

INSTRUCTION MANUAL

RAPIFLOW® microflow type

FSM-H-A series

- Analog type

- Separate indicator

Please read this instruction manual carefully before using this product, particularly the section describing safety.
Retain this instruction manual with the product for further consultation whenever necessary.

Precaution

• This product is designed for air and compressed dry air and N₂. Do not use it with combustible gases.

• Do not touch electric wiring connections (exposed live parts): this will cause an electric shock. During wiring, keep the power off. Also, do not touch these live parts with wet hands.

1.CAUTION

- ① The product can not be used as a business mater. Not conformed to the Measurement Law, do not use the product for the commercial purpose. Use the product as an industrial sensor.
- ② In installation, please be sure to hold the product's main body to prevent any impact to body and stress to the flying lead.
- ③ Do not use the product with other than applicable working fluids, or the accuracy can not be guaranteed.
- ④ Install a filter, an air dryer and an oil mist filter (micro alescer) onto the primary side(upstream) of the sensor since the compressed air from the compressor contains drain(water, oil oxide and foreign material, etc.) Mesh(wire net) in a sensor is used to rectify the flow in the pipe. Always install a filter since this mesh is not a filter to remove foreign materials, etc.
- ⑤ Even if twice as much as overflow as each series measuring range is applied to the sensor, it is no problem, however, if dynamic pressure is applied near to the maximum working pressure, (when the pressure applied to the primary side with the secondary side released.), the sensor may fail. When feeding workpieces during leakage inspection, if dynamic pressure is applied, always provide a by-pass circuit or a needle valve to avoid dynamic pressure applying to the sensor.

2. Specifications

Descriptions		Indicator type FSM-H-A-□-□ ML-□□
Flow rate range (m ³ /min) ^{Note1}	※1	005 0.25 to 5
		010 0.5 to 10
		050 2.5 to 50
		100 5 to 100
		100 5 to 100
Body material	※2	Stainless steel, Rc1/8
Port size		6G
Working conditions	Working fluid ^{Note2}	Clean air (JIS B 8392-1.1.1 to 6.2), compressed air(JIS B 8392-1.1.1 to 6.2), and nitrogen gas
	Maximum working pressure	1.0MPa
	Minimum working pressure	-0.09MPa
	Withstanding pressure	1.5MPa
	Ambient temperature/humidity	0 to 50°C, 90%RH or less
Accuracy	Working fluid temperature	0 to 50°C
	Linearity (display/reading output)	±3%F.S. or less (0.1Mpa, 25°C, flow rate range 5 to 100%F.S.)
	Pressure characteristics	±3%F.S. or less(-0.09 to 1.0 Mpa, 0.1Mpa criteria)
	Temperature characteristics	±0.2%F.S./°C(15 to 35°C, 25°C criteria)
	Repeatability (F.S.)	±0.5% F.S. or less
Response time	Response time ^{Note3}	50ms or less
	Display	Power display (green)
	Analog output	1 to 5V (connected load impedance 50kΩ and over)
	Power supply voltage	DC12/24V(10.8 to 26.4V)
	Current consumption	50mA or less
Functions	Lead wire	φ3.7 0.2mm ² ×3-conductor 1m
	Installation attitude	Both vertical and horizontal
	Strait piping section	Not required
	Protective structure	IP40
	Protective circuit ^{Note4}	Power supply reverse protections
EMC directive	EN55011, EN61000-6-2	EN61000-4-2/3/4/6/8
	Mass	140g

Note1: Converted to volumetric flow at 20°C and 1 atmospheric pressure (101kPa)

Note2: Consult with CKD for usage with a gas other than air and N₂.

Note3: The response time may change depended with piping condition.

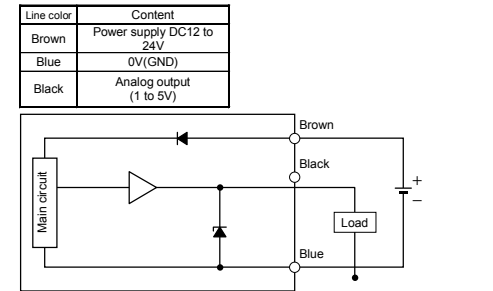
Note4: The protective circuit of this product is effective for the special incorrect wiring and load short circuits, but can not protect the product from all wrong connections.

