



# Operation Manual

PRODUCT NAME

Digital Flow Switch  
(Remote type sensor unit)

MODEL / Series / Product Number

*PF2D5##*

**SMC Corporation**

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# 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)\*1), and other safety regulations.

\*1) 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: Manipulating industrial robots -Safety.

etc.



## 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

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### 2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



# Safety Instructions

## Caution

### **1. The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

## **Limited warranty and Disclaimer/Compliance Requirements**

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

### **Limited warranty and Disclaimer**

#### **1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)**

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

#### **2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.**

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

#### **3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.**

##### **\*2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### **Compliance Requirements**

#### **1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.**

#### **2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.**

## Caution

### **SMC products are not intended for use as instruments for legal metrology.**

Products that SMC manufactures or sells are not measurement instruments that are qualified by pattern approval tests relating to the measurement laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the measurement laws of each country.

## Operator

- ◆ This operation manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment. Only those persons are allowed to perform assembly, operation and maintenance.
- ◆ Read and understand this operation manual carefully before assembling, operating or providing maintenance to the product.

### ■ Safety Instructions

#### **Warning**

■ Do not disassemble, modify (including changing the printed circuit board) or repair.  
An injury or failure can result.

■ Do not operate the product outside of the specifications.  
Do not use for flammable or harmful fluids.  
Fire, malfunction, or damage to the product can result.  
Verify the specifications before use.

■ Do not operate in an atmosphere containing flammable, explosive or corrosive gas.  
Fire, explosion or corrosion can result.  
This product is not designed to be explosion proof.

■ Do not use the product for flammable or highly permeable fluids.  
Fire, explosion, corrosion or damage can result.  
Refer to the Material Safety Data Sheet and confirm safety before use.

■ Do not use the product in a place where static electricity is a problem.  
Otherwise it can cause failure or malfunction of the system.

■ If using the product in an interlocking circuit:  
● Provide a double interlocking system, for example a mechanical system  
● Check the product regularly for proper operation  
Otherwise malfunction can result, causing an accident.

■ The following instructions must be followed during maintenance:  
● Turn off the power supply  
● Ensure the flow is shut off before performing maintenance  
Otherwise an injury can result.

## Caution

- Do not touch the terminals and connectors while the power is on.  
Otherwise electric shock, malfunction or damage to the product can result.
- Do not touch the piping or its connected parts when the fluid is at high temperature.  
It may lead to burnt.  
Ensure the piping cools sufficiently before touching.
- After maintenance is complete, perform appropriate functional inspections and leak tests.  
Stop operation if the equipment does not function properly or there is a leakage of fluid.  
When leakage occurs from parts other than the piping, the product might be faulty.  
Disconnect the power supply and stop the fluid supply.  
Do not apply fluid under leaking conditions.  
Safety cannot be assured in the case of unexpected malfunction.

### ■ NOTE

- Follow the instructions given below when designing, selecting and handling the product.
  - The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.
    - \*Product specifications
      - Use the specified voltage.  
Otherwise failure or malfunction can result.  
Insufficient supply voltage may not drive a load due to a voltage drop inside the product.  
Verify the operating voltage of the load before use.
      - Do not exceed the specified maximum allowable load.  
Otherwise it can cause damage or shorten the lifetime of the product.
      - Applicable fluids are DI water and fluids which do not corrode or erode fluoropolymer.  
Fluid viscosity should be 3 mPa·s (3 cP) or less.  
The operating fluid temperature range is 0 to 90 °C.
      - Confirm the pressure loss at the sensor according to the pressure loss graph before designing piping.  
Confirm detection condition of sensor electrified potential.
      - Consider measures to prevent over pressure due to water hammer.  
<Measures to reduce water hammer>
        1. Install a water hammer relieving valve.
        2. Use a flexible material for piping (such as a rubber hose) and an accumulator that can absorb impact pressure.
        3. Keep piping as short as possible.
      - Use within the specified measurement flow rate, operating pressure and temperature range.  
Otherwise it can cause damage to the product or inability to measure correctly.  
Rated pressure range and proof pressure depend on the fluid temperature. Refer to the specifications.
      - Reserve a space for maintenance.  
Allow sufficient space for maintenance when designing the system.

## ● Product handling

### \* Installation

- Avoid displacement of the product and loose screws.  
Tightening with excessive force may damage the product.
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply.
- Do not drop, hit or apply excessive shock to the product.  
Otherwise damage to the internal parts can result, causing malfunction.
- Do not pull the lead wire forcefully, or lift the product by the lead wire. (Tensile force 49 N or less)  
Hold the product body when handling, to prevent damage, failure or malfunction.
- The tensile strength of the power supply/output connection cable is 50 N and the sensor lead wire with a connector is 25 N.
- Any dust left in the piping should be flushed out by air blow before connecting the piping to the product.  
Otherwise damage or malfunction can result.
- Refer to the flow direction of the fluid indicated on the product label for installation and piping.
- Do not mount the body with the bottom facing upwards.
- Avoid piping in which the piping size of the IN side of the product changes suddenly.  
If the piping size is reduced sharply or there is a restrictor such as a valve on the IN side, fluid velocity distribution in the piping will be disturbed, leading to improper measurement.  
Therefore, the above-mentioned piping should be connected on the OUT side.  
If the OUT side is opened, or flow rate is excessive, cavitations may be generated, which may result in improper measurement.  
As a measure against this, it is possible to reduce the cavitations by increasing the fluid pressure.  
Take action such as mounting an orifice on the OUT side of the product, and confirm that there is no malfunction before handling.  
If the orifice of the OUT side is fully closed to operate the pump, the switch may malfunction due to the effect of pulsation (pressure fluctuation). Ensure that there is no malfunction before usage.
- Do not insert metal wires or other foreign matter into the piping port.  
This can damage the sensor causing failure or malfunction.
- Never mount a product in a location that will be used as a foothold.  
The product may be damaged if excessive force is applied by stepping or climbing onto it.
- If the fluid may contain foreign matter, install and connect a filter to the inlet.  
The adherence of foreign matter to the vortex generator or detector can cause errors in measurement accuracy.
- Design and install the application so that the fluid detection path is always full.
- If the product is mounted vertically, let the liquid flow from bottom to top.  
Trapped air bubbles can cause errors in measurement accuracy.  
(If the fluid detection path is always filled with liquid, there will be no problem.)
- If the PF2D5 and LQ fluoropolymer fittings series are ordered separately, it is not possible to assemble them with the tubing insertion tool of the LQ series. Please send them back to SMC. After assembling it, it will be delivered to you.

#### \*Wiring

- Do not pull the lead wires.

In particular, never lift a product equipped with fitting and piping by holding the lead wires. Otherwise damage to the internal parts can result, causing malfunction.

- Avoid repeatedly bending or stretching the lead wire, or placing heavy loads on it.

Repeated bending stress or tensile stress can cause damage to the sheath, or breakage of the wires. If the lead wire can move, fix it near the body of the product.

The recommended bend radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the outside diameter of the wire insulation material, whichever is larger.

- Wire correctly.

Incorrect wiring can damage the product.

- Do not perform wiring while the power is on.

Otherwise damage to the internal parts can result, causing malfunction.

- Do not route wires and cables together with power or high voltage cables.

Otherwise the product can malfunction due to interference or noise and surge voltage from power and high voltage cables to the signal line. Route the wires (piping) of the product separately from power or high voltage cables.

- Confirm proper insulation of wiring.

Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.

- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.

Do not use a cable longer than 30 m.

Wire the DC(-) line (blue) as close as possible to the power supply.

- When analogue output is used, install a noise filter (line noise filter, ferrite element, etc.) between the switch-mode power supply and this product.

