2-Color Display Digital Flow Switch

PFM Series

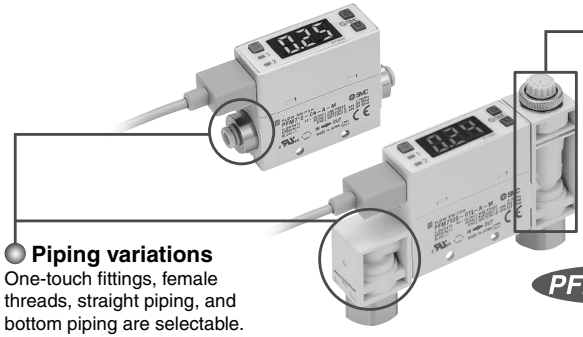
The PFM series now features a new model: the PF2M series.
Click here for details.

- Flow rate range: 10, 25, 50,100 L/min.
- Minimum unit setting: 0.01 L/min.
  (0.1 L/min when the flow rate range is 25, 50, 100 L/min.)
- Repeatability: ±1%F.S.
- Grease-free
- Flow adjustment valve is integrated.
  (Reduced piping and space saving)
- Response time:
  Either 50 ms, 0.5 s, 1 s
  or 2 s can be chosen.

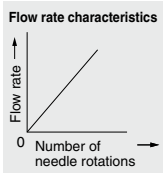
Fluid
Dry air, N_2, **Ar, CO_2**

2-color display
See abnormal values at a glance.

2-Color Display Digital Flow Switch

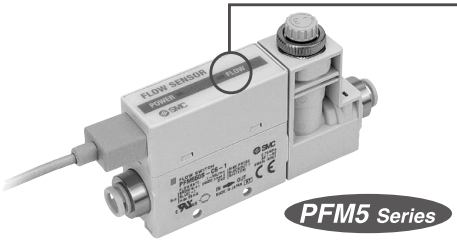


Integrated flow adjustment valve
Reduces piping installation work and space requirements. Special design provides smooth adjustment to match needle rotations.



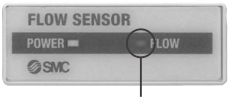
Piping variations
One-touch fittings, female threads, straight piping, and bottom piping are selectable.

PFM7 Series



PFM5 Series

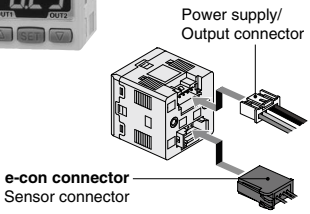
Indicator function
Flashing speed varies according to flow rate. Color changes from green to red when rated flow rate is exceeded. Can be used as a simple monitor.



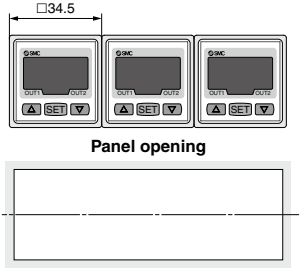
Flashing speed	Flow rate
Fast	High
Slow	Low

Connectors
Connection and removal of wiring is easy.

PFM3 Series



Support for vertical and horizontal secure mounting (panel mount)
A single panel opening is sufficient.
Reduces panel fitting labor and enables space-savings.

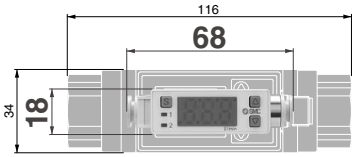


	Integrated type	Remote type	
			
Measurement flow range (L/min)	Model	Model	
		Sensor unit	Monitor unit
0.2 to 10 (0.2 to 5)	**PFM710**	**PFM510**	**PFM3□□**
0.5 to 25 (0.5 to 12.5)	**PFM725**	**PFM525**	
1 to 50 (1 to 25)	**PFM750**	**PFM550**	
2 to 100 (2 to 50)	**PFM711**	**PFM511**	

( ): Fluid: CO_2

Compact

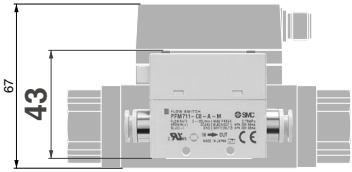
Same size even when the model with different flow rate range (10, 25, 50, 100 L/min) is chosen.



Lightweight: 55 g (PFM711)

(With One-touch fitting, without flow adjustment valve)

Current model PF2A711: 290 g

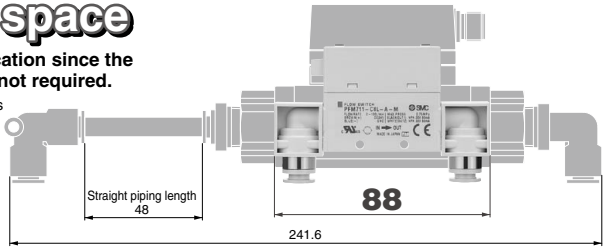


Comparison with the current model PF2A711 (10 to 100 L/min)

Reduced piping space

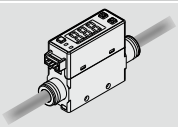
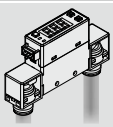
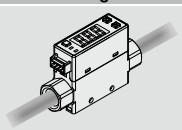
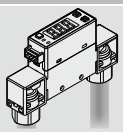
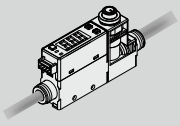
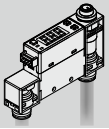
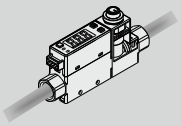
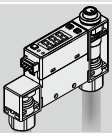
Mountable in a narrow location since the straight piping length* is not required.

* A straight piping length of 8 times the piping diameter is required for the current model.

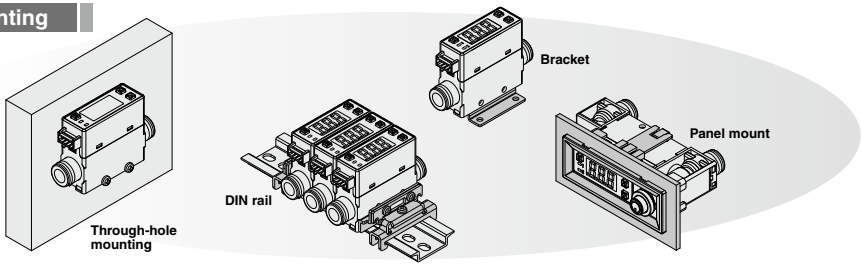


Comparison with the current model PF2A711 (10 to 100 L/min) when ø6 One-touch fittings are attached.

Piping Variations

	One-touch fitting: ø4, ø6, ø8, ø1/4		Female thread: Rc 1/8, 1/4 • NPT 1/8, 1/4 • G 1/8, 1/4	
	Straight	Bottom	Straight	Bottom
Without flow adjustment				
With flow adjustment				

Mounting



Main Functions

Selection of fluid

Dry air, Nitrogen (N_2), Argon (Ar) or Carbon dioxide (CO_2) can be selected using the buttons.

Secret code setting function

The user must input a secret code to cancel the keylock mode. This ensures that only authorized persons can operate the switch.

For details and other functions, refer to page 248.

Power-saving mode

Turning off the display can save power consumption.

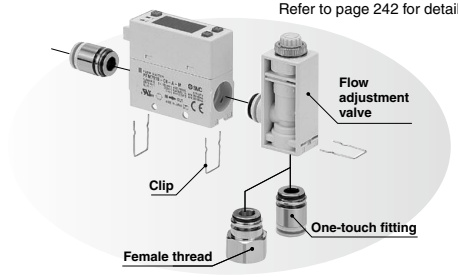
The decimal point indicators flash in power-saving mode.

Selection of indication unit	User can select between ANR and NL/min for each fluid. [ANR] Indicates the flow rate converted to a volume under standard conditions: 20°C, 1 atm (atmosphere), 65%RH [NL/min] Indicates the flow rate converted to a volume under normal conditions: 0°C, 1 atm (atmosphere).
External input	Can be selected from accumulated value external reset, auto-shift and auto-shift zero.
Indication resolution	Minimum unit setting can be selected from 1 L/min, 0.1 L/min and 0.01 L/min. Depends on the model. Refer to the specifications (P. 216, 244) for details.

Several Combinations

Depending on the installation conditions, it is possible to add or remove the **flow adjustment valve**, change the **fitting type** and the **piping direction** as desired.

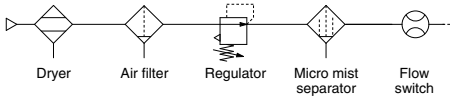
Refer to page 242 for details.



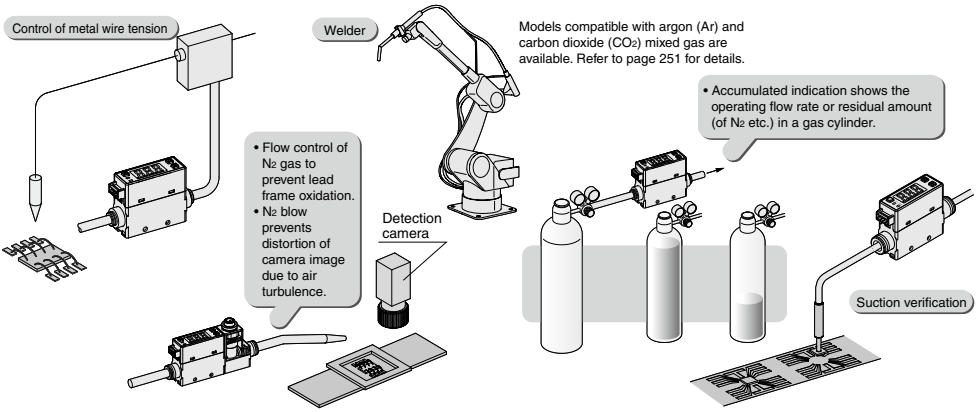
The accuracy may fluctuate by 2 to 3% just after replacement. (Repeatability does not change.)

Recommended Air Circuits

Compressed air line



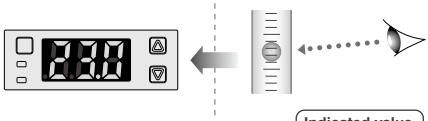
Applications



SMC

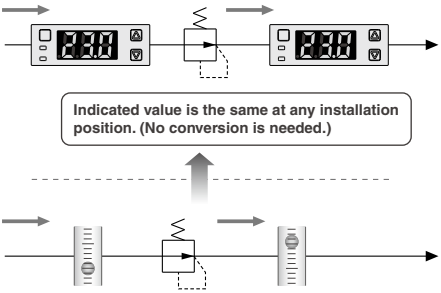
Comparison with Float Type Flow Meter

Digital display



Indicated value depends on the viewing angle.

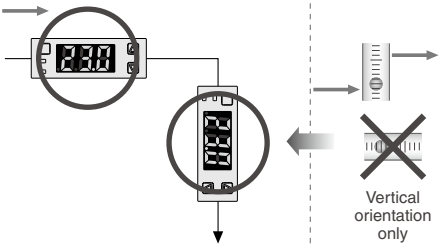
Not subject to pressure variations



Indicated value is the same at any installation position. (No conversion is needed.)

Indicated value depends on installation position. (Conversion is required.)

Free mounting orientation



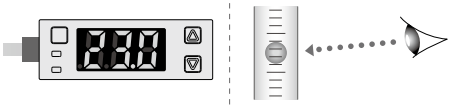
Vertical orientation only

Mounting orientation is not limited.

With switch output and analog output

Control by sensor output

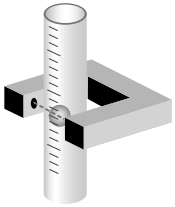
Visual control



With switch output and analog output

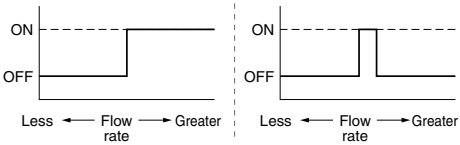
Without output function

A photoelectric switch, or similar, must be prepared separately.

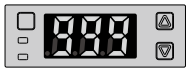


Can detect whether greater or less than set flow rate. The flow condition can be controlled all the time.

Can only detect when float passes. Cannot detect whether greater or less than set flow rate.



Accumulated flow display



Able to confirm the total air consumption per day (Max. 999999 L)
Accumulated pulse output is also equipped.

Not displayable

2-Color Display Digital Flow Switch

2-Color Display Digital Flow Switch

Integrated display

PFM7 Series

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_2

Flow adjustment valve

Nil	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

Nil	Straight
L	Bottom

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

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 Note 3)
H	1 PNP output + External input Note 3)

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

Unit specifications

M	Fixed SI unit Note1)
Nil	With unit switching function Note2)

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.

Operation manual

Nil	With operation manual (Japanese and English)
N	None

Calibration certificate

Nil	None
A	With calibration certificate

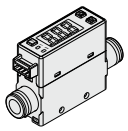
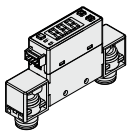
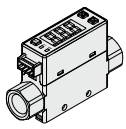
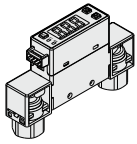
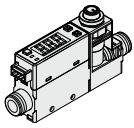
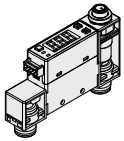
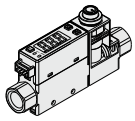
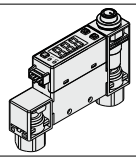
∗ The certificate is written in English and Japanese. Other languages are available as specials.

Option 1
(Refer to page 215.)

Option 2
(Refer to page 215.)

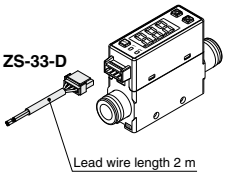
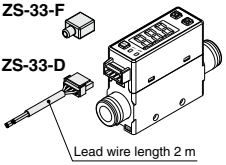
Made to Order
(Refer to pages 215 and 249.)

