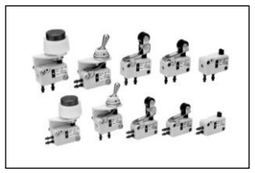
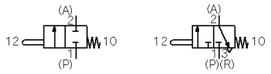
ORIGINAL INSTRUCTIONS

Instruction Manual

Micro Mechanical Valve

VM1000 Series





This product is used as a valve in pneumatic control circuits to transmit signals at the short parts of long piping for machining tools or general industrial machinery.
Validated according to ISO13849. Refer to specification section 2 for details.

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: Manipulating industrial robots -Safety.etc.

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- To ensure safety of personnel and equipment the safety instructions in this manual must be observed, along with other relevant safety practices.

⚠ **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.

⚠ Caution

- **The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**
- Since the products specified here can be used in various operating conditions, their compatibility with the specific pneumatic system must be decided by the person who designs the equipment or decides its specification based on necessary analysis and test results. The expected performance and safety performance 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.

1 Safety Instructions - continued

- **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.
- **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.
- **Do not use this product outside of the specifications.**
- **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, combustions and recreation, or equipment in contact with food or beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the specification described in this document.
  3) An application which could have negative effects on people, property, or animals requiring special safety analysis outside the scope of ISO 13849 described in this document.
  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.
- **Always ensure compliance with relevant safety laws and standards.**
- All electrical work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

⚠ Caution

- **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.

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2 Specifications

2.1. Standard specifications

Valve type		N. C. poppet		
Number of ports		2 or 3		
Piping		Side or bottom ported		
Fluid		Air/inert gas		
Filtration		5 µm		
Operating pressure		0 to 0.8 MPa		
Ambient and fluid temperature		-5 to 60℃ (No freezing)		
Flow characteristics		C [(dm³/(s·bar)]	b	Cv
Side ported	1(P)→2(A)	0.2	0.15	0.05
	2(A)→3(R)	0.2	0.15	0.05
Bottom ported	1(P)→2(A)	0.2	0.25	0.05
	2(A)→3(R)	0.2	0.15	0.05
Lubrication		Nor required (Use turbine oil Class ISO VG32, if lubricated)		
Fitting		With hose nipple		
Minimum operating frequency		Once every 30 days (1)		
Maximum operating frequency		Tested at 60 times/min (See section 2.3. B10 data)		
Standard		Complies with the basic and well-tried safety principles of EN ISO 13849-2:2012		
Vibration resistance		See section 3.3		

(1) Valves should be operated at least once every 30 days to prevent malfunction. (Use caution regarding the air supply)

2.2. Semi-standard specification

Total travel (T. T.)	2.5 mm (Basic)
*T. T. 2.5 mm is available for basic style only	

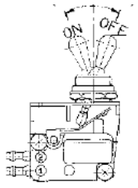
2.3. B10 data

The B10 figure is estimated from SMC life tests under SMC test conditions at maximum operating pressure. The B10d figure is derived from B10 using the assumption in ISO 13849-1:2008 Annex C. Contact SMC for details.

Product Number	B10	B10d
VM1000-4*-00	6.7 million cycles	13.4 million cycles
VM1000-4*-01	6.7 million cycles	13.4 million cycles
VM1000-4*-02	6.7 million cycles	13.4 million cycles
VM1000-4*-08	0.18 million cycles	0.36 million cycles
VM1000-4*-32	1.5 million cycles	3 million cycles

2.4. ON/OFF position of the “toggle lever “option

T. T. (Total Travel) 40°

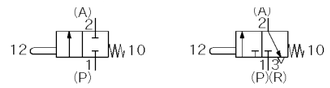


2 Specifications - continued

2.5. Pneumatic circuits and full operation forces

2.5.1. Side ported Basic

2 port 3 port



		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Side ported	3 port	VM1000-4N-00	VM1000-4NU-00
	2 port	VM1100-4N-00	VM1100-4NU-00
F.O.F		6 N (0.5 MPa supply)	
P.T.		2.5 mm (2 mm)	
O.T.		2.3 mm (0.5 mm)	
T.T.		4.8 mm (2.5 mm)	