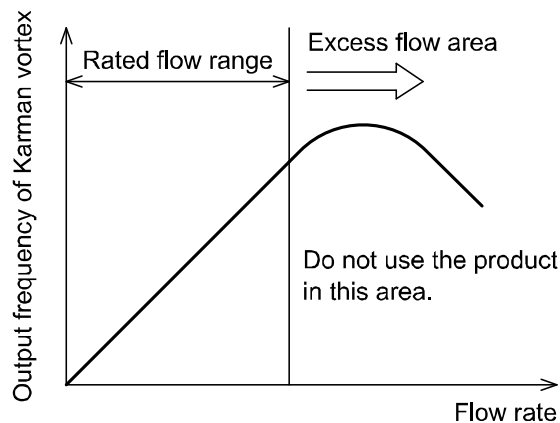


#### \*Environment

- Do not use the product in an environment that is constantly exposed to the splash of water.  
Otherwise failure or malfunction can result. Take measures such as using a cover.
- Do not use the product in an environment where corrosive gases or fluids could be splashed.  
Otherwise damage to the product and malfunction can result.
- Do not use in a place where the product could be splashed by oil or chemicals.  
If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction, or hardening of the lead wires)
- Do not use in an area where electrical surges are generated.  
If there is equipment generates large electrical surges (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the product, damage or failure of the internal circuit may occur. Take measures against the surge sources, and prevent the wires from coming into close contact.
- Do not use a load which generates a surge voltage.  
When a surge-generating load such as a relay or solenoid is driven directly, use a product with a built-in surge absorbing element.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Do not use the product in areas that are exposed to vibration or impact.  
Otherwise failure or malfunction can result.
- Do not use the product in the presence of a magnetic field.  
This may lead to the malfunction of the product.
- Prevent foreign matter such as wire debris from entering the product.  
Otherwise failure or malfunction can result.
- Do not use the product in areas subject to large temperature cycle.  
Heating/cooling cycles other than ordinary changes in temperature can adversely affect the internal structure of the product.
- Do not expose the product to direct sunlight.  
If using in a location directly exposed to sunlight, use a suitable protective cover.  
Otherwise failure or malfunction can result.
- Keep within the operating fluid temperature and operating temperatures range.  
The operating fluid temperature is 0 to 90 °C and operating temperature range is 0 to 50 °C.  
If the fluid freezes, it may cause damage and malfunction of the switch, so please take measures to prevent freezing.  
When a fluid at a lower temperature than the ambient temperature is supplied, the product can break due to condensation and malfunction. Keep the product from having condensation.  
Please be aware that water droplets may cause early deterioration/damage, particularly if the product is installed vertically or upside-down.  
Protection against freezing is necessary.  
Avoid sudden temperature changes even within the specified temperature range
- Do not operate close to a heat source, or in a location exposed to radiant heat.  
Otherwise malfunction can result.

#### \*Adjustment and Operation

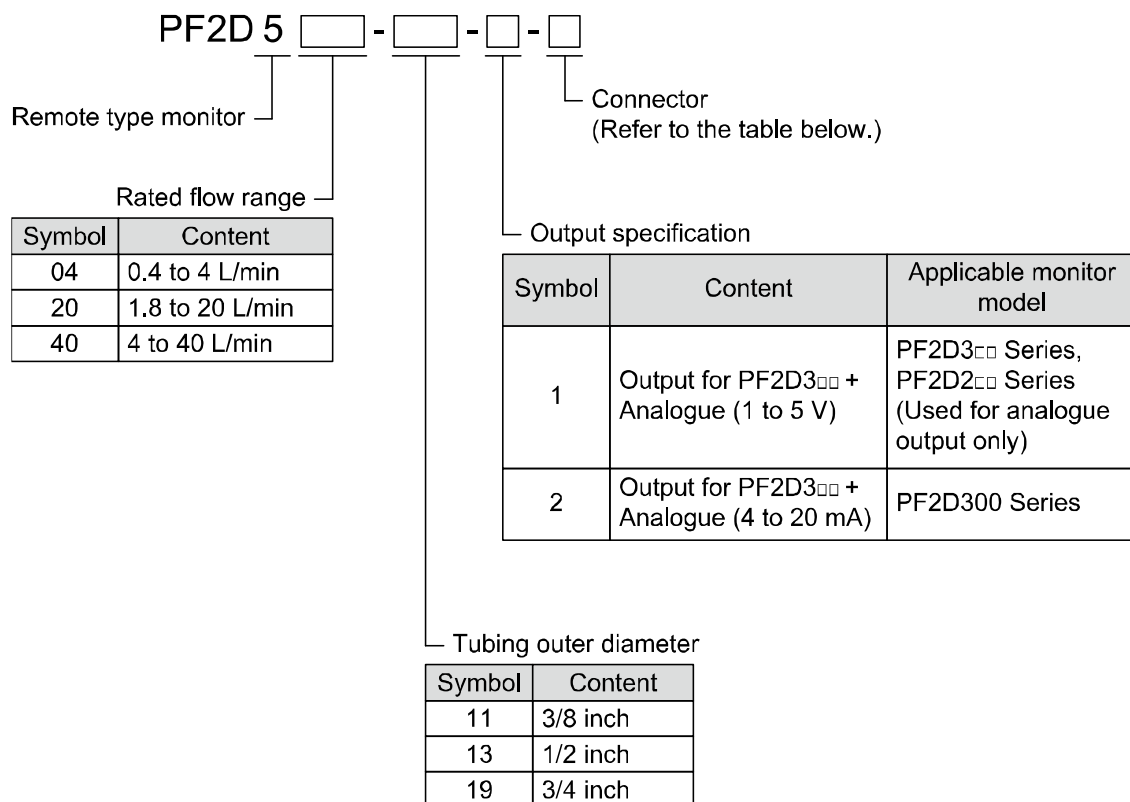
- Connect load before turning on the power.
- Supply the power when there is no flow.
- If using the product to detect very small flow rates, warm up the product for 10 to 15 minutes first. There will be a drift on the analogue output of approximate  $\pm 2$  to 3% immediately after the power supply is turn on, within 10 minutes.
- Check regulators and flow adjustment valves before introducing the fluid.  
If pressure or flow rate beyond the specified range are applied to the sensor, the sensor unit may be damaged.
- Do not attempt to insert or pull the flow rate sensor or its connector when the power is on.
- The product is a flow meter using Karman vortex. The flow meter using Karman vortex has lower output frequency at excess flow state. Do not use the product within the excess flow area in the chart below.



#### \*Maintenance

- Perform regular maintenance and inspections.  
There is a risk of unexpected malfunction of components due to the malfunction of equipment and machinery.
- Turn off the power supply, stop the fluid and check the safety before performing any maintenance.  
There is a risk of unexpected malfunction.
- Do not touch any chemicals left in the piping and the products.  
Check the characteristics of chemicals used, and handle them appropriately.
- Do not use solvents such as benzene, thinner etc. to clean the product.  
They could damage the surface of the body and erase the markings on the body.  
Use a soft cloth to remove stains.  
For heavy stains, use a cloth lightly dampened with diluted neutral detergent, then wipe up any residue with a dry cloth.
- Check the name and the nature of chemicals used and treat them accordingly.

## Model indication and How to Order

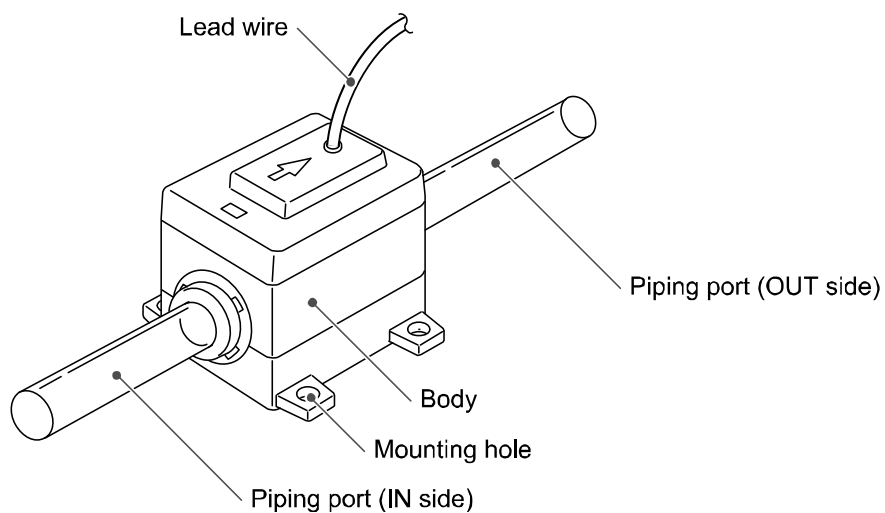


### Accessories/Part number

If an accessory is required separately, order using the following part numbers.

