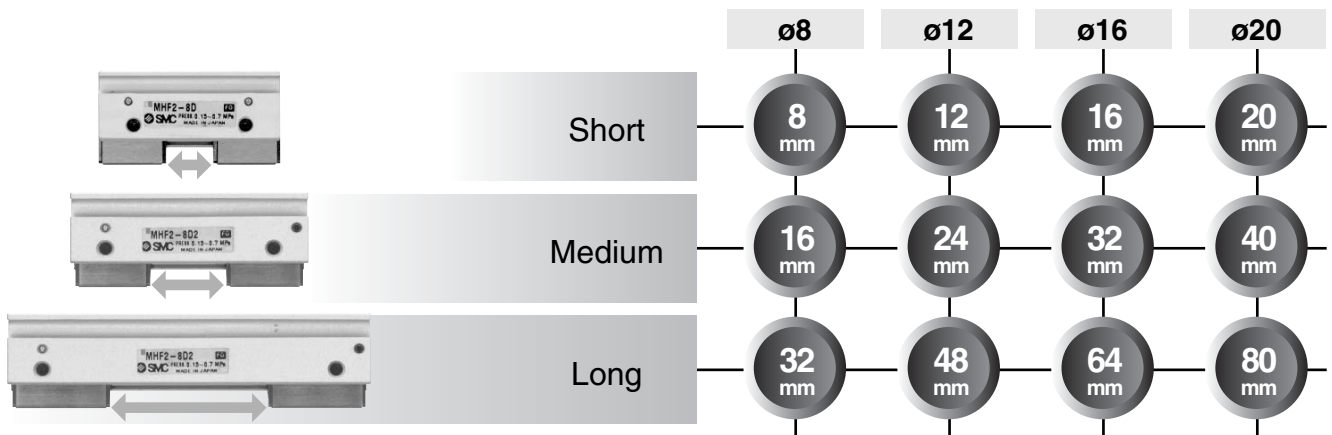


- The low profile design saves space and reduces bending moments.
- Improved accuracy with smooth operation



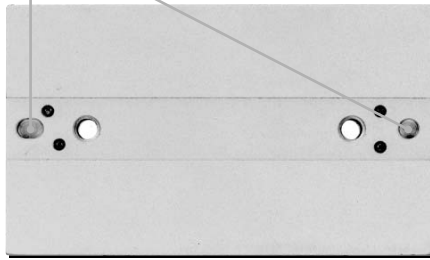
Stroke selection is available.

3 standard stroke lengths are available for each bore size. Stroke can be selected to suit the workpiece.

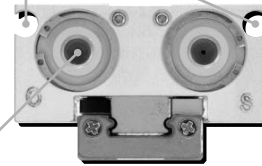


Improved mounting repeatability

With positioning pin holes



Auto switches can be mounted on both sides.

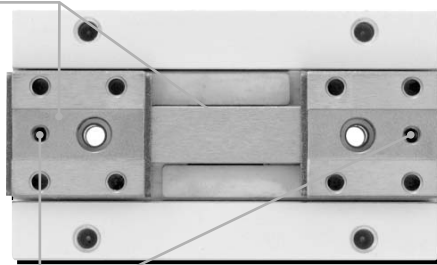


Piping is available from 2 directions

Piping port position can be specified using a part number.

Linear guide provides:

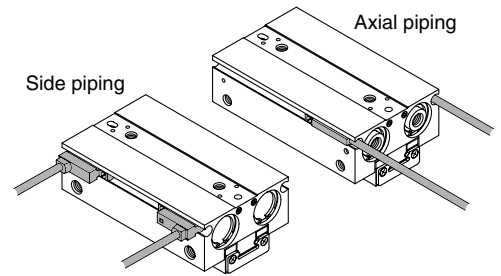
High precision and high rigidity with martensitic stainless steel



Easy positioning for mounting attachments

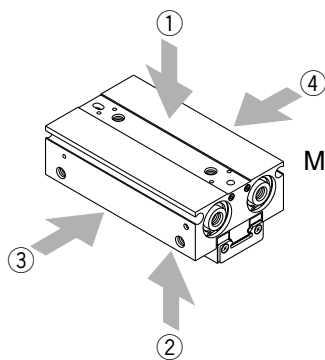
With positioning pin holes

Centralized wiring and piping are possible.



High degree of mounting flexibility

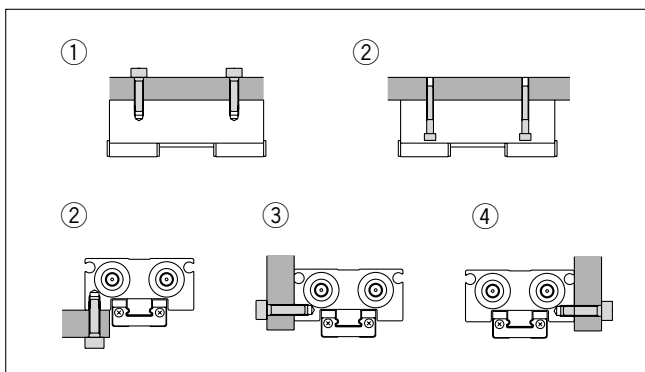
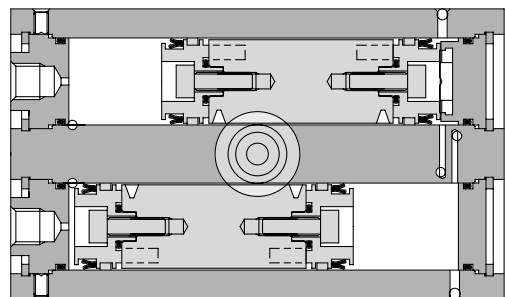
As no brackets are required, mounting height can be minimized.



Mounting is possible from 4 directions.

Strong gripping force

Double piston construction achieves compact design with strong gripping force.



Model	Bore size	Gripping force (N)
MHF2-8D□	8	19
MHZ2-10D□	10	11
MHF2-12D□	12	48
MHZ2-20D□	20	42
MHF2-16D□	16	90
MHZ2-25D□	25	65
MHF2-20D□	20	141
MHZ2-32D□	32	158

MHZ

MHF

MHL

MHR

MHK

MHS

MHC

MHT

MHY

MHW

MRHQ

Misc.

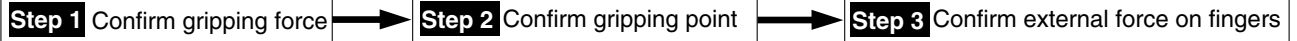
D-

20-

Series MHF2 Model Selection

Model Selection

Selection Procedure



Step 1 Confirmation of Gripping Force



Example Workpiece weight: 0.15 kg

Gripping method: External gripping

Model selection criteria with respect to workpiece weight

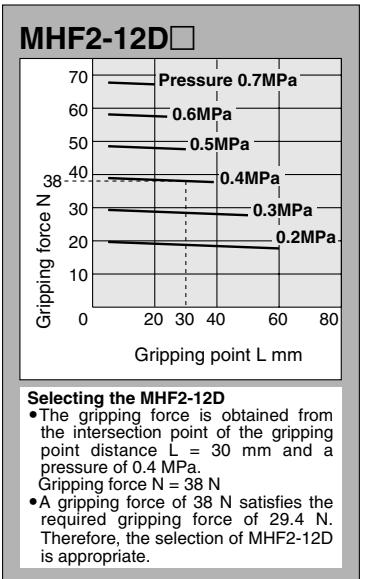
- Although differences will exist depending on factors such as shape and the coefficient of friction between attachments and workpieces, select a model which will provide a gripping force 10 to 20 times the weight of the workpiece.
- (Note1) Refer to the model selection illustration for more information.
- Furthermore, in cases with high acceleration or impact, etc., it is necessary to allow an even greater margin of safety.

Example

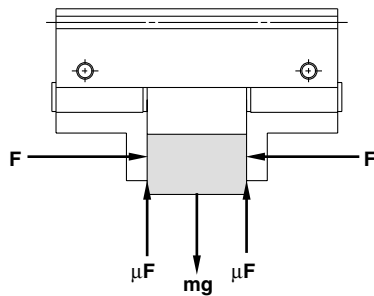
When it is desired to set the gripping force at 20 times or more the workpiece weight. Required gripping force = 0.15 kg x 20 x 9.8 m/s² = Approx. 29.4 N or more

Length of gripping point: 30 mm

Operating pressure: 0.4 MPa



Model Selection Illustration



When gripping a workpiece as in the figure to the left and with the following definitions,

F: Gripping force (N)
μ: Coefficient of friction between attachments and workpiece
m: Workpiece mass (kg)
g: Gravitational acceleration (= 9.8 m/s²)
mg: Workpiece weight (N)

the conditions under which the workpiece will not drop are

$$2\mu F > mg$$

Number of fingers

and therefore,

$$F > \frac{mg}{2 \times \mu}$$

With "a" as the safety margin, F is determined as follows:

$$F = \frac{mg}{2 \times \mu} \times a$$

Gripping force at least 10 to 20 times the workpiece weight

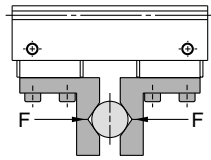
The "10 to 20 times or more of the workpiece weight" recommended by SMC is calculated with the safety margin of a = 4, which allows for impacts that occur during normal transportation, etc.

When μ = 0.2	When μ = 0.1
$F = \frac{mg}{2 \times 0.2} \times 4$ $= 10 \times mg$	$F = \frac{mg}{2 \times 0.1} \times 4$ $= 20 \times mg$
↑ 10 x workpiece weight	↑ 20 x workpiece weight

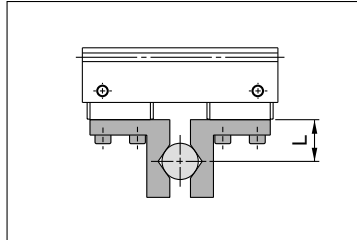
(Note) · Even in cases where the coefficient of friction is greater than μ = 0.2, for safety reasons, SMC recommends selecting a gripping force which is at least 10 to 20 times the workpiece weight.
 · If is necessary to allow a greater safety margin for high accelerations and strong impacts, etc.

Step 1 Effective Gripping Force: Series MHF2

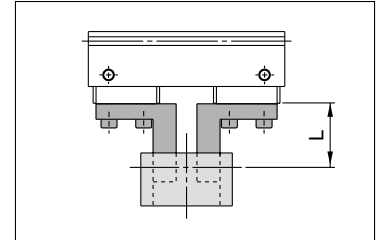
- Expressing the effective gripping force
The effective gripping force shown in the graphs to the right is expressed as F, which is the thrust of one finger when both fingers and attachments are in full contact with the work-piece as shown in the figure below.