Piping Variations

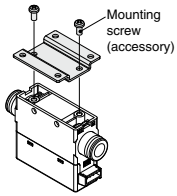
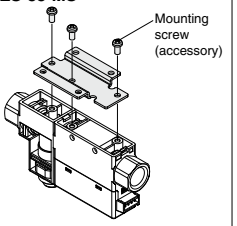
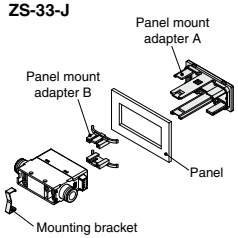
	With One-touch fittings (C4, C6, C8, N7)		Female thread (01, 02, N01, N02, F01, F02)	
	Straight (Nil)	**Bottom (L)**	**Straight (Nil)**	**Bottom (L)**
Without flow adjustment valve (Nil)				
With flow adjustment valve (S)				

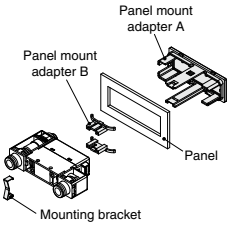
SMC

Option 1

Nil	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
ZS-33-D  	**ZS-33-F** **ZS-33-D**  	

Option 2

Nil	R	S	T
None	Bracket (For without flow adjustment valve) **ZS-33-M**  	Bracket (For with flow adjustment valve) **ZS-33-MS**  Piping direction: Cannot be mounted with bottom piping type.	Panel mount adapter (For without flow adjustment valve) **ZS-33-J** 

V
Panel mount adapter (For with flow adjustment valve) **ZS-33-JS** 

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

Made to Order

Symbol	Specification/Description
X693	Change of piping entry direction combination
X694	
X731	Compatible with argon (Ar) and carbon dioxide (CO_2) mixed gas

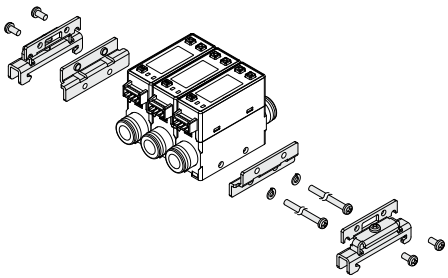
For details, refer to page 249 through to 251.

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.

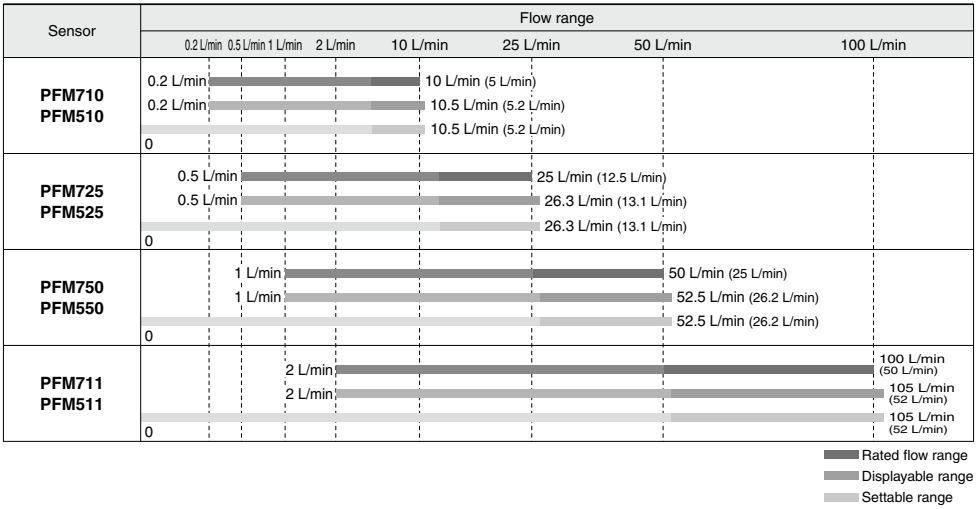
Model			PFM710	PFM725	PFM750	PFM711
Applicable fluid			Dry air, N_2, Ar, CO_2 (Air quality grade is JIS B8392.1-1, 1.2 to 1.6.2 and ISO 8573.1-1, 1.2 to 1.6.2.)			
Rated flow range (Flow rate range)		Dry air, N_2, Ar	0.2 to 10 L/min	0.5 to 25 L/min	1 to 50 L/min	2 to 100 L/min
		CO_2	0.2 to 5 L/min	0.5 to 12.5 L/min	1 to 25 L/min	2 to 50 L/min
Displayable range Note 1)		Dry air, N_2, 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_2	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
Settable range Note 1)		Dry air, N_2, 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_2	0 to 5.2 L/min	0 to 13.1 L/min	0 to 26.2 L/min	0 to 52 L/min
Minimum unit setting Note 2)			0.01 L/min	0.1 L/min	0.1 L/min	0.1 L/min
Accumulated pulse flow rate exchange value			0.1 L/pulse	0.1 L/pulse	0.1 L/pulse	1 L/pulse
Indication unit Note 3)			Instantaneous flow rate L/min, CFM x 10^{-2} Accumulated flow L, ft^3 x 10^{-1}			
Linearity			Display accuracy: ±3%F.S. Analog output accuracy: ±5%F.S. (Fluid: Dry air)			
Repeatability			±1%F.S. Analog output accuracy: ±3%F.S. (Fluid: Dry air)			
Pressure characteristics			±5%F.S. (0.35 MPa reference)			
Temperature characteristics			±2%F.S. (15 to 35°C) ±5%F.S. (0 to 50°C)			
Operating pressure range			–100 kPa to 750 kPa			
Rated pressure range			–70 kPa to 750 kPa			
Proof pressure			1 MPa			
Accumulated flow range			Max. 999999 L Note 4)			
Switch output			NPN or PNP open collector output			
	Maximum load current		80 mA			
	Maximum applied voltage		28 VDC (at NPN output)			
	Internal voltage drop		NPN output: 1 V or less (at 80 mA) PNP output: 1.5 V or less (at 80 mA)			
	Response time		1 s (50 ms, 0.5 s, 2 s can be selected.)			
	Output protection		Short-circuit protection			
Accumulated pulse output			NPN or PNP open collector output (Same as switch output)			
Analog output Note 5)		Response time	1.5 s or less (90% response)			
		Voltage output	Voltage output: 1 to 5 V Output impedance: 1 kΩ			
		Current output	Current output: 4 to 20 mA Max. load impedance: 600 Ω, Min. load impedance: 50 Ω			
Hysteresis Note 6)	Hysteresis mode		Variable			
	Window comparator mode		Variable			
External input			No-voltage input (Reed or Solid state) Input 30 ms or more			
Display method			3-digit, 7-segment LED 2-color display (Red/Green) Renewed cycle: 10 times/sec			
Status LED's			OUT1: Lights up when output is turned ON (Green). OUT2: Lights up when output is turned ON (Red).			
Power supply voltage			24 VDC ±10%			
Current consumption			55 mA or less			
Environment	Enclosure		IP40			
	Operating fluid temperature		0 to 50°C (with no freezing and condensation)			
	Operating temperature range		Operating: 0 to 50°C Stored: –10 to 60°C (with no freezing and condensation)			
	Operating humidity range		Operating, Stored: 35 to 85%R.H. (with no condensation)			
	Withstand voltage		1000 VAC for 1 minute between terminals and housing			
	Insulation resistance		50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing			
Standards			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.
When equipped with a unit switching function. (The SI unit (L/min or L) is fixed for types with no unit switching function.)
Note 4) 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 5) Set to 1.5 s (90%), can be changed to 100 ms.
Note 6) Set to hystresis mode at the time of shipment from the factory. Can be changed to window comparator mode using push-buttons.
Note 7) For details about wiring and thread type, refer to the Operation Manual that can be downloaded from SMC website (http://www.smcworld.com).
Note 8) 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 be guaranteed.
The flow range if using CO_2 is given in brackets.



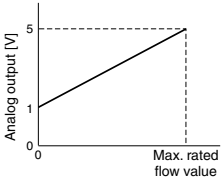
In the case of the PFM5 series, the displayable and settable ranges are the same as the PFM3 series flow monitor.

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: 55 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

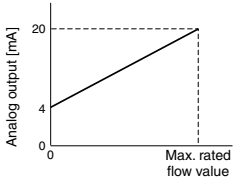
Note) Analog output at maximum rated flow rate when CO_2 is selected is 3 [V] for the voltage output type and 12 [mA] for the current output type.



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_2



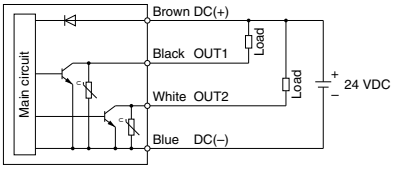
Analog Current Output (4 to 20 mA)

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)

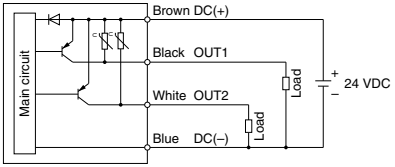
∗ ( ): Fluid: CO_2

Internal Circuits and Wiring Examples

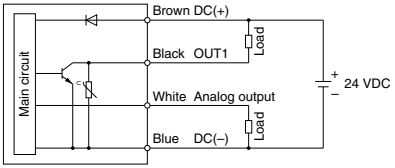
-A
NPN (2 outputs)



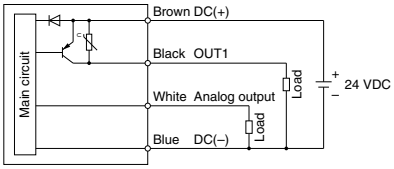
-B
PNP (2 outputs)



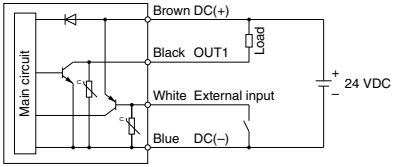
-C/D
C: NPN (1 output) + Analog voltage output
D: NPN (1 output) + Analog current output



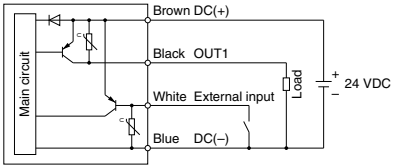
-E/F
E: PNP (1 output) + Analog voltage output
F: PNP (1 output) + Analog current output



-G
NPN (1 output) + External input

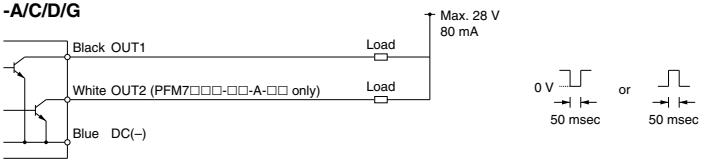


-H
PNP (1 output) + External input

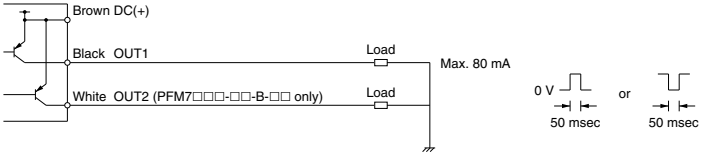


Accumulated pulse output wiring examples

-A/C/D/G

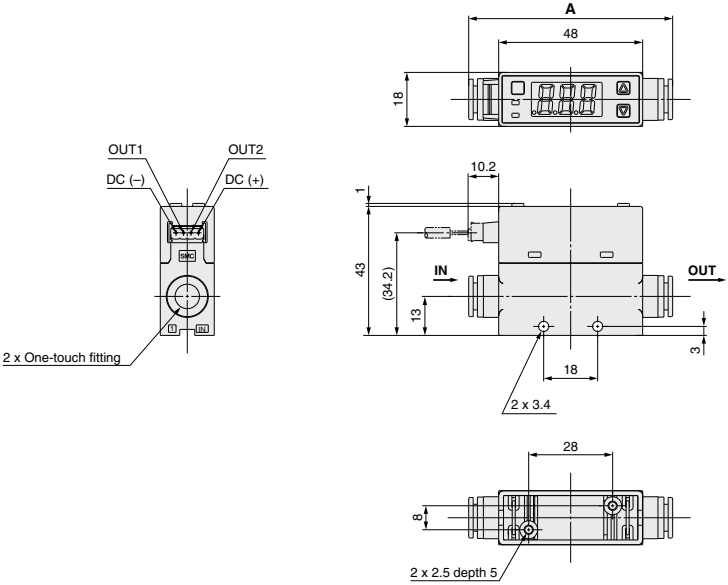


-B/E/F/H



Dimensions

PFM7□□-C4/C6/C8/N7

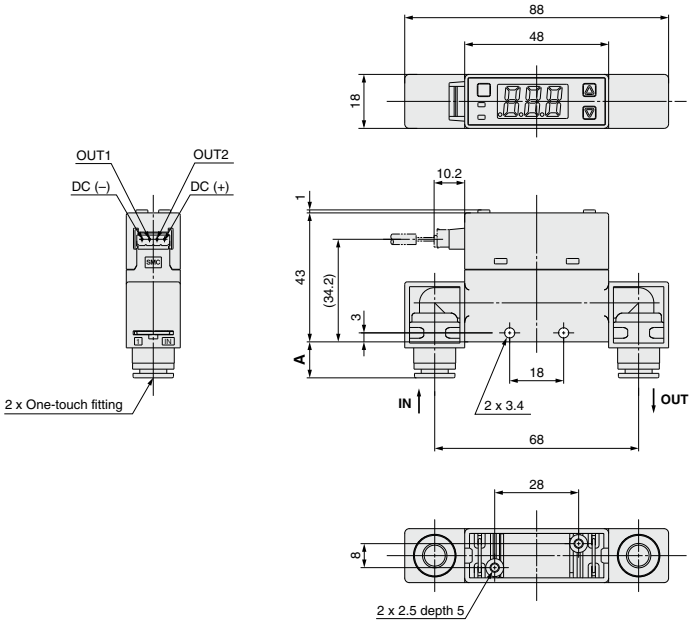


(mm)

One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	64.2
ø6	64.6
ø8 (5/16")	68
ø1/4"	64.6

