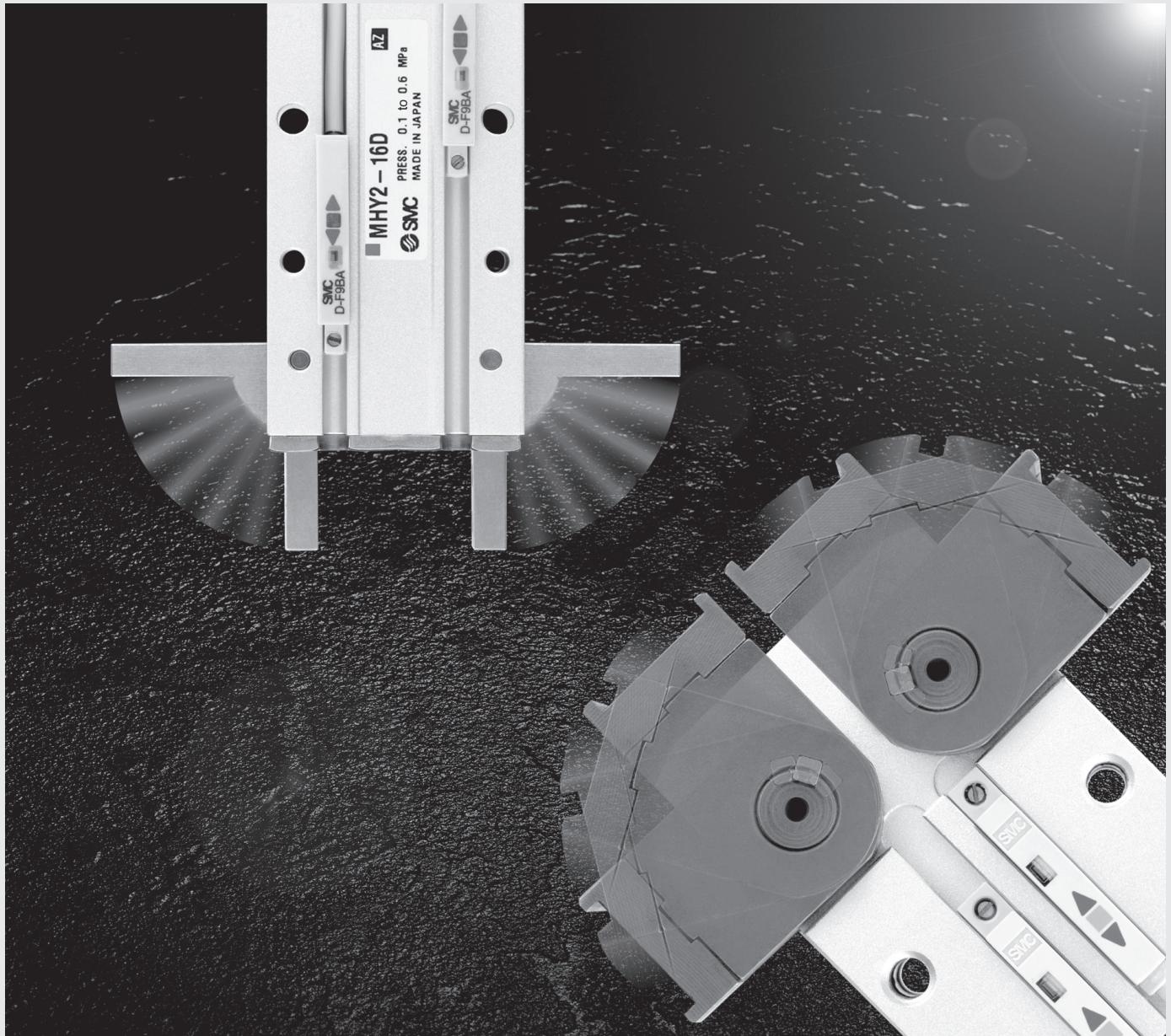


180° Angular Gripper

Series *MHW2*

Rack & Pinion Style



Cam actuation style is now standardised !

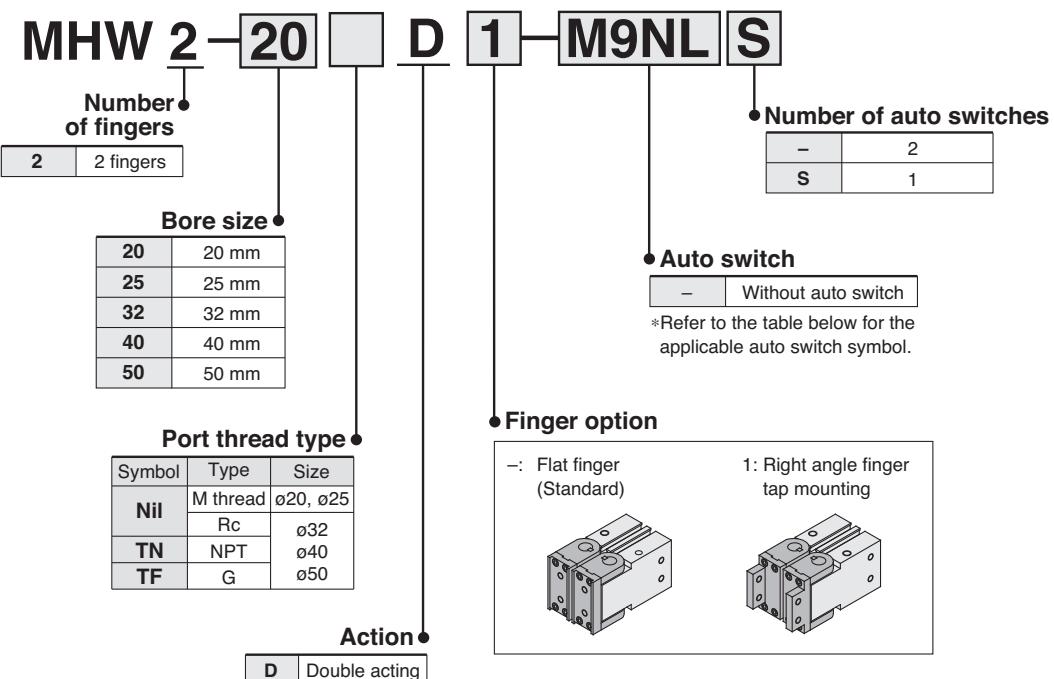


EMC-MHW2-01A-UK

Series MHW2

ø20, ø25, ø32, ø40, ø50

How to Order



Applicable 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 auto switch	—	Grommet	Yes	3-wire(NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	●	●	○	○	IC circuit
	Diagnosis (2-colour indication)			3-wire(PNP)		12 V		M9PV	M9P	●	●	●	○	○	
	Water resistant (2-colour indication)			2-wire		5 V, 12 V		M9BV	M9B	●	●	●	○	○	
				3-wire(NPN)		12 V		M9NWV	M9NW	●	●	●	○	○	IC circuit
				3-wire(PNP)		5 V, 12 V		M9PWV	M9PW	●	●	●	○	○	
				2-wire		12 V		M9BWV	M9BW	●	●	●	○	○	
				3-wire(NPN)		5 V, 12 V		M9NAV**	M9NA**	○	○	●	○	○	IC circuit
				3-wire(PNP)		12 V		M9PAV**	M9PA**	○	○	●	○	○	
				2-wire		12 V		M9BAV**	M9BA**	○	○	●	○	○	—
															Relay, PLC

** Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance.

* Lead wire length symbols: 0.5 m Nil (Example) M9NW

* Auto switches marked with a "○" symbol are produced upon receipt of order.

1 m M (Example) M9NWM

3 m L (Example) M9NWL

5 m Z (Example) M9NWZ

Note 1) When using the 2-colour indicator type, please make the setting so that the indicator is lit in red to ensure the detection at the proper position of the air gripper.

Note 2) When ordering the air gripper with the auto switch, the auto switch mounting bracket is included.

When ordering the auto switch separately, the auto switch mounting bracket (BMG2-012) is required.

Specifications



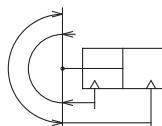
Fluid	Air
Operating pressure	0.15 to 0.7MPa
Ambient and fluid temperature	-10 to 60 C
Repeatability	0.2mm
Max. operating frequency	ø20-25: 60c.p.m ø32 to 50: 30c.p.m
Lubrication	Not required
Action	Double acting
Auto switch (Optional) Note	Solid state switch (3 wire, 2wire)



Note) Refer to p.6-15 for details of auto switch specifications.

