Mechanical Valve
Series VM

Model	VM1000	VM100	VM200
Dimensions (mm)	Side piping 11 X 36 X 16 Bottom piping 11 X 28 X 25	Side piping 17 X 44 X 25 Bottom piping 17 X 44 X 30	25 X 40 X 52
Basic	●	●	●
Roller Lever	●	●	●
One Way Roller Lever	●	●	●
Straight Plunger		●	●
Roller Plunger		●	●
Cross Roller Plunger		●	●
Toggle Lever	●	●	●
Push Button (Mushroom)		●	●
Push Button (Extended)	●	●	●
Push Button (Flush)		●	●
Twist Selector (2 position)		●	●
Key Selector (2 position)		●	●
Twist Selector (3 position)		●	●
Foot Pedal			●
Push-Pull			
	P2-44	P.2-48	P2-56
Effective Area (Nl/min)	1 (49.03)	2.5 (124.81)	19 (891.50)
Number of Ports	2, 3	2, 3	2, 3
Function	Poppet	Poppet	Poppet

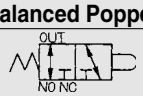
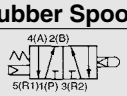
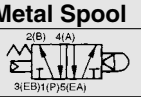
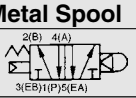
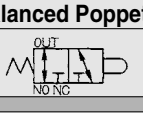
Mechanical Valve

VM400	VZM500	VZM400	VFM300	VFM200	VM800
21 X 35 X 53	18 X 28 X 87	18 X 30 X 91	26 X 35 X 94	23 X 40 X 115	30 X 40 X 57
					

Roller Lever

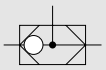
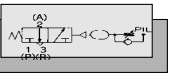
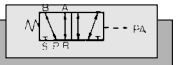
Adjustable Roller Lever

Adjustable Rod Lever

P2-62	P2-77	P2-71	P2-84	P2-90	P2-68
7 (338.77)	10.8 (534.90)	9.9 (490.33)	18 (891.50)	18 (891.50)	6 (294.20)
3	5	5	5	5	3
Balanced Poppet	Rubber Spool	Metal Spool	Rubber Spool	Metal Spool	Balanced Poppet
					

* Dual pressure available only on external pilot.

Related Products

			Effective Area (mm^2) (Nl/min)	No.of Ports	Function
Shuttle Valve Dimensions (mm) VR1210: 17.2 X 38 X 29 VR1220: 21.2 X 50 X 38	**VR1210**		7 (338.77)	3	
	VR1220		15 (722.12)	3	
Shuttle valve With One-Touch Fittings	**VR12□0F**			3	
AND valve With One-Touch Fittings	**VR1211F**			3	
Time Delay Valve Dimensions (mm) 70 X 68 X 66	**VR2110**		2.5 (124.81)	3	
Pneumatic Indicator Dimensions (mm) ø26 X 66	**VR3100**		–	–	
Miniature Pneumatic Indicator Dimensions (mm) ø12 X 17	**VR3110**		–	–	
Relay Valve Dimensions (mm) Side piping: 30 X 53 X 91 Bottom piping: 30 X 48 X 91	**VR4151**		7 (338.77)	5	 Metal Spool
	VR4152				

⚠ Precautions

Mounting

⚠ Warning

①Conditions for mechanical operation

Do not move the mechanical operation beyond the operating limit position, as this could damage the mechanical valve itself and lead to equipment malfunction.

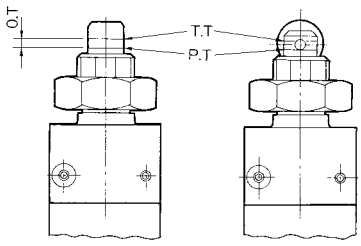
•Actuator Stroke

Operate the mechanism within the stroke range that has been obtained through the formula given below. (Do not move beyond the operating limit position.)

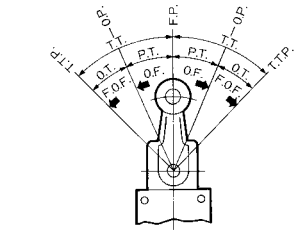
Operating stroke: P.T. + 0.5 X O.T.

