Low Profile Air Gripper

Series MHF2

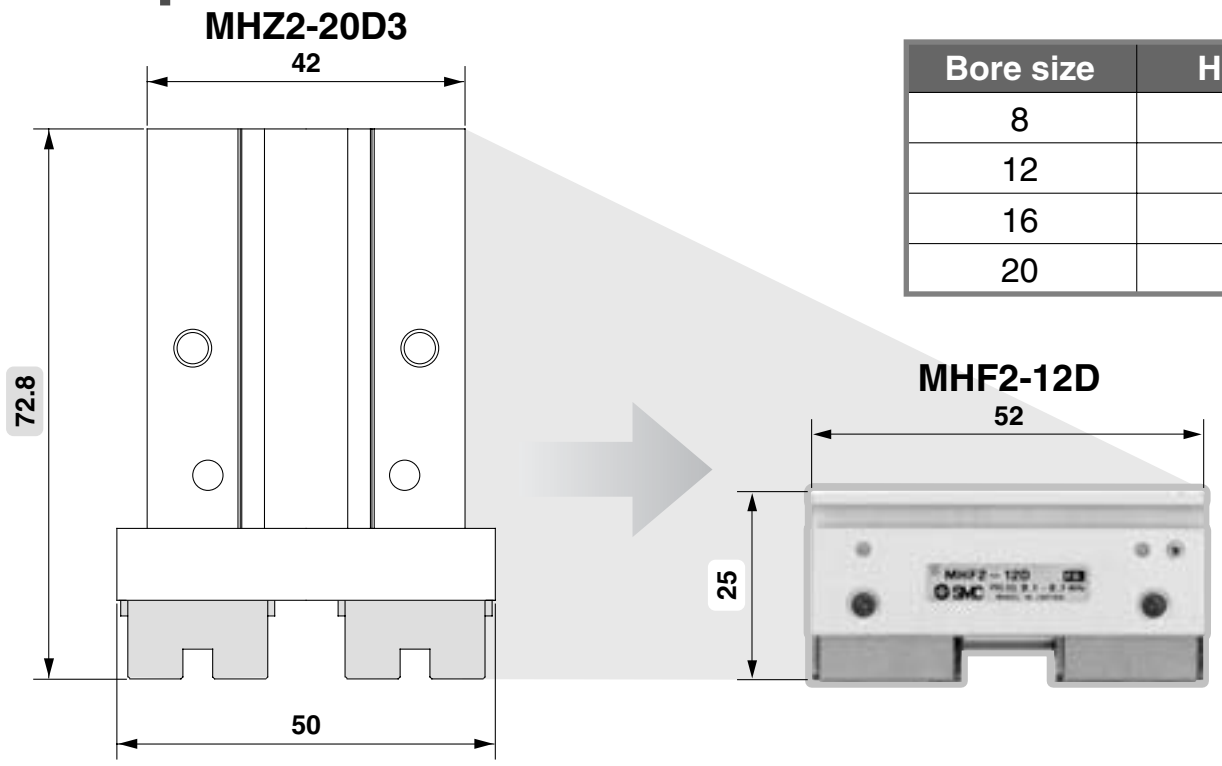
Low profile air gripper with space-saving design

RoHS

Low Profile Air Gripper

Series MHF2

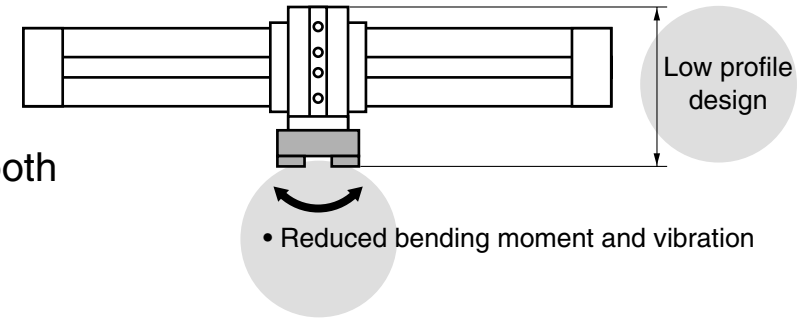
Height is approximately 1/3 the size of an equivalent Series MHZ2.



(mm)

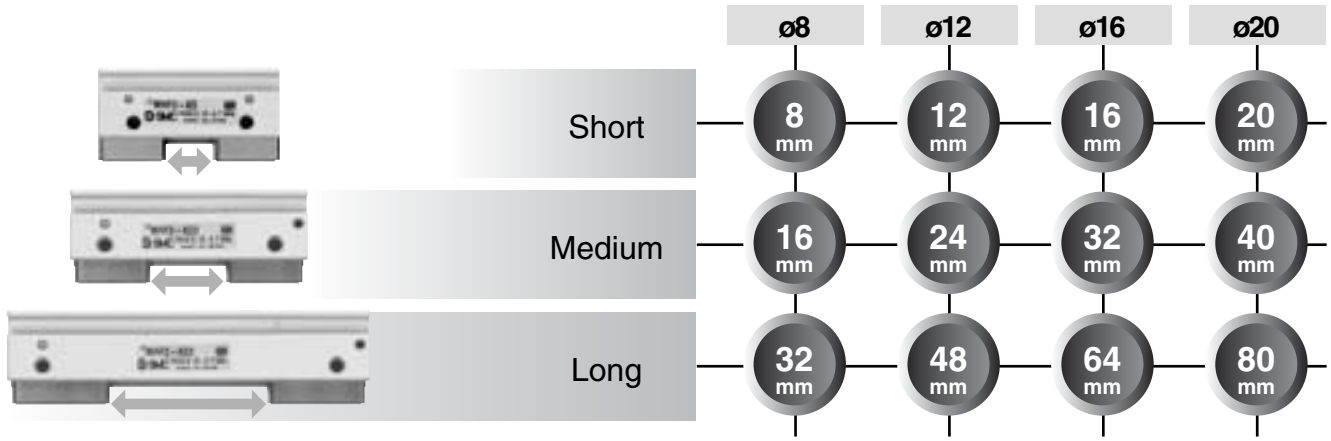
Bore size	Height
8	19
12	25
16	33
20	41

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



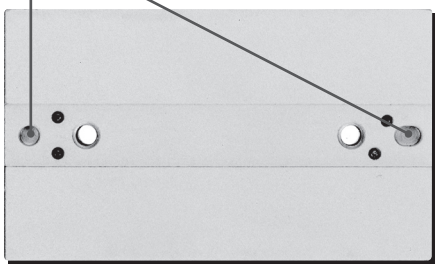
Stroke selection is available.

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

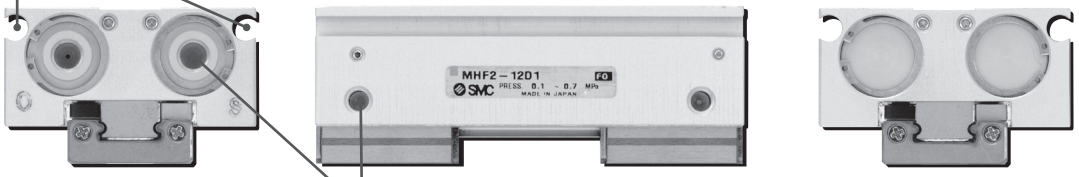


Improved mounting repeatability

With positioning pin holes



Auto switches can be mounted on both sides.

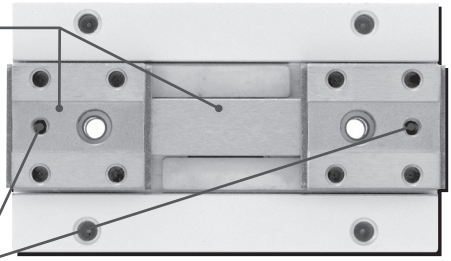


Piping is available from 2 directions

Piping port position can be specified using a part number.

Linear guide provides:

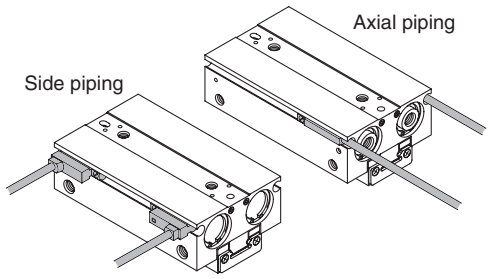
High precision and high rigidity with martensitic stainless steel



Easy positioning for mounting attachments

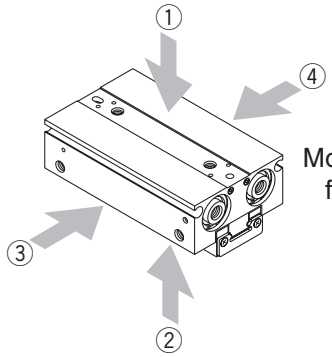
With positioning pin holes

Centralized wiring and piping are possible.

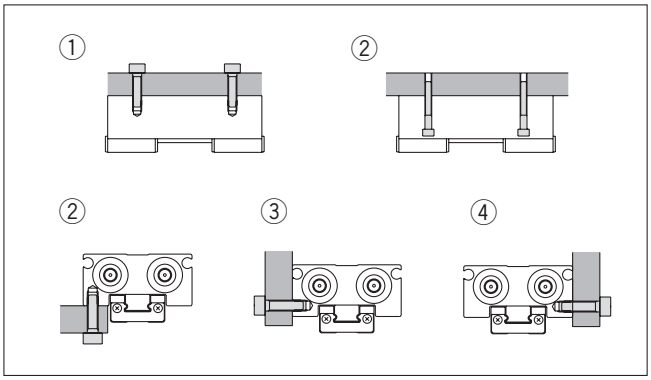


High degree of mounting flexibility

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

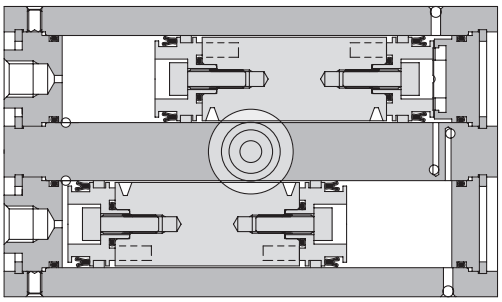


Mounting is possible from 4 directions.



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

Series MHF2
Model Selection

Model Selection

Selection Procedure

Step 1 Confirm gripping force → **Step 2** Confirm gripping point → **Step 3** Confirm external force on fingers

Step 1 Confirmation of Gripping Force

Confirmation of conditions → Calculation of required gripping force → Model selection from gripping force graph

Example

Workpiece mass: **0.15 kg** →

Gripping method: External gripping →

Model selection criteria with respect to workpiece mass

- 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.

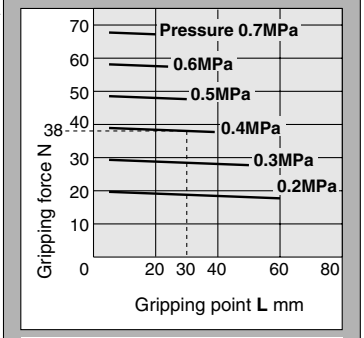
Example

When it is desired to set the gripping force at 20 times or more the workpiece weight. Required griping 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** →

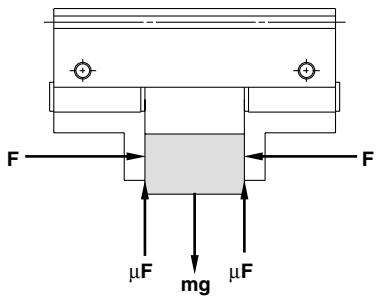
MHF2-12D□



Selecting the MHF2-12D

- The gripping force is obtained from the intersection point of the gripping point distance L = 30 mm and a pressure of 0.4 MPa.
  Gripping force N = 38 N
- A gripping force of 38 N satisfies the required gripping force of 29.4 N. Therefore, the selection of MHF2-12D is appropriate.

Model Selection Illustration



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

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

$$2 \times \mu F > mg$$

(2: Number of fingers)

and therefore,

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

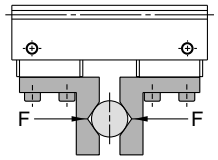
With **"a"** as the safety margin, **F** is determined as follows:

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

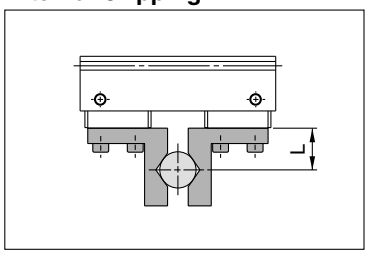
(Note) · Even in cases where the coefficient of friction is greater than μ = 0.2, for safety reasons, SMC recommends selecting a gripping force which is at least 10 to 20 times the workpiece weight.
· It is necessary to allow a greater safety margin for high accelerations and strong impacts, etc.

Step 1 Effective Gripping Force: Series MHF2

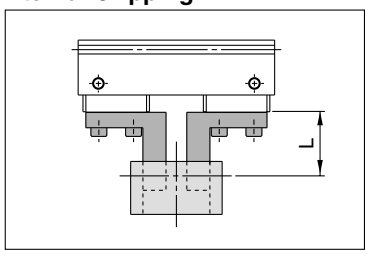
- Expressing the effective gripping force
  The effective gripping force shown in the graphs below is expressed as F, which is the thrust of one finger when both fingers and attachments are in full contact with the workpiece as shown in the figure below.



