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CAT.ES100-54 A -UK

SMC

CE

Digital Flow Switches









4-channel Flow Monitor



Series PF2□200

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1 *Flow rate setting and monitoring are possible with the digital display.*

2 *Two types are available: Integrated and Remote type.*

3 *Three types of output: Switch, accumulated pulse, and analogue outputs.*

4 *Switching from real-time flow rate to accumulated flow is possible.*
(Accumulated flow rate is reset when the power supply turns OFF.)

5 *Two independent flow rate settings are possible.*

6 *Water resistant construction conforming to IP65*



For Air
Series PF2A

For Water
Series PF2W

For De-ionised Water and Chemicals
Series PF2D

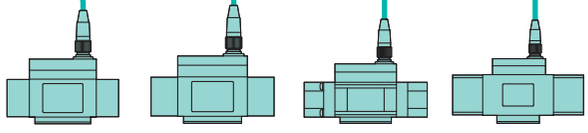
A single controller can monitor the flow rate of 4 different sensors.





4 independent flow rate ranges can be monitored by a single controller.

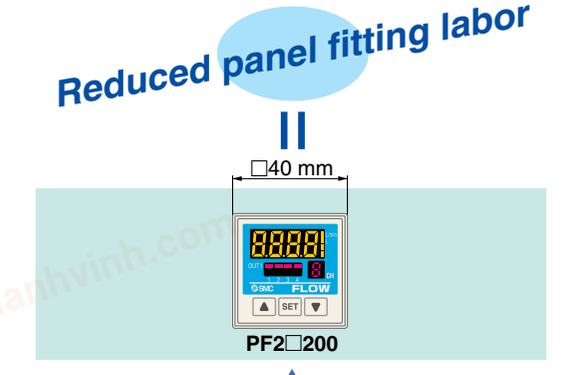
4-channel Flow Monitor
Series PF2□200



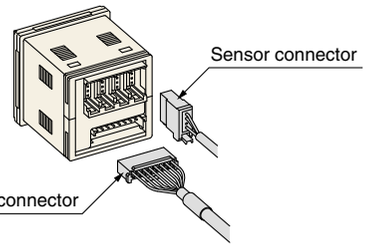
76% reduced intallation space

(Compared with a PF2A3□□ and PF2W3□□, when panel mounted.)

Reduced panel fitting labor



Connection

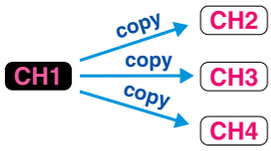


Function

Copy function

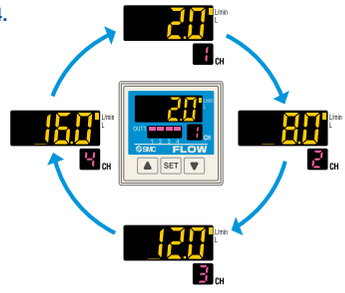
Possible to copy information from one channel to one or more other channels.

Copying CH1 setting to CH2, 3 and 4.



Channel scan function

Allows constant monitoring of the displayed flow rate value for each channel.



- Key lock function
- Unit switching function
- Peak value and lowest value holding

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For Air P. 1






Flow rate measurement range ℓ/min	Integrated type	Remote type		
		Sensor unit	Display unit	Display unit (4ch)
1 to 10	PF2A710	PF2A510	PF2A30□	PF2A20□
5 to 50	PF2A750	PF2A550		
10 to 100	PF2A711	PF2A511	PF2A31□	
20 to 200	PF2A721	PF2A521		
50 to 500	PF2A751	PF2A551		
150 to 3000	PF2A703H	—	—	—
300 to 6000	PF2A706H			
600 to 12000	PF2A712H			

For Water P. 15






Flow rate measurement range ℓ/min	Integrated type	Remote type		
		Sensor unit	Display unit	Display unit (4ch)
0.5 to 4	PF2W704(T)	PF2W504(T)	PF2W30□	PF2W20□
2 to 16	PF2W720(T)	PF2W520(T)		
5 to 40	PF2W740(T)	PF2W540(T)		
10 to 100	PF2W711	PF2W511	PF2W33□	

For De-ionised Water and Chemicals P. 44

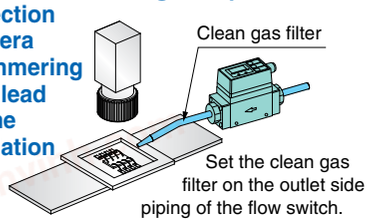




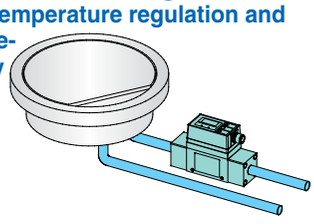
Flow rate measurement range ℓ/min	Remote type		
	Sensor unit	Display unit	Display unit (4ch)
0.4 to 4	PF2D504	PF2D30□	PF2D20□
1.8 to 20	PF2D520		
4.0 to 40	PF2D540		

Application Examples

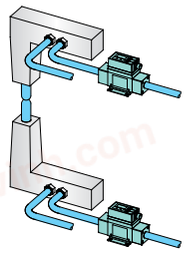
Flow control of N_2 gas to prevent detection camera shimmering and lead frame oxidation



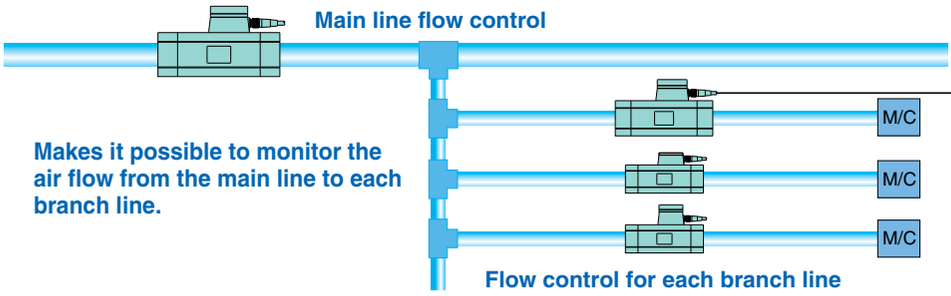
Flow control of cooling water for wafer temperature regulation and high frequency power supply



Flow control of pressurised cooling water for welding gun



Main line flow control



Makes it possible to monitor the air flow from the main line to each branch line.

■ The accumulated pulse output function enables remote monitoring of accumulated flow.

(Refer to page 36.)

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For Air
Digital Flow Switch
Series PF2A

Refer to www.smcworld.com for details of products compatible with overseas standards.



How to Order

Integrated Display Type **PF2A7 10 □ 01 27 □ M**

Flow rate range

10	1 to 10 ℓ/min
50	5 to 50 ℓ/min
11	10 to 100 ℓ/min
21	20 to 200 ℓ/min
51	50 to 500 ℓ/min

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (ℓ/min) 10	50	100	200	500	Applicable model
01	1/8	●	●				PF2A710/750
02	1/4	●	●				
03	3/8			●	●		PF2A711/721
04	1/2					●	PF2A751

Output specification

Symbol	Output specification
27	NPN open collector 2 outputs
67	PNP open collector 2 outputs

Lead wire (Refer to page 35.)

Symbol	
N	Without lead wire

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min

Specifications

Model		PF2A710	PF2A750	PF2A711	PF2A721	PF2A751
Measured fluid		Air, Nitrogen				
Flow rate measurement range		0.5 to 10.5 ℓ/min	2.5 to 52.5 ℓ/min	5 to 105 ℓ/min	10 to 210 ℓ/min	25 to 525 ℓ/min
Set flow rate range		0.5 to 10.5 ℓ/min	2.5 to 52.5 ℓ/min	5 to 105 ℓ/min	10 to 210 ℓ/min	25 to 525 ℓ/min
Rated flow range		1 to 10 ℓ/min	5 to 50 ℓ/min	10 to 100 ℓ/min	20 to 200 ℓ/min	50 to 500 ℓ/min
Minimum set unit		0.1 ℓ/min	0.5 ℓ/min	1 ℓ/min	2 ℓ/min	5 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms)		0.1 ℓ/pulse	0.5 ℓ/pulse	1 ℓ/pulse	2 ℓ/pulse	5 ℓ/pulse
Display units Note 1, 2)	Real-time flow rate	ℓ/min, CFM x 10^{-2}		ℓ/min, CFM x 10^{-1}		
	Accumulated flow	ℓ, ft^3 x 10^{-1}				
Operating fluid temperature		0 to 50C				
Linearity		±5% F.S. or less				
Repeatability		±1% F.S. or less		±2% F.S. or less		
Temperature characteristics		±3% F.S. or less (15 to 35°C, based on 25°C), ±5% F.S. or less (0 to 50°C, based on 25°C)				
Current consumption (No load)		150 mA or less		160 mA or less		170 mA or less
Weight Note 3)		250 g		290 g		
Port size (Rc, NPT, G)		1/8, 1/4		3/8		1/2
Detection type		Heater type				
Indicator light		3-digit, 7-segment LED				
Operating pressure range		–50 kPa to 0.5 MPa		–50 kPa to 0.75 MPa		
Proof pressure		1.0 MPa				
Accumulated flow range Note 4)		0 to 999999 ℓ				
Output specifications Note 5)	Switch output	NPN open collector	Maximum load current: 80 mA; Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V; 2 outputs			
		PNP open collector	Maximum load current: 80 mA Internal voltage drop: 1.5 V or less (with load current of 80 mA); 2 outputs			
	Accumulated pulse output	NPN or PNP open collector (same as switch output)				
Status LED's		Illuminates up when output is ON OUT1: Green; OUT2: Red				
Response time		1 sec. or less				
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed				
Power supply voltage		12 to 24 VDC (ripple ±10% or less)				
Resistance	Enclosure	IP65				
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)				
	Withstand voltage	1000 VAC for 1 min. between external terminal and case				
	Insulation resistance	50 MΩ or more (at 500 VDC measured via Megohmmeter) between external terminal and case.				
	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-energised)				
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each				
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns				

Note 1) For digital flow switch with unit switching function. (Fixed SI unit [(ℓ/min, or ℓ, m^3 or m^3 x 10^3)] will be set for switch type without the unit switching function.)
Note 2) Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.
Note 3) Without lead wire.
Note 4) Accumulated flow rate is reset when the power supply turns OFF.
Note 5) Switch output and accumulated pulse output can be selected during initial setting.
Note 6) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 7) The flow switch conforms to the CE mark.

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How to Order

Remote Type Sensor Unit

PF2A5 10 — □ 01 □ — □ — C



Flow rate range

10	1 to 10 ℓ/min
50	5 to 50 ℓ/min
11	10 to 100 ℓ/min
21	20 to 200 ℓ/min
51	50 to 500 ℓ/min

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (ℓ/min) 10	50	100	200	500	Applicable model
01	1/8	●	●				PF2A510/550
02	1/4	●	●				
03	3/8			●	●		PF2A511/521
04	1/2					●	PF2A551

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Option (Refer to page 35.)

Nil	None
C	e-con connector x 1 pc.

The cable and connector are shipped unassembled.

Output specification

Symbol	Specification	Applicable display unit (monitor) model
Nil	Output for display unit	Series PF2A300
1	Output for display unit + analogue output (1 to 5 V)	Series PF2A200/300
2	Output for display unit + analogue output (4 to 20 mA)	Series PF2A300

Specifications

Model		PF2A510	PF2A550	PF2A511	PF2A521	PF2A551
Measured fluid		Air, Nitrogen				
Detection type		Heater type				
Rated flow range		1 to 10 ℓ/min	5 to 50 ℓ/min	10 to 100 ℓ/min	20 to 200 ℓ/min	50 to 500 ℓ/min
Operating pressure range		–50 kPa to 0.5 MPa		–50 kPa to 0.75 MPa		
Proof pressure		1.0 MPa				
Operating fluid temperature		0 to 50°C				
Linearity Note 1)		±5% F.S. or less				
Repeatability Note 1)		±1% F.S. or less (Connected with PF2A3□□), ±3%F.S. or less (Connected with PF2A2□□)				
Temperature characteristics		±2% F.S. or less (15 to 35°C, based on 25°C) ±3% F.S. or less (0 to 50°C, based on 25°C)				
Output specifications Note 2)	Output for display unit	Analogue voltage output (non-linear) output impedance 1 kΩ output for display unit PF2A3□□				
	Analogue output	Voltage output 1 to 5 V (within the flow rate range) Linearity: ±5% F.S. or less; allowable load resistance: 100 kΩ or more.				
		Current output 4 to 20 mA (within the flow rate range) Linearity: ±5% F.S. or less; allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC				
Power supply voltage		12 to 24 VDC (ripple ±10% or less)				
Current consumption (No load)		100 mA or less				110 mA or less
Resistance	Enclosure	IP65				
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)				
	Withstand voltage	1000 VAC for 1 min. between external terminal and case				
	Insulation resistance	50 MΩ or more (500 VDC measured via Megohmmeter) between external terminal and case.				
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, whichever is smaller.				
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each				
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns				
Weight Note 3)		200 g		240 g		
Port size (Rc, NPT, G)		1/8, 1/4		3/8		1/2

Note 1) The system accuracy when combined with PF2A2□□/3□□.
Note 2) Output system can be selected during initial setting.
Note 3) Without lead wire. (Add 20 g for the types of analogue output whether voltage or current output selected.)
Note 4) Flow rate unit measured under the following conditions: 0°C and 101.3 kPa.
Note 5) The sensor unit conforms to the CE mark.

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Series PF2A



How to Order

Remote Type Display Unit **PF2A3 [0] [0] – [A] – [M]**

Flow rate range

Symbol	Flow rate range	Type for sensor unit
0	1 to 10 ℓ/min	PF2A510
	5 to 50 ℓ/min	PF2A550
1	10 to 100 ℓ/min	PF2A511
	20 to 200 ℓ/min	PF2A521
	50 to 500 ℓ/min	PF2A551

Mounting

A	Panel mounting

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Output specification

Symbol	Output specification	Applicable model
0	NPN open collector 2 outputs	PF2A300, 310
1	PNP open collector 2 outputs	PF2A301, 311

Specifications

Model		PF2A300/301		PF2A310/311		
Flow rate measurement range Note 1)		0.5 to 10.5 ℓ/min	2.5 to 52.5 ℓ/min	5 to 105 ℓ/min	10 to 210 ℓ/min	25 to 525 ℓ/min
Set flow rate range Note 1)		0.5 to 10.5 ℓ/min	2.5 to 52.5 ℓ/min	5 to 105 ℓ/min	10 to 210 ℓ/min	25 to 525 ℓ/min
Minimum set unit Note 1)		0.1 ℓ/min	0.5 ℓ/min	1 ℓ/min	2 ℓ/min	5 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms) Note 1)		0.1 ℓ/pulse	0.5 ℓ/pulse	1 ℓ/pulse	2 ℓ/pulse	5 ℓ/pulse
Note 2, 3) Display units	Real-time flow rate	ℓ/min, CFM x 10^{-2}		ℓ/min, CFM x 10^{-1}		
	Accumulated flow	ℓ, ft^3 x 10^{-1}				
Accumulated flow range Note 4)		0 to 999999 ℓ				
Linearity Note 5)		±5% F.S. or less				
Repeatability Note 5)		±1% F.S. or less				
Temperature characteristics		±1% F.S. or less (15 to 35°C, based on 25°C) ± 2% F.S. or less (0 to 50°C, based on 25°C)				
Current consumption (No load)		50 mA or less		60 mA or less		
Weight		45 g				
Output specifications Note 6)	Switch output	NPN open collector (PF2A300, PF2A310)		Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V 2 outputs		
		PNP open collector (PF2A301, PF2A311)		Maximum load current: 80 mA Internal voltage drop: 1.5 V or less (with load current of 80 mA) 2 outputs		
	Accumulated pulse output	NPN or PNP open collector (same as switch output)				
Indicator light		3-digit, 7-segment LED				
Status LED's		Illuminates up when output is ON OUT1: Green; OUT2: Red				
Power supply voltage		12 to 24 VDC (ripple ±10% or less)				
Response time		1 sec. or less				
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 7): Fixed (3-digits)				
Resistance	Enclosure	IP40				
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)				
	Withstand voltage	1000 VAC for 1 min. between external terminal and case				
	Insulation resistance	50 MΩ or more (at 500 VDC measured via Megohmmeter) between external terminal and case.				
	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.				
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each				
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns				

Note 1) The flow rate measurement range can be modified depending on the setting.
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [ℓ/min or ℓ] will be set for switch types without the unit switching function.)
Note 3) Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.
Note 4) Accumulated flow rate is reset when the power supply turns OFF.
Note 5) The system accuracy when combined with PF2A5□□.
Note 6) Switch output and accumulated pulse output can be selected during initial setting.
Note 7) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 8) The display unit conforms to the CE mark.

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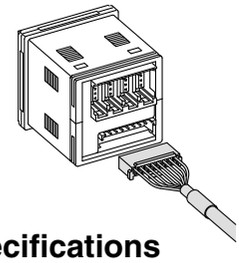


How to Order

4-channel Flow Monitor
Remote Type
Display Unit

PF2A20 0 — M □ □

Accessory / Power supply output cable (2 m)



Output specification

0	NPN4 outputs
1	PNP4 outputs

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Option 2 (Refer to page 35.)

Nil	None
4C	Sensor connector (4 pc.)

Option 1 (Refer to page 35.)

Nil	None
A	Panel mounting
B	Front protective cover + Panel mounting

Connectable remote type sensor part is PF2A5□□-□-1 (with analogue output 1 to 5 V).

Specifications

Model		**PF2A200/201**				
Applicable flow rate sensor		PF2A510-□-1	PF2A550-□-1	PF2A511-□-1	PF2A521-□-1	PF2A551-□-1
Flow rate measurement range Note 1)		0.5 to 10.5 ℓ/min	2.5 to 52.5 ℓ/min	5 to 105 ℓ/min	10 to 210 ℓ/min	25 to 525 ℓ/min
Set flow rate range Note 1)		0.5 to 10.5 ℓ/min	2.5 to 52.5 ℓ/min	5 to 105 ℓ/min	10 to 210 ℓ/min	25 to 525 ℓ/min
Minimum set unit Note 1)		0.1 ℓ/min	0.5 ℓ/min	1 ℓ/min	2 ℓ/min	5 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms) Note 1)		0.1 ℓ/pulse	0.5 ℓ/pulse	1 ℓ/pulse	2 ℓ/pulse	5 ℓ/pulse
Note 1, 2) **Display units**	**Real-time flow rate**	ℓ/min, CFM x 10^{-2}		ℓ/min, CFM x 10^{-1}		
	Accumulated flow	ℓ, ft^3 x 10^{-2}		ℓ, ft^3 x 10^{-1}		
Accumulated flow range Note 1)		0 to 999999 ℓ, 0 to 999999 ft^3 x 10^{-2}		0 to 999999 ℓ, 0 to 999999 ft^3 x 10^{-1}		
Power supply voltage		24 VDC (ripple ±10% or less) (With power supply polarity protection)				
Current consumption		55 mA or less (Not including the current consumption of the sensor)				
Power supply voltage for sensor		Same as [Power supply voltage]				
Power supply current for sensor Note 3)		Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.)				
Sensor input		1 to 5 VDC (Input impedance: Approx. 800K Ω)				
	No. of inputs	4 inputs				
	Input protection	Excess voltage protection				
Note 4) **Output specifications**	**Switch output (Real-time switch output, Accumulated switch output)**	NPN open collector (PF2A200)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V			
		PNP open collector (PF2A201)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA)			
	Accumulated pulse output	NPN open collector or PNP open collector (same as switch output)				
	No. of outputs	4 outputs (1 output per 1 sensor input)				
	Output protection	With short circuit protection				
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode: Fixed (3-digits)				
Response time Note 5)		1s or less				
Linearity Note 5)		±5% F.S. or less				
Repeatability Note 5)		±3% F.S. or less				
Temperature characteristics		±2% F.S. or less (0 to 50°C, based on 25°C)				
Display method		For measured value display: 4-digits, 7-segment LED (Orange) For channel display: 1-digit, 7-segment LED (Red)				
Status LED's		Illuminates when output is ON OUT1: Red				
Resistance	**Enclosure**	IP65 for the front face only, and IP40 for the remaining parts.				
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no freezing and condensation)				
	Operating humidity range	Operating or Stored: 35 to 85%RH (with no condensation)				
	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-energised)				
	Impact resistance	980 m/s^2 in X, Y, Z directions 3 times each (de-energised)				
	Noise resistance	500 Vp-p, Pulse width 1 μs, Rise time 1 ns				
Connection		Power supply / Output connection: 8P connector, Sensor connection: 4P connector (e-con)				
Material		Housing: PBT, Display: PET, Backside rubber: CR				
Weight		60 g (Except for any accessories that are shipped together)				

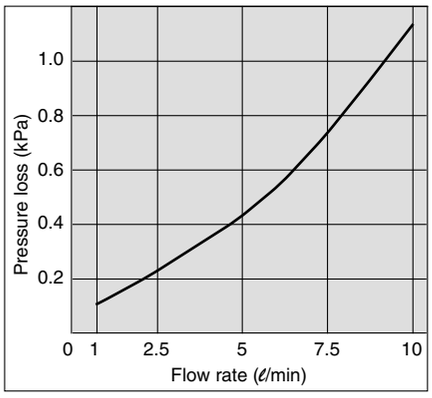
Note 1) Fixed SI unit [ℓ/min or ℓ] will be set for switch types without the unit switching function. ("-M" is suffixed at the end of part number.) Accumulated flow is reset when the power supply turns OFF.
Note 2) Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.
Note 3) If Vcc side on sensor input connector part is short-circuited with the 0V side, the flow monitor inside will be damaged.
Note 4) Switch output and accumulated pulse output can be selected during initial setting.
Note 5) The system accuracy when combined with an applicable flow sensor.
Note 6) This product conforms to the CE mark.

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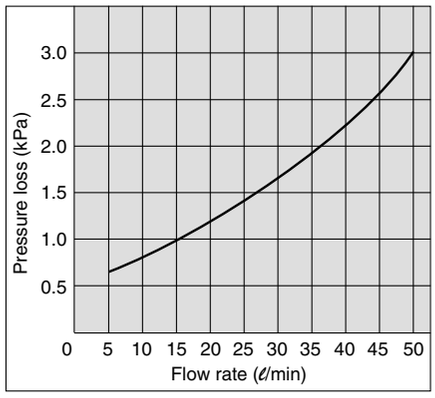
Series PF2A

Flow Characteristics (Pressure Loss)

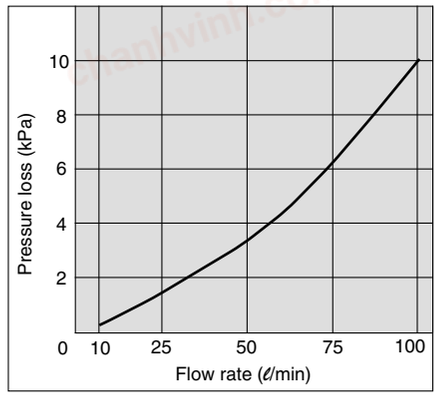
PF2A710, 510



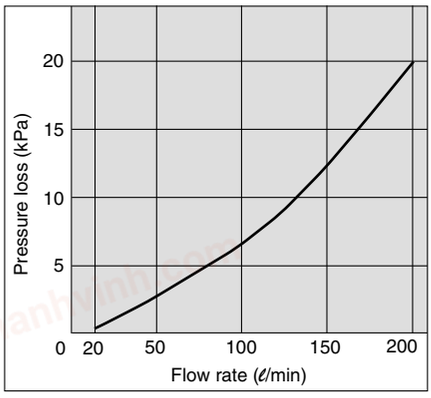
PF2A750, 550



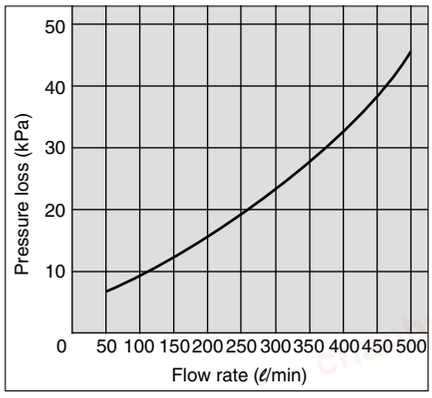
PF2A711, 511



PF2A721, 521

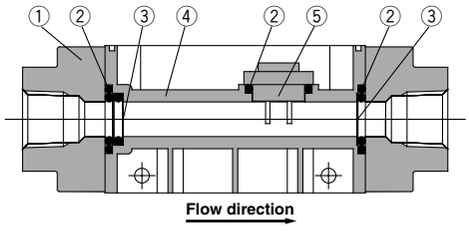


PF2A751, 551

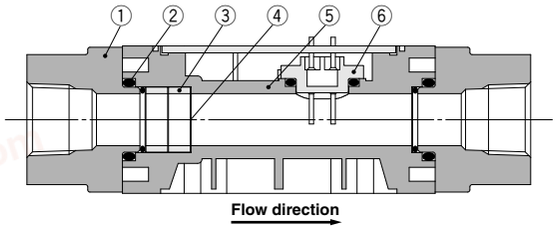


Sensor Unit Construction

PF2A710/750
PF2A510/550



PF2A711/721/751
PF2A511/521/551



Parts list

No.	Description	Material
1	**Attachment**	ADC
2	**Seal**	NBR
3	**Mesh**	Stainless steel
4	**Body**	PBT
5	**Sensor**	PBT

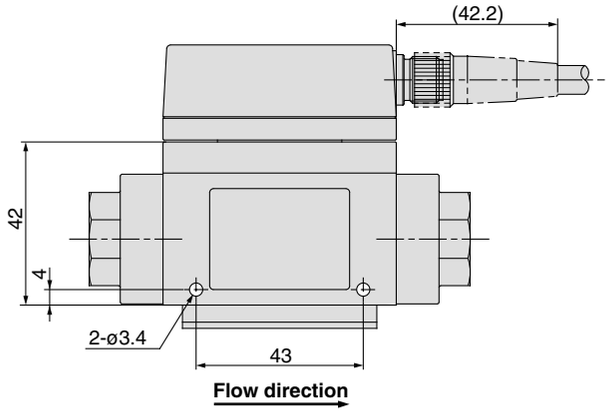
Parts list

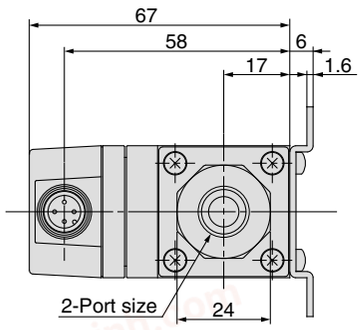
No.	Description	Material
1	**Attachment**	ADC
2	**Seal**	NBR
3	**Spacer**	PBT
4	**Mesh**	Stainless steel
5	**Body**	PBT
6	**Sensor**	PBT

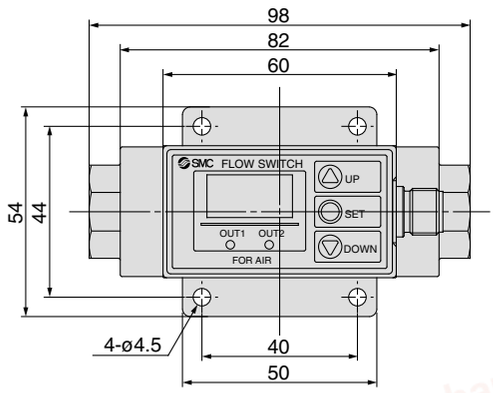
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Dimensions: Integrated Display Type for Air

PF2A710, 750

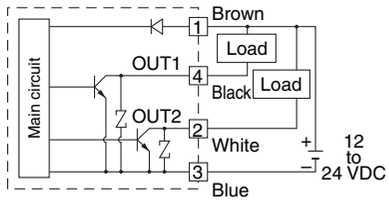




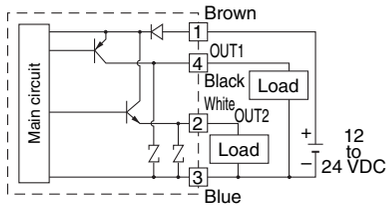


Internal circuits and wiring examples

1 to 4 are the terminal numbers.

