CAT.ES20-166 Ⓐ -UK

SMC

Low Profile Air Gripper

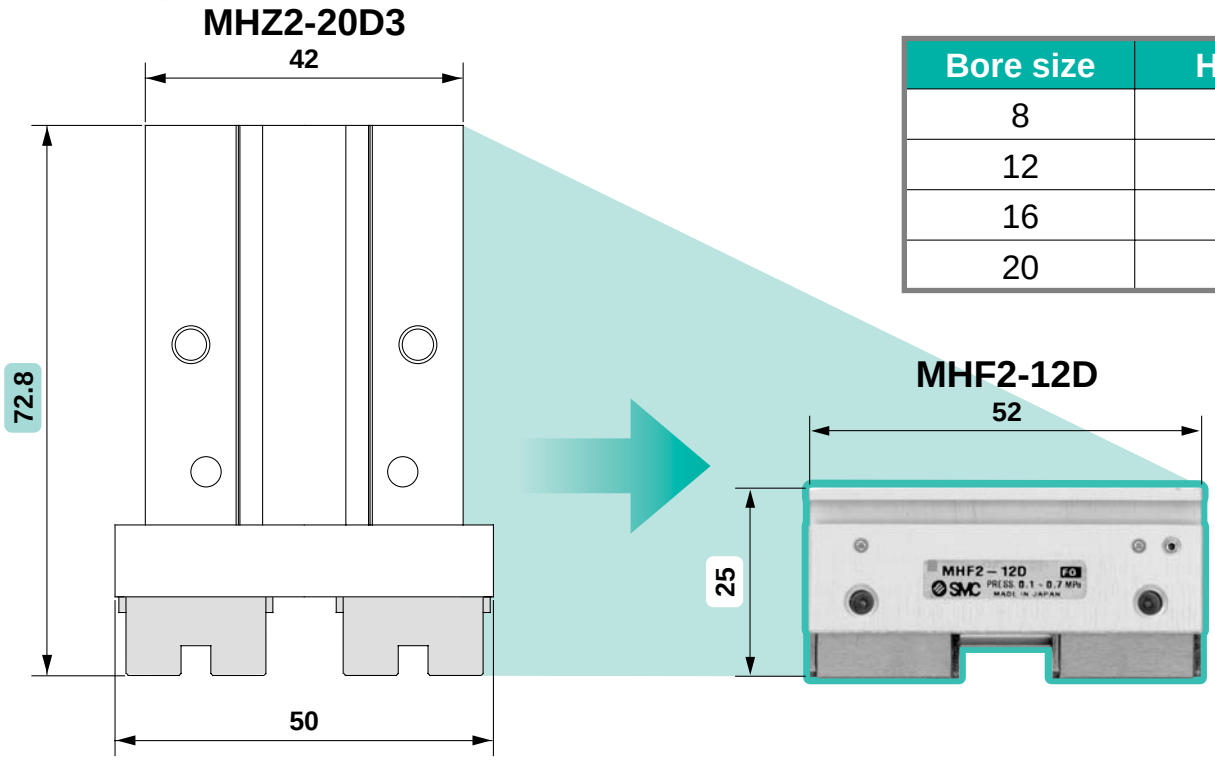
Series MHF2

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

Low Profile Air Gripper

Series MHF2

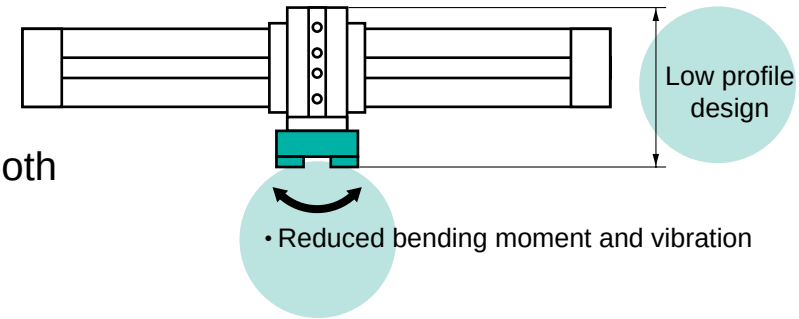
Height is approximately 1/3 the size of an equivalent Series MHZ2.



(mm)

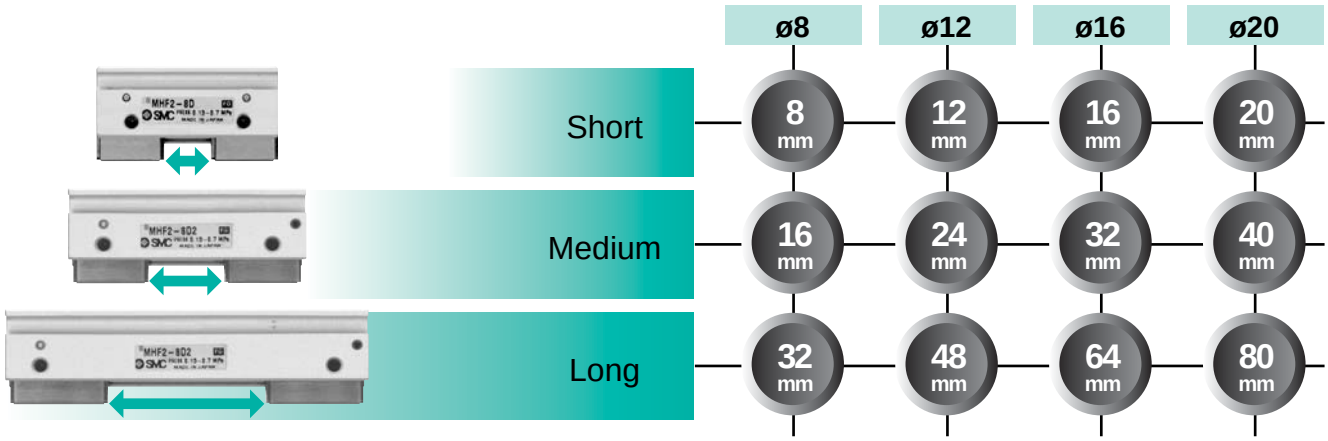
Bore size	Height
8	19
12	25
16	33
20	41

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



Stroke selection is available.

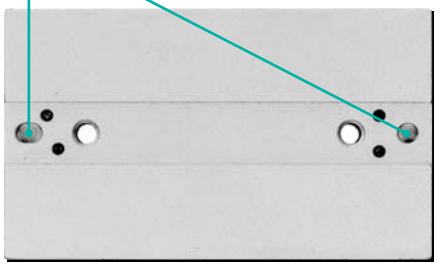
3 standard stroke lengths are available for each bore size.
Stroke can be selected to suit the work piece.



SMC

Improved mounting repeatability

With positioning pin holes



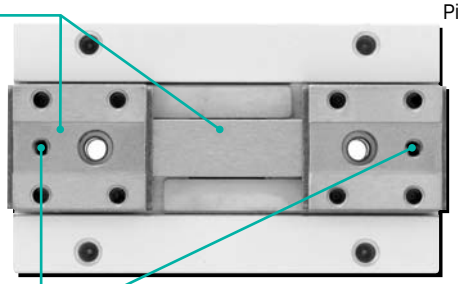
Auto switches can be mounted on both sides.

Piping is available from 2 directions

Piping port position can be specified using a part number.

Linear guide provides:

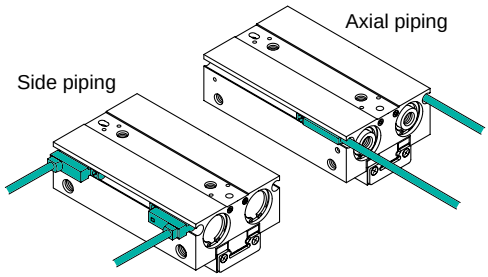
High precision and high rigidity with martensitic stainless steel



Easy positioning for mounting attachments

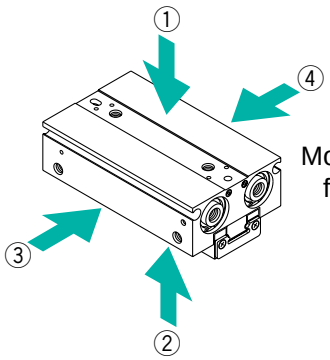
With positioning pin holes

Centralized wiring and piping are possible.

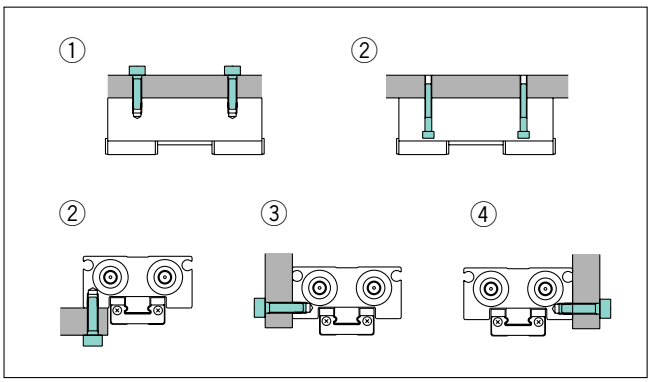


High degree of mounting flexibility

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

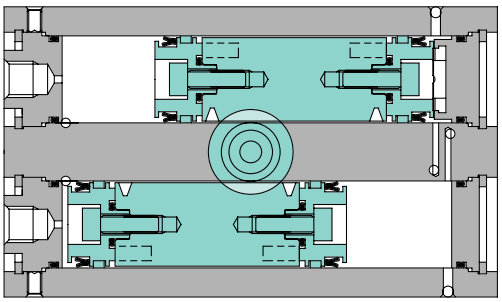


Mounting is possible from 4 directions.



Strong holding force

Double piston construction achieves compact design with strong holding force.



Model	Bore size	Holding 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

Work piece weight: **0.15kg**

Gripping method: External gripping

Model selection criteria with respect to work piece weight

- Although differences will exist depending on factors such as shape and the coefficient of friction between attachments and work pieces, select a model which will provide a gripping force 10 to 20 times the weight of the work piece.
  (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

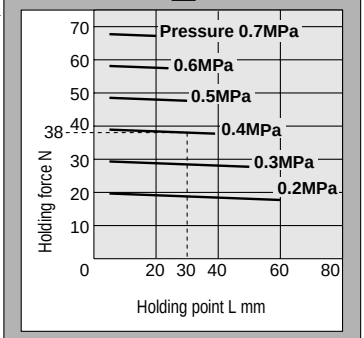
When it is desired to set the gripping force at 20 times or more the work piece weight.

Required griping force = 0.15 kg x 20 x 9.8 m/s² = Approx. 29.4N or more

Length of gripping point : **30mm**

Operating pressure : **0.4MPa**

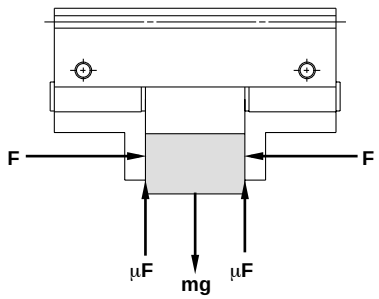
MHF2-12D□



Selecting the MHF2-12D

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

Model selection illustration



Gripping force at least 10 to 20 times the work piece weight

The "10 to 20 times or more of the work piece 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 work piece weight	↑ 20 x work piece weight

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

F : Gripping force (N)

μ : Coefficient of friction between attachments and work piece

m : Work piece mass (kg)

g : Gravitational acceleration (= 9.8m/s²)

mg : Work piece weight (N)

the conditions under which the work piece will not drop are

$$\underset{\text{Number of fingers}}{2}\mu F > mg$$

and therefore,

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

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

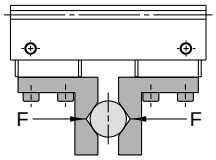
$$F = \frac{mg}{2 \times \mu} \times a$$

(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 work piece weight.

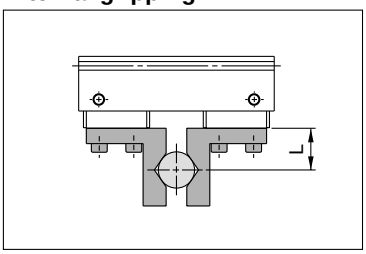
· If is necessary to allow a greater safety margin for high accelerations and strong impacts, etc.

Step 1 Effective gripping force: Series MHF2

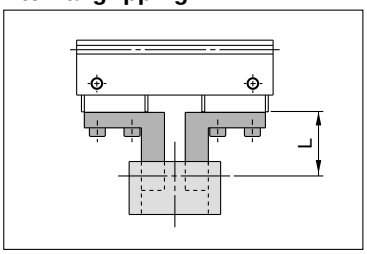
•Expressing the effective gripping force
The effective gripping force shown in the graphs to the right is expressed as F, which is the thrust of one finger when both fingers and attachments are in full contact with the work piece as shown in the figure below.



