



Installation & Maintenance Manual

Digital Flow Switch

(High Flow Rate for Air)

Series **PF2A703H**
PF2A706H
PF2A712H



Safety Instructions

The Digital Flow Switch and this manual contain essential information for the protection of users and others from possible injury and property damage and to ensure correct handling. Please confirm that you fully understand the definition of the following messages (signs) before going on to read the text, and always follow the instructions. Please read and understand the operation manuals of related apparatus before operating the flow switch.

IMPORTANT MESSAGES

Read this manual and follow its instructions. Signal words such as WARNING and NOTE will be followed by important safety information that must be carefully reviewed.

⚠WARNING	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
NOTE	Gives you helpful information.

⚠WARNING

Do not disassemble, modify (including change of printed circuit board) or repair.

An injury or failure can result.

Do not operate outside of the specification.

Fire, malfunction or switch damage can result. Please use it after confirming the specification.

Do not operate in a combustible gas or explosive gas atmosphere.

Fire or an explosion can result. This flow switch is not an explosion proof type.

Do not use with a combustible fluid.

Otherwise, a fire or an explosion or damage may potentially result. (The detector of the flow switch for air is heated to 150°C).

SAFETY (continue)

NOTE

- Follow the instructions given below when handling the flow switch. Otherwise, the switch may be damaged or may fail, thereby resulting in malfunction.
- Do not drop, bring into collision with other objects or apply excessive shock to the unit (490m/s² or more).
 - Do not pull the lead wire with force or lift the main unit by holding the lead wire. (Pulling strength less than 49N)
 - Connect wires and cables correctly.
 - Do not perform wiring while power is on.
 - Although the flow switch complies with the CE Marking, it does not have lightning surge protection, therefore please apply the necessary protection to the equipment.
 - Although the flow switch complies with the CE Marking, it should be protected against any sources of surge (electro-magnetic lifter, high frequency induction furnace, motors etc.) around the flow switch.
 - Do not use with power cable or high-voltage cable in the same wire route.
 - Do not use in a place in which water, oil or chemical splashes may occur.
 - Install a filter and/or mist separator on the primary side (inlet side) if foreign matter is feared to mix in a fluid.
 - Flush the dust in the piping with air blow before piping the flow switch.
 - Do not press the setting buttons with a sharp pointed object.
 - Turn on the power supply when the flow is zero. Some initial drift occurs during ten minutes after turning the power on.
 - For 3 seconds after power is turned ON the measurement output will be OFF. This includes after momentary disconnection of the power, by reset etc.)
 - During initial setting or when setting the flow switch, the measured output continues to change with the flow measurement as before setting. Please check how this will affect the equipment before use.
 - Opening and closing of flow passage by restrictor should be within max. measured flow rate value.

Model Indication Method

PF2A7□H-□□-□□-□

Units Specification

- No Symbol** : Unit selection function provided (*1,2)
- M** : SI units fixed

Lead Wire Specification

- No Symbol** : M12 Lead wire with connector (3m)
- N** : No Lead wire with connector

Output Specification

- 28** : NPN open collector 1output + Analog output (1 to 5V)
- 29** : NPN open collector 1output + Analog output (4 to 20mA)
- 68** : PNP open collector 1output + Analog output (1 to 5V)
- 69** : PNP open collector 1output + Analog output (4 to 20mA)

Piping Port

- 10** : Port size 1 (Applicable for PF2A703H)
- 14** : Port size 1·1/2 (Applicable for PF2A706H)
- 20** : Port size 2 (Applicable for PF2A712H)

Port Screw Type

- No Symbol** : Rc
- N** : NPT
- F** : G

Flow Rate Range

- 03** : 150 to 3000L/min
- 06** : 300 to 6000L/min
- 12** : 600 to 12000L/min

NOTE1 : The new Measurement Law prohibits use in Japan of flow switches with a unit selection function.

