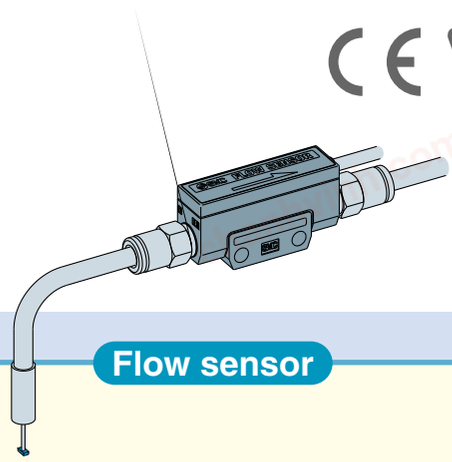
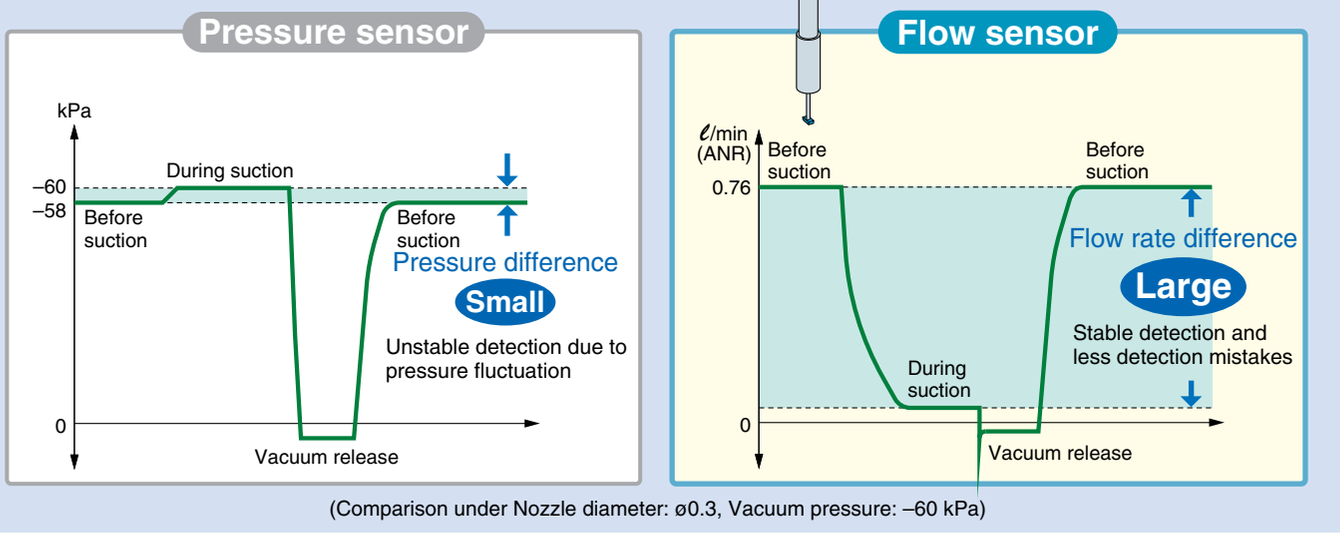
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Flow Sensor

Suction check of very small workpieces

This flow sensor enables precise suction.

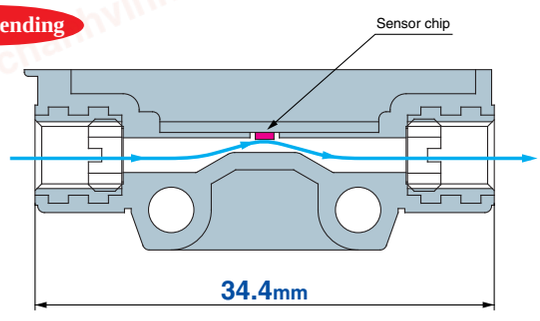




(Comparison under Nozzle diameter: ø0.3, Vacuum pressure: –60 kPa)

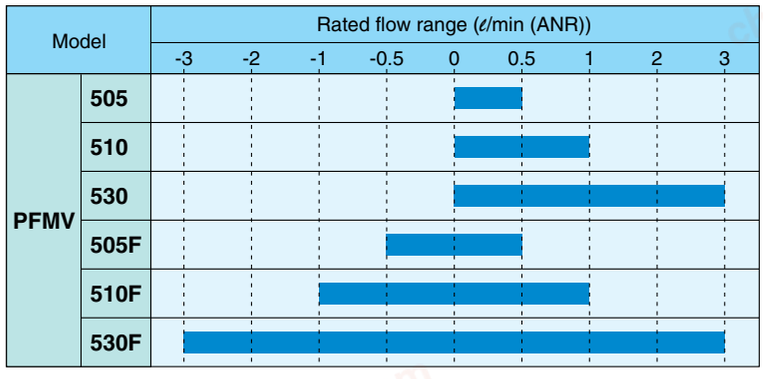
- Repeatability: ±2% F.S. or less
  The taper-shaped flow passage in front of the sensor chip enables stable sensing.
- Response speed: 5 ms or less
- Proof pressure: 500 kPa
- Grease-free
- RoHS compliant
- Flexible cable

Patent pending



New **Flow rate display function added**

Setting/Display according to flow value is possible





Sensor
Series PFMV5



Voltage Monitor
Series PFMV3

Series PFMV

SMC

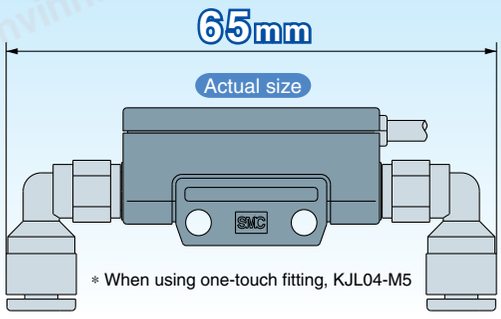
CAT.EUS100-67B-UK

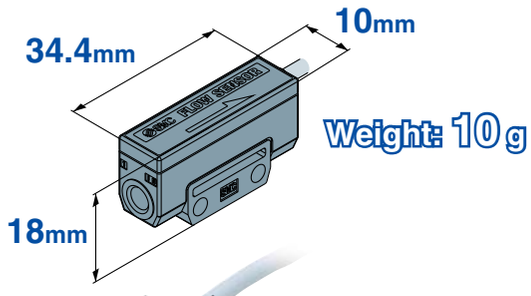
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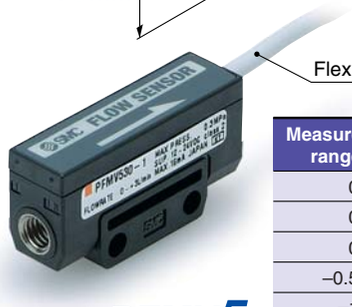
Sensor

Reduced piping space

Mountable in a space-saving location since the straight piping length is not required.







Series PFMV5

Measurement flow range (ℓ/min)	Model
0 to 0.5	PFMV505
0 to 1	PFMV510
0 to 3	PFMV530
–0.5 to 0.5	PFMV505F
–1 to 1	PFMV510F
–3 to 3	PFMV530F

Voltage Monitor

A full range of sensors (6 ranges) can be covered by one monitor.

No need to select the range of connected sensors (excluding external input).

Range for connected sensors must be selected in order to use the flow rate display function.



Voltage display

Output voltage of the sensor is displayed.

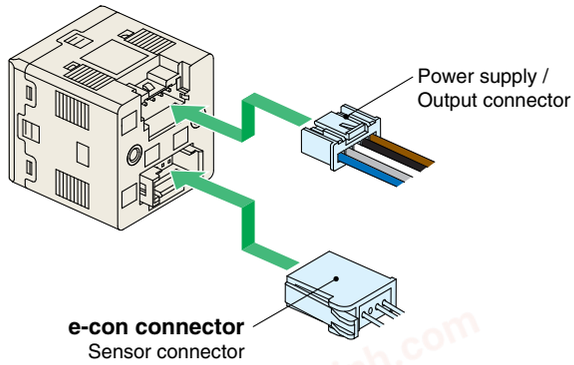
- Settable range: 0.7 to 5.10 V
- Minimum unit setting: 0.01 V

∗ Voltage value display and real-time flow rate display can be also selected.

Series PFMV3

Connectors

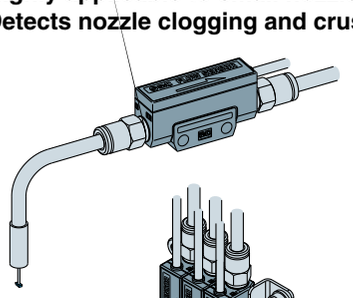
Easy connection and removal of wiring

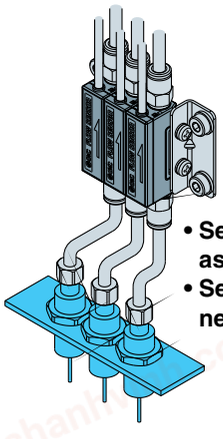


Applications

Suction check of very small workpieces

- Suction of small components can be checked.
- Highly applicable to small nozzles
- Detects nozzle clogging and crushing.

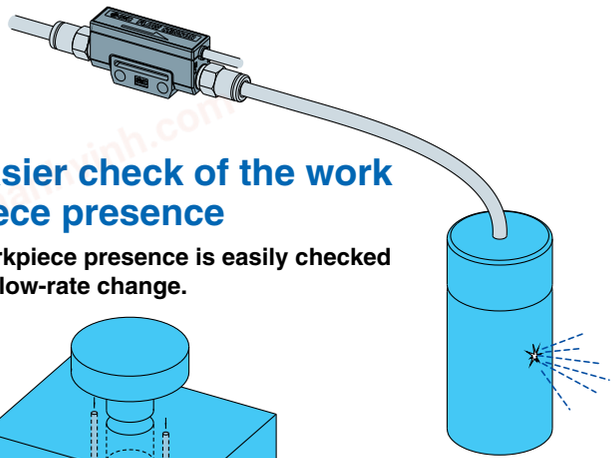




- Sensors can be mounted as a manifold.
- Sensors can be mounted near pads.

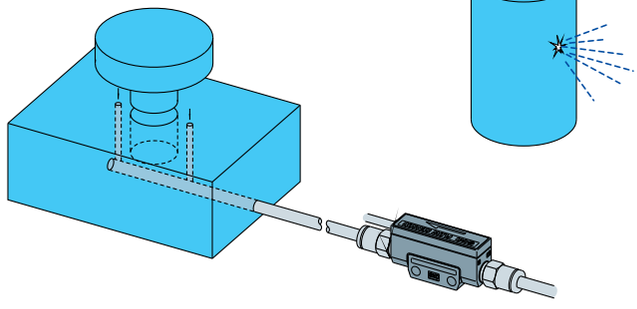
Easier leakage test

- Easily detects pin halls on molded parts.



Easier check of the work piece presence

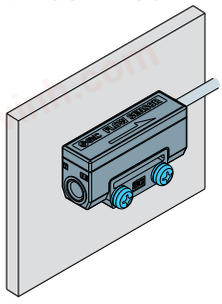
- Workpiece presence is easily checked by flow-rate change.