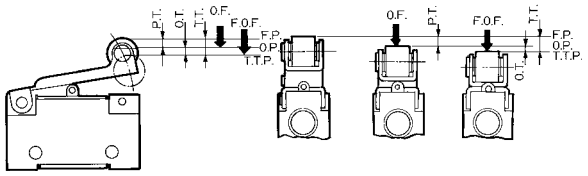
Series	Actuator		Actuator Stroke (mm)
VM1000	Basic	T.T.=4.8mm (T.T.=2.5mm)	3.7 to 4.7 (2.2 to 2.4)
	Roller lever		3.5 to 4.4
	One way roller lever		3.5 to 4.4
VM100	Basic		2.2 to 2.9
	Roller lever		4.3 to 5.3
	One way roller lever		4.3 to 5.3
	Straight plunger		2.7 to 3.4
	Roller plunger		2.7 to 3.4
	Cross roller plunger		2.7 to 3.4
VM200	Basic		4.0 to 4.9
	Roller lever		8.7 to 10.7
	One way roller lever		9.5 to 11.7
	Straight plunger		4.5 to 5.4
	Roller plunger		4.5 to 5.4
	Cross roller plunger		4.5 to 5.4
VM400	Basic		2.5 to 3.4
	Roller lever		6.2 to 8.2
	One way roller lever		6.5 to 8.7
	Straight plunger		4.5 to 5.4
	Roller plunger		4.5 to 5.4
	Cross roller plunger		4.5 to 5.4
VZM500 VZM400 VFM300 VFM200	Basic		2.0 to 2.9
	Roller lever		4.2 to 6.0
	One way roller lever		4.7 to 6.7
	Straight plunger		2.5 to 3.4
	Roller plunger		2.5 to 3.4

For straight and roller plunger styles, there is a groove indicating P.T. and T.T. for stroke adjustment.



Definition of Symbols





F.P. (Free Position)····· No external force applied.
O.P. (Operating Position) ····· Internal valve opening position.
T.T.P. (Total Travel Position)····· Includes over travel.
O.F. (Operating Force) ····· Operating force required to initial valve opening position.
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.

Air Flow Calculation

Refer to the p.0-36 for air flow calculations.

$$Q = 22.2S\sqrt{P_L(P_H - P_L)}\sqrt{\frac{273}{\theta + 273}} \quad \cdots\cdots\cdots\cdots(1\ \text{formula})$$

Cautions

This product cannot be used for applications in which the pressure must be sealed because there will be a slight leakage. Consult SMC for this type of application.

⚠ Precautions

Mounting

⚠ Warning

②Conditions for mechanical operation

●Cam and dog angle and maximum speed

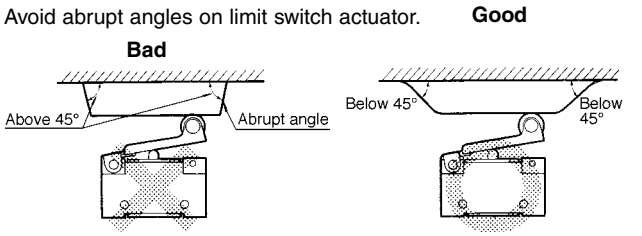
Select the angle and the maximum speed of the operating cam and the dog of the mechanism from within the selection range given in the table below.

If they are operated beyond the selection range, the cam and the dog could apply impact shocks to the actuator, leading to damage.

