Flow Sensor Monitor
Series PFM3

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.

Instruction manual

Nil	With instruction manual (Leaflet: 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

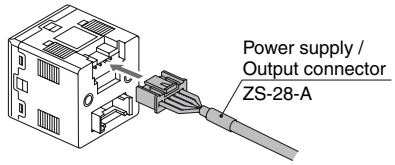
Symbol	Content	Applicable remote type sensor unit
0	Voltage input	PFM5□□(S)-□-1-□
1	Current input	PFM5□□(S)-□-2-□

Unit specification

Nil	With unit switching function Note 1)
M	Fixed SI unit Note 2)

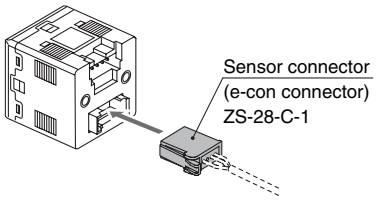
Note 1) This product is for overseas use only according to the new Measurement Law. (The SI unit is provided for use in Japan.)
Note 2) Fixed unit: Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Option 1

Nil	None
L	Power supply / Output connector 

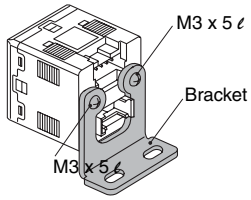
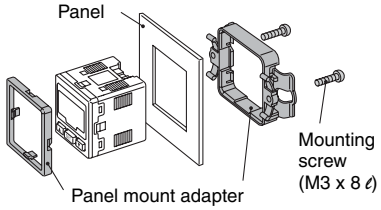
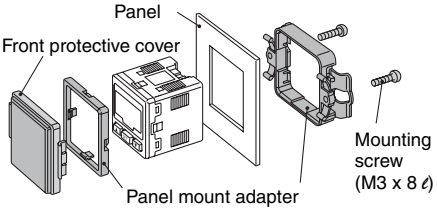
Note) Cable is not connected, but shipped together.

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

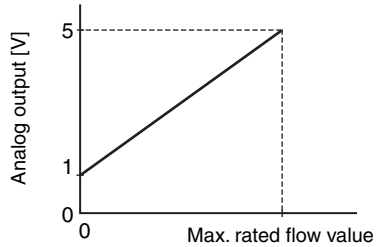
Model		PFM3□□			
Rated flow range (Flow rate range)	**Dry air, N_2, Ar**	0.2 to 10 ℓ/min	0.5 to 25 ℓ/min	1 to 50 ℓ/min	2 to 100 ℓ/min
	CO_2	0.2 to 5 ℓ/min	0.5 to 12.5 ℓ/min	1 to 25 ℓ/min	2 to 50 ℓ/min
Displayable range Note 1)	**Dry air, N_2, Ar**	0.2 to 10.5 ℓ/min	0.5 to 26.3 ℓ/min	1 to 52.5 ℓ/min	2 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)		Real-time 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 (ripple 10% or less) (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 M) PFM31□: Current input 4 to 20 mADC (input impedance: 250)			
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. or less, Analog output accuracy: ±0.3%F.S. or less			
Analog output		Voltage output: 1 to 5 VDC (0 ℓ/min to max. rated flow rate value) Output impedance: Approx. 1 k, Accuracy: ±1%F.S. or less (relative to display value) Current output: 4 to 20 mADC (0 ℓ/min to max. rated flow rate value) Max. load impedance: 600 (at 24 VDC), Min. load impedance: 50 Accuracy: ±1%F.S. or less (relative to display value)			
Display accuracy		±0.5%F.S. ±1 digit or less			
Display method		3+1/2-digit, 7-segment LED 2-color display (Red/Green) Sampling cycle: 10 times/sec			
Status LED's		OUT1: Illuminates when output is turned ON (Green). OUT2: Illuminates 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 50ºC Stored: –10 to 60ºC (with no freezing and condensation)			
Operating humidity range		Operating, Stored: 35 to 85%R.H. (with no condensation)			
Withstand voltage		1000 VAC for 1 min. between whole charging part and live part			
Insulation resistance		50 M or more (500 VDC Mega) between whole charging part and live part			
Vibration resistance		10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller. (de-energized)			
Impact resistance		100 m/s^2 in X, Y, Z directions 3 times each(de-energized)			
Temperature characteristics		±0.5%F.S. or less (based on 25C)			
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 0.01 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.