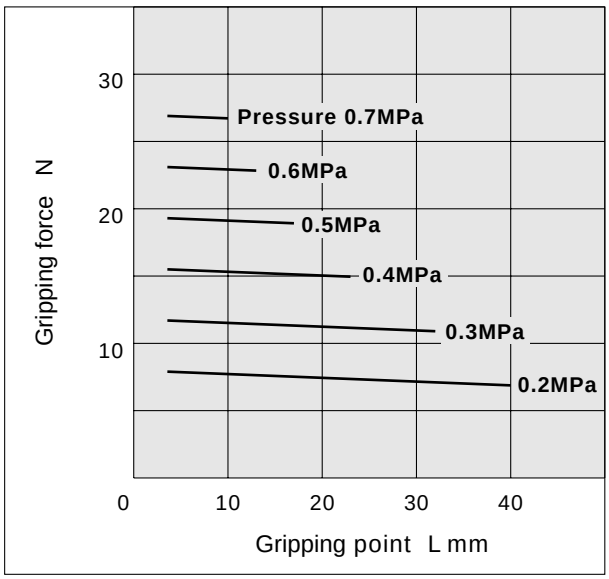
External gripping



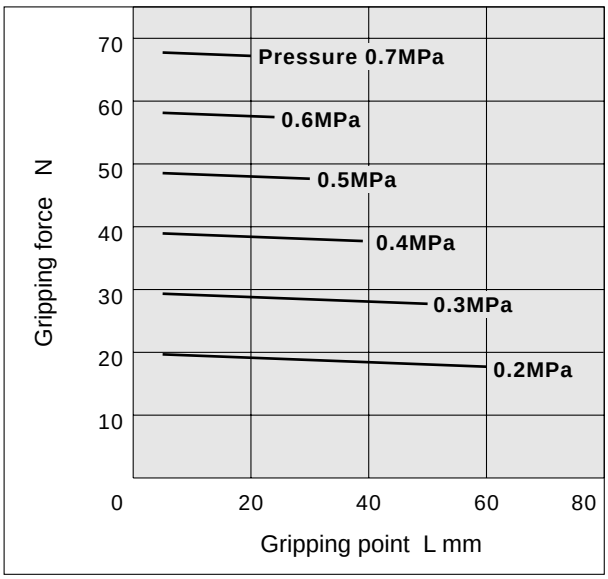
Internal gripping



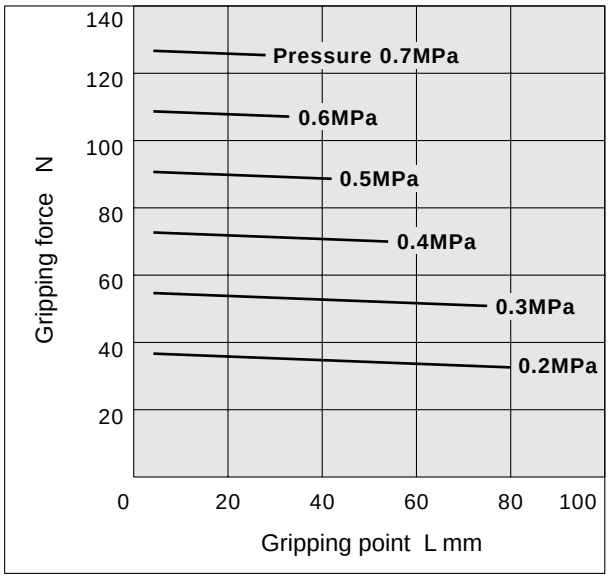
MHF2-8D□



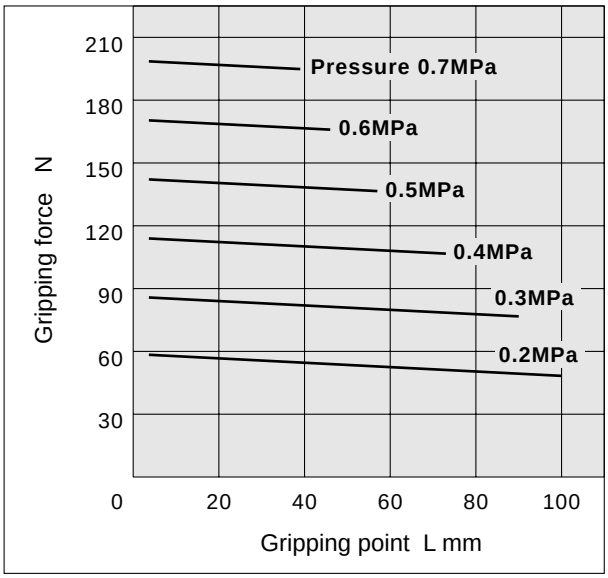
MHF2-12D□



MHF2-16D□



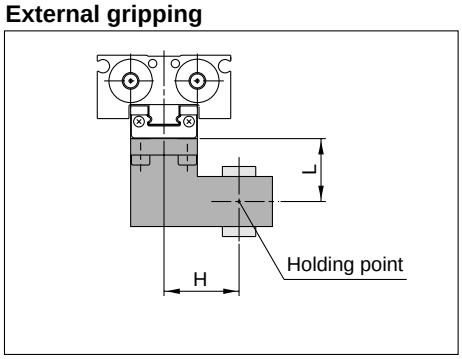
MHF2-20D□



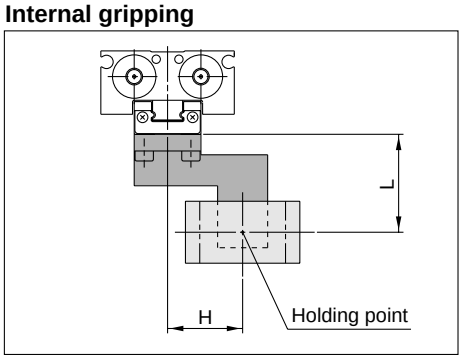
Model Selection

Step 2 Effective gripping force: Series MHF2

External gripping

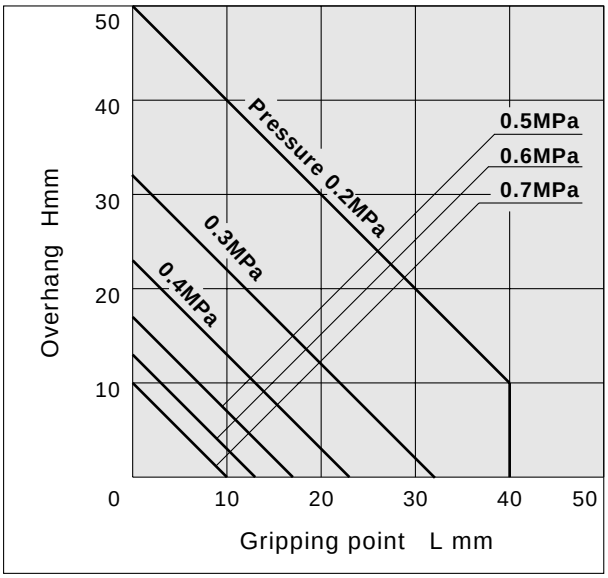


Internal gripping

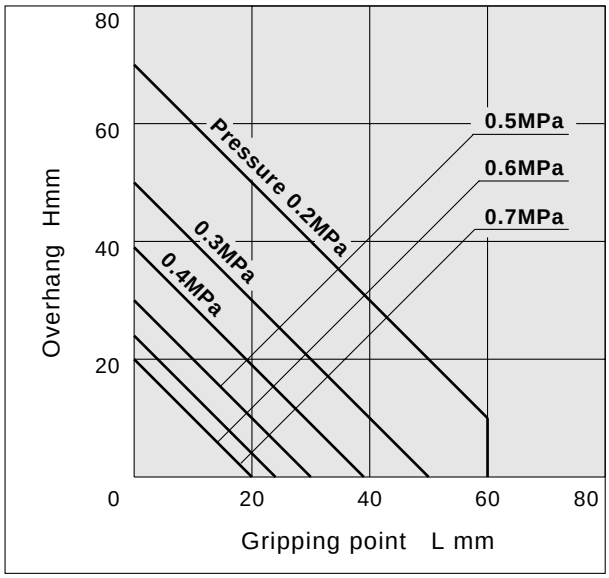


- The air gripper should be operated so that the amount of overhang "H" will stay within the range given in the graphs below.
- If the work piece gripping point goes beyond the range limits, this will have an adverse effect on the life of the air gripper.

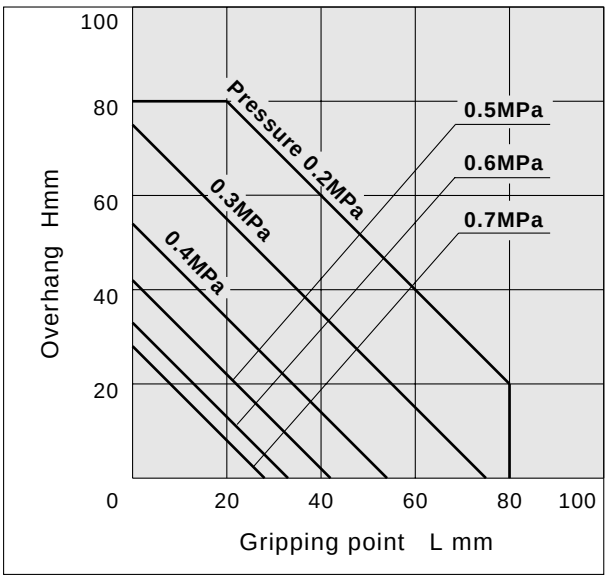
MHF2-8D□



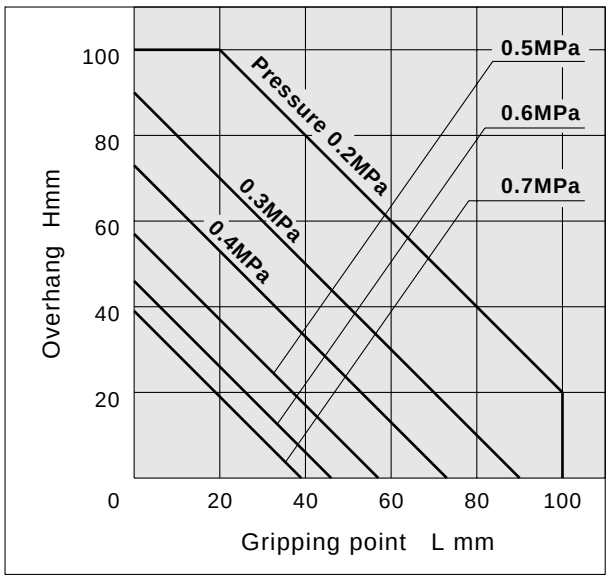
MHF2-12D□



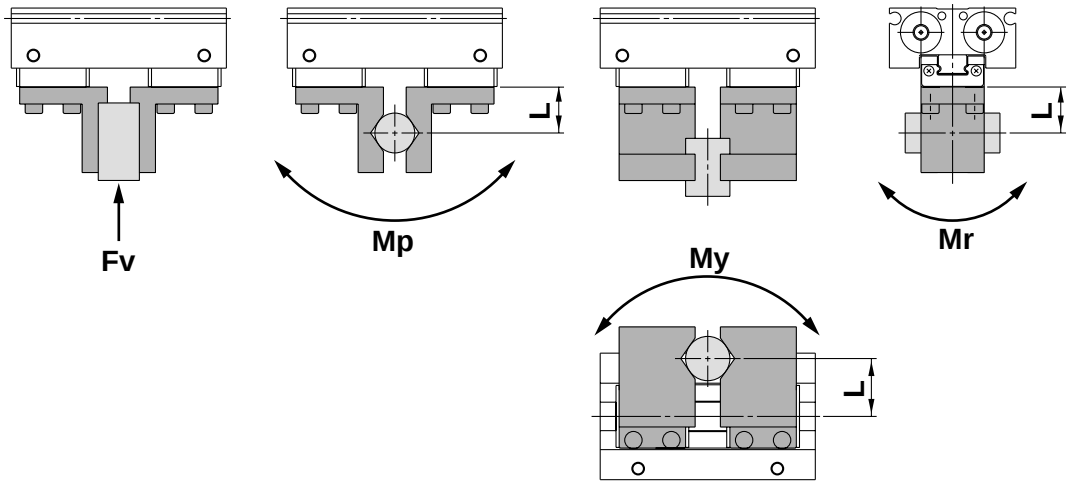
MHF2-16D□



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

Low Profile Air Gripper

Series MHF2

How to Order

MHF 2 – 12 D □ □ – F9B □

Number of fingers

2	2 finger

Bore size (mm)

8	8
12	12
16	16
20	20

Action

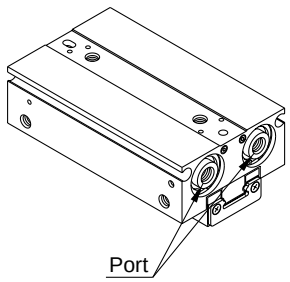
D	Double acting

Stroke

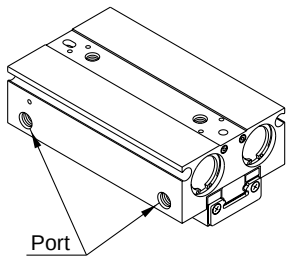
Nil	Short stroke
1	Middle stroke
2	Long stroke

Body option

Nil: Axial direction piping type



R: Side piping type



Auto switch type

Nil	Without auto switch (built-in magnet)

Number of auto switches

Nil	2 pcs.
S	1 pc.

Applicable auto switches/Refer to pages 25 through 28 for auto switch specifications.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage			Auto switch type		Lead wire length (m) ∗			Note2) Flexible lead wire (-61)	Applicable loads	Applicable model			
					DC		AC	Electrical entry direction		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	–	F9NV	F9N	●	●	○	○	Relay PLC	●	●	●	●
				3-wire (PNP)				F9PV	F9P	●	●	○	○		●	●	●	●
				2-wire				F9BV	F9B	●	●	○	○		●	●	●	●
	Note 1) Diagnostic indication (2-colour display)			3-wire (NPN)				F9NWV	F9NW	●	●	○	○		●	●	●	●
				3-wire (PNP)				F9PWV	F9PW	●	●	○	○		●	●	●	●
				2-wire				F9BWV	F9BW	●	●	○	○		●	●	●	●

∗Lead wire length symbol: 0.5m·····Nil (Example) F9N
3m·····L (Example) F9NL
5m·····Z (Example) F9NWZ

∗Auto switches marked "O" are produced upon receipt of order.

Note 1) Be careful for the differential of 2-color display type.
Refer to "Auto Switch Hysteresis" on page 22.

Note2) For the flexible wire specification, enter-61 after the part number.
Example: When ordering with an air chuck

MHF2-12D-F9NVS -61
Flexible wire

When ordering only an auto switch

D-F9PL -61
Flexible wire

These auto switches have been changed
Contact SMC or view www.smcworld.com

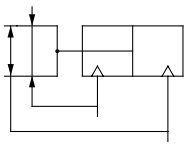
F9N➡**M9N**	F9NV➡**M9NV**
F9P➡**M9P**	F9PV➡**M9PV**
F9B➡**M9B**	F9BV➡**M9BV**

Specifications

Fluid		Air
Operating pressure		ø8: 0.15 to 0.7MPa
		ø12 to 20: 0.1 to 0.7MPa
Ambient and fluid temperature		−10 to 60°C (with no condensation)
Repeatability		±0.05mm Note1)
Maximum operating frequency	**Short stroke**	120c.p.m.
	Middle stroke	120c.p.m.
	Long stroke	60c.p.m.
Lubrication		Not required
Action		Double acting
Auto switch (Optional) Note2)		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 pages 25 through 28 for further information on auto switch specifications.

Symbol
Double acting



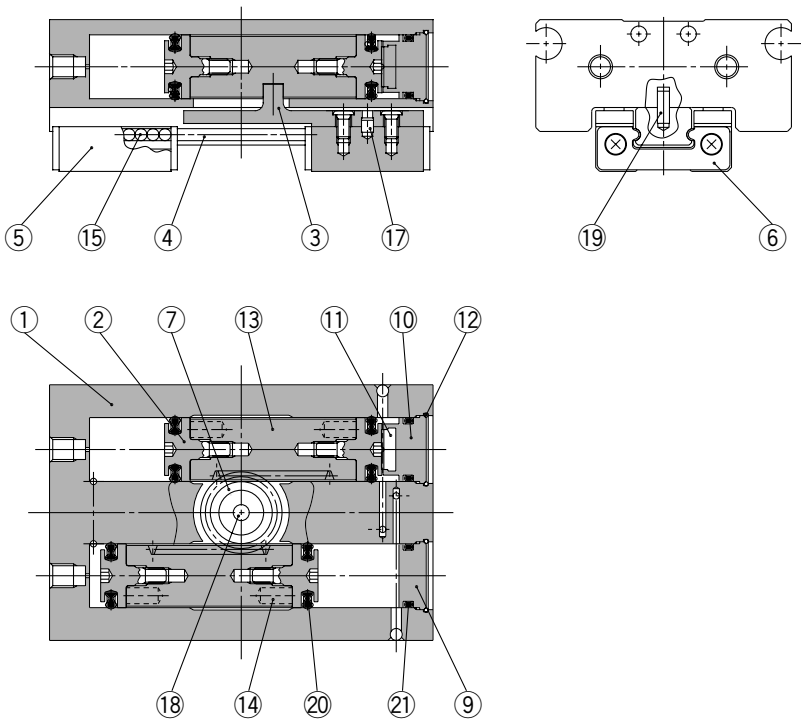
Model

Action	Model	Cylinder bore (mm)	Gripping force Note1) / Effective holding force per finger N	Opening /closing stroke (Both sides) mm	Weight Note2) g	Unobstructed capacity (cm^3)	
						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

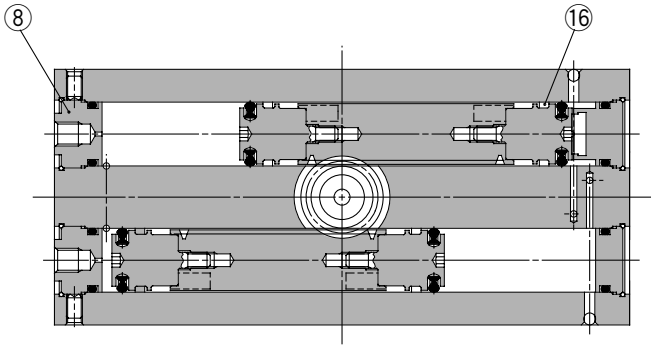
Note 1) At the pressure of 0.5MPa, when holding point L is 20mm.
Note 2) Excluding the auto switch weight

