No.PF##-OMN0005

Operation Manual

Flow Monitor

PRODUCT NAME

PFMV3## Series

MODEL / Series

SMC Corporation

Table of Contents

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), Japan Industrial Standards (JIS)[*1)] and other safety regulations[*2)].

*1) 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 10218-1992: Manipulating industrial robots -Safety.
JIS B 8370: General rules for pneumatic equipment.
JIS B 8361: General rules for hydraulic equipment.
JIS B 9960-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
JIS B 8433-1993: Manipulating industrial robots - Safety.
etc.
*2) Labor Safety and Sanitation Law, etc.

⚠ 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.

⚠ Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.
1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.
1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

⚠ Caution

1. The product is provided for use in manufacturing industries.
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".
Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.[*3)]
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

*3) Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

Operator

- ♦This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- ♦Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the product.

■Precautions

⚠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.

■NOTE

○Follow the instructions given below when designing, selecting and handling the product.

●The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.

∗Product specifications

- The direct current power supply to combine should be UL approved as follows.
  Circuit (of class 2) which is of maximum 30Vrms (42.4 V peak), with UL 1310 class 2 power supply unit or UL 1585 class 2 transformer.
  The Flow monitor is a UL approved product only if it has a UL mark on the body.
- Use the specified voltage.
  Otherwise failure or malfunction can result.
  Insufficient supply voltage may not drive a load due to a voltage drop inside the product.
  Verify the operating voltage of the load before use.
- Do not exceed the specified maximum allowable load.
  Otherwise it can cause damage or shorten the lifetime of the product.
  Reverse current can cause malfunction or damage to the product.
- Input data to the product is not deleted, even if the power supply is cut off.
  (Writing time: 1000000 times, Data duration: 20 years after power off.)
- Reserve a space for maintenance.
  Allow sufficient space for maintenance when designing the system.

∗Installation

- Tighten to the specified tightening torque.
  If the tightening torque is exceeded the mounting screws and brackets may be broken.
  If the tightening torque is insufficient, the product can be displaced and loosen the mounting screws.
  (Refer to "Mounting and Installation" on page 15 to 16.)
- Do not apply excessive stress to the product when it is mounted with a panel mount.
  Otherwise damage to the product and disconnection from the panel mount can result.
- Be sure to ground terminal FG when using a commercially available switch-mode power supply.
- Do not drop, hit or apply excessive shock (over 100 m/s^2) to the product.
  Otherwise damage to the internal parts can result, causing malfunction.
- Do not pull the lead wire forcefully, not lift the product by pulling the lead wire. (Tensile force 49 N or less)
- 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.

∗Wiring

- Do not pull the lead wires.
  In particular, never lift a product equipped with fitting and piping by holding the lead wires.
  Otherwise damage to the internal parts can result, causing malfunction or to be off the connector.
- Avoid repeatedly bending or stretching the lead wire, or placing heavy load on them.
  Repetitive bending stress or tensile stress can cause the sheath of the wire to peel off, or breakage of the wire.
  If the lead wire can move, fix it near the body of the product.
  The recommended bend radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the ouside diameter of the insulation material, whichever is larger.
  Replace the damaged lead wire with a new one.
- Wire correctly.
  Incorrect wiring can break the product.
- Do not perform wiring while the power is on.
  Otherwise damage to the internal parts can result, causing malfunction.
- 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. Route the wires (piping) of the product separately from power or high voltage cables.
- Confirm proper insulation of wiring.
  Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.
  Do not use a cable longer than 10 m.
  Wire the DC (-) line (blue) as close as possible to the power supply.
- When analog output is used, install a noise filter (line noise filter, ferrite element, etc.) between the switch-mode power supply and this product.

∗Environment

- Do not use the product in area that is exposed to corrosive gases, chemicals, sea water, water or steam.
  Otherwise failure or malfunction can result.
- Do not use in a place where the product could be splashed by oil or chemicals.
  If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction, or hardening of the lead wires)
- Do not use in an area where surges are generated.
  If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the product, this may cause deterioration or breakage of the internal circuit of the product.
  Avoid source.
- Do not use a load which generates surge voltage.
  When a surge-generating load such as a relay or solenoid is driven directly, use a product with a built-in surge absorbing element.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Mount the product in a place that is not exposed to vibration or impact.
  Otherwise failure or malfunction can result.
- Do not use the product in the presence of a magnetic field.
  This may lead to the malfunction of the product.
- Prevent foreign matter such as remnant of wires from entering the product.
  Take proper measures for the remnant not to enter the product in order to prevent failure or malfunction.
- Do not use the product in an environment that is exposed to temperature cycle.
  Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.
  If using in a location directly exposed to sunlight, shade the product from the sunlight.
  Otherwise failure or malfunction can result.
- Keep within the specified fluid and ambient temperatures range.
  Ambient temperature range is 0 to 50 °C.
  Operation under low temperature leads to cause damage or operation failure due to frozen moist in the fluid or air.
  Protection against freezing is necessary.
  Avoid sudden temperature change even within specified temperature.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
  Otherwise malfunction can result.

∗Adjustment and Operation

- Turn the power on after connecting a load.
  Otherwise it can cause excess current causing instantaneous breakage of the product.
- Do not short-circuit the load.
  Although error is displayed when the product load is short circuit, generated excess current lead to cause the damage of the product.
- Do not press the setting buttons with a sharp pointed object.
  It may damage the setting buttons.
- Supply the power when there is no flow.
  There will be a drift on the display and the analog output of approximate +/- 2 to 3% immediately after the power supply is turned on.
- The product is compulsory turned off for 3 seconds after power supplied.
  For 3 seconds after supplying power, the measurement output is turned off.
- Perform settings suitable for the operating conditions.
  Incorrect setting can cause operation failure.
  For details of each setting, refer to page 21 to 43 of this manual.
- During the initial setting and flow rate setting, the product will switch the measurement output with the condition before setting.
  Confirm the output has no adverse effect on machinery and equipment before setting.
  Stop the control system before setting if necessary.
- Do not touch the LCD during operation.
  The display can vary due to static electricity.

∗Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
  There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
  There is a risk of unexpected malfunction.
- Do not use solvents such as benzene, thinner etc. to clean the product.
  They could damage the surface of the body and erase the markings on the body.
  Use a soft cloth to remove stains.
  For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

Model Indication Method

PFM □ □ □ - □ □ □ □ - □ □

Type

Model	Contents
V3	Separate type monitor

Input specification

Model	Contents	Applicable model
0	Voltage input	PFMV5□ (F) -1-□□

Output specification

Model	Contents
0	NPN2 output + 1 to 5 V
1	NPN2 output + 4 to 20 mA
2	NPN2 output + External input*1
3	PNP2 output + 1 to 5 V
4	PNP2 output + 4 to 20 mA
5	PNP2 output + External input*1

*1: Auto-shift and auto-shift zero are selectable.

Unit specification

Model	Contents
Nil	Unit selection function*3
M	SI units only*4

*3: Since the unit for Japan is fixed to SI due to new measurement law, this option is for overseas.

*4: Fixed unit Voltage: V, Real-time flow: L/min

Option 1
(Refer to page10)

Option 2
(Refer to page10)

Option 3
(Refer to page11)

Operation manual

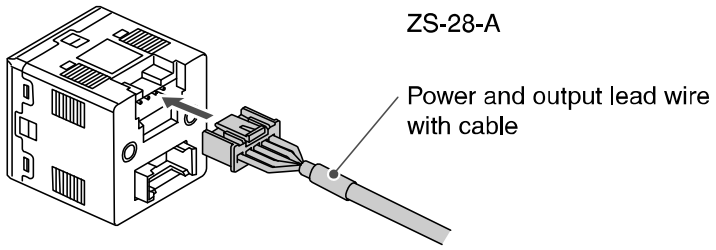
Model	Contents
Nil	With operation manual (Booklet: in Japanese and English)
N	Without operation manual

Proofreading certificate

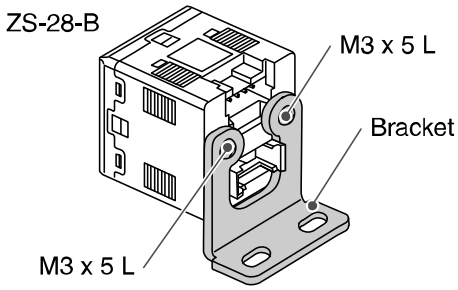
Model	Contents
Nil	Without proofreading certificate
A	With proofreading certificate*2

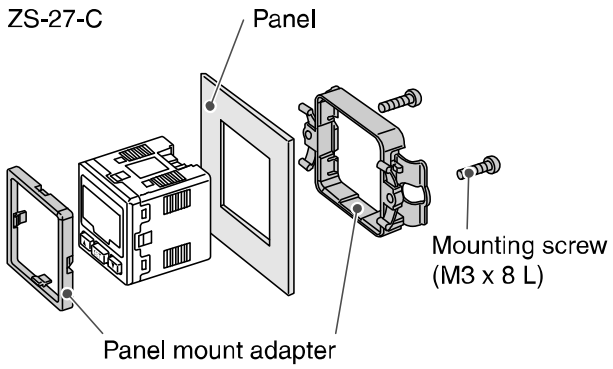
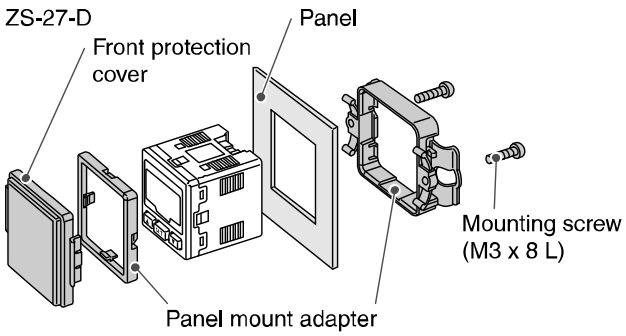
*2: Written in Japanese and English together. Other language is available as special request.
Calibration certificate is for indicated voltage value, not for indicated flow value.

Option 1

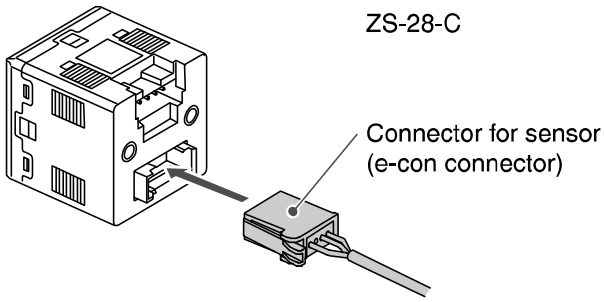
Nil	L
None	Power and output lead wire with cable 

Option 2

Nil	E
None	Bracket 

B	D
Panel mount adapter  	Panel mount adapter + Front protection cover 

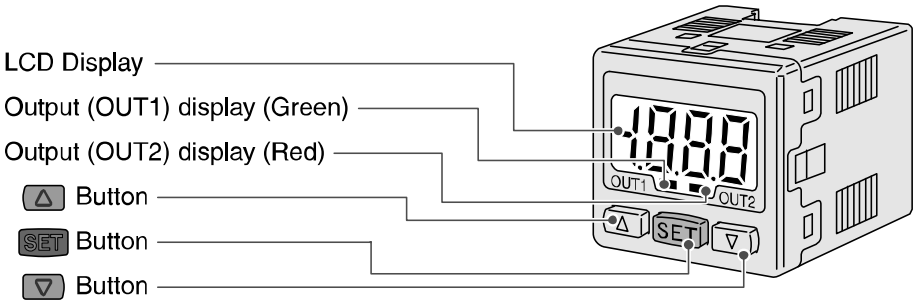
Option 3

Nil	G
None	Connector for sensor 

Part number for options

Model No.	Option	Remarks
ZS-28-A	Power and output lead wire with cable (2 m)	
ZS-28-B	Bracket	M3 x 5 L (2 pcs.)
ZS-28-C	Connector for sensor	1 pc.
ZS-27-C	Panel mount adapter	M3 x 8 L (2 pcs.)
ZS-27-D	Panel mount adapter + Front protection cover	M3 x 8 L (2 pcs.)
ZS-27-01	front protective cover	

Names and Functions of Individual Parts



Description	Function
Output (OUT1) Display (Green)	Light is on when output OUT1 is on.
Output (OUT2) Display (Red)	Light is on when output OUT2 is on.
LCD Display	Displays flow value, set mode condition, and error code. Indication color is selectable from Red and Green depending on output (OUT1) condition.
△Button	Selects the mode and increases the set ON/OFF value. Press this button to change to the peak display mode.
▽Button	Selects the mode and decreases the set ON/OFF value. Press this button to change to the bottom display mode.
SETButton	Press this button to change to each mode and to select a set value.