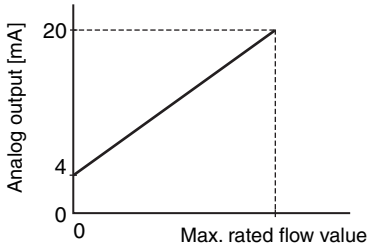
Analog Output

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 mADC



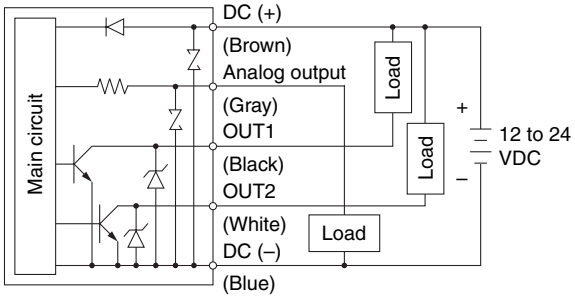
Rated flow range	Max. rated flow value [ℓ/min]
0.2 to 10 ℓ/min	10 (5)
0.5 to 25 ℓ/min	25 (12.5)
1 to 50 ℓ/min	50 (25)
2 to 100 ℓ/min	100 (50)

∗ ( ): Fluid: CO_2

Internal Circuits

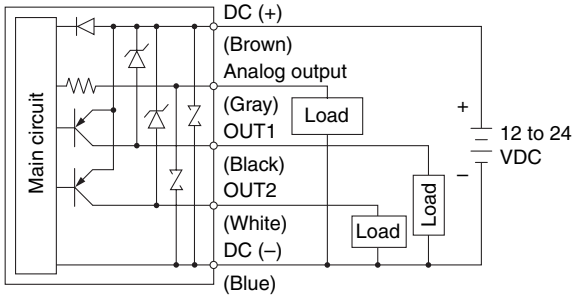
PFM3□0

NPN open collector output: 2 outputs
Max. 30 V, 80 mA, residual voltage 1 V or less
Analog output: 1 to 5 V
Output impedance: approx. 1 k



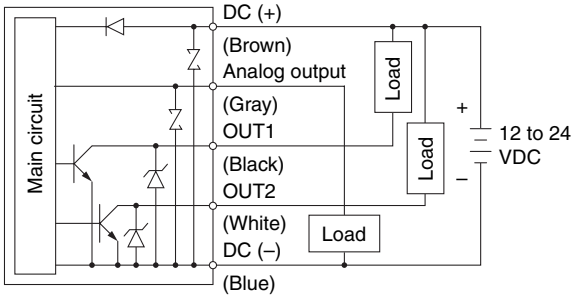
PFM3□3

PNP open collector output: 2 outputs
Max. 80 mA, residual voltage 1 V or less
Analog output: 1 to 5 V
Output impedance: approx. 1 k