• Separate indicator

Descriptions		Separate indicator FSM-H-D-□-□ ML
Flow rate range (mL/min)	※2	005 0~5
		010 0~10
		050 0~50
		100 0~100
		100 0~100
Display		Flow rate display (7 segments 3 digits, orange), operation and switch output (orange)
Switch output	※1	N 2 points (NPN open collector output, load current 50mA or less, voltage drop 2.4V)
		P 2 points (PNP open collector output, load current 50mA or less, voltage drop 2.4V)
Switch output response time		Appx. 5ms
Analog output		Output 1 point (1 to 5 V voltage output, and connected load impedance 50 kΩ and over)
Power supply voltage		DC12/24V (10.8~26.4V)
Current consumption		50mA or less (indicator only)
Lead wire		φ3.7 0.2mm ² ×5-conductor (1m)
Functions		Flow rate display, flow rate-peak hold, switch output, analog output
Ambient temperature/humidity		0 to 50°C, 85%RH or less (to be no dew condition)
Protective structure		IEC standards IP40
Mass		Approximate 70g (including lead wire 1m)

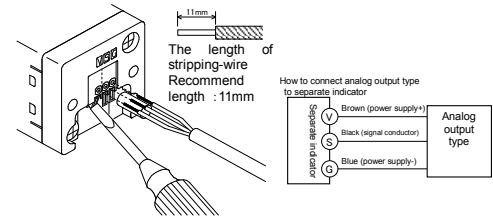
3. Wiring

• Analog output type (FSM-H-A)



• Separate indicator (FSM-H-D N_P)

<Connection of display unit and sensor>



Electrical connection of sensor controller is made with terminal stand.

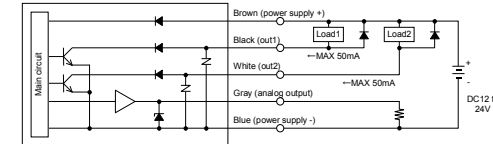
Insert the wire while yellow jaw is pushed.

- Refer to the spec. below if other wires than those for the products are used.

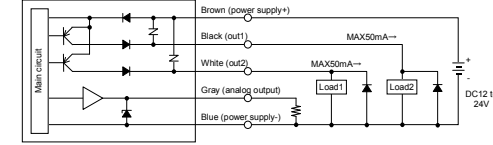
Single-wire	0.14 to 0.5mm ²
Twisted-wire	0.14 to 0.5mm ²
AWG	26 to 20

<Separate indicator>

• FSM-H-DN (separate indicator: NPN output)



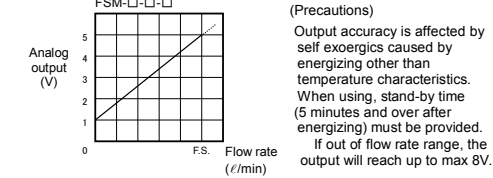
• FSM-H-DP(separate indicator: PNP output)



(Precautions for wiring)

- Wiring**
For wiring, turn off the power supply. Discharge static electricity built in body, tool and equipment before and during work. Use a wire elasticity as wire for robot connection in the movable part.
- Wiring installation**
This product and wiring must be installed as far away as possible from noise source such as strong electric line, etc. Take other countermeasures for a surge on the power supply line.
- Power voltage**
Do not use the product put of power supply voltage range. If voltage more than usage range is applied, or if alternating current power(AC100V) applied, causing damage or burn.
- Short-circuiting**
Do not short-circuit a load, otherwise, or causing damage or burn.
- Incorrect wiring**
Connect wires to the correct poles or terminals, otherwise, wires may be damaged or burned.
- Separate indicator ;**
By connecting display unit (FSM-A-D*) and flow sensor (analog output type: FSM-A), digital display and switch setting of flow rate is possible. The controller has been designed exclusively for FSM. Be sure to combine the controller and the sensor for the same flow rate. Never combine the other flow sensor, FSM for other flow rate or pressure sensor.
- FG connection**
Use DC safety power supply thoroughly insulated from the AC primary side for a power supply for the metal body type, while connecting either + or - side on the power supply to F.G. High potential and insulation resistance tests between the inside power circuit of metal body type and the metal body must not be done.

