Compact flow rate sensor
RAPIFLOW Fine flow rate
Display/analog output

FSM-H Series (for air/nitrogen gas)

● Flow rate range: 0.25 to 5 / 0.5 to 10 / 2.5 to 50 / 5 to 100 mℓ/min

Display type specifications

Item		Display			
		FSM-H-N/P-005ML	FSM-H-N/P-010ML	FSM-H-N/P-050ML	FSM-H-N/P-100ML
Flow rate range mℓ/min (*1)		0.25 to 5	0.5 to 10	2.5 to 50	5 to 100
Working conditions	Applicable fluids	Clean air (JIS B 8392-1:2012(ISO 8573-1:2010)1.1.1 to 5.6.2), compressed air (JIS B 8392-1:2012(ISO 8573-1:2010)1.1.1 to 1.6.2) *2, nitrogen gas *3			
	Max. working pressure MPa	1.0			
	Min. working pressure MPa	-0.09			
	Proof pressure MPa	1.5			
	Ambient temperature/humidity	0 to 50°C, 90% RH or less			
	Working fluid temperature °C	0 to 50 (no condensation)			
Accuracy	Linearity (display/analog output)	±3% F.S. or less (0.1 MPa, 25°C, flow rate range 5 to 100% F.S.)			
	Pressure characteristics	±3% F.S. or less (-0.09 to 1.0 MPa, 0.1 MPa reference)			
	Temperature characteristics	±0.2% F.S./°C or less (15 to 35°C, base temperature 25°C)			
	Reproducibility (repeatability)	±0.5% F.S. or less			
Responsivity (*5)		50 ms or less			
Display	Display	Flow rate display (7-segment 3 1/2-digit orange), operation and switch output display (orange)			
	Min. display units (*6)	0.01 mL/min *1		0.1 mL/min *1	
Output		Switch output 2 points (NPN or PNP open collector output, 30 VDC or less/50 mA or less, voltage drop 2.4 V or less, PLC/relay compatible) Analog output 1 point (1 to 5 V voltage output, connecting load impedance 50 kΩ and over)			
Power supply voltage		12/24 VDC (10.8 to 26.4 V)			
Current consumption		60 mA or less			
Lead wire		ø3.7 5-conductor (0.2mm² insulator outer diameter ø1.0) 1 m			
Functions		Flow rate display, flow rate display peak hold, switch output, analog output			
Mounting	Mounting orientation	Unrestricted in vertical/horizontal direction			
	Straight piping section	Not required			
Degree of protection		IEC standards IP40			
Protection circuit (*4)		Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection			
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8			

Display type weight

(Unit: g)

Model No. / Port size (body material)		FSM-N/P-005	FSM-N/P-010	FSM-N/P-050	FSM-N/P-100
6A	Rc1/8 (stainless steel)	150	150	150	150
6G	G1/8 (stainless steel)				

Analog output type weight

(Unit: g)

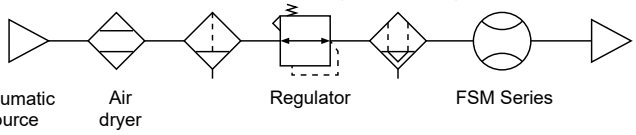
Model No. / Port size (body material)		FSM-A-005	FSM-A-010	FSM-A-050	FSM-A-100
6A	Rc1/8 (stainless steel)	140	140	140	140
6G	G1/8 (stainless steel)				

Analog output type specifications (no display)

Item		Analog output			
		FSM-H-A-005ML	FSM-H-A-010ML	FSM-H-A-050ML	FSM-H-A-100ML
Flow rate range mℓ/min (*1)		0.25 to 5	0.5 to 10	2.5 to 50	5 to 100
Working conditions	Applicable fluids	Clean air (JIS B 8392-1:2012(ISO 8573-1:2010)1.1.1 to 5.6.2), compressed air (JIS B 8392-1:2012(ISO 8573-1:2010)1.1.1 to 1.6.2) *2, N_2 gas *3			
	Max. working pressure MPa	1.0			
	Min. working pressure MPa	-0.09			
	Guaranteed proof pressure MPa	1.5			
	Operating ambient temperature/humidity	0 to 50°C, 90% RH or less			
	Working fluid temperature °C	0 to 50 (no condensation)			
Accuracy	Linearity (analog output)	±3% F.S. or less (0.1 MPa, 25°C, flow rate range 5 to 100% F.S.)			
	Pressure characteristics	±3% F.S. or less (-0.09 to 1.0 MPa, 0.1 MPa reference)			
	Temperature characteristics	±0.2% F.S./°C or less (15 to 35°C, base temperature 25°C)			
	Reproducibility (repeatability)	±0.5% F.S. or less			
Responsivity (*5)		50 ms or less			
Display		Power display (green)			
Output		Analog output 1 point (1 to 5 V voltage output, connected load impedance 50 kΩ and over)			
Power supply voltage		12/24 VDC (10.8 to 26.4 V)			
Current consumption		50 mA or less			
Lead wire		ø3.7 3-conductor (0.2mm² insulator outer diameter ø1.18) 1 m			
Functions		Analog output			
Protection circuit (*4)		Power reverse connection protection			
Mounting	Mounting orientation	Unrestricted in vertical/horizontal direction			
	Straight piping section	Not required			
Degree of protection		IEC standards IP40			
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8			

