






The intended use of the digital flow sensor is to monitor and control flow and provide an output signal.


1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) ^{*)}, and other safety regulations.

^{*)} ISO 4414: Pneumatic fluid power - General rules relating to systems.
ISO 4413: Hydraulic fluid power - General rules relating to systems.
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety. etc.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

 Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
 Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
 Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

 **Warning**

- Always ensure compliance with relevant safety laws and standards.
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- This product is class A equipment intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted or radiated disturbances.
- Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more safety instructions.

2 Specifications

2.1 General specifications

Item		Specifications
Environment	Enclosure	IP65 (IEC 60529)
	Operating temperature	Operating: 0 to 50 °C : Storage: -25 to 85 °C (no freezing or condensation)
	Humidity range	35 to 85% R.H. (no condensation)
	Withstand voltage	1000 VAC for 1 min. between charged part and case
	Insulation resistance	50 MΩ min (500 VDC Mega) between charged part and case
Materials in contact with fluid		newPFA, superPFA

2 Specifications (continued)

2.2 PF2D5## specifications

Model		PF2D504	PF2D520	PF2D540
Applicable fluid		Pure water or fluids that will not corrode Teflon. Fluid viscosity: 3 mPa·s (3 cP) or less		
Detection method		Karman vortex		
Fluid temperature		0 to 90 °C (no freezing or condensation)		
Flow	Rated flow range	0.4 to 4.0 L/min	1.8 to 20.0 L/min	4 to 40 L/min
	Operating pressure range	0 to 1 MPa		0 to 0.6 MPa
Pressure	Withstand pressure	1.5 MPa		0.9 MPa
Accuracy		±2.5% F.S. (at 25 °C water)		
Repeatability		±1% F.S. (at 25 °C water)		
Temperature characteristics		±5% F.S. (0 to 50 °C, at 25 °C)		
Output	Pulse output	N ch. open drain output for monitor unit PF2D30#. (Reference: Max. load current of 10 mA, Max. applied voltage of 30 V)		
	Analogue output	Voltage output: 1 to 5 V, Accuracy: ±2% F.S. Min. load impedance: 100 kΩ (Output impedance: 1 kΩ) Current output: 4 to 20 mA, Accuracy: ±2% F.S. or less. Load impedance: 300 Ω max. at 12 VDC, 600 Ω max. at 24 VDC.		
Supply voltage		12 to 24 VDC ±10%		
Power consumption (No load)		20 mA or less		
Port size		3/8	1/2	3/4
Weight (included lead wire)		182 g	192 g	275 g

2.3 Fluid Compatibility Checklist

Fluid	Condition	Compatibility
Acetone	-	○
Ammonium hydroxide	concentration 30% or less	○
Isobutyl alcohol	-	×
Isopropyl alcohol	-	○
Hydrochloric acid	concentration 38% or less	○
Ozone	-	×
Hydrogen peroxide	concentration 50% or less 50 °C or less	○
Ethyl acetate	-	○
Butyl acetate	-	○
Nitric acid	concentration 10% or less	○
Pure water	-	○
Sodium hydroxide	-	×
Super pure water	-	○
Toluene	-	○
Hydrofluoric acid	concentration 50% or less	○
Sulfuric acid	concentration 20% or less	○
Phosphoric acid	concentration 30% or less	○

○: Can be used (or under certain conditions), x: Cannot be used.

*1: The fluid compatibility checklist provides a reference value as a guide only.


*2: It is possible that some fluids are permeable 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 with testing, prior to making a decision to use it.

- Compatibility is indicated for 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.

2 Specifications (continued)

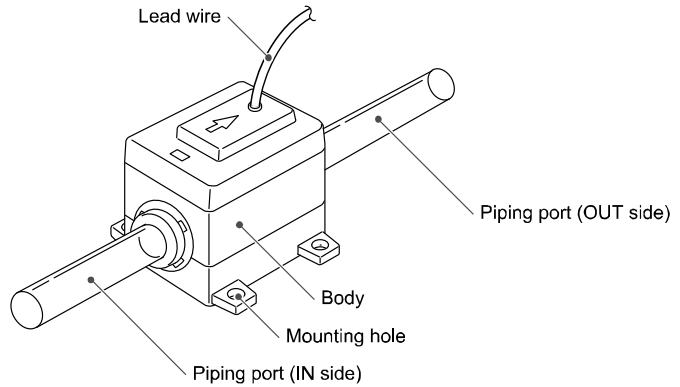
2.4 Cable specifications

Conductor	Nominal cross section	approx. 0.15 mm ²
	Individual wire diameter	approx. 0.5 mm
Insulator	Outside diameter	approx. 0.9 mm
	Colours	Brown, White, Black, Blue
Sheath	Material	oil resistant PVC
	Outer diameter	approx. φ3.5 mm

 **Warning**

- Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.


