VM-TF2Z574EN

ORIGINAL INSTRUCTIONS

Instruction Manual
Mechanical Valve
VZM500 Series

The intended use of this product is to control the movement of an actuator.

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.

*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: 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

Valve type	Internal pilot	External pilot	
Fluid	Air and inert gas		
Operating pressure	0.15 to 0.7 MPa	Main valve	0 to 0.7 MPa
		Pilot pressure	0.15 to 0.7 MPa
Operating temperature	-5 to 60°C (No freezing)		
Flow rate characteristics	Refer to catalogue		
Maximum operating frequency	≤ 300 cycle / min		
Minimum operating frequency	1 cycle / 30 days		
Lubrication	Unnecessary / If lubricated, use turbine oil, (ISO VG32)		
Port size	Main valve 1/8		
	Pilot valve (EXH.） M5x0.8		
Options	Foot bracket Note 1)		
Construction	Elastic spool		
Weight	110g (Basic type)		
Air quality	5μm or less		

2 Specifications - continued

Shock Note 2)	1000 m/s^2
Vibration Note 3)	50 m/s^2 (0.35mm)
Mounting orientation	Unrestricted
Weight	Refer to catalogue

Table 1.

Note 1) The configuration of the body with foot bracket is special. Bracket cannot be added afterwards.

Note 2) 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)

Note 3) 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 symbols.

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.
- If air leakage increases or the equipment does not operate properly, stop operation.
- Do not move the mechanical operation beyond the operating limit position.
  This could damage the mechanical valve itself and lead to equipment malfunction. Refer to Mechanical Operating Conditions on Page 13 of the Operation Manual.
  Never perform additional machining such as enlarging the body mounting hole. Scratches or dust may result in air leakage.

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.
- If there is a lot of dust, install a silencer onto the exhaust port of the valve to prevent the dust from entering the valve.
- Avoid using in a location where it could be splashed by liquids such as oils, coolant and water, and dust.
- Do not use in high humidity environment where condensation can occur.
- Contact SMC for altitude limitations.

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 1.5 to 2 threads exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.
- Tightening Torque for applicable piping

Connection screw	Appropriate tightening torque [N·m]	For reference
M5	1 to 1.5	First, tighten it by hand, then give it an additional approximately 1/6 to 1/4 turn with the wrench.
1/8	7 to 9	Add 2 to 3 turns using a tightening tool after tightening by hand.

Table 2.

3 Installation - continued

- Tighten with an appropriate wrench, using the hexagonal face of the fitting.
  Use the root nearest the thread when tightening with a wrench. Tightening with a wrench of the wrong size, or too close to the tube side, may cause damage or deformation of the fitting. After mounting, check that the fitting is not damaged or deformed.
  Note) Excessive tightening may damage the thread, or deform the gasket, causing air leakage.
  If the sealant comes out, remove the excess.
  Insufficient tightening may loosen the thread or cause air leakage
- Reuse
  Normally, the fittings with sealant can be reused 2 to 3 times. Remove loose sealant stuck to the fitting by blowing air over the threaded portion of the fitting before reusing. If the loose sealant enters adjacent machinery, it may cause air leakage or malfunction.

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

- 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.

⚠ Caution

- Install an air filter upstream of the valve. Select an air filter with a filtration size of 5 μm or smaller.
- Grease is used for the inside of the valves, so it may enter into the outlet port of the valve.

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.

3.7 Operation

- Operate all manual mechanical valves with your finger.
  If equipment such as a cylinder, cam or hammer is used, the mechanical valve will be damaged, which may result in malfunction of the equipment.
- Select the angle and the maximum speed of the operating cam and the dog of the mechanism so that they do not exceed the maximum values.
  This could damage the mechanical valve itself and lead to equipment malfunction.
- After operating for a long time, it will take some time for the valve to restart as the resistance between the seal and the parts increases.
  Please consult SMC if the operating condition is maintained for a long period of time.
- As the VZM series are pilot operated mechanical valves, when primary pressure is no longer being supplied due to the current operating state, the built-in spring will return the main valve to the non-operating state position. For this reason, when the supply of primary pressure is resumed, in the times it takes for the pilot pressure to be recovered, there may be some instantaneous output from 1 to 2 (P to B).