Construction

MHF2-8D, MHF2-8D1



MHF2-8D2



Parts list

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

Parts list

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	

Replaceable parts list

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

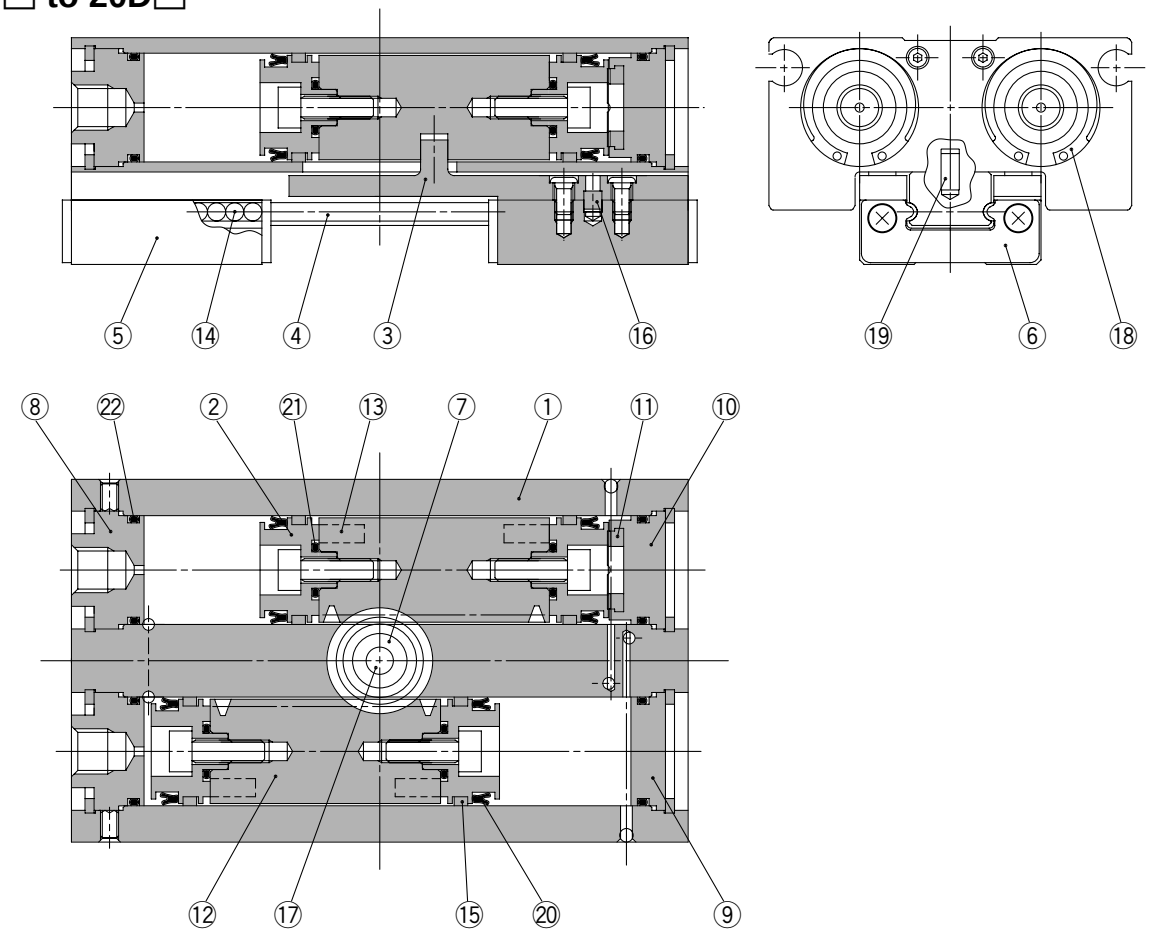
Bolts for body through hole mounting

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.

Construction

MHF2-12D□ to 20D□



Parts list

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

Parts list

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	
	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
	ø16 to 20: C type snap ring		
19	**Parallel pin**	Stainless steel	
20	**Piston seal**	NBR	
21	**Gasket**	NBR	
22	**Gasket**	NBR	

Replaceable parts list

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	
MHF-B12	MHF2-12D	2 pieces/unit
	MHF2-12D1	2 pieces/unit
	MHF2-12D2	4 pieces/unit

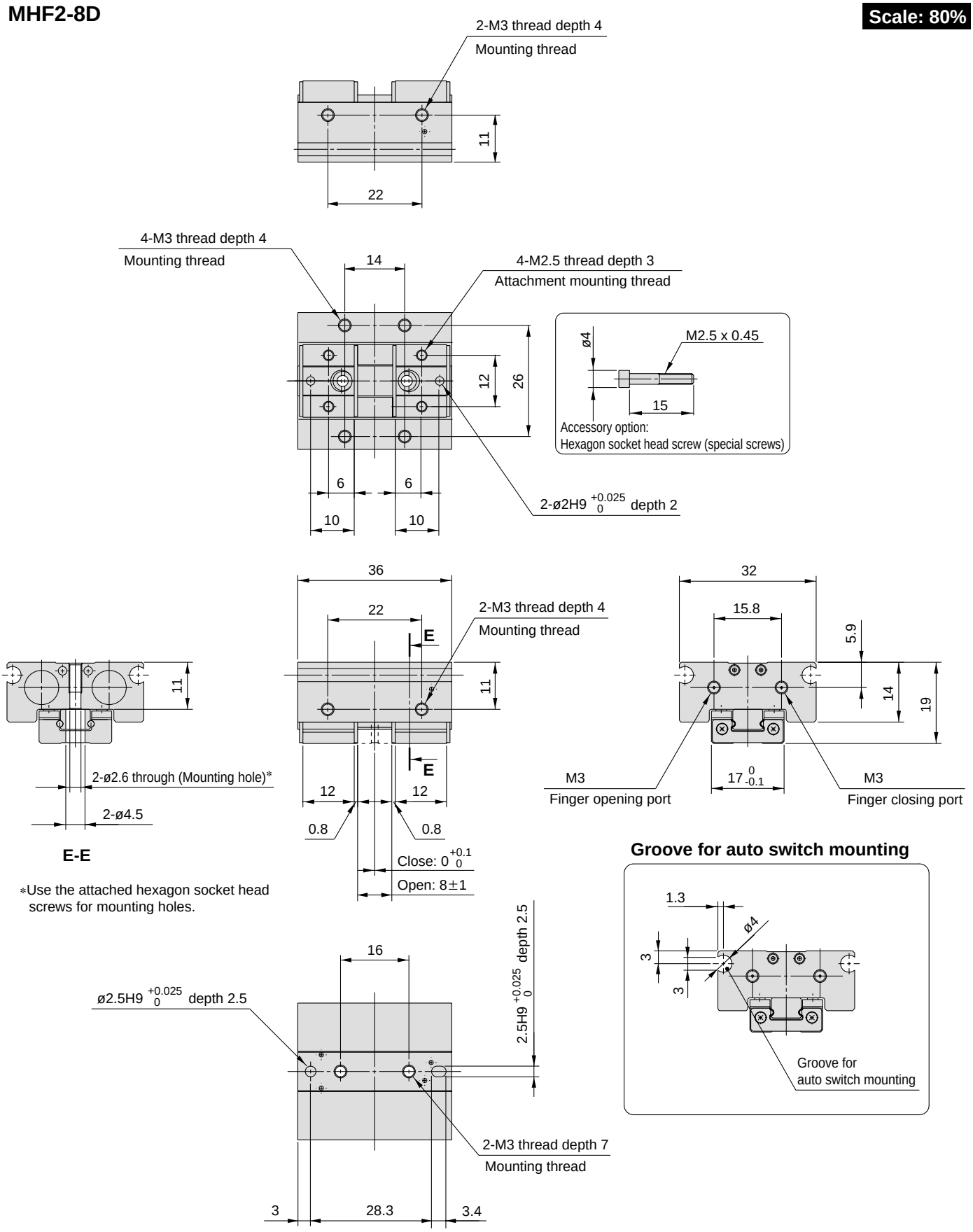
∗The bolts for body through hole mounting are attached to the product. They are also provided at an order of 1 piece or more with the above part numbers.

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

Dimensions

MHF2-8D

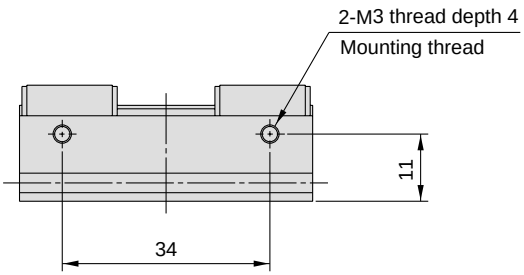
Scale: 80%

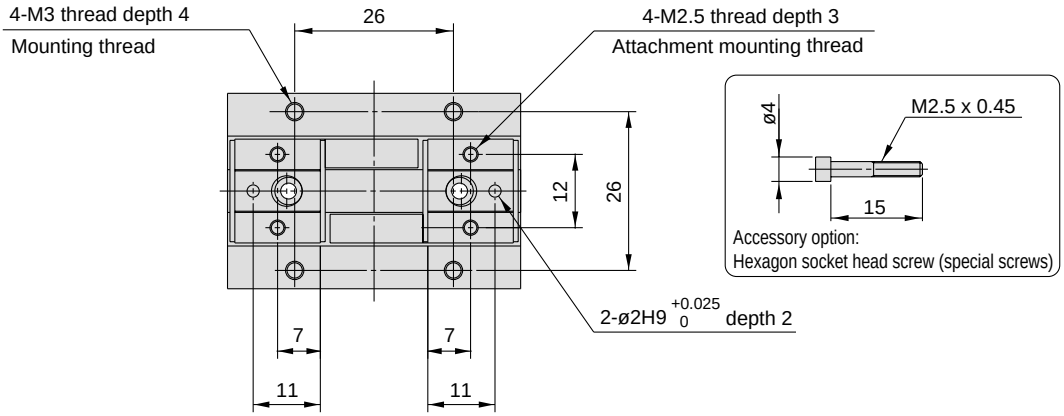


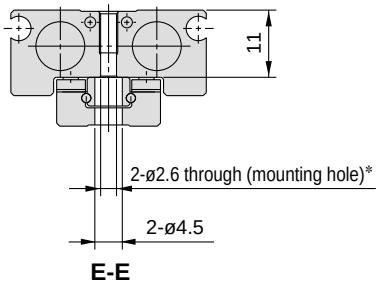
Dimensions

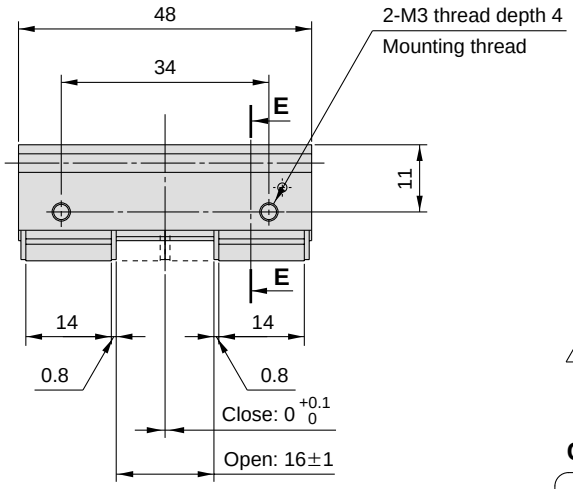
MHF2-8D1

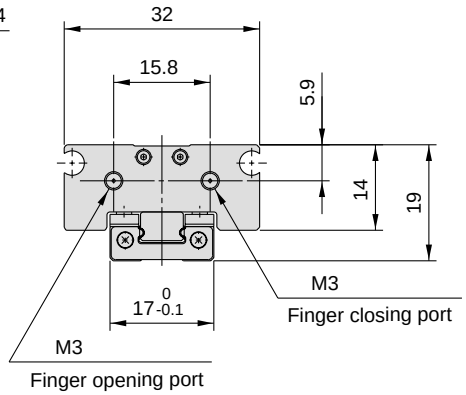
Scale: 80%





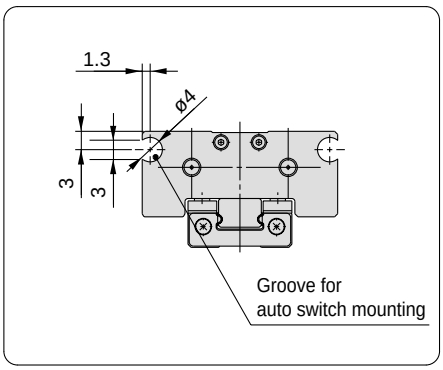


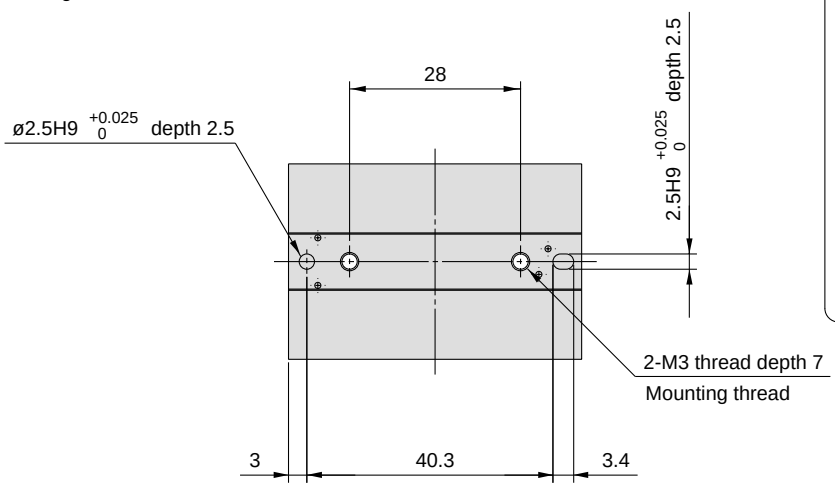




∗Use the attached hexagon socket head screws for mounting holes.