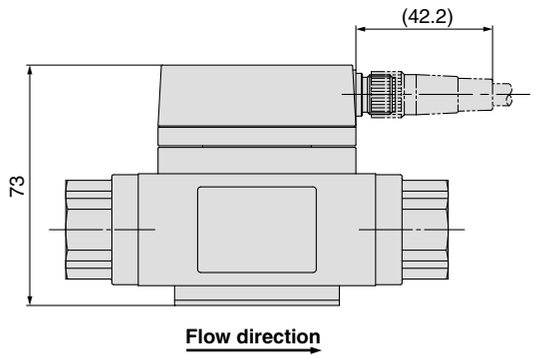


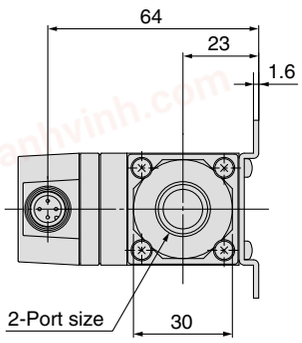
PF2A7□□-□□-27□(-M)

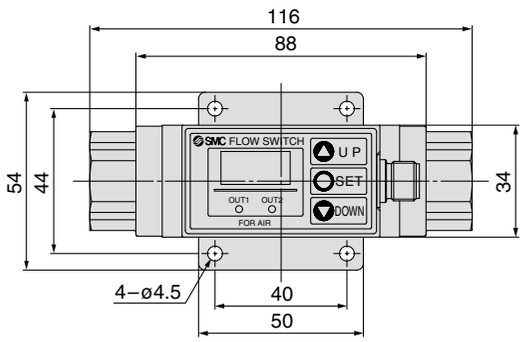


PF2A7□□-□□-67□(-M)

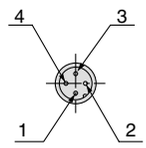
PF2A711, 721, 751







Connector pin numbers



Pin no.	Pin description
1	DC(+)
2	OUT2
3	DC(–)
4	OUT1

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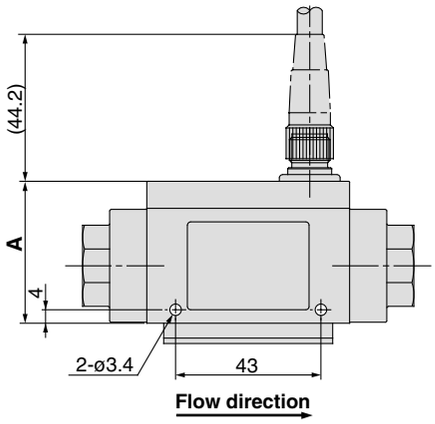
Series PF2A

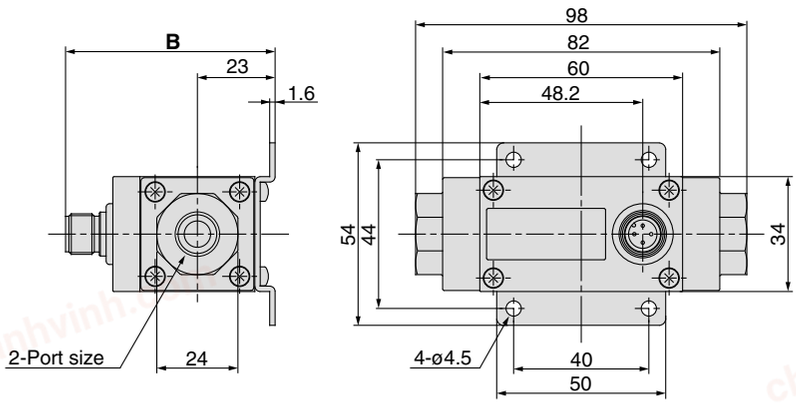
Dimensions: Remote Type Sensor Unit for Air

PF2A510, 550

(mm)

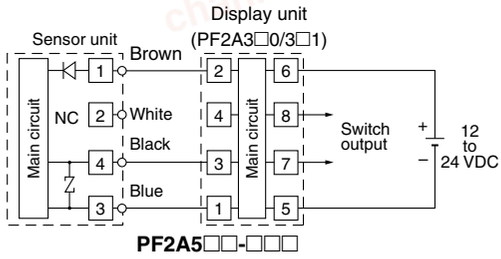
Output specification	A	B
Output for display unit only	42	62
Output for display unit + Analogue output	52	72



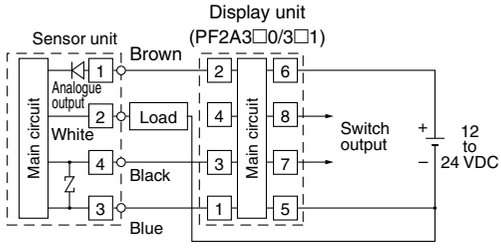


Internal circuits and wiring examples

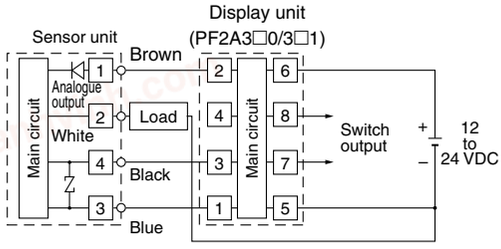
1 to 8 are the terminal numbers.



PF2A5□□-□□□



Load is an analogue input equipment such as a voltmeter.
PF2A5□□-□□□-1 (With voltage output type)

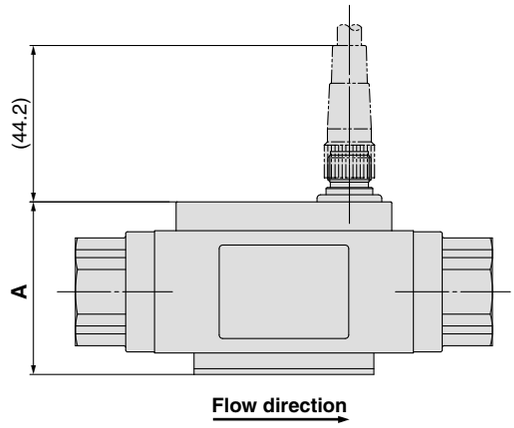


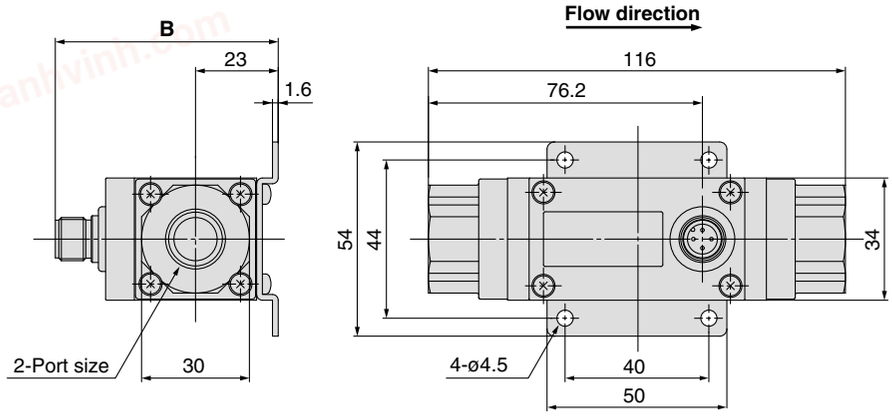
Load is an analogue input equipment such as a voltmeter.
PF2A5□□-□□□-2 (With voltage output type)

PF2A511, 521, 551

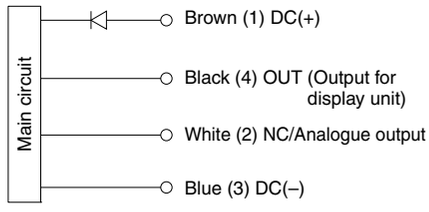
(mm)

Output specification	A	B
Output for display unit only	48	62
Output for display unit + Analogue output	58	72



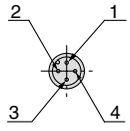


Wiring



* Use this sensor by connecting it to a SMC remote type display unit Series PF2A2□□/3□□.

Connector pin numbers



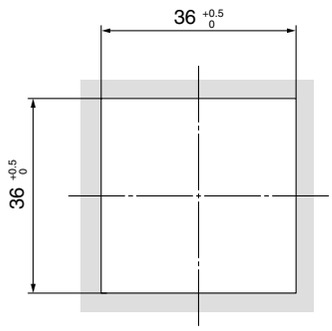
Pin no.	Pin description
1	DC(+)
2	NC/Analogue output
3	DC(–)
4	OUT

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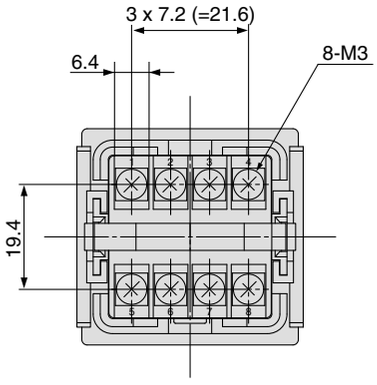
Dimensions: Remote Type Display Unit for Air

PF2A3□□-A
Panel mounting type

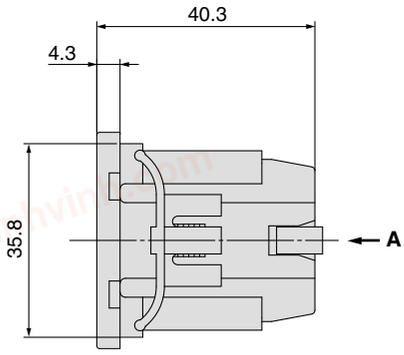
Panel fitting dimensions

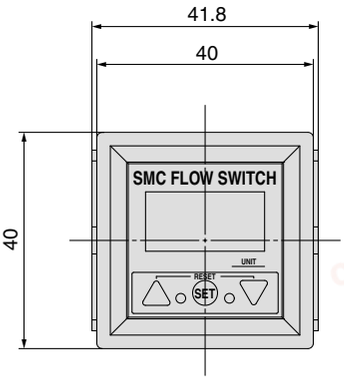


∗ The applicable panel thickness is 1 to 3.2 mm.



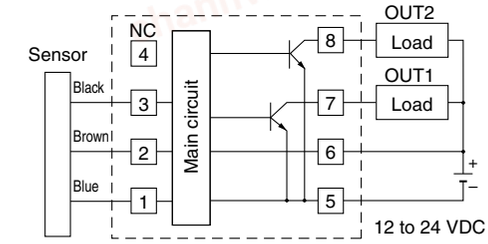
View A



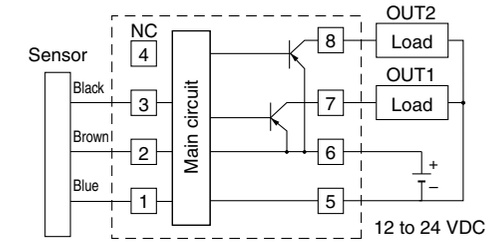


Internal circuits and wiring examples

1 to 8 are the terminal numbers.



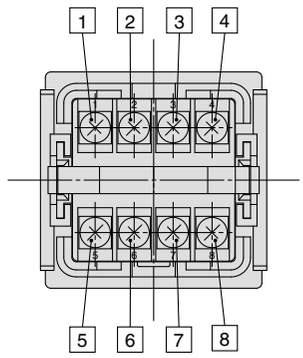
Series PF2A5□□ **PF2A3□0-A**



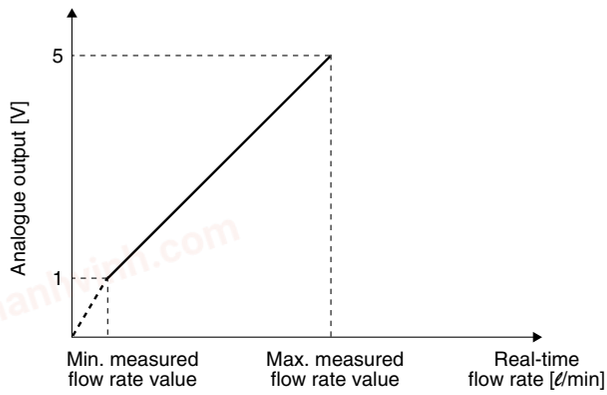
Series PF2A5□□ **PF2A3□1-A**

∗ Do not connect the white wire of the sensor to 3.

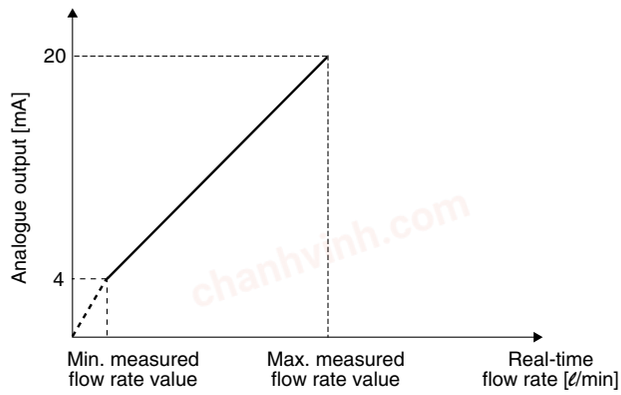
Terminal block numbers



Analogue output
1 to 5 VDC



4 to 20 mADC



Part no.	Normal condition		Standard condition	
	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]
PF2A510-□-1	1	10	1.1	10.7
PF2A550-□-1	5	50	5.4	53.5
PF2A511-□-1	10	100	11	107
PF2A521-□-1	20	200	21	214
PF2A551-□-1	50	500	54	535

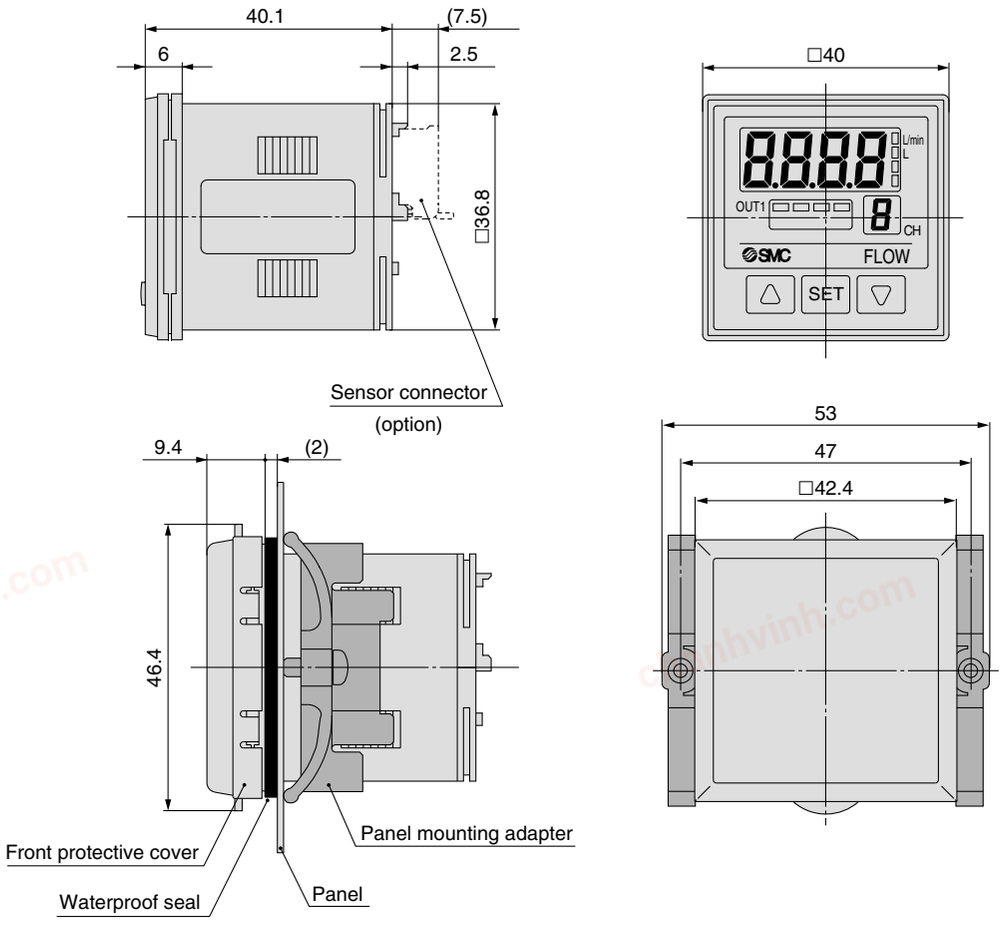
Part no.	Normal condition		Standard condition	
	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]
PF2A510-□-2	1	10	1.1	10.7
PF2A550-□-2	5	50	5.4	53.5
PF2A511-□-2	10	100	11	107
PF2A521-□-2	20	200	21	214
PF2A551-□-2	50	500	54	535

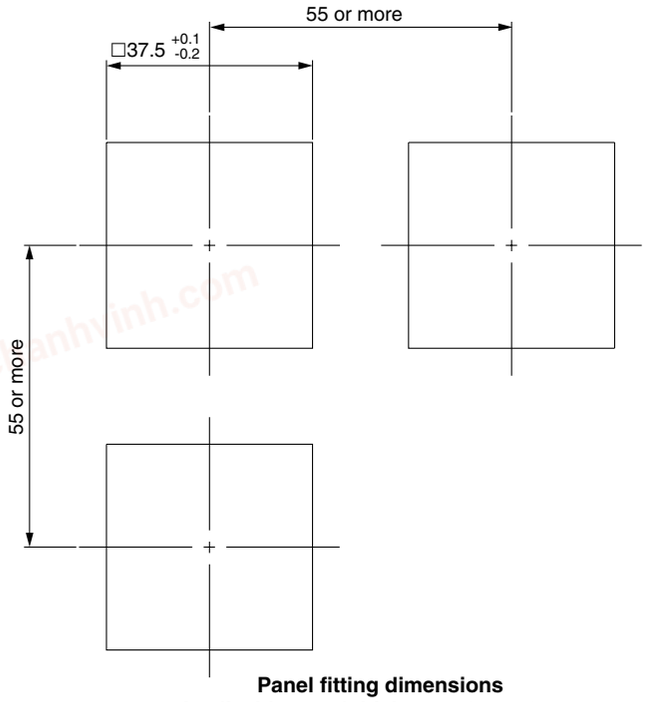
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Dimensions: Remote Type Display Unit for Air (4-channel Flow Monitor)

PF2A200, 201

Front protective cover + Panel mounting

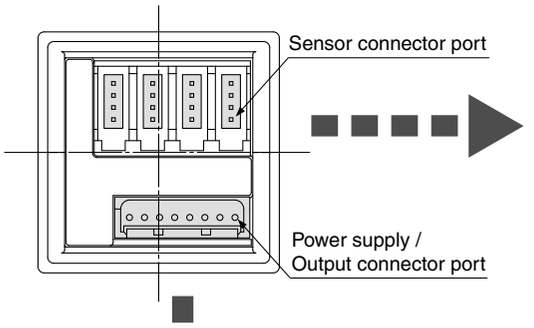




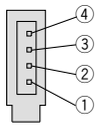
Panel fitting dimensions
Applicable panel thickness: 0.5 to 8 mm

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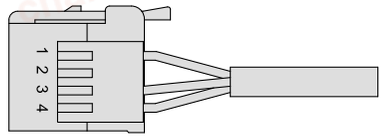
Dimensions: Remote Type Display Unit for Air (4-channel Flow Monitor)



Sensor connector (4P x 4)

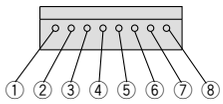


Connector (option)



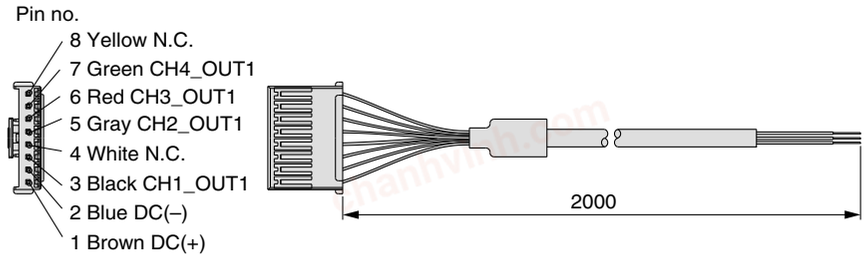
Pin no.	Terminal	Connector no.	Cable wire colour
①	DC+	1	Brown
②	N.C.	2	Not used
③	DC–	3	Blue
④	IN: 1 to 5 V	4	White

Power supply / Output connector (8P)



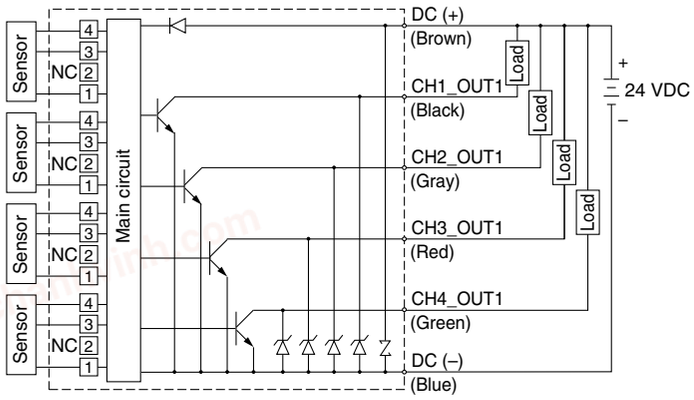
Pin no.	Terminal
①	DC (+)
②	DC (–)
③	CH1_OUT1
④	N.C.
⑤	CH2_OUT1
⑥	CH3_OUT1
⑦	CH4_OUT1
⑧	N.C.

Power supply / Output connector (accessory)

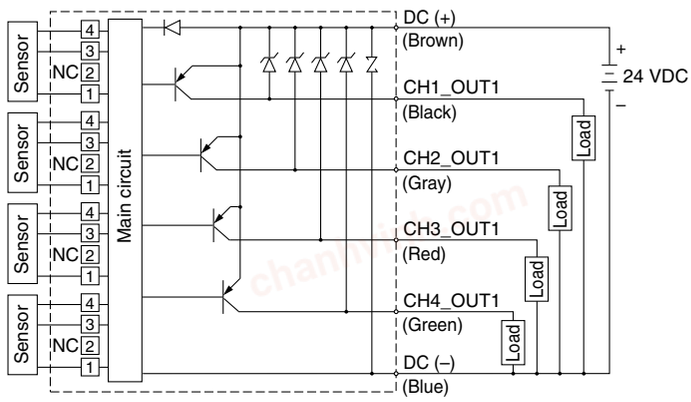


Internal circuits and wiring examples

PF2A200



PF2A201



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For Air

Digital Flow Switch/High Flow Rate Type

Series PF2A

Refer to www.smcworld.com for details of products compatible with overseas standards.



How to Order

Integrated Display Type **PF2A7 □ H — □ □ — □ □ — M**

Flow rate range

03	150 to 3000 ℓ/min
06	300 to 6000 ℓ/min
12	600 to 12000 ℓ/min

High flow rate type

Port specification

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (ℓ/min) 3000	6000	12000	Applicable model
10	1	●			PF2A703H
14	1 1/2		●		PF2A706H
20	2			●	PF2A712H

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Output specification

28	NPN open collector 1 output + Analogue output (1 to 5 V)
29	NPN open collector 1 output + Analogue output (4 to 20 mA)
68	PNP open collector 1 output + Analogue output (1 to 5 V)
69	PNP open collector 1 output + Analogue output (4 to 20 mA)

Switching of switch output and accumulated pulse output is possible with NPN or PNP open collector outputs.

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min
Accumulated flow: ℓ, m^3, $m^3 \times 10^3$

Specifications

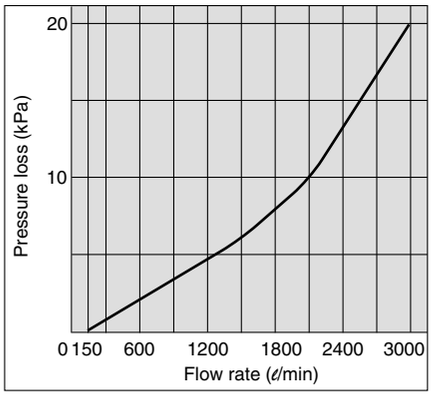
Model		PF2A703H	PF2A706H	PF2A712H
Measured fluid		Dry air		
Detection type		Heater type		
Rated flow range Note 1)		150 to 3000 ℓ/min	300 to 6000 ℓ/min	600 to 12000 ℓ/min
Minimum set unit Note 1)		5 ℓ/min	10 ℓ/min	
Display units Note 2)	Real-time flow rate	ℓ/min, CFM		
	Accumulated flow	ℓ, m^3, $m^3 \times 10^3$, ft^3, $ft^3 \times 10^3$, $ft^3 \times 10^6$		
Operating pressure range		0.1 to 1.5 MPa		
Proof pressure		2.25 MPa		
Pressure loss		20 kPa (at maximum flow rate)		
Accumulated flow range		0 to 9,999,999,999 ℓ		
Linearity Note 3)		±1.5% F.S. or less (0.7 MPa, at 20°C)		
Repeatability		±1.0% F.S. or less (0.7 MPa, at 20°C), ±3.0% of F.S. or less in case of analogue output		
Pressure characteristics		±1.5% F.S. or less (0.1 to 1.5 MPa, based on 0.7 MPa)		
Temperature characteristics		±2.0% F.S. or less (0 to 50°C, based on 25°C)		
Output specifications	Switch output Note 4)	NPN open collector Max. load current: 80 mA; Max. applied voltage: 30 V; Internal voltage drop: 1 V or less (with load current of 80 mA)		
		PNP open collector Max. load current: 80 mA; Internal voltage drop: 1.5 V or less (with load current of 80 mA)		
	Accumulated pulse output Note 4)	NPN or PNP open collector	Flow rate per pulse: 100 ℓ/pulse, 10.0 ft^3/pulse ON time per pulse width: 50 msec	
	Analogue output Note 5)	Output voltage: 1 to 5 V; Load impedance: 100 kΩ or more		
		Output current: 4 to 20 mA; Load impedance: 250 Ω or less		
Response time		1 sec. or less		
Hysteresis		Hysteresis mode: Variable (can be set from 0); Window comparator mode: (can be set from 0 to 3% F.S.)		
Power supply voltage		24 VDC (ripple ±10% or less)		
Current consumption		150 mA or less		
Resistance	Enclosure	IP65		
	Operating temperature range	0 to 50°C (with no freezing and condensation)		
	Withstand voltage	1000 VAC for 1 min. between external terminal and case		
	Insulation resistance	50 MΩ (at 500 VDC measured via Megohmmeter) between external terminal and case		
	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.		
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each		
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns		
Weight		1.1 kg (without lead wire)	1.3 kg (without lead wire)	2.0 kg (without lead wire)
Port size (Rc, NPT, G)		1	1 1/2	2

Note 1) Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [(ℓ/min, or ℓ, m^3 or $m^3 \times 10^3$)] will be set for switch type without the unit switching function.)
Note 3) The high flow rate type is CE marked; however, the linearity with applied noise is ±5% F.S. or less.
Note 4) Switch output and accumulated pulse output selections are made using the button controls.
Note 5) The analogue output operates only for real-time flow rate, and does not operate for accumulated flow.

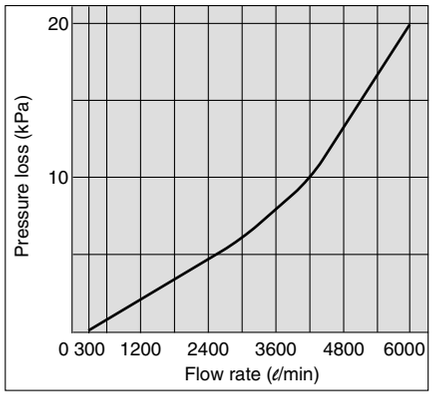
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Flow Characteristics (Pressure Loss)

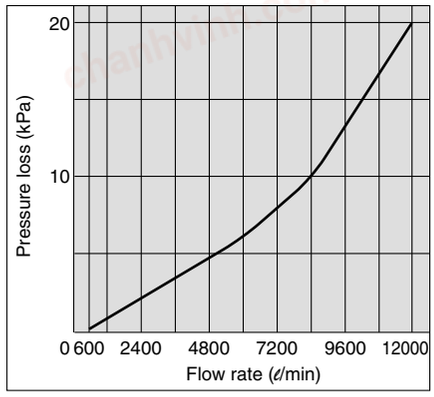
PF2A703H



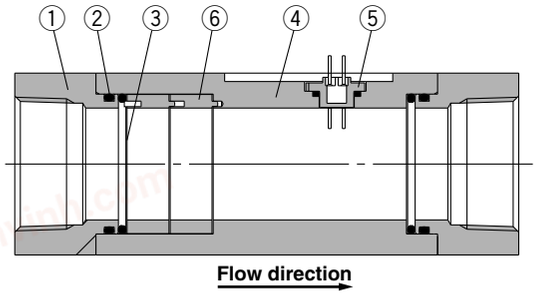
PF2A706H



PF2A712H



Construction



Parts list

No.	Description	Material	Note
1	**Attachment**	Aluminum alloy	Anodized
2	**Seal**	HNBR	—
3	**Mesh**	Stainless steel	—
4	**Body**	Aluminum alloy	Anodized
5	**Sensor**	PPS	—
6	**Spacer**	PBT	—

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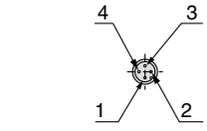
Series PF2A

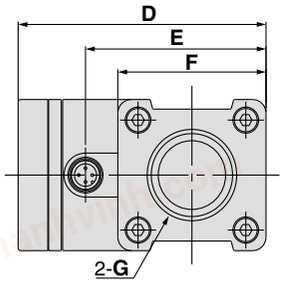
Dimensions

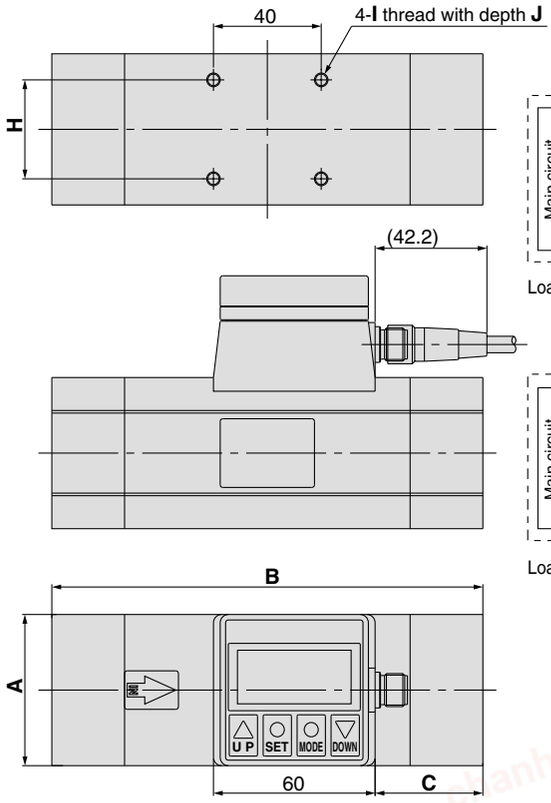
PFA703H, 706H, 712H

Connector pin numbers

Pin no.	Pin description
1	DC(+)
2	Analogue output
3	DC(–)
4	OUT1

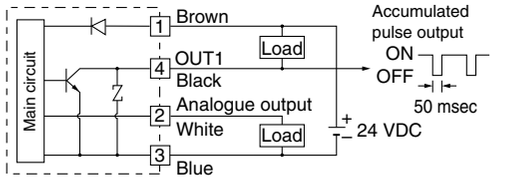






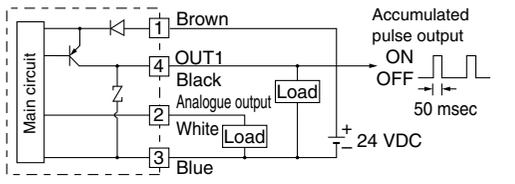
Internal circuits and wiring examples

1 to 4 are the terminal numbers.