3 Name and function of parts



Item	Description
Body	The body of the product.
Piping port (tube)	Connected to fluid inlet at IN and outlet at OUT.
Mounting hole	Used for mounting the product.
Lead wire	Lead wire for power supply and outputs (3m).


4 Installation

4.1 Installation

 **Warning**

- Do not install the product unless the safety instructions have been read and understood.
- Use the product within the specified operating rated flow, operating pressure and temperature range.
- Tighten to the specified tightening torque.
If the tightening torque is exceeded the mounting screws, brackets and the product can be broken. Insufficient torque can cause displacement of the product from its correct position.
- Do not drop, hit or apply excessive shock to the product.

4.2 Environment

 **Warning**

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.

4.3 Mounting

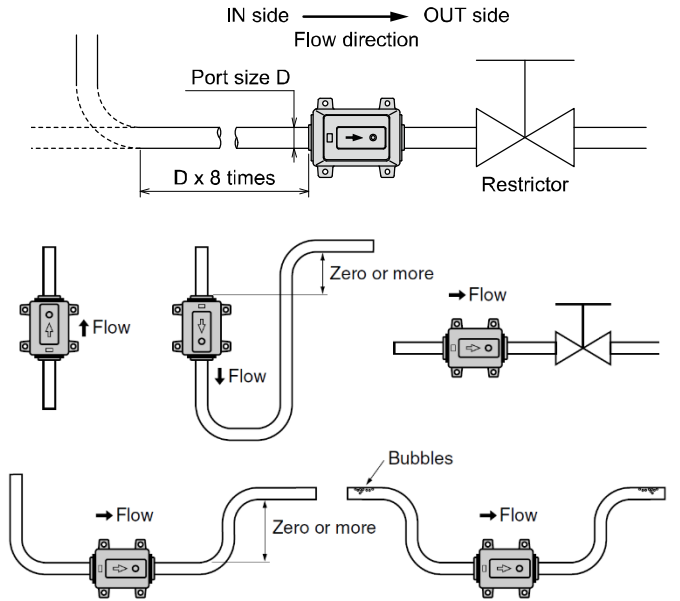
- Never mount the product in a location that will be used as a foothold.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the body.
- Install the product (with bracket) using M4 screws (4 pcs.).
- The required tightening torque is 0.69 to 0.83 N·m.

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for mounting hole dimensions.

4 Installation (continued)

4.4 Piping

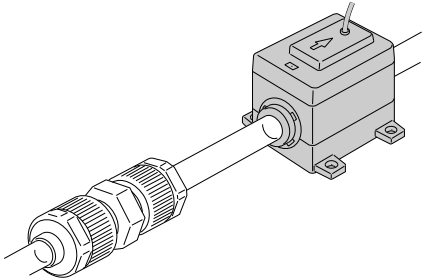
- Be sure to use the flow switch within the operating pressure range. The fluid temperature reduces lowers the operating pressure. Check the fluid temperature and carefully consult the operating pressure graph.
- Use the flow switch within the operating temperature range.
- Pressure resistance is 1.5 times the maximum operating temperature.
- Do not install the switch at a foothold position.
- Mount the product so that the fluid direction is the same as the arrow indicated on the product.
- The piping on the IN side must have a straight section of piping whose length is 8 times the piping diameter or more.
- Avoid sudden changes in the piping size on the IN side of the product.
- Cavitation (bubbles) will be generated depending on the piping design. Refer to the example of a recommended piping system.



