

# Flow Monitor Operation Manual



PF3W3

Thank you for purchasing an SMC PF3W3 Series Flow Monitor. 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

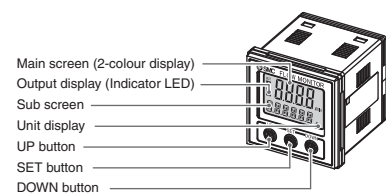
Warning	
<ul style="list-style-type: none"> <li>Do not disassemble, modify (including changing the printed circuit board) or repair. An injury or failure can result.</li> </ul>	
<ul style="list-style-type: none"> <li>Do not operate the product outside of the specifications. Do not use for flammable or harmful fluids. Fire, malfunction, or damage to the product can result. Verify the specifications before use.</li> </ul>	
<ul style="list-style-type: none"> <li>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.</li> </ul>	
<ul style="list-style-type: none"> <li>Do not use with flammable or highly permeable fluids. Fire, explosion, damage or corrosion can result.</li> </ul>	
<ul style="list-style-type: none"> <li>Do not use the product in a place where static electricity is a problem. Otherwise it can cause failure or malfunction of the system.</li> </ul>	
<ul style="list-style-type: none"> <li>If using the product in an interlocking circuit:                             <ul style="list-style-type: none"> <li>Provide a double interlocking system, for example a mechanical system.</li> <li>Check the product regularly for proper operation.</li> <li>Otherwise malfunction can result, causing an accident.</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>The following instructions must be followed during maintenance:                             <ul style="list-style-type: none"> <li>Turn off the power supply.</li> <li>Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.</li> <li>Otherwise an injury can result.</li> </ul> </li> </ul>	
Caution	
<ul style="list-style-type: none"> <li>Do not touch the terminals and connectors while the power is on. This can cause burns.</li> </ul>	
<ul style="list-style-type: none"> <li>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.</li> </ul>	
<ul style="list-style-type: none"> <li>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.</li> </ul>	

## 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.

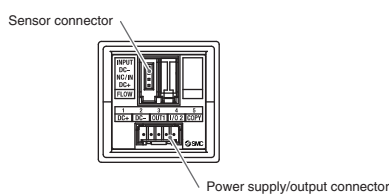
## Summary of Product parts

### Front



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 light 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 selection 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.

### Back



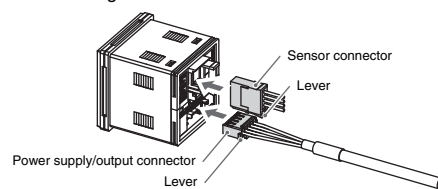
## Wiring

### Connector connection

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

### Connecting and disconnecting of the sensor connector and power supply/output connector

- When connecting, insert the connectors straight into the body until it clicks.
- To remove the connectors, push the lever downward with your thumb, and pull the connectors out straight.



### Sensor connector

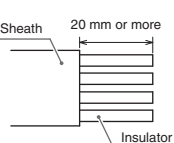
1	DC(+): Brown
2	N.C. / IN: White (unused / temp. sensor: 1 to 5 V)
3	DC(-): Blue
4	INPUT: Black (flow sensor: 1 to 5 V)

### Power supply/output connector

COPY:	Grey
OUT2:	White
OUT1:	Black
DC(-):	Blue
DC(+):	Brown

## Connection of the sensor cable and connector

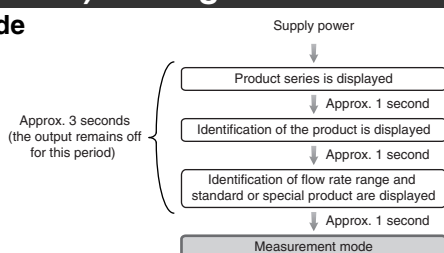
Strip the sensor cable as shown in the figure on the right. Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information about type of sensor connector, applicable gauge of cable and connection method.



## 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.

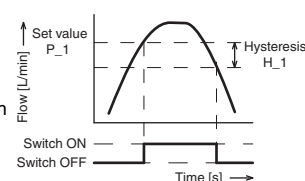


Be sure to select the correct sensor to be connected.

Setting the ON and OFF points of the switch output.

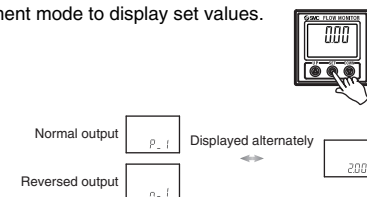
### Switch operation

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.

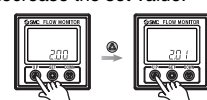


### <Operation>

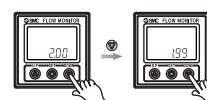
- Press the button in measurement mode to display set values.