3.7.1 Operating force

Full operating force increases according to the increase of the supply pressure.

Full operating force for each product type can be found by the formula below.

F1: Full operating force at 0.5MPa of the product type (F.O.F)
F2: Full operating force at supply pressure found from Fig.1.

3 Installation - continued

$$F(N) = \frac{F_1\,(N)}{16\,(N)} \cdot F_2$$

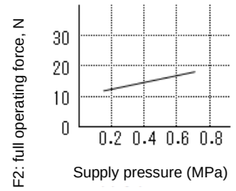

Figure 1.

3.7.2 Mechanical operating conditions

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.

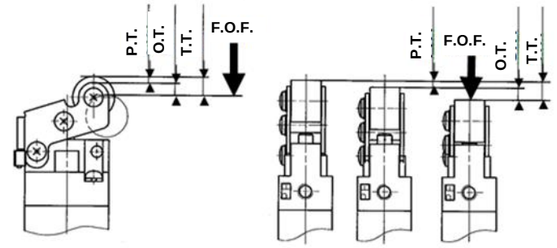

Figure 2.

Actuator type	F.O.F.at 0.5 MPa [N]	P.T. [mm]	O.T. [mm]	T.T.	Stroke range P.T.+(0.5~0.95)×O.T. [mm]
Basic style	16	1	2	3 mm	2.0 to 2.9
Roller lever	8	2.2	4	6.2 mm	4.2 to 6.1
One way lever	7	2.4	4.6	7 mm	4.7 to 6.9
Straight plunger	18	1.5	2	3.5 mm	2.5 to 3.4
Roller plunger	18	1.5	2	3.5 mm	2.5 to 3.4
Flip toggle	15	—	—	40°	—
Mushroom button	21	4.8	1.7	6.5 mm	—
Flat head button	21	4.8	1.7	6.5 mm	—
Flat button	21	4.8	1.7	6.5 mm	—
Selector (2 position)	23	—	—	90°	—
Key selector (2 position)	26	—	—	90°	—
Push-pull	20	—	—	2.7 mm	—

Table 3.

Note 1) Representative values are shown here. P.T. depends on pressure or individual difference between products. Keep the mechanical operating stroke value within the range of values obtained by calculation in the table to close the value securely.

Note 2) Do not move more than operation limit (T.T.). The plunger type rod has grooves as guidelines for P.T. and T.T.

3 Installation - continued

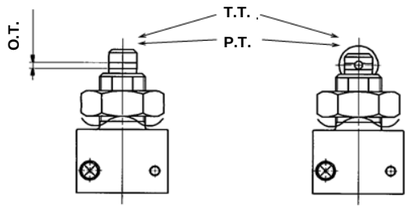

Figure 3.

3.7.3 Angle and maximum speed limit for cam and dog

Actuator	Dog angle	Max. speed limit for dog
Roller lever	30°	1.5
	45°	0.7
One way roller lever	30°	0.7
	45°	0.3
Straight plunger	-	0.4
Roller plunger	30°	0.7

Table 4.

3.7.4 Cam and dog materials

3.7.5 Operation mechanism and configuration

(1) Avoid acute angles on limit switch actuator.

Roller material	Dog material	Finish accuracy for dog
Polyacetal	Metal	Rz3.2 or less
Hard steel	Metal, resin	Rz12.5 or less

Table 5.

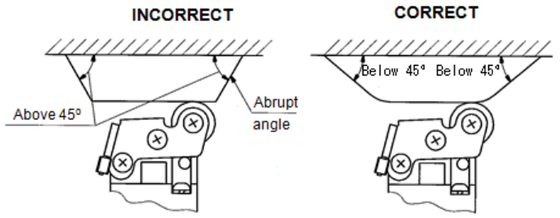

Figure 4.