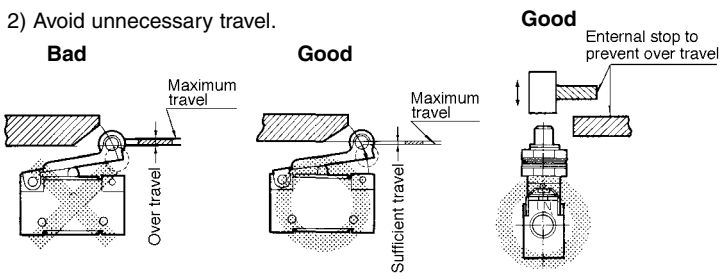
Series	Actuator	Angle limit switch actuator	Max. speed limit switch actuator m/s
VM1000	Roller lever	30°	0.7
		45°	0.3
	One way roller lever	30°	0.7
		45°	0.3
VM100 VM200 VM400	Roller lever	30°	0.7
		45°	0.3
	One way roller lever	30°	0.7
		45°	0.3
	Straight plunger	—	0.2
	Roller plunger	30°	0.3
	Cross roller plunger	30°	0.3
VZM500 VZM400 VFM300 VFM200	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
VM800	Roller lever	30°	0.5
		45°	0.2
	Adjustable roller lever	30°	0.2
		45°	0.1
	Adjustable rod lever	—	0.2

Installation recommendations

1) Avoid abrupt angles on limit switch actuator.



2) Avoid unnecessary travel.



Roller material	Plunger material	Plunger surface finish
Polyacetal	Steel	▽▽▽
Steel	Steel, Resin	▽▽

③Never perform additional machining such as enlarging the body mounting holes, as doing so could lead to abnormal conditions such as air leakage.

④Operate all manual valves such as the push pin styles, the selector styles, and the flip toggle styles with your finger.

If a hammer or other tools are used, or it is operated mechanically through the use of a cylinder or the like, damage could result.

Environment

⚠ Cautions

①Do not operate it in an area in which fluids such as oil, coolant, or water splash on it or dust comes in contact with it.

Because it does not have a waterproof or dustproof construction, fluids or dust could enter the valve, leading to malfunction. Therefore, take measures such as providing a protective cover to prevent direct exposure.

Maintenance

⚠ Warning

①Perform inspections on a regular basis as necessary, such as at the beginning of an operation, to make sure that the mechanical valve operates properly.

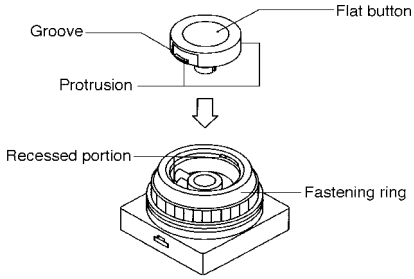
Failure to observe this precaution could lead to unsafe operation, such

How to Change the Button

Replace the button in the following manner to change color of the button.

①Push button (Flush style)

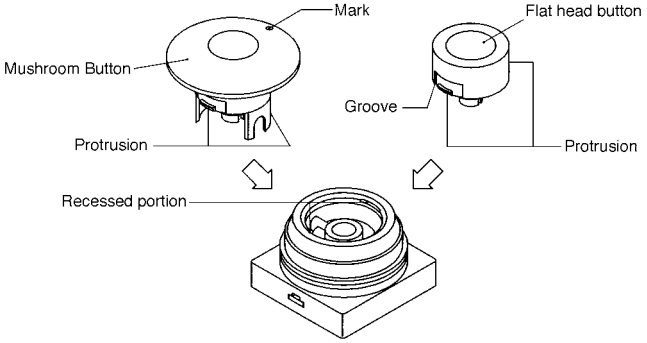
- Installation ··· Of the four colors, red, green, black, and yellow, select and align the protruding portion of the button with the recessed portion of the body and push in.
- Removal·····Remove the fastening ring and insert the tip of a small flat screwdriver into the groove of the button to pry it up.



②Push Button (Mushroom and extended styles)