*1: Flow rate converted to volumetric flow rate at 20°C, 1 barometric pressure (101 kPa)
*2: When using compressed air, use clean air that conforms to JIS B 8392-1: 2012 (ISO 8573-1: 2010) Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, install a filter (filtration degree: 5 µm), air dryer (min. pressure dew point 10˚C or less), and oil mist filter (max. oil content 0.1 mg/m³) on the primary side (upstream side) of this product.

[Recommended circuit]



[Recommended device]
Air filter: F Series
Oil mist filter: M Series

*3: **Contact CKD for use of gases other than air or N_2.**
*4: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*5: The response time varies depending on the piping conditions.
*6: This indicates min. display unit of flow rate, and does not guarantee indicator accuracy.

Separated display specifications (dedicated for analog output)

Model No. / Item		Separated display			
		FSM-H-D$^{N}_{P}$-005ML	FSM-H-D$^{N}_{P}$-010ML	FSM-H-D$^{N}_{P}$-050ML	FSM-H-D$^{N}_{P}$-100ML
Connection enabled Analog output type model No.		FSM-H-A-005ML	FSM-H-A-010ML	FSM-H-A-050ML	FSM-H-A-100ML
Display	Display	Flow rate display (7-segment 3-digit 1/2, orange), operation and switch output display (orange)			
	Min. display units (*6)	0.01 mL/min *1		0.1 mL/min *1	
Output		Switch output 2 points (NPN or PNP open collector output, 30 VDC or less/50 mA or less, voltage drop 2.4 V, PLC/relay compatible) Analog output 1 point (1 to 5 V voltage output, connecting load impedance 50 kΩ and over)			
Power supply voltage		12/24 VDC (10.8 to 26.4 V)			
Current consumption		50 mA or less (display only)			
Lead wire		ø3.7 0.2 mm² x 5-conductor (1 m)			
Functions		Flow rate display, flow rate display peak hold, switch output, analog output			
Operating ambient temperature/humidity		0 to 50°C, 85% RH or less (no condensation)			
Degree of protection		IEC standards IP40			
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8			
Weight g		Approx. 70 (including lead wire 1 m)			

How to order

FSM-H - N - 005ML - 6A - K

Ⓐ Output
Ⓑ Flow rate range
Ⓒ Port size
Ⓓ Option

Code	Description
Ⓐ Output	
A	Analog output 1 point
N	NPN output 2 points, analog output 1 point
P	PNP output 2 points, analog output 1 point
Ⓑ Flow rate range	
005ML	0.25 to 5 mℓ/min
010ML	0.5 to 10 mℓ/min
050ML	2.5 to 50 mℓ/min
100ML	5 to 100 mℓ/min
Ⓒ Port size	
6A	Rc1/8 (stainless steel body)
6G	G1/8 (stainless steel body)
Ⓓ Option	
Blank	None
K	With company certification
T(*1)	With traceability certification

* For the model No. and dimensions of the dedicated bracket (optional), refer to page 22.

*1) Traceability certification, company certification, and traceability system diagram are included.

[Example of model No.]

FSM-H-N-005ML-6A-K

Model name: FSM Display Type
Ⓐ Switch output format: NPN output
Ⓑ Flow rate range: 0.25 to 5 mℓ/min
Ⓒ Port size: Rc1/8 (stainless steel body)
Ⓓ Option: With company certification

● Separated display (dedicated for analog output)

FSM - H - D N - 010ML

Ⓐ Switch output
Ⓑ Flow rate range

Code	Description
Ⓐ Output	
N	NPN output 2 points, analog output 1 point
P	PNP output 2 points, analog output 1 point
Ⓑ Flow rate range	
005ML	0.25 to 5 mℓ/min
010ML	0.5 to 10 mℓ/min
050ML	2.5 to 50 mℓ/min
100ML	5 to 100 mℓ/min

* Refer to pages 29 to 34 for operation and dimensions, etc.