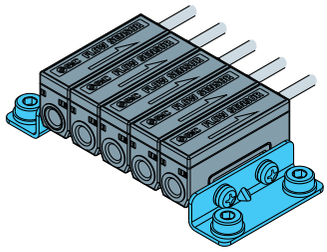
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Mountings

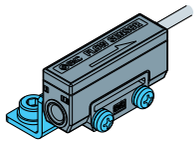
Direct mount



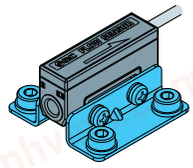
Manifold mount



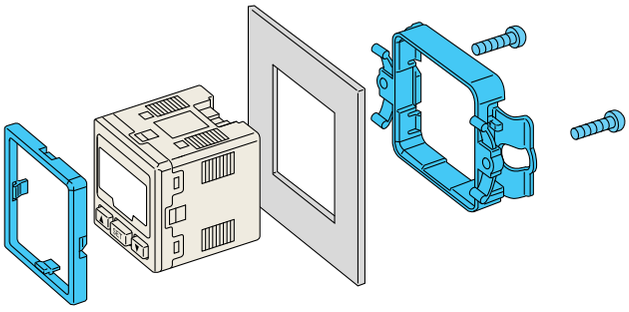
One-side bracket mount



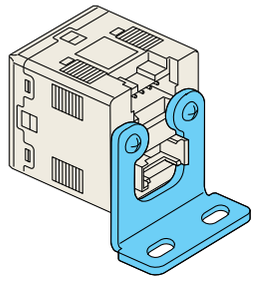
Both-side bracket mount



Panel mount

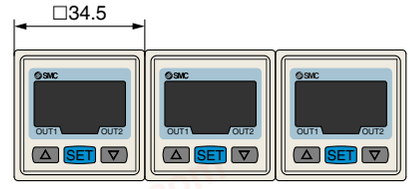


Bracket mount

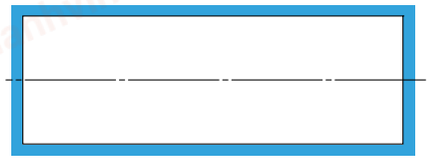


Support for vertical and horizontal secure mounting

- A single panel opening is sufficient.
- Reduces panel fitting work and enables space-savings.



Panel opening



Related Products Variations



CAT.ES100-63B

Integrated type	Remote type	
		

Measurement flow range (ℓ/min)	Model	Model	
		Sensor unit	Display unit
0.2 to 10 (0.2 to 5)	PFM710	PFM510	PFM3□□
0.5 to 25 (0.5 to 12.5)	PFM725	PFM525	
1 to 50 (1 to 25)	PFM750	PFM550	
2 to 100 (2 to 50)	PFM711	PFM511	

( ): Fluid: CO_2

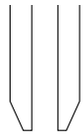
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Series PFMV
Model Selection

Nozzle Diameter and Flow Characteristics (Approximate values)

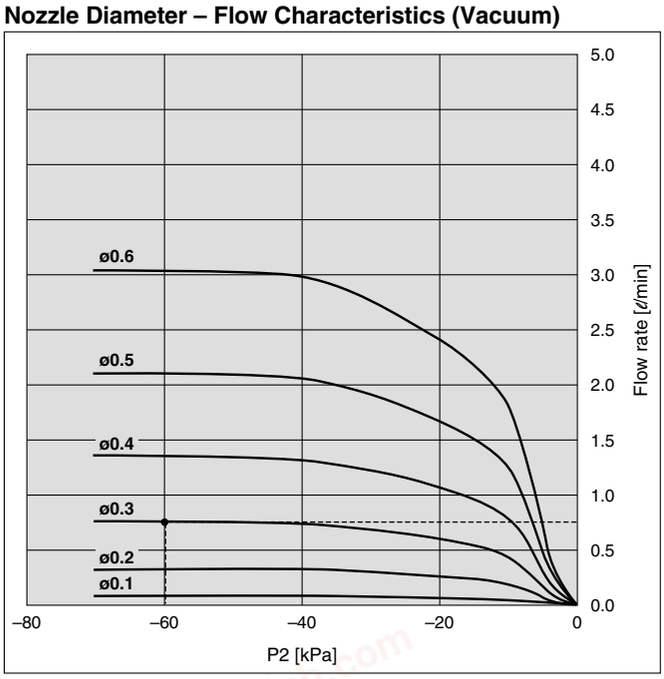
Use the following graphs as a reference to select sensor measuring range.

P2: Nozzle internal pressure

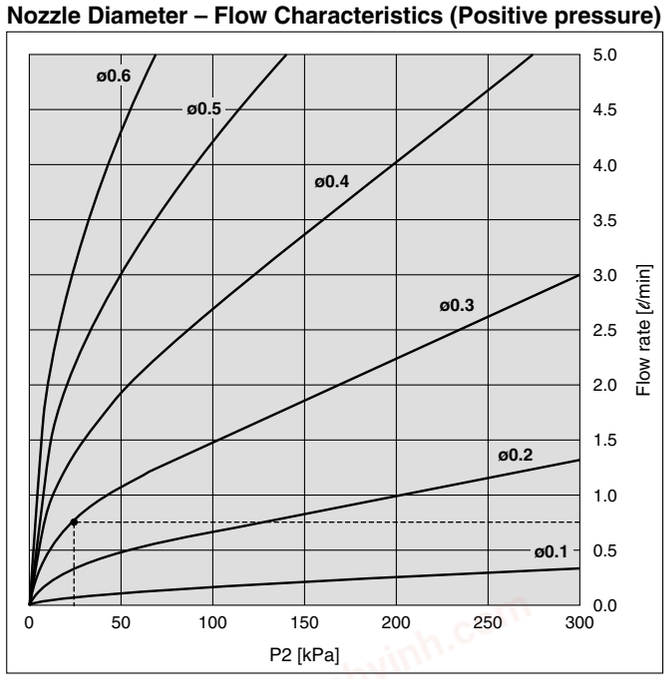


P1: Atmospheric pressure

Nozzle Diameter – Flow Characteristics (Vacuum)



Nozzle Diameter – Flow Characteristics (Positive pressure)

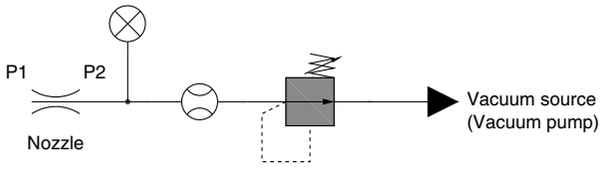


Example (Vacuum)

Selecting conditions:

Nozzle diameter: ø0.3 P1: 0 [kPa]
P2: –60 [kPa]

The flow rate will be 0.7 to 0.8 [ℓ/min] based on the graph.
→ Select the PFMV510-1.

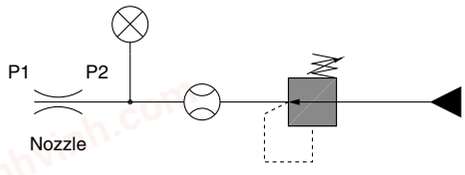


Example (Positive pressure)

Selecting conditions:

Nozzle diameter: ø0.3 P1: 0 [kPa]
P2: 20 [kPa]

The flow rate will be 0.7 to 0.8 [ℓ/min] based on the graph.
→ Select the PFMV510-1.



Note) Since the calculated value may not meet the approximate value due to leakage and pressure loss in the piping system, please check the result by using actual equipment.

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Flow Sensor
Series PFMV5



How to Order

PFMV5 05 – 1 – □□

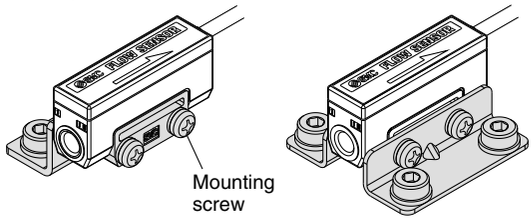
Measurement flow range

05	0.0 to 0.5 ℓ/min
10	0.0 to 1.0 ℓ/min
30	0.0 to 3.0 ℓ/min
05F	–0.5 to 0.5 ℓ/min
10F	–1.0 to 1.0 ℓ/min
30F	–3.0 to 3.0 ℓ/min

Output specification

1	Analogue output (1 to 5 V)

Option (shipped together)

—	None
A	With L-type bracket 

∗ 2 L-type brackets (with 2 mounting screws) are included.

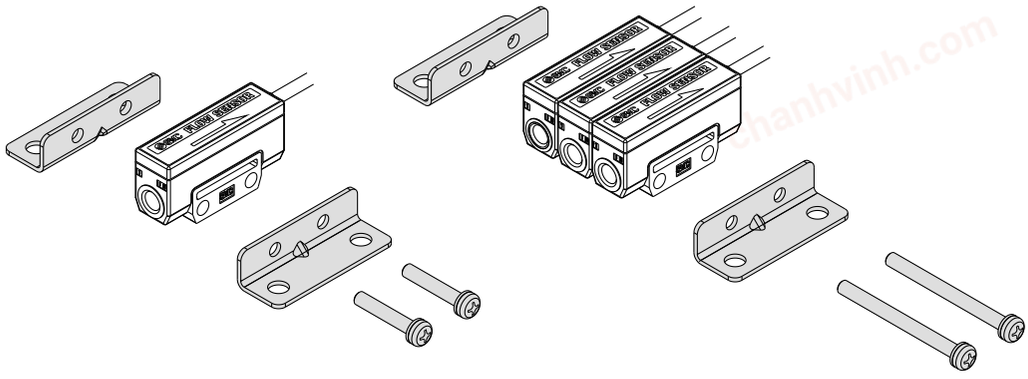
Instruction manual

—	With instruction manual (Leaflet: Japanese and English)
N	None

Option/Part No.

If a single option or manifold mounting are required, order sensors with the part numbers below separately.

Part no.	Stations	Remarks
ZS-36-A1	For 1 station (for single unit)	2 L-type brackets, 2 mounting screws M3 x 15L
ZS-36-A2	For 2 stations	2 L-type brackets, 2 mounting screws M3 x 25L
ZS-36-A3	For 3 stations	2 L-type brackets, 2 mounting screws M3 x 35L
ZS-36-A4	For 4 stations	2 L-type brackets, 2 mounting screws M3 x 45L
ZS-36-A5	For 5 stations	2 L-type brackets, 2 mounting screws M3 x 55L



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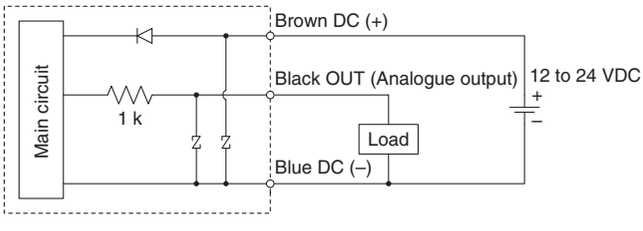
Series PFMV5

Specifications

Model		PFMV505	PFMV510	PFMV530	PFMV505F	PFMV510F	PFMV530F
Applicable fluid		Dry air, N_2 (JIS B 8392-1 1.1.2 to 1.6.2: 2003)					
Rated flow range (Flow rate range) Note 1)		0 to 0.5 ℓ/min	0 to 1 ℓ/min	0 to 3 ℓ/min	–0.5 to 0.5 ℓ/min Note 2)	–1 to 1 ℓ/min Note 2)	–3 to 3 ℓ/min Note 2)
Accuracy		±5% F.S. or less Note 3)					
Repeatability		±2 F.S. or less Note 3)					
Pressure characteristics (Based on 0 kPa Note 4)**)**		±2% F.S. or less (0 to 300 kPa) ±5% F.S. or less (–70 to 0 kPa)					
Temperature characteristics (Based on 25°C)		±2% F.S. or less (15 to 35°C) ±5% F.S. or less (0 to 50°C)					
Rated pressure range Note 5)		–70 kPa to 300 kPa					
Operating pressure range Note 6)		–100 kPa to 400 kPa					
Proof pressure		500 kPa					
Analogue output (Non-linear output)		Voltage output: 1 to 5 V, Output impedance: Approx. 1 kΩ					
Response time		5 ms or less (90% response)					
Power supply voltage		12 to 24 VDC ±10%, Ripple (p-p) ±10% or less (with polarity protection)					
Current consumption		16 mA or less					
Environ-mental resistance	**Enclosure**	IP40					
	Fluid temperature	0 to 50°C (No freezing and condensation)					
	Operating temperature range	0 to 50°C (No freezing and condensation)					
	Stored temperature range	–10 to 60°C (No freezing and condensation)					
	Operating humidity range	35 to 85% R.H. (No condensation)					
	Stored humidity range	35 to 85% R.H. (No condensation)					
	Withstand voltage	1000 VAC for 1 min. between whole charging part and case					
	Insulation resistance	50 MΩ or more (at 500 VDC Megohmmeter) between whole charging part and case					
	Vibration resistance	10 to 150 Hz with a 1.5 mm amplitude, max. 98 m/s², in each X, Y, Z direction for 2 hrs (De-energised)					
	Impact resistance	980 m/s² in X, Y, Z directions 3 times each (De-energised)					
	Port size	M5 x 0.8 (Tightening torque: 1 to 1.5 N·m)					
	Wetted parts material	PPS, Si, Au, Stainless steel 316, C3604 (Electroless nickel plated)					
Lead wire		Vinyl cabtire cord, 3 cores ø2.6, 0.15 mm², 2 m					
Weight		10 g (excluding lead wire)					

