



ORIGINAL INSTRUCTIONS

Instruction Manual

2/3 Port Mechanical Valve

Series VM100-A / VM200-A



The intended use of this product is to switch air pressure.

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)^{*)}, and other safety regulations.
^{*)} 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: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.
• Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
• Keep this manual in a safe place for future reference.

	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.

- Warning**
- Always ensure compliance with relevant safety laws and standards.
 - All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

2 Specifications

2.1 Valve specifications

Model	VM100-A		VM200-A
Piping	Side ported	Bottom ported	Side ported
Fluid	Air		
Operating pressure [MPa]	-100 kPa to 1		0 to 1
Ambient and fluid temperature [°C]	-5 to 60 (no freezing)		
Flow characteristics	Refer to catalogue		
Port size	1/8	M5 x 0.8	1/4
Bracket part number ^{Note 2)}	VM1-B	-	VM2-B
Min. operating frequency	1 cycle / 30 days		
Max. operating frequency [cycles / min]	60 (Toggle lever, Selector: 6) (Push button, Foot pedal: 30)		
Lubrication ^{Note 1)}	Not required		
Impact/Vibration resistance [m/s ²] ^{Note 3)}	1000 / 50		
Mounting orientation	Unrestricted		
Weight [g]	Refer to catalogue		

Table 1.

2 Specifications - continued

Note 1) If lubrication is used in the system, use class 1 turbine oil (no additive), ISO VG32.
Note 2) The bracket can only be used for side mounting of side ported type.
Note 3) Impact resistance: Two axes (horizontal and vertical) and two directions were tested and no malfunction of the valve occurred (pulse shape: sine shape), 3 times (test sample mounted with bracket).
Vibration resistance: No malfunction occurred in a sweep cycle test between 10 to 150 Hz at vibration sweep 0.35mm. The test was performed in the two axes and two directions, 7 min per cycle (20 cycles).

2.2 Pneumatic symbols

Refer to catalogue for pneumatic symbol.

2.3 Special products

Warning
Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

3 Installation

3.1 Installation

- Warning**
- Do not install the product unless the safety instructions have been read and understood.
 - For the type with bottom-mounting thread, select a suitable screw lead length so that the number of female thread ridges is four to six.

3.2 Environment

- Warning**
- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
 - Do not use in an explosive atmosphere.
 - Do not expose to direct sunlight. Use a suitable protective cover.
 - Do not install in a location subject to vibration or impact in excess of the product’s specifications.
 - Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product’s specifications.
 - Avoid using the product in environments where dust or liquids such as oil, coolants or water may come into contact with the product. As this

product is not water or dust proof, liquids or dust could enter the valve leading to product malfunction. Prevent direct contact from water droplets by mounting a protective cover.
• Do not use in high humidity environment where condensation can occur.

3.3 Piping

- Caution**
- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
 - When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
 - Tighten fittings to the specified tightening torque.

Connection thread size	Tightening torque [N·m]
M5	1 to 1.5
1/8	3 to 5
1/4	8 to 12

Table 2.

- Take measures to prevent the screw from being loosened due to vibration or impact.

3.4 Lubrication

- Caution**
- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
 - If a lubricant is used in the system, refer to catalogue for details.

3.5 Air supply

- Warning**
- Operable fluid is either air or inert gas only. It cannot be used for corrosive gas and fluid.
 - Use clean air. If the compressed air supply includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas etc., it can lead to damage or malfunction.

3 Installation - continued

- Caution**
- Install an air filter upstream of the valve. Select an air filter with a filtration size of 5 µm or smaller.
 - When extremely dry air is used as the fluid, degradation of the lubrication properties inside the equipment may occur, resulting in reduced reliability (or reduced service life) of the equipment. Please contact SMC.
 - Compressed air that contains a large amount of drainage can cause malfunction of pneumatic equipment such as valves. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer or water separator.
 - Grease is used for the inside of the valves, so it may enter into the outlet port of the valve.
 - When using vacuum pressure for the VM100, supply vacuum pressure to P port.

3.6 Mounting

- Warning**
- When installing the mechanical operation type mechanical valves, adjust the position so that the valves do not operate over the operating limit range. Operating over the limit could damage the mechanical valve or actuator, and lead to equipment malfunction.
 - Never perform additional machining such as enlarging the body mounting holes as it could lead to unexpected abnormal conditions such as air leakage.
 - For panel mount thickness and hole dimensions refer to catalogue.
 - For bottom mounting type, VM(1,2)#0U, tighten the M4 screws to a recommended tightening torque of 0.8 N·m to 1 N·m.