● Mounting bracket for separated display

PPD3 - KL-D

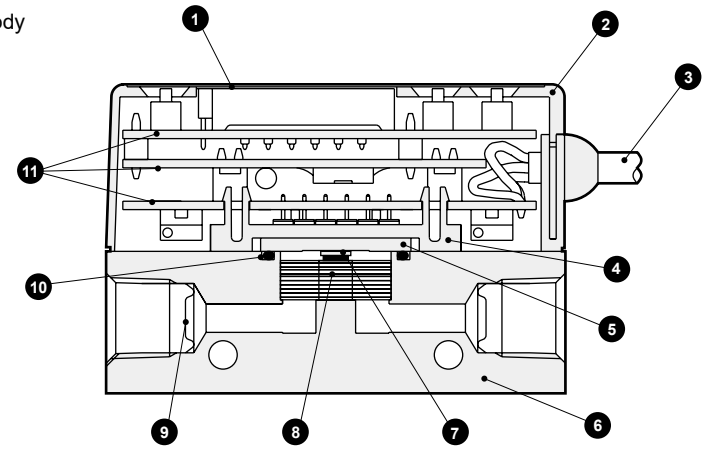
Ⓐ Mounting bracket kit

Code	Description
Ⓐ Mounting bracket kit	
KL-D	One-side mounting foot (L-shaped mounting)
KD-D	Two-side mounting foot (parallel mounting)
KHS-D	Panel mounting bracket set with cover
KC	Operation protective cover

* Refer to pages 29 and 30 for dimensions and mounting dimensions of mounting bracket.

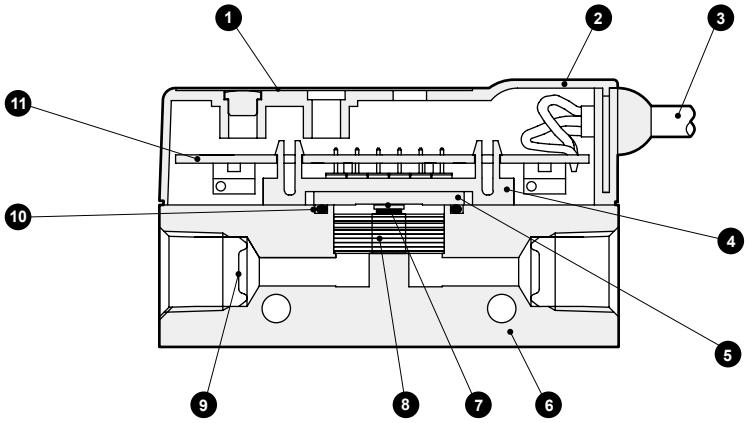
Internal structure and parts list

● FSM-H-N/P-□-□
Display type stainless steel body



No.	Part name	Material	No.	Part name	Material
1	Front sheet	Polyester film	7	Sensor chip	Silicone
2	Case	ABS resin	8	Rectifier	Stainless steel
3	Lead wire with holder (5-conductor)	ABS resin/polyvinyl chloride	9	Port filter	Stainless steel
4	Module holder	Polyamide resin	10	Sensor gasket	Fluoro rubber
5	Sensor board	Alumina	11	Electronic circuit board	
6	Stainless steel body	Stainless steel			

● FSM-H-A-□-□
Analog type stainless steel body



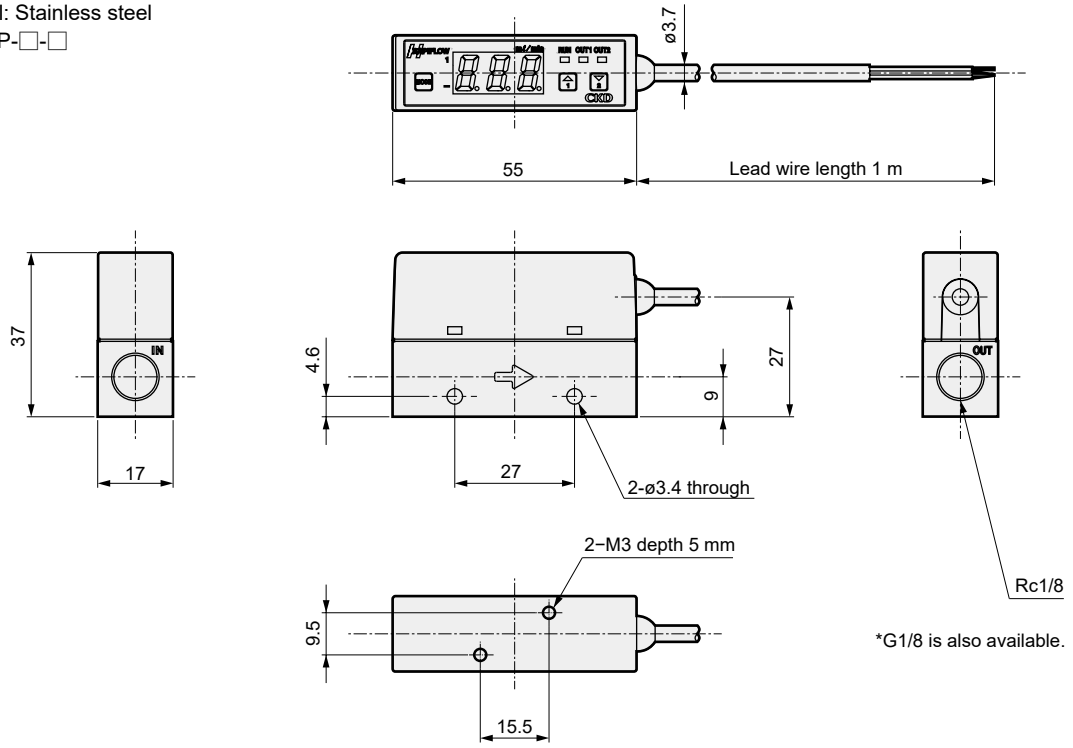
No.	Part name	Material	No.	Part name	Material
1	Front sheet	Polyester film	7	Sensor chip	Silicone
2	Case	ABS resin	8	Rectifier	Stainless steel
3	Lead wire with holder (3-conductor)	ABS resin/polyvinyl chloride	9	Port filter	Stainless steel
4	Module holder	Polyamide resin	10	Sensor gasket	Fluoro rubber
5	Sensor board	Alumina	11	Electronic circuit board	
6	Stainless steel body	Stainless steel			

