

# 2-Color Display

# Digital Flow Switch

Integrated display



# 25A-PFM7 Series



## How to Order

**Integrated display**

**25A - PFM7 10 - C6 - A - M - W**

**Series compatible with secondary batteries**

**Type**

7	Integrated display
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**Rated flow range (Flow rate range)**

10	0.2 to 10 (5) L/min
25	0.5 to 25 (12.5) L/min
50	1 to 50 (25) L/min
11	2 to 100 (50) L/min

\* ( ): Fluid: CO<sub>2</sub>

**Port size**

Symbol	Description	Flow rate range			
		10	25	50	11
01	Rc1/8	●	●	●	—
02	Rc1/4	—	—	—	●
N01	NPT1/8	●	●	●	—
N02	NPT1/4	—	—	—	●
F01	G1/8	●	●	●	—
F02	G1/4	—	—	—	●
C6	ø6 One-touch fitting	●	●	●	●
C8	ø8 (5/16") One-touch fitting	—	●	●	●

**Piping entry direction**

Nil	Straight
L	Bottom

**Output specifications**

A	2 NPN outputs
B	2 PNP outputs
C	1 NPN output + Analog output (1 to 5 V)
D	1 NPN output + Analog output (4 to 20 mA)
E	1 PNP output + Analog output (1 to 5 V)
F	1 PNP output + Analog output (4 to 20 mA)
G	1 NPN output + External input <sup>*3</sup>
H	1 PNP output + External input <sup>*3</sup>

<sup>\*3</sup> User can select from accumulated value external reset, auto-shift and auto-shift zero.

**Unit specifications**

Nil	With unit switching function <sup>*2</sup>
M	Fixed SI unit <sup>*1</sup>

<sup>\*1</sup> Fixed unit: Instantaneous flow: L/min  
Accumulated flow: L

<sup>\*2</sup> Under Japan's New Measurement Act, this is only for overseas sales.  
(SI units are to be used inside Japan.)

**Option 1**

W	Lead wire with connector (2 m) + Rubber cover for connector (Silicon rubber)
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**Calibration certificate**

Nil	None
A	With calibration certificate

\* The certificate is written in English and Japanese.  
Other languages are available as specials.

**Operation manual**

Nil	With operation manual (Japanese and English)
N	None

**Option 2**

Nil	None
R	Bracket (For without flow adjustment valve) <b>25A-ZS-33-M</b>
T	Panel mount adapter (For without flow adjustment valve) <b>ZS-33-J</b>

Directional Control Valves  
Air Cylinders  
Related Products  
Rotary Actuators  
Air Grippers  
Vacuum Equipment  
Air Preparation Equipment  
Clean Air Filters  
Modular F.R.L./Pressure Control Equipment  
Fittings/Flow Control Equipment  
Detection Switches  
Fluid Control Equipment  
Electric Actuators  
Auto Switches

\* The 25A- series specifications and dimensions are the same as those of the standard model.  
\* Digital flow switch with flow adjustment valve is not standard product. It can be supplied as Made-to-Order separately.

[Click here for details.](#)



# 2-Color Display Digital Flow Switch PFM7 Series

Integrated display



The PFM series now features a new model: the PF2M series. Click [here](#) for details.

## How to Order

Integrated display

**PFM7 10** - **C4** - **A** - **M**

Type

7 Integrated display

Rated flow range (Flow rate range)

10	0.2 to 10 (5) L/min
25	0.5 to 25 (12.5) L/min
50	1 to 50 (25) L/min
11	2 to 100 (50) L/min

( ) : Fluid: CO<sub>2</sub>

Flow adjustment valve

NII	None
S	Yes

Port size

Symbol	Description	Flow rate range			
		10	25	50	11
01	Rc 1/8	●	●	●	●
02	Rc 1/4	●	●	●	●
N01	NPT 1/8	●	●	●	●
N02	NPT 1/4	●	●	●	●
F01	G 1/8*	●	●	●	●
F02	G 1/4*	●	●	●	●
C4	ø4 (5/32") One-touch fitting	●	●	●	●
C6	ø6 One-touch fitting	●	●	●	●
C8	ø8 (5/16") One-touch fitting	●	●	●	●
N7	ø1/4" One-touch fitting	●	●	●	●

\* Conforming to ISO228-1.

Piping entry direction

NII	Straight
L	Bottom

\* Different combinations of piping entry directions for IN and OUT side are available as made-to-order. (Refer to page 249.)

Made to Order  
(Refer to pages 215 and 249.)

Option 2  
(Refer to page 215.)

Option 1  
(Refer to page 215.)

Calibration certificate

NII	None
A	With calibration certificate

\* The certificate is written in English and Japanese. Other languages are available as specials.

Operation manual

NII	With operation manual (Japanese and English)
M	None

Unit specifications

M	Fixed SI unit <sup>Note1)</sup>
NII	With unit switching function <sup>Note2)</sup>

Note1) Fixed unit: Instantaneous flow rate: L/min  
Accumulated flow: L

Note2) Since the unit for Japan is fixed to SI due to new measurement law, this option is for overseas.

Output specifications

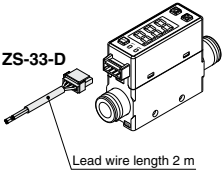
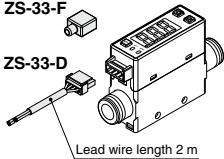
A	2 NPN outputs
B	2 PNP outputs
C	1 NPN output + Analog (1 to 5 V)
D	1 NPN output + Analog (4 to 20 mA)
E	1 PNP output + Analog (1 to 5 V)
F	1 PNP output + Analog (4 to 20 mA)
G	1 NPN output + External input <sup>Note 3)</sup>
H	1 PNP output + External input <sup>Note 3)</sup>

Note 3) User can select from accumulated value external reset, auto-shift and auto-shift zero.

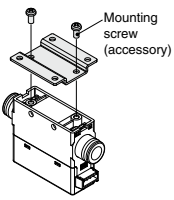
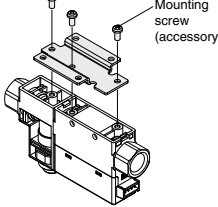
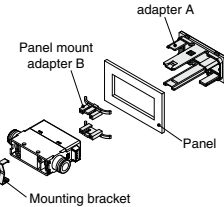
## Piping Variations

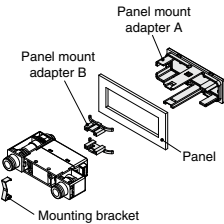
	With One-touch fittings (C4, C6, C8, N7)		Female thread (01, 02, N01, N02, F01, F02)	
	Straight (NII)	Bottom (L)	Straight (NII)	Bottom (L)
Without flow adjustment valve (NII)				
With flow adjustment valve (S)				

## Option 1

NII	W	Z
With lead wire with connector (2 m)	With lead wire with connector (2 m) + Rubber cover for connector (silicon rubber)	Without lead wire with connector
 <p><b>ZS-33-D</b></p> <p>Lead wire length 2 m</p>	 <p><b>ZS-33-F</b></p> <p><b>ZS-33-D</b></p> <p>Lead wire length 2 m</p>	

## Option 2

NII	R	S	T
None	Bracket (For without flow adjustment valve) <b>ZS-33-M</b>	Bracket (For with flow adjustment valve) <b>ZS-33-MS</b>	Panel mount adapter (For without flow adjustment valve) <b>ZS-33-J</b>
	 <p>Mounting screw (accessory)</p>	 <p>Mounting screw (accessory)</p> <p>Piping direction: Cannot be mounted with bottom piping type.</p>	 <p>Panel mount adapter A</p> <p>Panel mount adapter B</p> <p>Panel</p> <p>Mounting bracket</p>

V
Panel mount adapter (For with flow adjustment valve) <b>ZS-33-JS</b>
 <p>Panel mount adapter A</p> <p>Panel mount adapter B</p> <p>Panel</p> <p>Mounting bracket</p>

Each option is not assembled with the product, but shipped together.

