2-Color Display

Digital Flow Switch

PFMB Series

Applicable fluid Dry air, N_2

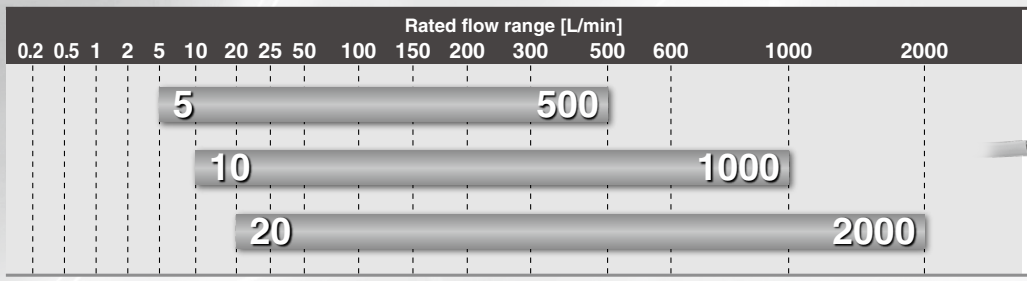
3-Screen Display **Digital Flow Monitor**
Allows for the monitoring of remote lines
PFG300 Series p. 340

Wide range of flow measurement with one product

Flow ratio*1 **100: 1**

*1 Rated flow ratio is 10 : 1 for the existing PF2A.

Smallest settable increment: **1 L/min**
Existing PF2A: 5 L/min

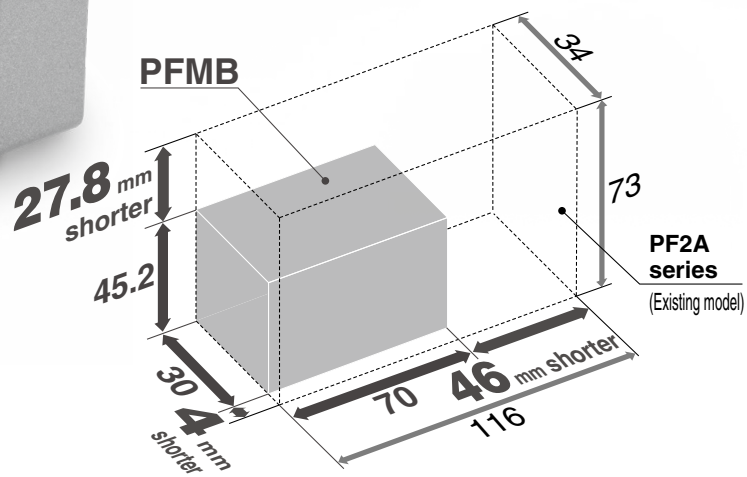


Compact, Space saving

Compared with the existing PF2A

Weight Approx. **66% reduction**
290 g ➡ **100 g**

Mounting space Approx. **67% reduction**



Compared with the PFMB7501-04 and PF2A751-04

2-Color Display Digital Flow Switch

Response time

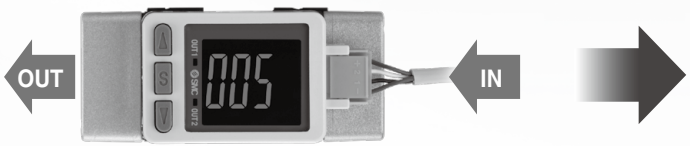
Can be selected from **50** ms (0.05 s)/ **0.1** s/**0.5** s/**1.0** s/**2.0** s

Response time can be set depending on application.

Reversible display

When the switch is used upside down, the orientation of the display can be rotated to make it easier to read.

When display is upside down.



With a reversible display function (Can be set with the reversible display mode.)

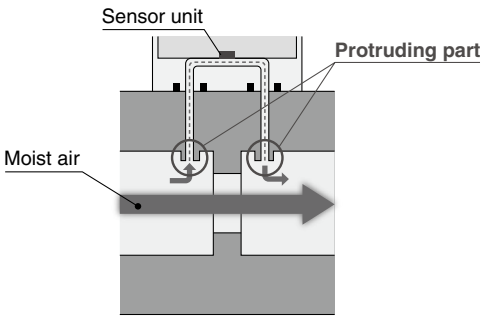
Grease-free

◎Functions (▶ Refer to pages 346 and 347 for details.)

- Output operation
- Display color
- Reference condition
- Display mode
- Response time
- Display OFF mode
- Setting of security code
- External input function
- Forced output function
- Accumulated value hold
- Peak/Bottom value display
- Keylock function
- Analog output free range function
- Reversible display mode
- Reset to the default settings
- Error display function

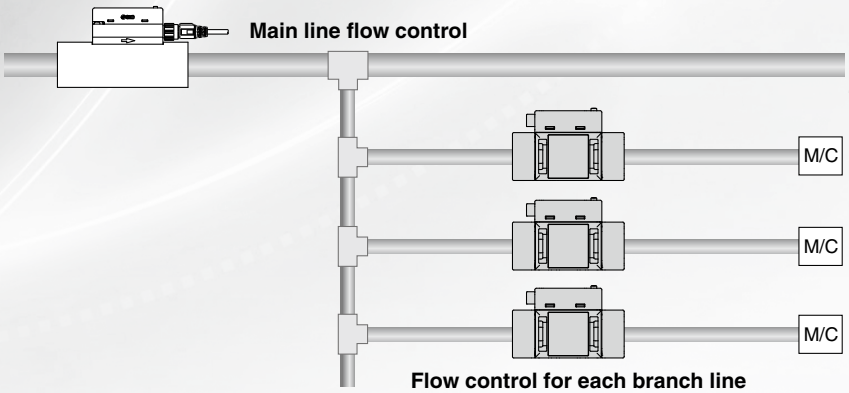
Bypass structure

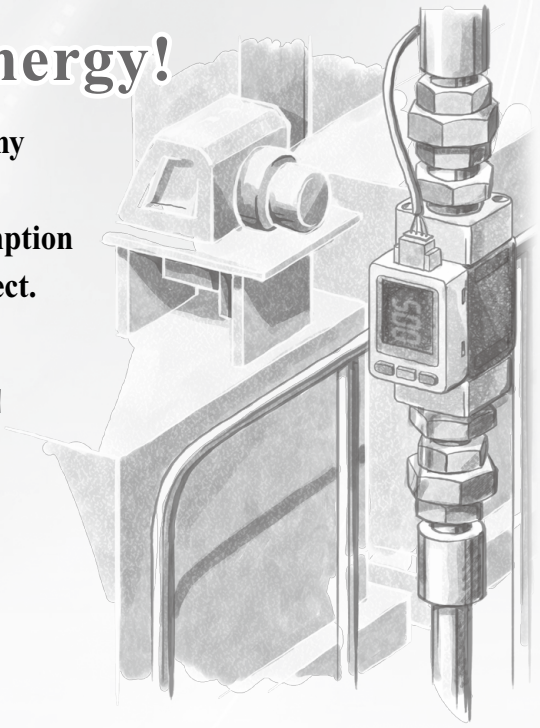
Bypass structure with protruding part at the main piping, reduces the contact of moist air with the sensor, reducing degradation of the sensor and maintaining accuracy.



Digital flow switch to save energy!

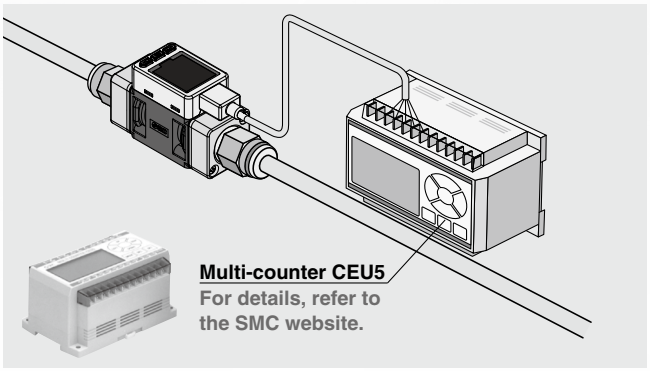
Flow control is necessary for promoting energy saving in any application.
Saving energy starts from numerical control of the flow consumption of equipment and lines and clarification of the purpose and effect.





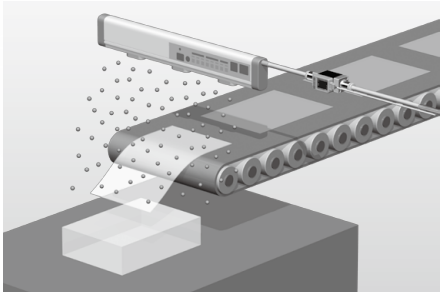
- Digital display allows visualization of flow rate.
- 2-color display, Improved visibility

- Remote control is possible with accumulated pulse.



Applications

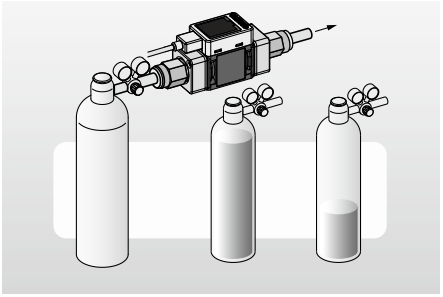
Control of purge air flow of ionizer



Flow control of the air for spray painting

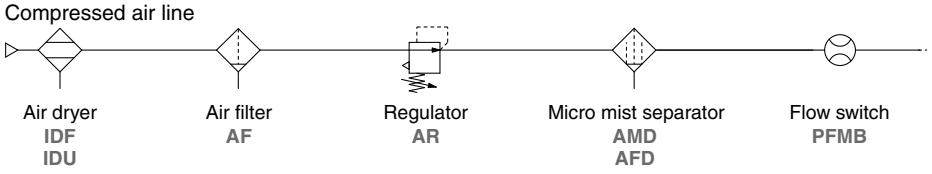
∗ The product is not designed to be explosion proof.

Accumulated indication shows the operating flow rate or residual amount (of N_2 etc.) in a gas cylinder.



Example of recommended pneumatic circuit

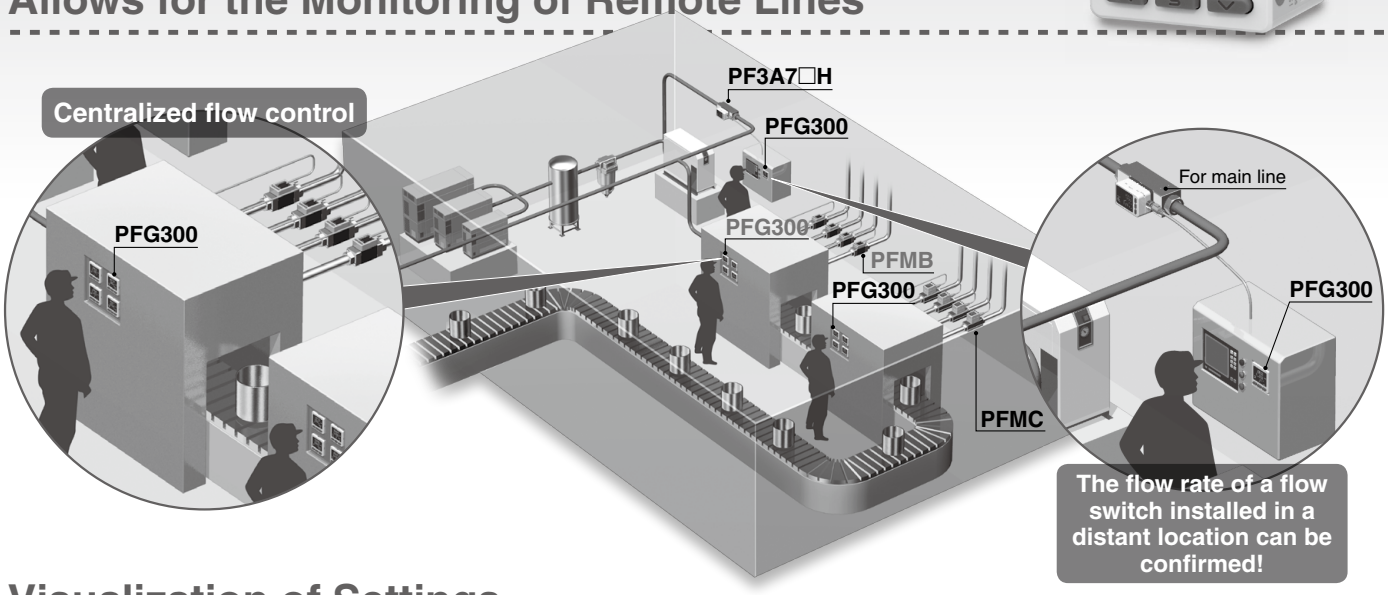
Air quality in the product specification can be satisfied by using this pneumatic circuit.