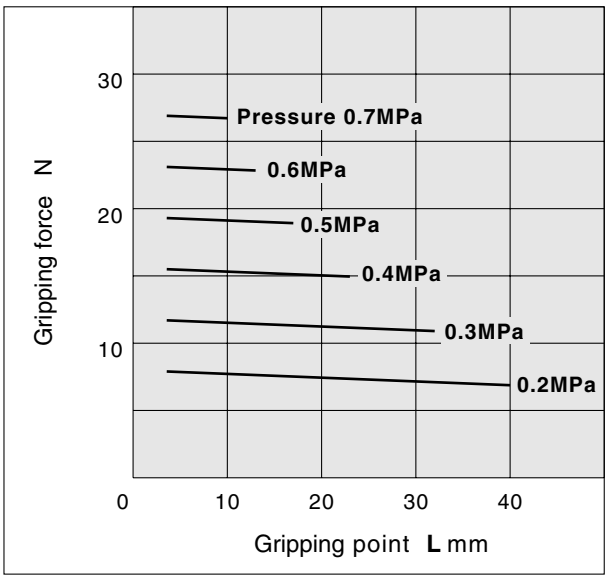
External Gripping



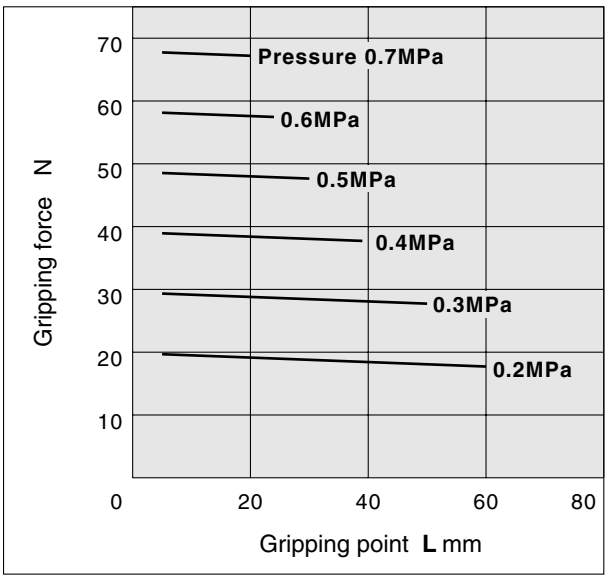
Internal Gripping



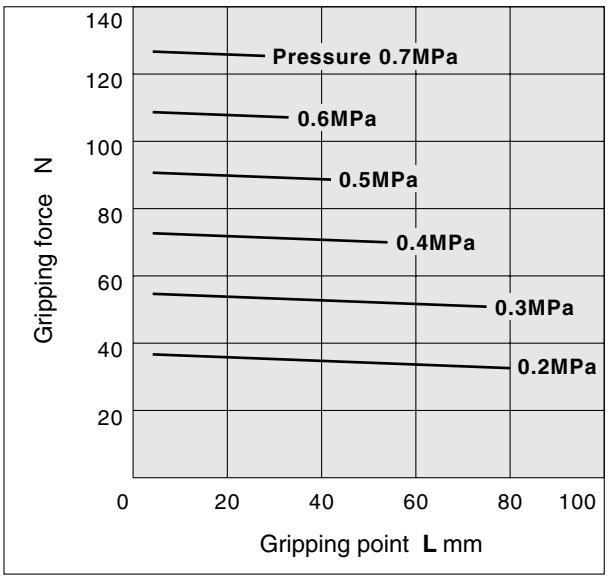
MHF2-8D□



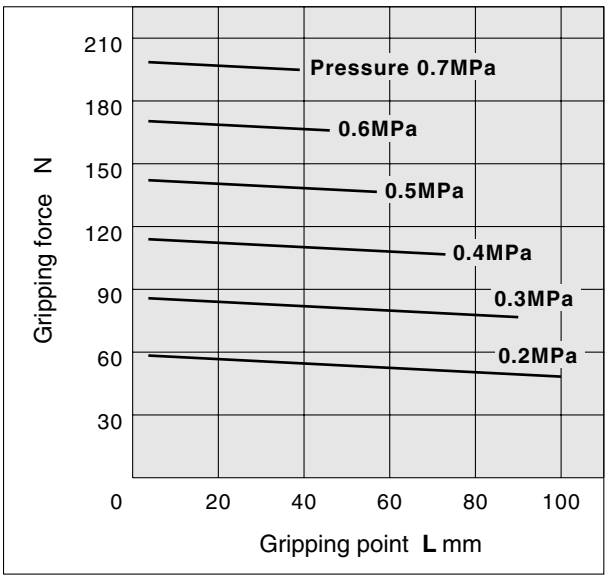
MHF2-12D□



MHF2-16D□



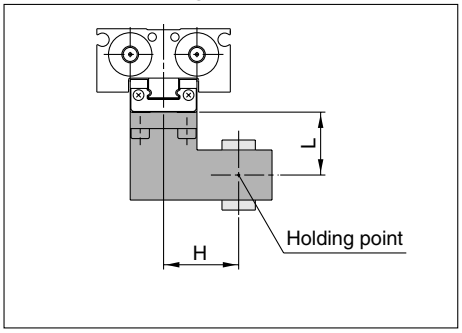
MHF2-20D□



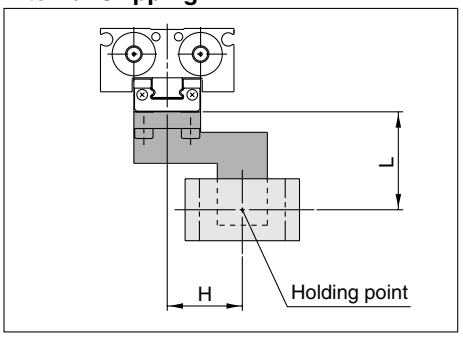
Model Selection

Step 2 Effective Gripping Force: Series MHF2

External Gripping

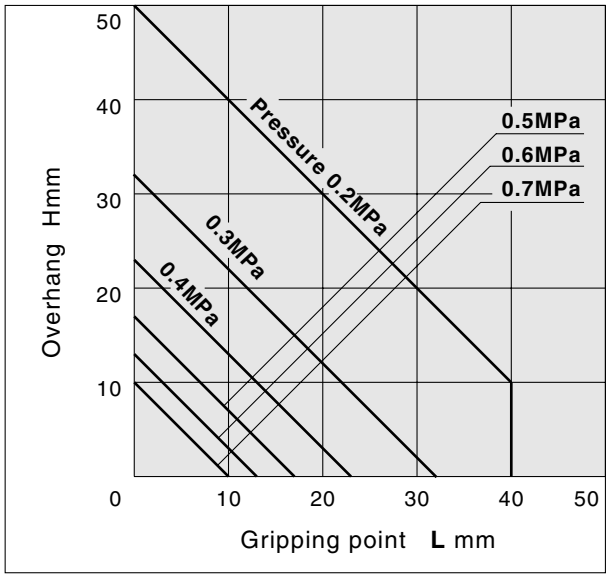


Internal Gripping

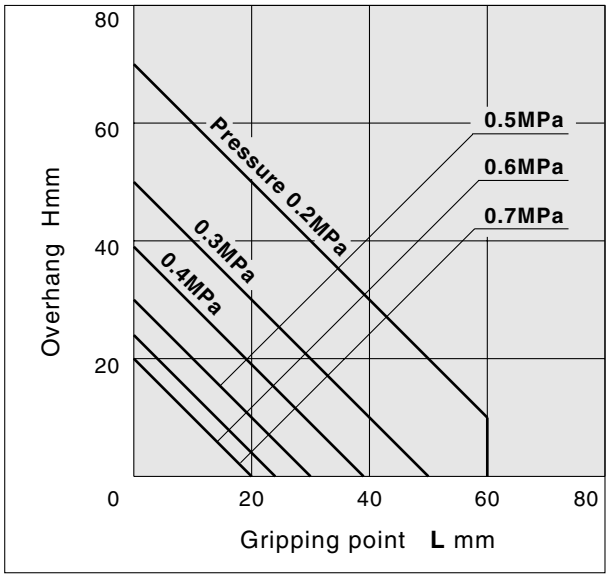


- The air gripper should be operated so that the amount of overhang "H" will stay within the range given in the graphs below.
- If the workpiece gripping point goes beyond the range limits, this will have an adverse effect on the life of the air gripper.

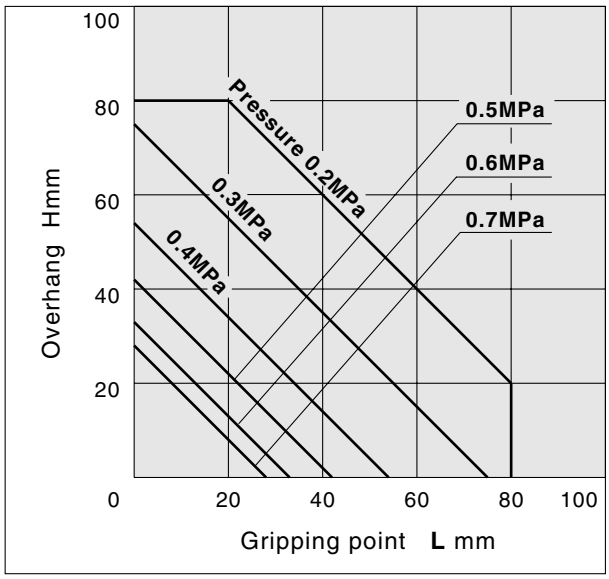
MHF2-8D□



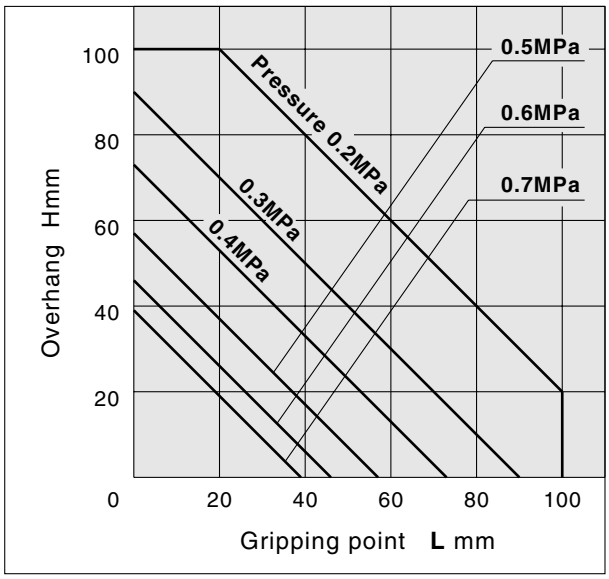
MHF2-12D□



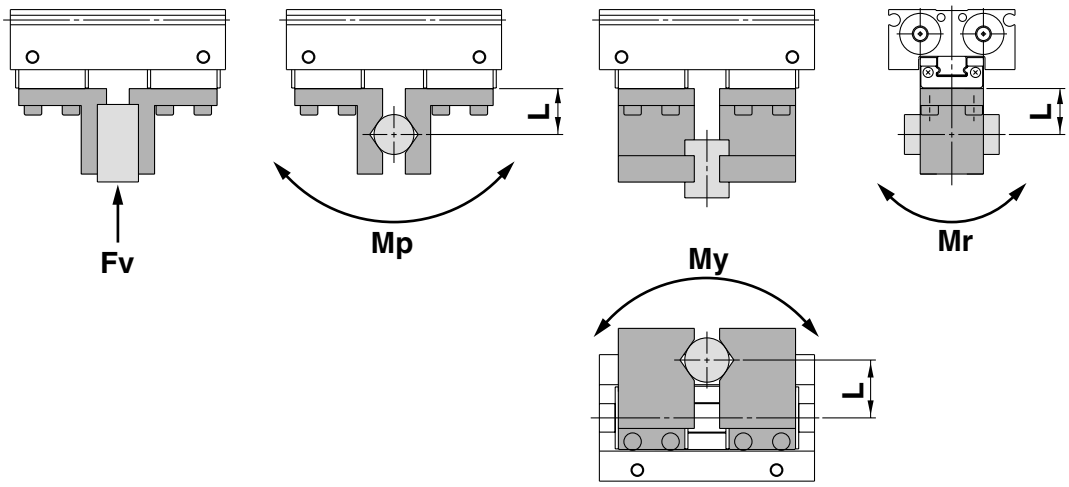
MHF2-16D□



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

Low Profile Air Gripper

Series MHF2

RoHS

How to Order

MHF 2 — 12 D □ □ — M9BW □ — □

Made to Order
Refer to page 453 for details.

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

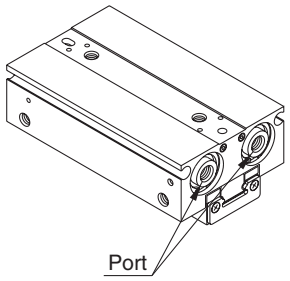
Nil	2 pcs.
S	1 pc.
n	n pcs.

Auto switch

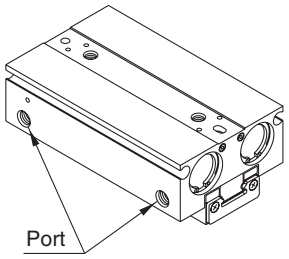
Nil	Without auto switch (Built-in magnet)

Body option

Nil: Axial piping type



R: Side piping type



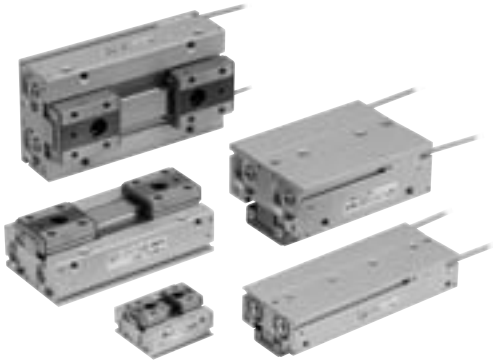
Applicable Auto Switches/Refer to pages 761 to 809 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage			Auto switch model		Lead wire length (m)*				Pre-wired connector	Applicable load	
								Electrical entry direction		0.5 (Nil)	1 (M)	3 (L)	5 (Z)			
					DC		AC	Perpendicular	In-line							
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	**M9NV**	**M9N**	●	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				**M9PV**	**M9P**	●	●	●	○	○		
				2-wire		12 V		**M9BV**	**M9B**	●	●	●	○	○	—	
	Diagnostic indication (2-color display)			3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	○	IC circuit	
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	

* Lead wire length symbols: 0.5 m ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

* Auto switches marked with "○" are made to order specification.

Note 1) Take note of hysteresis with 2-color indication type switches. When using, refer to page 471 for auto switch hysteresis.



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		±0.05 mm 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 auto switch (3-wire, 2-wire)

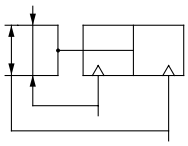
Note 1) This is the value when no offset load is applied to the finger.
When an offset load is applied to the finger, the maximum value is ±0.15 mm due to the influence of backlash of the rack and pinion.
Note 2) Refer to pages 761 to 809 for further information on auto switches.

Model

Action	Model	Cylinder bore (mm)	Gripping force Note 1) / Effective gripping force per finger N	Opening /closing stroke (Both sides) mm	Mass (g) Note 2)	Unobstructed capacity (cm^3) Finger open side	Unobstructed capacity (cm^3) 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 mass.

JIS Symbol
Double acting



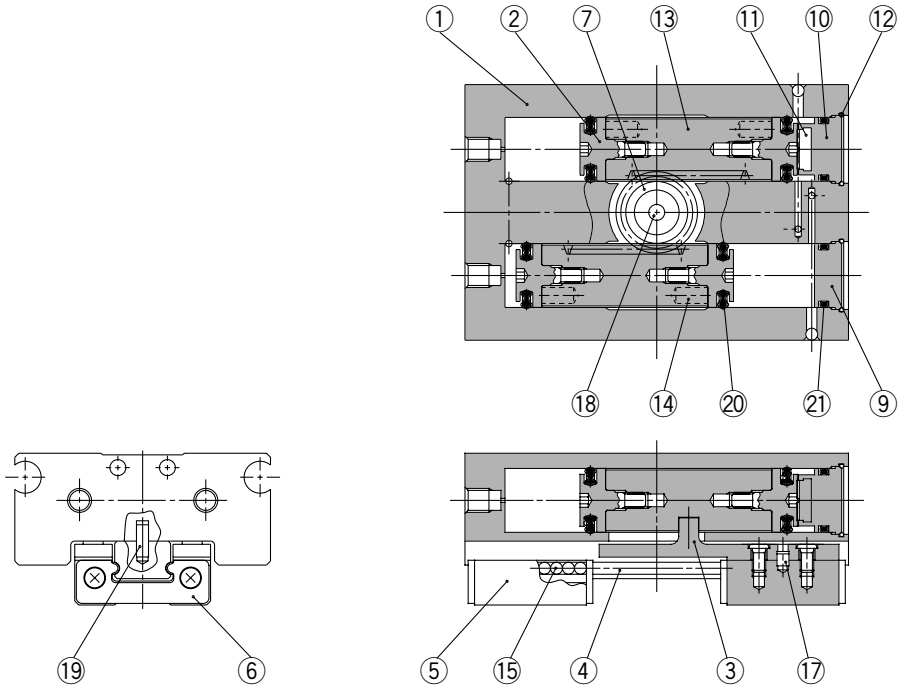
Made to Order

Made to Order
Refer to pages 683 to 713 for details.

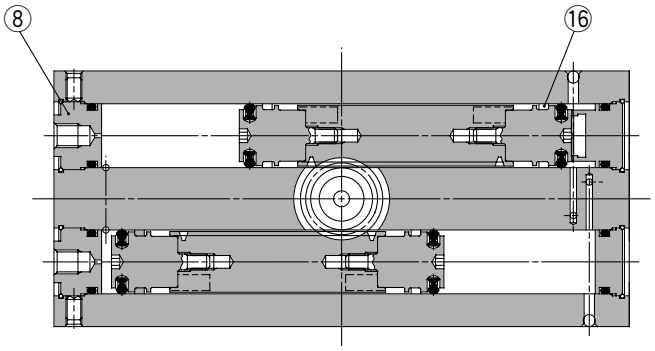
Symbol	Specifications/Description
-X4	Heat resistance (100°C)
-X5	Fluororubber seal
-X50	Without magnet
-X53	EPDM seal/Fluorine grease
-X63	Fluorine grease
-X79	Grease for food

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	Nitriding
8	**Cap A**	Aluminium alloy	Clear anodized
9	**Cap B**	Aluminium alloy	Clear anodized
10	**Cap C**	Aluminium alloy	Clear anodized

Component Parts

No.	Description	Material	Note
11	**Head damper**	Urethane rubber	
12	**Clip**	Stainless steel wire	
13	**Rack**	Stainless steel	Nitriding
14	**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

Replacement part/Grease pack part no.:
Guide unit: GR-S-005 (5g)
Cylinder unit: GR-L-005 (5g)

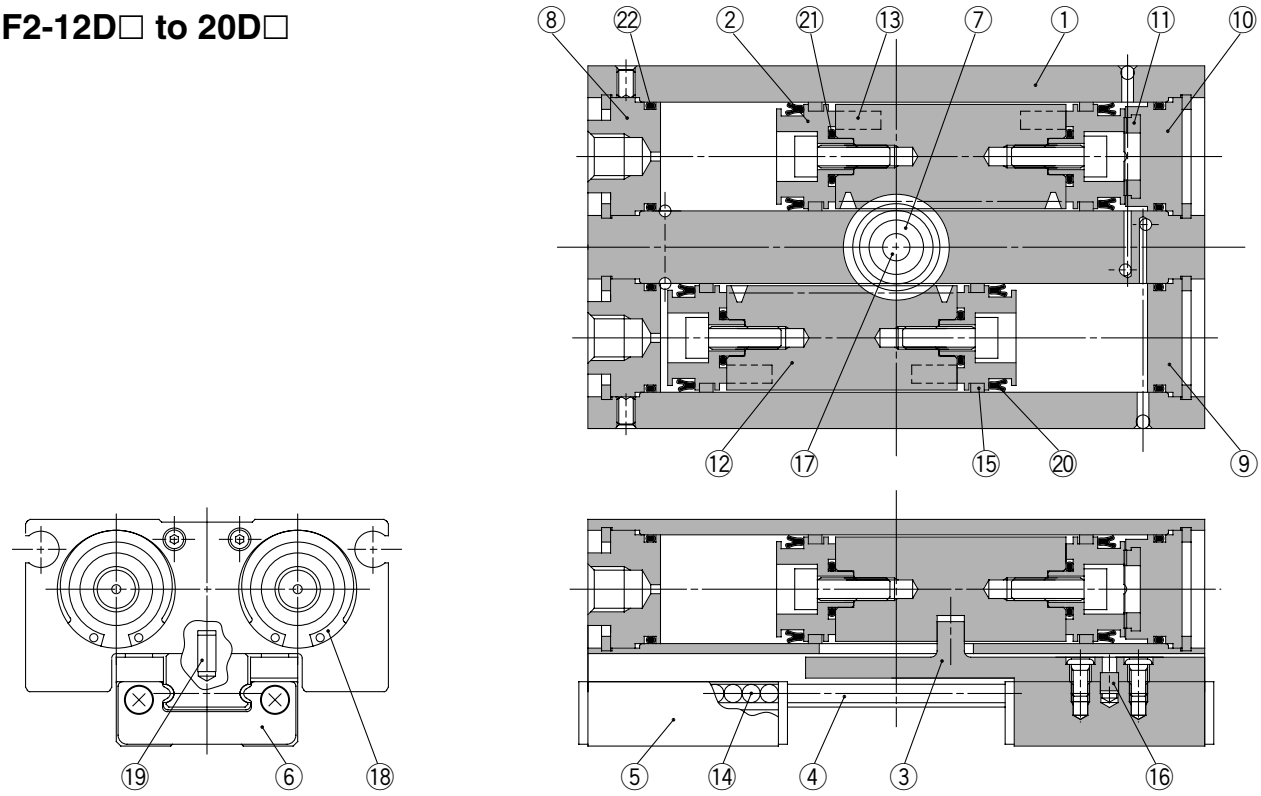
Bolts for Body Through-hole Mounting

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.

