

Flow Sensor Operation Manual



PF3W5

Thank you for purchasing an SMC PF3W5 Series Flow Sensor. Please read this manual carefully before operating the product and make sure you understand its capabilities and limitations. Please keep this manual handy for future reference.

To obtain more detailed information about operating this product, please refer to the SMC website (URL <http://www.smcworld.com>) or contact SMC directly.

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.

- 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.

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 or explosive gases. Fire or an explosion can result. This product is not designed to be explosion proof.
- Do not use with flammable or highly permeable fluids. Fire, explosion, damage or corrosion can result.
- 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.
 - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.
 - Otherwise an injury can result.

Caution

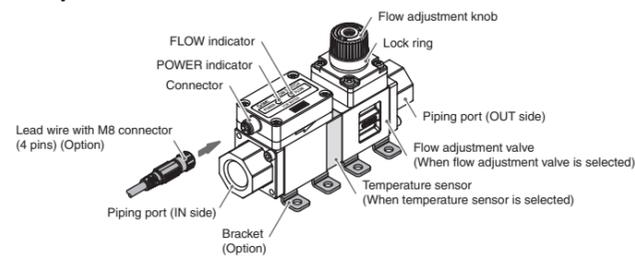
- Do not touch the terminals and connectors while the power is on. Otherwise electric shock, malfunction or damage to the product can result.
- Do not touch the piping or its connected parts when the fluid is at high temperature. This can cause burns. Ensure the piping cools sufficiently before touching.
- 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 fluid supply. Do not apply fluid under leaking conditions. Safety cannot be assured in the case of unexpected malfunction.

NOTE

- The direct current power supply to be used should be UL approved as follows. Circuit (of class 2) which is of maximum 30 Vrms (42.4 V peak), with UL 1310 class 2 power supply unit or UL 1585 class 2 transformer.
- The product is a approved product only if it has a mark on the body.

Summary of Product parts

Body

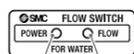


1	DC(+)
2	NC/Analogue output (temperature)
3	DC(-)
4	Analogue output (flow rate)

Pin number of the connector at the body side

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.

Display



POWER indicator FLOW indicator

Element	Description
POWER indicator	Displays the power supply and error status and confirms 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.

Mounting and Installation

Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information.

Installation

- Never mount 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.

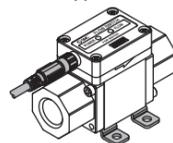
Mounting

- 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.

Installation

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.

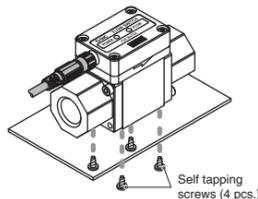


Bracket mounting (PF3W511)

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 the self tapping screws (nominal size: 3.0 x 4 pcs.) for installation. For models with flow adjustment valve attached, mount using 8 self tapping screws. The tightening torque must be 0.5 to 0.7 Nm.



Direct mounting (PF3W511)

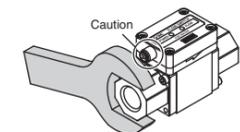
Mount using the self tapping screws (nominal size: 4.0 x 4 pcs.) for installation. The tightening torque must be 1 to 1.2 Nm.

The self tapping screws cannot be re-used.

Refer to the outline dimension drawing for mounting hole size. Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information.

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	
3/8	24 mm
1/2	27 mm
3/4	32 mm
1	41 mm
1 1/4	54 mm
1 1/2	54 mm

Tighten to the specified torque for piping. The tightening torque for connection threads is shown in the table below.

Nominal thread size	Tightening torque
Rc(NPT)3/8	22 to 24 Nm
Rc(NPT)1/2	28 to 30 Nm
Rc(NPT)3/4	28 to 30 Nm
Rc(NPT)1	36 to 38 Nm
Rc(NPT)1 1/4	40 to 42 Nm
Rc(NPT)1 1/2	48 to 50 Nm

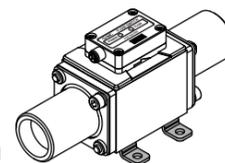
If the tightening torque is exceeded, the product can be broken. If the correct tightening torque is not applied, the fittings may become loose.

Avoid any sealing tape getting inside the piping. Ensure there is no leakage from loose piping.

Caution

Vinyl chloride piping •Mounting and joining of the vinyl chloride fitting (union)

The vinyl chloride fitting (union) must be mounted and joined by an engineer with sufficient knowledge. Be sure to confirm that there is no leakage from the fitting after mounting and joining. If it is mounted and joined by a person who does not have sufficient knowledge and skills, it may lead to failure such as leakage.



•When selecting adhesive for the vinyl chloride fitting (union), confirm that its heat resistance and endurance are compatible with the operating temperature of the fluids used. Otherwise, this may cause leakage and damage.

How to adjust the flow rate (when a flow adjustment valve is mounted)

- (1) Rotate the knob of the valve to adjust the flow rate to the target value.
- (2) Be sure to confirm that there is no fluid leakage generated after adjustment. (When fluid leakage is generated, open and close the valve several times for re-adjustment, and confirm that there is no fluid leakage.)
- (3) Tighten the lock ring to fix the valve as necessary.



The flow adjustment valve is not designed for applications that require daily and repetitive adjustment. If the valve is adjusted frequently, fluid may leak due to wear of the internal seal.

Wiring

Wiring of connector

Connections should only be made with the power supply turned off. Use separate routes for the Flow sensor 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.

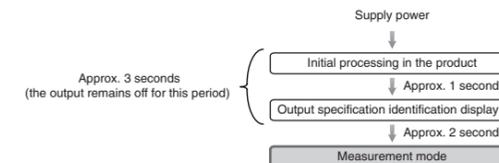
1	DC(+): Brown
2	NC / Analogue output (temperature): White
3	DC(-): Blue
4	Analogue output (flow rate): Black

*: When using the lead wire with M8 connector included with the PF3W5 series.

Flow (Temperature) Measurement

Measurement mode

The mode in which the flow is detected and the FLOW indicator flashes, and analogue output is operating.



*: Green: 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 indicator (Green) turns on, and the FLOW indicator flashes according to the flow rate.

Maintenance

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

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.

Specification

Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information about product specifications.

Dimensions

Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information about dimensions.

Troubleshooting

Error indication

Error Name	LED display	Content	Remedy
Flow rate upper limit is exceeded		The applied flow rate is above approx. 110% of the rated flow rate.	Adjust flow to within the rated flow range.
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.
"Flow rate upper limit exceeded" and "Outside the temperature measurement range" occur together.		See above.	See above.
System error		Internal data error has occurred.	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.
		The temperature sensor is damaged.	

If the error cannot be reset after the above measures are taken, then please contact SMC.

Refer to the SMC website (URL <http://www.smcworld.com>) for more detailed information about product troubleshooting.

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

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Rev.B

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