■Definition and terminology

	Terminology	Definition
A	Analog output	A type of variable output that has a value proportional to the measured quantity. When the analog output is in the range of 1 to 5 V or 4 to 20 mA, it will vary continuously, following the change of flow.
	Auto-preset	This function calculates and sets a rough set value automatically based on the on-going operation.
	Auto-shift	This function outputs the amount of variation relative to the instantaneous flow rate when the signal is input
	Auto-shift zero	This function outputs the amount of variation relative to the instantaneous flow rate when the signal is input, and resets the displayed value to zero when the signal is input.
C	Chattering	The problem of the switch output turning ON and OFF repeatedly around the set value at high frequency due to the effect of pulsation.
D	Display range	The range which can be displayed by the product with a digital display.
F	F.S. (Full span, Full scale)	It reads “full span” or “full scale”, and indicates varied analog output range at rated value. For example, when analog output is 1 to 5V, F.S.＝5[V]-1[V]＝4[V], (ref. 1%F.S.=4[V]x1%=0.04[V])
H	Hysteresis	The difference between ON and OFF points used to prevent chattering. Hysteresis can be effective in avoiding the effects of pulsation.
	Hysteresis mode	Mode where the switch output will turn ON when the flow is greater than the set value, and will turn off when the flow falls below (set value – hysteresis value).
I	Instantaneous flow rate	The flow passing per unit of time. If it is 10 L/min, there is a flow of 10 L passing through the device in 1 minute.
	Internal voltage drop	The voltage that appears in the output when the switch output is on. It depends on the present load current and ideally should be "0".
K	Key-lock function	This function prevents the set value from being changed by mishandling.
M	Min. setting unit	The fineness of the set value and display value. If the minimum setting unit is 1 L/min, the flow can be displayed by 1 L/min at a time, i.e. 10, 11, 12.
O	Operating temp. range	Ambient temperature range in which product is operable.
P	Power saving mode	The condition in which the numerical display turns off and current consumption is reduced.
R	Rated flow range	The flow range that can satisfy the specifications indicated in the catalog.
	Repeatability	Analog output repeatability when flow increases/decrease.
	Response time	Time for analog output reaches 90% of target voltage from when target flow is applied.
S	Setting range	The range of settable ON and OFF points (thresholds) of the product with switch output.

	Terminology	Definition
S	Storage temp. range	Temperature range in which product can be stored without being damaged while power supply and flow not applied.
	Storage humidity. range	Humidity range in which product can be stored without being damaged while power supply and flow not applied.
	Switch output	Output type that has only 2 conditions, ON or OFF. When in the ON condition an indicator light will show, and any connected load will be powered. When in the OFF condition, there will be no indicator light and no power supplied to the load.
T	Temperature characteristic	Analog output change when ambient temp.is changed.
U	Unit conversion function	A function to select display units other than the international unit (SI unit) specified in the new Japanese measurement law. Flow can only be displayed by SI units in Japan.
W	Window comparator mode	An operating mode in which the switch output is turned on and off depending on whether the flow is inside or outside the range of two set values.

Mounting and Installation

■Installation

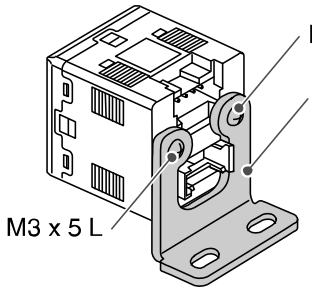
How to mount

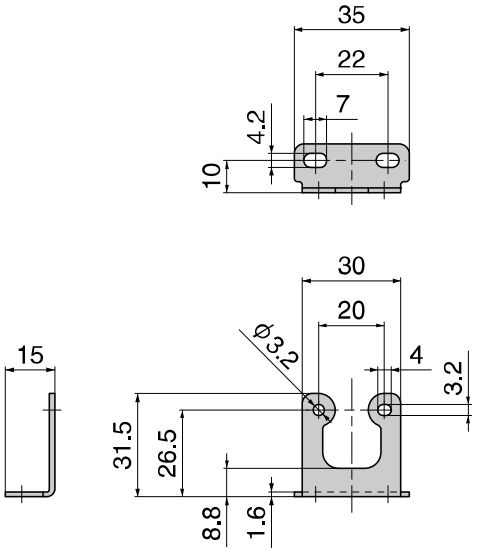
•Mount the optional bracket and panel mount adapter to the product.

Mounting with bracket

Fix the bracket to the product with the set screws M3 x 5 L (2 pcs.) attached.

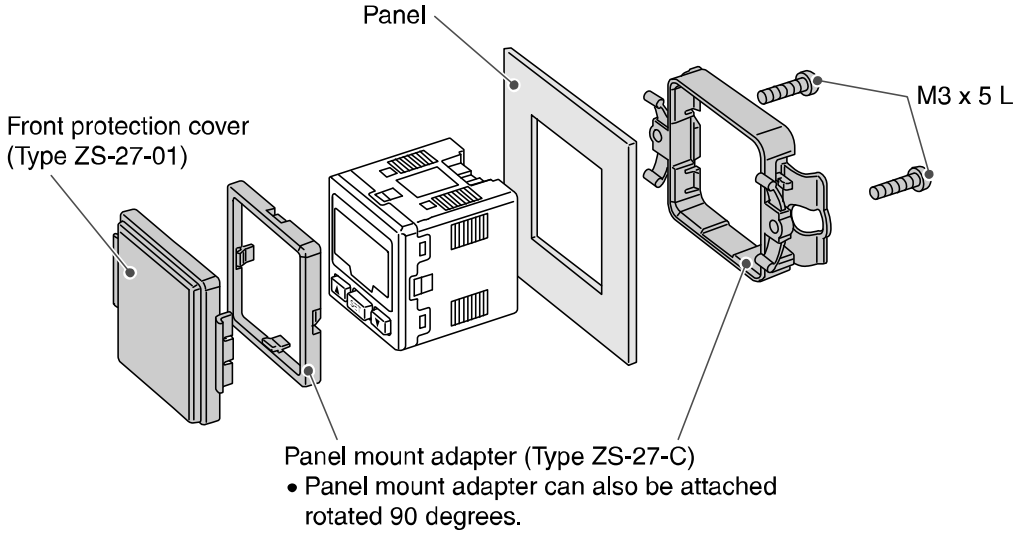
The tightening torque must be 0.5 to 0.7Nm.





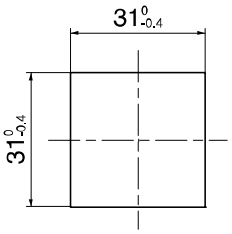
Mounting with panel mount adapter

Fix the panel mount adapter to the product with the set screws M3 x 8 L (2 pcs.) attached.



Panel cut dimensions Panel thickness: 0.5 to 6 mm

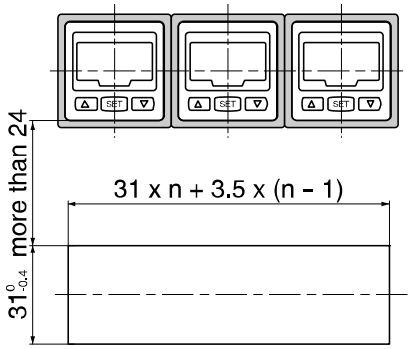
Separate



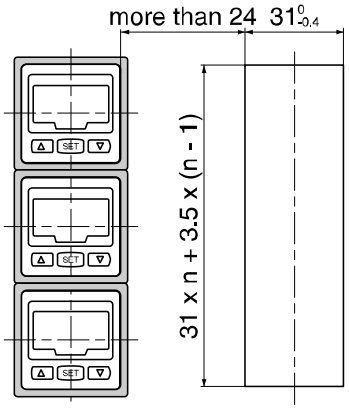
Corner: R2 or less

Two or more in row
n: The number of products

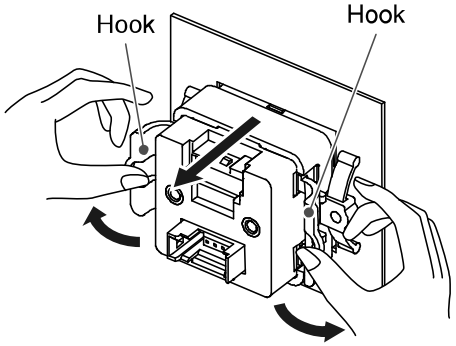
Horizontal



Vertical



Notice when removing the flow monitor
The flow monitor with adapter for panel mounting can be removed from facility by making hook of the product wide as illustration after removing two screws. The product and panel mount adapter may be damaged.



■Wiring

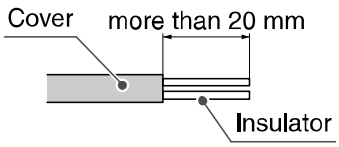
Connection

- •Make connection after turning the power off.
- •Install the lead wire separately from the route for power cable or high-voltage cable. Otherwise, malfunction may potentially result due to noise.
- •Be sure to ground Terminal FG when using a switching regulator obtained on the commercial market. If analog output is performed connecting to a switching regulator obtained on the market, switching noise will be superimposed and product specification can no longer be met. This can be prevented by inserting a noise filter, such as a line noise filter and a ferrite element, between the switching regulator and the product, or by using a series power supply instead of a switching regulator.

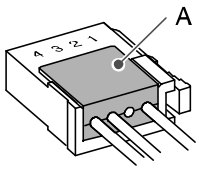
Attaching the connector to the lead wire

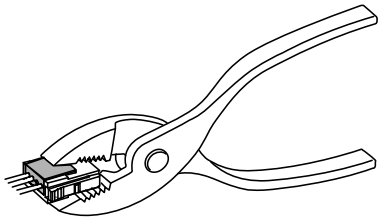
(Sensor wire is stripped as shown in the right figure. Do not cut the insulator.

(The core of the corresponding color shown in the following table is put into the pin of the number stamped on the connector for sensor connection to the back.



Pin no.	Wire color
1	Brown (DC+)
2	NC
3	Blue (DC-)
4	Black (IN (1 to 5 V))





(It checks that the above-mentioned preparation work has been performed correctly, and A part shown in right figure is pushed by hand and makes temporary connection.

(A part center is straightly pushed in by tools, such as pliers.

(Re-use cannot be performed once it connects the connector for sensor connection completely. When you fail in the connection mistake of a core and a pin, or the plug of wire, please use the new connector for sensor connection.

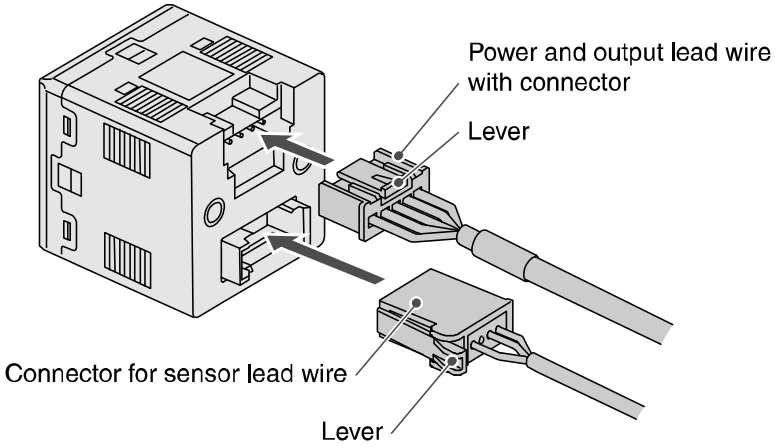
(When the sensor is not connected correctly “LLL” or "HHH” can be displayed.

Connector

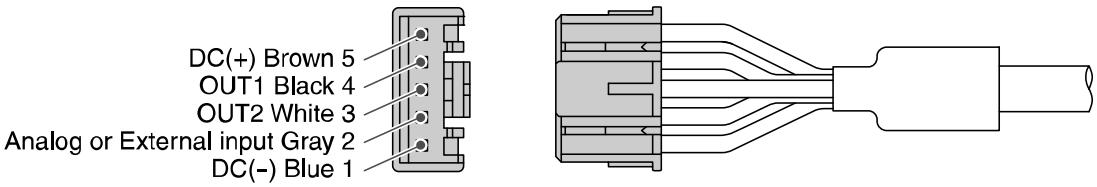
Connecting/Disconnecting

When connecting the connector, insert it straight onto the pin holding the lever and connector body between fingers and lock the connector by pushing the lever claw into the square groove in the housing until connector clicks.