Symbol

Double acting



Model

Model	Bore size (mm)	Effective force (Nm) ⁽¹⁾	Opening angle (Both sides)		Weight (g)
			Opening side	Closing side	
MHW2-20D	20	0.30	180	-5	300
MHW2-25D	25	0.73		-6	510
MHW2-32D	32	1.61		-5	910
MHW2-40D	40	3.70		-5	2140
MHW2-50D	50	8.27		-4	5100

Note 1) At the pressure of 0.5MPa

Note 2) Not including auto switch

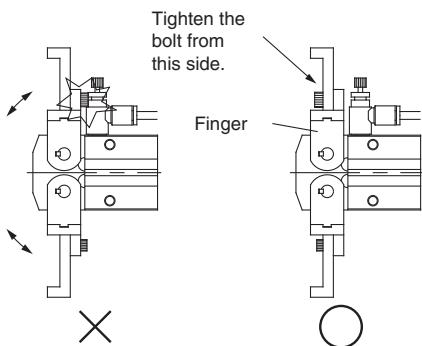
Precaution

Installation

MHW

⚠ Warning

When using right angle finger tap mounting type, pay attention the interference of bolt and speed controller.

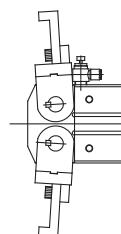


Bolt interferes with speed controller

MHW2-50 0₀₁

⚠ Warning

When using speed controller with One-touch fitting, use AS22 or AS23. If AS32 or AS33 is used, the finger interferes with speed controller as figure shown below. It causes malfunction.



Series MHY2/MHW2

How to Select the Applicable Model

How to Select

Procedure



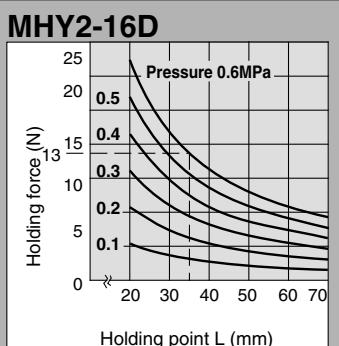
Step 1 Confirm holding force



Example Work weight: 0.05kg

Guidelines on model selection according to work weight

- Although the condition differs according to the coefficient of friction between the attachment and work, select a model that can produce a holding force of 10 to 20 times the work weight.
- Further allowance should be provided when great acceleration or impact is expected during work transfer.
Ex.) For setting the holding force to be at least 20 times the work weight;
Required holding force = $0.05\text{kg} \times 20 \times 9.8\text{m/s}^2 = 10\text{N}$ min.



Holding point L = 35mm

Operating pressure: 0.6MPa

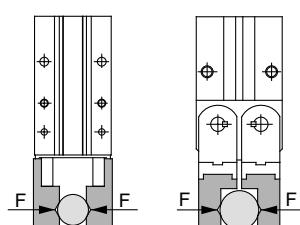
- When MHY2-16D is selected, the holding force is determined to be 13N according to the holding point distance (L = 35mm) and the pressure (0.6MPa).
- The holding force is 26 times the work weight meeting the guideline that holding force should be more than 20 times the set holding force value.

Effective holding force

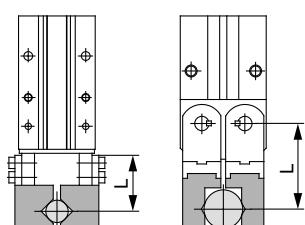
Series MHY2/MHW2 Double acting

- Indication of effective holding force

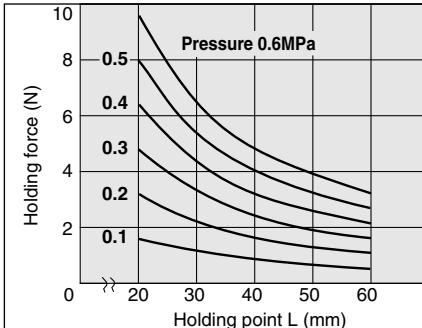
The holding force shown in the tables represents the holding force of one finger when all fingers and attachments are in contact with the work.
(F: Thrust of one finger)