With rubber cover for connector

PFM7□□-C4L/C6L/C8L/N7L

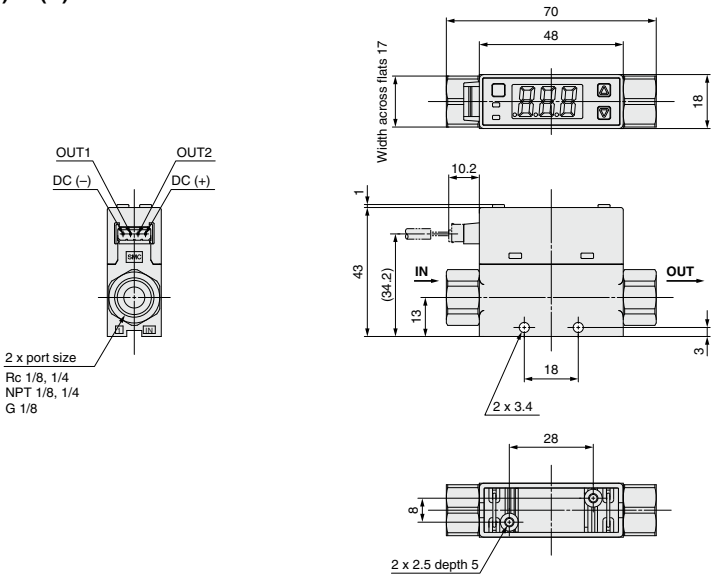


(mm)

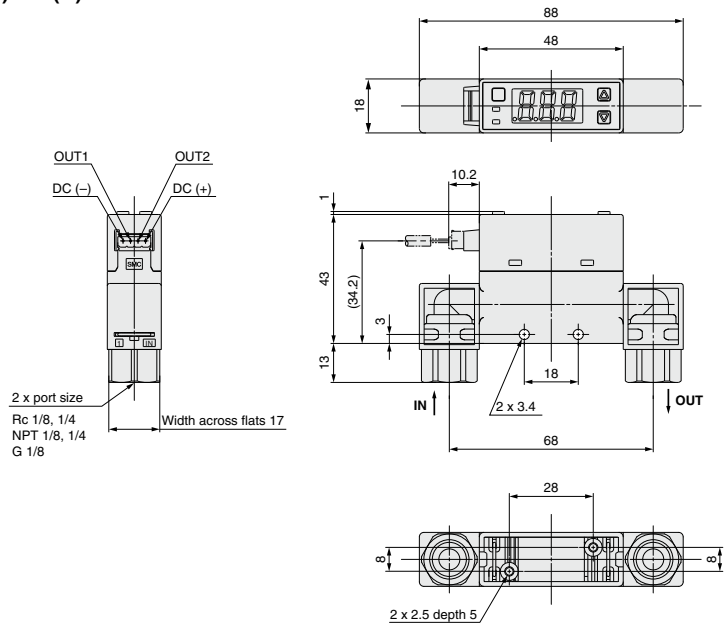
One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	10.1
ø6	10.3
ø8 (5/16")	12
ø1/4"	10.3

Dimensions

PFM7□□-(N)01/(N)02/F01

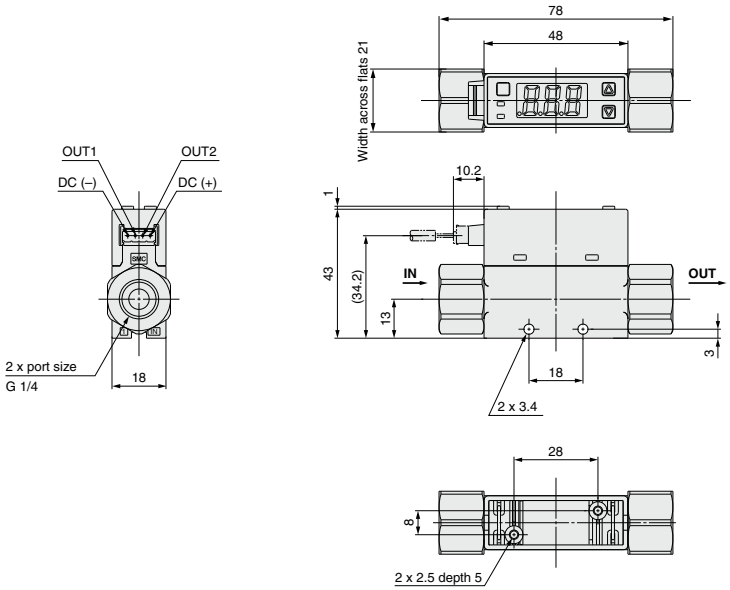


PFM7□□-(N)01L/(N)02L/F01L

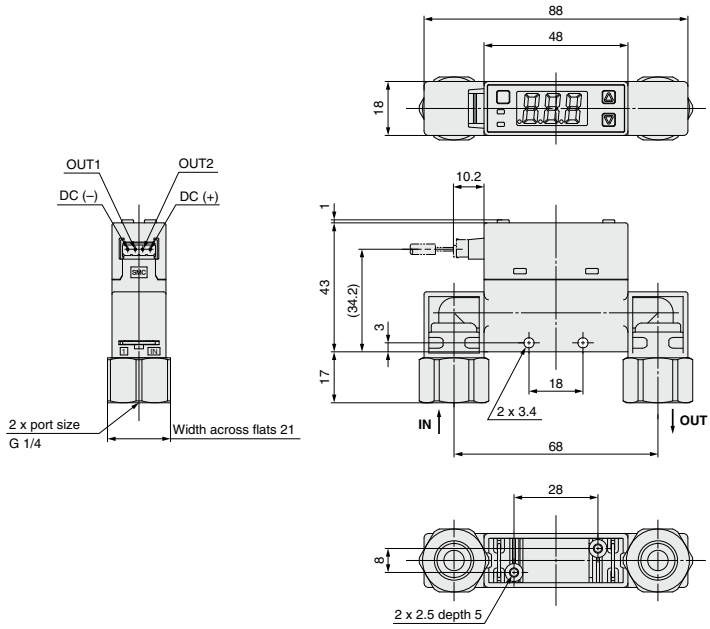


Dimensions

PFM7□□-F02

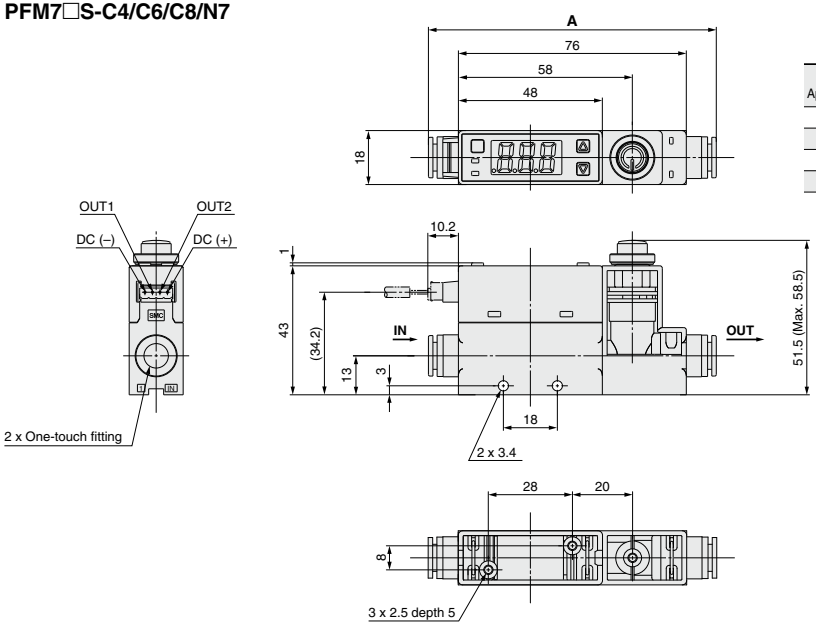


PFM7□□-F02L



Dimensions

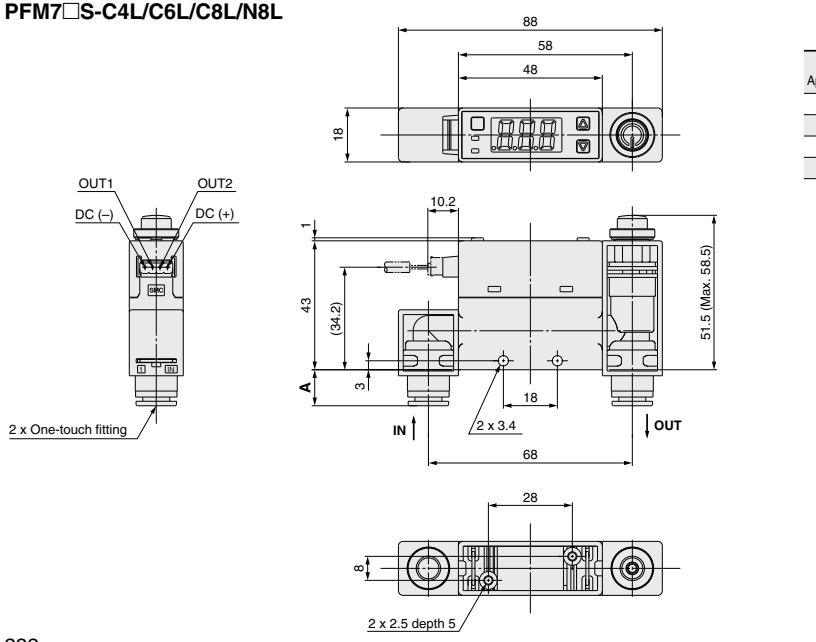
PFM7□S-C4/C6/C8/N7



(mm)

One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	92.2
ø6	92.6
ø8 (5/16")	96
ø1/4"	92.6

PFM7□S-C4L/C6L/C8L/N8L

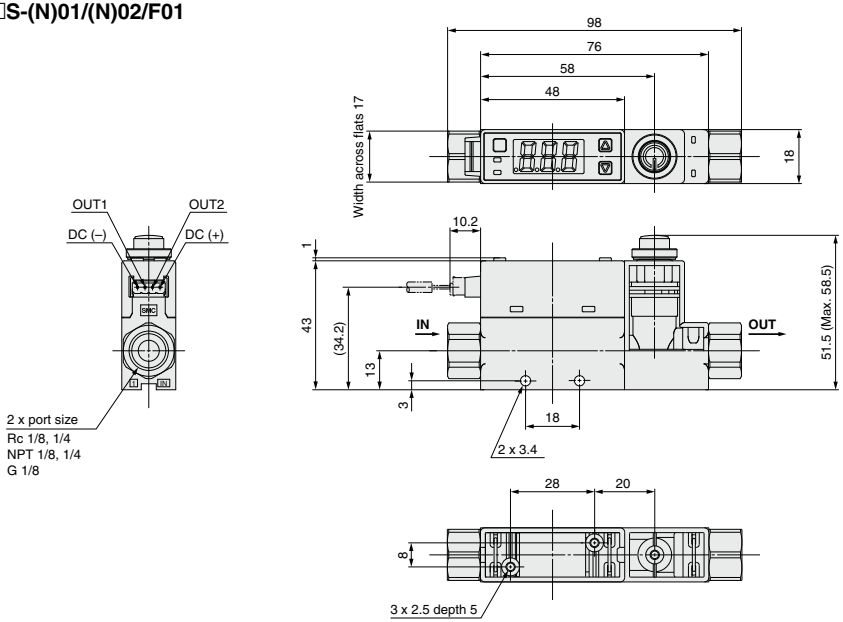


(mm)

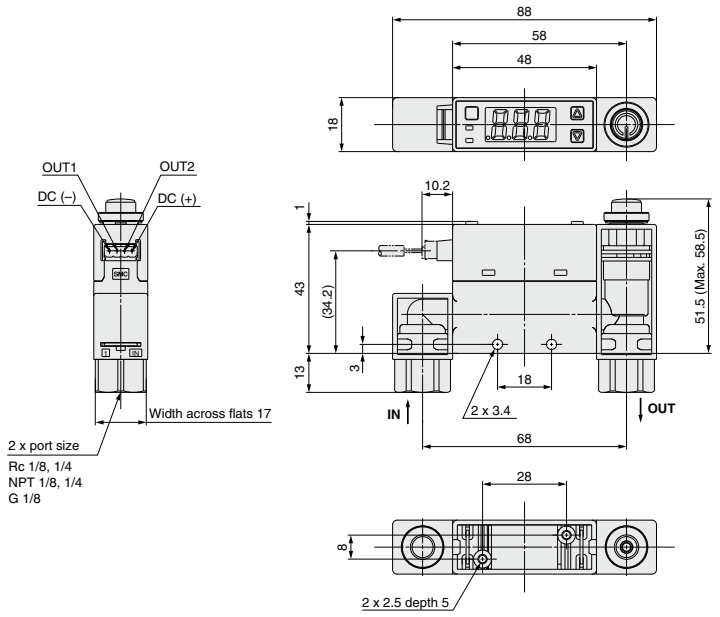
One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	10.1
ø6	10.3
ø8 (5/16")	12
ø1/4"	10.3