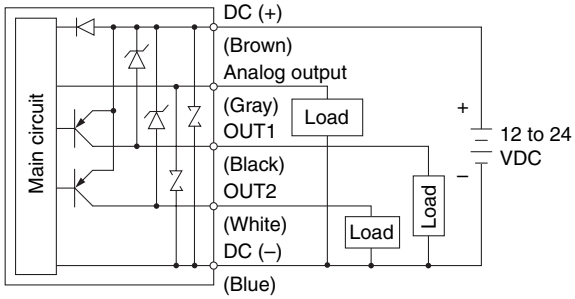
PFM3□1

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



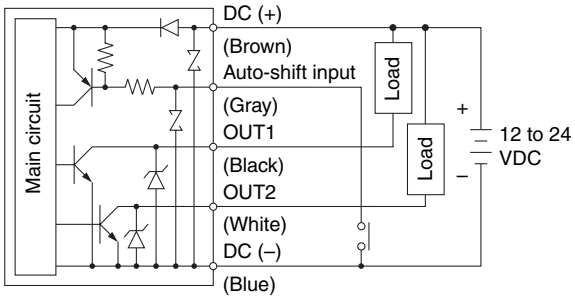
PFM3□4

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



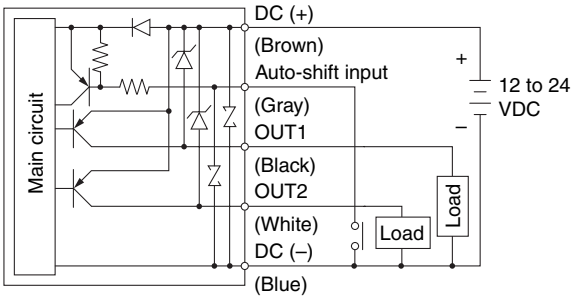
PFM3□2

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

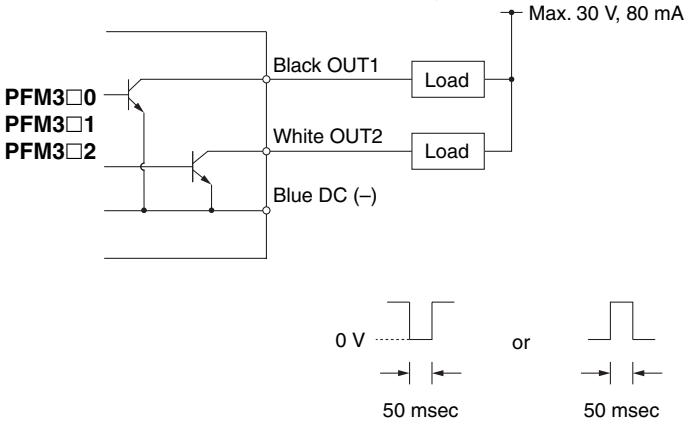


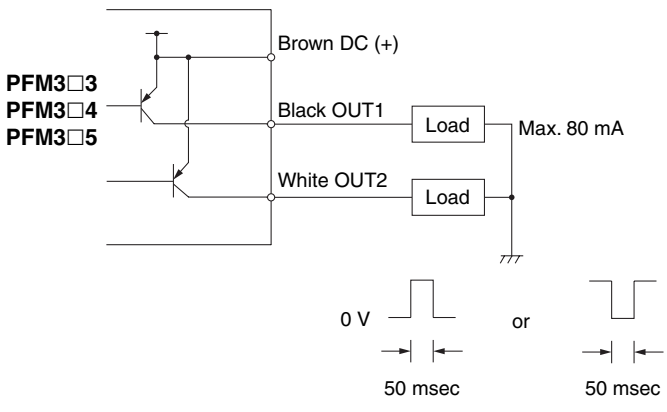
PFM3□5

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

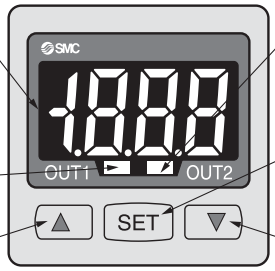


Accumulated pulse output wiring example





Descriptions



LCD Display

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

Output (OUT1) Indicator (Green)

Lights when the output (OUT1) is turned on.

△ Button

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

Output (OUT2) Indicator (Red)

Lights when the output (OUT2) is turned on.

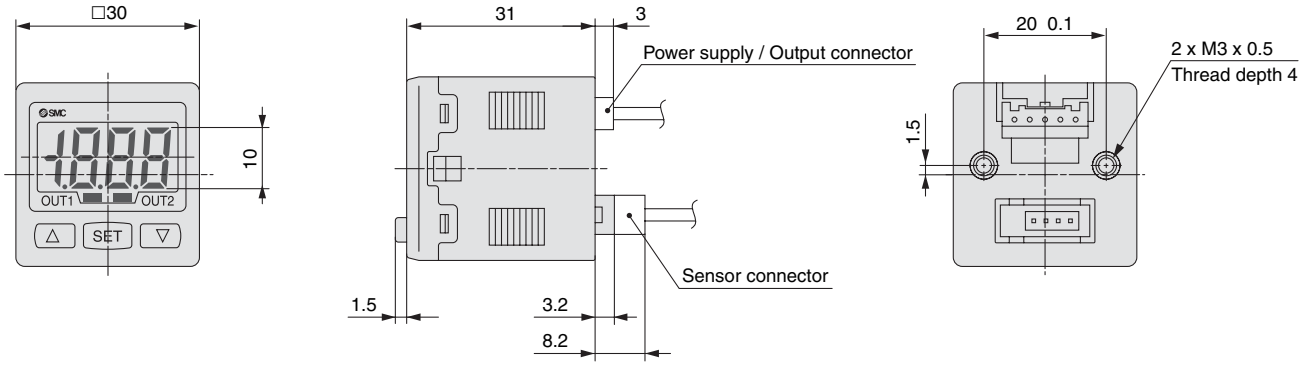
SET Button

Used to activate mode changes and new setting values.

