Digital Flow Switch for Deionized Water and Chemicals

Body and sensor
New PFA

Tube
Super PFA

Series PF2D

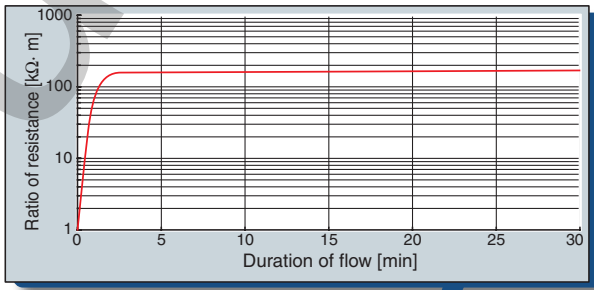
Three types of flow range

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

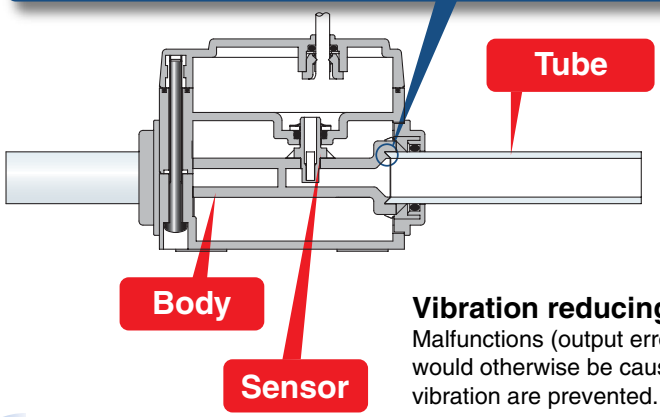
Swept flow characteristics

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

Swept flow characteristics (reference)



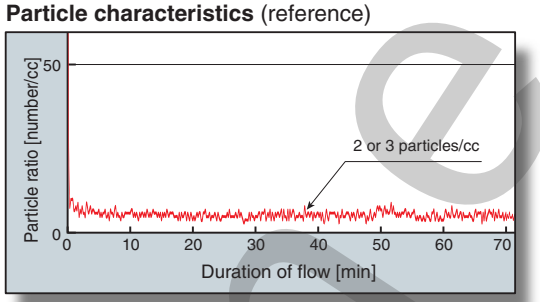
Fill the flow path with sulfuric acid and leave it for 30 minutes.
After disposing the sulfuric acid, flush the flow path out with deionized water and measure the resistance rate of the fluid that is discharged from the downstream side.
A quick recovery time indicates little liquid pool.



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

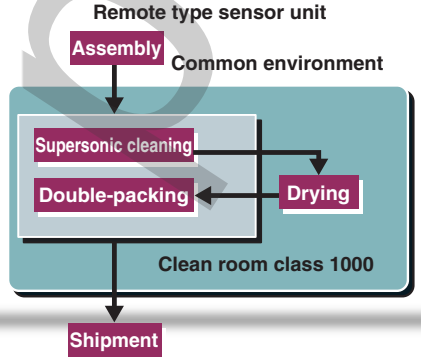
Karman vortex eliminates moving parts and allows low dust generation.

Particle characteristics (reference)



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

Processing chart for series PF2D



Vibration reducing seals

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

4 types of outputs available

With button operation, 4 types of output specification combinations are available.

	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

For Deionized Water and Chemicals

Digital Flow Switch

Series PF2D

How to Order

Remote Type Sensor Unit

PF2D5 [20] — [13] — [1]

Flow rate range

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

Port size: (inch)

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

Output specifications

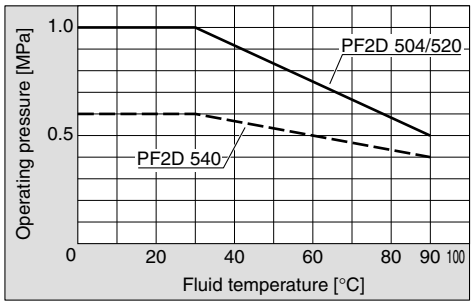
1	Output for display unit Note 1) + analog output (1 to 5V)
2	Output for display unit Note 1) + analog output (4 to 20mA)