(When disconnecting the connector, push down the lever by thumb to disengage the lever claw from the square groove. Then pull the connector straight out.



Pin no. of the connector for power and output lead wire

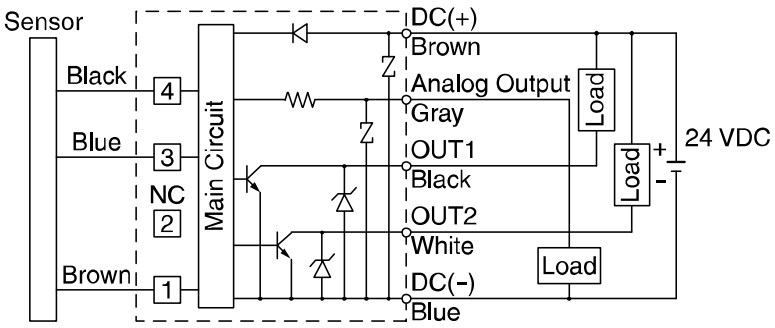


Internal circuit and wiring example

When the lead wire with SMC power and output lead wire (type ZS-28-A) is used, the colors of wire (Brown, Black, White, Gray, Blue) will apply as shown on circuit diagram.

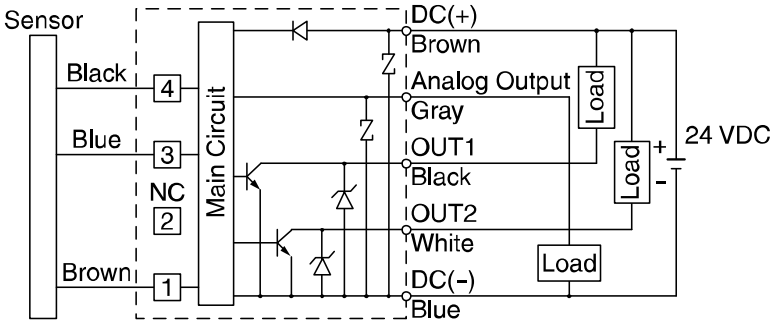
PFMV300

NPN open collector output:
2 outputs
Max. 30 V, 80 mA
Residual voltage 1 V or less
Analog output: 1 to 5 V
Output impedance: Approx. 1 kΩ



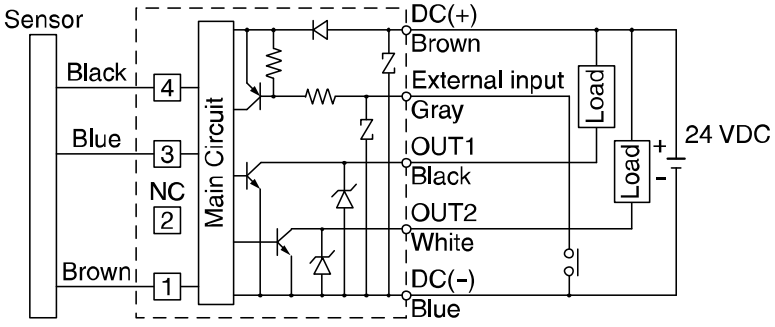
PFMV301

NPN open collector output:
2 outputs
Max. 30 V, 80 mA
Residual voltage 1 V or less
Analog output: 4 to 20 mA
Max. load impedance: 600 Ω (24 VDC)
Min. load impedance: 50 Ω



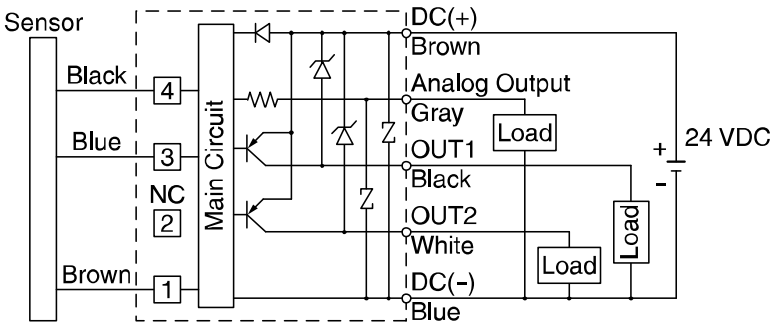
PFMV302

External input
NPN open collector output:
2 outputs
Max. 30V, 80 mA
Residual voltage 1 V or less



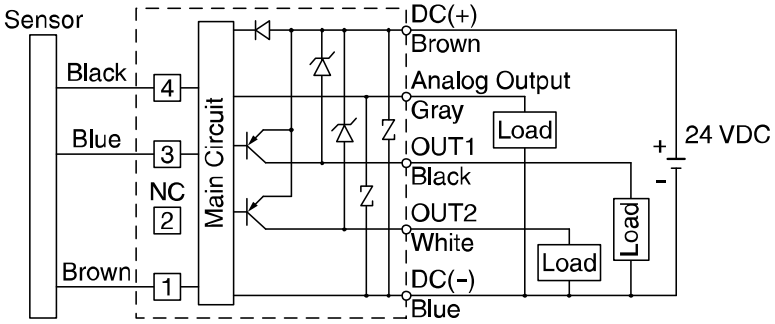
PFMV303

PNP open collector output:
2 outputs
Max. 80 mA
Residual voltage 1 V or less
Analog output: 1 to 5 V
Output impedance: Approx. 1 kΩ



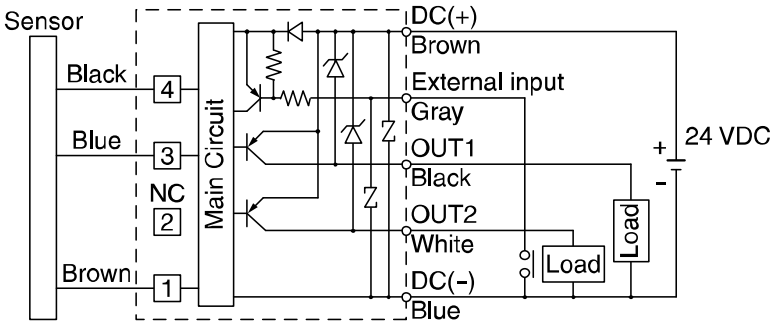
PFMV304

PNP open collector output:
2 outputs
Max. 80 mA
Residual voltage 1 V or less
Analog output: 4 to 20 mA
Max. load impedance: 600 Ω
(24 VDC)
Min. load impedance: 50 Ω



PFMV305

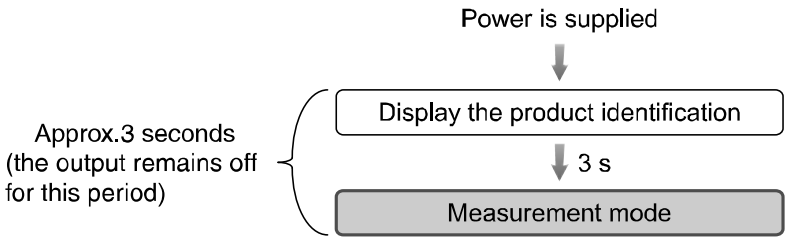
External input
PNP open collector output:
2 outputs
Max. 80 mA
Residual voltage 1 V or less



Flow Setting

What is measurement mode?

The measurement mode is the condition where the flow is detected and indicated, and the switch function is working. This is the basic mode where the setting change and other function settings are available as necessary.

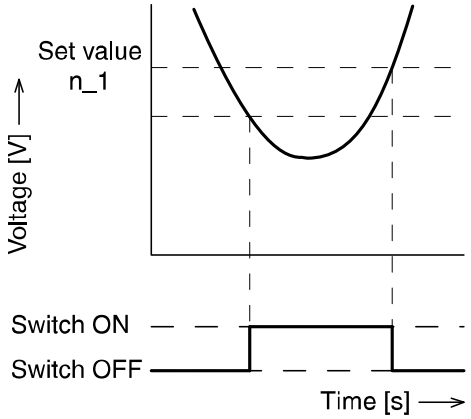


・The display shows [LLL] when the sensor is not connected.

Set ON point and OFF point of the switch.

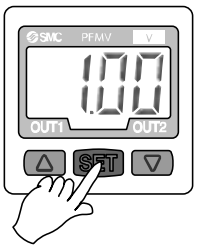
Switch operation

When a flow rate exceeds a setting point, the switch will be turned on.
When the flow rate falls below the setting point by hysteresis or more, the switch will be turned off.
The switch is adjusted such that it will be turned on with the centre point of a flow rate setting range for each product specification.
If the operation shown below doesn't cause any problem, do not change the settings.



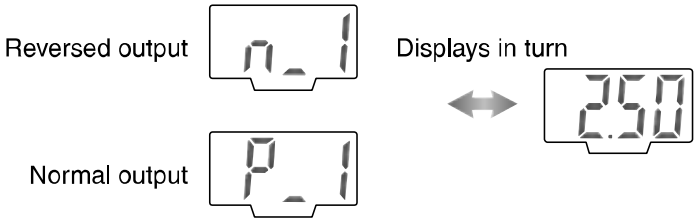
<How to perform> ∗: The flow monitor will also output during setting.

1. Press the SET button once in the measurement mode.



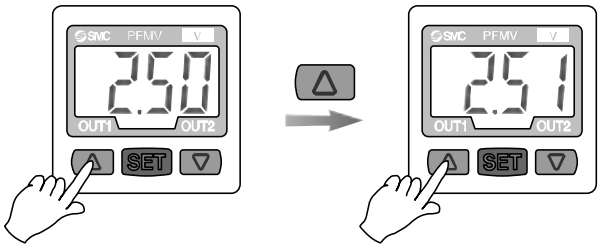
[LLL] is displayed during measurement mode when the sensor is not connected.

2. [n_1] or [P_1] and set value are displayed by turn.

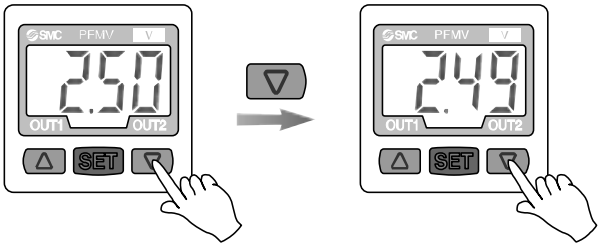


3. Press the △ or ▽ button to change the set value.
   The △ button is to increase and the ▽ button is for decrease.

   Press the △ button once to increase by one figure and press it continuously to keep set figure increased.



   Press the ▽ button once to decrease by one figure and press it continuously to keep set figure decreased.

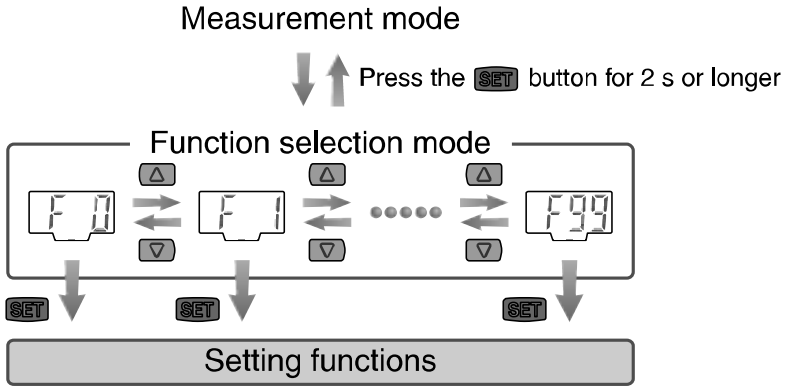


4. Press the SET button to finish the setting of OUT1.
   [n_2] or [P_2] is displayed to continue with settings for OUT2 as above.

Function setting

Function selection mode

It measurement mode, press the button for 2 seconds or longer to display [F 0].
Display [F((], and point the mode to change the setting of each function.
Press the ┌ button for 2 seconds or longer at function selection mode to return to measurement mode.



■Setting at the shipment from a factory

At the time of shipment, the settings are performed as follows.
For other items, keep their values for use if acceptable.

Caution for handling

When the setting is changed, since the different setting item appears in order depending on how many times the SET button is pressed, confirm the item which needs to be set appears and prevent undesired settings.