3-Screen Display Digital Flow Monitor

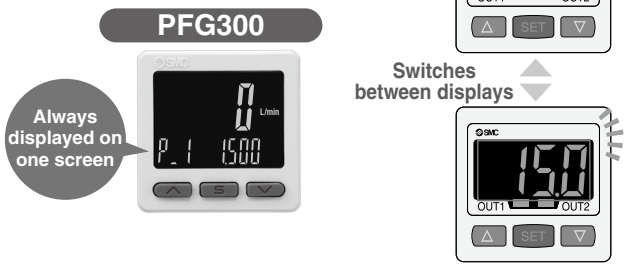
PFG300 Series p. 340

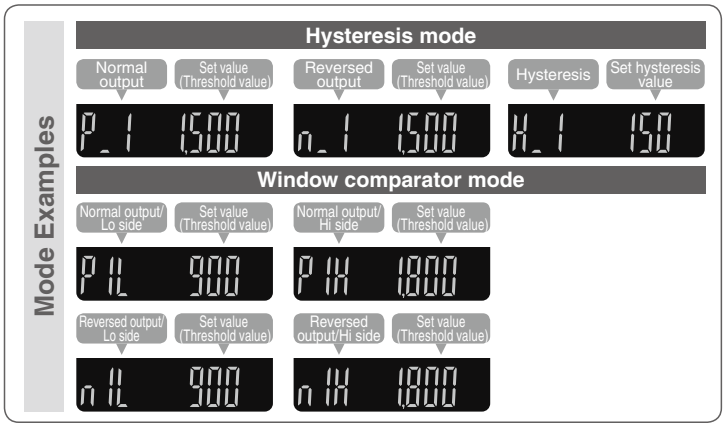
Allows for the Monitoring of Remote Lines



Visualization of Settings

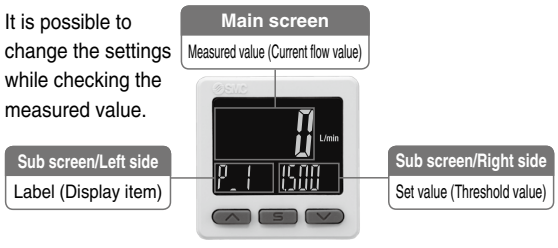
The sub screen (label) shows the item to be set.



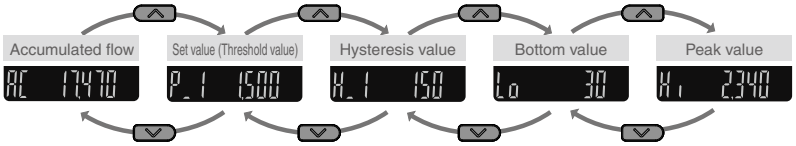


Easy Screen Switching

It is possible to change the settings while checking the measured value.



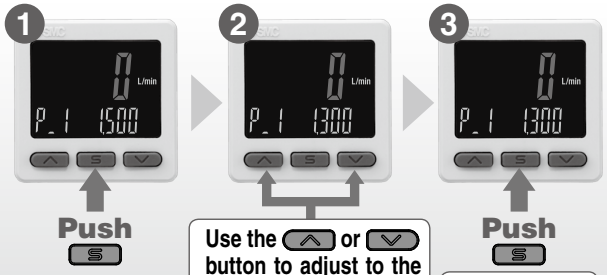
The sub screen can be switched by pressing the up/down buttons.



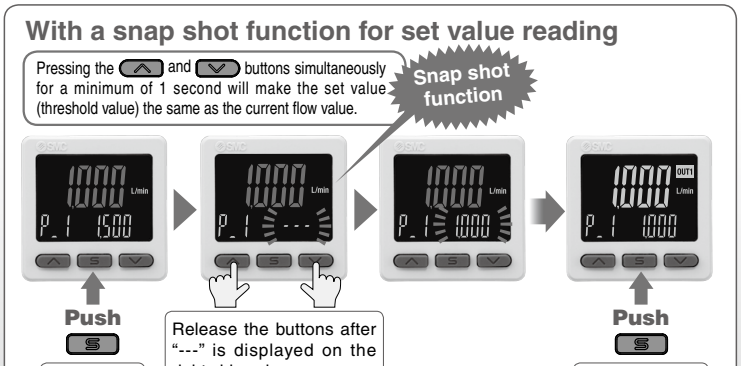
∗ Either “Input of line name” or “Display OFF” can be added via the function settings.

Simple 3-Step Setting

When the S button is pressed and the set value (P_1) is being displayed, the set value (threshold value) can be set. When the S button is pressed and the hysteresis (H_1) is being displayed, the hysteresis value can be set.



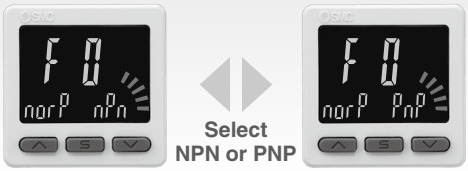
With a snap shot function for set value reading



SMC

NPN/PNP Switch Function

The number of stock items can be reduced.



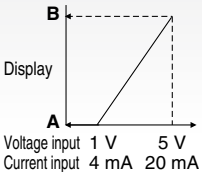
NPN **PNP**

Analog output of 0 to 10 V is also available.

Voltage output	1 to 5 V	Switchable
	0 to 10 V	
Current output	4 to 20 mA	Fixed

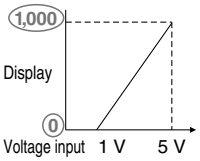
Input Range Selection (for Pressure/Flow rate)

The displayed value to the sensor input can be set as required.
(Voltage input: 1 to 5 V/Current input: 4 to 20 mA)
Pressure switch/Flow switch can be displayed.



A is displayed for 1 V (or 4 mA).
B is displayed for 5 V (or 20 mA).
The range can be set as required.

■ Pressure Sensor for General Fluids/PSE570



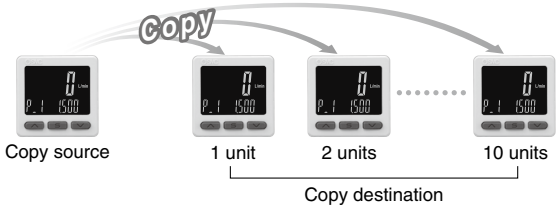
	A	B
PSE570	0	1,000
PSE573	–100	100
PSE574	0	500

Set A and B to the values shown in the table above.

Convenient Functions

Copy function

The set values of the monitor can be copied.



Security code

The key locking function keeps unauthorized persons from tampering with the settings.

Power saving mode

Power consumption is reduced by turning off the monitor.

Current consumption*1	Reduction rate*2
25 mA or less	Approx. 50% reduction

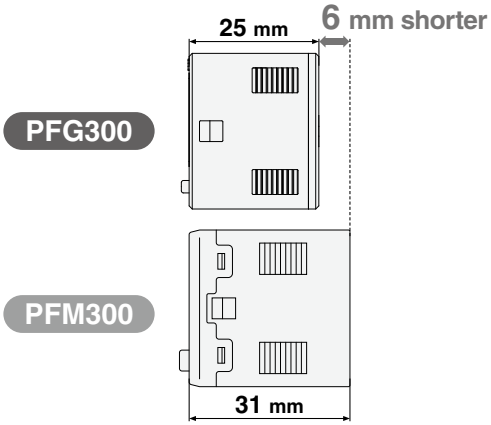
*1 During normal operation *2 In power saving mode

External input function

The accumulated value, peak value, and bottom value can be reset remotely.

Compact & Lightweight

- **Compact: Max. 6 mm shorter**
- **Lightweight: Max. 5 g lighter (30 g → 25 g)**



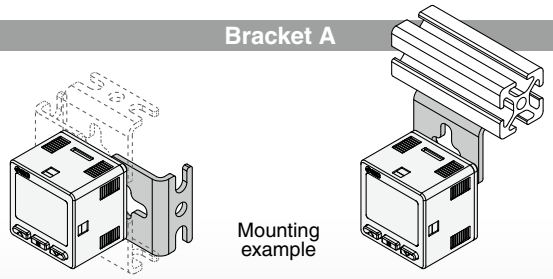
Functions (▶ Refer to pages 348 to 350 for details.)

- Output operation
- Simple setting mode
- Display color
- Delay time setting
- Digital filter setting
- FUNC output switching function
- Selectable analog output function
- External input function
- Forced output function
- Accumulated value hold
- Peak/Bottom value display
- Setting of security code
- Keylock function
- Reset to the default settings
- Display with zero cut-off setting
- Selection of display on sub screen
- Analog output free range function
- Error display function
- Copy function
- Selection of power saving mode

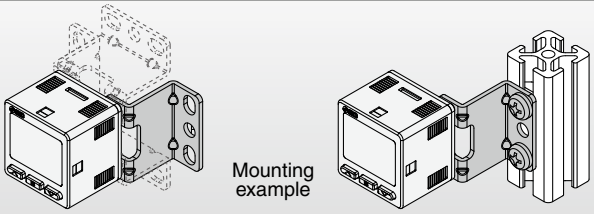
Mounting

The bracket configuration allows for mounting in four orientations.

Bracket A



Bracket B

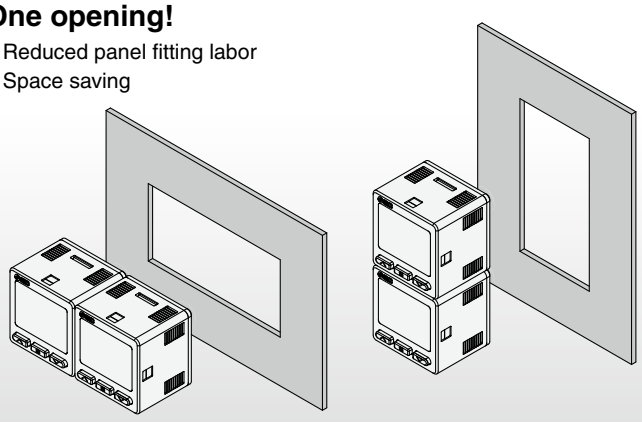


Panel mount

Mountable side by side without clearance

One opening!

· Reduced panel fitting labor
· Space saving



Flow Switch Flow Rate Variations

Series	Digital flow monitor	Applicable fluid	Detection method	Smallest settable increment	Rated flow range [L/min]
PFMV5 	**PFGV301** 	Dry air N_2	Thermal type (MEMS)		−3 −2 −1 −0.5 0 0.5 1 2 3 0 – 0.1 0 – 0.5 0 – 1 0 – 3 −0.5 – 0.5 −1 – 1 −3 – 3
PF2M7(-L) 	**PFGM302** 	Dry air N_2 Ar CO_2	Thermal type (MEMS)	0.001 L/min	0.1 0.2 0.5 1 2 5 10 20 25 50 100 150 200 300 500 600 1000 2000 3000 6000 12000 0.01 – 1
				0.01 L/min	0.02 – 2 0.05 – 5 0.1 – 10
				0.1 L/min	0.3 – 25 0.5 – 50 1 – 100
				1 L/min	2 – 200
PFMB 	**PFG300** 	**Dry air N_2**	**Thermal type (MEMS) Bypass flow type**	**1 L/min**	**5 – 500** **10 – 1000** **20 – 2000**
PF2MC7(-L) 	**PFG300** 	Dry air N_2	Thermal type (MEMS) Bypass flow type	1 L/min	5 – 500 10 – 1000 20 – 2000
PF2A 	**PFG200** 	Air N_2	Thermal type (Thermistor)	0.1 L/min	1 – 10
				0.5 L/min	5 – 50
				1 L/min	10 – 100
				2 L/min	20 – 200
				5 L/min	50 – 500
PF3A□H(-L)  Body ported type  Modular type	**PFG300** 	Air N_2	Thermal type (Platinum sensor) Bypass flow type	2 L/min	30 – Body ported type – 3000
				5 L/min	60 – Body ported type – 6000
				10 L/min	120 – Body ported type – 12000
				1 L/min	10 – Modular type – 1000
				2 L/min	20 – Modular type – 2000