Note 1) Output for the display units of PF2D 300/301

Specifications for Sensor Unit

Model		PF2D504	PF2D520	PF2D540
Measured fluid		Liquid not to corrode nor erode deionized water and/or Teflon®. Viscosity: 3mPa·s (3cP) or less		
Detection style		Karman vortex		
Flow rate measuring range		0.4 to 4ℓ/min	1.8 to 20ℓ/min Note 1)	4 to 40ℓ/min
Operating pressure range Note 2)		0 to 1MPa		0 to 0.6MPa
Proof pressure Note 3)		1.5MPa		0.9MPa
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)		
Output specifications	Pulse output	Pulse output, N channel, open drain, output for display unit PF2D 300/301 (Specifications: Maximum load current of 10mA; Maximum applied voltage of 30V)		
	Analog output	Voltage output Note 5) 1 to 5V within the flow rate range Linearity: ±2%F.S. or less, allowable load resistance: 100kΩ or more		
		Current output Note 6) 4 to 20mA within the flow rate range Linearity: ±2%F.S.or less, allowable load resistance: 300Ω or less with 12VDC, 600Ω or less with 24VDC		
Power supply voltage		12 to 24VDC (ripple ±10% or less)		
Current consumption		20mA or less (without load)		
Environmental resistance	Enclosure	IP65		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C in stock (no freeze nor condensation)		
	Voltage resistance	1000VAC for 1 min between external terminals and case		
	Insulation resistance	50MΩ or more (500VDC) between external terminals and case		
	Vibration resistance	4.9m/s^2		
	Impact resistance	490m/s^2 to X,Y,Z directions 3 times for each		
	Noise resistance	1000Vp-p, Pulse width: 1μs, Standing: 1ns		
Weight		140g (without lead wire)		225g (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 20ℓ/min (0.1MPa) with viscosity of 1mPa·s (1cP) 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 is conformed to CE mark.



How to Order

Remote Type Display Unit

PF2D30 [0] – [A] – [M]

Unit specification

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

Note 1) Fixed units: Real-time flow rate: ℓ/min
Accumulated flow: ℓ

Output specifications

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

Panel mounting

Specifications for Display Unit

Model		**PF2D300/301**		
Flow rate measurement range Note 1)		0.25 to 4.5ℓ/min	1.3 to 21.0ℓ/min	2.5 to 45ℓ/min
Set flow rate range Note 1)		0.25 to 4.5ℓ/min	1.3 to 21.0ℓ/min	2.5 to 45ℓ/min
Minimum setting unit Note 1)		0.05ℓ/min	0.1ℓ/min	0.5ℓ/min
Accumulated pulse flow rate exchange value (Pulse width: 50ms) Note 1)		0.05ℓ/pulse	0.1ℓ/pulse	0.5ℓ/pulse
Note 2) **Display units**	**Real-time flow rate**	ℓ/min, gal (US)/min		
	Accumulated flow	ℓ, gal (US)		
Accumulated flow range		0 to 999999ℓ		
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) ±2%F.S. or less (0 to 50°C)		
Current consumption		60mA or less		
Weight		45g		
Note 4) **Output specifications**	**Switch output**	NPN open collector (PF2D300, PF2W300, PF2W330)	Maximum load current: 80mA Internal voltage drop: 1.5V or less (with load current of 80mA) Maximum applied voltage: 30V 2 outputs	
		PNP open collector (PF2D301, PF2W301, PF2W331)	Maximum load current: 80mA Internal voltage drop: 1.5V or less (with load current of 80mA) 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 (no freezing nor condensation)		
	Voltage resistance	1000VAC for 1 min between external terminals and case		
	Insulation resistance	50MΩ or more (500VDC Mega) between external terminals and case		
	Vibration resistance	10 to 500Hz at whichever is smaller: 1.5mm amplitude or 98m/s^2 acceleration in X, Y, Z directions for 2 hrs each		
	Impact resistance	490m/s^2 to X, Y, Z directions 3 times for each		
	Noise resistance	1000Vp-p, Pulse width: 1μs, Standing: 1ns		
Indicator light		3-digits 7-segment LED		
Status LED's		ON: when light is on, OUT1: Green; OUT2: Red		
Power supply voltage		12 to 24VDC (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 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.

