

Magnet Gripper

∅16, ∅25, ∅32, ∅50

New

RoHS

Attracts and holds heavy objects with a magnet

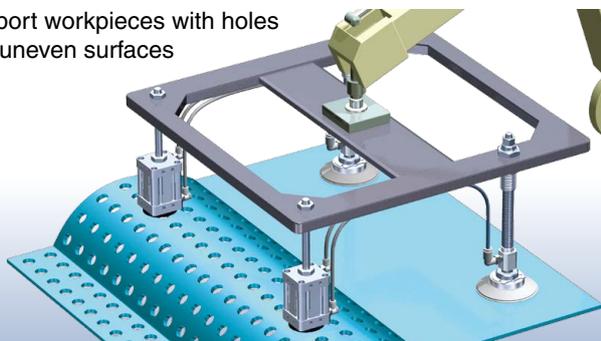
Holding force
Max. 1000 N

(∅50, Workpiece thickness 6 mm)



Transfers steel plates without a vacuum

Support workpieces with holes and uneven surfaces



Drop prevention

Holds workpieces even when air is shut off

Auto switches can be mounted on 2 surfaces.

Holding force (Attraction force) can be adjusted.

Attraction force: Small

Adjustment bolt for adjusting the holding force

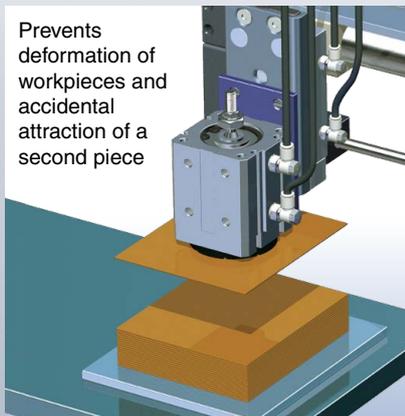


Attraction force: Large



Adjustable holding force type

Prevents deformation of workpieces and accidental attraction of a second piece



MHM Series



CAT.ES100-131A

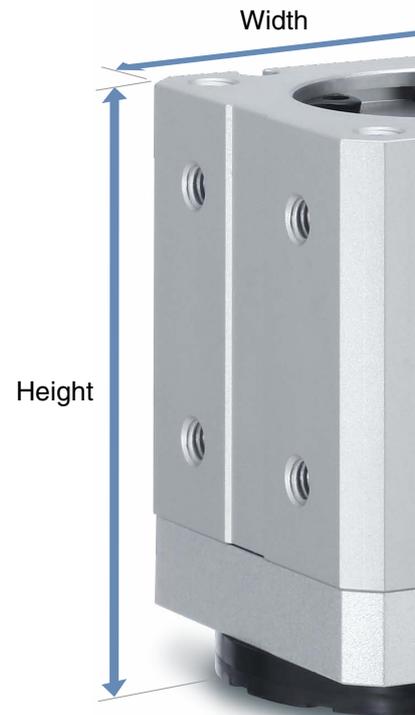
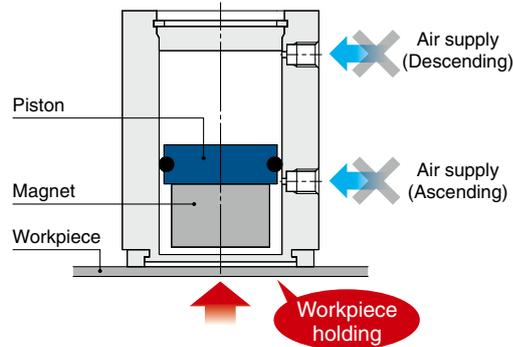
Compact with high holding force

Bore size	ø16	ø25	ø32	ø50
Depth [mm]	30	40	52	70
Width [mm]	30	40	50	68
Height [mm]	40	52	63	80
Max. holding force [N] (Workpiece thickness [mm])*1	50 (6)	200 (6)	500 (6)	1000 (6)

*1 Theoretical holding force (reference value) when a low carbon steel plate is held by entire attraction surface

Drop prevention

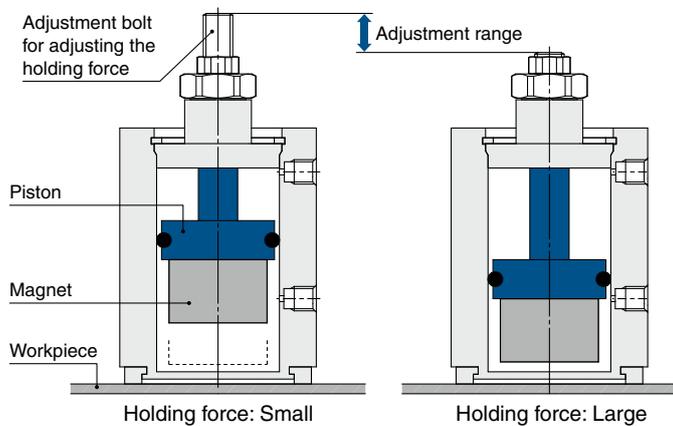
Holds workpieces even when air is shut off



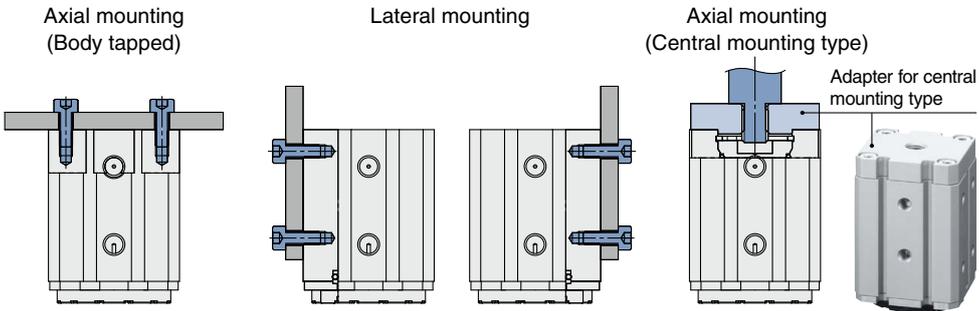
Holding force can be adjusted by changing the distance between the magnet and workpiece.

Bore size	ø16	ø25	ø32	ø50
Holding force*1 [N]	10 to 50	70 to 200	190 to 500	230 to 1000
Height adjustment range [mm]	5	5	5	5
Workpiece thickness [mm]	6	6	6	6

*1 Theoretical holding force (reference value) when a low carbon steel plate is held by entire attraction surface
* Refer to page 11 for the holding force adjustment method.



Mounting



Auto switches can be mounted on 2 surfaces.



Cushion pad (Pad for cushioning the impact when contacting with the workpiece)

Pads are replaceable.



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MHM Series Model Selection

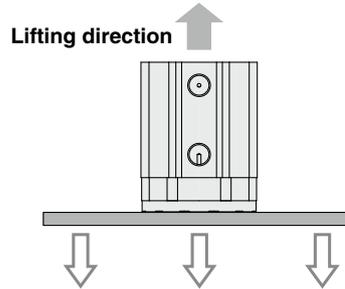
Selection Procedure



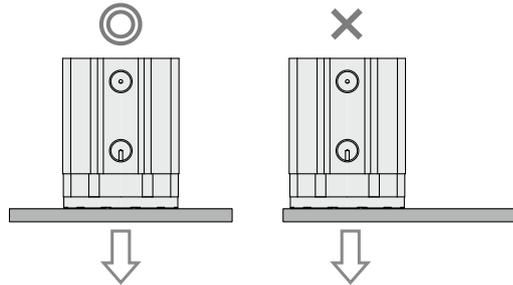
Step 1 Check the holding conditions.

Consider the workpiece balance carefully to select the correct holding position, orientation, and the number of the magnet gripper.

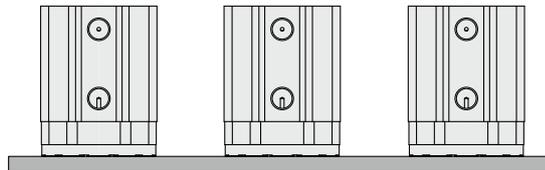
- To lift workpieces vertically, be sure to take into consideration the acceleration rate, air pressure, impact, etc., in addition to the mass of the workpieces.



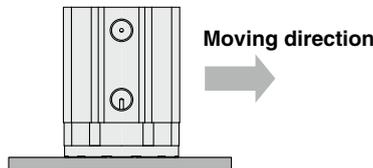
- Consider the center of gravity of the workpiece to avoid moments being applied to the magnet gripper as much as possible.



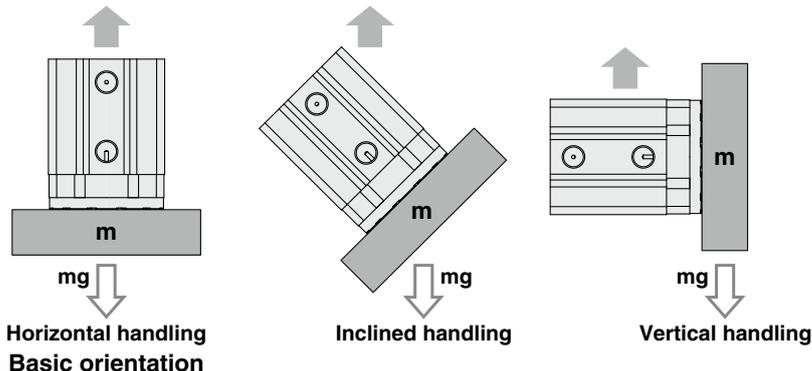
- If multiple magnet grippers are used for transferring a workpiece with a large surface area, properly allocate the magnet grippers to maintain balance.