▽ Button

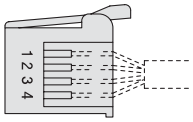
Used for mode selection and decreasing the on/off setting value. Also used to switch to bottom display mode.

Dimensions



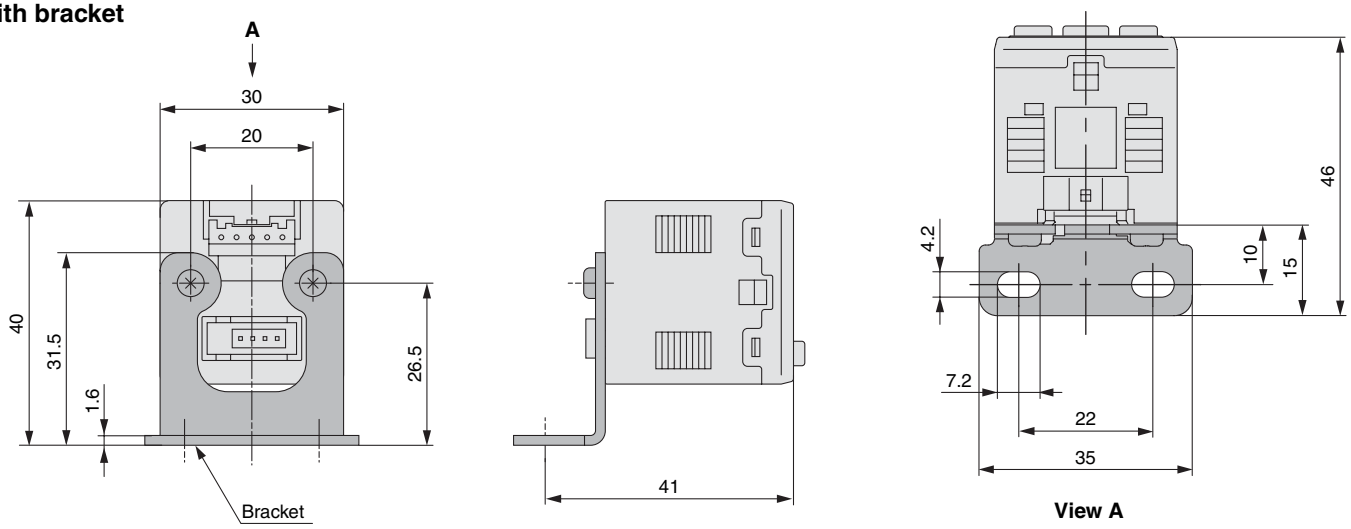
Sensor connector (ZS-28-C-1)

