Digital Flow Switch (Sensor Part)

Operation Manual

For Pure Water / Chemical Fluid

PF2D 504 Series
PF2D 520 Series
PF2D 540 Series

SMC Corporation

URL http://www.smcworld.com

The paper with low emission of particles is used for this operation manual.

Thank you for purchasing the SMC PF2D 5** Series Digital Flow Switch.
Please read this manual carefully before operating digital flow switch and understand digital flow switch, its capabilities and limitations.
Please keep this manual handy for future reference.

OPERATOR

- This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- Please read this operation manual carefully and understand it before assembling, operating or providing maintenance service to the flow switch.

CONTENTS

SAFETY

The Digital Flow Switch and this manual contain essential information for the protection of users and others from possible injury and property damage and to ensure correct handling. Please check that you fully understand the definition of the following messages (signs) before going on to read the text, and always follow the instructions.

IMPORTANT MESSAGES

Read this manual and follow its instructions. Signal words such as WARNING, CAUTION and NOTE, will be followed by important safety information that must be carefully reviewed.

⚠WARNING	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
⚠CAUTION	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
NOTE	Gives you helpful information.

⚠WARNING

Do not disassemble, remodel (including change of printed circuit board) or repair.

An injury or failure can result.

Do not operate beyond specification range.

Fire, malfunction or switch damage can result.

Do not operate in atmosphere of an inflammable, an explosive and corrosive gas.

Fire or an explosion can result.
This flow switch is not an explosion proof type.

Do not use with a combustible fluid.

Otherwise, a fire or an explosion or damage may potentially result.

This flow switch is solely for use with pure water or a chemical fluid.

See the specification for the complete information. See "MSDS" for the liquid in tended to use.

⚠CAUTION

Do not touch the pipe joining parts or the pipe of the flow switch.

Otherwise, a burn may potentially be inflicted.
Touch it after confirming that the part is sufficiently cool.

Check fluid leak after installing the switch pipe.

Neglecting fluid leak may cause a burn or damage to the machines and equipment.

NOTE

Follow the instructions given below when handling your flow switch. Otherwise, the switch may be damaged or may fail, thereby resulting in malfunction.

- Do not drop it, bring it into collision with other objects or apply excessive shock (490m/s^2 or more).
- Do not pull the lead wire with force nor lift the main unit by holding the lead wire. (Pulling strength less than 49N)
- Wiring correctly.
- Do not wiring while power is on.
- Do not use with power cable or high-voltage cable in the same wire route.
- Do not use in a place in which oil or a chemical splashes.
- Use only chemicals specified in the specification.
- Install a filter on the primary side (inlet side) if foreign matter is feared to mix in a fluid.
- Design the pipe and set the switch so that the fluid always fills the detection passage and flows.
  When the switch is mounted vertically, flow the fluid from the bottom up.
- Install and connect the pipe according to the fluid flowing direction marked on the switch body.
- Install straight tubes longer than 50mm on the primary side (inlet side) of the flow switch.

Names and Functions of Individual Parts

Sensor Part

Body

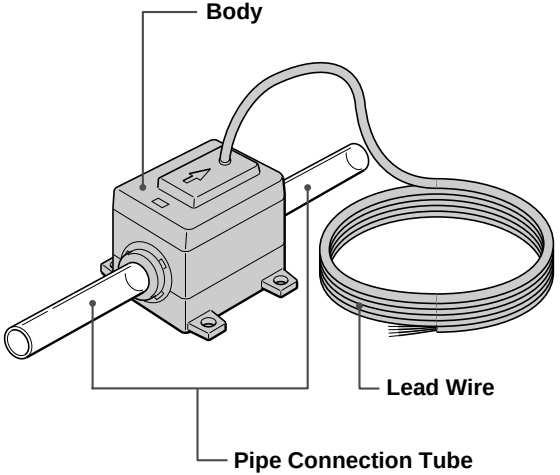
The sensor body of the flow switch.
The arrow on the body shows fluid flow direction.

Pipe Connection Tube

The tube for pipe connection. Use a joint to connect the tube.
NOTE: Joint in SMC LQ series is recommended.

Lead Wire

The lead wire (3m long) to connect to the display unit.



Model Indication Method

Sensor Part

PF2D 5□ - □□ - □

Output Specification
1: Pulse output + Analog output (1 to 5V)
2: Pulse output + Analog output (4 to 20mA)

Tube Specification
11: 3/8 inch (flow rate 0.4 to 4 ℓ/min)
13: 1/2 inch (flow rate 1.8 to 20 ℓ/min)
19: 3/4 inch (flow rate 4 to 40 ℓ/min)