- Horizontal movement of the magnet gripper may cause sideslip of the workpiece depending on the acceleration or friction coefficient between the pad and workpiece. Therefore, the acceleration rate of the lateral movement must be minimized.



- Use the magnet gripper for horizontal handling. Adequate safety factor needs to be considered for inclined handling or vertical handling.



- Thin workpieces may be deformed during transportation. It is recommended to use multiple magnet grippers for scenarios such as this.

Selection Procedure

Step 2 [Basic type] Calculate the required holding force.

$$W = S \frac{mg}{n}$$

W: Required holding force

n : Number of magnet grippers [pcs.]

m: Workpiece mass [kg]

g : Gravitational acceleration [= 9.8 m/s²]

S : Safety factor Horizontal lifting: 4 or more

Ensure there is sufficient holding force when using the adjustable holding force type so that the workpiece does not fall or slide sideways.

Selection example

Workpiece mass: **m** = 5 kg

Number of magnet grippers: **n** = 2 pcs.

Attraction surface faces downward (**S** = 4)

Required holding force: **W** = 4 x $\frac{5 \times 9.8}{2}$ = 98 N

Basic type

Workpiece plate thickness: **t** = 2 mm (assuming flat plate without holes)

For models where **F** is larger than **W** referring to the holding force graph: **MHM-25D**

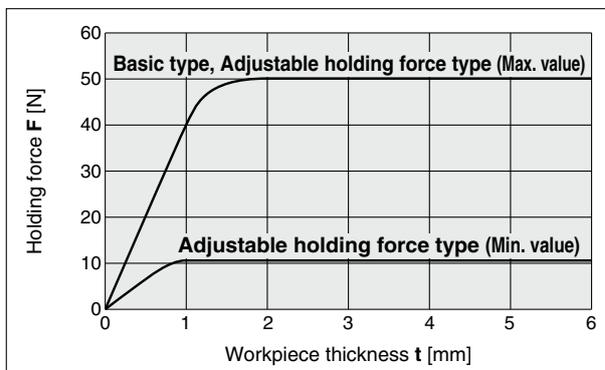
If the workpiece is subjected to large accelerational forces, increasing the bore size is recommended.

Step 3 Model selection

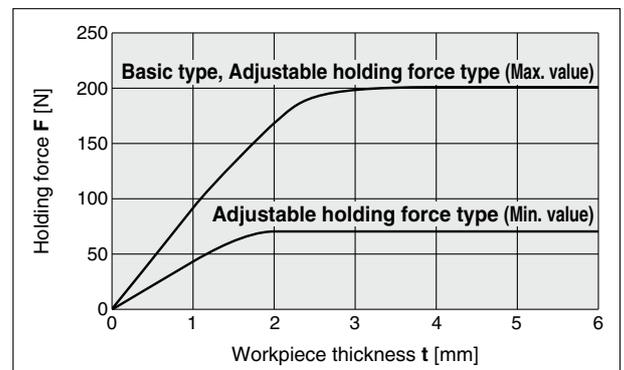
Referring to the theoretical holding force graph, select the models where **F** is larger than **W**.

The holding force graph shows the theoretical value for low carbon steel plate. Holding forces vary depending on the material and shape of the workpiece. Please perform a holding test referring to the value selected based on the graph.

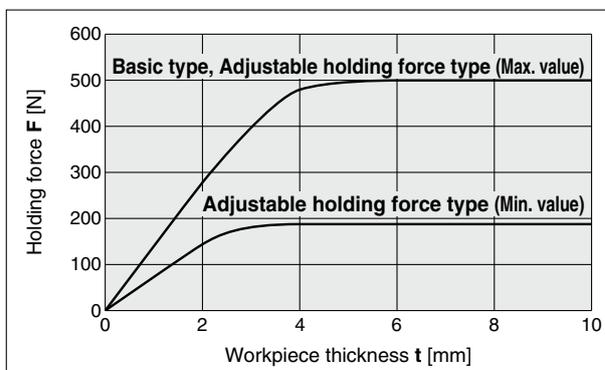
MHM-16



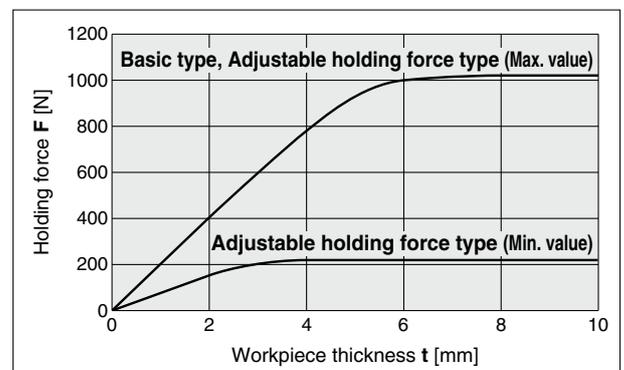
MHM-25



MHM-32



MHM-50



Magnet Gripper

MHM Series

ø16, ø25, ø32, ø50



How to Order

MHM - 32 [] D 1 - M9BW []

Bore size

16	16 mm
25	25 mm
32	32 mm
50	50 mm

Port thread type

Nil	M thread	ø16, ø25
	Rc	ø32, ø50
TF	G	ø32, ø50

Action: Double acting

Body type

Nil	Basic type
1	Adjustable holding force type
2	Central mounting type (M thread)
3	Central mounting type (G thread)

Number of auto switches

Nil	2
S	1
n	n

Auto switch

Nil	Without auto switch
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* For applicable auto switches, refer to the table below.

Applicable Auto Switches/Refer to the **Web Catalog** for further information on auto switches.

Small Auto Switches

Type	Special function	Electrical entry	Indicator/light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length [m]				Pre-wired connector	Applicable load		
					DC	AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)		IC circuit	Relay, PLC	
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	●	●	○			○
				3-wire (PNP)				M9PV	M9P	●	●	●	○	○		
				2-wire				M9BV	M9B	●	●	●	○	○		
				3-wire (NPN)				M9NWV	M9NW	●	●	●	○	○		
	Diagnostic indication (2-color indicator)			3-wire (PNP)	M9PWV	M9PW	●	●	●	○	○	○	IC circuit			
				2-wire	M9BWW	M9BW	●	●	●	○	○	○	—			
	Water resistant (2-color indicator)			3-wire (NPN)	M9NAV*1	M9NA*1	○	○	●	○	○	○	IC circuit			
				3-wire (PNP)	M9PAV*1	M9PA*1	○	○	●	○	○	○	IC circuit			
				2-wire	M9BAV*1	M9BA*1	○	○	●	○	○	○	—			
				2-wire	M9BAV*1	M9BA*1	○	○	●	○	○	○	—			

*1 Water-resistant type auto switches can be mounted on the above models, but SMC cannot guarantee water resistance. Please contact SMC for water-resistant products.

* Lead wire length symbols: 0.5 m..... Nil (Example) M9NV
 1 m..... M (Example) M9NWM
 3 m..... L (Example) M9NWL
 5 m..... Z (Example) M9NWX

* Solid state auto switches marked with "○" are produced upon receipt of order.
 * Auto switches are shipped together with the product but do not come assembled.

Magnetic Field Resistant Auto Switches

Type	Auto switch model	Applicable magnetic field	Electrical entry	Indicator light	Wiring (Pin no. in use)	Load voltage	Lead wire length	Applicable load
Solid state auto switch	P3DWA	AC magnetic field (Single-phase AC welding magnetic field)	Grommet	2-color	2-wire	24 VDC	0.5 m	Relay, PLC
	P3DWAL						3 m	
	P3DWAZ						5 m	
	P3DWASC						0.3 m	
	P3DWASE		Pre-wired connector		2-wire (3-4)			

Specifications



Central mounting type

Basic type



Adjustable holding force type

Bore size [mm]		16	25	32	50
Pilot port		M5 x 0.8		Rc1/8, G1/8	
Fluid		Air			
Action		Double acting			
Operating pressure	Workpiece thickness ≤ 2 mm	0.2 to 0.6 MPa			
	Workpiece thickness > 2 mm	0.2 to 0.6 MPa		0.35 to 0.6 MPa	
Proof pressure		0.9 MPa			
Ambient and fluid temperatures		-10 to 60°C (No freezing)			
Holding force*1	Workpiece thickness: 2 mm	50 N	160 N	250 N	400 N
	Workpiece thickness: 6 mm	50 N	200 N	500 N	1000 N
Residual holding force		0.3 N or less			
Lubrication		Non-lube			

*1 Theoretical holding force (reference value) when a low carbon steel plate is held by entire surface attraction surface

Weight

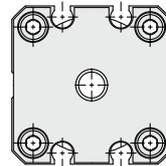
(Unit: g)

Bore size [mm]	16	25	32	50
Basic type	104	244	483	1,110
Adjustable holding force type	107	267	501	1,230
Central mounting type (M thread)	119	283	559	1,270
Central mounting type (G thread)	118	282	557	1,267

Parts Nos.

