
INSTRUCTION MANUAL**SMALL SIZE FLOW SENSOR****RAPIFLOW®****FSM2-[]N series****(Integrated needle valve type)**

- 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.

Warning / cautions to secure safety

- Safety cautions are ranked by the safety cautions as [danger] [warning] [caution] in this section.

⚠ Danger	When a dangerous situation may occur, or when there is high urgency to a warning leading to fatal or serious injuries, if handling is mistaken.
⚠ Warning	When a dangerous situation may occur if handling is mistaken, leading to fatal or serious injuries.
⚠ Caution	When a dangerous situation may occur if handling is mistaken, leading to minor injuries or physical damages.

• Working fluid, Working environment

⚠ Danger	<ul style="list-style-type: none"> ■ A flammable fluid must not be used. ■ Do not use the product in flammable gas environment. Since explosion-protection is not taken, explosion or fire may be caused.
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⚠ Warning	<ul style="list-style-type: none"> ■ 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. ■ Do not use the product with other than applicable working fluids, or the accuracy can not be guaranteed. Do not use for corrosive and flammable gases. ■ Install a filter, an air dryer and an oil mist filter (micro alescerc) onto the primary side (upstream) of the sensor since the compressed air from the compressor contains drain (water, oil oxide and foreign material, etc.) ■ When using this product with adsorption verification, etc., always install an air filter onto the upstream of suction side to prevent suction of foreign materials. ■ Do not use the product in an environment containing corrosive gas such as sulphur dioxide, etc. ■ Use the product within the ambient and fluid temperature ranges 0 to 50 °C. Even in the specified temperature range, do not use the product where ambient and fluid temperatures will change suddenly, and form dew condensations. ■ Use the product in accordance with specifications. If used out of the maximum working pressure and working flow range, the product may result in failures. ■ The protective structure of this product is equivalent to IP40. Do not install the product where moisture, salt, dust or swarf is contained, or where pressurized, or depressurized, neither.
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⚠ Caution	<ul style="list-style-type: none"> ■ The flow rate of this product is measured by mass flow not depended with temperature and pressure. Unit is L/min where mass flow is converted to volumetric flow at 20 °C and 1 atmospheric pressure (101kPa).
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• Installation

⚠ Caution	<ul style="list-style-type: none"> ■ Arrange piping so that the flow direction agrees with the direction of the arrow indicated on the sensor body. ■ When piping a sensor, do not apply excessive screw-in and load torques to the port. ■ Flash the pipe to remove foreign substances and swarf, etc., in inside of pipe before piping. ■ When piping, apply a spanner on the metal section not to apply forces onto the resin section. ■ When piping, care must be taken that sealing tape and adhesive must not enter into the inside. ■ When using the metal body with OUT side released, always connect a joint, or the port filter may be removed. ■ If a push-in joint is used, the tube must be inserted certainly. Pulls the tube to check that the tube not be come out. ■ Make sure that the joint and tube are not twisted or pulled, and that moment load is not applied. ■ The display part uses the LCD. The display becomes difficult to see for the view angle. ■ This product can be installed with any attitude; vertical, horizontal, right or left. ■ This product cannot be used as a stop valve with zero leakage. Slight leakage is allowed in product specifications. ■ Dust generation inside the paths of the needle valve is not zero. Install a final clean filter in circuits where dust generation causes problems. ■ When you install the panel, please install this product after piping etc. ■ Check that lock nuts are not loose. Actuator speed cannot be controlled if the lock nut is loose. ■ A stopper mechanism is provided, but damage could result if the needle is turned too far.
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⚠ Danger	<ul style="list-style-type: none"> ■ Power supply voltage and outputs must be used with the specified voltage. Applying the voltage more than specified voltage may cause malfunction, damage of sensor, electric shock or fire. ■ Do not apply load more than the rated output. Damage or fire of the output may be caused.
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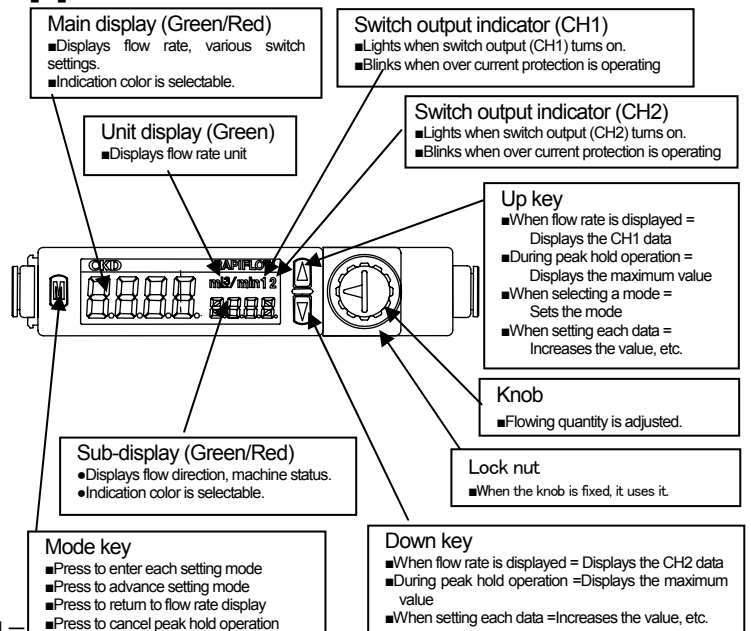
⚠ Caution	<ul style="list-style-type: none"> ■ For wiring, stop control unit/machinery and equipment, and turn off the power supply. ■ This product and wiring must be installed as far away as possible from noise source such as strong electric line, etc. Take other countermeasures for a surge on the power supply line. ■ Do not short-circuit a load, or causing damage or burn. ■ Line color must be checked when wiring. Check the wiring color with handling precaution, since improper wire connection may result in damage, failure or malfunction of the sensor. ■ Use DC safety power supply thoroughly insulated from the AC primary side for a power supply for the metal body (stainless steel and aluminum bodies) type, while connecting either + or - side on the power supply to F.G. ■ After the connectors are inserted, lay the connector covers over the connectors. ■ Make sure that stress by forcible bend of pulling is not applies directly to the sensor cable joint.
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• Usage & maintenance