### Made to Order

Symbol	Specification/Description
<b>X693</b>	Change of piping entry direction combination
<b>X694</b>	
<b>X731</b>	Compatible with argon (Ar) and carbon dioxide (CO <sub>2</sub> ) mixed gas

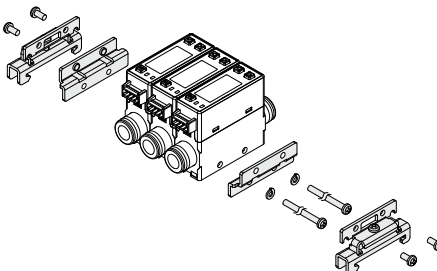
For details, refer to page 249 through to 251.

## DIN Rail Mounting Bracket (Order Separately)

### ZS-33-R

#### Stations

1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations



- DIN rail (supplied by customers)
- Port size F02: G 1/4 cannot be mounted on the DIN rail.

## Specifications

Refer to pages 202 and 203 for Flow Switch Precautions. For details about the Specific Product Precautions, refer to the Operation Manual on the SMC website, <http://www.smcworld.com> Click [here](#) for details.

Model	PFM710	PFM725	PFM750	PFM711																				
<b>Applicable fluid</b>	Dry air, N <sub>2</sub> , Ar, CO <sub>2</sub> (Air quality grade is JIS B8392.1-1, 1.2 to 1.6.2 and ISO 8573.1-1, 1.2 to 1.6.2.)																							
<b>Rated flow range</b> (Flow rate range)	Dry air, N <sub>2</sub> , Ar	0.2 to 10 L/min	0.5 to 25 L/min	1 to 50 L/min	2 to 100 L/min																			
	CO <sub>2</sub>	0.2 to 5 L/min	0.5 to 12.5 L/min	1 to 25 L/min	2 to 50 L/min																			
<b>Displayable range</b> (Note 1)	Dry air, N <sub>2</sub> , Ar	0.2 to 10.5 L/min	0.5 to 26.3 L/min	1 to 52.5 L/min	2 to 105 L/min																			
	CO <sub>2</sub>	0.2 to 5.2 L/min	0.5 to 13.1 L/min	1 to 26.2 L/min	2 to 52 L/min																			
<b>Settable range</b> (Note 1)	Dry air, N <sub>2</sub> , Ar	0 to 10.5 L/min	0 to 26.3 L/min	0 to 52.5 L/min	0 to 105 L/min																			
	CO <sub>2</sub>	0 to 5.2 L/min	0 to 13.1 L/min	0 to 26.2 L/min	0 to 52 L/min																			
<b>Minimum unit setting</b> (Note 2)	0.01 L/min	0.1 L/min	0.1 L/min	0.1 L/min																				
<b>Accumulated pulse flow rate exchange value</b>	0.1 L/pulse	0.1 L/pulse	0.1 L/pulse	1 L/pulse																				
<b>Indication unit</b> (Note 3)	Instantaneous flow rate L/min, CFM x 10 <sup>-2</sup> Accumulated flow L, ft <sup>3</sup> x 10 <sup>-1</sup>																							
<b>Linearity</b>	Display accuracy: ±3%F.S. (Fluid: Dry air) Analog output accuracy: ±5%F.S. (Fluid: Dry air)																							
<b>Repeatability</b>	±1%F.S. Analog output accuracy: ±3%F.S. (Fluid: Dry air)																							
<b>Pressure characteristics</b>	±5%F.S. (0.35 MPa reference)																							
<b>Temperature characteristics</b>	±2%F.S. (15 to 35°C) ±5%F.S. (0 to 50°C)																							
<b>Operating pressure range</b>	-100 kPa to 750 kPa																							
<b>Rated pressure range</b>	-70 kPa to 750 kPa																							
<b>Proof pressure</b>	1 MPa																							
<b>Accumulated flow range</b>	Max. 999999 L (Note 4)																							
<b>Switch output</b>	NPN or PNP open collector output																							
<table border="1"> <tr> <td><b>Maximum load current</b></td> <td colspan="3">80 mA</td> </tr> <tr> <td><b>Maximum applied voltage</b></td> <td colspan="3">28 VDC (at NPN output)</td> </tr> <tr> <td><b>Internal voltage drop</b></td> <td colspan="2">NPN output: 1 V or less (at 80 mA)</td> <td>PNP output: 1.5 V or less (at 80 mA)</td> </tr> <tr> <td><b>Response time</b></td> <td colspan="3">1 s (50 ms, 0.5 s, 2 s can be selected.)</td> </tr> <tr> <td><b>Output protection</b></td> <td colspan="3">Short-circuit protection</td> </tr> </table>	<b>Maximum load current</b>	80 mA			<b>Maximum applied voltage</b>	28 VDC (at NPN output)			<b>Internal voltage drop</b>	NPN output: 1 V or less (at 80 mA)		PNP output: 1.5 V or less (at 80 mA)	<b>Response time</b>	1 s (50 ms, 0.5 s, 2 s can be selected.)			<b>Output protection</b>	Short-circuit protection						
	<b>Maximum load current</b>	80 mA																						
	<b>Maximum applied voltage</b>	28 VDC (at NPN output)																						
	<b>Internal voltage drop</b>	NPN output: 1 V or less (at 80 mA)		PNP output: 1.5 V or less (at 80 mA)																				
	<b>Response time</b>	1 s (50 ms, 0.5 s, 2 s can be selected.)																						
<b>Output protection</b>	Short-circuit protection																							
<b>Accumulated pulse output</b>	NPN or PNP open collector output (Same as switch output)																							
<b>Analog output</b> (Note 5)	<b>Response time</b>	1.5 s or less (90% response)																						
	<b>Voltage output</b>	Voltage output: 1 to 5 V Output impedance: 1 kΩ																						
	<b>Current output</b>	Current output: 4 to 20 mA Max. load impedance: 600 Ω, Min. load impedance: 50 Ω																						
<b>Hysteresis</b> (Note 6)	<b>Hysteresis mode</b>	Variable																						
	<b>Window comparator mode</b>	Variable																						
<b>External input</b>	No-voltage input (Reed or Solid state) Input 30 ms or more																							
<b>Display method</b>	3-digit, 7-segment LED	2-color display (Red/Green)	Renewed cycle: 10 times/sec																					
<b>Status LED's</b>	OUT1: Lights up when output is turned ON (Green). OUT2: Lights up when output is turned ON (Red).																							
<b>Power supply voltage</b>	24 VDC ±10%																							
<b>Current consumption</b>	55 mA or less																							
<b>Environment</b>	<b>Enclosure</b>	IP40																						
	<b>Operating fluid temperature</b>	0 to 50°C (with no freezing and condensation)																						
	<b>Operating temperature range</b>	Operating: 0 to 50°C Stored: -10 to 60°C (with no freezing and condensation)																						
	<b>Operating humidity range</b>	Operating, Stored: 35 to 85%R.H. (with no condensation)																						
	<b>Withstand voltage</b>	1000 VAC for 1 minute between terminals and housing																						
<b>Insulation resistance</b>	50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing																							
<b>Standards</b>	CE UL,CSA RoHS																							

Note 1) When the minimum unit setting 0.01 L/min is selected for 10 L/min type, the indication upper limit will be [9.99 L/min].  
When the minimum unit setting 0.1 L/min is selected for 100 L/min type, the indication upper limit will be [99.9 L/min].  
Note 2) User can select between 0.01 L/min and 0.1 L/min for the PFM710, and between 0.1 L/min and 1 L/min for the PFM711 respectively.  
If the indication unit is selected to "CFM", the minimum unit setting cannot be changed.  
At the time of shipment from the factory, the minimum unit setting is set to 0.1 L/min for the PFM710 and 1 L/min for the PFM711 respectively.

Note 3) Set to "ANR" at the time of shipment from the factory.  
"ANR" is used for standard conditions: 20°C, 1 atm and 65%R.H.  
"NL/min" is used for normal conditions: 0°C and 1 atm.

Note 4) When equipped with a unit switching function, (The SI unit (L/min or L) is fixed for types with no unit switching function.)

Note 5) Cleared when the power supply is turned off. Hold function can be selected. (Interval of 2 min or 5 min can be selected.)

If the 5 min interval is selected, the life of the memory element (electronic part) is limited to 1 million cycles. (If energized for 24 hours, life is calculated as 5 min x 1 million = 5 million min = 9.5 years). Therefore, if using the hold function, calculate the memory life for your operating conditions, and use within this life.

Note 6) Set to 1.5 s (90%), can be changed to 100 ms.