Adapter for Central Mounting Type

Bore size [mm]	Model	Central mounting thread type
16	MHM-A1612	M6 x 1
	MHM-A1612G	G1/8
25	MHM-A2512	M8 x 1.25
	MHM-A2512G	G1/8
32	MHM-A3212	M10 x 1.5
	MHM-A3212G	G1/4
50	MHM-A5012	M12 x 1.75
	MHM-A5012G	G1/4

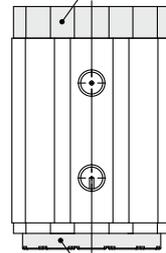


Adapter for central mounting type



Pad

Bore size [mm]	Part number
16	MHM-A1613
25	MHM-A2513
32	MHM-A3213
50	MHM-A5013



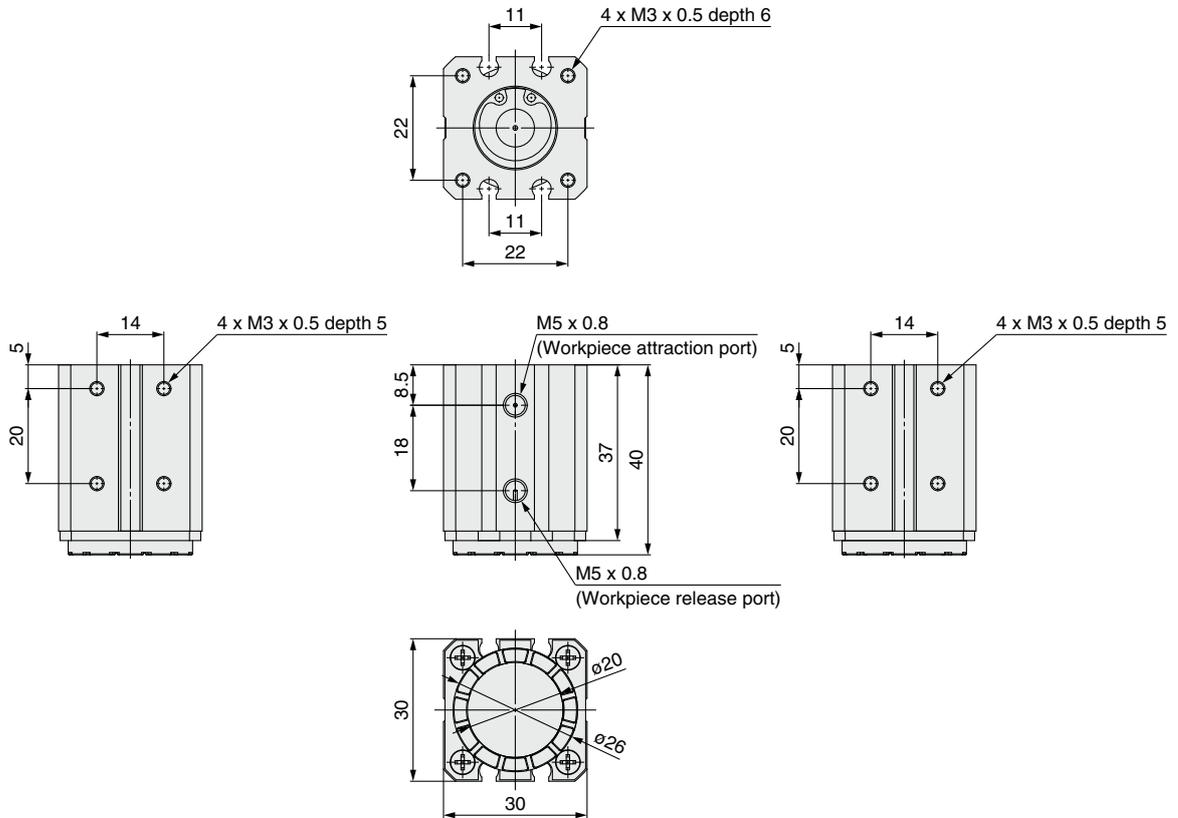
Pad



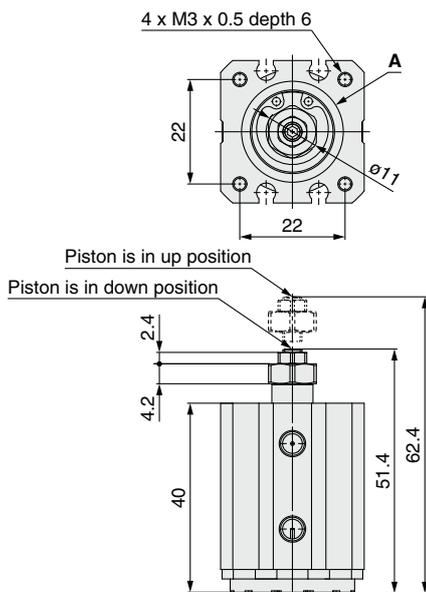
MHM Series

Dimensions: MHM-16D

MHM-16D Basic type

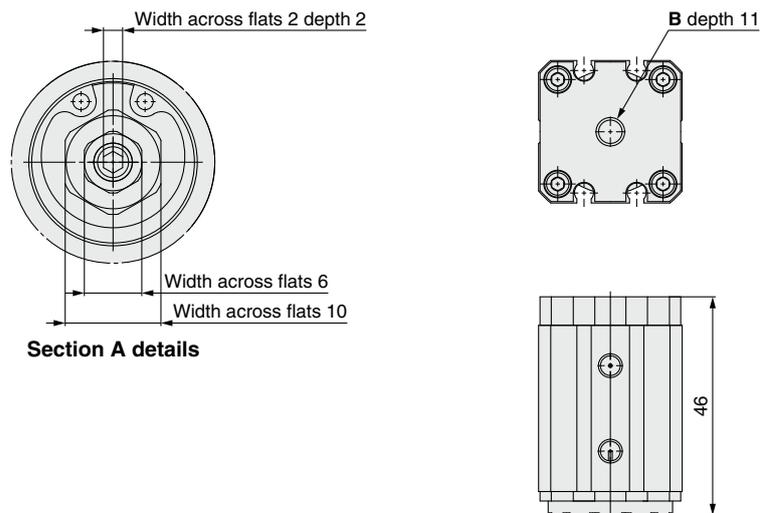


MHM-16D1 Adjustable holding force type



* Refer to page 11 for the holding force adjustment method.

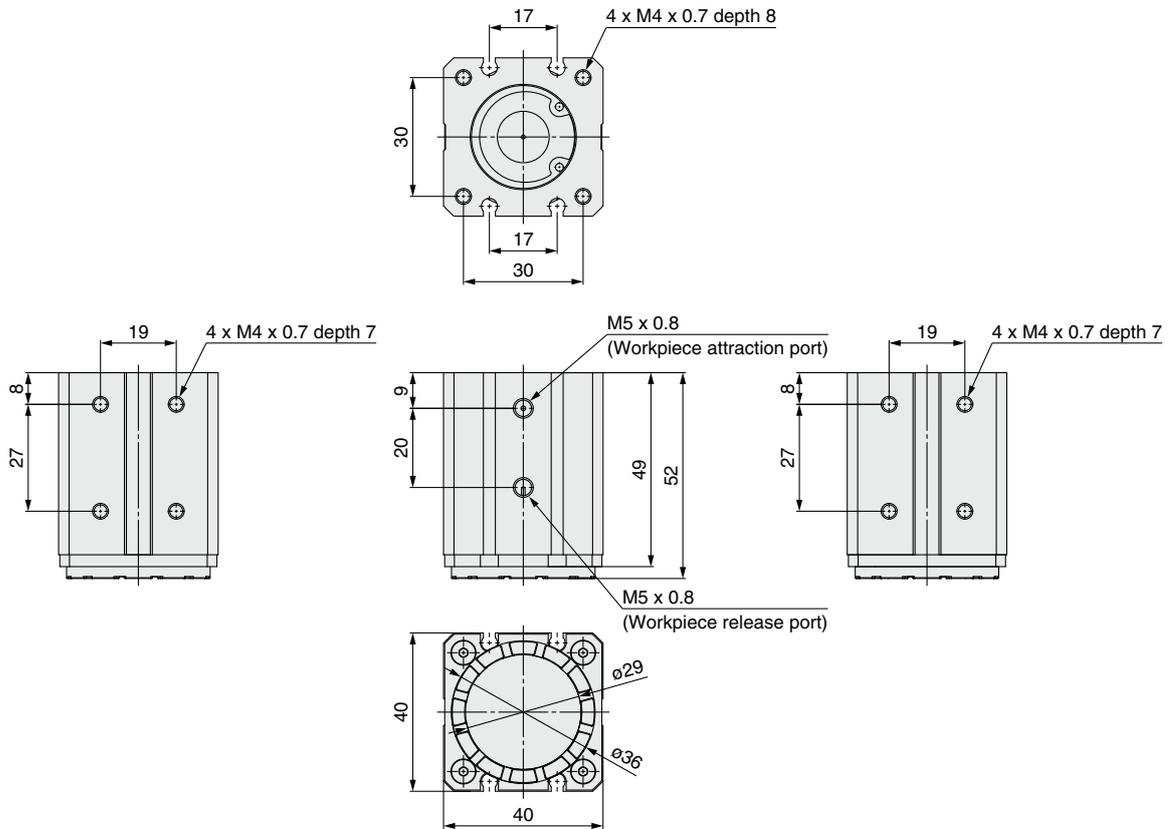
MHM-16D2 Central mounting type M thread MHM-16D3 Central mounting type G thread



