Digital Flow Switch

Operation Manual

PFM7

Thank you for purchasing an SMC PFM7 Series Digital Flow Switch.
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 maintenace 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

■ **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, explosive or corrosive gas.**
Fire or an explosion can result.
This product is not designed to be explosion proof.

■ **Do not use the product for flammable fluid.**
A fire or explosion can result.
Only dry air, N_2, CO_2 and Ar are applicable.

■ **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

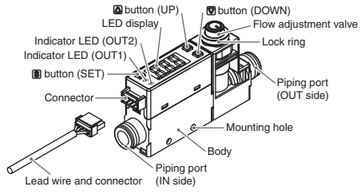
■ **Do not touch the terminals and connectors while the power is on.**
Otherwise electric shock, malfunction or damage to the product can result.

■ **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.

■NOTE

- The direct current power supply used should be UL approved as follows. Circuit (class 2) of maximum 30 Vrms (42.4 V peak) or less, with UL 1310 class 2 power supply unit or UL 1585 class 2 transformer.
- The product is a c UL us approved product only if it has a c UL us mark on the body.

Summary of Product parts



Element	Description
Indicator LED (OUT1)	Indicates the output status of OUT1. LED is ON (Green) when OUT1 is ON. When the accumulated pulse output mode is selected, the indicator LED will turn OFF.
Indicator LED (OUT2)	Indicates the output status of OUT2. LED is ON (Red) when OUT2 is ON. When the accumulated pulse output mode is selected, the indicator LED will turn OFF.
S button (SET)	Press this button to change to another mode and to set a value.
Connector	Connector for electrical connections.
Piping port	Connected to the fluid inlet at IN side and to the fluid outlet at OUT side.
LED display	Displays the flow value, setting mode, and error indication. Four display modes can be selected: display always in red or green, or display changing from green to red, or red to green, according to the output status (OUT1).
▲ button (UP)	Selects the mode or increases the ON/OFF set value. Press this button to change to the peak display mode.
▼ button (DOWN)	Selects the mode or decreases the ON/OFF set value. Press this button to change to the bottom display mode.
Flow adjustment valve *	Orifice mechanism to adjust the flow.
Lock ring *	Used to lock the flow adjustment valve.
Mounting hole	Used to mount the product on a DIN rail or directly to a panel.
Body	The body of the product.
Lead wire and connector	Lead wire to supply power and transmit output signals.

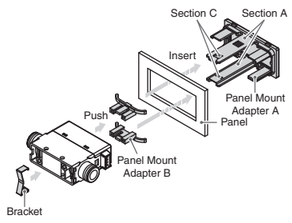
*: The table shows the specifications when a flow adjusting valve is included.

Mounting and Installation

■Installation

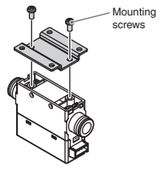
Refer to the product catalogue or SMC website (URL http://www.smcworld.com) for more information about panel cut-out and mounting hole dimensions.

Panel mounting
- •Insert Panel Mount Adapter B (supplied as an accessory) into Section A of Panel Mount Adapter A.
  Push Panel Mount Adapter B from behind until the display is fixed onto the panel.
  The pin of Panel Mount Adapter B engages the notched part of Panel Adapter section C to fix the display.
- •The switch can be mounted on a panel with a thickness of 1 to 3.2 mm.

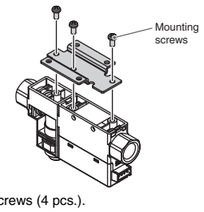


Bracket mounting
- •Mount the bracket using the mounting screws supplied.
- •The required tightening torque is 0.5±0.05 Nm.

Without flow adjustment valve (using ZS-33-M)

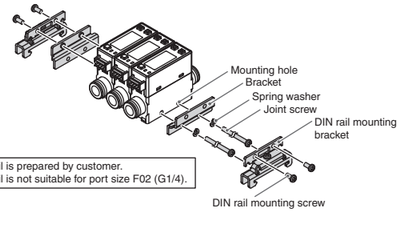


With flow adjustment valve (using ZS-33-MS)



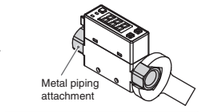
- •Install the product (with bracket) using the M3 screws (4 pcs.).
- •Bracket thickness is approximately 1.2 mm.

DIN rail mounting (using ZS-33-R□)
- •Mount the DIN rail mounting parts using DIN rail mounting screws and joint screws supplied.
- •The required tightening torque of the DIN rail mounting screws and joint screws is 0.4±0.05 Nm.



■Piping

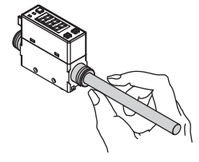
- •Ensure that the metal piping attachments are tightened to the required torque (refer to the table right).
- •If the tightening torque is exceeded, the product can be broken. If the tightening torque is insufficient, the fittings may become loose.
- •When connecting piping to the product, a spanner should be used on the metal piping attachment only. Using a spanner on other parts may damage the product.
- •Avoid any sealing tape from entering inside the piping.
- •Ensure that there is no leakage from loose piping.



Nominal thread size	Required torque
Rc (NPT)1/8	7 to 9 Nm
Rc (NPT)1/4	12 to 14 Nm

Nominal thread size	Width across flats of attachment
Rc (NPT)1/8 Rc (NPT)1/4 G1/4	17 mm
G1/4	21 mm

- •For one-touch fittings, insert the tube until it bottoms out, to ensure it cannot be pulled out.
- •Insertion with excessive force can cause damage.
- •Ensure that there is no leakage after piping.
- •Use this product within the specified operating pressure and temperature ranges.
- •Proof pressure is 1.0 MPa.