Groove for auto switch mounting

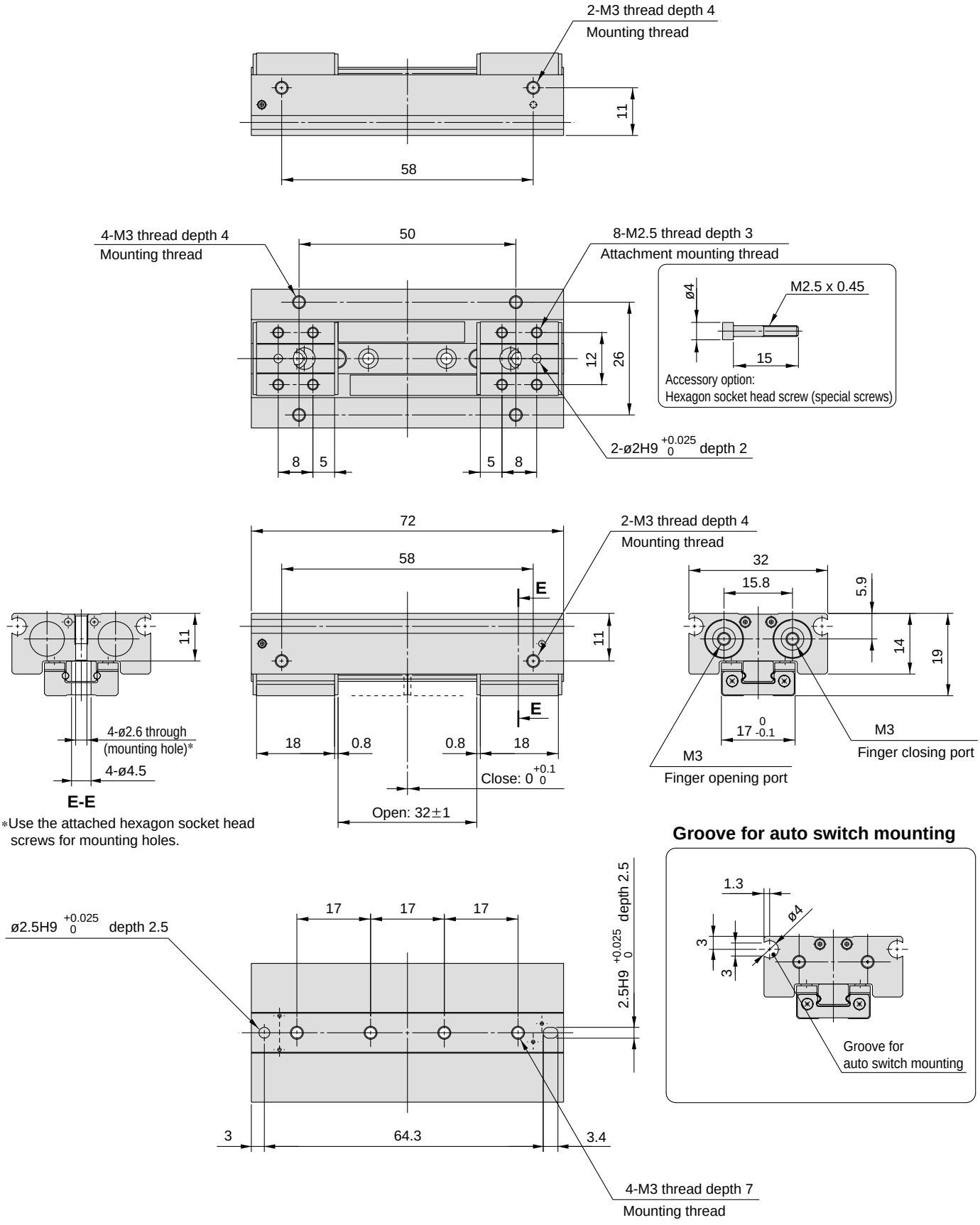




Dimensions

MHF2-8D2

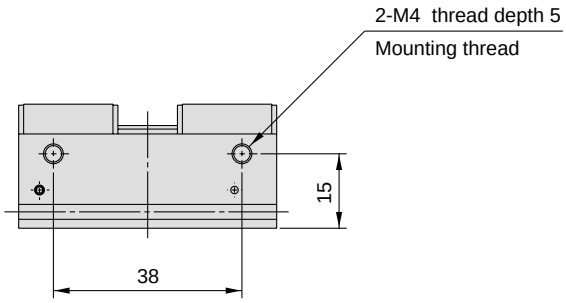
Scale: 80%

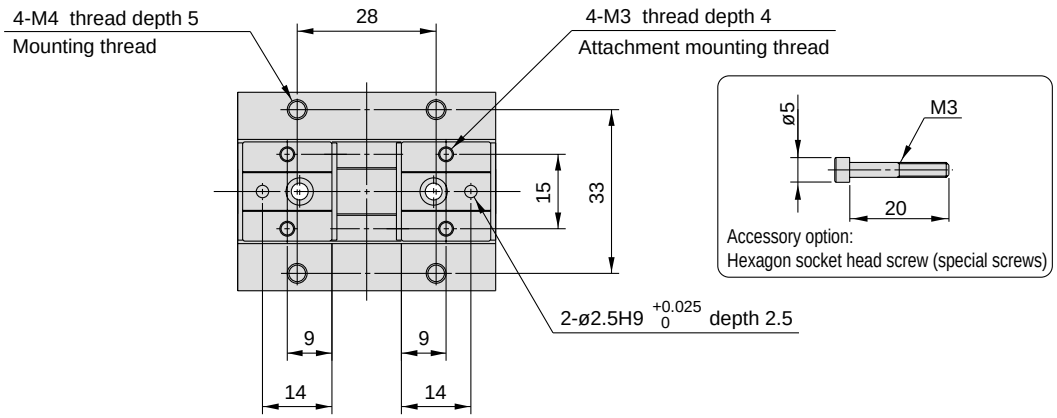


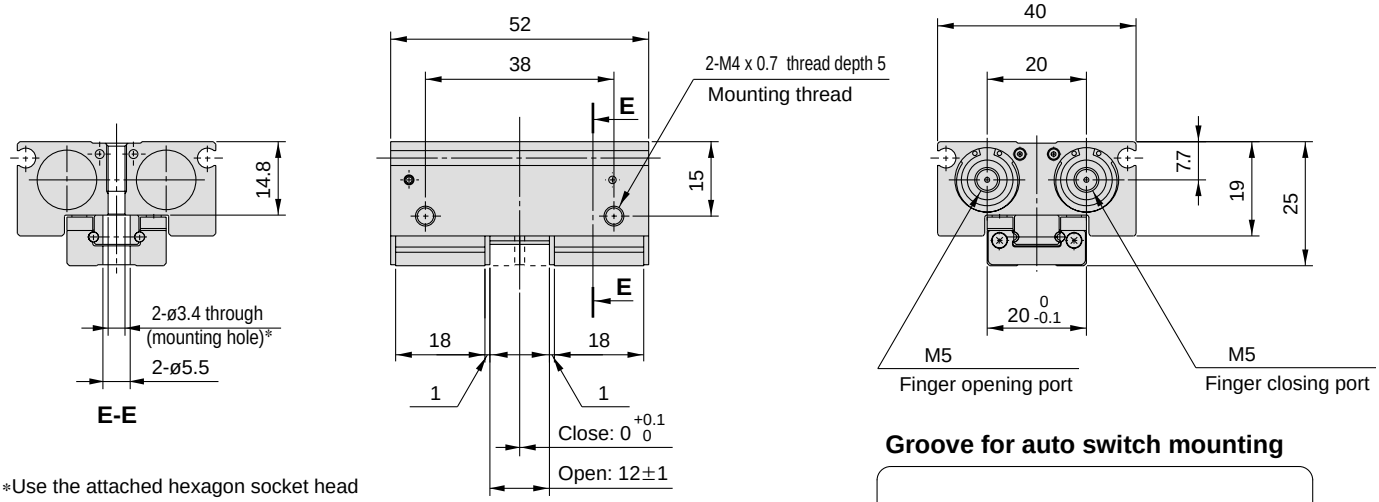
Dimensions

MHF2-12D

Scale: 65%

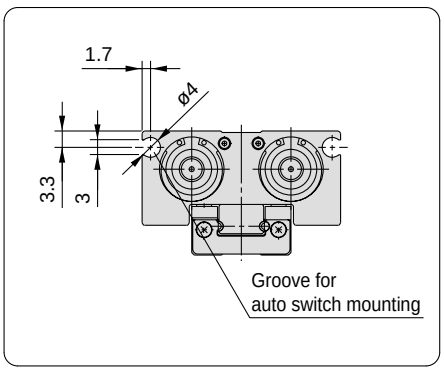


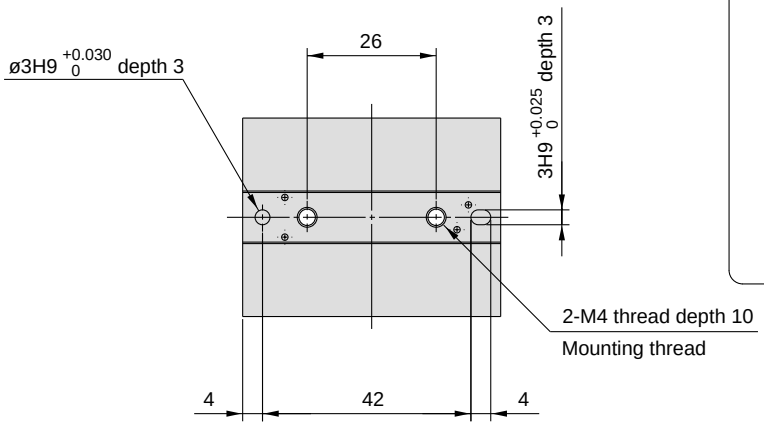




*Use the attached hexagon socket head screws for mounting holes.

Groove for auto switch mounting

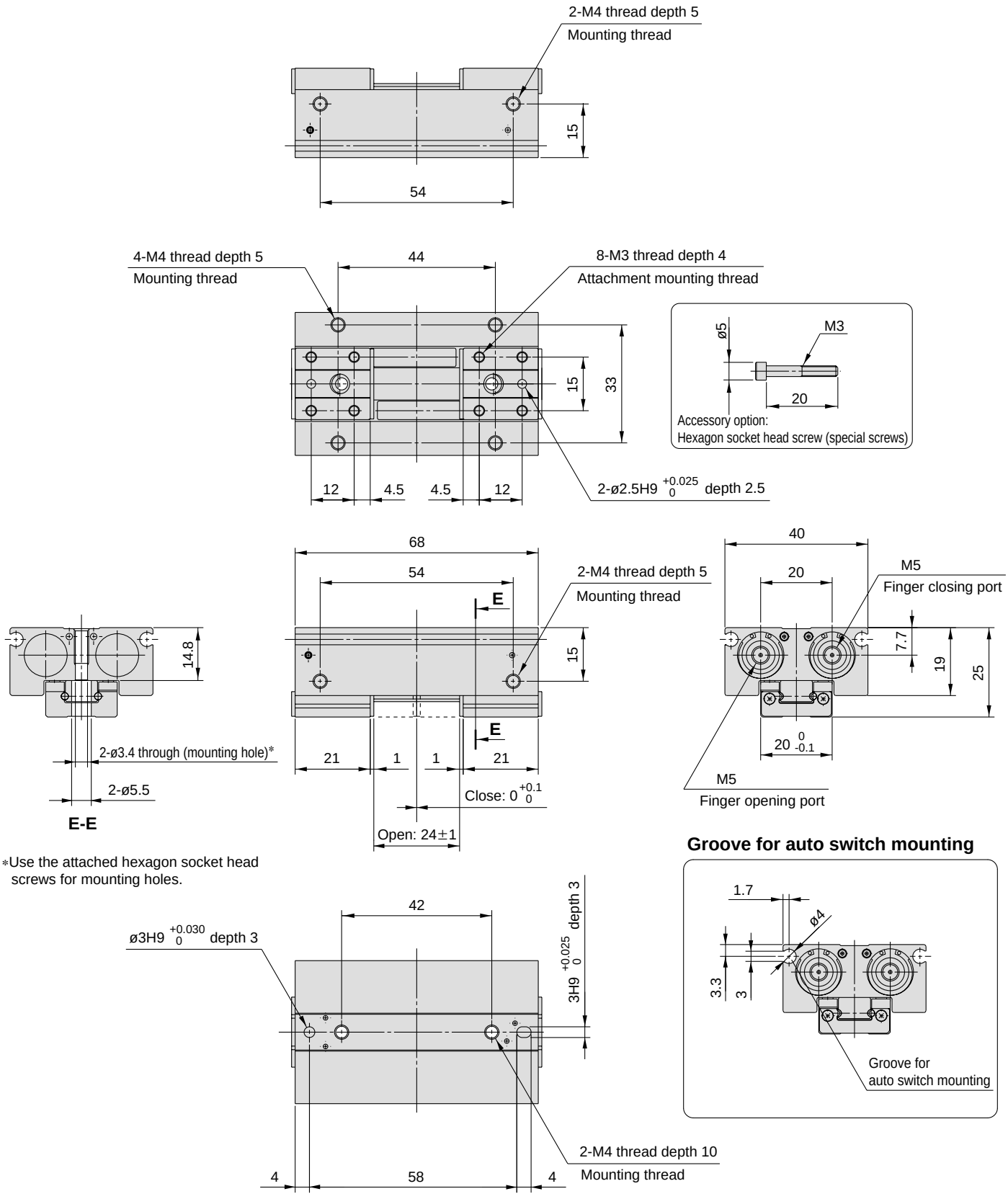




Dimensions

MHF2-12D1

Scale: 65%

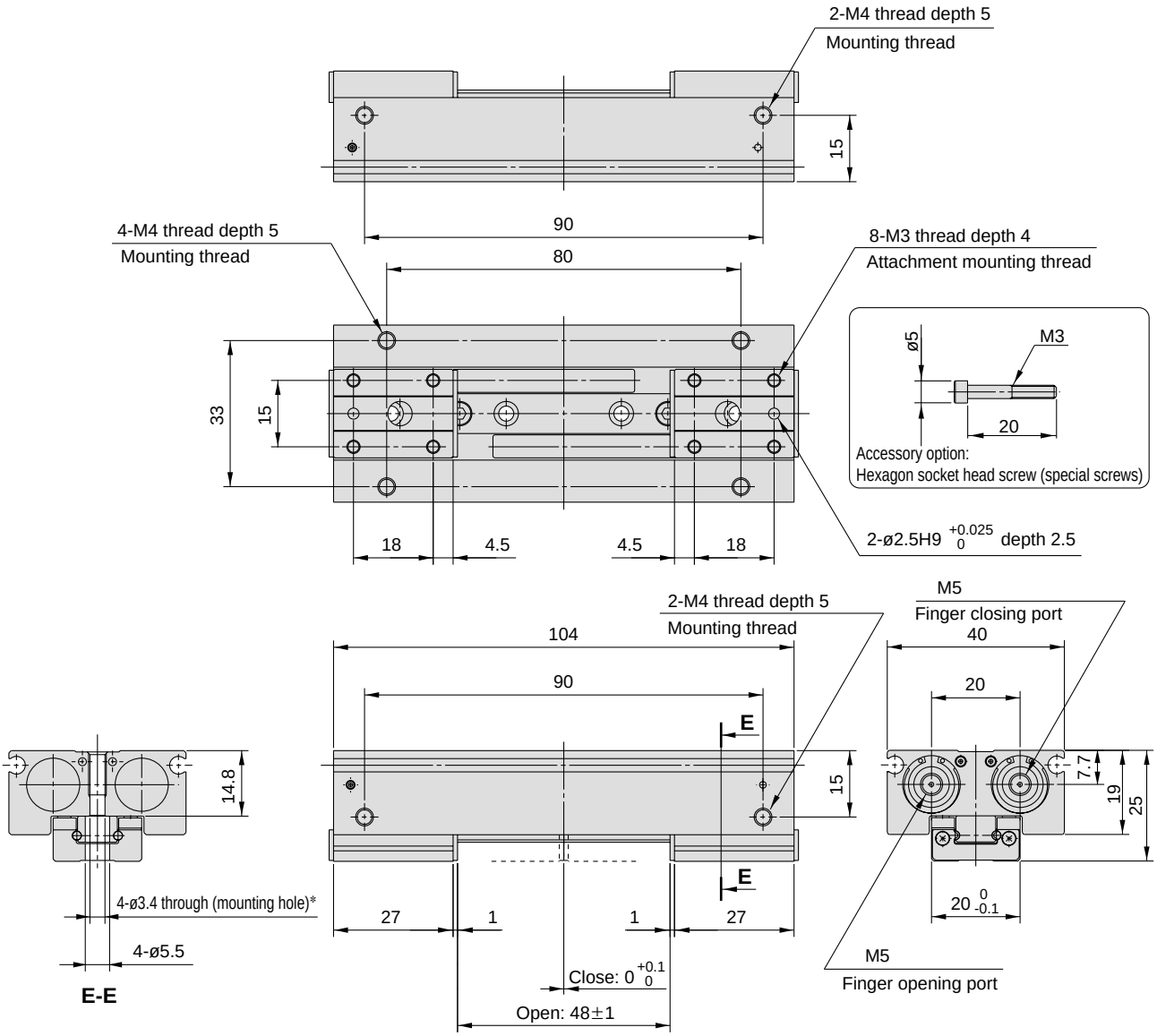


*Use the attached hexagon socket head screws for mounting holes.