(2) Do not move more than max. travel

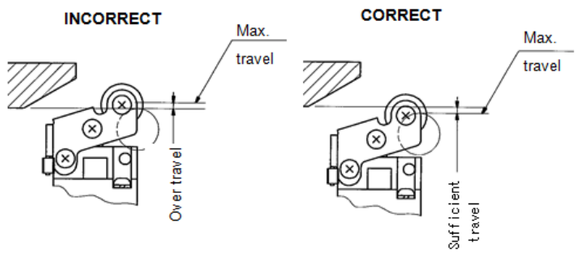

Figure 5.

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 Installation - continued

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.

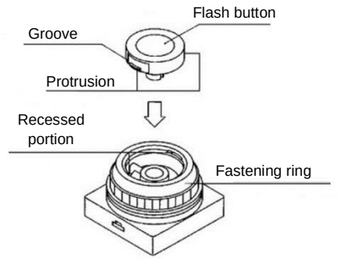

Figure 6.

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.

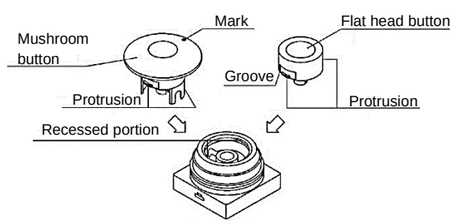

Figure 7.

3.8.3 How to remove a mushroom button

How to remove at panel mount

Removing valve as a unit

Figure 8.

3 Installation - continued

3.9 Panel mounting of X207A/X219A mushroom type button

1) Rotate the push button and fastening ring counter clockwise in order to remove them.

2) Insert the valve into the panel and fix it with the fastening ring. Remove the spacers depending on the thickness of the panel.

3) Tighten the push button clockwise by hand until it comes to a stop. Do not apply excessive force.

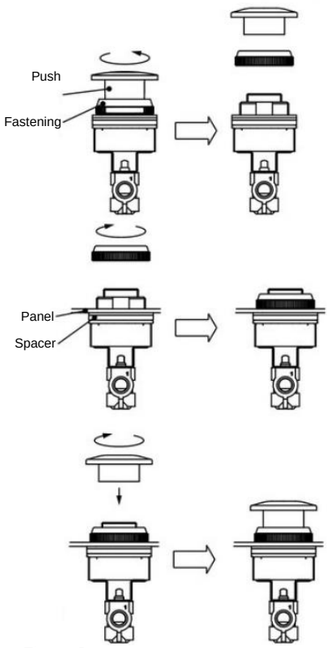

Figure 9.

Caution

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

4 How to Order

Refer to drawings or catalogue for 'How to Order' or to product drawing 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.
- Perform inspection on a regular basis as necessary, such as at the beginning of operation, to make sure that the mechanical valve operates properly.
- 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.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

6 Maintenance - continued

6.2 Maintainable parts

Caution

Refer to catalogue for replacement part numbers.

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.

7.2 Cannot be used for sealing pressure.

This product cannot be used for an application in which the pressure must be sealed because there will be a slight leakage.

7.3 Safety related applications

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

7.4 This product cannot be pressurized backwards.

Air pressure cannot be supplied from the OUT port.

7.5 This product cannot be used with negative pressure.

Please keep the operating pressure within the specification range.

7.6 It is possible to select N.C. or N.O. specification

The product can be used as a 3 port valve normal closed (N.C.) by plugging B port, and normal open (N.O) by plugging A port. Do not plug the exhaust ports (EXH.1 or EXH.2) during use.

7.7 Effect of energy loss on valve switching

- The valve is available as internal and external pilot type.
- When the valve supply pressure (or pilot air supply for external pilot type) is released, the spool valve returns to its initial position by means of a spring. The spool valve returns to its initial position even when the actuator is held in the ON position by a locking type, cam or lever. This may result in unexpected operation when air is supplied again, e.g. after maintenance

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

URL : https:// www.smcworld.com (Global) https:// www.smc.eu (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan

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