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

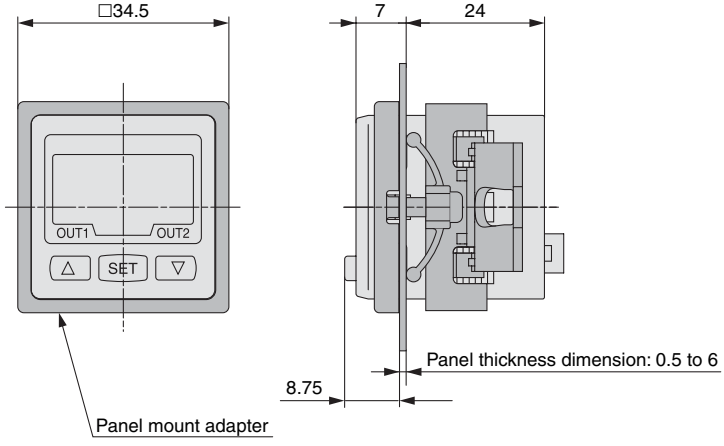


∗ 1 to 5 V or 4 to 20 mA

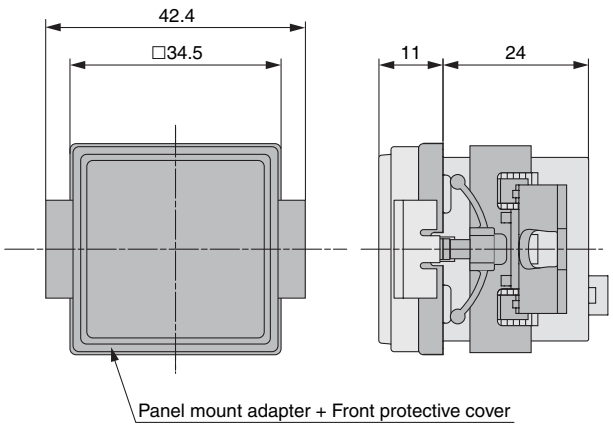
With bracket



With panel mount adapter



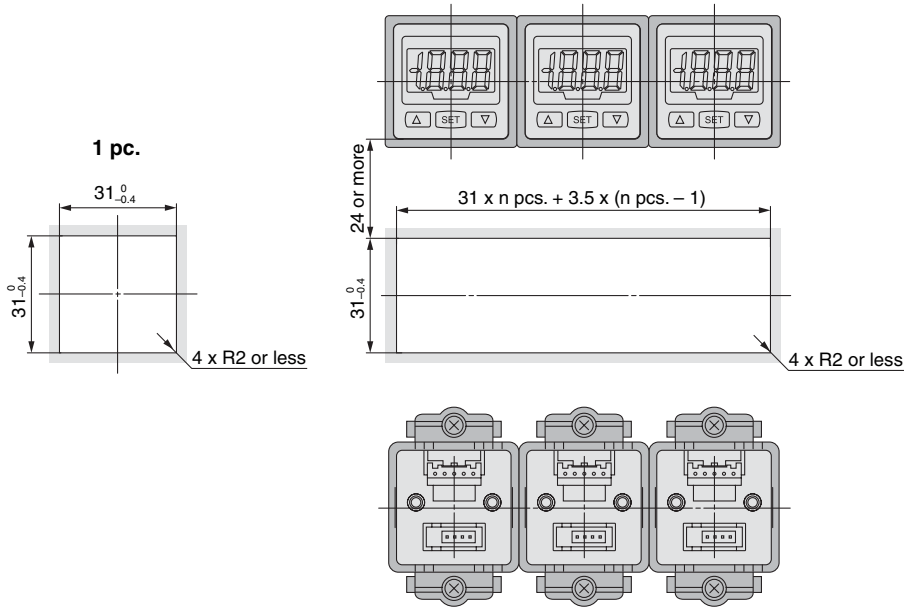
With panel mount adapter + Front protective cover



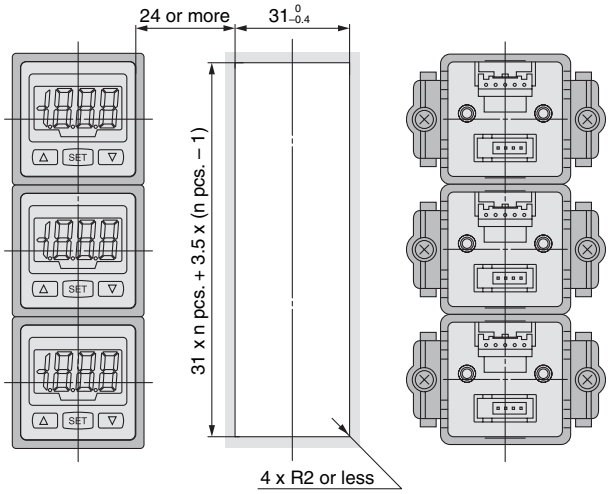
Dimensions

Panel fitting dimensions

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

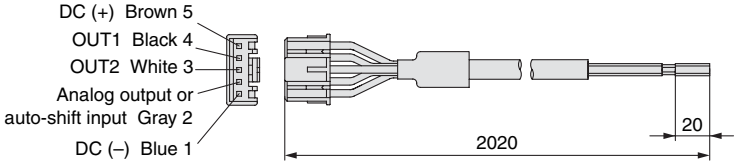


Secure mounting of n (2 or more) switches (vertical)



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

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



Cable Specifications

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

Function Details

■ Output operation

The output operation can be selected from the following:
Output (hysteresis mode and window comparator mode) corresponding to real-time 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 20ºC and 1atm (atmosphere)
Normal conditions: Flow rate converted to a volume at 0ºC 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 real-time flow rate and accumulated flow.

Real-time 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 real-time flow rate when an input signal is applied.
Auto-shift zero: This function displays real-time 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.

■ 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 ±7%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 error or abnormality cannot be solved by the action above, please contact SMC for further investigation.