4.Analog output voltage – flow rate characteristics



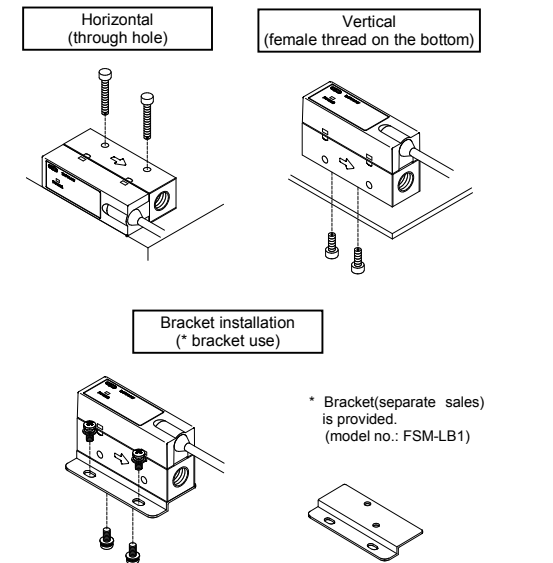
5.Piping

(Precautions for piping)

- This product must be piped, while matching the flow direction and direction specified on the body.
- When a valve is used in the primary side of the sensor, an oil-prohibited valve must be used. The sensor may malfunction or be destroyed by splash of grease and oil, etc.
- When piping in a resin tube, fix the piping as much as possible. When the piping moves during the flow control, abnormality of the flow output is caused as internal gas moves.
- When piping, apply a spanner on the metal section not to apply forces onto the resin section.
 - Never hold the plastic case for tightening.
- When piping, care must be taken that sealing tape and adhesive must not enter into the inside.
 - During the piping work, be sure that any excessive screw-in torque and/or load torque will be applied to the piping port.

Set screw	Tightening torque N·m
Rc1/8	3 to 5
G1/8	3 to 5

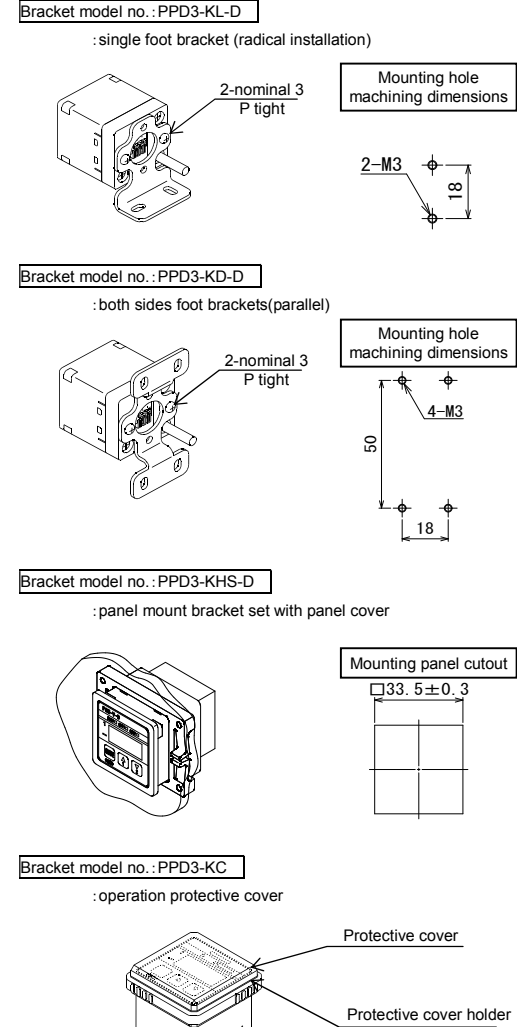
6.Installation



* Bracket(separate sales) is provided. (model no.: FSM-LB1)