Note 7) Set to hysteresis mode at the time of shipment from the factory. Can be changed to window comparator mode using push-buttons.

Note 8) For details about wiring and thread type, refer to the Operation Manual that can be downloaded from SMC website (<http://www.smcworld.com>).

Note 9) Any products with tiny scratches, smears, or display color variation or brightness which does not affect the performance are verified as conforming products.

## Settable Range and Rated Flow Range

### Set the flow rate within the rated flow range.

The settable rate range is the range of flow rate that can be set in the switch.

The rated flow range is the 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.

The flow range if using CO<sub>2</sub> is given in brackets.

Sensor	Flow range							
	0.2 L/min	0.5 L/min	1 L/min	2 L/min	10 L/min	25 L/min	50 L/min	100 L/min
PFM710 PFM510	0.2 L/min			10 L/min (5 L/min)				
	0.2 L/min			10.5 L/min (5.2 L/min)				
	0			10.5 L/min (5.2 L/min)				
PFM725 PFM525	0.5 L/min			25 L/min (12.5 L/min)				
	0.5 L/min			26.3 L/min (13.1 L/min)				
	0			26.3 L/min (13.1 L/min)				
PFM750 PFM550	1 L/min			50 L/min (25 L/min)				
	1 L/min			52.5 L/min (26.2 L/min)				
	0			52.5 L/min (26.2 L/min)				
PFM711 PFM511	2 L/min			100 L/min (50 L/min)				
	2 L/min			105 L/min (52 L/min)				
	0			105 L/min (52 L/min)				

Rated flow range  
 Displayable range  
 Settable range

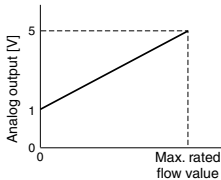
In the case of the PFM5 series, the displayable and settable ranges are the same as the PFM3 series flow monitor.

## Piping Specifications/Weight

Part no.	01	02	N01	N02	F01	F02	C4	C6	C8	N7
Port size	Rc 1/8	Rc 1/4	NPT 1/8	NPT 1/4	G 1/8	G 1/4	ø4 (5/32") One-touch fitting	ø6 One-touch fitting	ø8 (5/16") One-touch fitting	ø1/4" One-touch fitting
Weight	Straight Without orifice: 95 g Bottom Without orifice: 105 g		Straight With orifice: 135 g Bottom With orifice: 145 g		Straight Without orifice: 125 g Bottom Without orifice: 135 g Straight With orifice: 165 g Bottom With orifice: 175 g		Straight Without orifice: 65 g Bottom Without orifice: 65 g Straight With orifice: 95 g Bottom With orifice: 105 g			
Wetted parts material	LCP, PBT, Brass (Electroless nickel plating), HNBR (+ Fluoro coated), FKM (+ Fluoro coated), Silicon, Au, Stainless steel 304									

## Analog Output

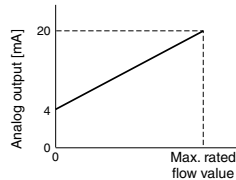
Note) Analog output at maximum rated flow rate when CO<sub>2</sub> is selected is 3 [V] for the voltage output type and 12 [mA] for the current output type.



### Analog Voltage Output (1 to 5 V)

Model	Max. rated flow value [L/min]
PFM710-□-C/E	10 (5)
PFM725-□-C/E	25 (12.5)
PFM750-□-C/E	50 (25)
PFM711-□-C/E	100 (50)

\* ( ): Fluid: CO<sub>2</sub>



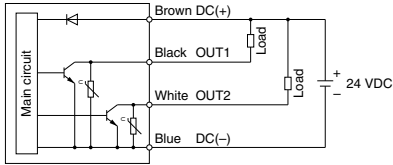
### Analog Current Output (4 to 20 mA)

Model	Max. rated flow value [L/min]
PFM710-□-D/F	10 (5)
PFM725-□-D/F	25 (12.5)
PFM750-□-D/F	50 (25)
PFM711-□-D/F	100 (50)

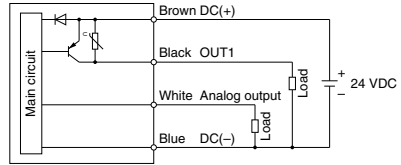
\* ( ): Fluid: CO<sub>2</sub>

## Internal Circuits and Wiring Examples

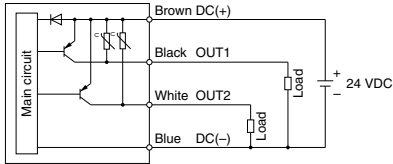
**-A**  
NPN (2 outputs)



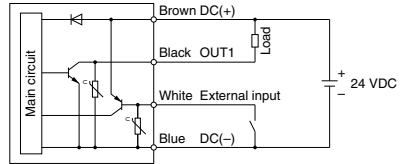
**-E/F**  
E: PNP (1 output) + Analog voltage output  
F: PNP (1 output) + Analog current output



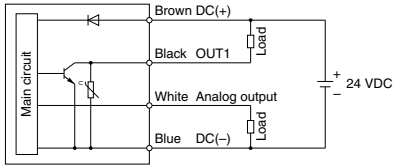
**-B**  
PNP (2 outputs)



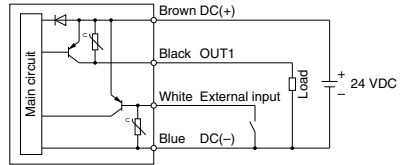
**-G**  
NPN (1 output) + External input



**-C/D**  
C: NPN (1 output) + Analog voltage output  
D: NPN (1 output) + Analog current output

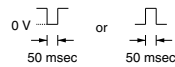
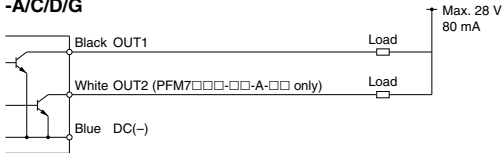


**-H**  
PNP (1 output) + External input

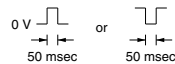
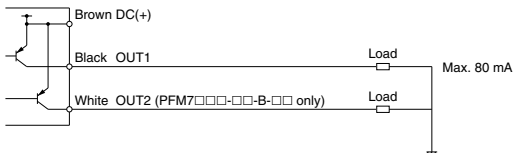