Construction

MHF2-12D□ to 20D□



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	Nitriding
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	Nitriding

No.	Description	Material	Note
13	**Magnet**	—	Nickel plated
14	**Steel balls**	High carbon chromium bearing steel	
15	**Wear ring**	Synthetic resin	
16	**ø12: Roller**	High carbon chromium bearing steel	
	ø16 to 20: Parallel pin	Stainless steel	
17	**Needle roller**	High carbon chromium bearing steel	
18	**ø12: R shape retaining ring**	Carbon steel	Nickel plated
	ø16 to 20: Type C retaining ring		
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

Replacement part/Grease pack part no.:

MHF2-□□D, D1 (ø12, 16, 20)	**GR-S-005** (5 g) (Guide unit)
MHF2-□□D2 (ø12)	**GR-L-005** (5 g) (Cylinder unit)
MHF2-□□D2 (ø16, 20)	**GR-S-005** (5 g) (Guide unit)
	GR-L-010 (10 g) (Cylinder unit)

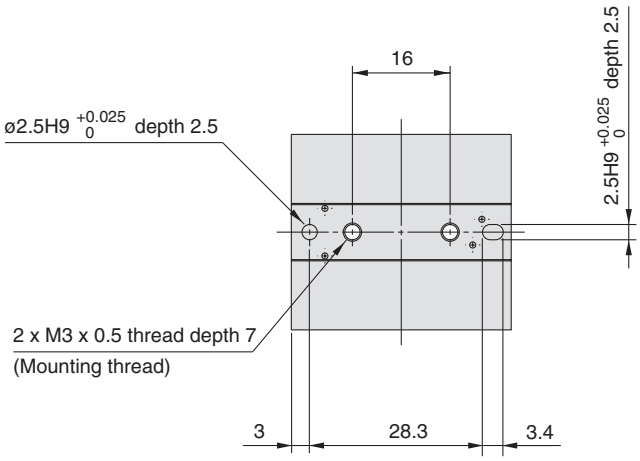
Bolts for Body Through-hole Mounting

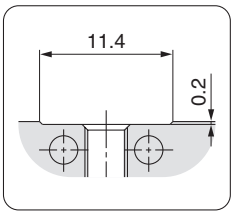
Part no.	Number of pieces	
MHF-B12	MHF2-12D	2 pieces/unit
	MHF2-12D1	2 pieces/unit
	MHF2-12D2	4 pieces/unit

* 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.

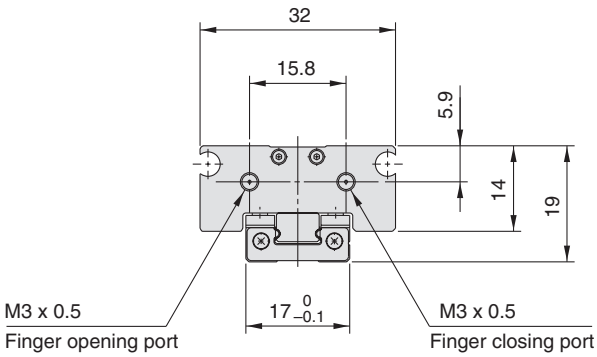
Dimensions

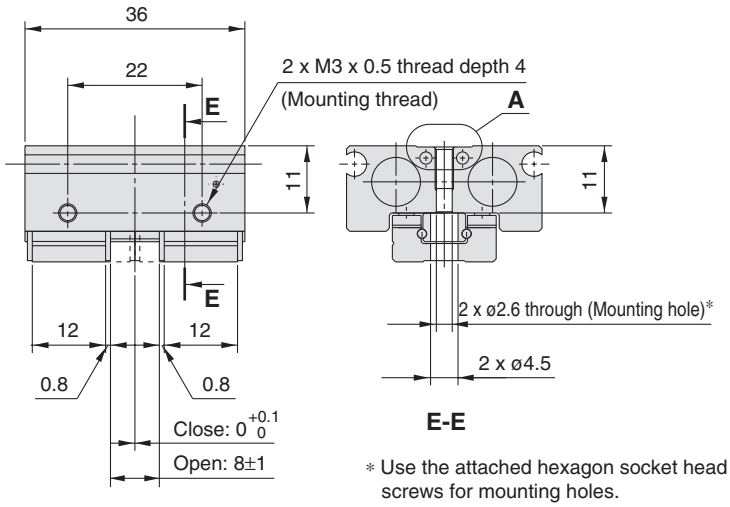
MHF2-8D





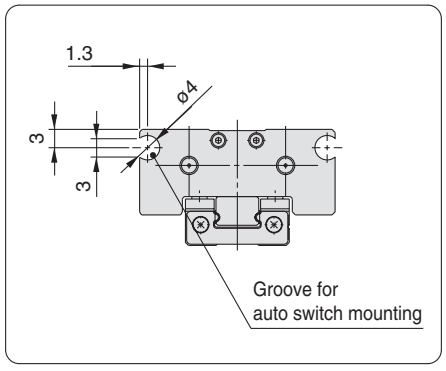
Detail of part A

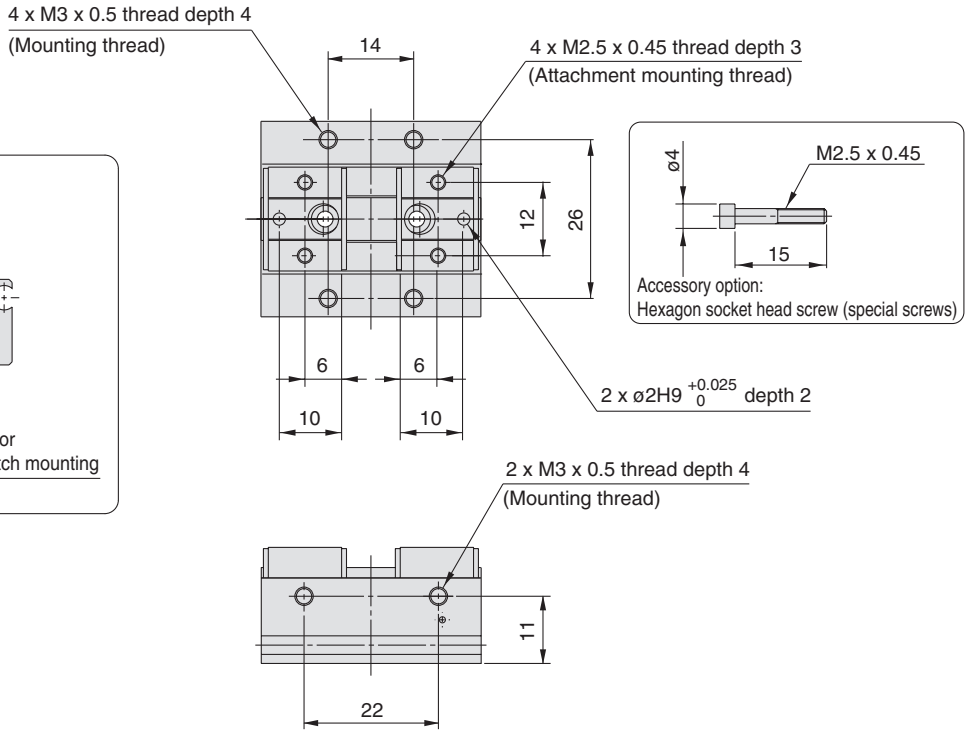




* Use the attached hexagon socket head screws for mounting holes.

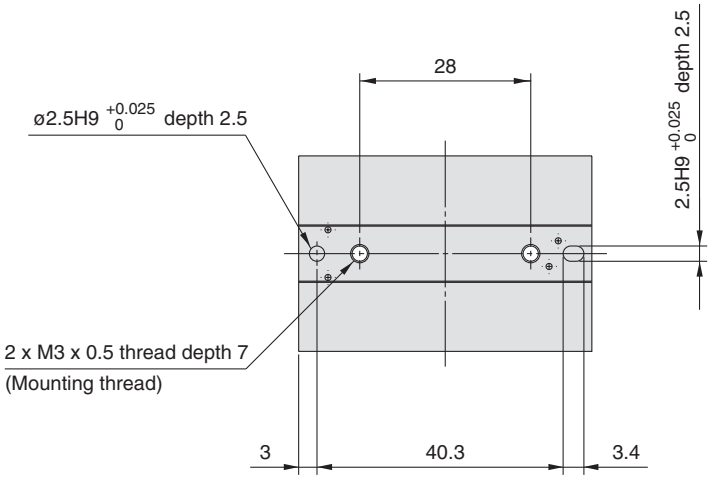
Auto Switch Mounting Groove Dimensions

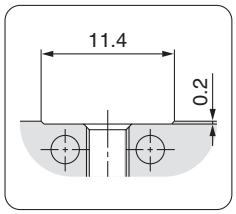




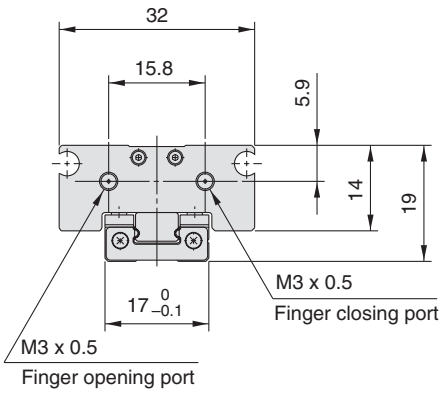
Dimensions

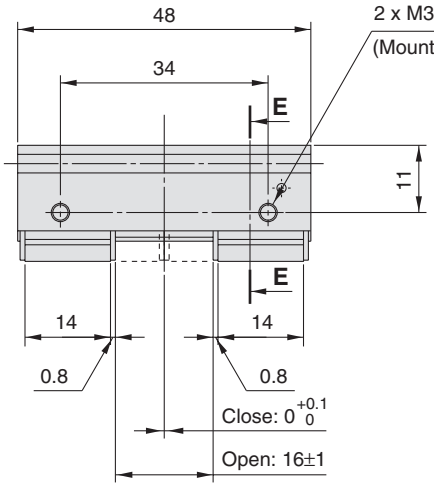
MHF2-8D1

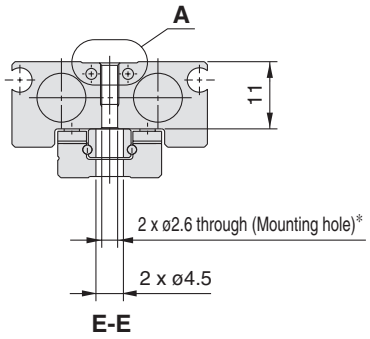




Detail of part A

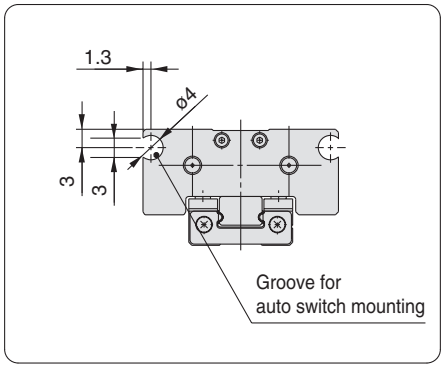


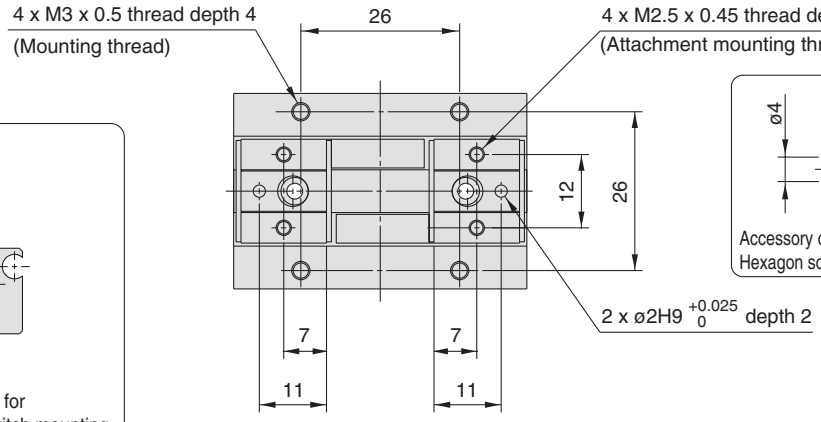


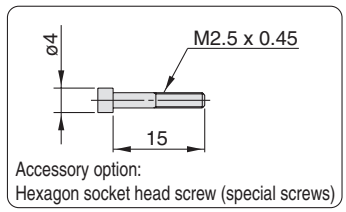


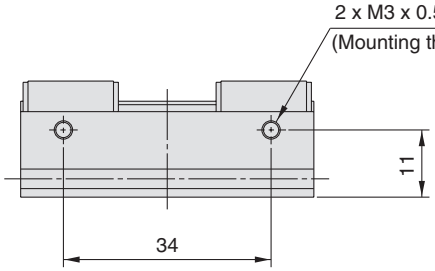
∗ Use the attached hexagon socket head screws for mounting holes.