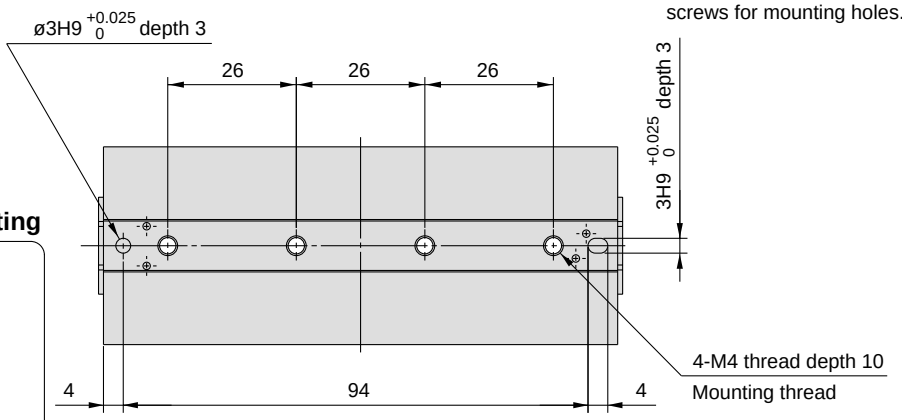
Dimensions

MHF2-12D2

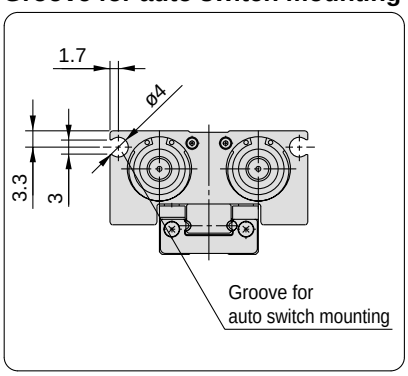
Scale: 65%



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



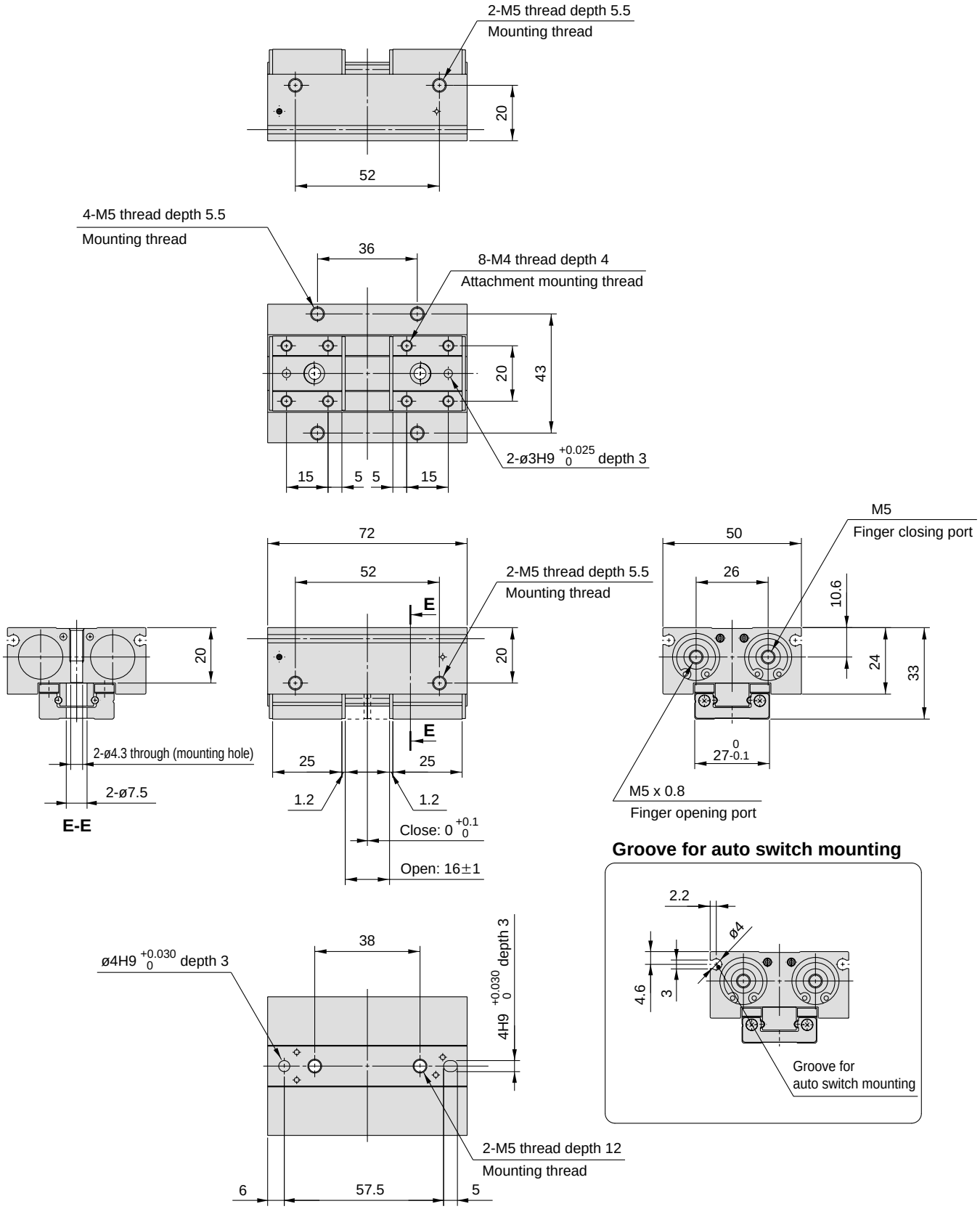
Groove for auto switch mounting



Dimensions

MHF2-16D

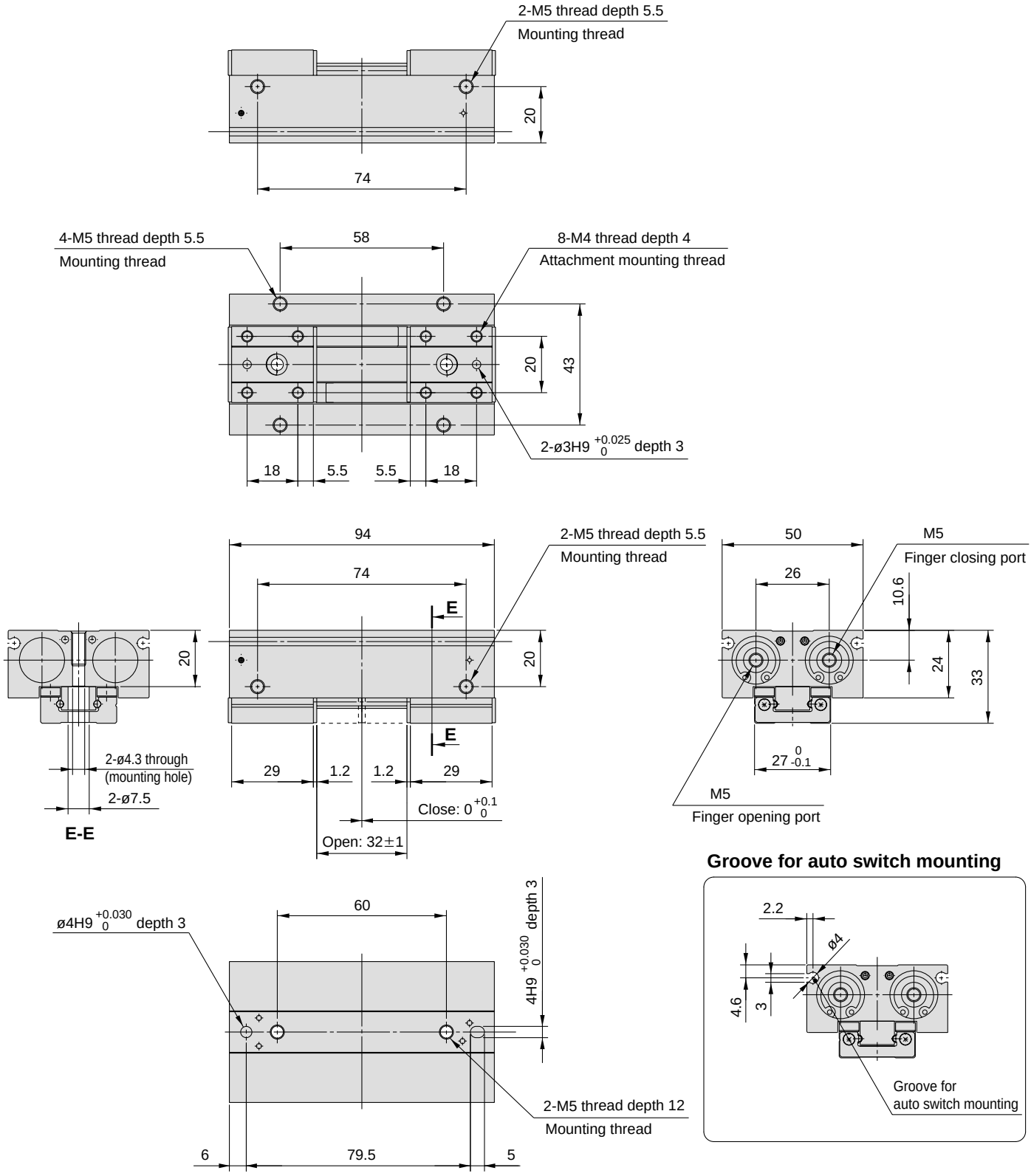
Scale: 50%



Dimensions

MHF2-16D1

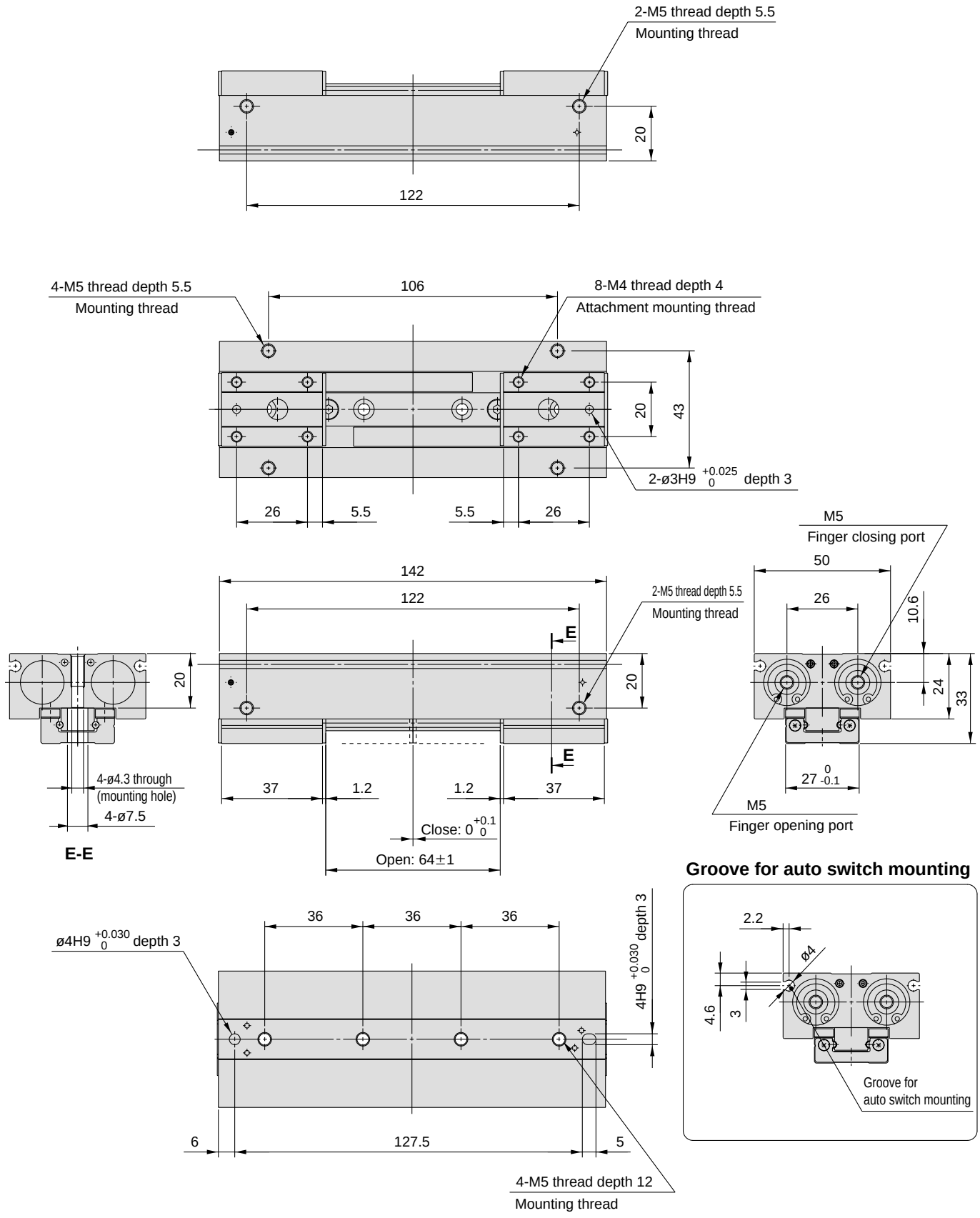
Scale: 50%



Dimensions

MHF2-16D2

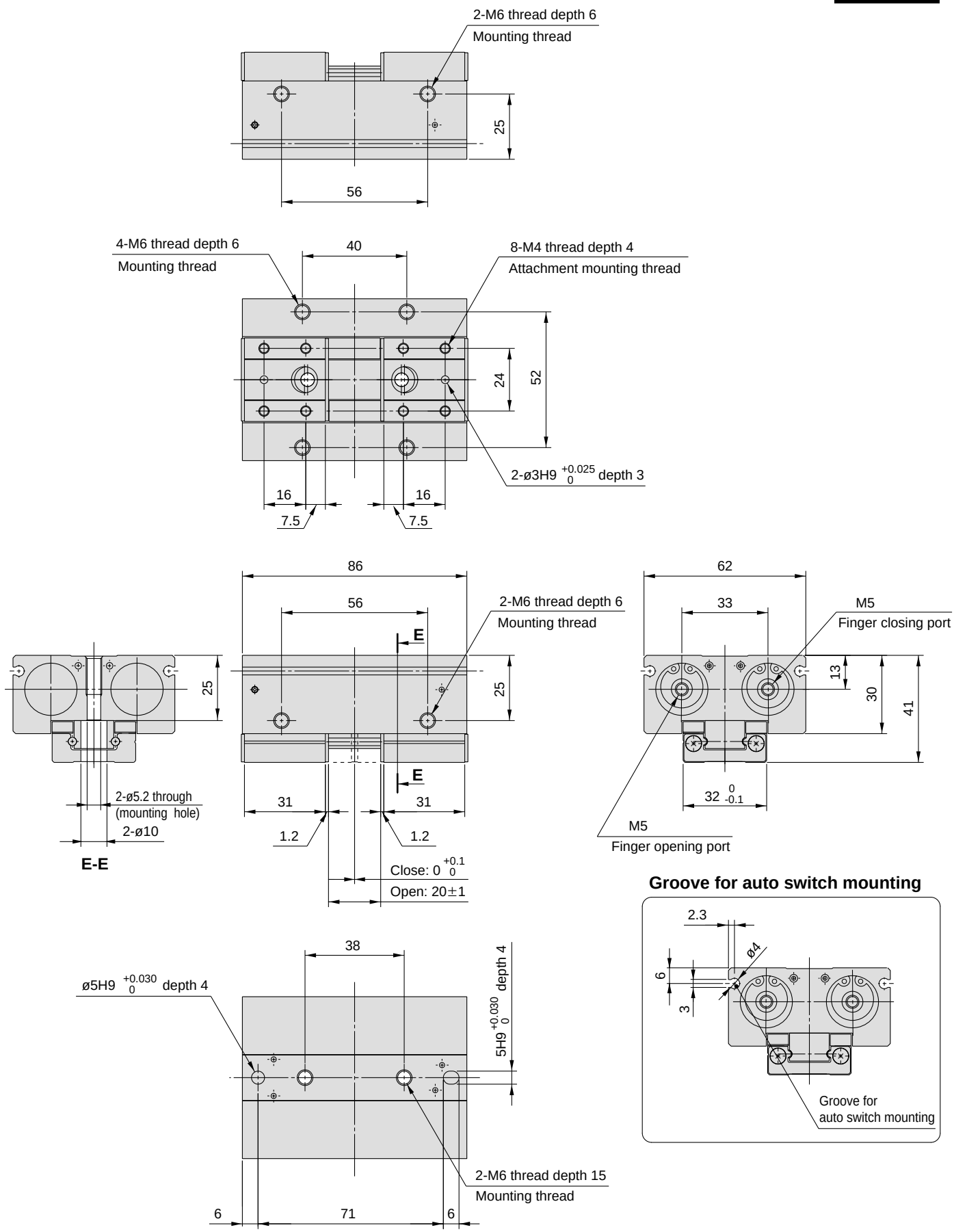
Scale: 50%



Dimensions

MHF2-20D

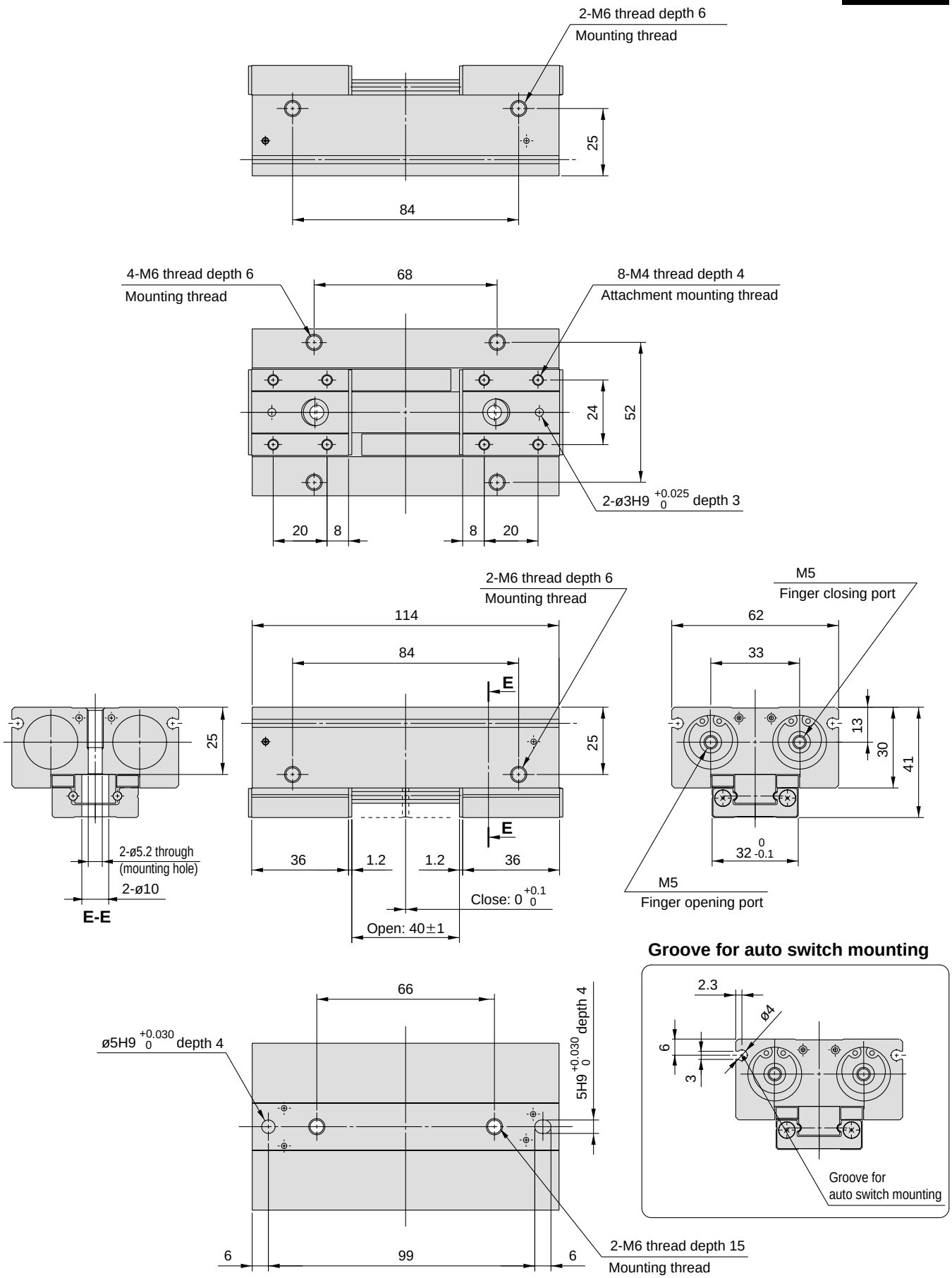
Scale: 50%



Dimensions

MHF2-20D1

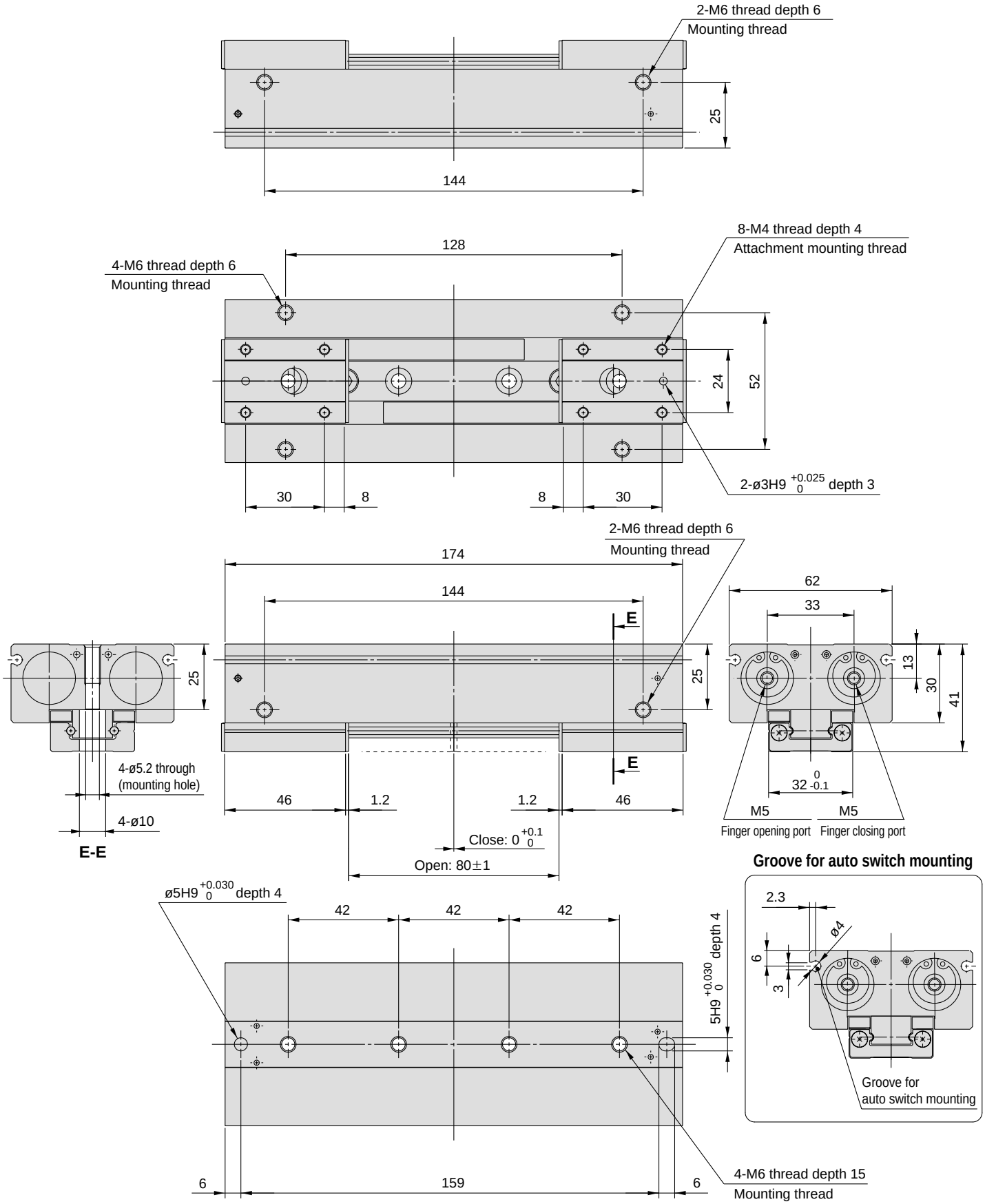
Scale: 50%



Dimensions

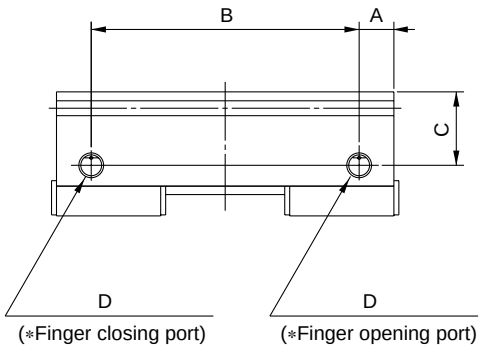
MHF2-20D2

Scale: 50%



Body Option: Side Piping Type

MHF2-□D□R



∗For dimensions not given above, please refer to the table of dimensions on pages 9 through 20.

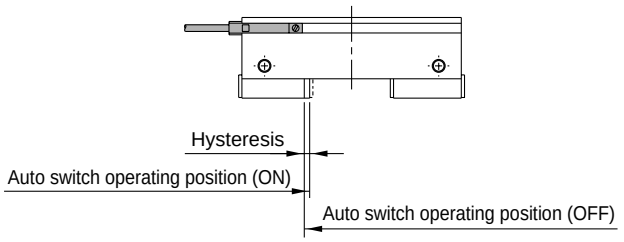
Body option dimension table

Unit: mm

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

Auto Switch Hysteresis

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

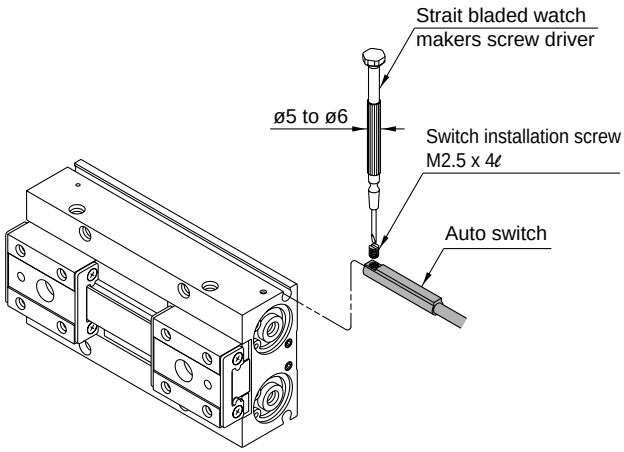


Hysteresis

	D-F9□(V)	D-F9□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

Auto Switch Mounting

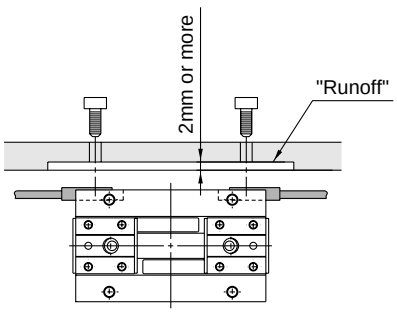
Insert the auto switch into the switch mounting groove in the air chuck in the direction shown below, and after setting the mounting position, tighten the attached switch mounting screw with a screwdriver.



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 0.1N·m. When you begin to feel that the screw is being tightened, turn it further by 90°.

⚠Caution

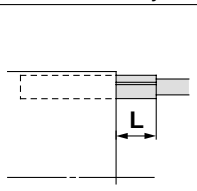
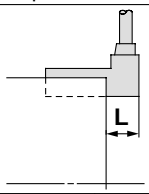
When using an auto switch on the mounting plate side, the switch will protrude from the end face as shown below. Please provide a run off apace of 2mm or deeper on the mounting plate.



Auto Switch Protrusion from the Body End Surface

- 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.

Auto switch protrusion

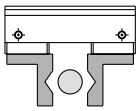
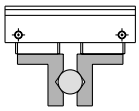
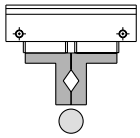
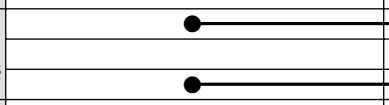
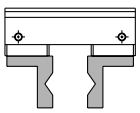
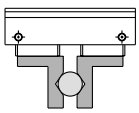
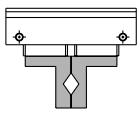
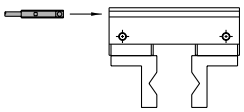
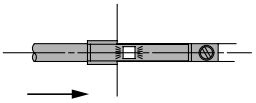
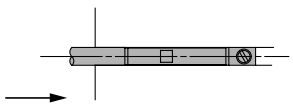
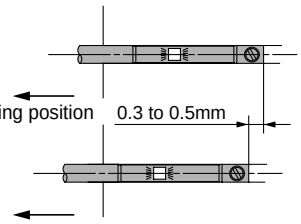
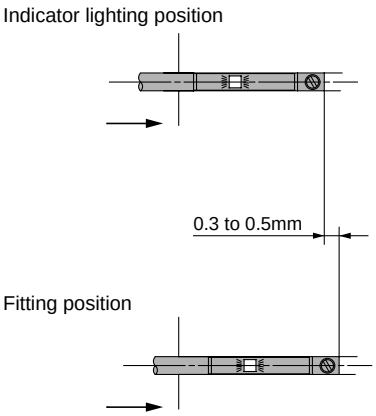
Lead wire type		In-line entry		Perpendicular entry	
Illustration					
Auto switch / Finger position / Model		D-F9□	D-F9□W	D-F9□V	D-F9□WV