● Separated display FSM-H-D□-□

Refer to page 29 for the internal structure of the separated display.

Dimensions (display type)

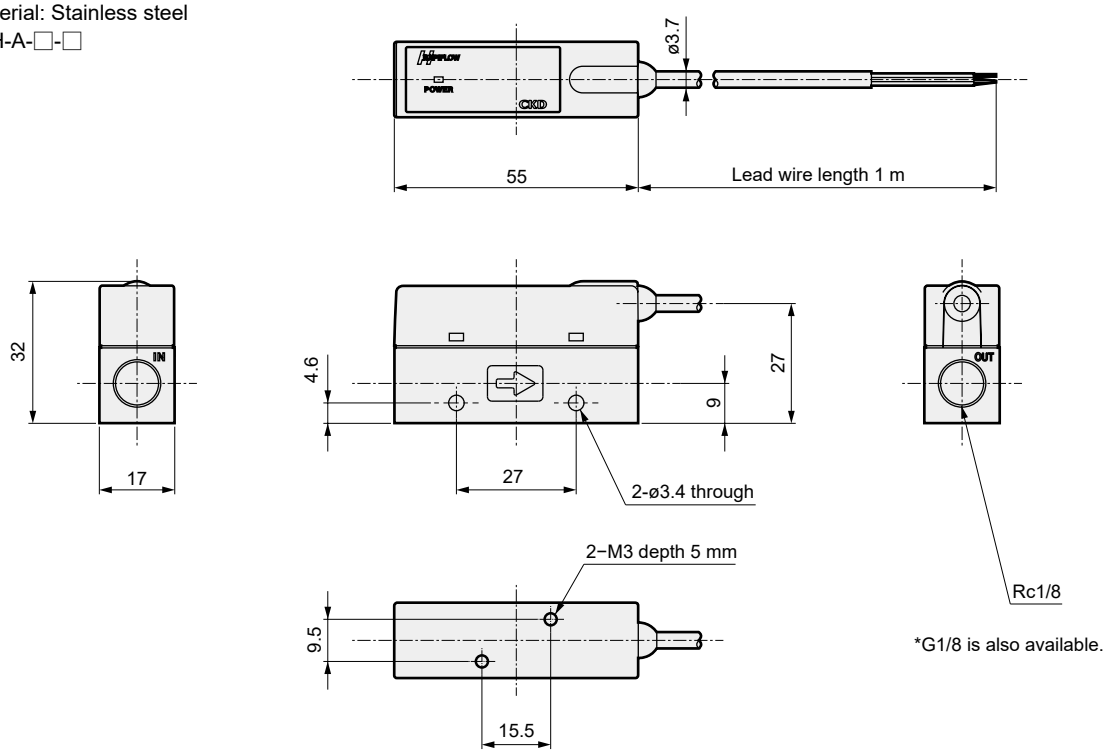
Body material: Stainless steel
● FSM-H-N/P-□-□



*G1/8 is also available.

Dimensions (analog output type)

Body material: Stainless steel
● FSM-H-A-□-□

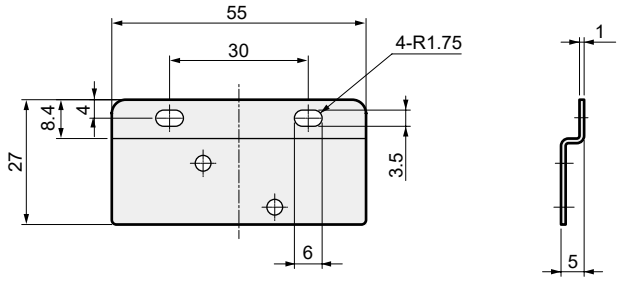


*G1/8 is also available.

*Refer to page 29 for the dimensions of the FSM-H-D□-□ separated display.