Auto Switch Mounting Groove Dimensions



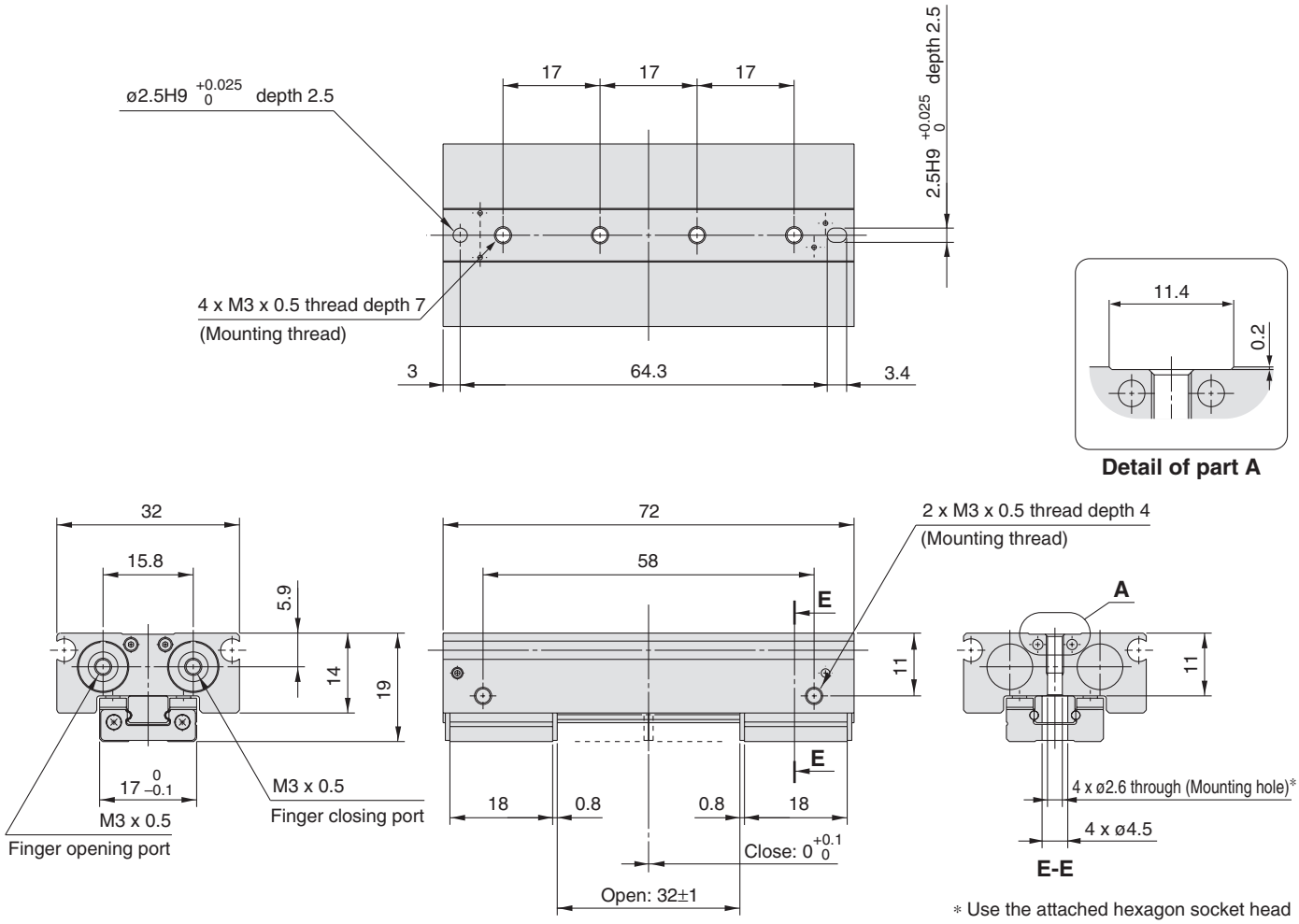




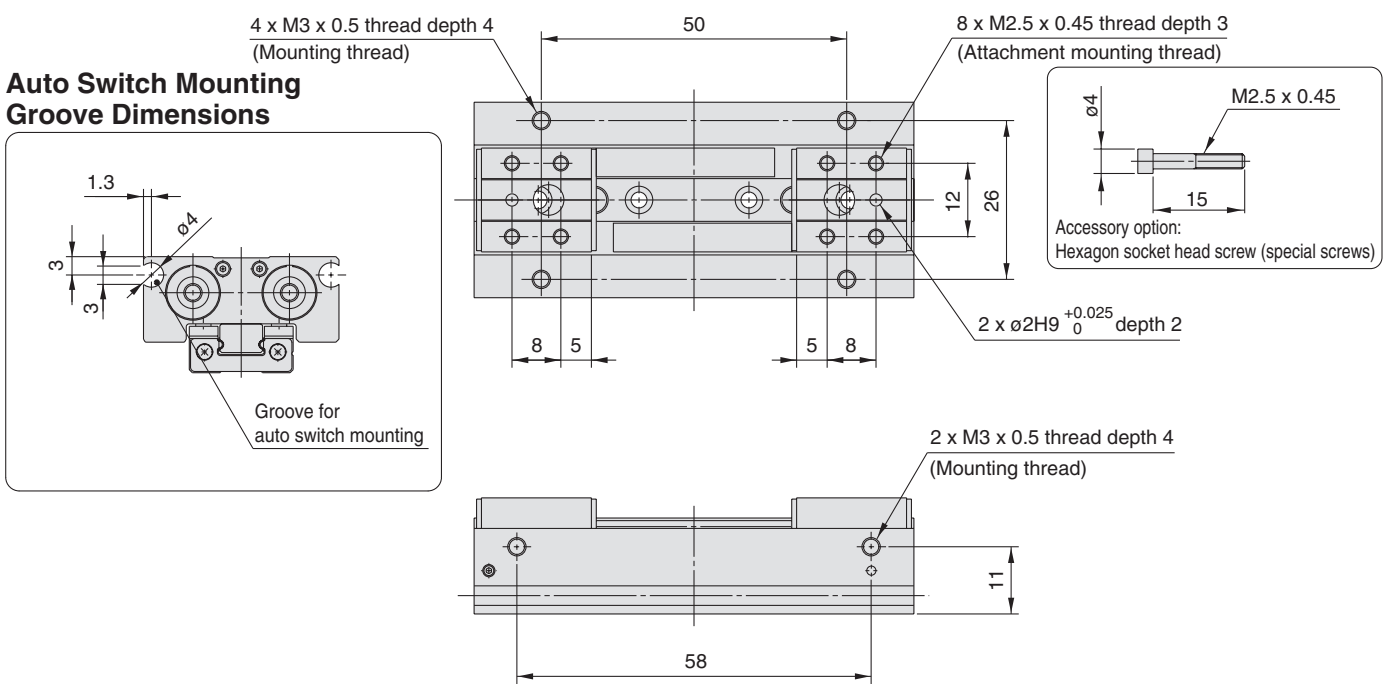


Dimensions

MHF2-8D2

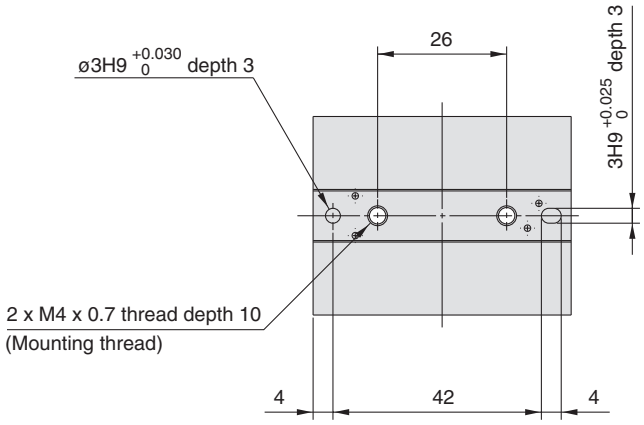


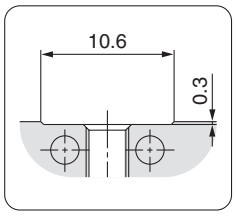
Auto Switch Mounting Groove Dimensions



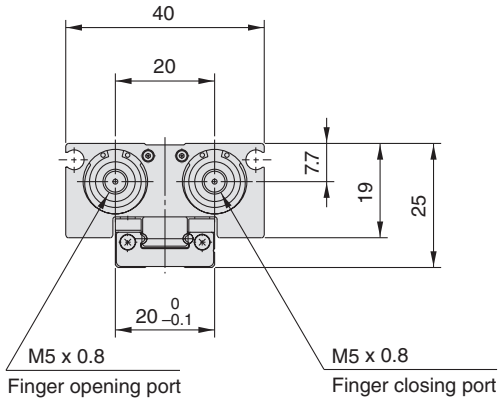
Dimensions

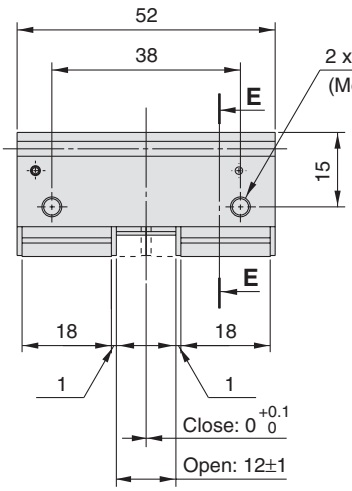
MHF2-12D

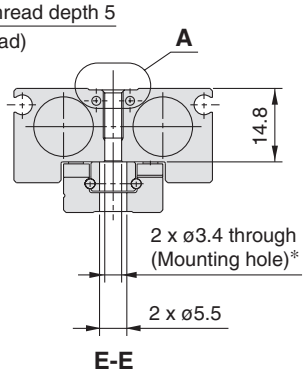




Detail of part A

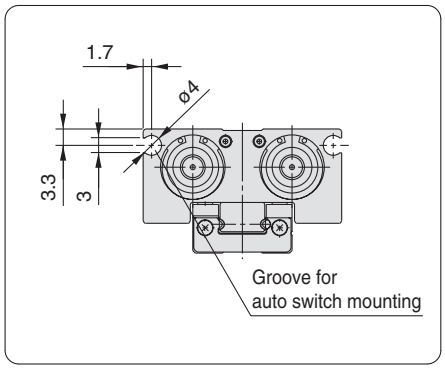


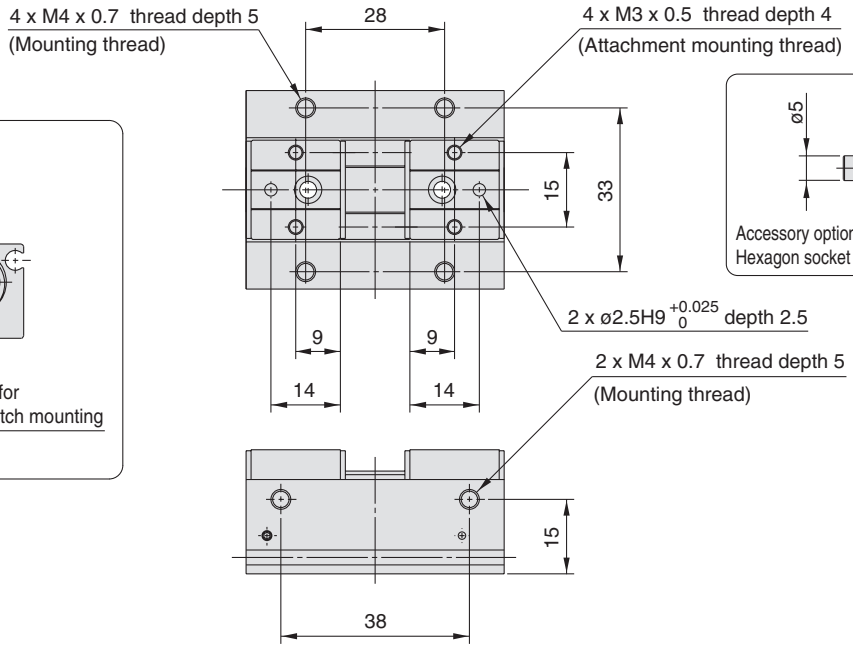


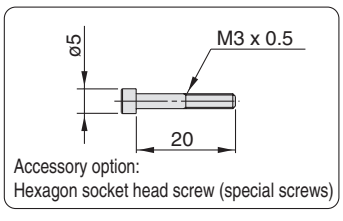


∗ Use the attached hexagon socket head screws for mounting holes.

Auto Switch Mounting Groove Dimensions

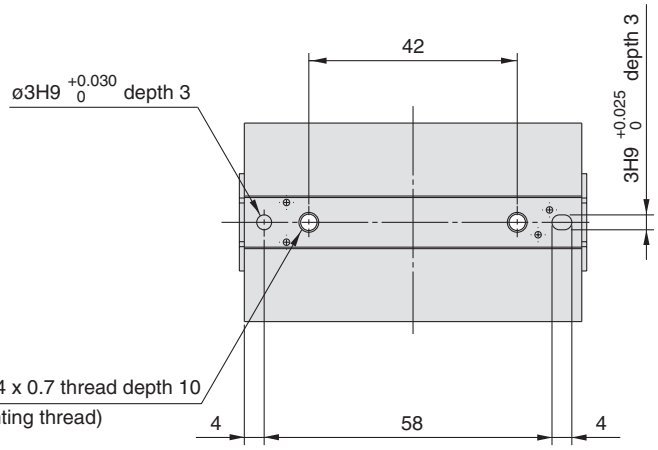


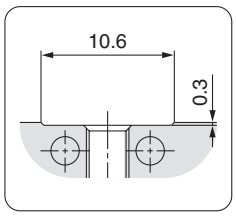




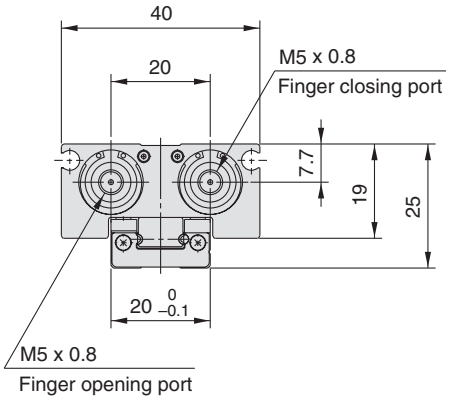
Dimensions

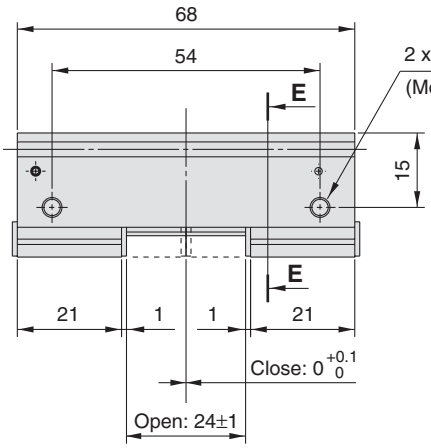
MHF2-12D1

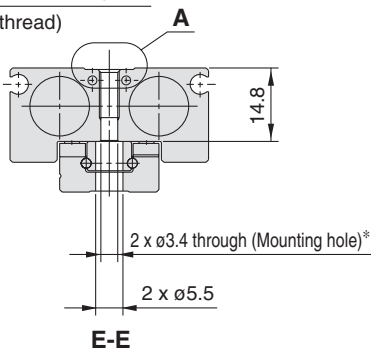




Detail of part A

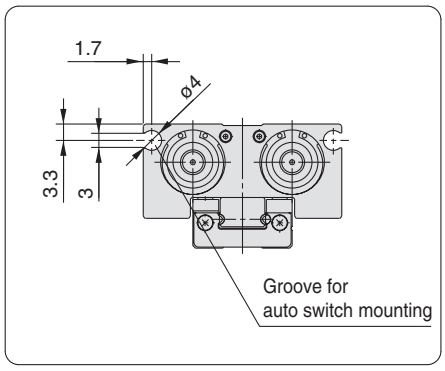


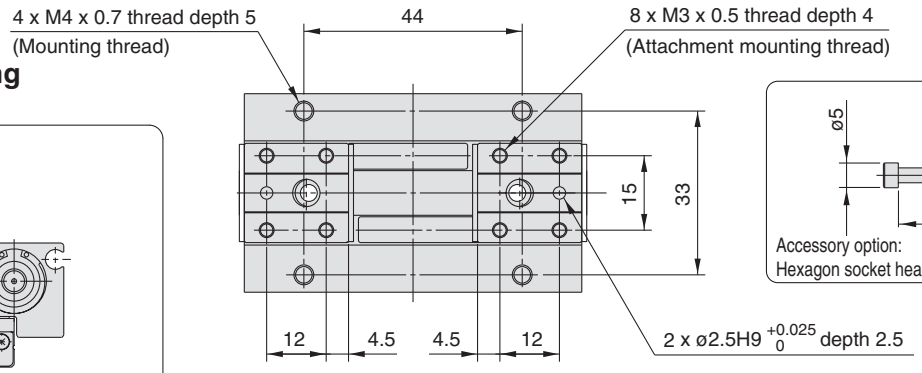


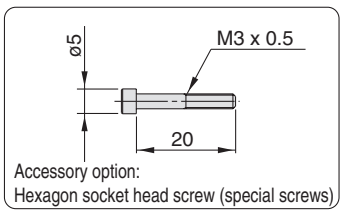


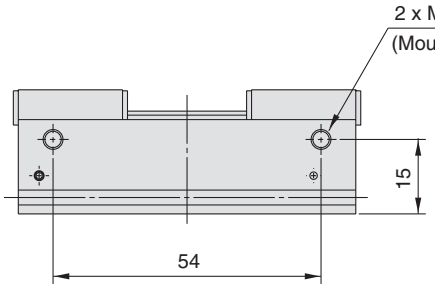
* Use the attached hexagon socket head screws for mounting holes.

Auto Switch Mounting Groove Dimensions



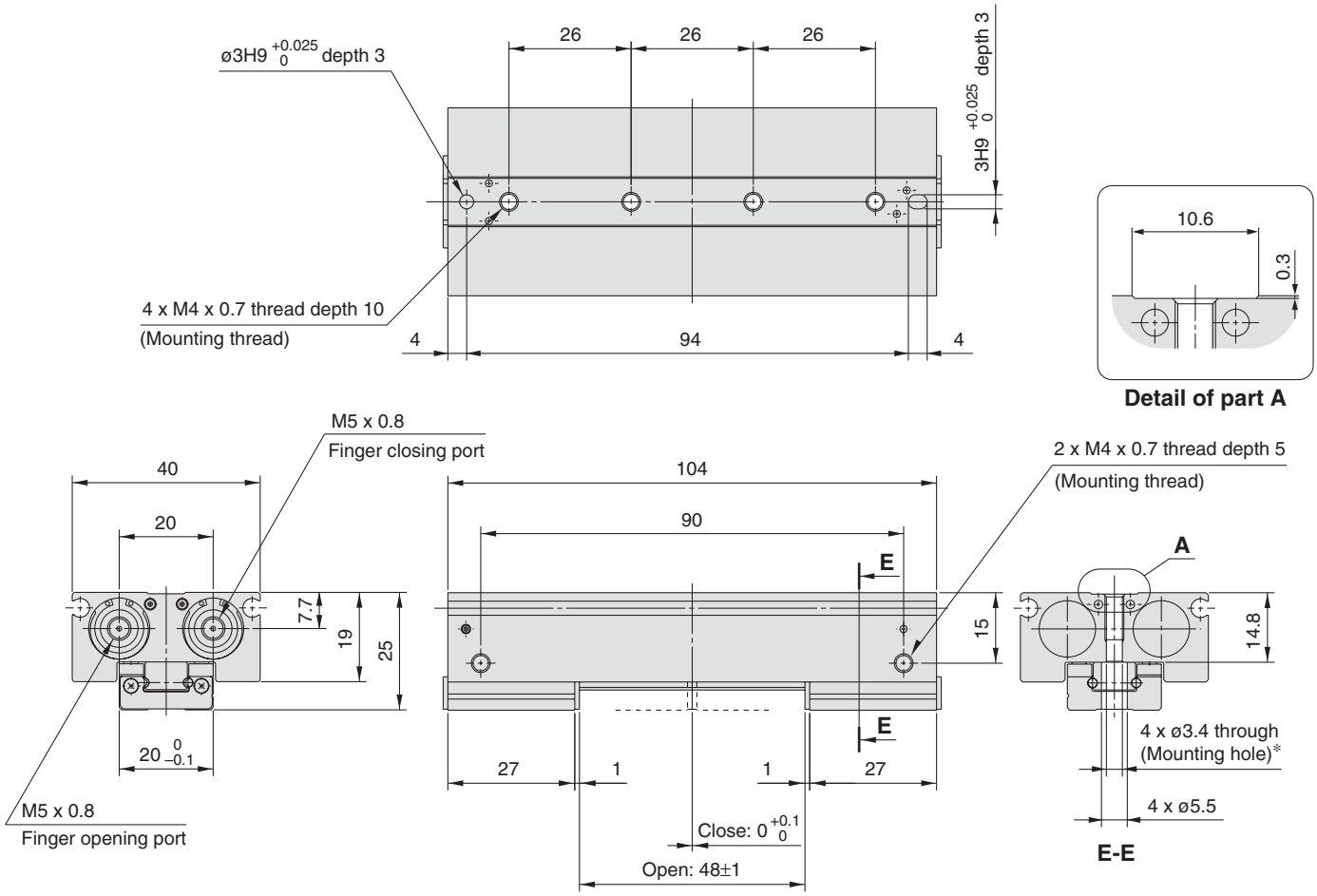




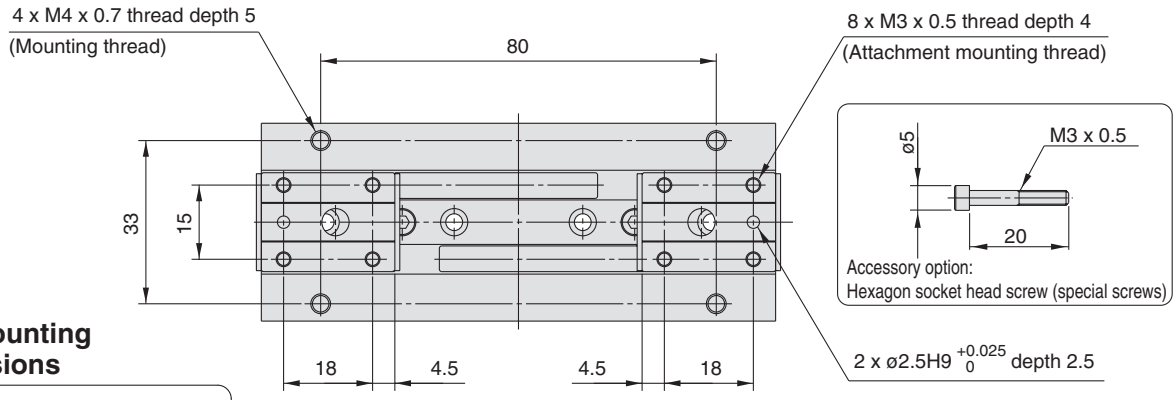


Dimensions

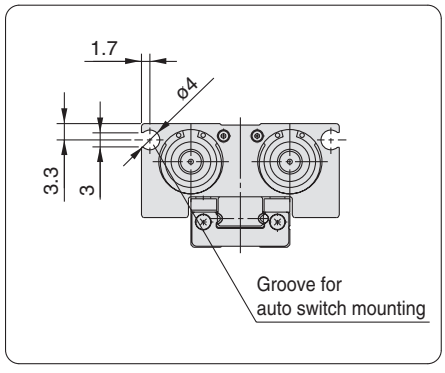
MHF2-12D2

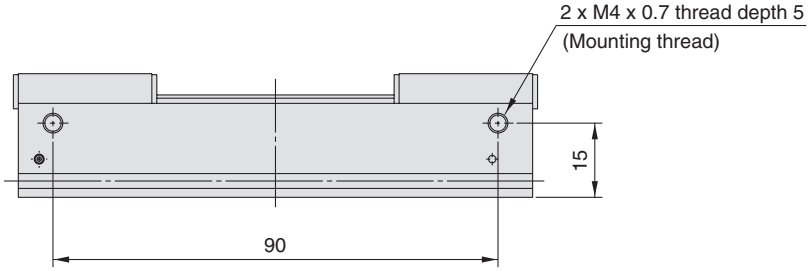


* Use the attached hexagon socket head screws for mounting holes.