Part number	Description	Qty.	Weight
ZS-28-CA-2	Connector	1 pc.	2 g

## Summary of Product parts



Item	Description
Body	The body of the product.
Piping port (Tube)	Connected to the fluid inlet at IN side and to the fluid outlet at OUT side.
Mounting hole	Used to mount the product.
Lead wire	Lead wire to supply power and transmit output signals. (3 m)

## ■ Definition and terminology

	Terms	Meaning
A	Analogue output	A type of variable output that has a value proportional to the measured quantity. When the analogue output is in the range of 1 to 5 V or 4 to 20 mA, it will vary continuously, following the change of flow
C	Cavitation	A phenomenon that may occur in a fluid moving at high speed. In the parts of the fluid where the pressure is low, vapour bubbles form and then rapidly collapse. If cavitation is present for a prolonged period, exposed surfaces will be damaged; this is called cavitation damage or erosion.
F	Fluid temperature	Range of fluid temperature that can be measured by the product.
	F.S. (Full span, Full scale)	Stands for "full span" or "full scale", and indicates varied analogue output range at rated value. For example, when analogue output is 1 to 5 V, F.S. = 5[V] - 1[V] = 4[V], (ref. 1%F.S. = 4[V]x1% = 0.04[V]) The maximum measuring range or change in analogue output over the maximum measurement range.
K	Karman vortex	When an object is placed in a fluid stream, a vortex will be created in the fluid on the downstream side. This vortex is called a Karman vortex. The frequency at which the vortices are generated is proportional to the fluid velocity, therefore it is possible to calculate the fluid flow rate by measuring the Karman vortex frequency.
O	Operating humidity range	The ambient humidity range within which the product will meet all published specifications.
	Operating temperature range	The ambient temperature range within which the product will meet all published specifications.
P	Part in contact with fluid	A part that comes into physical contact with the fluid.
	Pressure characteristics	The amount of variation in the analogue output or display value when the supply pressure is changed.
	Proof pressure	The pressure beyond which the flow switch will be damaged.
R	Rated flow range	The flow range within which the product will meet all published specifications.
	Rated pressure range	The pressure range within which the product will meet all published specifications.
	Repeatability	Reproducibility of the display or analogue output value, when the flow is repeatedly changing.
	Response time	Time from when the target flow is applied until the flow reaches 90% of the set value.
T	Temperature characteristics	The amount of variation in the analogue output or display value when the ambient temperature is changed.
W	Water hammer	A momentary steep pressure increase due the spread of pressure by closing a contactor such as a valve for an extremely short time while there is a flow. This pressure increase is known as water hammer or impact pressure.

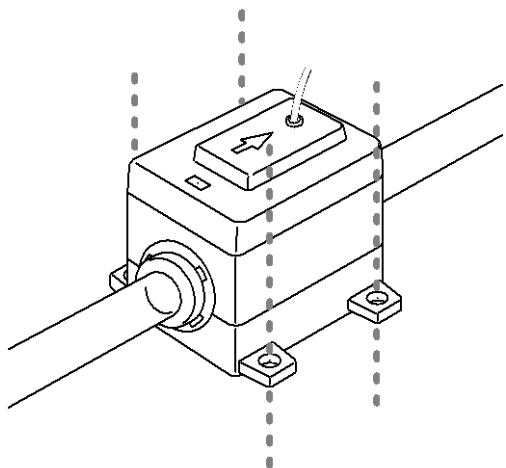
## Mounting and Installation

### ■ Installation

- Never mount the product in a location that will be used as a foothold.

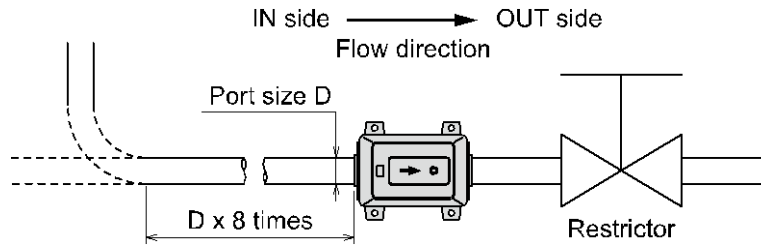
### ● Installing

- Install the product (with bracket) using the M4 screws (4 pcs.).  
The required tightening torque is 0.69 to 0.83 Nm.
- Tightening with excessive force may damage the product.
- Refer to the dimension drawing (page [22](#)) for mounting hole dimensions.

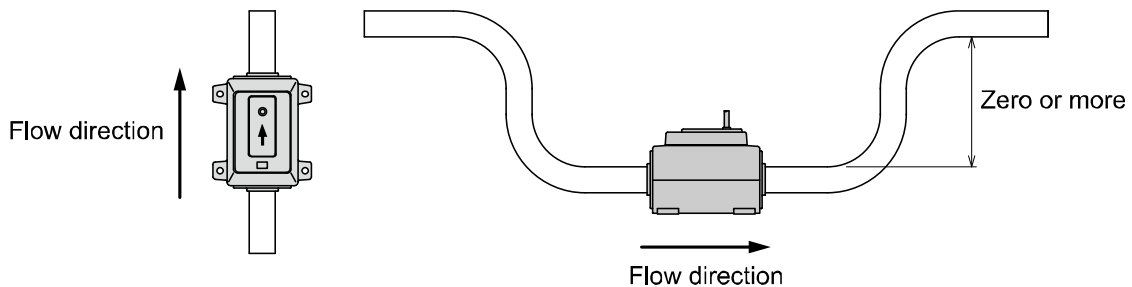


## ■ Piping

- Use the product within the specified operating pressure range and temperature range.
- Proof pressure is 1.5 MPa for PF2D504/520 and 0.9 MPa for PF2D540. Proof pressure could vary according to the fluid temperature. Check the characteristics data for operating pressure and proof pressure (page 21).
- Connect the piping using suitable fittings.
- 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.

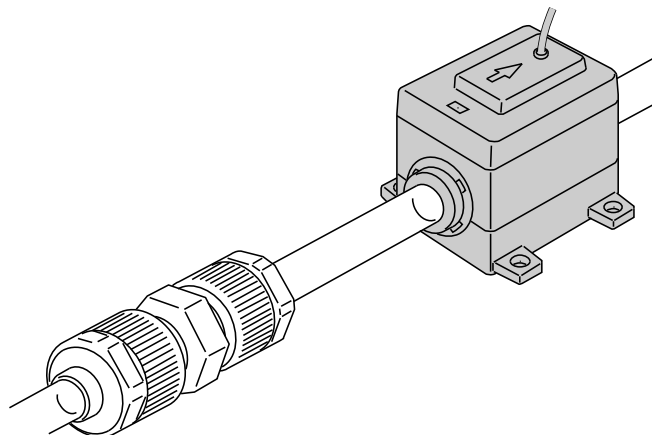


- Bubbles may be generated depending on the piping design. Refer to an example of recommended piping system.



## ● Connecting the piping

- LQ1 fitting is recommended for connecting of the piping.
- Refer to the literatures of fitting for piping method.



## ■Wiring

- Connections should only be made with the power supply turned off.
- Use separate routes for the product wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply. When a switch-mode power supply is connected to the product, switching noise will be superimposed and the product specification can no longer be met. This can be prevented by inserting a noise filter, such as a line noise filter and ferrite core, between the switch-mode power supply and the product, or by using a series power supply instead of a switch-mode power supply.

### ●Lead wire

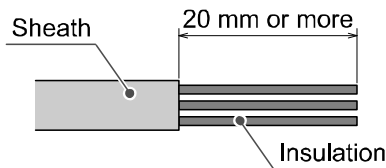
Colour	Content
Black	Output for PF2D3□□
Brown	DC(+)
Blue	DC(-)
White	Analogue output

### ●Connecting the wiring

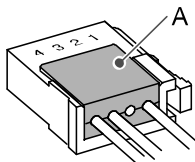
#### **Attaching the sensor connector to the lead wire (When the product connects to the PF2D2□□)**

Refer to the PF2D2□□ operation manual for details of the sensor connector pin numbers.

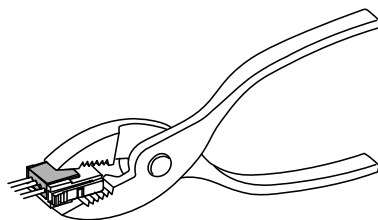
- Strip the lead wire as shown. Do not cut the insulator.



- Insert the corresponding wire colour into the pin number printed on the sensor connector, to the bottom, 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.