## Accumulated pulse output wiring examples

**-A/C/D/G**

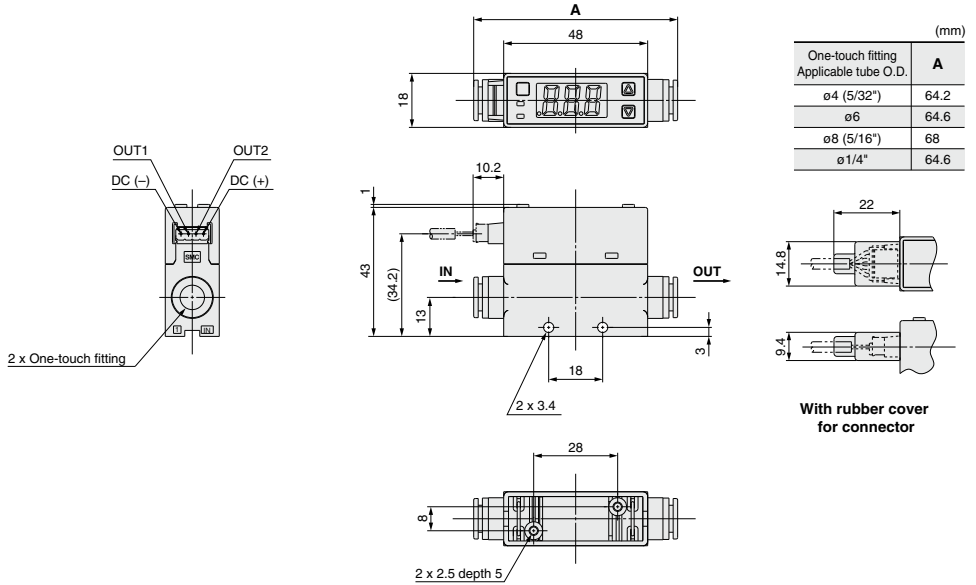


**-B/E/F/H**

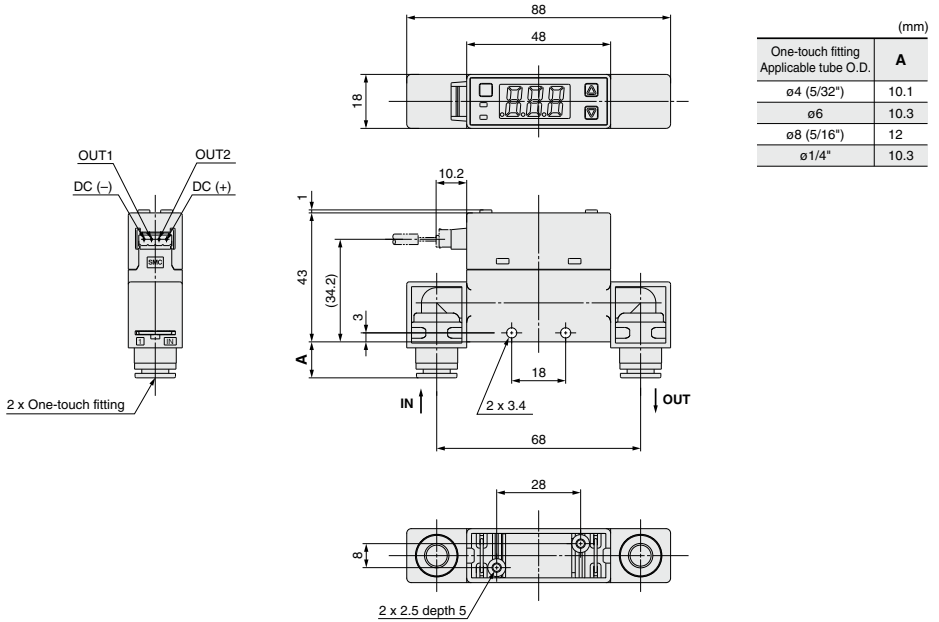


## Dimensions

### PFM7□□-C4/C6/C8/N7



### PFM7□□-C4L/C6L/C8L/N7L



## PFM

## PFMB

## PFMC

## PFMV

## PF2A

## PF3W

## LFE

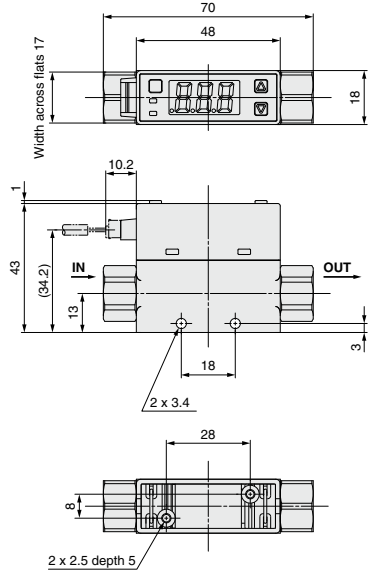
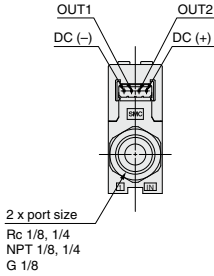
## PF2D

## IF

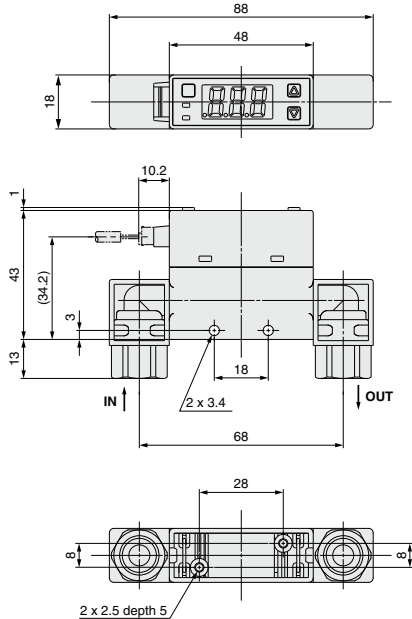
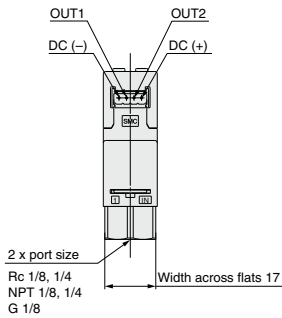
# PFM7 Series