( ) : T.T. = 2.5mm

2.5.2. Side ported Roller lever

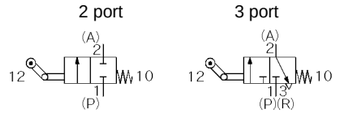
2 port 3 port



		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Side ported	3 port	VM1000-4N-01	VM1000-4NU-01
	2 port	VM1100-4N-01	VM1100-4NU-01
F.O.F		6 N (0.5 MPa supply)	
P.T.		2.5 mm	
O.T.		2 mm	
T.T.		4.5 mm	

2.5.3. Side ported One way roller lever

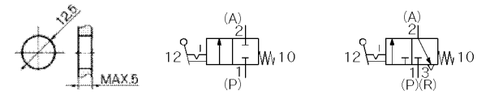
2 port 3 port



		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Side ported	3 port	VM1000-4N-02	VM1000-4NU-02
	2 port	VM1100-4N-02	VM1100-4NU-02
F.O.F		6 N (0.5 MPa supply)	
P.T.		2.5 mm	
O.T.		2 mm	
T.T.		4.5 mm	

2.5.4. Side ported Toggle lever

Panel mounting hole 2 port 3 port

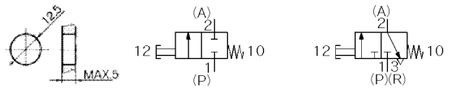


		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Side ported	3 port	VM1000-4N-08	VM1000-4NU-08
	2 port	VM1100-4N-08	VM1100-4NU-08
F.O.F		4 N (0.5 MPa supply)	
P.T.		40°	

2 Specifications - continued

2.5.5. Side ported Push button

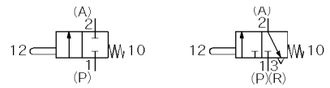
Panel mounting hole 2 port 3 port



		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Side ported	3 port	VM1000-4N-32(R,B,G)	VM1000-4NU-32(R,B,G)
	2 port	VM1100-4N-32(R,B,G)	VM1100-4NU-32(R,B,G)
F.O.F		6 N (0.5 MPa supply)	
P.T.		2.5 mm	
O.T.		2 mm	
T.T.		4.5 mm	

2.5.6. Bottom ported Basic

2 port 3 port

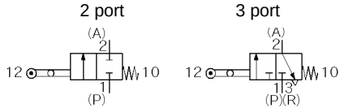


		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Bottom ported	3 port	VM1010-4N-00	VM1010-4NU-00
	2 port	VM1110-4N-00	VM1110-4NU-00
F.O.F		6 N (0.5 MPa supply)	
P.T.		2.5 mm (2 mm)	
O.T.		2.3 mm (0.5 mm)	
T.T.		4.8 mm (2.5 mm)	

( ) : T.T. = 2.5mm

2.5.7. Bottom ported Roller lever

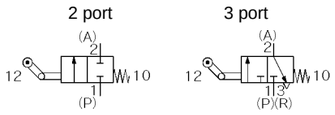
2 port 3 port



		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Bottom ported	3 port	VM1010-4N-01	VM1010-4NU-01
	2 port	VM1110-4N-01	VM1110-4NU-01
F.O.F		6 N (0.5 MPa supply)	
P.T.		2.5 mm	
O.T.		2 mm	
T.T.		4.5 mm	

2.5.8. Bottom ported One way roller lever

2 port 3 port

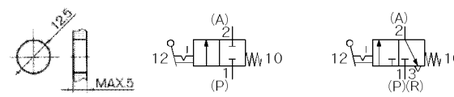


		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Bottom ported	3 port	VM1010-4N-02	VM1010-4NU-02
	2 port	VM1110-4N-02	VM1110-4NU-02
F.O.F		6 N (0.5 MPa supply)	
P.T.		2.5 mm	
O.T.		2 mm	
T.T.		4.5 mm	

2 Specifications - continued

2.5.9. Bottom ported Toggle lever

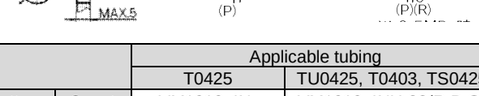
Panel mounting hole 2 port 3 port



		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Bottom ported	3 port	VM1010-4N-08	VM1010-4NU-08
	2 port	VM1110-4N-08	VM1110-4NU-08
F.O.F		4 N (0.5 MPa supply)	
P.T.		40°	

