Before Use

Digital Flow Switch
(Integrated display type)

PF3W7##-L

Thank you for purchasing an SMC PF3W7##-L Series Digital Flow Switch (Integrated display type).
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 the operation manual about this product and control unit, 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

- The 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 the 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 befor performing maintenance.
Otherwise an injury can result.

⚠Caution

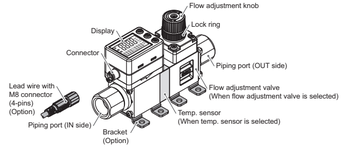
■**Do not touch the terminals and connectors while the power is on.**
Otherwise electric shock, malfunction or damage to the product can result.

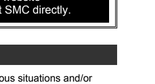
■**Do not touch the piping or its connected parts when the fluid is at high temperature.**
This can cause burns.
Ensure the piping cools sufficiently before touching.

■**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.

Summary of Product parts

Body



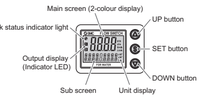


Pin number of the connector (On the product)

1	DC(+)
2	N.C.
3	DC(-)
4	OUT1 (C/Q)

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	Displays the flow, settings and error codes (See below).

Display



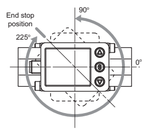
Element	Description
Main screen (2-colour display)	Displays the flow, the status of setting mode and error code.
Sub screen	Displays the accumulated flow, set value, peak/bottom value, fluid temperature and line names.
Output display (Indicator LED)	Displays the output status of OUT1 and OUT2. When ON: Orange LED is ON.
Unit display	Displays the unit selected.
UP button	Selects a mode and the display shown at the sub screen, and increases the ON/OFF set values.
SET button	Press this button to select mode and to confirm a set value.
DOWN button	Selects a mode and the display shown at the sub screen, and decreases the ON/OFF set values.
IO-Link status indicator light	LED is ON when OUT1 is used in IO-Link mode. (LED is OFF in SIO mode)

Mounting and Installation

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

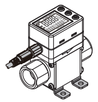
Installation
•Use the product within the specified operating pressure and temperature range.
•Proof pressure could vary according to the fluid temperature.
Check the characteristics data for operating pressure and proof pressure.

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.
•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.



■Installation

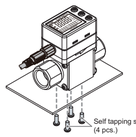
Bracket mounting (PF3W704/720/740)
Mount the product (with bracket) using the mounting screws supplied (M4 x 4 pcs.).
For models with flow adjustment valve attached, fix using 8 mounting screws.
Bracket thickness is approx. 1.5 mm.



Bracket mounting (PF3W711)
Mount the product (with bracket) using the mounting screws supplied (M5 x 4 pcs.).
Bracket thickness is approx. 2 mm.

Direct mounting (PF3W704/720/740)
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 (PF3W711)
Mount using the self tapping screws (nominal size: 4.0 x 4 pcs.) for installation.
The tightening torque must be 1.0 to 1.2 Nm.



The self tapping screws should not 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	20.9 mm
1/2	23.9 mm
3/4	29.9 mm
1	41 mm

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

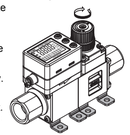
Nominal thread size	Tightening torque
Rc(NPT)3/8	15 to 20 Nm
Rc(NPT)1/2	20 to 25 Nm
Rc(NPT)3/4	28 to 30 Nm
Rc(NPT)1	36 to 38 Nm
Rc(NPT)1¼	40 to 42 Nm
Rc(NPT)1½	48 to 50 Nm

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.

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

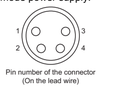
(1) Rotate the knob of the valve to adjust the flow rate to the target value.
(2) Be sure to confirm that there is no fluid leakage generated after adjustment.
(When fluid leakage is generated, open and close the valve several times for re-adjustment, and confirm that there is no fluid leakage.)
(3)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



Pin number of the connector (On the lead wire)

Used as switch output device

No.	Name	Lead wire colour	Function
1	DC(+)	Brown	12 to 24 VDC
2	N.C./OUT2	White	Not connected/Switch output 2 (SIO)
3	DC(−)	Blue	0 V
4	OUT1	Black	Switch output 1

Used as IO-Link device

No.	Name	Lead wire colour	Function
1	L+	Brown	18 to 30 VDC
2	N.C./OUT2	White	Not connected/Switch output 2 (SIO)
3	L−	Blue	0 V
4	C/Q	Black	Communication data (IO-Link)/Switch output 1 (SIO)

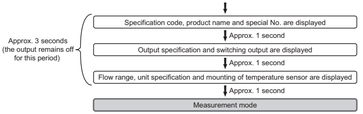
*: When using the lead wire with M8 connector included with the PF3W7 series.