Note 1) Volume flow converted value under standard conditions (ANR) of 20°C, 101.3 kPa and 65% RH
Note 2) Analogue output indicates 3 V when the flow rate is 0. When the flow direction is from IN to OUT, the output is changed to 5 V, and when it's from OUT to IN, the output is changed to 1 V.
Note 3) The unit % F.S. is based on the full scale of analogue 4 V (1-5 V).
Note 4) 0 kPa indicates the atmospheric release.
Note 5) Pressure range that satisfies the product specifications
Note 6) Applicable pressure range

Internal Circuits and Wiring Examples



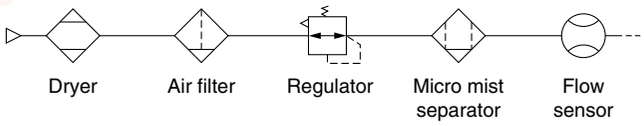
Lead Wire Specifications

Rated temperature		80°C
Rated voltage		1000 V
Number of wires		3
Conductor	**Material**	Copper alloy wire
	Construction	7/11/0.05 mm
	External diameter	0.58 mm
Insulator	**Material**	Cross-linked vinyl chloride (XL-PVC)
	External diameter	0.88 mm
	Standard thickness	0.15 mm
	Colours	Brown, Blue, Black
Sheath	**Material**	Oil-resistant/Heat resistant vinyl
	Standard thickness	0.35 mm
	Colour	Light grey (Munsell N7 equivalent)
Finished external diameter		$2.6^{+0.1}_{-0.15}$

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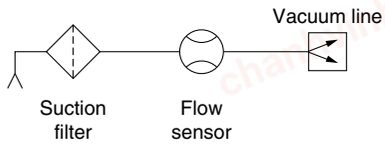
Recommended Pneumatic Circuits

Compressed air line



IDF IDU | **AF** | **AR IR** | **AMD AFD** | **PFMV**

Vacuum line



ZF | **PFMV**

Recommended Fittings

One-touch Fitting/Series KQ2

Type	Tubing O.D. (mm)	Port size	Model
Male connector	4	M5 x 0.8	KQ2H04-M5
Hex. socket head male connector			KQ2S04-M5
Male elbow			KQ2L04-M5

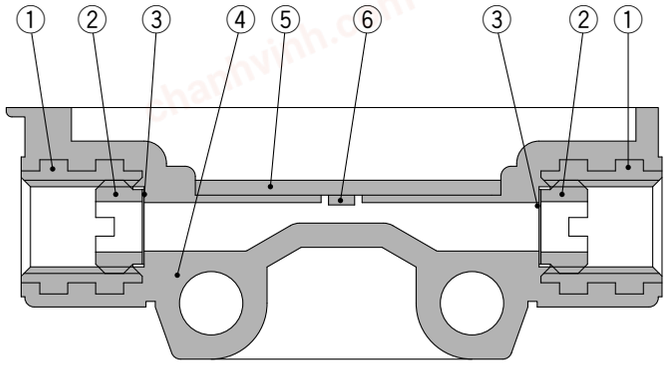
One-touch Mini/Series KJ

Type	Tubing O.D. (mm)	Port size	Model
Male connector	4	M5 x 0.8	KJH04-M5
Hex. socket head male connector			KJS04-M5
Male elbow			KJL04-M5

Miniature Fitting/Series M

Type	Tubing O.D. (mm)	Port size	Model
Barb fitting for nylon tube	4	M5 x 0.8	M-5AN-4
	6		M-5AN-6

Internal Construction

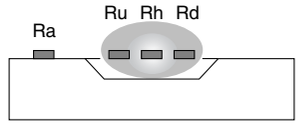


Component Parts

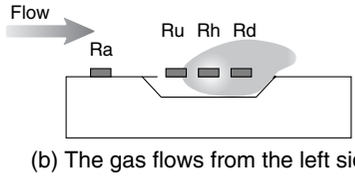
No.	Description	Material
1	**Fitting for piping**	C3604 (Electroless nickel plated)
2	**Mesh holding screw**	
3	**Mesh**	Stainless steel 316
4	**Body**	PPS
5	**Print circuit board**	GE4F
6	**Sensor chip**	Si, Au

Detection Principle

This MEMS sensor chip consists of upstream temperature measuring sensor (Ru) and downstream temperature measuring sensor (Rd), which are placed symmetrically from the centre of a platinum thin film coated heater (Rh) mounted on a membrane, and an ambient temperature sensor (Ra) for measuring gas temperature.
The principle is as shown in the diagram on the right. (a) When the gas is static, the temperature distribution of heated gas centreed around Rh is uniform, and Ru and Rd have the same resistance. (b) When the gas flows from the left side, it upsets the balance of the temperature distribution of heated gas, and the resistance of Rd becomes greater than that of Ru.
The difference in resistance between Ru and Rd is proportional to the gas velocity, so measurement and analysis of the resistance can show the flow direction and velocity of the gas.
Ra is used to compensate the gas and/or ambient temperature.



(a) The gas is static.



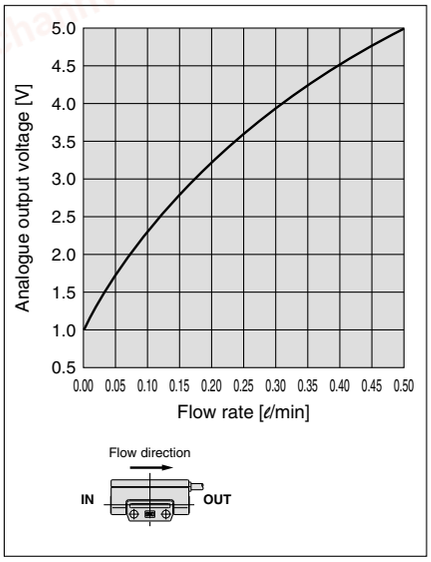
(b) The gas flows from the left side.

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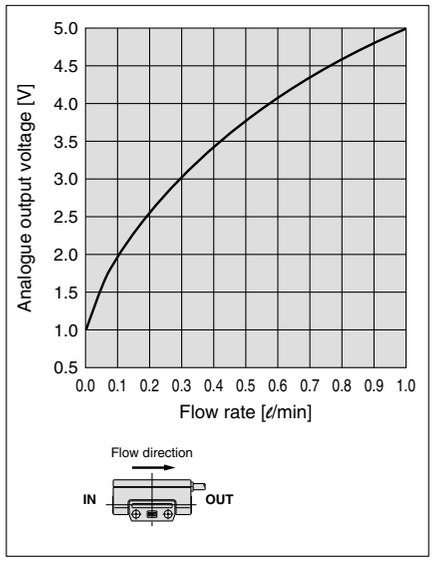
Series PFMV5

Analogue Output (Non-linear output)