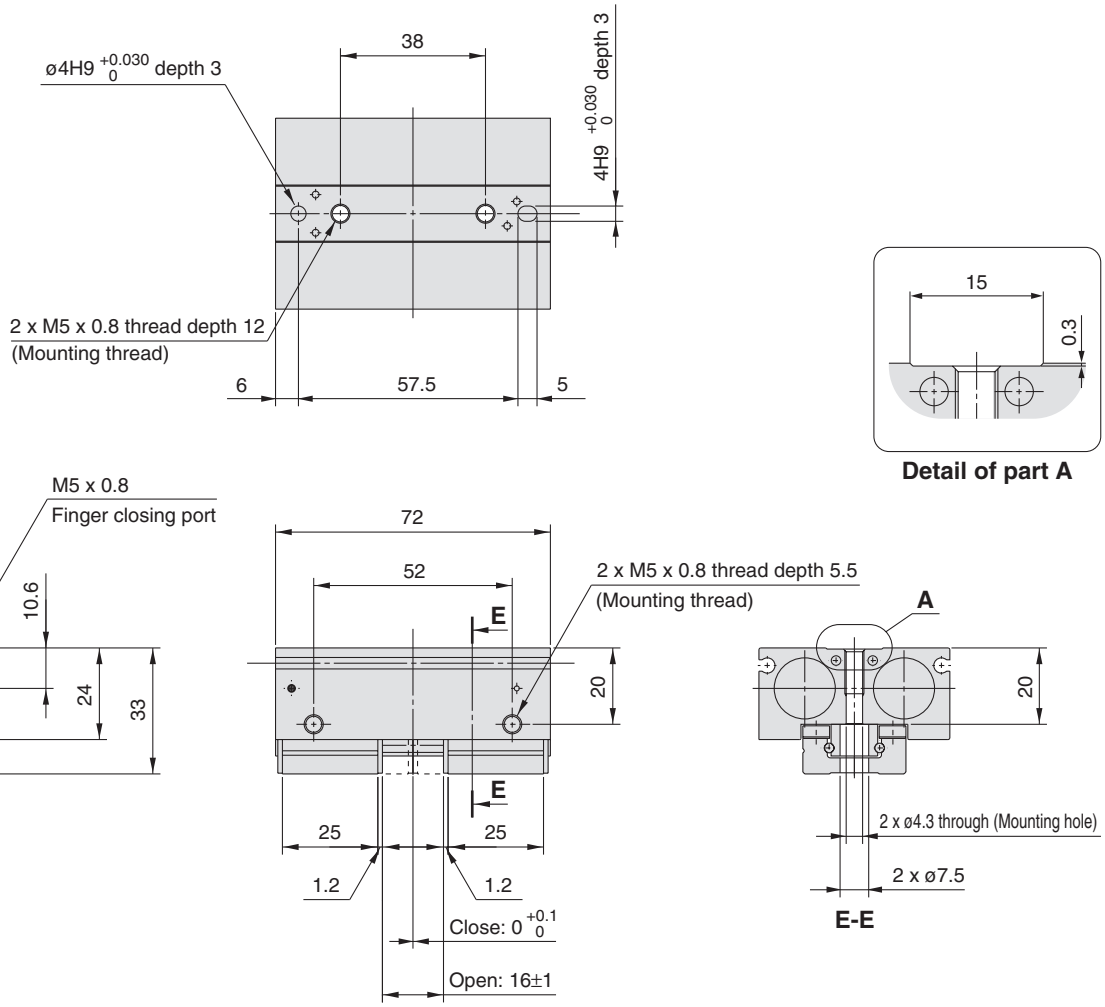
Auto Switch Mounting Groove Dimensions

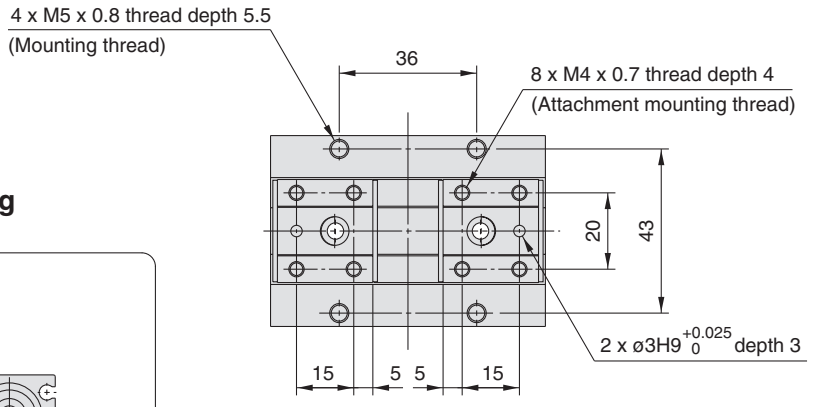




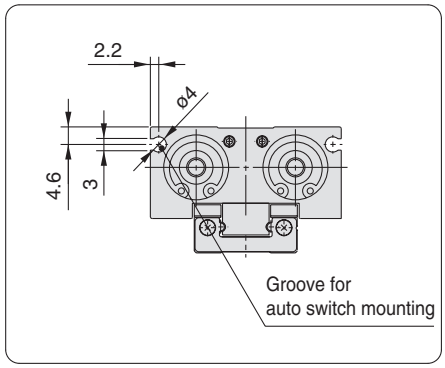
Dimensions

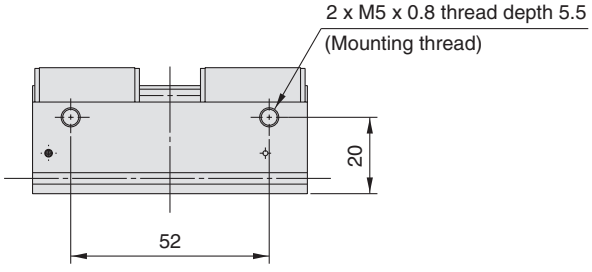
MHF2-16D





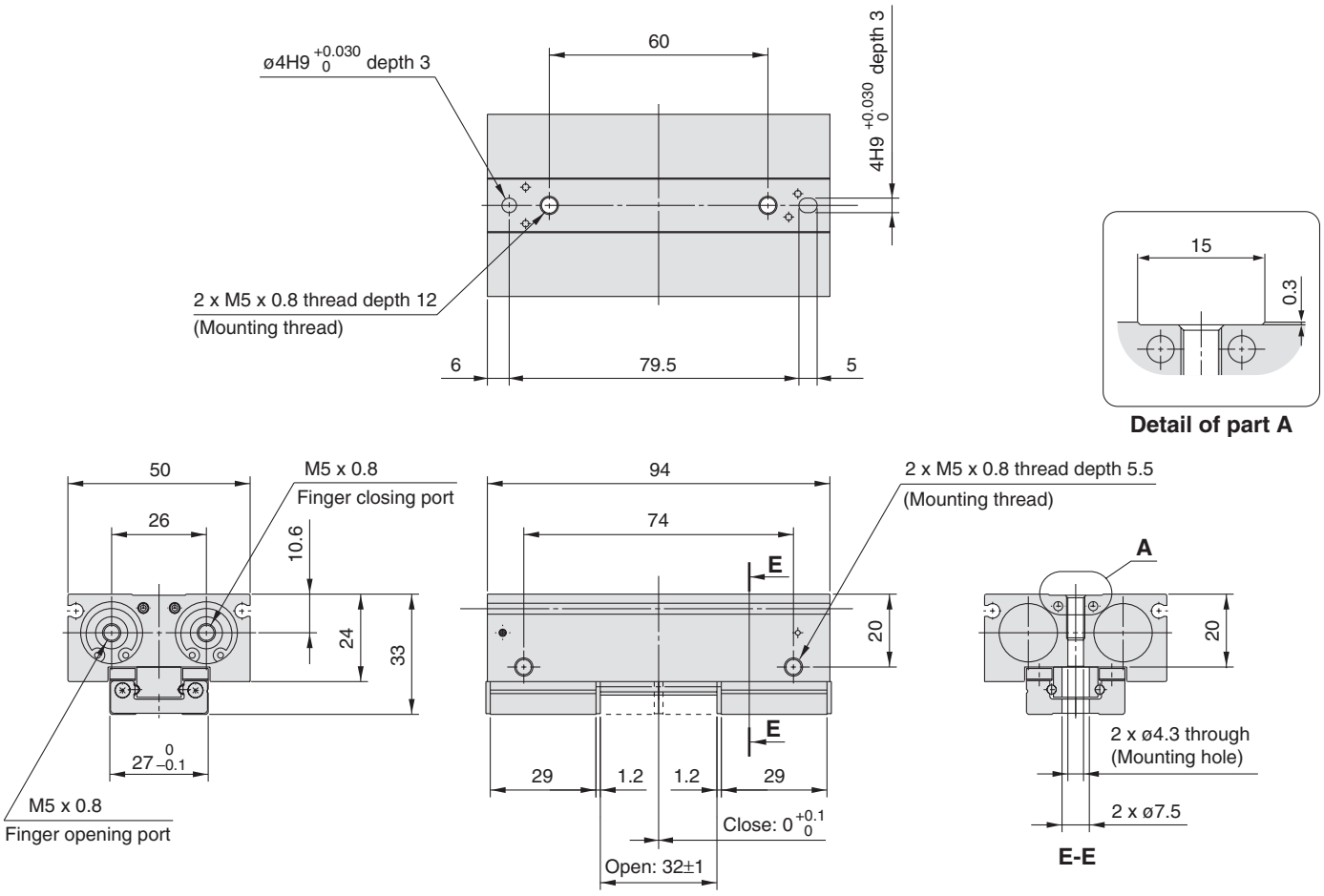
Auto Switch Mounting Groove Dimensions

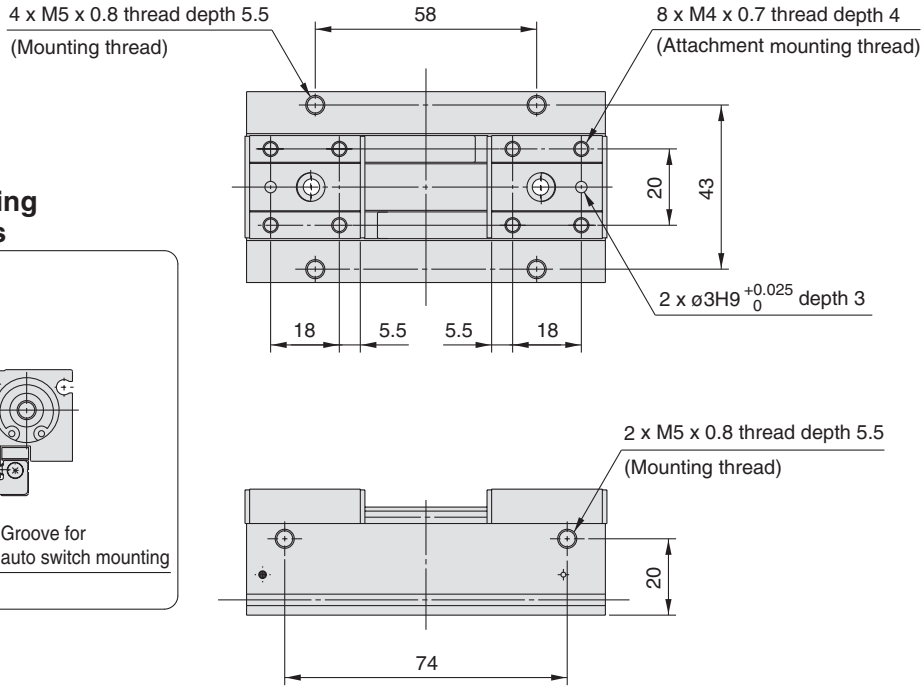




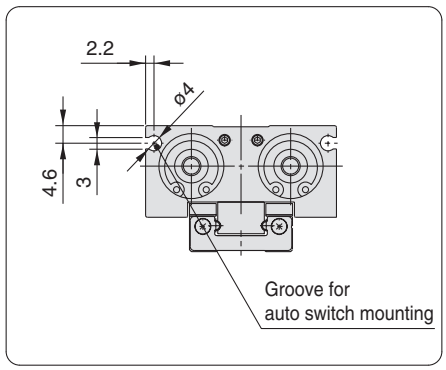
Dimensions

MHF2-16D1



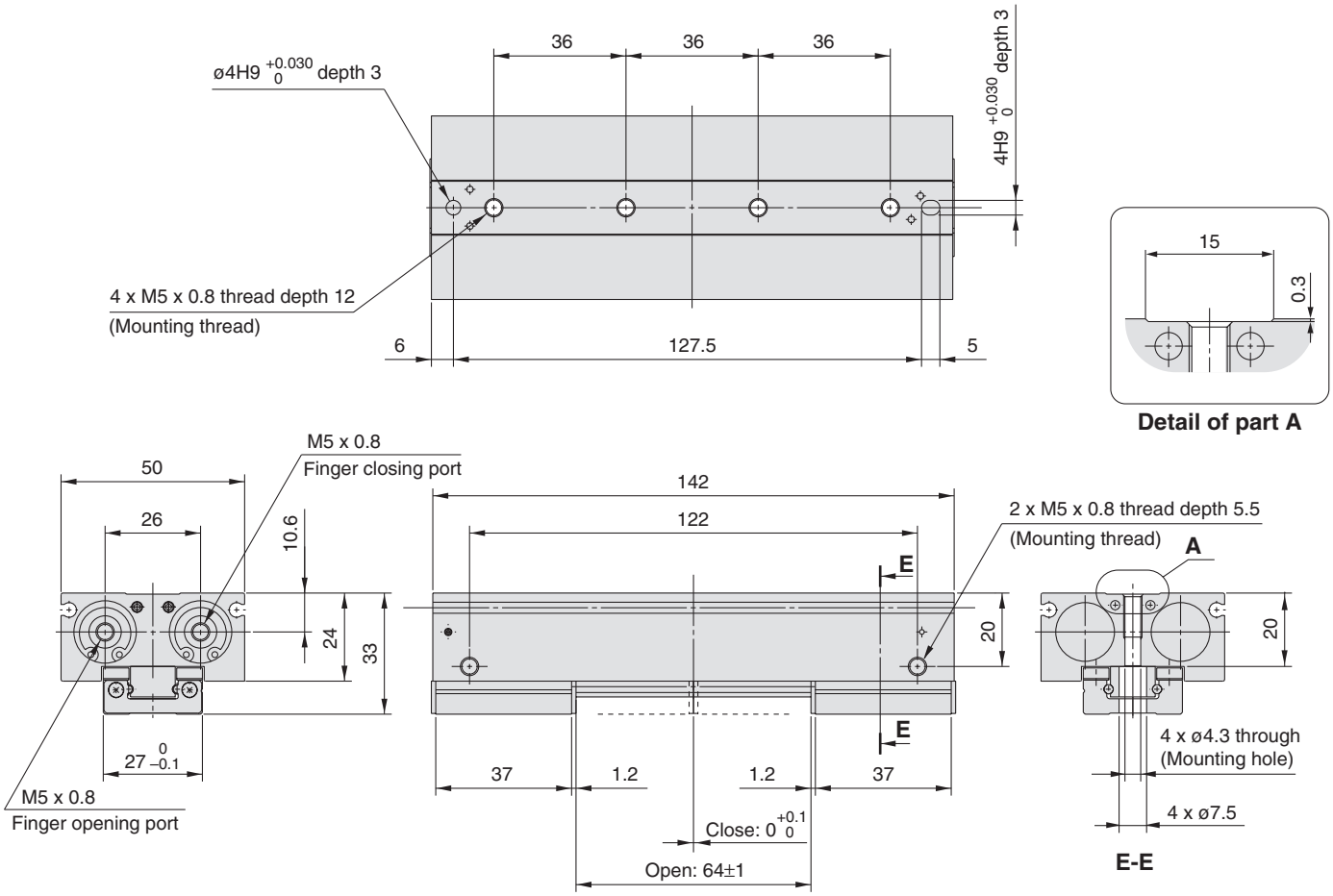


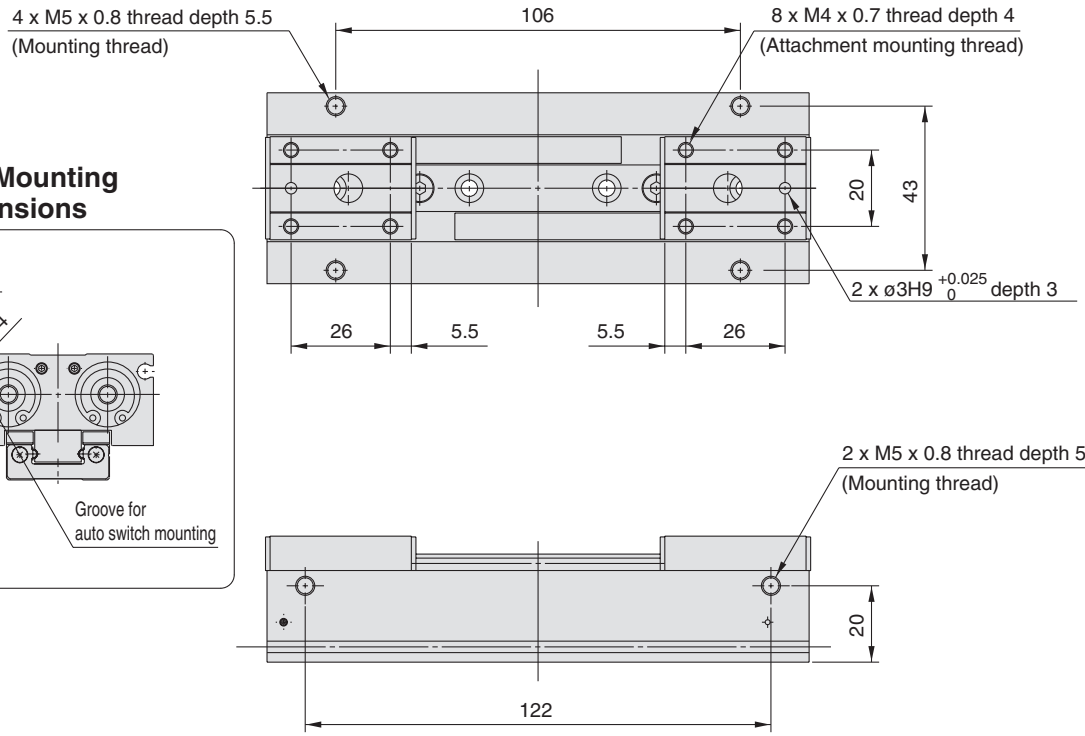
Auto Switch Mounting Groove Dimensions



Dimensions

MHF2-16D2

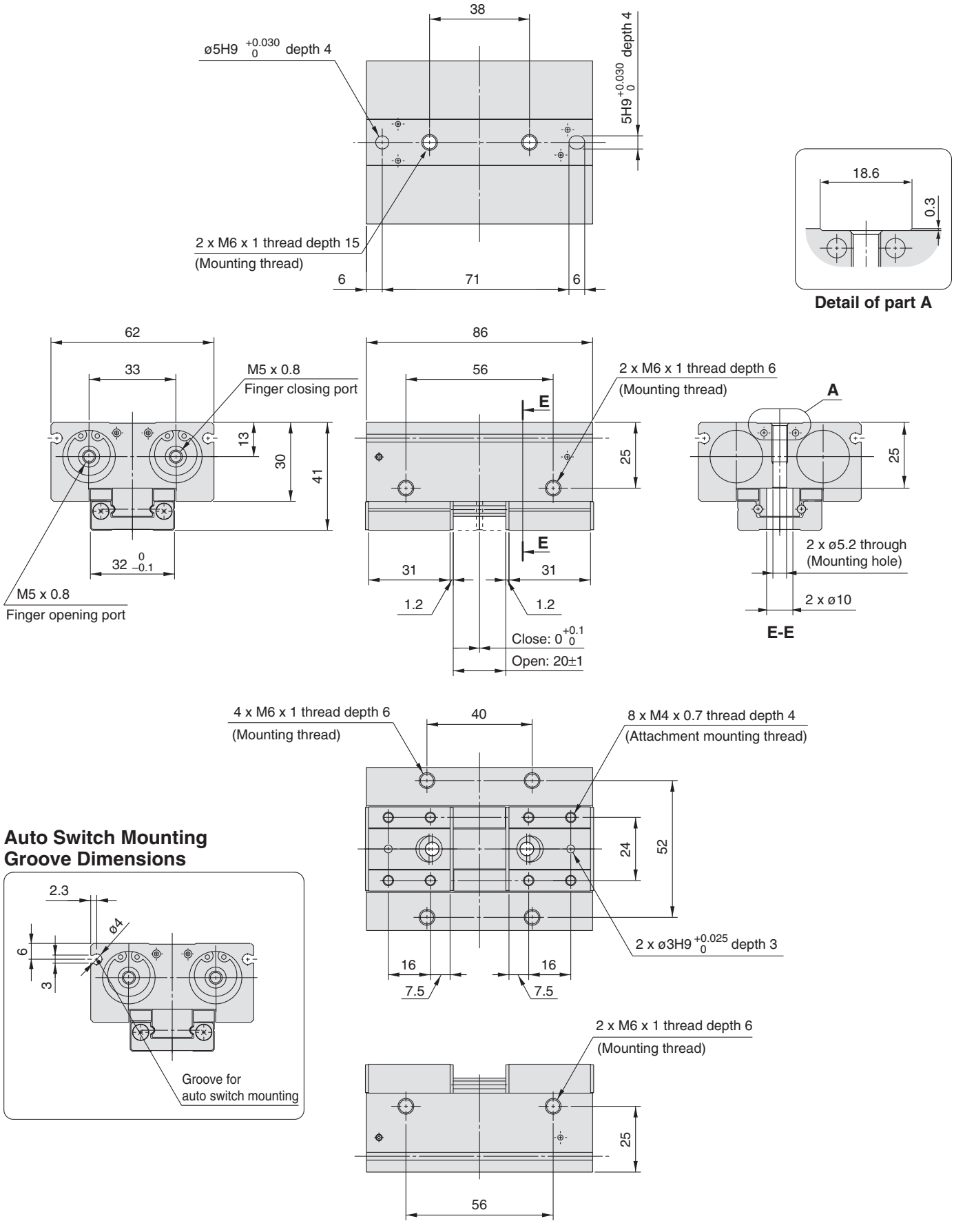




Auto Switch Mounting Groove Dimensions

Dimensions

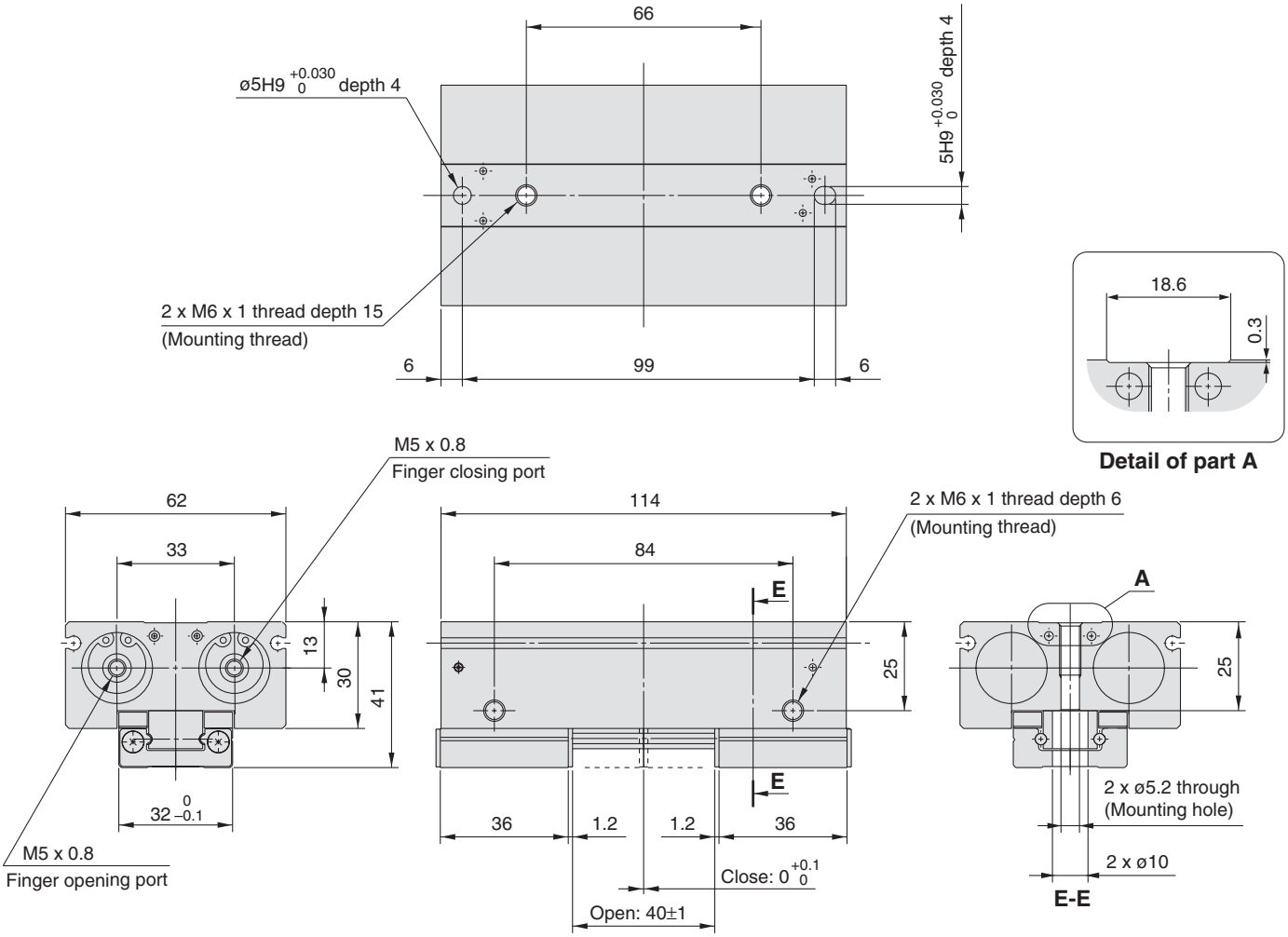
MHF2-20D

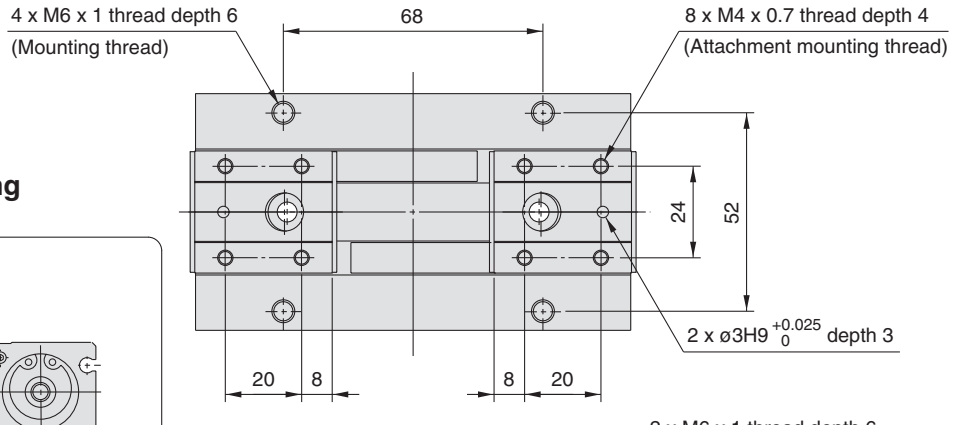


Auto Switch Mounting Groove Dimensions

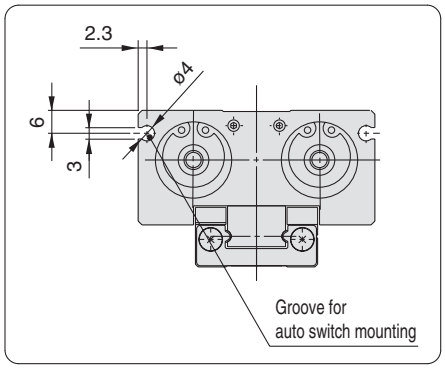
Dimensions

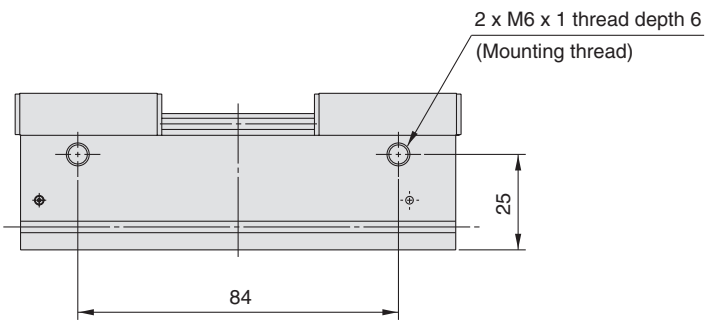
MHF2-20D1





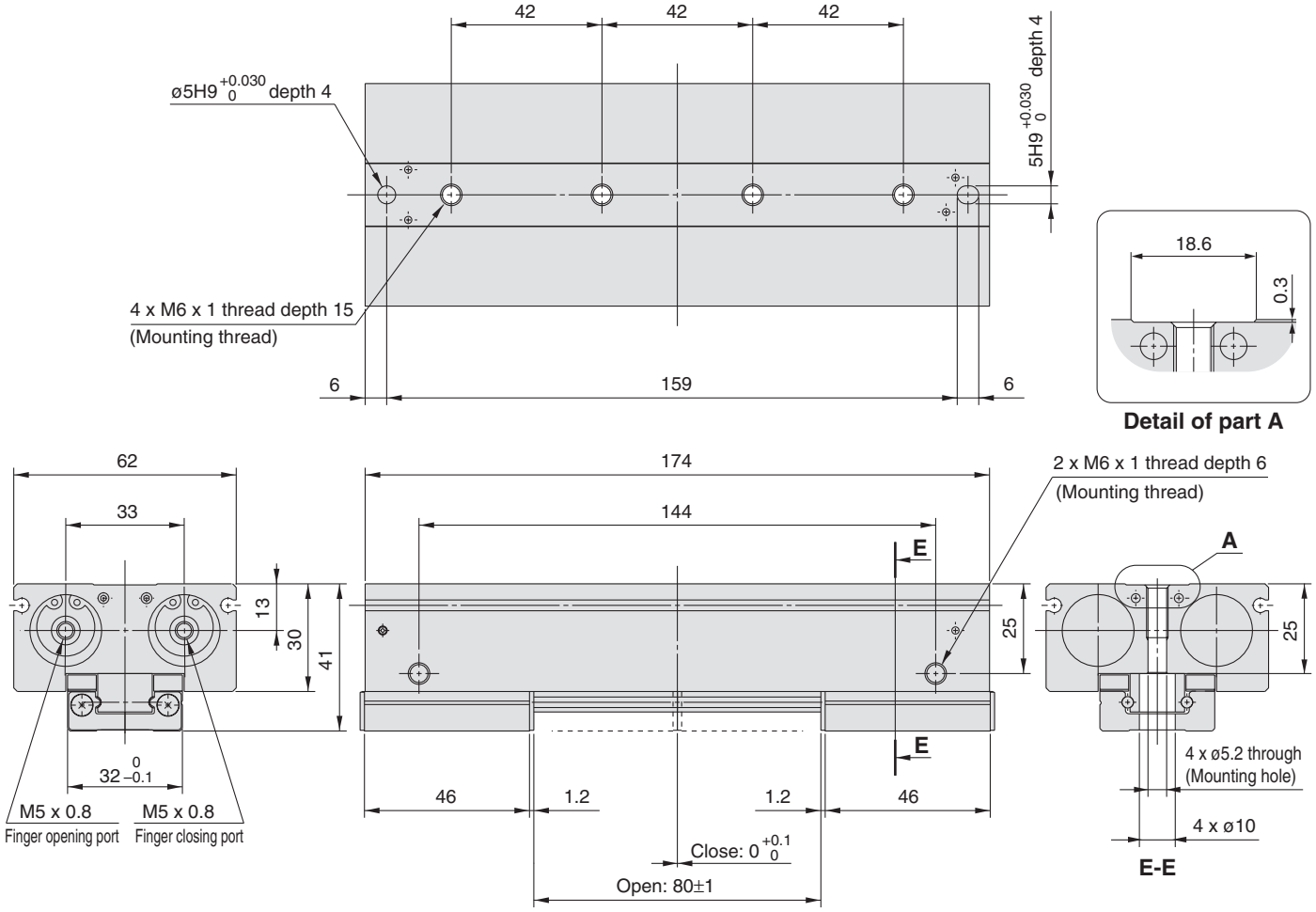
Auto Switch Mounting Groove Dimensions

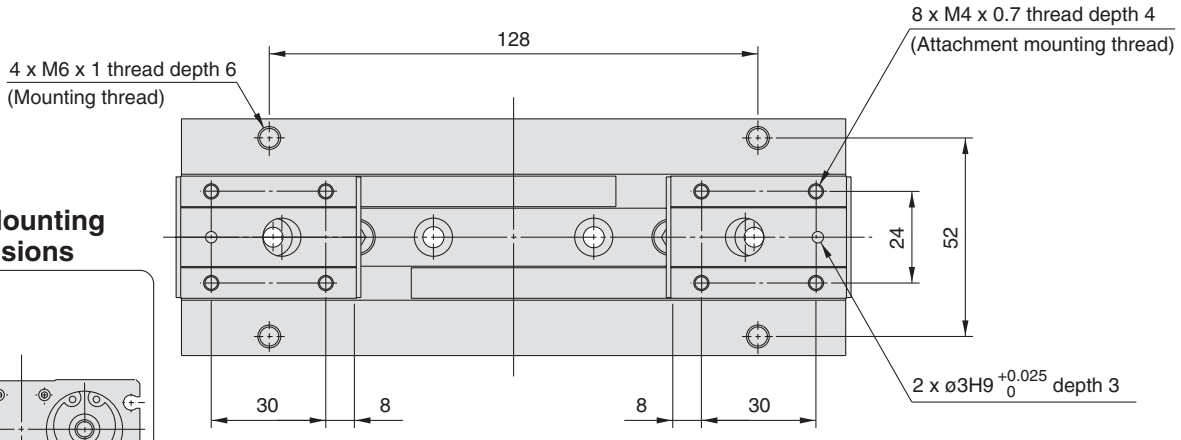




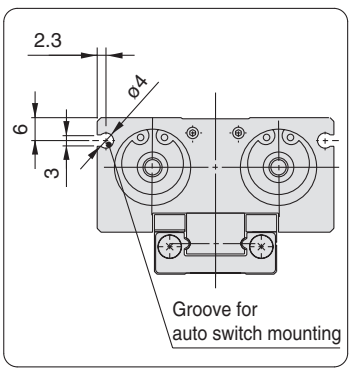
Dimensions

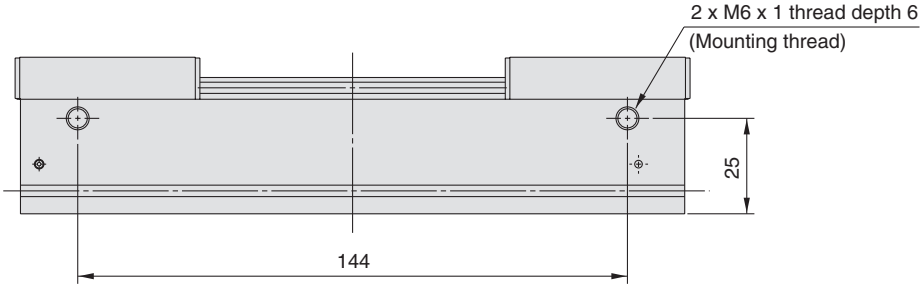
MHF2-20D2





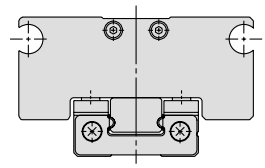
Auto Switch Mounting Groove Dimensions



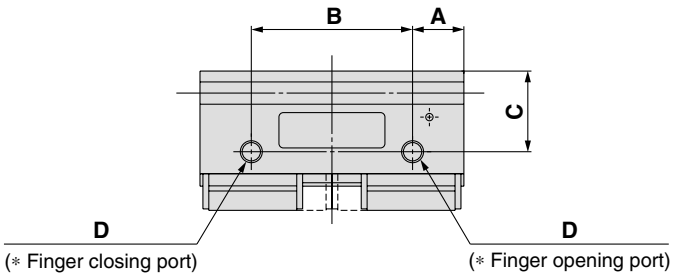


Body Option: Side Piping Type

MHF2-8DR
MHF2-8D1R



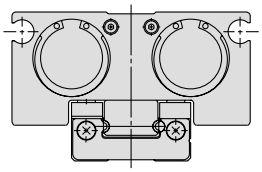
Port side of axial piping type



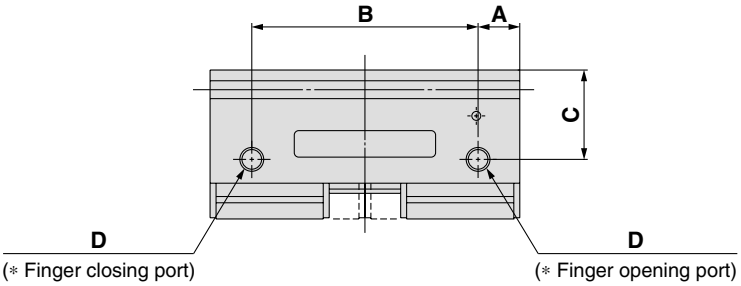
Body Option Dimension (mm)

Model	A	B	C	D
MHF2-8DR	5.5	25	11	M3 x 0.5
MHF2-8D1R		37		

MHF2-8D2R
MHF2-12D□R
MHF2-16D□R
MHF2-20D□R



Port side of axial piping type



Body Option Dimension (mm)

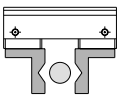
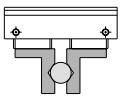
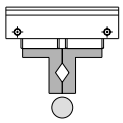
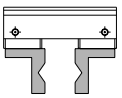
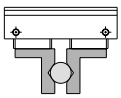
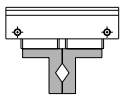
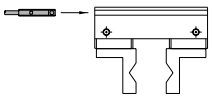
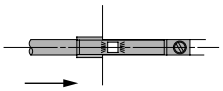
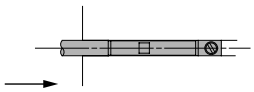
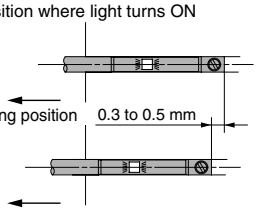
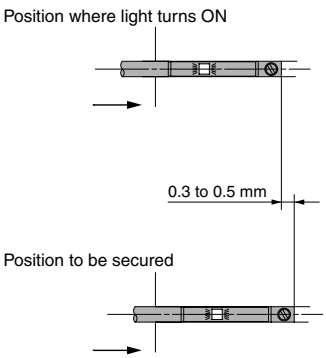
Model	A	B	C	D
MHF2-8D2R	5.5	61	11	M3 x 0.5
MHF2-12DR	7	38	14.8	M5 x 0.8
MHF2-12D1R		54		
MHF2-12D2R		90		
MHF2-16DR	9	54	19	M5 x 0.8
MHF2-16D1R		76		
MHF2-16D2R		124		
MHF2-20DR	10	66	23	M5 x 0.8
MHF2-20D1R		94		
MHF2-20D2R		154		

∗ For dimensions not given above, please refer to the table of dimensions on pages 456 to 467.

Auto Switch Installation Examples and Mounting Positions

Various auto switch applications are possible through different combinations of auto switch quantities and detecting positions.

1) Detection when Gripping Exterior of Workpiece

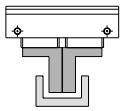
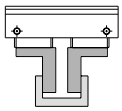
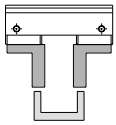
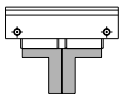
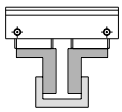
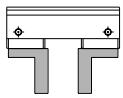
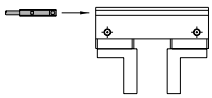
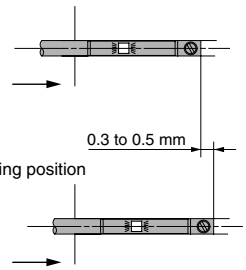
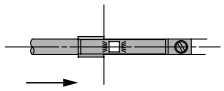
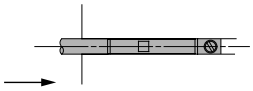
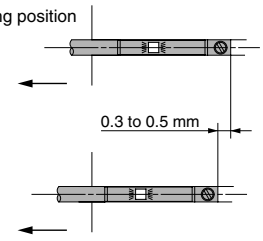
Detection example	1. Confirmation of fingers in reset position	2. Confirmation of workpiece held	3. Confirmation of workpiece released