2.5.10. Bottom ported Push button

Panel mounting hole 2 port 3 port



		Applicable tubing	
		T0425	TU0425, T0403, TS0425
Bottom ported	3 port	VM1010-4N-32(R,B,G)	VM1010-4NU-32(R,B,G)
	2 port	VM1110-4N-32(R,B,G)	VM1110-4NU-32(R,B,G)
F.O.F		6 N (0.5 MPa supply)	
P.T.		2.5 mm	
O.T.		2 mm	
T.T.		4.5 mm	

⚠ Caution

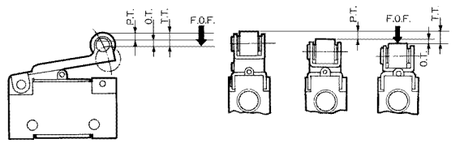
Special products might have specifications different from those shown in this section. Contact SMC for specific drawings. These drawings will give the appropriate specification details and compliance with the safety principles of ISO 13849-1:2008, if applicable.

3 Installation

⚠ Warning

- Do not install the product unless the safety instructions have been read and understood.

3.1. Definition of symbol



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.

3.2. Mounting

- **Ensure sufficient space for maintenance activities.**

When installing the products allow access for maintenance.

3.2.1 Mechanical Operation Conditions

Do not perform mechanical operation exceeding the operation limit position. The mechanical valve itself may be damaged leading to equipment malfunction.

3 Installation - continued

- **Operating stroke range**

Please set the mechanical operation stroke within the range shown by the formula below. Do not move beyond the operating limit position).
Operating Stroke Range: (P.T.＋0.5×O.T.)～(P.T.＋O.T.－0.1)

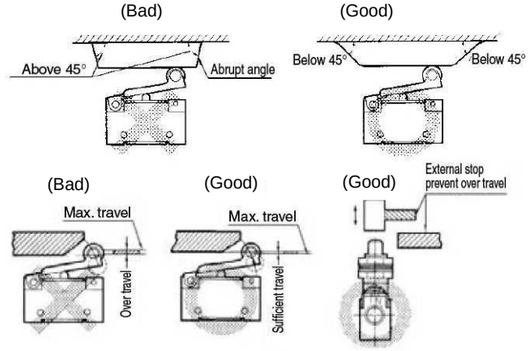
Series	Actuator		Actuator stroke (mm)
VM1000	Basic	T.T. = 4.8 mm	3.7 to 4.7
		(T.T. = 2.5 mm)	(2.2 to 2.4)
	Roller lever		3.5 to 4.4
	One way roller lever		3.5 to 4.4

- **Maximum speed and angle for cam or dog**

Select the maximum speed and angle for the mechanical operation cam or dog from the table below. If used outside of the instructed ranges, impact force may be applied to the actuator by the cam or dog, resulting in product damage.

Series	Actuator	Angle limit switch actuator	Max. speed limit switch actuator (m/s)
VM1000	Roller lever	30°	0.7
		45°	0.3
	One way roller lever	30°	0.7
		45°	0.3

Avoid abrupt angles on limit switch actuator.



- **Cam and dog material**

Roller material	Plunger material	Plunger surface finish
Polyacetal	Steel	Rz6.3

3.3. Operating Environment

⚠ Warning

- Use only with air or inert gas.
- 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. Check the product specifications.

3 Installation - continued

- Do not mount in a location exposed to radiant heat.
- 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.

3.4. Piping

⚠ Caution

- Before 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.
- Cut the tube perpendicularly to the required length. Please use a TK-1, 2 or 3 tube cutter. Allow a margin of length when cutting the tubing.
- Insert the tube up to the hub end. Air leakage or tube detachment may be caused by only inserting the tube in half way.

3.5. 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, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.

4 How to Order

VM1 [0] [0] [0] - [4N] - [00] [R]

Color of push button
- R: Red
- G: Green
- B: Black

Number of ports
- 0: 3 port
- 1: 2 port

Actuator type
- 00: Basic
- 01: Roller lever
- 02: One way roller lever
- 08: Toggle lever
- 32: Push button

Piping
- 0: Side ported
- 1: Bottom ported

Applicable tubing (Material/Size)
- 4N: Nylon Ø4/2.5 (T0425)
- 4NU: Nylon Ø4/3 (T0403)
- 4NU: Soft Nylon Ø4/2.5 (TS0425)
- 4NU: Polyurethane Ø4/2.5 (TU0425)