⚠ Warning	<ul style="list-style-type: none"> ■ Output accuracy is affected by self exoergics caused by energizing other than temperature characteristics. When using, stand-by time (5 minutes and over after energizing) must be provided. ■ For self-diagnosis, this product does not conduct flow rate detecting switch operation for proximate 4 seconds immediately after energized. Make a control circuit and programs to ignore signals for approximate 2 seconds after energized. ■ This product cannot be used as a stop valve with zero leakage. Slight leakage is allowed in product specifications. ■ Dust generation inside the paths of the needle valve is not zero. Install a final clean filter in circuits where dust generation causes problems.
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⚠ Caution	<ul style="list-style-type: none"> ■ When changing set-points of the output, stop the equipment, then change the set-points, or an accident may occur. ■ Disassembly and modification must not be done or causing a failure. ■ When an error occurs during operation, turn off power supply immediately, and terminate the operation, and contact to the sales office. ■ The material of case is resin. Solvent/alcohol/cleaner, etc., must not be used to remove contamination, etc., or causing a resin to be corroded. Wipe weakened neutral detergent with tightly squeezed waste cloth, etc. ■ When out of flow rate range, analog output will be provided. [Hi] or [Lo] will be displayed. However, accuracy is not guaranteed. ■ Do not push the display part, or causing damage. ■ Do not turn the knob too forcibly when fully closing or opening the knob (within 0.05N-m). As well, do not pinch the lock nut when adjusting the needle. Otherwise the needle will gall or be broken.
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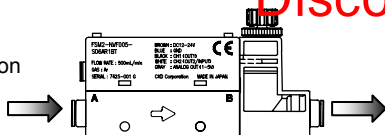
[1] Names and Functions of Each Parts



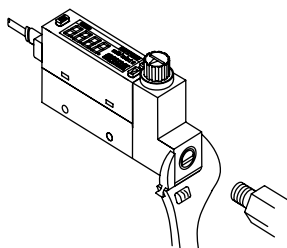
[2] Installation

Discontinue

■ Arrange piping so that the flow direction agrees with the direction of the arrow indicated on the sensor body.



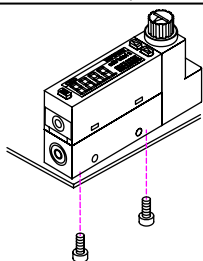
- Flash the pipe to remove foreign substances and swarf, etc., in inside of pipe before piping.
- When piping a sensor, do not apply excessive screw-in and load torques to the port. When piping, apply a spanner on the metal section not to apply forces onto the resin section.