Flow Switch Variations / Basic Performance Table

	PFMV5	PF2M7(-L)	PFMB	PF2MC7(-L)	PF2A	PF3A□H(-L)
Series	 PFGV301 	 PFGM302 	 PFG300 	 PFG300 	 PFG200 	 PFG300  
Enclosure	IP40	IP40	**IP40**	IP65 [**Monitor unit** IP40]	IP65	IP65 [**Monitor unit** IP40]
Fluid	Dry air, N_2	Dry air, N_2, Ar, CO_2	**Dry air, N_2**	Dry air, N_2	Air, N_2	Air, N_2
Setting	Digital	Digital	**Digital**	Digital	Digital	Digital
Rated flow range [L/min]	0 to 0.1 0 to 0.5 0 to 1 0 to 3 −0.5 to 0.5 −1 to 1 −3 to 3	0.01 to 1 0.02 to 2 0.05 to 5 0.1 to 10 0.3 to 25 0.5 to 50 1 to 100 2 to 200	**5 to 500** **10 to 1000** **20 to 2000**	5 to 500 10 to 1000 20 to 2000	1 to 10 5 to 50 10 to 100 20 to 200 50 to 500	30 to 3000 60 to 6000 120 to 12000 10 to 1000 20 to 2000
Power supply voltage	12 to 24 VDC ±10%	PF2M7: 12 to 24 VDC ±10% PF2M7-L: 18 to 30 VDC ±10%	**12 to 24 VDC ±10%**	PF2MC: 12 to 24 VDC ±10% PF2MC-L: 18 to 30 VDC ±10%	12 to 24 VDC ±10%	PF3A7□H: 24 VDC ±10% PF3A7□H-L: 18 to 30 VDC ±10% PF3A701H/702H-L: 21.6 to 30 VDC PF3A8□H-L: 21.6 to 30 VDC
Temperature characteristics (25°C standard)	±2% F.S. (15 to 35°C) ±5% F.S. (0 to 50°C) [**Monitor unit** ±0.5% F.S. (0 to 50°C)]	±3% F.S. ±1 digit (15 to 35°C) ±5% F.S. ±1 digit (0 to 50°C)	**±2% F.S. (15 to 35°C)** **±5% F.S. (0 to 50°C)** [**Monitor unit** ±0.5% F.S. (0 to 50°C)]	±2% F.S. (15 to 35°C) ±5% F.S. (0 to 50°C) [Monitor unit ±0.5% F.S. (0 to 50°C)]	±3% F.S. (15 to 35°C) ±5% F.S. (0 to 50°C)	±5% F.S. (0 to 50°C) [**Monitor unit** ±0.5% F.S. (0 to 50°C)]
Repeatability	±2% F.S. (Fluid: Dry air) Analog output: ±5% F.S. [**Monitor unit** ±0.1% F.S. Analog output: ±0.3% F.S.]	±1% F.S. ±1 digit (Fluid: Dry air)	**±1% F.S. (Fluid: Dry air)** [**Monitor unit** ±0.1% F.S. ±1 digit]	±1% F.S. (Fluid: Dry air) [Monitor unit ±0.1% F.S.]	±1% F.S. (PF2A7□0) ±2% F.S. (PF2A7□1)	±1% F.S. [**Monitor unit** ±0.1% F.S.]
Hysteresis	Hysteresis mode: Variable Window comparator mode: Variable	Hysteresis mode: Variable Window comparator mode: Variable	**Hysteresis mode: Variable** **Window comparator mode: Variable**	Hysteresis mode: Variable Window comparator mode: Variable	Hysteresis mode: Variable Window comparator mode: Fixed (3 digits)	Hysteresis mode: Variable Window comparator mode: Variable
Output	NPN/PNP open collector Analog voltage output Analog current output	NPN/PNP open collector Accumulated pulse output Analog voltage output Analog current output IO-Link	**NPN/PNP open collector** **Accumulated pulse output** **Analog voltage output** **Analog current output**	NPN/PNP open collector Accumulated pulse output Analog voltage output Analog current output IO-Link	NPN/PNP open collector Accumulated pulse output	NPN/PNP open collector Accumulated pulse output Analog voltage output Analog current output IO-Link
Display	[**Monitor unit** 2-color LCD display]	2-color LCD display [**Monitor unit** 3-color LCD display]	**2-color LCD display** [**Monitor unit** 3-color LCD display]	3-color LCD display	LED display	3-color LCD display

∗ The monitor unit shows the PFG200, PFG300, PFGM302, PFGV301.

CONTENTS

2-Color Display Digital Flow Switch *PFMB Series*
3-Screen Display Digital Flow Monitor *PFG300 Series*

2-Color Display

Digital Flow Switch

PFMB7 Series

How to Order

PFMB7 501 – □ 04 – A □ – M □ □

Rated flow range (Flow rate range)

501	5 to 500 L/min
102	10 to 1000 L/min
202	20 to 2000 L/min

Thread type

Nil	Rc
N	NPT
F	G ∗1

∗1 ISO228 compliant

Port size

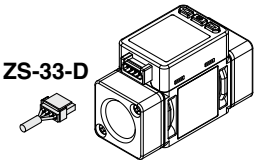
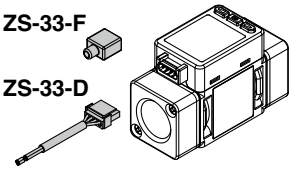
	Port size	Rated flow range		
		501	**102**	**202**
04	1/2	●	●	—
06	3/4	—	—	●

Output specification

	OUT1	OUT2	Applicable monitor unit model
A	NPN	NPN	—
B	PNP	PNP	—
C	NPN	Analog 1 to 5 V	PFG300 series
D	NPN	Analog 4 to 20 mA	PFG310 series
E∗1	PNP	Analog 1 to 5 V	PFG300 series
F∗1	PNP	Analog 4 to 20 mA	PFG310 series
G∗1	NPN	External input ∗2	—
H∗1	PNP	External input ∗2	—

∗1 Made to order
∗2 Accumulated flow value, peak/bottom flow value can be reset by external signal input.

Option 1

Nil	**W**
Lead wire with connector (2 m) 	Lead wire with connector (2 m) + Rubber cover for connector (Silicone rubber) 
N	
Without lead wire with connector	

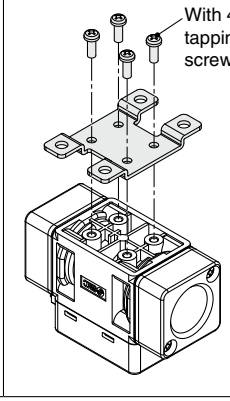
∗ When only optional parts are required, refer to Option 1/Part Nos. below.

Calibration certificate ∗1

Nil	None
A∗2	With calibration certificate

∗1 Certificate in both English and Japanese
∗2 Made to order

Option 2

Nil	**R**
No bracket	With bracket 

∗ Options are shipped together with the product, but not assembled.
When only optional parts are required, refer to Option 2/Part Nos. below.

Unit specification

M	SI unit only ∗1
Nil	Units selection function ∗2

∗1 Fixed unit: Instantaneous flow: L/min
Accumulated flow: L
∗2 This product is for overseas use only according to the New Measurement Act. (The SI unit type is provided for use in Japan.)
Unit can be changed. Instantaneous flow: L/min ⇔ cfm
Accumulated flow: L ⇔ ft³

Option 1/Part Nos.

Option	Part no.	Qty.	Note
Lead wire with connector	**ZS-33-D**	1	Lead wire: 2 m
Rubber cover (Silicone rubber)	**ZS-33-F**	1	For connector

Option 2/Part Nos.

Option	Part no.	Qty.	Note
Bracket (for PFMB7201)	**ZS-33-M**	1	With 2 tapping screws (3 x 6)
Bracket (for PFMB7201S)	**ZS-33-MS**	1	With 3 tapping screws (3 x 6)
Panel mount adapter (for PFMB7201)	**ZS-33-J**	1	
Panel mount adapter (for PFMB7201S)	**ZS-33-JS**	1	
Bracket (for PFMB7501/7102)	**ZS-42-C**	1	With 4 tapping screws (3 x 6)
Bracket (for PFMB7202)	**ZS-42-D**	1	With 4 tapping screws (3 x 6)

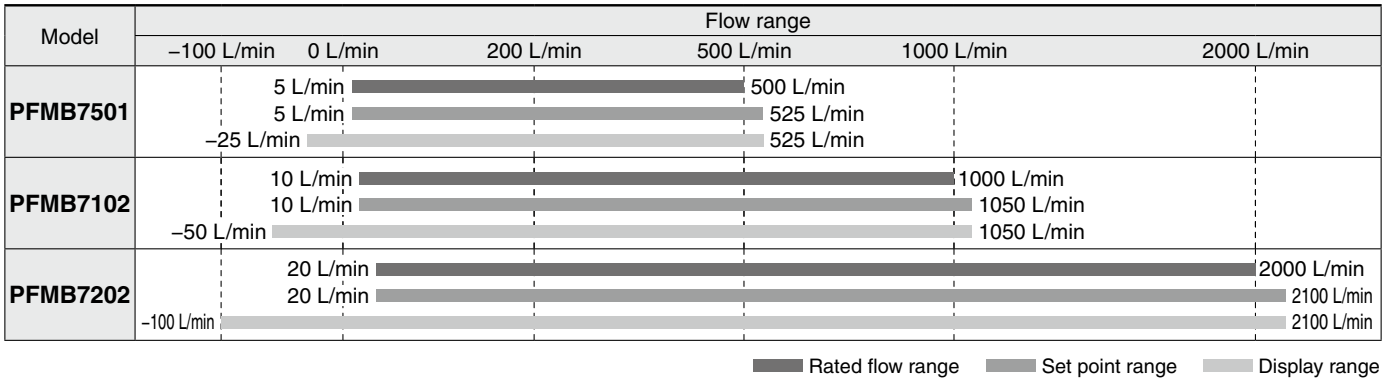
Specifications

Refer to pages 595 and 596 for Flow Switch Precautions. For details about the Specific Product Precautions, refer to the Operation Manual on the SMC website, https://www.smcworld.com Click here for details.

Model			PFMB7501	PFMB7102	PFMB7202
Fluid	Applicable fluid *1		Dry air, N_2 (Air quality grade is JIS B 8392-1 1.1.2 to 1.6.2, ISO 8573-1 1.1.2 to 1.6.2)		
	Fluid temperature range		0 to 50°C		
Flow	Detection method		Thermal type		
	Rated flow range		5 to 500 L/min	10 to 1000 L/min	20 to 2000 L/min
	Set point range	Instantaneous flow	5 to 525 L/min	10 to 1050 L/min	20 to 2100 L/min
		Accumulated flow	0 to 999,999,990 L		
	Smallest settable increment	Instantaneous flow	1 L/min		
		Accumulated flow	10 L		
	Accumulated volume per pulse (Pulse width = 50 ms)		1 L/pulse	10 L/pulse	
	Accumulated value hold function *2		Intervals of 2 or 5 minutes can be selected.		
Pressure	Rated pressure range		0 to 0.8 MPa		
	Proof pressure		1.2 MPa		
	Pressure loss		Refer to “Pressure Loss” graph.		
	Pressure characteristics *3		±5% F.S. (0 to 0.8 MPa, 0.6 MPa standard)		
Electrical	Power supply voltage		12 to 24 VDC ±10%		
	Current consumption		55 mA or less		
	Protection		Polarity protection		
Accuracy *11	Display accuracy		±3% F.S.		
	Analog output accuracy		±3% F.S.		
	Repeatability		±1% F.S. (±2% F.S. when the response time is set to 0.05 s)		
	Temperature characteristics		±5% F.S. (0 to 50°C, 25°C standard)		
Switch output	Output type		NPN open collector PNP open collector		
	Output mode		Select from Hysteresis, Window comparator, Accumulated output, or Accumulated pulse output modes.		
	Switch operation		Select from Normal or Reversed output.		
	Maximum load current		80 mA		
	Maximum applied voltage (NPN only)		28 VDC		
	Internal voltage drop (Residual voltage)		NPN output type: 1 V or less (at load current of 80 mA) PNP output type: 1.5 V or less (at load current of 80 mA)		
	Response time *4		Select from 0.05 s, 0.1 s, 0.5 s, 1 s, or 2 s.		
	Hysteresis *5		Variable from 0		
	Protection		Short circuit protection		
Analog output *6	Output type		Voltage output: 1 to 5 V, Current output: 4 to 20 mA		
	Impedance	Voltage output	Output impedance: Approx. 1 kΩ		
		Current output	Maximum load impedance at power supply voltage of 24 V: 600 Ω, at power supply voltage of 12 V: 300 Ω		
	Response time *7		Linked to the response time of the switch output		
External input *8	External input		Input voltage: 0.4 V or less (Reed or Solid state) for 30 ms or longer		
	Input mode		Select from Accumulated value external reset or Peak/Bottom value reset.		
Display	Reference condition *9		Select from Standard conditions or Normal conditions.		
	Display mode		Select from Instantaneous flow or Accumulated flow.		
	Unit *10	Instantaneous flow	L/min or cfm can be selected.		
		Accumulated flow	L or ft^3 can be selected.		
	Display range	Instantaneous flow	−25 to 525 L/min (Displays [0] when value is within the −4 to 4 L/min range)	−50 to 1050 L/min (Displays [0] when value is within the −9 to 9 L/min range)	−100 to 2100 L/min (Displays [0] when value is within the −19 to 19 L/min range)
		Accumulated flow	0 to 999,999,999 L		
	Minimum display unit	Instantaneous flow	1 L/min		
		Accumulated flow *13	10 L		
	Display		LCD, Color: Red/Green, 4 digits, 7 segments		
	Indicator LED		LED ON when switch output is ON (OUT1/OUT2: Orange)		
Environment	Enclosure		IP40		
	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		
	Operating temperature range		Operating: 0 to 50°C, Stored: −10 to 60°C (No condensation or freezing)		
	Operating humidity range		Operating/Stored: 35 to 85% RH (No condensation or freezing)		
Standards			CE/UKCA marking		
Piping	Piping specification		Rc1/2, NPT1/2, G1/2		Rc3/4, NPT3/4, G3/4
	Piping entry direction				
Main materials of parts in contact with fluid *12			ADC, PPS, Stainless steel 304, Au, HNBR, Si, GE4F		
Weight	Body		100 g		155 g
	Flow adjustment valve		—		
	Lead wire		+35 g		
	Bracket		+25 g		+30 g
	Panel mount adapter		—		
	DIN rail mounting bracket		—		

