

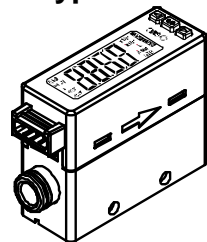


ORIGINAL INSTRUCTIONS



Refer to Declaration of Conformity for relevant Directives

**Instruction Manual**  
**Digital Flow Switch – Integrated type**  
**PF2M7## series**



The intended use of the digital flow switch is to monitor and display flow information.

**1 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)<sup>\*)</sup>, and other safety regulations.

<sup>\*)</sup> ISO 4414: Pneumatic fluid power - General rules relating to systems.  
ISO 4413: Hydraulic fluid power - General rules relating to systems.  
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)  
ISO 10218-1: Manipulating industrial robots -Safety. etc.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.
- This product is class A equipment intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted or radiated disturbances.

	<b>Caution</b>	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	<b>Warning</b>	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	<b>Danger</b>	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

**Warning**

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- **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.**  
Fire, malfunction or damage to the product can result.
- **Do not operate in an atmosphere containing flammable, explosive or corrosive gas.**  
Fire or an explosion can result.
- **Do not use the product for flammable fluids.**  
Fire, explosion, damage or corrosion can result.
- **If using the product in an interlocking circuit:**  
Provide a double interlocking system, for example a mechanical system.
- **Check the product for correct operation.**  
Otherwise malfunction can result, causing an accident.
- **Do not use the product in a place where static electricity is a problem.**  
Product failure or system malfunction may result.  
Otherwise electric shock, malfunction or product damage can result.
- Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more safety instructions.

**2 Specifications**

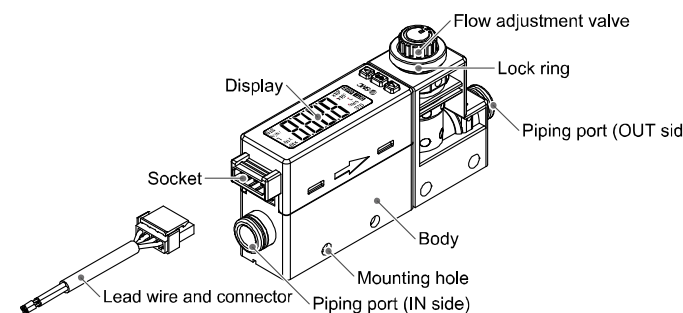
Model	PF2M710	PF2M725	PF2M750	PF2M711		
Fluid	Applicable fluid	Dry air, N <sub>2</sub> , Ar, CO <sub>2</sub> (ISO8573-1 1.1.2 to 1.6.2)				
	Fluid temp. range	0 to 50 °C				
Flow rate	Detection method	Thermal type (branch flow type)				
	Rated range	Dry air, N <sub>2</sub> , Ar	0.1 to 10 L/min	0.3 to 25 L/min	0.5 to 50 L/min	1 to 100 L/min
		CO <sub>2</sub>	0.1 to 5 L/min	0.3 to 12.5 L/min	0.5 to 25 L/min	1 to 50 L/min
	Set range	Instantaneous flow	-5 to 105% (to maximum rated flow)			
		Accumulated flow	0.0 to 99999999.9 L	0 to 999999999 L		
	Min. unit	Instantaneous flow	0.01 L/min	0.1 L/min		
		Accumulated flow	0.1 L	1 L		
	Accumulated volume per pulse		0.1 L/Pulse		1 L/Pulse	
		Accumulated value hold	Select from 2 minutes and 5 minutes			
	Pressure	Rated pressure range	-0.07 to 0.75 MPa			
Proof pressure		1.0 MPa				
Pressure loss		Refer to the pressure loss graph.				
Pressure characteristics		±5% F.S. ±1 digit (0.35 MPa standard)				
Electrical	Power supply voltage	12 to 24 VDC ±10%				
	Current consumption	35 mA or less				
	Protection	Polarity protection				
Accuracy	Display accuracy	±3% F.S. ±1 digit				
	Analogue output accuracy	±3% F.S.				
	Repeatability	±1%F.S. ±1 digit (±2% F.S. ±1 digit when digital filter is 0.05 s)				
	Temperature characteristics	±3%F.S. ±1 digit (15 to 35 °C: 25 °C standard) ±5%F.S. ±1 digit (0 to 50 °C: 25 °C standard)				
	Output type	Select from NPN or PNP open collector output				
Switch output	Output mode	Select from hysteresis mode, window comparator mode, accumulated output mode, accumulated pulse output mode, error output and switch output OFF				
	Switch operation	Select from normal output and reversed output				
	Maximum load current	80 mA				
	Maximum applied voltage	28 VDC (NPN only)				
	Internal voltage drop	NPN: 1 V or less (Load current 80 mA) PNP: 1.5 V or less (Load current 80 mA)				
	Response time	50 mA or less				
	Delay time	0 to 0.10 s (0.01 s increment), 0.1 to 1.0 s (0.1 s increment), 1 to 10 s (1 s increment) Select from 20 s, 30 s, 40 s, 50 s, 60 s				
	Hysteresis	Variable				
	Protection	Short circuit protection				
	Analogue output	Output type	Voltage output: 1 to 5 V (or 0 to 10 V), Current output: 4 to 20 mA			
Impedance		Voltage	Output impedance approx. 1 kΩ			
		Current	Max. load impedance Power supply voltage 24 V: 600 Ω Power supply voltage 12 V: 300 Ω			
Response time		50 ms ±40%				