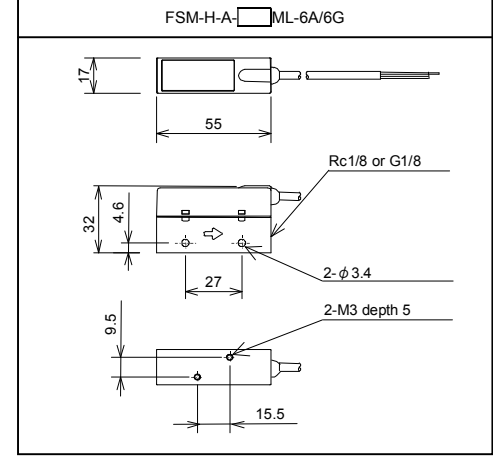
<Separate indicator>

- Bracket/kit (optional) are provided to install a separate indicator.

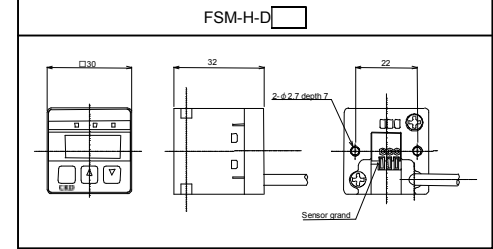


7.External dimensions

<Analog output type>

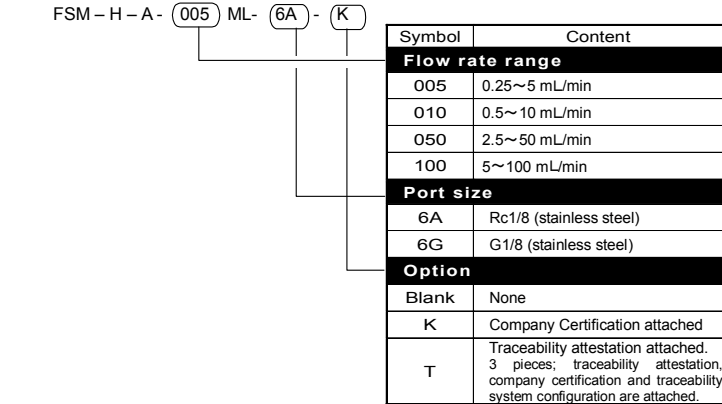


<Separate indicator type>

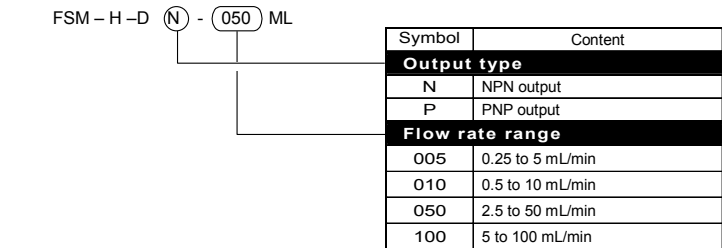


8. How to order

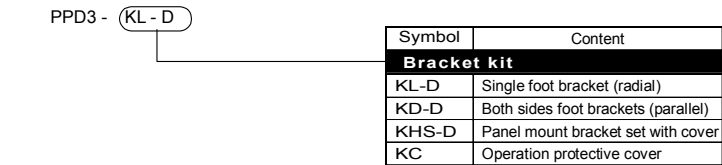
<Analog output type>



<Separate indicator>

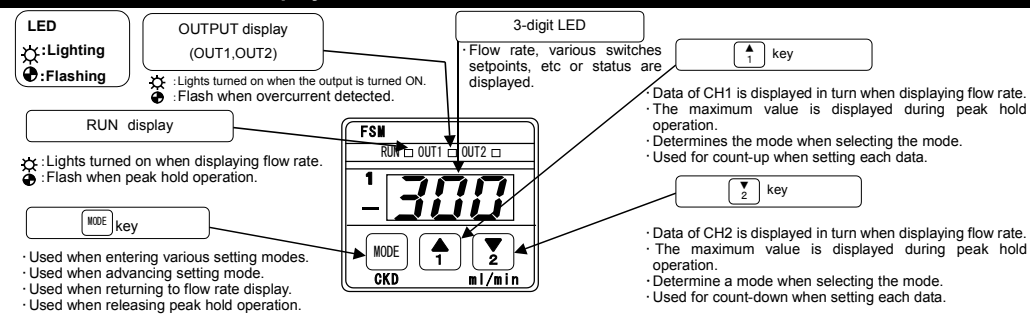


<Bracket for separate indicator>



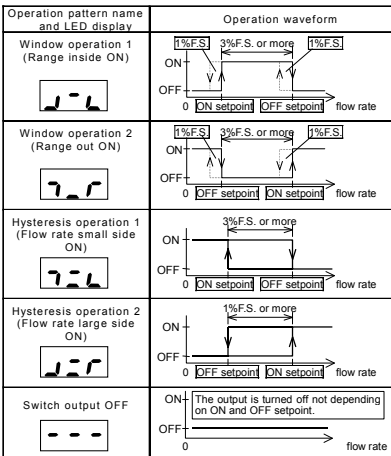
<Separate indicator>

Name and functions of display/controls



Switch function

Switching mode



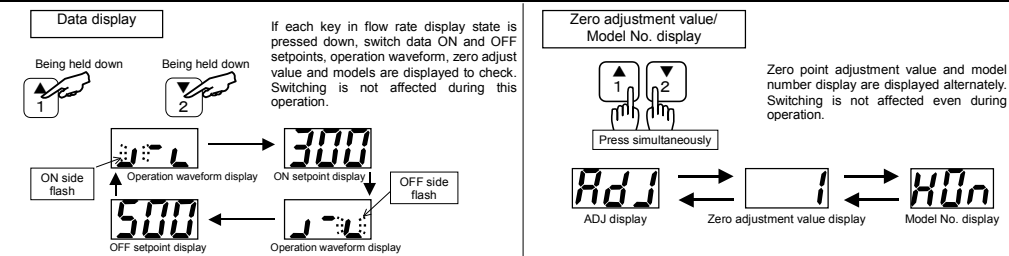
Note:

1. Maintain intervals more than 3% F.S. between two setpoints during window operation. Hysteresis of 1% F.S. is provided on each ON and OFF sides automatically.
2. Maintain intervals more than 1% F.S. between two setpoints when hysteresis operation.
3. If the differential between above 2 setpoints is not satisfied, it may result in not operated or unstable operation. If a switch is activated in unstable flow rate state such as a fluid pulsation, etc., unstable operation may be provided. In this case, maintain the difference between two setpoints satisfactorily, use the product after checking that switching is stabilized.