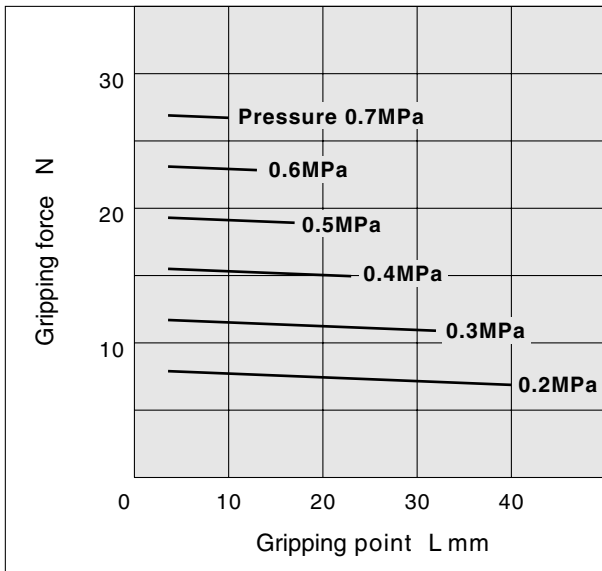
External Gripping



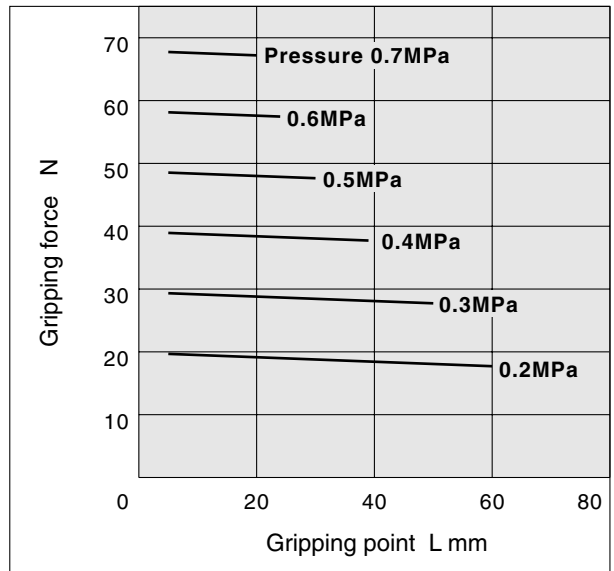
Internal Gripping



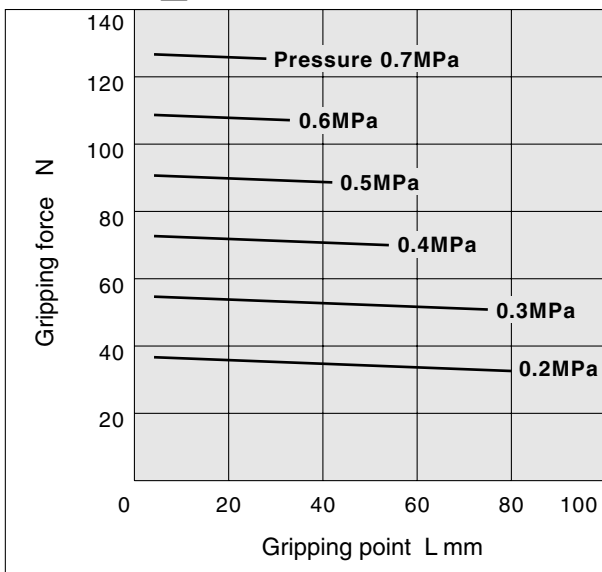
MHF2-8D



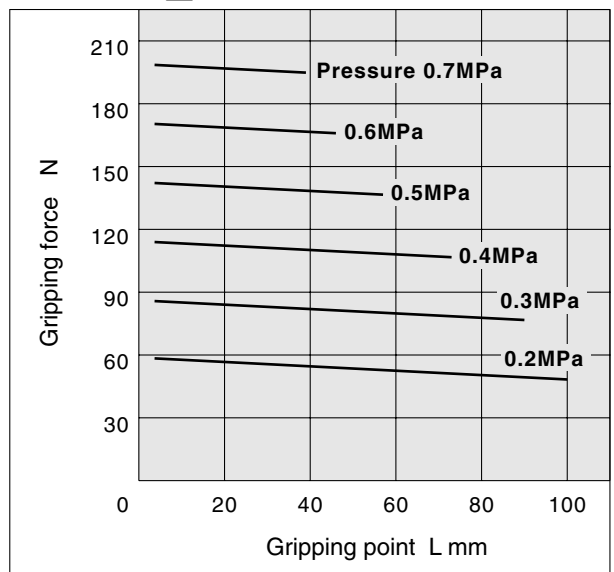
MHF2-12D



MHF2-16D



MHF2-20D



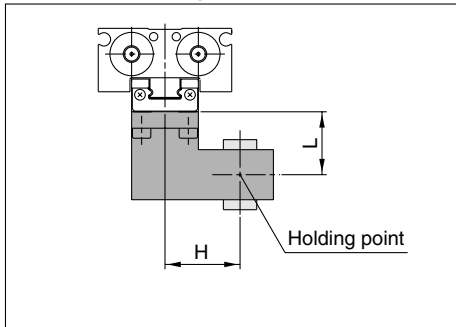
- MHZ
- MHF**
- MHL
- MHR
- MHK
- MHS
- MHC
- MHT
- MHY
- MHW
- MRHQ
- Misc.
- D-
- 20-

Series MHF2

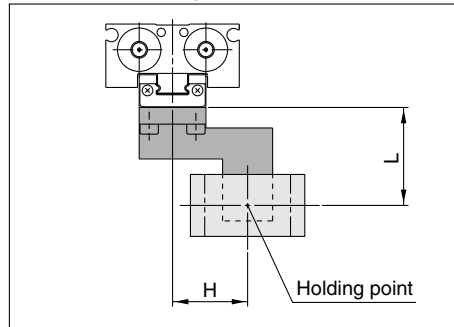
Model Selection

Step 2 Effective Gripping Force: Series MHF2

External Gripping

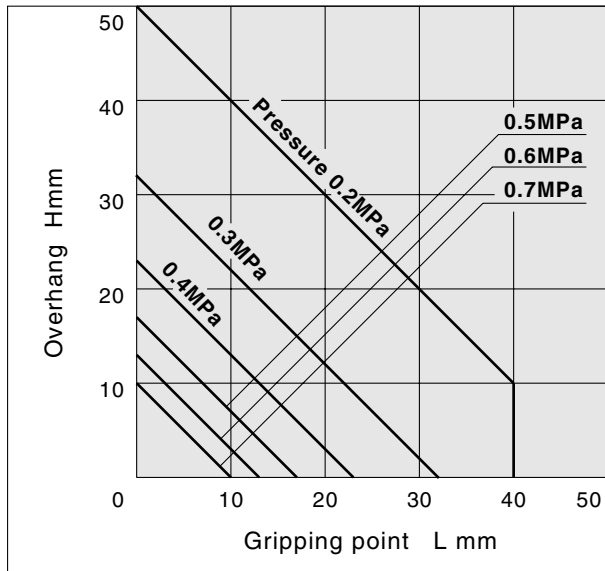


Internal Gripping

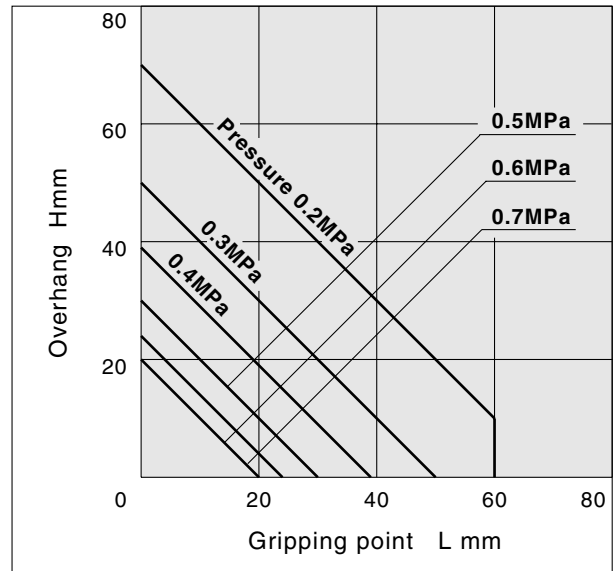


- The air gripper should be operated so that the amount of overhang "H" will stay within the range given in the graphs below.
- If the workpiece gripping point goes beyond the range limits, this will have an adverse effect on the life of the air gripper.

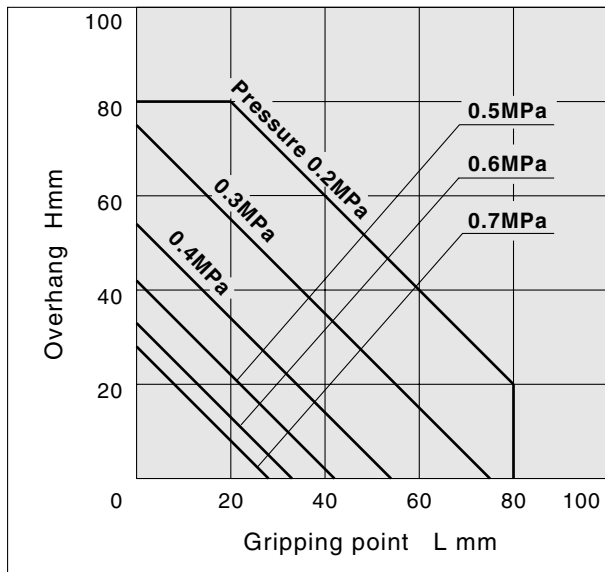
MHF2-8D



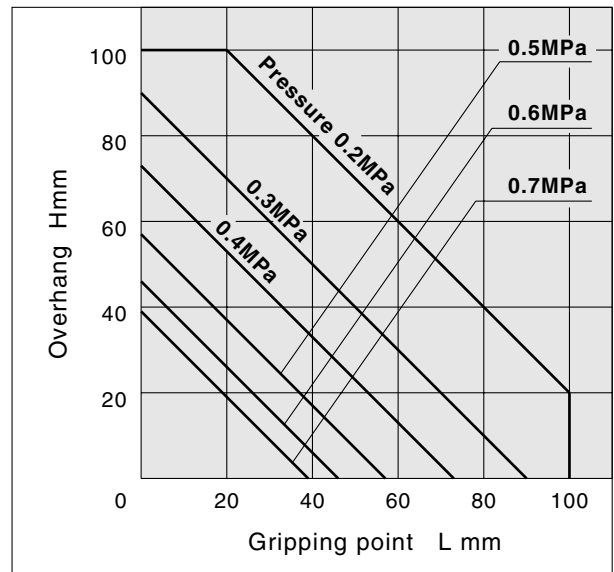
MHF2-12D

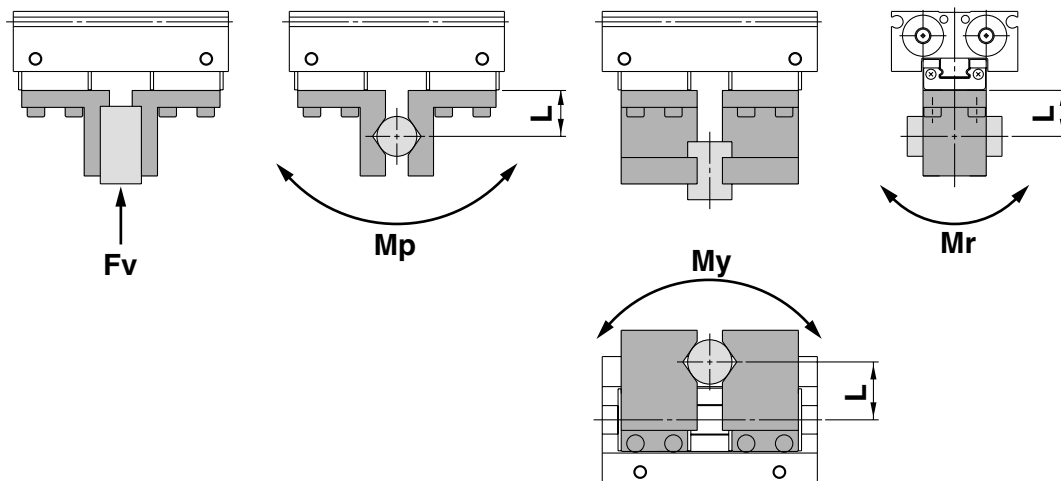


MHF2-16D



MHF2-20D



Step 3 Confirmation of External Force on Fingers: Series MHF2

L: Distance to the point at which the load is applied (mm)

Model	Allowable vertical load Fv (N)	Maximum allowable moment		
		Pitch moment Mp (N·m)	Yaw moment My (N·m)	Roll moment Mr (N·m)
MHF2-8D □	58	0.26	0.26	0.53
MHF2-12D □	98	0.68	0.68	1.4
MHF2-16D □	176	1.4	1.4	2.8
MHF2-20D □	294	2	2	4

Note) The load and moment values in the table indicate static values.

Calculation of allowable external force (when moment load is applied)	Calculation example
$\text{Allowable load } F \text{ (N)} = \frac{M \text{ (Maximum allowable moment) (N·m)}}{L \times 10^{-3} *}$ <p>(* Unit converted invariable number)</p>	<p>When a load $f = 10 \text{ N}$ is operating, which applies pitch moment to point $L = 30 \text{ mm}$ from the end of the MHF2-12D finger.</p> $\text{Allowable load } F = \frac{0.68}{30 \times 10^{-3}}$ $= 22.7 \text{ (N)}$ <p>Load $f = 10 \text{ (N)} < 22.7 \text{ (N)}$ Therefore, it can be used.</p>

MHZ

MHF

MHL

MHR

MHK

MHS

MHC

MHT

MHY

MHW

MRHQ

Misc.

D-

20-

Low Profile Air Gripper Series *MHF2*

Size: 8, 12, 16, 20

How to Order

MHF 2 — 12 D — M9B

Number of fingers

2	2 finger
---	----------

Bore size (mm)

8	8
12	12
16	16
20	20

Action

D	Double acting
---	---------------

Stroke

Nil	Short stroke
1	Medium stroke
2	Long stroke

Number of auto switches

Nil	2 pcs.
S	1 pc.

Auto switch

Nil	Without auto switch (Built-in magnet)
-----	---------------------------------------

Body option

Nil: Axial piping type R: Side piping type

Applicable Auto Switch/Refer to page 12-13-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m) *			Flexible lead wire (-61)	Applicable load	Applicable model					
					DC	AC	Electrical entry		0.5 (Nil)	3 (L)	5 (Z)			Bore size (mm)					
							Perpendicular	In-line						8	12	16	20		
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24V	12V	—	M9NV	M9N	●	●	○	Standard	Relay PLC	●	●	●	●	
				3-wire (PNP)				M9PV	M9P	●	●	○			●	●	●	●	
				2-wire				M9BV	M9B	●	●	○			●	●	●	●	
				3-wire (NPN)				F9NWV	F9NW	●	●	○			○	●	●	●	●
				3-wire (PNP)				F9PWV	F9PW	●	●	○			○	●	●	●	●
				2-wire				F9BWV	F9BW	●	●	○			○	●	●	●	●
	Note) Diagnostic indication (2-color display)																		

* Lead wire length symbols: 0.5 m..... Nil (Example) M9N
 3 m..... L (Example) M9NL
 5 m..... Z (Example) F9NWZ
 * Auto switches marked "O" are produced upon receipt of order.