●[F 0] Setting of auto preset→See page 24

●[F 1] Operation of OUT1→See page 26

Item	Explanation	Default setting
Output mode	Select hysterisis mode or window comparator mode.	Hysteresis mode
Reversed output	To select reversed output.	Normal output
Voltage setting	To set ON point or OFF point of the switch output.	2.50
Hysteresis	Chattering can be prevented by setting hysteresis.	0.12
Indication color	Select the color to indicate.	ON: Green OFF: Red

●[F 2] Operation of OUT2→See page 29

Same setting as [F 1] OUT1
Display colour depends on the setting of OUT1.

Item	Corresponding page	Default setting
[F 3] Setting of response time	29 page	2 ms
[F 4] Setting of external input	30 page	External input OFF
[F 5] Select power saving mode	35 page	OFF
[F 6] Set security code input	36 page	OFF
[F95] Selection of flow indication	37 page	OFF

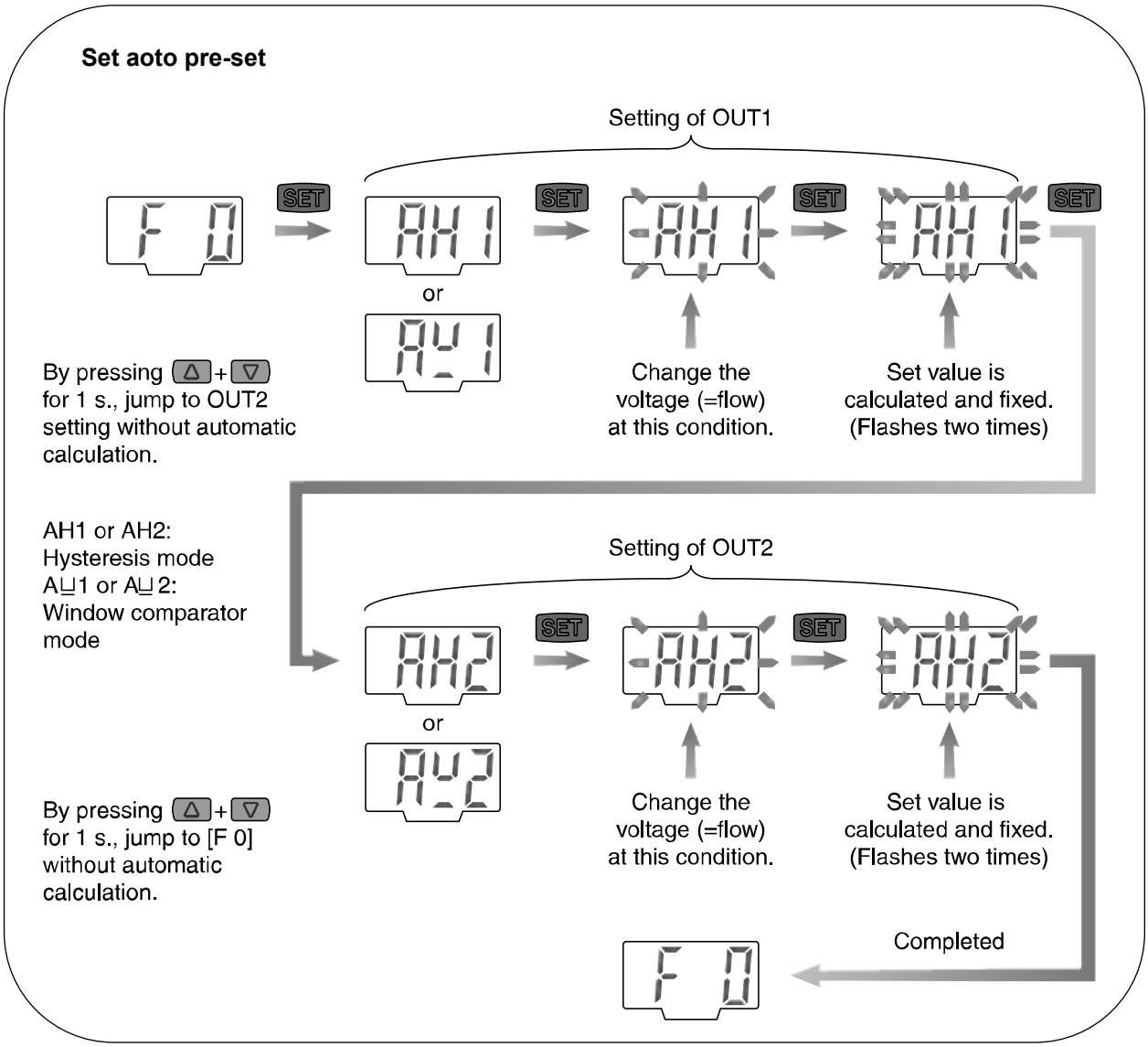
■[F 0] Set auto preset

This function is capable of calculating the specified set value automatically based on the on-going operation.

<Operation>

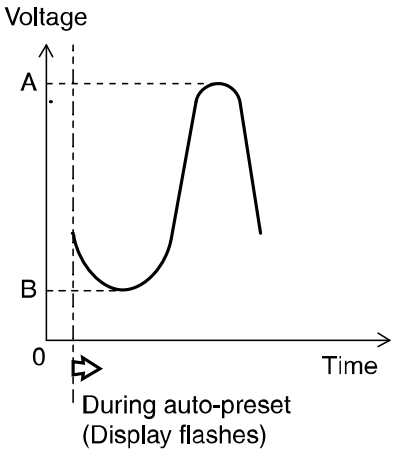
Press the △ or ▽ button at function selection mode to display [F 9]

Press the SET button. ↓ Move on to set auto preset.



Return to measurement mode, and press the SET button for fine adjustment of set value.

●Switch set value during auto preset function mode.
Auto preset is capable of calculating the specified set value automatically based on the on-going Operation.



A: Max. voltage during auto-preset mode
B: Min. voltage during auto-preset mode

・Auto-preset set value

	Hysteresis mode	Window comparator mode
Set value	・P_1＝A－(A－B)/4 ・H_1＝(A－B)/2 (n_1=B+(A-B)/4 in reverse output node)	・P1L＝B ・P1H＝A ・H_1＝5 digit 1 digit means set minimum unit (In reverse output, P1L, P1H become n1L, n1H respectively)

See output mode list for the operation of hysteresis mode and window comparator mode.

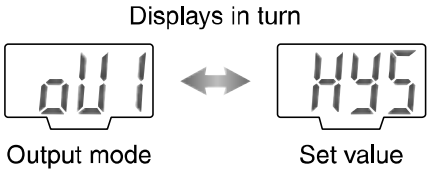
■[F 1] Operation of OUT1

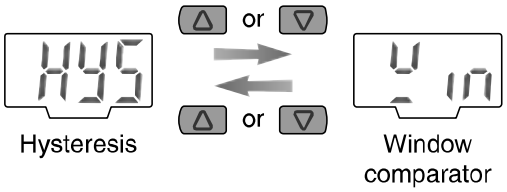
Set output method of OUT1.
The output is provided in relation to the set value.
Display color depends on OUT1 output condition.
In the default setting, green lights when output is turned on. Red lights when output turned off.

<Operation>
Press the △ or button at function selection mode to display [F 1].

Press the SET button to set. ↓ Move on to select output mode.

Select output mode
[oU1] and set value are displayed by turn.
Press the △ or ▽ button to select output mode.

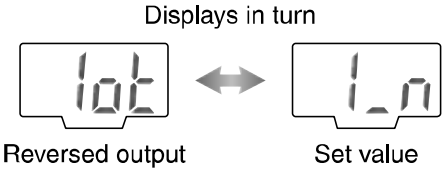


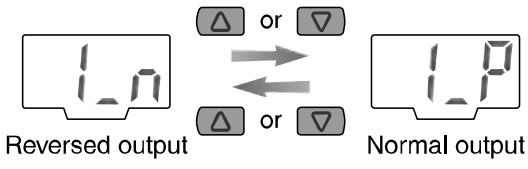


*: If hysteresis mode and window comparator mode is switched, set value is initialized.

Press the SET button to set. ↓ Move on to the selection of reversed output.

Select reversed output
[1ot] and set value are displayed by turn.
Press the △ or ▽ button to select reversed output.



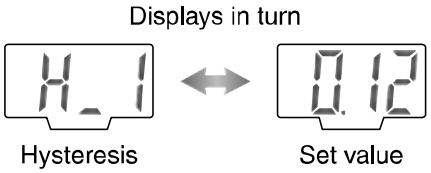


Press the SET button to set. ↓ Move on to flow setting (to be continued).

Voltage setting
Set voltage based on setting procedure on page 21
Hysteresis mode: [n_1]
Window comparator mode: [n1L] [n1H]
∗: At normal output, n becomes P.

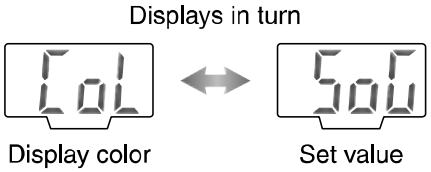
Press the SET button to set. ⇩ Move on to hysteresis change.

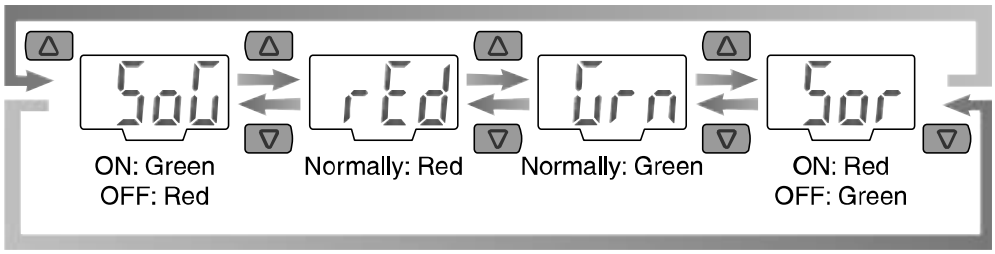
Hysteresis change
[H_1] and set value are displayed by turn.
Press the △ or ▽ button to select hysteresis.
Window comparator mode: [H1]



Press the SET button to set. ⇩ Move on to display color setting.

Display color setting
[CoL] and set value are displayed by turn.
Press the △ or ▽ button to select display color.

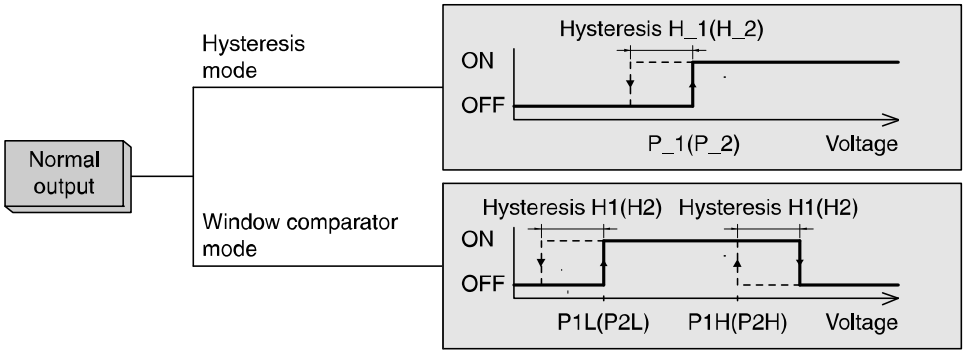


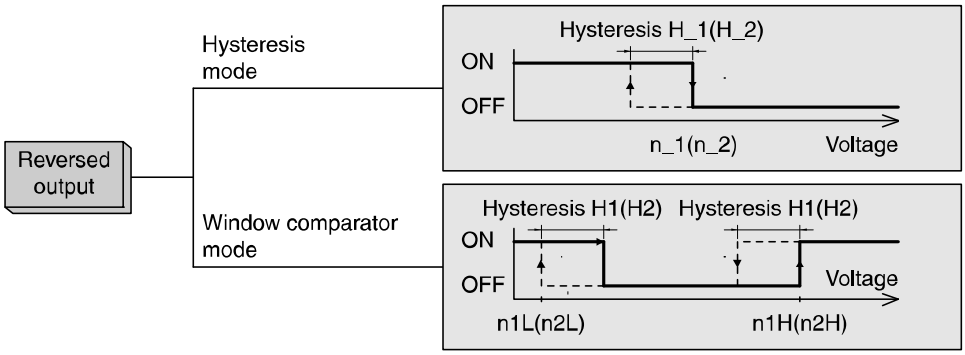


Press the SET button to set. ⇩ Return to function selection mode.