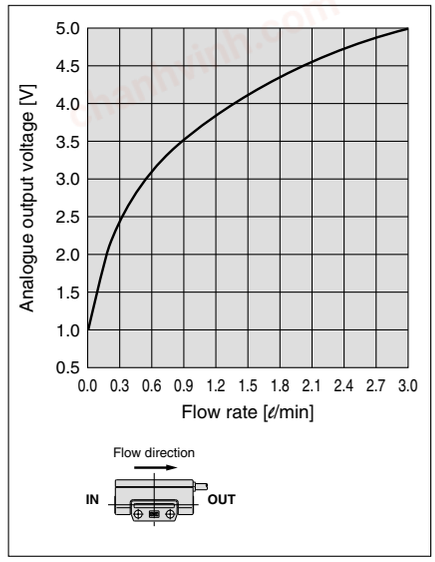
PFMV505-1



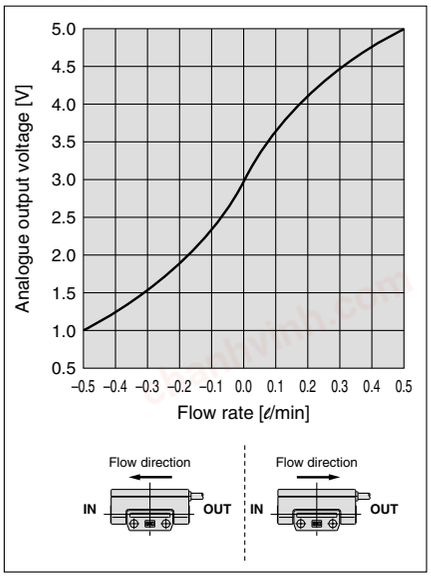
PFMV510-1



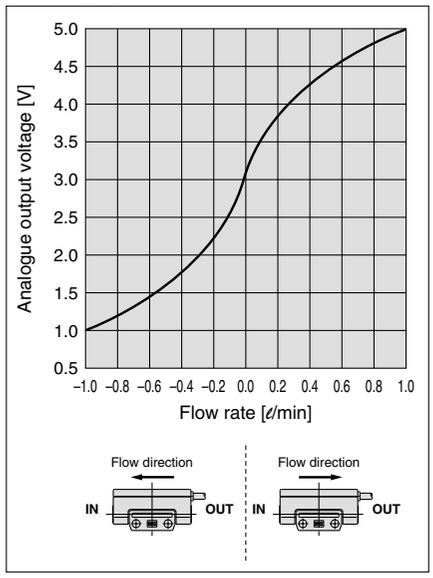
PFMV530-1



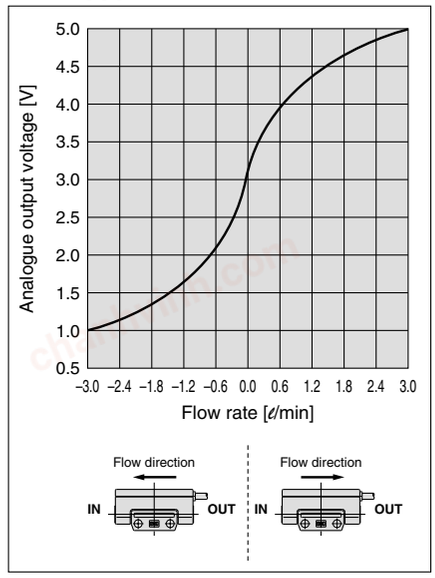
PFMV505F-1



PFMV510F-1

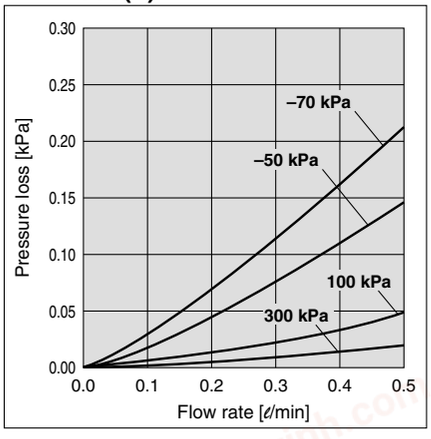


PFMV530F-1

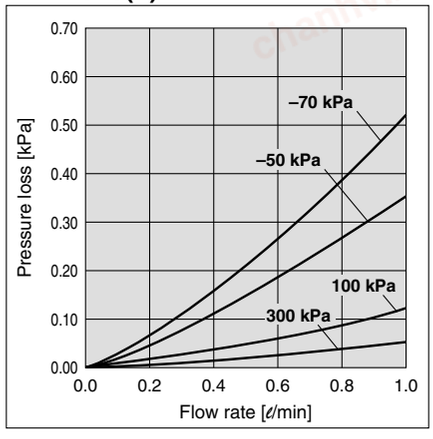


Pressure Loss

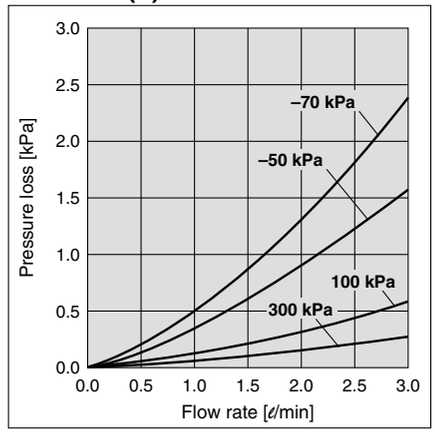
PFMV505(F)-1



PFMV510(F)-1



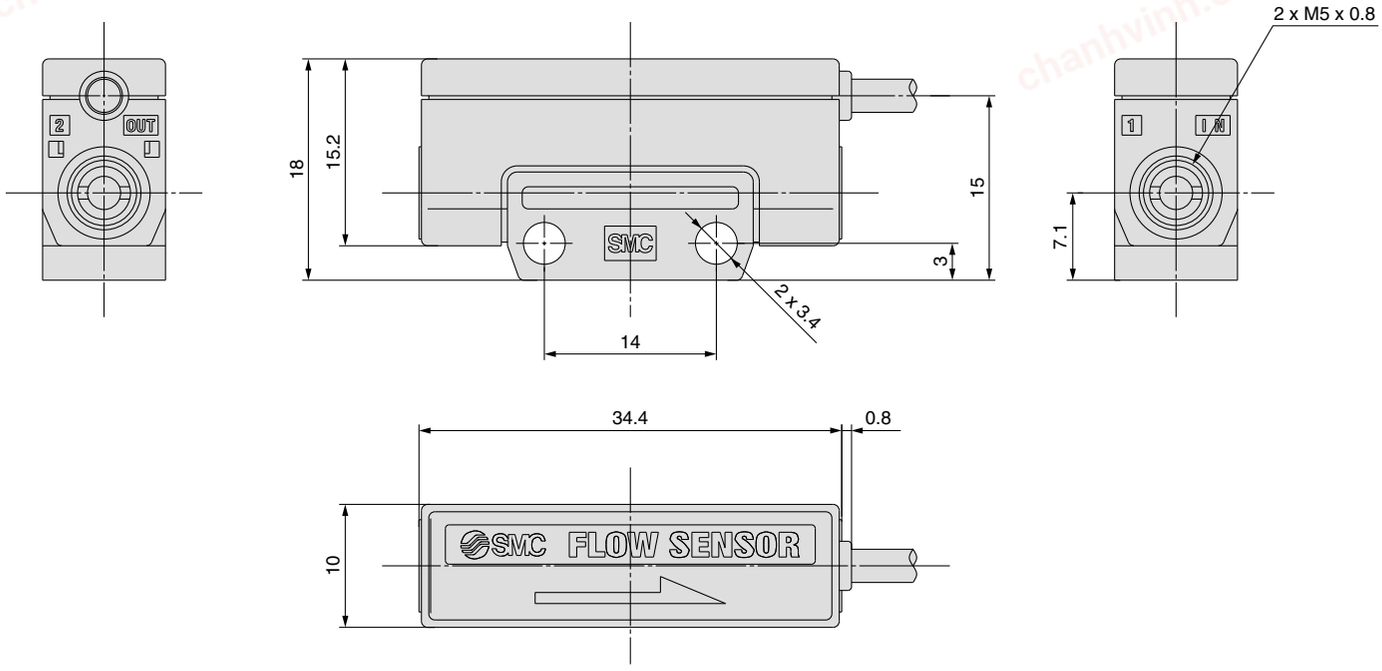
PFMV530(F)-1



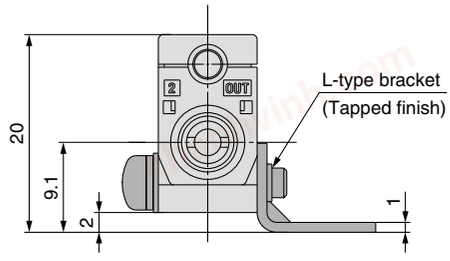
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Dimensions

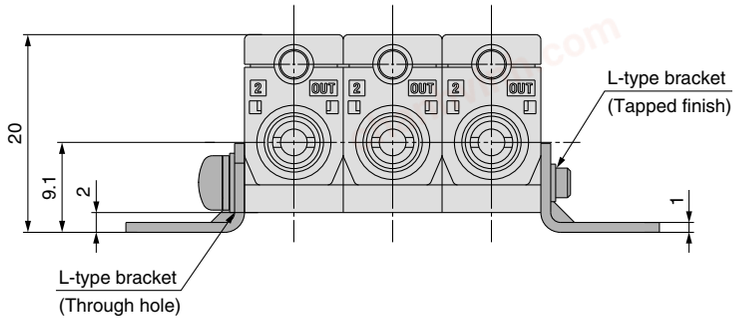
PFMV5□□-1
PFMV5□□F-1

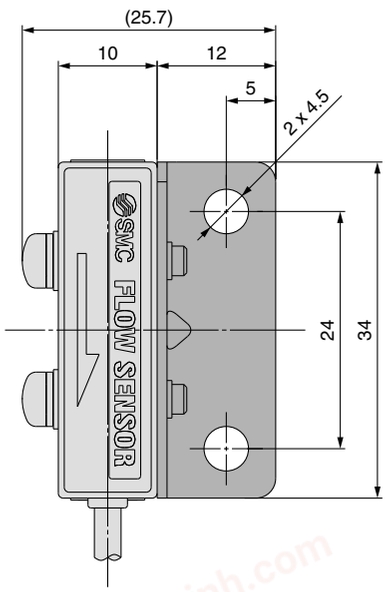


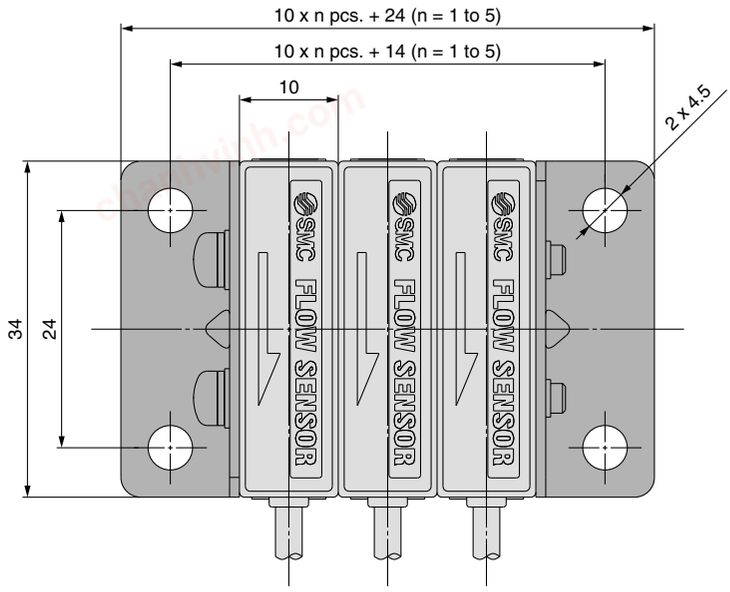
One-side bracket



Both-side bracket







Above dimensions correspond to PFMV5□□-1. PFMV5□□F-1 has the same dimensions.

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Voltage Monitor for PFMV5

Series PFMV3



How to Order

Output specification

0	2 NPN outputs + 1 to 5 V output
1	2 NPN outputs + 4 to 20 mA output
2	2 NPN outputs + Auto-shift input
3	2 PNP outputs + 1 to 5 V output
4	2 PNP outputs + 4 to 20 mA output
5	2 PNP outputs + Auto-shift input

Note) Auto-shift, Auto-shift zero can be selected.

Instruction manual

—	With instruction manual (Leaflet: Japanese and English)
N	None

Calibration certificate

—	None
A	With calibration certificate

Note 1) The certificate is written in both English and Japanese. Please consult with us for other languages.
Note 2) Only the voltage monitor will be calibrated. Calibration will not be made to the flow rate display.

PFMV3 0 0 – M L □ □ – □ □

Type

3	Remote display unit

Input specification

Symbol	Content	Applicable remote type sensor unit
0	Voltage input	PFMV5□(F)-1-□□

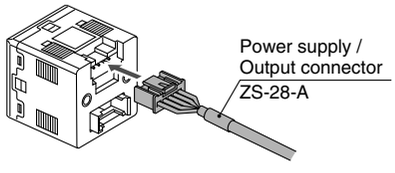
Unit specification

—	With unit switch function Note 1)
M	Fixed SI unit Note 2)

Note 1) Under the new Measurement Act, devices with unit switching functions cannot be used inside Japan.
Note 2) Fixed unit Voltage: V
Real-time flow rate: ℓ/min

Option 1

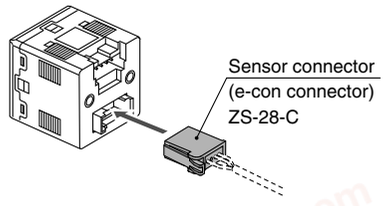
—	None
L	Power supply / Output connector



Note) Cable is shipped together, but not connected.

Option 3

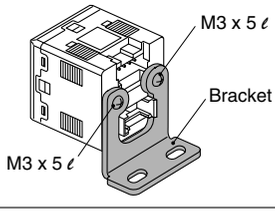
—	None
G	With sensor connector



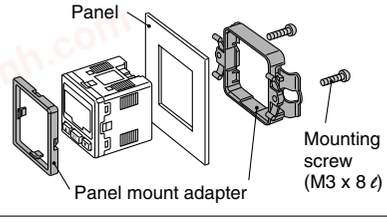
Note) Connector is shipped together, but not connected.

Option 2

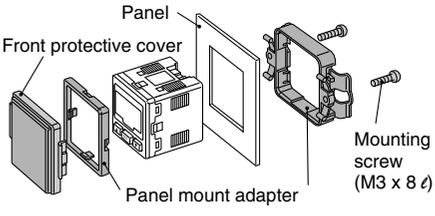
—	None
E	Bracket



B	Panel mount adapter



D	Panel mount adapter + Front protective cover



Note) Options are shipped together, but not assembled.

The PFMV3 series is a monitor that displays the output voltage of the PFMV5 series.

∗ Voltage value display and real-time flow rate display can be selected.

Option/Part No.

Description	Part no.	Note
Power supply / Output connector (2 m)	ZS-28-A	
Bracket	ZS-28-B	With M3 x 5 ℓ (2 pcs.)
Sensor connector	ZS-28-C	1 pc.
Panel mount adapter	ZS-27-C	With M3 x 8 ℓ (2 pcs.)
Panel mount adapter + Front protective cover	ZS-27-D	With M3 x 8 ℓ (2 pcs.)