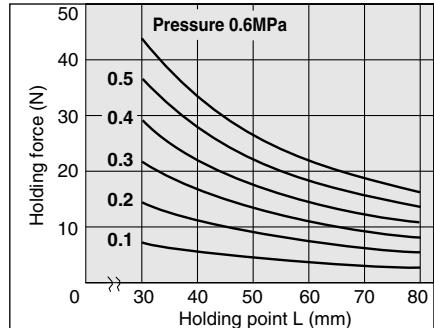
External hold



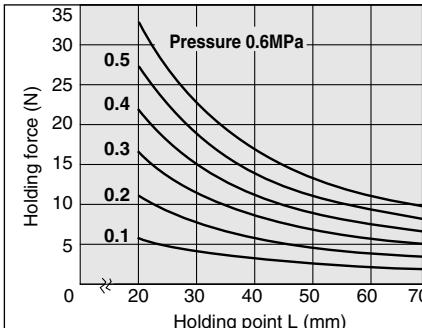
MHY2-10D



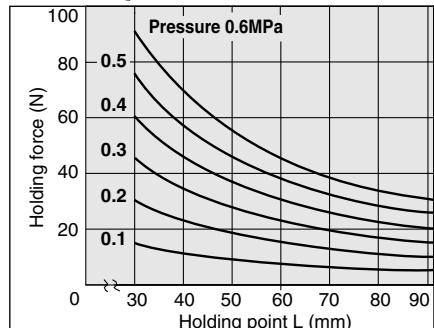
MHY2-20D



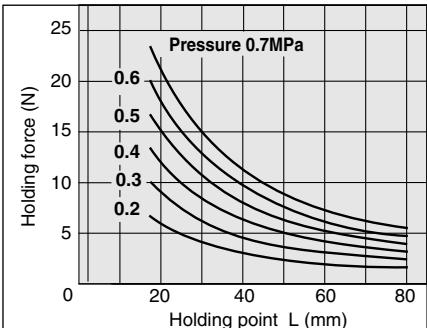
MHY2-16D



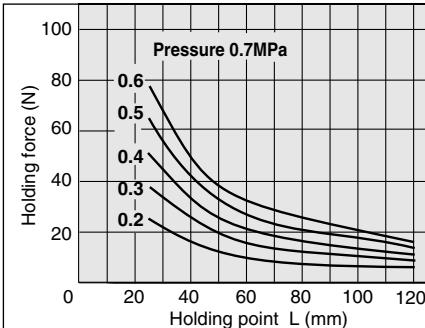
MHY2-25D



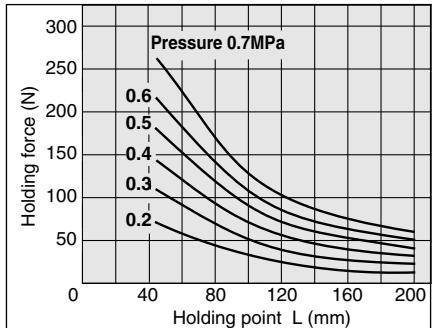
MHW2-20D



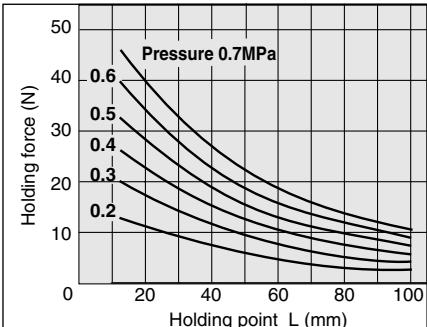
MHW2-32D



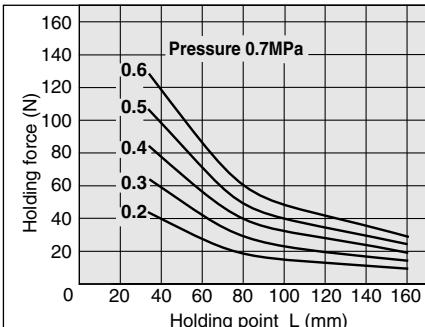
MHW2-50D



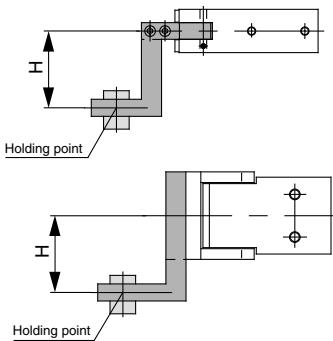
MHW2-25D



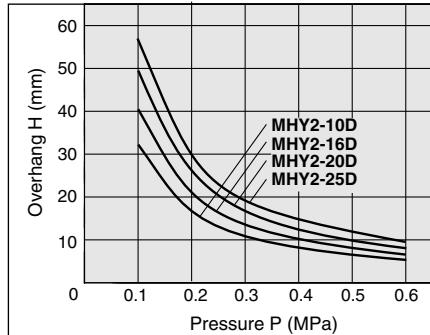
MHW2-40D



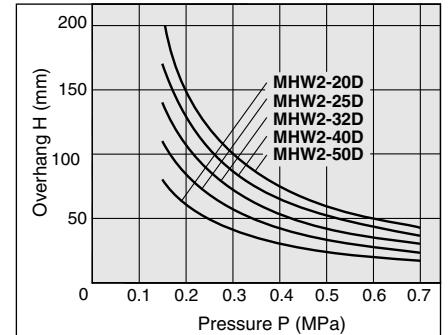
Step 2 Confirmation of holding point



MHY



MHW

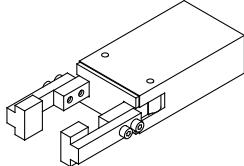


- Work should be held at a point within the range of overhanging distance (H) for a given pressure indicated in the tables on the right.
- When the work is held at a point outside of the recommended range for a given pressure, it may cause adverse effect on the product life.

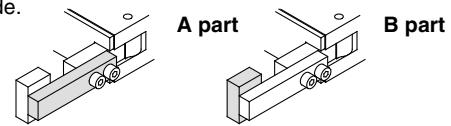
Series MHY2/MHW2

How to Select the Applicable Model

Step 3 Confirm moment of inertia of attachments



Confirm the moment of inertia for the attachment at one side.
Calculate the moment of inertia for A and B separately as shown in the figures on the right.



Procedure	Formula	Calculation example
1 Check the operating conditions, dimensions of attachment, etc.	A part B part 	Operating model: MHY2-16D Opening time: 0.15s a = 40 (mm) b = 7 (mm) c = 8 (mm) d = 5 (mm) e = 10 (mm) f = 12 (mm)
2 Calculate the moment of inertia of attachment.	A part Calculation of weight $m_1 = a \times b \times c \times \text{Specific gravity}$ Moment of inertia around Z1 axis $I_{Z1} = \{m_1(a^2 + b^2)/12\} \times 10^{-6}$ Moment of inertia around Z axis $I_A = I_{Z1} + m_1 r_1^2 \times 10^{-6}$ B part Calculation of weight $m_2 = d \times e \times f \times \text{Specific gravity}$ Moment of inertia around Z2 axis $I_{Z2} = \{m_2(d^2 + e^2)/12\} \times 10^{-6}$ Moment of inertia around Z axis $I_B = I_{Z2} + m_2 r_2^2 \times 10^{-6}$ Total moment of inertia $I = I_A + I_B$ (□: constant for unit conversion)	Material of attachment: Aluminum alloy (Specific gravity = 2.7) r = 37 (mm) $m_1 = 40 \times 7 \times 8 \times 2.7 \times 10^{-6}$ = 0.006(kg) $I_{Z1} = \{0.006 \times (40^2 + 7^2)/12\} \times 10^{-6}$ = 0.8 X 10 ⁻⁶ (kgm ²) $I_A = 0.8 \times 10^{-6} + 0.006 \times 37^2 \times 10^{-6}$ = 9.0 X 10 ⁻⁶ (kgm ²) r ² = 47(mm) $m_2 = 5 \times 10 \times 12 \times 2.7 \times 10^{-6}$ = 0.002(kg) $I_{Z2} = \{0.002 \times (5^2 + 10^2)/12\} \times 10^{-6}$ = 0.02 X 10 ⁻⁶ (kgm ²) $I_B = 0.02 \times 10^{-6} + 0.002 \times 47^2 \times 10^{-6}$ = 4.4 X 10 ⁻⁶ (kgm ²) I = 9.0 X 10 ⁻⁶ + 4.4 X 10 ⁻⁶ = 13.4 X 10 ⁻⁶ = 0.13 X 10 ⁻⁴ (kgm ²)
3 Determine the allowable moment of inertia from the graph.	MHY2-16D 	The moment of inertia is determined to be 0.9×10^{-4} (kgm ²) according to the operating time (0.15s) from the graph on the left.
4 Confirm the moment of inertia of one attachment is within the allowable range.	Moment of inertia of attachment < Allowable moment of inertia	0.13×10^{-4} (kgm ²) < 0.9×10^{-4} (kgm ²) Possible to use this model MHY2-16D completely.

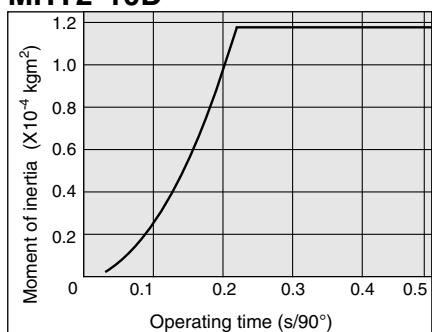
Symbol

Symbol	Definition	Unit
Z	Finger rotation axis	—
Z1	Axis on the centre gravity of A part of attachment and parallel to Z	—
Z2	Axis on the centre gravity of B part of attachment and parallel to Z	—
I	Total moment of inertia for attachment	kgm^2
I _{Z1}	Inertia moment around the Z1 axis of A part of attachment	kgm^2
I _{Z2}	Inertia moment around the Z2 axis of B part of attachment	kgm^2

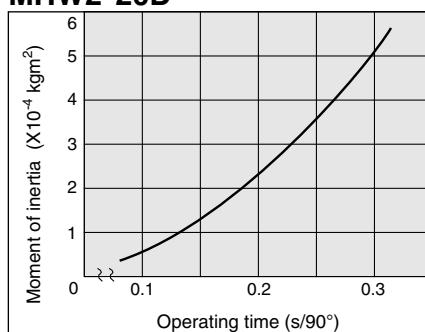
Symbol	Definition	Unit
I _A	Moment of inertia around the Z axis of A part of attachment	kgm^2
I _B	Moment of inertia around the Z axis of B part of attachment	kgm^2
m ₁	Weight of A part of attachment	kg
m ₂	Weight of B part of attachment	kg
r ₁	Distance between Z and Z1 axis	mm
r ₂	Distance between Z and Z2 axis	mm