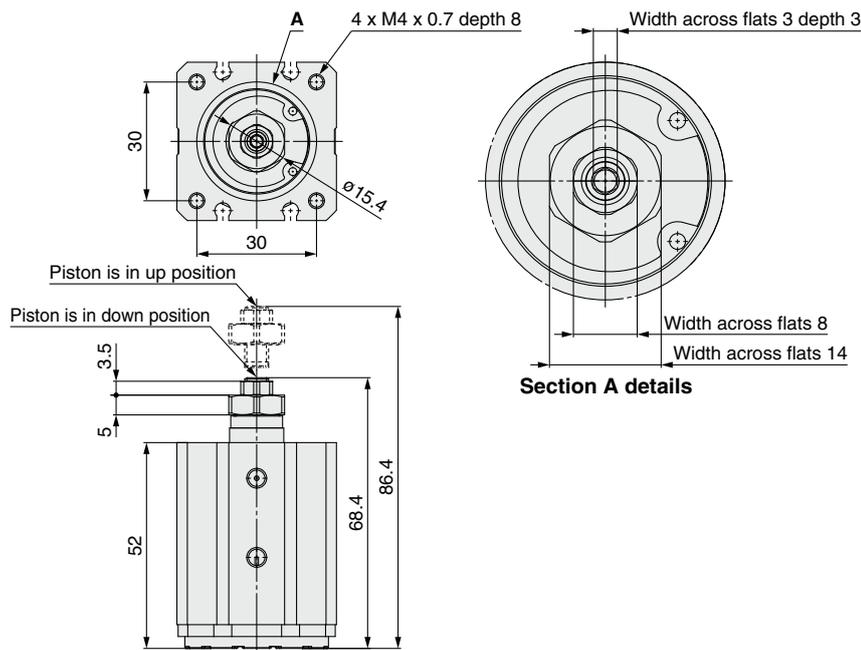
Model	B
MHM-16D2	M6 x 1
MHM-16D3	G1/8

Dimensions: **MHM-25D**

MHM-25D Basic type

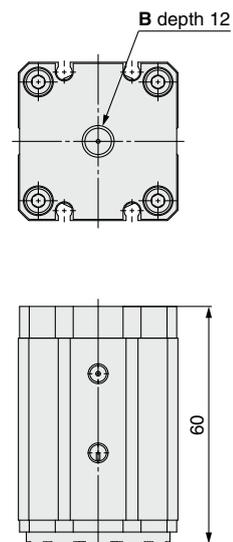


MHM-25D1 Adjustable holding force type



* Refer to page 11 for the holding force adjustment method.

MHM-25D2 Central mounting type M thread MHM-25D3 Central mounting type G thread

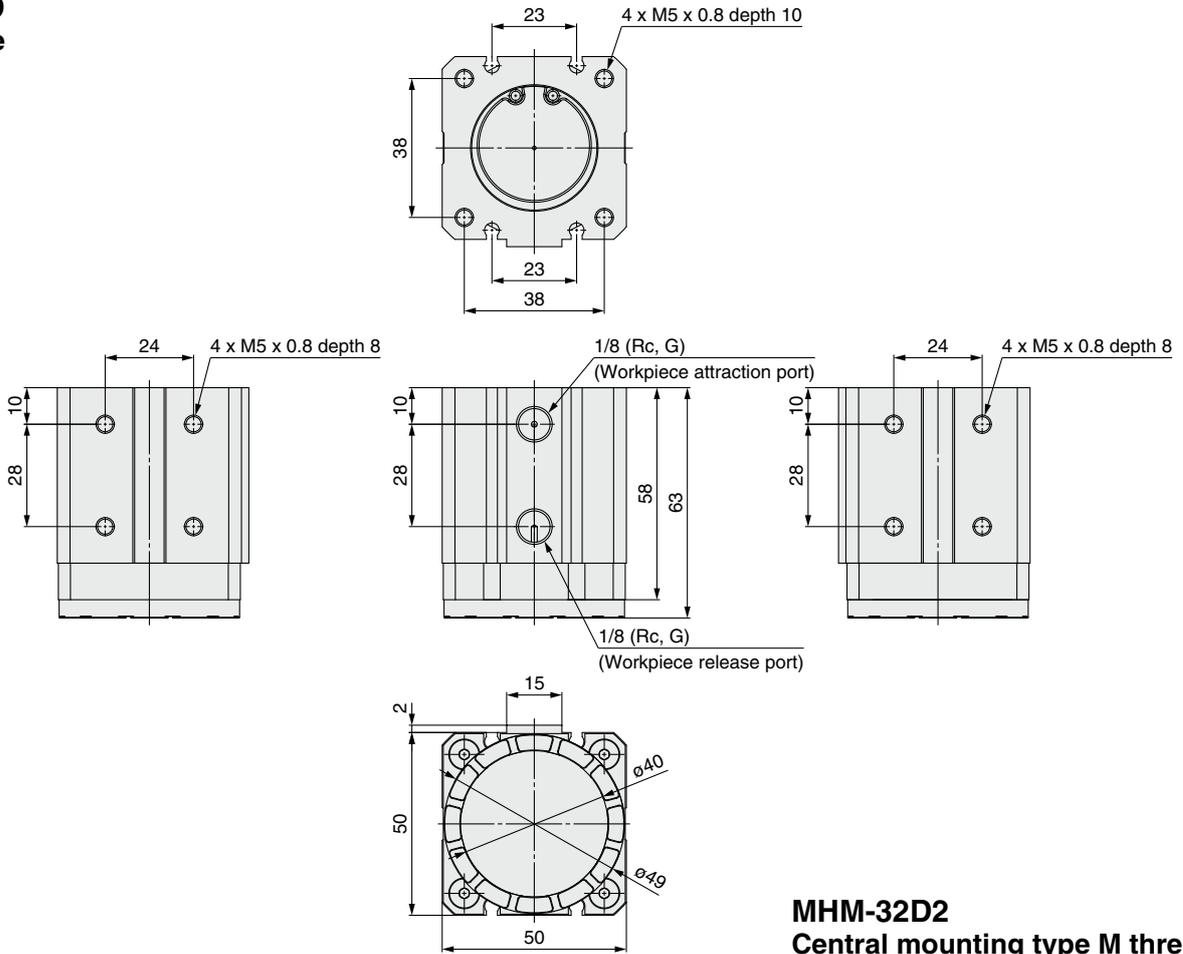


Model	B
MHM-25D2	M8 x 1.25
MHM-25D3	G1/8

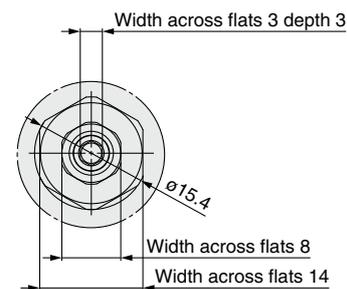
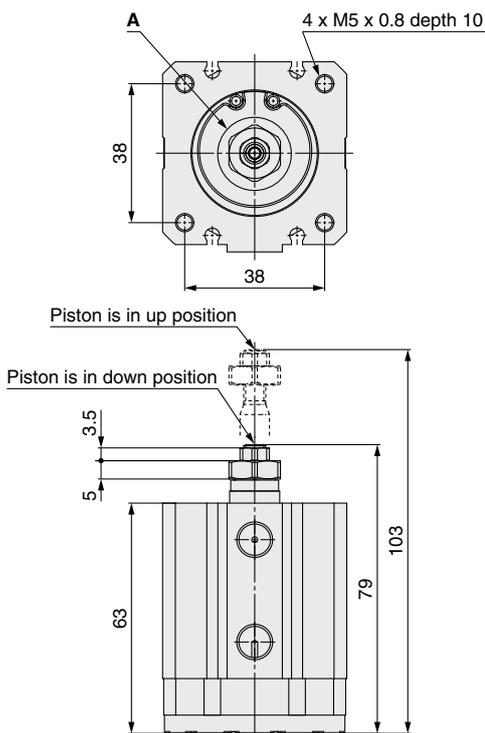
MHM Series