**2 Specifications (continued)**

Model	PF2M710	PF2M725	PF2M750	PF2M711	
Reference condition	Select from normal condition (STD) and Standard condition (NOR)				
	Output mode				
Unit	Instantaneous flow	L/min, cfm			
	Accumulated flow	L, ft <sup>3</sup>			
Display range	Instantaneous flow	-0.5 to 10.5 L/min	-1.3 to 26.3 L/min	-2.5 to 52.5 L/min	-5 to 105 L/min
	Zero cut-off range	0 to ±10%F.S. (selected for every 1% F.S. of max. rated flow rate)			
Display	Accumulated flow	0.0 to 99999999.9 L	0 to 999999999 L		
	Display	Display type: LCD, Display colour: Red, green, Display digit: 7-segment, 4 digits			
Operation LED	LED is ON when switch output is ON, OUT1/OUT2: Orange				
Digital filter	Select from 0.05 s, 0.1 s, 0.5 s, 1 s, 2 s and 5 s				
Environmental	Enclosure	IP40			
	Withstand voltage	1000 VAC, 1 min. between terminals and housing			
	Insulation resistance	50 MΩ or longer (with 500 VDC) between terminals and housing			
	Operating temperature range	Operation: 0 to 50 °C, Storage: -10 to 60 °C (no freezing or condensation)			
Operating humidity range	Operation, Storage: 35 to 85%R.H. (no freezing or condensation)				
Standards	CE marked (EMC, RoHS directive)				
Piping	Piping specification	C6 (φ6)		C8 (φ8)	
	Port direction	Straight			
Material fluid contact parts	PPS, PBT, FKM, SUS304, brass (Electroless nickel plating), Si, Au, GE4F				

**3 Names of Individual parts**

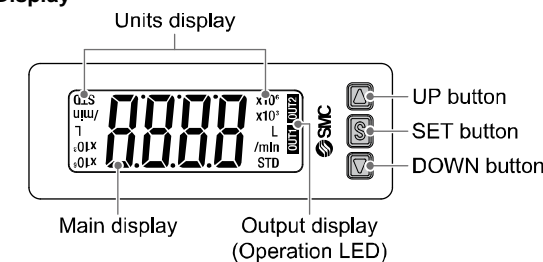
**3.1 PF2M7## (with flow adjustment valve)**



Item	Description
Socket	Socket for electrical connections.
Piping port	Connected to the fluid inlet IN side and to the fluid outlet OUT side.
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 output signals.

