



Installation & Maintenance Manual

Digital Flow Switch

PFMC7501/7102/7202



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.

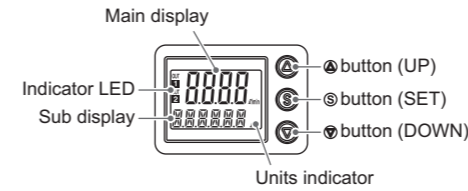
NOTE

- 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 (Continued)

Display



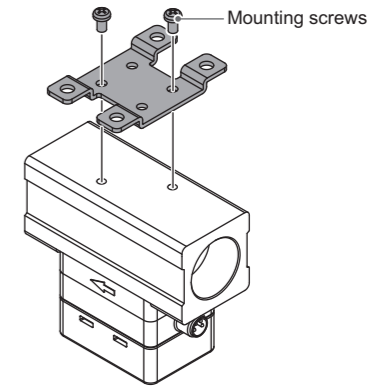
Element	Description
Main display	Displays the flow value, setting mode and error codes. (2 colour display)
Indicator LED	Displays the output status of OUT1 and OUT2. When the accumulated pulse output mode is selected, the output display will turn OFF.
Sub display	Displays the accumulated flow, set value, peak/bottom value and line names when in the measurement mode. (1 colour display)
▲ button (UP)	Selects the mode and the display shown on the Sub display, or increases the ON/OFF set value.
Ⓢ button (SET)	Press this button to change the mode and to set a value.
▼ button (DOWN)	Selects the mode and the display shown on the Sub display, or decreases the ON/OFF set value.
Unit indicator	Indicates the unit currently selected.

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

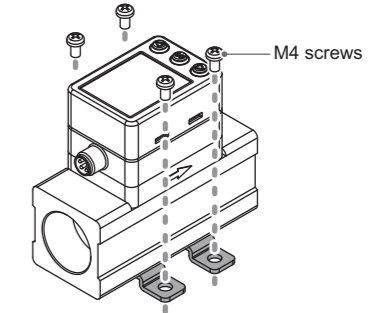
3 Mounting and Installation (Continued)

Bracket mounting

- Mount the bracket to the product using the mounting screws (2 pcs.).
- Fasten the bracket mounting screws to a torque of 0.5 to 0.7 Nm.

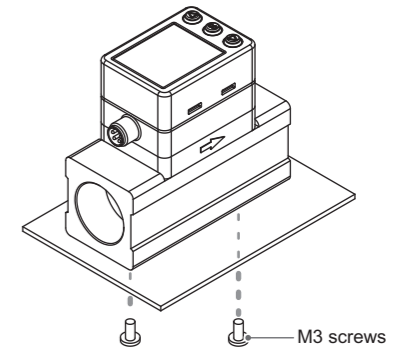


- Mount the product with bracket using M4 screws (4 pcs.) or equivalent.
- Screw is prepared by customer.
- Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for bracket thickness and mounting hole dimensions.



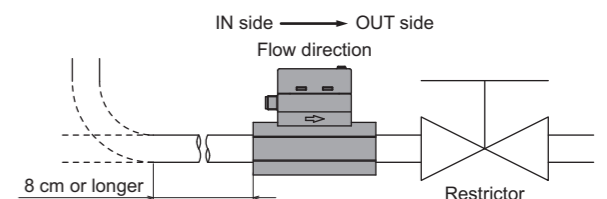
Direct mounting

- For direct mounting use M3 screws (2 pcs.) or equivalent.
- Screws are prepared by customer.
- Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>) for mounting hole sizes.
- Tightening torque is 0.5 to 0.7 Nm.



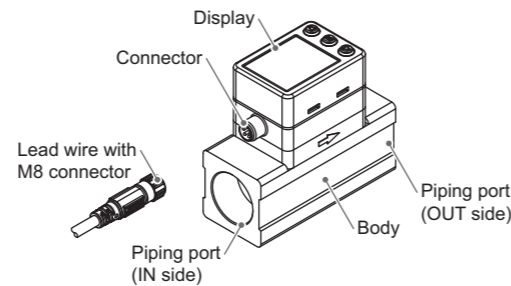
Piping

- 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.