Allowable range of inertia moment of attachment

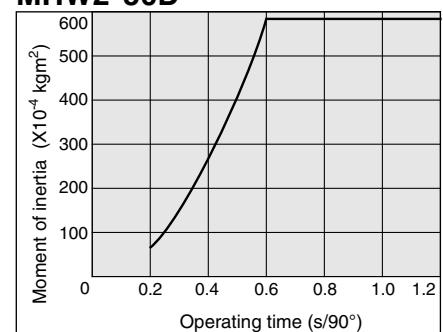
MHY2-10D



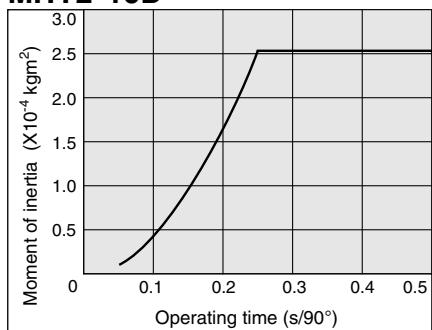
MHW2-20D



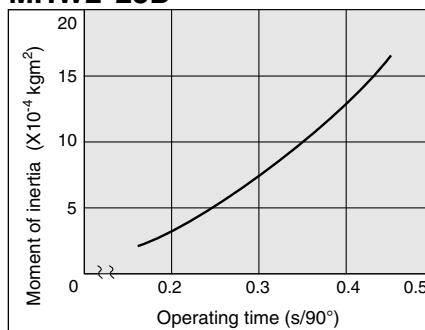
MHW2-50D



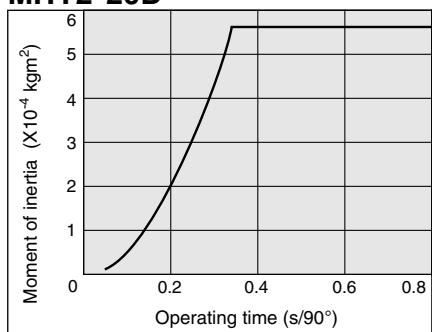
MHY2-16D



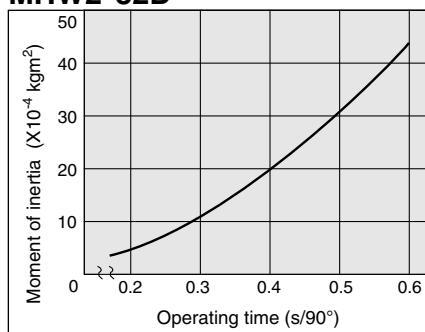
MHW2-25D



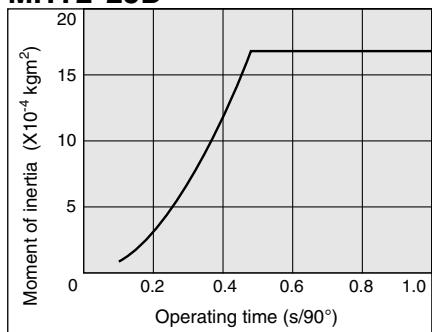
MHY2-20D



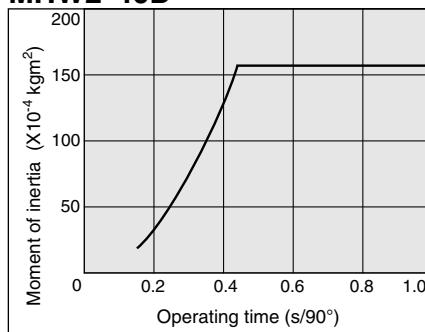
MHW2-32D



MHY2-25D

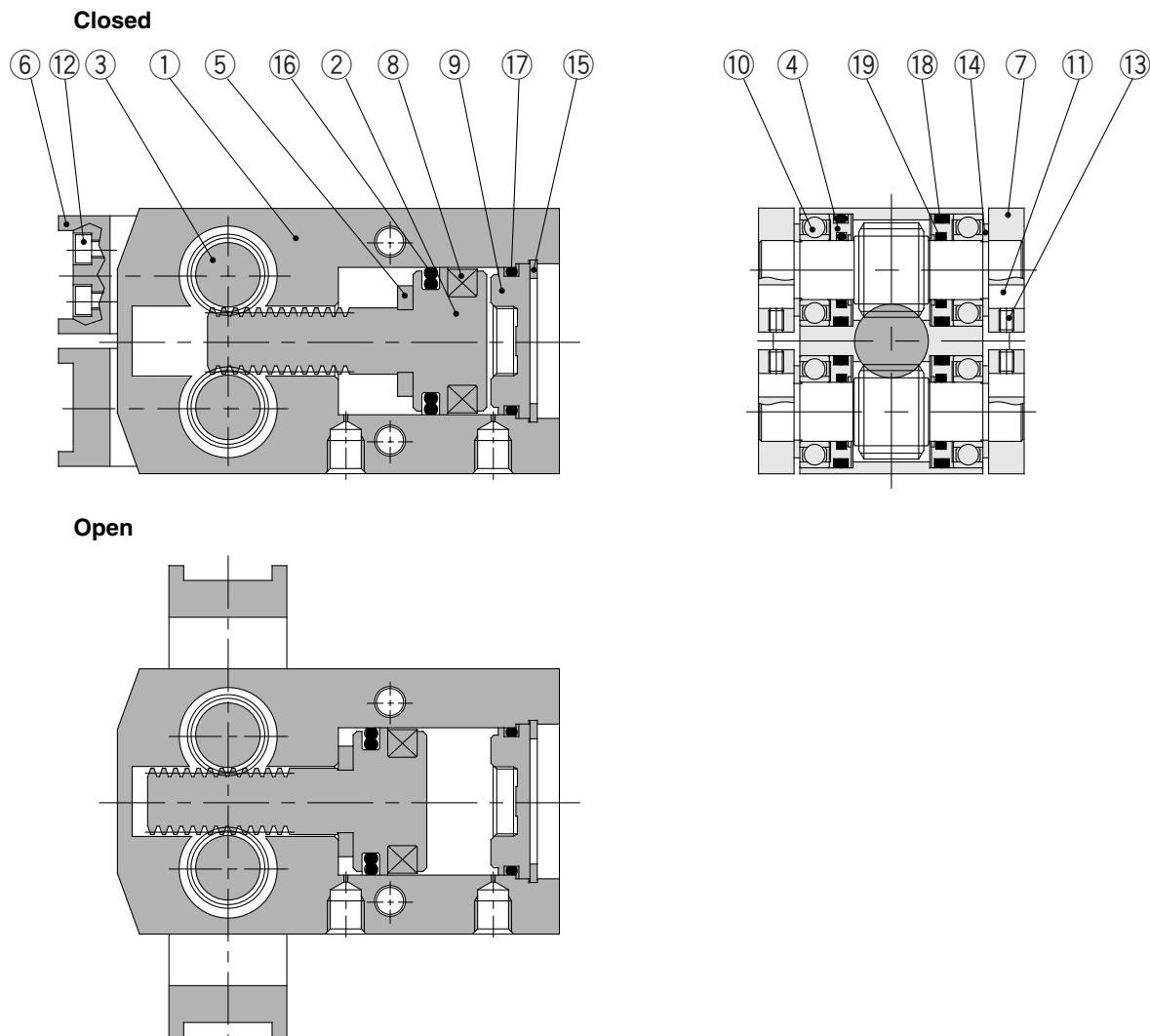


MHW2-40D



Series MHW2

Construction



Component Parts

No.	Description	Material	Note
①	Body	Aluminum alloy	Hard anodized
②	Piston	Stainless steel	Nitriding
③	Pinion gear	Carbon steel	Heat treatment
④	Seal cover	Brass	
⑤	Bumper	Urethane rubber	
⑥	Finger (A)	Carbon steel	
⑦	Finger (B)	Carbon steel	
⑧	Rubber magnet	Synthetic rubber	

Component Parts

No.	Description	Material	Note
⑨	Cap	ø20, 25: Resin ø32 to 50: Aluminum alloy	Hard anodized
⑩	Ball bearing	Carbon steel	Shield type
⑪	Key	Carbon steel	
⑫	Hexagon socket head screw	Carbon steel	
⑬	Hexagon socket cap screw	Carbon steel	
⑭	C-shape snap ring	Carbon steel	
⑮	C-shape snap ring	Carbon steel	

Replacement Parts: Seal Kits

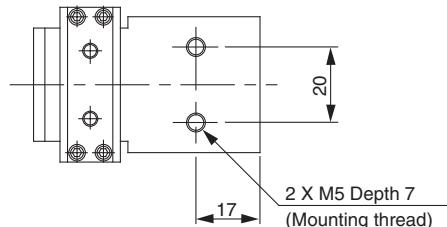
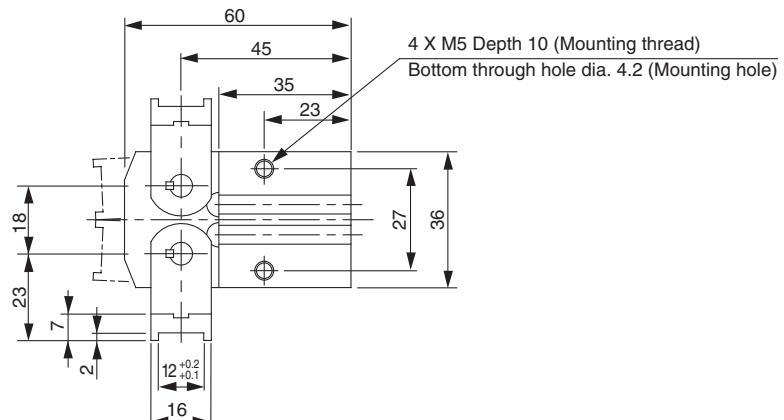
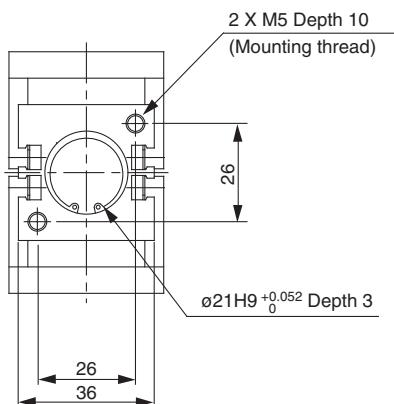
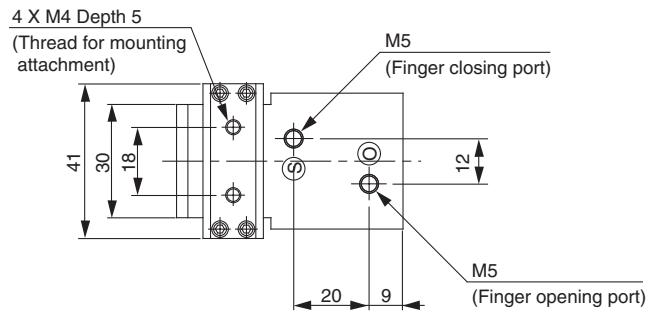
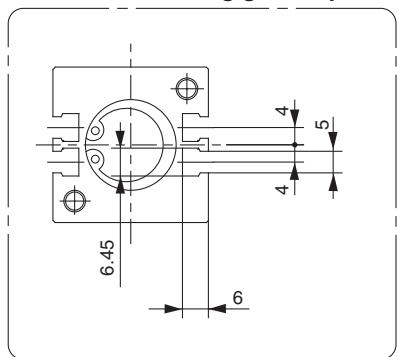
No.	Description	Material	Kit No.				
			MHW2-20D	MHW2-25D	MHW2-32D	MHW2-40D	MHW2-50D
⑯	Seal Kit	NBR	MHW20-PS	MHW25-PS	MHW32-PS	MHW40-PS	MHW50-PS
⑰							
⑱							
⑲							