*1 Refer to the “Example of recommended pneumatic circuit” on page 328.
*2 When using the accumulated value hold function, use the operating conditions to calculate the product life, and do not exceed it. The maximum access limit of the memory device is 1 million times. If the product is operated 24 hours per day, the product life will be as follows:
• 5 min interval: life is calculated as 5 min x 1 million = 5 million min = 9.5 years
• 2 min interval: life is calculated as 2 min x 1 million = 2 million min = 3.8 years
If the accumulated value external reset is repeatedly used, the product life will be shorter than the calculated life.
*3 Do not release the OUT side piping port of the product directly to the atmosphere without connecting piping. If the product is used with the piping port released to atmosphere, accuracy may vary.
*4 The time from when the flow is changed by a step input (when the flow rate changes from 0 to the maximum value of the rated flow range instantaneously) until the switch output turns ON (or OFF) when set to be 90% of the rated flow rate
*5 If the flow fluctuates around the set value, the width for setting more than the fluctuating width needs to be set. Otherwise, chattering will occur.
*6 When using a product with an analog output
*7 The time from when the flow is changed by a step input (when the flow rate changes from 0 to the maximum value of the rated flow range instantaneously) until the analog output reaches 90% of the rated flow rate
*8 When using a product with an external input
*9 The flow rate given in the specifications is the value under standard conditions.
*10 Setting is only possible for models with the units selection function.
*11 For details, refer to “IN Side Straight Piping Length and Accuracy” on page 336.
*12 For details, refer to “Construction: Parts in Contact with Fluid” on page 338.
*13 The accumulated flow display is the upper 3-digit, middle 3-digit, and lower 3-digit (total of 9 digits) display. The position of the dots on the upper part of the screen indicates which digits are displayed.
* Products with tiny scratches, marks, or display color or brightness variations which do not affect the performance of the product are verified as conforming products.

Flow Range

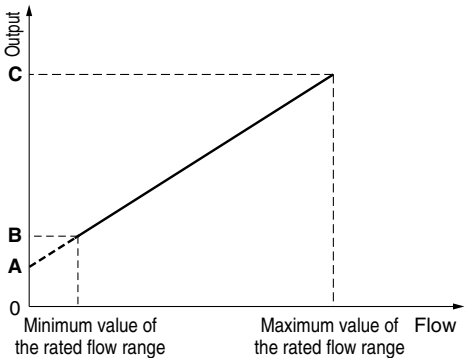


Analog Output

Flow/Analog Output

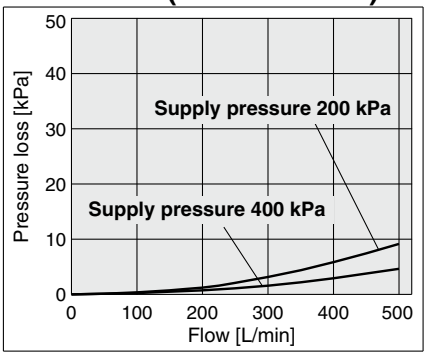
	A	B	C
Voltage output	1 V	1.04 V	5 V
Current output	4 mA	4.16 mA	20 mA

Model	Minimum value of the rated flow range	Maximum value of the rated flow range
PFMB7501	5 L/min	500 L/min
PFMB7102	10 L/min	1000 L/min
PFMB7202	20 L/min	2000 L/min

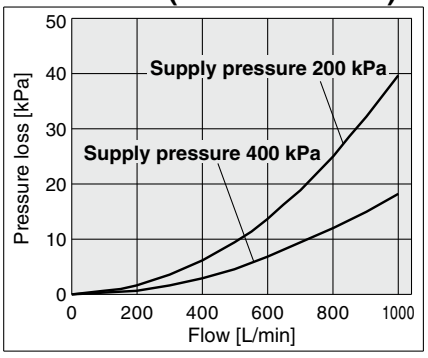


Pressure Loss (Reference Data)

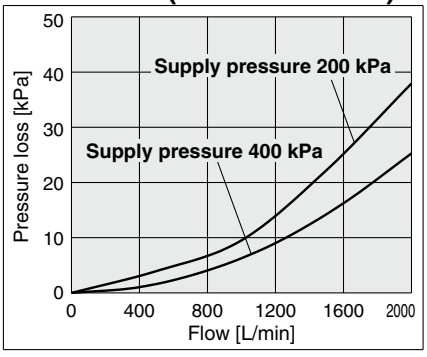
PFMB7501 (for 500 L/min)



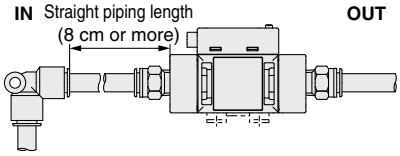
PFMB7102 (for 1000 L/min)



PFMB7202 (for 2000 L/min)

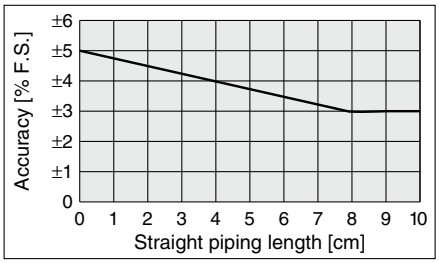


IN Side Straight Piping Length and Accuracy (Reference Data)



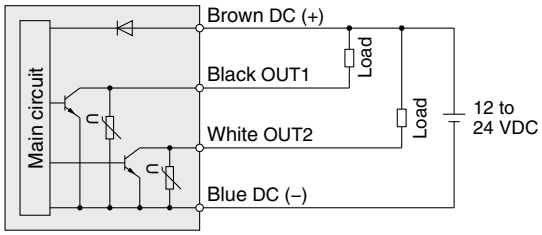
- The piping on the IN side must have a straight section of piping with a length of 8 cm or more.
  If a straight section of piping is not installed, the accuracy can vary by approximately ±2% F.S.
  * "Straight section" means a part of the piping without any bends or rapid changes in the cross sectional area.
- When the PFMB7501 or 7102 is connected to tubing, use a tube I.D. 9 mm or more just before the product.
  The accuracy can vary by approximately ±2% F.S. when such tubing is not used.

PFMB7501/7102/7202



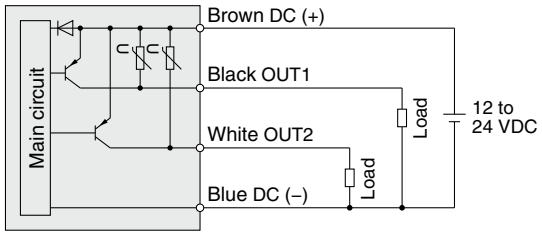
Internal Circuits and Wiring Examples

NPN (2 outputs) type
PFMB7□□□-□□-A□-□□□



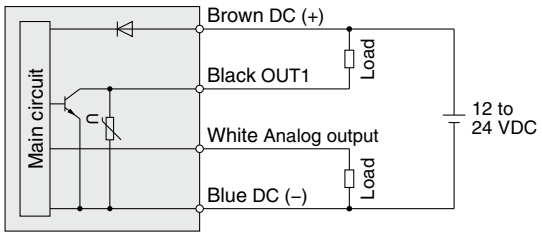
Max. applied voltage: 28 V, Max. load current: 80 mA, Internal voltage drop: 1 V or less

PNP (2 outputs) type
PFMB7□□□-□□-B□-□□□



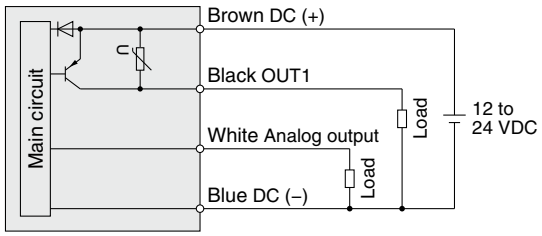
Max. load current: 80 mA, Internal voltage drop: 1.5 V or less

NPN (1 output) + Analog (1 to 5 V) output type
PFMB7□□□-□□-C□-□□□
NPN (1 output) + Analog (4 to 20 mA) output type
PFMB7□□□-□□-D□-□□□



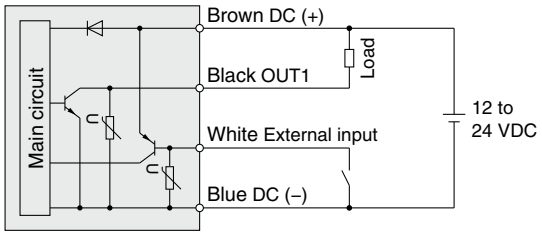
Max. applied voltage: 28 V, Max. load current: 80 mA, Internal voltage drop: 1 V or less
C: Analog output: 1 to 5 V
Output impedance: 1 kΩ
D: Analog output: 4 to 20 mA
Max. load impedance: 600 Ω

PNP (1 output) + Analog (1 to 5 V) output type
PFMB7□□□-□□-E□-□□□
PNP (1 output) + Analog (4 to 20 mA) output type
PFMB7□□□-□□-F□-□□□



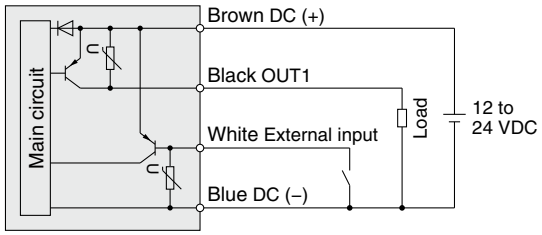
Max. load current: 80 mA, Internal voltage drop: 1.5 V or less
E: Analog output: 1 to 5 V
Output impedance: 1 kΩ
F: Analog output: 4 to 20 mA
Max. load impedance: 600 Ω

NPN (1 output) + External input type
PFMB7□□□-□□-G□-□□□



Max. applied voltage: 28 V, Max. load current: 80 mA, Internal voltage drop: 1 V or less
External input: Input voltage 0.4 V or less (Reed or Solid state input) for 30 ms or longer

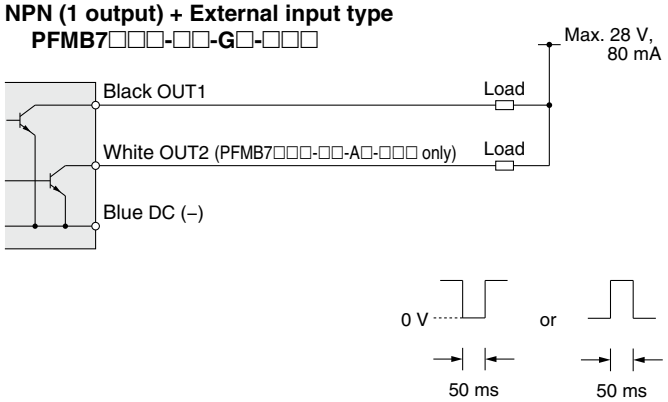
PNP (1 output) + External input type
PFMB7□□□-□□-H□-□□□