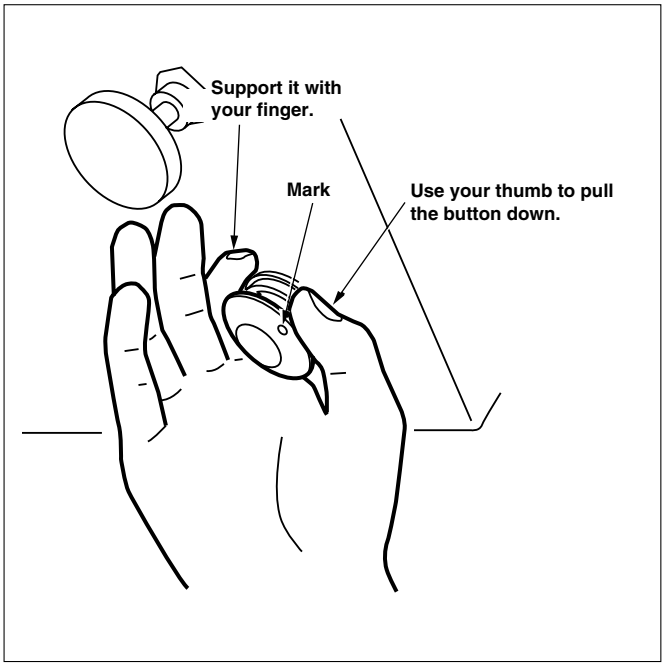
At the time of shipment, only 1 button of the color that you specified is attached to the body.

	Mushroom style	Extended style
Mounting	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 button 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 screwdriver into the groove of the button to pry it up.

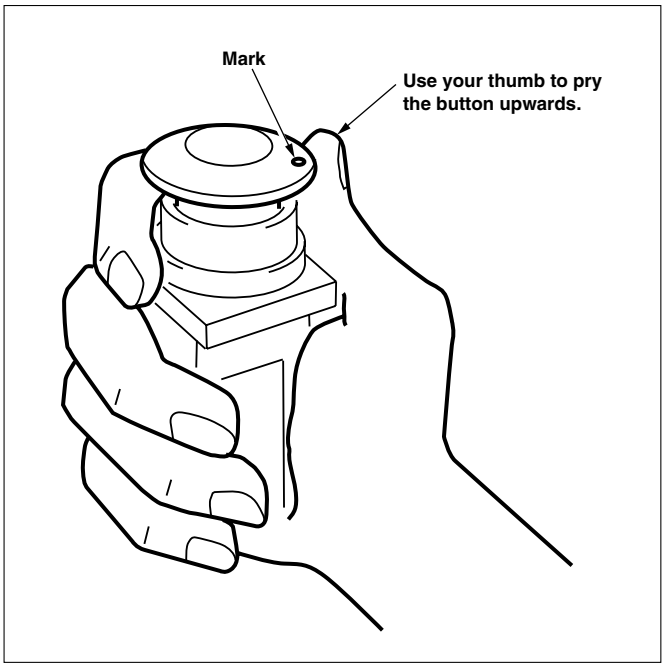


How to Remove a Mushroom Button

How to remove at panel mount



Removing the valve as a unit.



Replacement Parts

Use the part numbers listed below to order individual mushroom head or flat head buttons.

Color	Mushroom button	Extended button
Red	3402186R	3402187R
Black	3402186B	3402187B
Green	3402186G	3402187G
Yellow	3402186Y	3402187Y

Micro Mechanical Valve

Series VM1000

Miniature stucture requires little mounting space.
Built-in hose nipple connection.
Porting options: Side Porting Bottom Porting
Over Travel after actuation (mechanical operated styles).

Specifications

Style of valve	N.C. poppet
Number of ports	2 or 3
Total travel	4.8mm (Basic)
Piping	Side or bottom
Fluid	Air
Operating pressure	0 to 0.8MPa
Ambient and fluid temperature	–5 to 60°C (No freezing)
Effective area (Nℓ/min)	1mm^2 (49.03)
Lubrication	Not required/Turbine oil #1 (ISO VG32)
Fitting	With hose nipple
Weight (Basic)	6g

Options

Total travel (T.T.)	2.5mm (Basic)

• A commercially available actuator for the V microswitch can be installed.
• However, be aware that there are different microswitches, such as the P.T./O.T. or F.O.F. styles.
• T.T. 2.5mm is available for basic style only.

