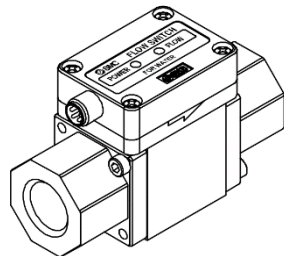




ORIGINAL INSTRUCTIONS

Instruction Manual
Digital Flow Switch – Remote sensor
PF3W5## series



The intended use of the digital flow switch is to monitor and display flow information 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

Model	PF3W 504	PF3W 520	PF3W 540	PF3W 511	PF3W 521
Applicable fluid	Water and ethylene glycol solution with a viscosity of 3 mPa·s (3 cP) or less				
Detection method	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	50 to 250 L/min
Fluid temperature	0 to 90 °C				0 to 70°C
	(no freezing and condensation)				
Accuracy	±3% F.S.				
Repeatability	±2% F.S.				
Temperature characteristics	±5% F.S. max. (25 °C reference)				
Operating pressure range	Refer to graph of operating pressure and proof pressure				
Proof pressure	Refer to graph of pressure loss				
Pressure loss	Refer to graph of pressure loss				
Analogue output	Response time	1 s			
	Voltage output	Output voltage: 1 to 5 V, Output impedance: 1 kΩ			
	Current output	Output current: 4 to 20 mA Max. load impedance: 300 Ω for 12 VDC, 600 Ω for 24 VDC			
Indicator light	LED for power supply, LED for flow rate indicator (Flashing speed changes depending on the flow rate), LED for error display.				
Power Supply voltage	12 to 24 VDC ±10%, including ripple (p-p)				
Current consumption	30 mA max.				
Environment	Enclosure	IP65			
	Operating temp. range	0 to 50 °C (no freezing and condensation)			
	Operating humidity range	Operation, Storage: 35 to 85%R.H. (no condensation)			
	Withstand voltage	1000 VAC, for 1 minute between terminals and housing			
	Insulation resistance	50 MΩ min. (with 500 VDC) between terminals and housing			

- Material specifications for models with metal attachments

Material of fluid contact parts	PPS, SUS304, FKM, SCS13				PPS, SUS304FKM
	Grease free				
Piping port size	3/8	3/8, 1/2	1/2, 3/4	3/4, 1	1 1/4, 1 1/2

- Material specifications for models with vinyl chloride piping

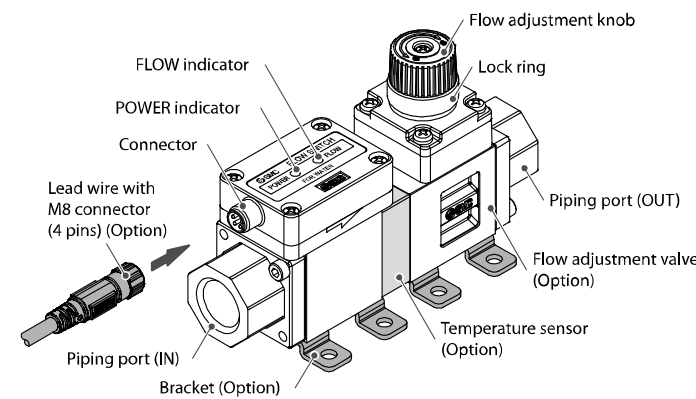
Material of fluid contact parts	-	-	-	PPS, FKM, CPVC	
	Grease free				
Piping port size	-	-	-	25A union	30A union

Warning

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

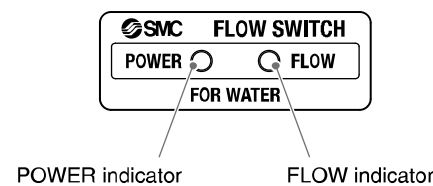
3 Names of Individual parts

3.1 PF3W5## (with flow adjustment valve)



Element	Description
Connector	Connector for electrical connections.
Lead wire with M8 connector	Lead wire to supply power and transmit output signals.
Piping port	Port to connect the fluid inlet at IN and fluid outlet at OUT.
Bracket	Bracket for mounting the product.
Temperature sensor	Sensor for detecting the fluid temperature.
Flow adjustment valve	Restricting valve to adjust the flow rate.
Flow adjustment knob	Knob for adjusting the flow rate.
Lock ring	Ring for locking the flow adjustment valve.

3.2 Display



Element	Description
POWER indicator	Displays the power supply and error status and confirms the product specifications.
FLOW indicator	Flashes at intervals proportional to the flow rate and displays the error status. The LED will be OFF when the flow is outside of the rated flow range.

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 pressure and temperature range.
- Proof pressure could vary according to the fluid temperature. Check the characteristics data for operating pressure and proof pressure.

4.2 Environment

Warning

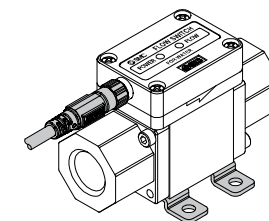
- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- 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 where it will be used as a support.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the side of the body.
- Check the flow characteristics data for pressure loss and the straight inlet pipe length effect on accuracy, to determine inlet piping requirements.
- Do not sharply reduce the piping size.

Bracket mounting (PF3W504 / 520 / 540)

Mount the product (with bracket) using the mounting screws supplied (M4 x 4 pcs). For models with flow adjustment valve attached, fix using 8 mounting screws. Bracket thickness is approx. 1.5 mm.