Dimensions: MHM-32D

MHM-32D Basic type

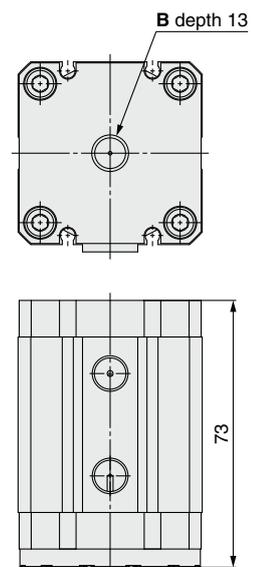


MHM-32D1 Adjustable holding force type



Section A details

MHM-32D2 Central mounting type M thread MHM-32D3 Central mounting type G thread

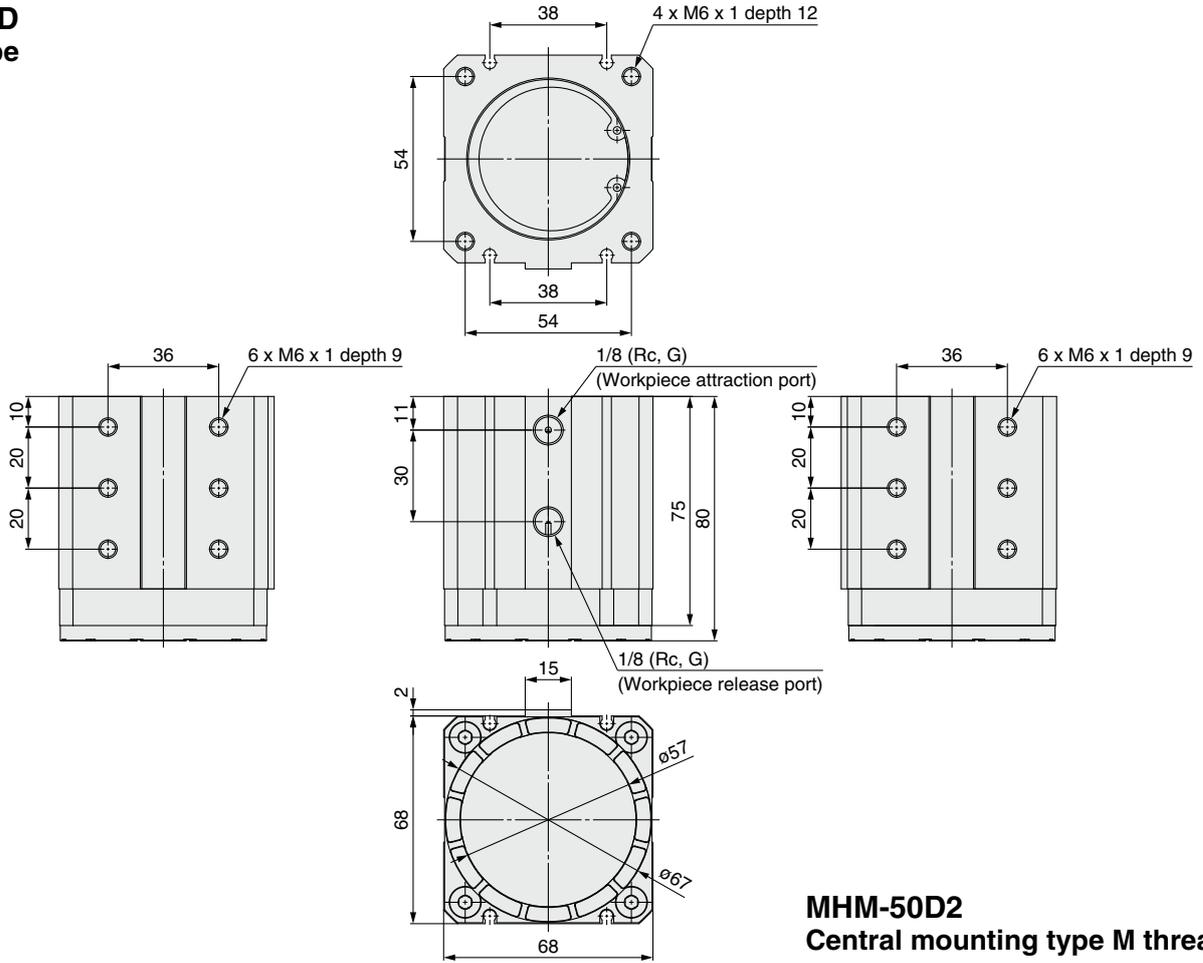


Model	B
MHM-32D2	M10 x 1.5
MHM-32D3	G1/4

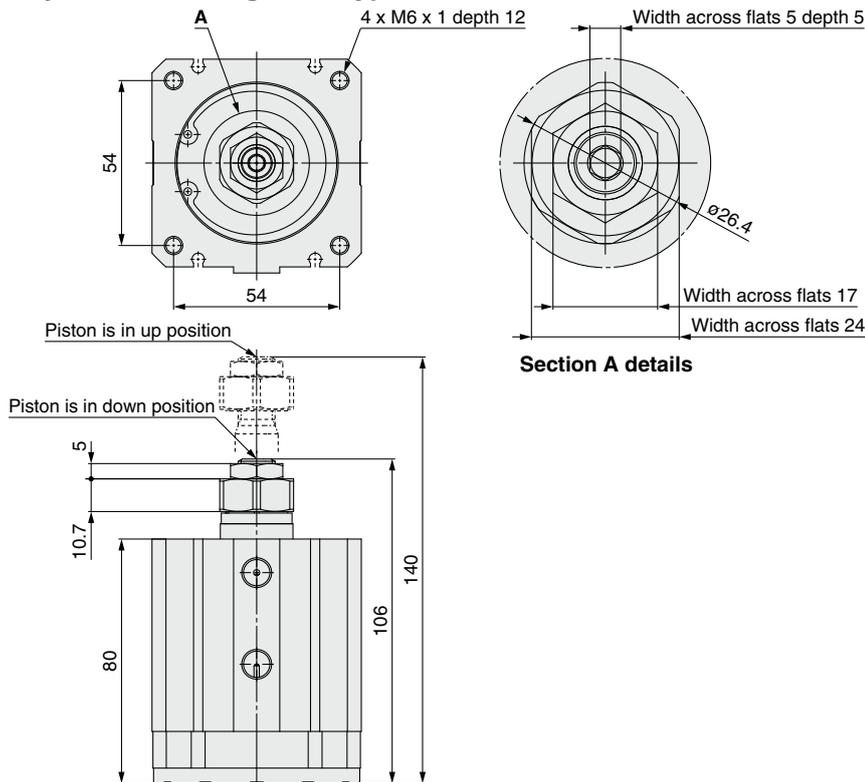
* Refer to page 11 for the holding force adjustment method.

Dimensions: MHM-50D

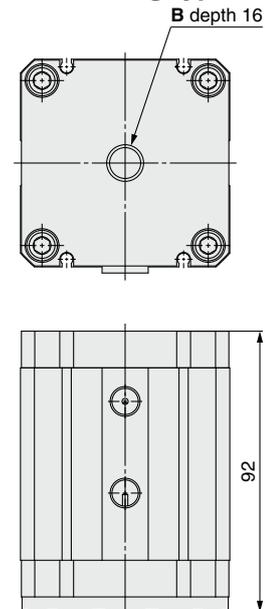
**MHM-50D
Basic type**



**MHM-50D1
Adjustable holding force type**



**MHM-50D2
Central mounting type M thread**
**MHM-50D3
Central mounting type G thread**



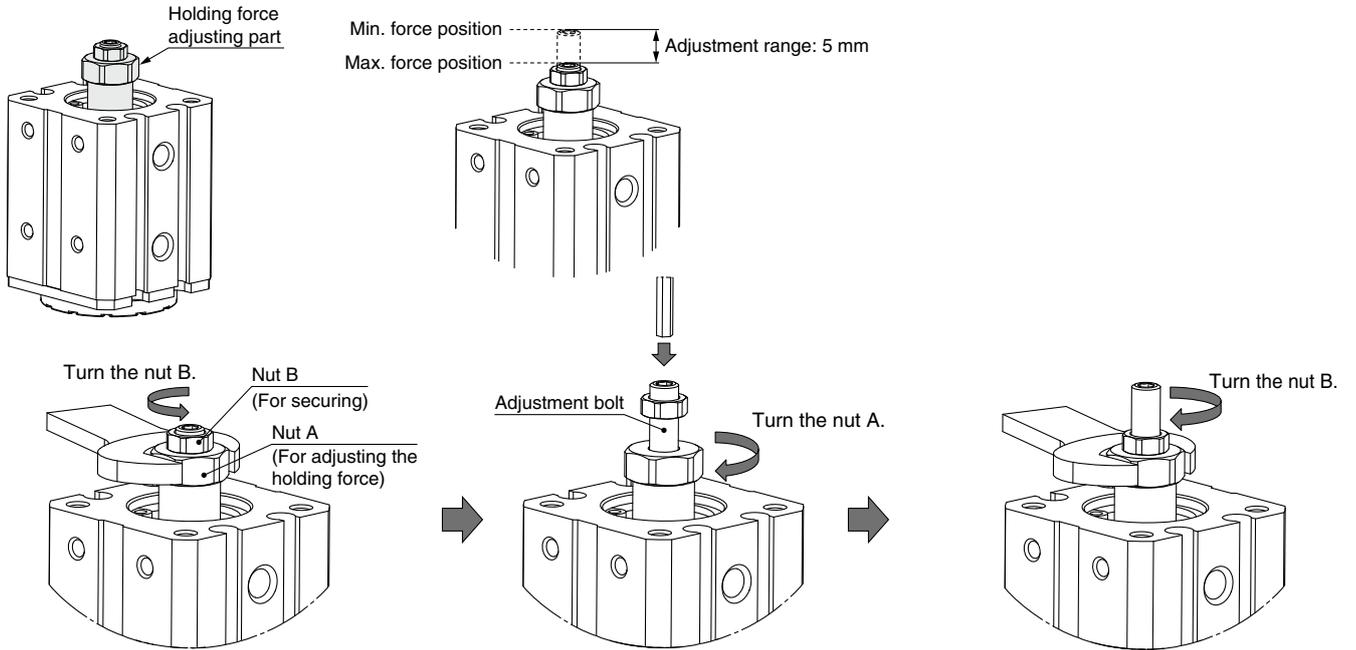
Model	B
MHM-50D2	M12 x 1.75
MHM-50D3	G1/4

* Refer to page 11 for the holding force adjustment method.

