

# Before Use

## Digital Flow Monitor

### PF3# Series



Thank you for purchasing an SMC PF3# Series Digital 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 the operation manual about 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

- 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 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.

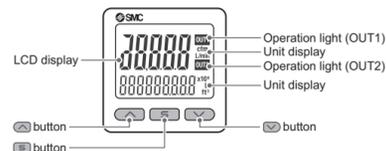
The following instructions must be followed during maintenance: Turn off the power supply. Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance work. Otherwise an injury can result.

### Caution

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

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 the fluid supply. Do not apply fluid under leaking conditions. Safety cannot be assured in the case of unexpected malfunction.

## Summary of Product parts



Name	Description
Operation light	Displays the switch operating condition.
LCD display	Displays the current status of flow, setting mode, selected display units and error code. 4 types of display can be selected for the main display: Single colour of constant red or green; or switching from red to green or green to red corresponding to the output. The indication for the sub display is orange.
▲ button	Increases mode and ON/OFF set values.
▼ button	Decreases mode and ON/OFF set values.
↔ button	Press this button to change mode and to confirm settings.
Unit display	Indicates the units currently selected.

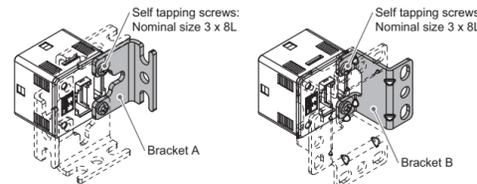
## Mounting and Installation

### Installation

#### Mounting with bracket

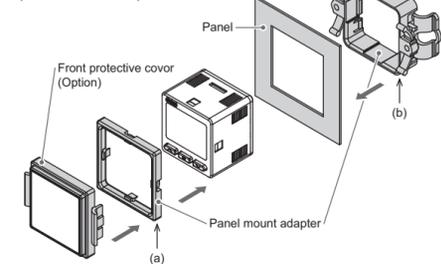
- Mount the bracket to the body with mounting screws (Self tapping screws: Nominal size 3 x 8L (2 pcs)), then set the body to the specified position. Tighten the bracket mounting screws to a torque of 0.5±0.05 Nm. Self tapping screws are used, and should not be re-used several times.

- Bracket A (Part No.: ZS-46-A1)
- Bracket B (Part No.: ZS-46-A2)



#### Mounting with panel mount adapter

- Mount part (a) to the front of the body and fix it. Then insert the body with (a) into the panel until (a) comes into contact with the panel front surface. Next, mount part (b) to the body from the rear and insert it until (b) comes into contact with the panel for fixing.
- Panel mount adapter (Part No.: ZS-46-B)
- Panel mount adapter + Front protective cover (Part No.: ZS-46-D)



\*: The panel mount adapter can be rotated through 90 degrees for mounting.

Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more information about panel cut-out and mounting hole dimensions.

## Wiring

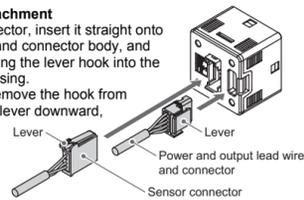
### Wiring connections

- Connections should be made with the power supply turned off.
- Use a separate route for the product wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.
- If a commercially available switching power supply is used, be sure to ground the frame ground (FG) terminal. If the switching power supply is connected for use, switching noise will be superimposed and it will not be able to meet the product specifications. In that case, insert a noise filter such as a line noise filter/ferrite between the switching power supplies or change the switching power supply to the series power supply.

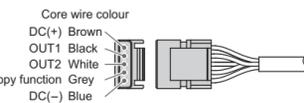
## How to use connector

### Connector attachment/detachment

- When connecting the connector, insert it straight onto the pins, holding the lever and connector body, and lock the connector by pushing the lever hook into the concave groove on the housing.
- To detach the connector, remove the hook from the groove by pressing the lever downward, and pull the connector straight out.

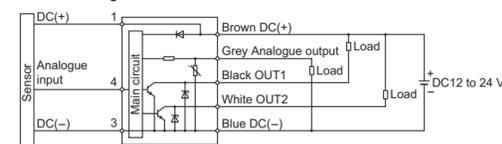


### Connector pin out

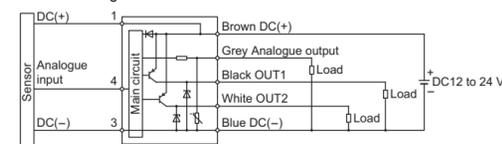


### Internal circuit and wiring examples

- NPN open collector 2 output + Analogue output  
Max. 30 V, 80 mA  
Residual voltage: 1 V or less



- PNP open collector 2 output + Analogue output  
Max. 80 mA  
Residual voltage: 1.5 V or less



Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more information about other internal circuit and wiring examples.