2 Summary of Product parts

Body



Element	Description
Display *	See below.
Connector	M8 connector for electrical connections.
Lead wire with M8 connector	Lead wire for power supply and outputs.
Piping port	For piping connections. Connected to the fluid inlet at IN and to the fluid outlet at OUT.
Body	The body of the product.

*: A protective tape is affixed to the display. Please remove it before use.

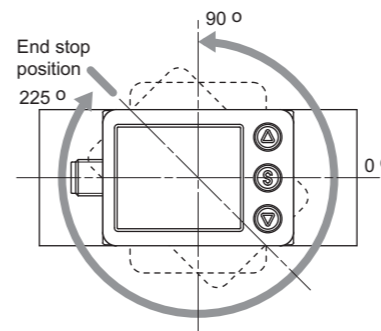
Connector pin numbers (on the product)

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

3 Mounting and Installation

Mounting

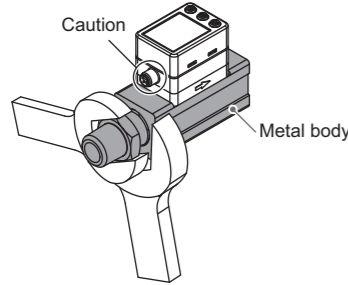
- Never mount the product in a place where it will be used as a mechanical support.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the side of the body.
- The monitor with integrated display can be rotated. It can be positioned at 45° and 90° intervals, clockwise and anti-clockwise. Rotating the display with excessive force will damage the end stop.



3 Mounting and Installation (Continued)

○Piping for the metal body

- Tighten to the specified torque. Refer to the table below for the required torque values.
- 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 body 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.



Nominal thread size	Required torque	Piping port size	Width across flats of attachment
Rc1/2, NPT1/2	28 to 30 Nm	1/2	30 mm
Rc3/4, NPT3/4		3/4	35 mm

○Piping for the One-touch fitting

- For the one-touch fitting, use tubing with a tube inside diameter of 9 mm or more.
- Accuracy can vary approximately ±2%F.S. when such tubing is not used.

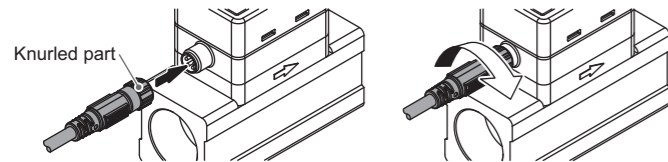
■Wiring

○Connection

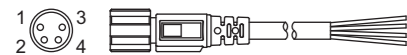
- Connections should only be made with the power supply turned off.
- Use a separate route for the product wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode 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

- Align the lead wire connector with the connector key groove, and insert it straight in. When the knurled part is fully tightened. Check that the connection is not loose.
- When removing the connector, unlock the knurled part and pull out the connector straight.



○Connector pin numbers (lead wire)



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

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

Power is supplied

The output will not operate for 3 seconds after supplying power. The identification code of the product is displayed.

[Measurement mode]

Measurement mode is the condition where the flow is detected and displayed, and the switch function is operating. This is the basic mode; other modes should be selected for set-point changes and other function settings.

Sub display

In measurement mode, the sub display can be temporarily changed (for 30 seconds) by pressing the Δ or ∇ button.

*: Example for 500 L/min type
 *: The set values of OUT2 and the accumulated value of OUT2 cannot be displayed.
 *: To display other indications than "Set values" normally, perform settings referring to the function selection mode [F10].

Press the S button once. Press the S button for 2 seconds or longer.

Flow Setting [3 step setting mode] **Function Setting** [Function selection mode] **Other functions**

*: 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.

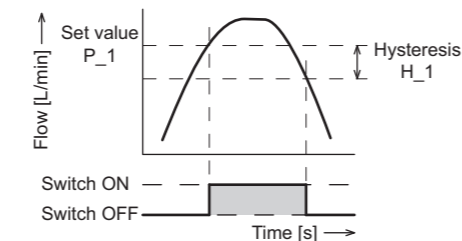
5 Flow Setting (set value only) of OUT1 • OUT2

■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 *	PFMC7501	250 L/min
	PFMC7102	500 L/min
	PFMC7202	1000 L/min
[H_1] Hysteresis of OUT1 [H_2] Hysteresis of OUT2 *	PFMC7501	25 L/min
	PFMC5102	50 L/min
	PFMC7202	100 L/min

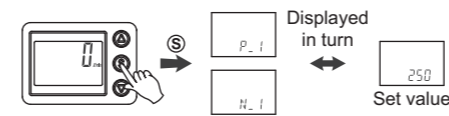
*: Only available for models with switch outputs for both OUT1 and OUT2.

