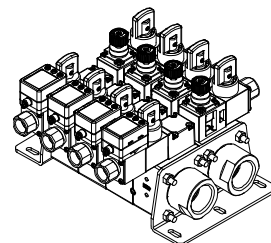




ORIGINAL INSTRUCTIONS

Instruction Manual
Digital Flow Switch – Manifold type
PF3WB / PF3WC
PF3WS / PF3WR



The intended use of the digital flow switch manifold is to monitor and adjust fluid flow to a device while connected to the IO-Link protocol.

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 manuals on the SMC website (URL: <https://www.smcworld.com>) for more safety instructions.

Warning

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

2 Specifications

2.1 Manifold Common Specifications

Model	PF3WB	PF3WC	PF3WS	PF3WR
Manifold specifications	Integrated type		Remote type	
Arrangement	1 to 10 station	Supply or Return: 1 to 5 station	1 to 10 station	1 to 10 station
Unit	Rated flow range	0.5 to 4 L/min, 2 to 16 L/min, 5 to 40 L/min		
	Supply unit construction	With flow adjustment valve / stop valve		-
	Return unit construction	Flow switch, flow adjustment valve, stop valve	-	Flow switch, adjustment valve, stop valve
Fluid	Applicable fluid	Water and ethylene glycol solution with a viscosity of 3 mPa•s(3 cP) or less		
	Fluid temp.	0 to 90 °C (No freezing and condensation)		
Pressure	Operating pressure range	0 to 1 MPa		
	Proof pressure	1.5 MPa		
	Pressure loss	Refer to graph for pressure loss		
	Enclosure	IP65		
Environment	Operating temp. range	0 to 50 °C (No freezing and condensation)		
	Operating humidity range	Operation, Storage: 85%R.H. (No condensation)		
Materials in contact with fluid		PPS, SUS304, FKM		
		Grease free		
Piping port	Main piping	1 inch		
	Attachments	3/8, 1/2, 3/4 inch		

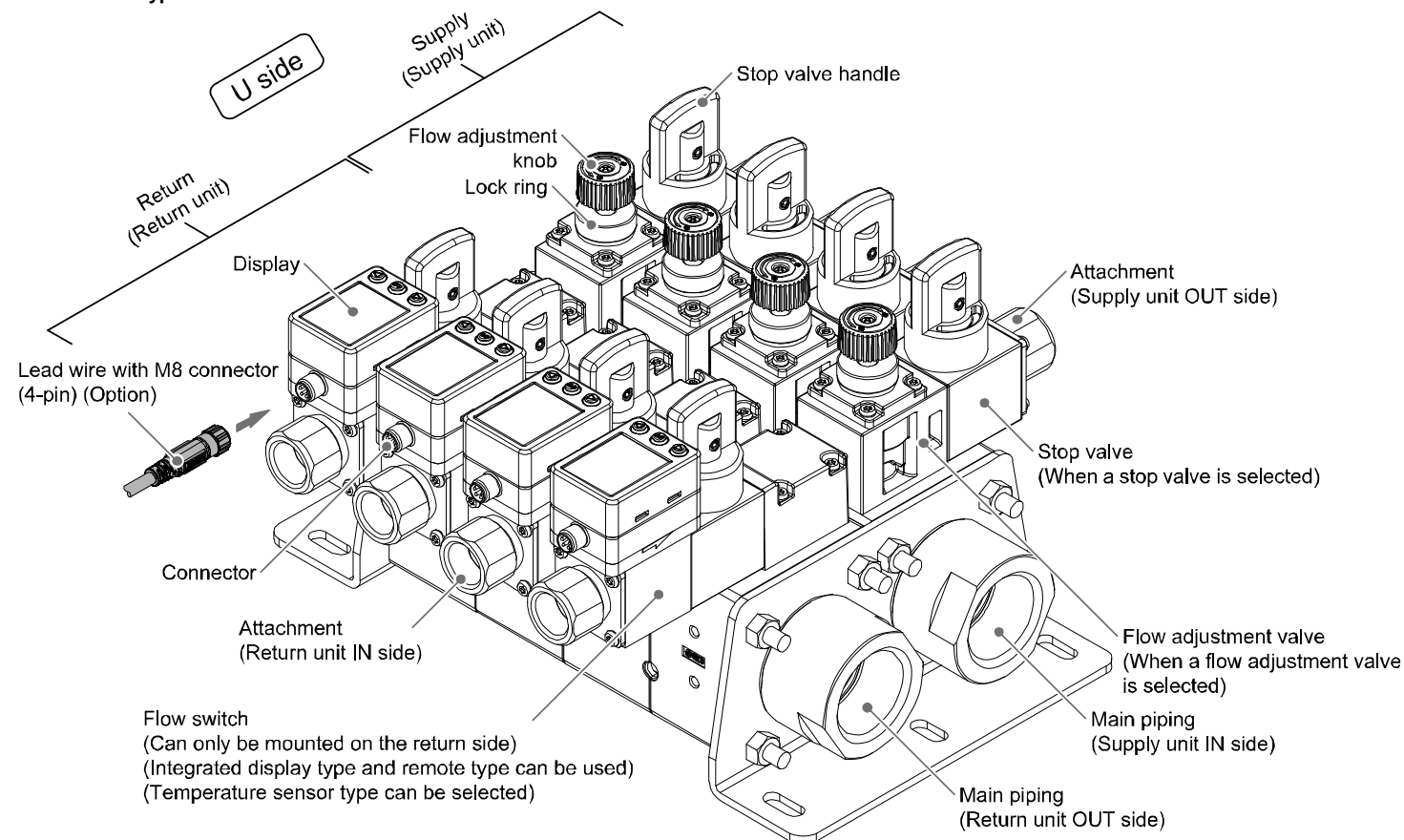
2.2 IO-Link specifications (for PF3W7##-L flow switch)