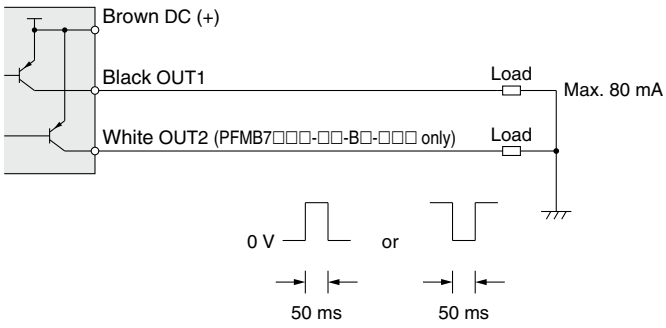
Max. load current: 80 mA, Internal voltage drop: 1.5 V or less
External input: Input voltage 0.4 V or less (Reed or Solid state input) for 30 ms or longer

Accumulated pulse output wiring examples

NPN (2 outputs) type
PFMB7□□□-□□-A□-□□□
NPN (1 output) + Analog output type
PFMB7□□□-□□-C□-□□□
PFMB7□□□-□□-D□-□□□
NPN (1 output) + External input type
PFMB7□□□-□□-G□-□□□

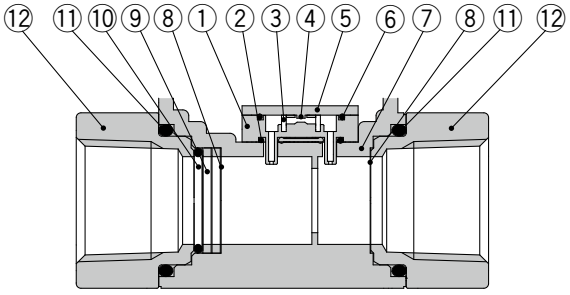


PNP (2 outputs) type
PFMB7□□□-□□-B□-□□□
PNP (1 output) + Analog output type
PFMB7□□□-□□-E□-□□□
PFMB7□□□-□□-F□-□□□
PNP (1 output) + External input type
PFMB7□□□-□□-H□-□□□



Construction: Parts in Contact with Fluid

PFMB7501/7102/7202

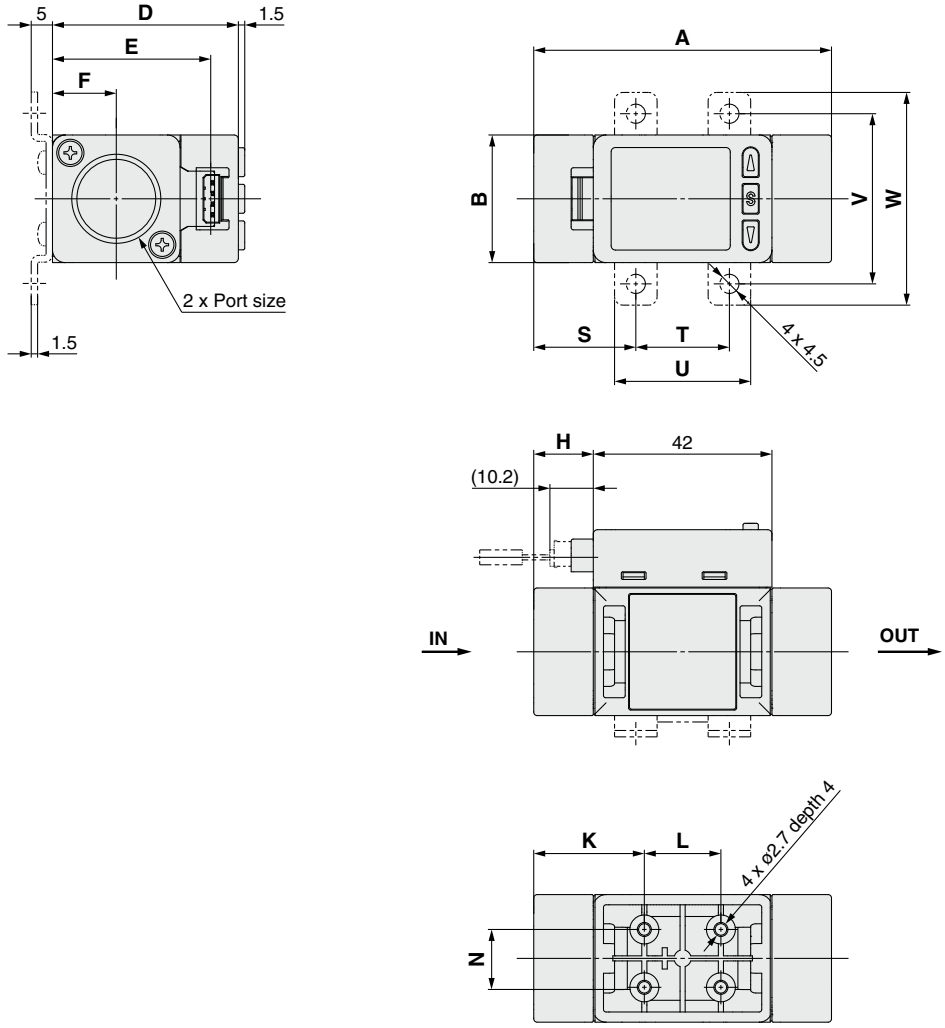


Component Parts

No.	Description	Material	Note
1	**Sensor body**	PPS	
2	**Gasket**	HNBR	
3	**Flow rectifier**	Stainless steel 304	
4	**Sensor chip**	Silicon	
5	**Printed circuit board**	GE4F	
6	**Gasket**	HNBR	
7	**Body**	PPS	
8	**Mesh**	Stainless steel 304	
9	**Spacer**	PPS	
10	**O-ring**	HNBR	
11	**O-ring**	HNBR	
12	**Attachment**	ADC	Coating

Dimensions

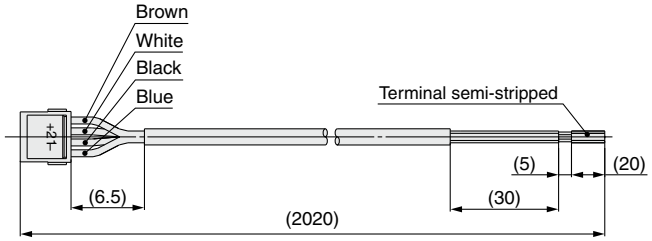
PFMB7501/7102/7202



Model \ Symbol	A	B	D	E	F	H	K	L	N
PFMB7501/7102	70	30	43.7	37.2	15	14	26	18	13.6
PFMB7202	90	35	49.2	42.7	17.5	24	31	28	16.8

Model \ Symbol	Bracket dimensions				
	S	**T**	**U**	**V**	**W**
PFMB7501/7102	24	22	32	40	50
PFMB7202	30	30	42	48	58

Lead wire with connector (Part no.: ZS-33-D)



Cable Specifications

Conductor	**Nominal cross section**	AWG26
	Outside diameter	Approx. 0.50 mm
Insulator	**Outside diameter**	Approx. 1.00 mm
	Color	Brown, White, Black, Blue
Sheath	**Material**	Oil-resistant PVC
Finished outside diameter		ø3.5

* For wiring, refer to the “Operation Manual” on the SMC website. Documents/Download --> Instruction Manuals

3-Screen Display

Digital Flow Monitor

PFG300 Series

How to Order

PFG 3 0 0 – RT – M – L □□□

Type

3	Remote type monitor unit

Input specification

Symbol	Description	Applicable flow switch model
0	Voltage input	PFMB7□-C/E series
1	Current input	PFMB7□-D/F series

Output specification

RT	2 outputs (NPN/PNP switching type) + Analog voltage output*1, 2
SV	2 outputs (NPN/PNP switching type) + Analog current output*2
XY	2 outputs (NPN/PNP switching type) + Copy function

*1 Can switch between 1 to 5 V and 0 to 10 V

*2 Can be switched to external input or copy function

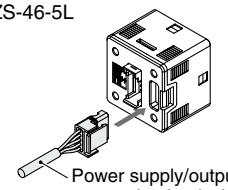
Unit specification

Nil	Units selection function*3
M	SI unit only*4

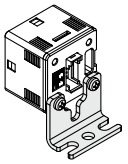
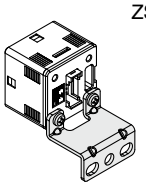
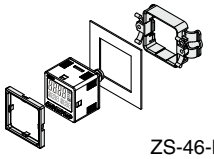
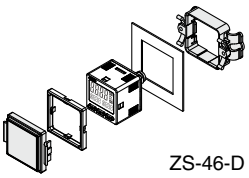
*3 This product is for overseas use only according to the New Measurement Act. (The SI unit type is provided for use in Japan.)

*4 Fixed unit: Instantaneous flow: L/min
Accumulated flow: L

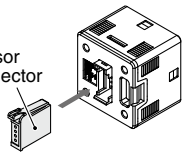
Option 1

Symbol	Description	
Nil	Without lead wire	
L	Power supply/output connection lead wire (Lead wire length: 2 m)	ZS-46-5L  Power supply/output connection lead wire

Option 2

Symbol	Description	
Nil	None	
A1	Bracket A (Vertical mounting)	ZS-46-A1 
A2	Bracket B (Horizontal mounting)	ZS-46-A2 
B	Panel mount adapter	 ZS-46-B
D	Panel mount adapter + Front protection cover	 ZS-46-D

Option 3

Nil	None
F	ZS-28-C-1  Sensor connector

Option 4

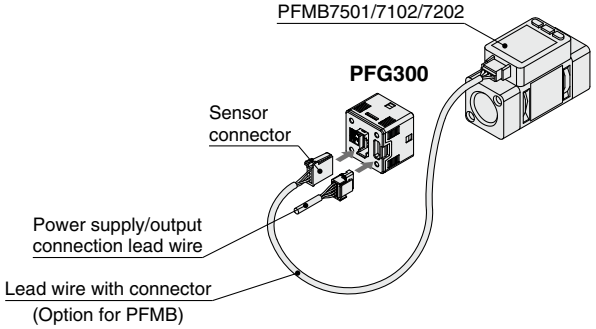
	Operation manual	Calibration certificate
Nil	○	—
Y	—	—
K	○	○
T	—	○

Options/Part Nos.

When only optional parts are required, order with the part numbers listed below.

Part no.	Option	Note
ZS-28-C-1	Sensor connector	For PFMB
ZS-46-A1	Bracket A	Tapping screw: Nominal size 3 x 8 L (2 pcs.)
ZS-46-A2	Bracket B	Tapping screw: Nominal size 3 x 8 L (2 pcs.)
ZS-46-B	Panel mount adapter	
ZS-46-D	Panel mount adapter + Front protection cover	
ZS-46-5L	Power supply/output connection lead wire	5-core, 2 m
ZS-27-01	Front protection cover	

Connection Example



Specifications

Refer to pages 595 and 596 for Flow Switch Precautions. For details about the Specific Product Precautions, refer to the Operation Manual on the SMC website, https://www.smcworld.com Click here for details.