Model

	Actuator	Piping	No. of ports	Applicable tube		Notes
				T0425	TU0425/T0403	
Mechanical operation	Basic	Side	3	**VM1000-4N-00**	**VM1000-4NU-00**	
			2	**VM1100-4N-00**	**VM1100-4NU-00**	
		Bottom	3	**VM1010-4N-00**	**VM1010-4NU-00**	
			2	**VM1110-4N-00**	**VM1110-4NU-00**	
	Roller lever	Side	3	**VM1000-4N-01**	**VM1000-4NU-01**	
			2	**VM1100-4N-01**	**VM1100-4NU-01**	
		Bottom	3	**VM1010-4N-01**	**VM1010-4NU-01**	
			2	**VM1110-4N-01**	**VM1110-4NU-01**	
	One way roller lever	Side	3	**VM1000-4N-02**	**VM1000-4NU-02**	
			2	**VM1100-4N-02**	**VM1100-4NU-02**	
		Bottom	3	**VM1010-4N-02**	**VM1010-4NU-02**	
			2	**VM1110-4N-02**	**VM1110-4NU-02**	
Manual operation	Toggle lever	Side	3	**VM1000-4N-08**	**VM1000-4NU-08**	
			2	**VM1100-4N-08**	**VM1100-4NU-08**	
		Bottom	3	**VM1010-4N-08**	**VM1010-4NU-08**	
			2	**VM1110-4N-08**	**VM1110-4NU-08**	
	Push button	Side	3	**VM1000-4N-32R**	**VM1000-4NU-32R**	Red
			2	**VM1100-4N-32R**	**VM1100-4NU-32R**	Red
		Bottom	3	**VM1010-4N-32R**	**VM1010-4NU-32R**	Red
			2	**VM1110-4N-32R**	**VM1110-4NU-32R**	Red
		Side	3	**VM1000-4N-32B**	**VM1000-4NU-32B**	Black
			2	**VM1100-4N-32B**	**VM1100-4NU-32B**	Black
		Bottom	3	**VM1010-4N-32B**	**VM1010-4NU-32B**	Black
			2	**VM1110-4N-32B**	**VM1110-4NU-32B**	Black
		Side	3	**VM1000-4N-32G**	**VM1000-4NU-32G**	Green
			2	**VM1100-4N-32G**	**VM1100-4NU-32G**	Green
		Bottom	3	**VM1010-4N-32G**	**VM1010-4NU-32G**	Green
			2	**VM1110-4N-32G**	**VM1110-4NU-32G**	Green

How To Order

VM1 [0] [0] [0] – [4N] – [00] [R]

Number of ports

0	3 ports
1	2 ports

Piping

0	Side
1	Bottom

Total travel/Basic (T.T.)

0	4.8mm
1	2.5mm (Option)*

*Basic only.

Applicable tube (Meterial/Size)

4N	Nylon ø4/2.5 (T0425)
4NU	Nylon ø4/3 (T0403)
	Soft Nylon ø4/2.5 (TS0425)
	Polyurethane ø/2.5 (TU0425)

Actuator

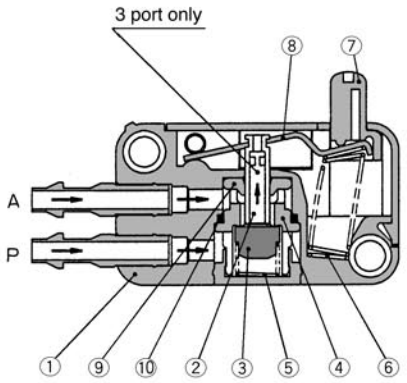
00	Basic
01	Roller lever
02	One way roller lever
08	Toggle lever
32	Push button