## Outline of Settings

### Power is supplied.

The product code is displayed for approximately 3 sec. after power is supplied. Then, measurement mode will be displayed.  
\*: When moving on to measurement mode, the switch operation will start.

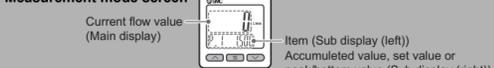
### [Initial setting]

Set the flow range, display unit and NPN/PNP output specifications of the connected sensor.

### [Measurement mode]

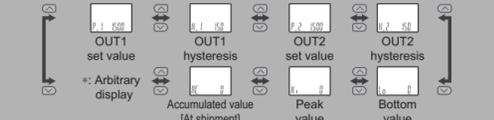
Detects the flow after power is supplied, and indicates the display and switch operating status. This is the basic mode; other modes should be selected for set-point changes and other function settings.

#### Measurement mode screen

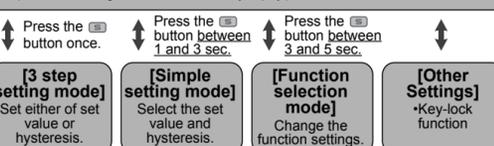


#### Sub display (Hysteresis mode)

In measurement mode, the display of the sub display can be temporarily changed by pressing the ▲ or ▼ buttons.



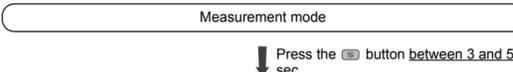
\*: One arbitrary display mode can be added to the sub display by setting the [F10] sub display setting. (The default setting does not include arbitrary display.)



\*: The outputs will continue to operate during setting.  
\*: 3 step setting mode, simple setting mode and function selection mode settings are reflected each other.

## Initial Setting

Set the flow range, display unit and NPN/PNP output specifications of the connected sensor.



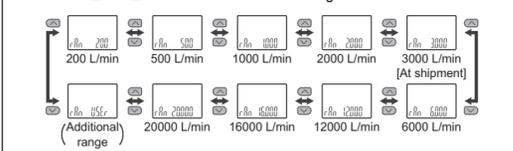
[F 0] Display the switching function of the flow range, display unit and switch output specifications.



Press the ↔ button. ↓ Move on to the flow range setting.

### Flow range setting

Press the ▲ or ▼ button to select the flow range.



\*: When you select the additional range by flow range setting, refer to the SMC website (URL <http://www.smcworld.com>) for more information.

### When the products with a units selection

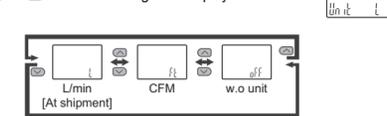
When other than [USER] is selected, press the ↔ button to move on to the display unit setting.

When fixed to SI unit  
When other than [USER] is selected, press the ↔ button to move on to the switching setting of switch output NPN/PNP specifications.

Press the ↔ button to set.

### Display unit setting

Press the ▲ or ▼ button to change the display units.

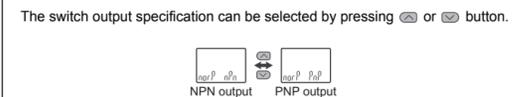


\*: [CFM] cannot be selected if the additional range is set by the SI unit.  
\*: [w.o unit] cannot be selected if set items other than additional range are set with the units selection function.

Press the ↔ button to set. ↓ Move on to the switching setting of switch output NPN/PNP specifications.

### Switching setting of switch output NPN/PNP specifications

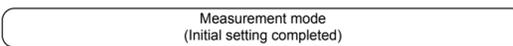
The switch output of this product can be switched to NPN or PNP output in accordance with the user device construction.



Press the ↔ button to set. ↓ Return to function selection mode.

[F 0] Setting of the switching function of the flow range, display unit and switch output specifications is completed.

Press the ↔ button 2 sec. or longer.



Perform the setting with the 3 step setting mode, simple setting mode and function selection mode.

## 3 Step Setting Mode

### [3 step setting mode (hysteresis mode)]

In the 3 step setting mode, the set value (P\_1 or n\_1, P\_2 or n\_2) and hysteresis (H\_1, H2) can be changed.

- Press the ↔ button once when the item to be changed is displayed on the sub display. The set value on the sub display (right) will start flashing.
- Press the ▲ or ▼ button to change the set value. The set value can be increased with ▲ button and can be reduced with ▼ button. When the ▲ and ▼ buttons are pressed and held simultaneously for 1 second or longer, the set value is displayed as [- -], and the set value will be the same as the current flow value automatically (snap shot function). Afterwards, it is possible to adjust the value by pressing the ▲ or ▼ button.
- Press the ↔ button to complete the setting.