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Specifications

Model		Series PFMV3□□					
Applicable sensor		PFMV505	PFMV510	PFMV530	PFMV505F	PFMV510F	PFMV530F
Flow rate	**Rated range**	0 to 0.5 ℓ/min	0 to 1 ℓ/min	0 to 3 ℓ/min	–0.5 to 0.5 ℓ/min	–1 to 1 ℓ/min	–3 to 3 ℓ/min
	Displayable range	–0.025 to 0.525 ℓ/min	–0.05 to 1.05 ℓ/min	–0.15 to 3.15 ℓ/min	–0.525 to 0.525 ℓ/min	–1.05 to 1.05 ℓ/min	–3.15 to 3.15 ℓ/min
	Settable range	–0.025 to 0.525 ℓ/min	–0.05 to 1.05 ℓ/min	–0.15 to 3.15 ℓ/min	–0.525 to 0.525 ℓ/min	–1.05 to 1.05 ℓ/min	–3.15 to 3.15 ℓ/min
	Minimum unit setting	0.001 ℓ/min	0.01 ℓ/min		0.001 ℓ/min	0.01 ℓ/min	
Voltage	**Rated range**	1.00 to 5.00 V					
	Displayable range	0.70 to 5.10 V: Voltages below 0.7 V displayed as "LLL", voltages above 5.10 V displayed as "HHH".					
	Settable range	0.70 to 5.10 V					
	Minimum unit setting	0.01 V					
Indication unit Note 1)		Voltage: V Real-time flow rate: ℓ/min, CFH (ft^3/h)					
Power supply voltage		12 to 24 VDC (Ripple ±10% or less) (with polarity protection)					
Current consumption		50 mA or less					
Hysteresis Note 2)		Hysteresis mode: Variable, Window comparator mode: Variable					
Switch output		NPN or PNP open collector output: 2 outputs Max. load current: 80 mA, Max. load voltage 30 VDC (at NPN output), Residual voltage 1 V or less (at load current 80 mA), With short-circuit protection					
Response time		Switch output: 2 ms (10 ms, 50 ms, 0.5 s, 1 s can be selected.) Note 3)					
Repeatability Note 4)		±0.1% F.S. or less, , Analog output accuracy: ±0.3% F.S. or less					
Analogue output		Voltage output: 1 to 5 VDC, Output impedance: Approx. 1 kΩ Current output: 4 to 20 mADC, Max. load impedance: 600 Ω (at 24 VDC) Min. load impedance: 50 Ω, Accuracy: ±1% F.S. or less (relative to display value), Response: 0.1 s (90% response or less)					
Display accuracy Note 4)		±0.5% F.S. ±1 digit or less					
Display method		3+1/2-digit, 7-segment LED 2-colour display (Red/Green) Updated cycle: 10 times/sec					
Status LEDs		OUT1: Illuminates when output is turned ON (Green). OUT2: Illuminates when output is turned ON (Red).					
External input (Auto-shift input) Note 5)		No-voltage input (Reed or Solid state), LOW level input 5 msec or more, LOW level 0.4 V or less					
Enclosure		IP40					
Operating temperature range		Operating: 0 to 50°C Stored: –10 to 60°C (No freezing and condensation)					
Operating humidity range		Operating, Stored: 35 to 85% R.H. (No condensation)					
Withstand voltage		1000 VAC for 1 min. between whole charging part and live part					
Insulation resistance		50 MΩ or more (at 500 VDC Megohmmeter) between whole charging part and live part					
Vibration resistance		10 to 150 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller (De-energized)					
Impact resistance		100 m/s^2 in X, Y, Z directions 3 times each (De-energized)					
Temperature characteristics		±0.5% F.S. or less (Based on 25°C)					
Connection		Power supply / Output connection: 5P connector, Sensor connection: 4P connector (For cable specifications, refer to page 12.)					
Material		Front case, Rear case: PBT					
Weight		30 g (without cable) 85 g (with cable)					

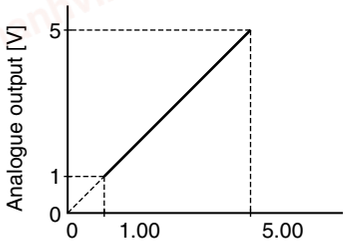
Note 1) When equipped with a unit switching function. (The SI unit (ℓ/min or ℓ) is fixed for types with no unit switching function.)
Note 2) Set to hysteresis mode at the time of shipment from the factory. Can be changed to window comparator mode using push-buttons.
Note 3) This is the response when the setting value is set to 90% to a 0 to 100% of step input.
Note 4) When the flow rate display function is selected, the repeatability and display accuracy should be exactly like the graph on page 9.
Note 5) Auto-shift function is turned OFF at the time of shipment from the factory. Use it after auto-shift function is turned ON using push-buttons.

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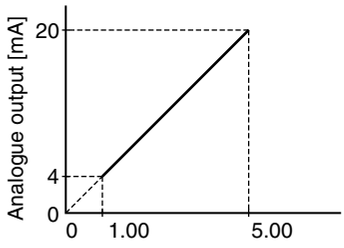
Series PFMV3

Analogue Output

1 to 5 VDC

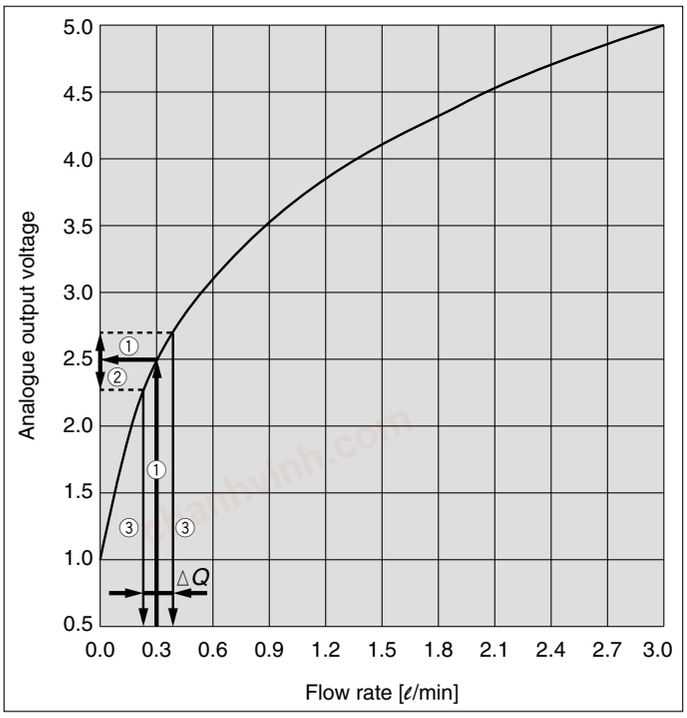


4 to 20 mADC



Display Accuracy and Repeatability when Combined with PFMV5.

PFMV530-1



When the flow rate display function for the PFMV3 series is selected, calculate the repeatability from the analogue output characteristics graph (page 5).

Example) For PFMV530-1 (0 to 0.3 ℓ/min)

① When the actual flow rate is 0.3 ℓ/min, the PFMV530-1 outputs approximately 2.5 V of analogue voltage (Arrow ① in the graph on the left).

② The PFMV5 series has a repeatability of ±2% F.S. (±80 mV) (Arrow ② in the graph on the left).

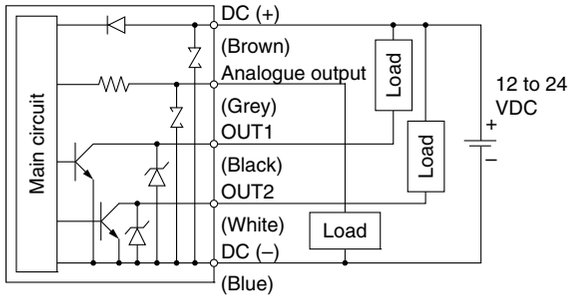
③ When this accuracy is converted to a flow rate, it becomes approximately ±3% F.S. (±0.09 ℓ/min), and this width becomes the repeatability when the flow rate is displayed (arrow ③, and the width of △ Q, in the graph on the left).

The flow rate display accuracy can be also calculated from the PFMV5 series accuracy (±5% F.S.).

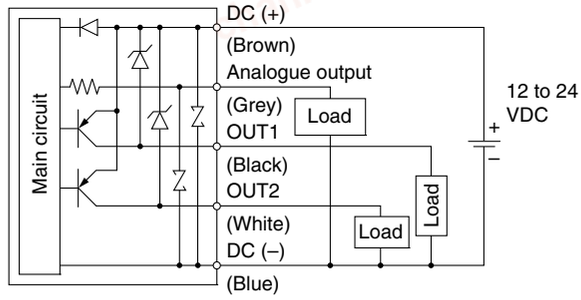
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Internal Circuits

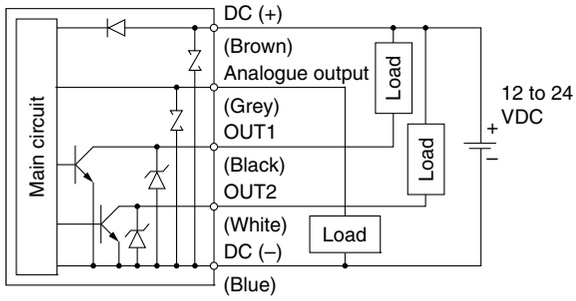
PFMV300
NPN open collector output: 2 outputs
Max. 30 V, 80 mA, residual voltage 1 V or less
Analogue output: 1 to 5 V
Output impedance: Approx. 1 kΩ



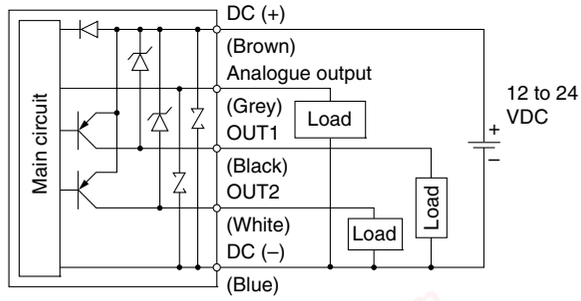
PFMV303
PNP open collector output: 2 outputs
Max. 80 mA, residual voltage 1 V or less
Analogue output: 1 to 5 V
Output impedance: Approx. 1 kΩ



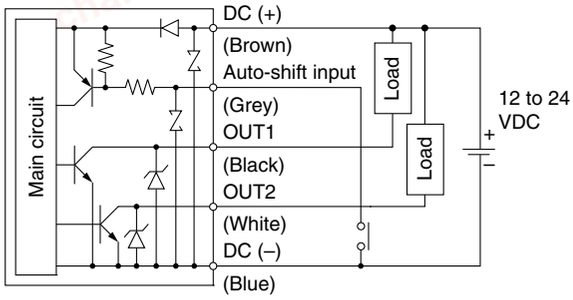
PFMV301
NPN open collector output: 2 outputs
Max. 30 V, 80 mA, residual voltage 1 V or less
Analogue output: 4 to 20 mA
Max. load impedance: 300 Ω (at 12 VDC) 600 Ω (at 24 VDC)
Min. load impedance: 50 Ω



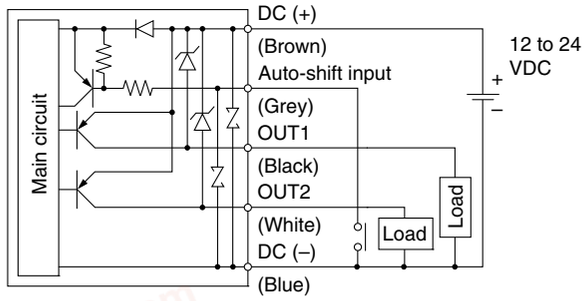
PFMV304
PNP open collector output: 2 outputs
Max. 80 mA, residual voltage 1 V or less
Analogue output: 4 to 20 mA
Max. load impedance: 300 Ω (at 12 VDC) 600 Ω (at 24 VDC)
Min. load impedance: 50 Ω



PFMV302
NPN open collector output with auto-shift input: 2 outputs
Max. 30 V, 80 mA, residual voltage 1 V or less



PFMV305
PNP open collector output with auto-shift input: 2 outputs
Max. 80 mA, residual voltage 1 V or less



Descriptions

LCD Display

Shows the current voltage, mode setting, and error code. Four display modes are available, some of which use indications that are fixed either red or green, and others use indications that change from green to red.

Output (OUT1) Indicator (Green)

Lights when the output (OUT1) is turned on.

△ Button

Used for mode selection and increasing the ON/OFF setting value. Also used to switch to peak display mode.



Output (OUT2) Indicator (Red)

Lights when the output (OUT2) is turned on.

SET Button

Used to activate mode changes and new setting values.