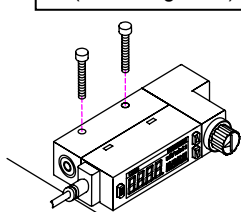
Set screw	Tightening torque N·m
Rc1/8	3~5
Rc1/4	6~8

- When piping, care must be taken that sealing tape and adhesive must not enter into the inside.
- If a push-in joint is used, the tube must be inserted certainly. Pulls the tube to check that the tube not be come out.
- This product can be installed with any attitude; vertical, horizontal, right or left. The tightening torque for screws should be 0.5N·m.

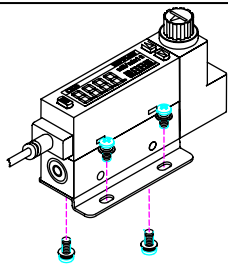
Vertical mount(with bottom thread)



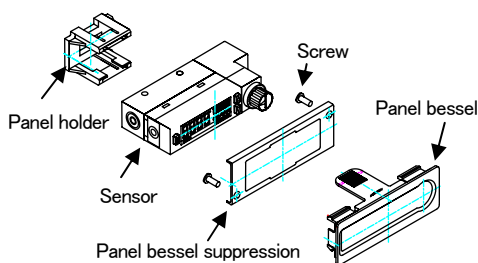
Horizontal mount
(with through hole)



Bracket mount (with bracket)



Panel mount



Bracket (separate sales)

Model no. : FSM2-LB1

Port size: Push-in joint ϕ 4, 6, 8, 10
Rc1/8, Rc1/4

Panel mount kit Model no.
:FSM2-KHS-N

<How to panel mount>

<p>[1] The panel bessel is inserted from the front side of the panel.</p>	<p>[2] The panel Bessel is inserted from the back side of the panel, and holding with the screw.</p>	<p>[3] The separation indicator is inserted from the back side of the panel.</p>
<p>[4] The panel holder is inserted from the back side of the panel.</p>	<p>[5] The panel holder is pushed until the sensor is firmly fixed, and connector is connected.</p>	<p>Note:</p> <ul style="list-style-type: none"> • Please do the piping work before it works of the panel mount, and please do not add the stress to parts of the panel mount. • Please fix by the tightening torque of 0.06N·m when you fix the panel bessel suppression.

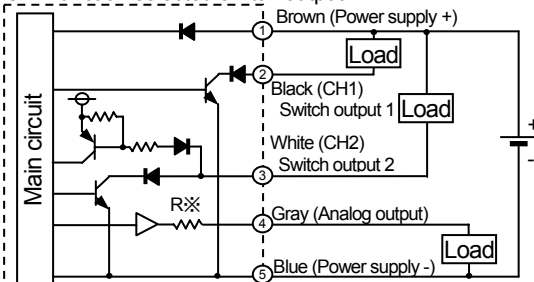
[3] Piping

- Power supply voltage and outputs must be used with the specified voltage. Applying the voltage more than specified voltage may cause malfunction, damage of sensor, electric shock or fire. Do not apply load more than the rated output. Damage or fire of the output may be caused.
- For wiring, stop control unit/machinery and equipment, and turn off the power supply.
- 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.
- Do not short-circuit a load, or causing damage or burn.
- Line color must be checked when wiring. Check the wiring color with handling precaution, since improper wire connection may result in damage, failure or malfunction of the sensor.
- Use DC safety power supply thoroughly insulated from the AC primary side for a power supply for the metal body (stainless steel and aluminum bodies) type, while connecting either + or - side on the power supply to F.G.
- After the connectors are inserted, lay the connector covers over the connectors. Make sure that stress by forcible bend of pulling is not applies directly to the sensor cable joint.

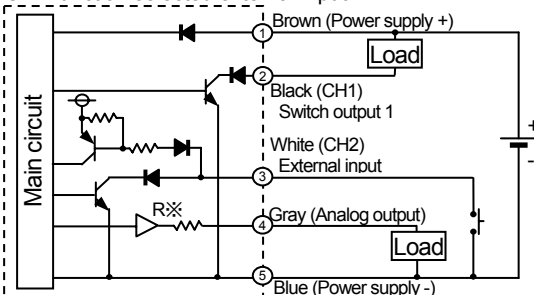
•Example of internal circuit and load connection

NPN output Model no.: FSM2 -N[-][-]

