



Installation & Maintenance Manual Digital Flow Switch PFMB7201/7501/7102/7202



1 Safety Instructions

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger", followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.

	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.

This product is class A equipment that is intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.

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, explosion or corrosion can result. This product is not designed to be explosion proof.
- Do not use the product for flammable fluid. Fire or explosion can result. Only air and N₂ 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.

1 Safety Instructions (Continued)

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.

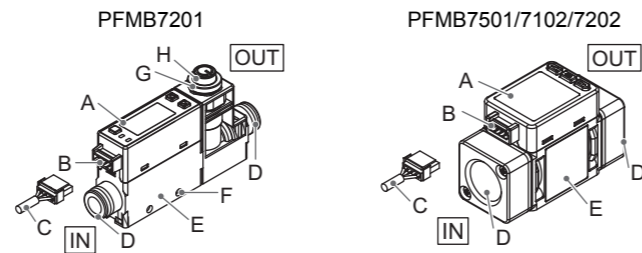
NOTE

- 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 UL1310 class 2 power supply unit or UL1585 class 2 transformer.
- The product is a UL approved product only if it has a mark on the body.

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for more information about safety instructions.

2 Summary of Product parts

Body

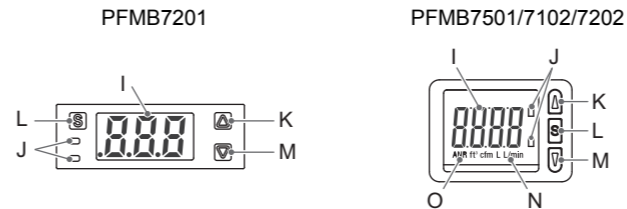


Element	Description
A Display *1	See below.
B Connector	Connector for electrical connections.
C Lead wire with connector	Lead wire for power supply and outputs.
D Piping port	For piping connections. Connected to the fluid inlet at IN and to the fluid outlet at OUT.
E Body	The body of the product.
F Through hole	Used to mount the product on a DIN rail or directly to a panel.
G Lock ring *2	Used to lock the flow adjustment valve.
H Flow adjustment valve *2	Orifice mechanism to adjust the flow rate.

*1: A protective tape is affixed to the display. Please remove it before use.
*2: The table lists the parts when a flow adjusting valve is included.

2 Summary of Product parts (Continued)

Display



Element	Description
I LED display	Displays the flow value, setting mode and error codes.
J Indicator LED	Displays the output status of OUT1 and OUT2. When the accumulated pulse output mode is selected, the LED will turn OFF.
K button (UP) *3	Selects the mode and increases the ON/OFF set value.
L S button (SET)	Press this button to change the mode and to set a value.
M button (DOWN) *3	Selects the mode and decreases the ON/OFF set value.
N Unit indicator	Indicates the unit currently selected.
O Reference condition indicator	Indicates the reference condition selected. LED is ON (red) when standard condition is selected.

*3: When the reversed display is used, the function of the and buttons is reversed.

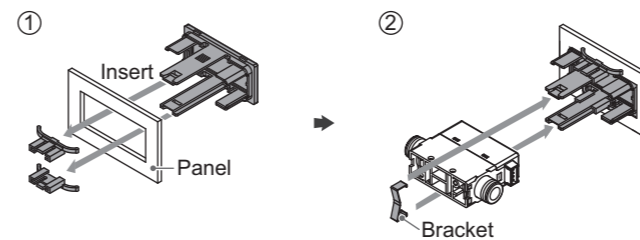
3 Mounting and Installation

■ Mounting

- Never mount the product in a place where it will be used as a mechanical support.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the side of the body.