Dimensions

MHW2-20D

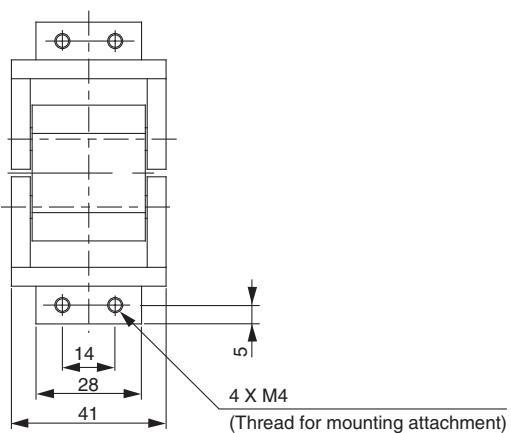
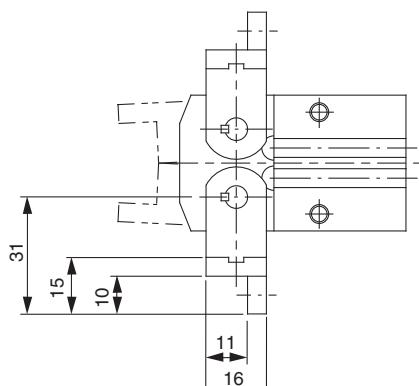
Flat finger (Standard)

Auto switch mounting groove position



MHW2-20D1

Right angle finger



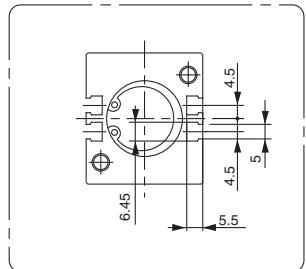
Series MHW2

Dimensions

MHW2-25D

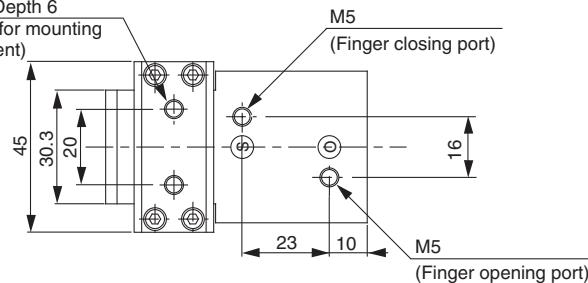
Flat finger (Standard)

Auto switch mounting groove position

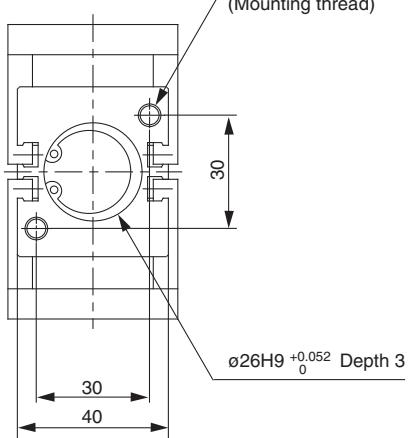


4 X M5 Depth 6

(Thread for mounting attachment)

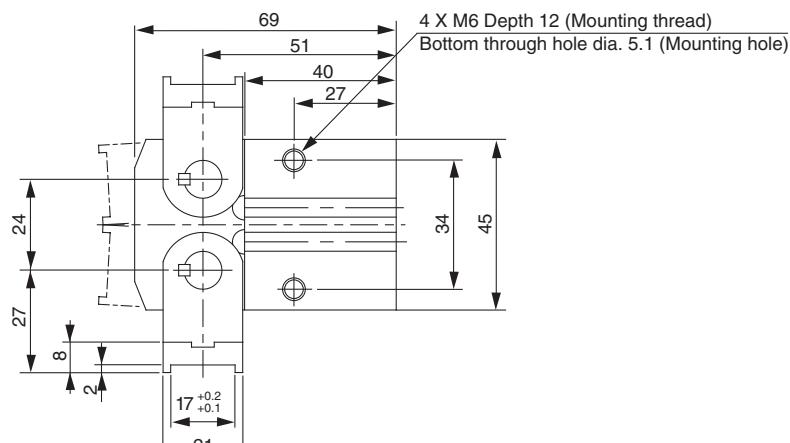


2 X M6 Depth 12
(Mounting thread)

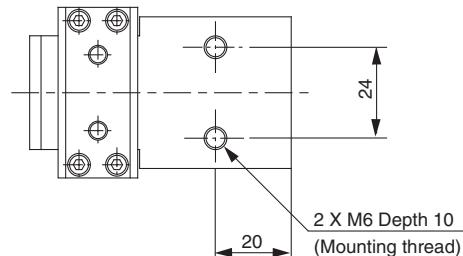


4 X M6 Depth 12 (Mounting thread)

Bottom through hole dia. 5.1 (Mounting hole)

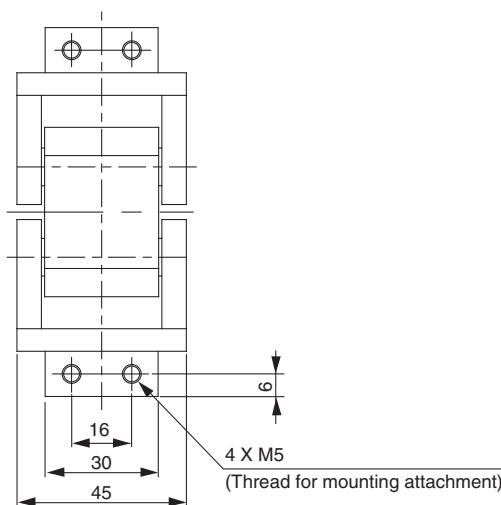
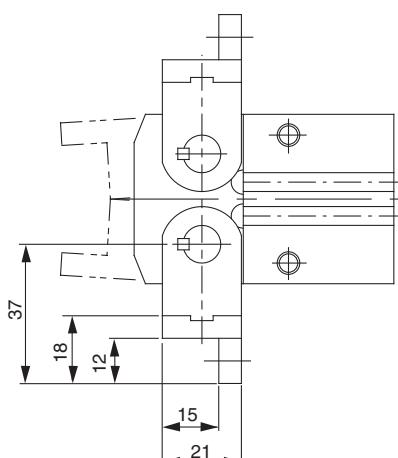