<CH2 function selected switch output>

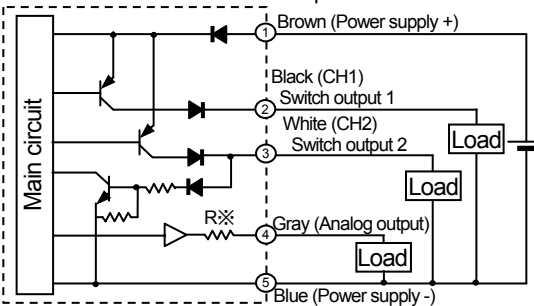


<CH2 function selected external input>

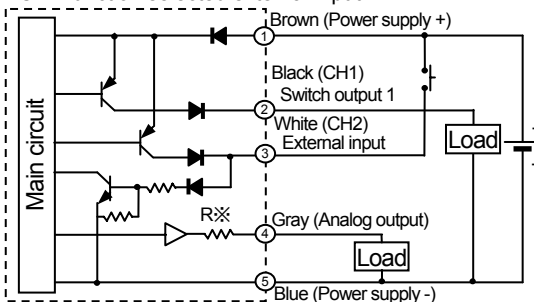


PNP output Model no.: FSM2 -P[-][-]

<CH2 function selected switch output>

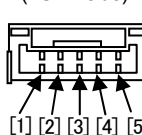


<CH2 function selected external input>



Pin No.	Line color	Content
[1]	Brown	Power supply (DC 12 to 24V, DC 24V)
[2]	Black	CH1(Switch output 1: max50mA)
[3]	White	CH2(Switch output 2: max50mA or External input)
[4]	Gray	Analog voltage output : DC 1 to 5V Connected load impedance 50k Ω and over) Analog current output : DC 4 to 20mA Connected load impedance 300 Ω or less)
[5]	Blue	0V (GND)

(FSM2 side)



※Analog output voltage output type R: about1k Ω
Current output type R: about100 Ω

Discontinue

[4] Function

<Normal mode>

Item	Description
Flow rate display	Instantaneous flow rate is displayed.
Integrating function	Integrated flow rate is displayed.
Peak hold function	Maximum and minimum flow rate values during the specified period can be read.
Set-point verification	Switch data (set-point value and operation mode) are displayed to check.
Key lock	Setting changes are disabled to prevent incorrect operations.
Error display function	The error state is displayed.

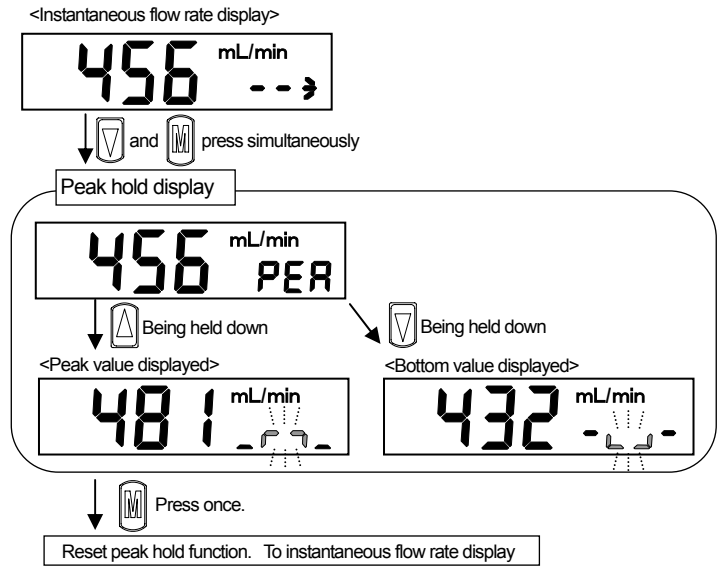
<Standard setting mode>

Item	Description
Switch output	Having 2 pieces of switch output, 7 operation patterns and stop of operation can be set.
Forcible output function	Switch output is turned on forcibly to check wiring connection and initial operation of input unit.
0 point adjustment	Deviation of the display from 0 is corrected.