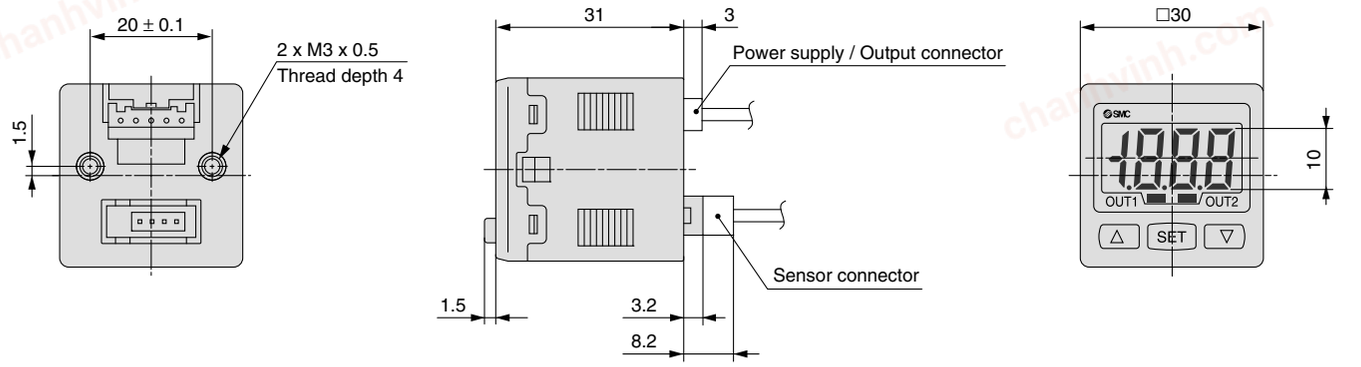
▽ Button

Used for mode selection and decreasing the on/off setting value. Also used to switch to bottom display mode.

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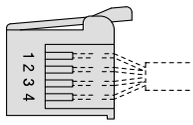
Series PFMV3

Dimensions



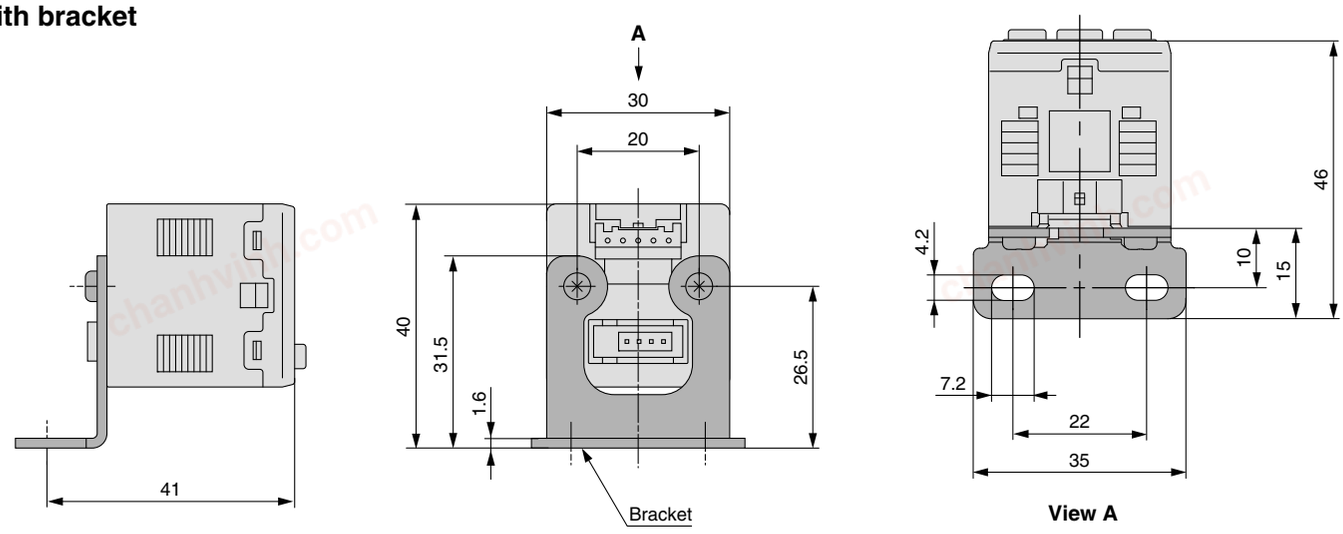
Sensor connector (ZS-28-C)

Pin no.	Terminal name
1	DC (+)
2	N.C.
3	DC (–)
4	IN

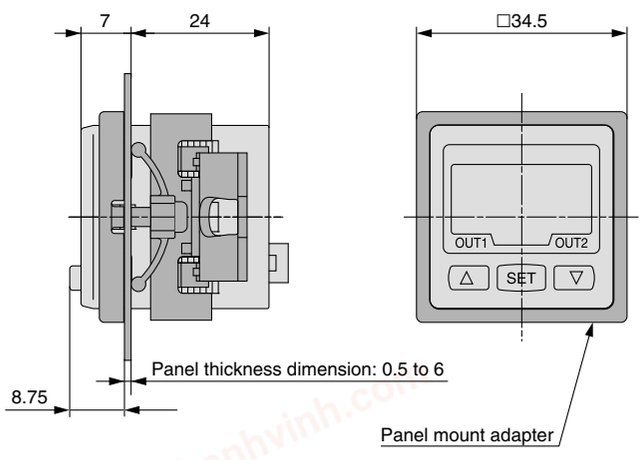


∗ 1 to 5 V (Sensor output)

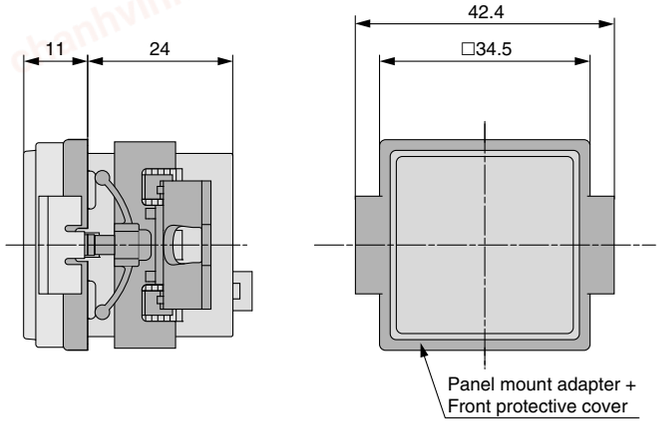
With bracket



With panel mount adapter



With panel mount adapter + Front protective cover

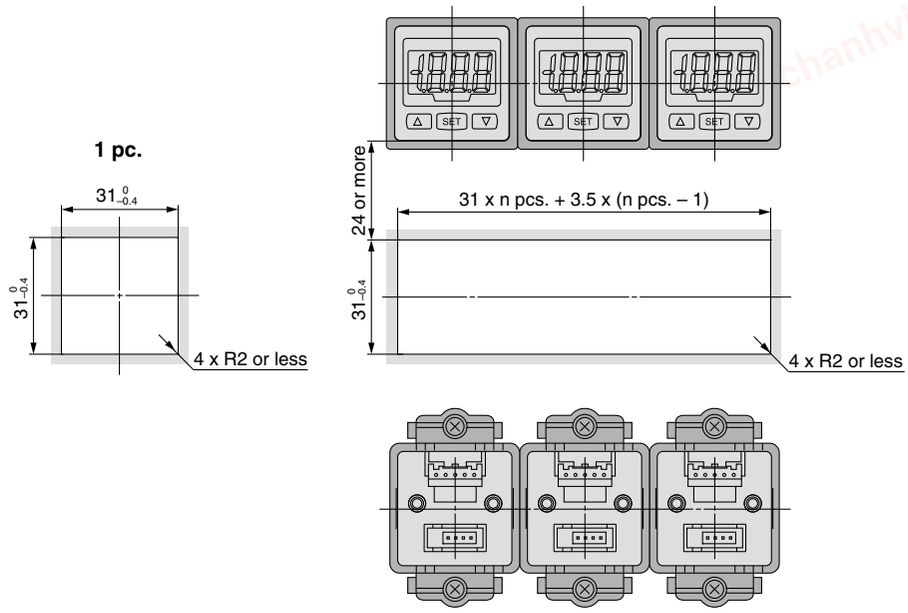


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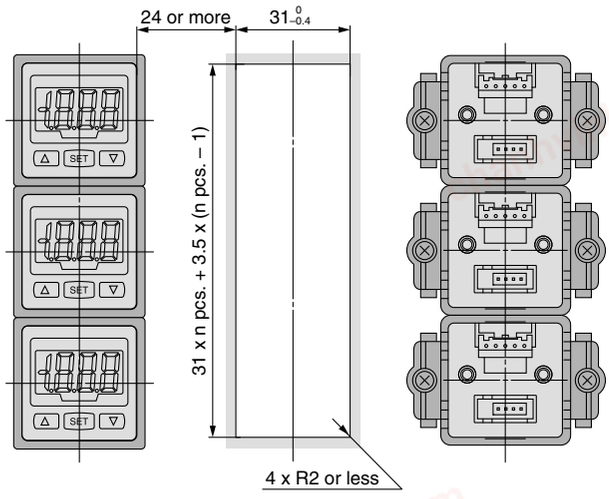
Dimensions

Panel fitting dimensions

Secure mounting of n pcs. (2 or more) switches (Horizontal)

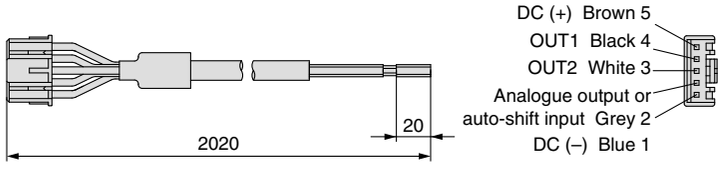


Secure mounting of n pcs. (2 or more) switches (Vertical)



Note) If a bend (R) is used, limit it to R2 or less.

Power supply / Output connector (ZS-28-A)



Cable Specifications

Rated temperature		105°C
Rated voltage		300 V
Number of wires		5
Con-ductor	**Nominal cross section area**	0.2 mm^2
	Material	Soft copper wire
	Construction	40 pcs. / 0.08 mm
	External diameter	0.58 mm
Insula-tor	**Material**	Cross-linked vinyl chloride resin compound
	External diameter	Approx. 1.12 mm
	Standard thickness	0.27 mm
	Colours	Brown, Black, White, Grey, Blue
Sheath	**Material**	Oil-resistant vinyl chloride resin compound
	Standard thickness	0.5 mm
	Colour	Light grey (Munsell N7)
Finished external diameter		ø4.1

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Series PFMV3
Function Details

■ Output operation
The output operation can be selected from the following:
Output (hysteresis mode and window comparator mode) corresponding to receiving voltage

At the time of shipment from the factory, it is set to hysteresis mode and reverse output.

■ Displayed values
The monitor receives the output voltage of the connected sensor and displays the received voltage. The unit is [V] and the voltage is displayed at 0.01 V intervals.
However, the voltage under 0.70 V is displayed as “LLL” and that of 5.1 V or more is displayed as “HHH”.
Since the voltage is displayed on the monitor, it doesn’t rely on the sensor range.

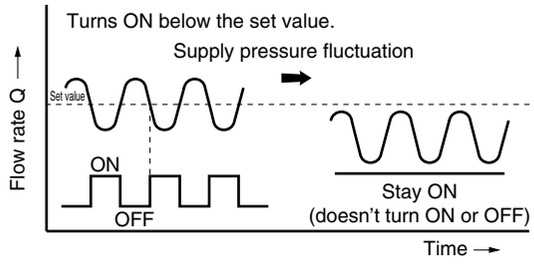
■ Indication colour
The indication colour can be selected for each output condition. The selection of the indication colour provides visual identification of abnormal values. (The indication color depends on OUT1 setting.)