Model			PFG300 series		
Applicable SMC flow switch	Model		PFMB7501	PFMB7102	PFMB7202
	Rated flow range*1		5 to 500 L/min	10 to 1000 L/min	20 to 2000 L/min
Flow	Set point range	Instantaneous flow	–25 to 525 L/min	–50 to 1050 L/min	–100 to 2100 L/min
		Accumulated flow	0 to 999,999,999,990 L		
	Smallest settable increment	Instantaneous flow	1 L/min		
		Accumulated flow	10 L		
	Accumulated volume per pulse (Pulse width = 50 ms)		1 L/pulse	10 L/pulse	
	Accumulated value hold function*3		Intervals of 2 or 5 minutes can be selected. The stored accumulated flow is held even when the power supply is OFF.		
Electrical	Power supply voltage		12 to 24 VDC ±10%		
	Current consumption		25 mA or less		
	Protection		Polarity protection		
Accuracy	Display accuracy		±0.5% F.S. ± Minimum display unit (Ambient temperature of 25°C)		
	Analog output accuracy		±0.5% F.S. (Ambient temperature of 25°C)		
	Repeatability		±0.1% F.S. ±1 digit		
	Temperature characteristics		±0.5% F.S. (Ambient temperature: 0 to 50°C, 25°C standard)		
Switch output	Output type		Select from NPN or PNP open collector output.		
	Output mode		Select from Hysteresis, Window comparator, Accumulated output, Accumulated pulse output, Error output, or Switch output OFF modes.		
	Switch operation		Select from Normal or Reversed output.		
	Max. load current		80 mA		
	Max. applied voltage (NPN only)		30 VDC		
	Internal voltage drop (Residual voltage)		NPN output: 1 V or less (at load current of 80 mA), PNP output: 1.5 V or less (at load current of 80 mA)		
	Response time*2		3 ms or less		
	Delay time*2		Select from 0.00, 0.05 to 0.1 s (increment of 0.01 s), 0.1 to 1.0 s (increment of 0.1 s), 1 to 10 s (increment of 1 s), 20 s, 30 s, 40 s, 50 s, or 60 s		
	Hysteresis*4		Variable from 0		
	Protection		Short circuit protection		
Analog output*5	Output type		Voltage output: 1 to 5 V, 0 to 10 V (only when the power supply voltage is 24 VDC) Current output: 4 to 20 mA (0 L/min to maximum value of the rated flow)		
	Impedance	Voltage output	Output impedance: 1 kΩ		
		Current output	Maximum load impedance: 300 Ω (at power supply voltage of 12 V), 600 Ω (at power supply voltage of 24 VDC)		
	Response time*2		50 ms or less		
External input*6	External input		Input voltage: 0.4 V or less (Reed or Solid state) for 30 ms or longer		
	Input mode		Select from Accumulated value external reset or Peak/Bottom value reset.		
Sensor input	Input type		Voltage input: 1 to 5 VDC (Input impedance: 1 MΩ), Current input: 4 to 20 mA DC (Input impedance: 51 Ω) (0 L/min to maximum value of the rated flow)		
	Connection method		Connector (e-CON)		
	Protection		Over voltage protection (Up to 26.4 VDC)		
Display	Display mode		Select from Instantaneous flow or Accumulated flow.		
	Unit*7	Instantaneous flow	L/min, cfm (ft³/min)		
		Accumulated flow	L, ft³, L x 10⁶, ft³ x 10⁶		
	Display range	Instantaneous flow	–25 to 525 L/min	–50 to 1050 L/min	–100 to 2100 L/min
		Accumulated flow*9	0 to 999,999,999,990 L		
	Minimum display unit	Instantaneous flow	1 L/min		
		Accumulated flow	10 L		
	Display type		LCD		
	Number of displays		3-screen display (Main screen, Sub screen)		
	Display color		1) Main screen: Red/Green, 2) Sub screen: Orange		
	Number of display digits		1) Main screen: 5 digits (7 segments), 2) Sub screen: 9 digits (7 segments)		
	Indicator LED		LED ON when switch output is ON OUT1/2: Orange		
Digital filter*8			Select from 0.00, 0.05 to 0.1 s (increment of 0.01 s), 0.1 to 1.0 s (increment of 0.1 s), 1 to 10 s (increment of 1 s), 20 s, or 30 s		
Environment	Enclosure		IP40		
	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		
	Operating temperature range		Operating: 0 to 50°C, Stored: –10 to 60°C (No condensation or freezing)		
	Operating humidity range		Operating/Stored: 35 to 85% RH (No condensation or freezing)		
Standards			CE/UKCA marking		
Weight	Body		25 g (Excluding the power supply/output connection lead wire)		
	Lead wire with connector		+39 g		

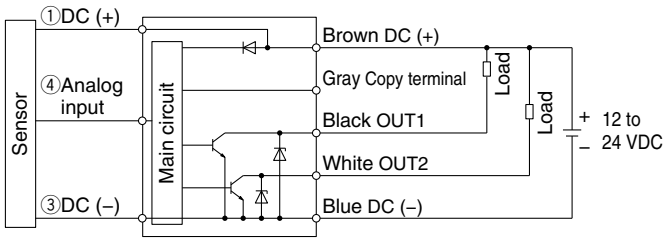
*1 Rated flow range of the applicable flow switch
*2 Value without digital filter (at 0.00 s)
*3 When using the accumulated value hold function, use the operating conditions to calculate the product life, and do not exceed it. The maximum access limit of the memory device is 1.5 million times. If the product is operated 24 hours per day, the product life will be as follows:
- 5 min interval: life is calculated as 5 min x 1.5 million = 7.5 million min = 14.3 years
- 2 min interval: life is calculated as 2 min x 1.5 million = 3 million min = 5.7 years

If the accumulated value external reset is repeatedly used, the product life will be shorter than the calculated life.

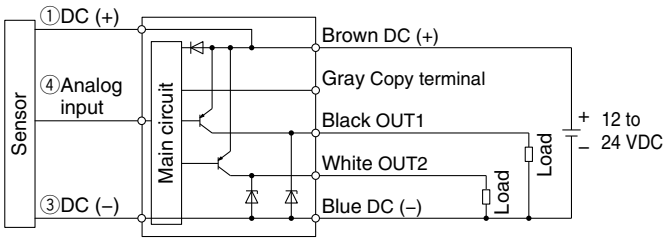
*4 If the flow fluctuates around the set value, the width for setting more than the fluctuating width needs to be set. Otherwise, chattering will occur.
*5 Setting is only possible for models with analog output.
*6 Setting is only possible for models with external input.
*7 Setting is only possible for models with the units selection function.
*8 The response time indicates when the set value is 90% in relation to the step input.
*9 The accumulated flow display is the upper 6-digit and lower 6-digit (total of 12 digits) display. When the upper digits are displayed, x 10⁶ lights up.
* Products with tiny scratches, marks, or display color or brightness variations which do not affect the performance of the product are verified as conforming products.

Internal Circuits and Wiring Examples

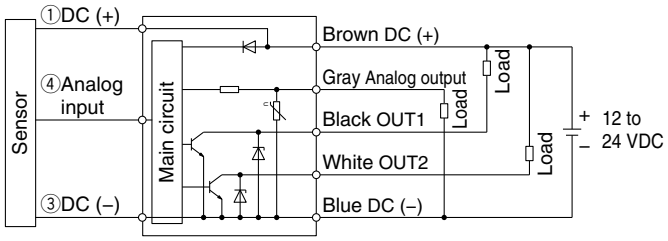
-XY
-RT
-SV
NPN (2 outputs) + Copy function



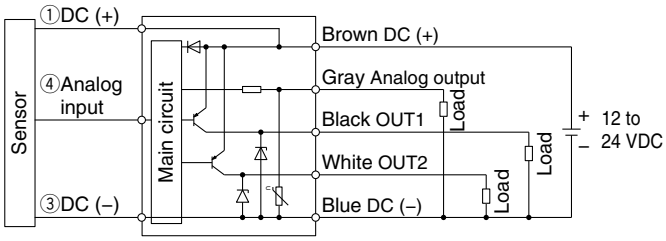
-XY
-RT
-SV
PNP (2 outputs) + Copy function



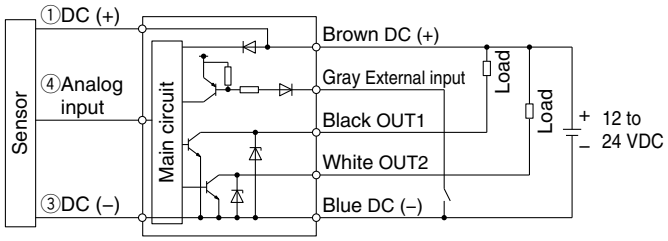
-RT: NPN (2 outputs) + Analog voltage output
-SV: NPN (2 outputs) + Analog current output



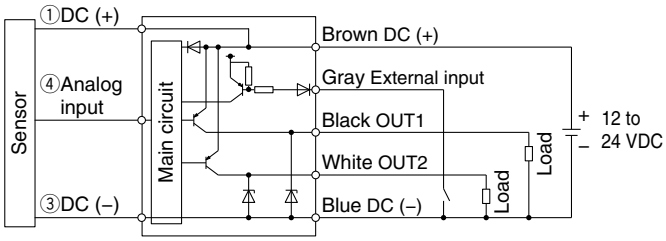
-RT: PNP (2 outputs) + Analog voltage output
-SV: PNP (2 outputs) + Analog current output



-RT: NPN (2 outputs) + External input
-SV: NPN (2 outputs) + External input

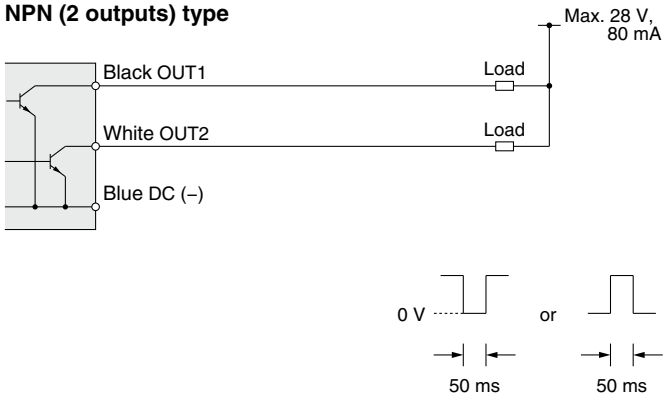


-RT: PNP (2 outputs) + External input
-SV: PNP (2 outputs) + External input

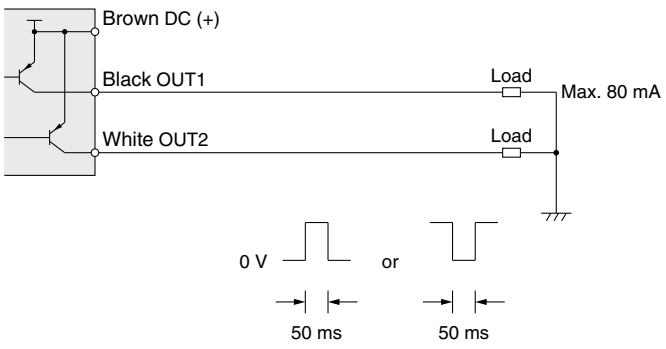


Accumulated pulse output wiring examples

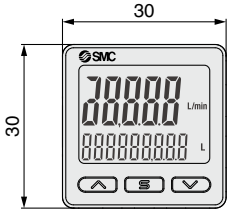
NPN (2 outputs) type

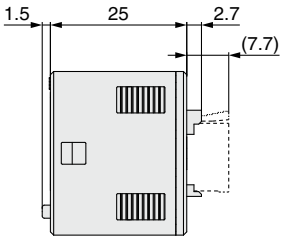


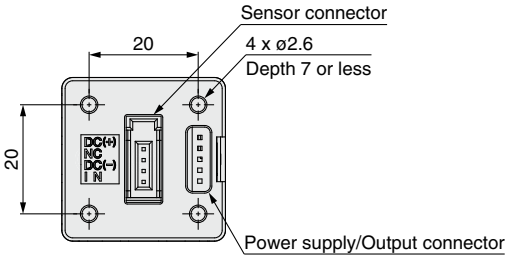
PNP (2 outputs) type



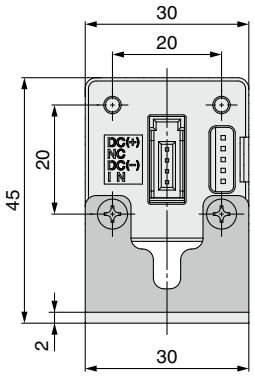
Dimensions

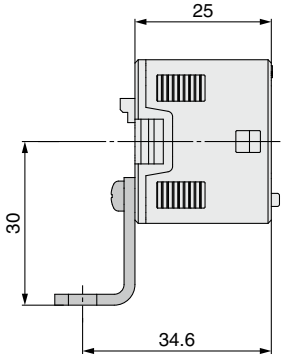


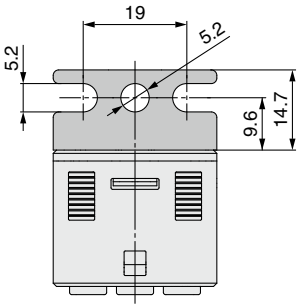


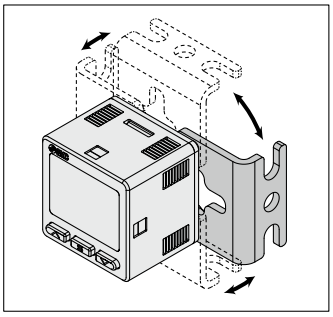


Bracket A (Part no.: ZS-46-A1)



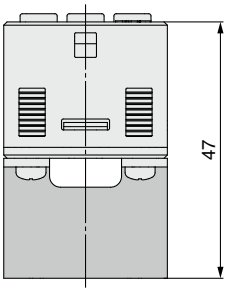


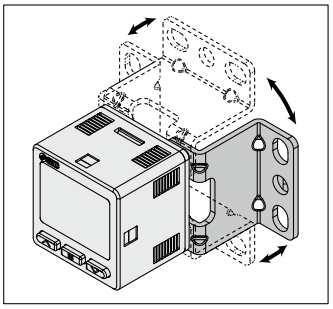




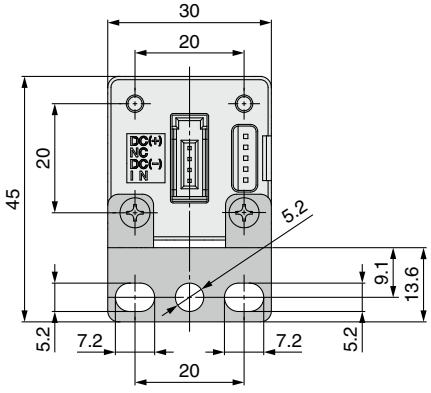
* Bracket configuration allows for mounting in four orientations.