- [P\_1] or [n\_1] and the set value are displayed alternately.
  - Press the button once to increase by one digit, or press and hold to continuously increase.



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



- Press the 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. If the output to the fluid temperature is selected, [tn] or [tP] 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.

## [F 0] Selection of sensor

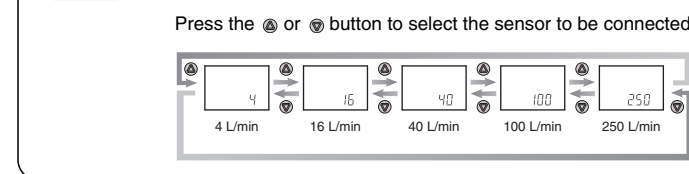
Be sure to select the correct sensor to be connected before use.

In measurement mode, when the button is pressed for 2 seconds or longer, [F 0] is displayed.



Press the button.

Sub screen displays: Press the or button to select the sensor to be connected.



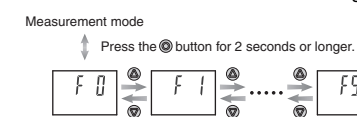
Press the button to confirm. Press the button to return to the function selection mode.

[F 0] Sensor selection is completed.

## Setting of Functions

### Function selection mode

In measurement mode, when the button is pressed for 2 seconds or longer, [F 0] is displayed. This [F 0] indicates the mode for changing each functional setting. Press the button for 2 seconds or longer to return to measurement mode.



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

The function number is increased and decreased by the and buttons. Display the required function number and press the 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.

#### [F 0] Selection of the sensor to be connected

Item	Content	Default setting
Range selection of the sensor to be connected	The flow rate range of the sensor to be connected is set.	Rated flow 4L/min type

#### [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
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 pulse or fluid temperature (either hysteresis or window comparator mode)	Hysteresis mode for instantaneous flow
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

\*: Display colour is linked to the setting of OUT1, and can not be selected.

### Other parameter settings

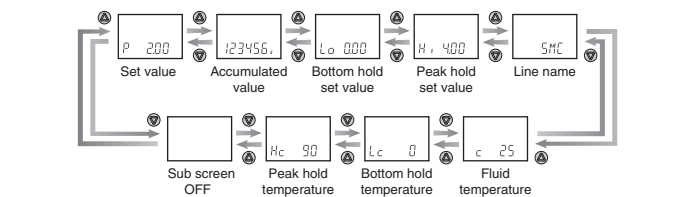
Item	Default setting
[F 3] Response time setting	1 second
[F10] Selection of sub screen	Display of set value
[F20] Setting of external input	Accumulated flow external reset
[F22] Setting of analogue output	Free range analogue output for instantaneous flow: OFF *
[F30] Storing of accumulated flow	OFF (not held)
[F80] Setting of power saving mode	No setting (display is turned on)
[F81] Setting of security code	OFF
[F82] Input of line name	No name [*****]
[F90] Setting of all functions	OFF
[F96] Input value check	Display of input voltage (sensor output voltage)
[F97] Selection of copy function	OFF
[F98] Output check	OFF
[F99] Reset to the default settings	OFF

\*: There is no analogue output free range function for fluid temperature.

### Display of sub screen

In measurement mode, the display of the sub screen can be temporarily changed by pressing the or 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 shown is for 4 L/min type)

## Other Settings

### 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

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

Error Name	Display	Content	Remedy
OUT1 over current error	Er 1	A load current of 80 mA or more is flowing to the switch output (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 of 80 mA or more is flowing to the switch output (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. 110% of the rated flow rate.	Reset applied flow to a level within the display range.
Sensor disconnection error	LLL	The remote sensor is not connected to the Monitor, or the sensor output is below 0.6 V.	Connect the sensor, or check the sensor output voltage.

Excessive accumulated flow		The accumulated flow range is exceeded. (In some flow ranges, the decimal point may flash.)	Clear the accumulated flow once. (This will not be a problem if the accumulated flow is not used.)
Temperature upper limit exceeded	HHH	The fluid temperature is above 110 °C.	Reduce the fluid temperature.
Temperature lower limit exceeded	LLL	The fluid temperature is below -10 °C.	Rise the fluid temperature.
Temperature sensor disconnection error	LLL	The temperature sensor output line is not connected.	Connect the temperature sensor output line.
Temperature sensor failure	LLL	The remote sensor does not have a temperature sensor.	Check whether the temperature can be measured with the remote sensor.
System error	Er 0, Er 4, Er 6, Er 8	If an error is displayed even if measures are taken to improve the "exceeding temperature lower limit" and "temperature sensor is not connected", the temperature sensor of the remote sensor might be broken.	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.

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.