Position to be detected	Position of fingers fully opened 	Position when gripping workpiece 	Position of fingers fully closed 
Operation of auto switch	Auto switch turned on when fingers return. (Light ON)	Auto switch turned on when gripping a workpiece. (Light ON)	When a workpiece is not held (Abnormal operation): Auto switch to turn ON (Light illuminating)
Detection combinations: One auto switch * One position, any of ①, ②, and ③, can be detected.	●	●	●
Detection combinations: Two auto switches * Two positions of ①, ②, and ③ can be detected. Pattern A	●	●	—
Pattern B	—	●	●
Pattern C	●	—	●
How to determine auto switch installation position	Step 1) Fully open the fingers. 	Step 1) Position fingers for gripping a workpiece. 	Step 1) Fully close the fingers. 
At no pressure or low pressure, connect the auto switch to a power supply, and follow the directions.	Step 2) Insert the auto switch into the auto switch installation groove in the direction shown in the drawing. 		
	Step 3) Slide the auto switch in the direction of the arrow until the indicator light illuminates.  Step 4) Slide the auto switch further in the direction of the arrow until the indicator light goes out.  Step 5) Move the auto switch in the opposite direction and fasten it at a position 0.3 to 0.5 mm beyond the position where the indicator light illuminates. Position where light turns ON 	Step 3) Slide the auto switch in the direction of the arrow until the light illuminates and fasten it at a position 0.3 to 0.5 mm in the direction of the arrow beyond the position where the indicator light illuminates. 	

Note 1) It is recommended that gripping of a workpiece be performed close to the center of the finger stroke.
Note 2) When holding a workpiece close at the end of open/close stroke of fingers, detecting performance of the combinations listed in the above table may be limited, depending on the hysteresis of an auto switch, etc.

Auto Switch Installation Examples and Mounting Positions

Various auto switch applications are possible through different combinations of auto switch quantities and detecting positions.

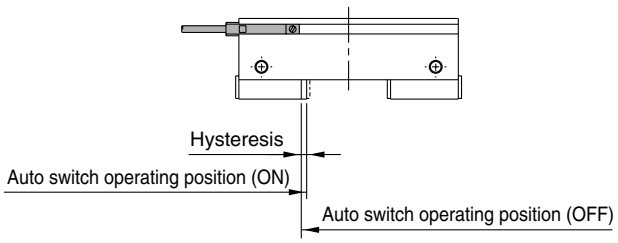
2) Detection when Gripping Interior of Workpiece

Detection example	1. Confirmation of fingers in reset position	2. Confirmation of workpiece held	3. Confirmation of workpiece released
Position to be detected	Position of fingers fully closed 	Position when gripping workpiece 	Position of fingers fully opened 
Operation of auto switch	Auto switch turned on when fingers return. (Light ON)	Auto switch turned on when gripping a workpiece. (Light ON)	When a workpiece is not held (Abnormal operation): Auto switch to turn ON (Light illuminating)
Detection combinations: One auto switch * One position, any of ①, ②, and ③, can be detected.	●	●	●
Detection combinations: Two auto switches * Two positions of ①, ②, and ③ can be detected. — Pattern A	●	●	—
Pattern B	—	●	●
Pattern C	●	—	●
How to determine auto switch installation position	Step 1) Fully close the fingers. 	Step 1) Position fingers for gripping a workpiece. 	Step 1) Fully open the fingers. 
At no pressure or low pressure, connect the auto switch to a power supply, and follow the directions.	Step 2) Insert the auto switch into the auto switch installation groove in the direction shown in the drawing. 		