IO-Link type	Device
IO-Link version	V1.1
Communication speed	COM2 (38.4 kbps)
Min. cycle time	3.5 ms
Process data length	Input Data: 6 bytes, Output Data: 0 byte
On request data communication	Available
Data storage function	Available
Event function	Available
Vendor ID	131 (0x0083)
Device ID	PF3W704-L(2): 0x0160 (352)
	PF3W704-L(2)T: 0x0165 (357)
	PF3W720-L(2): 0x0161 (353)
	PF3W720-L(2)T: 0x0166 (358)
	PF3W740-L(2): 0x0162 (354)
	PF3W740-L(2)T: 0x0167 (359)

- Refer to the PF3WB Operation Manual and the Operation Manual for the PF3W7, PF3W7-L or PF3W5 series on the SMC website (URL: <https://www.smcworld.com>) for more Specification details.

3 Names of Individual parts

3.1 PF3WB type Manifold



- **The PF3WB type manifold is shown.**
 The individual parts of the PF3WC, PF3WS and PF3WR are the same.

Part	Description
Supply (Supply unit)	This unit supplies the fluid from the supply side main piping to the application. Flow adjustment valve and stop valve can be combined to comprise the equipment. <ul style="list-style-type: none"> • The supply unit is not suitable for a flow switch.
Return (Return unit)	This unit returns the fluid exhausted from the application. Flow adjustment valve and stop valve can be combined to comprise the equipment.
Flow switch	The flow switch displays or outputs the flow rate when flow is applied. <ul style="list-style-type: none"> • Applicable to integrated display type / remote sensor type (temperature sensor type can be selected). • IO-Link compatible (Integrated display type PF3W7##-L only). • Cannot be used for the supply unit.
Display	The integrated display type displays flow rate, set value and error codes. The remote type displays POWER indicator and FLOW indicator. For display, refer to the Operation Manual. (Display integrated type: PF3W7, remote sensor type sensor: PF3W5)
Connector	This is for connecting the lead wire.

Part	Description
Lead wire with M8 connector	Lead wire to supply power to and obtain output signals from the flow switch
Flow adjustment valve	Orifice mechanism to adjust the flow rate. <ul style="list-style-type: none"> • The flow adjustment valve is not suitable for applications which require constant adjustment of flow rate. • This valve is not suitable for stopping the flow. • Applicable to both the supply and return unit.
Flow adjustment knob	This knob is for adjusting the flow rate.
Lock ring	This is used for holding the flow adjustment valve.
Stop valve	This is the mechanism for stopping the flow rate. <ul style="list-style-type: none"> *: Not suitable for adjusting the flow rate. *: Applicable to supply/return unit.
Stop valve handle	This handle is for stopping the flow rate. When the handle is rotated by 90°, it is possible to stop the flow rate.
Attachment	To connect the piping of the supply/return units.
Main piping	To connect the piping of the manifold body. Open or close cannot be selected. <ul style="list-style-type: none"> • PF3WC series is not applicable to "Close". • It is not possible to change the main piping after ordering.

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.
- 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. Otherwise damage to the internal parts can result, causing malfunction.
- Do not pull the lead wire forcefully, and do not lift the product by pulling the lead wire (tensile force 49 N or less).

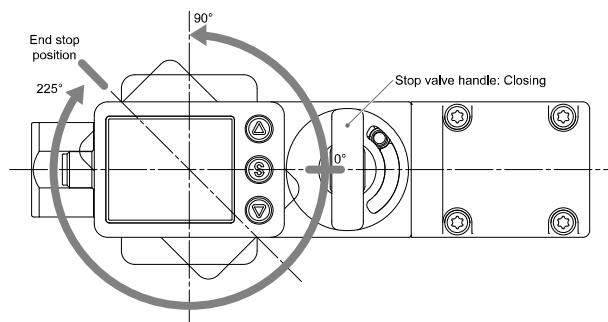
4.2 Environment

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.
- Do not use the product in places where there are cyclic temperature changes. Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.