Dimensions

PFM7□S-(N)01/(N)02/F01

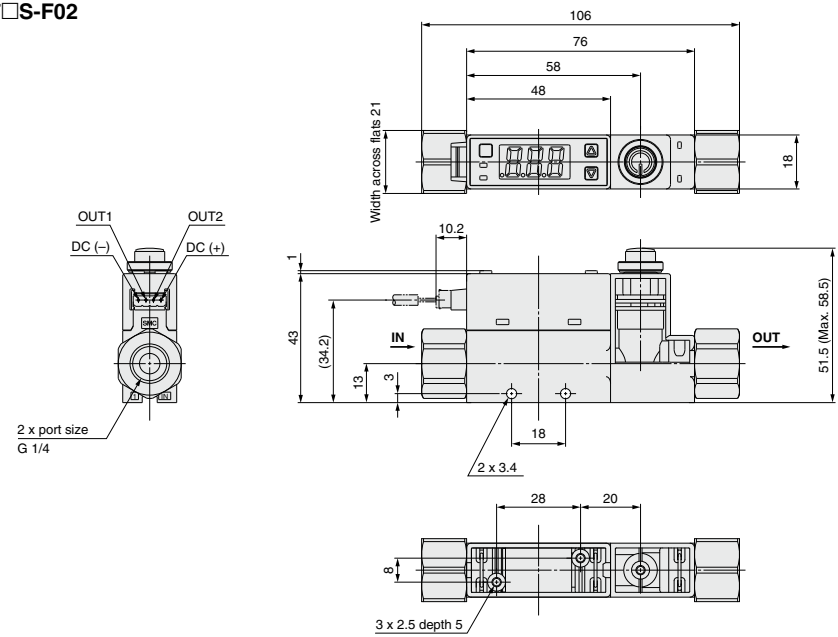


PFM7□S-(N)01L/(N)02L/F01L

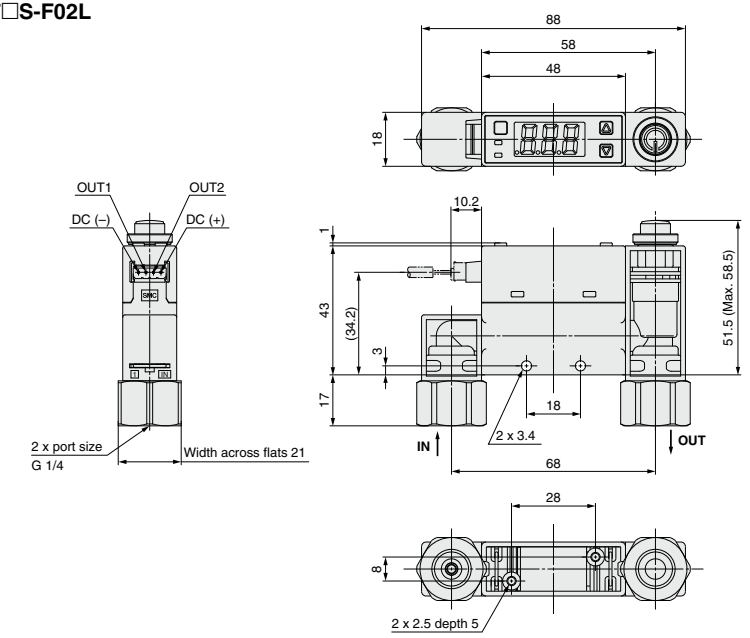


Dimensions

PFM7□S-F02



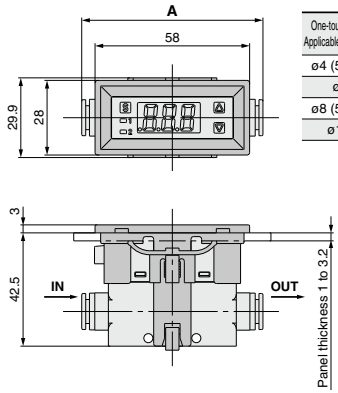
PFM7□S-F02L



SMC

Dimensions

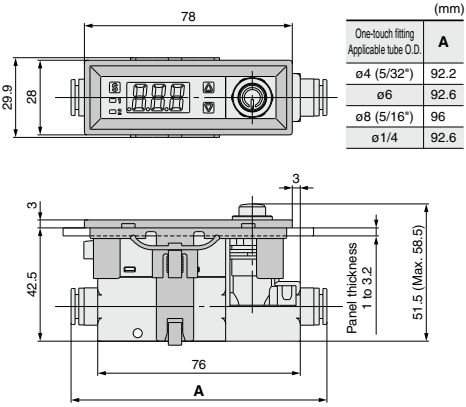
Panel mount adapter/ Without flow adjustment valve/Straight



(mm)

One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	64.2
ø6	64.6
ø8 (5/16")	68
ø1/4	64.6

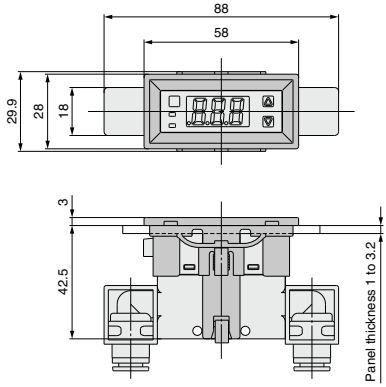
Panel mount adapter/ With flow adjustment valve/Straight



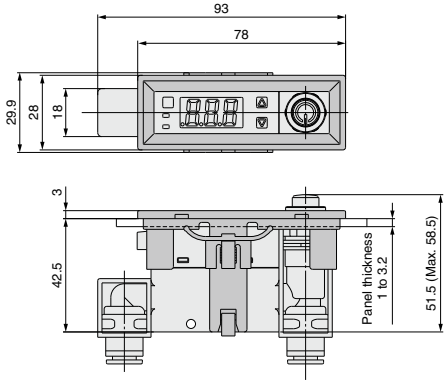
(mm)

One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	92.2
ø6	92.6
ø8 (5/16")	96
ø1/4	92.6

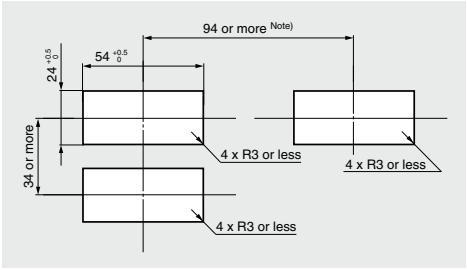
Panel mount adapter/ Without flow adjustment valve



Panel mount adapter/ With flow adjustment valve



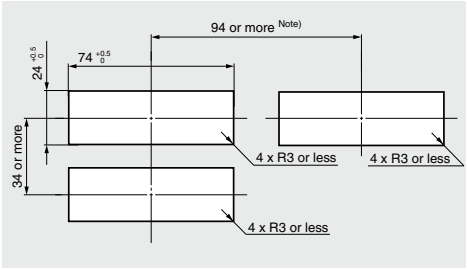
Panel Fitting Dimensions



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.

Panel Fitting Dimensions

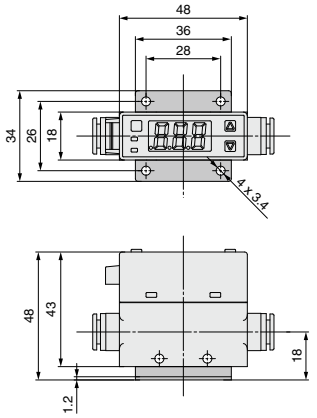


Panel thickness 1 to 3.2 mm

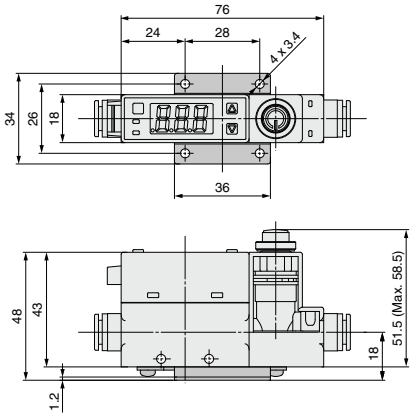
Note) Piping entry direction: Minimum dimensions for bottom side piping. If using straight piping, the piping material and tubing need to be taken into consideration when designing the system. If a bend (R) is used, limit it to R3 or less.

Dimensions

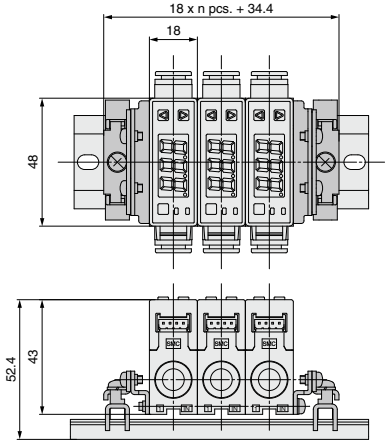
With bracket/Without flow adjustment valve



With bracket/With flow adjustment valve

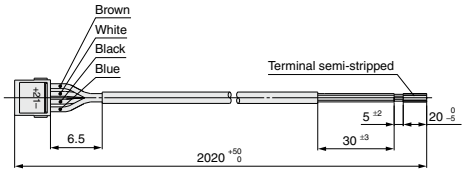


DIN rail mounting



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

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

2-Color Display Digital Flow Switch

Remote sensor unit

PFM5 Series

The PFM series now features a new model: the PF2M series. Click **here** for details.

How to Order

Remote sensor unit

PFM 5 10 □ – C4 □ – 1 – □ □ – □ □ – □

Type

5	Remote sensor unit

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_2

Flow adjustment valve

Nil	None
S	Yes

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∗				●
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

Nil	Straight
L	Bottom

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

Output specification

No.	Description	Applicable display unit
1	Analog output (1 to 5 V)	PFM30□
2	Analog output (4 to 20 mA)	PFM31□

Operation manual

Nil	With operation manual (Japanese and English)
N	None

Calibration certificate

Nil	None
A	With calibration certificate

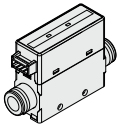
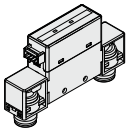
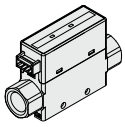
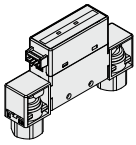
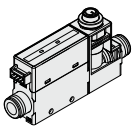
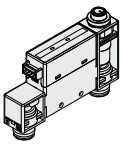
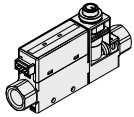
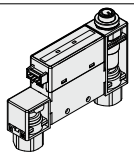
∗ The certificate is written in English and Japanese. Other languages are available as specials.

Option 1
(Refer to page 229.)

Option 2
(Refer to page 229.)

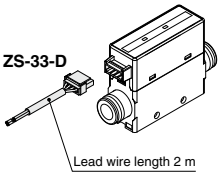
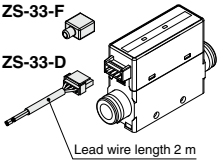
Made to Order
(Refer to pages 229 and 249.)

Piping Variations

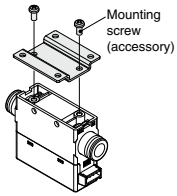
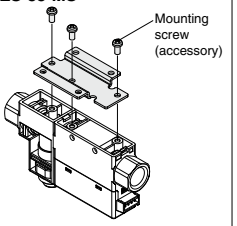
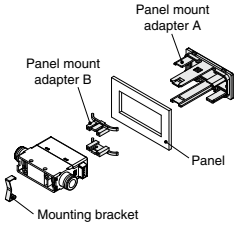
	With One-touch fittings (C4, C6, C8, N7)		Female thread (01, 02, N01, N02, F01, F02)	
	Straight (Nil)	**Bottom (L)**	**Straight (Nil)**	**Bottom (L)**
Without flow adjustment valve (Nil)				
With flow adjustment valve (S)				

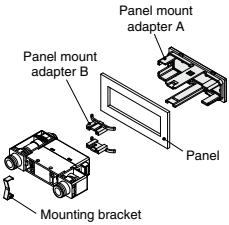
SMC

Option 1

Nil	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
ZS-33-D  	**ZS-33-F** **ZS-33-D**  	

Option 2

Nil	R	S	T
None	Bracket (For without flow adjustment valve) **ZS-33-M**  	Bracket (For with flow adjustment valve) **ZS-33-MS**  Piping direction: Cannot be mounted with bottom piping type.	Panel mount adapter (For without flow adjustment valve) **ZS-33-J** 

V
Panel mount adapter (For with flow adjustment valve) **ZS-33-JS** 

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

Made to Order

Symbol	Specification/Description
X693	Change of piping entry direction combination
X694	

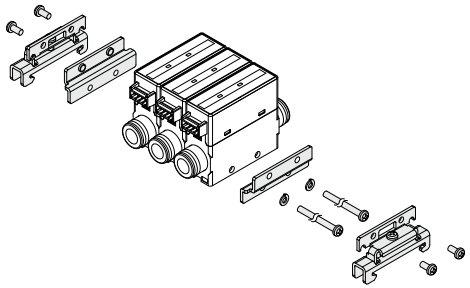
For details, refer to pages 249 and 250.

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: G1/4 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			PFM510	PFM525	PFM550	PFM511
Applicable fluid			Dry air, N_2, Ar, CO_2 (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.)			
Rated flow range (Flow rate range) Note 1)		Dry air, N_2, Ar	0.2 to 10 L/min	0.5 to 25 L/min	1 to 50 L/min	2 to 100 L/min
		CO_2	0.2 to 5 L/min	0.5 to 12.5 L/min	1 to 25 L/min	2 to 50 L/min
Accuracy			±3%F.S.(Fluid: Dry air)			
Repeatability			±1%F.S. (Fluid: Dry air)			
Pressure characteristics			±5%F.S. (0.35 MPa reference)			
Temperature characteristics			±2%F.S. (15 to 35°C) ±5%F.S. (0 to 50°C)			
Operating pressure range			–100 kPa to 750 kPa			
Rated pressure range			–70 kPa to 750 kPa			
Proof pressure			1 MPa			
Analog output		Response time	50 msec or 1 s (with response time selection function: 1 s at no-voltage input)			
		Voltage output	Voltage output: 1 to 5 V Output impedance: 1 kΩ			
		Current output	Current output: 4 to 20 mA Max. load impedance: 600 Ω, Min. load impedance: 50 Ω			
Status LED's			Power ON indicator: Lights when power is turned on (Green). Flow rate indicator: Flashes when flow is applied (Green).			
Power supply voltage			24 VDC ±10%			
Current consumption			35 mA or less			
Environment	Enclosure		IP40			
	Operating fluid temperature		0 to 50°C (with no freezing and condensation)			
	Operating temperature range		Operating: 0 to 50°C Stored: –10 to 60°C (with no freezing and condensation)			
	Operating humidity range		Operating, Stored: 35 to 85%R.H. (with no condensation)			
	Withstand voltage		1000 VAC for 1 minute between terminals and housing			
	Insulation resistance		50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing			
Standards			CE UL, CSA RoHS			

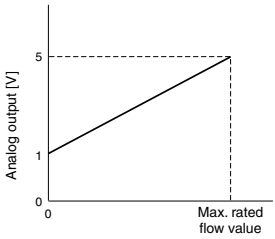
Note 1) Flow rate unit is based on standard conditions (20°C, 1 atm, 65% RH).
Note 2) For details about wiring and thread type, refer to the Operation Manual that can be downloaded from SMC website (http://www.smcworld.com).
Note 3) Any products with tiny scratches, smears, or display color variation or brightness which does not affect the performance are verified as conforming products.