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

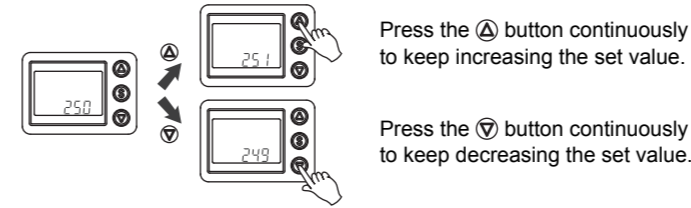
5 Flow Setting (set value only) of OUT1 • OUT2 (Continued)

■Operation

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



- 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.



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

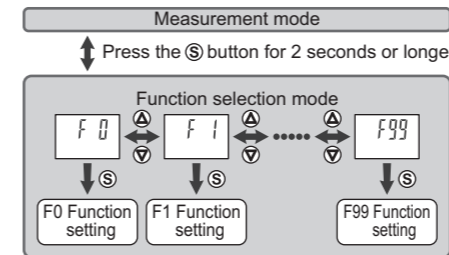


- *: For models with switch outputs for both OUT1 and OUT2, [P_2] or [n_2] will be displayed too. Set as above.
- *: If a mode other than Hysteresis Mode is selected, refer to the operation manual from SMC website (URL <http://www.smcworld.com>) or contact SMC.
- *: Note that the set value and hysteresis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

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. → A
 - Turn the switch output ON when the flow falls below the set value. → B
 - Turn the switch output ON when the flow is more, or less, than a specific flow range. → C

Switch operation	Normal output	Reversed output
Hysteresis mode	<p>Instantaneous flow A</p>	<p>Instantaneous flow B</p>
Window comparator mode	<p>Instantaneous flow C</p>	<p>Instantaneous flow C</p>

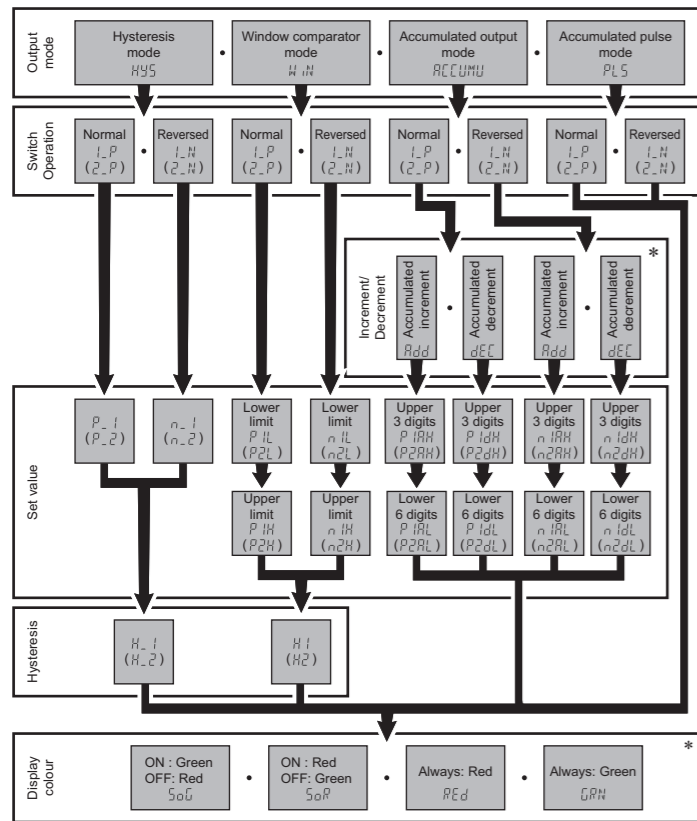
Accumulated output mode	<p>Display: Count up (AC1 = Add)</p> <p>•Count up from "0". •Turn ON when the set value is reached. •Return to "0" by set.</p>	<p>Display: Count up (AC1 = Add)</p> <p>•Count up from "0". •Turn OFF when the set value is reached. •Return to "0" by set.</p>
	<p>Display: Count down (AC1 = dEC)</p> <p>•Count down from set value. •Turn ON when the "0" is reached. •Return to set value by set.</p>	<p>Display: Count down (AC1 = dEC)</p> <p>•Count down from set value. •Turn OFF when the "0" is reached. •Return to set value by set.</p>
Accumulated pulse output mode		

*: 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 **▲** or **▼** button in function selection mode to display [F 1] on the main display. [oUt1] and [the current set value (output mode)] are displayed in turn on the sub display.