Colour of push button

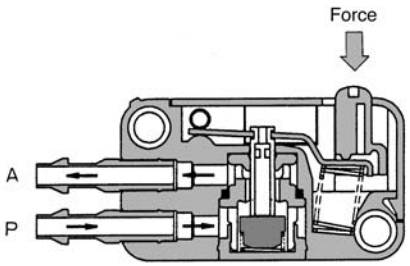
R	Red
G	Green
B	Black

Construction

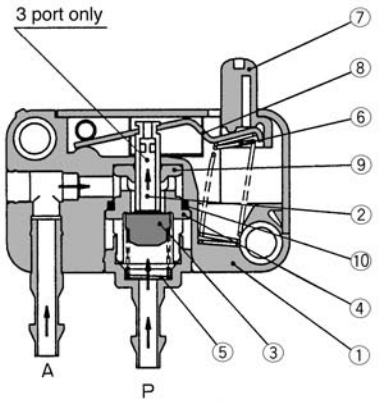
Side Piping/Non-actuated



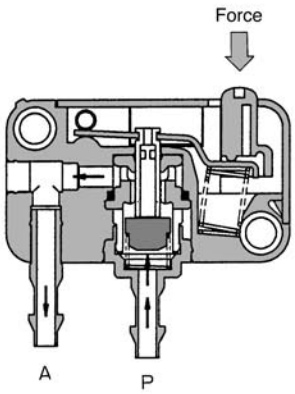
Side Piping/Actuated



Bottom Piping



Bottom Piping/Actuated



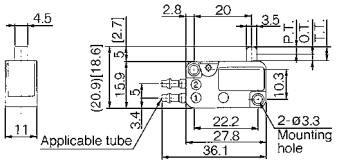
Component Parts

No.	Description	Material	Notes
①	Body	PBT	
②	Valve rod	Polyacetal	
③	Valve	NBR	
④	Retainer	Polyacetal	
⑤	Spring	Stainless steel	

No.	Description	Material	Notes
⑥	Spring	Stainless steel	
⑦	Plunger	Polyacetal	T.T.=2.5mm only, w/threads
⑧	Lever	Stainless steel	
⑨	Packing	NBR	
⑩	O ring	NBR	

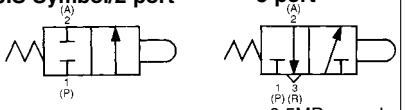
Series VM1000/Side Piping

Basic/VM1000-4N-00, VM1000-4NU-00
VM1100-4N-00, VM1100-4NU-00



[ ]: T.T.=2.5mm

JIS Symbol/2 port **3 port**

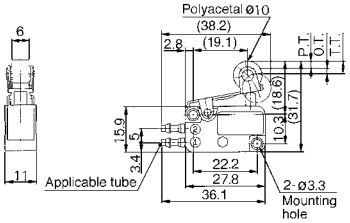


∗ 0.5MPa supply

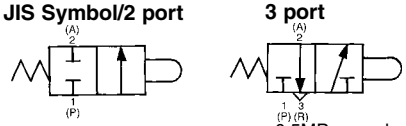
		Applicable tube	
		T0425	TU0425, T0403, TS0425
Side piping	3 ports	**VM1000-4N-00**	**VM1000-4NU-00**
	2 ports	**VM1100-4N-00**	**VM1100-4NU-00**
F.O.F.*		6N	
P.T.		2.5mm[2mm]	
O.T.		2.3mm[0.5mm]	
T.T.		4.8mm[2.5mm]	

Roller Lever/VM1000-4N-01, VM1000-4NU-01

VM1100-4N-01, VM1100-4NU-01



JIS Symbol/2 port **3 port**

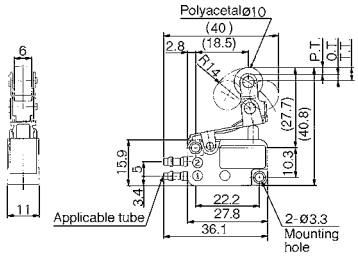


∗ 0.5MPa supply

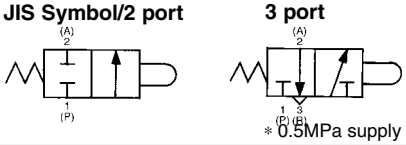
		Applicable tube	
		T0425	TU0425, T0403, TS0425
Side piping	3 ports	**VM1000-4N-01**	**VM1000-4NU-01**
	2 ports	**VM1100-4N-01**	**VM1100-4NU-01**
F.O.F.*		6N	
P.T.		2.5mm	
O.T.		2mm	
T.T.		4.5mm	