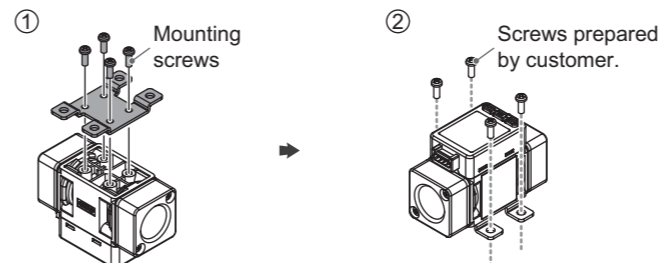
○ Panel mounting (Only PFMB7201)

- Refer to the diagram and table below for mounting details.
- Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for panel thickness and panel cut-out dimensions.



○ Bracket mounting (PFMB7501/7102/7202 shown below)

- Refer to the diagram and table below for mounting details.
- Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for bracket thickness and mounting hole dimensions.

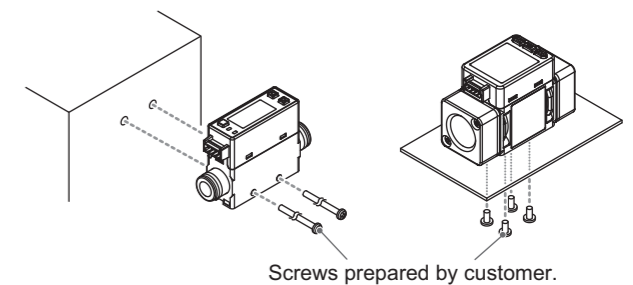


Model	Mounting bracket		Mounting to equipment
	Mounting crew	Tightening torque	Screw
PFMB7201	Accessory	0.45 to 0.55 Nm	M3 screws (4 pcs.)
PFMB7501		0.5 to 0.7 Nm	M4 screws (4 pcs.)
PFMB7102			
PFMB7202			

3 Mounting and Installation (Continued)

○ Direct mounting

- Refer to the diagram and table below for mounting details.
- Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for mounting hole sizes.

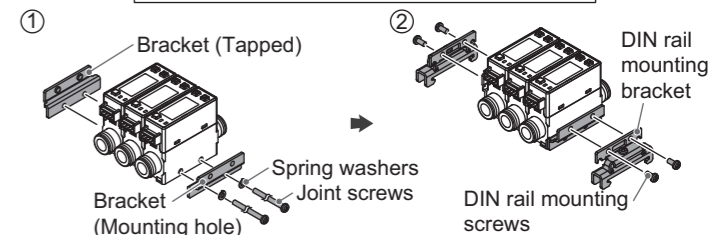


Model	Direct mounting	
	Screw	Tightening torque
PFMB7201	M3 screws (2 pcs.)	0.35 to 0.45 Nm
PFMB7501	Self tapping screws (nominal size: 3.0 x 4 pcs.)	0.5 to 0.7 Nm
PFMB7102		
PFMB7202		

○ DIN rail mounting (Only PFMB7201)

- Refer to the diagram and table below for mounting details.

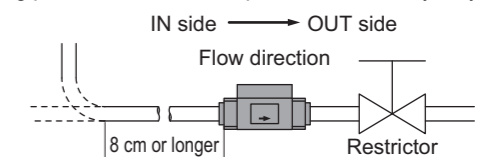
•DIN rail is prepared by customer.
•DIN rail is not suitable for port size F02 (G1/4).



Model	Bracket		DIN rail mounting bracket	
	Screw	Tightening torque	Screw	Tightening torque
PFMB7201	Joint screws	0.35 to 0.45 Nm	DIN rail mounting screws	0.35 to 0.45 Nm

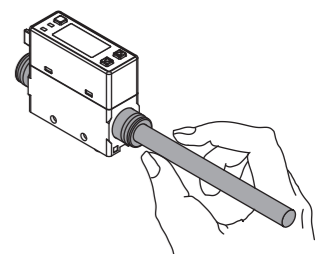
■ Piping

- Never mount the product upside down.
- The straight piping length shall be 8 cm or longer. Otherwise, if a straight section of piping is not installed, the accuracy varies by approximately ±2% F.S.
- Avoid sudden changes in the piping size on the IN side of the product.
- Do not release the OUT side piping port of the product directly to the atmosphere without the piping connected. If the product is used with the piping port released to atmosphere, the accuracy may vary.