NOTE2 : The fixed unit
For instantaneous flow rate is : L/min
For integrated flow rate is : L, m³, m³ x 10³

Specification

Model	PF2A703H	PF2A706H	PF2A712H
Flow Rate Indication/Range	Dry air, Nitrogen		
Flow rate indication range (L/min)	125 to 3025	250 to 6050	550 to 12050
Set flow rate range (L/min)	125 to 3025	250 to 6050	550 to 12050
Measured flow rate range (L/min)	150 to 3000	300 to 6000	600 to 12000
Measured min unit (L/min)	5	10	
Flow rate conversion	100L/pulse		
Integrated flow rate range	0 to 9,999,999,999L		
Indication Unit (*1, 2)	Instantaneous flow rate : L/min, CFM Integrated flow rate : L, m ³ , m ³ x 10 ³ , ft ³ , ft ³ x 10 ³		
Operating fluid temp.	0 to 50°C (No condensation or freezing)		
Linearity	Indicated value	±1.5%F.S. or less	
	Analog output	±3%F.S. or less	
Power supply voltage	24VDC, ripple ±10% or less		
Current consumption	150mA or less (No load)		
Repeatability	±1.5%F.S. or less (0.7MPa, 20°C)		
Hysteresis	Hysteresis mode : Variable (Settable starting 0) Window comparator mode : Set for 0 to 3%F.S.		
Response time	1s or less		
Detecting method	Thermal sensing		
Withstanding pressure	2.25MPa		
Operation indication range	0.1 to 1.5MPa		
Indication digit	5 digits 7 segment LCD		

*1) With units selection function (Without units selection function, fixed to SI unit [L/min or L, m³, m³ x 10³])

*2) Flow rate indication can be switched to normal condition of 0°C/101.3kPa or standard condition of 20°C/101.3kPa/65%RH (ANR)

Names and Functions of Individual Parts

Display Part

Output(OUT1)Lamp : Lit when OUT1 is ON.

Flashes when an overcurrent error occurs.

Flow display : Display the Instantaneous or integrated flow rate, Set mode status and error codes.

Flow check display : Flashing interval varies depending on the flow.

Unit display : Selected unit is displayed. Single unit type is displayed in SI unit (L/min or L, m³, m³ x 10³).

▲ Button (UP) : Selects the mode and increases a set ON/OFF value.

▼ Button (DOWN) : Selects the mode and decreases a set ON/OFF value.

MODE Button (MODE) : Changes the mode.

SET Button (SET) : Changes the mode and sets a set value.

* RESET

Pressing the ▲ and ▼ buttons simultaneously will activate the RESET function. Use this function to clear errors when a problem occurs.

Body

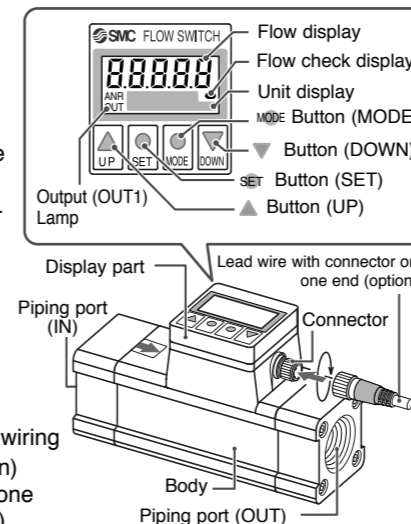
Flow switch sensor body. The arrow on the side of the body indicates the direction of flow.

Piping port

This port connects with pipeline. Use a pipe fitting to connect with external pipeline.

Accessories

(When option is specified for wiring in the model type specification)
Lead wire with connector on one end (3 m in length) (ZS-29-A)