Press the **S** button for 2 seconds or longer.

Press the **S** button.

Output mode

[oU1] is displayed on the main display. [The current set value] flashes on the sub display. Press the **▲** or **▼** button to select.

Press the **S** button to set.

Switch operation

[1ot] is displayed on the main display. [The current set value] flashes on the sub display. Press the **▲** or **▼** button to select.

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 **▲** 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 **▲** or **▼** button to change the value.
*: The set value and hysteresis settings limit each other.

Press the **S** button to set.

Display colour

[CoL] is displayed on the main display. [The current set value] flashes on the sub display. Press the **▲** or **▼** button to select.

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

- **Reset operation** (Press the **▲** 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

- In measurement mode, press the **S** button for 2 seconds or longer to display [F 0].
- Press the **▲** or **▼** button to display [F99]. Press the **S** button.
- Press the **▲** or **▼** button to display [on]. Press the **S** and **▼** buttons simultaneously for 5 seconds or longer.
- 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 (Main display)	Default settings (Sub display)
[F 0] [r EF] Reference condition	[ANR] Standard condition
[Un i] Unit selection function *1	[L] L/min
[oU1] Output mode of OUT1	[HYS] Hysteresis mode
[1ot] Switch operation of OUT1	[1_P] Normal output
[P_1] Set value of OUT1	[250] 250 L/min (PFMC7501)
	[500] 500 L/min (PFMC7102)
	[1000] 1000 L/min (PFMC7202)
[H_1] Hysteresis of OUT1	[25] 25 L/min (PFMC7501)
	[50] 50 L/min (PFMC7102)
	[100] 100 L/min (PFMC7202)
[CoL] Display colour of OUT1	[SoG] Green when ON, Red when OFF
[oU2] Output mode of OUT2 *2	[HYS] Hysteresis mode
[2ot] Switch operation of OUT2 *2	[2_P] Normal output
[P_2] Set value of OUT2 *2	[250] 250 L/min (PFMC7501)
	[500] 500 L/min (PFMC7102)
	[1000] 1000 L/min (PFMC7202)
[H_2] Hysteresis of OUT2 *2	[25] 25 L/min (PFMC7501)
	[50] 50 L/min (PFMC7102)
	[100] 100 L/min (PFMC7202)
[F 3] [r ES] Response time	[1.0] 1 second
[F10] [Sub] Sub display	[oUt] Set value
[F20] [inP] External input *3	[REACUM] Accumulated flow external reset
[F22] [Fr E] Setting of analogue output *4	[oFF] Variable range OFF
[F30] [SAVe] Accumulated value hold	[oFF] Not held
[PoS] Orientation	[HoR] Horizontal mounting
[F31] [Pr S] Supply pressure	[M id] 0.4 MPa minimum, 0.6 MPa maximum

[F80] [dSP] Display OFF mode	[oN] Display ON
[F81] [P in] Security code	[oFF] Not used
[F82] [L inE] Line name	[* * * * *]
[F90] [ALL] Setting of all functions	[oFF] Not used
[F98] [tESt] Output check	[NoRMAL] Normal output
[F99] [in i] Reset to the default settings	[oFF] Reset OFF

- *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	HHH	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	Er 1	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	Er 2	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	Er 0	An internal data error has occurred.	Turn the power OFF and turn it ON again.
	Er 4		
	Er 6		
	Er 8		

Accumulated flow error	999	The accumulated flow has exceeded the accumulated flow range. (For accumulated increment)	Reset the accumulated flow. (Press the ▲ and ▼ buttons simultaneously for 1 second or longer.)
	999999		
	0	The accumulated flow has reached the set accumulated flow value. (For accumulated decrement)	

*: 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.smceu.com> (Europe)

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