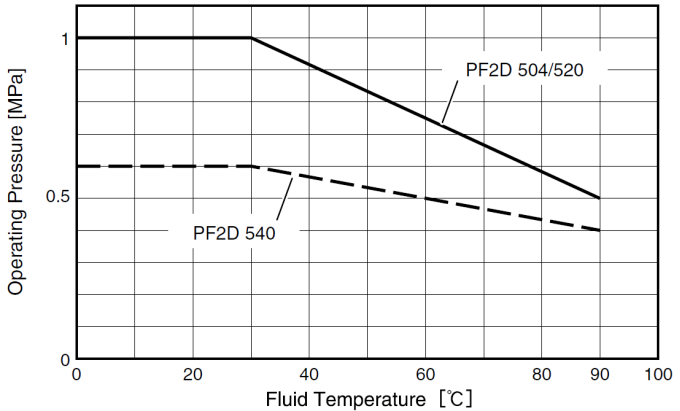
4.4.1 Connecting the piping

 **Caution**

- The SMC LQ1 fitting is recommended for connecting to the piping. Refer to the literature for the fitting for the piping method.
- Ensure there is no leakage after piping.



4.4.2 Operating Pressure Graph



5 Wiring

5.1 Wiring



Caution

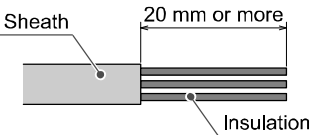
- Wiring should only be performed with the power supply turned OFF.
- Confirm proper insulation of wiring.
- Use separate routes for the product wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.

5.1.1 Lead wire details

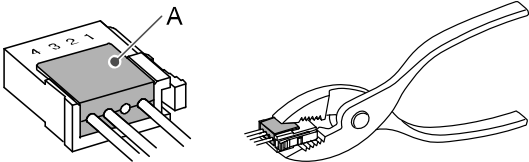
Wire colour	Signal
Brown	DC (+)
White	Analogue output
Blue	DC (-)
Black	Output for PF2D3##

5.1.2 Sensor Connector

- Strip the lead wire as shown. Do not cut the insulator.



- Insert the corresponding wire colour into the pin number printed on the e-CON sensor connector (SMC Part number ZS-28-CA-2) to the bottom.
- Check that the above preparation has been performed correctly, then part A shown should be pressed in by hand to make temporary connection.

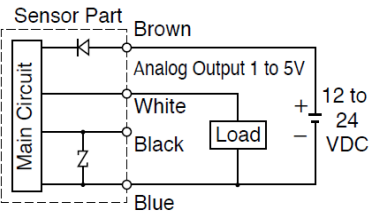


- Part A should then be pressed in using a suitable tool, such as pliers.
- The connector cannot be re-used once it has been fully crimped.
- In case of connection failure such as incorrect order of wires or incomplete insertion, use a new e-CON connector.

5.1.3 Internal Circuit and Wiring

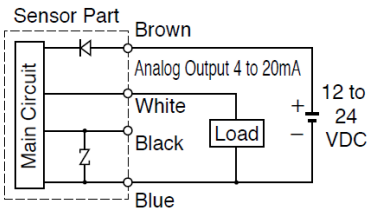
PF2D5##-#-1

Pulse Output
N ch. Open Drain Output
1 Output
(For PF2D30# series)
Analogue Output: 1 to 5 VDC
Load Impedance: 100 kΩ min.



PF2D5##-#-2

Pulse Output
N ch. Open Drain Output
1 Output
(For PF2D30# series)
Analogue Output: 4 to 20 mA
Load Impedance:
300Ω max. (at 12VDC),
600Ω max. (at 24VDC).



6 How to Order

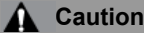
Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for How to order information.

7 Outline Dimensions (mm)

Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for Outline Dimensions.

8 Maintenance

8.1 General Maintenance



Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

• How to reset the product after a power cut or when the power has been unexpectedly removed

The settings of the product are retained from before the power cut or de-energizing.

The output condition also recovers to that before the power cut or de-energizing, but may change depending on the operating environment. Therefore, check the safety of the whole system before operating the product.

9 Limitations of Use

9.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

10 Product disposal

This product should not be disposed of as municipal waste. Check your local regulations and guidelines to dispose of this product correctly, in order to reduce the impact on human health and the environment.

11 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor / importer.

SMC Corporation

URL: <https://www.smcworld.com> (Global) <https://www.smceu.com> (Europe)
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Specifications are subject to change without prior notice from the manufacturer.
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