Setting of [F 1] operation of OUT1 completed

●List of output mode





*:
Operation becomes unstable if hysteresis mode or window comparator mode during unstable condition such as fluid fluctuating. This case, keep interval between set values and start using after confirming stable operation.

■[F 2] Operation of OUT2

Set output method of OUT2.
Display color depends on OUT1 output, and is not set with this function.

<Operation>
Press the △ or ▽ button at function selection mode to display [F 2].

Press the SET button. ↓ Move on to output mode selection.

Set based on [F 1] operation of OUT1 (page26-27)

The part displayed as “1”for OUT1 setting is displayed as “2” for OUT2 setting.
〈Ex.〉P_1→P_2
H_1→H_2

*: Voltage indication ⇔ Flow indication
Set value is initialized by switching indication mode.
Changed output is initialized when changing the setting of external input.

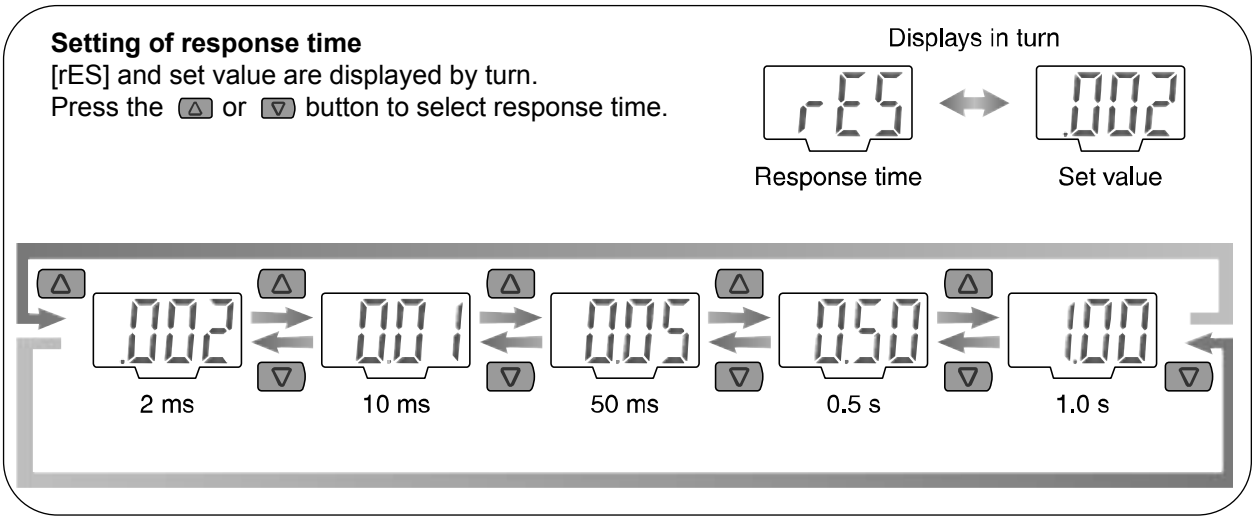
■[F 3] Setting of response time

Select response time.
Output chattering is prevented by setting the response time.

<Operation>
Press the △ or ▽ button at function selection mode to display [F 3].

Press the SET button. ↓ Move on to setting of response time.

Setting of response time
[rES] and set value are displayed by turn.
Press the △ or ▽ button to select response time.



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

Setting of [F 3] Response time completed

The value is the response time obtained when the set value is determined to be 90% in relation to 0 to 100% step input. The response of analog output is fixed to 0.1 second.
(90% response to the step input)

*: If [.002] is selected during flow indication, actual response time is 3 ms.

■[F 4] External input

This function is available when external input function is equipped.
(Input signal: Connect input wire to GND for 5 ms or longer)

*: [・・・] is displayed when external input function is not available.

Selection of flow indication changes the selected content of the external input function.

Voltage indication (Refer to page 31)

Auto-shift: Function to perform output to relative change referring the instantaneous flow when signal is input.

Connect sensor: If PFMV5□ series (single direction) is selected, operation is based on 1.00 V (=sensor output value when the flow is zero.)
If PFMV5□F series (dual directional) is selected, operation is based on 3.00 V (=sensor output value when the flow is zero.)

Flow indication (Refer to page 33)

Auto-shift: Function to perform output to relative change referring the instantaneous flow when signal is input.

Auto-shift zero: Function to perform output to relative change and clear the display value as zero referring the instantaneous flow when signal is input.

<Operation>

Press the △ or ▽ button at function selection mode to display [F 4].

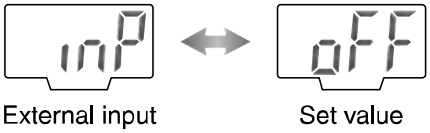
Press the SET button. ↓ Move on to select external input.

□Selecton of external input during voltage indication

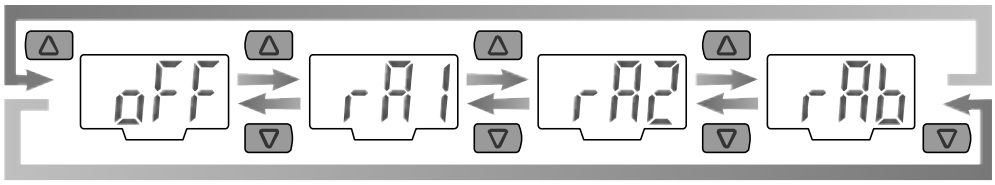
[inP] and set value are displayed by turn.

Press the △ or ▽ button to select external input.

Displays in turn



External input　　Set value



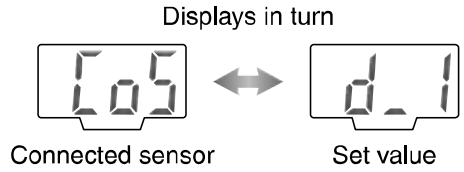
If auto-shift input selection is chanded, the output previously selected is initialized.

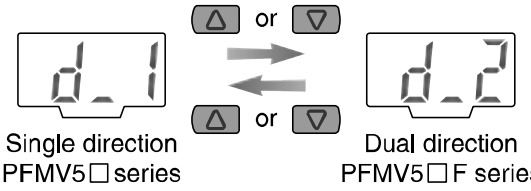
[rA1] or [r01]: Only OUT1 is valid
[rA2] or [r02]: Only OUT2 is valid
[rAb] or [r0b]: Both OUT1, OUT2 are valid

Press the SET button to set. ↓ Move on to the selection of connected sensor.

(to be continued)

Select connect sensor
[Cos] and set value are displayed by turn.
Press the △ or ▽ button to select connect sensor.

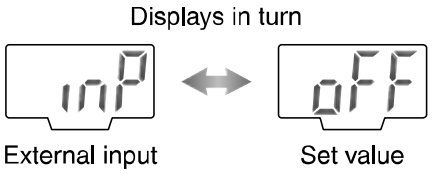


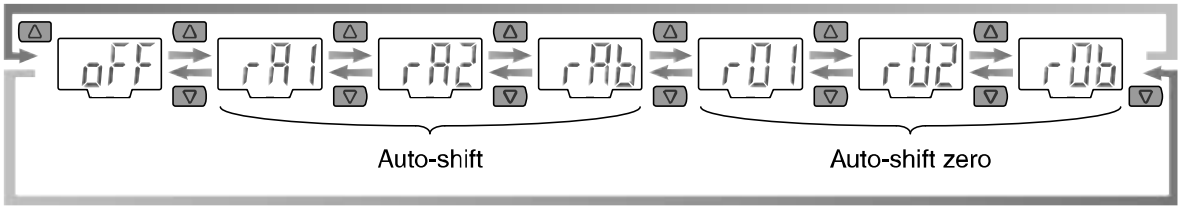


Press the SET button to set. ↓ Return to function selection mode.

Setting of [F 4] External input completed

□**Selection of external input during flow indication**
[inP] and set value are displayed by turn.
Press the △ or ▽ button to select connected sensor.





The setting of selected output is initialized when switching the selection of the externalinput.

[rA1] : Auto-shift input is valid for OUT1 only
[rA2] : Auto-shift input is valid for OUT2 only
[rAb] : Auto-shift input is valid for both OUT1 and OUT2
[r01] : Auto-shift zero input is valid for OUT1 only
[r02] : Auto-shift zero input is valid for OUT2 only
[r0b] : Auto-shift zero input is valid for both OUT1 and OUT2

Press the SET button to set. ⇓ Return to function selection mode.

Setting of [F 4] External input completed

*: Voltage indication mode is set at ex-factory. If auto-shift is used, select flow indication mode by function mode [F95] beforehand.
If flow indication mode is turned off, then turnedon, set value is initialized.

Operation example of auto-shift (When voltage indication mode)

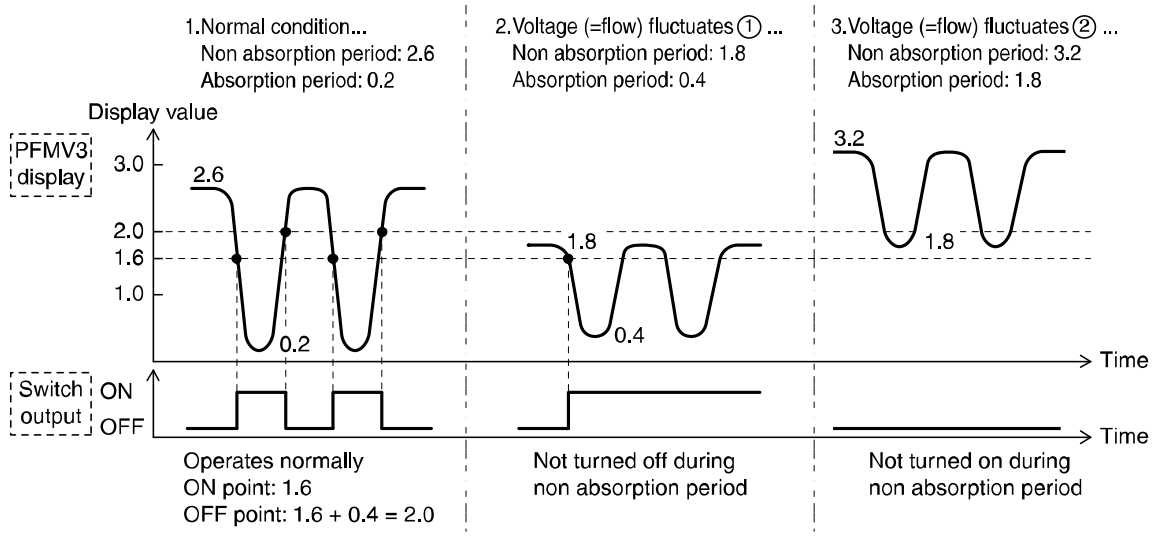
<Ex.> This function is used during the confirmation of adsorption/release as a solution for voltage (=flow rate) change due to source pressure fluctuation or nozzle diameter change.
When auto-shift function is not used, even if the work is adsorbed, switching operation is not made when the voltage (=flow rate) amount fluctuates. Auto-shift function is useful for this case.
If auto-shift function is used, switching operation is made based on the time when auto-shift signal is input as reference. Therefore, switching operation is available without a fail as long as auto-shift signal is inputted during non-adsorption period.

Example below is of voltage indication mode.