## Dimensions

### PFM7□□-(N)01/(N)02/F01



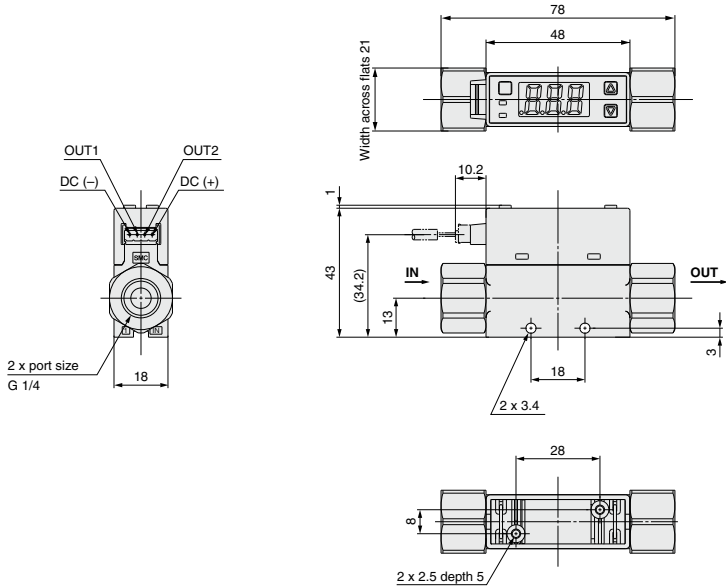
### PFM7□□-(N)01L/(N)02L/F01L



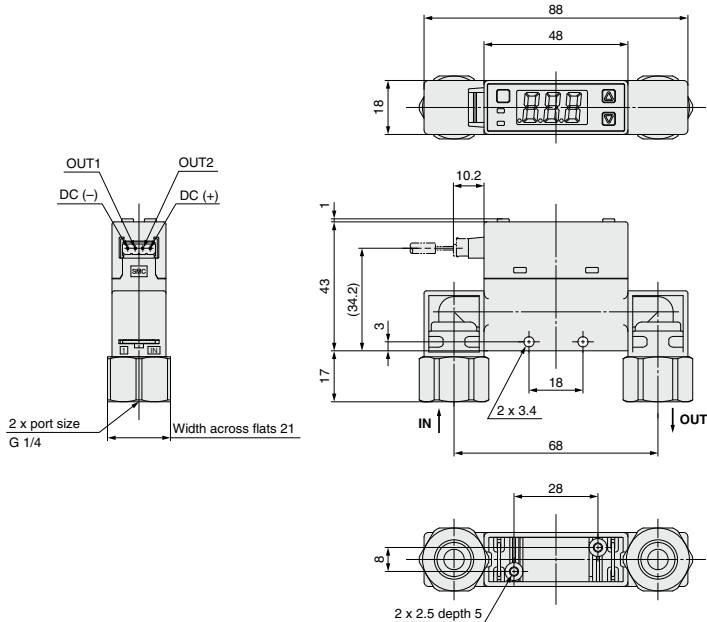


## Dimensions

### PFM7□□-F02



### PFM7□□-F02L



PFM

PFMB

PFMC

PFMV

PF2A

PF3W

LFE

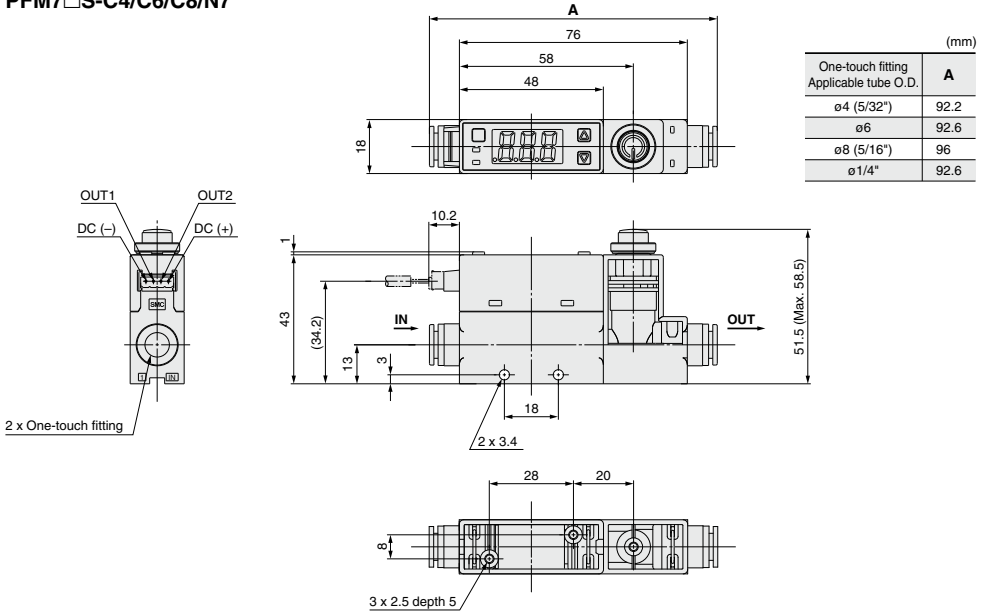
PF2D

IF

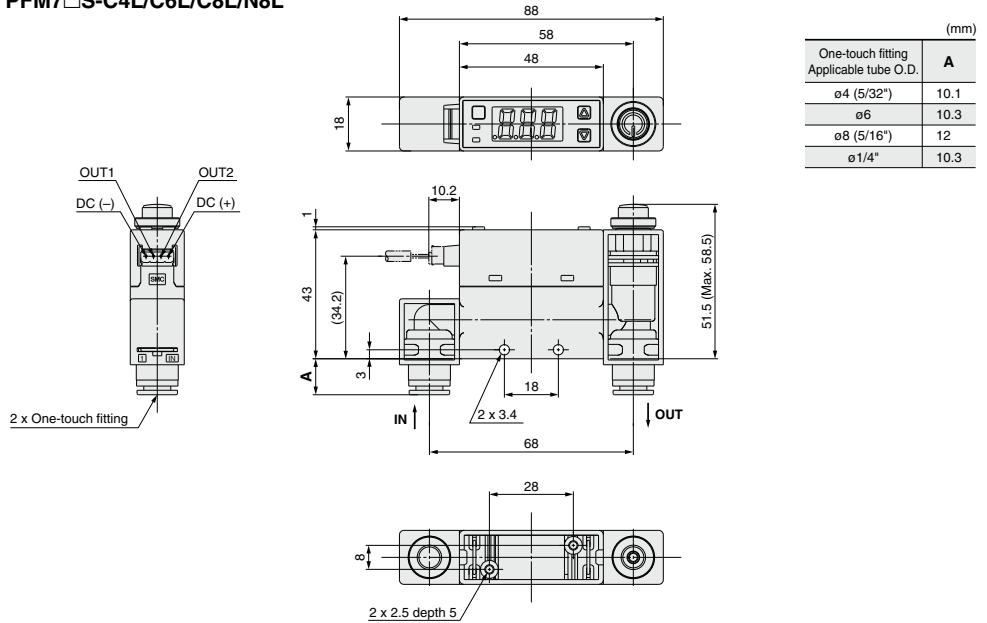
# PFM7 Series

## Dimensions

### PFM7□S-C4/C6/C8/N7

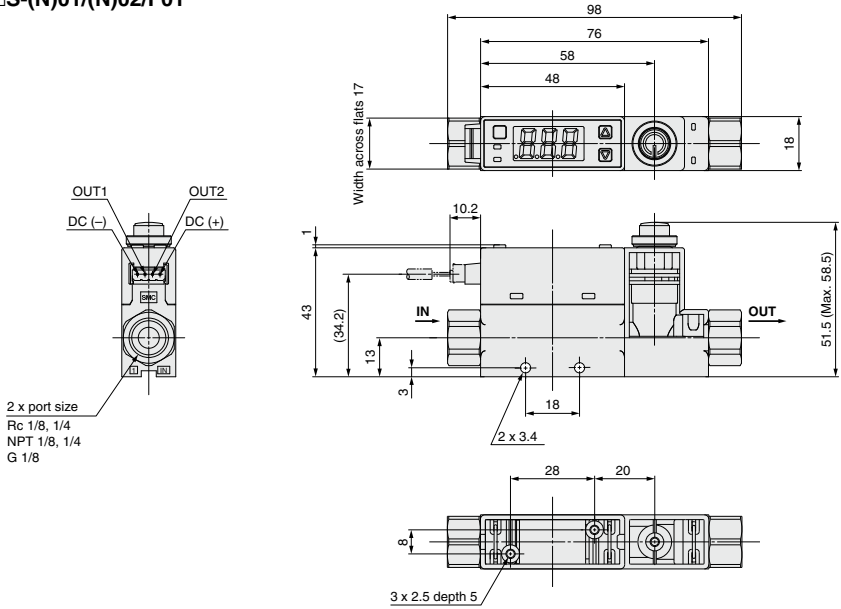


### PFM7□S-C4L/C6L/C8L/N8L

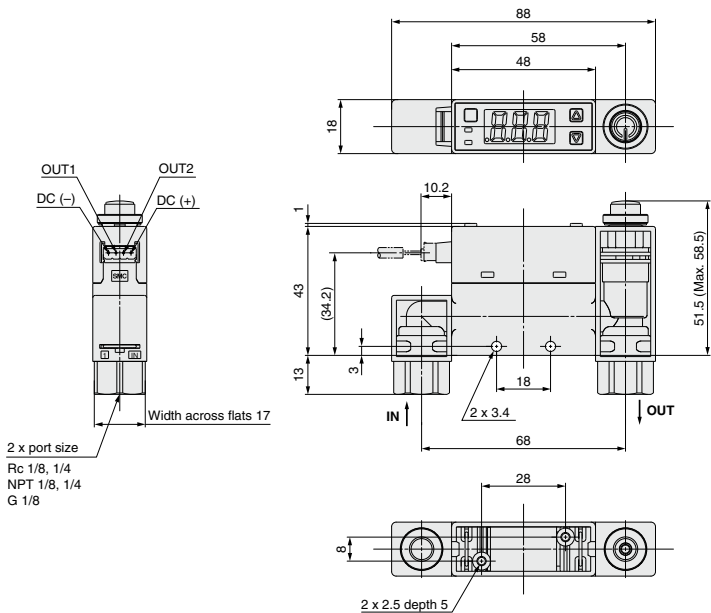


## Dimensions

### PFM7□S-(N)01/(N)02/F01



### PFM7□S-(N)01L/(N)02L/F01L



PFM

PFMB

PFMC

PFMV

PF2A

PF3W

LFE

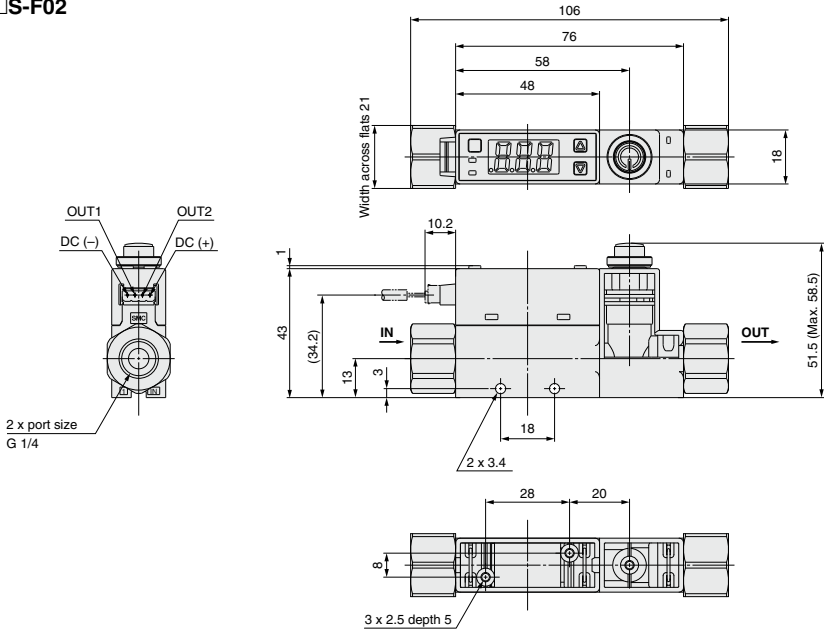
PF2D

IF

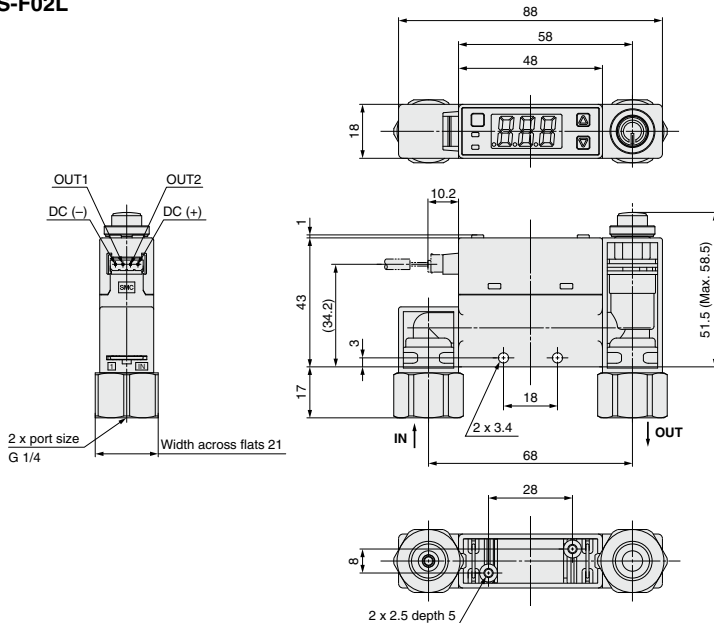
# PFM7 Series

## Dimensions

### PFM7□S-F02

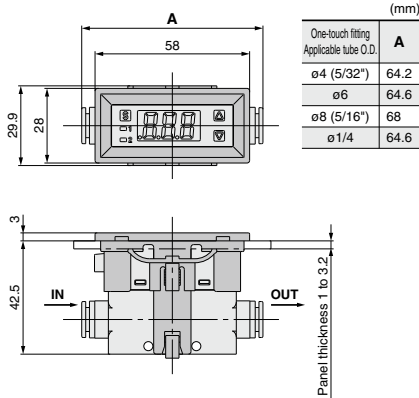


### PFM7□S-F02L

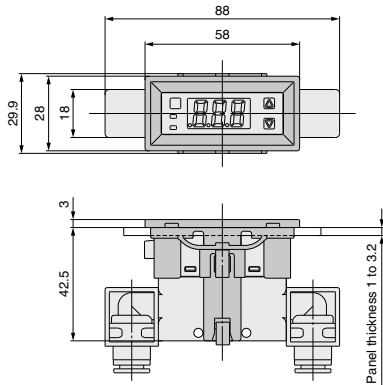


## Dimensions

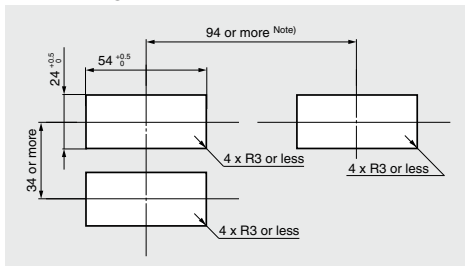
### Panel mount adapter/ Without flow adjustment valve/Straight



### Panel mount adapter/ Without flow adjustment valve



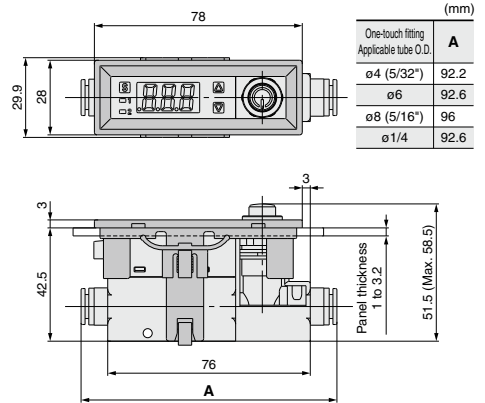
### Panel Fitting Dimensions



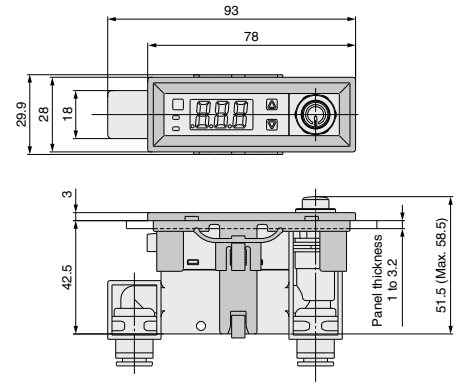
Panel thickness 1 to 3.2 mm

Note) Piping entry direction: Minimum dimensions for bottom side piping. If using straight piping, the piping material and tubing need to be taken into consideration when designing the system. If a bend (R) is used, limit it to R3 or less.