○ Piping for the One-touch fitting

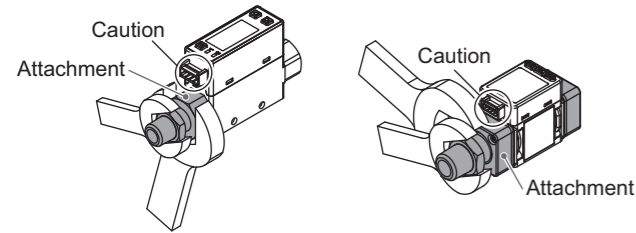
- Accuracy can vary approximately ±2% when tubing other than the recommended tubing is used.
- Insert the tube all the way into the fitting so that it cannot be pulled out.
- Insertion with excessive force can cause damage.
- Ensure there is no leakage after piping.
- Use the product within the specified operating pressure and temperature range.



3 Mounting and Installation (Continued)

○Piping for the metal attachment

- Tighten to the specified torque. Refer to the table below for the required torque values.
- Use a suitable spanner for the appropriate torque. Do not use a spanner 40 cm or longer.
- If the tightening torque is exceeded, the product can be broken. If the tightening torque is insufficient, the fitting may become loose.
- Avoid any sealing tape getting inside the flow path.
- Ensure there is no leakage after piping.
- When mounting the fitting, a spanner should be used on the metal part (attachment) of the fitting only. Holding other parts of the product with a spanner may damage the product. Specifically, make sure that the spanner does not damage the connector.



Model	Required torque	Model	Nominal thread size	Width across flats of attachment
PFMB7201	12 to 14 Nm	PFMB7201	Rc1/4 NPT1/4	17 mm
PFMB7501	28 to 30 Nm			
PFMB7102				
PFMB7202				
		PFMB7501	1/2	30 mm
		PFMB7102		
		PFMB7202		

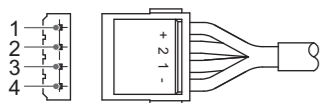
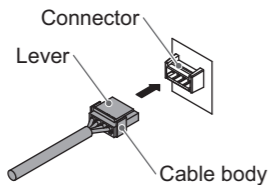
■Wiring

○Connection

- Connections should only 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.
- 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

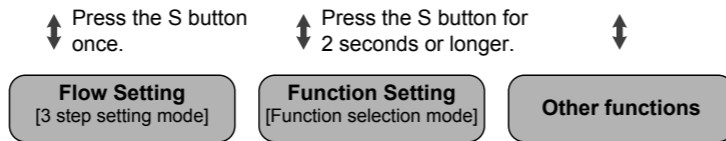
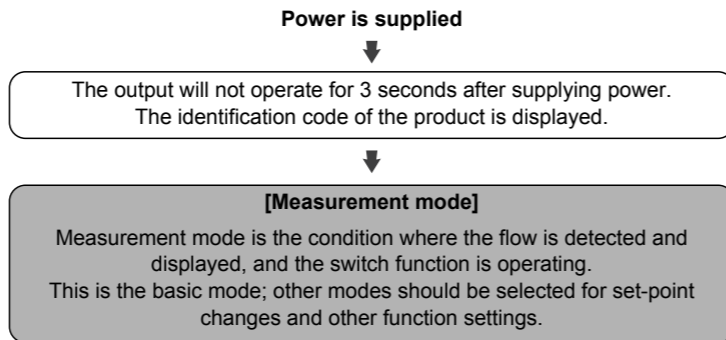
- When mounting the connector, insert it straight into the socket, holding the lever and connector body, and push the connector until the lever hooks into the housing, and locks.
- When removing the connector, press down the lever to release the hook from the housing and pull the connector straight out.