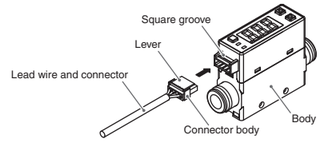


■Wiring

Wiring of connector
- •Connections should only be made with the power supply turned off.
- •Use separate routes for the product 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 / Disconnecting
- •When mounting the connector, insert it straight into the socket, holding the lever and connector body, and push the connector until the lever hooks into the housing, and locks.
- •When removing the connector, press down the lever to release the hook from the housing and pull the connector straight out.

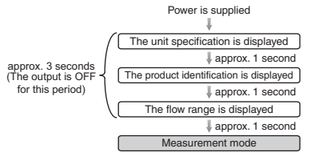
Blue	DC(-)
Black	OUT1
White	OUT2 Analogue output External input
Brown	DC(+)



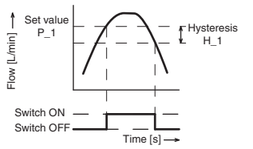
Flow Setting

■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.



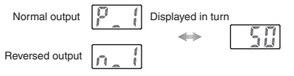
Switch operation
When the flow exceeds the set value, the switch will turn ON.
When the flow falls below the set value by the amount of hysteresis or more, the switch will turn OFF.
If this condition, shown to the right, is acceptable, then keep these settings.



<Operation> *: The Product outputs will continue operating during setting.

1. Press the S button once in measurement mode.

[P_1] or [n_1] and the set value are displayed in turn.



2. Press the ▲ or ▼ button to change the set value.
   The ▲ button is to increase and the ▼ button is to decrease the set value.

- •Press the ▲ button once to increase by one digit, or press it continuously to keep increasing the set value.

- •Press the ▼ button once to decrease by one digit, or press it continuously to keep decreasing the set value.

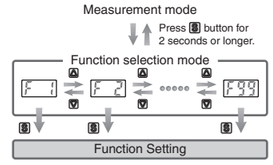
3. Press the S button to complete the setting of OUT1.
   For models with 2 outputs, [P_2] or [n_2] will be displayed. Set as above.

Zero clear of display
The display is reset to zero when ▲ and ▼ are pressed simultaneously for 1 second.
For the initial operation, always perform zero clear with no flow applied.

Function Setting

■Function selection mode

In measurement mode, press the S button for 2 seconds or longer, to display [F 1]. (when using a product with unit selection function, [F 0] will be displayed).
The [F□□] indicates the mode for changing each Function Setting.
Press the S button for 2 seconds or longer in function selection mode to return to measurement mode.



■Default setting

The default settings are provided as follows. If these settings are acceptable, retain for use.

Item		Default setting
[F 0]	[Un i] Unit selection function	[L] L/min
[F 1]	[oU1] Output mode (OUT1)	[HYS] Hysteresis mode
	[1ot] Reversed output (OUT1)	[1_P] Normal output
	[P_1] Input of set value (OUT1)	Medium value of rated flow range
	[H_1] Setting of Hysteresis (OUT1)	[3] 3% of rated flow range
	[CoL] Display colour	[SoG] ON: Green OFF: Red
[F 2]	[oU2] Output mode (OUT2)	[HYS] Hysteresis mode
	[2ot] Reversed output (OUT2)	[2_P] Normal output
	[P_2] Input of set value (OUT2)	Medium value of rated flow range
	[H_2] Setting of Hysteresis (OUT2)	[3] 3% of rated flow range
[F 3]	[FLU] Operating fluid	[A ir] dry air, N_2
[F 4]	[r EF] Reference condition	[Anr] Standard condition
[F 5]	[oES] Response time	[1.00] 1 second
[F 6]	[dSP] Display mode	[inS] Instantaneous flow
[F 7]	[inP] External input	[r_r] Accumulated flow external reset
[F 8]	[dr E] Display resolution	[1E2] 100-split
[F 9]	[PrS] Auto-preset	[oFF] Manual
[F10]	[EEP] Accumulated value hold	[oFF] OFF
[F11]	[AFL] Analogue output filter	[on] With filter
[F12]	[Eco] Power saving mode	[oFF] Unused
[F13]	[P in] Security code	[oFF] Unused
[F98]	[ALL] Setting of all functions	[oFF] Unused
[F99]	[in i] Reset to the default settings	[oFF] Unused

Other Settings

○**Peak / Bottom value display** ○**Zero Clear** ○**Key lock function**
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.

Troubleshooting

■Error indication

Error name	Error display	Error type	Troubleshooting method
Flow error	HHH	The flow has exceeded the upper limit of the flow display range.	Reduce the flow.
	LLL	There is a flow of 5% or more in the wrong direction.	Ensure the flow is in the correct direction.
Over current error	Er 1	The switch output load current (OUT1) has exceeded 80 mA.	Turn off the power supply and remove the cause of the over current. Then supply the power again.
	Er2	The switch output load current (OUT2) has exceeded 80 mA.	
System error	Er0	The product has lost the factory adjustment settings. The internal circuit may be damaged.	Stop operation immediately and contact SMC.
	Er 3	System error. The product has failed to store the data, or the internal circuit may be damaged.	Turn the power off and turn it on again, then repeat the Function Setting.
Zero clear error	Er4	The zero clear function has been performed while the fluid is flowing. "Er4" will be displayed for 1 second.	Perform the zero clear function again under no flow conditions.
Accumulated flow error	-999- Accumulated flow displayed (flashing)	Accumulated flow range has been exceeded.	Reset the accumulated flow. (pressing ▲ and ▼ buttons simultaneously for 1 second or more)

*: 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 information about troubleshooting.

Specifications / Outline with Dimensions

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

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