Note) Be careful for the differential of 2-color display type.
 Refer to "Auto Switch Hysteresis" on page 12-3-25.

Low Profile Air Gripper Series MHF2

Specifications



Fluid		Air
Operating pressure		ø8: 0.15 to 0.7 MPa ø12 to 20: 0.1 to 0.7 MPa
Ambient and fluid temperature		-10 to 60°C (with no condensation)
Repeatability		±0.05mm ^{Note 1)}
Maximum operating frequency	Short stroke	120 c.p.m.
	Medium stroke	120 c.p.m.
	Long stroke	60 c.p.m.
Lubrication		Not required
Action		Double acting
Auto switch (Option) ^{Note 2)}		Solid state switch (3-wire, 2-wire)

Note 1) This is the value when no offset load is applied to the finger.

When an offset load is applied to the finger, the maximum value is ±0.15 mm due to the influence of backlash of the rack and pinion.

Note 2) Refer to page 12-13-1 for further information on auto switches.

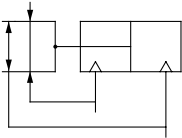
Model

Action	Model	Cylinder bore (mm)	Gripping force ^{Note 1)}		Opening /closing stroke (Both sides) mm	Weight ^{Note 2)} g		Unobstructed capacity (cm ³)	
			Effective gripping force per finger N			Finger open side	Finger close side		
Double acting	MHF2-8D	8	19		8	65	0.7	0.6	
	MHF2-8D1				16	85	1.1	1.0	
	MHF2-8D2				32	120	2.0	1.9	
	MHF2-12D	12	48		12	155	1.9	1.6	
	MHF2-12D1				24	190	3.3	3.0	
	MHF2-12D2				48	275	6.1	5.8	
	MHF2-16D	16	90		16	350	4.9	4.1	
	MHF2-16D1				32	445	8.2	7.4	
	MHF2-16D2				64	650	14.9	14.0	
	MHF2-20D	20	141		20	645	8.7	7.3	
	MHF2-20D1				40	850	15.1	13.7	
	MHF2-20D2				80	1,225	28.0	26.6	

Note 1) At the pressure of 0.5 MPa, when gripping point L is 20 mm.

Note 2) Excluding the auto switch weight

JIS Symbol
Double acting



MHZ

MHF

MHL

MHR

MHK

MHS

MHC

MHT

MHY

MHW

MRHQ

Misc.

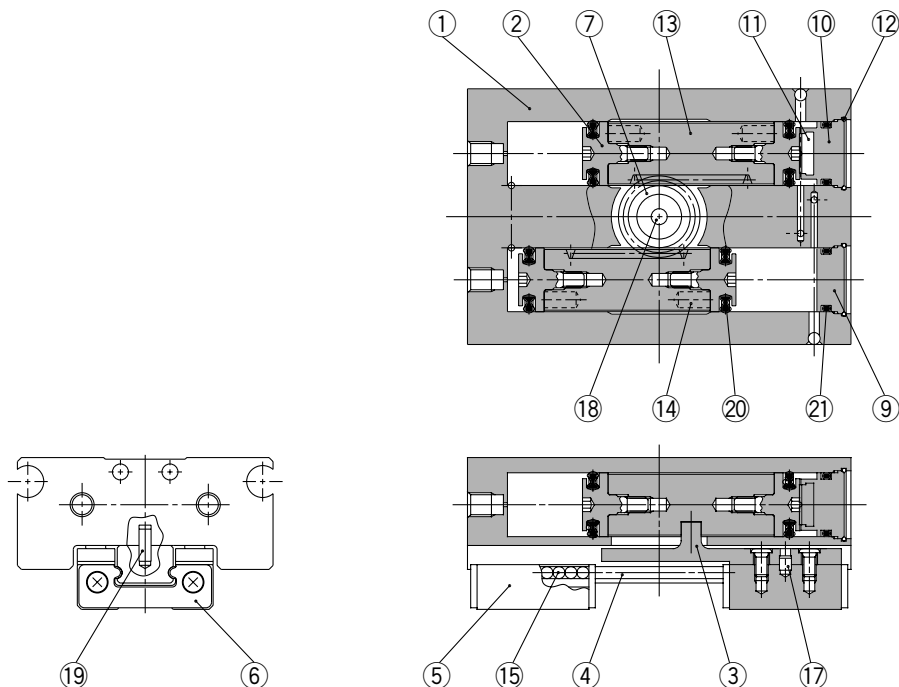
D-

20-

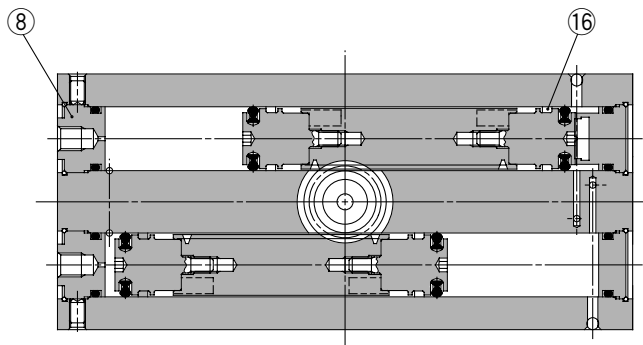
Series MHF2

Construction

MHF2-8D, MHF2-8D1



MHF2-8D2



Component Parts

No.	Description	Material	Note
①	Body	Aluminium alloy	Hard anodized
②	Piston	Stainless steel	
③	Joint	Stainless steel	Heat treatment
④	Guide rail	Stainless steel	Heat treatment
⑤	Finger	Stainless steel	Heat treatment
⑥	Roller stopper	Stainless steel	
⑦	Pinion	Carbon steel	Nit riding
⑧	Cap A	Aluminium alloy	Clear anodized
⑨	Cap B	Aluminium alloy	Clear anodized
⑩	Cap C	Aluminium alloy	Clear anodized

No.	Description	Material	Note
⑪	Head damper	Urethane rubber	
⑫	Clip	Stainless steel wire	
⑬	Rack	Stainless steel	Nit riding
⑭	Magnet	Rare earth magnet	Nickel plated
⑮	Steel balls	High carbon chromium bearing steel	
⑯	Wear ring	Synthetic resin	
⑰	Roller	High carbon chromium bearing steel	
⑱	Needle roller	High carbon chromium bearing steel	
⑲	Parallel pin	Stainless steel	
⑳	Piston seal	NBR	
㉑	Gasket	NBR	

Replacement Parts

Description	Kit no.			Contents
	MHF2-8D	MHF2-8D1	MHF2-8D2	
Seal kit	MHF8-PS	MHF8-PS	MHF8-PS-2	⑫, ⑳, ㉑
Finger assembly	MHF-A0802	MHF-A0802-1	MHF-A0802-2	③, ④, ⑤, ⑥, ⑮, ⑰, ⑲ Mounting screw

Bolts for Body Through-hole Mounting

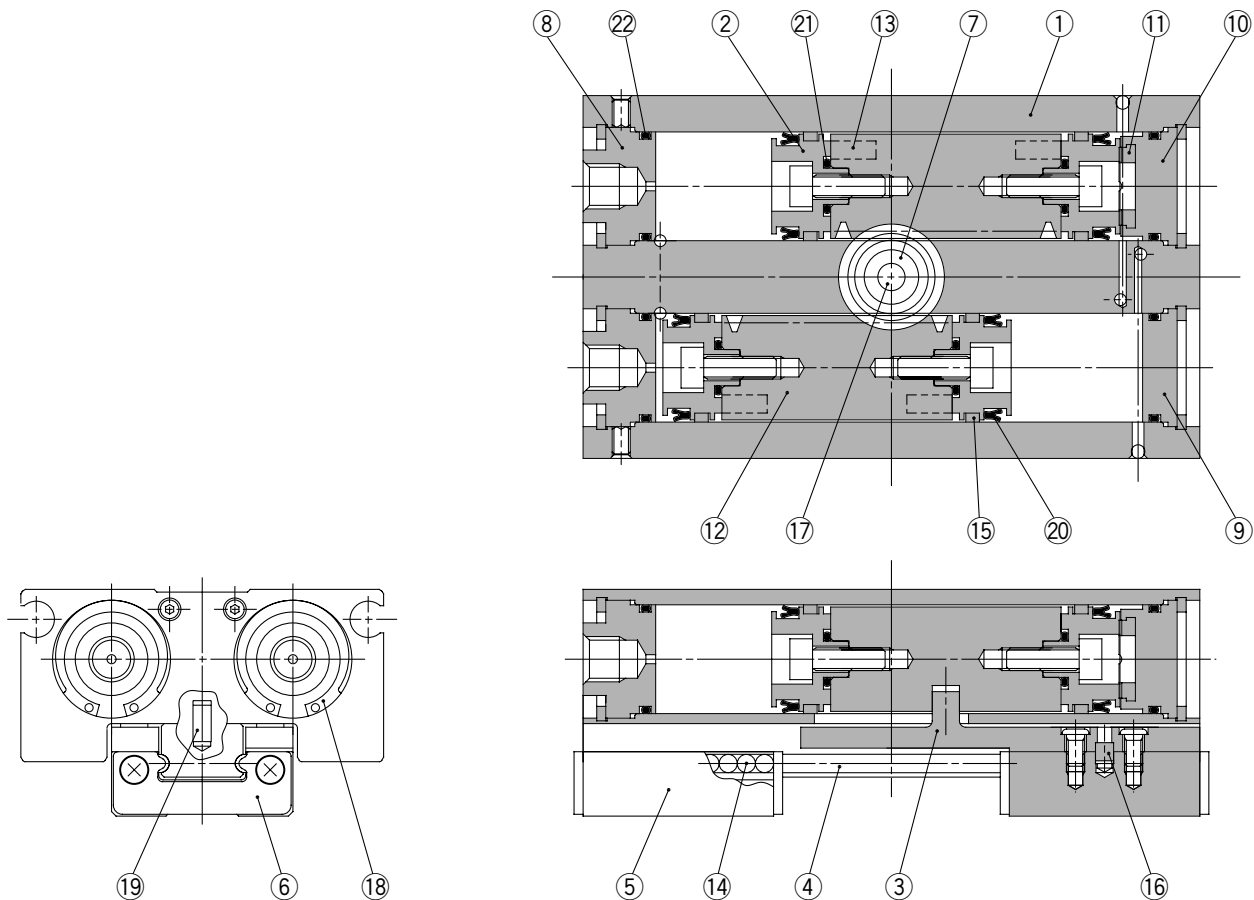
Part no.	Number of pieces	
MHF-B08	MHF2-8D	2 pieces/unit
	MHF2-8D1	2 pieces/unit
	MHF2-8D2	4 pieces/unit

* The bolts for body through-hole mounting are attached to the product. They are also provided at an order of 1 piece or more with the above part numbers.

Low Profile Air Gripper Series MHF2

Construction

MHF2-12D□ to 20D□



MHZ

MHF

MHL

MHR

MHK

MHS

MHC

MHT

MHY

MHW

MRHQ

Misc.