4. In operation waveform, left side shows minus side, while, right shows plus side.
5. If waveform pattern is decided, magnitude of ON and OFF setpoints is decided, and the reverse magnitude is not allowed. However, in this product, operation with specified operation pattern has precedence over all things. When the two setpoints are inputted, the magnitude is identified automatically, processing the proper identification as ON and OFF setpoints. As result, even if ON and OFF setpoints are inputted reversely, re-recognized as correct ON and OFF setpoints, always operating with the specified operation pattern.

Set example

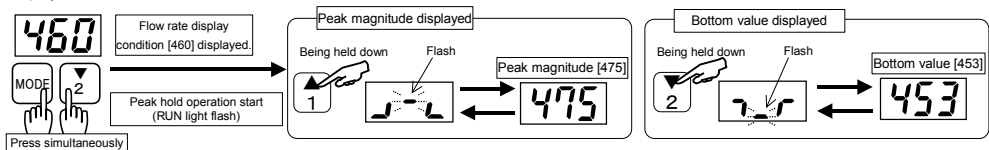
CH	Waveform	ON setpoint	OFF setpoint
1		200	350
2		300	250

Setpoint verification method



Peak hold function

Maximum and minimum values indicated with flow rate value can be read during the specified period. Use this function when checking instantaneous flow rate change. Also, peak hold operation never affects the basic function of this product such as switching and flow rate display, etc.