Tighten the connector by hand.

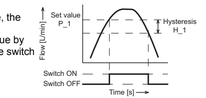
Flow Setting

■Measurement mode

The mode in which the flow is detected and displayed, and the switch function is operating.
This is the basic operating mode; other modes should be selected for set-point and other function setting changes.



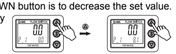
Default settings
When the flow exceeds the set value, the switch will be turned ON.
When the flow falls below the set value by the amount of hysteresis or more, the switch will be turned OFF.
If the operation shown the right is acceptable, please keep this setting.



<Operation of the set value change> (3 step setting mode)

1. Press the SET button in measurement mode to display set values.
(The item to be changed is displayed on the sub display)
Set value on the right side of the sub screen flashes.

2. Press the UP or DOWN button to change the set value.
The UP button is to increase and the DOWN button is to decrease the set value.
•Press the UP button once to increase by one digit, or press and hold to continuously increase.



•Press the DOWN button once to decrease by one digit, or press and hold to continuously decrease.

3. Press the SET button to finish the setting.

The switch turns on within a set flow range (from P1L to P1H) during window comparator mode. Set P1L (switch lower limit) and P1H (switch upper limit) using the setting procedure above.
When reversed output is selected, the main screen displays [n1L] and [n1H].

To set accumulated output functions, refer to the product catalogue or SMC website (URL http://www.smcworld.com) for more detailed information.

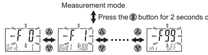
For models with 2 outputs, [P_2] or [n_2] will be displayed. Set as above.

For models with the temperature sensor attached, [tn] will be displayed.
When the fluid temperature falls below the set value, the output turns ON.
*: If a button operation is not performed for 30 seconds during the change of setting, the set value will start flashing.

Setting of Functions

■Function selection mode

In measurement mode, press the SET button for 3 to 5 seconds to display [F□□] on the main screen.
Select to display the function to be change [F□□].
Press and hold the SET button for 2 seconds or longer in function selection mode to return to measurement mode.



The function number is increased and decreased by the UP and DOWN buttons.
Display the required function number and press the SET button.

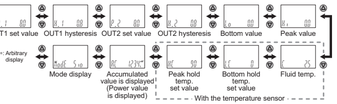
■Default settings

The default settings are provided as follows. If these settings are acceptable, retain for use. To change setting, refer to SMC website (URL http://www.smcworld.com) for more detailed information or contact us.