2 X M6 Depth 10
(Mounting thread)



MHW2-25D1

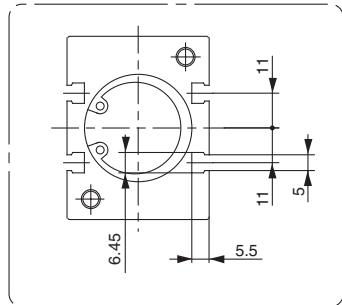
Right angle finger



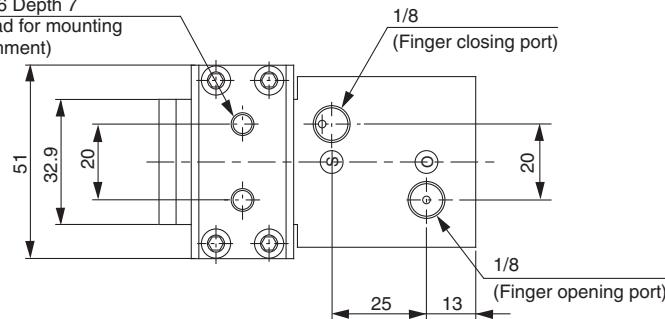
MHW2-32D

Flat finger (Standard)

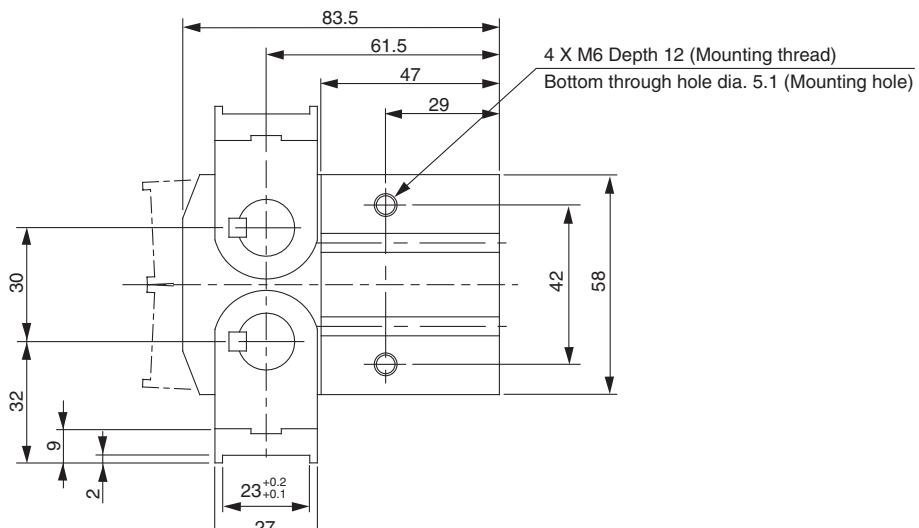
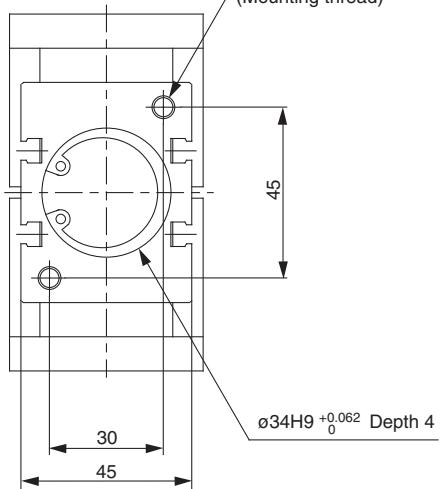
Auto switch mounting groove position



4 X M6 Depth 7
(Thread for mounting attachment)

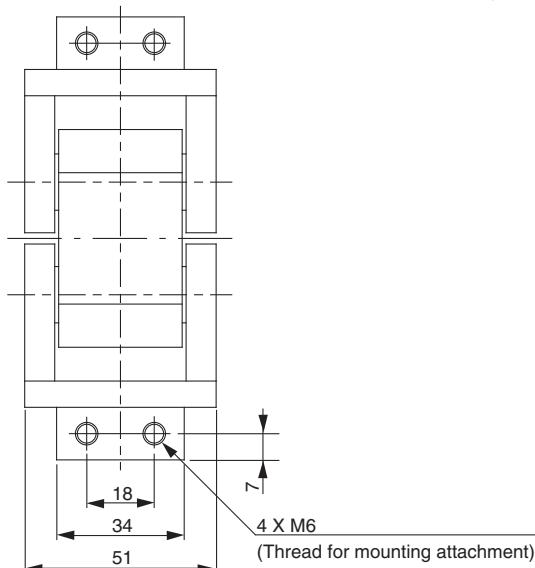
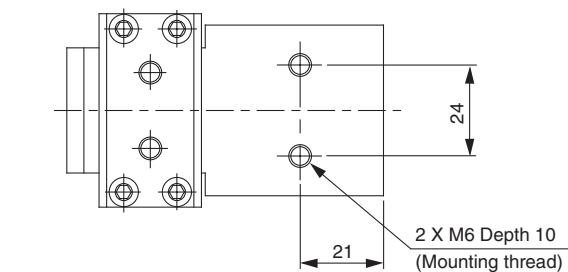
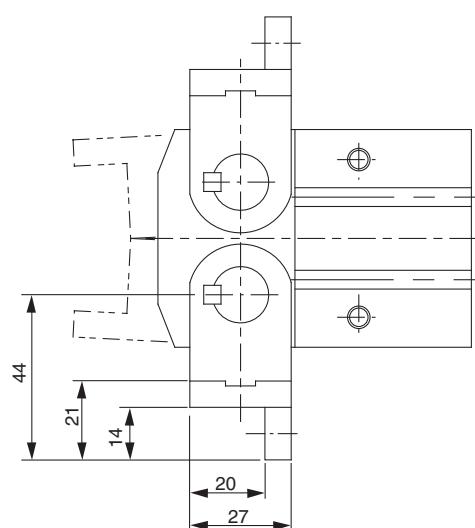


2 X M6 Depth 12
(Mounting thread)



MHW2-32D1

Right angle finger



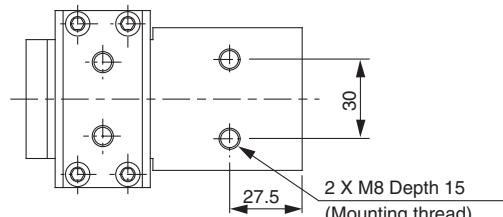
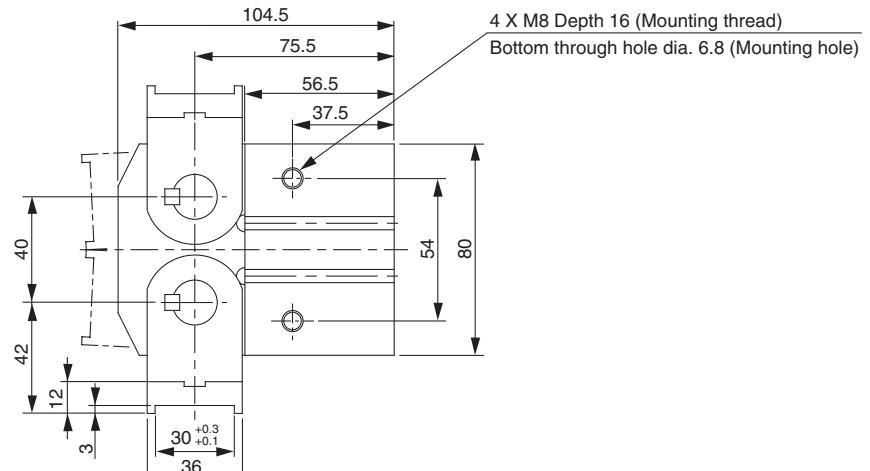
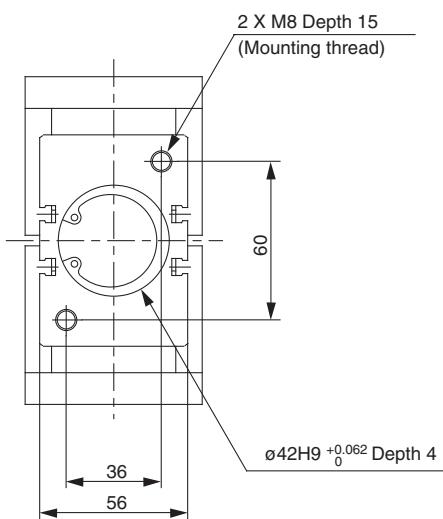
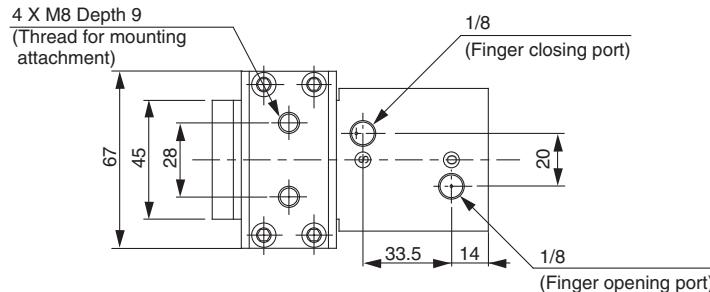
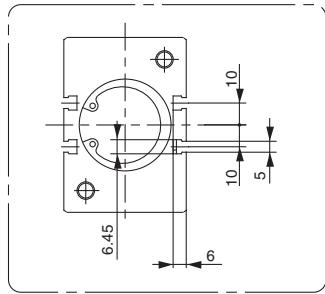
Series MHW2