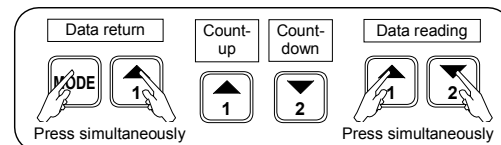


Switch output function/forcible output function/0 point adjustment operation

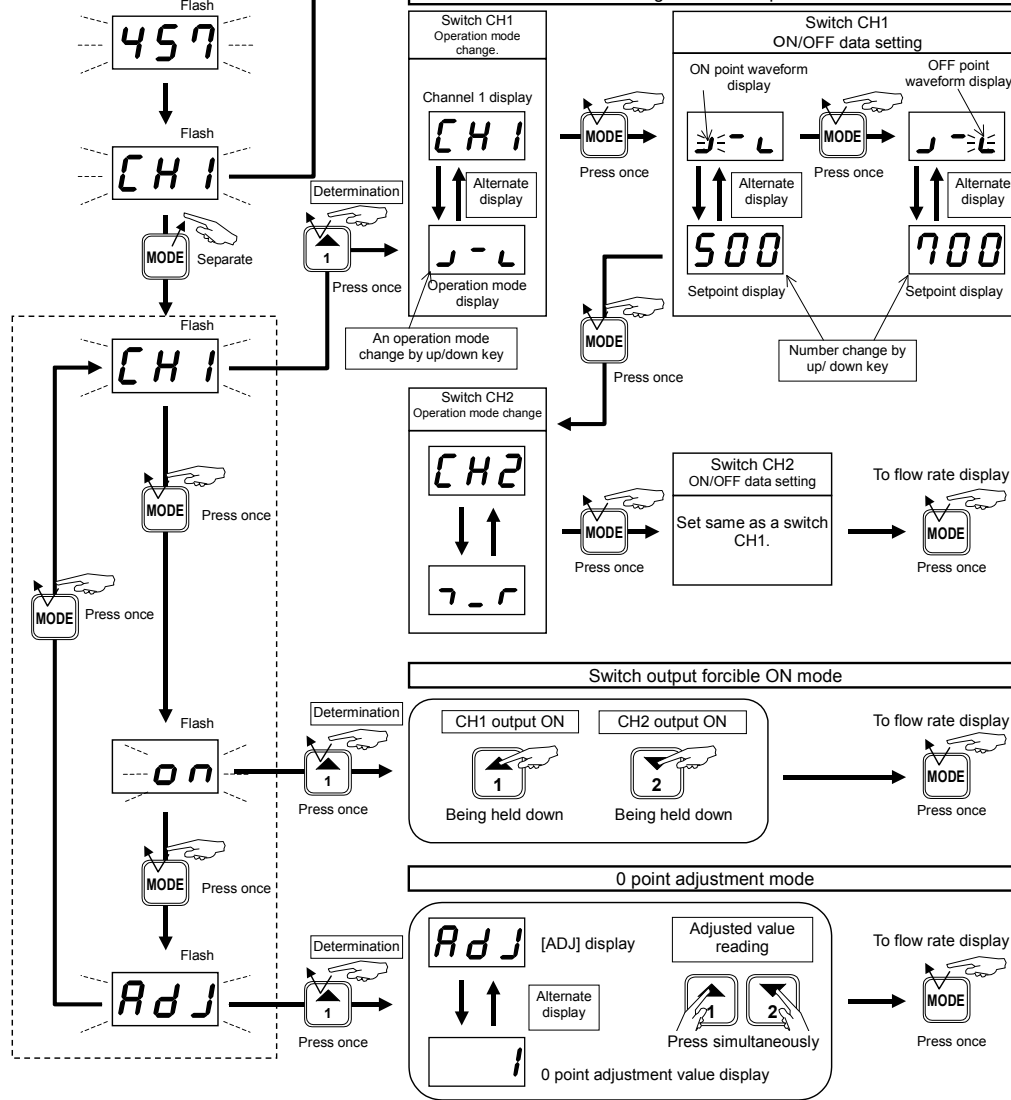
If key operation is not done more than 2 seconds before confirming mode, the display will be returned to flow rate display for safety. If switching off during operation (state of each setting mode), the display will be returned to flow rate display when the product is switched on again.

Basic key operation

It is effective in the switching pattern setting/ ON/ OFF setpoint/ 0 adjustment mode.



Data setting of switch output function



Caution Adjust 0 point in the state that a fluid never flows.