	Item	Default setting
[F 0]	[Unit] Display unit setting	[L] L/min, °C
	[NorP] Switching setting of switch output NPN/PNP	[PnP] PNP output
[F 1]	[oUt1] Output mode (OUT1)	[HYS] Hysteresis mode
	[1ot] Switch operation (OUT1)	[1_P] Normal output
	[P_1] Set value (OUT1)	50% of maximum rated flow [2.00] 2.00 L/min (4 L type) [8.0] 8.0 L/min (16 L type) [20.0] 20.0 L/min (40 L type) [50] 50 L/min (100 L type)
	[H_1] Hysteresis (OUT1)	5% of maximum rated flow [0.20] 0.20 L/min (4 L type) [0.8] 0.8 L/min (16 L type) [2.0] 2.0 L/min (40 L type) [5] 5 L/min (100 L type)
	[dtH1] Delay time setting at ON	[0.00] 0.00 s
	[dtL1] Delay time setting at OFF	[0.00] 0.00 s
	[CoL] Display colour (OUT1)	[1SoG] ON: Green, OFF: Red (OUT1)
[F 2] *: When a temp. sensor is not connected	[oUt2] Output mode (OUT2)	[HYS] Hysteresis mode
	[2ot] Switch operation (OUT2)	[2_P] Normal output
	[P_2] Set value (OUT2)	50% of maximum rated flow [2.00] 2.00 L/min (4 L type) [8.0] 8.0 L/min (16 L type) [20.0] 20.0 L/min (40 L type) [50] 50 L/min (100 L type)
	[H_2] Hysteresis (OUT2)	5% of maximum rated flow [0.20] 0.20 L/min (4 L type) [0.8] 0.8 L/min (16 L type) [2.0] 2.0 L/min (40 L type) [5] 5 L/min (100 L type)
	[dtH2] Delay time setting at ON	[0.00] 0.00 s
	[dtL2] Delay time setting at OFF	[0.00] 0.00 s
	[CoL] Display colour (OUT2)	[1SoG] ON: Green, OFF: Red (OUT2)
[F 2] *: When a temp. sensor is connected	[oUt2] Output mode (OUT2)	[HYS] Temperature hysteresis
	[2ot] Switch operation (OUT2)	[2_n] Reverse output
	[tn_2] Set value (OUT2)	50% of maximum rated flow [50] 50 °C (for all ranges)
	[tH_2] Hysteresis (OUT2)	0% of maximum rated flow [5] 5 °C (for all ranges)
	[dtH2] Delay time setting at ON	[0.00] 0.00 s
	[dtL2] Delay time setting at OFF	[0.00] 0.00 s
	[CoL] Display colour (OUT2)	[1SoG] ON: Green, OFF: Red (OUT2)
[F 3]	[FiL] Digital filter setting	[1.0] 1.0 s
[F10]	[SUb] Sub screen display setting	[dEF] Standard (OUT1 set value displayed) *: When a temperature sensor is not connected.
		[dEF] Standard (fluid temp. displayed) *: When a temperature sensor is connected.
[F30]	[SAvE] Accumulated flow value storage	[oFF] Not saved
[F80]	[diSP] Display OFF mode	[on] Normal display
[F81]	[Pin] Security code setting	[oFF] OFF
[F90]	[ALL] Setting of all functions	[oFF] OFF
[F98]	[tESt] OUT1 output test mode	[n] Normal output
[F99]	[ini] Reset to the default settings	[oFF] OFF

■Display of sub screen

In measurement mode, the display of the sub screen can be temporarily changed by pressing the UP or DOWN buttons.
After 30 seconds, it will automatically reset to the display selected in [F10].
(Example shown is for 16 L/min type)



*: An arbitrary display can be added to the sub display by setting in [F10].
If the sub display is switched during the arbitrary display, the display will return to the arbitrary display 30 seconds later.
(The default setting does not include arbitrary display).

Other Settings

○**Snap shot function**
The current flow/temperature value can be stored to the switch output ON/OFF set point.
When the set value and hysteresis are set, press the UP and DOWN buttons for 1 second or longer simultaneously. Then, the set value of the sub display (right) shows [- - -], and then values corresponding to the current flow/temperature are automatically displayed.

○**Peak/bottom value indication**
The maximum (minimum) flow/temperature when the power is supplied is detected and updated.
The value can be displayed on the sub display by pressing the UP or DOWN button in measurement mode.

○**Key-lock function**

To set this function, refer to SMC website (URL http://www.smcworld.com) for more detailed information or contact us.

Maintenance

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.

Specification

The IODD file can be downloaded from the SMC website (URL http://www.smcworld.com).
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 function

This function is to display error location and content when a problem or error has occurred.

Error	Error displayed	Description	Measures
OUT1 over current error		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		A load current applied to the switch output has exceeded the max. value (OUT2).	
Excessive instantaneous flow		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		The accumulated flow range is exceeded. (The decimal point position changes depending on the flow range.)	Reset the accumulated flow range to exceeded. (Press the SET and DOWN button for 1 second or longer.)
Temperature upper limit exceeded		The fluid temperature is above 110 °C.	Reduce the fluid temperature.
Temperature lower limit under		The fluid temperature is below -10 °C.	Rise the fluid temperature.
System error		Displayed if an internal data error has occurred.	Turn the power off andturn it on again. If the failure cannot be solved, contact SMC for repair.
Temperature sensor failure		The temperature sensor is damaged.	
Version does not match		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.

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

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

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