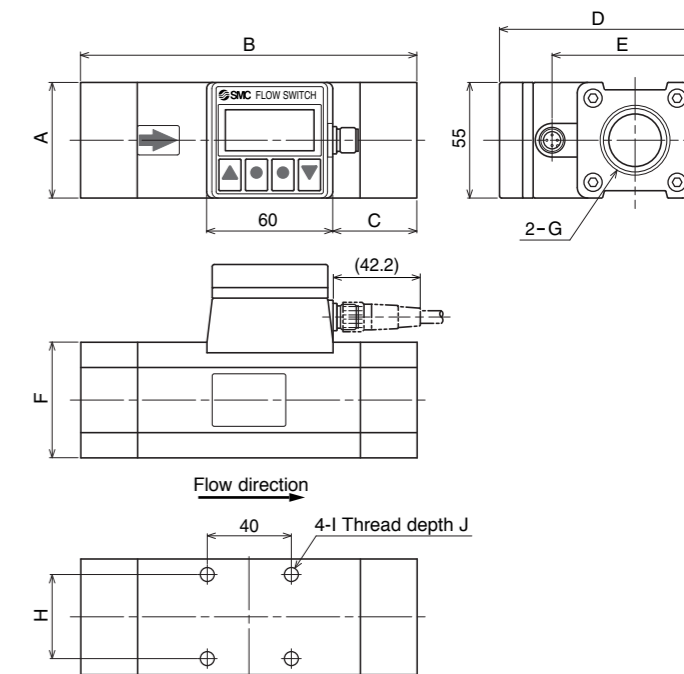
Model	PF2A703H	PF2A706H	PF2A712H
Output specification (*3)	Switch Output or Integrated Pulse Output	[NPN open collector] Max. load current : 80mA, Internal voltage drop : 1V or less (At load current 80mA), Max. input voltage : 30VDC [PNP open collector] Max. load current : 80mA, Internal voltage drop : 1.5V or less (At load current 80mA)	
	Analog output	Voltage output : 1 to 5V (within rated flow range) Linearity : ±3%F.S. or less Permissible load impedance : 100kΩ or more Current output : 4 to 20mA (within rated flow range) Linearity : ±3%F.S. or less Permissible load impedance : 250Ω or less	
Enclosure	IP65 (IEC60529)		
Ambient temperature range	Operation : 0 to 50°C, Storage : -25 to 85°C (No condensation or freezing)		
Withstand voltage	1000VAC, 1minute (between terminal block and case)		
Insulation resistance	50MΩ or less (at 500VDC M) (between terminal block and case)		
Noise resistance	1000Vp-p Pulse width 1μs rise time 1ns		
Vibration proof	10 to 500Hz smaller one 1.5mm or 98m/s ² , double amplitude, each in directions of X,Y and Z 2hours		
Impact proof	490m/s ² , 3 times each in directions of X,Y and Z		
Temp. characteristics	±2.0%F.S. or less (0 to 50°C, 25°C standard)		
Material	Attachment : A6063, Packing : H-NBR, Spacer : PPS, Mesh : SUS, Inner body : A6063, Sensor case : PPS, Sensor : Leaded glass/ptlr/FeNi/OFC		
Port size	1	1·1/2	2
Mass (Weight) (*4)	1.1kg	1.3kg	2.0kg

*3) Select switch output or pulse output of integrated flow rate at initial setting.

*4) Lead wire not included.

*5) The flow switch conforms entirely to the CE standard.

Outline with Dimensions (in mm)



Thred G

PF2A703H	Rc1, NPT1, G1
PF2A706H	Rc1·1/2, NPT1·1/2, G1·1/2
PF2A712H	Rc2, NPT2, G2

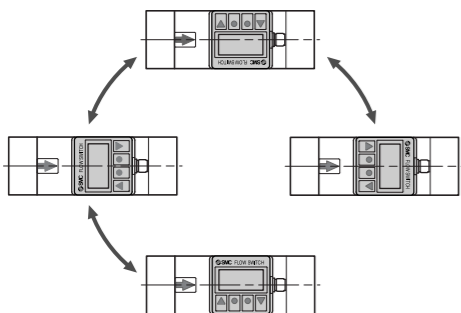
Model No.	A	B	C	D	E	F	H	I	J
PF2A703H	55	160	40	92	67	55	36	M5 x 0.8	8
PF2A706H	65	180	45	104	79	65	46	M6 x 1	9
PF2A712H	75	220	55	114	89	75	56	M6 x 1	9

Installation

Before mounting the flow switch, read "Safety Instructions" and "Installation" described in this manual carefully to ensure safe and correct measurement.

Mounting

- Use this flow switch within the specified operating pressure range and operating temperature range.
- Withstand pressure is 2.25 MPa.
- Do not install a flow switch at a foothold position.
- Install a flow switch so that the flow direction agrees with the arrow direction on the side of the body.
- Mount the body so that the underneath of the body does not face upward.
- Provide a straight pipe length of more than eight times the pipe diameter on the primary side (Inlet side) of the flow switch.
- Set the required display part position taking the cable entry and display position into account. The display part rotates 270 degree.