**3 Names of Individual parts (continued)**

**3.2 Display**



Item	Description
UP button	Selects the mode or increases the ON/OFF set value. Press this button to change to the peak display mode.
DOWN button	Selects the mode or decreases the ON/OFF set value. Press this button to change to the bottom display mode.
Main 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).
SET button	Press this button to change to another mode and to set a value.
Output display (Operation LED)	Displays the output status of OUT1 and OUT2. OUT1: LED is ON (Orange) when the output is ON. OUT2: LED is ON (Orange) when the output is ON. When the accumulated pulse output mode is selected, the output display is OFF.
Units display	Arbitrary units are ON based on the flow display setting (instantaneous or accumulated flow)

**4 Installation**

**4.1 Installation**

**Warning**

- Do not install the product unless the safety instructions have been read and understood.
- Use the product within the specified operating pressure and temperature range.
- Proof pressure could vary according to the fluid temperature. Check the characteristics data for operating pressure and proof pressure.

**4.2 Environment**

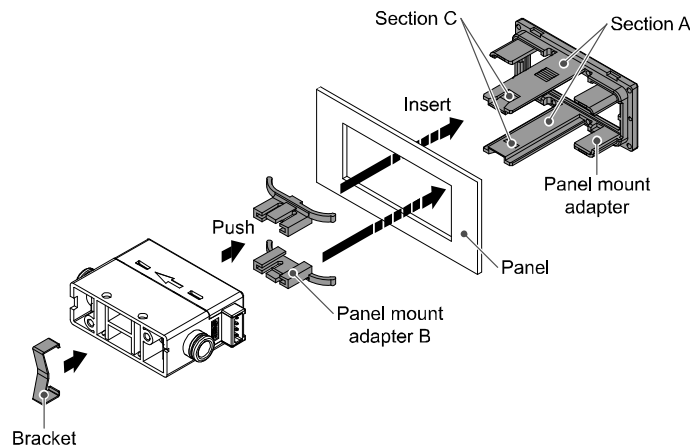
**Warning**

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Refer to the flow direction of the fluid indicated on the product for installation and piping.
- Do not mount the body with the bottom facing upwards. Retention of air can cause inability to measure accurately.
- Do not insert metal wires or other foreign matter into the piping port. This can damage the sensor causing failure or malfunction.
- Never mount a product in a location that will be used as a foothold. The product may be damaged if excessive force is applied by stepping or climbing onto it.
- If there is a risk of foreign matter entering the fluid, install and pipe a filter or mist separator at the inlet to avoid failure and malfunction. Otherwise damage or malfunction can result.

### 4 Installation (continued)

#### 4.3 Panel mounting

- Insert panel mount adapter B (supplied as an accessory) into section A of the panel mount adapter. Push panel mount adapter B from behind until the display is fixed onto the panel.
- The bracket pin 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.

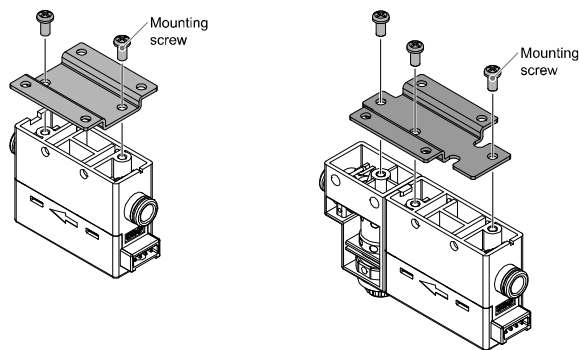


#### 4.4 Bracket mounting

- Mount the bracket using the mounting screws supplied.
- The required tightening torque is 0.42 ±0.04 Nm.
- Install the product (with bracket) using the M3 screws (4 pcs.).
- Bracket thickness is approximately 1.2 mm.