Total travel/Basic (T.T.)
- 0: 4.8 mm
- 1: 2.5 mm (Option)*

* Basic only

4 How to Order - continued

	Actuator	Piping	No. of ports	Applicable tubing		Weight (g)
				T0425	TU0425/T0403 /TS0425	
Mechanical operation	Basic	Side ported	3 port	VM1000-4N-00	VM1000-4NU-00	6
			2 port	VM1100-4N-00	VM1100-4NU-00	
		Bottom ported	3 port	VM1010-4N-00	VM1010-4NU-00	
			2 port	VM1110-4N-00	VM1110-4NU-00	
	Roller lever	Side ported	3 port	VM1000-4N-01	VM1000-4NU-01	11
			2 port	VM1100-4N-01	VM1100-4NU-01	
		Bottom ported	3 port	VM1010-4N-01	VM1010-4NU-01	
			2 port	VM1110-4N-01	VM1110-4NU-01	
	One way roller lever	Side ported	3 port	VM1000-4N-02	VM1000-4NU-02	12
			2 port	VM1100-4N-02	VM1100-4NU-02	
		Bottom ported	3 port	VM1010-4N-02	VM1010-4NU-02	
			2 port	VM1110-4N-02	VM1110-4NU-02	
Manual operation	Toggle lever	Side ported	3 port	VM1000-4N-08	VM1000-4NU-08	20
			2 port	VM1100-4N-08	VM1100-4NU-08	
		Bottom ported	3 port	VM1010-4N-08	VM1010-4NU-08	
			2 port	VM1110-4N-08	VM1110-4NU-08	
	Push button*	Side ported	3 port	VM1000-4N-32R	VM1000-4NU-32R	31
			2 port	VM1100-4N-32R	VM1100-4NU-32R	
		Bottom ported	3 port	VM1010-4N-32R	VM1010-4NU-32R	
			2 port	VM1110-4N-32R	VM1110-4NU-32R	
		Side ported	3 port	VM1000-4N-32B	VM1000-4NU-32B	
			2 port	VM1100-4N-32B	VM1100-4NU-32B	
		Bottom ported	3 port	VM1010-4N-32B	VM1010-4NU-32B	
			2 port	VM1110-4N-32B	VM1110-4NU-32B	
		Side ported	3 port	VM1000-4N-32G	VM1000-4NU-32G	
			2 port	VM1100-4N-32G	VM1100-4NU-32G	
		Bottom ported	3 port	VM1010-4N-32G	VM1010-4NU-32G	
			2 port	VM1110-4N-32G	VM1110-4NU-32G	

* Red (R), black (B) or green (G) push button

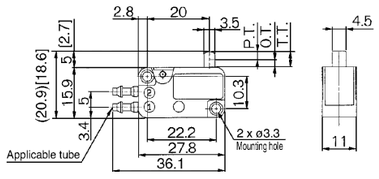
5 Outline Dimensions (mm)

5.1 Series VM1000/Side ported

- **Basic**

VM1000-4N-00
VM1000-4NU-00
VM1100-4N-00
VM1100-4NU-00



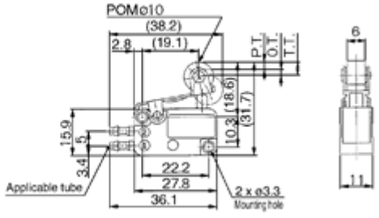


[ ] : T.T. = 2.5mm

- **Roller lever**

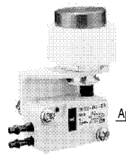
Roller lever
VM1000-4N-01
VM1000-4NU-01
VM1100-4N-01
VM1100-4NU-01