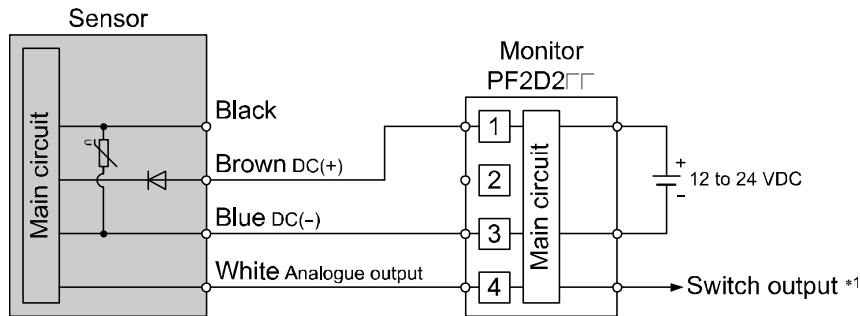
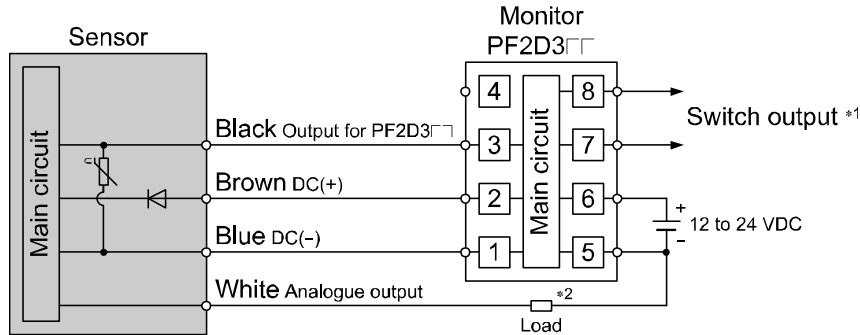
In cases of connection failure such as incorrect order of wires or incomplete insertion, please use the new connector.



● Internal circuit and wiring example

**Output for PF2D3□□ + Analogue (1 to 5 V) type**

PF2D5□□-□□-1

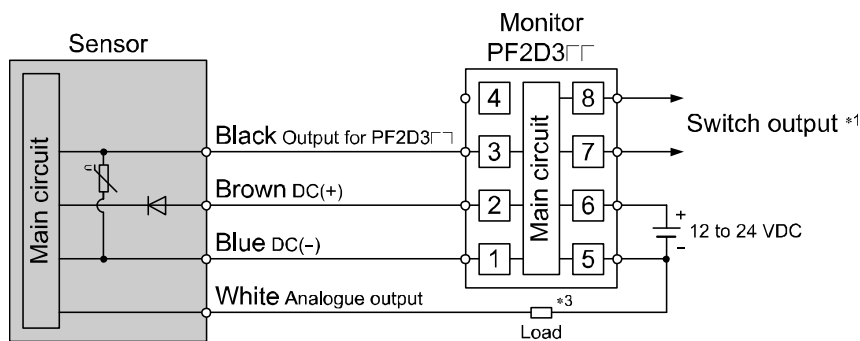


Analogue output: 1 to 5 V  
 Output impedance: 1 k $\Omega$   
 (load impedance: 100 k $\Omega$  or more)

\*1: Refer to the PF2D3□□ or PF2D2□□ operation manual for details of the flow monitors.  
 \*2: Load indicates analogue input equipment such as a voltmeter.

**Output for PF2D3□□ + Analogue (4 to 20 mA) type**

PF2D5□□-□□-2



Analogue output: 4 to 20 mA  
 Load impedance: 300  $\Omega$  (12 VDC)  
 600  $\Omega$  (24 VDC)

\*1: Refer to the PF2D3□□ operation manual for details of the flow monitor.  
 \*3: Load indicates analogue input equipment such as an ammeter.

## Troubleshooting

### Troubleshooting

If an operation failure occurs with the product, use the chart below to find out the cause of the problem. If none of the countermeasures seem to be applicable, or a replacement product operates normally when installed, the product may be faulty. A product can be damaged by the operating environment (system configuration etc). If the product seems to be faulty, please contact SMC.

#### ■ Cross-reference for troubleshooting

Fault		Probable cause	Recommended action
Output	There is no output.	Wiring failure.	Correct the wiring.
	Output is unstable.	Foreign matter inside.	Set up filter at IN side of product. If there is foreign matter stuck to the mesh, remove it completely, taking care not to damage the product.
		Piping is connected in the wrong direction.	Install with the mounting direction corresponding to the flow direction (arrow indicated on the product).
		Insufficient fluid supply.	Full up the fluid path.
		Pulsation in the flow.	Change to a pump that has less pulsation. Install a tank to reduce the pressure fluctuation. Change the piping to elastic piping such as rubber hose.
		Liquid leakage.	Correct the piping.

# Specification

## ■ Specifications

Model		PF2D504	PF2D520	PF2D540
Applicable fluid		Liquid not to corrode nor erode deionized water and/or fluoropolymer. Viscosity: 3 mPa·s (3 cP) or less		
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 * <sup>1</sup>	4 to 40 L/min
	Rated pressure range * <sup>2</sup>	0 to 1 MPa		0 to 0.6 MPa
Pressure	Proof pressure * <sup>2</sup>	1.5 MPa		0.9 MPa
	Accuracy * <sup>3</sup>	±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, based on 25 °C)		
Output specifications	Pulse output	Pulse output, N channel, open drain, output for monitor unit PF2D300/301 (Specifications: 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 Max. load impedance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC		
Supply voltage		12 to 24 VDC ±10%		
Power consumption (No load)		20 mA or less		
Environment	Enclosure	IP65		
	Operating temperature range	Operation: 0 to 50 °C, Storage: -25 to 85 °C (no condensation or freezing)		
	Operating humidity range	Operation, Storage: 35 to 85%R.H. (no condensation)		
	Temperature characteristics	±5%F.S. max. (0 to 50 °C, 25 °C reference)		
	Withstand voltage	1000 VAC, for 1 minute between the external terminals and case		
	Insulation resistance	50 MΩ or more (at 500 VDC) between external terminals and case		
Standards and regulations		CE, RoHS		
Port size		3/8	1/2	3/4
Materials of parts in contact with fluid		newPFA, superPFA		
Weight (included lead wire)		182 g	192 g	275 g

\*1: 1.6 to 20 L/min. when viscosity is 1 mPa·s (1 cP) or less. (At 0.1 MPa)

\*2: Varies depending on the fluid temperature. Refer to the fluid temperature graph and the pressure in the characteristics data (page 20).

\*3: The system accuracy when combined with PF2D30□.

## Lead wire Specifications

Sheath	Finished outside diameter	approx. 3.5 mm
	Material	Oil-resistant PVC
Insulator	Colours	Brown, White, Black, Blue
	Outside diameter	approx. 0.9 mm
Conductor	Nominal cross section area	approx. 0.15 mm <sup>2</sup>
	Outside diameter	approx. 0.5 mm

## ■ Material of parts in contact with fluid and fluids compatibility checklist

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

Table symbol ○: Can be used, Can be used under certain condition x: Cannot be used

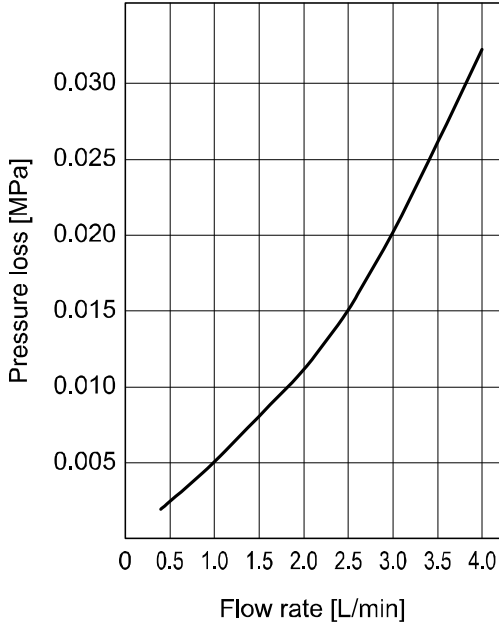
- \*1: The material and fluid compatibility check list provides reference value as a guide only.
- \*2: It is possible that some fluids are permeable on the type of fluid, its density and temperature.  
Any permeated fluid may affect the products life.  
Thus, when using these fluids type verify the fluid in advance by testing it, prior to making a decision to use it.
- \*3: Refer to the T-file (PF※※-TDQ0010) too.

- 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.