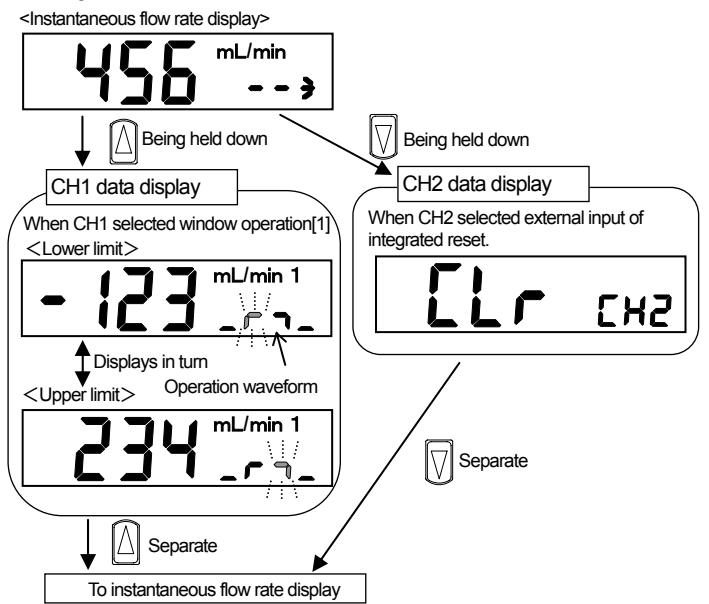
<Detailed setting mode>

Item	Description
Flow direction selection	Only bi-directional type, flow direction can be switched.
CH2 function selection	Sets the CH2 function. Selects "Switch output", "External input of auto reference", or "External input of integrated reset".
Auto reference function	When CH2 function selected external input of auto reference, setting value of switch output can be taken by external input or key operation.
Response time setting	Sets the response time. The response time can be selected from 20ms to 1280ms.
Display speed selection	Change the speed of the displayed.
Sub-display selection	Change the indication of the sub-display. Selects "Flow direction", "Flow rate unit", or "Working fluid".
Displayed color selection	Displayed color can be changed.
Hysteresis fixed value selection	Sets hysteresis of the window operation mode and the auto reference mode. (8 steps)
Flow rate unit selection	Flow rate unit can be changed. Standard condition (ANR): Converted to volumetric flow at 20°C and 1 atmospheric pressure (101kPa). Reference condition (NOR): Converted to volumetric flow at 0°C and 1 atmospheric pressure (101kPa).(calculation value)
Eco mode setting	Current consumption can be lowered. When the product is left for 1 min. without any operation, it's shift to eco mode.
Reset setting	Return to default settings (factory settings)

<Peak hold function>



<Set-point verification method>

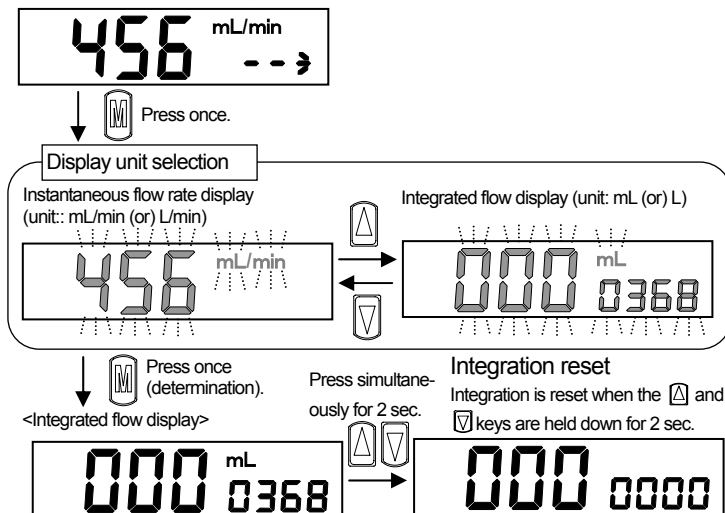


[5]How to operate

5-1.Normal mode

< Displaying the integrated flow >

<Instantaneous flow rate display>



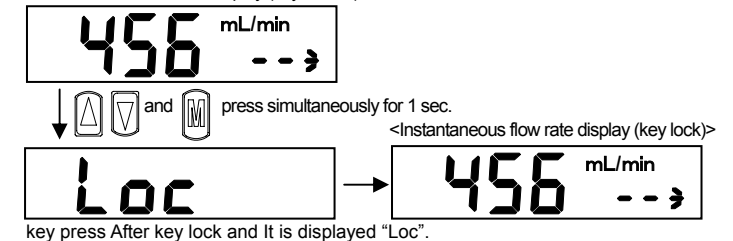
Note: Integration is reset with the external input. See auto reference function.

Note: Integration is also reset or Integrating function display setting is keeping when power is turned OFF.

