

Before Use

Digital Flow Switch (Integrated display type)



PF3W7□□-X445

Thank you for purchasing an SMC PF3W7□□-X445 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 before performing maintenance.
- Otherwise an injury can result.

Caution

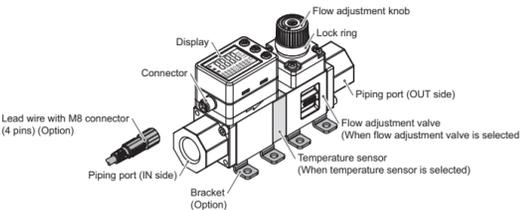
Do not touch the terminals and connectors while the power is on. Otherwise electric shock, malfunction or damage to the product can result.

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.

Summary of Product parts

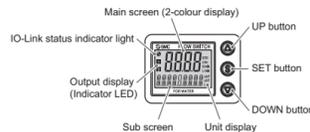
Body



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	Refer to the below.

Display



Element	Description
Main screen (2-colour display)	Displays the flow, the status of setting mode and error indication.
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 turns 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

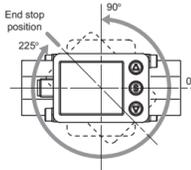
Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information.

Installation

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

Mounting

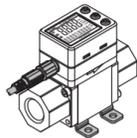
- Never mount the product in a location where it will be used as a support.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the side of the body.
- Check the flow characteristics data for pressure loss and the straight inlet pipe length effect on accuracy, to determine 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 clockwise and anticlockwise, and also at 45° and 225°. 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)

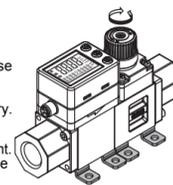
Mount using the self tapping screws (nominal size: 4.0 x 4 pcs.) for installation. The tightening torque must be 1 to 1.2 Nm.

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.

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

- Rotate the knob of the valve to adjust the flow rate to the target value.
- 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.)
- Tighten the lock ring to fix the valve as necessary.

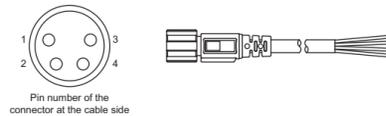


The flow adjustment valve is not designed for applications that require daily and repetitive adjustment. If the valve is adjusted frequently, fluid may leak due to wear of the internal seal.

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.



Used as switch output device

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

Used as IO-Link device

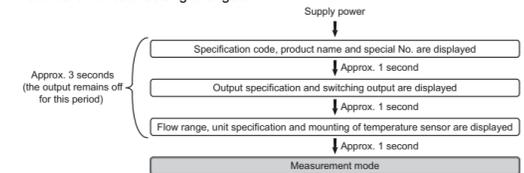
No.	Name	Lead wire colour	Function
1	L+	Brown	18 to 30 VDC
2	N.C.	White	Not connected
3	L-	Blue	0 V
4	C/Q	Black	Communication data (IO-Link)/Switch output 1 (SIO)

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

Flow (Temperature) Setting

Measurement mode

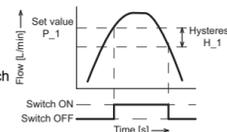
The mode in which the flow is detected and displayed, and the switch function is operating. This is the basic operating mode; other modes should be selected for set-point and other function setting changes.



Setting the ON and OFF points of the switch output.

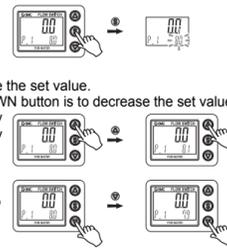
Switch operation

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>

- Press the SET button in measurement mode to display set values. Set value on the right side of the sub screen flashes.
- 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, press and hold to continuously increase. Press the DOWN button once to decrease by one digit, 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 two outputs, [P_2] or [n_2] will be displayed. Set as above.

For models with the temperature sensor attached, [t] will be displayed.

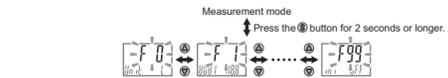
When the fluid temperature falls below the set value, the output turns ON.