MHF2-8D	Open	6.5	6.5	4.5	4.5
	Close	6.5	6.5	4.5	4.5
MHF2-8D1	Open	6.5	6.5	4.5	4.5
	Close	6.5	6.5	4.5	4.5
MHF2-8D2	Open	0.5	0.5	—	—
	Close	0.5	0.5	—	—
MHF2-12D	Open	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.

Installation and Setting of Auto Switch

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

1) Detection of work (External holding)

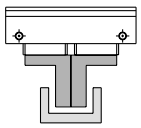
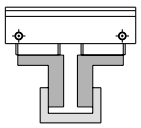
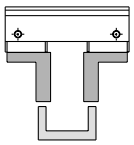
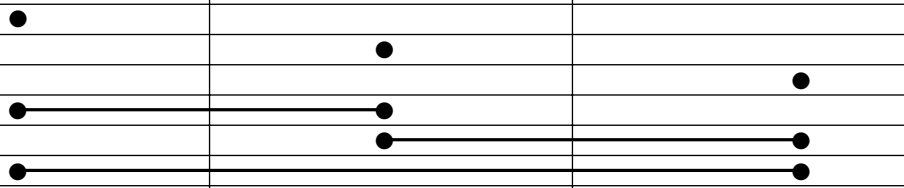
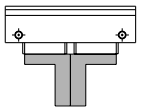
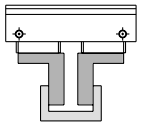
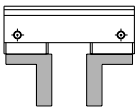
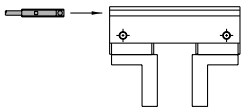
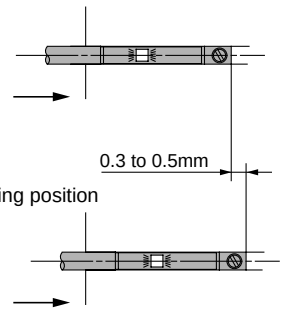
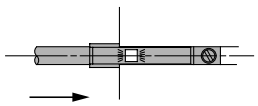
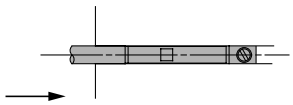
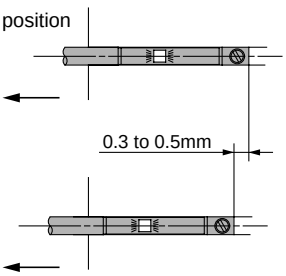
Detection example	① Confirmation of finger reset position	② Confirmation of work holding	③ Confirmation of work releasing
Detecting position	Finger fully open position 	Work holding position 	Finger fully closed position 
Operation of auto switch	Switch ON at finger reset position (Light: ON)	Switch ON at work holding position (Light: ON)	At work holding position [Normal operation] : Switch OFF (Light: OFF) Work releasing condition [Abnormal operation] : Switch ON (Light: ON)
Combination of detection — **One auto switch**			
Combination of detection — **Two auto switches**			
Auto switch mounting position /setting procedure	**Procedure 1)** Fully open the fingers. 	**Procedure 1)** Locate the fingers in the work holding position. 	**Procedure 1)** Locate the fingers in the fully closed position. 
	Procedure 2) Insert the auto switch mounting groove from the direction shown in the figure. 		
∗Connect a switch applying no or low voltage and follow the procedures for setting.	**Procedure 3)** Slide auto switch in the direction of the arrow until the indicator light comes on.  **Procedure 4)** Slide the auto switch a further distance in the direction of the arrow until the indicator light goes out.  **Procedure 5)** Move the auto switch in the opposite direction, as shown by the arrow, a distance of 0.3 to 0.5mm and set. 	**Procedure 3**) Slide auto switch in the direction of the arrow until the indicator lights. Move switch a further 0.3 to 0.5mm in the direction of the arrow and set. 	

Note) •It is recommended that work be held at the center of the finger stroke.
•If work is held around the end position of finger opening stroke, the above detecting combination may be limited due to the ON/OFF differential of the auto switches.