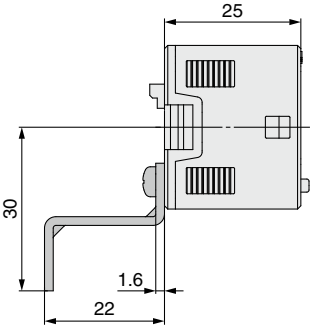
Bracket B (Part no.: ZS-46-A2)





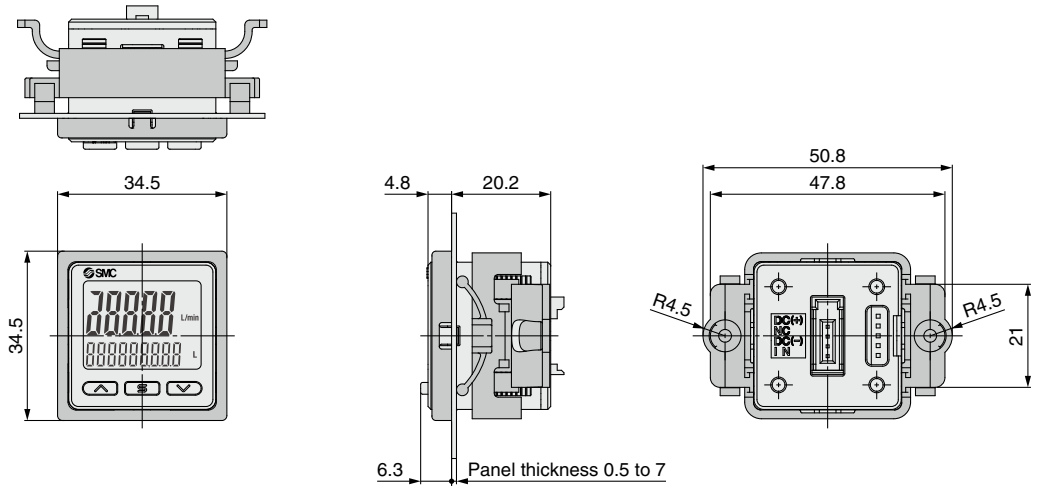
* Bracket configuration allows for mounting in four orientations.



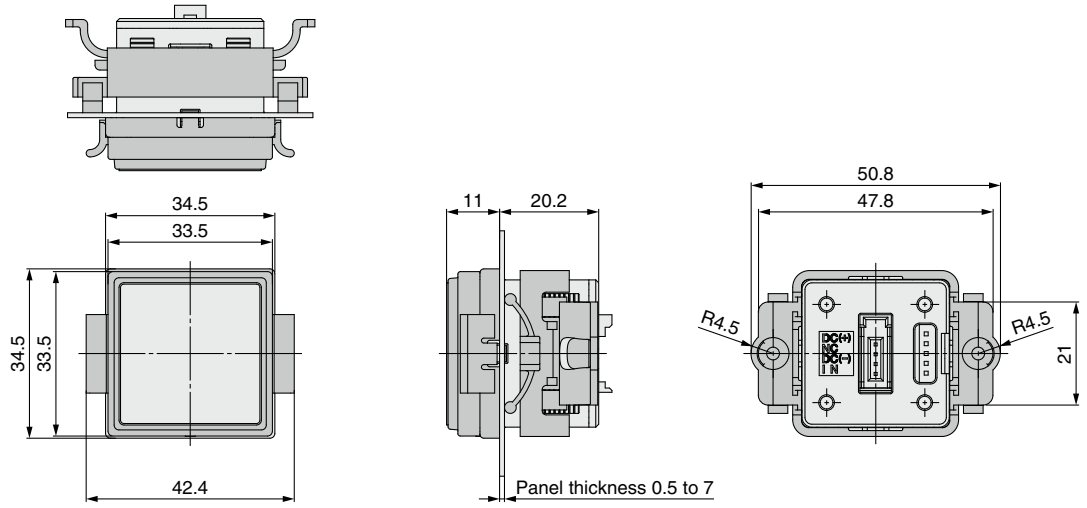


Dimensions

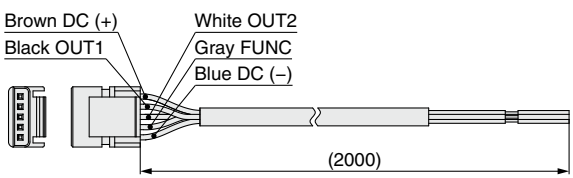
Panel mount adapter (Part no.: ZS-46-B)



Panel mount adapter + Front protection cover (Part no.: ZS-46-D)



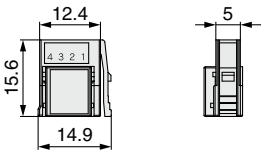
Power supply/output connection lead wire (Part no.: ZS-46-5L)



Sensor connector (Part no.: ZS-28-C-1)

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

*1 1 to 5 V or 4 to 20 mA



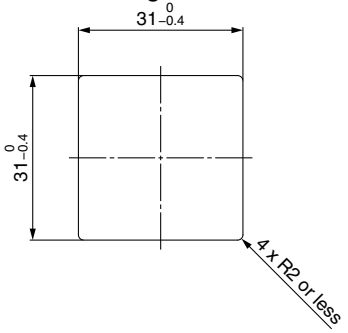
Cable Specifications

Conductor cross section		0.15 mm² (AWG26)
Insulator	**Outside diameter**	1.0 mm
	Color	Brown, Blue, Black, White, Gray (5-core)
Sheath	**Finished outside diameter**	ø3.5

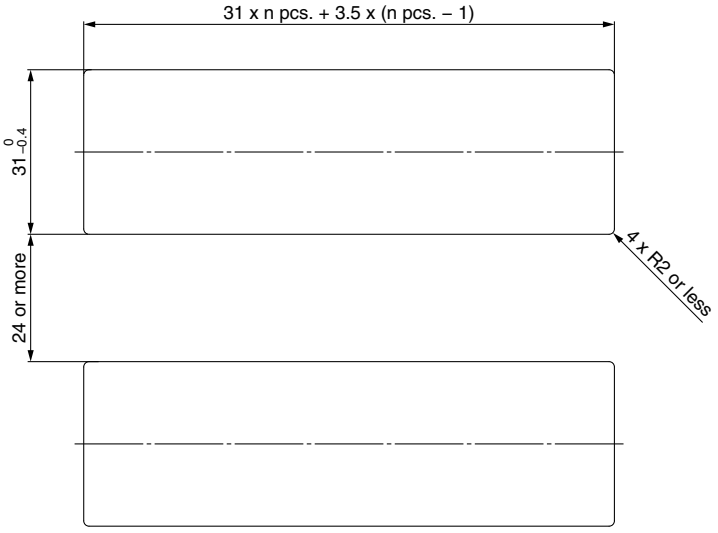
Dimensions

Panel fitting dimensions

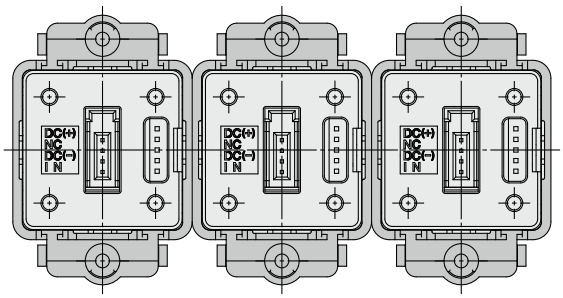
Individual mounting



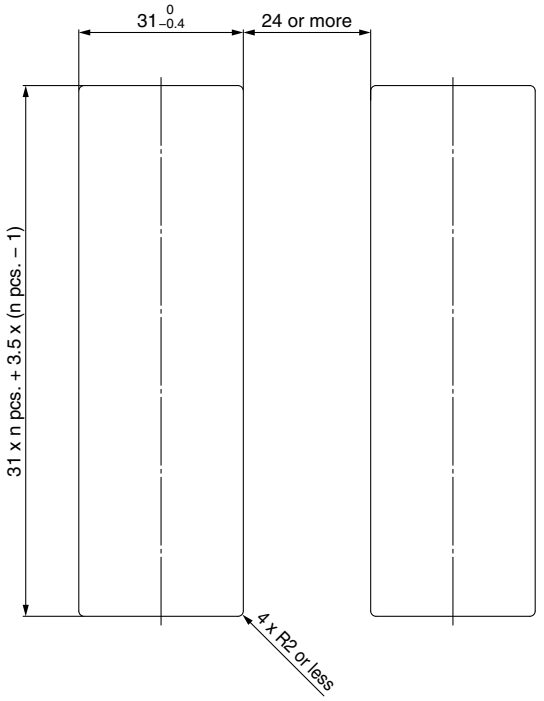
Multiple (2 pcs. or more) secure mounting
<Horizontal>



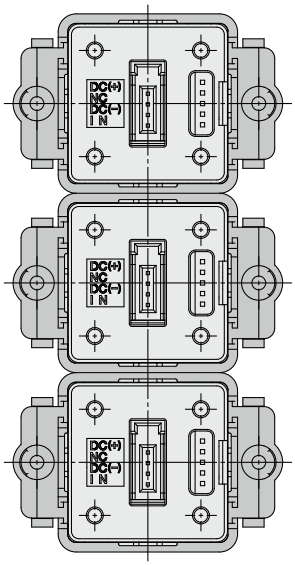
Panel mount example
<Horizontal>



<Vertical>



Panel mount example
<Vertical>



PFMB 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 or output (accumulated output and pulse output) corresponding to accumulated flow.

(Default setting: Hysteresis mode, Normal output)

■ Display color

The display color can be selected for each output condition. The selection of the display color provides visual identification of abnormal values. (The display 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

■ Reference condition

The display unit can be selected from standard condition or normal condition.

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

■ Display mode

The display mode can be selected from instantaneous flow or accumulated flow.

Instantaneous flow display
Accumulated flow display

■ Response time

The response time can be selected to suit the application. (Default setting: 1 s) Abnormalities can be detected more quickly by setting the response time to 0.05 seconds. The effect of fluctuation and flickering of the display can be reduced by setting the response time to 2 seconds.

0.05 s
0.1 s
0.5 s
1 s
2 s

■ Display OFF mode

This function will turn the display OFF. In this mode, decimal points flash on the main screen. If any button is pressed during this mode, the display reverts to normal for 30 seconds to allow checking of the flow, etc.

■ Setting of security code

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

■ External input function

This function can be used only when the optional external input is present. The accumulated flow, peak value, and bottom value can be reset remotely.

Accumulated value external reset: A function to reset the accumulated flow value when an external input signal is applied.
In accumulated increment mode, the accumulated value will reset to and increase from zero.
In accumulated decrement mode, the accumulated value will reset to and decrease from the set value.

* When the accumulated value is stored to memory, every time the accumulated value external reset is activated, the memory (EEPROM) will be accessed. Take into consideration that the maximum number of times the memory can be accessed is 1 million times. The total number of external inputs and the accumulated value memorizing time interval should not exceed 1 million times.

Peak/Bottom value reset: Peak and bottom value are reset.

■ Forced output function

The output is turned on/off in a fixed state when starting the system or during maintenance. This enables confirmation of wiring and prevents system errors due to unexpected output.
For the analog output type, when ON the output will be 5 V or 20 mA, and when OFF, it will be 1 V or 4 mA.

* Also, an increase or decrease of the flow and temperature will not change the on/off status of the output while the forced output function is activated.

■ Accumulated value hold

The accumulated value is not cleared even when the power supply is turned off. The accumulated value is memorized every 2 or 5 minutes during measurement and continues from the last memorized value when the power supply is turned on again.
The life time of the memory device is 1 million access times. Take this into consideration before using this function.

■ Peak/Bottom value display

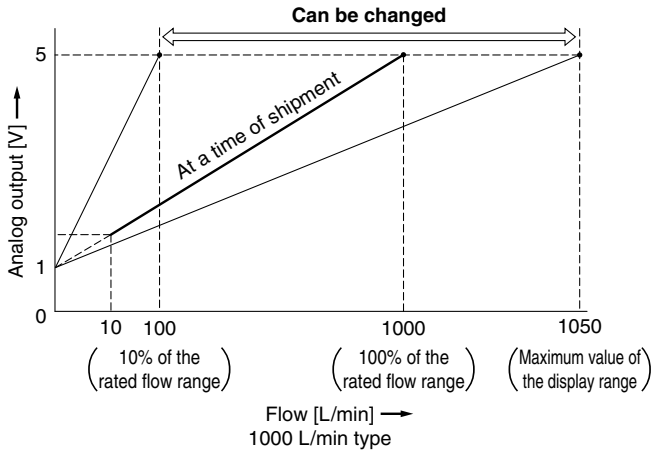
The maximum (minimum) flow rate is detected and updated from when the power supply is turned on. In peak (bottom) value display mode, this maximum (minimum) flow rate is displayed.