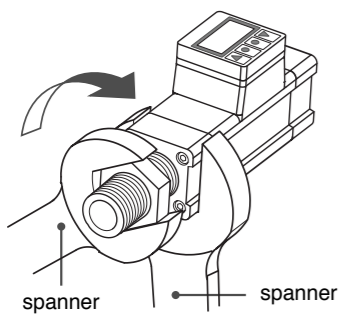


Piping connections

- Use a suitable pipe fitting to connect pipeline with the flow switch. Observe the specified tightening torque when connecting pipes. Refer to the following table for the appropriate torque values.

Nominal size of thread	Tightening torque(N·m)
Rc 1	36 to 38
Rc 1-1/2	48 to 50
Rc 2	48 to 50

- When connecting the pipeline to the flow switch, apply a spanner to the metal part of the flow switch body.
- Make sure that sealing tapes do not enter inside the pipe when connecting pipes.



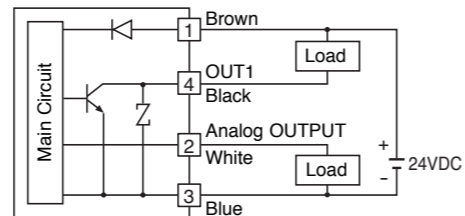
Internal Circuit and Wiring

Output Specification

When the Lead wire with connector provided by SMC corporation is used the color of wire (Brown, White, Black, Blue) shown on circuit diagram will be applied.

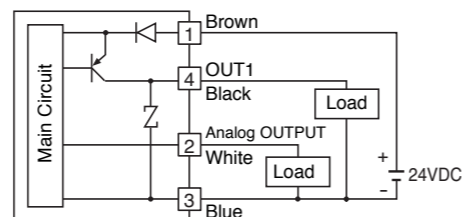
-28, -29

NPN open collector 1 output + Analog output
Max. 30V, 80mA Internal voltage drop : 1V or less



-68, -69

PNP open collector 1 output + Analog output
Max. 80mA Internal voltage drop : 1.5V or less

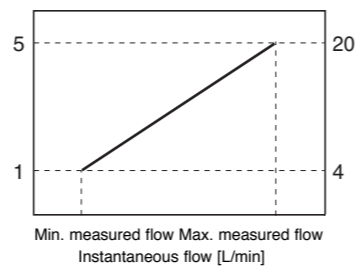


PF2A7□H□ -28/68

Output : 1 to 5V

PF2A7□H□ -29/69

Output : 4 to 20mA

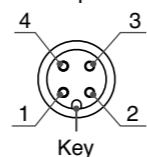


Model No.	Min. measured flow (L/min)	Max. measured flow (L/min)
PF2A703H	150	3000
PF2A706H	300	6000
PF2A712H	600	12000

How to attach connectors:

- Turn off power before connecting or disconnecting the connector.
- To insert the connector, push the connector socket of the lead wire to the key part of the switch connector after aligning them to each other and secure the connector with the lock nut.
- To disconnect the connector, unlock the connector lock nut and pull out the connector straight.
- Install the lead wire separately from the route for power cable or high-voltage cable. Otherwise, malfunction may potentially result due to noise.