Installation and Setting of Auto Switch

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

2) Detection of work (Internal holding)

Detection example	① Confirmation of finger reset position	② Confirmation of work holding	③ Confirmation of work releasing
Detecting position	Finger fully closed position 	Work holding position 	Finger fully open position 
Operation of auto switch	Switch ON at finger reset position (Light: ON)	Switch ON at work holding position (Light: ON)	At work holding position [Normal operation] : Switch OFF (Light: OFF) Work releasing condition [Abnormal operation] : Switch ON (Light: ON)
Combination of detection — **One auto switch**			
Combination of detection — **Two auto switches**			
Auto switch mounting position /setting procedure	**Procedure 1)** Fully open the fingers. 	**Procedure 1)** Locate the fingers in the work holding position. 	**Procedure 1)** Locate the fingers in the fully closed position. 
∗Connect a switch applying no or low voltage and follow the procedures for setting.	**Procedure 2)** Insert the auto switch mounting groove from the direction shown in the following drawing. 		
	Procedure 3) Slide auto switch in the direction of the arrow until the indicator lights comes on. Move switch a further 0.3 to 0.5mm in the direction of the arrow and set. Indicator lighting position 	**Procedure 3)** Slide auto switch in the direction of the arrow until the indicator lights.  **Procedure 4)** Slide the auto switch a further distance in the direction of the arrow until the indicator light goes out.  **Procedure 5)** Move the auto switch in the opposite direction, as shown by the arrow, a distance of 0.3 to 0.5mm and set. Indicator lighting position 

Note) •It is recommended that work be held at the center of the finger stroke.
•If work is held around the end position of finger opening stroke, the above detecting combination may be limited due to the ON/OFF differential of the auto switches.

Series MHF2
Auto Switch Common Specifications

Auto Switch Common Specifications

Type	**Solid state switch**
Operating time	1ms or less
Shock resistance	1000m/s^2
Insulation resistance	50MΩ or more at 500VDC (between lead wire and case)
Withstand voltage	1000VAC for 1min (between lead wire and case)
Ambient temperature	−10 to 60°C
Enclosure	IEC529 standard IP67, JISC0920 watertight construction

Lead Wire Length

Lead wire length indication

(Example)

D-F9P L

Lead wire length

Nil	0.5m
L	3m
Z	5m

Note 1) Lead wire length Z: 5m applicable auto switch
Solid state switch: All models are produced upon receipt of order (as standard).
Note 2) The standard lead wire length is 3 meters for water resistant 2-color display solid state auto switches. (0.5m is not available.)
Note 3) For the flexible wire specification, enter-61 after the part number.

(Example) **D-F9PL-61**

Flexible wire Specifications

Lead Wire Colour Changes

The lead wire colours of SMC auto switches have been changed as shown below to satisfy IEC947-5-2 standards for production beginning September, 1996 and thereafter.
Take special care regarding wire polarity during the time that old colours still coexist with the new colours.

2-wire

	Old	New
Output (+)	Red	Brown
Output (−)	Black	Blue

3-wire

	Old	New
Power supply +	Red	Brown
Power supply GND	Black	Blue
Output	White	Black

Solid state with diagnostic output

	Old	New
Power supply +	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

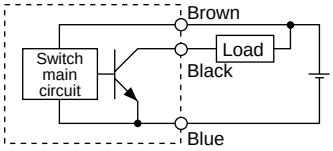
Solid state with latch type diagnostic output

	Old	New
Power supply +	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange

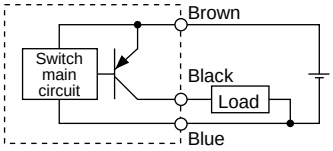
Auto Switch Connections and Examples

Basic Wiring

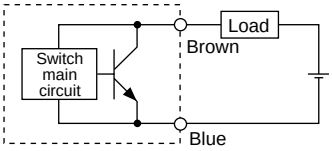
Solid State 3-wire, NPN



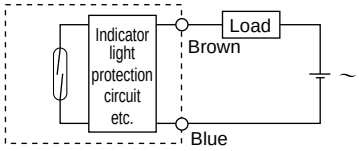
Solid State 3-wire, PNP



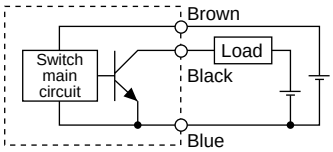
2-wire
<Solid state switch>

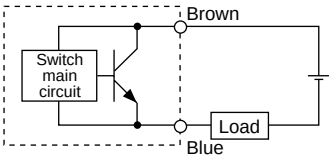


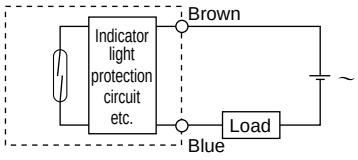
2-wire
<Reed switch>



(When power source for switch and load is not common.)

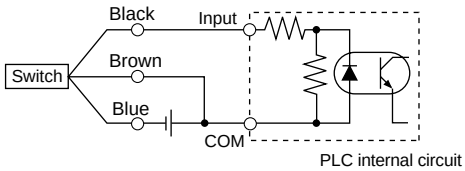




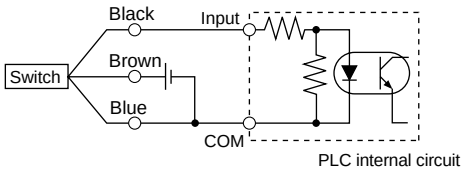


Examples of Connection to PLC

Sink input specifications
3-wire, NPN

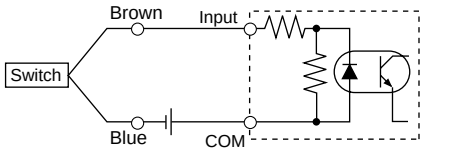


Source input specifications
3-wire, PNP

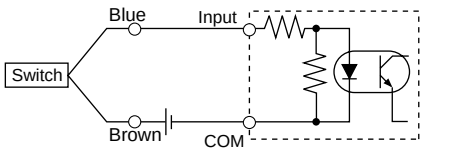


Connect according to the input specification of the sequence controller because the connection method varies with the input specification of the sequence controller.

2-wire



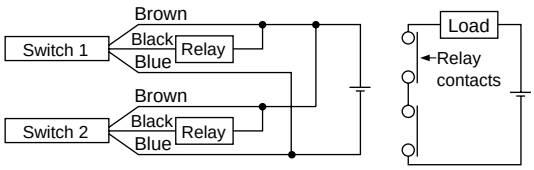
2-wire



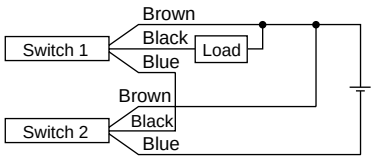
Connection Examples for AND (Series) and OR (Parallel)

3-wire system

AND connection for NPN output (using relays)

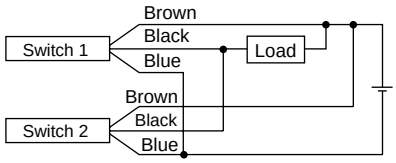


AND connection for NPN output (performed with switches only)

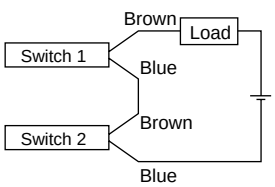


The indicator lights will light up when both switches are turned ON.

OR connection for NPN output



2-wire with 2 switch AND connection

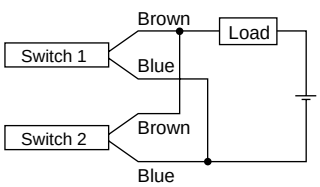


In case of AND connection of two 2-wire type switches, load malfunction may be caused by the load voltage decrease when turned ON. The indicator light comes on when the two switches are turned ON.

Load voltage when turned ON = Power supply voltage - Residual voltage x 2 pcs.
= 24V − 4V x 2 pcs.
= 16V

(Example) Power supply voltage: 24VDC
Internal voltage drop: 4V

2-wire with 2 switch OR connection



<Solid state switch>
In case of OR connection of two 2-wire type switches, load malfunction may be caused by the load voltage increase when turned OFF.

Load voltage when turned OFF = Leakage voltage x 2 pcs. x Load impedance
= 1mA x 2 pcs. x 3kΩ
= 6V

(Example) Load impedance: 3kΩ
Current leakage: 1mA

<Reed switch>
The load voltage will not increase when the switch is turned OFF because there is no current leakage. However, depending on the number of the switches in the ON state, the current value at each switch will be distributed and consequently reduced, making the indication light dark or even impossible to light up.

Solid State Switch/Direct Mounting
D-F9N(V), D-F9P(V), D-F9B(V)

Grommet

⚠Caution

Precautions

When fixing the switch, be sure to use the set screws attached on the body. Using screws other than the specified ones will cause damage to the switch.

Auto Switch Specifications

D-F9□, D-F9□V (with indicator light)						
Auto switch symbol	D-F9N	D-F9NV	D-F9P	D-F9PV	D-F9B	D-F9BV
Electrical entry	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring method	3-wire				2-wire	
Output method	NPN		PNP		—	
Applicable load	IC circuit, Relay, PLC				24VDC relay, PLC	
Power supply	5, 12, 24VDC (4.5 to 28VDC)				—	
Current consumption	10mA or less				—	
Load voltage	28VDC or less		—		24VDC (10 to 28VDC)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at 10mA load current)		0.8V or less		4V or less	
Leakage current	100μA max at 24VDC				0.8mA or less	
Indicator light	ON: Red light emitting diode					

●Lead wire — Heavy duty oil resistant vinyl cord, ø2.7, 3 cores (Brown, Black, Blue), 0.15mm², 2 cores (Brown, Blue), 0.18mm², 0.5m.

Note 1) Refer to page 21 for solid state switch common specifications.

Note 2) Refer to page 21 for lead wire length.

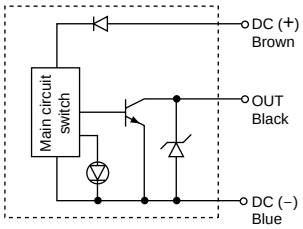
Auto Switch Weight Table

Unit: g

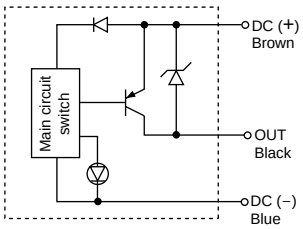
Model		D-F9N(V)	D-F9P(V)	D-F9B(V)
lead wire length (m)	0.5	7	7	6
	3	37	37	31
	5	61	61	51

Auto Switch Internal Circuits

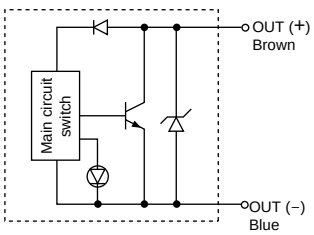
D-F9N, F9NV



D-F9P, F9PV

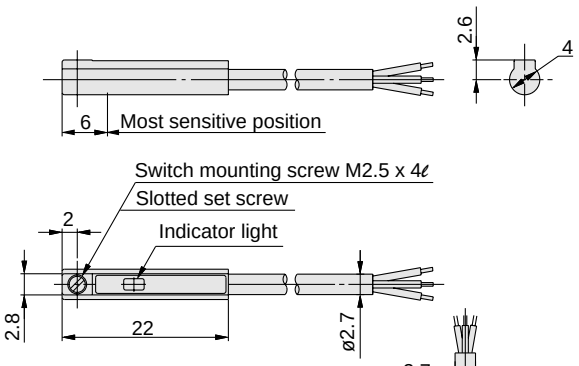


D-F9B, F9BV

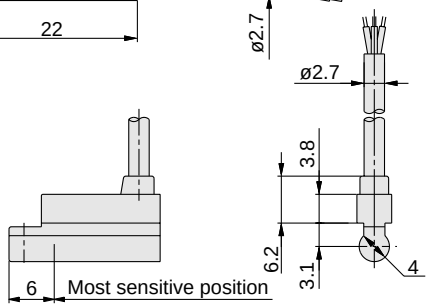


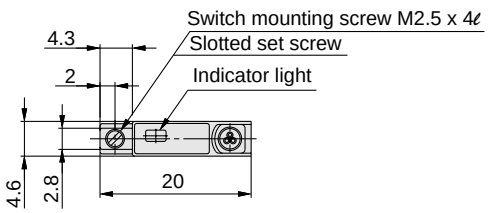
Auto Switch Dimensions

D-F9□



D-F9□V





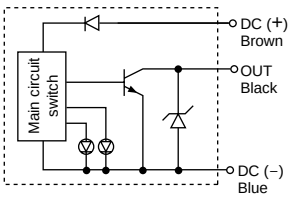
SMC

2-Color Display Solid State Switch/Direct Mounting
D-F9NW(V), D-F9PW(V), D-F9BW(V)

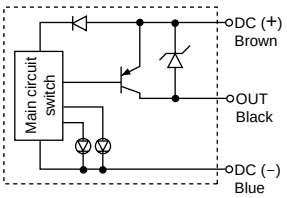
Grommet

Auto Switch Internal Circuits

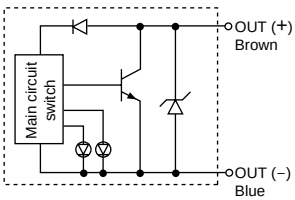
D-F9NW, F9NWV



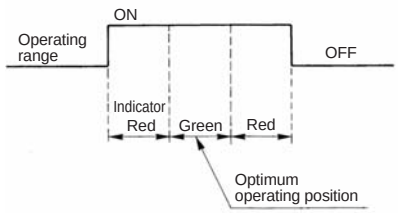
D-F9PW, F9PWV



D-F9BW, F9BWV



Indicator light/Display method



Auto Switch Specifications

D-F9□W, D-F9□WV(with indicator light)						
Auto switch symbol	D-F9NW	D-F9NWV	D-F9PW	D-F9PWV	D-F9BW	D-F9BWV
Electrical entry	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring method	3-wire				2-wire	
Output method	NPN		PNP		–	
Applicable load	IC circuit, Relay IC, PLC				24VDC relay, PLC	
Power supply	5, 12, 24VDC (4.5 to 28VDC)				–	
Current consumption	10mA or less				–	
Load voltage	28VDC or less		–		24VDC (10 to 28VDC)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at 10mA load current)		0.8V or less		4V or less	
Leakage current	100μA max at 24VDC				0.8mA or less	
Indicator light	Operating position ·····Red light emitting diode Most sensitive position ····Green light emitting diode					

●Lead wire — Heavy duty oil resistant vinyl cord, ø2.7, 3 cores (Brown, Black, Blue), 0.15mm², 2 cores (Brown, Blue), 0.18mm², 0.5m.

Note 1) Refer to page 21 for solid state switch common specifications.

Note 2) Refer to page 21 for lead wire length.

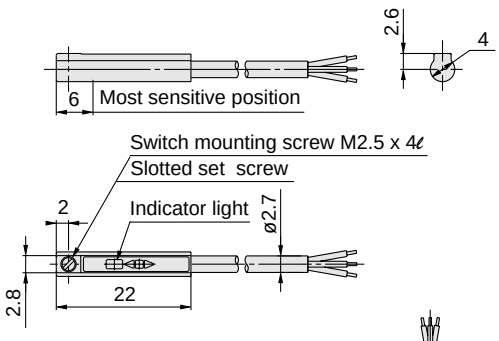
Auto Switch Weight Table

Unit: g

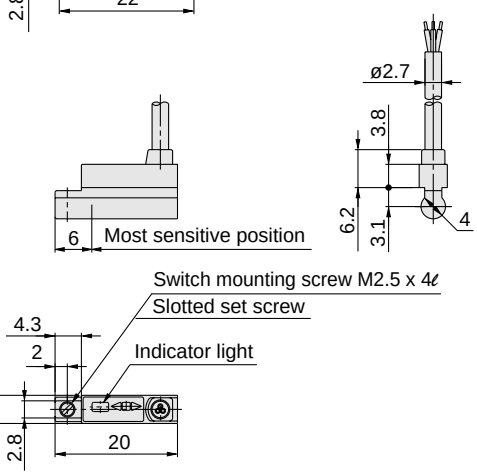
Model		D-F9NW(V)	D-F9PW(V)	D-F9BW(V)
Lead wire length (m)	0.5	7	7	7
	3	34	34	32
	5	56	56	52

Auto Switch Dimensions

D-F9□W



D-F9□WV



Series MHF2
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning"** or **"Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠ Caution : Operator error could result in injury or equipment damage.