Piping Specifications/Weight

Part no.	01	02	N01	N02	F01	F02	C4	C6	C6	N7
Port size	Rc 1/8	Rc 1/4	NPT 1/8	NPT 1/4	G1/8	G1/4	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: 55 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

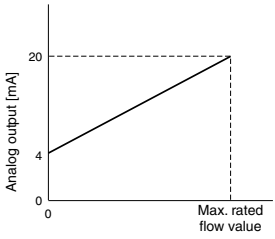
Note) Analog output at maximum rated flow rate when CO_2 is selected is 4.57 [V] for the voltage output type and 18.28 [mA] for the current output type.



Analog Voltage Output (1 to 5 V)

Model	Max. rated flow value [L/min]
PFM510-□-1	10 (5)
PFM525-□-1	25 (12.5)
PFM550-□-1	50 (25)
PFM511-□-1	100 (50)

∗ ( ): Fluid: CO_2



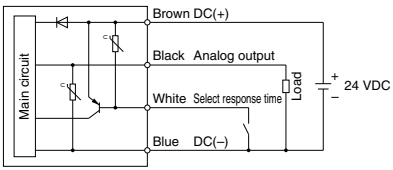
Analog Current Output (4 to 20 mA)

Model	Max. rated flow value [L/min]
PFM510-□-2	10 (5)
PFM525-□-2	25 (12.5)
PFM550-□-2	50 (25)
PFM511-□-2	100 (50)

∗ ( ): Fluid: CO_2

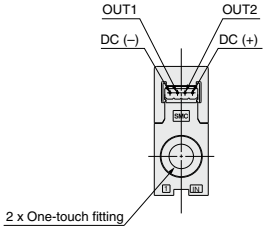
Internal Circuits and Wiring Examples

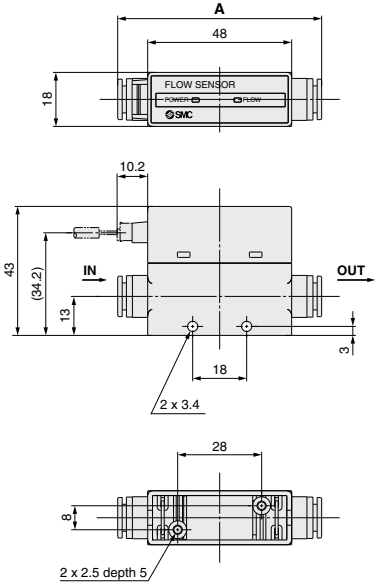
-1/2
1: Analog voltage output
2: Analog current output



Dimensions

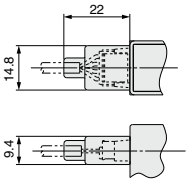
PFM5□□-C4/C6/C8/N7





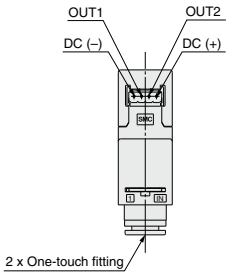
(mm)

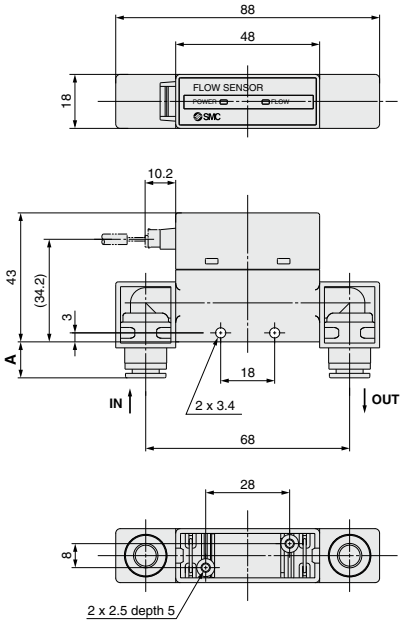
One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	64.2
ø6	64.6
ø8 (5/16")	68
ø1/4"	64.6



With rubber cover for connector

PFM5□□-C4L/C6L/C8L/N7L



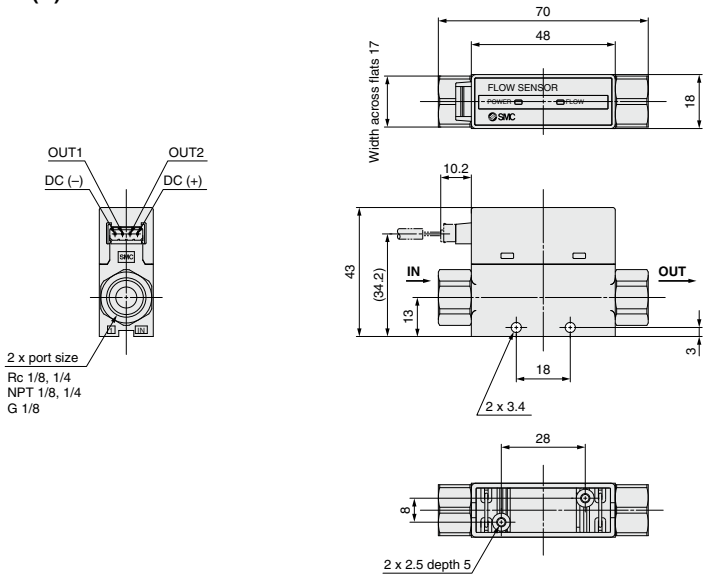


(mm)

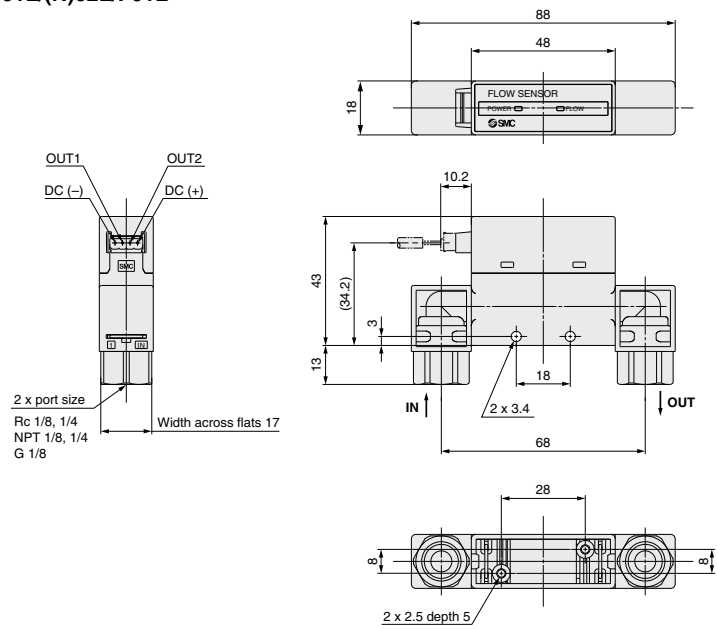
One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	10.1
ø6	10.3
ø8 (5/16")	12
ø1/4"	10.3

Dimensions

PFM5□□-(N)01/(N)02/F01

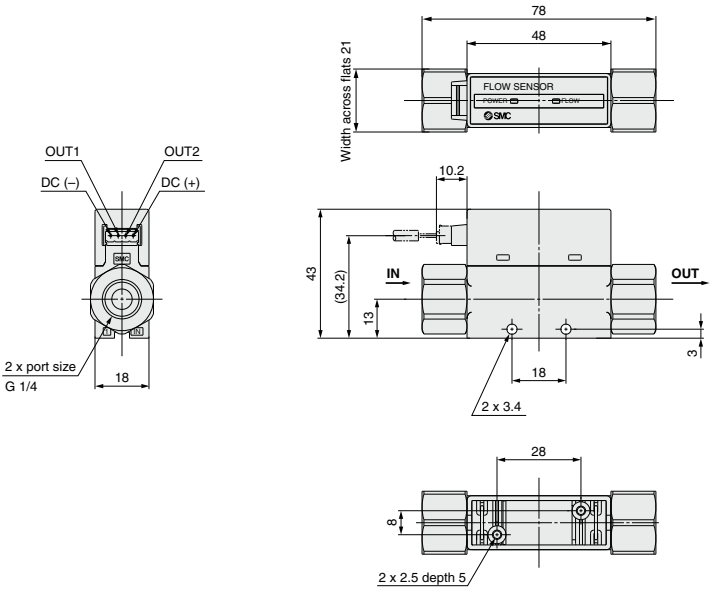


PFM5□□-(N)01L/(N)02L/F01L

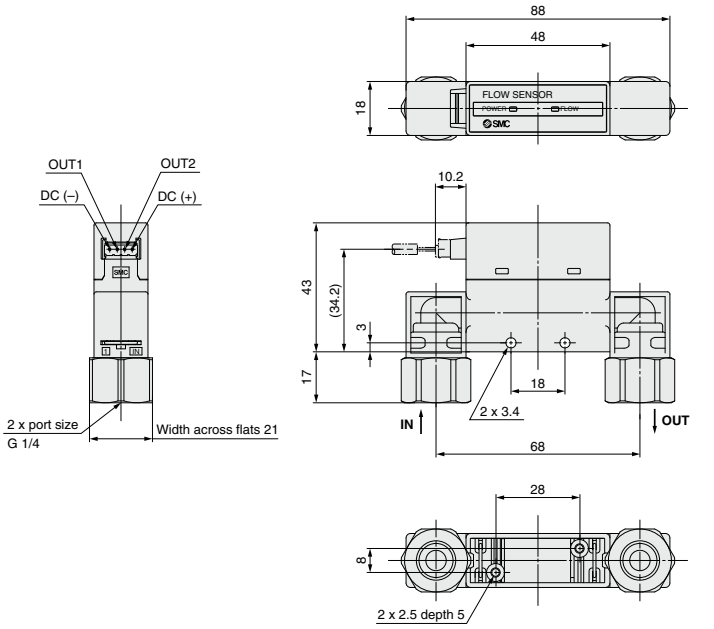


Dimensions

PFM5□□-F02



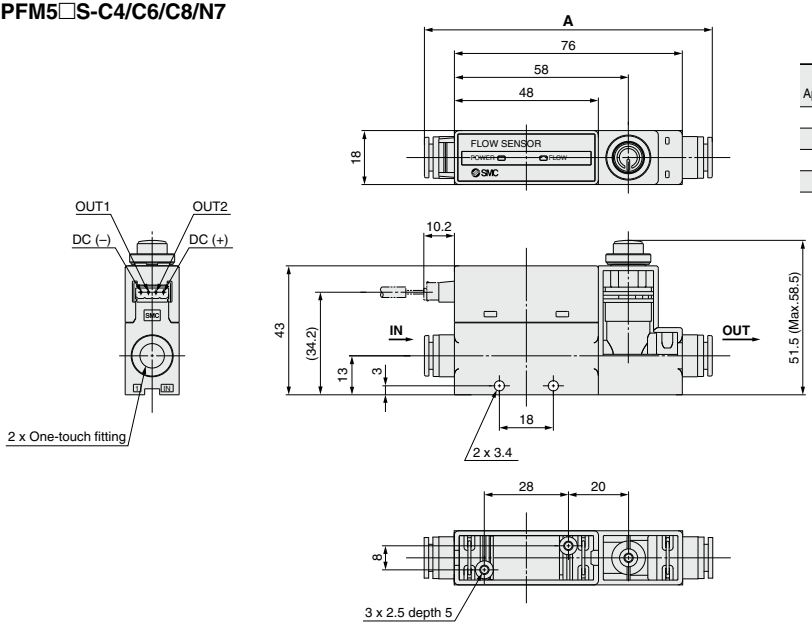
PFM5□□-F02L



SMC

Dimensions

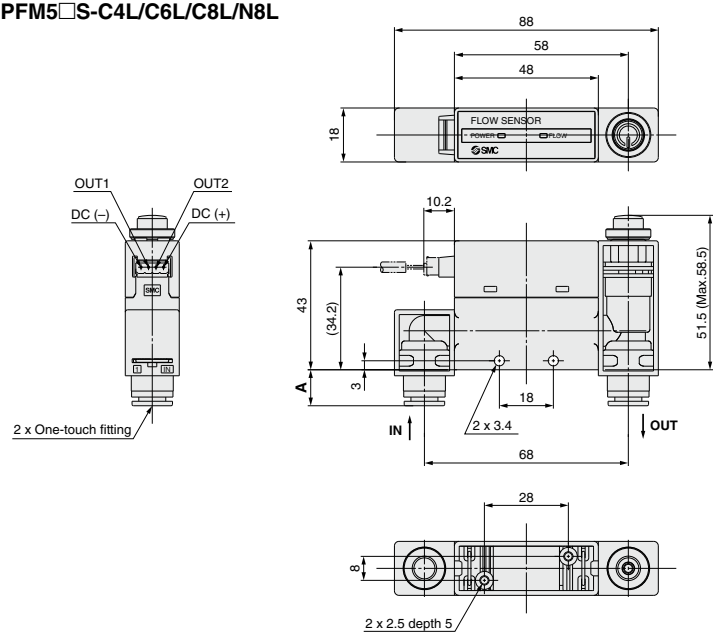
PFM5□S-C4/C6/C8/N7



(mm)

One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	92.2
ø6	92.6
ø8 (5/16")	96
ø1/4"	92.6

PFM5□S-C4L/C6L/C8L/N8L

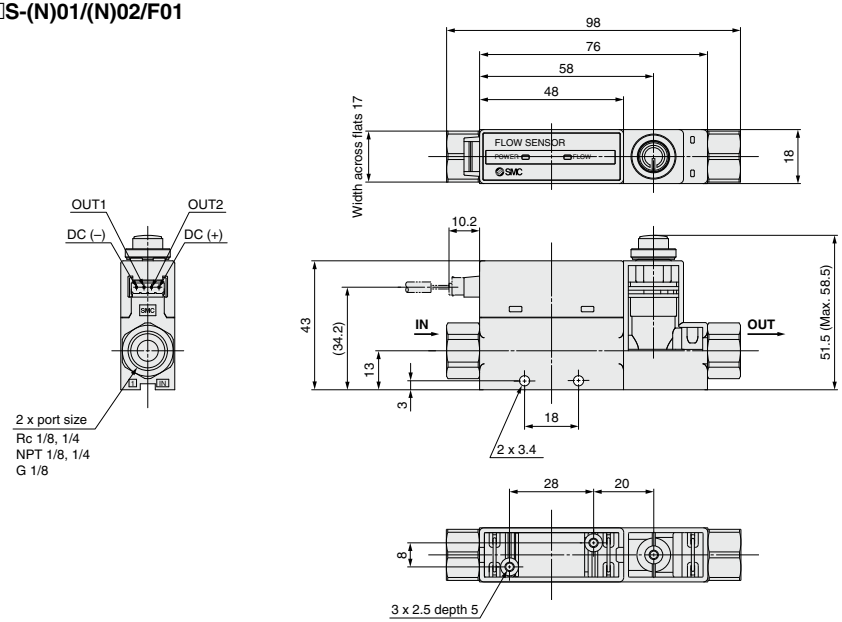


(mm)