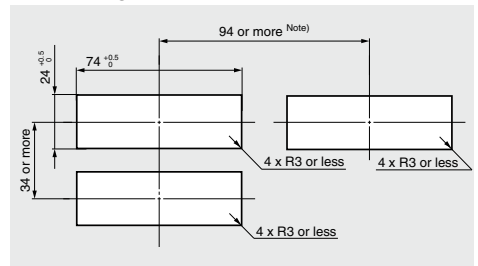
### Panel mount adapter/ With flow adjustment valve/Straight



### Panel mount adapter/ With flow adjustment valve



### Panel Fitting Dimensions



Panel thickness 1 to 3.2 mm

Note) Piping entry direction: Minimum dimensions for bottom side piping. If using straight piping, the piping material and tubing need to be taken into consideration when designing the system. If a bend (R) is used, limit it to R3 or less.

PFM

PFMB

PFMC

PFMV

PF2A

PF3W

LFE

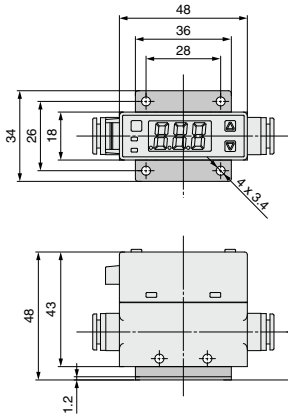
PF2D

IF

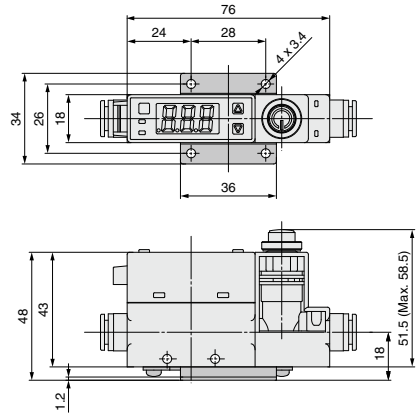
# PFM7 Series

## Dimensions

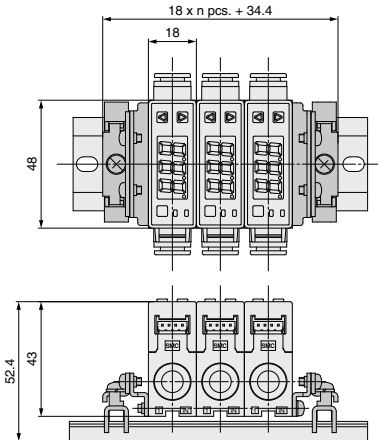
With bracket/Without flow adjustment valve



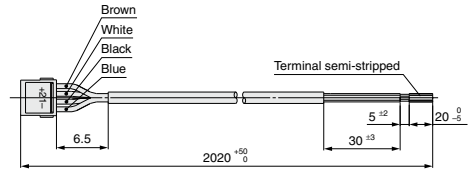
With bracket/With flow adjustment valve



DIN rail mounting



Lead wire with connector  
ZS-33-D



Cable Specifications of Lead Wire  
with Connector

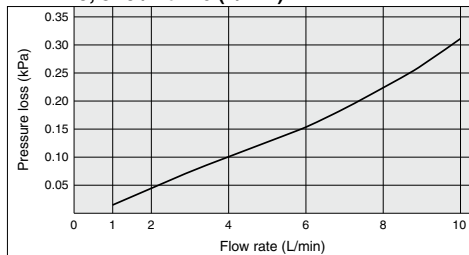
Conductor	Nominal cross section area	AWG26
	External diameter	Approx. 0.50 mm
Insulation	External diameter	Approx. 1.00 mm
	Colors	Brown, White, Black, Blue
Sheath	Material	Oil-resistant PVC
	Finished external diameter	ø3.5

- DIN rail (supplied by customers)
- Port size, F02: G 1/4 cannot be mounted on the DIN rail.