D-

20-

Component Parts

No.	Description	Material	Note
①	Body	Aluminium alloy	Hard anodized
②	Piston	Aluminium alloy	Clear anodized
③	Joint	Stainless steel	Heat treatment
④	Guide rail	Stainless steel	Heat treatment
⑤	Finger	Stainless steel	Heat treatment
⑥	Roller stopper	Stainless steel	
⑦	Pinion	Carbon steel	Nit riding
⑧	Cap A	Aluminium alloy	Clear anodized
⑨	Cap B	Aluminium alloy	Clear anodized
⑩	Cap C	Aluminium alloy	Clear anodized
⑪	Head damper	Urethane rubber	
⑫	Rack	Stainless steel	Nit riding

No.	Description	Material	Note
⑬	Magnet	Tare earth magnet	Nickel plated
⑭	Steel balls	High carbon chromium bearing steel	
⑮	Wear ring	Synthetic resin	
⑯	ø12: Roller	High carbon chromium bearing steel	
⑯	ø16 to 20: Parallel pin	Stainless steel	
⑰	Needle roller	High carbon chromium bearing steel	
⑱	ø12: R shape snap ring	Carbon steel	Nickel plated
⑱	ø16 to 20: Type C snap ring	Carbon steel	Nickel plated
⑲	Parallel pin	Stainless steel	
⑳	Piston seal	NBR	
㉑	Gasket	NBR	
㉒	Gasket	NBR	

Replacement Parts

Description	Kit no.			Contents
	MHF2-12D	MHF2-12D1	MHF2-12D2	
Seal kit	MHF12-PS	MHF12-PS	MHF12-PS	⑳, ㉑, ㉒
Finger assembly	MHF-A1202	MHF-A1202-1	MHF-A1202-2	③, ④, ⑤, ⑥, ⑭, ⑯, ⑲ Mounting screw
Description	Kit no.			Contents
	MHF2-16D	MHF2-16D1	MHF2-16D2	
Seal kit	MHF16-PS	MHF16-PS	MHF16-PS	⑳, ㉑, ㉒
Finger assembly	MHF-A1602	MHF-A1602-1	MHF-A1602-2	③, ④, ⑤, ⑥, ⑭, ⑯, ⑲ Mounting screw
Description	Kit no.			Contents
	MHF2-20D	MHF2-20D1	MHF2-20D2	
Seal kit	MHF20-PS	MHF20-PS	MHF20-PS	⑳, ㉑, ㉒
Finger assembly	MHF-A2002	MHF-A2002-1	MHF-A2002-2	③, ④, ⑤, ⑥, ⑭, ⑯, ⑲ Mounting screw

Bolts for Body Through-hole Mounting

Part no.	Number of pieces	
	MHF2-12D	MHF2-12D1
MHF-B12	MHF2-12D	2 pieces/unit
	MHF2-12D1	2 pieces/unit
	MHF2-12D2	4 pieces/unit

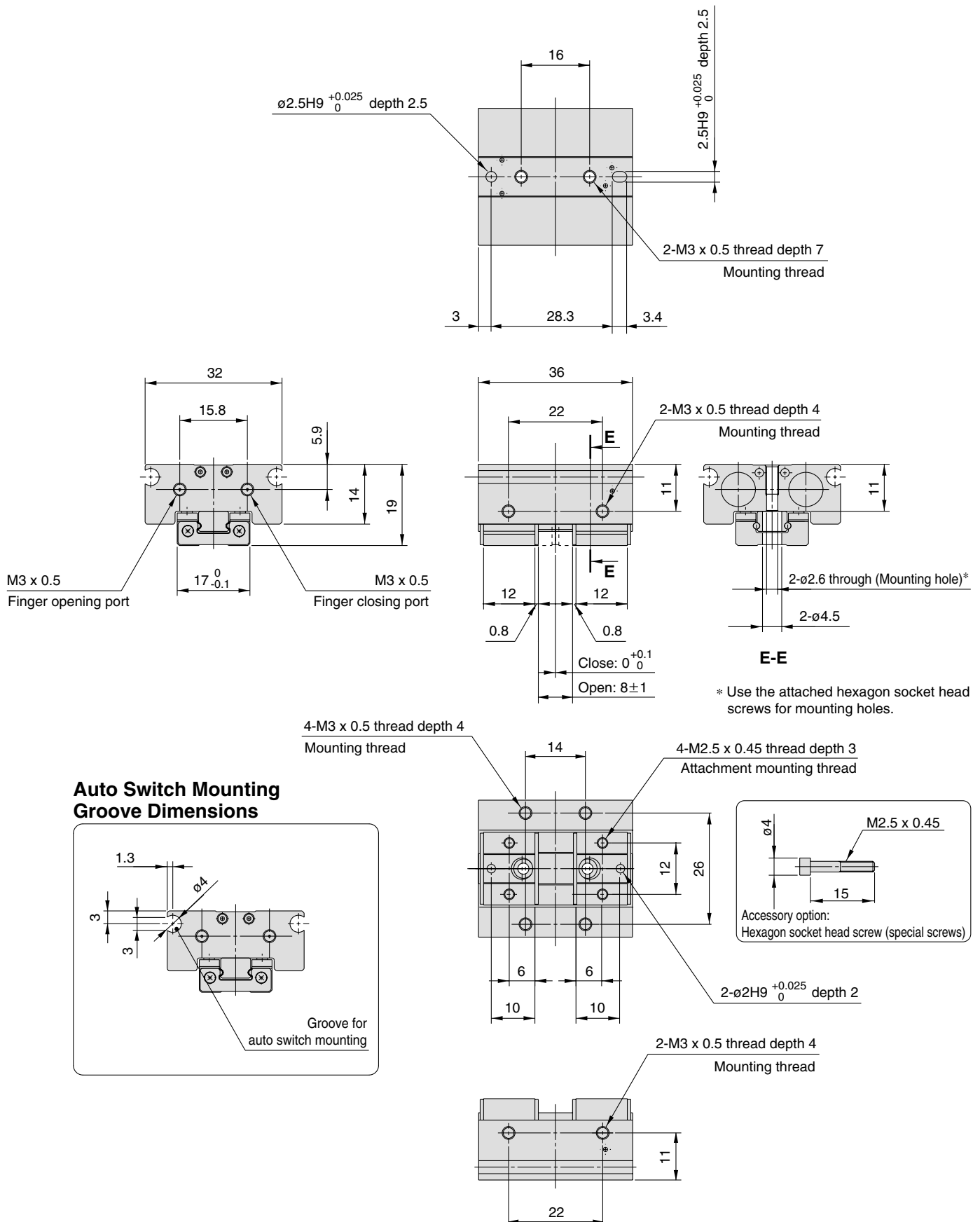
* The bolts for body through-hole mounting are attached to the product. They are also provided at an order of 1 piece or more with the above part numbers.

* When mounting MHF2-16D□ or MHF2-20D□ with the body through-holes, use hexagon socket head screws available on the market.

Series MHF2

Dimensions

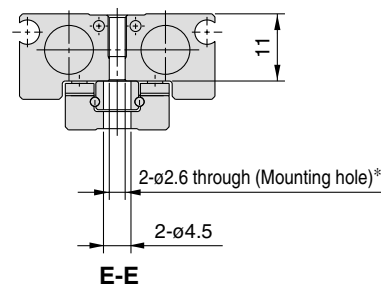
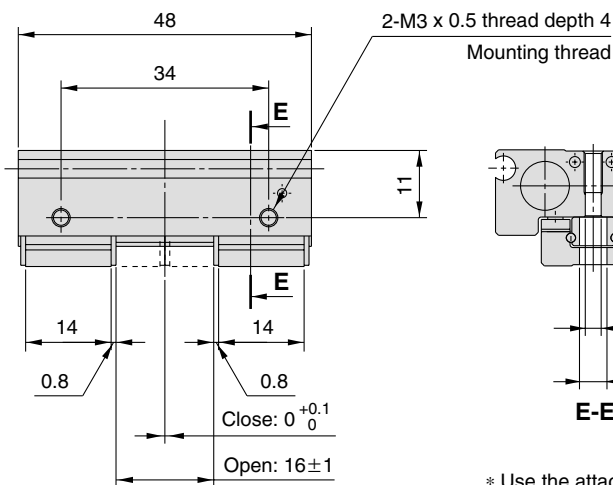
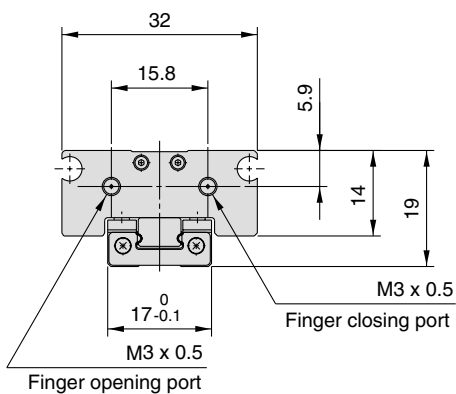
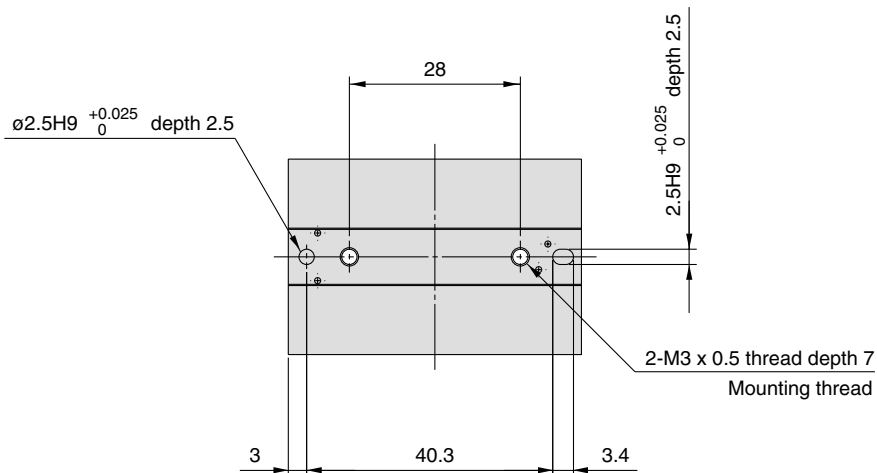
MHF2-8D



Low Profile Air Gripper Series MHF2

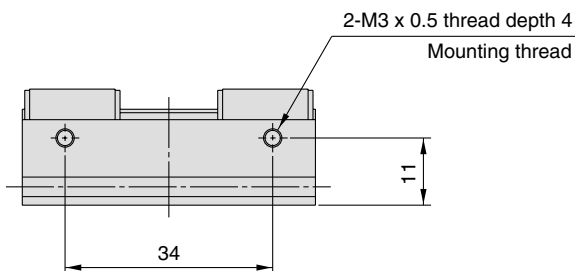
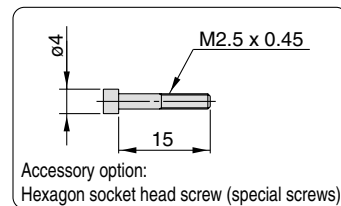
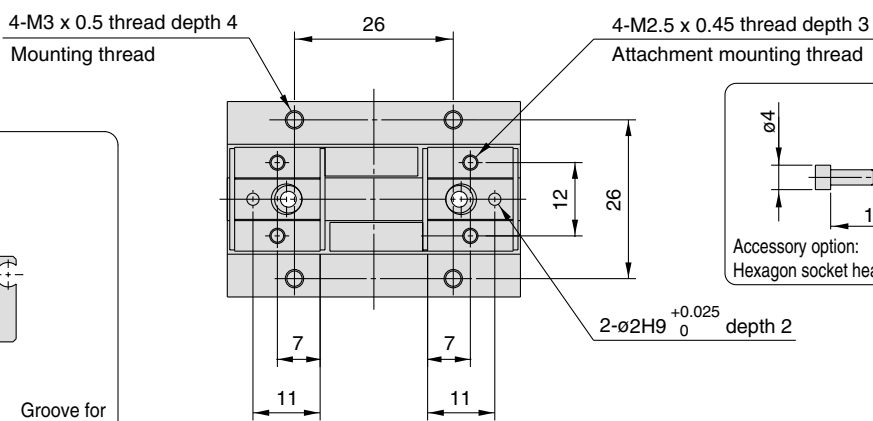
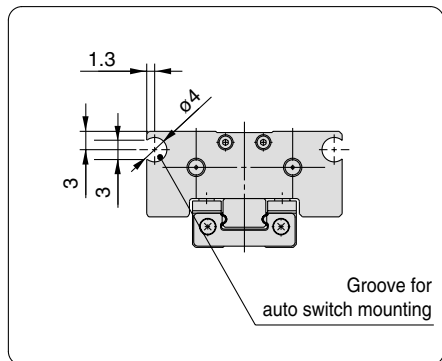
Dimensions

MHF2-8D1



* Use the attached hexagon socket head screws for mounting holes.

Auto Switch Mounting Groove Dimensions



MHZ

MHF

MHL

MHR

MHK

MHS

MHC

MHT

MHY

MHW

MRHQ

Misc.