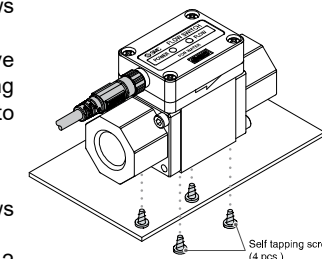


Bracket mounting (PF3W511)

Mount the product (with bracket) using the mounting screws supplied (M5 x 4 pcs). Bracket thickness is approx. 2 mm.

Direct mounting (PF3W504 / 520 / 540)

Mount using self-tapping screws (nominal size: 3.0 x 4 pcs). For models with flow adjustment valve attached, mount using 8 self tapping screws. Tightening torque must be 0.5 to 0.7 N·m.



Direct mounting (PF3W511)

Mount using self tapping screws (nominal size: 4.0 x 4 pcs). Tightening torque must be 1.0 to 1.2 N·m.

Self tapping screws should not be re-used.

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

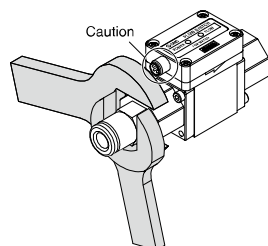
4 Installation (continued)

4.4 Piping

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port.
- Ensure there is no leakage after piping.
- When connecting piping to the product, a spanner should be used on the metal piping attachment only.

Using a spanner on other parts may damage the product. In particular, do not let the spanner come into contact with the M8 connector. The connector can be easily damaged.



Width across flats of attachment

Part size	Identification symbol	
	None	With
3/8	24 mm	20.9 mm
1/2	27 mm	23.9 mm
3/4	32 mm	29.9 mm
1	41 mm	41 mm
1 1/4	54 mm	-
1 1/2	54 mm	-

After hand tightening, apply a spanner of the correct size to the spanner flats on the product, and tighten it for 2 to 3 rotations, to the tightening torque shown in the table below.

Nominal thread size	Tightening torque
Rc (NPT) 3/8	15 to 20 N•m
Rc (NPT) 1/2	20 to 25 N•m
Rc (NPT) 3/4	28 to 30 N•m
Rc (NPT) 1	36 to 38 N•m
Rc (NPT) 1 1/4	40 to 42 N•m
Rc (NPT) 1 1/2	48 to 50 N•m

If the tightening torque is exceeded, the product can be damaged. If the correct tightening torque is not applied, the fittings may become loose.

4.5 Wiring

Caution

- Do not perform wiring while the power is on.
- Confirm proper insulation of wiring.
- Do not route wires and cables together with power or high voltage cables.
- Otherwise the product can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply.

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

Connector Pin Layout – M8 4 pin

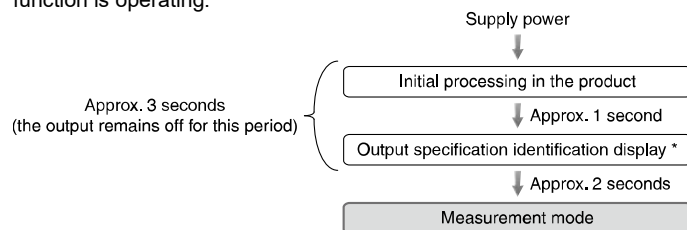
No.	Name	Wire colour	Function
1	DC(+)	Brown	12 to 24 VDC
2	OUT2	White	Temp. / analogue output (1 to 5 V)
3	DC(-)	Blue	0 V
4	OUT1	Black	Flow analogue output (1 to 5 V) or (4 to 20 mA)

*: Wire colours are for lead wire included with the PF3W5 series.

5 Flow Measurement

5.1 Measurement mode

The mode in which the flow is detected and displayed, and the switch function is operating.



- * Green LED: Flashes once. PF3W5#-#-1 (Analogue 1 to 5 V type: Without temperature sensor) Flashes twice. PF3W5#-#-2 (Analogue 4 to 20 mA type: Without temperature sensor) Flashes three times. PF3W5#-#-1T (Analogue 1 to 5 V type: With temperature sensor)

The power LED (Green) turns ON and the flow rate indicator flashes according to the flow rate.

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 Troubleshooting

8.1 Error indication

LED display	Error description	Measures
<p>POWER indicator: Green is ON FLOW indicator: Red is ON</p>	Flow rate upper limit is exceeded The applied flow rate is above approx. 110% of maximum rated flow rate.	Adjust flow to within the rated flow range.
<p>POWER indicator: OFF FLOW indicator: Flashing Red</p>	Outside the temperature measurement range The fluid temperature is lower than -10°C or exceeds 110°C.	Adjust the fluid temperature to within the rated temperature range.
<p>POWER indicator: OFF FLOW indicator: Flashing Red</p>	Flow rate upper limit exceeded and Outside the temperature measurement range. See above.	See above.
<p>POWER indicator: Red is ON FLOW indicator: Red is ON</p>	System error	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.
<p>POWER indicator: Red is ON FLOW indicator: Flashing Red</p>	Internal data error has occurred.	
<p>POWER indicator: Red is ON FLOW indicator: OFF</p>	System error The temperature sensor is damaged.	

If the error cannot be reset after the above measures are taken, or errors other than the above are displayed, please contact SMC.

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more detailed information about troubleshooting.

9 Maintenance

9.1 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.

10 Limitations of Use

8.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

11 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.

12 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.smc.eu> (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
Specifications are subject to change without prior notice from the manufacturer.
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