Dimensions (dedicated bracket)

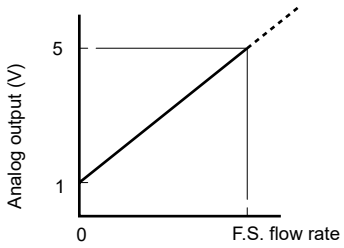
Model No.: FSM-LB1



4 M3 fixing screws (length 6 mm) included

Analog output characteristics

● FSM-H-□-□

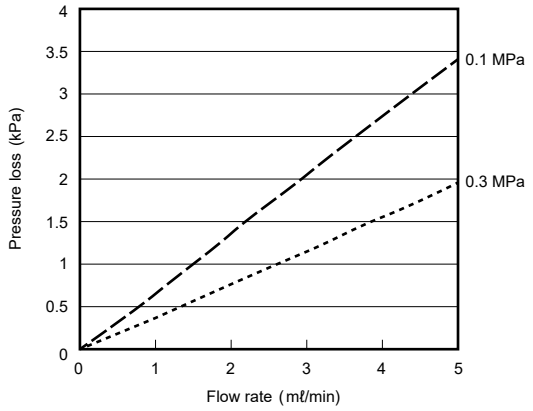


Flow rate (ℓ/min)

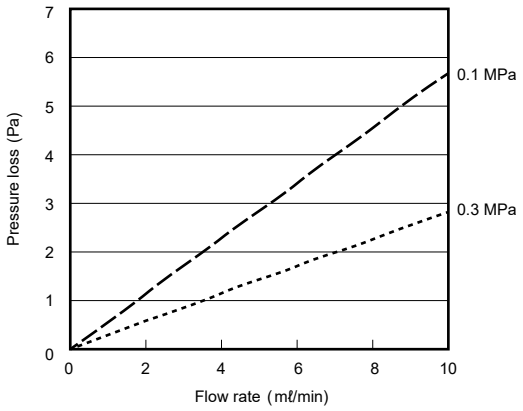
(Note) Output is up to maximum 8 V if the flow rate range is exceeded.

Pressure loss characteristics

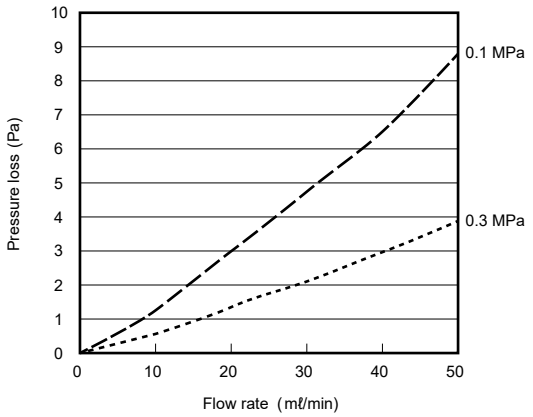
● FSM-H-□-005ML-□



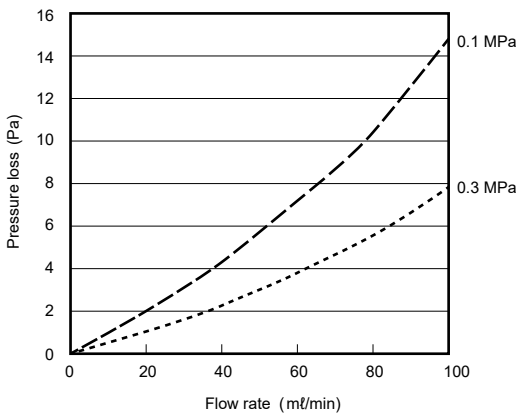
● FSM-H-□-010ML-□



● FSM-H-□-050ML-□



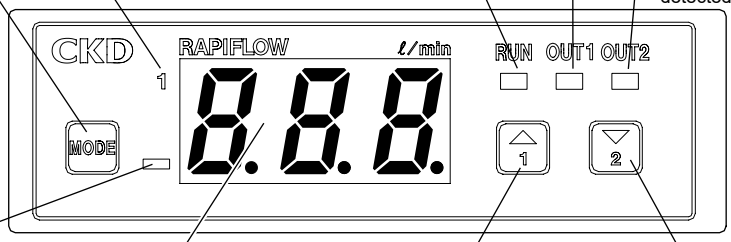
● FSM-H-□-100ML-□



For names, functions, and operation method of the display/operation section,
refer to page 23 for the integrated display and page 31 for the separated display.

Names and functions of display/operation section

● Integrated display (FSM-H) Series



Overflow display
- Turns ON when 3-digit display limit is exceeded, 1.
  (at 10.00 ℓ/min, this 1 turns ON and displays a 3-digit 0.00 LED.)

RUN display
- Turns ON when flow rate is displayed.
- Blinks when peak hold operates.
- Turns OFF in setting mode.

Output (OUT1) display
- Lights when switch CH1 output is ON.
- Blinks when overcurrent is detected.

Output (OUT2) display
- Lights when CH2 output is ON.
- Blinks when overcurrent is detected.

MODE key
- Used to enter each setting mode.
- Used to return to flow rate display.
- Used to cancel peak hold operation.

Negative display [excluding FSM (for air/nitrogen)]
- Turns ON during reverse direction flow.