Load is an analogue input equipment such as a voltmeter, ammeter.

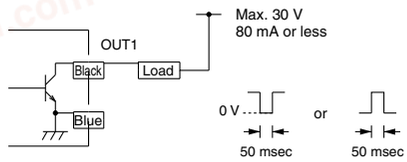
PF2A7□□H-□□-$^{28}_{29}$ (-M)



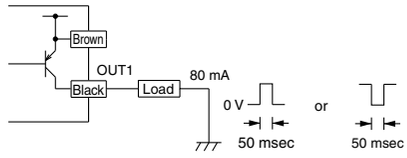
Load is an analogue input equipment such as a voltmeter, ammeter.

PF2A7□□H-□□-$^{68}_{69}$ (-M)

Accumulated pulse output wiring examples



PF2A7□□H-□□-$^{28}_{29}$ (-M)

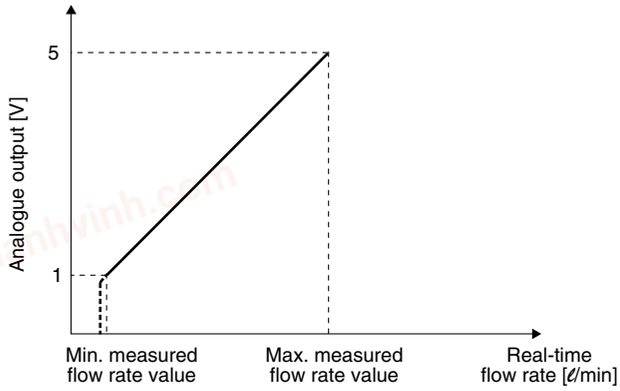


PF2A7□□H-□□-$^{68}_{69}$ (-M)

Model	A	B	C	D	E	F	G	H	I	J
PF2A703H	55	160	40	92	67	55	Rc1, NPT1, G1	36	M5	8
PF2A706H	65	180	45	104	79	65	Rc1 1/2, NPT1 1/2, G1 1/2	46	M6	9
PF2A712H	75	220	55	114	89	75	Rc2, NPT2, G2	56	M6	9

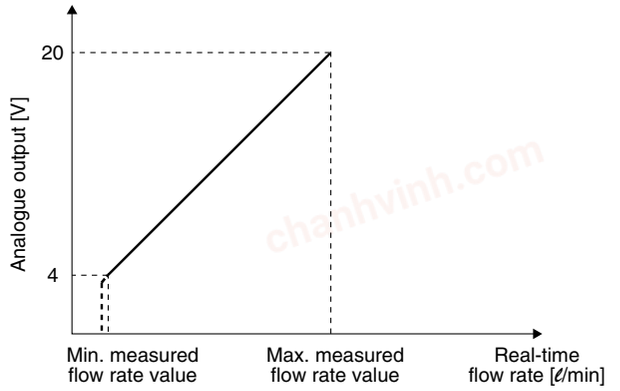
Analogue output

1 to 5 VDC



Part no.	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]
PF2A703H-□-28 **PF2A703H-□-68**	150	3000
PF2A706H-□-28 **PF2A706H-□-68**	300	6000
PF2A712H-□-28 **PF2A712H-□-68**	600	12000

4 to 20 mADC



Part no.	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]
PF2A703H-□-29 **PF2A703H-□-69**	150	3000
PF2A706H-□-29 **PF2A706H-□-69**	300	6000
PF2A712H-□-29 **PF2A712H-□-69**	600	12000

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For Water

Digital Flow Switch

Series PF2W

CE

Refer to www.smcworld.com for details of products compatible with overseas standards.



How to Order

Integrated Display Type

PF2W7 20 □ 03 27 □ M

Flow rate range

04	0.5 to 4 ℓ/min
20	2 to 16 ℓ/min
40	5 to 40 ℓ/min
11	10 to 100 ℓ/min

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (ℓ/min) 4	16	40	100	Applicable model
03	3/8	●	●			PF2W704, PF2W720
04	1/2		●	●		PF2W720, PF2W740
06	3/4			●	●	PF2W740, PF2W711
10	1				●	PF2W711

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Output specification

27	NPN open collector 2 outputs
67	PNP open collector 2 outputs

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Specifications

Model		PF2W704	PF2W720	PF2W740	PF2W711
Measured fluid		Water			
Flow rate measurement range		0.35 to 4.5 ℓ/min	1.7 to 17.0 ℓ/min	3.5 to 45 ℓ/min	7 to 110 ℓ/min
Set flow rate range		0.35 to 4.5 ℓ/min	1.7 to 17.0 ℓ/min	3.5 to 45 ℓ/min	7 to 110 ℓ/min
Rated flow range		0.5 to 4 ℓ/min	2 to 16 ℓ/min	5 to 40 ℓ/min	10 to 100 ℓ/min
Minimum set unit		0.05 ℓ/min	0.1 ℓ/min	0.5 ℓ/min	1 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms)		0.05 ℓ/pulse	0.1 ℓ/pulse	0.5 ℓ/pulse	1 ℓ/pulse
Operating fluid temperature		0 to 50°C			
Linearity		±5% F.S. or less			±3% F.S. or less
Repeatability		±3% F.S. or less			±2% F.S. or less
Temperature characteristics Note 1)		±5% F.S. or less (0 to 50°C, based on 25°C)			
Current consumption (No load)		70 mA or less			80 mA or less
Weight Note 2)		460 g	520 g	700 g	1150 g
Port size (Rc, NPT, G)		3/8	3/8, 1/2	1/2, 3/4	3/4, 1
Detection type		Karman vortex			
Indicator light		3-digit, 7-segment LED			
Display units Note 3)	Real-time flow rate	ℓ/min, gal(US)/min			
	Accumulated flow	ℓ, gal(US)			
Operating pressure range		0 to 1 MPa			
Proof pressure		1.5 MPa			
Accumulated flow range Note 4)		0 to 999999 ℓ			
Ambient temperature range		Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)			
Output specifications Note 5)	Switch output	NPN open collector: Maximum load current: 80 mA; Internal voltage drop: 1 V or less (with load current of 80 mA); Maximum applied voltage: 30 V; 2 outputs			
		PNP open collector: Maximum load current: 80 mA; Internal voltage drop: 1.5 V or less (with load current of 80 mA); 2 outputs			
	Accumulated pulse output	NPN or PNP open collector (same as switch output)			
Status LED's		Illuminates when output is ON, OUT1: Green; OUT2: Red			
Response time		1 sec. or less			
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed			
Power supply voltage		12 to 24 VDC (ripple ±10% or less)			
Resistance	Enclosure	IP65			
	Operating temperature range	0 to 50°C			
	Withstand voltage	1000 VAC for 1 min. between external terminal and case			
	Insulation resistance	50 MΩ or more (at 500 VDC measured via Megohmmeter) between external terminal and case			
	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.			
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each			
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns			

Note 1) In the case of PF2W711, ±3% of F.S. or less (15°C to 35°C, based on 25°C). Note 2) Without lead wire.
Note 3) For digital flow switch with unit switching function. (Fixed SI unit [ℓ/min or ℓ] will be set for switch type without the unit switching function.)
Note 4) Accumulated flow rate is reset when the power supply turns OFF. Note 5) Switch output and accumulated pulse output can be selected during initial setting.
Note 6) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more.
(In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.) Note 7) This product conforms to the CE mark.

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How to Order

Remote Type Sensor Unit **PF2W5 20 □ 03 □ □ C**

Flow rate range

04	0.5 to 4 ℓ/min
20	2 to 16 ℓ/min
40	5 to 40 ℓ/min
11	10 to 100 ℓ/min

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (ℓ/min) 4	16	40	100	Applicable model
03	3/8	●	●			PF2W504, PF2W520
04	1/2		●	●		PF2W520, PF2W540
06	3/4			●	●	PF2W540, PF2W511
10	1				●	PF2W511

Lead wire (Refer to page 35.)

Nil	M12 3m lead wire with connector
N	Without lead wire

Option (Refer to page 35.)

Nil	None
C	e-con connector x 1 pc.

The cable and connector are shipped unassembled.

Output specification

Symbol	Specification	Applicable display unit (monitor) model
Nil	Output for display unit	Series PF2W300
1	Output for display unit + Analogue output (1 to 5 V)	Series PF2W200/300
2	Output for display unit + Analogue output (4 to 20 mA)	Series PF2W300

Specifications

Model		PF2W504	PF2W520	PF2W540	PF2W511
Measured fluid		Water			
Detection type		Karman vortex			
Rated flow range		0.5 to 4 ℓ/min	2 to 16 ℓ/min	5 to 40 ℓ/min	10 to 100 ℓ/min
Operating pressure range		0 to 1 MPa			
Withstand pressure		1.5 MPa			
Operating fluid temperature		0 to 50°C			0 to 50°C
Linearity Note 1)		±5% F.S. or less			±3% F.S. or less
Repeatability Note 1)		±3% F.S. or less			±1% F.S. or less (connected with PF2W33□) ±3% F.S. or less (connected with PF2W2□□)
Temperature characteristics		2% F.S. or less (15 to 35°C based on 25°C), 3% F.S. or less (0 to 50°C, based on 25°C)			
Output specifications Note 2)	Output for display unit	Pulse output, N channel, open drain, output for display unit PF2W3□□. (Specifications: Maximum load current of 10 mA; Maximum applied voltage of 30 V)			
	Analogue output	Voltage output 1 to 5 V Linearity: ±5% F.S. or less; allowable load resistance: 100 kΩ or more.			
		Current output 4 to 20 mA Linearity: ±5% F.S. or less; allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC			
Power supply voltage		12 to 24 VDC (ripple ±10% or less)			
Current consumption (No load)		20 mA or less			
Resistance	Enclosure	IP65			
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)			
	Withstand voltage	1000 VAC for 1 min. between external terminal and case			
	Insulation resistance	50 MΩ or more (at 500 VDC measured via Megohmmeter) between external terminal and case			
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, whichever is smaller.			4.9 m/s^2
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each			
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns			
Weight Note 3)		410 g	470 g	650 g	1,100 g
Port size (Rc, NPT, G)		3/8	3/8, 1/2	1/2, 3/4	3/4, 1

Note 1) The system accuracy when combined with PF2W2□□/3□□.
Note 2) Output system can be selected during initial setting.
Note 3) Without lead wire. (Add 20 g for the types of analogue output whether voltage or current output selected.)
Note 4) The sensor unitis conforms to the CE mark.

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Series PF2W



How to Order

Remote Type Display Unit

PF2W3 [0] [0] – [A] – [M]

Flow rate range

Symbol	Flow rate range	Type for sensor unit
0	0.5 to 4 ℓ/min	PF2W504
	2 to 16 ℓ/min	PF2W520
	5 to 40 ℓ/min	PF2W540
3	10 to 100 ℓ/min	PF2W511

Output specification

0	NPN open collector 2 outputs
1	PNP open collector 2 outputs

Mounting

A	Panel mounting

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Panel mount adapter part no.

Description	Panel adapter B
Part No.	ZS-22-02

Specifications

Model		PF2W300/301			PF2W330/331
Flow rate measurement range Note 1)		0.35 to 4.5 ℓ/min	1.7 to 17.0 ℓ/min	3.5 to 45 ℓ/min	7 to 110 ℓ/min
Set flow rate range Note 1)		0.35 to 4.5 ℓ/min	1.7 to 17.0 ℓ/min	3.5 to 45 ℓ/min	7 to 110 ℓ/min
Minimum set unit Note 1)		0.05 ℓ/min	0.1 ℓ/min	0.5 ℓ/min	1 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms) Note 1)		0.05 ℓ/pulse	0.1 ℓ/pulse	0.5 ℓ/pulse	1 ℓ/pulse
Note 2) Display units	Real-time flow rate	ℓ/min, gal(US)/min			
	Accumulated flow	ℓ, gal(US)			
Accumulated flow range Note 3)		0 to 999999 ℓ			
Linearity Note 4)		±5% F.S. or less			±3% F.S. or less
Repeatability Note 4)		±3% F.S. or less			±1% F.S. or less
Temperature characteristics		±2% F.S. or less (0 to 50°C, based on 25°C), ±1% F.S. or less (15 to 35°C, based on 25°C)			
Current consumption (No load)		50 mA or less			60 mA or less
Weight		45 g			
Output specifications Note 5)	Switch output	NPN open collector (PF2W300, PF2W330)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V 2 outputs		
		PNP open collector (PF2W301, PF2W331)	Maximum load current: 80 mA Internal voltage drop: 1.5 V or less (with load current of 80 mA) 2 outputs		
	Accumulated pulse output	NPN or PNP open collector (same as switch output)			
Resistance	Enclosure	IP40			
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)			
	Withstand voltage	1000 VAC for 1 min. between external terminal and case			
	Insulation resistance	50 MΩ or more (500 VDC measured via Megohmmeter) between external terminal and case			
	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.			
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each			
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns			
Indicator light		3-digit, 7-segment LED			
Status LED's		Illuminates when output is ON, OUT1: Green; OUT2: Red			
Power supply voltage		12 to 24 VDC (ripple ±10% or less)			
Response time		1 sec. or less			
Hysteresis		Hysteresis mode: Variable (can be set from 0) Window comparator mode: 3-digit fixed Note 6)			

Note 1) Values vary depending on each set flow rate range.
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [ℓ/min or ℓ] will be set for switch types without the unit switching function.)
Note 3) Accumulated flow rate is reset when the power supply turns OFF.
Note 4) The system accuracy when combined with PF2W5□□.
Note 5) Switch output and accumulated pulse output can be selected during initial setting.
Note 6) Window comparator mode — Since hysteresis (H) will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 7) The display unit conforms to the CE mark.

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How to Order

4-channel Flow Monitor
Remote Type Display Unit

PF2W20 □ — M □ □

Output specification

0	NPN4 outputs
1	PNP4 outputs

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min
Accumulated flow: ℓ

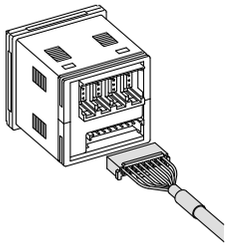
Option 1 (Refer to page 35.)

Nil	None
A	Panel mounting
B	Front protective cover + Panel mounting

Option 2 (Refer to page 35.)

Nil	None
4C	Sensor connector (4 pc.)

Accessory / Power supply output cable (2 m)



Connectable remote type sensor part is PF2W5□□-□-1 (with analogue output 1 to 5 V).

Specifications

Model		**PF2W200/201**			
Applicable flow rate sensor		PF2W504/504T-□-1	PF2W520/520T-□-1	PF2W540/540T-□-1	PF2W511-□-1
Flow rate measurement range Note 1)		0.35 to 4.50 ℓ/min	1.7 to 17.0 ℓ/min	3.5 to 45.0 ℓ/min	7 to 110 ℓ/min
Set flow rate range Note 1)		0.35 to 4.50 ℓ/min	1.7 to 17.0 ℓ/min	3.5 to 45.0 ℓ/min	7 to 110 ℓ/min
Minimum set unit Note 1)		0.05 ℓ/min	0.1 ℓ/min	0.5 ℓ/min	1 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms) Note 1)		0.05 ℓ/pulse	0.1 ℓ/pulse	0.5 ℓ/pulse	1 ℓ/pulse
Display units Note 1)	**Real-time flow rate**	ℓ/min, gal(US)/min			
	Accumulated flow	ℓ, gal(US)			
Accumulated flow range Note 1)		0 to 999999 ℓ, 0 to 999999 gal(US)			
Power supply voltage		24 VDC (ripple ±10% or less) (With power supply polarity protection)			
Current consumption		55 mA or less (Note including the current consumption of the sensor)			
Power supply voltage for sensor		Same as [Power supply voltage]			
Power supply current for sensor Note 2)		Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.)			
Sensor input		1 to 5 VDC (Input impedance: Approx. 800K Ω)			
	No. of inputs	4 inputs			
	Input protection	Excess voltage protection			
Output specifications Note 3)	**Switch output (Real-time switch output, accumulated switch output)**	NPN open collector (PF2W200)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V		
		PNP open collector (PF2W201)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA)		
	Accumulated pulse output	NPN open collector or PNP open collector (same as switch output)			
	No. of outputs	4 outputs (1 output per 1 sensor input)			
	Output protection	Short circuit protection			
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode: Fixed (3-digits)			
Response time Note 4)		1s or less			
Linearity Note 4)		±5% F.S. or less			
Repeatability Note 4)		±3% F.S. or less			
Temperature characteristics		±2% F.S. or less (0 to 50°C, based on 25°C)			
Display method		For measured value display: 4-digits, 7-segment LED (Orange) For channel display: 1-digit, 7-segment LED (Red)			
Status LED's		Illuminates when output is ON OUT1: Red			
Resistance	**Enclosure**	IP65 for the front face only, and IP40 for the remaining parts.			
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no freezing and condensation)			
	Operating humidity range	Operating or Stored: 35 to 85%RH (with no condensation)			
	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-energised)			
	Impact resistance	980 m/s^2 in X, Y, Z directions 3 times each (de-energised)			
	Noise resistance	500 Vp-p, Pulse width 1 μs, Rise time 1 ns			
Connection		Power supply / Output connection: 8P connector, Sensor connection: 4P connector (e-con)			
Material		Housing: PBT, Display: PET, Backside rubber: CR			
Weight		60 g (Except for any accessories that are shipped together)			

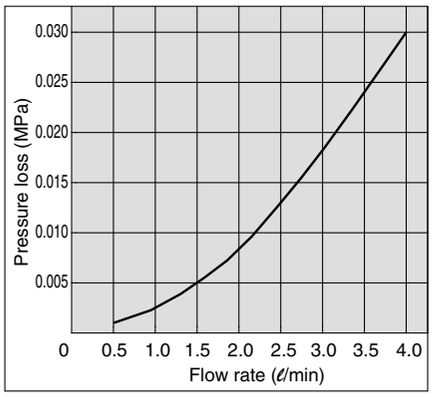
Note 1) Fixed SI unit [ℓ/min or ℓ] will be set for switch types without the unit switching function. ("-M" is suffixed at the end of part number.) Accumulated flow is reset when the power supply turns OFF.
Note 2) If Vcc side on sensor input connector part is short-circuited with 0V side, the flow monitor inside will be damaged.
Note 3) Switch output and accumulated pulse output can be selected during initial setting.
Note 4) The system accuracy when combined with applicable flow sensor.
Note 5) This product conforms to the CE mark.

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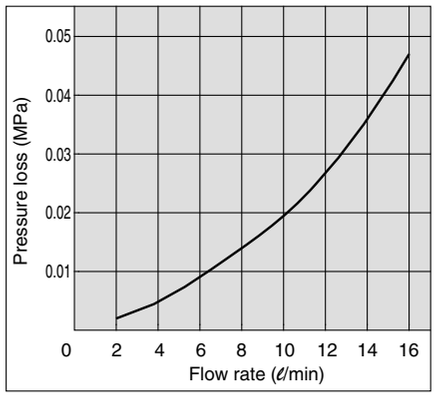
Series PF2W

Flow Characteristics (Pressure Loss)

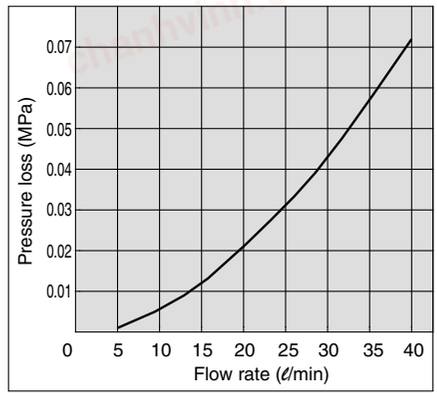
PF2W704, 504



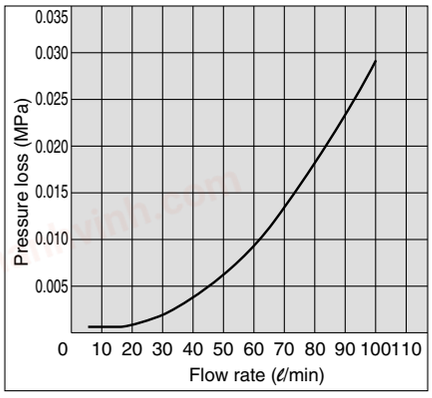
PF2W720, 520



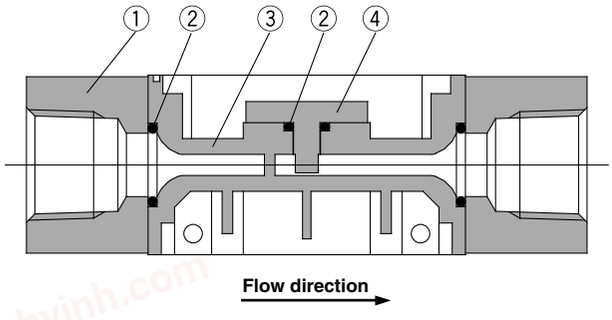
PF2W740, 540



PF2W711, 511



Sensor Unit Construction



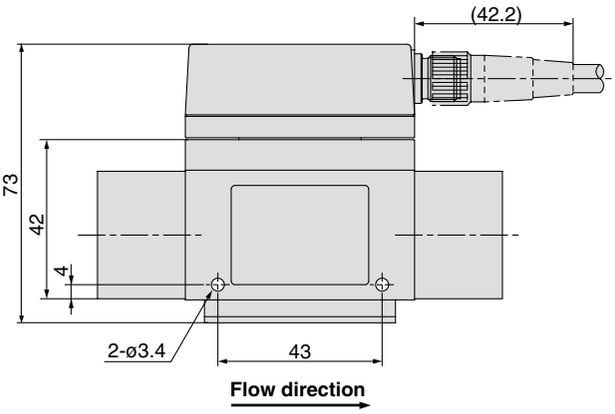
Parts list

No.	Description	Material
1	**Attachment**	Stainless steel
2	**Seal**	NBR
3	**Body**	PPS
4	**Sensor**	PPS

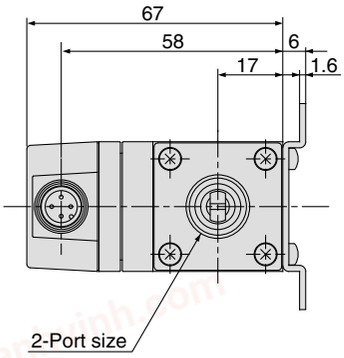
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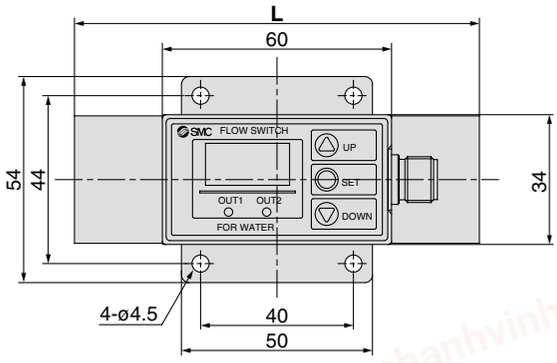
Dimensions: Integrated Display Type for Water

PF2W704, 720



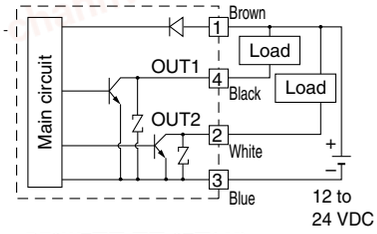
Model	L Dimension
PF2W704	100
PF2W720	106



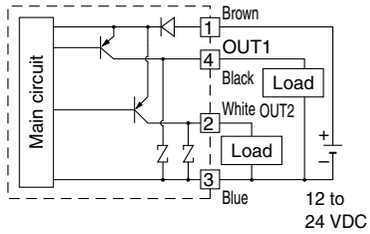


Internal circuits and wiring examples

1 to 4 are the terminal numbers.