< Key lock function>

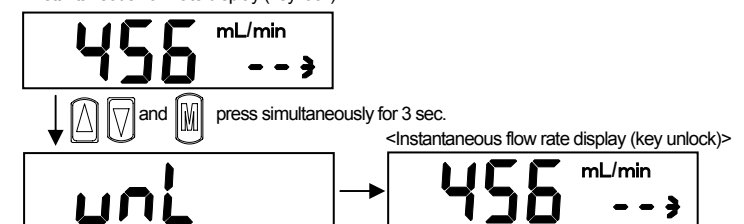
Key lock

<Instantaneous flow rate display (key unlock)>



Key unlock

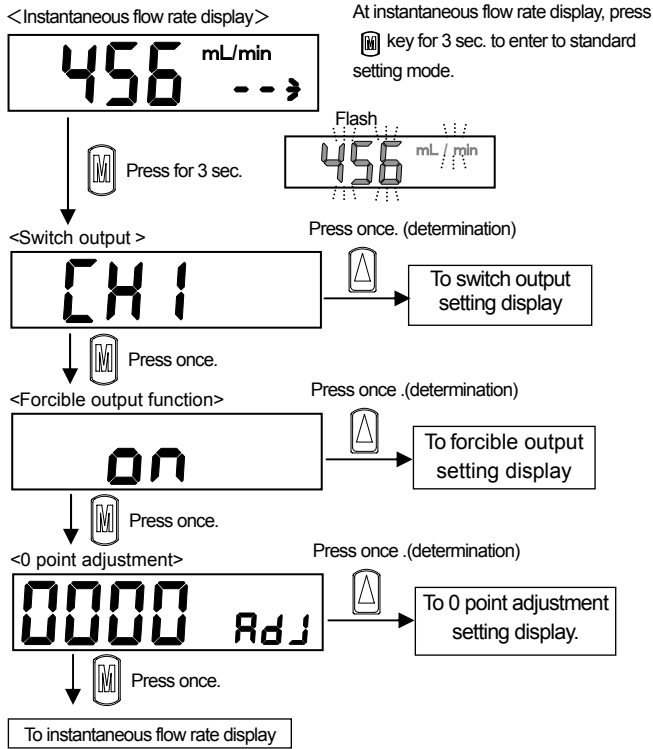
<Instantaneous flow rate display (key lock)>



Note: Keys are unlocked when the controller is shipped. Lock keys if necessary. The key lock/unlock state is held even if power is turned OFF. While key lock, all the operations are not accepted excluding the key lock release operation. While key lock, If the key is operated, it becomes a "Loc" display.

5-2. Standard setting mode

<How to enter to standard setting mode>



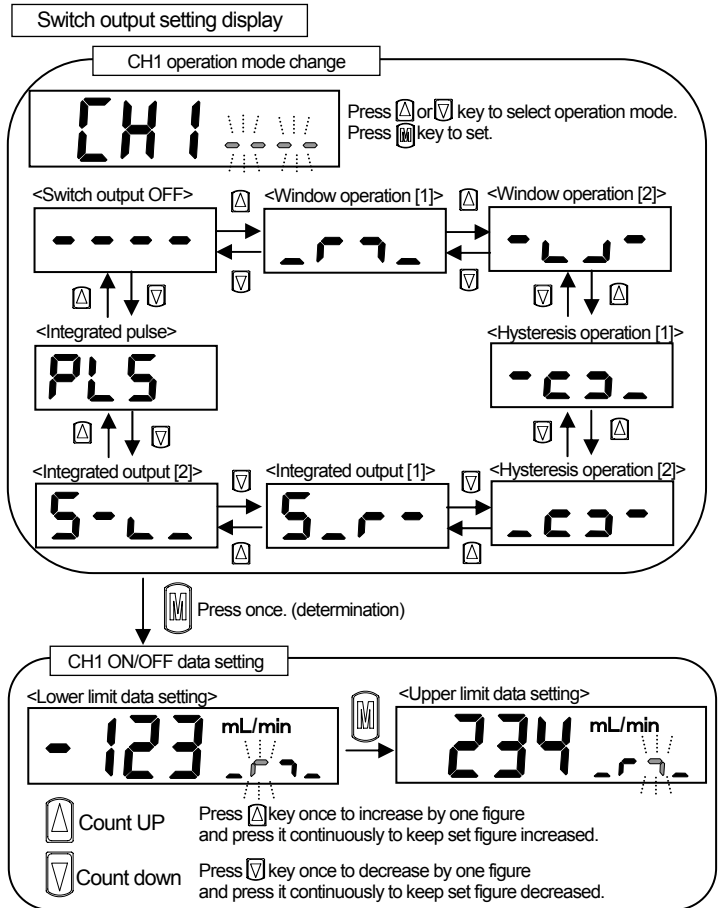
<Switch output>

Having 2 pieces of switch output, 7 operation patterns and stop of operation can be set.