•When auto-shift in not used

Switch set value: n_1=60, H_1=0.40 (Revers output, hysterisis mode)

ON/OFF point of this setting ··· •ON point: n_1 •OFF point: (n_1)+(H_1)

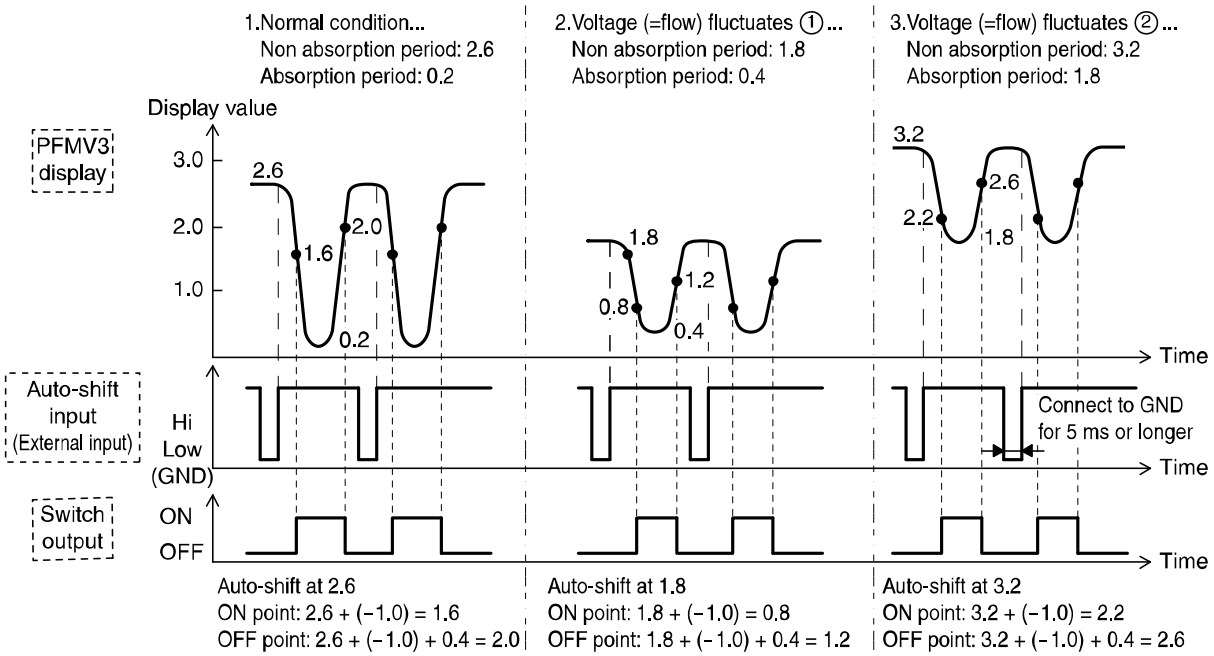


•When auto-shift in used

Switch set value: n_1=-1.00, H_1=0.40 (Revers output, hysteresis mode)

ON/OFF point of this setting ··· •ON point: (Flow when auto-shift is input)+(n_1)

•OFF point: (Flow when auto-shift is input)+(n_1)+(H_1)



Setting range when auto-shift function is selected is -4.40 to 4.40.
If relative set value after the auto-shift is out of upper or lower limit, this monitor operates with upper limit (5.10) or lower limit (0.70).

∗: When flow indication mode is selected, flow setting range when external input is selected is changed.

<Ex.> Flow range: Set at 3 [L/min.]

External input: Set to rAb(Set range of both OUT1 and OUT2 will be changed as below)

[L/min.] Unit: -3.30 to 3.30 [CFH] Unit: -6.99 to 6.99

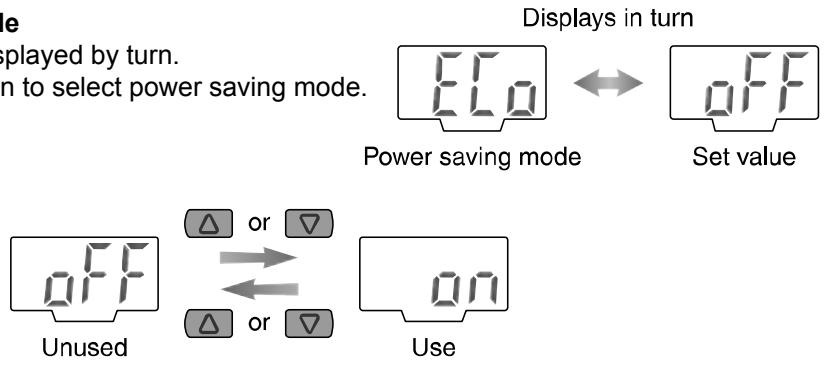
■[F 5] Select power saving mode

Power saving mode is selectable.
When the product is left for 30 seconds without any operation, it's shifted to power saving mode.
In the default setting, power saving mode is OFF (normal mode).
(During operation, the operation indicator is turned on or turned off corresponding to decimal points and output conditions.)

<Operation>
Press the △ or ▽ button at function selection mode to display [F 5].

Press the SET button. ↓ Move on to select power saving mode.

Select power saving mode
[ECo] and set value are displayed by turn.
Press the △ or ▽ button to select power saving mode.

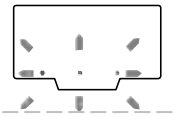


Press the SET button to set. ↓ Return to function selection mode.

Setting of [F 5] Power saving mode completed

When power saving mode is set ON, all the indication is in power saving mode right after returning to measurement mode.
In power saving mode, the key-in operation can return the normal display.
Without key-in operation for 30 seconds, the power saving mode is returned again.
(Only in the measurement mode.)

During power saving mode, decimal points flash as in the drawing right.



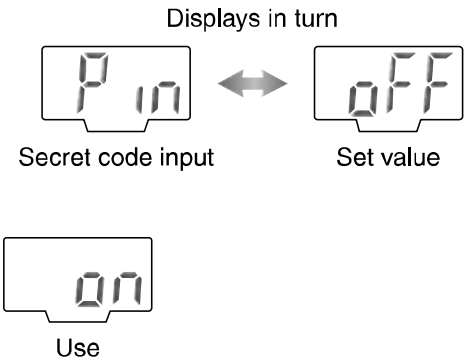
■[F 6] Set security code input

Pin number can be entered during the key-lock state.
See page 40 for key lock function.
In the defaut setting, security code entry is not necessary.

<Operation>
Press the △ or ▽ button at function selection mode to display [F 6].

Press the SET button ↓ Move on to set secret code input.

Set secret code input
[Pin] and set value are displayed by turn.
Press the △ or ▽ button to select secret code input.



Press the SET button to set/ ↓ Return to function selection mode.

Setting of [F 6] Security code input completed

With secret code input, it becomes necessary to input the security code to release key lock. The secret code can be decided optionally by the operator. In the defaut setting, the security code is set to [000].

With secret code input, refer to page 42.

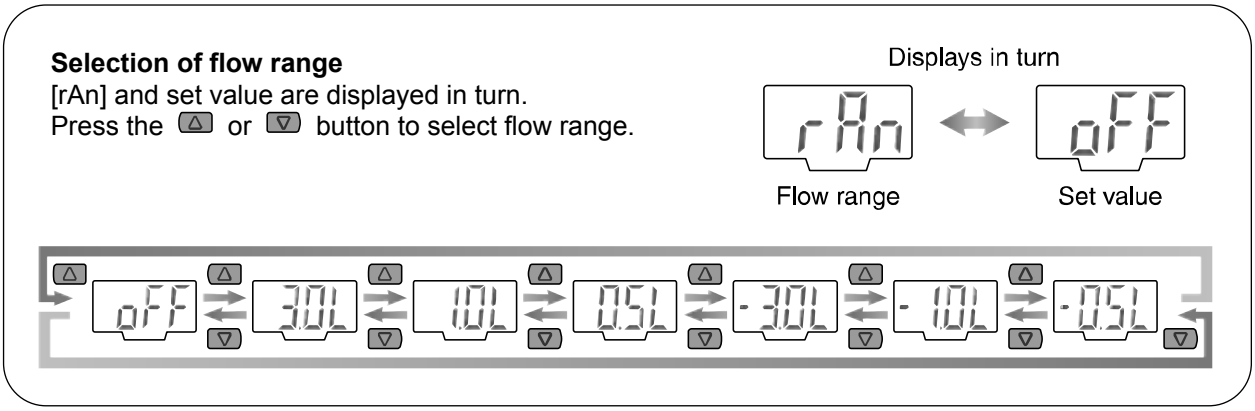
■[F95] Selection of flow indication

Flow range or flow indication unit can be selected.
To use flow indication mode, select the flow range and flow unit with this function mode before setting the function of [F1], [F2], [F4].

<Operation>
Press the △ or ▽ button in function selection mode to display [F 95].

Press the SET button. ↓ Move on to the selection of flow range.

Selection of flow range
[rAn] and set value are displayed in turn.
Press the △ or ▽ button to select flow range.



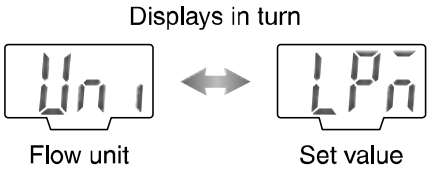
Connect sensor type	Selection of flow indication range	Rated flow
PFMV505	0.5[L/min]	0 to 0.5[L/min]
PFMV510	1.0[L/min]	0 to 1.0[L/min]
PFMV530	3.0[L/min]	0 to 3.0[L/min]
PFMV505F	−0.5[L/min]	−0.5 to 0.5[L/min]
PFMV510F	−1.0[L/min]	−1.0 to 1.0[L/min]
PFMV530F	−3.0[L/min]	−3.0 to 3.0[L/min]

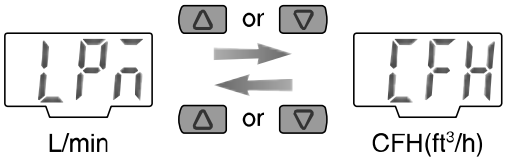
*: Set values of OUT1 and OUT2 are initialized when the flow range setting is changed.

Press the SET button to set. ↓ Move on to the selection of flow unit.

(to be continued)

Selection of flow unit
[Uni] and set value are displayed by turn.
Press the △ or ▽ button to select flow range.





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

Setting of [F95] flow indication moe completed

Fllow unit selection is available only for unit selection type.
When the unit is changed, use unit seal included in accessories.

■[F99] Reset to the default setting
Press the △ or ▽ button to display [ON], and press SET and ▽ buttons at the same time for 5 seconds or longer.
With this action, the mode is returned to ex-factory mode when currently operating mode becomes unknown.

Other Setting

●Standard value offset function

If the displayed value can be 1.00 due to the deviation in each product, the displayed value can be forcibly changed to 1.00 for PFMV505, 510 and 530.

For PFMV505F, 510F and 530F, the forcibly changed value will be 3.00.

Press the △ or ▽ buttons together for 1 second or longer under the condition with no flow.

(If the offset is succeeded, the display starts flashing.)

The effective range of this function is 1.00 ± 0.2 V or 3.00 ± 0.2 V.

If this function is operated outside of the above range, the display shows “Er4” and the offset is not performed.

Also, this function must be operated with no flow.

For example, if there is a flow with PFMV505 connected, and the flow rate is around 3.00 V as sensor output, the offset function will start.

If this function is operated by mistake with a flow, make the condition with no flow, and retry to operate the function.

During flow indication mode, effective range for correction is ± 2%F.S.

●Peak/Bottom value indication

The maximum (minimum) voltage (flow rate) from when the power is supplied to this moment is detected and updated.

In peak/bottom indication mode, the voltage (flow rate) is displayed.

As the peak indication, when the △ button is pressed for 1 second or longer, the maximum voltage (flow rate) starts flashing and is held.

To release holding the indication of the maximum voltage (flow rate), press the △ button for 1 second or longer again.

The measurement mode is returned.

As the bottom indication, when the ▽ button is pressed for 1 second or longer, the minimum voltage (flow rate) starts flashing and is held.

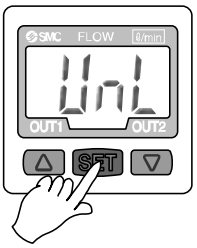
To release holding the indication of the minimum voltage (flow rate), press the ▽ button for 1 second or longer again.

The measurement mode is returned.

If the ▽ and ▽ buttons are pressed simultaneously for 1 second or longer while the voltage (flow rate) is being held, the maximum (minimum) value is initialized.

●Key Lock

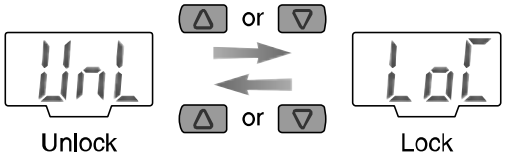
A wrong operation performed unintentionally such as change of set value can be prevented.
If the button operation is performed while key lock setting is being performed, [LoC] is indicated for approx. 1 second.



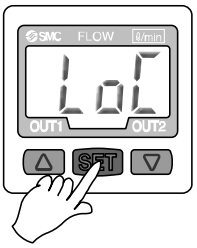
<Operation-Without secret code input>

(1) Keep pressing the SET button for 5 seconds or longer in the measurement mode. The current setting [LoC] or [UnL] is indicated.
(Releasing key lock can be done in the same way.)

(2) Press the △ or ▽ button to select locking or unlocking of the key.



(3) Press the SET button to enter the setting.