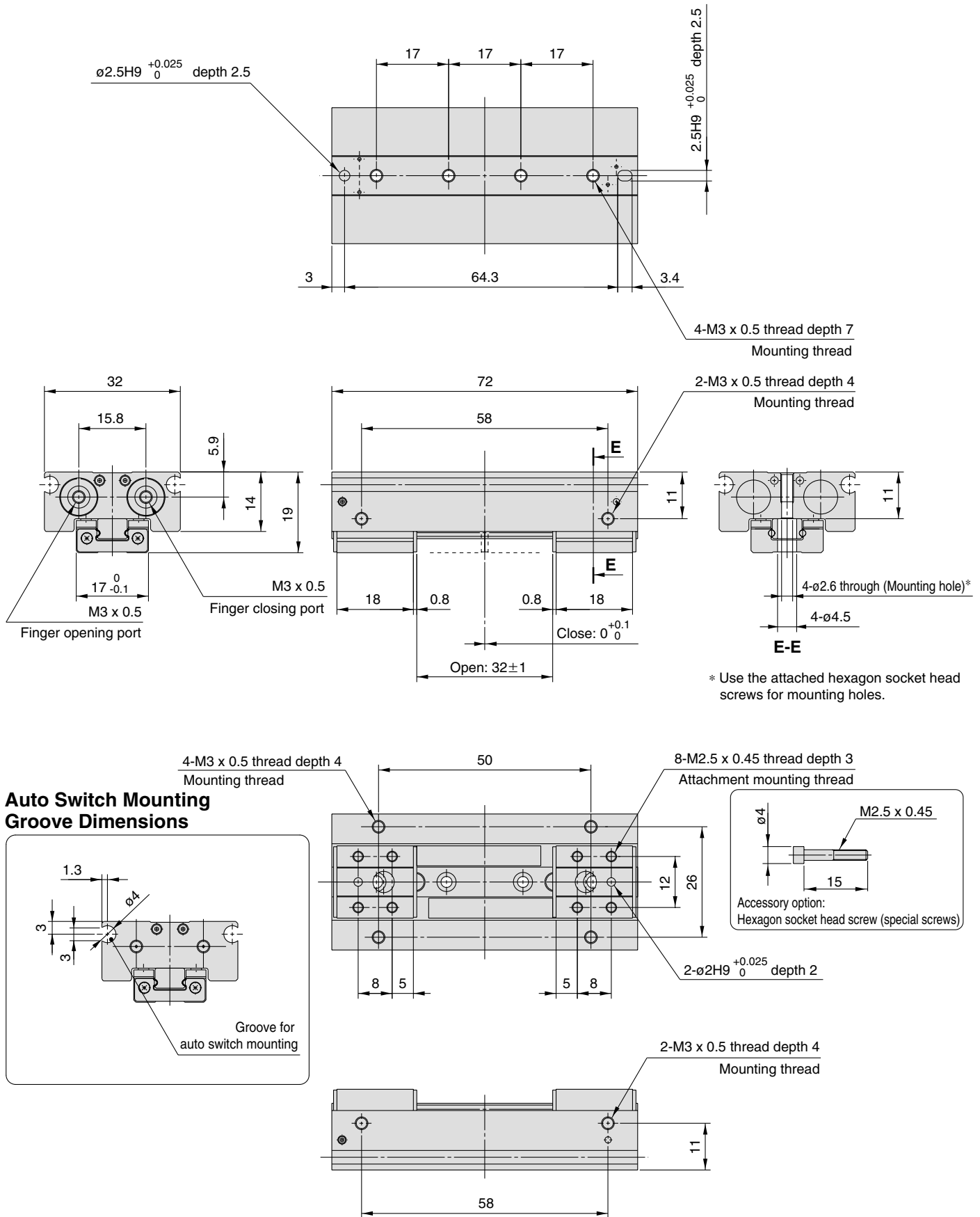
D-

20-

Series MHF2

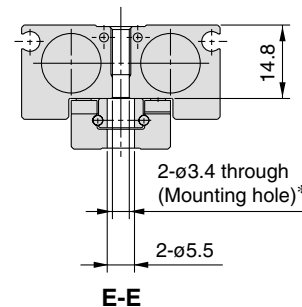
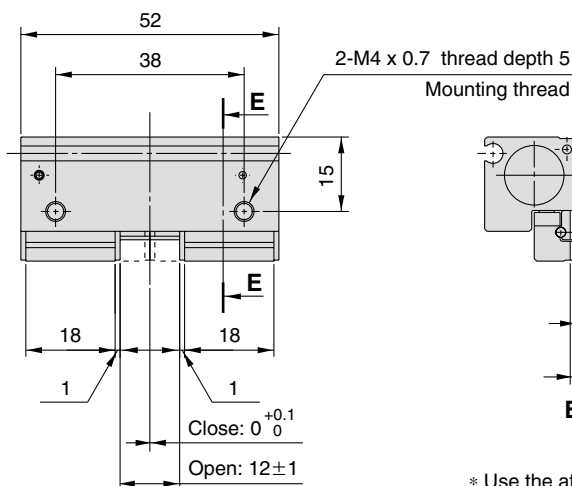
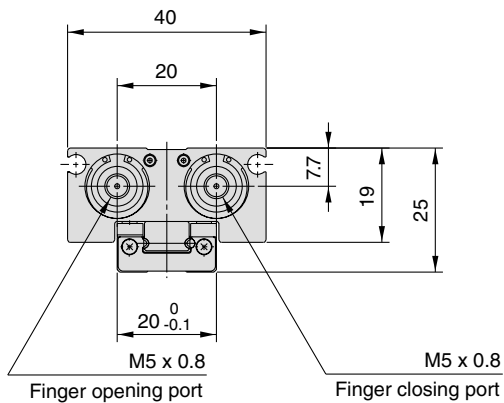
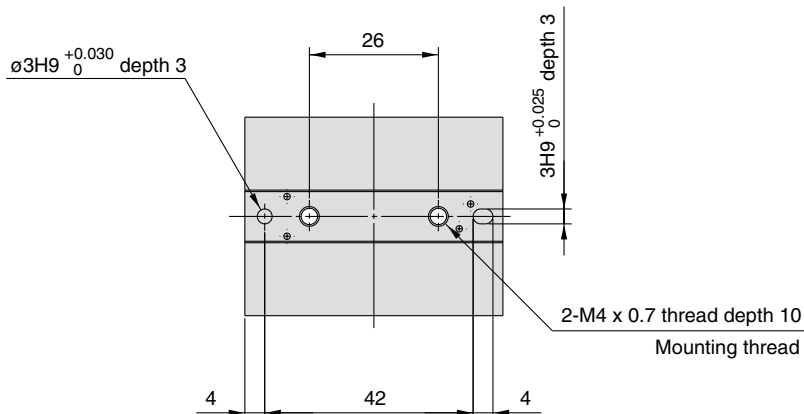
Dimensions

MHF2-8D2



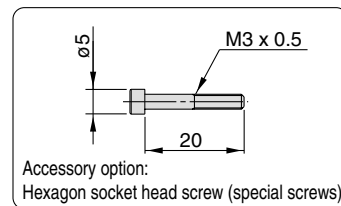
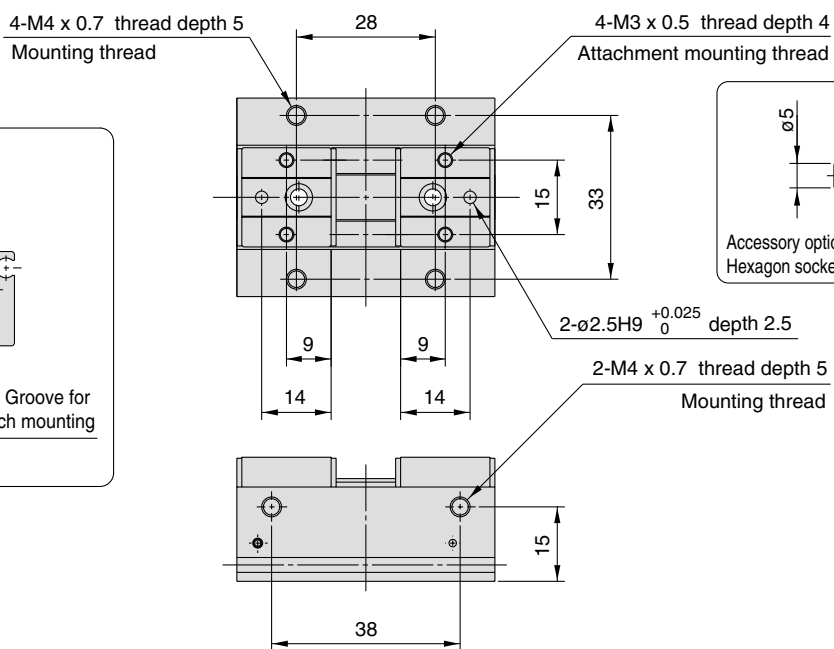
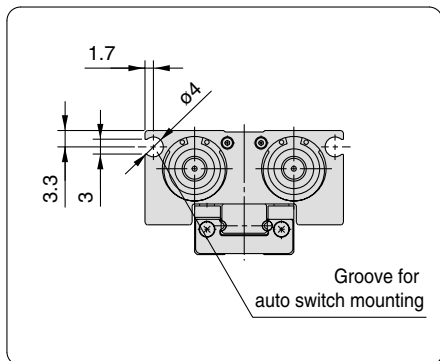
Dimensions

MHF2-12D



* Use the attached hexagon socket head screws for mounting holes.

Auto Switch Mounting Groove Dimensions



MHZ

MHF

MHL

MHR

MHK

MHS

MHC

MHT

MHY

MHW

MRHQ

Misc.

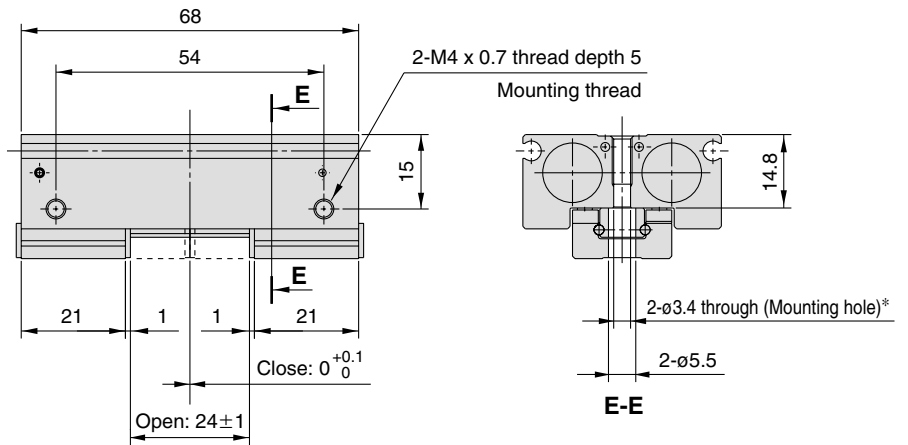
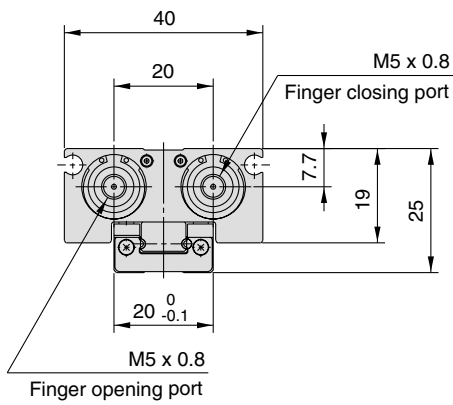
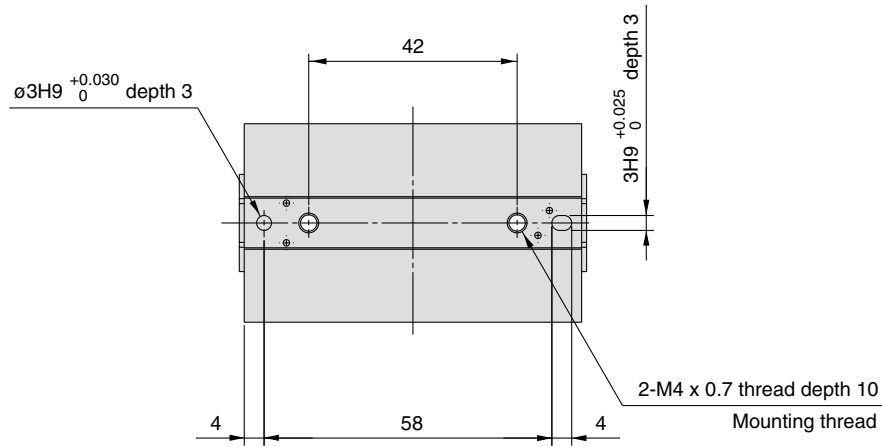
D-

20-

Series MHF2

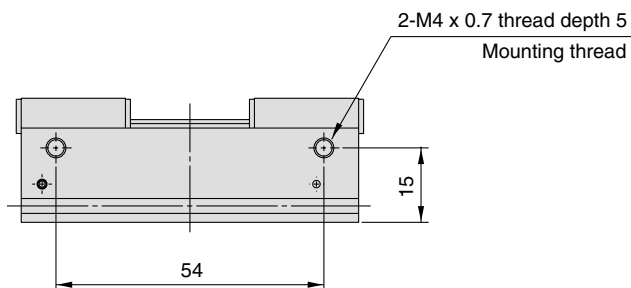
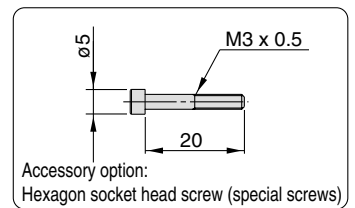
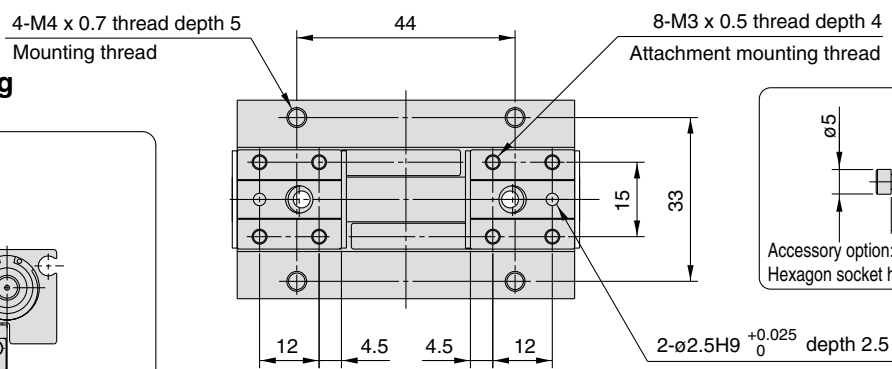
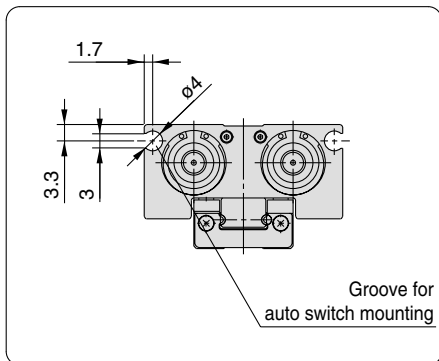
Dimensions