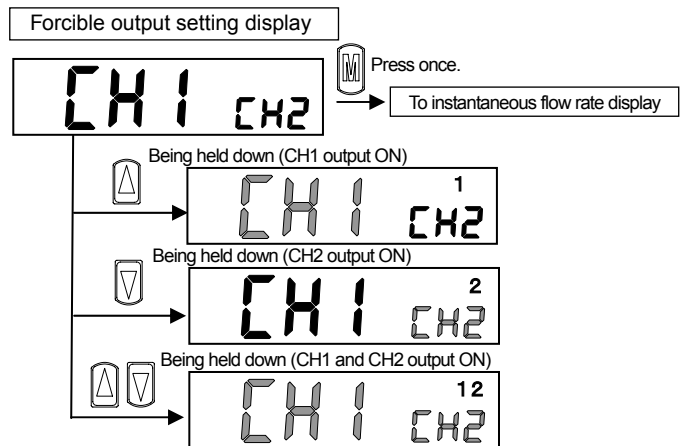
Operation pattern	Description	Operation waveform
Window operation[1] (Range inside ON)	The switch turns ON when the level is within the designated flow rate range.	
Window operation[2] (Range outside ON)	The switch turns ON when the level is not within the designated flow rate range.	
Hysteresis operation[1] (Flow rate small side ON)	ON when lower than set point. Hysteresis can be arbitrarily set.	
Hysteresis operation[2] (Flow rate large side ON)	ON when higher than set point. Hysteresis can be arbitrarily set.	
Integrated output[1] (ON when higher than set integration)	The switch turns ON at the set integrated flow.	
Integrated output[2] (OFF when higher than set integration)	The switch turns OFF at the set integrated flow.	
Integrated pulse	The integrated pulse is output during integration. See specifications for details on the pulse output rate.	
Switch output OFF	Switch output OFF	

Note: Hysteresis is provided on upper and lower limit of window operation automatically. The hysteresis can be fixed in 8 steps. Refer to <Hysteresis fixed value selection> in <Detailed setting mode>.

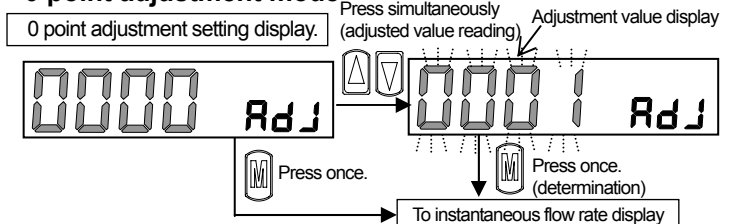
<Data setting of switch output function>



<Switch output forcible ON mode>



<0 point adjustment mode>




Caution Always adjust 0 point without flow.
Note: If fluid flows during zero adjustment setting, "E 02" is indicated.


5-3. Detailed setting mode

<How to enter to detailed setting mode>

<Instantaneous flow rate display>

456 mL/min -->

At instantaneous flow rate display, press  key for 8 sec. to enter to detailed setting mode.

 Press for 8 sec.

456 mL/min → CH1

<Flow direction selection>

FLO -->

Not change to flow direction

 Press once.

Setting value.

<Auto reference function (CH2 setting)>

OUT CH2

Press once. (determination)

To auto reference setting display

 Press once.

Setting value.

<Response time setting>

SP 1 SPEED

Press once. (determination)

To response time setting display

 Press once.

Setting value.

<Display speed selection>

250 d-SP

Press once. (determination)

To display speed setting display

 Press once.

Setting value.

<Sub-display selection>

FLO Sub

Press once. (determination)

To sub-display setting display

 Press once.

Setting value.

<Displayed color selection>

r-on Clor

Press once. (determination)

To displayed color setting display

 Press once.

Setting value.

<Hysteresis fixed value selection>

1 HYS

Press once. (determination)

To hysteresis fixed value setting display

 Press once.

Setting value.

<Flow rate unit selection>

Rnr unit

Press once. (determination)

To flow rate unit setting display

 Press once.

Setting value.

<Eco mode setting>

OFF Eco

Press

To eco mode setting display

 Press once.

Setting value.