*: 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.

*: The sub screen displays the content of function and the setting of the function alternately.

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.

[F 1] Setting of OUT1

Item	Content	Default setting
Output mode	Selects the switch output type from: Instantaneous flow (either hysteresis or window comparator mode), accumulated flow or accumulated pulse.	Hysteresis mode
Reversed output	Selects which type of switch output is used, normal or reverse.	Normal output
Set value	Sets the ON or OFF point of the switch output.	50% of rated flow
Hysteresis	Setting of hysteresis can prevent chattering.	5% of rated flow
ON delay time	ON point delay time of the switch output can be set.	0.00 second
OFF delay time	OFF point delay time of the switch output can be set.	0.00 second
Display colour	The display colour of the main screen can be selected.	Output ON: Green Output OFF: Red

[F 2] Setting of OUT2

Item	Content	Default setting
Output mode	Selects the switch output type from: Instantaneous flow (either hysteresis or window comparator mode), accumulated flow or accumulated pulse.	Hysteresis mode
Reversed output	Selects which type of switch output is used, normal or reverse.	Normal output
Set value	Sets the ON or OFF point of the switch output.	50% of rated flow
Hysteresis	Setting of hysteresis can prevent chattering.	5% of rated flow
ON delay time	ON point delay time of the switch output can be set.	0.00 second
OFF delay time	OFF point delay time of the switch output can be set.	0.00 second
Display colour	The display colour of the main screen can be selected.	Output ON: Green Output OFF: Red

•With the temperature sensor

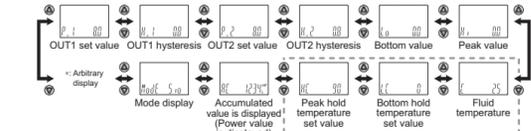
Item	Content	Default setting
Output mode	Selects the switch output type for fluid temperature from either hysteresis or window comparator mode.	Hysteresis mode
Reversed output	Selects which type of switch output is used, normal or reverse.	Reversed output
Set value	Sets the ON or OFF point of the switch output.	50 °C
Hysteresis	Setting of hysteresis can prevent chattering.	5 °C
ON delay time	ON point delay time of the switch output can be set.	0.00 second
OFF delay time	OFF point delay time of the switch output can be set.	0.00 second
Display colour	The display colour of the main screen can be selected.	Output ON: Green Output OFF: Red

•Other parameter settings

Item	Default setting / With the temperature sensor in parenthesis
[F 3] Digital filter setting	1 second
[F 10] Selection of sub screen	Display of set value (Display of fluid temperature)
[F 30] Storing of accumulated flow	OFF [not held]
[F 80] Setting of power saving mode	No setting (display is turned on)
[F 81] Setting of security code	OFF
[F 90] Setting of all functions	OFF
[F 98] Output check	OFF
[F 99] Reset to the default settings	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].



The set values and accumulated output of OUT2 cannot be displayed. (Example for 16 L/min type the above)

Other Settings

Snap shot function

The current flow rate/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 rate/temperature are automatically displayed.

Peak/bottom value indication

The max. (min.) rate/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

Error Name	Display	Content	Remedy
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.
OUT2 over current error	[Er 2]	A load current applied to the switch output has exceeded the max. value (OUT2).	Then turn the power on again.
Excessive instantaneous flow	[RRR]	The applied flow rate is above approx. 140% of the rated flow rate.	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 once. (Press the SET and DOWN button for 1 second or longer.)
Temperature upper limit exceeded	[H]	The fluid temperature is above 110 °C.	Reduce the fluid temperature.
Temperature lower limit exceeded	[L]	The fluid temperature is below -10 °C.	Rise the fluid temperature.
System error	[Er 0], [Er 4], [Er 6], [Er 7], [Er 8], [Er 9], [Er 10]	Displayed in the case of an internal data error.	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.
Temperature sensor failure	[Er 12]	The temperature sensor is damaged.	
Version does not match	[Er 15]	IO-Link Master and product version are not matched. 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.