Dimensions

MHW2-40D

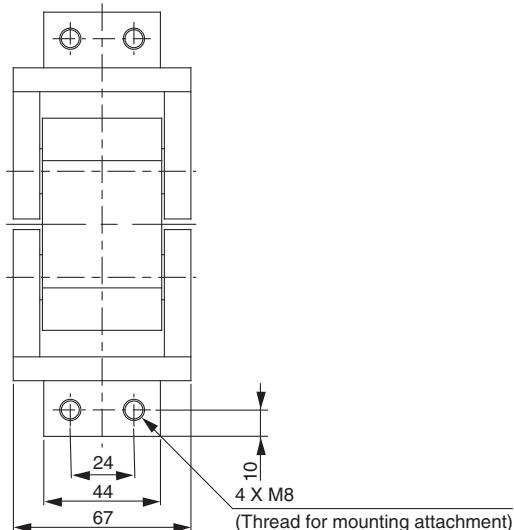
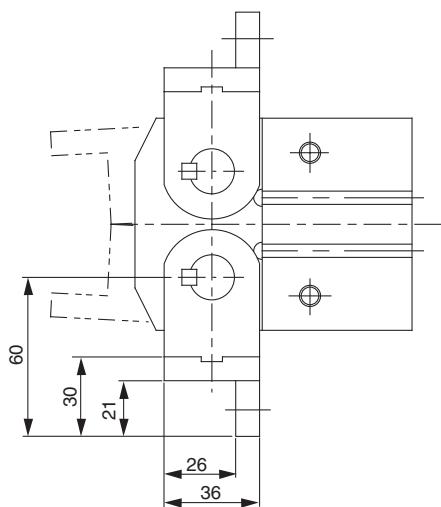
Flat finger (Standard)

Auto switch mounting groove position



MHW2-40D1

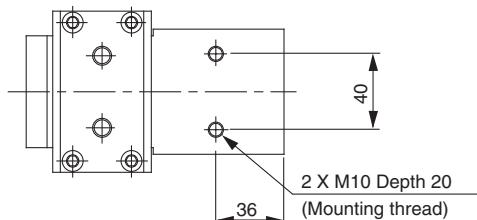
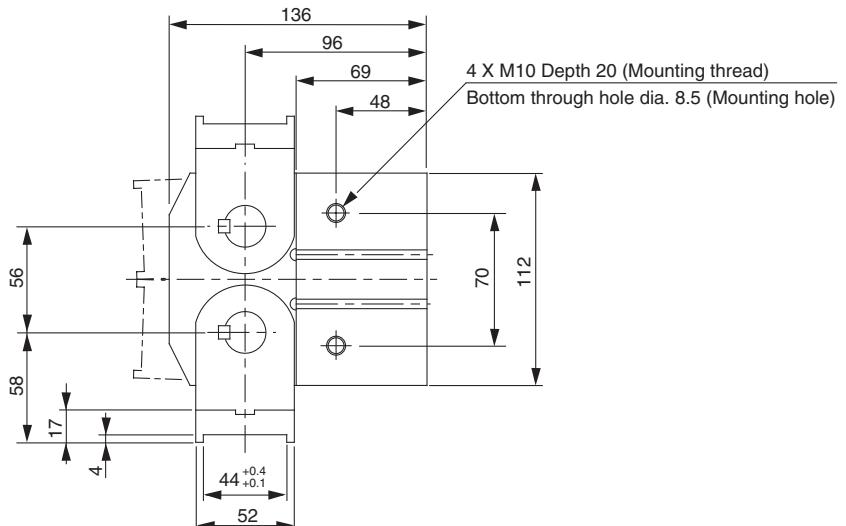
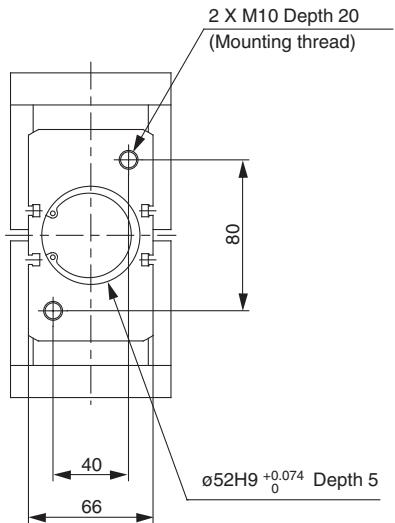
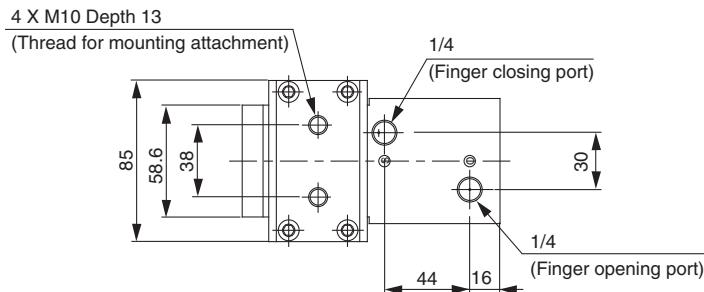
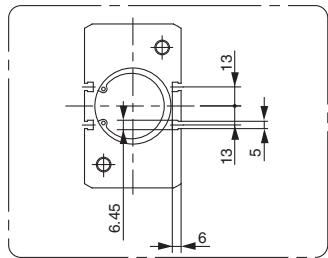
Right angle finger



MHW2-50D

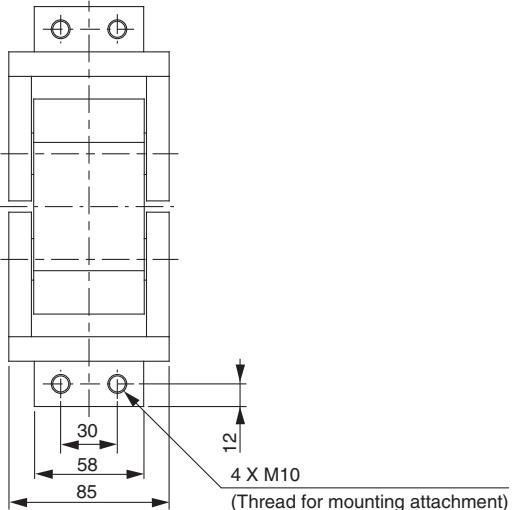
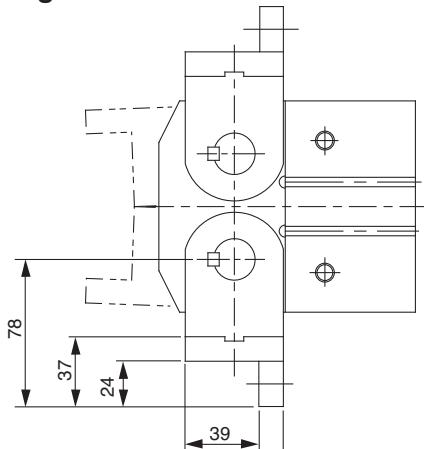
Flat finger (Standard)