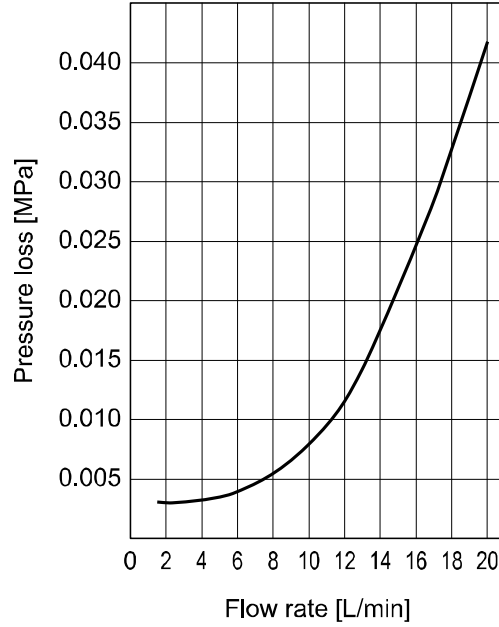
■ Characteristics data

● Flow characteristics (pressure loss)

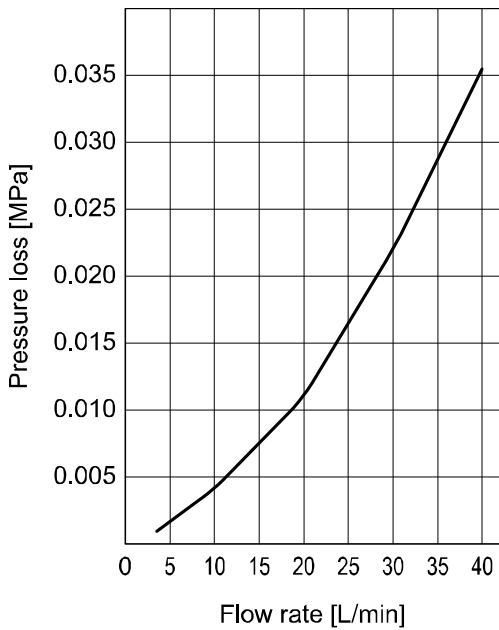
PF2D504



PF2D520



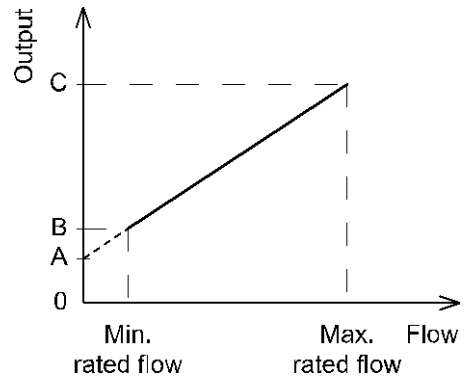
PF2D540



● Analogue output

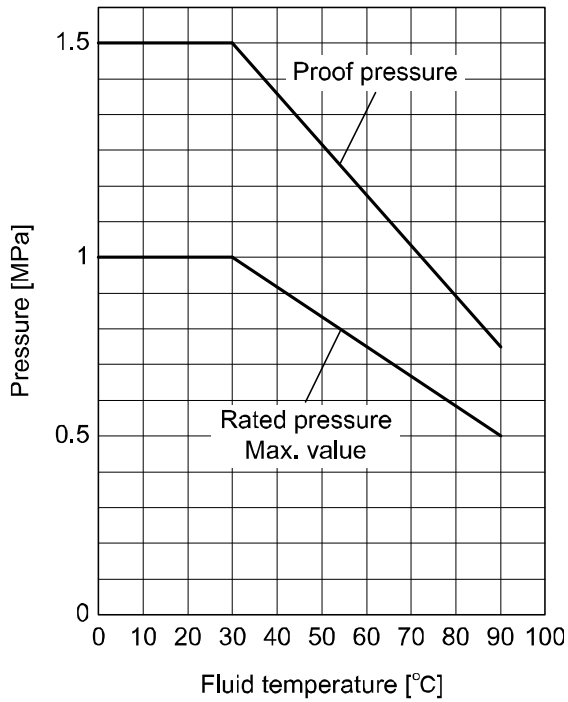
	A	B	C
Voltage output	1 V	1.5 V	5 V
Current output	4 mA	6 mA	20 mA

Model	Rated flow range [L/min]	
	Min.	Max.
PF2D504	0.4	4
PF2D520	1.8	20
PF2D540	4	40

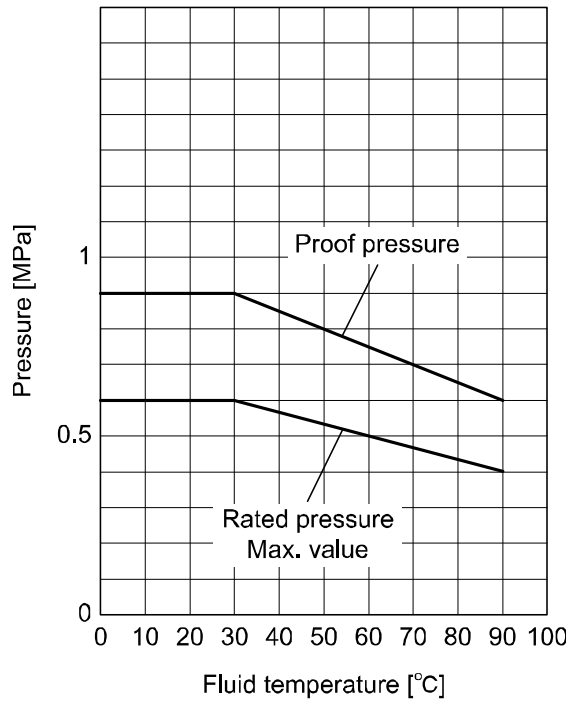


● Fluid temperature and pressure

PF2D504/520

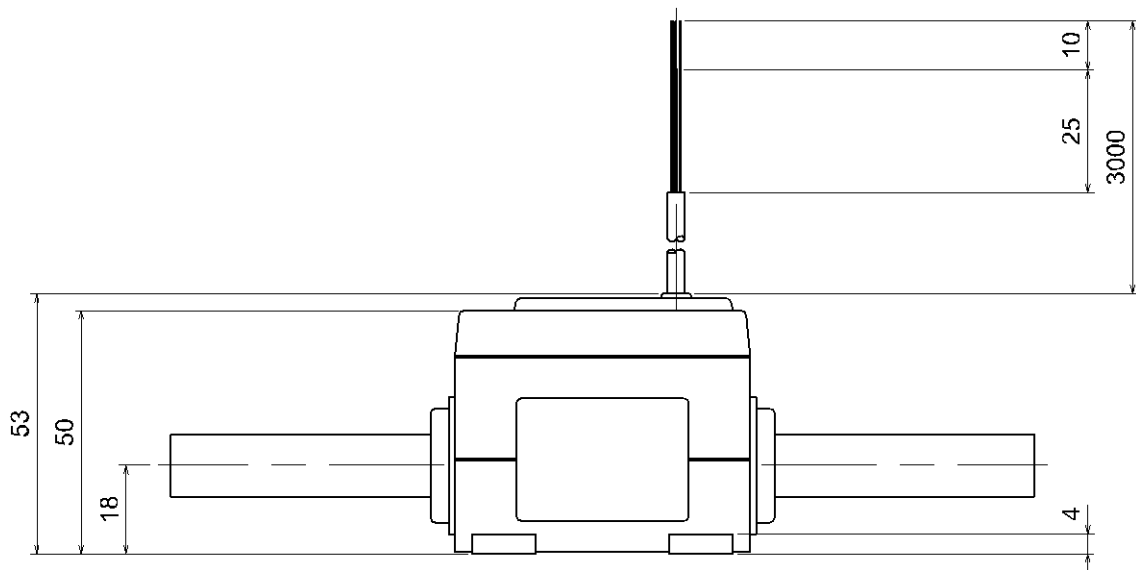
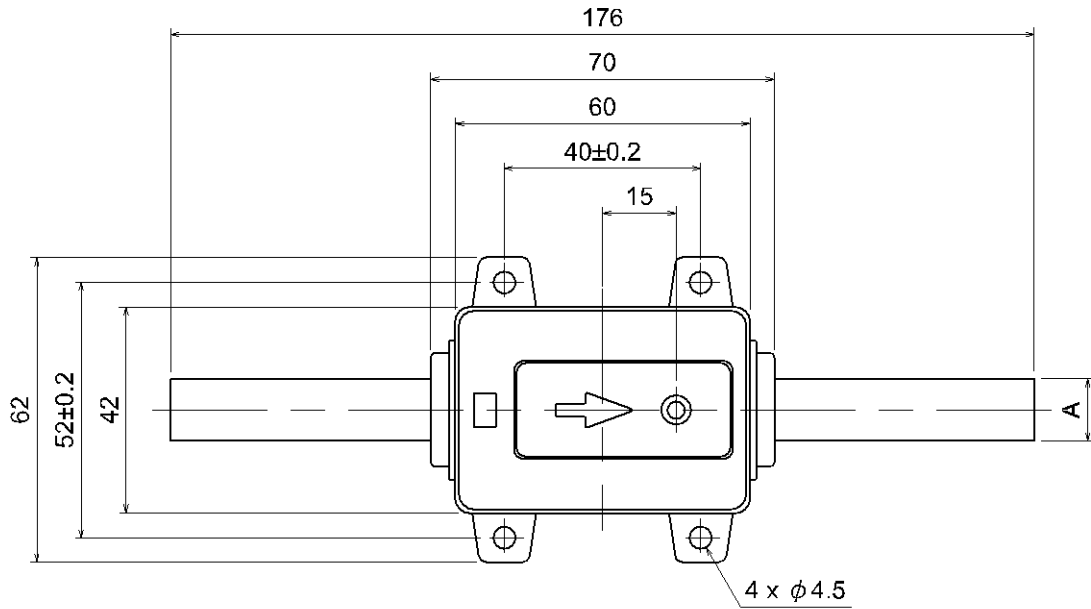