MHM Series

Holding Force Adjustment

Holding Force Adjustment



1. Turn the nut B to loosen while holding the nut A. (Nuts are tightened to a specified torque around the maximum holding force position (zero adjustment).)
2. Hold the adjustment bolt while holding the workpiece. Turn the nut A to adjust the holding force.
3. Turn the nut B to tighten at the specified torque while holding the nut A.

Model	Width across flats			Tightening torque for nut B [N·m]	Holding force adjustment range
	Adjustment bolt	Nut A	Nut B		
MHM-16D1	2	10	6	1.5	5
MHM-25D1	3	14	8	5.2	5
MHM-32D1	3	14	8	5.2	5
MHM-50D1	5	24	17	42	5

Precautions

⚠ Caution

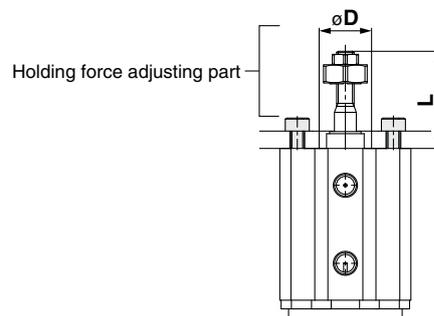
1. Do not apply external forces to the holding force adjusting part other than for the purpose of holding force adjustment.

Do not fix the holding force adjusting part to the outside or attempt to rotate it.

2. Take safety measures during the adjustment of the holding force. The workpiece may drop.

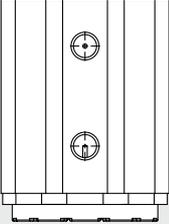
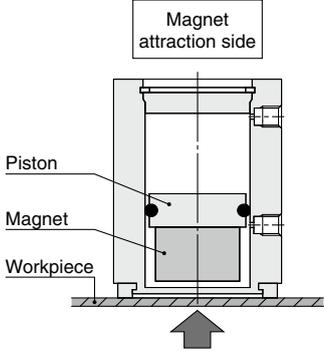
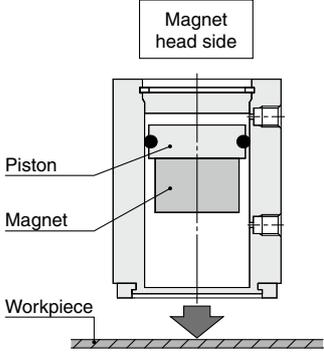
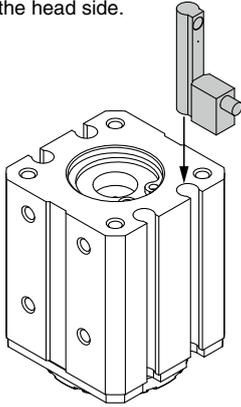
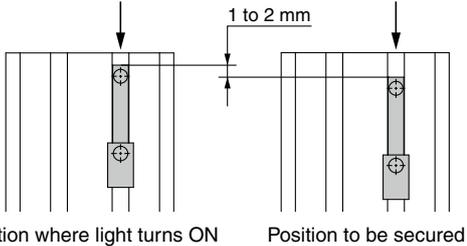
3. For vertical mounting of the holding force adjusting type, keep space shown below around the force adjusting part.

Model	Required hole diameter ϕD [mm]	Required length L [mm]
MHM-16D1	14	25
MHM-25D1	19	37
MHM-32D1	19	43
MHM-50D1	30	63



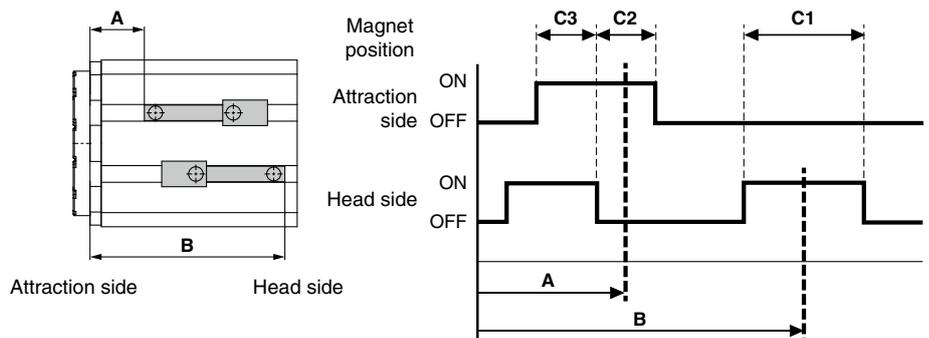
MHM Series Auto Switch Mounting

Auto Switch Mounting Position Setting

Detection example	① Detect the magnet position for workpiece holding.	② Detect the magnet position for workpiece release.
<p>Position to be detected</p> <p>Head side</p>  <p>Attraction side</p>	 <p>Magnet attraction side</p> <p>Piston</p> <p>Magnet</p> <p>Workpiece</p>	 <p>Magnet head side</p> <p>Piston</p> <p>Magnet</p> <p>Workpiece</p>
<p>How to determine auto switch installation position</p> <p>Connect the auto switch to a power supply and follow the directions.</p>	<p>Step 1) Hold the workpiece.</p> <p>Step 2) Insert the auto switch into the auto switch mounting groove from the head side.</p> 	<p>Step 1) Release the workpiece.</p> <p>Step 3) Slide the auto switch in the direction of the arrow until the indicator light illuminates and fasten it at a position 1 to 2 mm in the direction of the arrow beyond the position where the indicator light illuminates.</p>  <p>Position where light turns ON</p> <p>Position to be secured</p>

* The auto switch reacts at 2 places when the magnet is at the head side (workpiece release). At C3 in the waveform chart, the magnet position cannot be detected.

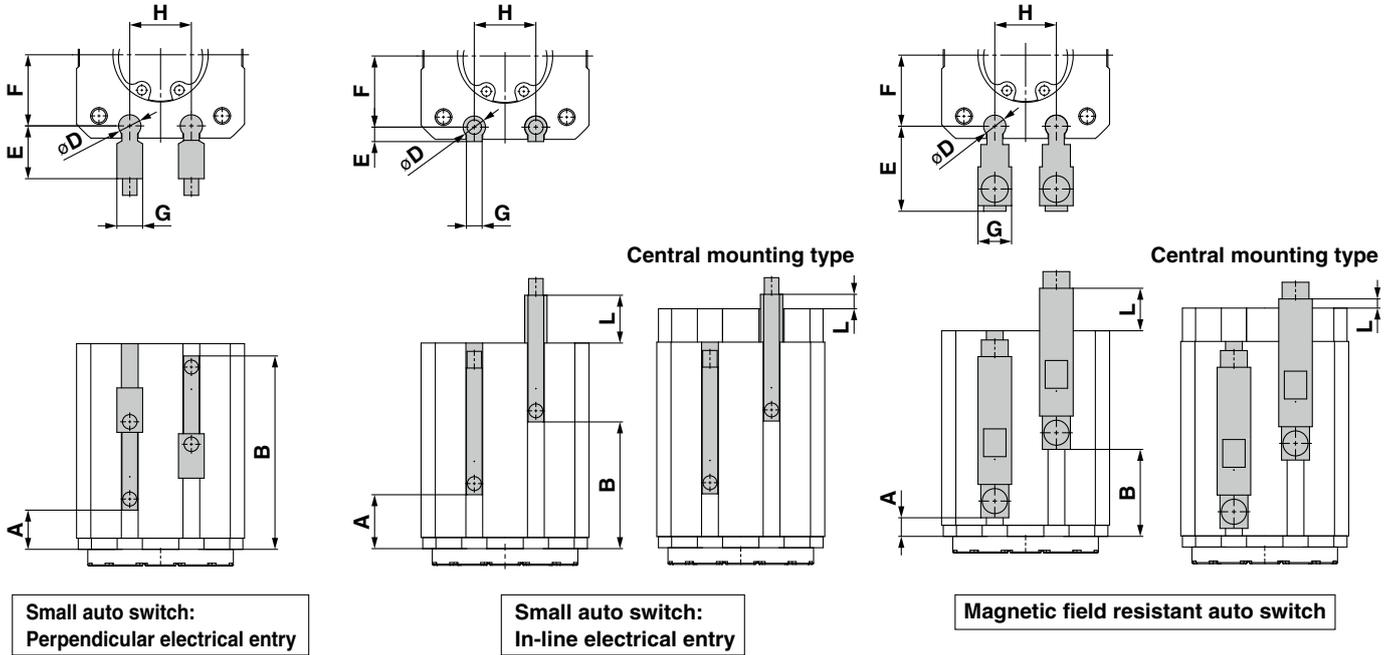
- C1:** Detection area of the magnet position for workpiece release
- C2:** Detection area of the magnet position for workpiece holding
- C3:** Area where the magnet position cannot be detected



Auto Switch Mounting Position and Mounting Method

Table below shows the mounting positions and dimensions of the auto switch.