1	Brown	DC(+)
2	White	OUT2/Analogue output/External input
3	Black	OUT1
4	Blue	DC(-)

Refer to the specific product precautions in the operation manual on the SMC website (URL <http://www.smcworld.com>) for more information about installation.

4 Outline of Settings

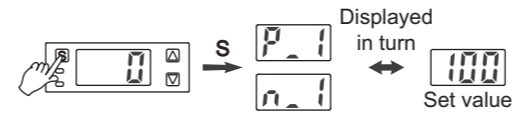


- *: The outputs will continue to operate during setting.
- *: If a button operation is not performed for 30 seconds during the setting, the display will flash. (This is to prevent the setting from remaining incomplete if, for instance, an operator were to leave during setting)
- *: 3 step setting mode and Function selection mode are reflected on each other.

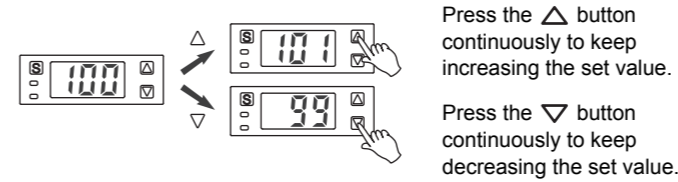
5 Flow Setting (set value only) of OUT1 • OUT2 (Continued)

■Operation (The example below is the explanation for PFMB7201 (1 output type) when reverse function is not used.)

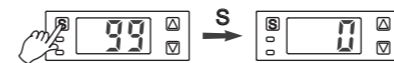
- ① Press the S button once in measurement mode. [P_1] or [n_1] and [the current set value] are displayed in turn.



- ② Press the Δ or ∇ button to change the set value. The Δ button is to increase and the ∇ button is to decrease the set value.



- ③ Press the S button to complete the setting. Return to measurement mode.



- *: For models with switch outputs for both OUT1 and OUT2, [P_2] or [n_2] will be displayed too. Set as above.
- *: If a mode other than Hysteresis Mode is selected, refer to the operation manual from SMC website (URL <http://www.smcworld.com>) or contact SMC.
- *: Note that the set value and hysteresis are limited by each other.
- *: For more detailed settings, set each function in function selection mode.

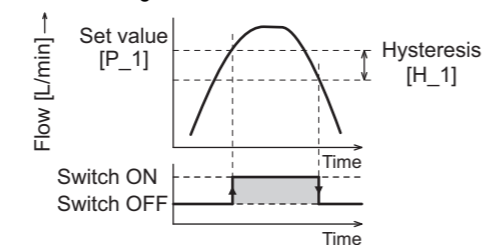
5 Flow Setting (set value only) of OUT1 • OUT2

■3 step setting mode

In this mode, only the set values can be input, in just 3 steps. Use this mode if the product is to be used straight away, after changing only the set values.

■Default settings

When the flow exceeds the set value [P_1], the switch will be turned ON. When the flow falls below the set value by the amount of hysteresis [H_1] or more, the switch will turn OFF. If the operation shown in the diagram below is acceptable, then keep these settings.



Item	Model	Setting
[P_1] Set value of OUT1 [P_2] Set value of OUT2 *	PFMB7201	100 L/min
	PFMB7501	250 L/min
	PFMB7102	500 L/min
	PFMB7202	1000 L/min
[H_1] Hysteresis of OUT1 [H_2] Hysteresis of OUT2 *	PFMB7201	10 L/min
	PFMB7501	25 L/min
	PFMB7102	50 L/min
	PFMB7202	100 L/min

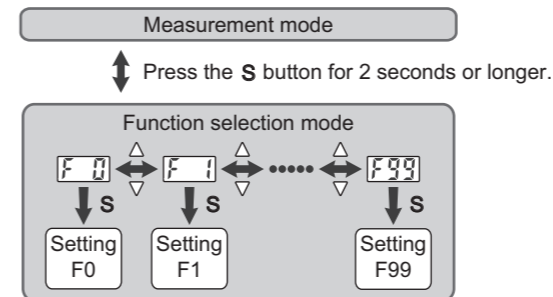
*: Only available for models with switch outputs for both OUT1 and OUT2.