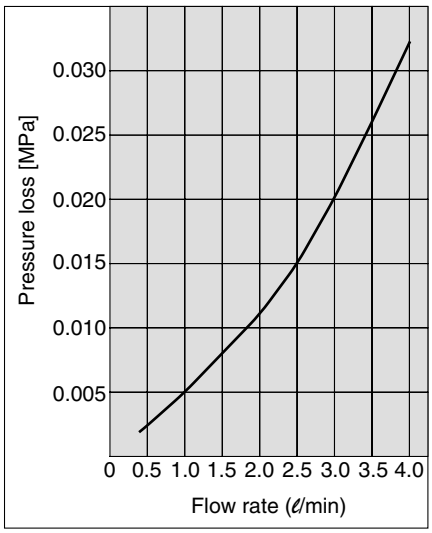
	1	2	3	4
Output 1	Switch output	Switch output	Accumulated pulse output	Accumulated pulse output
Output 2	Switch output	Accumulated pulse output	Switch output	Accumulated pulse output

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 is conformed to CE mark.

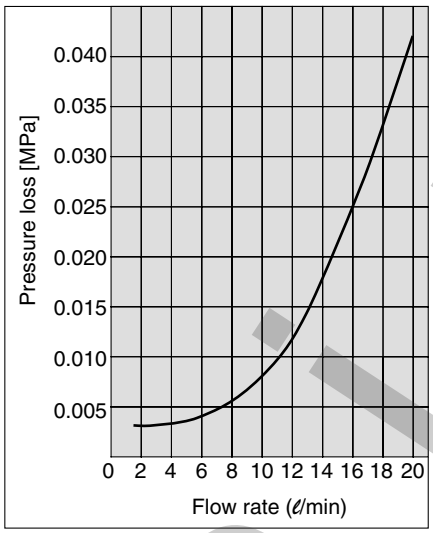
Series PF2D

Flow Characteristics (Pressure Characteristics)