3.6.1 Stroke range

- Operate the mechanism within the stroke range given below:

Actuator type	Actuator stroke [mm]	
	VM100-A	VM200-A
Basic	2.2 to 2.9	4 to 4.9
Roller lever	4.3 to 5.4	8.7 to 10.9
One way roller lever		9.5 to 11.9
Straight plunger	2.7 to 3.4	4.5 to 5.4
Roller plunger		
Cross roller plunger		

Table 3.

- P.T. depends on pressure or differences between the individual product specifications. In order to ensure that the valve opens, keep the operating stroke value for the mechanical operations type within the range specified by the following formula.
Operating stroke = (P.T. + 0.5 x O.T.) to (P.T. + O.T. - 0.1)

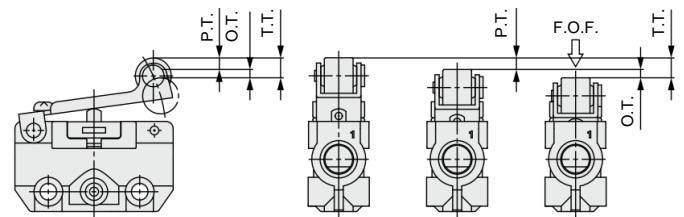


Figure 1.

- F.O.F (Full operating force): Required force to total travel position.
- P.T. (Pre-travel): From free position to initial valve operating position.
- O.T. (Over travel): From initial valve operating position to total travel position.
- T.T. (Total travel): From free position to total travel position.

- Caution**
- Refer to catalogue for F.O.F., P.T., O.T. and T.T. values.
 - For straight and roller plunger styles, there is a groove indicating P.T. and T.T. for stroke adjustment.

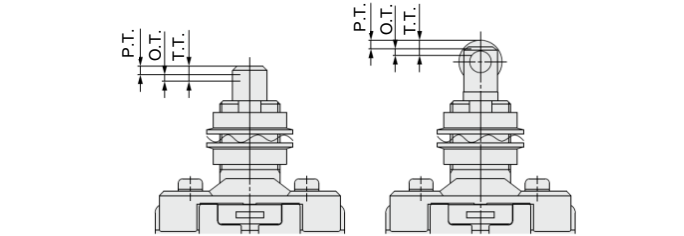


Figure 2.

3 Installation - continued

- Warning**
- Do not make any alterations to the valve body, such as enlarging the body mounting holes. Doing so could lead to unexpected abnormal conditions such as air leakage.

3.6.2 Cam and dog angle and maximum speed

Actuator type	Angle limit of cam and dog	Max. speed limit of cam and dog [m/s]
Roller lever / One way roller lever	30°	0.7
	45°	0.3
Straight plunger	–	0.2
Roller plunger	30°	0.3
Cross roller plunger		

Table 4.

3.7 Operation

- Warning**
- Operate the manual operation type mechanical valves (such as push button, twist selector and toggle lever types) with your finger.
 - The use of equipment such as a cylinder, cam or hammer, can result in the actuator and the valve being damaged.
 - Do not operate over the operation limit. If excessive operation force is applied over total travel position, actuator part can get deformed and lead to equipment malfunction.
 - When operating the mechanical operation type mechanical valves, select the angle and the maximum speed limit of cam and dog so that valves do not operate over the following maximum values.
 - If operated over the maximum values, impact force from cam and dog will be applied to the actuator, leading to damage of the actuator or the valve itself.
 - Refer to table 3.

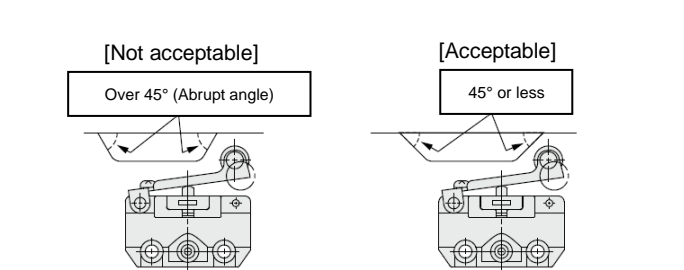


Figure 3.