	Step 3) Slide the auto switch in the direction of the arrow until the light illuminates and fasten it at a position 0.3 to 0.5 mm in the direction of the arrow beyond the position where the indicator light illuminates. 	Step 3) Slide the auto switch in the direction of the arrow until the indicator light illuminates.  Step 4) Slide the auto switch further in the direction of the arrow until the indicator light goes out.  Step 5) Move the auto switch in the opposite direction and fasten it at a position 0.3 to 0.5 mm beyond the position where the indicator light illuminates. 

Note 1) It is recommended that gripping of a workpiece be performed close to the center of the finger stroke.
Note 2) When holding a workpiece close at the end of open/close stroke of fingers, detecting performance of the combinations listed in the above table may be limited, depending on the hysteresis of an auto switch, etc.

Auto Switch Hysteresis

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

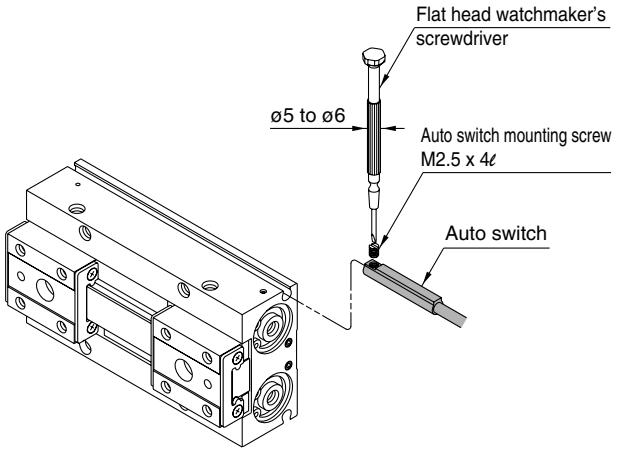


Hysteresis

	D-M9□(V)	D-M9□W(V)	
		Red ON	Green ON
MHF2-8D□	0.2	0.2	0.4
MHF2-12D□	0.3	0.3	0.6
MHF2-16D□	0.2	0.2	0.4
MHF2-20D□	0.5	0.5	1.0

Auto Switch Mounting

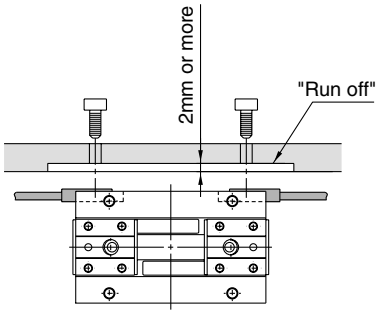
Insert the auto switch into the auto switch mounting groove in the air chuck in the direction shown below, and after setting the mounting position, tighten the attached switch mounting screw with a flat head watchmaker's screwdriver.



Note) Use a watchmaker's 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 0.15 N·m.

⚠Caution

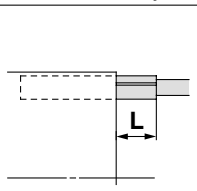
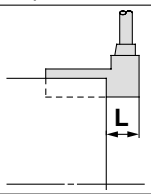
When using an auto switch on the mounting plate side, the switch will protrude from the end face as shown below. Please provide a run off space of 2 mm or more on the mounting plate.



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 / Illustration / Auto switch / Finger position / Model		In-line entry	Perpendicular entry
			
		D-M9□ D-M9□W	**D-M9□V D-M9□WV**
MHF2-8D	Open	6.5	4.5
	Close	6.5	4.5
MHF2-8D1	Open	6.5	4.5
	Close	6.5	4.5
MHF2-8D2	Open	0.5	—
	Close	0.5	—
MHF2-12D	Open	3	1
	Close	3	1
MHF2-12D1	Open	1	—
	Close	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
-X□
MRHQ
MA
D-□

Specific Product Precautions

Be sure to read before handling.

Mounting

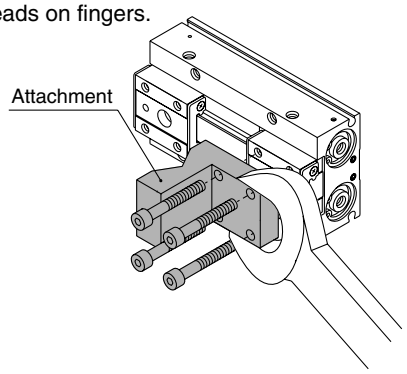
⚠Warning

1. Do not scratch or dent the air gripper by dropping or bumping it when mounting.
Slight deformation can cause inaccuracy or a malfunction.

2. Tighten the screw within the specified torque range when mounting the attachment.
Tightening with a torque above the limit can cause malfunction, while insufficient tightening can cause slippage and dropping.

How to Mount Attachment to the Finger

Make sure to mount the attachments on fingers with the tightening torque in the table below by using bolts, etc., for the female threads on fingers.

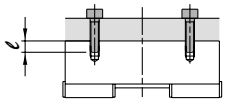


Model	Bolt	Max. tightening torque N·m
MHF2-8D□	M2.5 x 0.45	0.36
MHF2-12D□	M3 x 0.5	0.63
MHF2-16D□	M4 x 0.7	1.5
MHF2-20D□	M4 x 0.7	1.5

3. Tighten the screw within the specified torque range when mounting the air gripper.
Tightening with a torque above the limit can cause malfunction, while insufficient tightening can cause slippage and dropping.