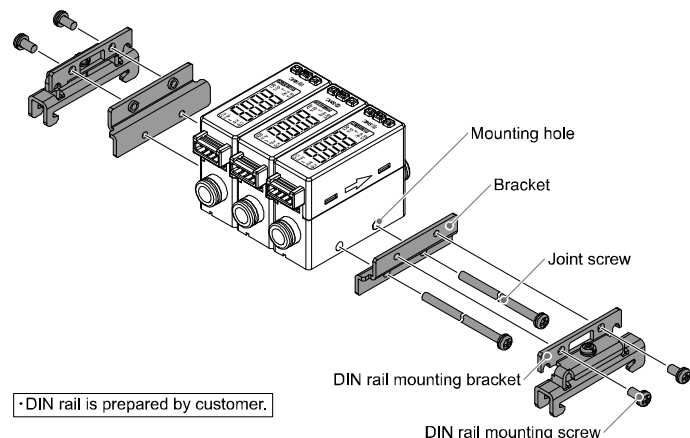
Without flow adjustment valve (using ZS-33-M)

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



#### 4.5 DIN rail mounting (using ZS-33-R#)

- Mount the DIN rail mounting parts using the 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.



\*DIN rail is prepared by customer.

- Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for all mounting dimensions.

### 4 Installation (continued)

#### 4.6 Piping

##### Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- Ensure there is no leakage after piping.
- Any dust left in the piping should be flushed out by air blow before connecting piping to the product. Otherwise damage or malfunction can result.

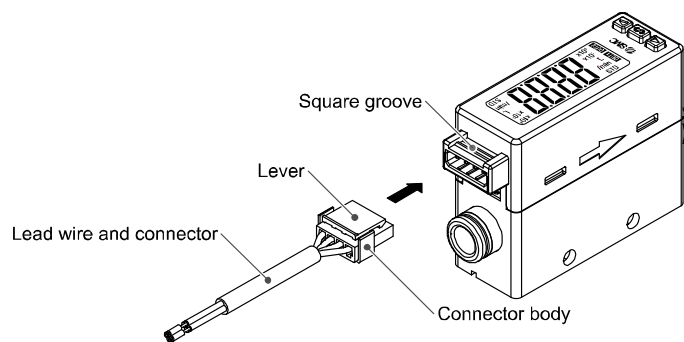
#### 4.7 Wiring

##### Caution

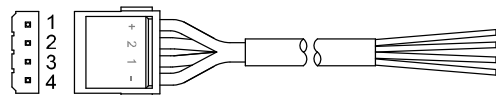
- Do not perform wiring while the power is on.
- Confirm proper insulation of wiring.
- Do not route wires and cables together with power or high voltage cables. Otherwise the product can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage. Do not use a cable longer than 30 m.
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply.
- When the analogue output is used, install a noise filter (line noise filter, ferrite element, etc.) between the switch-mode power supply and this product.

#### 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.



#### Connector pin numbers (on the lead wire)



Connector pin numbers	Wire colour	Description
1	Brown	DC (+)
2	White	OUT2 / Analogue output
3	Black	OUT1
4	Blue	DC (-)

### 5 Outline of Settings

#### Power is supplied

The product code is displayed for approximately 3 seconds after power is supplied. Then measurement mode will be displayed and the switch operation will start.

**[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.

Current flow rate value or peak/bottom value

- Press the SET button once
- Press the SET button between 2 to 5 seconds
- Press the SET button for 5 seconds or longer

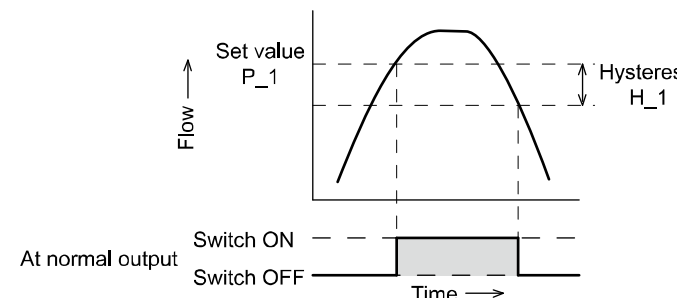
<b>Flow Setting and Hysteresis</b> (Simple setting mode)	<b>Function Setting</b> (Function selection mode)	<b>Other Settings</b> • Snap shot • Key-lock • Zero clear
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- \*: The outputs will continue to operate during setting.
- \*: Simple setting mode and function selection mode settings are reflected each other.