■ Keylock function

Prevents operation errors such as accidentally changing setting values

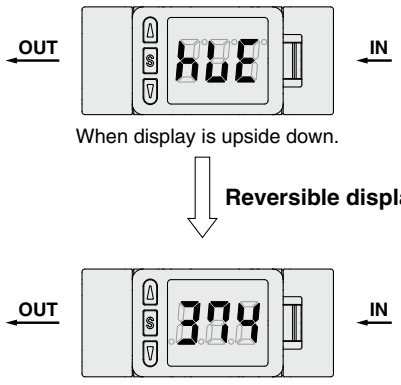
■ Analog output free range function

This function allows a flow that generates an output of 5 V or 20 mA to be changed. The value can be changed between 10% of the maximum value of the rated flow and the maximum value of the display range.



■ Reversible display mode

When the switch is used upside down, the orientation of the display can be rotated to make it easier to read by using the reversible display function.



■ Reset to the default settings

The product can be returned to its factory default settings.

■ Error display function

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

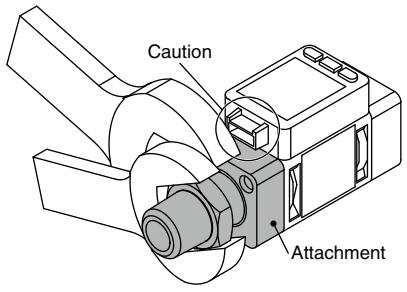
Display		Error name	Description	Action
Er1		OUT1 over current error	A load current of 80 mA or more is applied to the switch output (OUT1).	Eliminate the cause of the over current by turning off the power supply and then turning it on again.
Er2		OUT2 over current error	A load current of 80 mA or more is applied to the switch output (OUT2).	
HHH		Instantaneous flow error	The flow rate exceeds the maximum value of the display range.	Decrease the flow rate.
LLL		Reverse flow error	There is a reverse flow equivalent to –5% or more.	Change the flow to the correct direction.
999999999 ("999" will flash in any of upper, middle, lower 3-digit displays.)	PFMB7201 PFMB7501 PFMB7102	Accumulated flow error	The flow rate exceeds the accumulated flow rate range.	Clear the accumulated flow rate.
Er0		System error	Internal data error	Turn the power off and then on again.
Er4				
Er6				
Er8				

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

⚠Precautions on piping

Piping for the metal attachment

- Tighten to the specified torque. Refer to the table below for the required torque values.
- Use a wrench suited for the required torque. Do not use an extremely large wrench (Total length of 40 cm or more).
- If the tightening torque is exceeded, the product can be broken.
  If the tightening torque is insufficient, the fitting may become loose.
- Avoid any sealant tape getting inside the flow path.
- Ensure there is no leakage after piping.
- When mounting the fitting, a wrench should be used on the metal part (attachment) of the fitting only.
  Holding other parts of the product with a wrench may damage the product.
  Specifically, make sure that the wrench does not damage the connector.



Model	Nominal thread size	Width across flats of attachment
PFMB7501	1/2	30 mm
PFMB7102		
PFMB7202	3/4	35 mm

PFG300 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 or output (accumulated output and pulse output) corresponding to accumulated flow.

(Default setting: Hysteresis mode, Normal output)

■ Simple setting mode

Only the set values for instantaneous flow and accumulated flow can be changed. Output mode, output type, display color, and accumulate pulse output cannot be changed.

■ Display color

The display color can be selected for each output condition. The selection of the display color provides visual identification of abnormal values.

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

■ Delay time setting

The time from when the instantaneous flow reaches the set value to when the switch output operates can be set. Setting the delay time can prevent the switch output from chattering.

(Default setting: 0 s)

0.00 s
0.05 to 0.1 s (increment of 0.01 s)
0.1 to 1.0 s (increment of 0.1 s)
1 to 10 s (increment of 1 s)
20 s
30 s
40 s
50 s
60 s

■ Digital filter setting

The time for the digital filter can be set to the sensor input. Setting the digital filter can reduce chattering of the switch output and flickering of the analog output and the display.

The response time indicates when the set value is 90% in relation to the step input.

(Default setting: 0 s)

0.00 s
0.05 to 0.1 s (increment of 0.01 s)
0.1 to 1.0 s (increment of 0.1 s)
1 to 10 s (increment of 1 s)
20 s
30 s

■ FUNC output switching function

Analog output, external input, or copy function can be selected.
(Default setting: Analog output)

■ Selectable analog output function

1 to 5 V or 0 to 10 V can be selected for the analog voltage output type.
(Default setting: 1 to 5 V)

■ External input function

The accumulated flow, peak value, and bottom value can be reset remotely.

Accumulated value external reset: A function to reset the accumulated flow value when an external input signal is applied.
In accumulated increment mode, the accumulated value will reset to and increase from zero.
In accumulated decrement mode, the accumulated value will reset to and decrease from the set value.

∗ When the accumulated value is stored to memory, every time the accumulated value external reset is activated, the memory will be accessed. Take into consideration that the maximum number of times the memory can be accessed is 1.5 million times. The total number of external inputs and the accumulated value memorizing time interval should not exceed 1.5 million times.

Peak/Bottom value reset: Peak and bottom value are reset.

■ Forced output function

The output is turned on/off in a fixed state when starting the system or during maintenance. This enables the confirmation of wiring and prevents system errors due to unexpected output.
For the analog output type: When ON, the output will be 5 V (or 10 V when 0 to 10 V is selected) or 20 mA, and when OFF, 1 V (or 0 V when 0 to 10 V is selected) or 4 mA.

∗ Also, an increase or decrease of the flow will not change the on/off status of the output while the forced output function is activated.

■ Accumulated value hold

The accumulated value is not cleared even when the power supply is turned off. The accumulated value is memorized every 2 or 5 minutes during measurement and continues from the last memorized value when the power supply is turned on again.
The maximum writable limit of the memory device is 1.5 million times, which should be taken into consideration.

■ Peak/Bottom value display

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

■ Setting of security code

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

■ Keylock function

Prevents operation errors such as accidentally changing setting values

■ Reset to the default settings

The product can be returned to its factory default settings.

■ Display with zero cut-off setting

When the flow is close to 0 L/min, the product will round the value down and zero will be displayed. A flow value may be displayed even when the flow rate is 0 L/min due to high pressure or depending on the installation. The zero cut function will force the display to zero. The range to display zero can be changed.

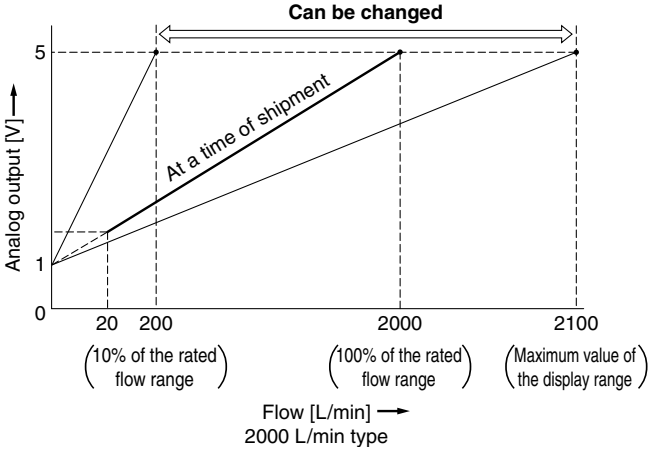
■ Selection of display on sub screen

The display on the sub screen in measuring mode can be set.

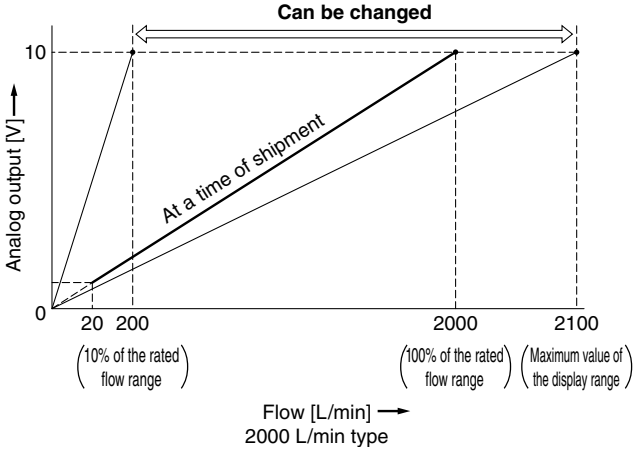
Set value display	Accumulated value display	Peak value display
Displays the set value	Displays the accumulated value	Displays the peak value
		
Bottom value display	**Line name display**	**OFF**
Displays the bottom value	Displays the line name (Up to 5 alphanumeric characters can be input.)	Displays nothing
		

■ Analog output free range function

This function allows a flow that generates an output of 5 V (or 10 V when 0 to 10 V is selected) or 20 mA to be changed. The value can be changed between 10% of the maximum value of the rated flow and the maximum value of the display range.



For analog voltage output of 0 to 10 V



■ Error display function

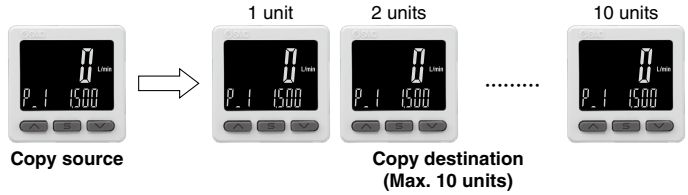
When an error or abnormality arises, the location and contents are displayed.

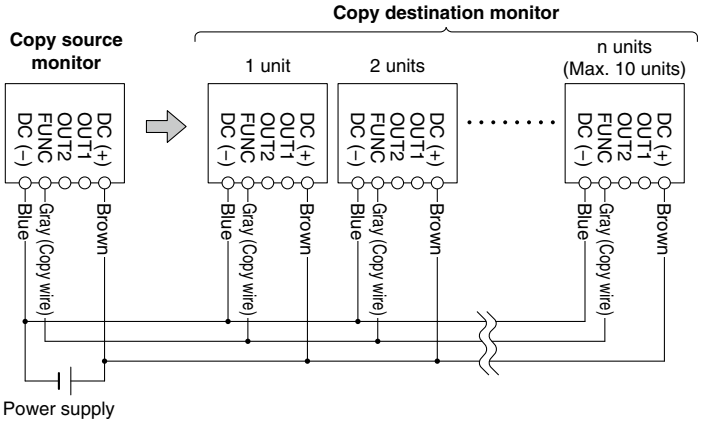
Display	Error name	Description	Action
Er1 Er2	OUT over current error	A load current of 80 mA or more is applied to the switch output (OUT).	Eliminate the cause of the over current by turning off the power supply and then turning it on again.
HHH	Instantaneous flow error	The flow rate exceeds the maximum value of the display range.	Decrease the flow rate.
LLL	Reverse flow error	There is a reverse flow equivalent to –5% or more.	Change the flow to the correct direction.
999999 flashes x 10^6	Accumulated flow error	The flow rate exceeds the accumulated flow rate range.	Clear the accumulated flow rate.
Er0	System error	Internal data error	Turn the power off and then on again.
Er4			
Er6			
Er7			
Er8			
Er14			
Er40			
Er13	Copy error	The copy function does not operate properly.	After clearing the error by pressing the ▲ and ▼ buttons simultaneously for a minimum of 1 second, check the wiring and the model, and then attempt to copy again.

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

■ Copy function

The set values of the monitor can be copied.
This can reduce setting labor and minimize the risk of setting mistakes.
The set value can be copied to up to 10 flow monitors simultaneously.
(Maximum transmission distance: 4 m)





1) Wire as shown in the figure on the left.
2) All monitors are set to copy destination when first purchased.
(Default condition is the monitor to be copied to.)
3) Press the S button on the source monitor to start copying.

■ Selection of power saving mode

Power saving mode can be selected.
It shifts to the power saving mode without button operation for 30 seconds.
It is set to the normal mode (Power saving mode is OFF.) at a time of shipment from the factory.
(During power saving mode, [ECo] will flash in the sub screen and the operation light is ON (only when the switch is ON).)

* There may be a difference in the displayed value on the connected flow switch and the flow monitor. When the flow monitor display is being used, it is recommended to set the flow switch display to OFF mode.