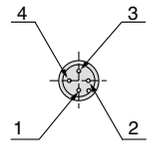


PF2W7□□-□□-27□(-M): NPN type



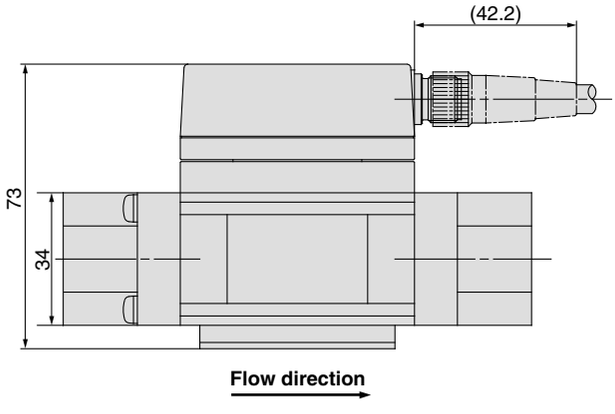
PF2W7□□-□□-67□(-M): PNP type

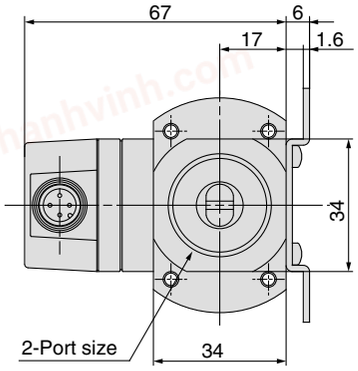
Connector pin numbers

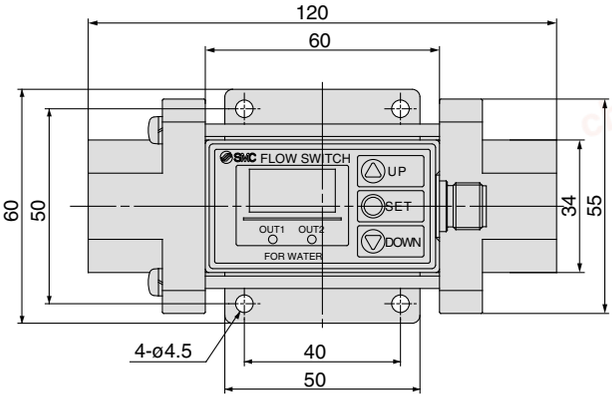


Pin no.	Pin description
1	DC(+)
2	OUT2
3	DC(–)
4	OUT1

PF2W740





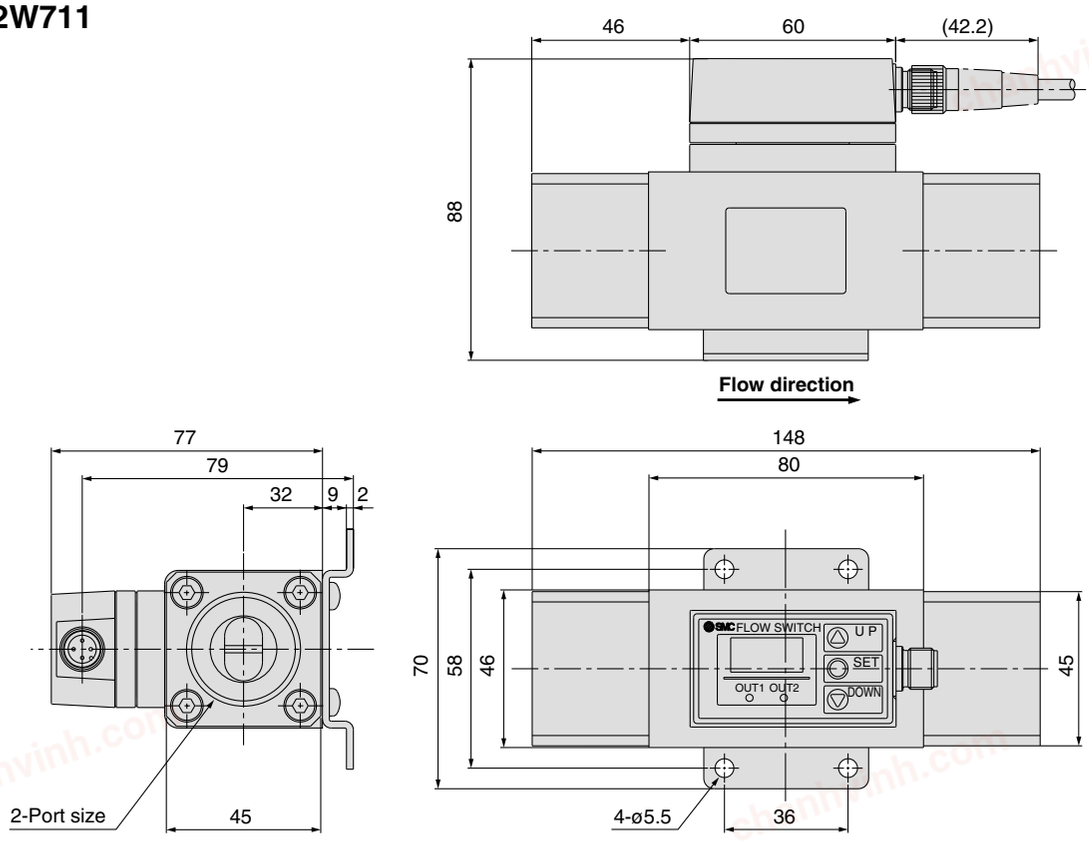


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Series PF2W

Dimensions: Integrated Display Type for Water

PF2W711



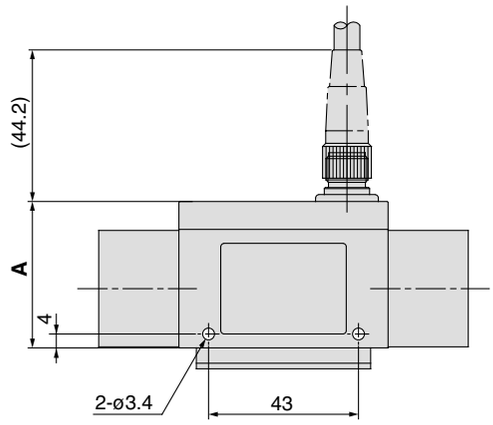
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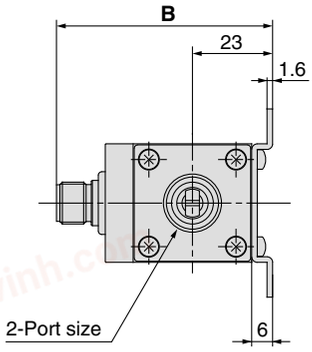
Dimensions: Remote Type Sensor Unit for Water

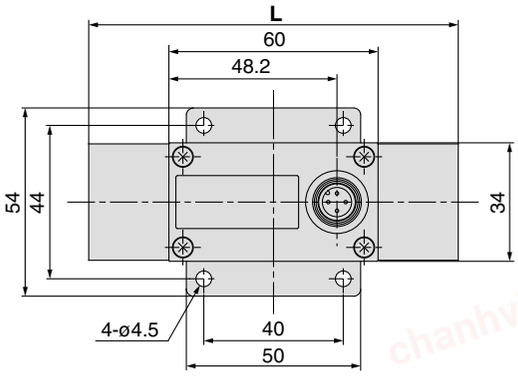
PF2W504, 520-□(N)-□

(mm)

Output specification	A	B
Output for display unit only	42	62
Output for display unit + Analogue output	52	72





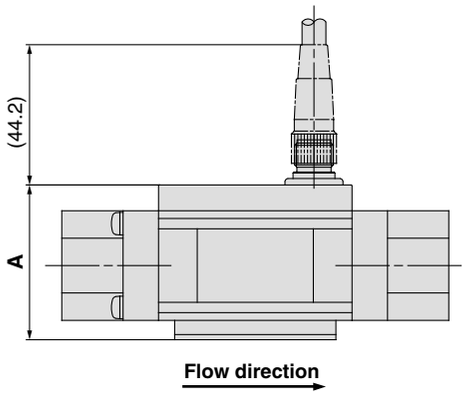


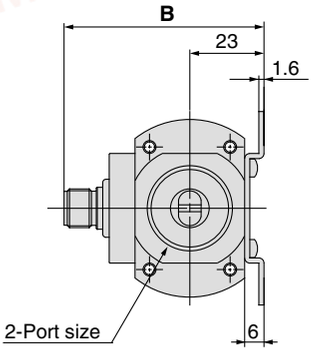
Model	L dimension
PF2W504	100
PF2W520	106

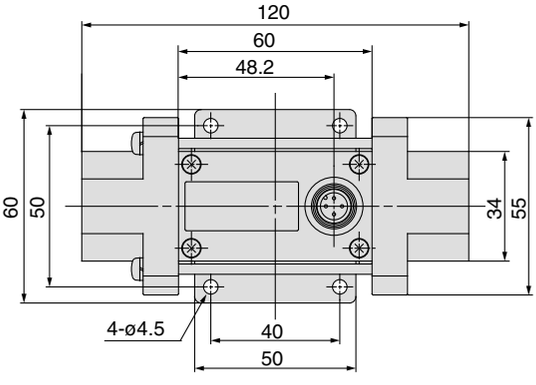
PF2W540-□(N)-□

(mm)

Output specification	A	B
Output for display unit only	42	62
Output for display unit + Analogue output	52	72

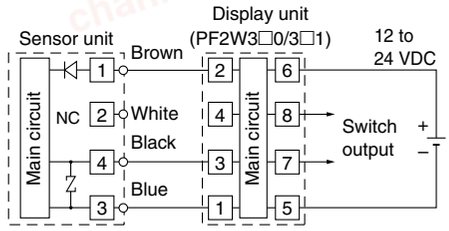




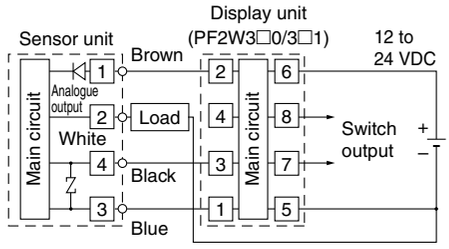


Internal circuits and wiring examples

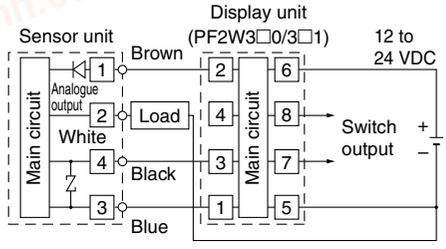
1 to 8 are the terminal numbers.



PF2W5□□-□□□

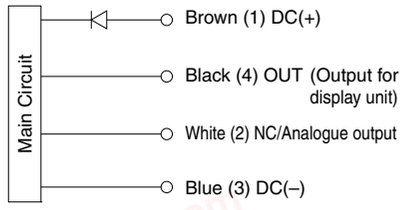


Load is an analogue input equipment such as a voltmeter.
PF2W5□□-□□□-1 (With voltage output type)



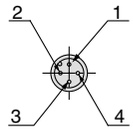
Load is an analogue input equipment such as a voltmeter.
PF2W5□□-□□□-2 (With voltage output type)

Wiring



∗ Use this sensor by connecting it to a SMC remote type display unit Series PF2W2□□/3□□.

Connector pin numbers



Pin no.	Pin description
1	DC(+)
2	NC/Analogue output
3	DC(–)
4	OUT

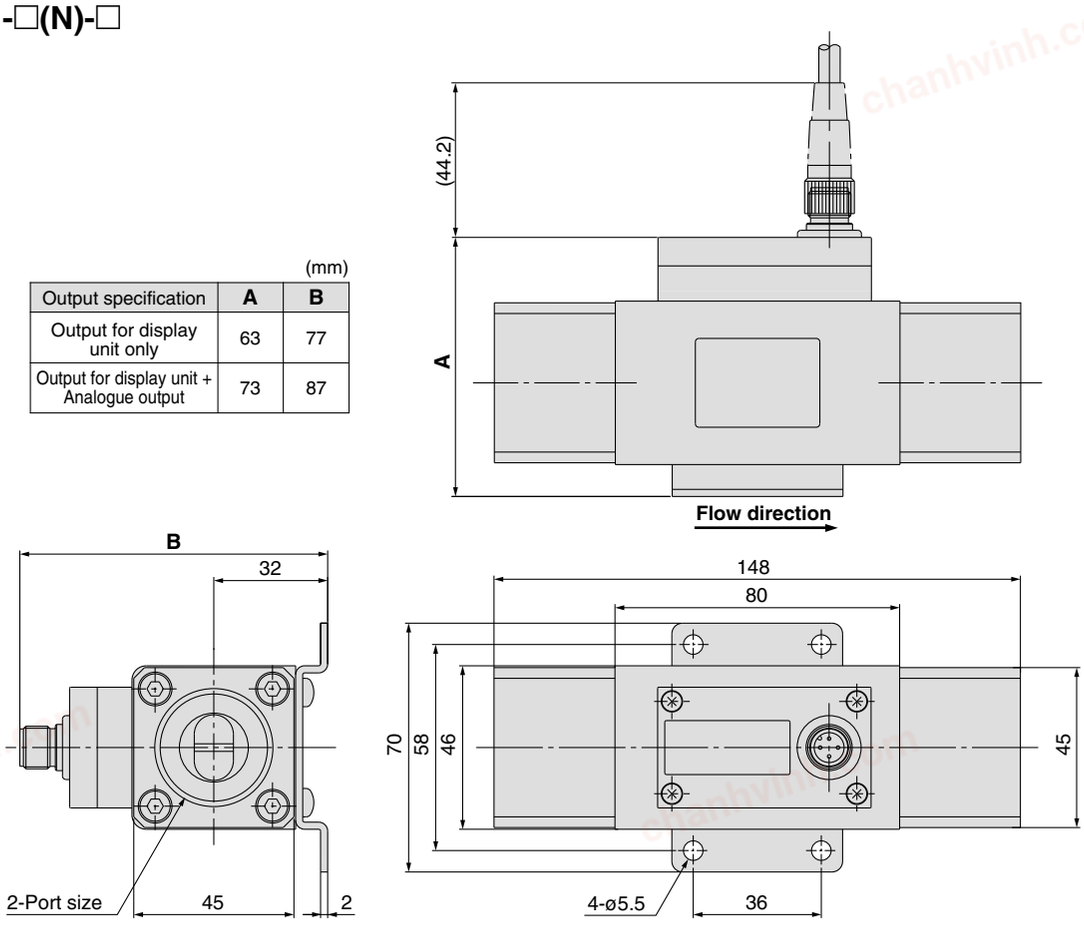
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Dimensions: Remote Type Sensor Unit for Water

PF2W511-□(N)-□

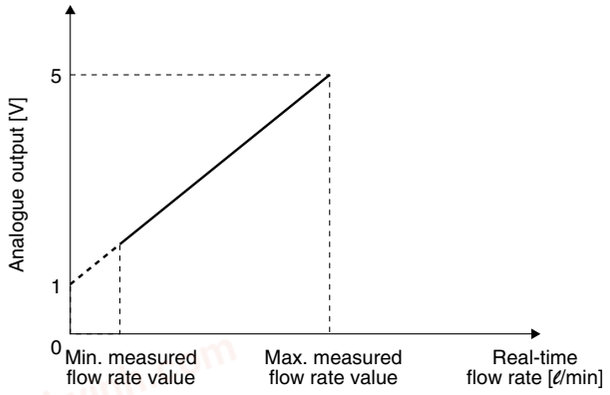
(mm)

Output specification	A	B
Output for display unit only	63	77
Output for display unit + Analogue output	73	87



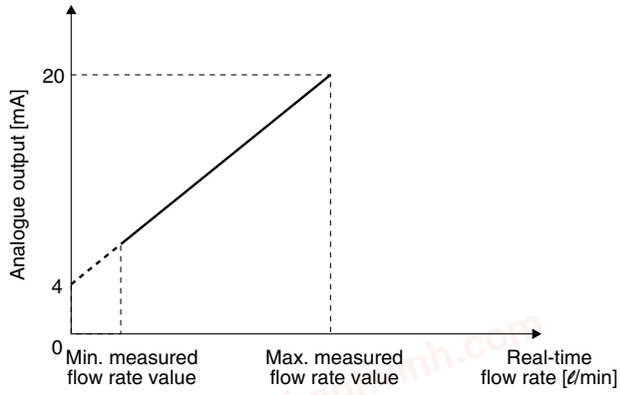
Analogue output

1 to 5 VDC



Part no.	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]
PF2W504-□-1	0.5	4
PF2W520-□-1	2	16
PF2W540-□-1	5	40
PF2W511-□-1	10	100

4 to 20 mADC



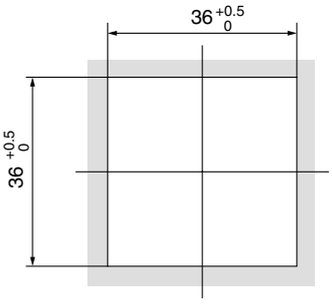
Part no.	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]
PF2W504-□-2	0.5	4
PF2W520-□-2	2	16
PF2W540-□-2	5	40
PF2W511-□-2	10	100

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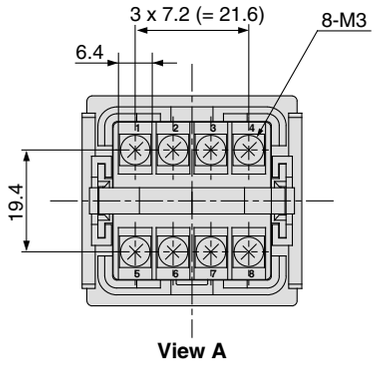
Dimensions: Remote Type Display Unit for Water

PF2W3□□-A
Panel mounting type

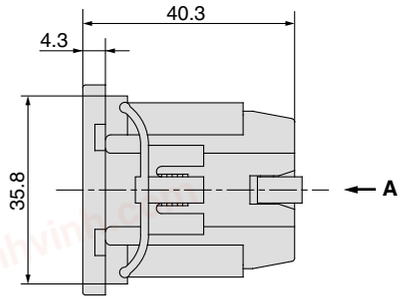
Panel fitting dimension

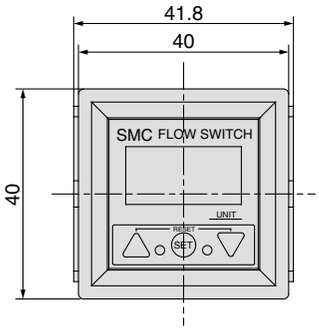


∗ The applicable panel thickness is 1 to 3.2 mm.



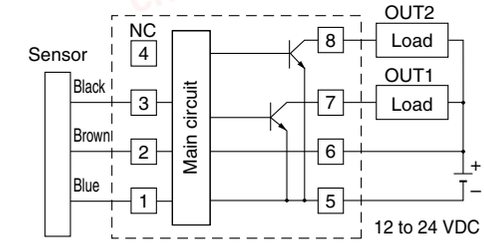
View A





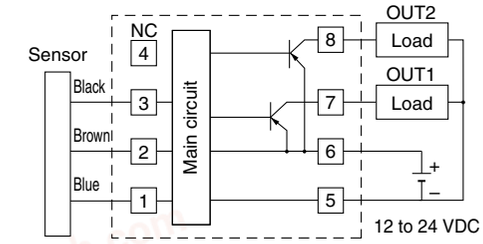
Internal circuits and wiring examples

1 to 8 are the terminal numbers.



Series PF2W5□□

PF2W3□0-A

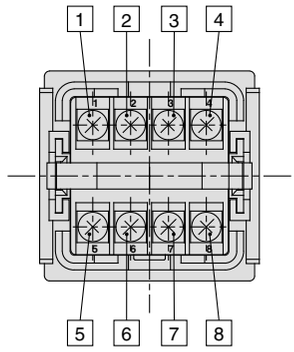


Series PF2W5□□

PF2W3□1-A

∗ Do not connect the white wire of the sensor to 3.

Terminal block numbers

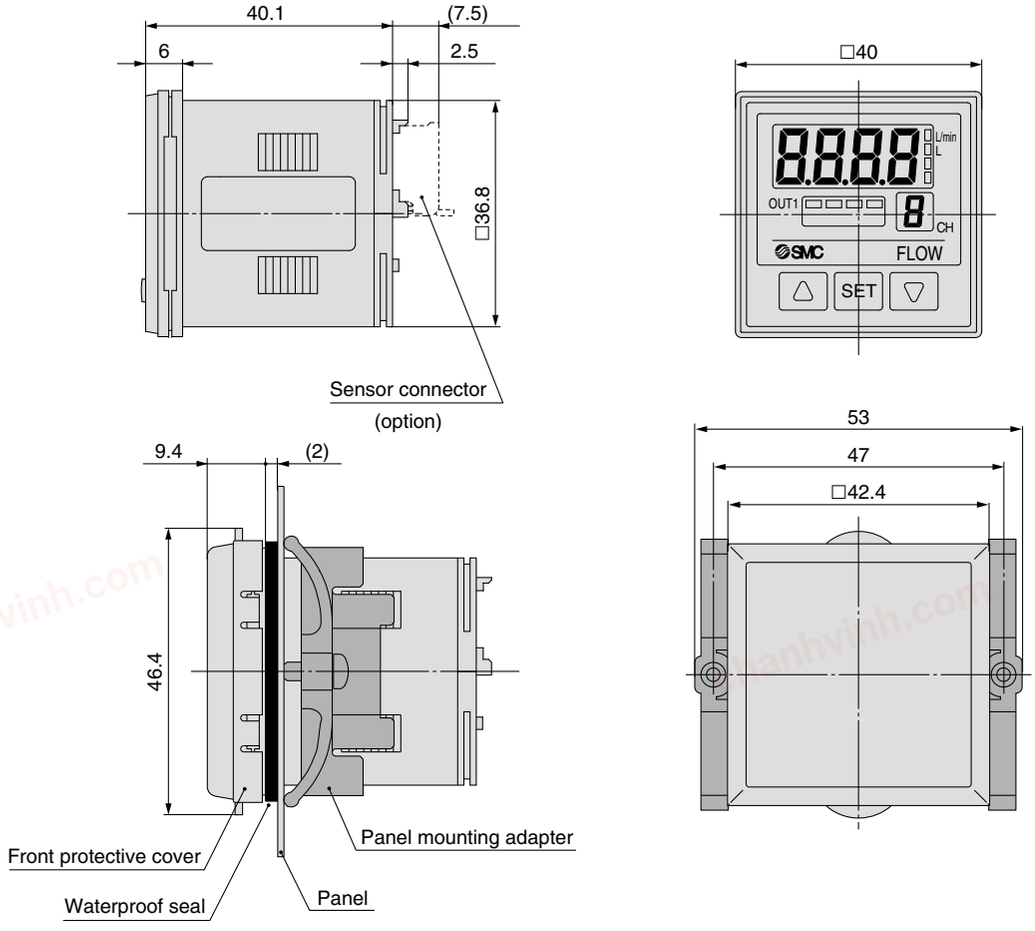


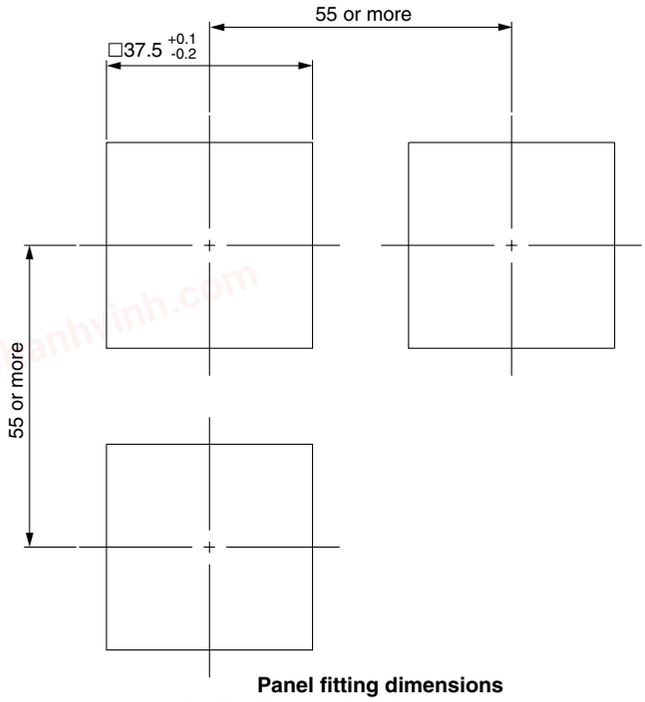
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Dimensions: Remote Type Display Unit for Water (4-channel Flow Monitor)

PF2W200, 201

Front protective cover + Panel mounting

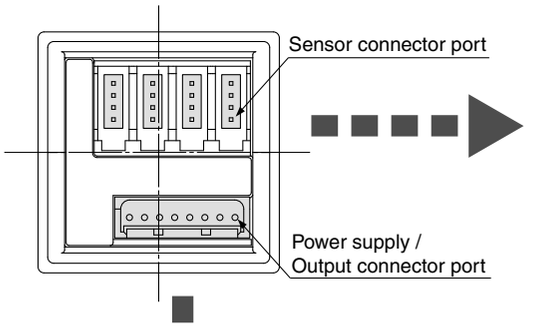




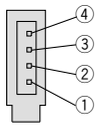
Panel fitting dimensions
Applicable panel thickness: 0.5 to 8 mm

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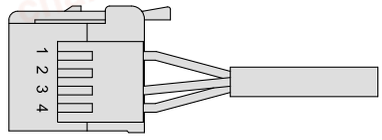
Dimensions: Remote Type Display Unit for Water (4-channel Flow Monitor)



Sensor connector (4P x 4)

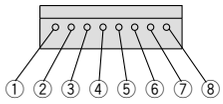


Connector (option)



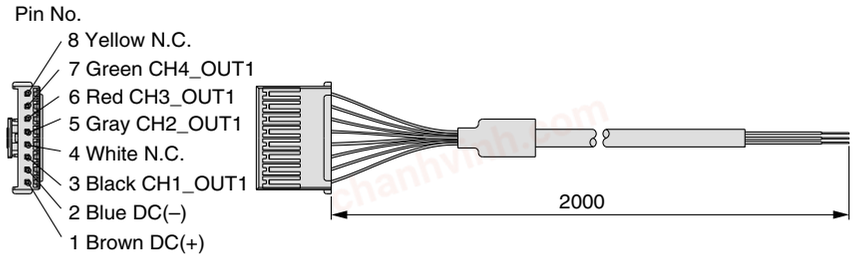
Pin no.	Terminal	Connector no.	Cable wire colour
①	DC+	1	Brown
②	N.C.	2	Not used
③	DC–	3	Blue
④	IN: 1 to 5 V	4	White

Power supply / Output connector (8P)



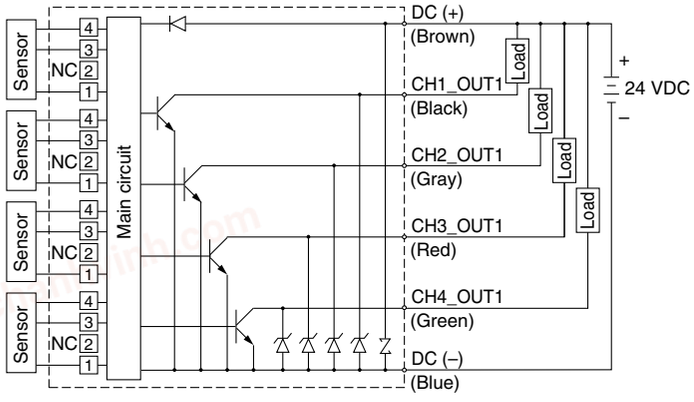
Pin no.	Terminal
①	DC (+)
②	DC (–)
③	CH1_OUT1
④	N.C.
⑤	CH2_OUT1
⑥	CH3_OUT1
⑦	CH4_OUT1
⑧	N.C.

Power supply / Output connector (accessory)

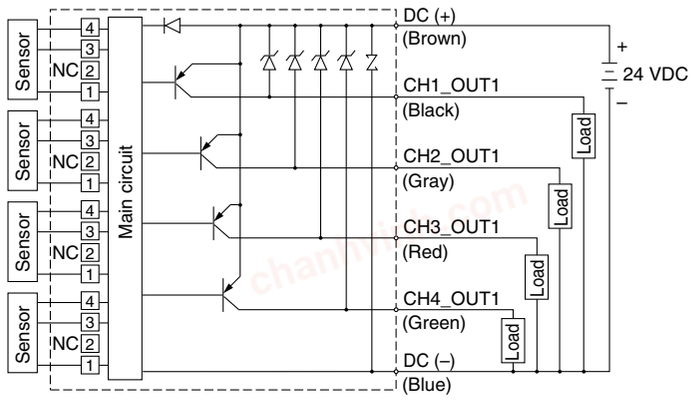


Internal circuits and wiring examples

PF2W200



PF2W201



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For Water

Digital Flow Switch/High Temperature Fluid Type

Series PF2W

CE

Refer to www.smcworld.com for details of products compatible with overseas standards.



How to Order

Integrated Display Type

PF2W7 20 T — □ 03 — 27 □ — □

Flow rate range

04	0.5 to 4 ℓ/min
20	2 to 16 ℓ/min
40	5 to 40 ℓ/min

Temperature range

T	0 to 90°C

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (ℓ/min) 4	16	40	Applicable model
03	3/8	●	●		PF2W704T, PF2W720T
04	1/2		●	●	PF2W720T, PF2W740T
06	3/4			●	PF2W740T

Output specification

27	NPN open collector 2 outputs
67	PNP open collector 2 outputs

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Specifications

Model		PF2W704T	PF2W720T	PF2W740T
Measured fluid		Water, Mixture of water (50%) and ethylene glycol (50%)		
Flow rate measurement range		0.35 to 4.5 ℓ/min	1.7 to 17.0 ℓ/min	3.5 to 45 ℓ/min
Set flow rate range		0.35 to 4.5 ℓ/min	1.7 to 17.0 ℓ/min	3.5 to 45 ℓ/min
Rated flow range		0.5 to 4 ℓ/min	2 to 16 ℓ/min	5 to 40 ℓ/min
Minimum set unit		0.05 ℓ/min	0.1 ℓ/min	0.5 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms)		0.05 ℓ/pulse	0.1 ℓ/pulse	0.5 ℓ/pulse
Operating fluid temperature		0 to 90°C (with no cavitation)		
Linearity		±5% F.S. or less		
Repeatability		±3% F.S. or less		
Temperature characteristics Note 1)		±5% F.S. or less (0 to 90°C, based on 25°C)		
Current consumption (No load)		70 mA or less		
Weight Note 2)		710 g		
Port size (Rc, NPT, G)		3/8	3/8, 1/2	1/2, 3/4
Detection type		Karman vortex		
Indicator light		3-digit, 7-segment LED		
Display units Note 3)	Real-time flow rate	ℓ/min, gal(US)/min		
	Accumulated flow	ℓ, gal(US)		
Operating pressure range		0 to 1 MPa		
Withstand pressure		1.5 MPa		
Accumulated flow range Note 4)		0 to 999999 ℓ		
Output specifications Note 5)	Switch output	NPN open collector	Maximum load current: 80 mA; Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V; 2 outputs	
		PNP open collector	Maximum load current: 80 mA; Internal voltage drop: 1.5 V or less (with load current of 80 mA); 2 outputs	
	Accumulated pulse output	NPN or PNP open collector (same as switch output)		
Status LED's		Illuminates when output is ON OUT1: Green; OUT2: Red		
Response time		1 sec. or less		
Hysteresis		Hysteresis mode: Variable (can be set from 0); Window comparator mode Note 6): 3-digit fixed		
Power supply voltage		12 to 24 VDC (ripple ±10% or less)		
Resistance	Enclosure	IP65		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)		
	Withstand voltage	1000 VAC for 1 min. between external terminal and case		
	Insulation resistance	50 MΩ and more (at 500 VDC measured via Megohmmeter) between external terminal and case		
	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.		
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each		
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns		

Note 1) ±5% F.S. or less (0 to 50°C, based on 25°C), ±3% F.S. or less (15 to 35°C, based on 25°C)
Note 2) Without lead wire.
Note 3) For digital flow switch with unit switching function. (Fixed SI unit [ℓ/min or ℓ] will be set for switch type without the unit switching function.)
Note 4) Accumulated flow rate is reset when the power supply turns OFF.
Note 5) Switch output and accumulated pulse output can be selected during initial setting.
Note 6) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more.
(In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 7) The flow switch conforms to the CE mark.