### 6 Flow Setting

#### 6.1 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. The default setting is to turn on the flow switch when the flow reaches the centre of the upper limit of the rated flow range. If the operation shown below is acceptable, keep this setting.



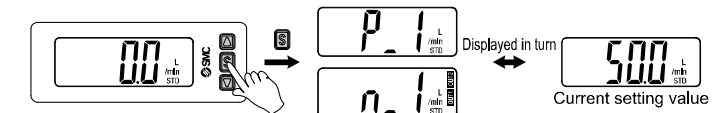
- \*: For hysteresis refer to [F 1] Setting of OUT1 and [F 2] Setting of OUT2.

### 7 Simple Setting mode

#### [Simple setting mode (Hysteresis mode)]

In the Simple setting mode, the set value and hysteresis can be changed.

- Press the SET button once in measurement mode. [P\_1] or [n\_1] and the [current set value] are displayed alternately.



- Change the set value using the UP or DOWN button and press the SET button to set the value. Then, the setting moves to hysteresis setting (The snap shot function can be used).

- Press the UP button continuously to keep increasing the set value.



- Press the DOWN button continuously to keep decreasing the set value.



- [H\_1] and the current set value are displayed in turn.



- Change the hysteresis by pressing the UP or DOWN button and press the SET button. Setting is completed and the product returns to measurement mode (The snap shot function can be used).



- \* For models with switch outputs for both OUT1 and OUT2, [P\_2] or [n\_2] will be displayed. These are set simultaneously.
- \* After enabling the setting by pressing the SET button, it is possible to return to measurement mode by pressing the SET button for 2 seconds or longer.
- \* When hysteresis mode is not used, "Input set value" is displayed.
- \* The set value and hysteresis settings limit each other.
- \* For more detailed setting, set each function in function selection mode.

### 8 Function Setting

#### 8.1 Function selection mode

In measurement mode, press the SET button for 2 to 5 seconds to display [F0] on the display. Select to display the function to be change [F□□]. Press the SET button for 2 seconds or longer in function selection mode to return to measurement mode.

Measurement mode

Press the SET button for 2 to 5 seconds.

Function selection mode

- \*: Some products do not have all the functions. If a function is not available or selected due to configuration of other functions, [- -] is displayed.