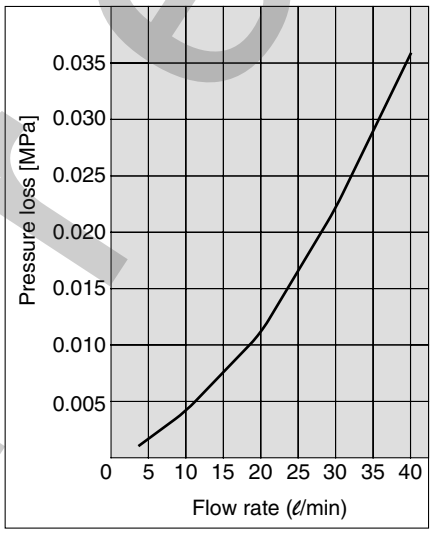
PF2D504



PF2D520

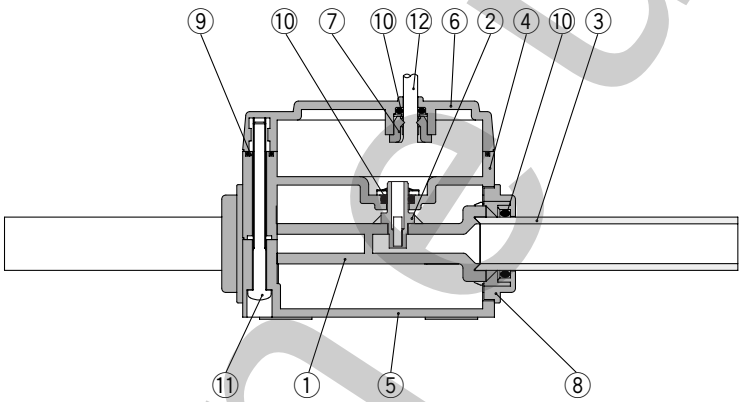


PF2D540



Construction

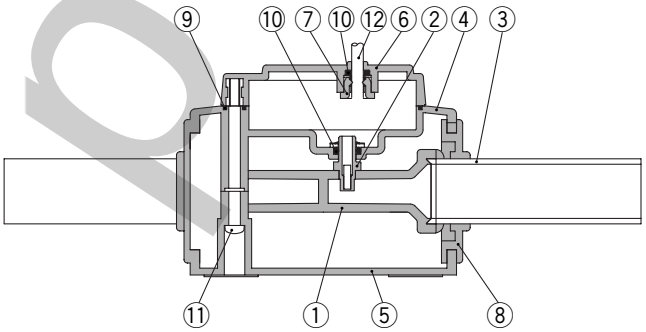
PF2D504/520



Parts list

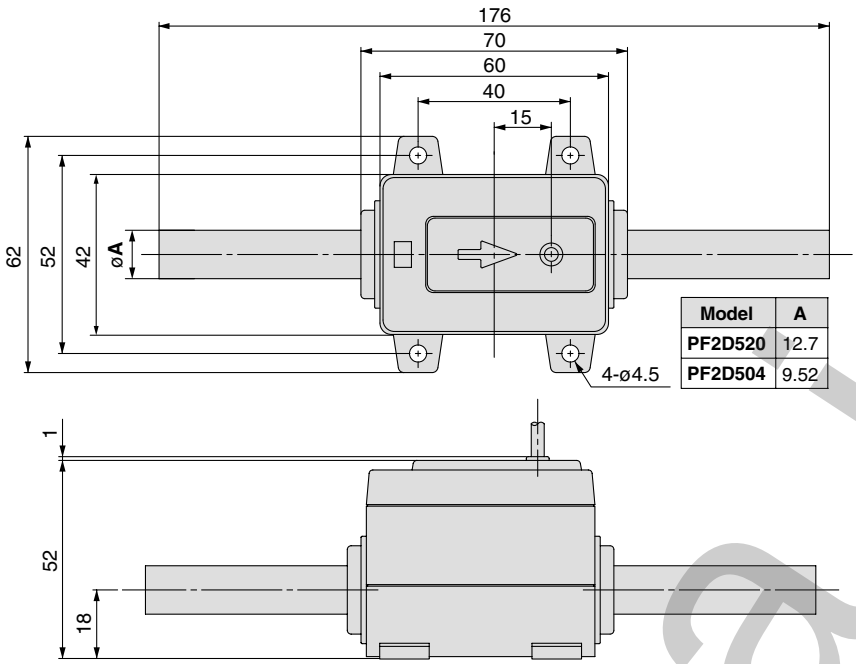
Number	Parts	Material
1	**Body**	New PFA
2	**Sensor**	New PFA
3	**Tube**	Super PFA
4	**Housing A**	PPS
5	**Housing B**	PPS
6	**Housing C**	PPS
7	**Bushing**	POM
8	**Cap**	PPS
9	**Gasket**	FKM
10	**O-ring**	FKM
11	**Thread**	SUS304
12	**Lead wire**	PVC

PF2D540



Dimensions: Separate Type Sensor Unit

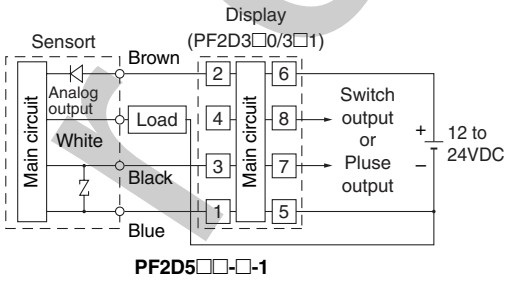
PF2D504-11/520-13



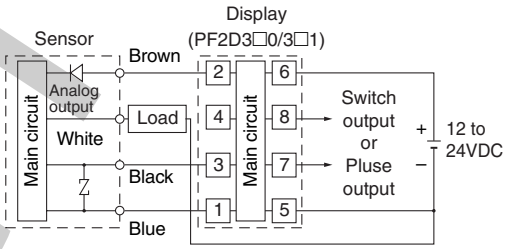
Model	A
PF2D520	12.7
PF2D504	9.52

Internal circuits and wiring examples

1 to 8 are terminal numbers.