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How to Order

Remote Type Display Unit

PF2W5 [20] [T] – [ ] [03] [ ] [ ] – [C]

Flow rate range

04	0.5 to 4 ℓ/min
20	2 to 16 ℓ/min
40	5 to 40 ℓ/min

Temperature range

T	0 to 90°C

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (ℓ/min) 4	16	40	Applicable model
03	3/8	●	●		PF2W504T, 520T
04	1/2		●	●	PF2W520T, 540T
06	3/4			●	PF2W540T

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Output specification

Symbol	Specification	Applicable display unit (monitor) model
Nil	Output for display unit	Series PF2W300
1	Output for display unit + Analogue output (1 to 5 V)	Series PF2W200/300
2	Output for display unit + Analogue output (4 to 20 mA)	Series PF2W300

Option (Refer to page 35.)

Nil	None
C	e-con connector x 1 pc.

The cable and connector are shipped unassembled.

Specifications

Model		PF2W504T	PF2W520T	PF2W540T
Measured fluid		Water, Mixture of water (50%) and ethylene glycol (50%)		
Detection type		Karman vortex		
Rated flow range		0.5 to 4 ℓ/min	2 to 16 ℓ/min	5 to 40 ℓ/min
Operating pressure range		0 to 1 MPa		
Withstand pressure		1.5 MPa		
Operating fluid temperature		0 to 90°C (with no cavitation)		
Linearity Note 1)		±5% F.S. or less		
Repeatability Note 1)		±2% F.S. or less		
Temperature characteristics		±2% F.S. or less (15 to 35°C, based on 25°C), ±3% F.S. or less (0 to 50°C, based on 25°C)		
Output specifications Note 2)	Output for display unit	Pulse output, N channel, open drain, output for display unit PF2W3□□. (Specifications: Maximum load current of 10 mA; Maximum applied voltage of 30 V)		
	Analogue output	Voltage output 1 to 5 V Linearity: ±5% F.S. or less; allowable load resistance: 100 kΩ or more.		
		Current output 4 to 20 mA Linearity: ±5% F.S. or less; allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC		
Power supply voltage		12 to 24 VDC (ripple ±10% or less)		
Current consumption (No load)		20 mA or less		
Resistance	Enclosure	IP65		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)		
	Withstand voltage	1000 VAC for 1 min. between external terminal and case		
	Insulation resistance	50 MΩ or more (at 500 VDC measured via Megohmmeter) between external terminal and case		
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, whichever is smaller.		
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each		
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1ns		
Weight Note 3)		660 g		
Port size (Rc, NPT, G)		3/8	3/8, 1/2	1/2, 3/4

Note 1) The system accuracy when combined with PF2W2□□/3□□.
Note 2) Output system can be selected during initial setting.
Note 3) Without lead wire. (Add 20g for the types of analogue output whether voltage or current output selected.)
Note 4) The sensor unit conforms to the CE mark.

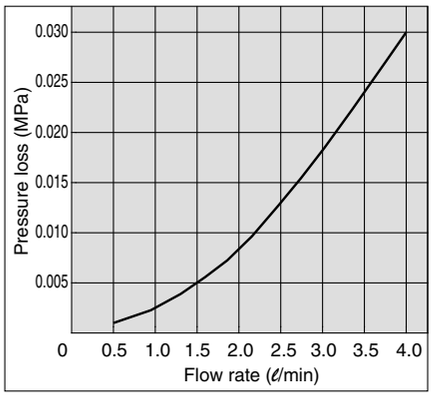
Display units are the same as those of remote type digital flow switch for water (series PF2W3□□/PF2W20□). Refer to pages 17, 18 for details.

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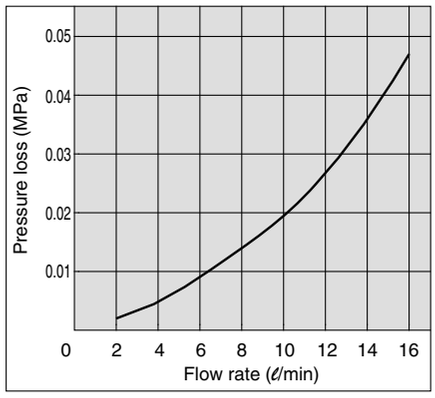
Series PF2W

Flow Characteristics (Pressure Loss)

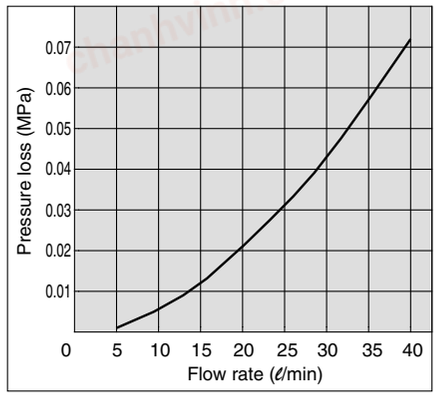
PF2W704T, 504T



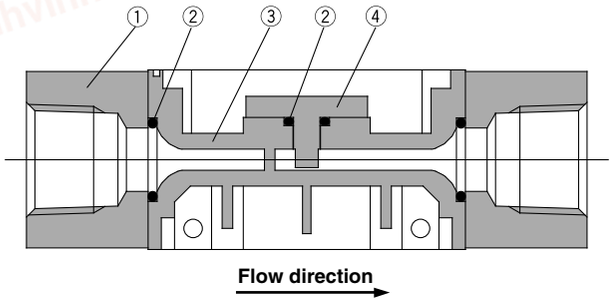
PF2W720T, 520T



PF2W740T, 540T



Sensor Unit Construction



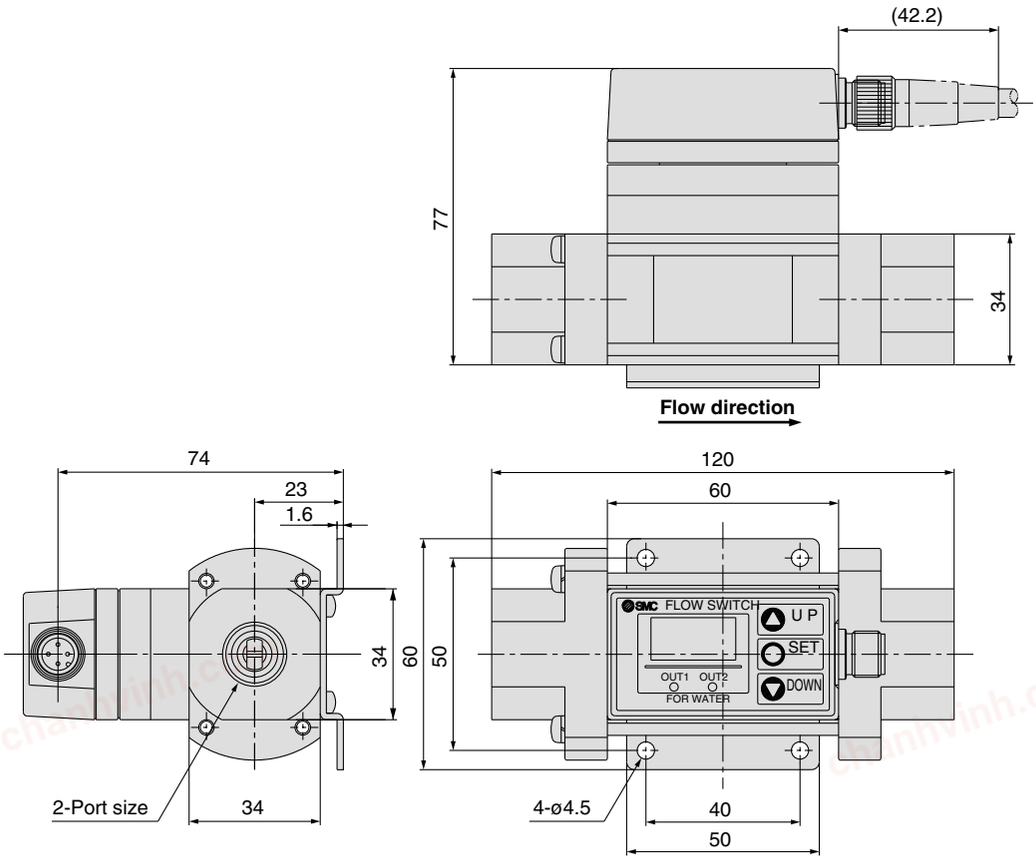
Parts list

No.	Description	Material
1	**Attachment**	Stainless steel
2	**Seal**	FKM
3	**Body**	PPS
4	**Sensor**	PPS

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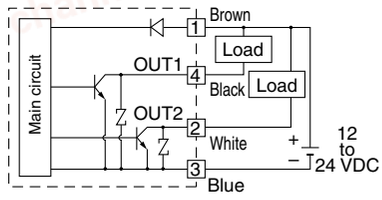
Dimensions: Integrated Display Type for Water

PF2W704T, 720T, 740T

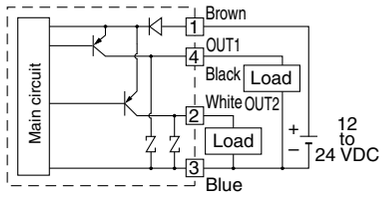


Internal circuits and wiring examples

1 to 4 are the terminal numbers.

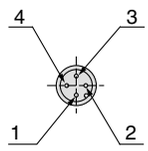


PF2W7□□T-□□-27□(-M)



PF2W7□□T-□□-67□(-M)

Connector pin numbers



Pin no.	Pin description
1	DC(+)
2	OUT2
3	DC(–)
4	OUT1

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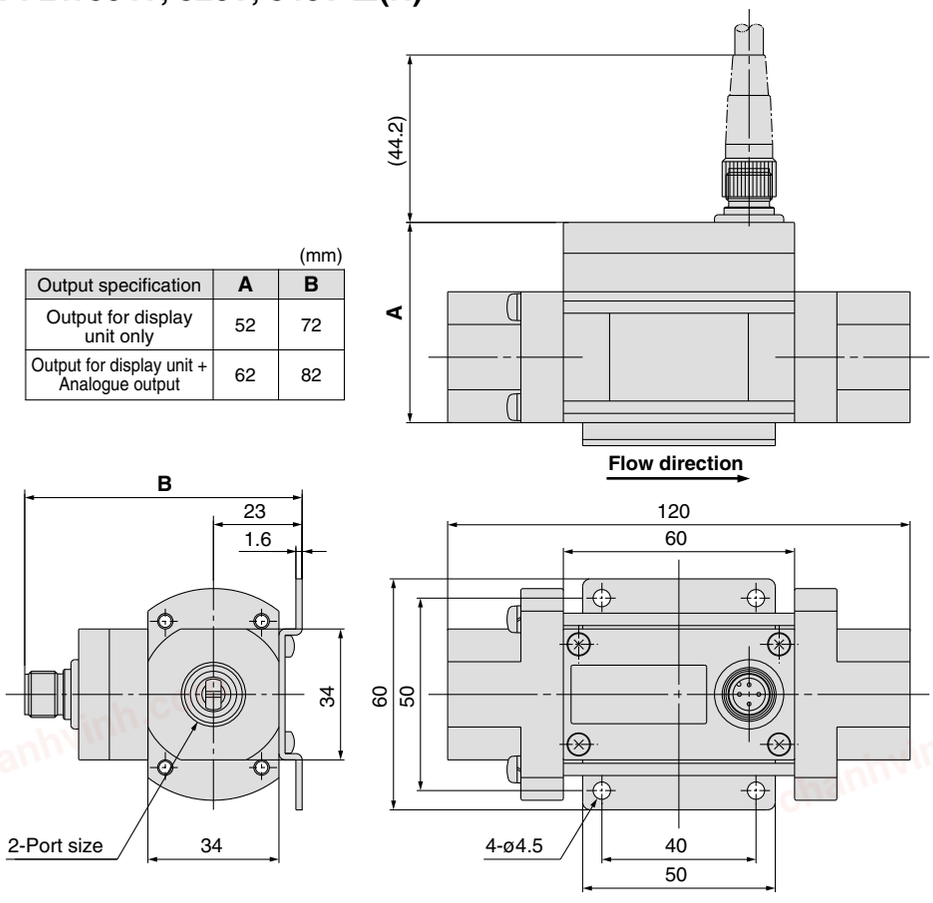
Series PF2W

Dimensions: Remote Type Sensor Unit for Water

PF2W504T, 520T, 540T-□(N)

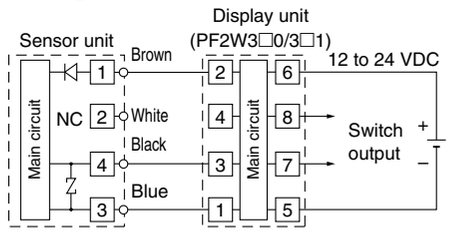
(mm)

Output specification	A	B
Output for display unit only	52	72
Output for display unit + Analogue output	62	82

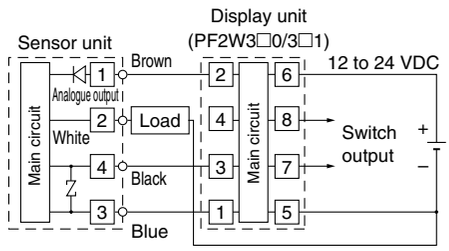


Internal circuits and wiring examples

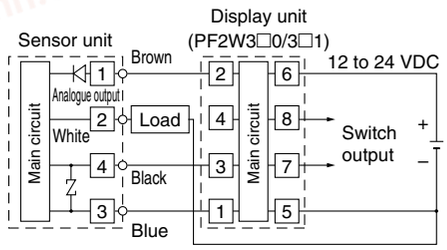
1 to 8 are the terminal numbers.



PF2W5□□T-□□□



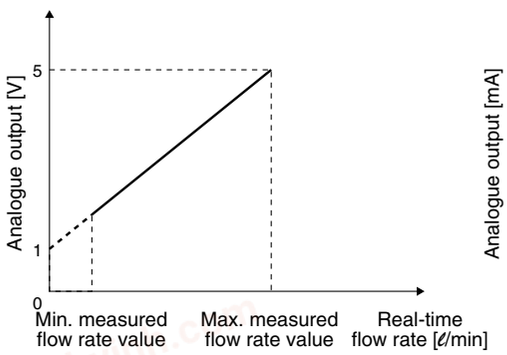
Load is an analogue input equipment such as a voltmeter.
PF2W5□□T-□□□-1 (With voltage output type)



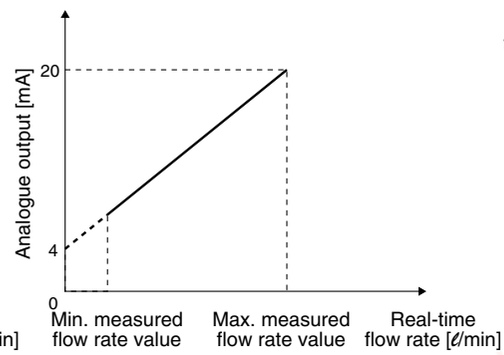
Load is an analogue input equipment such as a voltmeter.
PF2W5□□T-□□□-2 (With voltage output type)

Analogue output

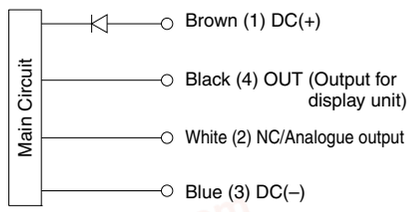
1 to 5 VDC



4 to 20 mADC



Wiring

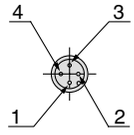


* Use this sensor by connecting it to a SMC remote type display unit Series PF2W3□□.

Part no.	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]
PF2W504T-□-1	0.5	4
PF2W520T-□-1	2	16
PF2W540T-□-1	5	40

Part no.	Min. measured flow rate value [ℓ/min]	Max. measured flow rate value [ℓ/min]
PF2W504T-□-2	0.5	4
PF2W520T-□-2	2	16
PF2W540T-□-2	5	40

Connector pin numbers



Pin no.	Pin description
1	DC(+)
2	NC/Analogue output
3	DC(–)
4	OUT

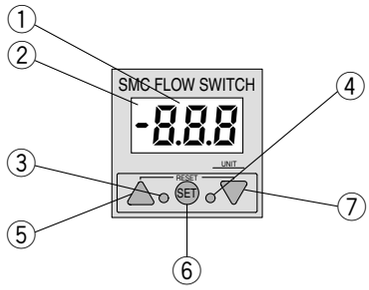
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Description

Integrated Display Type
PF2A710, 750, 711, 721, 751
PF2W704(T), 720(T), 740(T), 11



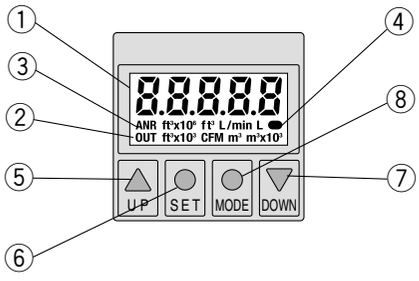
Remote Type/Display Unit
PF2A300, 301, 310, 311
PF2W300, 301, 330, 331



RESET button (▲ + ▼ button)
If the UP and DOWN buttons are pressed simultaneously, the RESET function will activate. In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

①	LED display/Red	Displays the measured flow rate, each setting condition, and error code.
②	Indicator (PF2A7□□, PF2A3□□ for air only)	Illuminates when the normal condition (nor) is selected.
③	Output (OUT1) display/Green	Displays the output condition of OUT1. Illuminates when turned ON.
④	Output (OUT2) display/Red	Displays the output condition of OUT2. Illuminates when turned ON.
⑤	UP button (▲ button)	Use to change the mode or to increase the set value.
⑥	SET button (● button)	Use this button to set the valve or the set mode.
⑦	DOWN button (▼ button)	Use to change the mode or decrease the set value.

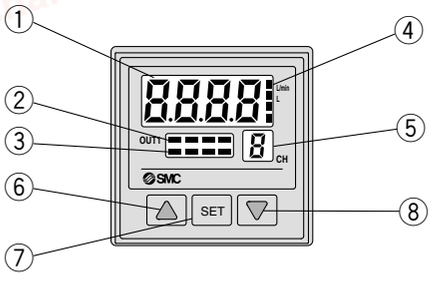
Integrated Display Type
PF2A703H, 706H, 712H



RESET button (▲ + ▼ button)
If the UP and DOWN buttons are pressed simultaneously, the RESET function will activate. In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

①	LCD display/Orange	Displays the measured flow rate, each setting condition, and error code.
②	Output (OUT1) display/Orange	Displays the output condition of OUT1. Illuminates when turned ON.
③	Unit display/Orange	Displays the selected unit. Type without unit switching function is fixed SI units (ℓ/min, or ℓ, m^3, m^3 x 10^3).
④	Flow rate confirmation display/Orange	The blinking intervals change depending on the flow rate value.
⑤	UP button (▲ button)	Use to change the mode or to increase the set value.
⑥	SET button (● button)	Use to select the function.
⑦	DOWN button (▼ button)	Use to change the mode or decrease the set value.
⑧	MODE button (● button)	Use for changing the function.

4-channel Flow Monitor (Remote type/Display unit)
PF2A200, 201
PF2W200, 201



①	LCD display/Orange	Displays the measured flow rate, each setting condition, and error code.
②	Switch output display/Red	Displays the output condition of OUT1 (CH1 to 4). Illuminates when turned ON.
③	Unit display of flow rate for air/ Red (PF2A200, 201 for air only)	CH1 to 4 will illuminate when the normal condition (nor) is selected.
④	Unit display/Orange	Illuminates the selected unit. Use after putting the unit label other than ℓ/min, ℓ.
⑤	Channel display/Red	Displays the selected channel.
⑥	UP button (▲ button)	Use to change the mode or to increase the set value.
⑦	SET button	Use this button to set the value or the set mode.
⑧	DOWN button (▼ button)	Use to change the mode or decrease the set value.

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Series PF2A/PF2W

Functions

Refer to the "Instruction Manual" for information on setting and operating.

Flow rate measurement selection

Real-time flow rate and accumulated flow rate can be selected.
A flow rate of up to 999999 can be accumulated.
The accumulated flow rate is reset when the power supply turns OFF. (PF2A7□H maintains the values.)

Unit switching

For Air

Display	Real-time flow rate	Accumulated flow
U_1	ℓ/min	ℓ
U_2	CFM x 10^{-2} x CFM x 10^{-1}	ft^3 x 10^{-1}

CFM = ft^3/min

High Flow Rate Type (For Air)

Display	Real-time flow rate	Accumulated flow
U_1	ℓ/min	ℓ, m^3, m^3 x 10^3
U_2	CFM	ft^3, ft^3 x 10^3, ft^3 x 10^6

For Water / High Temperature Fluid Type (For Water)

Display	Real-time flow rate	Accumulated flow
U_1	ℓ/min	ℓ
U_2	GPM	gal (US)

GPM = gal (US)/min

Note) Fixed SI unit (ℓ/min, or ℓ, m^3, m^3 x 10^3) will be set for the type without the unit switching function.

Flow rate conversion

Normal condition: 0°C, 101.3 kPa, dry air
Standard condition: 20°C, 101.3 kPa, 65%RH (ANR)
Switchable between these conditions.

Flow rate measuring unit confirmation

This function allows for the confirmation of the accumulated flow rate when real-time flow rate is selected and to confirm the real-time flow rate when accumulated flow rate is selected.

Key lock

This function prevents accidental operations such as changing the set value.

Accumulation clearance

This function clears the accumulated value.

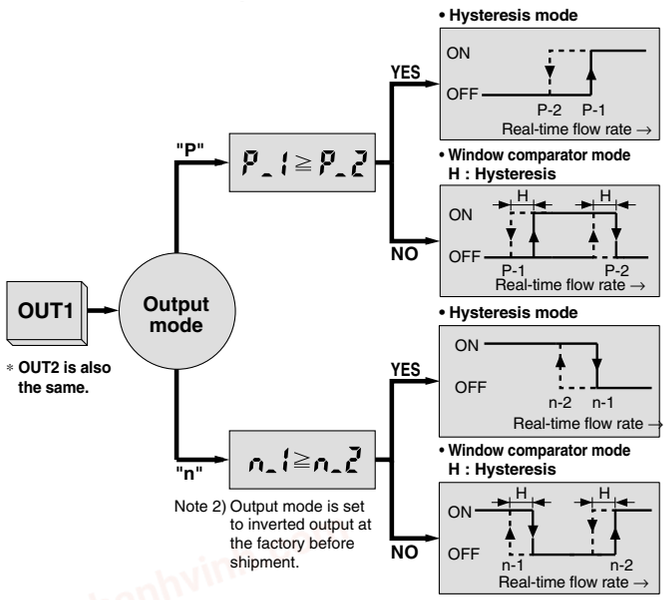
Initialization of setting (only for Series PF2A7□□H)

This function restores the setting to the original state, just as it had been shipped from the factory.

Output types

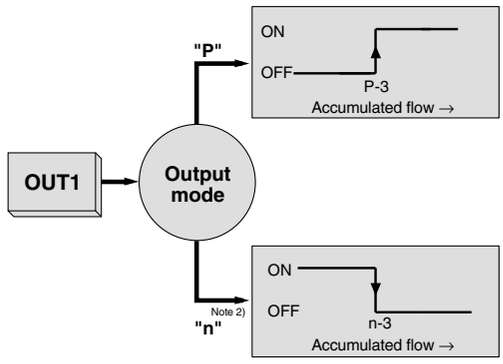
Real-time switch output, accumulated switch output, or accumulated pulse output can be selected as an output type.

Real-time switch output



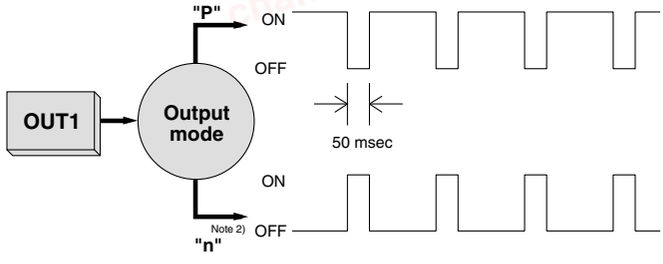
Note 2) Output mode is set to inverted output at the factory before shipment.

Accumulated switch output



Note 2) Output mode is set to inverted output at the factory before shipment.

Accumulated pulse output



Note1) For a digital flow switch with an unit switching function. (Fixed SI unit [ℓ/min, or ℓ, m^3 or m^3 x 10^3] will be set for switch types without an unit switching function.)
Refer to the specifications of the display unit for the flow rate value per pulse.

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Functions

Copy function (PF2□200, 201 only)

Information to be copied is:
① **Flow rate range**
② **Display mode**
③ **Display unit (Only available when the unit specification is nil.)**
④ **Output method**
⑤ **Output mode**
⑥ **Flow rate display unit (available with PF2A20□ only)**
⑦ **Flow rate value**

Peak hold, Bottom hold display function (PF2□200, 201 only)

The maximum or minimum value can be held in the case where the real-time flow rate display mode is selected during the initial setting.

Error correction

LED display	Contents	Solution
Er 1 Note 1) Err_1 Note 2)	A current of more than 80 mA is flowing to OUT1.	Check the load and the wiring for OUT1.
Er2 Note 1)	A current of more than 80 mA is flowing to OUT2.	Check the load and the wiring for OUT2.
Err_3 Note 2) Er4 Note 1)	The set data has changed for some reason.	Perform the RESET operation, and reset all the data again.
--- Note 1) ----- Note 2)	The flow rate is over the flow rate measurement range.	Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.

Note 1) Applicable to display integrated type and remote type except PF2A7□□H series.
Note 2) Applicable to PF2A7□□H series only.

For PF2A/W200, 201

LED display	Contents	Solution
Er 1	Over current is flowing to the load of a switch output.	Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.
Er0	Internal data error.	Contact SMC.
Er7	Internal data error.	
Er10	Internal data error.	
Er5	Internal data error.	Shut off the power supply and then reset the switch.
Er6	Internal data error.	
---	The flow rate is over the flow rate measurement range.	Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.

Channel select function (PF2□200, 201 only)

Every pushing the △ button, channel selection "1→2→3→4→1..." is available. The flow rate measurement of each selected channel is shown in the display unit.

Channel scan function (PF2□200, 201 only)

Changes displaying the channel shown every about 2 seconds and its detected flow rate.

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Series PF2A/PF2W

Option

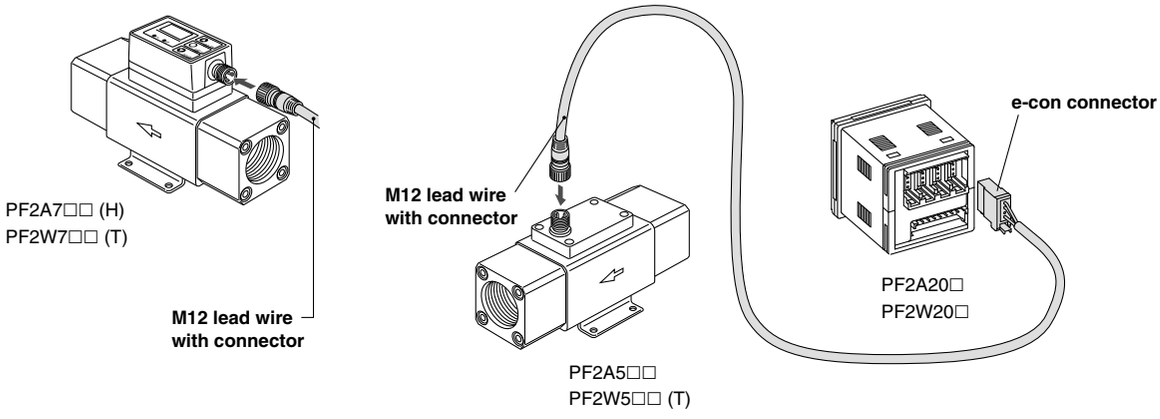
When only optional parts are required, order with the part numbers listed below.

M12 lead wire with connector

Part no.	Qty.	Lead wire length
ZS-29-A	1	3 m

e-con connector

Part no.	Qty.
ZS-28-CA-4	1



In addition to the lead wire assembly shown above, those listed below (female contact) can be connected.
However, they cannot be connected with an e-con connector because the diameter of the core wire and its coverage diameter are different. For details, contact each manufacturer.

Connector size	Pin no.	Manufacturer	Applicable series
M12	4	Correns Corp.	VA-4D
		OMRON Corp.	XS2
		Yamatake Co.,Ltd.	PA5-4I
		Hirose Electric Co., Ltd.	HR24
		DKK Ltd.	CM01-8DP4S

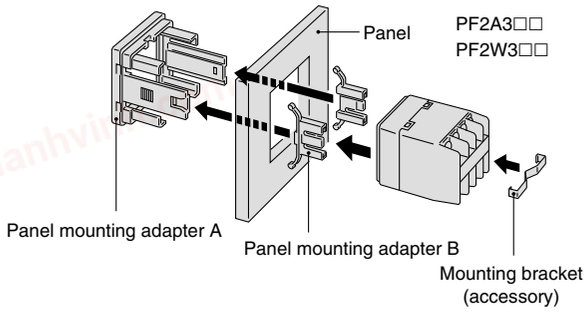
In addition to the connectors shown above, those listed below (e-con) can be connected.