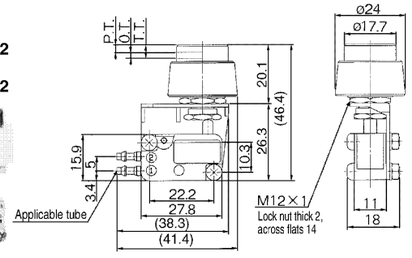




- **Push button**

VM1000-4N-32
VM1000-4NU-32
VM1100-4N-32
VM1100-4NU-32



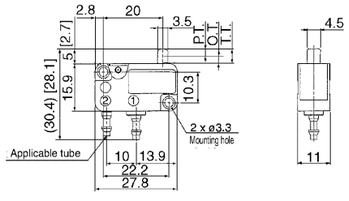


5.2 Series VM1000/Bottom ported

- **Basic**

VM1010-4N-00
VM1010-4NU-00
VM1110-4N-00
VM1110-4NU-00





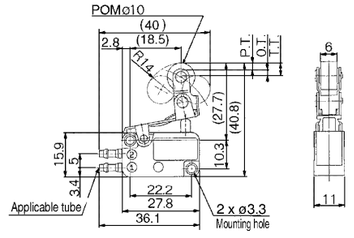
[ ] : T.T. = 2.5mm

5 Outline Dimensions (mm) - continued

- **One way roller lever**

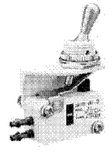
VM1000-4N-02
VM1000-4NU-02
VM1100-4N-02
VM1100-4NU-02

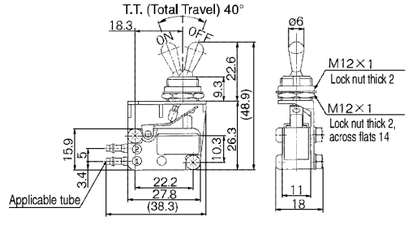




- **Toggle lever**

VM1000-4N-08
VM1000-4NU-08
VM1100-4N-08
VM1100-4NU-08



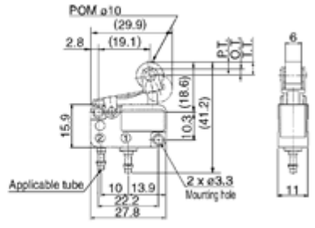


5 Outline Dimensions (mm) - continued

- **Roller lever**

VM1010-4N-01
VM1010-4NU-01
VM1110-4N-01
VM1110-4NU-01

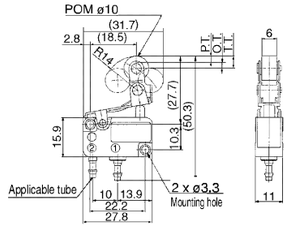




- **One way roller lever**

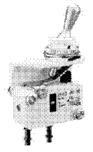
VM1010-4N-02
VM1010-4NU-02
VM1110-4N-02
VM1110-4NU-02

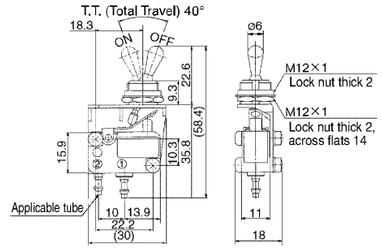




- **Toggle lever**

VM1010-4U-08
VM1010-4NU-08
VM1110-4N-08
VM1110-4NU-08

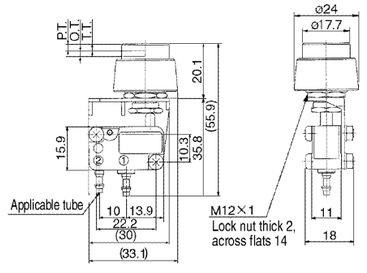




- **Push button**

VM1010-4N-32
VM1010-4NU-32
VM1110-4N-32
VM1110-4NU-32





6 Maintenance

6.1 General Maintenance

⚠ Caution

* Perform inspections on a regular basis as necessary, such as at the beginning of an operation, to make sure that the mechanical valve operates properly. 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.
* To replace the push button and push button cover alone, refer to section 6.2. Other parts and actuator cannot be replaced.

6.2 Replacement parts

1. To order a single push button for series VM1000 and a single cover use the part number below.

Colour	Mushroom button	Extended button
Red	3410701-R	3410703 (white only)
Black	3410701-B	
Green	3410701-G	

7 Limitations of Use

7.1 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(1). 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.

(1) Vacuum pads are excluded from this 1 year warranty.

7 Limitations of use - continued

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.
- Small amount of leakage is normal for this valve. Do not use in applications where leakage is critical.

⚠ Warning

- Any use in an ISO 13849 system must be within the specified limits and application conditions. The user is responsible for the specification, design, implementation, validation and maintenance of the safety system (SPR/CS).

⚠ Danger

- Do not make any additional machining to enlarge the body mounting holes. This may result in abnormalities such as air leakage.
- Operate all manual valves such as the push button, selector and flip toggle types with your finger. Use of hammers or mechanical methods such as cylinders may result in damage.

1 Contacts

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