⚠ Warning : Operator error could result in serious injury or loss of life.

⚠ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Series MHF2
Air Gripper Precautions 1
Be sure to read before handling.

Precautions on design

⚠Warning

1. A protective cover is recommended to minimize the risk of personal injury due to accidental contact with moving parts of the gripper.

2. If circuit pressure drops due to a power failure or trouble with the air supply, etc., there is a danger of work pieces dropping because of reduced gripping force. Measures should be taken to protect against unexpected drop of work due to loss of air pressure.

Selection

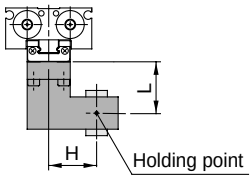
⚠Warning

1. Keep the holding point within the specified range of the holding distance.

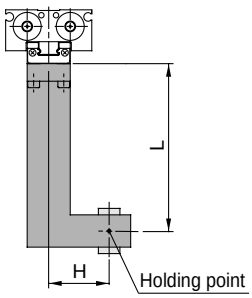
When the holding point distance becomes large, the finger attachment applies an excessively large load to the cross roller section, causing excessive play of the fingers and possibly leading to premature failure.

Refer to the graph of the specified range of the holding distance for each series.

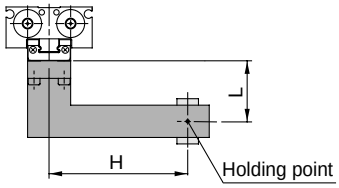
○ "L and H "are appropriate.



✕ "L" is too long.



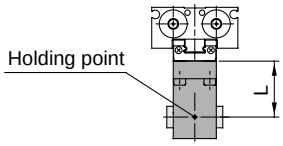
✕ "H" is too long.



Selection

2. Attachment should be designed as light and short as possible.

1. Long and heavy attachment increases the inertia force to open or close the fingers. It may cause unsteady movement of fingers and have an adverse effect on life.
2. Even if holding point remains within the limited range, make the attachment as light and short as possible.

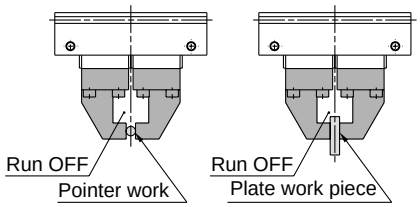


3. Select the large size gripper or use two or more grippers for one piece at once for handling long and large work.

⚠Warning

3. Provide run off space in the attachment when using for the small or thin work.

If the run off space is not provided with the finger part, holding condition becomes unsteady and the holding point may slide from the best position.



4. Select the model whose holding force is sufficient against work weight.

Incorrect selection may lead to release of work etc.

Refer to "Effective holding force" and information to select the model by weight of work.

5. Do not use in applications where excessive external force or impact force may be applied to gripper.

It may cause malfunction.

Consult SMC with regard to any other applications.

6. Select the model taking the width of fingers between opening and closing points into consideration.

Selection

<In case of short width>

1. The holding condition becomes unsteady due to the unstable opening/closing width or the changeable work diameter.
2. When using the auto switch, the detection is insufficient.
   Refer to "Auto Switch Hysteresis" and set the stroke including the hysteresis length for reliable switch function.
   When using water tight 2-color display auto switch, operation stroke may be limited due to light color setting at detection point. Refer to hysteresis of auto switch.

Mounting

⚠Warning

1. Do not drop nor dent the gripper when mounting.

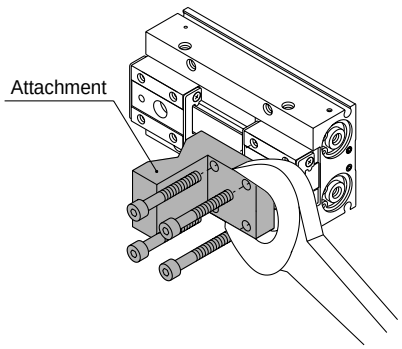
Slight deformation can cause unaccuracy or malfunction.

2. Tighten the screw within the specified torque range to mount the attachment.

The tightening with large torque than specified range may cause malfunction, while the tightening with smaller torque may allow movement of holding position and dropping of work.

How to mount the attachment on fingers

Mount the attachment to the mounting female thread of the finger with a bolt etc. applying the following tightening torque.



Model	Bolt used	Maximum 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

Series MHF2
Air Gripper Precautions 2
Be sure to read before handling.

Mounting

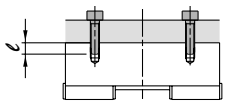
⚠ Warning

3. Tighten the screw within the specified torque range to mount the attachment.

The tightening with large torque than specified range may cause malfunction, while the tightening with smaller torque may allow movement of holding position and dropping of work.

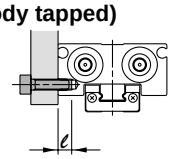
Mounting of gripper

Axis mounting (Body tapped)



Model	Bolt used	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

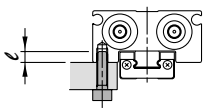
Vertical mounting (Body tapped)



Model	Bolt used	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

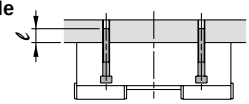
Side mounting (Body tapped, Body through hole)

●Body tapped



Model	Bolt used	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 used	Max. tightening torque N·m	Max. 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 mounting MHF2-8D□ or MHF2-12D□ with the body through holes, use the attached mounting screws.

⚠ Caution

1. Avoid the excessive force on fingers when mounting the attachment.

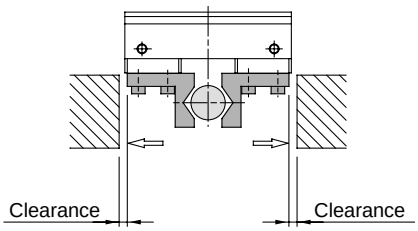
Any change of fingers may cause the malfunction and deteriorate the accuracy.

2. Avoid the external force to fingers.

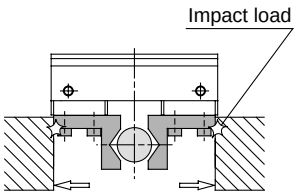
Fingers may be damaged by continual lateral or the impact load. Provide clearance to prevent the work or the attachment from striking against any object at the stroke end.

1) Stroke end when fingers are open

○With clearance

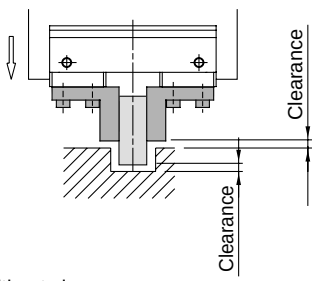


×Without clearance

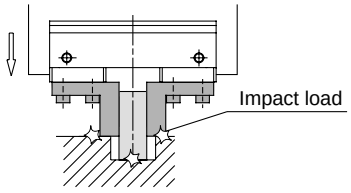


2) Stroke end when gripper is moving

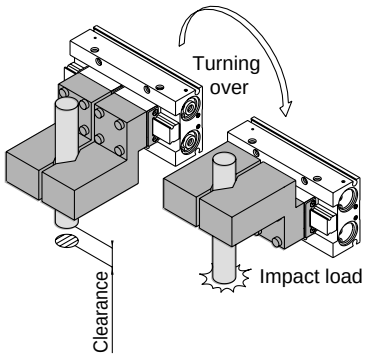
○With clearance



×Without clearance



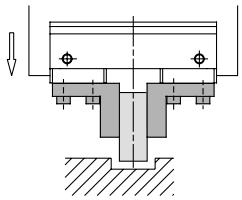
3) When turning over



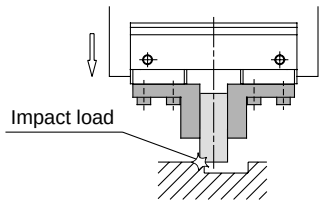
3. Adjust the holding point so that excessive force will not be applied on fingers when inserting the work.

Particularly when performing a trial run, operate the equipment manually or with low cylinder pressure and speed while confirming that there is no impact or other unsafe conditions.

○Holding point is adjusted.



×Holding point is not adjusted.



4. If the closing speed of the fingers is greater than necessary, rattling and dam-age can occur due to the inertia of the fingers and attachments.

Therefore, a speed controller should be installed and adjusted so that there is no impact.

Applicable speed controller

Air gripper mounted type — AS1201F-M3
AS1201F-M5 etc.

Piping type — AS1000 series
AS1001F

Series MHF2
Air Gripper Precautions 3
Be sure to read before handling.

Piping

⚠Caution

1. **Preparation before piping**
   Thoroughly flush the fittings to prevent dust or chips from entering the gripper.
2. **Wrapping of pipe tape**
   When piping and fittings are installed, care should be taken to prevent contamination (Chips from piping and seal materials).

Environment

⚠Warning

1. **Do not use in environment of corrosive gases, sea water, water, nor vapor or in environment gives bad influence specially. Some environment gives bad influence into dust cover and packing, it may lead malfunction and shortened life. Contact SMC after the environment is confirmed when you have the question.**
2. **Do not use in direct sun light.**
3. **Do not subject to excessive vibration.**
4. **Do not use close to flame.**
5. **Use a cover when gripper must be used in an environment where dust or cutting oil will come in contact with gripper.**
6. **Consult SMC for the use in any other special environment.**

Lubrication

⚠Caution

1. **Non-lube type is lubricated already. Therefore, it is not necessary to lubricate before using.**
   When lubricating the gripper, use the turbine oil class1 (ISO VG32) and refuel continually.
   When lubrication has been started, it must be continued throughout the life of the gripper or malfunction may result.

Maintenance

⚠Warning

1. **Do not enter the transfer line nor put the object.**
   It may cause unexpected accidents.
2. **Do not enter your hands between finger and attachment.**
   It may cause unexpected accidents.
3. **Confirm that no work is held by fingers before releasing the compressed air to remove the gripper from the line.**
   Dropping of work can be dangerous.

Series MHF2
Auto Switch Precautions 1
Be sure to read before handling.

Design and Selection

⚠Warning

1. Confirm the specifications.
Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications for load current, voltage, temperature or impact.

2. Take precautions when multiple air grippers are used close together.
When multiple auto switch air grippers are used in close proximity, magnetic field interference may cause the switches to malfunction. Maintain a minimum air gripper separation of 40mm. (When the allowable separation is indicated for each air gripper series, use the specified value.)

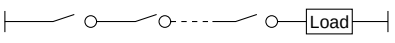
3. Pay attention to the length of time that a switch is ON at an intermediate stroke position.
When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, although the auto switch will operate, the operating time will be shortened and the load may not operate properly if the speed is too great. The maximum detectable piston speed is:

$$V\ (mm/s) = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time (ms)}} \times 1000$$

4. Keep wiring as short as possible.
<Solid state switch>
Although wire length should not affect switch function, use a wire of 100m or shorter.

5. Take precautions for the internal voltage drop of the switch.
<Solid state switch>
Generally, the internal voltage drop will be greater with a 2 wire solid state auto switch than with a reed switch.

- Take note that there will be a large voltage drop if auto switches are connected in series as shown below. (Refer to internal voltage drop in the auto switch specifications.)
  [The voltage drop will be "n" times larger when "n" auto switches are connected.]
  Even though an auto switch operates normally, the load may not operate.



- In the same way, when operating below the specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Supply voltage} - \frac{\text{Internal voltage}}{\text{drop of switch}} > \frac{\text{Minimum operating}}{\text{voltage of load}}$$

Also, note that a 12 VDC relay is not applicable.

6. Pay attention to leakage current.
<Solid state switch>
With a 2 wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

$$\frac{\text{Operating current of load}}{\text{(OFF condition)}} > \text{Leakage current}$$

If the criteria given by the above formula are not met, it will not reset correctly (stays ON). Use a 3 wire switch if this specification will not be satisfied.
Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

7. Do not use a load that generates surge voltage.
<Solid state switch>
Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load, such as a relay or solenoid, which generates surge is directly driven, use a type of switch having a built-in surge absorbing element.

8. Cautions for use in an interlock circuit.
When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch.
Also perform periodic maintenance and confirm proper operation.

9. Secure sufficient clearance for maintenance activities.
When designing an application, be sure to allow sufficient clearance for maintenance and inspections.

Mounting and Adjustment

⚠Warning

1. Do not drop or bump.
Do not drop, bump or apply excessive impacts (1000m/s^2 or more for solid state switches) while handling.
Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

2. Do not carry a cylinder by the auto switch lead wires.
Never carry a cylinder by its lead wires. This may not only cause broken lead wires but it may cause internal elements of the switch to be damaged by the stress.

3. Mount switches using the proper fastening torque.
When a switch is tightened beyond the range of fastening torque, the mounting screws, mounting bracket or switch may be damaged.
On the other hand, tightening below the range of fastening torque may allow the switch to slip out of position.
(Refer to page 18 regarding switch mounting, movement and fastening torque, etc.)

Wiring

⚠Warning

1. Avoid repeatedly bending or stretching lead wires.
Broken wires will result from applying repeated bending stress or stretching force to the lead wires.

2. Be sure to connect the load before power is applied.
<2-wire types>
If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

3. Confirm proper insulation of wiring.
Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.) Damage may occur due to excess current flow into a switch.

Series MHF2
Auto Switch Precautions 2
Be sure to read before handling.

Wiring

⚠Warning

4. Do not run wiring near power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

∗Lead wire colour changes

Lead wire colours of SMC switches have been changed in order to meet NECA Standard 0402 for production beginning September, 1996 and thereafter.

Special care should be taken regarding wire polarity during the time that the old colours still coexist with the new colours.

2-wire

	Old	New
Output (+)	Red	Brown
Output (−)	Black	Blue

Solid state with diagnostic output

	Old	New
Power supply +	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

3-wire

	Old	New
Power supply +	Red	Brown
Power supply GND	Black	Blue
Output	White	Black

Solid state with latch type diagnostic output

	Old	New
Power supply +	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange

5. Solid state with latch type diagnostic output

<Solid state switch>

Models D-F9□(V),F9□W(V) and all models of PNP output type switches do not have built-in short circuit protection circuits. If loads are short circuited, the switches will be instantly damaged.

Take special care to avoid reverse wiring with the power supply line (brown) and the output line (black) on 3 wire type switches.

6. Avoid incorrect wiring.

<Solid state switch>

1) If connectors are reversed on a 2 wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.

Wiring

2) If connections are reversed (power supply line + and power supply line -) on a 3 wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue wire and the power supply line (-) is connected to the black wire, the switch will be damaged.

Operating Environment

⚠Warning

1. Never use in an atmosphere of explosive gases.

The structure of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive since this may cause a serious explosion.

2. Do not use in an area where magnetic field is generated.

Auto switches will malfunction or magnets inside air grippers will become demagnetized.

3. Do not use in an environment where auto switches will be continually exposed to water.

Although switches, except for a few models, conform, to the IEC standard IP67 structure (JISC 0920: watertight construction), do not use switches in applications where they are continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

4. Do not use in an environment with oil or chemicals.

Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

5. Do not use in an environment with temperature cycles.

Consult SMC if switches are used where there are temperature cycles other than normal air temperature changes, as they may be adversely affected internally.

Operating Environment

6. Do not use in locations where surge is generated.

<Solid state switch>

When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around air grippers with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and disorganized lines.

7. Avoid accumulation of iron powder or close contact with magnetic substances.

When a large amount of ferrous powder such as matching chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch air gripper, it may cause the auto switch to malfunction due to a loss of the magnetic force inside the air gripper.

Maintenance

⚠Warning

1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.

1) Secure and tighten switch mounting screws.
If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.

2) Confirm that there is no damage to lead wires.
To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.

3) Confirm the lightening of the green light on the 2-color display type switch.
Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate, Readjust the mounting position until the green LED lights up.

Other

⚠Warning

1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.

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