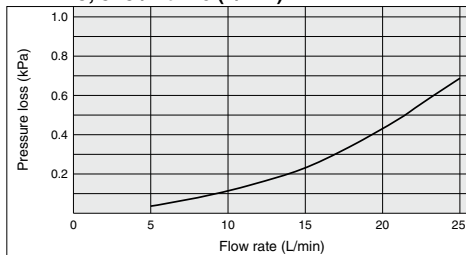
# PFM7/PFM5 Series Common Specifications

## Pressure Loss (Pressure: 0.35 [MPa])

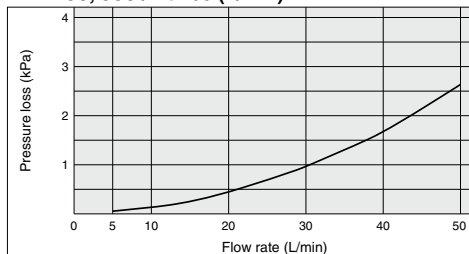
**PFM710, 510 / For 10 (L/min)**



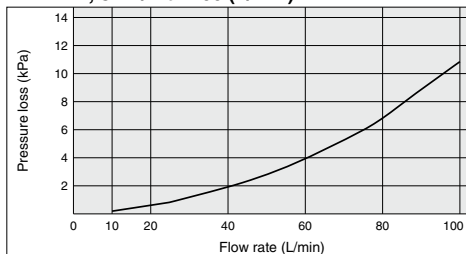
**PFM725, 525 / For 25 (L/min)**



**PFM750, 550 / For 50 (L/min)**

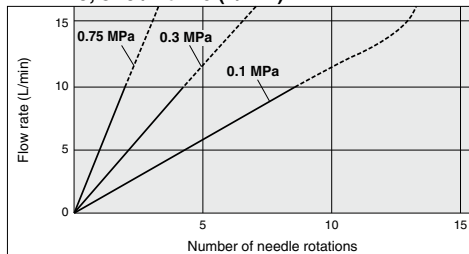


**PFM711, 511 / For 100 (L/min)**

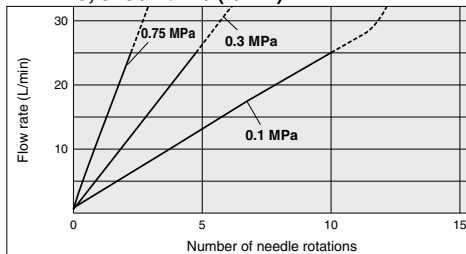


## Flow Rate Characteristics (Reference Value)

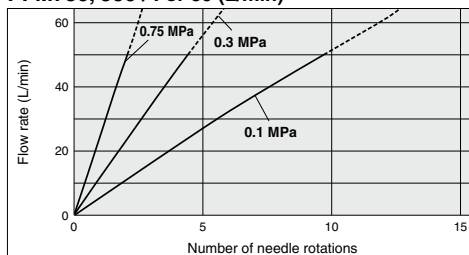
**PFM710, 510 / For 10 (L/min)**



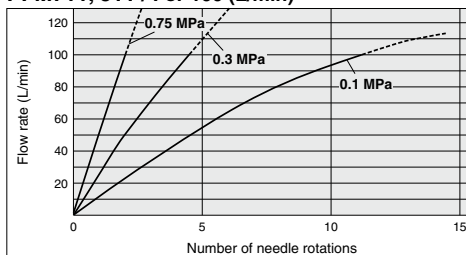
**PFM725, 525 / For 25 (L/min)**



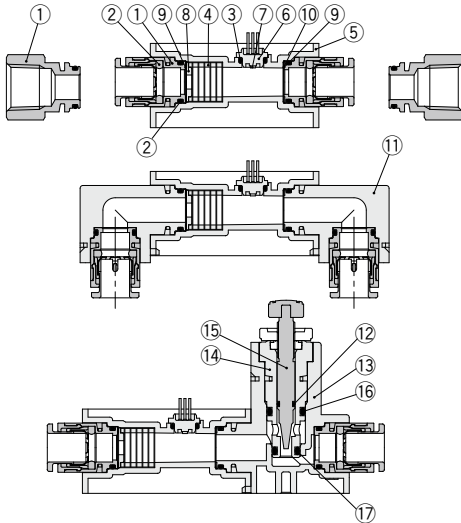
**PFM750, 550 / For 50 (L/min)**



**PFM711, 511 / For 100 (L/min)**



## Wetted parts construction



### Component Parts

No.	Description	Material	Note
1	Fitting for piping	Brass	Electroless nickel plating
2	O-ring	FKM	Fluoro coated
3	O-ring	HNBR	Fluoro coated
4	Rectifying module	Stainless steel 304	
5	Body	PBT	
6	Sensor housing	LCP	
7	Sensor chip	Silicon	
8	Orifice	Brass	Electroless nickel plating
9	Seal	FKM	Fluoro coated
10	Mesh	Stainless steel 304	
11	Bottom piping adapter	PBT	
12	O-ring	HNBR	Fluoro coated
13	Flow adjustment valve assembly	PBT	
14	Body B	Brass	Electroless nickel plating
15	Needle	Brass	Electroless nickel plating
16	O-ring	HNBR	Fluoro coated
17	O-ring	HNBR	Fluoro coated

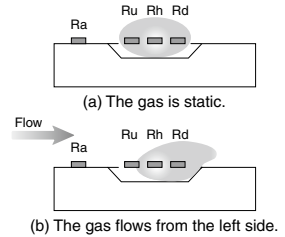
## Detection Principle

This MEMS sensor chip consists of upstream temperature measuring sensor (Ru) and downstream temperature measuring sensor (Rd), which are placed symmetrically from the center 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 shown as the diagram on the right. (a) When the gas is static, the temperature distribution of heated gas centered 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 flow 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.



**PFM**

**PFMB**

**PFMC**

**PFMV**

**PF2A**

**PF3W**

**LFE**

**PF2D**

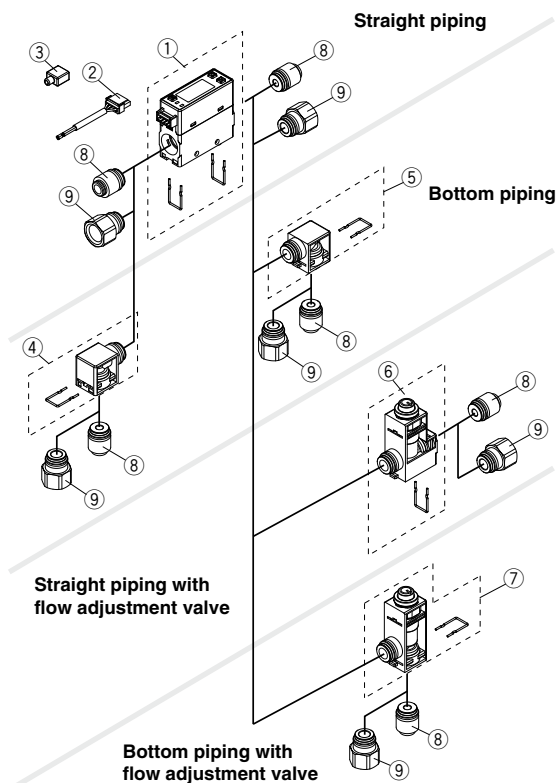
**IF**



# PFM7/PFM5 Series

## Component Parts

No.	Description	Model	
1	Body		
2	Lead wire with connector (2 m)	ZS-33-D	
3	Rubber cover for connector (silicon rubber)	ZS-33-F	
4	IN side Bottom piping adapter (with pin)	ZS-33-P1L	
5	OUT side Bottom piping adapter (with pin)	ZS-33-P2L	
6	For straight piping Flow adjustment valve assembly (with pin)	For 10 L/min	ZS-33-10N
		For 25 L/min	ZS-33-25N
		For 50 L/min	ZS-33-50N
7	For bottom piping Flow adjustment valve assembly (with pin)	For 10 L/min	ZS-33-10NL
		For 25 L/min	ZS-33-25NL
		For 50 L/min	ZS-33-50NL
8	One-touch fitting	ø4 (5/32")	ZS-33-C4
		ø6	ZS-33-C6
		ø8 (5/16")	ZS-33-C8
		ø1/4"	ZS-33-N7
9	Female thread	Rc 1/8	ZS-33-01
		NPT 1/8	ZS-33-N01
		G 1/8	ZS-33-F01
		Rc 1/4	ZS-33-02
		NPT 1/4	ZS-33-N02
		G 1/4	ZS-33-F02



## ⚠ Caution

- ① The accuracy could change by 2 to 3% when the piping is removed or replaced.