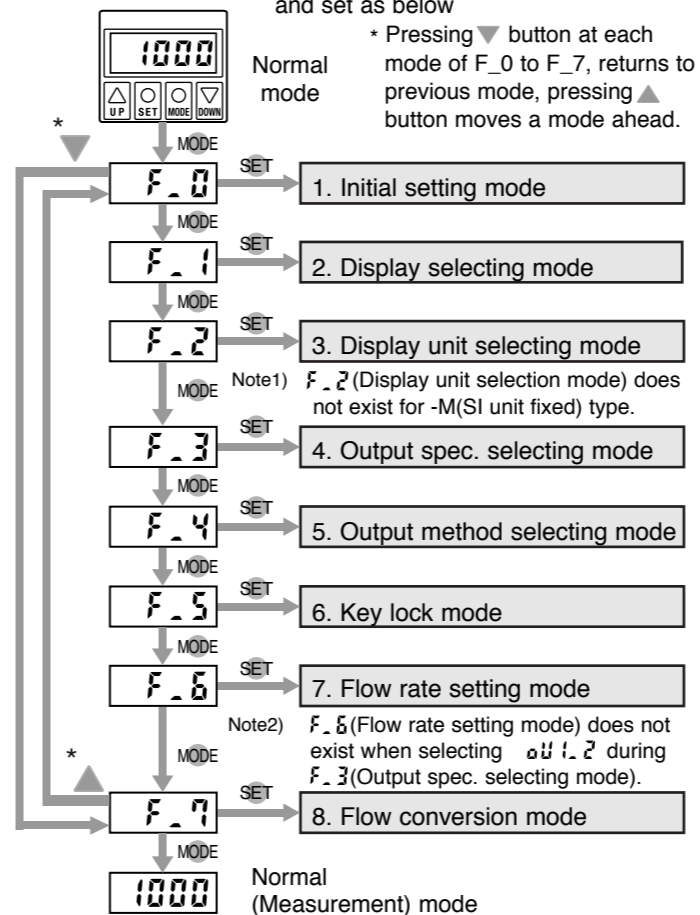
Connector pin number



Pin No.	Pin name
1	DC(+)
2	Analog Output
3	DC(-)
4	OUT1

Setting

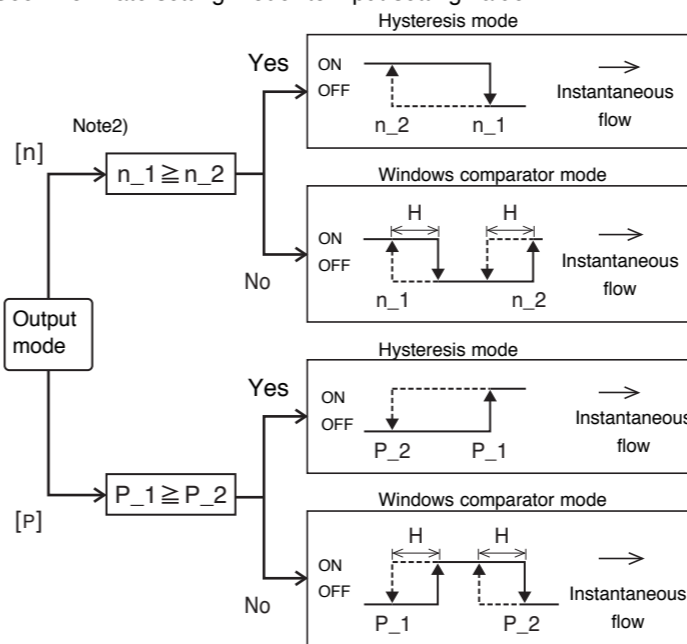
Setting Procedure : Check installation condition and wiring and set as below



OUT1 Output Specifications

Instantaneous switch output (oU1_0)

See "Flow rate setting mode" to input setting value.

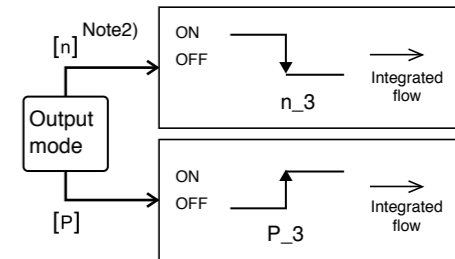


H : Hysteresis
n : Reverse
P : Non-reverse

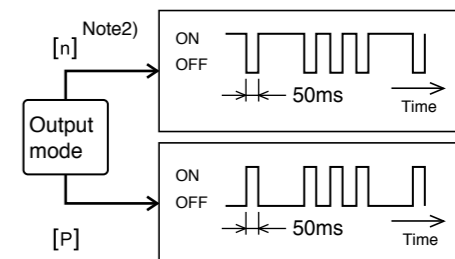
OUT1 Output Specifications (continue)

Integration switch output (oU1_1)

See "Flow rate setting mode" to input setting value.



Integration Pulse output(oU1_2)



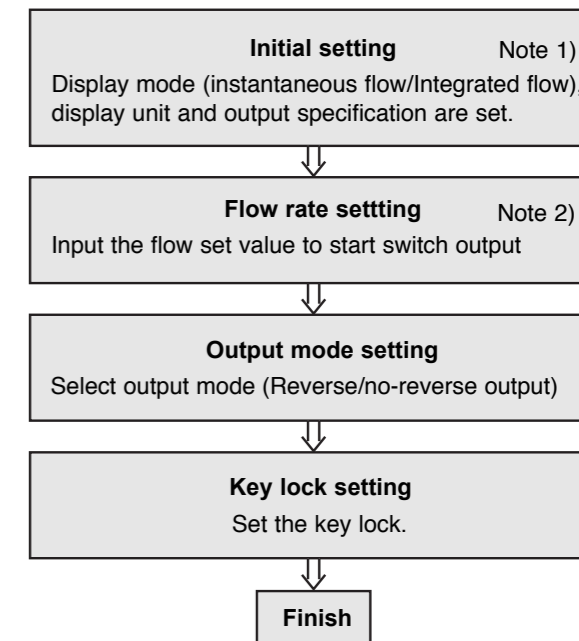
Flow rate per pulse Note1)