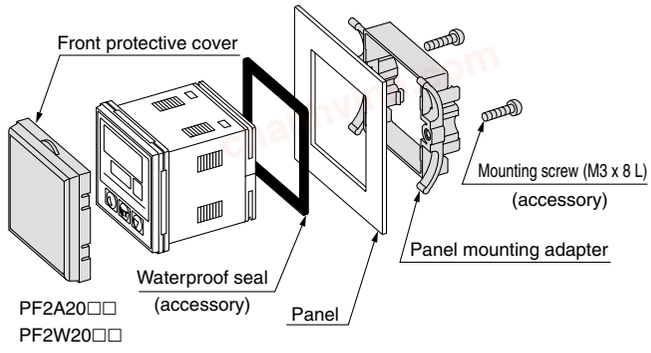
Manufacturer	Model
Sumitomo 3M Limited	37104-3122-000FL
Tyco Electronics AMP K.K.	2-1473562-4
OMRON Corp.	XN2A-1430

Panel mounting

Pin no.	Description	Note
ZS-22-E	Panel mounting adapter A, B	With mounting bracket

Part no.	Description	Note
ZS-26-B	Panel mounting adapter	With waterproof seal, mounting screw
ZS-26-C	Front protective cover + Panel mounting adapter	With waterproof seal, mounting screw





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Related Product
Multi Counter
Series CEU5



How to Order

CEU5 □ □ — □

Output transistor mode

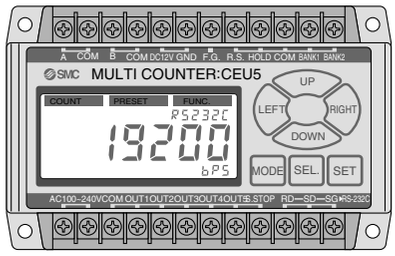
Nil	NPN open collector output
P	PNP open collector output

Power supply voltage

Nil	100 to 240 VAC
D	24 VDC

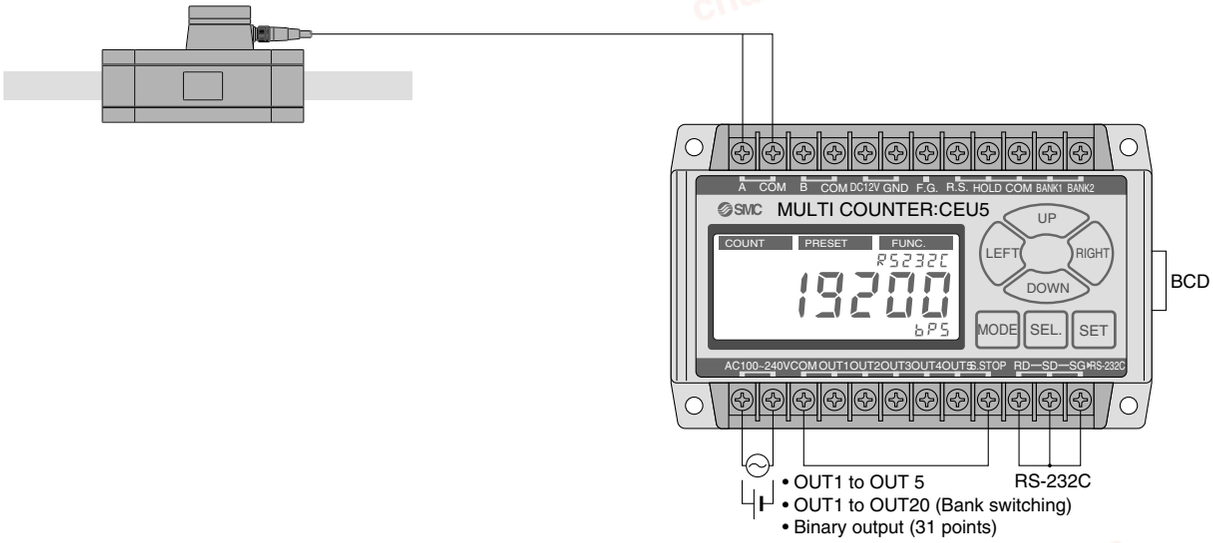
External output

Nil	RS-232C
B	RS-232C + BCD



Connection Method

Connection with the Digital Flow Switch (Series PF2)



- Possible to measure accumulated pulse output of a Digital Flow Switch by an unit of 100 ℓ (litter) and 10 ft^3 (cube foot) using the pre-scaling function* of the multi counter (When inputting to the multi counter, Up or Down is selected as input method.)
- Possible to take advantage of all CEU5 functions using preset mode and function mode.

* The set value is calculated by selecting manual mode. By multiplication by 4, then, per pulse value is set.

<Connection with other manufacturers' encoders>

- Possible to switch multi counter side input method to 2-phase or Up/Down.
- Possible to connect to an encoder if the output method is Open Collector.
- When selecting UP or DOWN, phase A to COM input is counted toward addition direction, phase B to COM input is counted toward subtraction direction.

⚠ Caution

When connecting the CEU5 with an encoder from another manufacturer, please thoroughly confirm the specification beforehand. Please note that the CEU5 may not count normally depending on the output method, output frequency and connecting cable length, etc. of the encoders.

Regarding connection with scale cylinder, refer to "Stroke reading cylinders & Counters CE series" in the Best Pneumatics Vol. 10.

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Series PF2A/PF2W
Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by all safety practices, including labels of **"Caution", "Warning"** or **"Danger"**. To ensure safety, please observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠Caution : Operator error could result in injury or equipment damage.

⚠Warning : Operator error could result in serious injury or loss of life.

⚠Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General Rules for Pneumatic Equipment
Note 2) JIS B 8370: Pneumatic system axiom

⚠Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications, post analysis and/or tests to meet a specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information and taking into consideration the possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or maintenance of the pneumatic system should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirming the control positions are safely locked-out.
2. When equipment is to be removed, confirm the safety processes mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.
3. Before the machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc. (Bleed air into the system gradually, to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having a negative effects on people, property, or animals, and therefore requires special safety analysis.

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Series PF2A/PF2W
Specific Product Precautions 1

Be sure to read before handling. Refer to page 37 for safety instructions.

Design and Selection

⚠Warning

1. Operate the switch only within the specified voltage.

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

2. Do not exceed the maximum allowable load specification.

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

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

Although the circuit at the output side of the switch is surge-protected, damage may still occur if a voltage surge is applied repeatedly. When a load which generates a surge, such as from a relay or solenoid valve, is directly driven, use a switch with a built-in surge absorbing element.

4. Since the type of fluid varies depending on the product, be sure to verify the specifications.

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

5. Monitor the internal voltage drop of the switch.

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

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

[For air]

6. Use the switch within the specified flow rate measurement and operating pressure.

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

[For water]

7. Use the switch within the specified flow rate measurement and operating pressure.

Operating beyond the specified flow rate and operating pressure can damage the switch. Especially avoid the application of pressure through a water hammer, which is above the specification.

<Examples of pressure reduction measures>

a) Use a device such as a water hammer relief valve to slow the valve's closing speed.

b) Absorb impact pressure by using an accumulator or elastic piping material such as a rubber hose.

c) Keep the piping length as short as possible.

8. Design the system, so that the fluid always fills the detection passage.

Especially for vertical mounting, introduce the fluid from the bottom to the top.

9. Operate within the flow rate measurement range.

If operated outside of the flow rate measurement range, the Karman vortex will not be generated and normal measurement will not be possible.

[Series PF2A7□□H]

10. Sudden increase in flow rate may destroy the flow sensor. Ensure to open/close the flow control valve not to exceed the maximum flow rate measurement values.

Design and Selection

⚠Caution

1. Data from the flow switch is stored even after the power supply is turned off.

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

2. Accumulated flow rate is reset when it is turned OFF.

Only the PF2A7□□H series (for air) will maintain, its accumulated flow rate value, even though the power supply is cut.

Mounting

⚠Warning

1. Mount the switch using the proper tightening torque.

When the switch is tightened beyond the specified tightening torque, it may be damaged. On the other hand, tightening below the specified tightening torque may cause the installation screws to loosen during operation.

Thread	Tightening torque N·m	Thread	Tightening torque N·m
Rc 1/8	7 to 9	Rc 3/4	28 to 30
Rc 1/4	12 to 14	Rc 1	36 to 38
Rc 3/8	22 to 24	Rc 1, 1/2	48 to 50
Rc 1/2	28 to 30	Rc 2	48 to 50

2. Apply a wrench only to the metal part of the piping when installing the flow switch onto the system piping.

Do not apply the wrench to any part other than the piping attachment or the switch may be damaged.

3. Monitor the flow direction of the fluid.

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

4. Remove dirt and dust from inside of the piping by means of air blow, before attaching to the switch.

5. Do not drop or bump.

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

6. Hold the body of the switch when handling.

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

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

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

8. Avoid the mounting orientation with the bottom of the body facing up.

The switch can be mounted in any way such as vertically or horizontally, however, avoid the mounting orientation with the bracket on the bottom of the body facing upward.

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Series PF2A/PF2W
Specific Product Precautions 2

Be sure to read before handling. Refer to page 37 for safety instructions.

Mounting

⚠Warning

[For air]

9. Never mount a switch in a place that will be used as a step stool during piping.

Damage may occur if an excessive load is applied to the switch.

10. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.

When abruptly reducing the size of piping or when there is a restriction such as a valve on the upstream side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the downstream side of the switch.

[For water]

11. Never mount a switch in a place that will be used as a step stool during piping.

Damage may occur if an excessive load is applied to the switch. Especially when the switch supports the piping, do not apply a load of 15N·m or more to the metal part of the switch.

12. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.

When abruptly reducing the size of piping or when there is a restriction such as a valve on the upstream side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the downstream side of the switch.
When used with the downstream side open, be careful of the cavitation that is prone to occur.

Wiring

⚠Warning

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

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

2. Avoid repeatedly bending or stretching of the lead wire.

Repeatedly applying bending stress or stretching force to the lead wire will cause it to break.

3. Confirm proper insulation of wiring.

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

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

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

5. Do not allow a load to short circuit.

Although a switch indicates excess current error if a load is short circuited, all incorrect wiring connections such as power supply polarity cannot be protected. Take precautions to avoid incorrect wiring.

Usage

⚠ Warning

1. When using a switch for high temperature fluid, the switch itself also becomes hot due to the high temperature fluid. Avoid touching the switch directly as this may cause a burn.

Operating Environment

⚠Warning

1. Never use in the presence of explosive gases.

The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

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

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

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

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

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

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

The switches are dustproof and splashproof, however avoid using in an environment where the likelihood of heavy splashing or spraying of liquids exists. Since the display unit of the remote type switches featured here is not dust or splashproof, the use in an environment where liquid splashing or spraying exists must be avoided.

[For air]

6. Use the switch within the specified fluid and ambient temperature range.

The fluid and ambient temperature range is 0° to 50°C. Take measures to prevent the fluid from freezing when it is below 5°C, since this may damage the switch and lead to a malfunction. The installation of an air dryer is recommended for eliminating condensation and moisture. Never use the switch in an environment where there are drastic temperature changes even when these temperatures are within the specification.

[For water]

7. Use the switch within the specified fluid and ambient temperature range.

The fluid and ambient temperatures range for the switch is 0 to 50°C (and 0 to 90°C for high temperature fluid). Take measures to prevent the fluid from freezing when it is below 5°C, since this may cause damage to the switch and lead to a malfunction. Never use the switch in an environment where there are drastic temperature changes even when these temperatures fall within the specified temperature range.

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Series PF2A/PF2W
Specific Product Precautions 3

Be sure to read before handling. Refer to page 37 for safety instructions.

Maintenance

⚠Warning

1. Perform periodical inspections to ensure proper operation of the switch.
Unexpected malfunctions may cause a possible danger.

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

3. Do not disassemble or perform any conversion work on flow switches.

Measured Fluid

⚠Warning

1. Check regulators and flow adjustment valves before introducing the fluid.
If pressure or flow rate beyond the specified range are applied to the switch, the sensor unit may be damaged.

[For air]

2. The fluids that the switch can measure accurately are nitrogen and dry air.
Please note that accuracy cannot be guaranteed when other fluids are used.

3. Never use inflammable fluids.
The flow velocity sensor heats up to approximately 150°C.

4. Install a filter or mist separator on the upstream side when there is a possibility of condensate and foreign matter being mixed in with the fluid.
The rectifying device built into the switch will be clogged up and accurate measurement will no longer be possible.

[For water]

5. The fluid that the switch can measure accurately is water. Also, combination of equal parts water/ethylene glycol (50/50%) can be used if its temperature is high.
Please note that accuracy cannot be guaranteed when other fluids are used.

Measured Fluid

⚠Warning

6. Never use inflammable fluids.

7. Install a filter on the inlet side when there is a possibility of condensation and foreign matter being mixed with the fluid.
If foreign matter adheres to the switch's vortex generator or vortex detector, accurate measurement will no longer be possible.

Others

⚠Warning

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

2. Perform settings after stopping control systems.
When the switch's initial setting and flow rate setting are performed, output maintains the condition prior to the settings.

3. Do not apply excessive rotational force to the display unit.
The integrated type display unit can rotate 360°. Rotation is controlled by the stopper; however, the stopper may be damaged if the display unit is turned with excessive force.

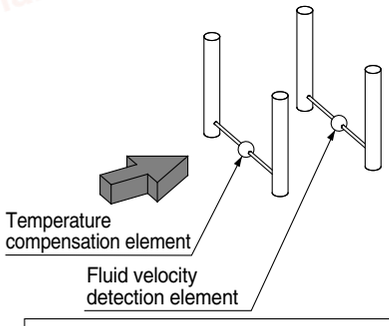
[For air]

4. Be certain to turn on the power supply when the flow rate is at zero.
Allow an interval of 10 minutes after turning on the power, as there are some changes in the display.

5. Flow rate unit
The switch measures at mass flow rates without being influenced by temperature and pressure. The switches use ℓ/min as the flow rate indicator unit, in which the volumetric flow is substituted for mass flow at 0°C and 101.3 kPa (nor). The volumetric flow rate at 20°C, 101.3 kPa, and 65%RH (ANR) can be displayed with the high flow rate type switches for air.

Detection principle of digital flow switch for air

A heated thermistor is installed in the passage, and fluid absorbs heat from the thermistor as it is introduced to the passage. The thermistor's resistance value increases as it loses heat. Since the resistance value increase ratio has a uniform relationship to the fluid velocity, the fluid velocity can be detected by measuring the resistance value. To further compensate the fluid and ambient temperature, the temperature sensor is also built into the switch to allow stable measurement within the operating temperature range.



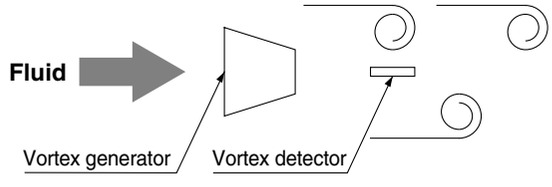
This flow switch uses ℓ/min as the flow rate indicator unit. The mass flow is converted and displayed under the conditions of 0°C and 101.3 kPa.
The conversion conditions can be switched to 20°C and 101.3 kPa with high flow type switches.

Detection principle of digital flow switch for water

When an elongated object (vortex generator) is placed in the flow, reciprocal vortexes are generated on the downstream side. These vortexes are stable under certain conditions, and their frequency is proportional to the flow velocity, resulting the following formula.

$$f = k \times v$$

f: Frequency of vortex v: Flow velocity k: Proportional constant (determined by the vortex generator's dimensions and shape).
Therefore, the flow rate can be measured by detecting this frequency.



Contact SMC regarding the specifications for clean environment.

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Series PF2A/PF2W
Specific Product Precautions 4

Be sure to read before handling. Refer to page 37 for safety instructions.

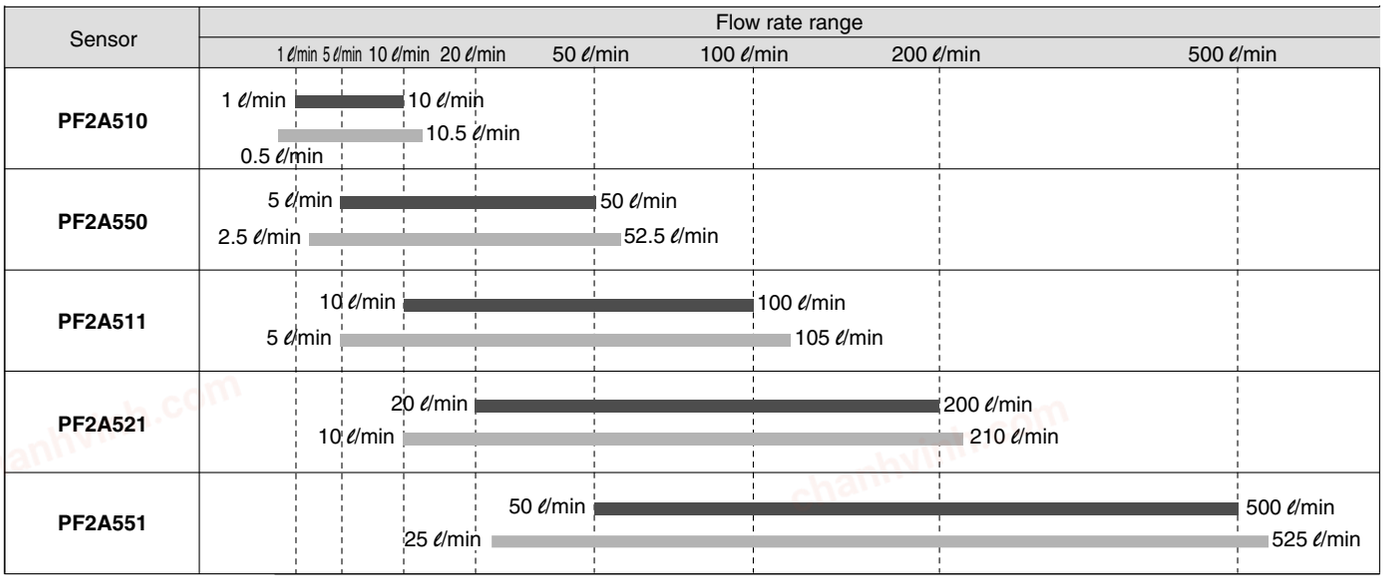
Set Flow Rate Range and Rated Flow Range

⚠ Caution

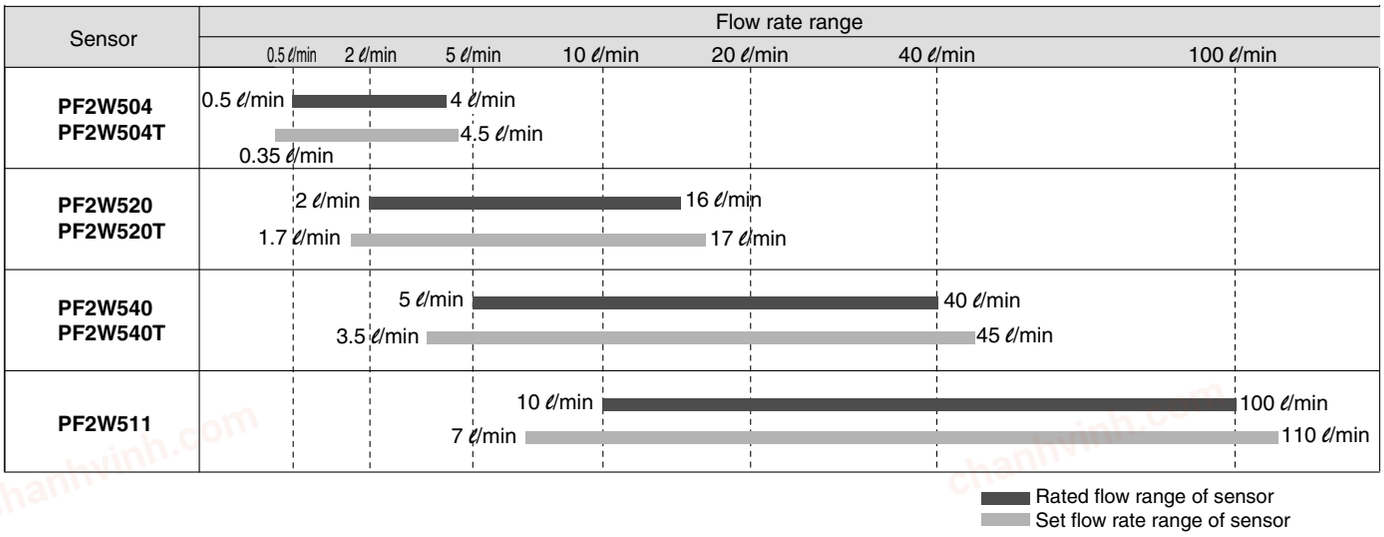
Set the flow rate within the rated flow range.

The set flow rate range is the range of flow rate that can be set on the controller.
The rated flow range is the range that satisfies the sensor's specifications (accuracy, linearity etc.).
It is possible to set a value outside of the rated flow range, however, the specification is not be guaranteed.

<For Air/PF2A>



<For Water/PF2W>



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Series PF2A/PF2W
Specific Product Precautions 5

Be sure to read before handling. Refer to page 37 for safety instructions.

■ 4-channel Flow Monitor

Handling

⚠ Warning

1. **Do not drop, bump, or apply excessive impacts (980 m/s²) while handling. Although the body of the flow monitor case may not be damaged, the inside of the flow monitor could be damaged and lead to a malfunction.**
2. **The tensile strength of the power supply/output connection cable is 50N and the sensor lead wire with a connector is 25N. Applying a greater pulling force than the applicable specified tensile strength to either of these components can lead to a malfunction. When handling, hold the body of the controller.**

Connection

⚠ Warning

1. **Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output. Connections should be done while the power is turned off.**
2. **Do not attempt to insert or pull the flow rate sensor or its connector when the power is on. Switch output may malfunction.**
3. **Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these other lines.**
4. **If a commercial switching power supply is used, make sure that the F.G. terminal is grounded.**

Operating Environment

⚠ Warning

1. **Our 4-channel flow monitor is CE marked, however, it is not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.**
2. **Our 4-channel flow monitor does not have an explosion proof rating. Never use pressure sensors in the presence of inflammable or explosive gases.**
3. **Enclosure "IP65" applies only to the front face of the panel when mounting. Do not use in an environment where oil splashing or spraying are anticipated.**

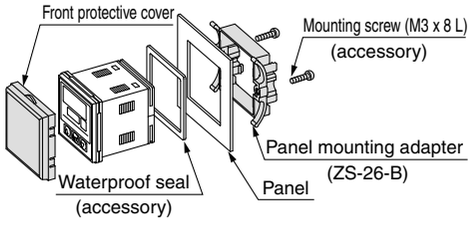
Mounting

⚠ Caution

The front face of the panel mount conforms to IP65, however there is a possibility of liquid infiltration if the panel mount adapter is not installed securely and properly. Securely fix the adapter with screws as shown below.

Front protective cover + Panel mounting

Tighten screws 1/4 to 1/2 turn after the heads are flush with the panel.

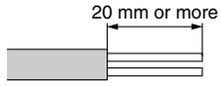


Wiring

⚠ Caution

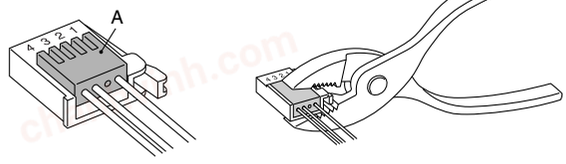
1. Connecting sensor cable and connector (ZS-28-CA-□)

- Cut the sensor cable as shown below.
- Insert each lead wire into the corresponding connector number by following the chart provided below.



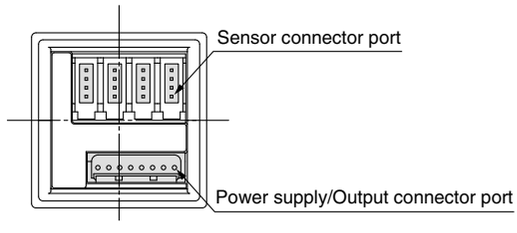
Connector no.	Cable wire colour
1	Brown (DC+)
2	Not used
3	Blue (DC–)
4	White (IN: 1 to 5 V)

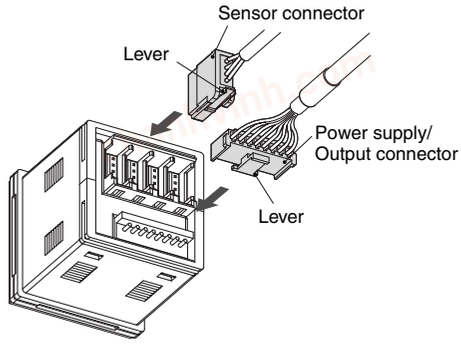
- Make sure that the numbers on the connector and the wire colours match. After verifying that the wires are fully inserted, temporarily hold A down by hand.
- Using pliers, press the center of A straight down.
- Note that that connector cannot be taken apart for reuse once it is crimped. Use a new sensor connector if wiring or cable insertion is done incorrectly.

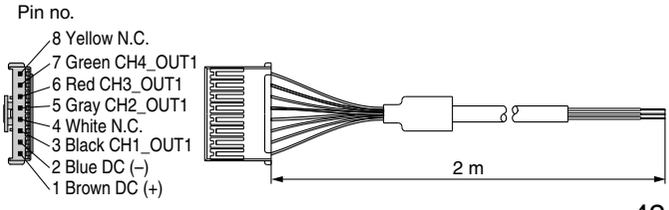


2. Inserting/Detaching of sensor connector, power supply/output connector

- Insert each connector straightforwardly until it clicks and locks onto the body.
- To remove the connector, pull it straight out while pushing the lever with your thumb.







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Digital Flow Switch for De-ionised Water and Chemicals

Series PF2D



A single controller can monitor the flow rate of 4 different sensors.



Body and Sensor

New PFA

Tube

Super PFA

Three types of flow range

0.4 to 4 ℓ/min (PF2D504)
1.8 to 20 ℓ/min (PF2D520)
4.0 to 40 ℓ/min (PF2D540)

4-channel Flow Monitor *Series PF2D200*

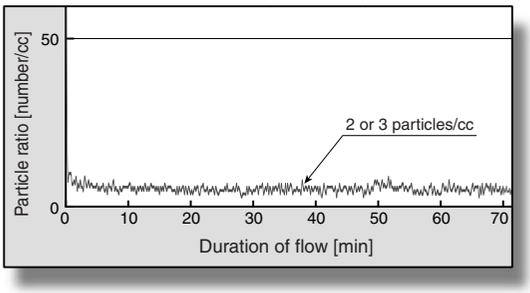
Dust generation of 3 particles/cc or less (average number)

Karman vortex eliminates moving parts and allows low dust generation.

Swept flow characteristics

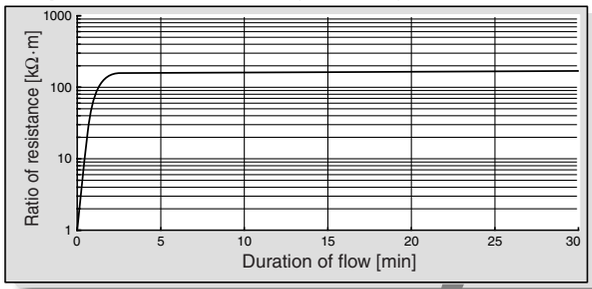
Tapered side seal minimizes dead volume to reduce accumulation of liquid pool.

Particle characteristics (reference)



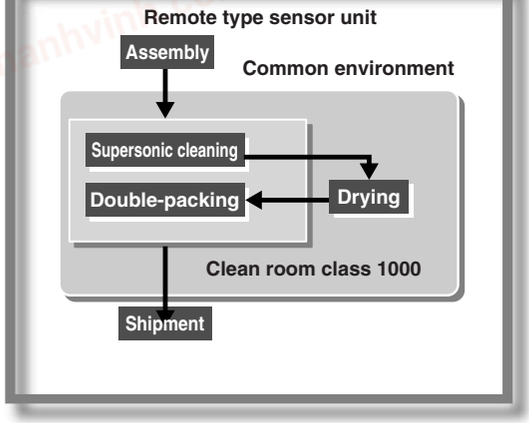
The data was obtained by performing an actual 10 minutes' supersonic cleaning using an average 16 MΩ·cm of de-ionised water at class 10000 clean room (1 ℓ/min flow rate).
The diameter of the measured particles ranges from 0.1 to 0.5 μm. The flow rate used during measuring is 100 cc/min.

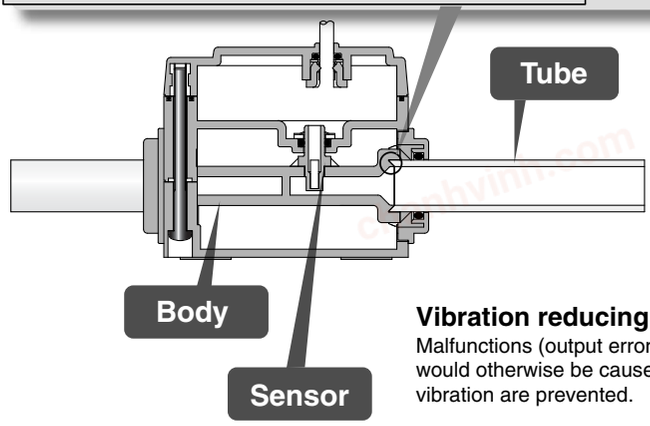
Swept flow characteristics (reference)



Fill the flow path with sulfuric acid and leave it for 30 minutes.
After disposing the sulfuric acid, flush the flow path out with de-ionised water and measure the resistance rate of the fluid that is discharged from the downstream side.
A quick recovery time indicates little liquid pool.