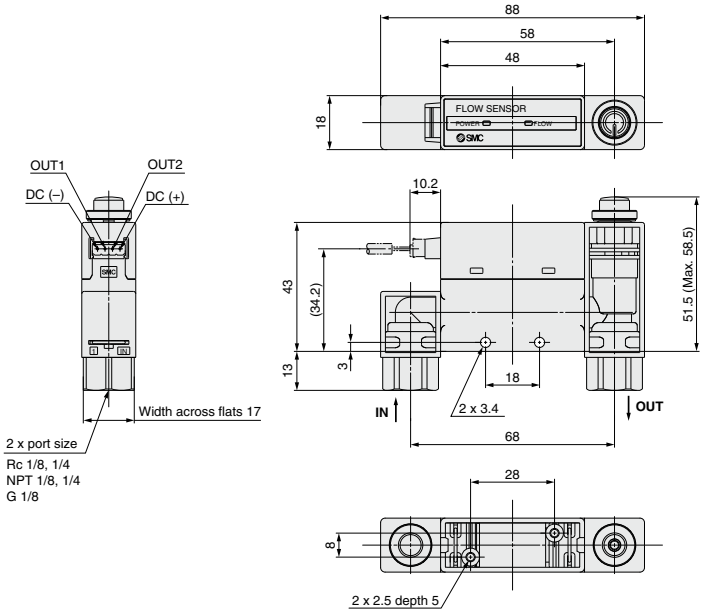
One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	10.1
ø6	10.3
ø8 (5/16")	12
ø1/4"	10.3

Dimensions

PFM5□S-(N)01/(N)02/F01

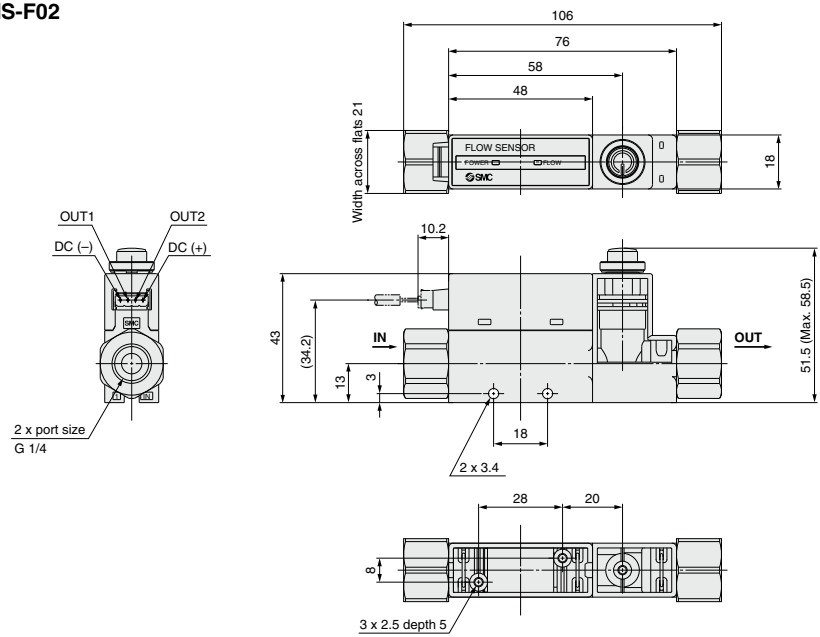


PFM5□S-(N)01L/(N)02L/F01L

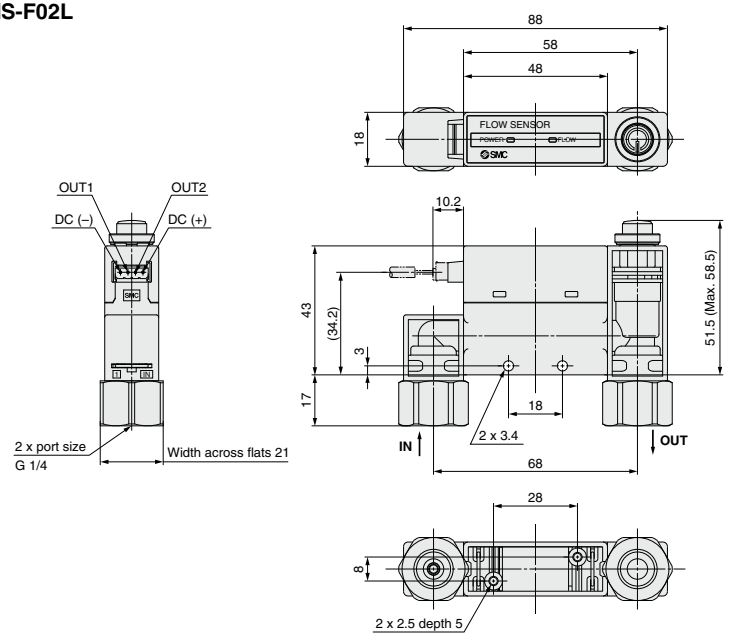


Dimensions

PFM5□S-F02

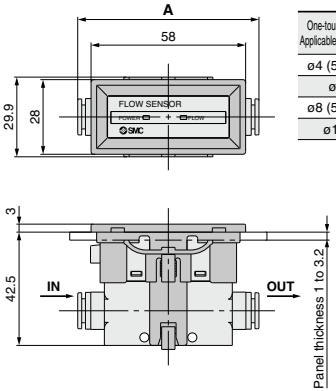


PFM5□S-F02L



Dimensions

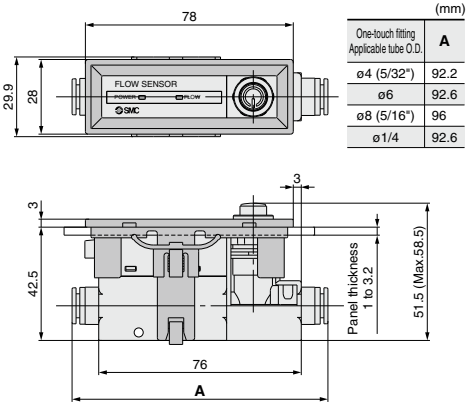
Panel mount adapter/Without flow adjustment valve/Straight



(mm)

One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	64.2
ø6	64.6
ø8 (5/16")	68
ø1/4	64.6

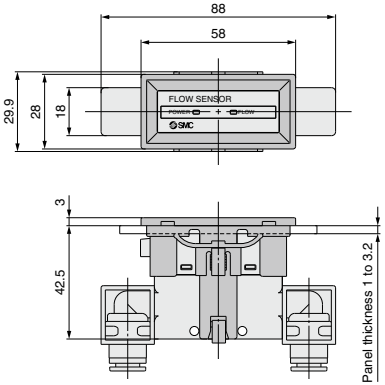
Panel mount adapter/With flow adjustment valve/Straight



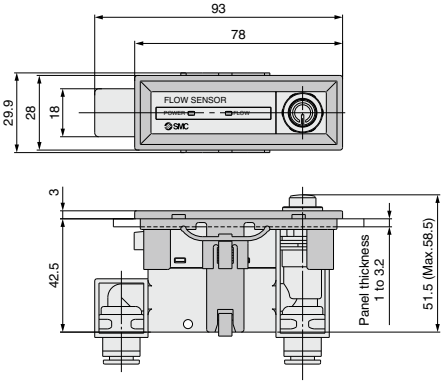
(mm)

One-touch fitting Applicable tube O.D.	A
ø4 (5/32")	92.2
ø6	92.6
ø8 (5/16")	96
ø1/4	92.6

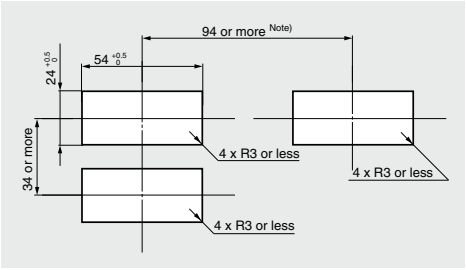
Panel mount adapter/Without flow adjustment valve



Panel mount adapter/With flow adjustment valve



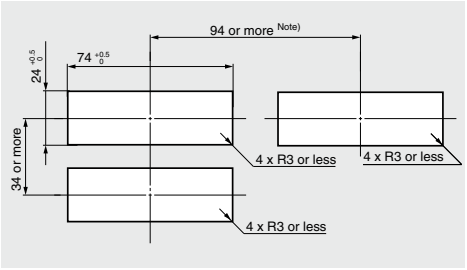
Panel Fitting Dimensions



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.

Panel Fitting Dimensions

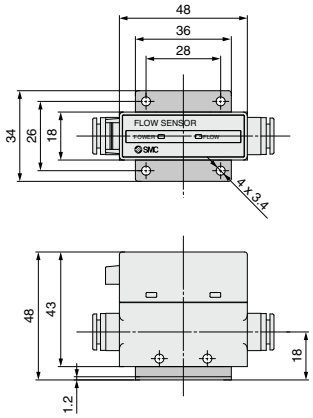


Panel thickness 1 to 3.2 mm

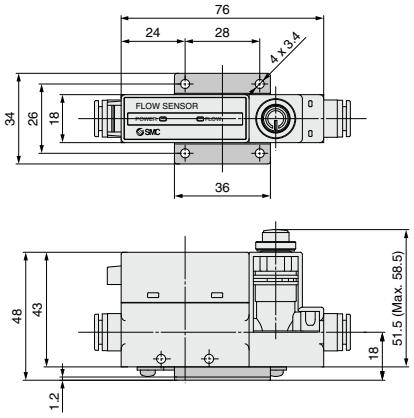
Note) Piping entry direction: Minimum dimensions for bottom side piping. If using straight piping, the piping material and tubing need to be taken into consideration when designing the system. If a bend (R) is used, limit it to R3 or less.

Dimensions

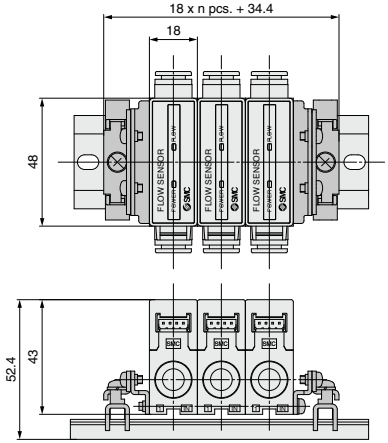
With bracket/Without flow adjustment valve



With bracket/With flow adjustment valve

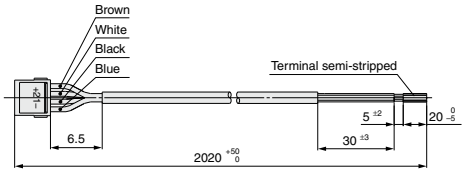


DIN rail mounting



- DIN rail (supplied by customers)
- Port size, F02: G1/4 cannot be mounted on the DIN rail.

Lead wire with connector ZS-33-D



Cable Specifications of Lead Wire with Connector

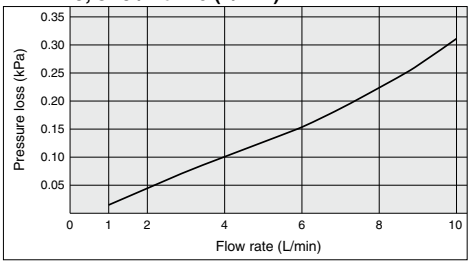
Conductor	Nominal cross section area	AWG26
	External diameter	Approx. 0.50 mm
Insulation	External diameter	Approx. 1.00 mm
	Colors	Brown, White, Black, Blue
Sheath	Material	Oil-resistant PVC
Finished external diameter		ø3.5

∗ Connects to the PFM3□□ series.