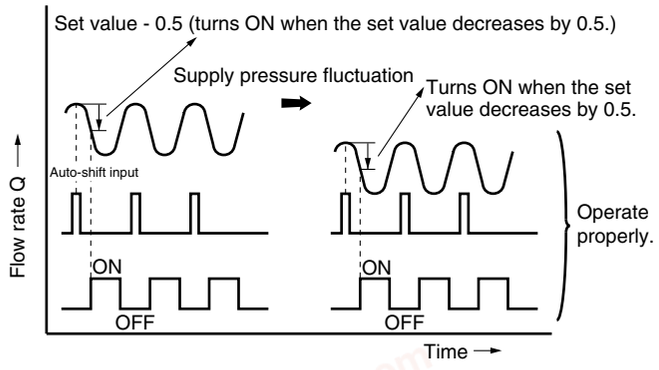
Green for ON, Red for OFF
Red for ON, Green for OFF
Red all the time
Green all the time

■ Setting of response time
The flow rate may change momentarily during transition between ON (open) and OFF (closed) of the valve. It can be set so that this momentary change is not detected.

2 ms
10 ms
50 ms
0.5 s
1 s

■ External input function
• Auto-shift
If the supply pressure of the air source fluctuates, the flow rate of vacuum generators such as an ejector also fluctuates. In that case, the switch may not operate properly when checking absorption. Auto-shift is a function that corrects this fluctuation.
This function sends the output corresponding to the relative change based on the flow rate when the auto shift signal is input.
Set value = 0.50: The switch turns ON and OFF when the set value increases by 0.5 V from the reference value.
Set value = –0.50: The switch turns ON and OFF when the set value decreases by 0.5 V from the reference value.
The reference value shows the voltage (= flow rate) when the auto-shift signal is input.





• Auto-shift zero
A function that displays the real-time flow rate as zero when the above auto-shift signal is input.

■ Auto-preset function
This is a function that calculates the set value automatically.
When predetermined operation is conducted while the sensor is connected, the set value is calculated and decided automatically by changing the flow rate. (Fine adjustment is available.)

■ Selection of power-saving mode
The power-saving mode can be selected.
With this function, if no buttons are pressed for 30 sec., it shifts to power-saving mode.
At the time of shipment from the factory, the product is set to the normal mode (the power-saving mode is turned off).
(When power-saving mode is activated, the decimal point flashes.)

■ Setting of secret code
The user can select whether a secret code must be entered to release key lock.
At the time of shipment from the factory, it is set such that the secret code is not required.

■ Peak/Bottom value indication
The maximum (minimum) voltage is detected and updated from when the power supply is turned on. In peak (bottom) value indication mode, this maximum (minimum) voltage is displayed.

■ Keylock function
Prevents operation errors such as accidentally changing setting values.

■ Error indication function
When an error or abnormality arises, the location and contents are displayed.

Description	Contents	Action
Input voltage error	The voltage outside the applicable indication range is input.	Check the input voltage.
System error	Possibility of internal circuit damage before factory adjustment.	Stop operation immediately and contact SMC.
	System error. Possibility of data memorizing failure or internal circuit damage.	Reset the unit, and carry out all settings again.

If the error or abnormality cannot be solved by the action above, please contact SMC for further investigation.

■ Reference value correcting function
If the displayed value doesn’t become 1.00 due to the difference of the analogue output of the connected sensors PFMV505, 510 and 530, the reference value will compulsively be set to 1.00.
When sensors PFMV505F, 510F and 530F are connected, the reference value will compulsively be set to 3.00.
Press the (△)and (▽)ttons simultaneously for 1 second or more when the flow rate is zero (The display flashes when successfully corrected).
The effective range of the correcting function is from 1.00 ± 0.2 V or 3.00 ± 0.2 V. If the monitor is operated outside this range, it displays “Er4” and the reference value won’t be corrected. Be sure to operate the monitor when the flow rate is zero.
When the PFM505 is used and the flow rate is applied, please pay attention to the following point. If this correcting function is applied around 3.00 V, the reference value will be changed and the function won’t work properly. If the monitor is improperly operated, return the flow rate to zero and operate the monitor again.

■ Display Mode
Select whether to display the voltage or the real-time flow rate.
The displayed flow rate value is for the standard condition (ANR), of 20°C, 1 αtm, and 65% R.H.

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Series PFMV5
Specific Product Precautions 1

Be sure to read this before handling.
Refer to the back cover for Safety Instructions and "Handling Precautions for SMC Products" (M-E03-3) for Common Precautions.

■ Flow Sensor

Design and Selection

⚠ Warning

1. Operate the sensor only within the specified voltage.

Use of the sensor outside of the specified voltage range can cause not only a malfunction and damage to the sensor, but it can also cause electrocution and fire.

2. Be sure to verify the applicable fluid.

The sensors do not have an explosion proof rating. To prevent possible fire hazard, do not use with flammable gases or fluids.

3. Use the sensor within the specified flow rate measurement and operating pressure.

Operating beyond the specified flow rate and operating pressure can damage the sensor.

4. Never use flammable fluids and/or permeable fluids.

They may cause a fire, an explosion or corrosion.
∗ Refer to the MSDS (Material Safety Data Sheet) when using chemicals.

5. Be sure to use the sensor within the specified ambient and fluid temperatures.

If the ambient or fluid temperatures exceed the specified range, it may damage the sensor.
Even if they are in the specified range, do not use it in a place where condensation occurs in the piping.

6. To prevent damage due to failure and/or malfunction of the product, establish a backup system such as a fail-safe system which enables multiple-stage type operation of the equipment and machinery.

7. When the product is for an interlock circuit, the following points should be noted.

- Provide double interlocking through another system (mechanical protection function, etc.).
- Perform checks to ensure the product is operating properly, as there is a risk of injury.

⚠ Caution

1. Ensure sufficient space for maintenance activities.

Provide space required for maintenance.

2. The direct-current power supply to combine should be UL authorized power supply.

(1) Limited voltage current circuit in accordance with UL 508.
A circuit in which power is supplied by the secondary coil of a transformer that meets the following conditions.
- Maximum voltage (with no load):
  30 Vrms (42.4 V peak) or less
- Maximum current:
  (1) 8 A or less (including when short circuited)
  (2) limited by circuit protector (such as fuse) with the following ratings.

No load voltage (V peak)	Max. current rating
0 to 20 [V]	5.0
Above 20 to 30 [V]	$\frac{100}{\text{Peak voltage}}$

(2) A circuit using max. 30 Vrms or less (42.4 V peak), which is powered by UL1310 or UL1585 compatible Class-2 power supply.

⚠ Caution

3. When the sensor is used for suction check

When the sensor is used to check the suction, select the flow rate range based on the operating vacuum pressure and suction nozzle diameter.
Refer to page 1, "Nozzle Diameter and Flow Characteristics."

4. Pay attention to the response speed.

When the sensor is used to check the suction, the response speed of the sensor might be delayed due to the piping volume between the suction nozzle and sensor. Therefore, take measures to reduce the piping volume.

5. The analogue output may fluctuate by 2 to 3% for 5 minutes after the power is supplied.

Mounting

⚠ Caution

1. Monitor the flow direction of the fluid.

Install and connect piping so that fluid flows in the direction of the arrow indicated on the body.

2. Remove dirt and dust from inside of the piping before attaching to the sensor.

3. Observe the proper tightening torque.

When the sensor is tightened beyond the specified tightening torque, the sensor may be damaged.
Tightening torque for mounting part (Direct mount, Bracket mount): 0.32 ± 0.02 N·m
Tightening torque for fitting part: 1 to 1.5 N·m

4. Do not mount the sensor in a place that will be used as a scaffold.

The sensor could break if subjected to excessive load such as being accidentally stepped on.

5. Do not drop or bump.

Do not drop, bump, or apply excessive impacts while handling. Although the external body of a sensor (sensor case) may not be damaged, the sensor inside could be damaged and cause a malfunction.

6. Hold the body of the sensor when handling.

The tensile strength of the cord is 49 N and applying a greater pulling force than this can cause a malfunction. When handling, hold the body of the sensor.

7. Do not use until you can verify that equipment can operate properly.

Following mounting, repair, or retrofit, verify correct mounting by conducting suitable function and leakage tests after piping and power connections have been made.

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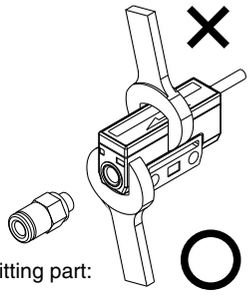
Series PFMV5
Specific Product Precautions 2

Be sure to read this before handling.
Refer to the back cover for Safety Instructions and "Handling Precautions for SMC Products" (M-E03-3) for Common Precautions.

Mounting

⚠ Caution

8. Apply a wrench only to the designated part when installing the flow sensor in the system piping.



Tightening torque for fitting part:
1 to 1.5 N·m

9. When sensors are mounted as a manifold, pay attention to the dimensions of the connected fittings.
If the dimensions of the fittings are larger than those of sensors, they will be interfered with each other and the sensors cannot be mounted properly.

Wiring

⚠ Warning

1. Verify the colour and the terminal number when wiring.
Incorrect wiring can cause the sensor to be damaged and malfunction. Verify the colour and the terminal number in the instruction manual when wiring.

2. Use caution not to repeatedly apply excessive bending or stretching forces to the lead wire.
Repeated pulling or bending of the lead wire may cause some of the wires to break.

3. Confirm proper insulation of wiring.
Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a sensor.

4. Do not connect wiring while energizing the product.
The sensor and any equipment connected to it could break and malfunction.

Operating Environment

⚠ Warning

1. Never use in the presence of explosive gases.
The sensor does not have an explosion proof construction. If it is used in an environment where explosive gases are used, it may cause an explosive disaster. Therefore, never use it in such an environment.

2. Mount the sensor in a location where there is no vibration or no impact.
The sensor output may change because the sensor and connecting piping move.

3. Fix the sensor and connecting piping.
The sensor output may change because the sensor and connected piping move.

4. Do not use in an area where surges are generated.
When there are units that generate a large amount of surge in the area around a sensor, (e.g., solenoid type lifters, high frequency induction furnaces, motors, etc.) this may cause deterioration or damage to the sensor's internal circuitry. Avoid sources of surge generation and crossed lines.

5. Sensors are not equipped with surge protection against lightning.
The flow sensors are CE compliant; however, they are not equipped with surge protection against lightning. Lightning surge protection measures should be applied directly to system components as necessary.

6. Avoid using the sensor in an environment where the likelihood of splashing or spraying of liquids exists.
The sensor is an open type and should not be used in an environment exposed to splashing of water and oil.

7. Do not use the product in an environment subject to a temperature cycle.
If the product is subject to a temperature cycle other than natural changes in air temperature, the internal components of the sensor could be adversely affected.

8. Do not mount the product in locations where it is exposed to radiant heat.
This could result in damage and/or malfunction.

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Series PFMV5
Specific Product Precautions 3

Be sure to read this before handling.
Refer to the back cover for Safety Instructions and "Handling Precautions for SMC Products" (M-E03-3) for Common Precautions.

Maintenance

⚠ Warning

1. **Perform periodical inspections to ensure proper operation of the sensor.**
   Unexpected malfunctions may cause possible danger.
2. **Take precautions when using the sensor for an interlock circuit.**
   When a sensor is used for the interlock circuit, devise a multiple interlock system to prevent trouble or malfunction, and verify the operation of the sensor and interlock function on a regular basis.
3. **Do not make any modifications (including exchanging the printed circuit boards) to the product.**
   It may cause human injuries and damage.
4. **When maintenance work is performed, the following points should be noted.**
   - Turn off the power supply.
   - Cut off the fluid supply, drain the fluid from the piping and ensure the fluid is released to atmosphere before carrying out maintenance. Otherwise, it could cause injury.

⚠ Caution

1. **Do not wipe the product with chemicals such as benzene or thinner.**
   Such chemicals could damage the product.
2. **Do not poke the inside of the piping port with a stick.**
   The rectifier could break, making the product unable to sustain the desired performance.
3. **Do not touch terminals when energizing the product.**
   It could cause electric shock, malfunction, or damage to the sensor.