3-digit LED display
- Displays the flow rate display and switch set values, etc.
- In the case of overflow, H 0 is displayed.
- In the case of reverse direction overflow, L 0 is displayed.
  (excluding FSM [for air/nitrogen])

1 (UP) key
- During flow rate display, displays CH1 data sequentially.
- During peak hold operation, displays max. value.
- During mode selection, sets the mode.
- When setting each data, this key is used to count up the values, etc.

2 (DOWN) key
- During flow rate display, displays CH2 data sequentially.
- During peak hold operation, displays the min. value.
- When setting each data, this key is used to count down the values, etc.

*The FSM-H Series has a different front sheet design. The names and functions of the display/operation section are the same.

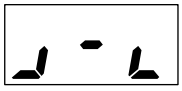
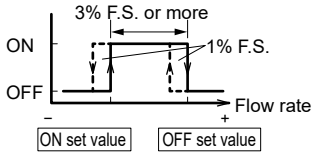
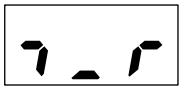
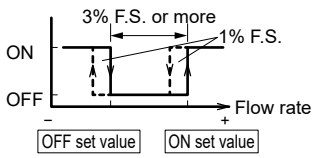
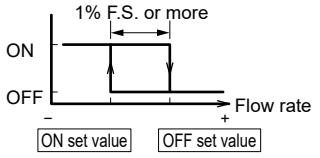
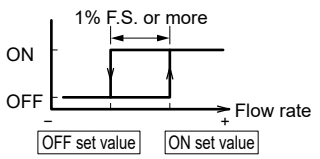
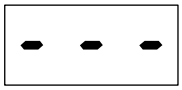
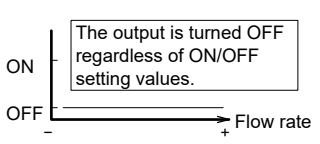
● Separated display

Refer to pages 31 to 34 for names, functions and operation.

Operation mode

Switch output function

Switch operation mode

Name of operation pattern	LED display	Operation waveform
Window operation 1 (ON when inside range)		
Window operation 2 (ON when outside range)		
Hysteresis operation 1 (ON at low flow rate side)		
Hysteresis operation 2 (ON at high flow rate side)		
Switch output OFF		

*1: In a window operation, provide an interval of 3% F.S. or more between the two set values.
A 1% F.S. hysteresis is automatically added to the ON and OFF sides.

*2: For hysteresis operation, provide an interval of 1% F.S. or more between the 2 set values.
If the two settings are the same, operation may not take place or may be unstable.

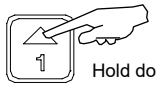
*3: If switches are operated when fluid is pulsating or flow rate is otherwise unstable, operation may be unstable.
In this case, provide sufficient margin between the two setting values, and confirm that switch operation is stable before use.

*4: The left side of the operation waveform indicates negative pressure and the right side positive pressure.

*5: Specifying the waveform pattern naturally determines the magnitude relationship of the ON and OFF set values and precludes the reverse thereof.
With this product, however, operation of the designated operation pattern is the priority.
When two setting values are input, the device automatically judges their magnitude and assigns them setting values as ON and OFF accordingly.
Thus, even if ON and OFF setting values are input the other way by mistake, they will be corrected and the specified operation pattern will be performed.

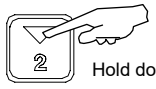
Confirmation of set value

CH1 data display



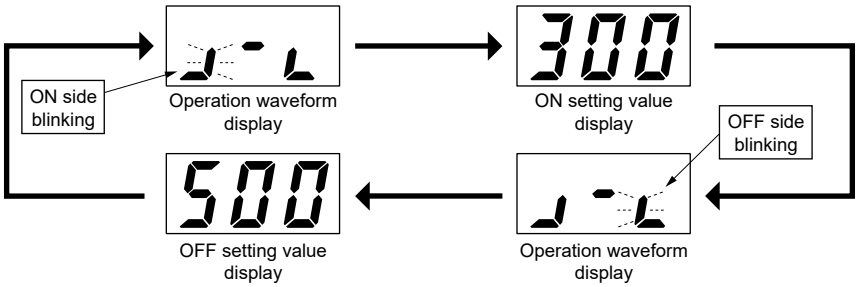
Hold down

CH2 data display



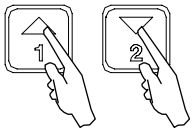
Hold down

By pressing each key during flow rate display, the switch data ON setting/OFF setting/ operation waveform, zero point adjustment value, and model No. can be confirmed.
Switch operation is not affected during this operation.