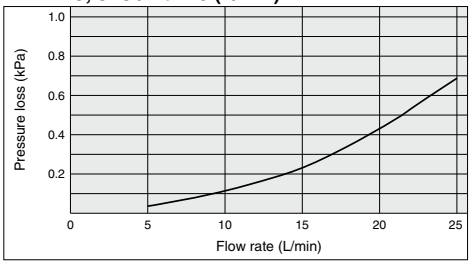
PFM7/PFM5 Series
Common Specifications

Pressure Loss (Pressure: 0.35 [MPa])

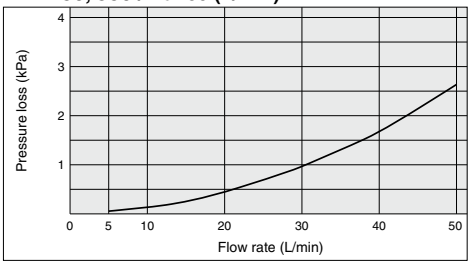
PFM710, 510 / For 10 (L/min)



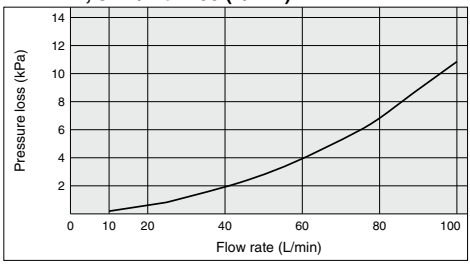
PFM725, 525 / For 25 (L/min)



PFM750, 550 / For 50 (L/min)

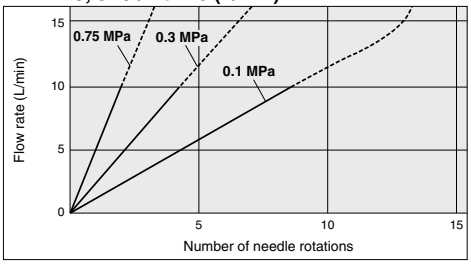


PFM711, 511 / For 100 (L/min)

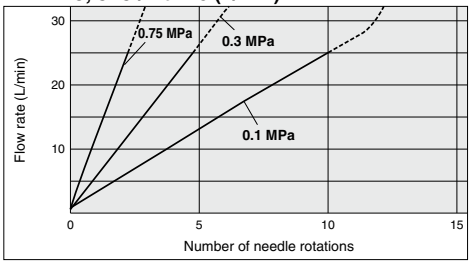


Flow Rate Characteristics (Reference Value)

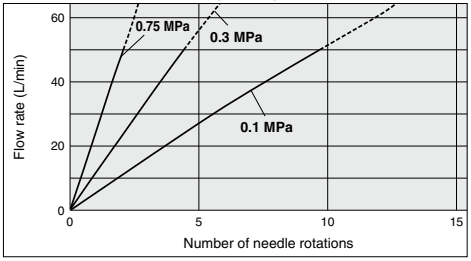
PFM710, 510 / For 10 (L/min)



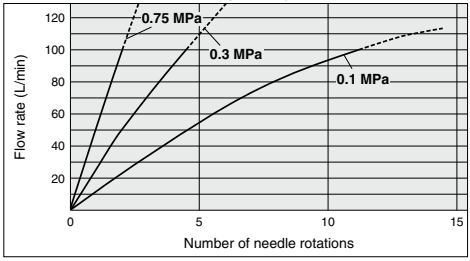
PFM725, 525 / For 25 (L/min)



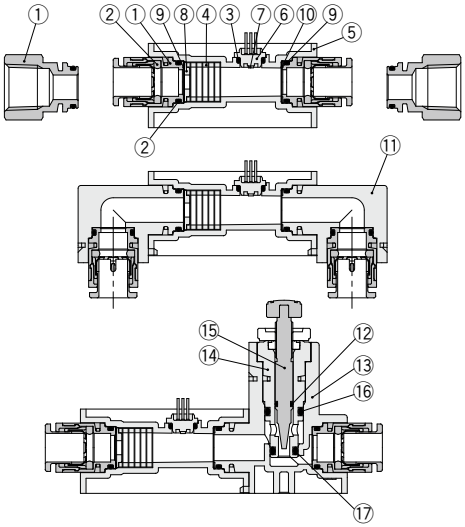
PFM750, 550 / For 50 (L/min)



PFM711, 511 / For 100 (L/min)



Wetted parts construction

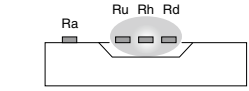


Component Parts

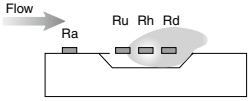
No.	Description	Material	Note
1	**Fitting for piping**	Brass	Electroless nickel plating
2	**O-ring**	FKM	Fluoro coated
3	**O-ring**	HNBR	Fluoro coated
4	**Rectifying module**	Stainless steel 304	
5	**Body**	PBT	
6	**Sensor housing**	LCP	
7	**Sensor chip**	Silicon	
8	**Orifice**	Brass	Electroless nickel 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.



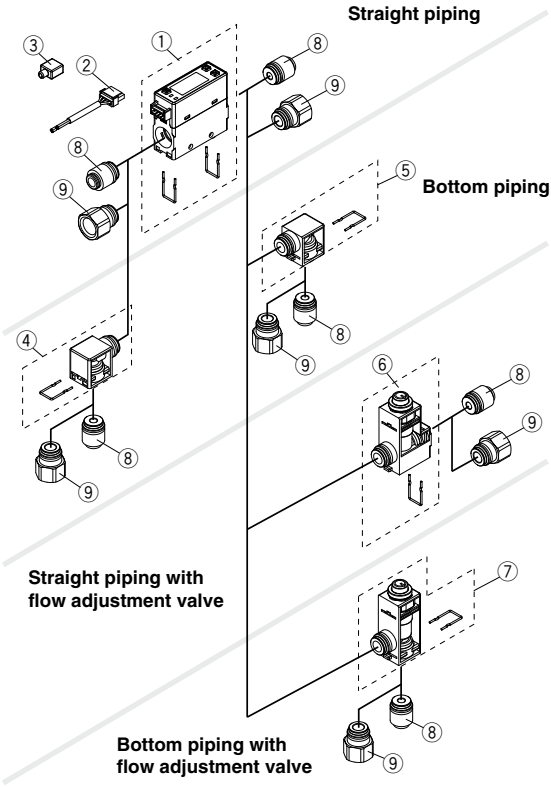
(a) The gas is static.



(b) The gas flows from the left side.

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
		For 100 L/min	ZS-33-11N
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
		For 100 L/min	ZS-33-11NL
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

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

The repeatability accuracy is ±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.

Flow Sensor Monitor
PFM3 Series

RoHS

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 + External input Note)
3	2 PNP outputs + 1 to 5 V output
4	2 PNP outputs + 4 to 20 mA output
5	2 PNP outputs + External input Note)

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

Operation manual

Nil	With operation manual (Japanese and English)
N	None

Calibration certificate

Nil	None
A	With calibration certificate

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

PFM3 [0] [0] – [M] [L] [ ] [ ] – [ ] [ ]

Type

3	Remote display unit

Input specification

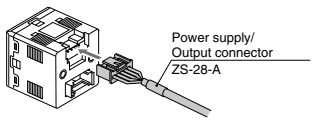
Symbol	Content	Applicable remote type sensor unit
0	Voltage input	PFM5□□(S)-□-1-□
1	Current input	PFM5□□(S)-□-2-□

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

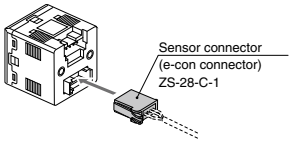
Note) Fixed unit: Instantaneous flow rate: L/min
Accumulated flow: L

Option 1

Nil	None
L	Power supply/Output connector 

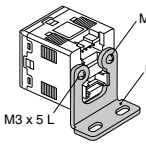
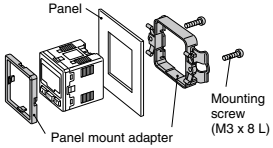
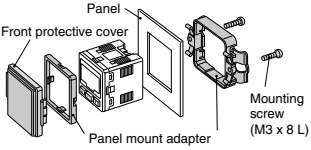
Note) Cable is not connected, but shipped together.

Option 3

Nil	None
F	With sensor connector 

Note) Connector is not connected, but shipped together.

Option 2

Nil	None
E	Bracket 
B	Panel mount adapter 
D	Panel mount adapter + Front protective cover 

Note) Options are not assembled, but shipped together.

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	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.)

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.

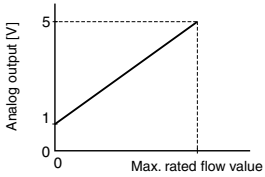
Model		PFM3□□			
Rated flow range (Flow rate range)	**Dry air, N_2, Ar**	0.2 to 10 L/min	0.5 to 25 L/min	1 to 50 L/min	2 to 100 L/min
	CO_2	0.2 to 5 L/min	0.5 to 12.5 L/min	1 to 25 L/min	2 to 50 L/min
Displayable range Note 1)	**Dry air, N_2, Ar**	0.2 to 10.5 L/min	0.5 to 26.3 L/min	1 to 52.5 L/min	2 to 105 L/min
	CO_2	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
Settable range Note 1)	**Dry air, N_2, 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_2	0 to 5.2 L/min	0 to 13.1 L/min	0 to 26.2 L/min	0 to 52 L/min
Minimum unit setting Note 2)		0.01 L/min	0.1 L/min	0.1 L/min	0.1 L/min
Accumulated pulse flow rate exchange value		0.1 L/pulse	0.1 L/pulse	0.1 L/pulse	1 L/pulse
Indication unit Note 3)		Instantaneous flow rate L/min, CFM x 10^{-2} Accumulated flow L, ft^3 x 10^{-1}			
Accumulated flow range Note 4)		1999999 L			
Power supply voltage		24 VDC ±10% (With polarity protection)			
Current consumption		50 mA or less			
Sensor input **Number of inputs: 1**		PFM30□: Voltage input 1 to 5 VDC (input impedance: 1 MΩ) PFM31□: Current input 4 to 20 mA DC (input impedance: 250 Ω)			
Hysteresis Note 5)		Hysteresis mode: Variable, Window comparator mode: Variable			
Switch output		NPN or PNP open collector output: 2 outputs Maximum 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			
Accumulated pulse output		NPN or PNP open collector output (Same as switch output)			
Response time		1 s (50 ms, 0.5 s, 2 s can be selected.)			
Repeatability		±0.1%F.S., Analog output accuracy: ±0.3%F.S.			
Analog output		Voltage output: 1 to 5 VDC (0 L/min to max. rated flow rate value) Output impedance: Approx. 1 kΩ, Accuracy: ±1%F.S. (relative to display value) Current output: 4 to 20 mA DC (0 L/min to max. rated flow rate value) Max. load impedance: 600 Ω (at 24 VDC), Min. load impedance: 50 Ω Accuracy: ±1%F.S. (relative to display value)			
Display accuracy		±0.5%F.S. ±1 digit			
Display method		3+1/2-digit, 7-segment LED 2-color display (Red/Green) Sampling cycle: 10 times/sec			
Status LED's		OUT1: Lights up when output is turned ON (Green). OUT2: Lights up when output is turned ON (Red).			
External input Note 6)		No-voltage input (Reed or Solid state), LOW level input 30 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 (with no freezing and condensation)			
Operating humidity range		Operating, Stored: 35 to 85%R.H. (with no condensation)			
Withstand voltage		1000 VAC for 1 minute between terminals and housing			
Insulation resistance		50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing			
Temperature characteristics		±0.5%F.S. (25°C reference)			
Standards		CE UL, CSA RoHS			
Connection		Power supply/Output connection: 5P connector, Sensor connection: 4P connector			
Material		Front case, Rear case: PBT			
Weight		30 g (Without cable) 85 g (With cable)			

Note 1) Select the sensor to connect in the initial setting. If CO_2 is selected as the operating fluid, the value is 1/2 on the maximum side.
Note 2) When 10 L/min with a minimum unit setting of 0.01 L/min is selected for the connected sensor, the upper limit of the display range is 10.50 L/min.
When 100 L/min with a minimum unit setting of 0.1 L/min is selected for the connected sensor, the upper limit of the display range is 105.0 L/min.
The setting at the time of shipment is 10 L/min with a minimum unit setting of 0.1 L/min for the connected sensor.
Note 3) When equipped with a unit switching function. (The SI unit (L/min or L) is fixed for types with no unit switching function.)
Note 4) The accumulated flow value is cleared to 0 when power is turned off. It is possible to select function that holds the accumulated flow value so it is not cleared. (The accumulated flow value can be held at 2- or 5-minute intervals.) The service life of the memory element (electronic component) is limited to 1 million overwrite cycles (assuming 24-hour operation, 5 minutes x 1 million cycles = 5 million minutes = 9.5 years) when 5-minute intervals are selected. Therefore, when using the holding function, calculate the service life based on the usage conditions, and use the switch within the service life. Applies to models equipped with a unit switching function. (The SI unit (L/min or L) is fixed for types with no unit switching function.)
Note 5) Set to hystresis mode at the time of shipment from the factory. Can be changed to window comparator mode using push-buttons.
Note 6) Accumulated external reset function at the time of shipment from the factory. Auto-shift or auto-shift zero function can be selected using push-buttons.
Note 7) For details about wiring and thread type, refer to the Operation Manual that can be downloaded from SMC website (http://www.smcworld.com).
Note 8) Any products with tiny scratches, smears, or display color variation or brightness which does not affect the performance are verified as conforming products.

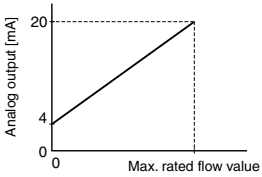
Analog Output

Note: Analog output at maximum rated flow rate when CO_2 is selected is 3 [V] for the voltage output type and 12 [mA] for the current output type.