One Way Roller Lever/VM1000-4N-02, VM1000-4NU-02

VM1100-4N-02, VM1100-4NU-02



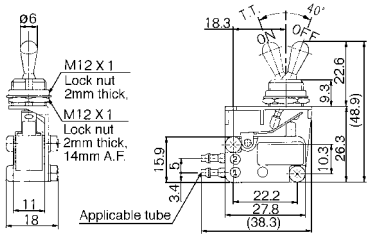
JIS Symbol/2 port **3 port**



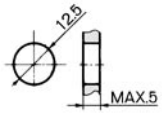
∗ 0.5MPa supply

		Applicable tube	
		T0425	TU0425, T0403, TS0425
Side piping	3 ports	**VM1000-4N-02**	**VM1000-4NU-02**
	2 ports	**VM1100-4N-02**	**VM1100-4NU-02**
F.O.F.*		6N	
P.T.		2.5mm	
O.T.		2mm	
T.T.		4.5mm	

Toggle Lever/VM1000-4N-08, VM1000-4NU-08
VM1100-4N-08, VM1100-4NU-08



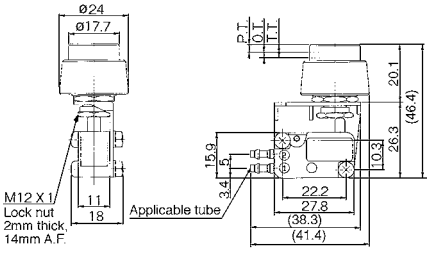
Panel mounted hole **JIS Symbol/2 port** **3 port**



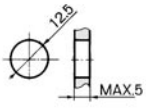
∗ 0.5MPa supply

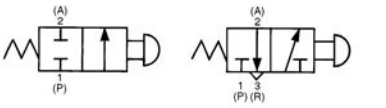
		Applicable tube	
		T0425	TU0425, T0403, TS0425
Side piping	3 ports	**VM1000-4N-08**	**VM1000-4NU-08**
	2 ports	**VM1100-4N-08**	**VM1100-4NU-08**
F.O.F.*		4N	
P.T.		40°	

Push Button/VM1000-4N-32, VM1000-4NU-32
VM1100-4N-32, VM1100-4NU-32



Panel mounted hole **JIS Symbol/2 port** **3 port**



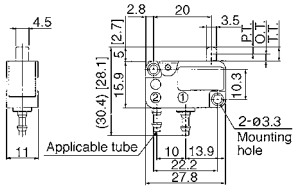


∗ 0.5MPa supply

		Applicable tube	
		T0425	TU0425, T0403, TS0425
Side piping	3 ports	**VM1000-4N-32**	**VM1000-4NU-32**
	2 ports	**VM1100-4N-32**	**VM1100-4NU-32**
F.O.F.*		6N	
P.T.		2.5mm	
O.T.		2mm	
T.T.		4.5mm	

Series VM1000/Bottom Piping

Basic/VM1010-4N-00, VM1010-4NU-00
VM1110-4N-00, VM1110-4NU-00



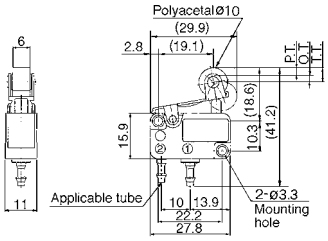
[ ]: T.T.=2.5mm

JIS Symbol/2 port **3 port**

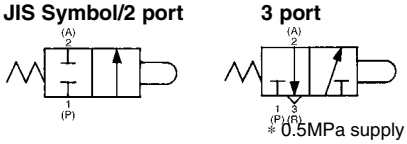
∗ 0.5MPa supply

		Applicable tube	
		T0425	TU0425, T0403, TS0425
Bottom piping	3 ports	**VM1010-4N-00**	**VM1010-4NU-00**
	2 ports	**VM1110-4N-00**	**VM1110-4NU-00**
F.O.F.∗		6N	
P.T.		2.5mm	
O.T.		2.3mm[0.5mm]	
T.T.		4.8mm[2.5mm]	