Connecting Pipe
No Symbol: Tube exposed

Flow Rate Range
04: 0.4 to 4 ℓ/min
20: 1.8 to 20 ℓ/min
40: 4 to 40 ℓ/min

Specification

Model	PF2D 504	PF2D 520	PF2D 540
Fluid to be Measured	Pure water or fluids that will not corrode Teflon. The fluid viscosity must be 3mPa·s (3cP) or less.		
Detecting Method	Karman Vortex Method		
Rated Flow Range	0.4 to 4 ℓ/min	1.8 to 20 ℓ/min (*1)	4 to 40 ℓ/min
Operating Pressure Range (*2)	0 to 1MPa		0 to 0.6MPa
Withstand Pressure (*2)	1.5MPa (*3)		0.9MPa (*3)
Operating Fluid Temperature	0 to 90˚C		
Ambient Temperature Range	Operation: 0 to 50˚C, Storage: –25 to 85˚C (No condensation or Freezing)		
Linearity	±2%F.S. or less (With 25˚C water)		
Repeatability	±1%F.S. or less (With 25˚C water)		
Temperature Characteristic	±5%F.S. or less (0 to 50˚C, 25˚C standard)		
Mass (Weight)	140g (Lead wire not included)		
Enclosure	IP65		
Piping Specification	3/8 inch tube	1/2 inch tube	3/4 inch tube
Material of Wet Part	Body: newPFA, sensor: newPFA, tube: superPFA		

*1: 1.6 to 20 ℓ/min if viscosity is 1mPa·s (1cP) or less. @ 0.1MPa

*2: The operating pressure range lowers depending on fluid temperature. See the operating pressure graph.

*3: 1.5times the maximum operating pressure. Varies depending on fluid temperature.

Model		PF2D 504	PF2D 520	PF2D 540
Output Specification	Pulse Output	Nch Open Drain, Output for Display Part PF2D 300/301 (Reference : Maximum load current 10mA, maximum applied voltage 30V)		
	Analog Output	Voltage Output (*4) 1 to 5V (Within rated flow rate range) Linearity: ±2%F.S. or less, permissible load impedance: 100kΩ or more		
		Current Output (*5) 4 to 20mA (Within rated flow rate range) Linearity: ±2%F.S. or less, permissible load impedance: 300Ω or less (@ 12VDC), 600Ω or less (@ 24VDC)		
Power Supply Voltage		12 to 24V DC, ripple ±10% or less		
Current Consumption		20mA (No load)		
Withstand Voltage		1000VAC 1 minute. Between group of external terminals and case		
Insulation Resistance		50MΩ or more (@ 500VDC M). Between group of external terminals and case		
Resistance to Noise		1000Vp-p pulse width 1μs, rise 1ns		
Vibration proof		4.9m/s^2		
Impact proof		490m/s^2, 3times each directions of X, Y and Z respectively		

*4: Applicable when voltage output is selected.

*5: Applicable when current output is selected.

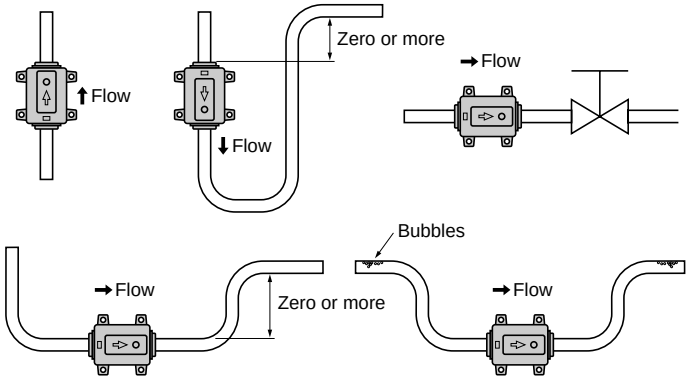
*6: The sensor part conforms to the CE standard.

Installation

Install the flow sensor after carefully reading “WARNING”, “CAUTION”, “NOTE” and “Mounting” below to ensure safety and accurate measurement.

Mounting

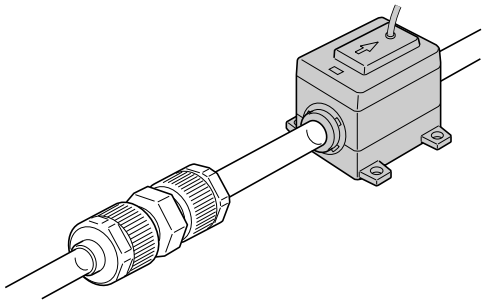
- Be sure to use within the operating pressure range. The fluid temperature lowers the operating pressure. Check the fluid temperature and make sure on the operating pressure graph.
- Use within the operating temperature range.
- Pressure resistance is 1.5 times the maximum operating temperature.
- Do not install the switch where it is used as a footstep.
- Bubbles will generate depending on pipe conditions. See the example of recommended piping when installing pipe.