4.3 Mounting

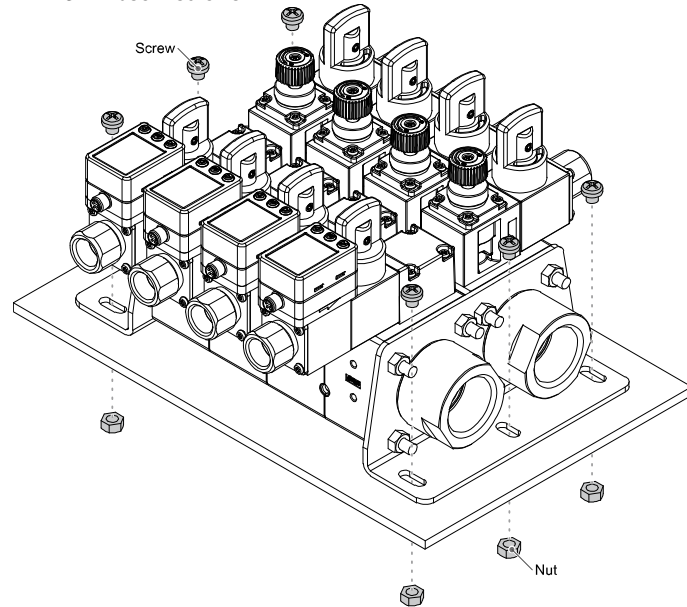
- Never mount the product in a location where it will be used as a support.
 - Mount the product so that the fluid flows in the direction indicated by the arrow on the product label or on the product body.
 - Check the flow characteristics data for pressure loss and the straight inlet pipe length effect on accuracy, to determine inlet piping requirements.
 - Do not sharply reduce the piping size.
 - The monitor with integrated display can be rotated. It can be set at 90° intervals clock and anticlockwise, and also at 45° and 225° clockwise. Rotating the display with excessive force will damage the end stop.
 - When a stop valve is mounted, rotate the monitor after closing the stop valve handle.
- Rotating the monitor with excessive force with the stop valve open, the monitor and stop valve will interfere with each other, causing damage (refer to the figure below).



4 Installation (continued)

4.4 Direct mounting (PF3W704 / 720 / 740)

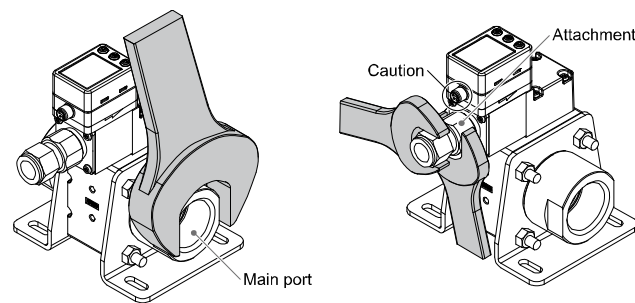
- When mounting the product, mount it to a panel with screws (equivalent to M6) using the mounting holes provided.
- Mounting plate thickness should be approximately 3 mm.
- Screws and nuts must be prepared by the user. The PF3WB uses 6 mounting screws, and the PF3WC, PF3WS and PF3WR use 4 screws.



4.5 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.
- Eliminate any dust left in the piping using an air blow before connecting the piping to the product.
- Ensure there is no leakage after piping.
- When connecting piping to the product, hold the piping with a wrench on the metal part of the piping (piping attachment) and main port of the main piping, which is integrated into the piping.
- 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.



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.

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

Nominal Thread size	Tightening torque	Width across flats
Rc (NPT) 3/8	15 to 20 N•m	20.9 mm
Rc (NPT) 1/2	20 to 25 N•m	23.9 mm
Rc (NPT) 3/4	28 to 30 N•m	29.9 mm
Rc (NPT) 1	36 to 38 N•m	41.0 mm

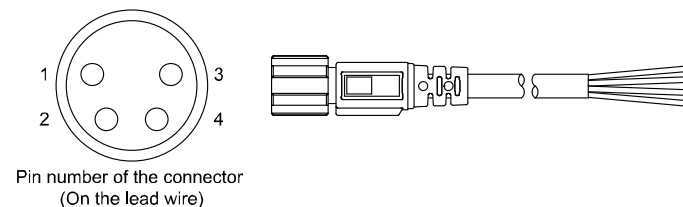
4 Installation (continued)

4.6 Wiring

Caution

- Do not perform wiring while the power is on.
- 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.
- 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. Route the wires (piping) of the product separately from power or high voltage cables.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage. Do not use a cable longer than 30 m. (IO-Link compatible device: 20 m or less).
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply.
- When an analogue output is used, install a noise filter (line noise filter, ferrite element, etc.) between the switch-mode power supply and this product.