PF2D540



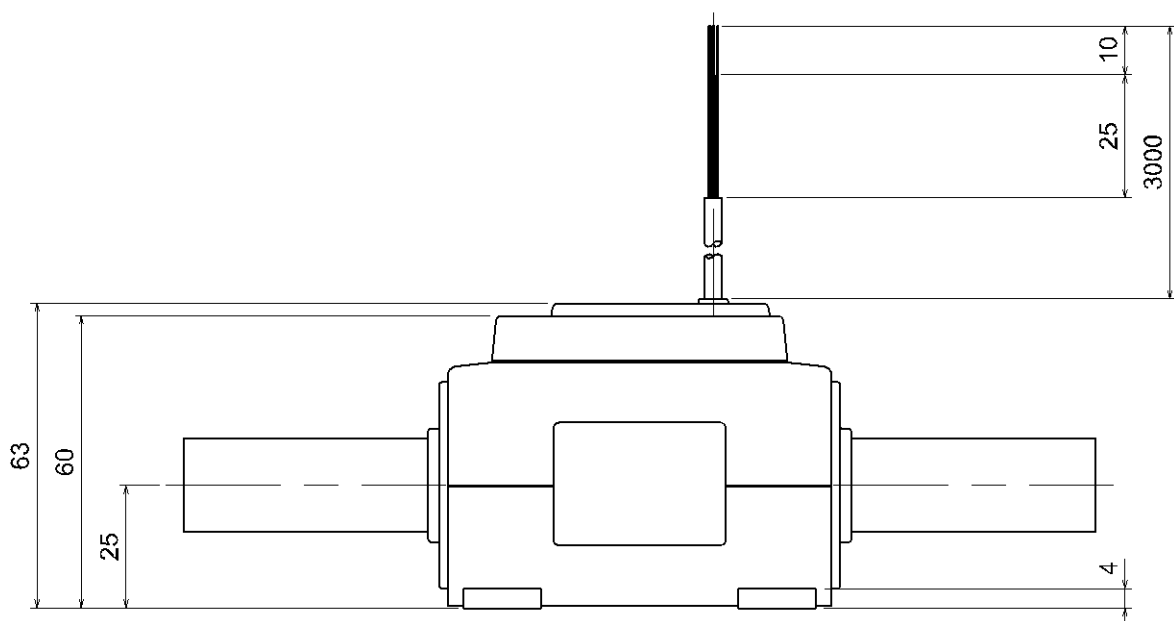
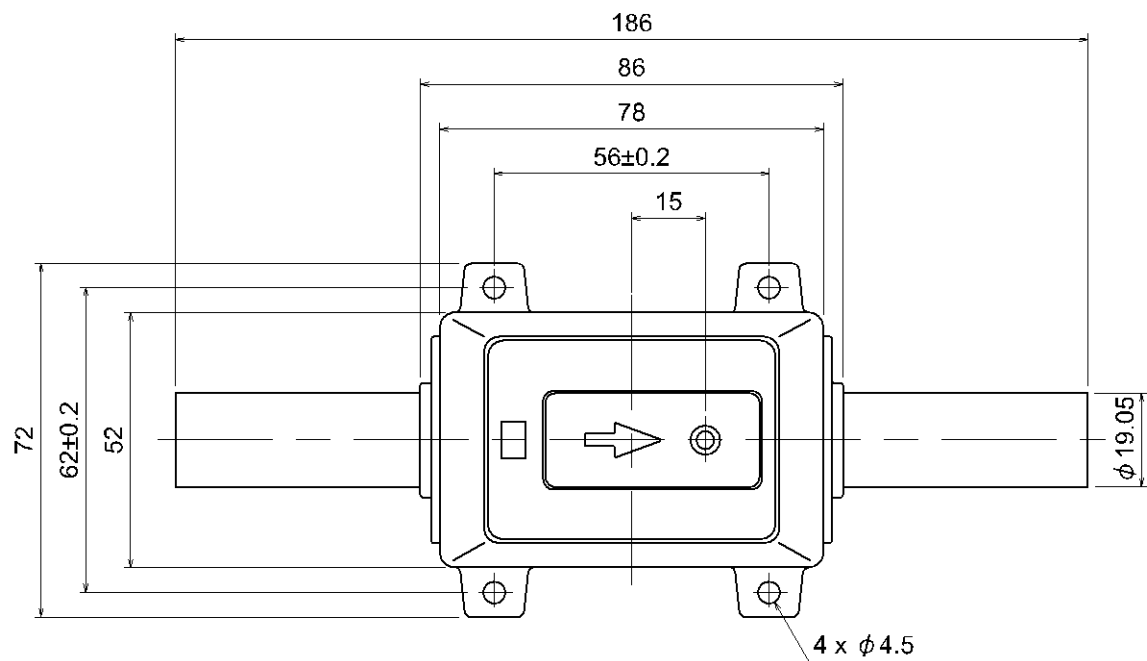
■Dimensions (in mm)

PF2D504/520



Model	A
PF2D504	φ9.53
PF2D520	φ12.7

PF2D540

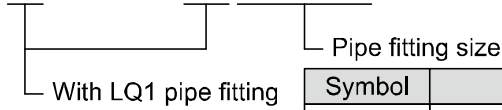




## Made to Order

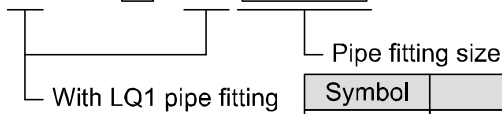
### ● Model Indication and How to Order

PF2D504 S -11-  - 1S



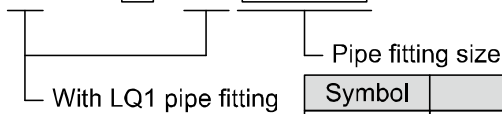
Symbol	IN side	OUT side
11	3	3
1113	3	4 (With plug-in reducer)
1311	4 (With plug-in reducer)	3
13	4 (With plug-in reducer)	4 (With plug-in reducer)

PF2D520 S -13-  - 1S



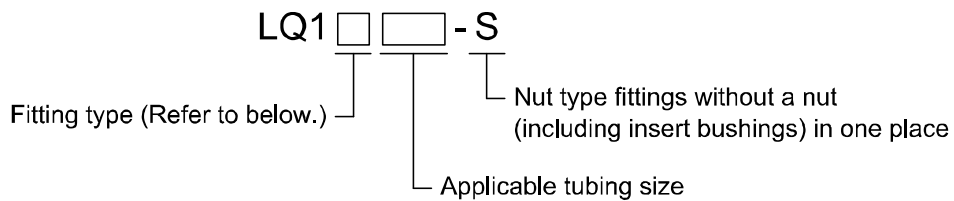
Symbol	IN side	OUT side
13	4	4
1319	4	5 (With plug-in reducer)
1913	5 (With plug-in reducer)	4
19	5 (With plug-in reducer)	5 (With plug-in reducer)

PF2D540 S -19-  - 1S



Symbol	IN side	OUT side
19	5	5
1925	5	6 (With plug-in reducer)
2519	6 (With plug-in reducer)	5
25	6 (With plug-in reducer)	6 (With plug-in reducer)

Refer to page 10 for details of model indication and how to order.