Processing chart for Series PF2D





Vibration reducing seals
Malfunctions (output errors) that would otherwise be caused by vibration are prevented.

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For De-ionised Water and Chemicals

Digital Flow Switch

Series PF2D



How to Order

Remote Type Sensor Unit

PF2D5 [20] — [13] — [1] — [C]

Flow rate range

04	0.4 to 4 ℓ/min
20	1.8 to 20 ℓ/min
40	4 to 40 ℓ/min

Port size: (inch)

11	3/8	PF2D504
13	1/2	PF2D520
19	3/4	PF2D540

Output specification

Symbol	Specification	Applicable display unit (monitor) model
Nil	Output for display unit	Series PF2D300
1	Output for display unit + analogue output (1 to 5 V)	Series PF2D200/300
2	Output for display unit + analogue output (4 to 20 mA)	Series PF2D300

Option (Refer to page 55.)

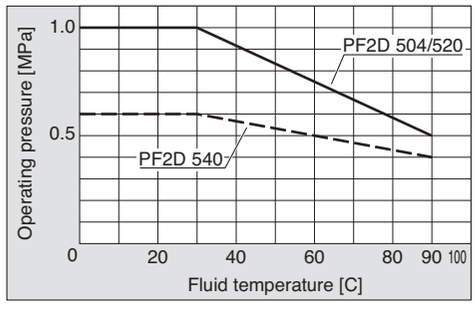
Nil	None
C	e-con connector x 1 pc.

The cable and connector are shipped unassembled.

Specifications for Sensor Unit

Model		PF2D504	PF2D520	PF2D540
Measured fluid		Liquid not to corrode nor erode de-ionised water and/or PFA. Viscosity: 3mPa·s (3cP) or less		
Detection style		Karman vortex		
Rated flow range		0.4 to 4 ℓ/min	1.8 to 20 ℓ/min Note 1)	4 to 40 ℓ/min
Operating pressure range Note 2)		0 to 1 MPa		0 to 0.6 MPa
Proof pressure Note 3)		1.5 MPa		0.9 MPa
Operating fluid temperature		0 to 90°C		
Linearity Note 4)		±2.5% F.S. or less (at 25°C water)		
Repeatability		±1% F.S. or less (at 25°C water)		
Temperature characteristics		±5% F.S. or less (0 to 50°C, based on 25°C)		
Output specifications	Pulse output	Pulse output, N channel, open drain, output for display unit PF2D 300/301 (Specifications: Maximum load current of 10 mA; Maximum applied voltage of 30 V)		
	Analogue output	Voltage output Note 5) 1 to 5 V Linearity: ±2% F.S. or less, allowable load resistance: 100 kΩ or more		
		Current output Note 6) 4 to 20 mA Linearity: ±2% F.S.or less, allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC		
Power supply voltage		12 to 24 VDC (ripple ±10% or less)		
Current consumption		20 mA or less (without load)		
Environmental resistance	Enclosure	IP65		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C in stock (with no condensation and freezing)		
	Voltage resistance	1000 VAC for 1 min. between external terminals and case		
	Insulation resistance	50 MΩ or more (at 500 VDC measured via Megohmmeter) between external terminals and case		
	Vibration resistance	4.9 m/s²		
	Impact resistance	490 m/s² to X,Y,Z directions 3 times for each		
	Noise resistance	1000 Vp-p, Pulse width: 1 μs, Rise time: 1 ns		
Weight		140 g (without lead wire)		225 g (without lead wire)
Port size		3/8 inch tube	1/2 inch tube	3/4 inch tube
Wetted material		Body: New PFA, Sensor: New PFA, Tube: Super PFA		

Note 1) 1.6 to 20 ℓ/min (0.1 MPa) with viscosity of 1 mPa·s (1 cP) or less
Note 2) The operating pressure range drops according to the fluid temperature. See attached graph.
Note 3) 1.5 times of the maximum operating pressure and varying with fluid temperature.
Note 4) The system accuracy when combined with PF2D30□.
Note 5) When the voltage output is selected.
Note 6) When the current output is selected.
Note 7) The sensor unit conforms to the CE mark.



SMC

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For De-ionised Water and Chemicals
Digital Flow Switch *Series PF2D*



How to Order

Remote Type Display Unit

PF2D30 [0] — [A] — [M]

Output specification

0	NPN open collector 2 outputs
1	PNP open collector 2 outputs

Panel mounting

Unit specification

Nil	With unit switching function
M	Fixed SI unit

Note) Fixed units: Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Specifications for Display Unit

Model		PF2D300/301		
Flow rate measurement range Note 1)		0.25 to 4.5 ℓ/min	1.3 to 21.0 ℓ/min	2.5 to 45 ℓ/min
Set flow rate range Note 1)		0.25 to 4.5 ℓ/min	1.3 to 21.0 ℓ/min	2.5 to 45 ℓ/min
Minimum set unit Note 1)		0.05 ℓ/min	0.1 ℓ/min	0.5 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50ms) Note 1)		0.05 ℓ/pulse	0.1 ℓ/pulse	0.5 ℓ/pulse
Note 2) Display units	Real-time flow rate	ℓ/min, gal (US)/min		
	Accumulated flow	ℓ, gal (US)		
Accumulated flow range Note)		0 to 999999 ℓ		
Linearity Note 3)		±2.5% F.S. or less		
Repeatability		±0.5% F.S. or less		
Temperature characteristics		±1% F.S. or less (15 to 35°C, based on 25°C) ±2% F.S. or less (0 to 50°C, based on 25°C)		
Current consumption (No load)		60 mA or less		
Weight		45 g		
Note 4) Output specifications	Switch output	NPN open collector (PF2D300)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V 2 outputs	
		PNP open collector (PF2D301)	Maximum load current: 80 mA Internal voltage drop: 1.5 V or less (with load current of 80 mA) 2 outputs	
	Accumulated pulse output	NPN open collector or PNP open collector (same as switch output)		
Environmental resistance	Enclosure	IP40		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no condensation and freezing)		
	Voltage resistance	1000 VAC for 1 min. between external terminal and case		
	Insulation resistance	50 MΩ or more (at 500 VDC measured via Megohmmeter) between external terminal and case		
	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.		
	Impact resistance	490 m/s^2 to X, Y, Z directions 3 times for each		
	Noise resistance	1000 Vp-p, Pulse width: 1 μs, Rise time: 1 ns		
Indicator light		3-digits 7-segment LED		
Status LED's		ON: when light is on, OUT1: Green; OUT2: Red		
Power supply voltage		12 to 24 VDC (ripple ±10% or less)		
Response time		1sec. or less		
Hysteresis		Hysteresis mode: adjustable (can be set from 0) Window comparator mode Note 5): fixed (3 digits)		

Note 1) The value varies depending on set flow range
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [ℓ/min or ℓ] will be set for switch types without the unit switching function.)
Note 3) The system accuracy when combined with PF2D5□□.
Note 4) Switch output and accumulated pulse output can be selected using the control button operation during initial setting.

	1	2	3	4
Output 1	Switch output	Switch output	Accumulated pulse output	Accumulated pulse output
Output 2	Switch output	Accumulated pulse output	Switch output	Accumulated pulse output

Note 5) Window comparator mode: Since hysteresis (H) will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 6) The display unit conforms to the CE mark.
Note) Accumulated flow rate is reset when the power supply turns OFF.

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Series PF2D

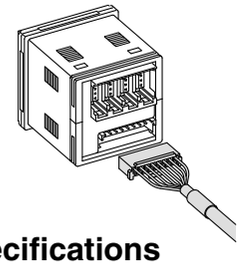
How to Order



4-channel Flow Monitor
Remote Type
Display Unit

PF2D20 □ — M □ □

Accessory / Power supply output cable (2 m)



Output specification

0	NPN4 outputs
1	PNP4 outputs

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Option 2 (Refer to page 55.)

Nil	None
4C	Sensor connector (4 pc.)

Option 1 (Refer to page 55.)

Nil	None
A	Panel mounting
B	Front protective cover + Panel mounting

Connectable remote type sensor part is PF2D5□□-□-1 (with analogue output 1 to 5 V).

Specifications

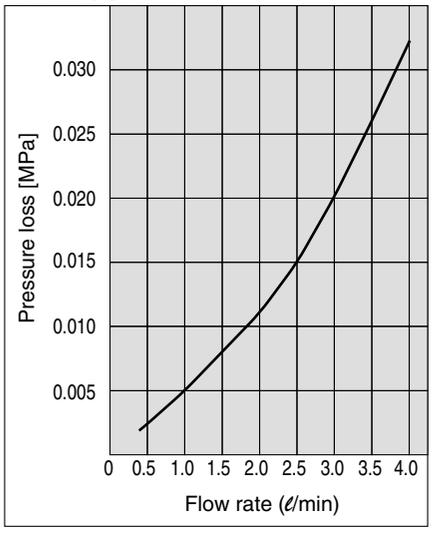
Model		PF2D200/201		
Applicable flow rate sensor		PF2D504-□-1	PF2D520-□-1	PF2D540-□-1
Flow rate measurement range Note 1)		0.25 to 4.50 ℓ/min	1.3 to 21.0 ℓ/min	2.5 to 45.0 ℓ/min
Set flow rate range Note 1)		0.25 to 4.50 ℓ/min	1.3 to 21.0 ℓ/min	2.5 to 45.0 ℓ/min
Minimum set unit Note 1)		0.05 ℓ/min	0.1 ℓ/min	0.5 ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50ms) Note 1)		0.05 ℓ/pulse	0.1 ℓ/pulse	0.5 ℓ/pulse
Display units Note 1)	Real-time flow rate	ℓ/min, gal(US)/min		
	Accumulated flow	ℓ, gal(US)		
Accumulated flow range Note 1)		0 to 999999 ℓ, 0 to 999999 gal(US)		
Power supply voltage		24 VDC (ripple ±10% or less) (With power supply polarity protection)		
Current consumption		55 mA or less (Not including the current consumption of the sensor)		
Power supply voltage for sensor		Same as [Power supply voltage]		
Power supply current for sensor Note 2)		Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.)		
Sensor input		1 to 5 VDC (Input impedance: Approx. 800K Ω)		
Output specifications Note 3)	No. of inputs	4 inputs		
	Input protection	Excess voltage protection		
	Switch output (Real-time switch output, Accumulated switch output)	NPN open collector (PF2D200)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V	
		PNP open collector (PF2D201)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA)	
	Accumulated pulse output	NPN open collector or PNP open collector (same as switch output)		
	No. of outputs	4 outputs (1 output per 1 sensor input)		
	Output protection	Short circuit protection		
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode: Fixed (3-digits)		
Response time Note 4)		1s or less		
Linearity Note 4)		±5% F.S. or less		
Repeatability Note 4)		±3% F.S. or less		
Temperature characteristics		±2% F.S. or less (0 to 50°C, based on 25°C)		
Display method		For measured value display: 4-digits, 7-segment LED (Orange) For channel display: 1-digit, 7-segment LED (Red)		
Status LED's		Illuminates when output is ON OUT1: Red		
Resistance	Enclosure	IP65 for the front face only, the rest is IP40.		
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no freezing and condensation)		
	Operating humidity range	Operating or Stored: 35 to 85%RH (with no condensation)		
	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-energised)		
	Impact resistance	980 m/s^2 in X, Y, Z directions 3 times each (de-energised)		
	Noise resistance	500 Vp-p, Pulse width 1 μs, Rise time 1 ns		
Connection		Power supply / Output connection: 8P connector, Sensor connection: 4P connector (e-con)		
Material		Housing: PBT, Display: PET, Backside rubber: CR		
Weight		60 g (Except for any accessories that are shipped together.)		

Note 1) Fixed SI unit [ℓ/min or ℓ] will be set for switch types without the unit switching function. ("-M" is suffixed at the end of part number.) Accumulated flow is reset when the power supply turns OFF.
Note 2) If Vcc side on sensor input connector part is short-circuited with the 0V side, the flow monitor inside will be damaged.
Note 3) Switch output and accumulated pulse output can be selected during initial setting.
Note 4) The system accuracy when combined with an applicable flow sensor.
Note 5) This product conforms to the CE mark.

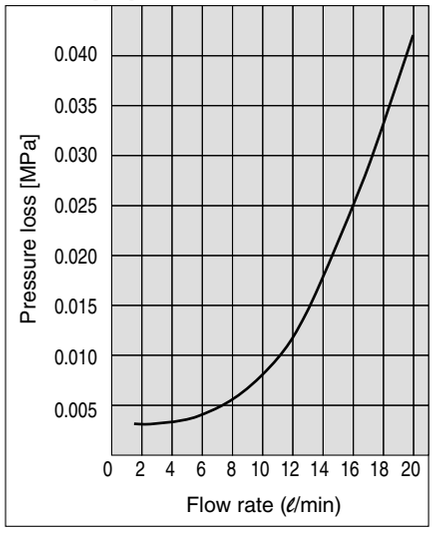
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Flow Characteristics (Pressure Characteristics)

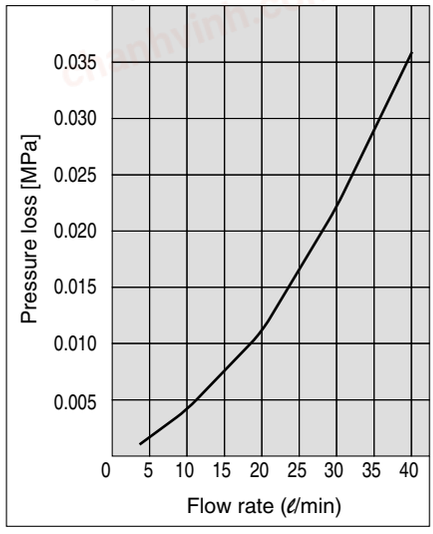
PF2D504



PF2D520

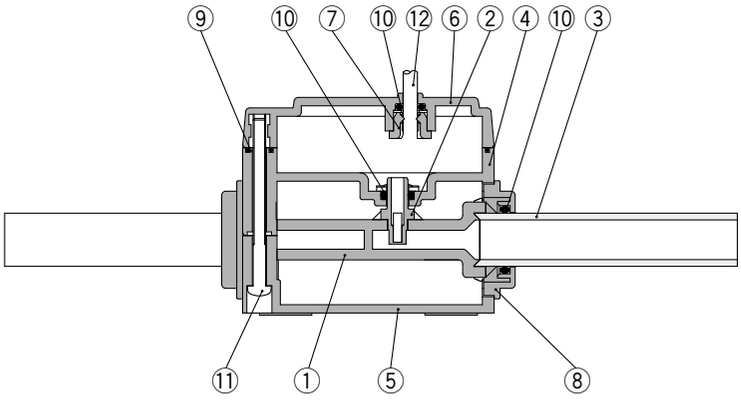


PF2D540



Construction

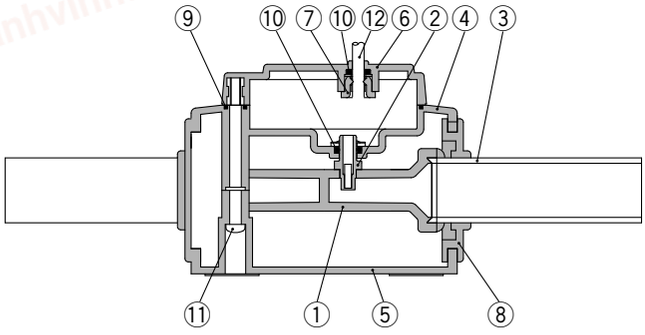
PF2D504/520



Parts list

Number	Parts	Material
1	**Body**	New PFA
2	**Sensor**	New PFA
3	**Tube**	Super PFA
4	**Housing A**	PPS
5	**Housing B**	PPS
6	**Housing C**	PPS
7	**Bushing**	POM
8	**Cap**	PPS
9	**Gasket**	FKM
10	**O-ring**	FKM
11	**Thread**	Stainless steel 304
12	**Lead wire**	PVC

PF2D540

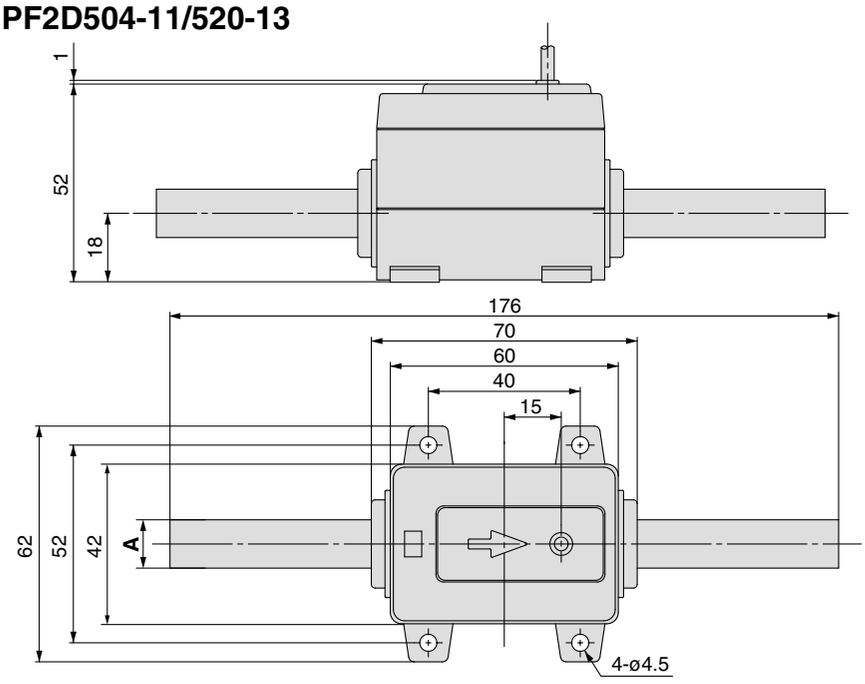


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Series PF2D

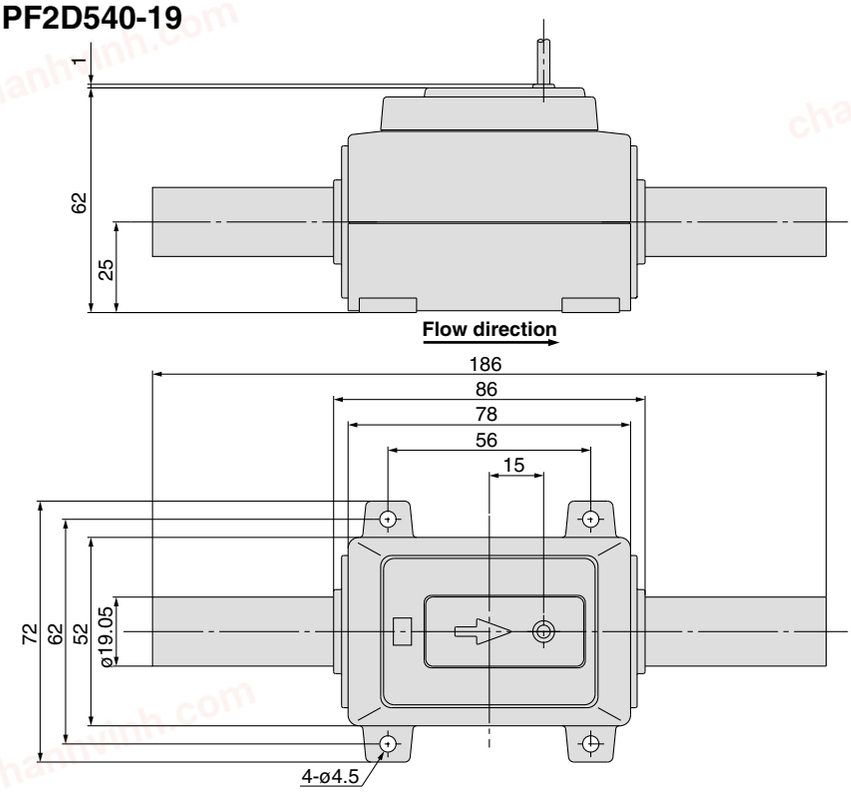
Dimensions: Remote Type Sensor Unit

PF2D504-11/520-13



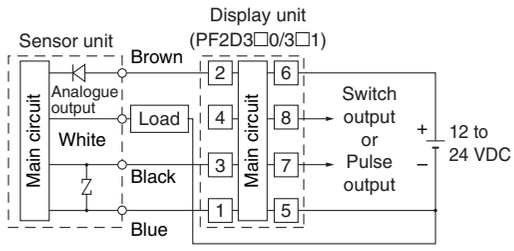
Model	A
PF2D504	ø9.52
PF2D520	ø12.7

PF2D540-19

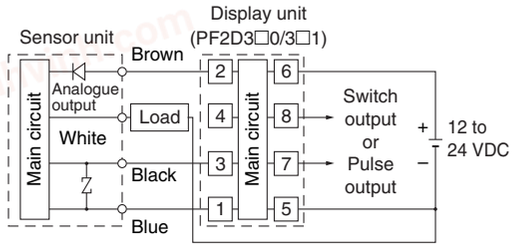


Internal circuits and wiring examples

1 to 8 are the terminal numbers.

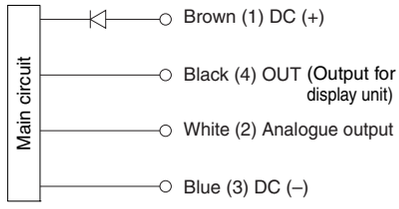


Load is an analogue input equipment such as a voltmeter.
PF2D5□□-□-1 (With voltage output type)



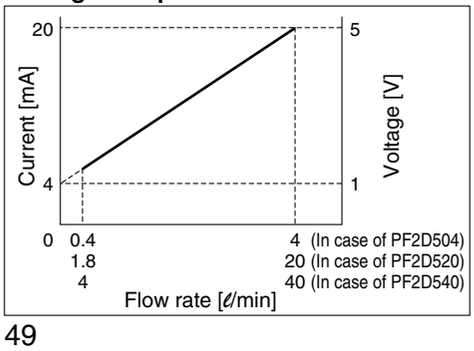
Load is an analogue input equipment such as a voltmeter.
PF2D5□□-□-2 (With voltage output type)

Wiring



∗ Use this sensor by connecting it to a SMC remote type display unit Series PF2D2□□/3□□.

Analogue output

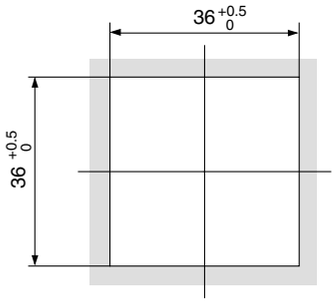


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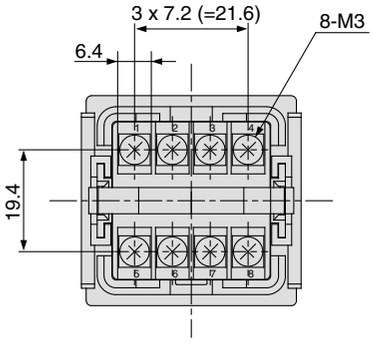
Dimensions: Remote Type Display Unit

PF2D30⁰₁-A
Panel mounting type

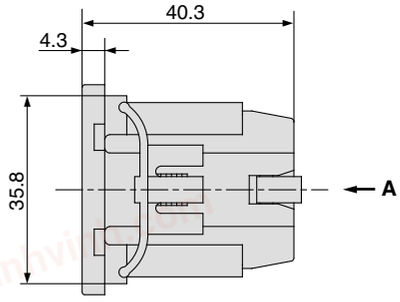
Panel fitting dimensions

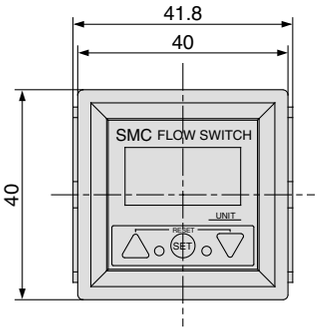


∗ The applicable panel thickness is 1 to 3.2 mm.



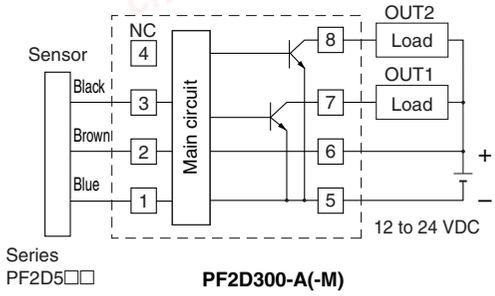
View A



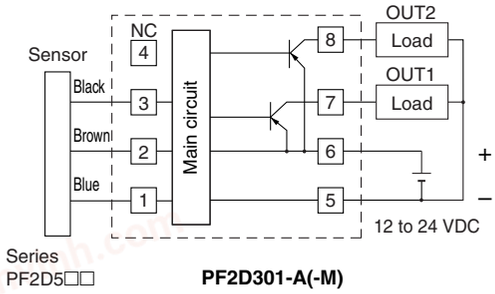


Internal circuits and wiring examples

1 to 8 are the terminal numbers.



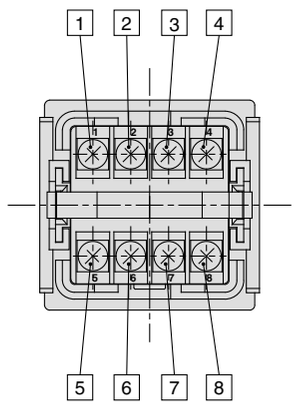
PF2D300-A(-M)



PF2D301-A(-M)

∗ Do not connect the white wire of the sensor to 3 of the display unit.