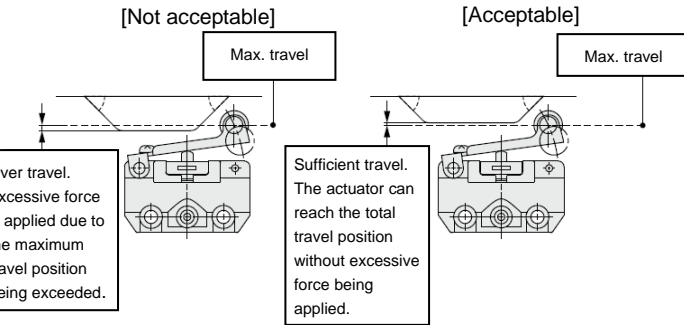


Figure 4.

3.7.1 Cam and dog material

Roller material	Cam and dog material	Surface finish of cam and dog
Polyacetal	Steel	Rz 6.3 or less
Hard steel	Steel, Resin	Rz 25 or less

Table 5.

3 Installation - continued

- ⚠ Caution
- If the operating condition is maintained for long periods of time, it may take some time for the valve to restart due to the adherence of the seals and there might be a delay for recovery.

3.8 How to change the buttons

⚠ Caution

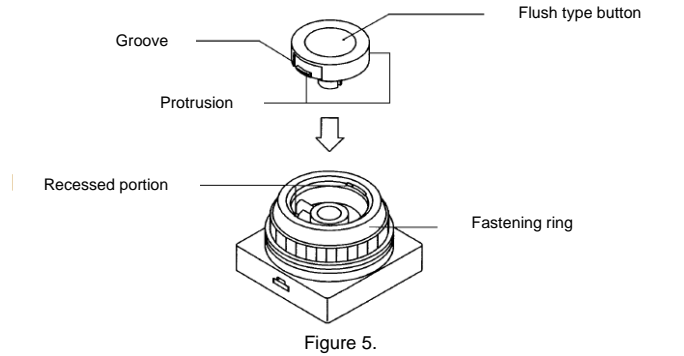
3.8.1 Push button (Flush type)

3.8.1.1 Installation

Of the four colours, red, green, black and yellow, select and align the protruding portion of the button with the recessed portion of the body and push in.

3.8.1.2 Removal

Remove the fastening ring and insert the tip of a small flat head screwdriver into the groove of the button to pry it up.

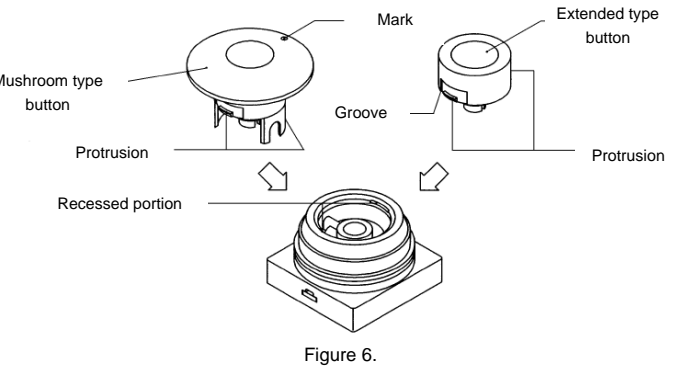


3.8.2 Push button (Mushroom and extended types)

At the time of shipment, only 1 button of the colour that you specified is attached to the body.

	Mushroom type	Extended type
Installation	Align the protruding portion of the button with the recessed portion of the body and push in. (Use the mark on the button as a reference to align the protruding part.)	Align the protruding portion of the button with the recessed portion of the body and push in.
Removal	Placing your finger under the collar of the button on the side of the mark, tilt it upward.	Remove the fastening ring and insert the tip of a small flat head screwdriver into the groove of the button to pry it up.

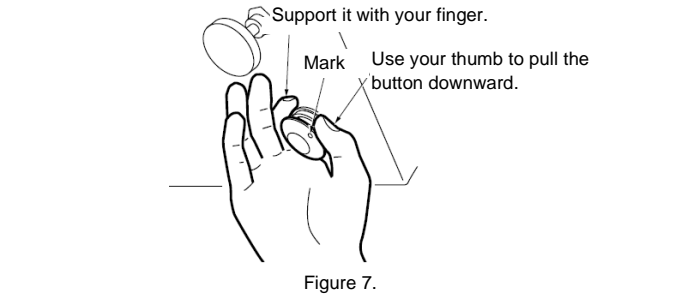
Table 6.