Zero point adjustment value/model No. display

(excluding FSM [for air/nitrogen])



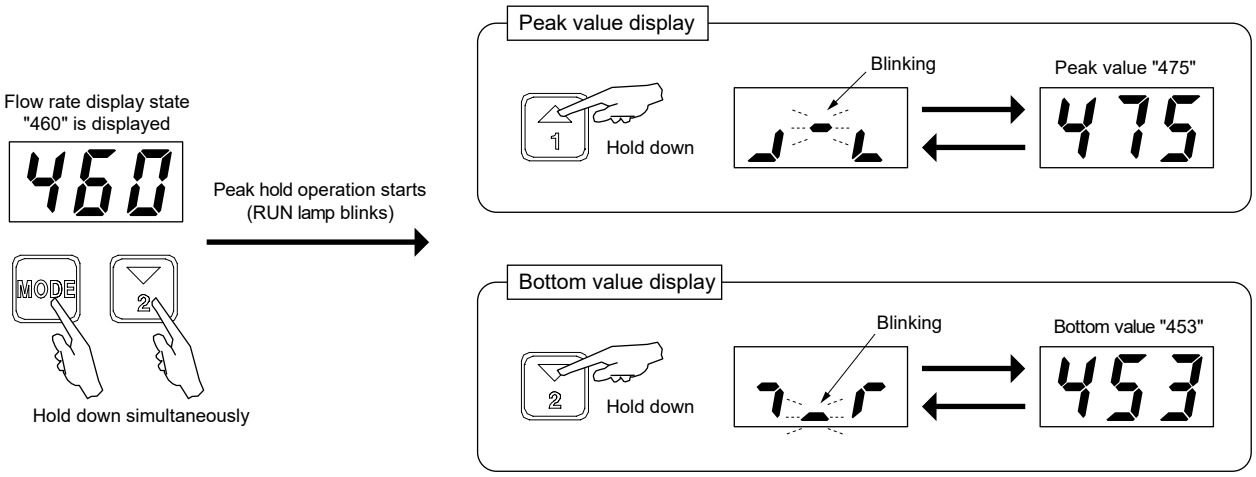
Hold down simultaneously

The zero point adjustment value and model No. are displayed alternately.
Switch operation is not affected even during this operation.

Operation method of each function

Peak hold function

Max. and min. values for the flow rate within a set interval are displayed.
Use this to check the instantaneous flow rate change, etc.
The peak hold operation does not affect this product's basic functions such as switch operations or flow rate display.



Switch output function

Refer to page 26 for operation.

This product has 2-point switch output, and uses four operation modes and operation stop.
The switch function is started by setting the required operation pattern and by configuring two setting values, "ON/OFF", that specify the operation point.
Determine the required operation pattern and ON/OFF setting values before setting.
Select and set the following data to operate the switch.

CH1: Operation pattern	CH1: ON set value	CH1: OFF set value
CH2: Operation pattern	CH2: ON set value	CH2: OFF set value

Forced output function

Refer to page 26 for operation.

Use this function to forcibly turn the switch output ON and confirm the wiring connection or initial operation of the input device.
(Note) Use this test function to check the wiring connection and input device operation.
Avoid using this function instead of actual signals when executing the sequence program while the machinery and equipment are operating.