The repeatability accuracy is  $\pm 1\%$  F.S. when piping is replaced with piping of the same size. However, the accuracy could change by 2 to 3% if the size is different or when changing from straight to elbow or from elbow to straight piping.

# PFM Series

## Function Details

### ■ Output operation

The output operation can be selected from the following:  
 Output (hysteresis mode and window comparator mode) corresponding to instantaneous flow rate,  
 Output corresponding to accumulated flow,  
 Accumulated output pulse output

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

### ■ Indication color

The indication color can be selected for each output condition. The selection of the indication color 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

### ■ Selection of operating fluid

The fluid can be selected. If argon (Ar) or carbon dioxide (CO<sub>2</sub>) is used, the setting needs to be changed.

Dry air, N <sub>2</sub>
Argon
CO <sub>2</sub>

Note) When CO<sub>2</sub> is selected, the upper limit of the measured flow rate range will be 1/2 of that for other fluids.

### ■ Selection of indication unit reference

The indication unit reference can be selected between standard conditions and normal conditions.

Standard conditions: Flow rate converted to a volume at 20°C and 1atm (atmosphere)
Normal conditions: Flow rate converted to a volume at 0°C and 1atm (atmosphere)

### ■ 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.

0.05 sec.
0.5 sec.
1 sec.
2 sec.

<Principle>

When the switch has been in ON area for a set period of time, the output will turn on (or off).

### ■ Indication mode

The indication mode can be selected between instantaneous flow rate and accumulated flow.

Instantaneous flow rate display
Accumulated flow display

### ■ External input function

The external input function can be selected from accumulated value external reset, auto-shift and auto-shift zero.

(Input signal: Connect input line to GND for 30 ms or more.)

External reset: This function resets the accumulated value to "0" when an input signal is applied.

Auto-shift: This function generates an output corresponding to the change in relation to instantaneous flow rate when an input signal is applied.

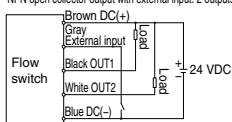
Auto-shift zero: This function displays instantaneous flow rate as "0" when a positive input signal is applied in the auto shift function described above.

Set values and flow rates that are relatively on the negative side are expressed by illumination of the decimal point on the far left.

### ■ External input wiring example

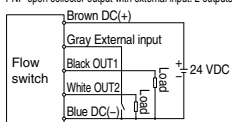
#### PFM3□2

NPN open collector output with external input: 2 outputs



#### PFM3□5

PNP open collector output with external input: 2 outputs



### ■ Indication resolution

The indication resolution of the PFM710 and 711 series can be changed to enable values to be indicated in smaller steps.

100 resolution	PFM710 by 0.1 L/min PFM711 by 1 L/min
1000 resolution	PFM710 by 0.01 L/min PFM711 by 0.1 L/min

### ■ Accumulated value hold

Accumulated value is not cleared even when the power supply is turned off.

The accumulated value is memorized every 2 or 5 min. during measurement, and continues from the last memorized value when the power supply is turned on again.

The life time of the memory element is 1 million access cycles. Take this into consideration before using this function.

### ■ Selection of analog output filter

This selection is available when using a product with an analog output. A signal with fast response speed can be generated by turning off the analog output filter.

### ■ 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) flow rate is detected and updated from when the power supply is turned on. In peak (bottom) value indication mode, this maximum (minimum) flow rate is displayed.

### ■ Keypress function

Prevents operation errors such as accidentally changing setting values.

### ■ Zero-clear function

Allows the user to adjust the measured flow rate indication to zero. The adjustment range is ±10%F.S. of the initial factory setting.

### ■ Error indication function

When an error or abnormality arises, the location and contents are displayed.

Description	Contents	Action
Flow rate error	The flow rate exceeds the upper limit of indicated flow rate range.	Decrease the flow rate.
	There is a reverse flow equivalent to -5% or more.	Turn the flow to correct direction.
Overcurrent error	Load current of 80 mA or more is applied to the switch output (OUT1).	Eliminate the cause of the overcurrent by turning off the power supply and then turn on it again.
	Load current of 80 mA or more is applied to the switch output (OUT2).	
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.
Zero-clear error	If zero-clear is performed (by holding down  and  buttons simultaneously for 1 sec.) while there is some flow, "Er4" will be displayed for 1 sec.	Perform zero-clear of accumulated flow rate when there is no flow.
Flow rate error	The flow rate exceeds the accumulated flow rate range.	Clear the accumulated flow rate. (This error does not matter when the accumulated flow rate is not being used.)

If the failure cannot be solved after the above instructions are performed, please contact SMC for investigation.



# PFM7/PFM5 Series

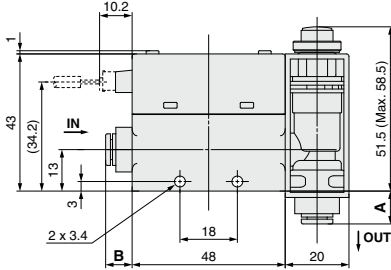
## Made to Order 2

Please contact SMC for detailed specifications, lead times and prices.



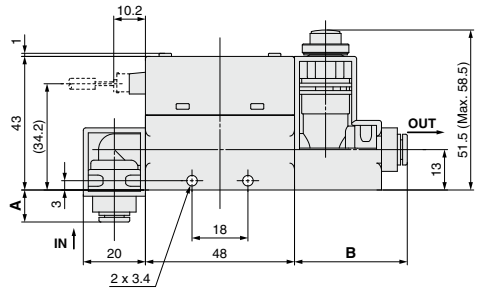
### Dimensions

PFM<sub>5</sub> □ □ S-C4/C6/C8/N7-□-X693



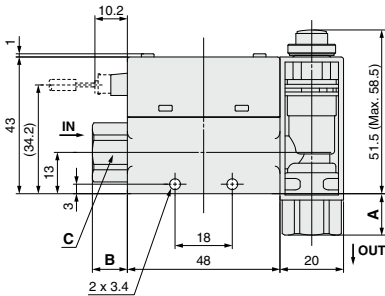
One-touch fitting Applicable tube O.D.	A	B
ø4 (5/32")	10.1	8.1
ø6	10.3	8.3
ø8 (5/16")	12	10
ø1/4	10.3	8.3

PFM<sub>5</sub> □ □ S-C4/C6/C8/N7-□-X694



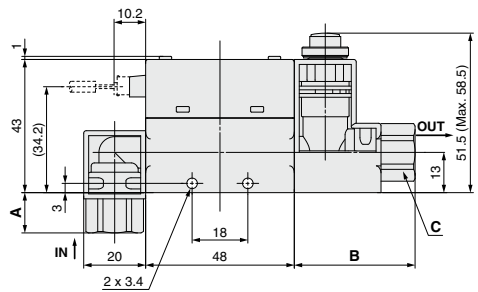
One-touch fitting Applicable tube O.D.	A	B
ø4 (5/32")	10.1	36.1
ø6	10.3	36.3
ø8 (5/16")	12	37
ø1/4	10.3	36.3

PFM<sub>5</sub> □ □ S-□01/02-□-X693



Port size	A	B	C (Width across flats)
Rc 1/8, 1/4 NPT 1/8, 1/4 G 1/8	13	11	17
G 1/4	17	15	21

PFM<sub>5</sub> □ □ S-□01/02-□-X694



Port size	A	B	C (Width across flats)
Rc 1/8, 1/4 NPT 1/8, 1/4 G 1/8	13	39	17
G 1/4	17	43	21