MHF2-12D1



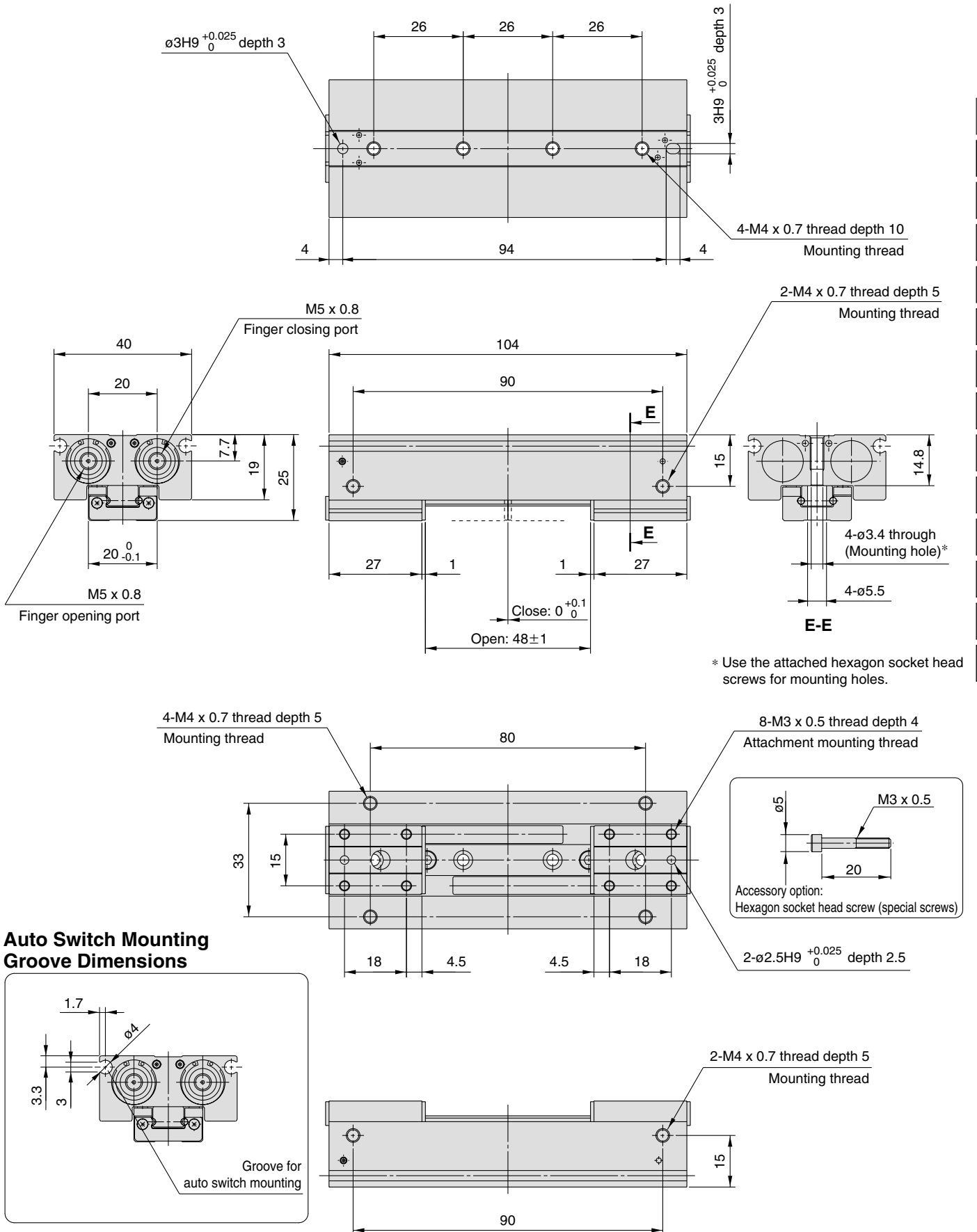
* Use the attached hexagon socket head screws for mounting holes.

Auto Switch Mounting Groove Dimensions



Dimensions

MHF2-12D2

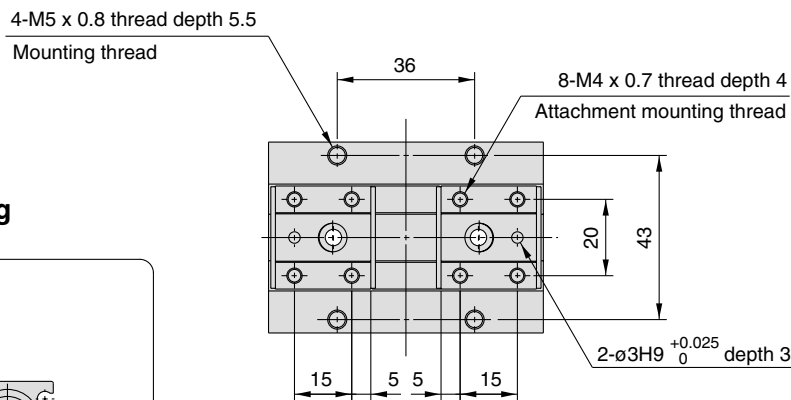
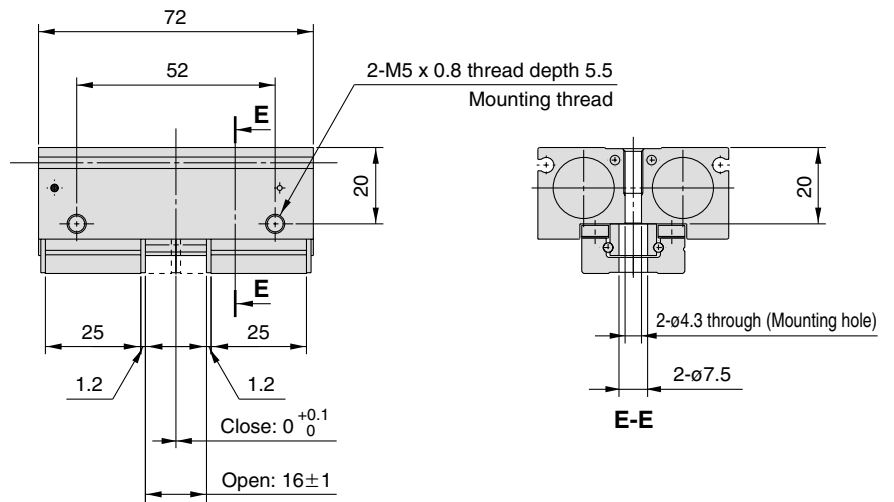
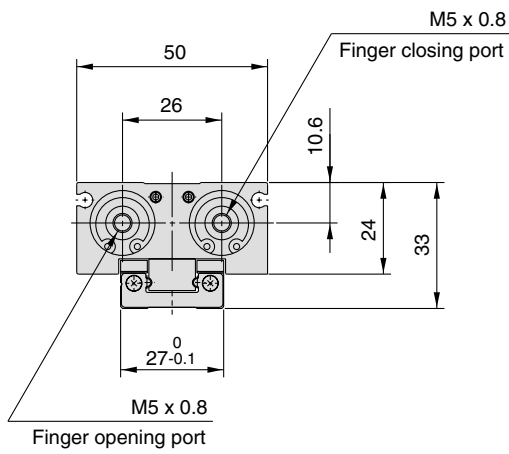
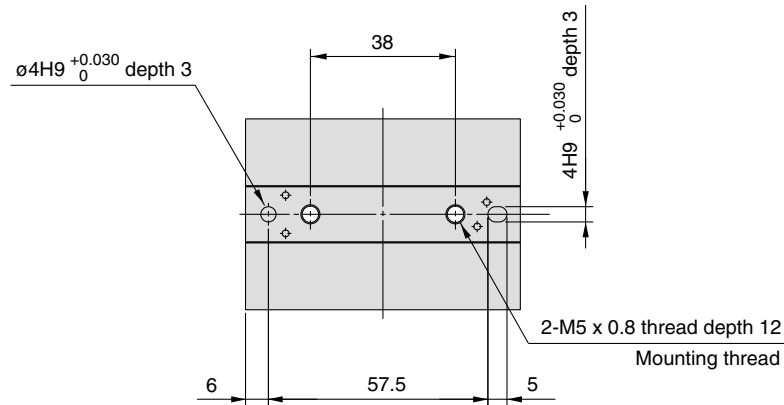


- MHZ
- MHF**
- MHL
- MHR
- MHK
- MHS
- MHC
- MHT
- MHY
- MHW
- MRHQ
- Misc.
- D-
- 20-

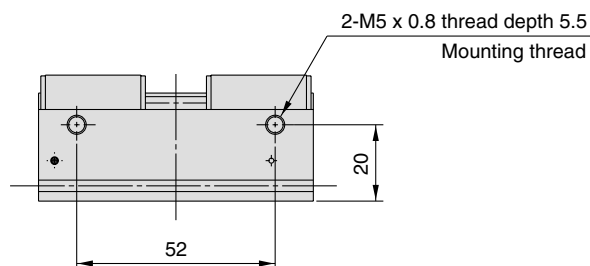
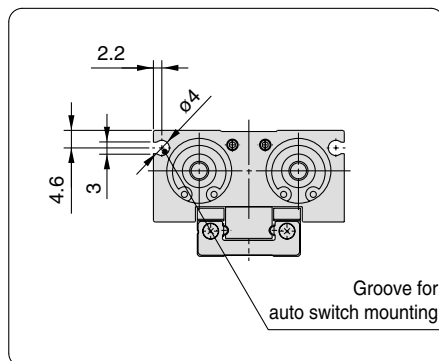
Series MHF2