Refer to the function selection mode to change the hysteresis. For more detailed settings, set each function in function selection mode.

6 Function Setting

■Function selection mode

In this mode, each function setting can be changed separately. In measurement mode, press the S button for 2 seconds or longer to display [F 0]. Press the Δ or ∇ button to select the function to be changed.

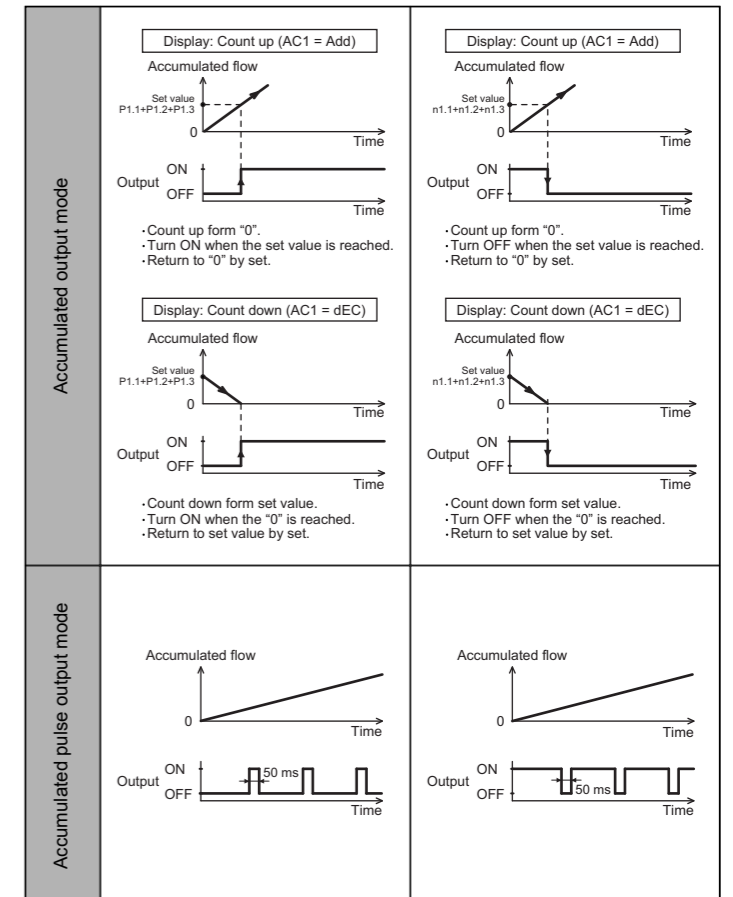
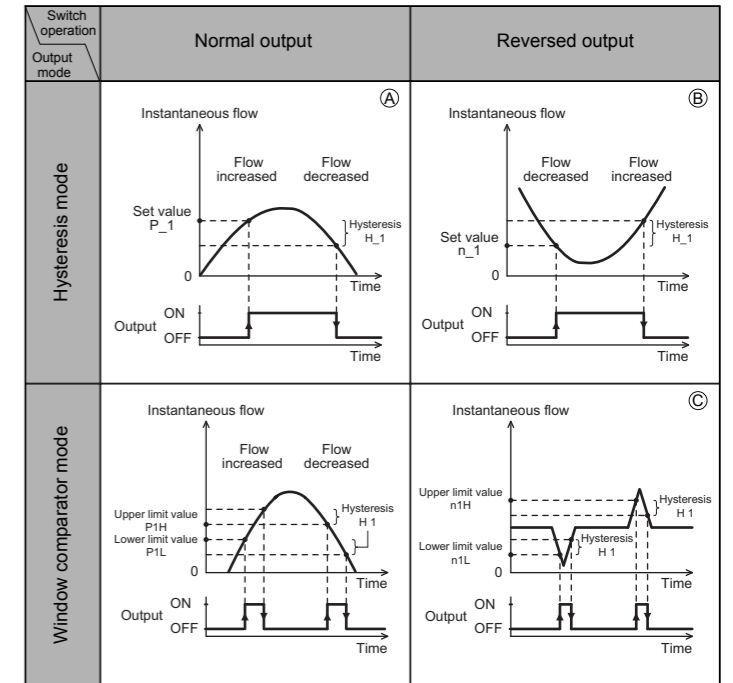