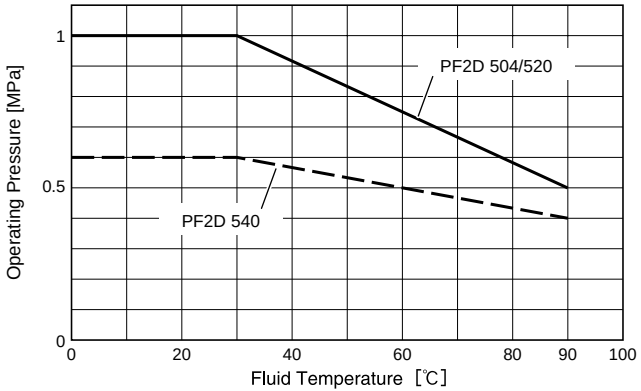
- Mount the flow sensor in the fluid flow direction shown by the arrow marked on the sensor body.
- Install straight tubes longer than 50mm on the primary side (inlet side) of the flow switch.

Pipe Connection

- Use joints when connecting the switch pipe.
  Note: Joint in SMC LQ series is recommended.
- Join pipe securely so that a chemical will not leak due to a loose joint during operation.



Operating Pressure Graph

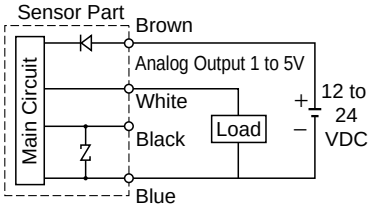


Example of Internal Circuit and Wiring

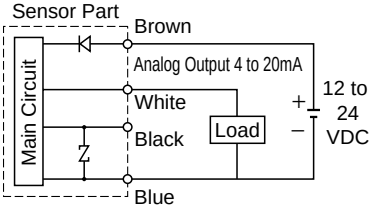
• The pulse output is output for flow rate display. Be sure to combine the display part with the PF2D 300/301 series manufactured by SMC.

Output Specification

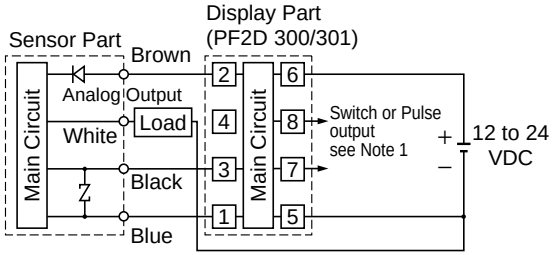
-1
Pulse Output
Nch Open Drain Output
1 Output
(For PF2D 300/301 Series)
Analog Output: 1 to 5V
Load Impedance: 100kΩ or more



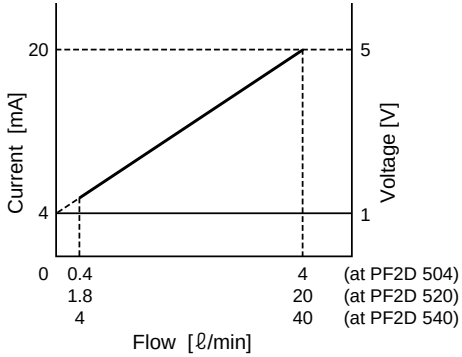
-2
Pulse Output
Nch Open Drain Output
1 Output
(For PF2D 300/301 Series)
Analog Output: 4 to 20mA
Load Impedance:
300Ω or less (@ 12VDC),
600Ω or less (@ 24VDC)



When both analog output and pulse output are used



(Note1) See the operation manual of PF2D 300/301 series for the complete information of switch and pulse output.

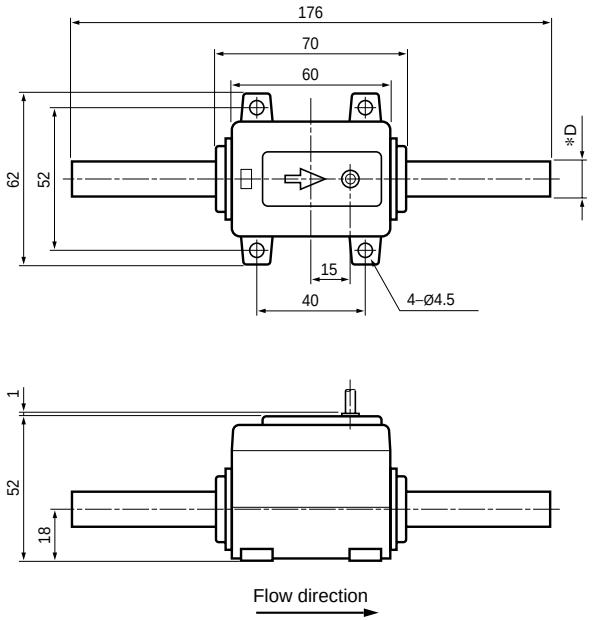


Lead Wire Connection

• Turn the power off before making connection.
• Install the lead wire separately from the route for power cable or high-voltage cable. Otherwise, malfunction may potentially result due to noise.

Full View with Dimensions (in mm)

PF2D 504 / 520



Model	⁎D
PF2D 504	ø9.53
PF2D 520	ø12.7

PF2D 540