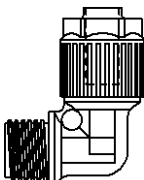
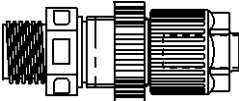
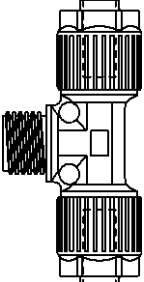



Symbol		Content	
Class	No.	Applicable tubing size	Reducing
3	1	10 x 8 mm	○
3	2	8 x 6 mm	●
3	3	6 x 4 mm	●
3	A	3/8" x 1/4" inch	○
3	B	1/4" x 5/32" inch	●
4	1	12 x 10 mm	○
4	2	10 x 8 mm	●
4	A	1/2" x 3/8" inch	○
4	B	3/8" x 1/4" inch	●
5	1	19 x 16 mm	○
5	2	12 x 10 mm	●
5	A	3/4" x 5/8" inch	○
5	B	1/2" x 3/8" inch	●
6	1	25 x 22 mm	○
6	2	19 x 16 mm	●
6	A	1" x 7/8" inch	○
6	B	3/4" x 5/8" inch	●

○: Basic size ●: With reducer

\*: Select an isometric fitting with the same size as the fitting at the flow sensor.

●Fitting type

E	P	T	U
Union elbow	Panel mount union	Union tee	Union
			

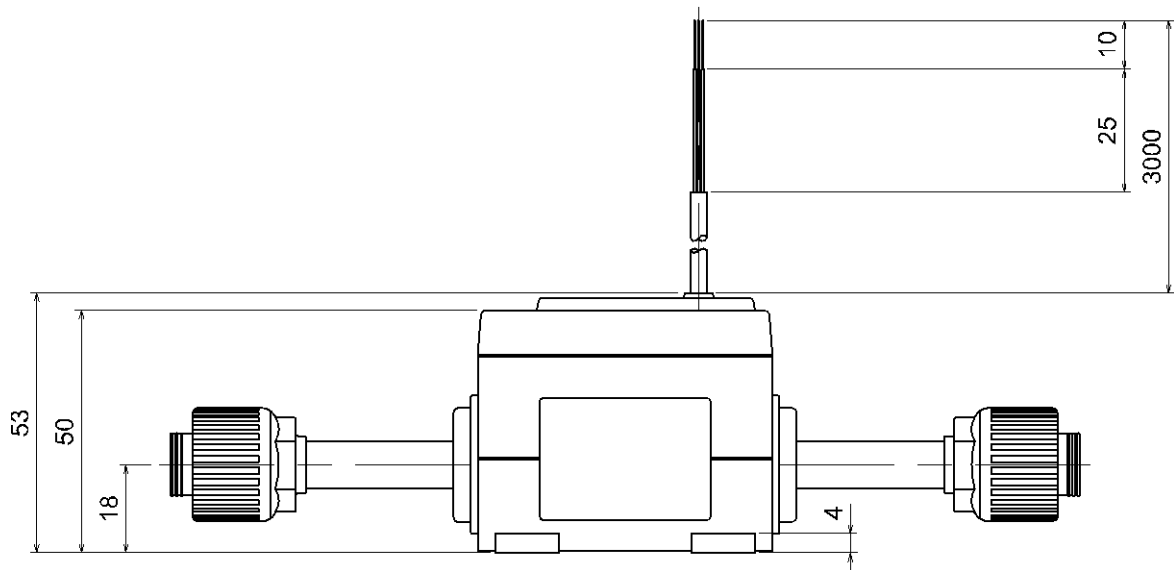
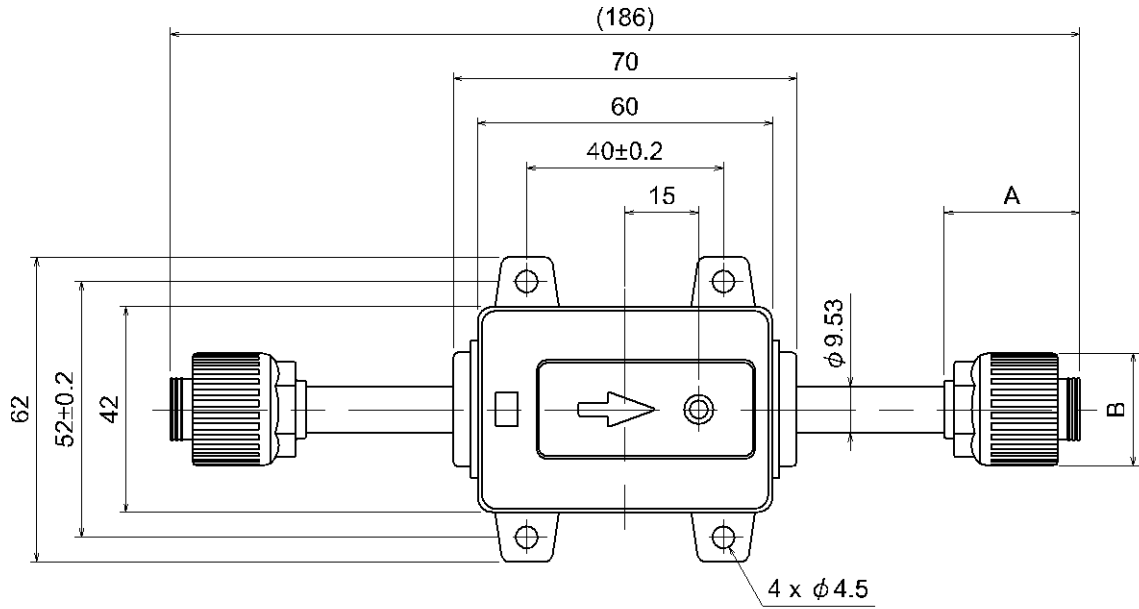
●Specifications

Model	PF2D504	PF2D520	PF2D540
Weigh (included lead wire)	11: max. +20 g	13: max. +30 g	19: max. +65 g
	1113: max. +25 g	1319: max. +45 g	1925: max. +90 g
	1311: max. +25 g	1913: max. +45 g	2519: max. +90 g
	13: max. +30 g	19: max. +65 g	25: max. +115 g

\*: Other specifications are equal to standard product.

●Dimensions (in mm)