Press the S button for 2 seconds or longer in function selection mode to return to measurement mode.

7 Setting of OUT1 ... [F 1]

① Switch output operation list

- Select the operation required from the table below. For example ...
- Turn the switch output ON when the flow exceeds the set value. \rightarrow A
 - Turn the switch output ON when the flow falls below the set value. \rightarrow B
 - Turn the switch output ON when the flow is more, or less, than a specific flow range. \rightarrow C

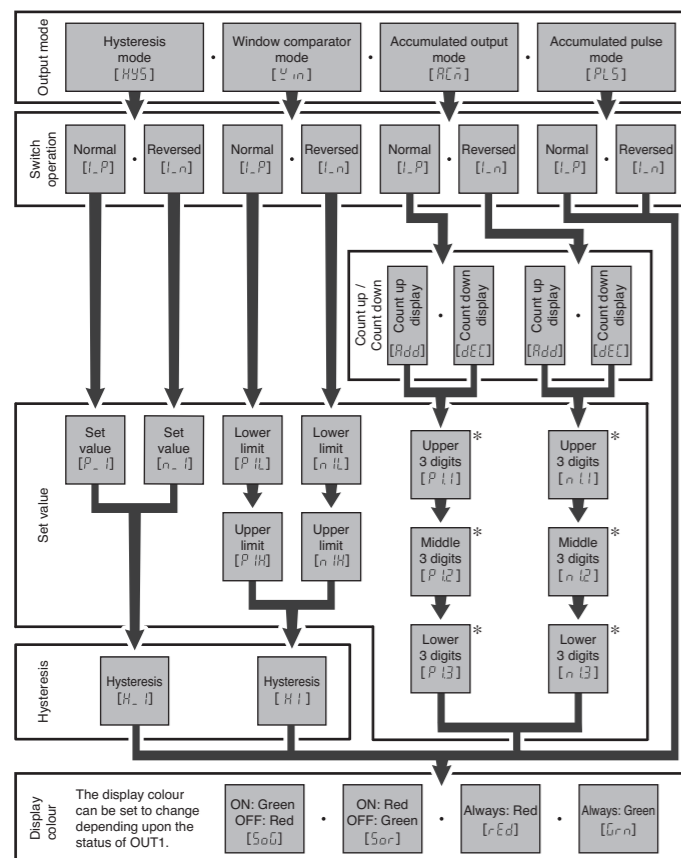


*: The operation may become unstable if hysteresis mode or window comparator mode are used during fluctuating flow conditions. In this case, maintain an interval between the set values and start using after confirming stable operation.

7 Setting of OUT1 ··· [F 1] (Continued)

② Setting flowchart

Refer to the list of Switch output operation list for the setting procedure. Characters in () are for OUT2.
Mark the procedure path with a pen or marker.



*: The accumulated output can be set between 0 to 999, 999, 999 L.
The set value is input starting from the upper 3 digits.

Enter the items in [] that you selected, following the procedure below.

③ Operation

Follow the setting flowchart.

In measurement mode, press the S button for 2 seconds or longer to enter function selection mode.

Press the S button for 2 seconds or longer.