**8 Function Setting (continued)****8.2 Default settings**

Item	Default setting
[F 0]	[FLU] Fluid setting [Air] Dry air, N <sub>2</sub>
	[rEF] Ref. condition [Std] Standard condition
	[Unit] Measurement units [ L ] L/min (L)
	[oUt1] Setting of OUT1 [HYS] Hysteresis mode
	[1ot] OUT1 output configuration [1_P] Normal output
[F 1] [oUt1]	[ P_1 ] Set value [ ] 50% of max. rated flow PF2M710: 5 L/min, PF2M725: 12.5 L/min, PF2M750: 25 L/min, PF2M711: 50 L/min
	[ H_1 ] Hysteresis [ ] 5% of max. rated flow PF2M710: 0.5 L/min, PF2M725: 1.3 L/min, PF2M750: 2.5 L/min, PF2M711: 5 L/min
	[dt1] Delay time [0.00] 0.00 s
	[CoL] Display colour [1SoG] ON: Green, OFF: Red
	[oUt2] Setting of OUT2 [HYS] Hysteresis mode
	[2ot] OUT2 output configuration [2_P] Normal output
[F 2] [oUt2]	[ P_2 ] Set value [ ] 50% of max. rated flow PF2M710: 5 L/min, PF2M725: 12.5 L/min, PF2M750: 25 L/min, PF2M711: 50 L/min
	[ H_2 ] Hysteresis [ ] 5% of max. rated flow PF2M710: 0.5 L/min, PF2M725: 1.3 L/min, PF2M750: 2.5 L/min, PF2M711: 5 L/min
	[dt2] Delay time [0.00] 0.00 s
	[CoL] Display colour [1SoG] ON: Green, OFF: Red
[F 3]	[FIL] Digital filter [1.0] 1.0 s
[F 4]	[PrS] Auto-preset function [oFF] Manual
[F10]	[FLo] Display mode [inS] Instantaneous flow
[F11]	[drE] Display resolution [1000] 1000-split
[F13]	[rEv] Reverse display [oFF] Not reverse
[F14]	[CUt] Zero cut-off [1.0] 1% of max. rated flow PF2M710: 0.1 L/min, PF2M725: 0.3 L/min, PF2M750: 0.5 L/min, PF2M711: 1 L/min
[F22]	[AoUt] Analogue output [1-5] 1 to 5 V voltage output. [---] Analogue output is not selectable (current type output)
[F30]	[SAvE] Accumulated flow value hold [oFF] Not held
[F80]	[diSP] Display OFF mode [ on ] Normal display
[F81]	[Pin] Security code [oFF] Unused
[F90]	[ALL] Setting of all functions [oFF] Unused
[F98]	[tEst] Output checking [ n ] Normal output
[F99]	[ini] Reset to the default settings [oFF] Not recover

- \* [Unit] setting is only possible for models with units selection function.
- \* [F 2] only available for models with OUT1 and OUT2 switch outputs.
- \* [F22] function is only available for models with analogue output. Analogue free span function can be selected.

**9 Other Settings**

- Snap shot function
- Key-lock function
- Zero clear function

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for setting these functions.

**10 Maintenance****10.1 General Maintenance****Caution**

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

- **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.

**11 How to Order**

Refer to drawings/catalogue for 'How to Order' information.

**12 Outline Dimensions (mm)**

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for outline dimensions.

**13 Troubleshooting****13.1 Error indication**

Error name	Error display	Description	Measures
Instantaneous flow error		Flow exceeding the upper limit of the set flow range is applied.	Reduce the flow.
		Flow exceeding the lower limit of the set flow range is applied.	Ensure the flow is in the correct direction.
OUT1 over current error		The load current applied to the switch output has exceeded the maximum value. (OUT1)	Turn the power off and remove the cause of the over current.
OUT2 over current error		The load current applied to the switch output has exceeded the maximum value. (OUT2)	Then turn the power on again.
Zero clear error		During zero clear operation, pressure greater than ±5% F.S. is applied. (the mode is returned to measurement mode automatically 1 second later).	Retry the zero clear operation without applying fluid.
System error		An internal data error has occurred.	Turn the power off and turn it on again.
Accumulated flow error	 Accumulated flow is displayed (flashing)	The accumulated flow has exceeded the accumulated flow range. (for accumulated increment)	Reset the accumulated flow. (Press the UP and DOWN buttons simultaneously for <u>1 second or longer</u> )
	 Accumulated flow is displayed (flashing)	The accumulated flow has reached the set accumulated flow. (for accumulated decrement)	

If the error cannot be reset after the above measures are taken, or errors other than the above are displayed, please contact SMC.

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

**14 Limitations of Use****14.1 Limited warranty and Disclaimer/Compliance Requirements**

Refer to Handling Precautions for SMC Products.

**15 Contacts**

Refer to Declaration of Conformity and URL: <https://www.smcworld.com> for contacts.

**SMC Corporation**

URL : <https://www.smcworld.com> (Global) <https://www.smceu.com> (Europe)  
SMC Corporation, Akihabara UDX15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101 0021  
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