Dimensions

MHF2-16D



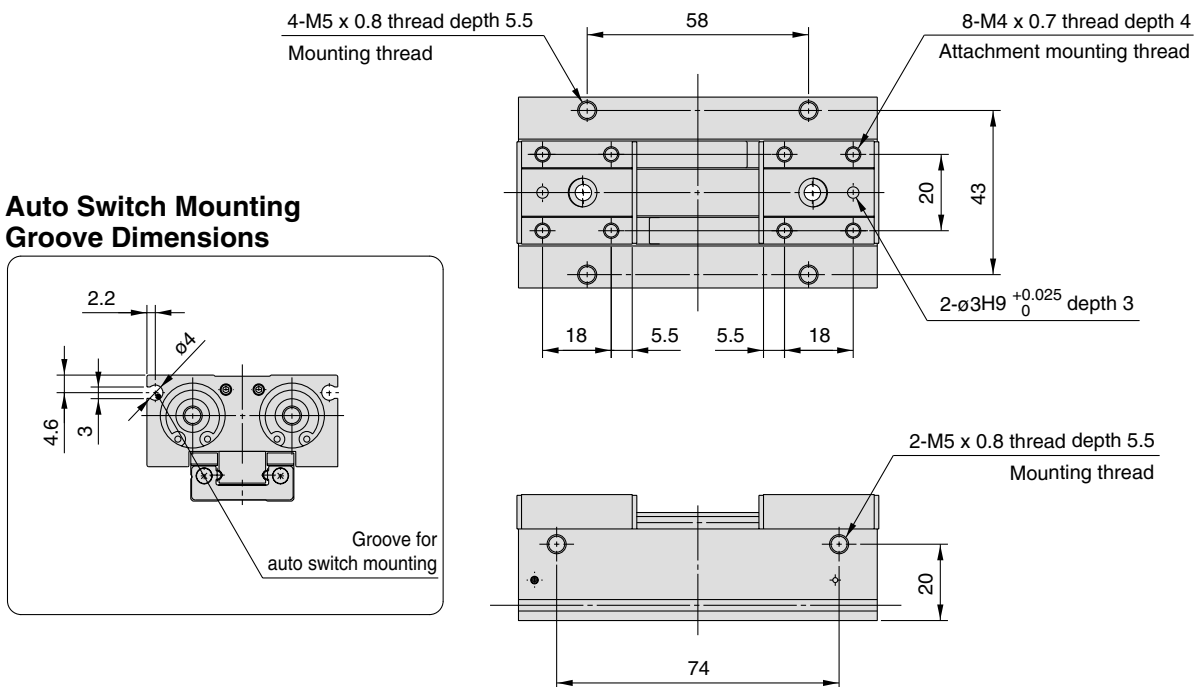
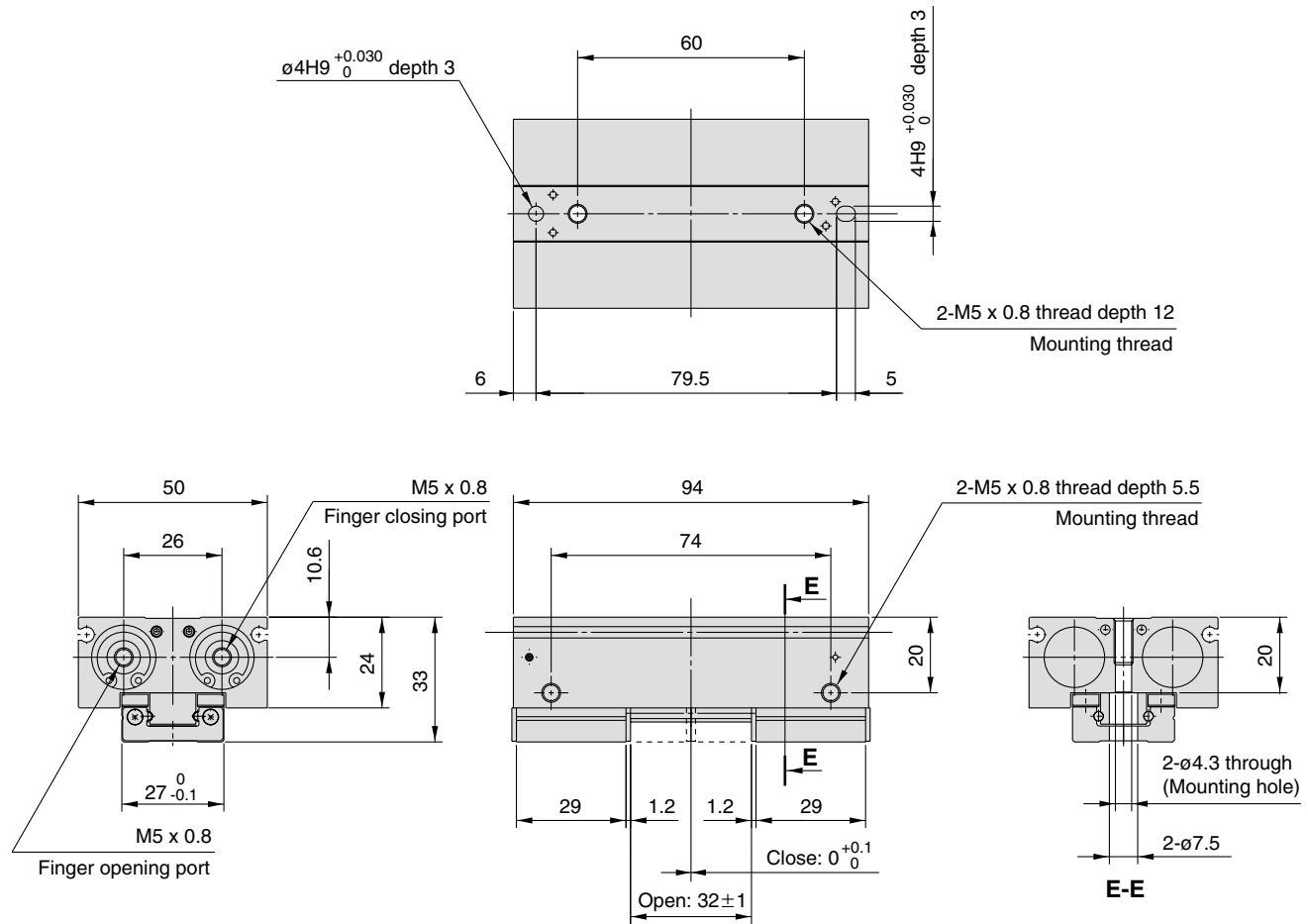
Auto Switch Mounting Groove Dimensions