Measurement mode: [0] → Function selection mode: [F0]

Press the Δ or ▽ button in function selection mode to display [F 1]. [F 1] and [oU1] are displayed in turn.

Function selection mode: [F0] → [F1]

↓ Press the S button.

Output mode

[oU1] and [the current set value] are displayed in turn.

Displayed in turn: [oU1] ↔ [Set value]

Press the Δ or ▽ button to select.

Output mode: [oU1] | Set value: []

↓ Press the S button to set.

Switch operation

[1ot] and [the current set value] are displayed in turn.

Displayed in turn: [1ot] ↔ [Set value]

Press the Δ or ▽ button to select.

*: By switching to reversed output, the display colour will change in relation to the setting.

Select reversed output: [1ot] | Set value: []

7 Setting of OUT1 ··· [F 1] (Continued)

↓ Press the S button to set.

Set value (When hysteresis mode, window comparator mode, accumulated output mode is selected)

Press the Δ or ▽ button to change the value.
*: The set value and hysteresis settings limit each other.

↓ Press the S button to set.

Hysteresis (When hysteresis mode, window comparator mode is selected)

Press the Δ or ▽ button to change the value.
*: The set value and hysteresis settings limit each other.

↓ Press the S button to set.

Display colour

[CoL] and [the current set value] are displayed in turn.

Press the Δ or ▽ button to select.

Displayed in turn: [CoL] ↔ [Set value]

Display colour: [CoL] | Set value: []

↓ Press the S button to complete the setting.

Return to function selection mode.
Press the S button for 2 seconds or longer to return to measurement mode.

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for settings other than those shown above.

8 Other Functions

- **Peak value display** (Press the Δ button for 1 second).
- **Bottom value display** (Press the ▽ button for 1 second).
- **Reset operation** (Press the Δ and ▽ buttons simultaneously for 1 second or longer.)
- **Key lock function** (Press the S button for 5 seconds or longer.)

9 Maintenance

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for more information about product maintenance.

10 Specifications

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

11 Dimensions

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

12 Reset to the default settings

- ① In measurement mode, press the S button for 2 seconds or longer to display [F 0].
- ② Press the Δ or ▽ button to display [F99]. Press the S button.
- ③ Press the Δ or ▽ button to display [on]. Press the S and ▽ buttons simultaneously for 5 seconds or longer.
- ④ Reset to the default settings is complete. Press the S button for 2 seconds or longer to return to measurement mode.

12 Reset to the default settings (Continued)

■ Default settings

Item	Default settings
[r EF] Reference condition	[Rnr] Standard condition
[Un] Unit selection function *1	[L] L/min
[oU] Output mode of OUT1	[HYS] Hysteresis mode
[1oE] Switch operation of OUT1	[L_P] Normal output
[P_] Set value of OUT1	[100] 100 L/min (PFM7201)
[250] 250 L/min (PFM7501)	
[500] 500 L/min (PFM7102)	
[1000] 1000 L/min (PFM7202)	
[H_] Hysteresis of OUT1	[10] 10 L/min (PFM7201)
[25] 25 L/min (PFM7501)	
[50] 50 L/min (PFM7102)	
[100] 100 L/min (PFM7202)	
[CoL] Display colour	[5oG] ON: Green OFF: Red
[oU2] Output mode of OUT2 *2	[HYS] Hysteresis mode
[2oE] Switch operation of OUT2 *2	[L_P] Normal output
[P_2] Set value of OUT2 *2	[100] 100 L/min (PFM7201)
[250] 250 L/min (PFM7501)	
[500] 500 L/min (PFM7102)	
[1000] 1000 L/min (PFM7202)	
[H_2] Hysteresis of OUT2 *2	[10] 10 L/min (PFM7201)
[25] 25 L/min (PFM7501)	
[50] 50 L/min (PFM7102)	
[100] 100 L/min (PFM7202)	