Display	Intrgrated flow
U_1	100L/pulse
U_2	10.0ft³/pulse

- Note1) Unit selection function type (Unit is fixed to SI unit for the type without this function)
Note2) Reversed output is assigned at shipment.

Function Setting

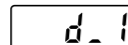
1. Initial setting mode



- Note1) Display unit setting is not available when the model indication specifies the unit as "-M" (fixed units).
Note 2) It does not go into Flow rate setting mode when the integration pulse output [oU1_2] is selected as output specification.

Function Setting (continue)

2. Display selecting mode



Select to display either instantaneous flow or integrated flow. Press ▲ button to select desired flow, then press SET button.

[d_1] instantaneous flow, [d_2] integrated flow.

3. Display unit selecting mode

Display unit can be selected when the units selection option is specified. -M means the unit is fixed to SI units, so it does not enter into Display unit selecting mode.

Display unit selecting mode

(When Unit spec. in Model Indication is without "-M")

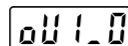
Unit can be selected from that of Instantaneous flow or integrated flow. The unit is changed by pressing ▲ button.

It will be set up if the SET button is pressed.

If the MODE button is pressed instead of the SET button, it will move to [F_3].

Display	Instantaneous flow	Integrated flow
U_1	L/min	L, m ³ , m ³ x 10 ³
U_2	CFM	ft ³ , ft ³ x 10 ³ , ft ³ x 10 ⁶

4. Output specification selecting mode

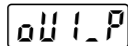


To set OUT1 Output specifications.

Press ▲ button to select OUT1 output mode, then press SET button. [oU1_0] indicates instantaneous switch output, [oU1_1] indicates Integrated switch output, [oU1_2] indicates Integrated pulse output. Set the flow rate set value after selecting OUT1 output mode. Flow rate setting is not required when selecting integrated pulse output [oU1_2].

5. Output method selecting mode

To set OUT1 output mode. Reverse output and non-reverse output modes are available.



* Press ▲ button to select the mode from reverse output or non-reverse output. Press SET button to set. [oU1_n] indicates reverse output mode, [oU1_P] indicates non-reverse output mode.

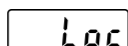
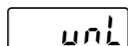
Press MODE button instead of SET button to move to [F_5].

6. Key lock mode

Prevents wrong operation such as unintentional change of set value.

LOCK

- Press SET button, and the display changes from [F_5] to [unL].
- Press ▲ button to set the display to [Loc].
- Press MODE button to move to [F_6], or to [F_7] if [oU1_2] integrated pulse output is selected.
- Setting is completed by pressing SET button.



RELEASE

- Press MODE button longer than 3 sec. at the normal mode to display [F_5], then press SET button.
- Press ▲ button to display [unL].
- Setting is completed by pressing SET button.

Function Setting (continue)

7. Flow rate setting mode

Input the flow rate set value. Input method depends on OUT1 output specification. The flow switch does not go into flow rate setting mode when the [oU1_2] integrated pulse output is selected for OUT1.

Instantaneous switch output (oU1_0)

1. Press SET button to select [n_1] ([P_1]) set value. [n_1] and the set value display alternately in reverse output mode. ([P_1] and the set value display alternately in non-reverse output mode).
2. Select set value by ▲ button or ▼ button. ▲ button to increase value, ▼ button to reduce.
3. Press SET button to select [n_2] ([P_2]) set value. [n_2] and the set value display alternately in reverse output mode. ([P_2] and the set value display alternately in non-reverse output mode).
4. Select the set value by ▲ and ▼ button as above.
5. Press SET button to set the value.
6. Window comparator mode: n_1 < n_2 (P_1 < P_2) [HIS] and hysteresis set value display alternately.
 - Press SET button after selecting hysteresis with ▲ or ▼ button.
 - ▲ button to increase the value, ▼ button to reduce.
 - Hysteresis value is adjustable from 0 to 3% of rated flow value. If the difference between n_1 (P_1) and n_2 (P_2) is less than 6% of rated flow, the max. value of hysteresis is half of the difference between n_1 (P_1) and n_2 (P_2).
7. Hysteresis mode : n_1 ≥ n_2 (P_1 ≥ P_2)
 - Hysteresis value is not set.
 - The hysteresis is determined by the difference between n_1 and n_2 (P_1 and P_2).