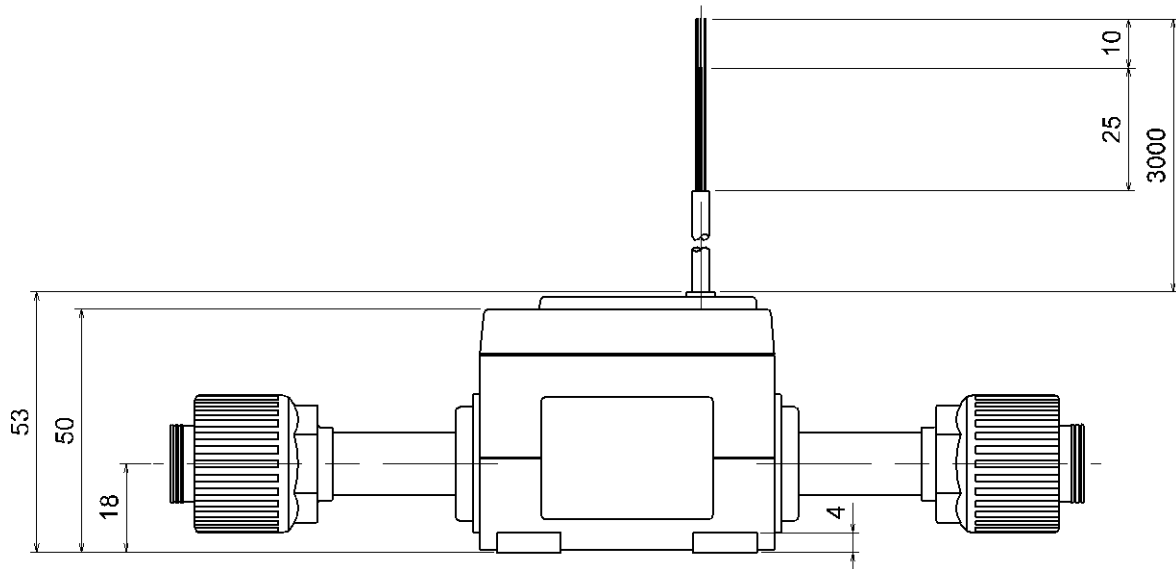
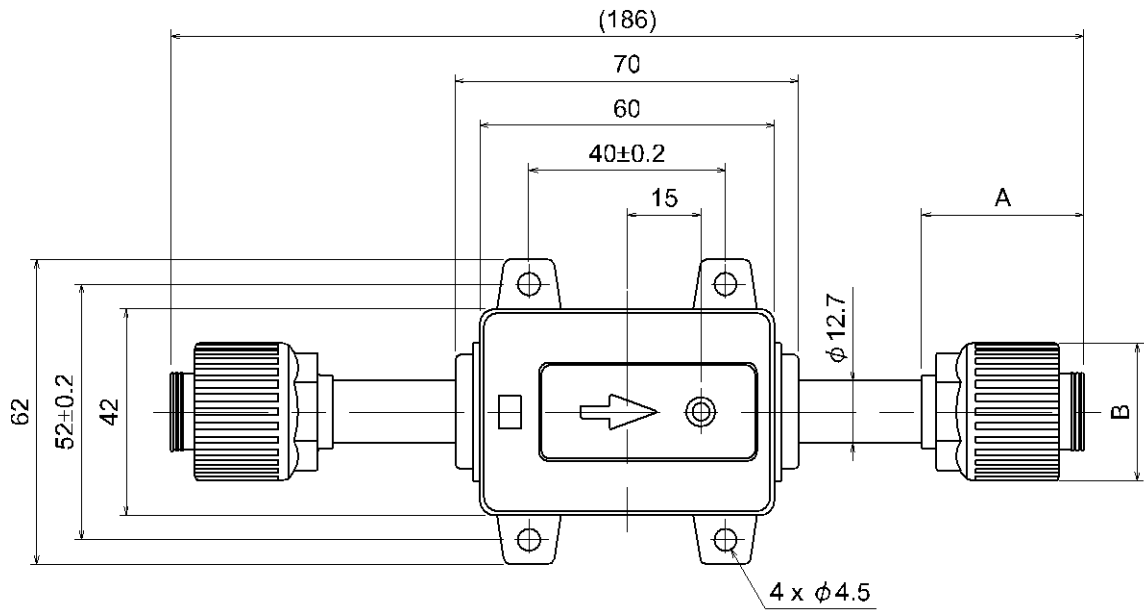
PF2D504S-11-□-1S □



Tubing size	A
3	27.5 mm
4	33 mm

Tubing size	B
3	23 mm
4	39 mm

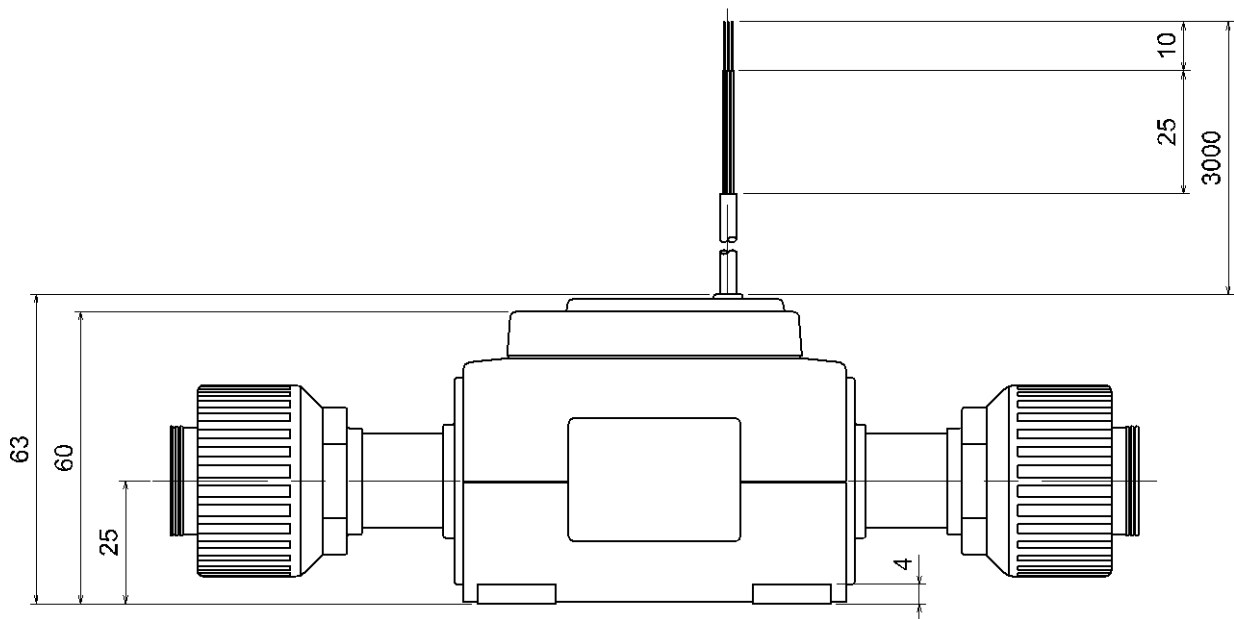
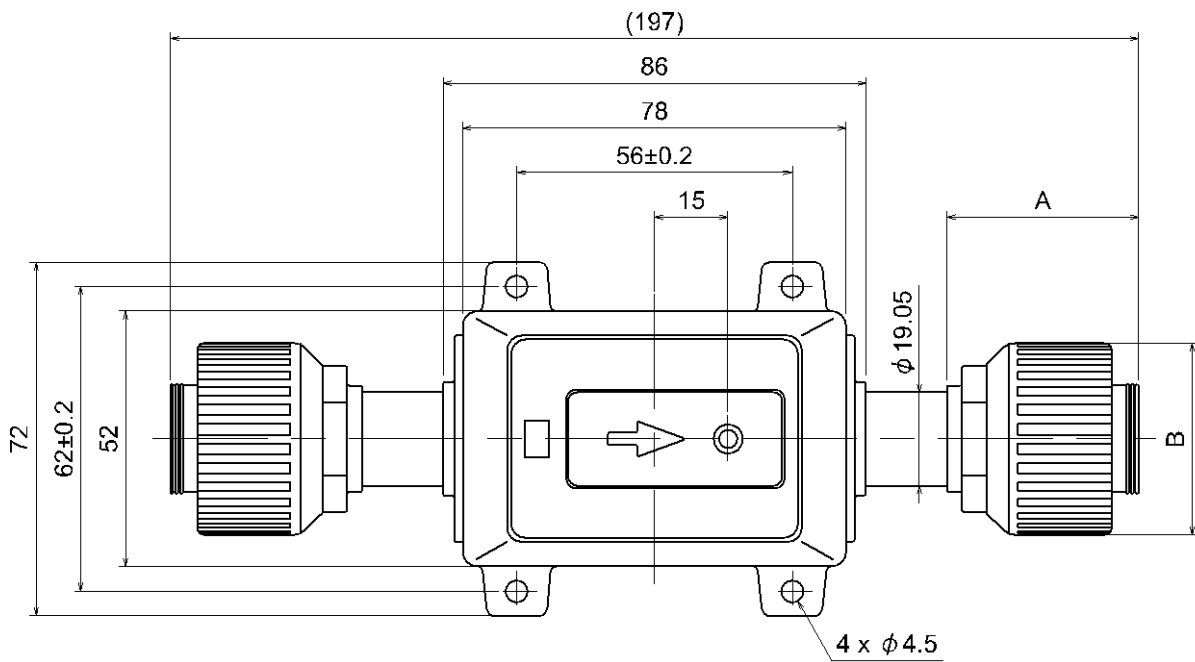
PF2D520S-13-□-1S □



Tubing size	A
4	33 mm
5	39 mm

Tubing size	B
4	23 mm
5	28 mm

PF2D540S-19-□-1S □



Tubing size	A
5	39 mm
6	49.5 mm

Tubing size	B
5	39 mm
6	49 mm

#### Revision history

- A: Full scale revision due to the change of the format and addition of items.
- B: Content is changed due to the change of the format.
- C: Contents revised in several places.
- D: Contents revised in several places.
- E: Contents revised in several places.  
[September 2017]
- F: Contents revised in several places. [July 2018]

## SMC Corporation

4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021 JAPAN

Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362

URL <http://www.smcworld.com>

Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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