The Flow switch turns on within a set flow range (OUT1: from P1L to P1H, OUT2: from P2L to P2H) during window comparator mode. Set P1L/P2L, the lower limit of the switch operation, and P1H/P2H, the upper limit of the switch operation and WH1/WH2 (hysteresis) following the instructions given on above. (When reversed output is selected, the sub display (left) shows [n1L/n2L] and [n1H/n2H].)

In accumulated output mode, the switch will start at the set accumulated flow rate. Set each P1/P2 (set value), referring to the Setting method on above. (When reversed output is selected, the sub display (left) shows [n1/n2].)

\*: Set OUT2 in the same way.  
\*: Setting of the normal/reverse output switching and hysteresis/window comparator mode switching are performed with the function selection mode [F 1] Setting of OUT1 and [F 2] Setting of OUT2.

## Simple Setting Mode

- Press and hold the ↔ button between 1 and 3 seconds in measurement mode. [SET] is displayed on the main display. When the button is released while in the [SET] display, the current flow value is displayed on the main display, [F 1] or [n 1] is displayed on the sub display (left), and the set value is displayed on the sub display (right) (Flashing).

- Change the set value with ▲ or ▼ button, and press the ↔ button to set the value. Then, the setting moves to setting of OUT2. (The snap shot function can be used.)
- Change the set value with ▲ or ▼ button, and press the ↔ button to set the value. Then, the setting moves to setting of OUT2. (The snap shot function can be used.)

Press and hold the ↔ button for 2 seconds or longer to complete the setting. The product will return to measurement mode.

In the window comparator mode, set P1L/P2L, the lower limit of the switch operation, and P1H/P2H, the upper limit of the switch operation and WH1/WH2 (hysteresis) following the instructions given on above. (When reversed output is selected, the sub display (left) shows [n1L/n2L] and [n1H/n2H].)

## Function Selection Mode

### Function selection mode

In measurement mode, press the ↔ button between 3 and 5 seconds, to display [F 0]. Select to display the function to be changed [F□]. Press and hold the ↔ button for 2 seconds or longer in function selection mode to return to measurement mode.

\*: Some products do not have all the functions. If no function is available or selected due to configuration of other functions, [- -] is displayed on the sub display (right).

### Default setting

The default setting is as follows. If no problem is caused by this setting, keep these settings.

- Switching function of [F 0] Flow range, display unit and switch output specifications

Item	Default setting
Flow range	3000 L/min
Display units <sup>1)</sup>	L
Switch output specifications	NPN

\*1: This setting is only available for models with the units selection function.

### Other parameter settings

Item	Default setting
[F 3] Digital filter setting	0.00 s
[F 5] FUNC terminal function setting <sup>2)</sup>	Analogue output: 1 to 5 V/4 to 20 mA External input: Accumulated value reset
[F10] Sub display setting	dEF
[F14] Display with zero cut-off setting	1.0%F.S.
[F30] Accumulated value hold setting	OFF
[F80] Power saving mode	OFF
[F81] Security code	OFF
[F90] Setting of all functions	OFF
[F96] Sensor input/External input signal status display	No configurable items
[F97] Copy master setting	No configurable items
[F98] Output check	N/A (normal output)
[F99] Reset to default settings	OFF

\*2: This function is available for models with analogue output.

If you use the product by changing the setting, refer to the SMC website (URL <http://www.smcworld.com>) for more detailed information, or contact SMC.

## Other Settings

### Snap shot function

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

### Peak/bottom value indication

The maximum (minimum) flow when the power is supplied is detected and updated. The value can be displayed on the sub display by pressing ▲ or ▼ button in measurement mode.

### Key-lock function

### Reset operation

To set each of these functions, refer to the SMC website (URL <http://www.smcworld.com>) for more detailed information, or contact SMC.

## Maintenance

### How to reset the product after a power cut or forcible de-energizing

The setting of the product will be retained as it was before a power cut or de-energizing. The output condition is also basically recovered to that before a power cut or de-energizing, but may change depending on the operating environment. Therefore, check the safety of the whole installation before operating the product. If the installation is using accurate control, wait until the product has warmed up (approximately 10 to 15 minutes).

## 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
Over current error	Er 1 Er 2	The switch output load current is 80 mA or more.	Turn the power off and remove the cause of the over current. Then supply the power again.

Flow error	HHH	Flow exceeding the upper limit of the set flow range is applied.	Reset applied flow to a level within the set flow range.
	LLL	Flow exceeding the lower limit of the set flow range is applied.	
Accumulated flow error	HHH	Accumulated flow rate has exceeded the upper limit of the display.	Reset the accumulated flow.
COPY receiving error	Er 13	Communication is not complete.	After checking the wiring, retry copying.
System error	Er 0	Displayed if an internal data error has occurred.	Turn the power off and on again. If the failure cannot be solved, contact SMC.
	Er 4		
	Er 6		
	Er 9		
	Er 8		
	Er 14		

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 information about troubleshooting.

## Specifications/Outline with Dimensions (in mm)

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