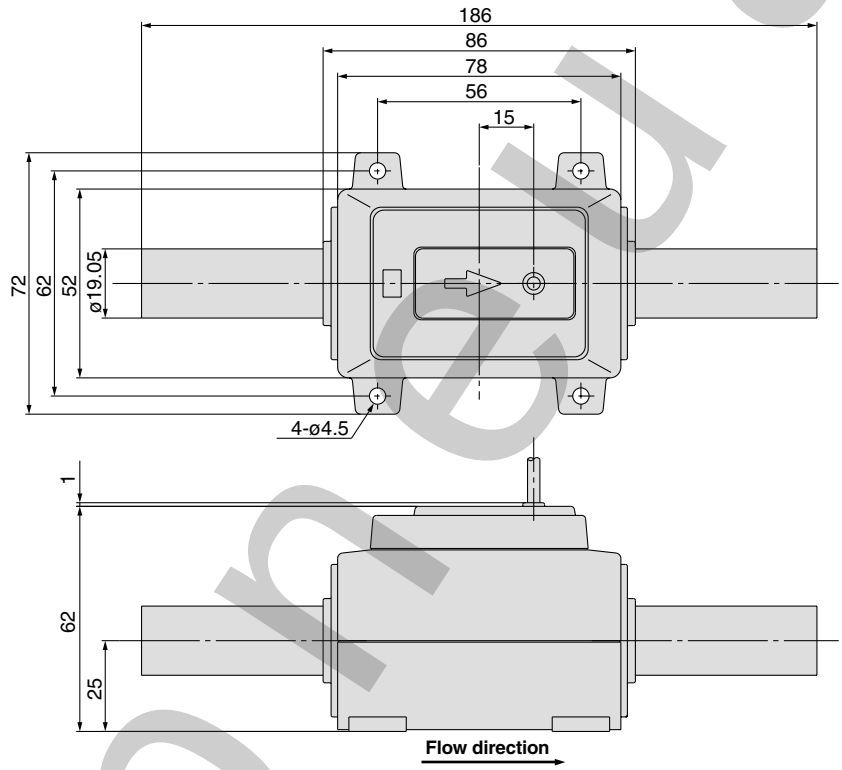


PF2D5□□-□-1

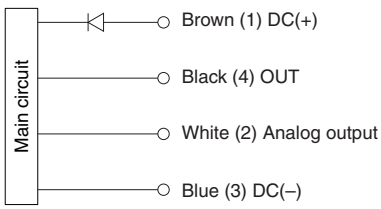


PF2D5□□-□-2

PF2D540-19

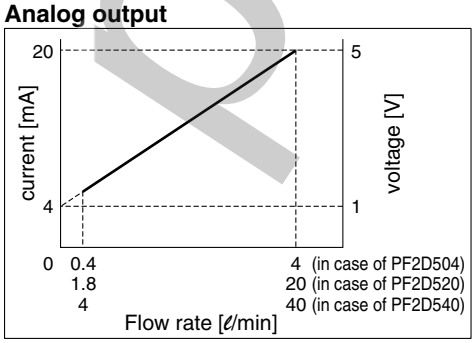


Wiring



∗ Use this sensor by connecting to P/A remote type display unit Series PF2D3□□.