1 to 5 VDC



4 to 20 mA DC



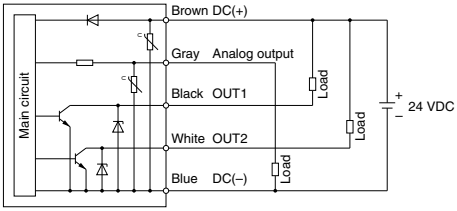
Rated flow range	Max. rated flow value [L/min]
0.2 to 10 L/min	10 (5)
0.5 to 25 L/min	25 (12.5)
1 to 50 L/min	50 (25)
2 to 100 L/min	100 (50)

∗ ( ): Fluid: CO_2

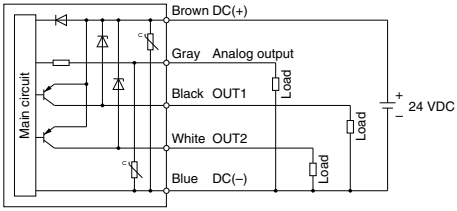
SMC

Internal Circuits and Wiring Examples

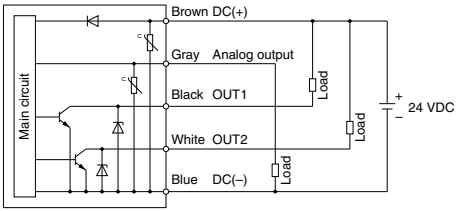
-0
NPN (2 outputs) + Analog voltage output



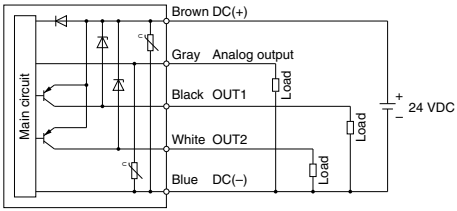
-3
PNP (2 outputs) + Analog voltage output



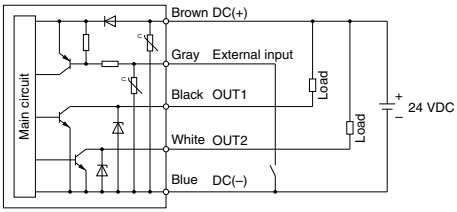
-1
NPN (2 outputs) + Analog current output



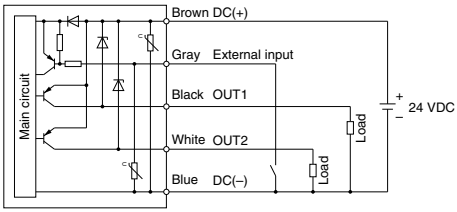
-4
PNP (2 outputs) + Analog current output



-2
NPN (2 outputs) + External input

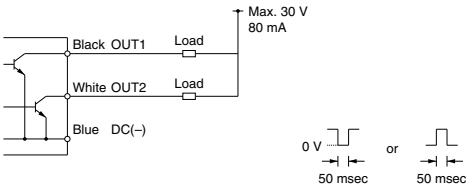


-5
PNP (2 outputs) + External input

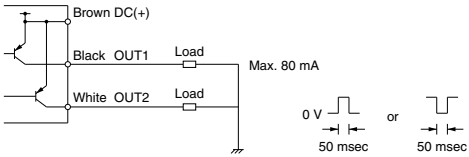


Accumulated pulse output wiring examples

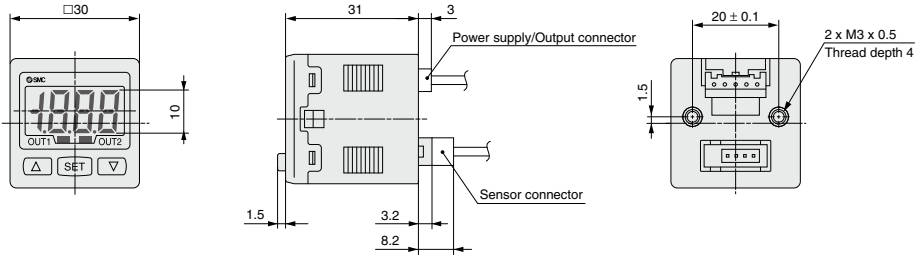
-0/1/2



-3/4/5

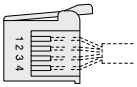


Dimensions



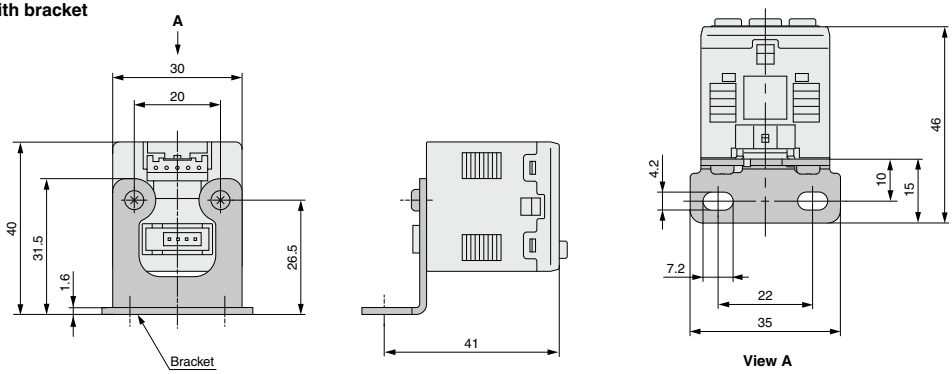
Sensor connector (ZS-28-C-1)

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

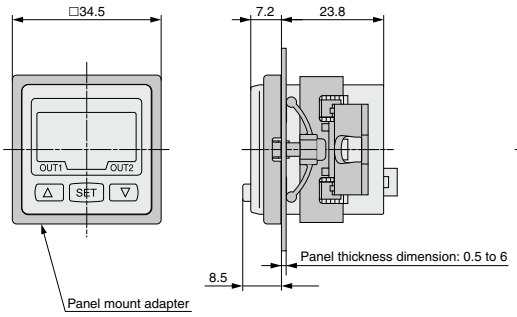


* 1 to 5 V or 4 to 20 mA

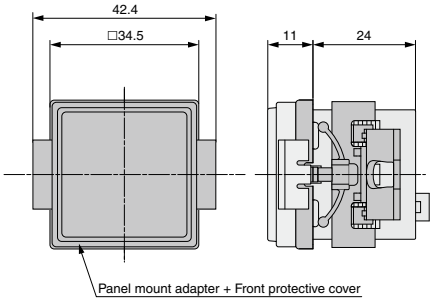
With bracket



With panel mount adapter



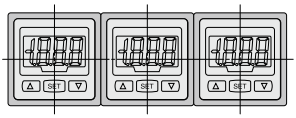
With panel mount adapter + Front protective cover



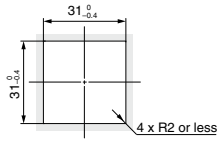
Dimensions

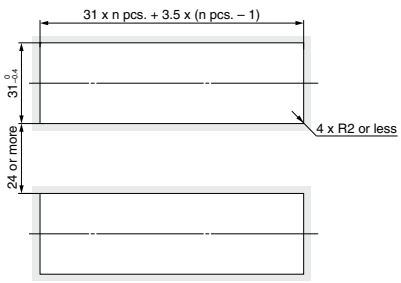
Panel fitting dimensions

Secure mounting of n (2 or more) switches (horizontal)

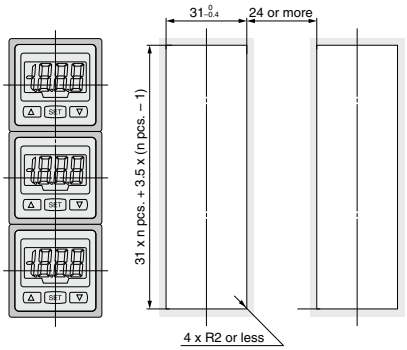


1 pc.



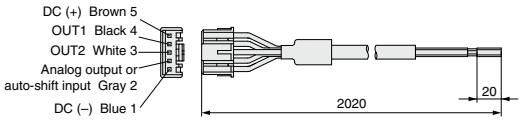


Secure mounting of n (2 or more) switches (vertical)



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

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



Cable Specifications

Conductor	**Nominal cross section area**	0.2 mm^2
	External diameter	0.58 mm
Insulation	**External diameter**	Approx. 1.12 mm
	Colors	Brown, Black, White, Gray, Blue
Sheath	**Material**	Oil-resistant PVC
Finished external diameter		ø4.1

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_2) is used, the setting needs to be changed.

Dry air, N_2
Argon
CO_2

Note) When CO_2 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).

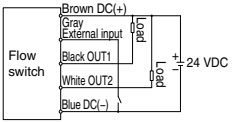
■ Indication mode
The indication mode can be selected between instantaneous flow rate and accumulated flow.

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.

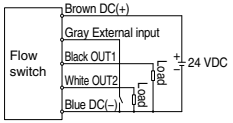
■ External input wiring example
PFM3□2

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

■ Keylock 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.

Made to Order 1

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

Made to Order

1 Changing the Piping Entry Direction Combination for IN and OUT Side

Symbol: **X693, X694**

PFM 7 □□–□ _ –□–□□□–X693

- **Type**

5	Remote sensor unit
7	Integrated display

- **Piping entry direction**
  Note) No symbol is entered.

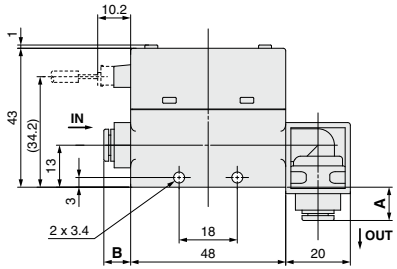
- **Changing the piping entry direction combination**

X693	IN side: Straight/OUT side: Bottom
X694	IN side: Bottom/OUT side: Straight

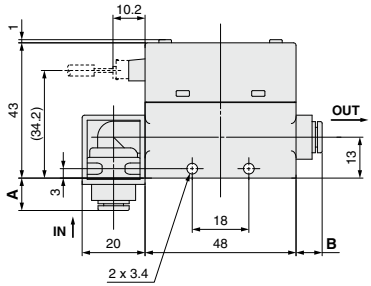
For details of How to Order, refer to pages 214 and 228.

Dimensions

PFM$^{7}_{5}$□□-C4/C6/C8/N7-□-X693

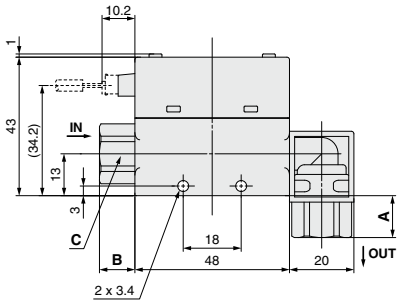


PFM$^{7}_{5}$□□-C4/C6/C8/N7-□-X694

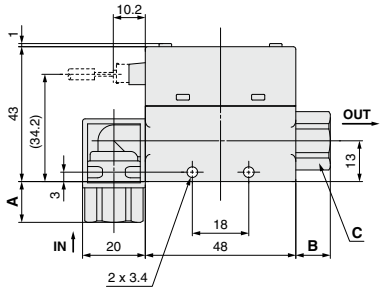


One-touch fitting Applicable tube O.D.		A	B
C4	ø4 (5/32")	10.1	8.1
C6	ø6	10.3	8.3
C8	ø8 (5/16")	12	10
N7	ø1/4	10.3	8.3

PFM$^{7}_{5}$□□-□01/02-□-X693



PFM$^{7}_{5}$□□-□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	11	17
G 1/4	17	15	21

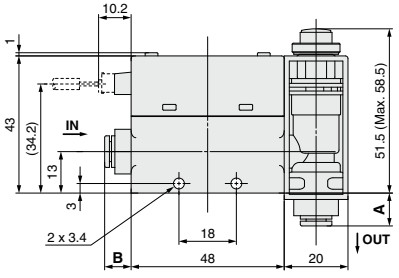
Made to Order 2

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

Made to Order

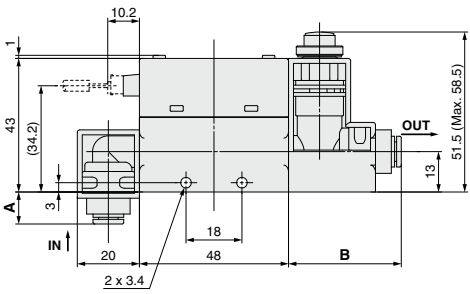
Dimensions

PFM$^{7}_{5}$□□S-C4/C6/C8/N7-□-X693



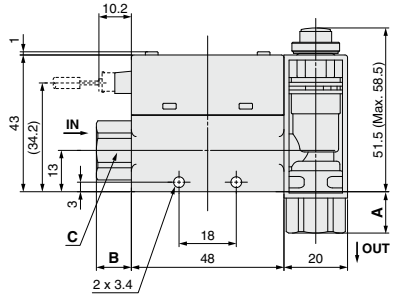
One-touch fitting Applicable tube O.D.	A	B
ø4 (5/32")	10.1	8.1
ø6	10.3	8.3
ø8 (5/16")	12	10
ø1/4	10.3	8.3

PFM$^{7}_{5}$□□S-C4/C6/C8/N7-□-X694



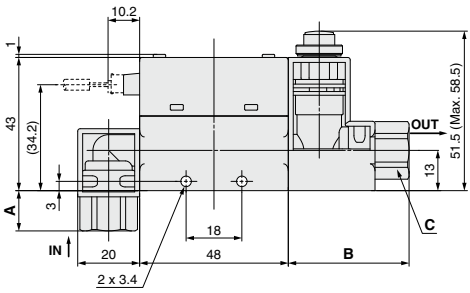
One-touch fitting Applicable tube O.D.	A	B
ø4 (5/32")	10.1	36.1
ø6	10.3	36.3
ø8 (5/16")	12	37
ø1/4	10.3	36.3

PFM$^{7}_{5}$□□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$^{7}_{5}$□□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

Made to Order 3

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

Made to Order

Symbol **X731**

2 Compatibility with Argon (Ar) and Carbon Dioxide (CO_2) Mixed Gas

The argon–carbon dioxide gas ratio (Ar: CO_2) can be selected using the push-buttons from among the following: 92 : 8, 90 : 10, 80 : 20, 70 : 30, and 60 : 40. Dimensions are same as those of standard models.

PFM 7 □□-□□-□-□□□-X731

7 Integrated display

For details of How to Order, refer to pages 214 and 228.

Model	Gas ratio		Rated flow range	Displayable range	Settable range	Max. analog output	
	Ar	CO_2				Voltage (Vmax)	Current (Imax)
PFM710	92%	8%	0.2 to 7.0 L/min	0.2 to 7.4 L/min	0 to 7.4 L/min	3.80 V	15.2 mA
	90%	10%					
	80%	20%					
	70%	30%					
	60%	40%					
PFM725	92%	8%	0.5 to 25.0 L/min	0.5 to 26.3 L/min	0 to 26.3 L/min	5.00 V	20.0 mA
	90%	10%					
	80%	20%	0.5 to 20.0 L/min	0.5 to 21.0 L/min	0 to 21.0 L/min	4.20 V	16.8 mA
	70%	30%					
	60%	40%					
PFM750	92%	8%	1.0 to 50.0 L/min	1.0 to 52.5 L/min	0 to 52.5 L/min	5.00 V	20.0 mA
	90%	10%					
	80%	20%	1.0 to 40.0 L/min	1.0 to 42.0 L/min	0 to 42.0 L/min	4.20 V	16.8 mA
	70%	30%					
	60%	40%					
PFM711	92%	8%	2 to 100 L/min	2 to 105 L/min	0 to 105 L/min	5.00 V	20.0 mA
	90%	10%					
	80%	20%	2 to 90 L/min	2 to 95 L/min	0 to 95 L/min	4.60 V	18.4 mA
	70%	30%	2 to 80 L/min	2 to 84 L/min	0 to 84 L/min	4.20 V	16.8 mA
	60%	40%					

Output characteristics using mixed gas