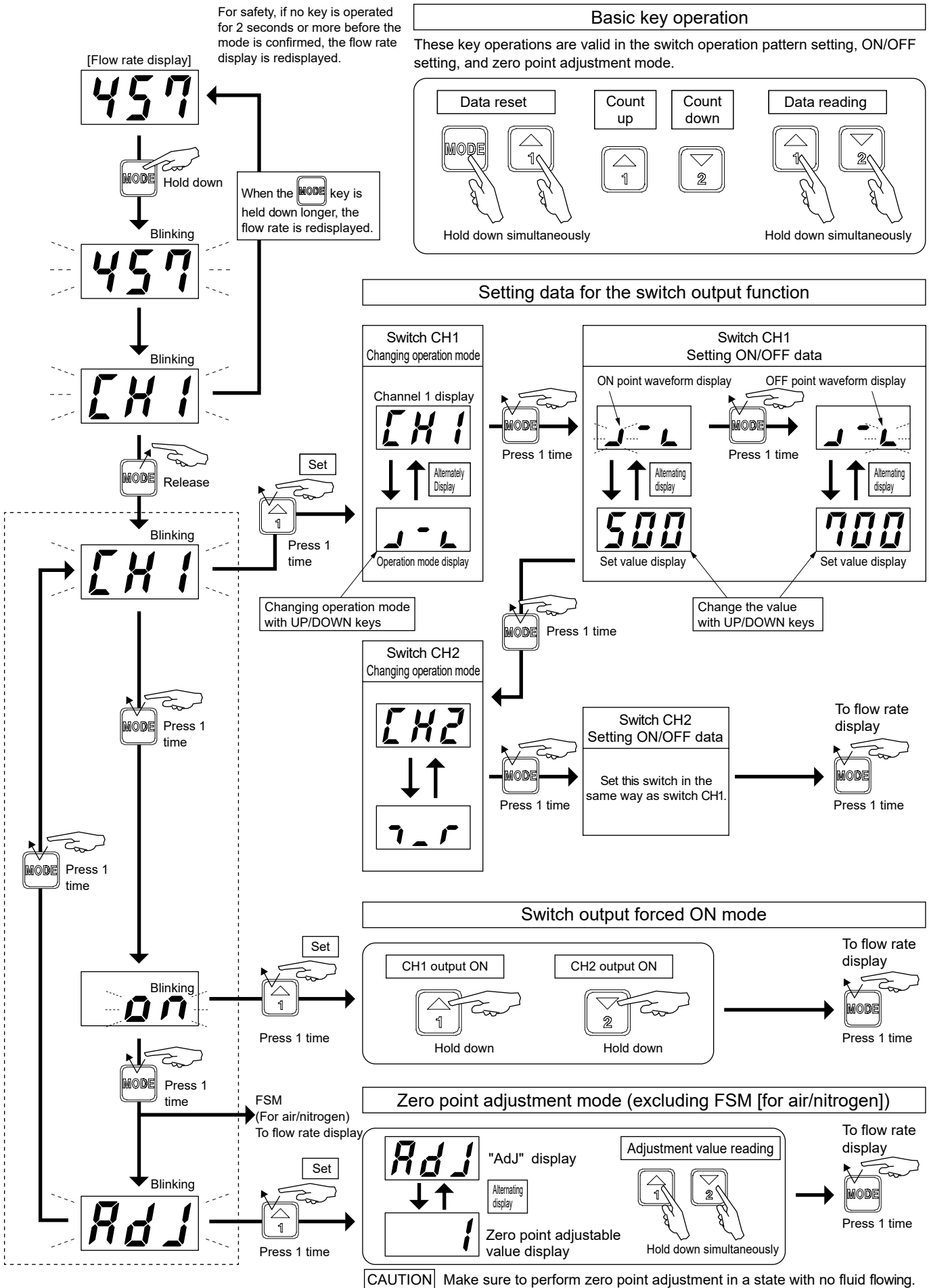
Zero point adjustment function

Operation methods are on page 26 (excluding FSM [for air/nitrogen]).

Deviation of the display from zero is compensated for in the no flow rate state.

(Note) The above settings and test significantly affect the output signal and display.
Before this operation, be sure to stop the machinery and equipment using this product and confirm that safety can be ensured in case of incorrect operation or display.
Using this function while the machinery and equipment are operating is dangerous and may cause incorrect operation or display.

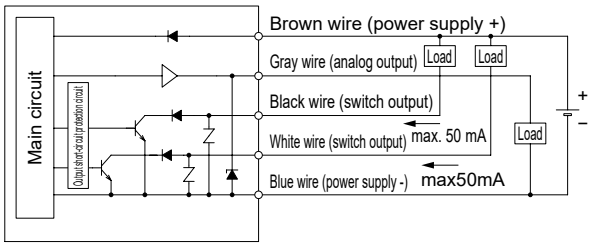
Operation for switch output function/forced output function/zero point adjustment function



CAUTION Make sure to perform zero point adjustment in a state with no fluid flowing.

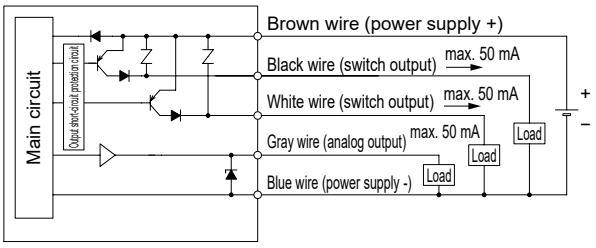
Example of internal circuit and load connection

● FSM-H-N (display type, NPN output)



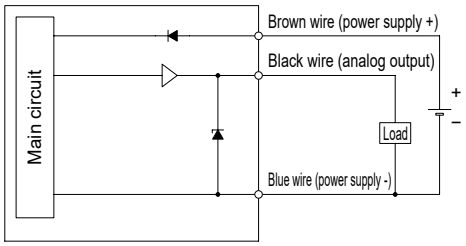
Line color	Description
Brown	Power supply 12 to 24 VDC
Blue	0 V(GND)
Gray	Analog output (1 to 5 V)
Black	OUT1 (max. 50 mA)
White	OUT2 (max. 50 mA)

● FSM-H-P (display type, PNP output)



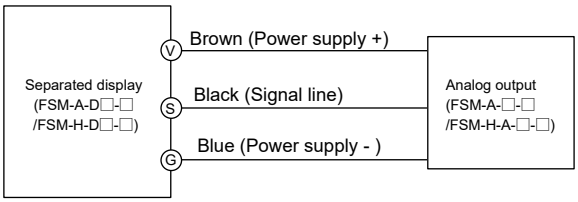
Line color	Description
Brown	Power supply 12 to 24 VDC
Blue	0 V(GND)
Gray	Analog output (1 to 5 V)
Black	OUT1 (max. 50 mA)
White	OUT2 (max. 50 mA)

● FSM-H-A (analog output)



Line color	Description
Brown	Power supply 12 to 24 VDC
Blue	0 V(GND)
Black	Analog output (1 to 5 V)

● Connection method of separated display with analog output



Note: For the metal body type (stainless steel body, aluminum body) connect the body and the F.G. of equipment connected to the - or + of the power source. Do not perform insulation resistance or withstand voltage tests with the F.G. connected. Failure to observe this could result in damage or burning.