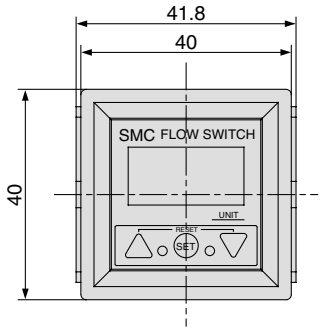
Analog output

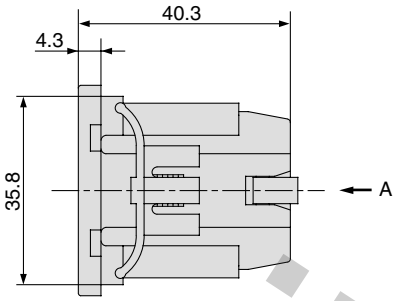


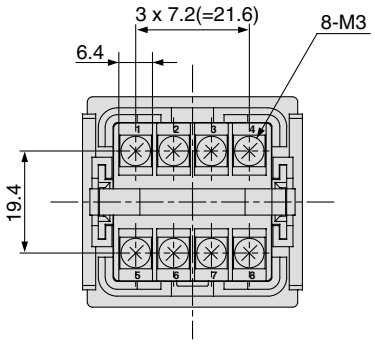
Dimensions: Separate Type Display Unit

PF2D30$^{0}_{1}$-A

Panel mounting type

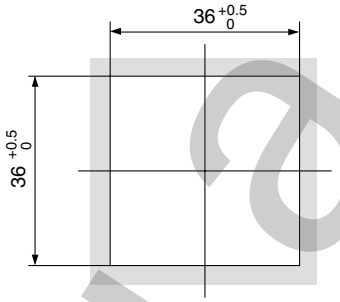






View A

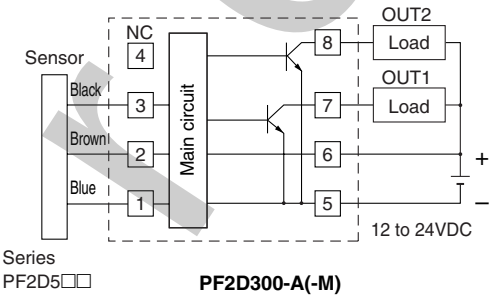
Panel fitting dimension



The applicable panel thickness is 1 to 3.2mm.

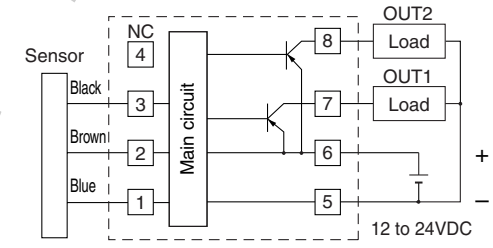
Internal circuits and wiring examples

1 to 8 are terminal numbers.



Series PF2D5□□

PF2D300-A(-M)

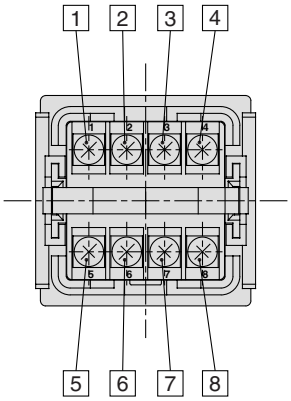


Series PF2D5□□

PF2D301-A(-M)

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

Terminal block number



Functions/PF2D

Refer to the operation manual how to set and to operate.

Flow rate measurement selection

Real-time flow rate and accumulated flow rate can be selected.
Up to 999999 of flow rate value can be accumulated.

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

LED display	Contents	Solution
Er 1	A current of more than 80mA is flowing to OUT1	Check the load and wiring for OUT1
Er4	The setting data has changed for whatever reasons.	Perform the RESET operation, and reset all data again.
-----	The flow rate is over the flow rate measurement range.	Reduce the flow rate until it is within the flow rate range, using an adjustment valve.