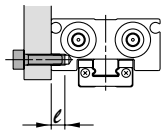
How to Mount Air Grippers

Top mounting (Body tapped)



Model	Bolt	Max. tightening torque N·m	Max. screw-in depth ℓ mm
MHF2-8D	M3 x 0.5	0.95	7
MHF2-12D	M4 x 0.7	2.2	10
MHF2-16D	M5 x 0.8	4.5	12
MHF2-20D	M6 x 1	7.8	15

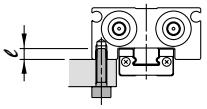
Lateral mounting (Body tapped)



Model	Bolt	Max. tightening torque N·m	Max. screw-in depth ℓ mm
MHF2-8D	M3 x 0.5	0.63	4
MHF2-12D	M4 x 0.7	1.5	5
MHF2-16D	M5 x 0.8	3	5.5
MHF2-20D	M6 x 1	5.2	6

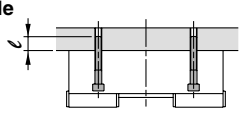
Bottom mounting (Body tapped, body through-hole)

● **Body tapped**



Model	Bolt	Max. tightening torque N·m	Max. screw-in depth ℓ mm
MHF2-8D	M3 x 0.5	0.63	4
MHF2-12D	M4 x 0.7	1.5	5
MHF2-16D	M5 x 0.8	3	5.5
MHF2-20D	M6 x 1	5.2	6

● **Body through-hole**



Model	Bolt	Max. tightening torque N·m	Screw-in depth ℓ mm
MHF2-8D	M2.5 x 0.45*	0.36	4
MHF2-12D	M3 x 0.5*	0.63	5.2
MHF2-16D	M4 x 0.7	1.5	—
MHF2-20D	M5 x 0.8	3	—

* When MHF2-8D□ and MHF2-12D□ are mounted body through-hole, use the attached special bolts.

Operating Environment

⚠Caution

Use caution for the anti-corrosiveness of the linear guide section.
Martensitic stainless steel is used for the finger guide rail, so make sure that anti-corrosiveness is inferior to the austenitic stainless steel. In particular, watch for rust in environments where waterdrops are likely to adhere due to condensation.

SMC Information

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http://www.smcworld.com

11-E572
D-DN Printing PW 7850SZ

Low Profile Air Gripper
With An Adjustable Opening/Closed Finger Positioning
Series MHF2-X83□□
ø8, ø12, ø16, ø20

■Stroke can be adjusted to suit the workpiece
The basic stroke setting is available and it makes the operating time reduced.

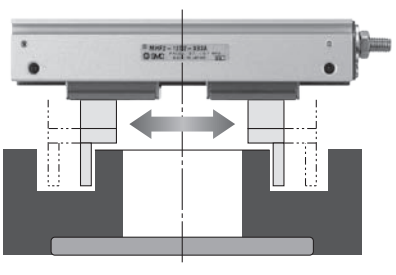
■3 types of opening/closed finger stroke adjustments
- Applicable when outside or inside of the installation location is limited.
- Adjustable finger opening/closed position type
- Adjustable finger opening position type
- Adjustable finger closed position type

■Various strokes
- Standardized 3 stroke types and 2 stroke adjustment types for fine tuning.

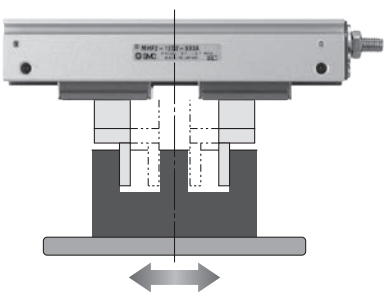
Bore size (mm)	Short stroke		Medium stroke		Long stroke	
	Full stroke	Stroke adjustable width	Full stroke	Stroke adjustable width	Full stroke	Stroke adjustable width
ø8	8 mm	Short Adjuster **4** mm Long Adjuster **8** mm	16 mm	Short Adjuster **6** mm Long Adjuster **10** mm	32 mm	Short Adjuster **12** mm Long Adjuster **22** mm
ø12	12 mm	Short Adjuster **8** mm Long Adjuster **12** mm	24 mm	Short Adjuster **8** mm Long Adjuster **14** mm	48 mm	Short Adjuster **18** mm Long Adjuster **28** mm
ø16	16 mm	Short Adjuster **10** mm Long Adjuster **14** mm	32 mm	Short Adjuster **8** mm Long Adjuster **18** mm	64 mm	Short Adjuster **16** mm Long Adjuster **36** mm
ø20	20 mm	Short Adjuster **8** mm Long Adjuster **18** mm	40 mm	Short Adjuster **10** mm Long Adjuster **20** mm	80 mm	Short Adjuster **20** mm Long Adjuster **40** mm

<Application Examples>

- Travel distance is adjustable when clamping exterior of workpiece.
- Applicable when the external diameter of workpiece is larger.
- Applicable when exterior is limited.



- Travel distance is adjustable when clamping interior of workpiece.
- Applicable when the internal diameter of workpiece is smaller.
- Applicable when the center is limited.



Low Profile Air Gripper
With An Adjustable Opening/Closed Finger Positioning
Series MHF2-X83□□
ø8, ø12, ø16, ø20

How to Order

MHF 2 – 12 D □ □ – M9BW □ – X83 A 2

Number of fingers

2	2 fingers

Bore size (mm)

8	8
12	12
16	16
20	20

Action

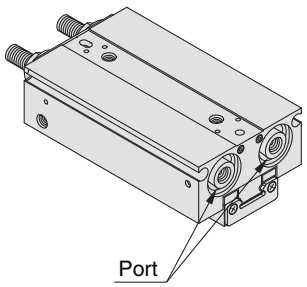
D	Double acting

Stroke

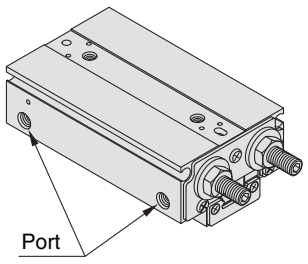
Nil	Short stroke
1	Medium stroke
2	Long stroke

Body option

Nil: Axial piping type



R: Side piping type



Auto switch

Nil	Without auto switch (Built-in magnet)

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	n pcs.

With an adjustable opening/closed finger positioning

Stroke adjustable side

A	Both sides
B	Opening side
C	Closed side

Stroke adjustable width

1	Short Adjuster
2	Long Adjuster

Applicable Auto Switches
/Refer to pages 761 to 809 in Best Pneumatics No. 4 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage			Auto switch model		Lead wire length (m)*				Pre-wired connector	Applicable load	
					DC		AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)			
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V,12 V	—	M9NV	M9N	●	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				M9PV	M9P	●	●	●	○	○		
				2-wire		12 V		M9BV	M9B	●	●	●	○	○	—	
	Diagnostic indication (2-color indication)			3-wire (NPN)		5 V,12 V		M9NWV	M9NW	●	●	●	○	○	IC circuit	
				3-wire (PNP)				M9PWV	M9PW	●	●	●	○	○		
				2-wire		12 V		M9BWV	M9BW	●	●	●	○	○	—	

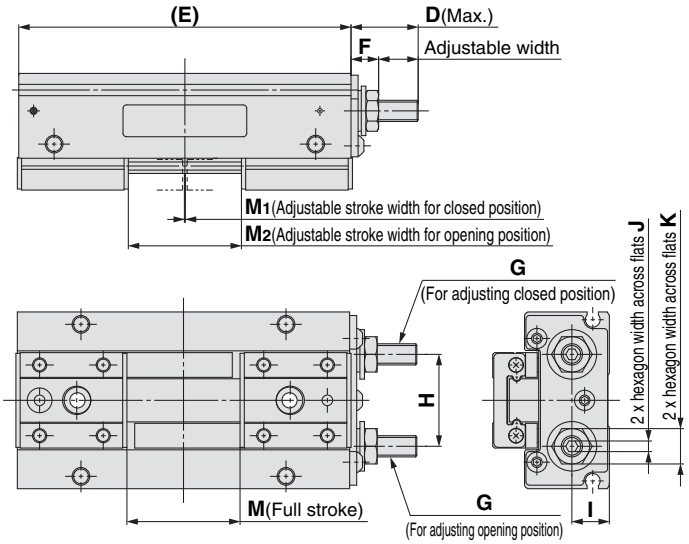
∗Lead wire length symbols: 0.5 m ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

∗Solid state auto switches marked with a "○" symbol are produced upon receipt of order.

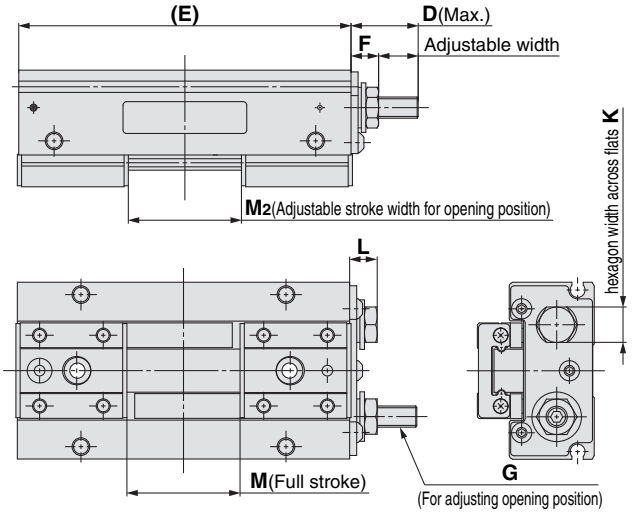
Note) For 2-color indication type, use caution on hysteresis. Refer to page 471 in Best Pneumatics No. 4, "Auto Switch Hysteresis" prior to use.

Dimensions(The dimensions below are the same as the standard type.)

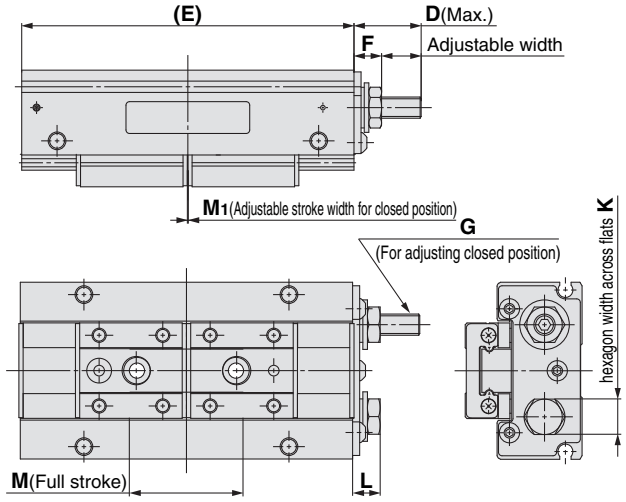
Adjustable finger opening/closed position type/MHF2-□-X83A1 X83A2



Adjustable finger opening position type/MHF2-□-X83B1 X83B2



Adjustable finger closed position type/MHF2-□-X83C1 X83C2



Dimensions(□ in the table below indicates the symbol for stroke adjustable side (**A**: Adjustable finger opening/closed position type, **B**: Adjustable finger opening position type, or **C**: Adjustable finger closed position type).) (mm)

Model		A: Adjustable finger opening/closed position type		B: Adjustable finger opening position type		C: Adjustable finger closed position type		D	(E)	F	G	H	I	J	K	L	M
		M_1	M_2	M_1	M_2	M_1	M_2										
MHF2-8D□	-X83□1	0 to 4	4 to 8	—	4 to 8	0 to 4	—	9	36	5	M4 x 0.7	15.8	5.9	2	7	4.6	8
	-X83□2	0 to 8	0 to 8	—	0 to 8	0 to 8	—	12									
MHF2-8D1□	-X83□1	0 to 6	10 to 16	—	10 to 16	0 to 6	—	10	48								16
	-X83□2	0 to 10	6 to 16	—	6 to 16	0 to 10	—	12									
MHF2-8D2□	-X83□1	0 to 12	20 to 32	—	20 to 32	0 to 12	—	13	72								32
	-X83□2	0 to 22	10 to 32	—	10 to 32	0 to 22	—	18									
MHF2-12D□	-X83□1	0 to 8	4 to 12	—	4 to 12	0 to 8	—	12	52	5.9	M5 x 0.8	20	7.7	2.5	8	5.4	12
	-X83□2	0 to 12	0 to 12	—	0 to 12	0 to 12	—	14									
MHF2-12D1□	-X83□1	0 to 8	16 to 24	—	16 to 24	0 to 8	—	12	68								24
	-X83□2	0 to 14	10 to 24	—	10 to 24	0 to 14	—	15									
MHF2-12D2□	-X83□1	0 to 18	30 to 48	—	30 to 48	0 to 18	—	18	104								48
	-X83□2	0 to 28	20 to 48	—	20 to 48	0 to 28	—	23									
MHF2-16D□	-X83□1	0 to 10	6 to 16	—	6 to 16	0 to 10	—	15	72	7.8	M6 x 1	26	10.6	3	10	7.4	16
	-X83□2	0 to 14	2 to 16	—	2 to 16	0 to 14	—	17									
MHF2-16D1□	-X83□1	0 to 8	24 to 32	—	24 to 32	0 to 8	—	14	94								32
	-X83□2	0 to 18	14 to 32	—	14 to 32	0 to 18	—	19									
MHF2-16D2□	-X83□1	0 to 16	48 to 64	—	48 to 64	0 to 16	—	18	142								64
	-X83□2	0 to 36	28 to 64	—	28 to 64	0 to 36	—	28									
MHF2-20D□	-X83□1	0 to 8	12 to 20	—	12 to 20	0 to 8	—	18	86	10.2	M8 x 1.25	33	13	4	13	9.9	20
	-X83□2	0 to 18	2 to 20	—	2 to 20	0 to 18	—	23									
MHF2-20D1□	-X83□1	0 to 10	30 to 40	—	30 to 40	0 to 10	—	18	114								40
	-X83□2	0 to 20	20 to 40	—	20 to 40	0 to 20	—	23									
MHF2-20D2□	-X83□1	0 to 20	60 to 80	—	60 to 80	0 to 20	—	23	174								80
	-X83□2	0 to 40	40 to 80	—	40 to 80	0 to 40	—	33									

Finger Opening/Closed Stroke Adjustment Specifications

(mm)

Model		Full stroke	Adjustable stroke width	A: Adjustable finger opening/closed position type		B: Adjustable finger opening position type	C: Adjustable finger closed position type
				Adjustable stroke width		Adjustable stroke width for opening position	Adjustable stroke width for closed position
				Closed position	Opening position		
MHF2-8D□	Short Adjuster (**-X83□1**)	8	4	0 to 4	4 to 8	4 to 8	0 to 4
	Long Adjuster (**-X83□2**)		8	0 to 8	0 to 8	0 to 8	0 to 8
MHF2-8D1□	Short Adjuster (**-X83□1**)	16	6	0 to 6	10 to 16	10 to 16	0 to 6
	Long Adjuster (**-X83□2**)		10	0 to 10	6 to 16	6 to 16	0 to 10
MHF2-8D2□	Short Adjuster (**-X83□1**)	32	12	0 to 12	20 to 32	20 to 32	0 to 12
	Long Adjuster (**-X83□2**)		22	0 to 22	10 to 32	10 to 32	0 to 22
MHF2-12D□	Short Adjuster (**-X83□1**)	12	8	0 to 8	4 to 12	4 to 12	0 to 8
	Long Adjuster (**-X83□2**)		12	0 to 12	0 to 12	0 to 12	0 to 12
MHF2-12D1□	Short Adjuster (**-X83□1**)	24	8	0 to 8	16 to 24	16 to 24	0 to 8
	Long Adjuster (**-X83□2**)		14	0 to 14	10 to 24	10 to 24	0 to 14
MHF2-12D2□	Short Adjuster (**-X83□1**)	48	18	0 to 18	30 to 48	30 to 48	0 to 18
	Long Adjuster (**-X83□2**)		28	0 to 28	20 to 48	20 to 48	0 to 28
MHF2-16D□	Short Adjuster (**-X83□1**)	16	10	0 to 10	6 to 16	6 to 16	0 to 10
	Long Adjuster (**-X83□2**)		14	0 to 14	2 to 16	2 to 16	0 to 14
MHF2-16D1□	Short Adjuster (**-X83□1**)	32	8	0 to 8	24 to 32	24 to 32	0 to 8
	Long Adjuster (**-X83□2**)		18	0 to 18	14 to 32	14 to 32	0 to 18
MHF2-16D2□	Short Adjuster (**-X83□1**)	64	16	0 to 16	48 to 64	48 to 64	0 to 16
	Long Adjuster (**-X83□2**)		36	0 to 36	28 to 64	28 to 64	0 to 36
MHF2-20D□	Short Adjuster (**-X83□1**)	20	8	0 to 8	12 to 20	12 to 20	0 to 8
	Long Adjuster (**-X83□2**)		18	0 to 18	2 to 20	2 to 20	0 to 18
MHF2-20D1□	Short Adjuster (**-X83□1**)	40	10	0 to 10	30 to 40	30 to 40	0 to 10
	Long Adjuster (**-X83□2**)		20	0 to 20	20 to 40	20 to 40	0 to 20
MHF2-20D2□	Short Adjuster(**-X83□1**)	80	20	0 to 20	60 to 80	60 to 80	0 to 20
	Long Adjuster (**-X83□2**)		40	0 to 40	40 to 80	40 to 80	0 to 40

Note) Specifications and details other than above are the same as standard type.

How to Adjust Finger Stroke

After adjusting the opening/closed width adjustment thread, tighten the nut to fix.

Nut tightening torque

Part no.	Thread size	Tightening torque N·m
MHF2-8D□-X83□□	M4 x 0.7	1.5
MHF2-8D□R-X83□□		
MHF2-12D□-X83□□	M5 x 0.8	3.0
MHF2-12D□R-X83□□		
MHF2-16D□-X83□□	M6 x 1.0	5.2
MHF2-16D□R-X83□□		
MHF2-20D□-X83□□	M8 x 1.25	12.5
MHF2-20D□R-X83□□		

⚠ Warning

1. Adjust the stroke adjustment screw within the adjustable width.

If you adjust the adjustment screw beyond the maximum value, the adjustment screw may fall out and may cause damage to human bodies or equipment/devices.

2. Do not adjust stroke when air pressure is applied to the adjustment screw side.

If air pressure is applied to the adjustment screw, the adjustment screw may fall out in some adjustment statuses. When applying pressure, make sure the adjustment screw is tightened enough.