Fluid

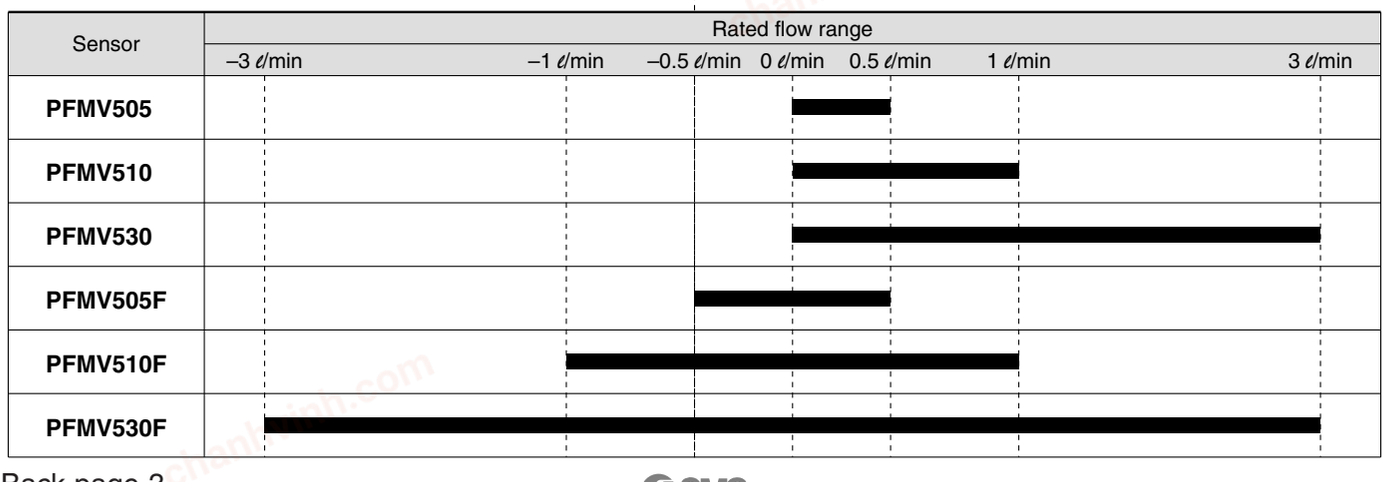
⚠ Warning

1. **Check regulators and flow adjustment valves before introducing the fluid.**
   If pressure or flow rate beyond the specified range are applied to the sensor, the sensor unit may be damaged.
2. **Install a filter on the inlet side when there is a possibility of foreign matter being mixed with the fluid.**
3. **Use dry air of quality compliant with JIS B 8392-1 1.1.2 to 1.6.2: 2003, ISO8573-1 1.1.2 to 1.6.2: 2001 for this product.**
   If any mist or drainage present in the air attaches to the product, the sensor could be damaged or accurate measurement could be prevented.

Rated Flow Range

⚠ Caution

Set the flow rate within the rated flow range.
The rated flow range is the range that satisfies the sensor specifications.



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Series PFMV3
Specific Product Precautions 4

Be sure to read this before handling.
Refer to the back cover for Safety Instructions and "Handling Precautions for SMC Products" (M-E03-3) for Common Precautions.

■ Flow Monitor

Design and Selection

⚠ Warning

1. Operate the switch only within the specified voltage.

Use of the switch outside of the specified voltage range can cause not only a malfunction and damage to the switch, but it can also cause electrocution and fire.

2. Do not exceed the maximum allowable load specification.

A load exceeding the maximum load specification can cause damage to the switch.

3. Do not use a load that generates surge voltage.

Although surge protection is installed in the circuit at the output side of the switch, damage may still occur if a surge is applied repeatedly. When working directly such an unit as relay, solenoid valve, etc., which generates surge, use a built-in surge absorbing element type.

4. Monitor the internal voltage drop of a switch.

When operating below the specified voltage, it is possible that a load may be ineffective, even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the voltage of the load.

Supply voltage	−	Internal voltage drop of switch	>	Minimum operating voltage of load

5. To prevent damage due to failure and/or malfunction of the product, establish a backup system such as a fail-safe system which enables multiple-stage type operation of the equipment and machinery.

6. When the product is for an interlock circuit, the following points should be noted.

- Provide double interlocking through another system (mechanical protection function, etc.).
- Perform checks to ensure the product is operating properly, as there is a risk of injury.

⚠ Caution

1. Ensure sufficient space for maintenance activities.

Provide space required for maintenance.

2. The direct-current power supply to combine should be UL authorized power supply.

(1) Limited voltage current circuit in accordance with UL 508.
A circuit in which power is supplied by the secondary coil of a transformer that meets the following conditions.
- Maximum voltage (with no load):
  30 Vrms (42.4 V peak) or less
- Maximum current:
  (1) 8 A or less (including when short circuited)
  (2) limited by circuit protector (such as fuse) with the following ratings.

No load voltage (V peak)	Max. current rating
0 to 20 [V]	5.0
Above 20 to 30 [V]	$\frac{100}{\text{Peak voltage}}$

(2) A circuit using max. 30 Vrms or less (42.4 V peak), which is powered by UL1310 or UL1585 compatible Class-2 power supply.

⚠ Caution

3. Data of the switch are stored even after the power supply is turned off.

Input data is stored in an EEPROM so that the data will not be lost after the flow switch is turned off. (The data can be rewritten for up to one million times, and stored for up to 20 years.)

Mounting

⚠ Warning

1. Do not drop or bump.

Do not drop, bump, or apply excessive impacts (490 m/s^2) while handling. Although the external body of a switch (switch case) may not be damaged, the switch inside could be damaged and cause a malfunction.

2. Do not use until you can verify that equipment can operate properly.

Following mounting, repair, or retrofit, verify correct mounting by conducting suitable function and leakage tests after piping and power connections have been made.

3. Never mount the switch in a place that will be used as a scaffold during piping.

⚠ Caution

1. Do not mount the switch in a place that will be used as a scaffold.

The switch could break if subjected to excessive load such as being accidentally stepped on.

Wiring

⚠ Warning

1. Verify the colour and the terminal number when wiring.

Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colour and the terminal number in the instruction manual when wiring.

2. Use caution not to repeatedly apply bending or stretching forces to the lead wire.

Repeated pulling or bending of the lead wire may cause some of the wires to break.

3. Confirm proper insulation of wiring.

Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines and high voltage lines, and avoid wiring in the same conduit with these lines. Control circuits, including switches, may malfunction due to noise from these lines.

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Series PFMV3
Specific Product Precautions 5

Be sure to read this before handling.
Refer to the back cover for Safety Instructions and "Handling Precautions for SMC Products" (M-E03-3) for Common Precautions.

Wiring

⚠ Warning

5. Do not short-circuit a load.

Although the switch displays an overcurrent error if a load is short-circuited, there is not protection against incorrect wiring (power source polarity, etc.). Use caution to avoid wiring incorrectly.

6. Do not connect wiring while energizing the product.

The switch and any equipment connected to it could break and malfunction.

Operating Environment

⚠ Warning

1. Never use in the presence of explosive gases.

The switch does not have an explosion proof construction. If it is used in an environment where explosive gases are used, it may cause an explosive disaster. Therefore, never use it in such an environment.

2. Mount the switch in a location where there is no vibration greater than 98 m/s², or no impact greater than 490 m/s².

3. Do not use in an area where surges are generated.

When there are units that generate a large amount of surge in the area around a pressure switch, (e.g., solenoid type lifters, high frequency induction furnaces, motors, etc.) this may cause deterioration or damage to the switch's internal circuitry. Avoid sources of surge generation and crossed lines.

4. Switches are not equipped with surge protection against lightning.

The flow switches are CE compliant; however, they are not equipped with surge protection against lightning. Lightning surge protection measures should be applied directly to system components as necessary.

5. Avoid using the switch in an environment where the likelihood of splashing or spraying of liquids exists.

The switch is an open type and should not be used in an environment exposed to splashing of water and oil.

6. Do not use the product in an environment subject to a temperature cycle.

If the product is subject to a temperature cycle other than natural changes in air temperature, the internal components of the switch could be adversely affected.

7. Do not mount the product in locations where it is exposed to radiant heat.

This could result in damage and/or malfunction.

Maintenance

⚠ Warning

1. Perform periodical inspections to ensure proper operation of the switch.

Unexpected malfunctions may cause possible danger.

2. Take precautions when using the switch for an interlock circuit.

When a pressure switch is used for the interlock circuit, devise a multiple interlock system to prevent trouble or malfunction, and verify the operation of the switch and interlock function on a regular basis.

3. Do not make any modifications (including exchanging the printed circuit boards) to the product.

It may cause human injuries and damage.

4. When maintenance work is performed, the following points should be noted.

- Turn off the power supply.

⚠ Caution

1. Do not wipe the product with chemicals such as benzene or thinner.

Such chemicals could damage the product.

4. Do not touch terminals or connectors when energizing the product.

It could cause electric shock, malfunction, or damage to the switch.

Others

⚠ Warning

1. After the power is turned on, the switch's output remains off while a message is displayed. Therefore, start the measurement after a value is displayed.

2. Perform settings after stopping control systems.

Operation reflects the new values when settings are made. However, if the power is turned OFF in that state, the settings return to the values before the change when the power is turned ON again. Make sure to press the S button to save any setting changes before turning OFF the power.

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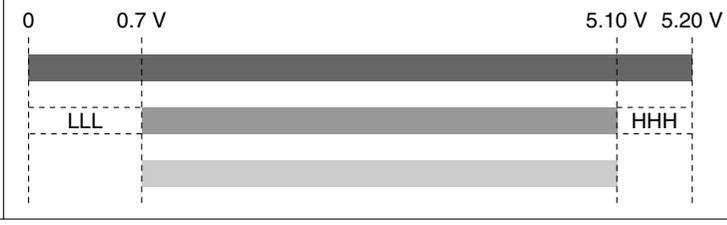
Series PFMV3
Specific Product Precautions 6

Be sure to read this before handling.
Refer to the back cover for Safety Instructions and "Handling Precautions for SMC Products" (M-E03-3) for Common Precautions.

Settable Range and Voltage Input Range

⚠ Caution

The settable rate range is the range that can be set in the switch.
The inputtable range is the range that satisfies the switch specifications (accuracy, linearity, etc.).
It is possible to set a value outside of the inputtable range if it is within the settable range, however, the specification is not guaranteed.

Item	Input voltage
Voltage input range Displayable range Settable range	

The settable rate range is the flow range that can be set in the switch.
The rated flow range is the flow rate range that satisfies the switch specifications (accuracy, linearity, etc.).
It is possible to set a value outside of the rated flow range if it is within the settable range, however, the specification is not guaranteed.

Sensor	Flow rate range –3 ℓ/min · –1 ℓ/min · –0.5 ℓ/min · 0 · 0.5 ℓ/min · 1 ℓ/min · 3 ℓ/min
PFMV505	0 to 0.5 ℓ/min –0.025 ℓ/min to 0.525 ℓ/min –0.025 ℓ/min to 0.525 ℓ/min
PFMV510	0 to 1 ℓ/min –0.05 ℓ/min to 1.05 ℓ/min –0.05 ℓ/min to 1.05 ℓ/min
PFMV530	0 to 3 ℓ/min –0.15 ℓ/min to 3.15 ℓ/min –0.15 ℓ/min to 3.15 ℓ/min
PFMV505F	–0.5 ℓ/min to 0.5 ℓ/min –0.525 ℓ/min to 0.525 ℓ/min –0.525 ℓ/min to 0.525 ℓ/min
PFMV510F	–1 ℓ/min to 1 ℓ/min –1.05 ℓ/min to 1.05 ℓ/min –1.05 ℓ/min to 1.05 ℓ/min
PFMV530F	–3 ℓ/min to 3 ℓ/min –3.15 ℓ/min to 3.15 ℓ/min –3.15 ℓ/min to 3.15 ℓ/min

The values shown on the graph are the displayed flow rate range and set flow rate range when Series PFMV5 and Series PFMV3 are connected.

Rated flow range
Displayable flow range
Settable range

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⚠ 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 catalogue 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 catalogue.
   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.*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 catalogue 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.

⚠ Safety Instructions | Be sure to read "Handling Precautions for SMC Products" (M-E03-3) before using.

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