Key lock

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

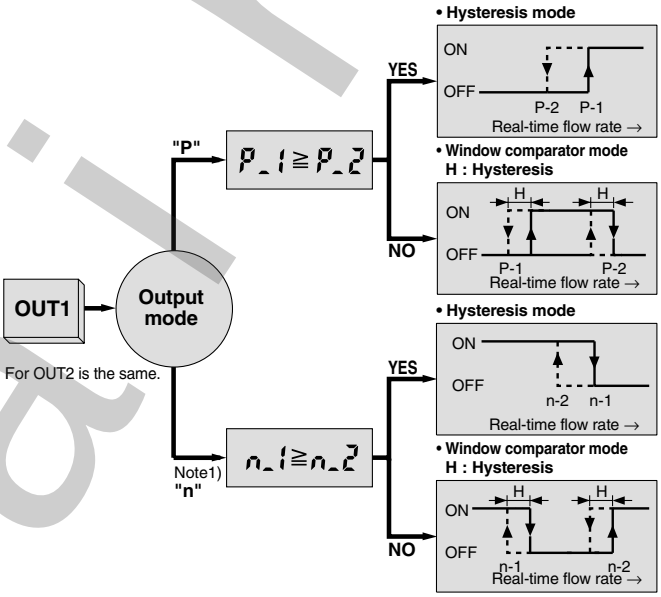
Accumulation clearance

This is to clear the accumulated value.

Output types

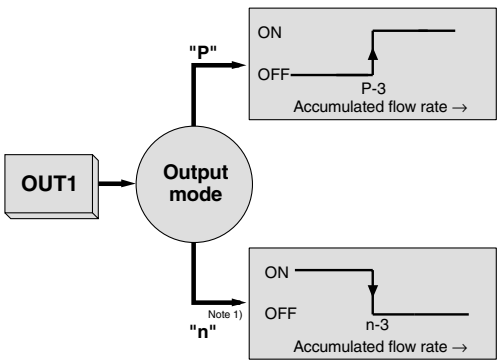
Real-time switch output, accumulated switch output, or accumulated pulse output can be selected as an output type.

Real-time switch output (oU1_0)



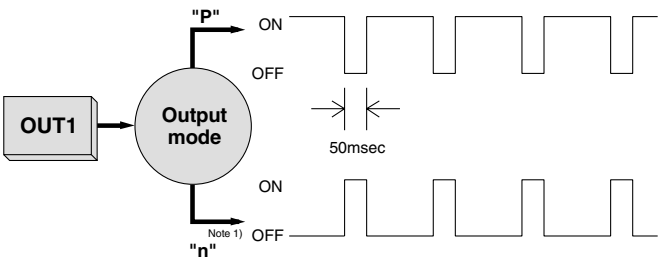
Note1) Output mode is set to inverted output at the factory before shipment.

Accumulated switch output (oU1_1)



Note1) Output mode is set to inverted output at the factory before shipment.

Accumulated pulse output (oU1_2)



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

Applicable Fluid

Compatibility checklist: materials of digital flow switch for deionized water and chemicals and fluid

Chemical		Compatibility
Acetone		v
Ammonium hydroxide		v
Isobutyl alcohol		□
Isopropyl alcohol		v
Hydrochloric acid		v
Ozone		□
Hydrogen peroxide	Concentration 50% or less 50°C or less	v
Ethyl acetate		v
Butyl acetate		v
Nitric acid (except fuming nitric acid)	Concentration 10% or less	v
Deionized water		v
Sodium hydroxide		□
Ultra deionized water		v
Toluene		v
Hydrofluoric acid	Concentration 50% or less	v
Sulfuric acid (except fuming sulfuric acid)	Concentration 20% or less	v
Phosphoric acid	Concentration 30% or less	v

Note 1) The material and fluid compatibility check list provides reference values as a guide only.
Note 2) Consult P/A for made to order specifications such as: Teflon coated threads to prevent rust/corrosion when in contact with strong acid or alkali.

· Compatibility is indicated for fluid temperatures at 100°C or less.
· Consult P/A regarding fluids other than the above.
· Consult P/A regarding operating conditions.
· The product is not explosion proof. Please be sure to take measures to guard it from explosive gas when using explosive fluid.

Table symbols v : Can be used
: Can be used under certain conditions
□ : Cannot be used