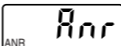
Integration switch output (oU1_1)

The value can be set up to 9999[m³ x 10³], 999[m³], 999[L]. which represents 9,999,999,999L

1. Press SET button to input the set value in the digit of [L]. [n_3]([P_3]) and the set value display alternately and "OUT" and "L" are flashing.
 - * Press SET button longer than 2 sec. to complete setting.
2. Select set value with ▲ and ▼ button. ▲ button to increase, ▼ button to reduce.
3. Press SET button to input the set value in the digit of [m³]. [n_3] ([P_3]) and the set value display alternately and "OUT" and "m³" are flashing.
 - * Press SET button longer than 2 sec. to complete setting.
4. Select the set value by ▲ and ▼ button as above.
5. Press SET button to input the set value in the digit of [m³ x 10³]. [n_3] ([P_3]) and the set value display alternately, and "OUT" and "m³ x 10³" are flashing.
 - * Press SET button longer than 2 sec. to complete setting.
6. Select the set value by ▲ and ▼ button as above.
7. Press SET button to return to the status of 1. above. Press SET button longer than 2 sec. to complete setting.

8. Flow conversion mode

Displays air flow converted during standard condition (Anr : 20°C, 101.3kPa, 65%RH[ANR]), or normal condition (nor : 0°C, 101.3kPa).



1. Press SET button, and select with ▲ button. [Anr] indicates standard condition, [nor] normal condition.
2. Press SET button or MODE button to complete the setting.

Other Functions

Flow display check

Check integrated flow when instantaneous flow is displayed

Integrated flow is displayed only during ▼ button is pressed. (Returns to instantaneous flow when releasing ▼ button.)

* The unit of integrated flow is changed as [L] → [m³] → [m³ x 10³] → [L] if press ▲ button is pressed while pressing ▼ button.

Check instantaneous flow when integrated flow is displayed

Instantaneous flow is displayed only during ▼ button is pressed. (Returns to integrated flow when releasing ▼ button.)

Change the unit of integrated flow display

To set the integrated flow display unit while integrated flow is displayed.

1. Unit flashes by pressing ▲ button.
2. The unit is changed as [L] → [m³] → [m³ x 10³] → [L] by pressing ▲ button.
3. Unit stops flashing when the unit is selected by pressing SET button.
 - * The unit stops flashing if no buttons are pressed for 5 seconds. The Integrated flow display unit is not changed.

Clear the Integrated Value

The Integrated value is cleared by pressing both the ▲ and ▼ buttons simultaneously for 5 seconds.

Initialize the Set Value

All of the settings can be returned to initialized values at shipment. Press ▲ and ▼ button simultaneously for longer than 2 seconds during initial setting mode [F_0]. Press SET button after [F_00] appears.

* Setting is returned to [F_0] without change by pressing MODE button.

See below for settings at shipment.

Display setting : Instantaneous flow (d_1)

Unit setting : L/min (U_1)

Output spec. : Instantaneous switch output (oU1_0)

Output mode : Reverse output (oU1_n)

Flow setting value : Instantaneous flow, Intermediate value of full-range/Integrated flow : 0

Key lock mode : Unlocked (unL)

Flow conversion condition : 20°C, 101.3kPa, 65%RH[ANR](Anr)

Error Display and Troubleshooting

This function displays error location and nature. When a problem or an error occurs, take the following actions.

LED display	Error Nature	Troubleshooting
Err_1	A current exceeding 80mA is flowing to OUT1.	Turn the power off. Check the load and wiring of OUT1.
Err_3	Set data has been changed due to an unknown reason.	Reset all the data.
-----	The fluid flow is higher than rated value.	Reduce the flow to below the rated value.

To reset display of Error 1 and 3, press ▲ and ▼ button simultaneously.

Contact

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

SMC Corporation

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

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