Roller Lever/VM1010-4N-01, VM1010-4NU-01
VM1110-4N-01, VM1110-4NU-01



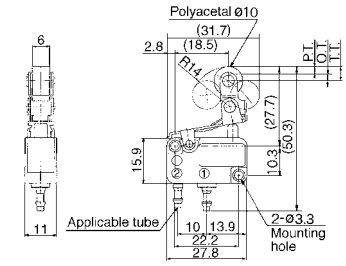
JIS Symbol/2 port **3 port**



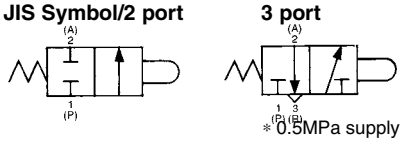
∗ 0.5MPa supply

		Applicable tube	
		T0425	TU0425, T0403, TS0425
Bottom piping	3 ports	**VM1010-4N-01**	**VM1010-4NU-01**
	2 ports	**VM1110-4N-01**	**VM1110-4NU-01**
F.O.F.∗		6N	
P.T.		2.5mm	
O.T.		2mm	
T.T.		4.5mm	

One Way Roller Lever/VM1010-4N-02, VM1010-4NU-02
VM1110-4N-02, VM1110-4NU-02



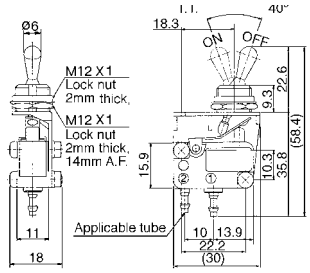
JIS Symbol/2 port **3 port**



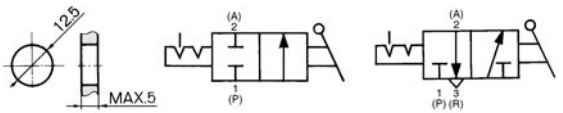
∗ 0.5MPa supply

		Applicable tube	
		T0425	TU0425, T0403, TS0425
Bottom piping	3 ports	**VM1010-4N-02**	**VM1010-4NU-02**
	2 ports	**VM1110-4N-02**	**VM1110-4NU-02**
F.O.F.∗		6N	
P.T.		2.5mm	
O.T.		2mm	
T.T.		4.5mm	

Toggle Lever/VM1010-4N-08, VM1010-4NU-08
VM1110-4N-08, VM1110-4NU-08



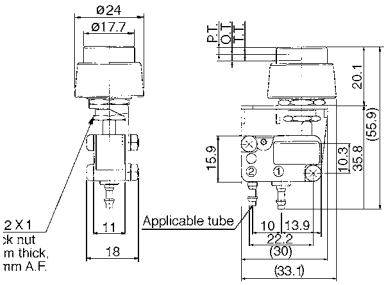
Panel mounted hole **JIS Symbol/2 port** **3 port**



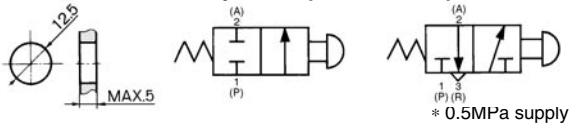
∗ 0.5MPa supply

		Applicable tube	
		T0425	TU0425, T0403, TS0425
Bottom piping	3 ports	**VM1010-4N-08**	**VM1010-4NU-08**
	2 ports	**VM1110-4N-08**	**VM1110-4NU-08**
F.O.F.∗		4N	
T.T.		40°	

Push Button/VM1010-4N-32, VM1010-4NU-32
VM1110-4N-32, VM1110-4NU-32



Panel mounted hole **JIS Symbol/2 port** **3 port**



∗ 0.5MPa supply

		Applicable tube	
		T0425	TU0425, T0403, TS0425
Bottom piping	3 ports	**VM1010-4N-32**	**VM1010-4NU-32**
	2 ports	**VM1110-4N-32**	**VM1110-4NU-32**
F.O.F.∗		6N	
P.T.		2.5mm	
O.T.		2mm	
T.T.		4.5mm	