[F 3] Response time	[r E5] Response time	[10] 1 second
[F 10] Display mode	[FLo] Display mode	[on] Instantaneous flow
[F 13] Reversed display	[r Ew] Reversed display	[oFF] Unused
[F 20] External input *3	[onP] External input *3	[r rC] Accumulated flow external reset
[F 22] Setting of analogue output *4	[F rE] Setting of analogue output *4	[oFF] Variable OFF
[F 30] Accumulated value hold	[SRw] Accumulated value hold	[oFF] Unused
[F 31] Orientation correction	[P oS] Orientation correction	[Hor] Horizontal mounting
[F 35] Supply pressure	[P rS] Supply pressure	[n id] 0.4 MPa minimum, 0.6 MPa maximum
[F 80] Display OFF mode	[dSP] Display OFF mode	[on] Display ON
[F 81] Security code	[P in] Security code	[oFF] Unused
[F 90] Setting of all items	[RL] Setting of all items	[oFF] Unused
[F 98] Output check	[t E5] Output check	[n] Normal output
[F 99] Reset to the default settings	[in] Reset to the default settings	[oFF] Unused

- *1: This setting is only available for models with the unit selection function.
- *2: This setting is only available for models with switch outputs for both OUT1 and OUT2.
- *3: This setting is only available for models with the external input.
- *4: This setting is only available for models with the analogue output.

13 Troubleshooting

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for more information about troubleshooting.

■ Error indication

Error name	Error code	Description	Measures
Instantaneous flow error	XXX	The flow has exceeded the upper limit of the flow display range.	Reduce the flow.
	LLL	Fluid is flowing in the reverse direction by at least -5% of the maximum rated flow value.	Connect the fluid flow in the correct direction.
OUT1 over current error	Er1	The switch output (OUT1) load current has exceeded 80 mA.	Turn the power OFF and remove the cause of the over current. Then turn the power ON again.
OUT2 over current error	Er2	The switch output (OUT2) load current has exceeded 80 mA.	Turn the power OFF and remove the cause of the over current. Then turn the power ON again.
System error	Er0	An internal data error has occurred.	Turn the power OFF and turn it ON again.
	Er4		
	Er6		
	Er8		

Accumulated flow error	999 Accumulated flow displayed (flashing)	The accumulated flow has exceeded the accumulated flow range. (For count up display)	Reset the accumulated flow. (Press the Δ and ▽ buttons simultaneously for 1 second or longer)
	0 Accumulated flow displayed (flashing)	The accumulated flow has reached the set accumulated flow value. (For count down display)	

*: If the error cannot be reset after the above measures are taken, then please contact SMC.

14 Contacts

AUSTRIA	(43) 2262 62280-0	LATVIA	(371) 781 77 00
BELGIUM	(32) 3 355 1464	LITHUANIA	(370) 5 264 8126
BULGARIA	(359) 2 974 4492	NETHERLANDS	(31) 20 531 8888
CZECH REP.	(420) 541 424 611	NORWAY	(47) 67 12 90 20
DENMARK	(45) 7025 2900	POLAND	(48) 22 211 9600
ESTONIA	(372) 651 0370	PORTUGAL	(351) 21 471 1880
FINLAND	(358) 207 513513	ROMANIA	(40) 21 320 5111
FRANCE	(33) 1 6476 1000	SLOVAKIA	(421) 2 444 56725
GERMANY	(49) 6103 4020	SLOVENIA	(386) 73 885 412
GREECE	(30) 210 271 7265	SPAIN	(34) 945 184 100
HUNGARY	(36) 23 511 390	SWEDEN	(46) 8 603 1200
IRELAND	(353) 1 403 9000	SWITZERLAND	(41) 52 396 3131
ITALY	(39) 02 92711	UNITED KINGDOM	(44) 1908 563888

SMC Corporation

URL <http://www.smcworld.com> (Global) <http://www.smc.eu.com> (Europe)

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