Some auto switches may protrude from the end surface of the body. Refer to the table below for the space.

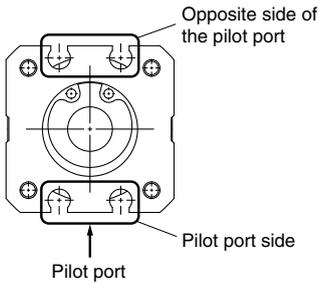


Model	Body type	D-M9□V D-M9□WV D-M9□AV				D-M9□ D-M9□W D-M9□A				D-P3DWA□					Common					
		A	B	E	G	A	B	E	G	L	A	B	E	G	L	D	F	H		
MHM-16	Basic type	9.1	32.6	9.5	4.6	9.1	20.6	2.6	2.8	5.6	4.6	16.1	14.3	6	8.1	4	12.8	11		
	Adjustable holding force type	*1				*1					*1								*1	*1
	Central mounting type	9.1				9.1					—								4.6	2.1
MHM-25	Basic type	14.6	43.6	9.5	4.6	14.6	31.6	2.6	2.8	4.6	10.1	27.1	14.3	6	7.1	4	17.5	17		
	Adjustable holding force type	*1				*1					*1								*1	
	Central mounting type	14.6				14.6					—								10.1	—
MHM-32	Basic type	19	51.8	9.5	4.6	19	39.8	2.6	2.8	3.8	14.5	35.3	14.3	6	6.3	4	22.5	23		
	Adjustable holding force type	*1				*1					*1								*1	
	Central mounting type	19				19					—								14.5	—
MHM-50	Basic type	27.2	66.2	9.5	4.6	27.2	54.2	2.6	2.8	1.2	22.7	49.7	14.3	6	3.7	4	31.5	38		
	Adjustable holding force type	*1				*1					*1								*1	
	Central mounting type	27.2				27.2					—								22.7	—

*1 When detecting the magnet position for workpiece holding with adjustable holding force type, the mounting position of the auto switch needs to be changed depending on the adjustment amount of the holding force.

* Dimensions above are for reference. Keep 1 mm or more clearance between the auto switch and peripheral equipment to avoid any interference.

* When mounting the auto switch D-M9□ (W or A) V and D-P3DWA□ to MHM-16D□, mount them in the groove on the opposite side of the pilot port in order to avoid any interference between the fitting and speed controller.



Auto Switch Mounting Method

1. Auto switch mounting tool

When tightening the auto switch mounting screw (included with the auto switch), use a screwdriver with a handle diameter of about 5 to 6 mm.

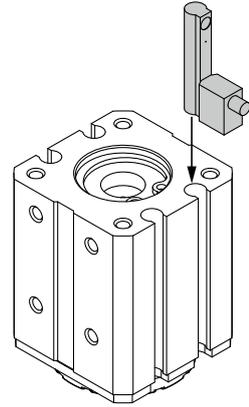
Tightening Torque for Auto Switch

Mounting Screws [N·m]

Auto switch model	Tightening torque
D-M9□(V) D-M9□W(V)	0.05 to 0.15
D-P3DWA□	0.20 to 0.30
D-M9□A(V)	0.05 to 0.10

The indicator light may turn on when the tip of the screwdriver is close to the auto switch mounting screw. This is not a malfunction.

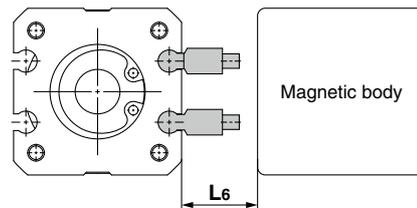
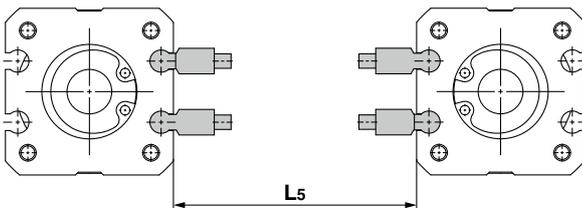
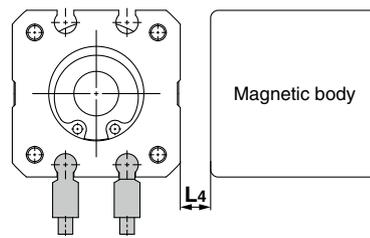
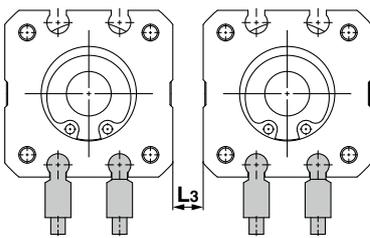
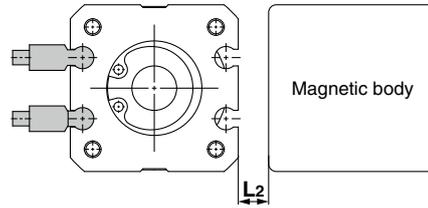
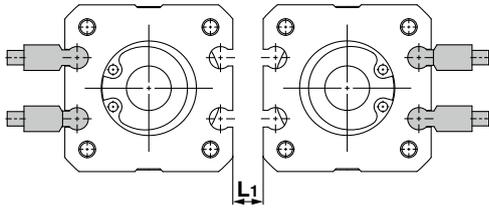
Keep the screwdriver away from the auto switch when searching mounting position of the auto switch where it operates correctly.



2. Keep a gap wider than the values listed in the table when arranging the magnet grippers side by side or when placing the magnet grippers close to magnetic objects such as iron.

Required Gap [mm]

Model	L1	L2	L3	L4	L5	L6
MHM-16D□	1	1	1	1	16	5
MHM-25D□					36	34
MHM-32D□			23	25	80	41
MHM-50D□						

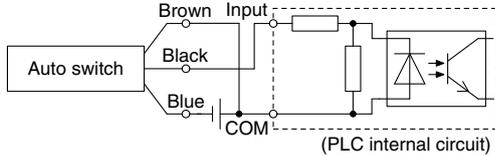


Prior to Use

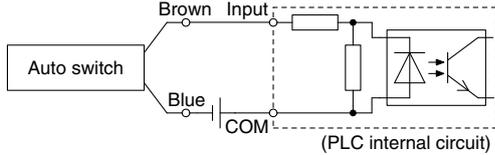
Auto Switch Connections and Examples

Sink Input Specifications

3-wire, NPN

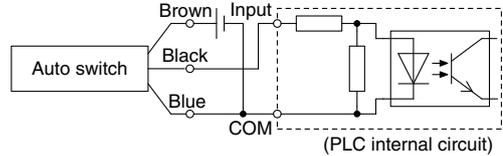


2-wire

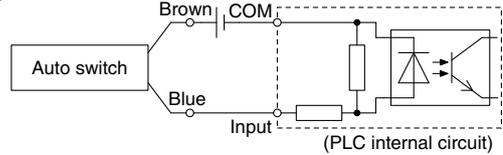


Source Input Specifications

3-wire, PNP



2-wire

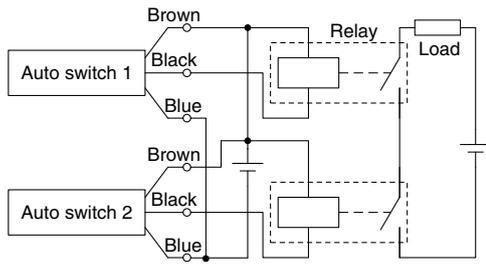


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

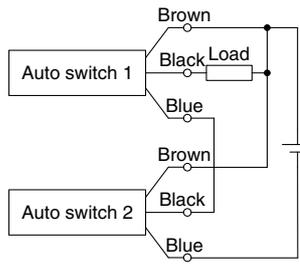
Examples of AND (Series) and OR (Parallel) Connections

* When using solid state auto switches, ensure the application is set up so the signals for the first 50 ms are invalid. Depending on the operating environment, the product may not operate properly.