Terminal block numbers

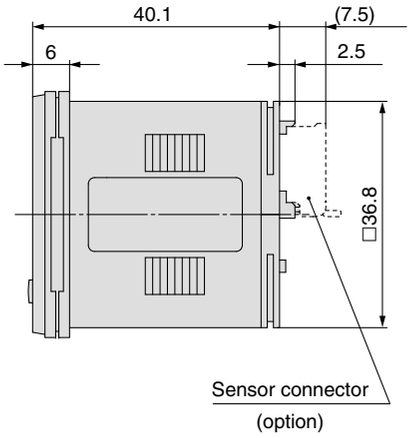


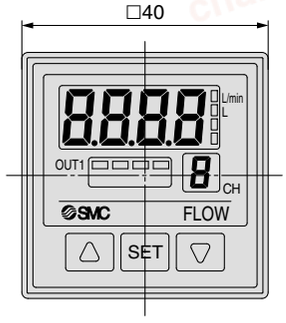
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Series PF2D

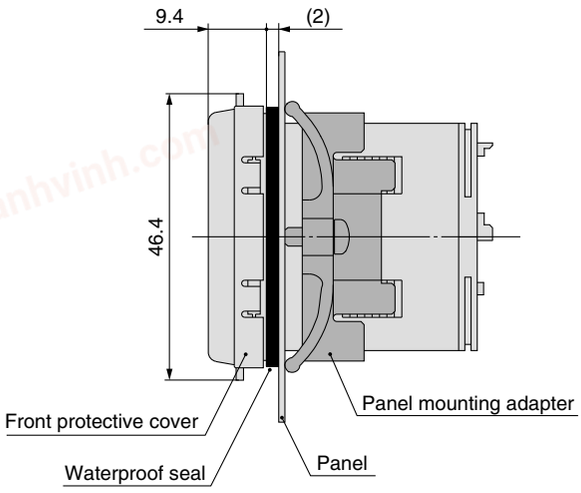
Dimensions: Remote Type Display Unit for De-ionised Water and Chemicals (4-channel Controller)

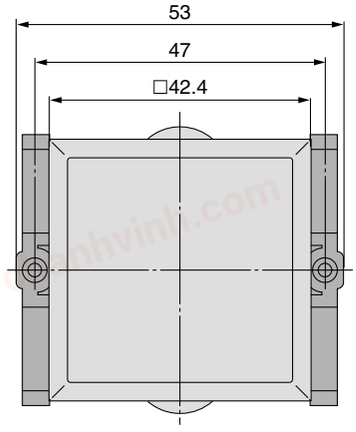
PF2D200/201

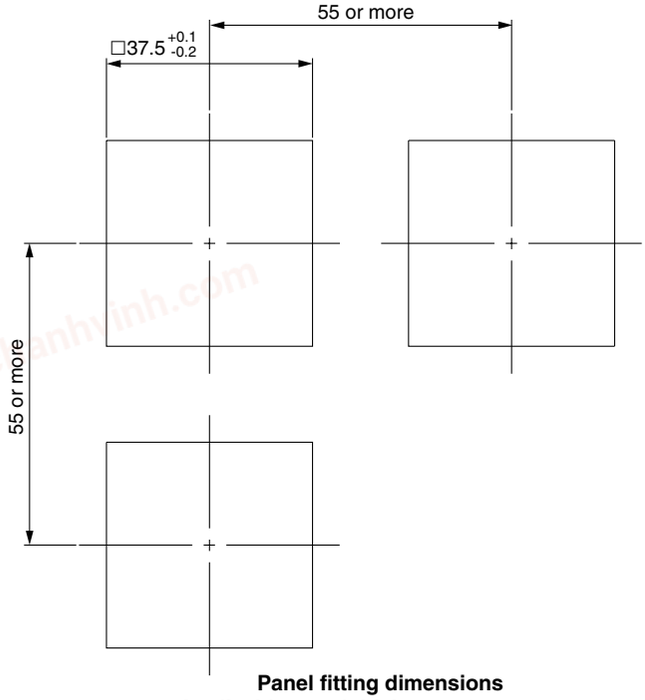




Front protective cover + Panel mounting



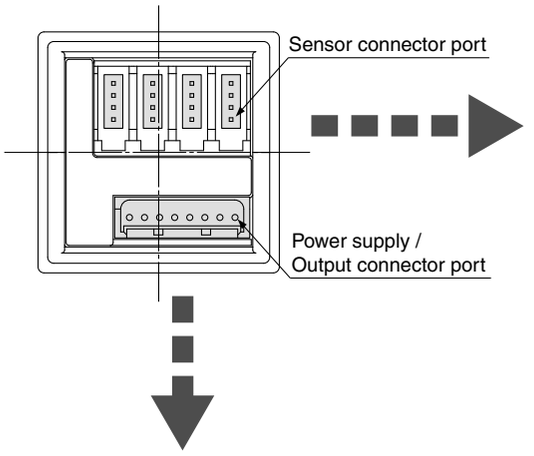




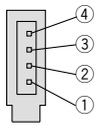
Panel fitting dimensions
Applicable panel thickness: 0.5 to 8 mm

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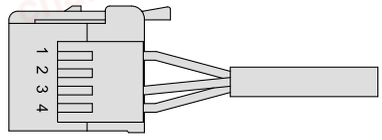
Dimensions: Remote Type Display Unit for De-ionised Water and Chemicals (4-channel Controller)



Sensor connector (4P x 4)

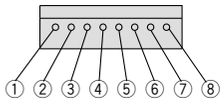


Connector (option)



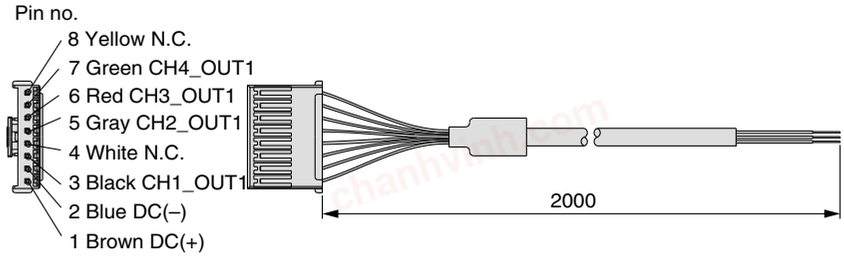
Pin no.	Terminal	Connector no.	Cable wire colour
①	DC+	1	Brown
②	N.C.	2	Not used
③	DC–	3	Blue
④	IN: 1 to 5 V	4	White

Power supply / Output connector (8P)



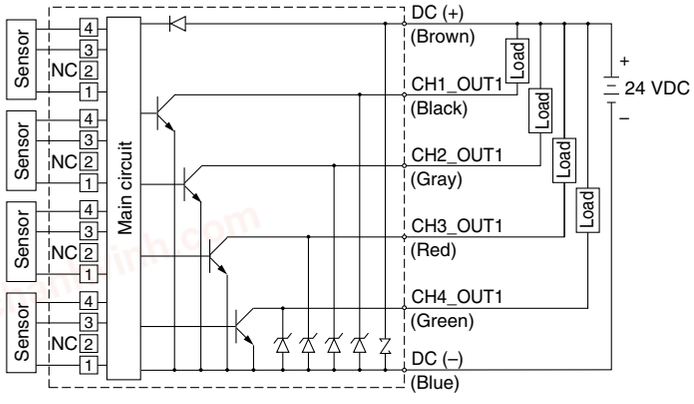
Pin no.	Terminal
①	DC (+)
②	DC (–)
③	CH1_OUT1
④	N.C.
⑤	CH2_OUT1
⑥	CH3_OUT1
⑦	CH4_OUT1
⑧	N.C.

Power supply / Output connector (accessory)

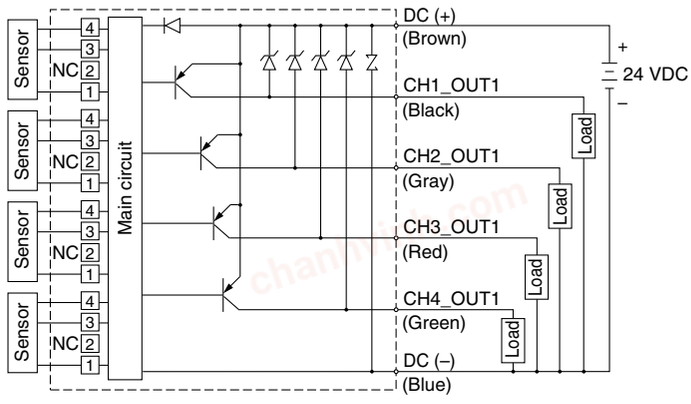


Internal circuits and wiring examples

PF2D200



PF2D201

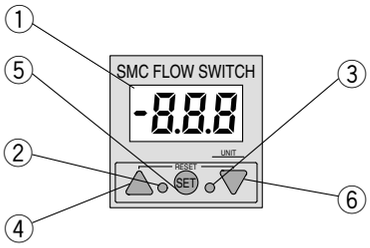


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Series PF2D

Description

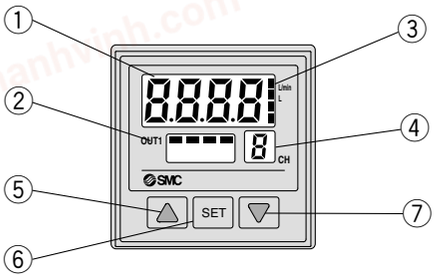
Remote Type/Display Unit
PF2D300, 301



RESET button (▲ + ▼ button)
If the UP and DOWN buttons are pressed simultaneously, the RESET function will activate.
In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

①	LED display/Red	Displays the measured flow rate, each setting condition, and error code.
②	Output (OUT1) display/Green	Displays the output condition of OUT1. Illuminates when turned ON.
③	Output (OUT2) display/Red	Displays the output condition of OUT2. Illuminates when turned ON.
④	UP button (▲ button)	Use to change the mode or to increase the set value.
⑤	SET button (● button)	Use this button to set the value or the set mode.
⑥	DOWN button (▼ button)	Use to change the mode or decrease the set value.

4-channel Flow Monitor (Remote type/Display unit)
PF2D200, 201



①	LED display/Orange	Displays the measured flow rate, each setting condition, and error code.
②	Switch output display/Red	Displays the output condition of OUT1 (CH1 to 4). Lights up when turned ON.
③	Unit display/Orange	Illuminates the selected unit. Use after putting the unit label other than ℓ/min, ℓ.
④	Channel display/Red	Displays the selected channel.
⑤	UP button (▲ button)	Use to change the mode or to increase the set value.
⑥	SET button	Use this button to set the value or the set mode.
⑦	DOWN button (▼ button)	Use to change the mode or decrease the set value.

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Functions/PF2D

Refer to the "Instruction Manual" for information on setting and operating.

Flow rate measurement selection

Real-time flow rate and accumulated flow rate can be selected.
A flow rate of up to 999999 can be accumulated.
The accumulated flow rate is reset when the power supply turns OFF.

Unit switching

Display	Real-time flow rate	Accumulated flow
U_1	ℓ/min	ℓ
U_2	GPM	gal (US)

GPM = gal (US)/min

Note) Fixed SI unit (ℓ/min, ℓ, m^3 or m^3x10) will be set for the type without the unit switching function.

Flow rate measuring unit confirmation

This function allows to confirm the accumulated flow rate when real-time flow rate is selected and to confirm the real-time flow rate when accumulated flow rate is selected.

Error correction

For PF2D300/301

LED display	Contents	Solution
Er1	A current of more than 80 mA is flowing to OUT1.	Check the load and the wiring for OUT1.
Er2	A current of more than 80 mA is flowing to OUT2.	Check the load and the wiring for OUT2.
Er4	The set data has changed for some reason.	Perform the RESET operation, and reset all the data again.
---	The flow rate is over the flow rate measurement range.	Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.

For PF2D200/201

LED display	Contents	Solution
Er1	Over current is flowing to the load of a switch output.	Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.
Er0	Internal data error.	Contact SMC.
Er7	Internal data error.	
Er10	Internal data error.	
Er5	Internal data error.	Shut off the power supply and then reset the switch.
Er6	Internal data error.	
---	The flow rate is over the flow rate measurement range.	Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.

Key lock

This function prevents incorrect operations such as changing the set value accidentally.

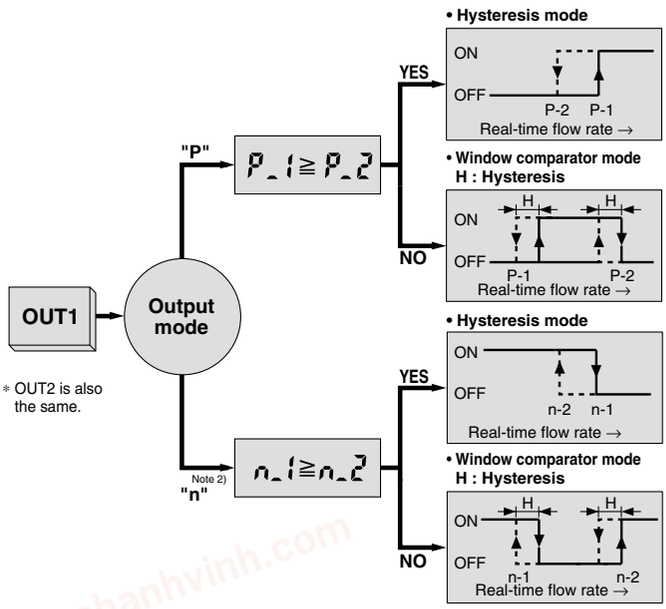
Accumulation clearance

This is to clear the accumulated value.

Output types

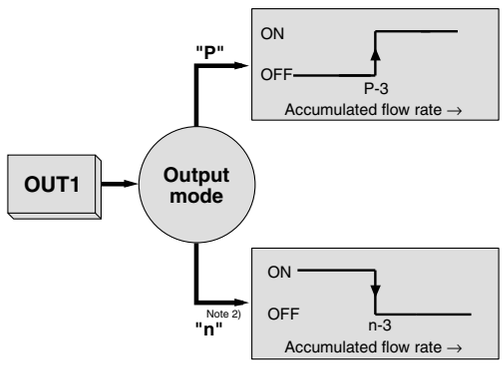
Real-time switch output, accumulated switch output, or accumulated pulse output can be selected as an output type.

Real-time switch output



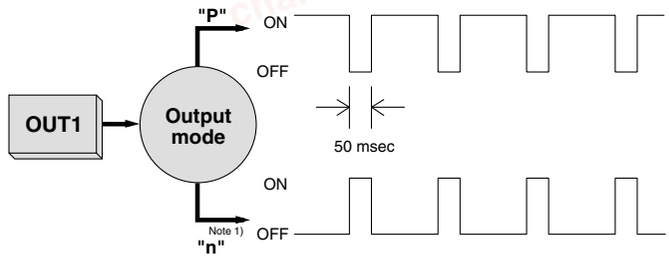
Note 2) Output mode is set to inverted output at the factory before shipment.

Accumulated switch output



Note 2) Output mode is set to inverted output at the factory before shipment.

Accumulated pulse output



Note1) Refer to the specifications of display unit for the flow rate value per pulse.

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Series PF2D

Functions

Copy function (PF2D200, 201 only)

Information to be copied is:
① **Flow rate range**
② **Display mode**
③ **Display unit (Only available when the unit specification is nil.)**
④ **Output method**
⑤ **Output mode**
⑥ **Flow rate value**

Peak hold, Bottom hold display function (PF2D200, 201 only)

The maximum or minimum value can be held in the case where the real-time flow rate display mode is selected during the initial setting.

Channel select function (PF2D200, 201 only)

Every pushing the △ button, channel selection "1→2→3→4→1..." is available. The flow rate measurement of each selected channel is shown in the display unit.

Channel scan function (PF2D200, 201 only)

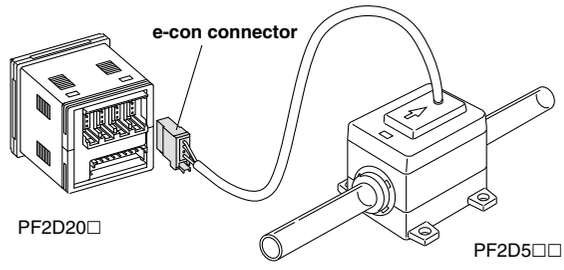
Changes displaying the channel shown every about 2 seconds and its detected flow rate.

Option

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

e-con connector

Part no.	Qty.
ZS-28-CA-2	1

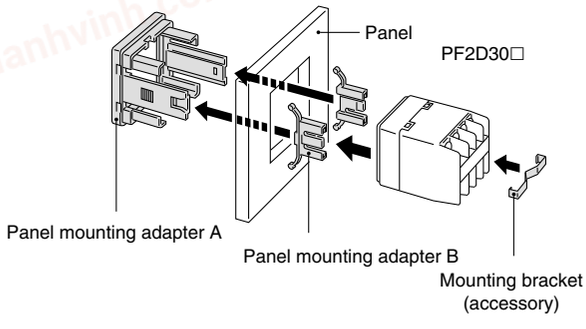


In addition to the connector shown above, those listed below (female contact) can be connected.

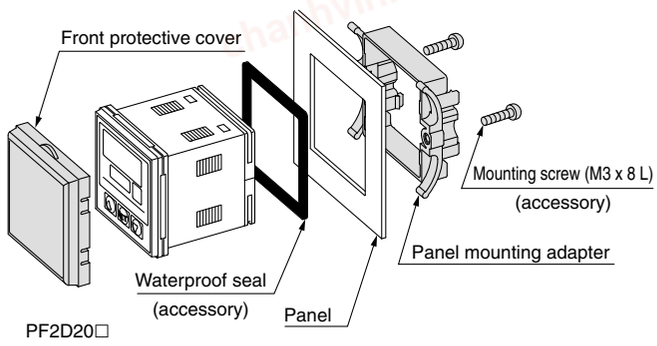
Manufacturer	Model
Sumitomo 3M Limited	37104-3101-000FL
Tyco Electronics AMP K.K.	1-1473562-4
OMRON Corp.	XN2A-1430

Panel mounting

Pin no.	Description	Note
ZS-22-E	Panel mounting adapter A, B	With mounting bracket



Part no.	Description	Note
ZS-26-B	Panel mounting adapter	With waterproof seal, mounting screw
ZS-26-C	Front protective cover + Panel mounting adapter	With waterproof seal, mounting screw



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Applicable Fluid

Compatibility checklist: Between the digital flow switch material for de-ionised water and chemicals and the fluid selected.

Fluid		Compatibility
Acetone		○
Ammonium hydroxide		○
Isobutyl alcohol		×
Isopropyl alcohol		○
Hydrochloric acid		○
Ozone		×
Hydrogen peroxide	Concentration 50% or less 50°C or less	○
Ethyl acetate		○
Butyl acetate		○
Nitric acid (except fuming nitric acid)	Concentration 10% or less	○
De-ionised water		○
Sodium hydroxide		×
Ultra de-ionised water		○
Toluene		○
Hydrofluoric acid	Concentration 50% or less	○
Sulfuric acid (except fuming sulfuric acid)	Concentration 20% or less	○
Phosphoric acid	Concentration 30% or less	○

Note 1) The material and fluid compatibility check list provides reference values as a guide only.
Note 2) It is possible that some fluids are permeable depending on the type of fluid, its density and temperature. Any permeated fluid may affect the products life.
Thus, when using these fluid types, verify the fluid in advance by testing it, prior to making a decision to use it.

Table symbols
○ : Can be used
: Can be used under certain conditions
× : Cannot be used

· Compatibility is indicated for fluid temperatures at 90°C or less.
· The product does not have an explosion proof construction. Be sure to take measures to prevent the area around the product from becoming filled with an explosive gas, when using an explosive fluid.

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Series PF2D
Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning"** or **"Danger"**. To ensure safety, please observe all safety practices.

⚠Caution : Operator error could result in injury or equipment damage.

⚠Warning : Operator error could result in serious injury or loss of life.

⚠Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

⚠ Warning

1. **The compatibility of equipment is the responsibility of the person who designs the system or decides its specifications.**
   Since the products specified here are used in various operating conditions, their compatibility with the specific system must be based on specifications, post analysis and/or tests to meet a specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information and taking into consideration the possibility of equipment failure when configuring a system.
2. **Only trained personnel should operate machinery and equipment.**
   Assembly, handling or repair of systems should be performed by trained and experienced operators.
3. **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
4. **To promote safe operation, be sure to observe company standard and legal regulations, etc.**
   Refer to ISO4414, JIS B 8370 (pneumatic system axiom), labor health and safety laws and other safety regulations.

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Series PF2D
Specific Product Precautions 1

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

Design and Selection

⚠Warning

1. Operate the switch only within the specified voltage.

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

2. Do not exceed the maximum allowable load specification.

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

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

Although the circuit at the output side of the switch is surge protected, damage may still occur if a voltage surge is applied repeatedly. When a load which generates a surge, such as from a relay or solenoid valve is directly driven, use a switch with a built-in surge absorbing element.

4. Be sure to verify the applicable fluid.

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

5. Monitor the internal voltage drop of the switch.

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

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

6. Use the switch within the specified flow rate measurement and operating pressure.

Operating beyond the specified flow rate and operating pressure can damage the switch. Especially avoid the application of pressure through a water hammer, which is above the specification.

<Examples of pressure reduction measures>

a) Use a device such as a water hammer relief valve to slow the valve's closing speed.

b) Absorb impact pressure by using an accumulator or elastic piping material such as a rubber hose.

c) Keep the piping length as short as possible.

7. Design the system so that the fluid always fills the detection passage.

Especially for vertical mounting, introduce the fluid from the bottom to the top.

8. Operate within the flow rate measurement range.

If operated outside of the flow rate measurement range, the Karman vortex will not be generated and normal measurement will not be possible.

9. Never use inflammable fluids and/or permeable fluids.

They may cause a fire, an explosion or corrosion.

∗Refer to the MSDA (material safety data sheet) when using chemicals.

Design and Selection

⚠Caution

1. Data from the flow switch is stored even after the power supply is off.

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

2. Accumulated flow rate is reset when it is turned OFF.

Mounting

⚠Warning

1. Monitor the flow direction of the fluid.

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

2. Remove dirt and dust from inside of the piping by means of air blow, before attaching to the switch.

3. Do not drop or bump.

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

4. Hold the body of the switch when handling.

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

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

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

6. Never mount a switch in a place that will be used as a step stool during piping.

7. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.

When abruptly reducing the size of piping or when there is a restriction such as a valve on the inlet side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the outlet side of the switch.

When used with the outlet side open, be careful of the cavitation that is prone to occur.

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Series PF2D
Specific Product Precautions 2

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

Wiring

⚠Warning

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

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

2. Avoid repeatedly bending or stretching of the lead wire.

Repeatedly applying bending stress or stretching force to the lead wire will cause it to break.

3. Confirm proper insulation of wiring.

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

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

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

5. Do not allow loads to short circuit.

Although a switch indicate excess current error if a load is short circuited, all incorrect wiring connections such as power supply polarity cannot be protected. Take precautions to avoid incorrect wiring.

Usage

⚠Warning

1. When using a switch for high temperature fluid, the switch itself also becomes hot due to the high temperature fluid. Avoid touching the switch directly as this may cause a burn.

Operating Environment

⚠Warning

1. Never use in the presence of explosive gases.

The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

2. Mount the switch in a location where there is no vibration (Display: greater than 98 m/s², Sensor: 4.9 m/s² or less), or no impact greater than 490 m/s².

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

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

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

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

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

The switches are dustproof and splashproof; however, avoid using in an environment where the likelihood of heavy splashing or spraying of water and/or oil exist. Since the display unit of the remote type switches featured here is not dust or splash proof, the use in an environment where water and/or oil splashing or spraying exists must be avoided.

Maintenance

⚠Warning

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

Unexpected malfunctions may cause a possible danger.

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

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

3. Do not disassemble or perform any conversion work on flow switches.

4. The following should be observed during regular maintenance to avoid damage and loss due to chemicals.

a) Do not touch the remaining chemicals in piping and/or digital flow switch.

b) Check the name and the nature of chemicals used and treat them accordingly.

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Series PF2D
Specific Product Precautions 3

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

Measured Fluid

⚠Warning

1. **Check regulators and flow adjustment valves before introducing the fluid.**
   If pressure or flow rate beyond the specified range are applied to the switch, the sensor unit may be damaged.
2. **Be sure to take measures to prevent exposing the switch to inflammable and/or explosive gases when using inflammable fluid.**
3. **Install a filter on the inlet side when there is a possibility of condensation and foreign matter being mixed with the fluid.**
   If foreign matter adheres to the switch's vortex generator or vortex detector, accurate measurement will no longer be possible.

Others

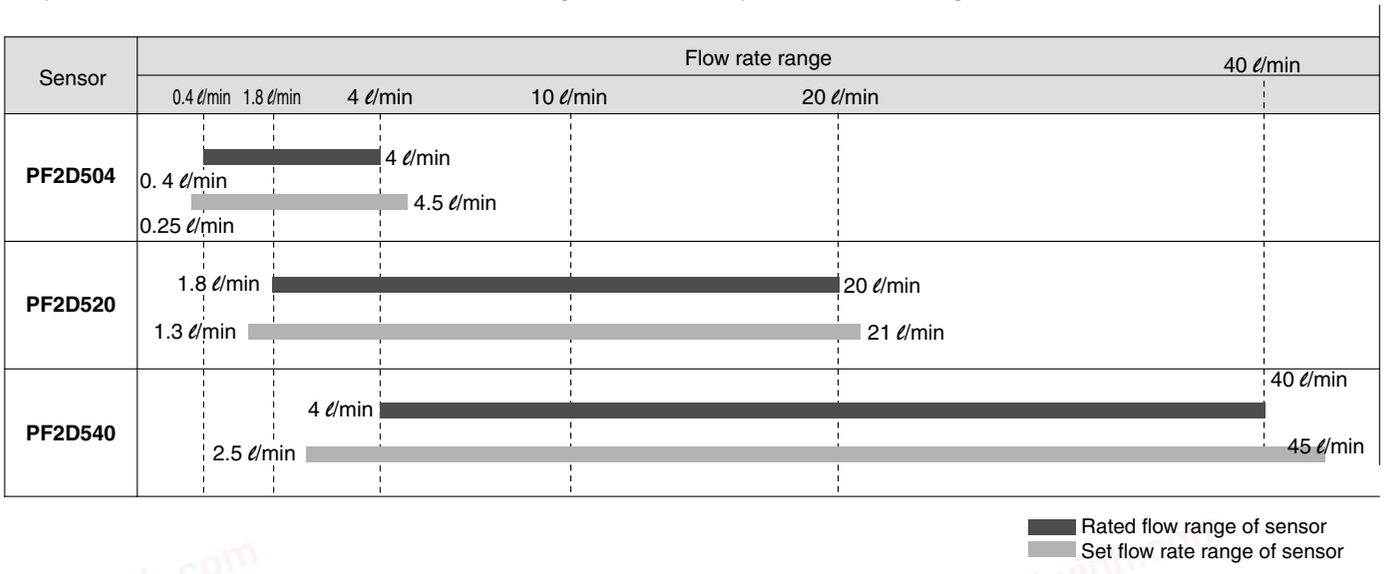
⚠Warning

1. **After the power is turned on, the switch's output remains off while a message is displayed. Therefore, start the measurement after a value is displayed.**
2. **Perform settings after stopping control systems.**
   When the switch's initial setting and flow rate setting are performed, output maintains the condition prior to the settings. Output turns OFF when the switch's initial setting and flow rate setting are preformed.

Set Flow Rate Range and Rated Flow Range

⚠Caution

Set the flow rate within the rated flow range.
The set flow rate range is the range of flow rate that can be set on the controller side.
The rated flow range is the range that satisfies the sensor's specifications (accuracy, linearity etc.).
It is possible to set a value outside off the rated flow range, however, the specification is not be guaranteed.



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Series PF2D
Specific Product Precautions 4

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

■ 4-channel Flow Monitor

Handling

⚠ Warning

1. **Do not drop, bump, or apply excessive impacts (980 m/s²) while handling. Although the body of the flow monitor case may not be damaged, the inside of the flow monitor could be damaged and lead to a malfunction.**
2. **The tensile strength of the power supply/output connection cable is 50N and the sensor lead wire with a connector is 25N. Applying a greater pulling force than the applicable specified tensile strength to either of these components can lead to a malfunction. When handling, hold the body of the controller.**

Connection

⚠ Warning

1. **Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output. Connections should be done while the power is turned off.**
2. **Do not attempt to insert or pull the flow rate sensor or its connector when the power is on. Switch output may malfunction.**
3. **Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these other lines.**
4. **If a commercial switching power supply is used, make sure that the F.G. terminal is grounded.**

Operating Environment

⚠ Warning

1. **Our 4-channel flow monitor is CE marked, however it is not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.**
2. **Our 4-channel flow monitor does not have an explosion proof rating. Never use pressure sensors in the presence of inflammable or explosive gases.**
3. **Enclosure "IP65" applies only to the front face of the panel when mounting. Do not use in an environment where oil splashing or spraying are anticipated.**

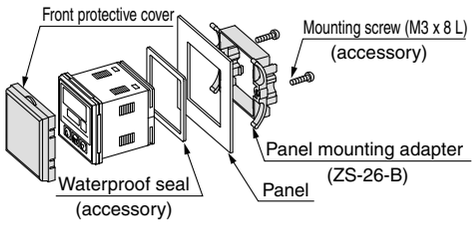
Mounting

⚠ Caution

The front face of the panel mount conforms to IP65, however there is a possibility of liquid infiltration if the panel mount adapter is not installed securely and properly. Securely fix the adapter with screws as shown below.

Front protective cover + Panel mounting

Tighten screws 1/4 to 1/2 turn after the heads are flush with the panel.

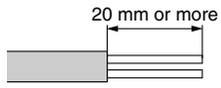


Wiring

⚠ Caution

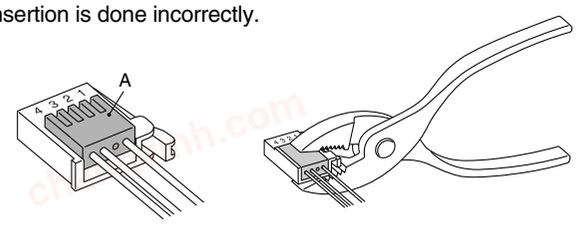
1. Connecting sensor cable and connector (ZS-28-CA-□)

- Cut the sensor cable as shown below.
- Insert each lead wire into the corresponding connector number by following the chart provided below.



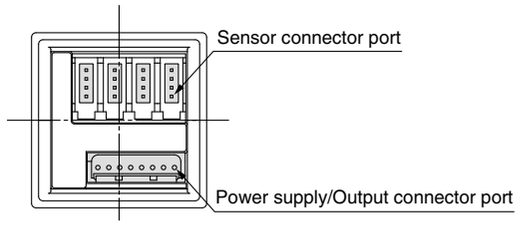
Connector no.	Cable wire colour
1	Brown (DC+)
2	Not used
3	Blue (DC–)
4	White (IN: 1 to 5 V)

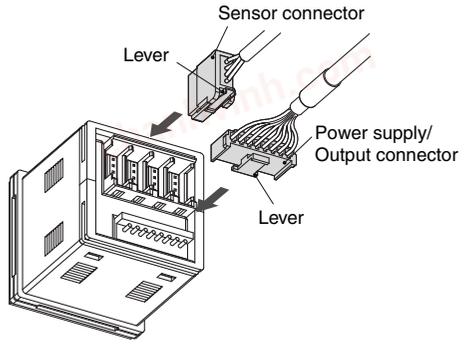
- Make sure that the numbers on the connector and the wire colours match. After verifying that the wires are fully inserted, temporarily hold A down by hand.
- Using pliers, press the center of A straight down.
- Note that that connector cannot be taken apart for reuse once it is crimped. Use a new sensor connector if wiring or cable insertion is done incorrectly.

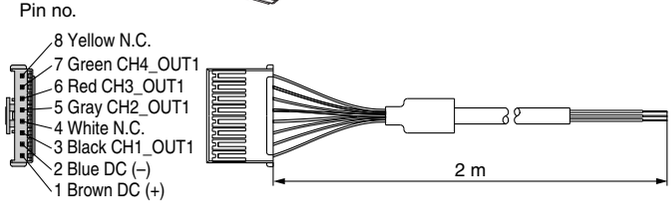


2. Inserting/Detaching of sensor connector, power supply/output connector

- Insert each connector straightforwardly until it clicks and locks onto the body.
- To remove the connector, pull it straight out while pushing the lever with your thumb.







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