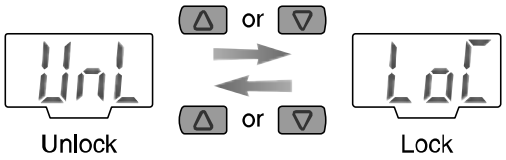


<Operation-With secret code input>

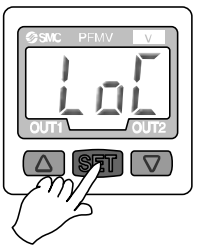
●Locking

(1) Keep pressing the button for 5 seconds or longer in the measurement mode. [UnL] is indicated.

(2) Press the △ or ▽ button to select locking of the key [LoC].



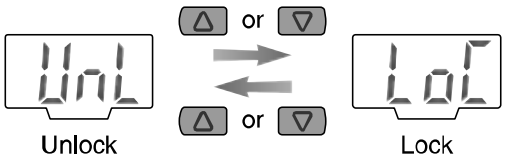
(3) Press the SET button to enter the setting.

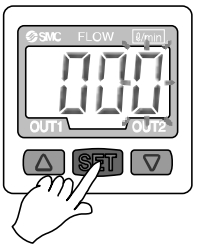


●Unlocking

(1) Keep pressing the button for 5 seconds or longer in the measurement mode. [LoC] is indicated.

(2) Press the △ or ▽ button to select unlocking of the key [UnL].





(3) When the SET button is pressed, the input of security code is asked. For how to input the security code, refer to [How to input and change the security code] on page 42.

(4) If inputted security code is correct, the display changes to [UnL], and pressing one of △, SET and ▽ buttons releases key lock, and returns measurement mode. If inputted security code is wrong, [FAL] is displayed and the security input mode is returned. If the wrong security code is inputted three times, [LoC] is indicated and the measurement mode is returns.

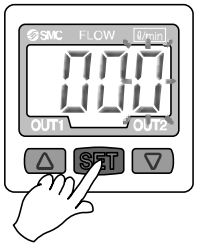
●How to change the security code
In the defaut setting, the security code is set to [000], but can be changed to optional one.

<Operation>

(1) After the lock setting is finished (page 40), perform all three steps in the unlock setting procedure. (page 40,(3)).

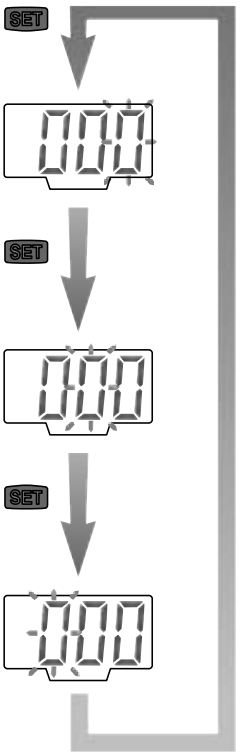
(2) After the security code is inputted and the indication changes to [UnL], keep pressing SET and ▽ buttons simultaneously for 5 seconds or longer. [000] is indicated and the change of security code is asked. For how to input the security code, refer to [How to input and change the security code]. Changed security code is indicated.

(3) After check it is as desired, press the SET button. The measurement mode is returned. At this time, if the △ or ▽ button is pressed, changed security code is not entered and the change of security code is asked.



How to input and change the secret code
The first digit starts flashing.
Press the △ or ▽ button to set the value.
Pressing the SET button starts flashing the second digit.
(If the SET button is pressed at the uppermost digit, the first digit starts flashing again.)

After the setting is finished, keep pressing the SET button for 1 second or longer.
(If the operation is not performed for 30 seconds or longer during input and change of the security code, the measurement mode is returned.)



●Indicated content check function

This is the function to check if indicated content during measurement mode is voltage or flow rate.
This function is available only when flow indication is selected with function mode [F95].

<Operation>

Press the △ or ▽ button and release it within 1 second to indicate the flow range for 0.5 second which is selected by function mode [F95].
(If pressed for 1 second or longer, mode is changed to peak/bottom value indication mode on page 39)
While voltage indication mode is selected, indicated content check function does not operate.

Troubleshooting

●Troubleshooting

If operation failure happens at a product, please seek a cause of your trouble with the following chart by tracing failure applicable to your case. If the cause you reached seems not to be applicable to your case, and the product operates normally after replacing the failed one with a new one, the product would be broken. A product can be broken due to the operating environment. If your product seems to be broken, please contact us.

●Possible cause and countermeasure

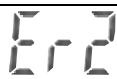
Fault	Status	Possible cause	Item to check	Countermeasure
Wrong display	Indication is not shown	Wiring failure	Check that brown line and blue line are connected to DC (+) and DC (–) respectively.	Have correct wiring.
		Connector is come off	Check the connection of the connectors.	Connect the connectors.
	Indication is blinking	Peak/bottom Indicating function	Check whether or not flow rate indication is in peak value (bottom value) indication mode.	"Peak/bottom value indication", and remove the setting if unnecessary. (Refer to page 39)
	Indication/voltage is not stable	Foreign matter was got in or attached.	(1) Possibility of foreign matter to be got in. (2) Possibility of foreign matter to be attached. Check whether or not mesh got foreign matter.	Set up filter or mist separator at upstream side of the product.
		Mounting direction of the product and signal output direction do not match.	Check that the mounting direction of the product and the analog voltage output direction are the same as the flow direction.	Mounting direction of the product, analog signal output direction and fluid flow direction should be the same. (Refer to page 52)
		Flow is pulsing	Check if there is supply pressure fluctuation or pressure pulsation due to the characteristics of the compressor or pump acting as the pressure source.	Install a tank to reduce the pressure fluctutation. Change the pressure source to one which has less pulsation.
	Incorrect display	Foreign matter was got in or attached.	(1) Possibility of foreign matter to be got in. (2) Possibility of foreign matter to be attached. Check whether or not mesh got foreign matter.	Set up filter or mist separator at upstream side of the product.

Fault	Status	Possible cause	Item to check	Countermeasure
Wrong display	Incorrect display	Mounting direction of the product and signal output direction do not match.	Check that the mounting direction of the product and the analog voltage output direction are the same as the flow direction.	Mounting direction of the product, analog signal output direction and fluid flow direction should be the same. (Refer to page 52)
		Incorrect display mode	Check the display mode to find out if it is in the voltage monitoring state or the flow display mode.	Select the voltge monitoring display if it is used as a voltage monitor, and select the flow display function if you want it to display flow.
		An incorrect flow unit was selected.	Check the selection of the flow unit.	Select the appropriate flow unit
		An incorrect flow range was selected for the product to be connected.	Check the selection of the flow range.	Select the appropriate flow range.
		Air leakage	Check if there is air leakage because of insufficient screwing in of the pipes or insufficient sealing, etc.	Reconnect the pipes with the specified tightening torque and rewrap the sealant tape.
Wrong output	No output	Wiring failure	Check that brown line and blue line are connected to DC (+) and DC (−) respectively.	Have correct wiring.
		Connector is come off	Check the connection of the connectors.	Connect the connectors.
	Indication/voltage is not stable	Foreign matter was got in or attached.	(1) Possibility of foreign matter to be got in. (2) Possibility of foreign matter to be attached. Check whether or not mesh got foreign matter.	Set up filter or mist separator at upstream side of the product.
		Mounting direction of the product and signal output direction do not match.	Check that the mounting direction of the product and the analog voltage output direction are the same as the flow direction.	Mounting direction of the product, analog signal output direction and fluid flow direction should be the same. (Refer to page 52)

Fault	Status	Possible cause	Item to check	Countermeasure
Wrong display	Indication/voltage is not stable	Flow is pulsing	Check if there is supply pressure fluctuation or pressure pulsation due to the characteristics of the compressor or pump acting as the pressure source.	Install a tank to reduce the pressure fluctutation. Change the pressure source to one which has less pulsation.
		Small hysteresis	Check the hysteresis set value.	Increase the hysteresis.
Inoperable with the push button	No reaction when the buttons are pushed	The keys are locked.	Check if it displays “Loc” when the buttons are pushed.	Release the key lock. (Refer to page 40)
External input does not operate	It does not accept the input (no reaction)	Wiring failure	Check that the brown line (DC+) and the blue line DC(-) are connected to the black line (OUT1) and the white line (OUT2) respectively .	Have correct wiring.
		The input time is too short.	Check whether or not a white line is connected to GND for 5 ms or longer.	If external input is added, the white line should be connected to GND for 5 ms or longer.

■Error indication function

This function is to display error location and content when a problem or an error occurs.

Error Name	Error Display	Error type	Troubleshooting
Input voltage Error		Input voltage (=flow rate) exceeds the upper limit.	Reduce input voltage (=flow rate)
		Input voltage (=flow rate) is less than the lower limit.	Increase input voltage(=flow rate)
		Sensor may not be connected.	Connect the sensor.
Overcurrent Error		Load current of the switch output (OUT1) exceeds 80 mA.	Turn off the power supply And eliminate the cause of over current. Then supply the power again.
		Load current of the switch output (OUT2) exceeds 80 mA	
System Error		Condition is that of before the adjustment at factory, Internal circuit is possibly damaged.	Stop operation immediately And contact SMC.
		System error. Failed to memorize the data, or internal circuit is possibly damaged.	Reset using reset function.
Standard value offset Error		The standard value offset operation Is conducted out of the effective range for correction. (page 39)	Perform the standard value Offset under the condition with no flow.

In the error can not be reset after the above measures are taken, then please contact SMC.

Specification

■ Specifications

Model		Series PFMV3□□		
Applicable sensor		Series PFMV505(F), PFMV510(F), PFMV530(F)		
Rated range	Voltage	1.00 to 5.00 V		
	Flow	0.000 to 0.500 L/min	0.00 to 1.00 L/min	0.00 to 3.00 L/min
		-0.500 to 0.500 L/min	-1.00 to 1.00 L/min	-3.00 to 300 L/min
Displayable range	Voltage	0.70 to 5.10 V: The voltage under 0.70 V is display as"LLL" and that of 5.10 V or more is displayed as "HHH".		
	Flow	-0.025 to 0.525 L/min	-0.05 to 1.05 L/min	-0.15 to 3.15 L/min
		-0.525 to 0.525 L/min	-1.05 to 1.05 L/min	-3.15 to 3.15 L/min
Settable range	Voltage	0.70 to 5.10 V		
	Flow	-0.025 to 0.525 L/min	-0.05 to 1.05 L/min	-0.15 to 3.15 L/min
		-0.525 to 0.525 L/min	-1.05 to 1.05 L/min	-3.15 to 3.15 L/min
Minimum unit setting	Voltage	0.01 V		
	Flow	0.001 L/min	0.01 L/min	0.01 L/min
Indication unit[*1]		Voltage : V Instantaneous flow : L/min,CFH(ft ^{3}/h)		
Power supply voltage		12 to 24 VDC (Riple ±10% or less) (with polarity protection)		
Current consumption		50 mA or less		
Hysterisis[*2]	Hysterisis mode	Variable		
	Window comparator mode	Variable		
Switch output		NPN or PNP open collector output: 2 outputs		
	Max. load current	80 mA		
	Max. load voltage	30 V DC (at NPN output)		
	Residual voltage	1 V or less (at load current 80 mA)		
	Output protection	Short-circuit protection		
Response time[*3]		Switch output: 2 ms (10 ms, 50 ms, 0.5 s, 1 s can be selected)		
Repeatability[*4]		±0.1% F.S.or less, analog output accuracy; ±0.3% F.S. or less		
Analog output	Voltage output	1 to 5 V		
	Output impedance	Approx. 1 kΩ		
	Current output	4 to 20 mA		
	Maximum load impedance	600 Ω (at 24 VDC)		
	Minimum load impedance	50 Ω		
	accuracy	±1%F.S. less (relative to display value)		
	response	0.1 s (90% response or less)		

Model		Series PFMV3□□□
Display accuracy		±0.5% F.S. ± 1 digit or less.
Display method		3+1/2-digit, 7-segment LED 2-color display (Red/Green) Updated cycle: 10 times/sec
Status LEDs		OUT1: Illuminates when output is turned ON (Green), OUT2: Illuminates when output is turned ON (Red).
External inout (Auto-shift input)*5		No-voltage input (Reed or Solid state), LOW level input 5 msec or more, LOW level 0.4 V oe less
Enviromental resistance	Enclosure	IP40
	Operating temperature range	Operating: 0 to 50 °C; stored: -10 to 60 °C (with no frezzing nor condensation)
	Operating humidity range	Operating and stored: 35 to 85% R.H. (with nocondensation)
	Withstand voltage	1000 VAC for 1 min. between whole charging part and live part
	Insulation resistance	50 MΩ or more (500 VDC Mega) between whole charging part and live part
	Vibration resistance	10 to 150 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X,Y,Z direction for 2 hrs, whichever is smaller (De-energized)
	Impact resistance	100 m/s^2 in X, Y, Z directions 3 times each (De-energized)
Temperature characteristics		±0.5% F.S. or less (Reference 25 °C)
Connection		Power supply/ Output connection: 5P connector, Sensor connector (for cable specifications, refer to page 12.)
Material		Front and rear cases: PBT
Weight		30 g (without cable); 85 g (with cable)

*1: The flow is the value at the standard condition (ANR), 20 °C, 1 atm and 65% RH.
When unit change function is equipped (For type without unit change function, the unit is fixed to SI (L/min or L)).