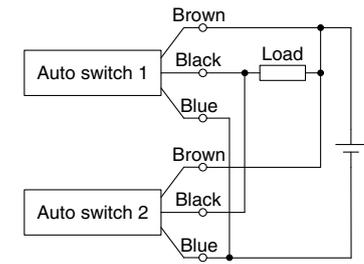
3-wire AND connection for NPN output (Using relays)



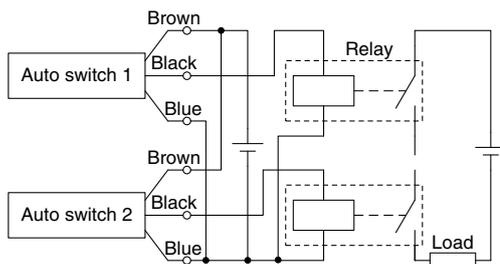
(Performed with auto switches only)



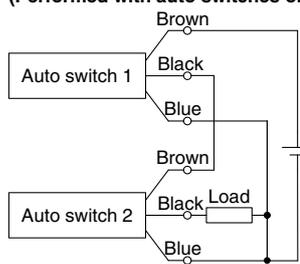
3-wire OR connection for NPN output



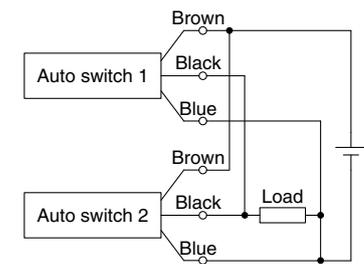
3-wire AND connection for PNP output (Using relays)



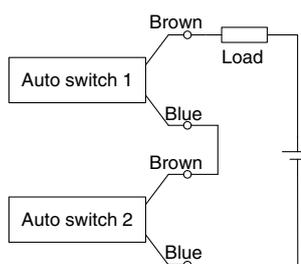
(Performed with auto switches only)



3-wire OR connection for PNP output



2-wire AND connection

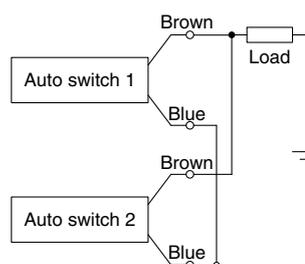


When two auto switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state. The indicator lights will light up when both of the auto switches are in the ON state. Auto switches with a load voltage less than 20 V cannot be used.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Power supply voltage} - \\ &\quad \text{Residual voltage} \times 2 \text{ pcs.} \\ &= 24 \text{ V} - 4 \text{ V} \times 2 \text{ pcs.} \\ &= 16 \text{ V} \end{aligned}$$

Example: Power supply is 24 VDC
Internal voltage drop in auto switch is 4 V.

2-wire OR connection



(Solid state)
When two auto switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

(Reed)
Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of auto switches in the ON state, the indicator lights may sometimes grow dim or not light up, due to the dispersion and reduction of the current flowing to the auto switches.

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \\ &\quad \text{Load impedance} \\ &= 1 \text{ mA} \times 2 \text{ pcs.} \times 3 \text{ k}\Omega \\ &= 6 \text{ V} \end{aligned}$$

Example: Load impedance is 3 k Ω .
Leakage current from auto switch is 1 mA.



MHM Series

Specific Product Precautions 1

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For actuator and auto switch precautions, refer to the “Handling Precautions for SMC Products” and the “Operation Manual” on the SMC website: <https://www.smcworld.com>

Design / Selection

Warning

1. Confirm the specifications.

Products represented in this catalog are designed only for use in compressed air systems (including vacuum).

Do not operate at pressures, temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)

Please contact SMC when using a fluid other than compressed air (including vacuum).

We do not guarantee against any damages if the product is used outside of the specification range.

2. Take safety measures (e.g. mounting protective covers) when there is a danger of fingers being caught between the magnet gripper and the workpiece or with moving workpieces causing personal injury.

3. Select a model whose holding force is compatible with the workpiece mass.

Expected holding force may not be obtained depending on the material or shape of the workpiece, please evaluate the safety against the fall of workpiece with actual machine.

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

5. Consider the possibility of a power source related malfunction.

Measures should be taken to prevent injury and equipment damage in the event that there is a power malfunction to equipment controlled by air pressure, electricity or hydraulics, etc.

6. Consider the action of the product in the event of an emergency stop.

Devise a safe system so that if a person engages the emergency stop or if a safety device is tripped during a system malfunction, such as a power outage, the operation of the magnet gripper will not cause a hazard to humans or damage the equipment.

7. Consider the action when operation is restarted after an emergency or abnormal stop.

Design machinery so that bodily injury or equipment damage will not occur upon the restart of operation.

8. Do not disassemble the product or make any modifications, including additional machining.

Doing so may cause human injury and/or an accident.

9. Refer to the Auto Switches Precautions (Web Catalog) if using with an auto switch.

10. Risk to people with pacemakers

The product has a magnet inside. It may interfere with the use of an electronic equipment such as a pacemaker. People with pacemakers should stay away from the magnet gripper or take safety measures to block the magnetic force.

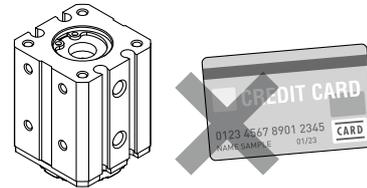
Design / Selection

Caution

1. If pressure is applied to the external magnet gripper parts, there is a possibility that air will get inside the cylinder from the rod seal section. (Example: inside a chamber, etc.)

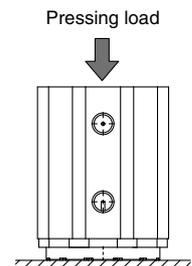
2. Keep away from objects which are influenced by magnets.

As the body magnets are built-in, do not allow close contact with magnetic disks, magnetic cards, or magnetic tapes. Data may be erased.



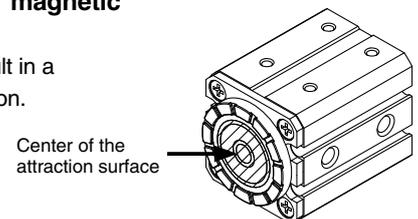
3. The pressing load applied to the workpiece should be smaller than the allowable pressing load.

Model	Allowable pressing load [N]
MHM-16D <input type="checkbox"/>	100
MHM-25D <input type="checkbox"/>	200
MHM-32D <input type="checkbox"/>	300
MHM-50D <input type="checkbox"/>	500

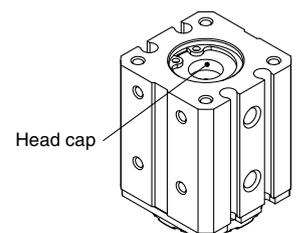


4. Do not apply impact load to the center of the magnetic attraction surface.

Otherwise, it may result in a breakage or malfunction.



5. The head cap is magnetized during the release of workpiece. Iron particles may be attracted.





MHM Series

Specific Product Precautions 2

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For actuator and auto switch precautions, refer to the “Handling Precautions for SMC Products” and the “Operation Manual” on the SMC website: <https://www.smcworld.com>

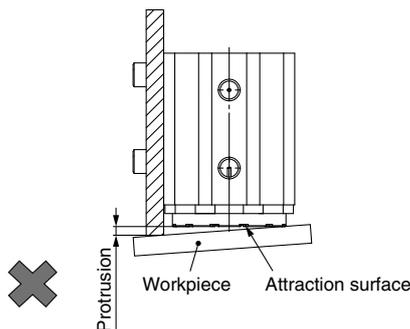
Mounting

Warning

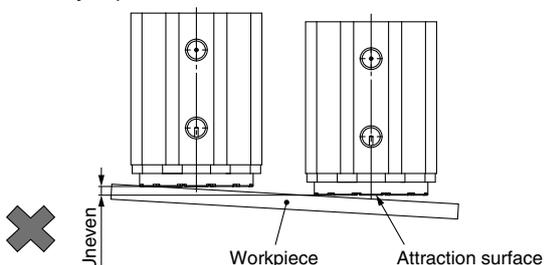
- 1. Keep the manual in a safe place for future reference.**
The product should be mounted and operated only after thoroughly reading the operation manual and understanding its contents.
- 2. Ensure sufficient space for maintenance activities.**
When installing the products, allow access for maintenance and inspection.
- 3. Observe the tightening torque for screws.**
Tighten the screws to the recommended torque for mounting the product.
- 4. Do not place a magnetic object near the product.**
The auto switch is a magnetic sensing type product. If a magnetic object is placed close to it, the product could operate suddenly, which could pose a hazard to humans or damage the machinery and equipment.
When the magnet grippers are used in parallel, keep the specified gap between them to avoid malfunction.
- 5. Do not perform additional machining to the product.**
Additional machining to the product can result in insufficient strength and cause damage to the product. This can lead to possible human injury or damage to the surrounding equipment.

Caution

- 1. Ensure the mounting bracket or peripheral parts are not protruded from the magnetic attraction surface.**
Protrusion reduces the holding force and causes the workpiece to slip or fall.



- 2. When multiple magnet grippers are used side by side, mount them so that the attraction surfaces are not uneven.**
Otherwise, adequate holding force is not available and the workpiece may slip or fall.



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 catalog 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 catalog.
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 catalog 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 the “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” before use.