4.7 Connector Wiring



Pin number of the connector (On the lead wire)

When using PF3W7 integrated display or PF3W5 remote sensor

No.	PF3W7 Function	PF3W5 Function	Wire colour
1	DC(+)	DC(+)	Brown
2	OUT2	N.C. / Temperature analogue output	White
3	DC(-)	DC(-)	Blue
4	OUT1	Flow rate analogue output	Black

When PF3W7-L (IO-Link) is used in SIO mode

No.	Name	Wire colour	Function
1	DC(+)	Brown	12 to 24 VDC
2	N.C. / OUT2	White	N.C. / Switch output 2 (SIO)
3	DC(-)	Blue	0 V
4	OUT1	Black	Switch output 1 (SIO)

When PF3W7-L (IO-Link) is used as IO-Link device

No.	Name	Wire colour	Function
1	L+	Brown	18 to 30 VDC
2	N.C. / OUT2	White	N.C. / Switch output 2 (SIO)
3	L-	Blue	0 V
4	C/Q	Black	IO-Link data / Switch output 1 (SIO)

*: Wire colours are for the lead wire included with the PF3W7 series.

5 Settings

Refer to the Operation manuals on the SMC website (URL: <https://www.smcworld.com>) for the following Settings:

Flow switch Setting and Function setting

- Integrated display type: PF3W7
- Integrated display type (IO-Link compatible): PF3W7-L
- Remote type sensor: PF3W5

6 Maintenance

6.1 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. When the flow switch is the integrated display type, 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.

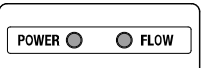
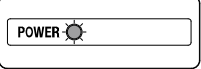
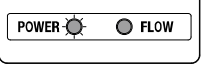
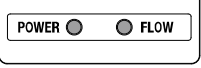
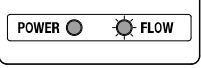
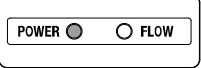
7 Troubleshooting

7.1 Error indication (PF3W7 Integrated display type)

Error	Error displayed	Description	Measures
OUT1 over current error	Er 1	A load current applied to the switch output has exceeded the max. value (OUT1).	Turn the power off and remove the cause of the over current. Then turn the power on again.
OUT2 over current error	Er 2	A load current applied to the switch output has exceeded the max. value (OUT2).	Turn the power off and remove the cause of the over current. Then turn the power on again.
Excessive instantaneous flow	HHH	The applied flow rate is above approx. 140% of maximum rated flow.	Reset applied flow to a level within the display range.
Excessive accumulated flow	HHH	The accumulated flow range is exceeded. (The decimal point position changes depending on the flow range.)	Reset the accumulated flow once. (Press the SET and DOWN button for 1 second or longer.)
Temp. upper limit exceeded	HHH	The fluid temperature is above 110 °C.	Reduce the fluid temperature.
Temp. lower limit exceeded	LLL	The fluid temperature is below -10 °C.	Rise the fluid temperature.
System error	Er 0, Er 4, Er 6, Er 7, Er 8, Er 40	Displayed if an internal data error has occurred.	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.
Temp. sensor failure	Er 12	The temperature sensor is damaged.	
Version does not match	Er 15	Version of master and IO-Link does not match. Mismatch because master version is 1.0.	Align the master IO-Link version to the device.

7 Troubleshooting (continued)

7.2 Error indication (PF3W5 Remote sensor type)

Error	LED display	Description	Measures
Flow rate upper limit exceeded	 <p>POWER indicator: Green is ON FLOW indicator: Red is ON</p>	The applied flow rate is above approx. 110% of maximum rated flow rate.	Adjust flow to within the rated flow range.
Outside temperature measurement range	 <p>POWER indicator: Flashing Red</p>	The fluid temperature is lower than -10 °C or exceeds 110 °C.	Adjust the fluid temp. to within the rated temp. range.
"Flow rate upper limit exceeded" and "Outside temperature measurement range".	 <p>POWER indicator: Flashing Red FLOW indicator: Red is ON</p>	Refer to above	Refer to above.
System error	 <p>POWER indicator: Red is ON FLOW indicator: Red is ON</p>	Internal data error has occurred	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>		
	 <p>POWER indicator: Red is ON FLOW indicator: OFF</p>	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.

8 How to Order

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

9 Outline Dimensions (mm)

Refer to the Operation manual on the SMC website (URL: <https://www.smcworld.com>) for outline and mounting dimensions for the PF3WB, PF3WC, PF3WS and PF3WR.

10 Limitations of Use

10.1 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.smceu.com> (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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