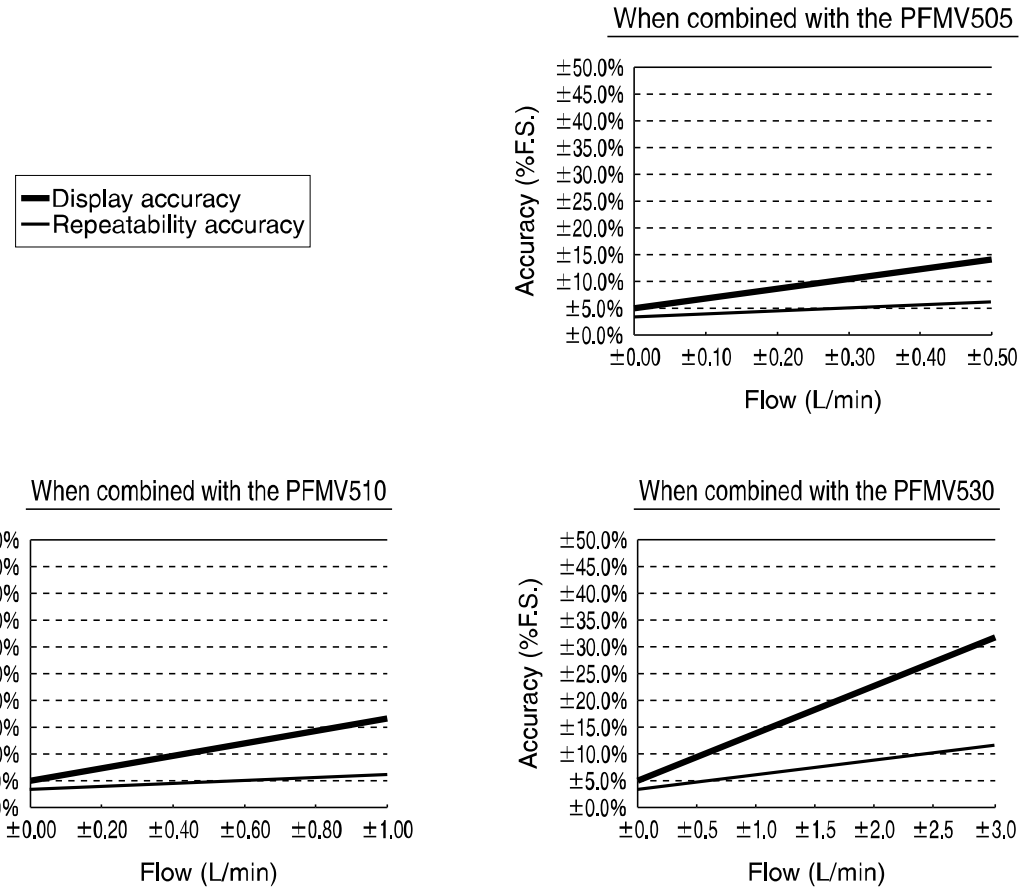
*2: With ex-factory conditions, the mode is hysteresis mode. Window comparator mode is selectable by button.

*3: This the response when the setting value is set to 90% to a 0 to 100% of step input.

*4: When the flow display function is selected, the display accuracy and repeatability will be as shown in Fig. 1.

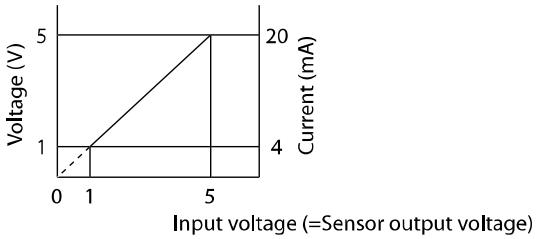
*5: Auto-shift function is turned OFF in the default setting. Use it after auto-shift function is turned ON using push-bottons.

Fig.1 Display accuracy and repeatability for combination with each appropriate sensor when the flow display function is selected



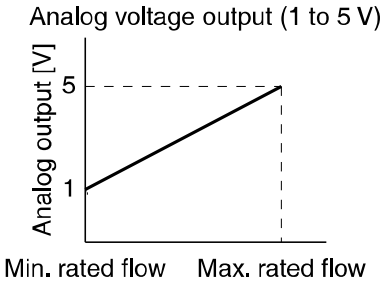
Output characteristics

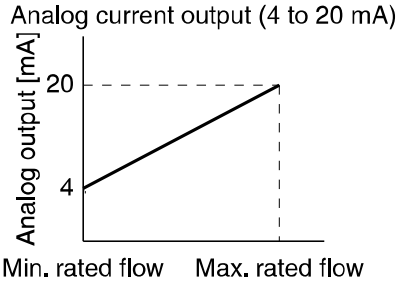
(Voltage display)



Analog output

(Flow display)





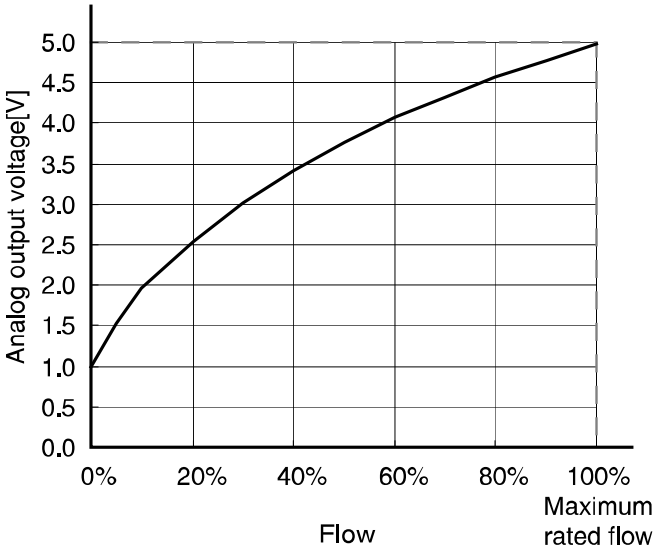
Part number	Min.rated flow	Max.rated flow
PFMV505	0 L/min	0.5 L/min
PFMV510	0 L/min	1.0 L/min
PFMV530	0 L/min	3.0 L/min
PFMV505F	-0.5 L/min	0.5 L/min
PFMV510F	-1.0 L/min	1.0 L/min
PFMV530F	-3.0 L/min	3.0 L/min

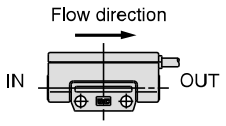
Cable specifications: Power supply/Output connector (ZS-28-A)

Conductor	Nominal cross section area	0.2 mm^2
	Outside diameter	0.58 mm
Insulator	Material	Cross-linked vinyl chloride resin compound
	Outside diameter	Approx. 1.12 mm
	Colors	Brown, Black, White, Gray, Blue
Sheath	Material	Oil-resistant vinyl chloride resin compound
Finished outside diameter		ϕ4.1

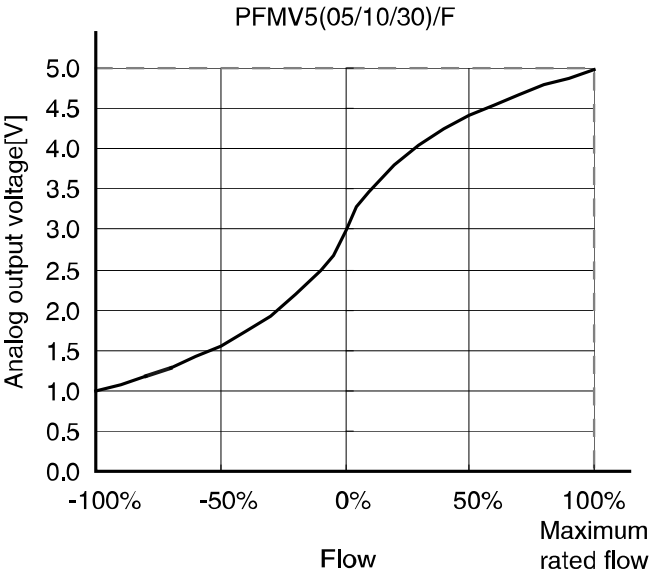
Characteristic chart

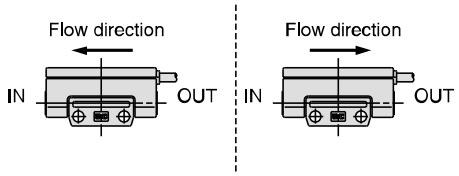
PFMV5(05/10/30)





PFMV5(05/10/30)/F

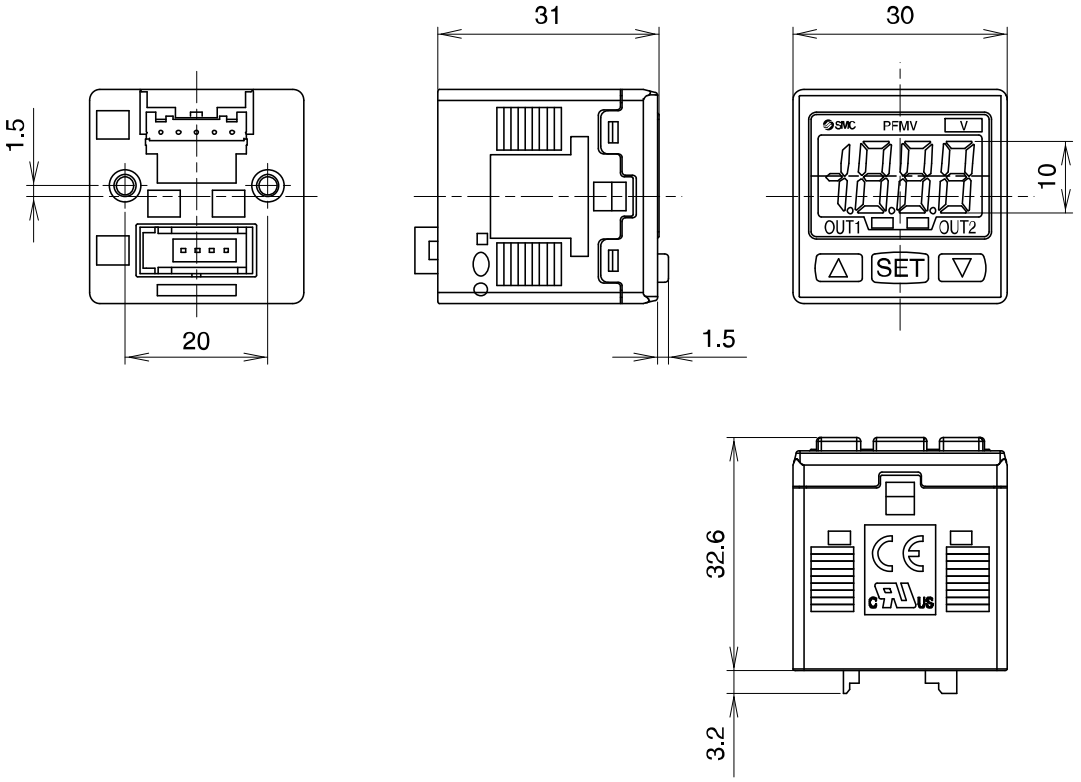




•Refer to catalog for details of the flow characteristic.

■Dimensions

PFMV3□□



Revision history

SMC Corporation URL http://www.smcworld.com

4-14-1, Sotokanda, Chiyoda-ku, Tokyo 102-0021 Japan
Tel:+81 3 5207 8249 Fax:+81 3 5298 5362

Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
© 2010 SMC Corporation All Rights Reserve