Low Profile Air Gripper Series MHF2

Dimensions

MHF2-16D1

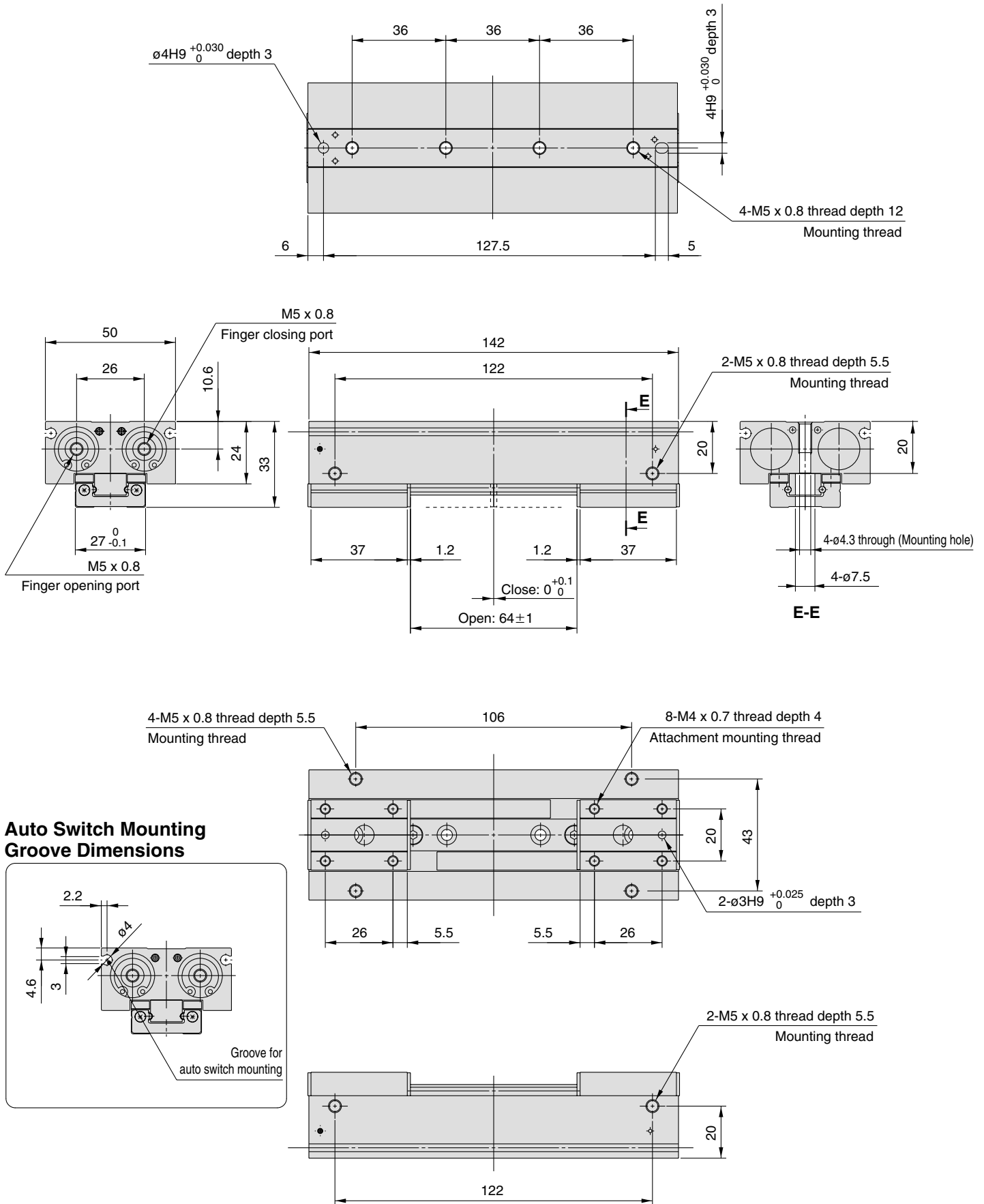


MHZ
MHF
MHL
MHR
MHK
MHS
MHC
MHT
MHY
MHW
MRHQ
Misc.
D-
20-

Series MHF2

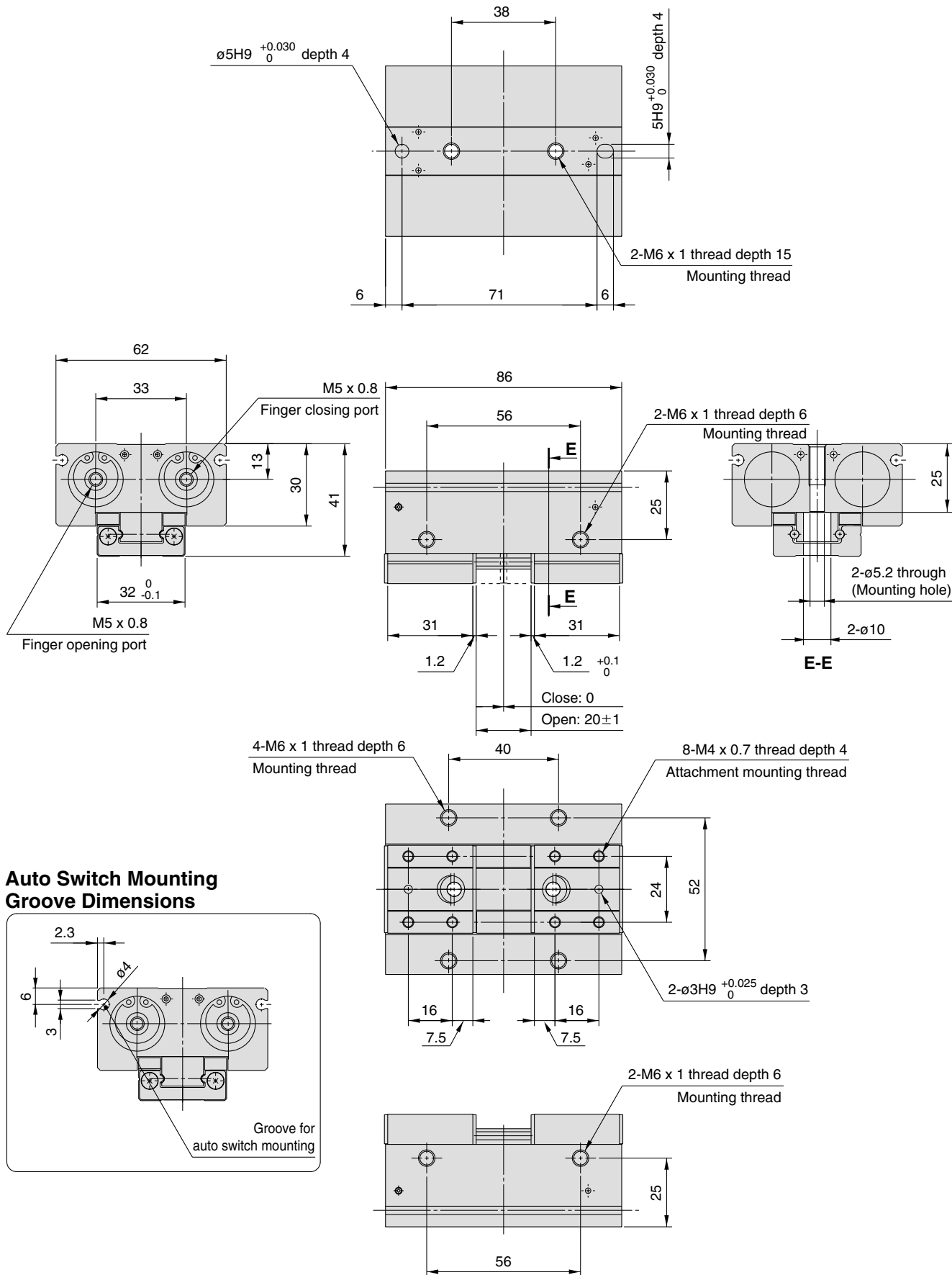
Dimensions

MHF2-16D2



Dimensions

MHF2-20D

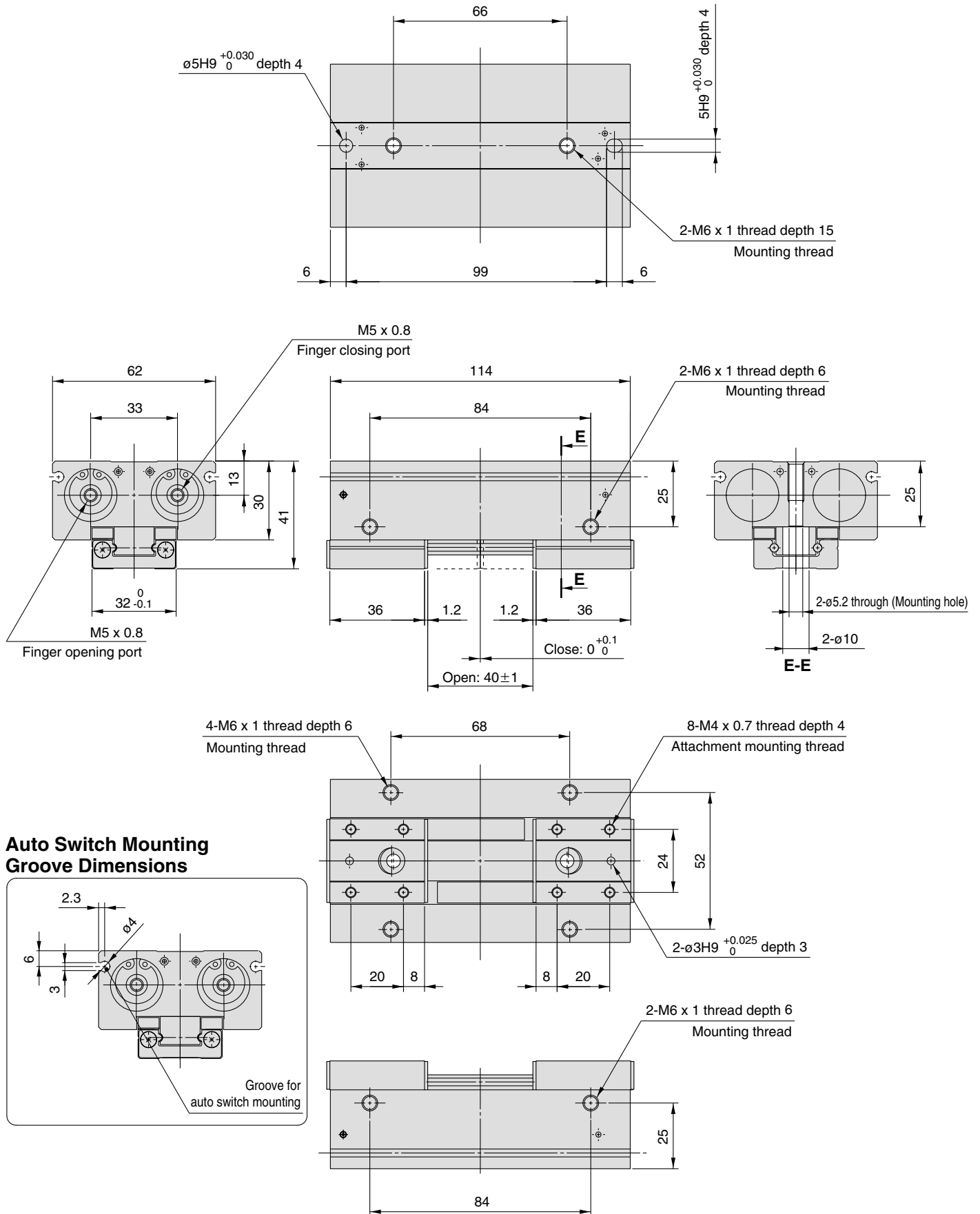


- MHZ
- MHF**
- MHL
- MHR
- MHK
- MHS
- MHC
- MHT
- MHY
- MHW
- MRHQ
- Misc.
- D-
- 20-

Series MHF2

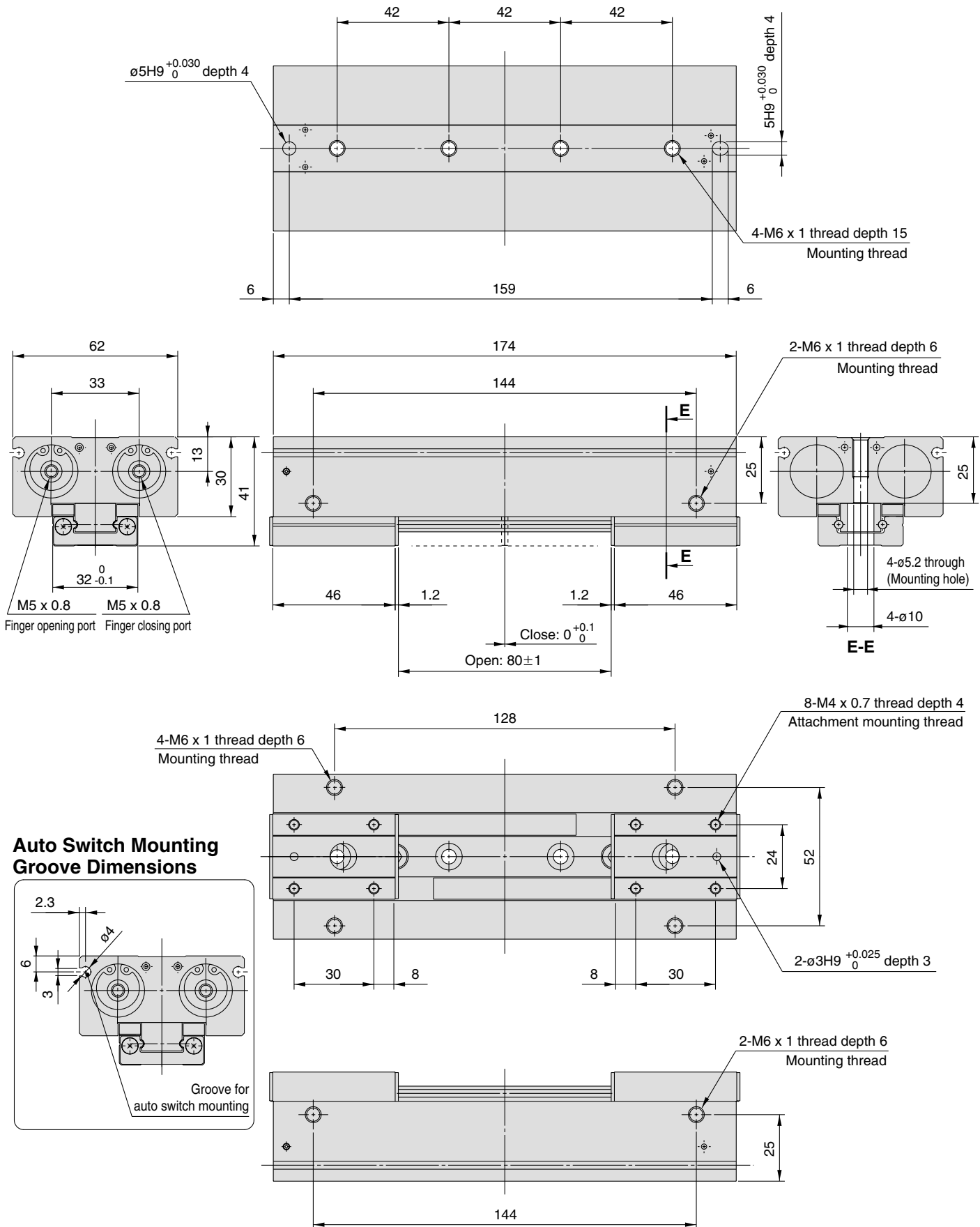
Dimensions

MHF2-20D1



Dimensions

MHF2-20D2

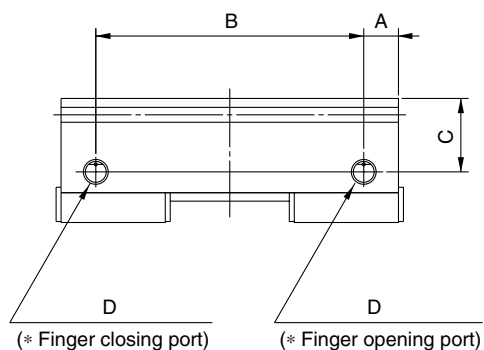


MHZ
MHF
MHL
MHR
MHK
MHS
MHC
MHT
MHY
MHW
MRHQ
Misc.
D-
20-

Series MHF2

Body Option: Side Piping Type

MHF2-□D□R



* For dimensions not given above, please refer to the table of dimensions on pages 12-3-12 to 12-3-23.

Body Option Dimension

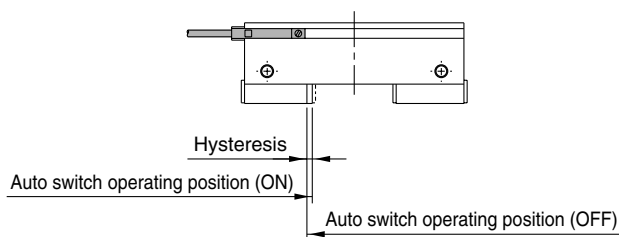
(mm)

Model	A	B	C	D
MHF2-8DR	5.5	25	11	M3 x 0.5
MHF2-8D1R		37		
MHF2-8D2R		61		
MHF2-12DR	7	38	14.8	M5 x 0.8
MHF2-12D1R		54		
MHF2-12D2R		90		
MHF2-16DR	9	54	19	M5 x 0.8
MHF2-16D1R		76		
MHF2-16D2R		124		
MHF2-20DR	10	66	23	M5 x 0.8
MHF2-20D1R		94		
MHF2-20D2R		154		

Low Profile Air Gripper Series **MHF2**

Auto Switch Hysteresis

Auto switches have hysteresis similar to micro switches. Use the table below as a guide when adjusting auto switch positions, etc.

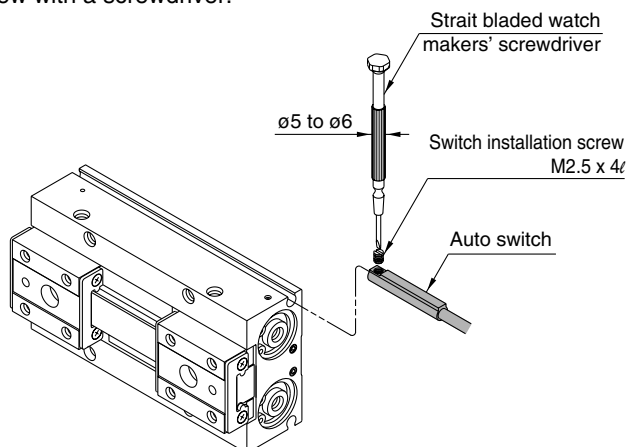


Hysteresis

	D-M9□(V)	D-M9□W(V)	
		Red ON	Green ON
MHF2-8D□	0.5	0.5	1
MHF2-12D□	0.5	0.5	1
MHF2-16D□	0.5	0.5	1
MHF2-20D□	0.5	0.5	1

Mounting of Auto Switch

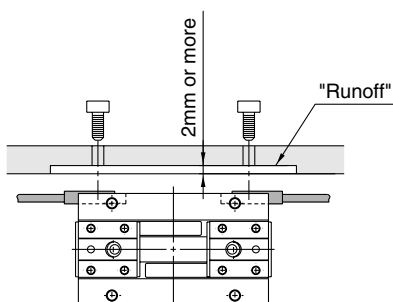
Insert the auto switch into the switch mounting groove in the air chuck in the direction shown below, and after setting the mounting position, tighten the attached switch mounting screw with a screwdriver.



Note) Use a screwdriver with a grip diameter of 5 to 6 mm to tighten the auto switch mounting screw. The tightening torque should be about 0.05 to 0.1 N·m. When you begin to feel that the screw is being tightened, turn it further by 90°.

⚠ Caution

When using an auto switch on the mounting plate side, the switch will protrude from the end face as shown below. Please provide a runoff space of 2 mm or deeper on the mounting plate.



Protrusion of Auto Switch from Edge of Body

- The amount of auto switch protrusion from the body end surface is shown in the table below.
- Use this as a standard when mounting, etc.

Protrusion of Auto switch

Lead wire type	In-line entry		Perpendicular entry		
	Illustration	Finger position	Illustration	Finger position	
Model	D-M9□	D-F9□W	D-M9□V	D-F9□WV	
MHF2-8D	Open	6.5	6.5	4.5	4.5
	Close	6.5	6.5	4.5	4.5
MHF2-8D1	Open	6.5	6.5	4.5	4.5
	Close	6.5	6.5	4.5	4.5
MHF2-8D2	Open	0.5	0.5	—	—
	Close	0.5	0.5	—	—
MHF2-12D	Open	3	3	1	1
	Close	3	3	1	1
MHF2-12D1	Open	1	1	—	—
	Close	1	1	—	—
MHF2-12D2	Open	—	—	—	—
	Close	—	—	—	—
MHF2-16D	Open	—	—	—	—
	Close	—	—	—	—
MHF2-16D1	Open	—	—	—	—
	Close	—	—	—	—
MHF2-16D2	Open	—	—	—	—
	Close	—	—	—	—
MHF2-20D	Open	—	—	—	—
	Close	—	—	—	—
MHF2-20D1	Open	—	—	—	—
	Close	—	—	—	—
MHF2-20D2	Open	—	—	—	—
	Close	—	—	—	—

Note) There is no protrusion for sections of the table with no values entered.

MHZ

MHF

MHL

MHR

MHK

MHS

MHC

MHT

MHY

MHW

MRHQ

Misc.

D-

20-