Auto switch mounting groove position



MHW2-50D1

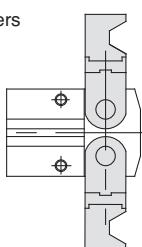
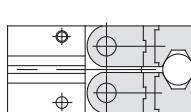
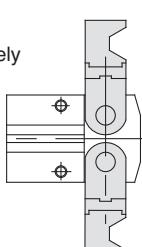
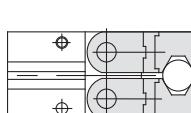
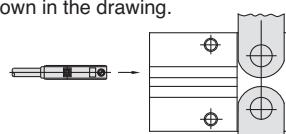
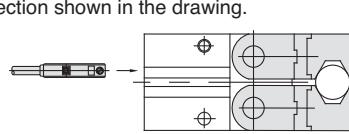
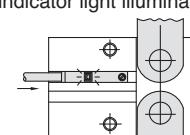
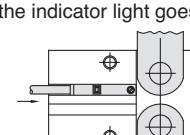
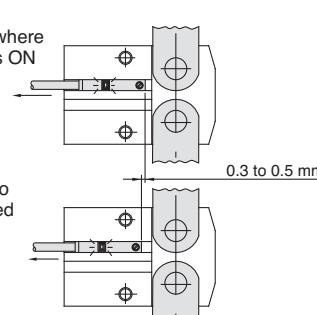
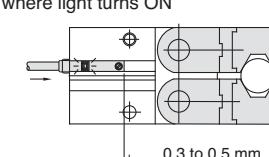
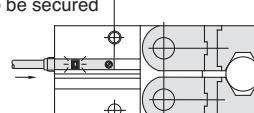
Right angle finger



Series MHY2/MHW2

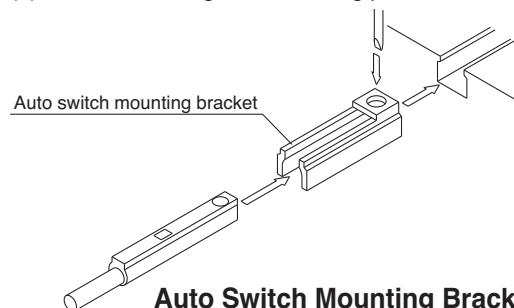
Auto Switch Installation Examples and Mounting Positions

Various auto switch applications are possible through different combinations of auto switch quantities and detecting positions.
Detection when Gripping Exterior of Workpiece

Detection example	1. Confirmation of the fingers in reset position	2. Confirmation of work held
Position to be detected	<p>Position of fingers fully opened</p> 	<p>Position when gripping a workpiece</p> 
Operation of auto switch	<p>Auto Switch turned ON when fingers return. (Light ON)</p>	<p>Auto Switch turned ON when gripping a workpiece. (Light ON)</p>
How to determine auto switch installation position	<p>Step 1) Completely open the fingers.</p> 	<p>Step 1) Position fingers for gripping a workpiece.</p> 
At no pressure or low pressure, connect the auto switch to a power supply, and follow the directions.	<p>Step 2) Insert the auto switch into the switch groove in the direction shown in the drawing.</p> 	<p>Step 2) Insert the auto switch into the switch groove in the direction shown in the drawing.</p> 
	<p>Step 3) Slide the auto switch in the direction of the arrow until the indicator light illuminates.</p>  <p>Step 4) Slide the auto switch further in the direction of the arrow until the indicator light goes out.</p>  <p>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.</p> 	<p>Step 3) Slide the auto switch in the direction of the arrow until the indicator light illuminates. Move the switch an additional 0.3 to 0.5 mm in the direction of the arrow and fasten it.</p> <p>Position where light turns ON</p>  <p>Position to be secured</p> 

Auto Switch Mounting

- (1) Insert the auto switch bracket into the installation groove of the gripper as shown below and roughly set it.
- (2) Insert the auto switch into the auto switch bracket installation groove.
- (3) After confirming the detecting position, tighten the set screws (M2.5) attached to the auto switch and set it.
- (4) Be sure to change the detecting position in the state of (2).



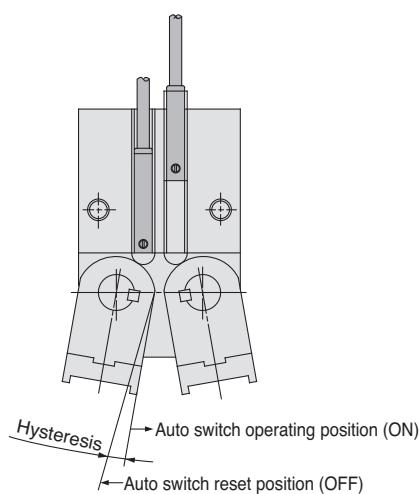
Auto Switch Mounting Bracket: Part No.

Auto switch part no.	Auto switch mounting bracket part no.
D-M9□(V)/M9□W(V)/M9□A(V)	BMG2-012

Note) Use a screwdriver with a grip diameter of 5 to 6 mm to tighten the set screws (M2.5). The tightening torque should be 0.5 to 1 N·m. As a rule, it should be turned about 90° beyond the point at which tightening can be felt.

Auto Switch Hysteresis

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

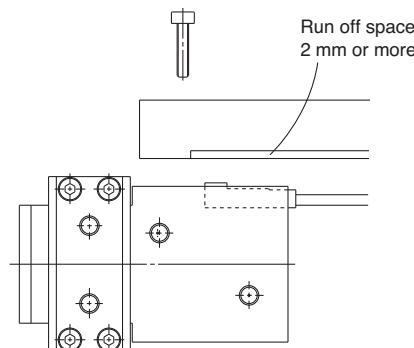


Auto switch Air gripper model	D-Y59□/Y69□ D-Y7P(V)/Y7□W(V)
MHW2-20D	4°
MHW2-25D	4°
MHW2-32D	2°
MHW2-40D	2°
MHW2-50D	2°

Auto switch Air gripper model	Max. hysteresis (Max. value)
	D-M9□(V) D-M9□W(V) D-M9□A(V)
MHW2-20D	4°
MHW2-25D	4°
MHW2-32D	2°
MHW2-40D	2°
MHW2-50D	2°

Handling of Mounting Brackets

When auto switch is set on mounting side as shown below, allow at least 2 mm run off space on mounting late since the auto switch is protruded from the gripper edge.

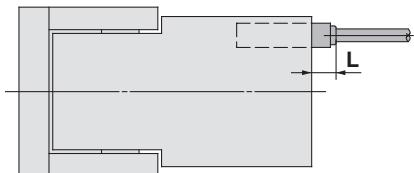


Protrusion of Auto Switch from Edge of Body

The maximum protrusion of an auto switch (when fingers are fully closed) from the edge of the body is shown in the table below. Use the table as a guideline for mounting.

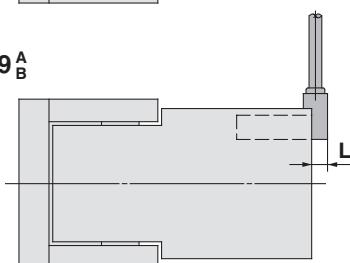
When auto switches

D-M9□/M9□W/Y59^A
D-M9□A
D-Y7□, Y7□W
are used



When auto switches

D-M9□V/M9□WV/Y69^A
D-M9□AV
D-Y7□V, Y7□WV
are used



Max. Protrusion of Auto Switch from Edge of Body (L)

Air gripper model	Auto switch Finger model position	Protrusion (mm)	
		In-line electrical entry type	Perpendicular electrical entry type
MHW2-20D	Open	—	—
	Closed	7	5
MHW2-25D	Open	—	—
	Closed	7	5
MHW2-32D	Open	—	—
	Closed	4	2
MHW2-40D	Open	—	—
	Closed	3	1
MHW2-50D	Open	—	—
	Closed	1	—

Air gripper model	Auto switch Finger model position	Protrusion (mm)			
		In-line electrical entry type	M9□A	Perpendicular electrical entry type	M9□AV
MHW2-20D	Open	—	—	—	—
	Closed	7	9	5	7
MHW2-25D	Open	—	—	—	—
	Closed	7	9	5	7
MHW2-32D	Open	—	—	—	—
	Closed	4	6	2	4
MHW2-40D	Open	—	—	—	—
	Closed	3	5	1	3
MHW2-50D	Open	—	—	—	—
	Closed	1	3	—	1

Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC ¹⁾), and other safety regulations.

- Caution:** **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
- Warning:** **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
- Danger:** **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

- 1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines.
(Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots - Safety.
etc.

Warning

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Caution

1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first. ²⁾
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.
- 2) Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Caution

SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.
Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

Safety Instructions

Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.

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Hungary	+36 23513000	www.smc.hu	office@smc.hu	Switzerland	+41 (0)523963131	www.smc.ch	info@smc.ch
Ireland	+353 (0)14039000	www.smcautomation.ie	sales@smcautomation.ie	Turkey	+90 212 489 0 440	www.smcturkey.com.tr	info@smcturkey.com.tr
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