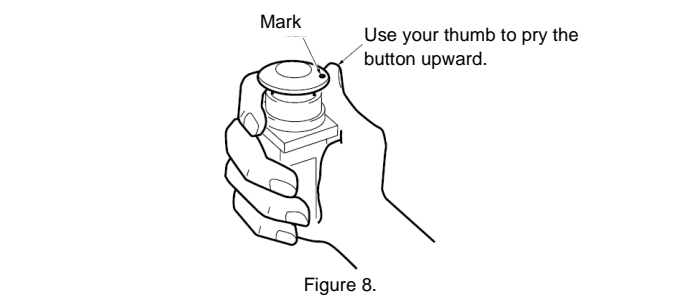
3 Installation - continued

3.8.3 Remove a mushroom type button

3.8.3.1 How to remove at panel mount



3.8.3.2 Removing the valve as a unit



3.9 Panel mounting of X207A/X219A mushroom type button

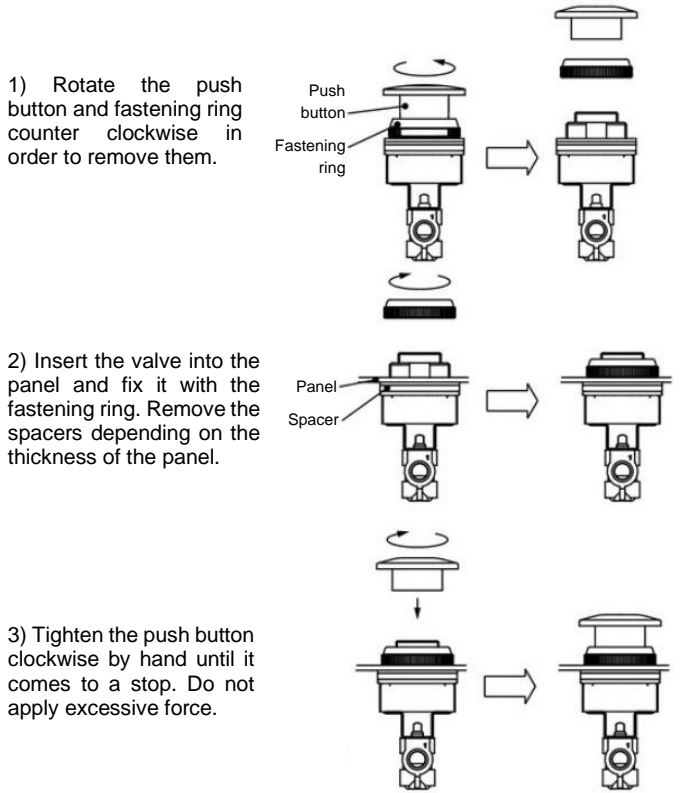


Figure 9.

⚠ Caution

For the removal of the standard mushroom button, please refer to 3.8.

4 How to Order

Refer to catalogue for 'How to Order' or to product drawings for special products.

5 Outline Dimensions

Refer to drawings or catalogue for outline dimensions.

⚠ Caution

Dimensions of the roller lever type may exceed the values specified in the catalogue if the roller lever is positioned in any direction other than upwards, due to the design of the lever.

6 Maintenance

6.1 General maintenance

⚠ Warning

- To prevent unexpected movements of the pneumatic actuator, the user shall consider the state of the valve before conducting maintenance. Additional consideration shall be given when the valve is held in the ON position by an external mechanism such as cam, lever, etc., or in the case that locking type valve actuators are used.

⚠ Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

7 Limitations of Use

⚠ Warning

The system designer should determine the effect of the possible failure modes of the product on the system.

7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

⚠ Warning

7.2 Effect of energy loss on valve switching

- VM100-A series valves may not be closed only by load pressure if the spring that closes the valve is damaged.
- VM200-A series valves do not close if the spring that closes the valve is damaged.
- Valves with locking type actuators or valves operated by an external mechanism such as cam, lever, etc., remain in the ON position even when the energy source is interrupted. If the air supply is reconnected again, e.g. after maintenance, it may behave unexpectedly.

7.3 Intermediate stopping

Refer to Handling Precautions for 3/4/5 port Solenoid Valves.

7.4 Holding of pressure

Since valves are subject to air leakage, they cannot be used for applications such as holding pressure (including vacuum) in a system.

7.5 Vacuum absorption (For VM100)

Stopping of continuous absorption can result in leakage a workpiece dropping or problems from foreign matter sticking to the vacuum pad.

7.6 Safety related applications

This product shall not be used as an emergency shut-off valve or as any part of an emergency stop circuit.

7 Limitations of Use - continued

7.7 Design

Since the VM100 and VM200 are poppet type valves, fluid flows backward when the pressure on port 2 (A) rises.

⚠ Caution

7.8 Low temperature operation

Unless otherwise indicated in the specifications for each valve, operation is possible to -5 °C, but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

8 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

9 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

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