<Reset setting>

OFF rEst

Press once. (determination)

To reset setting display

 Press once.

<Model number display>

0 Adj

Press once. (determination)

To model number display

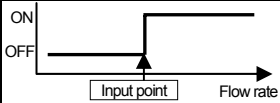
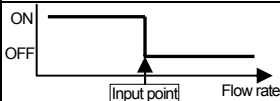
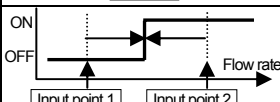
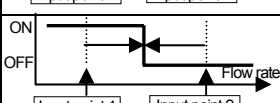
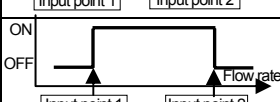
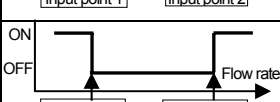
 Press once.

To instantaneous flow rate display

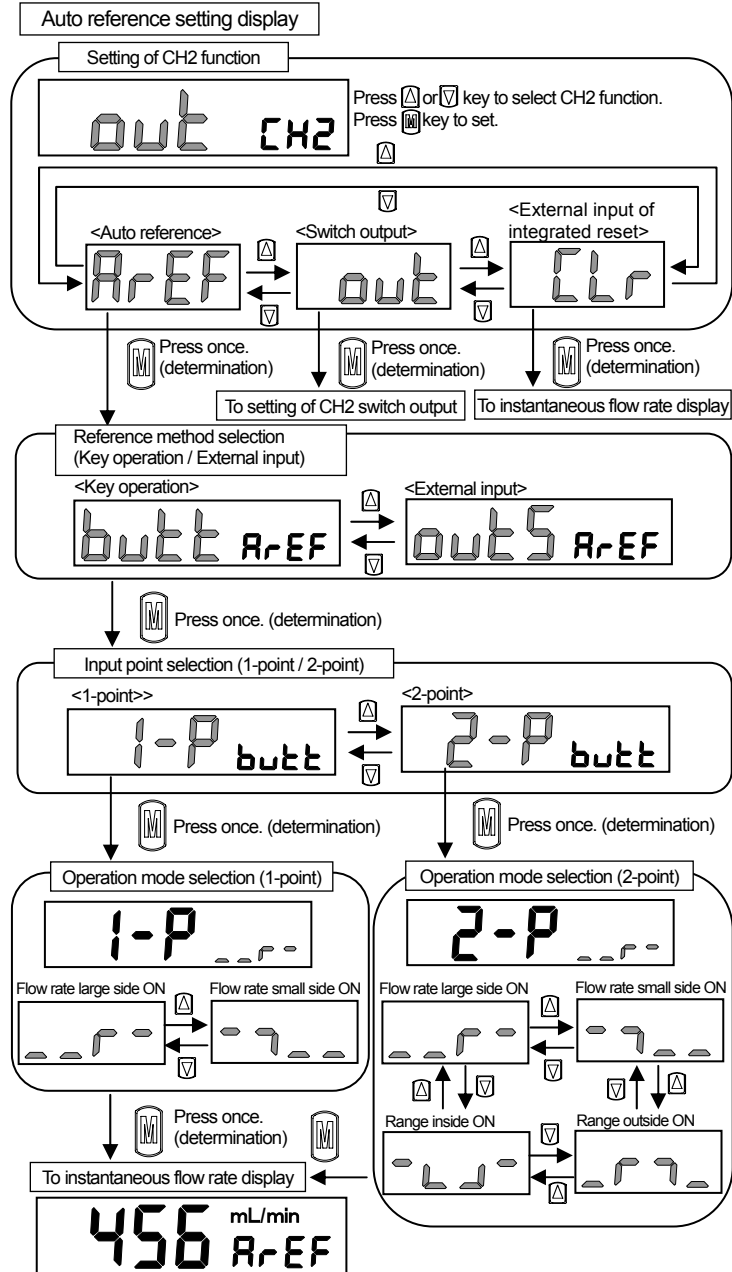
<Auto reference function>

When CH2 function selected external input of auto reference, setting value of switch output can be taken by external input or key operation.

The set point takes the flow rate when external input is turned on (or key operation). When auto reference is executed, the switch setting of CH2 becomes invalid.

Input point	Operation mode	Description	Operation waveform
1 point	1-point input [1] (Flow rate large side ON)	ON when higher than input point. Set-point=input point	
	1-point input [2] (Flow rate small side ON)	OFF when higher than input point. Set-point=input point	
2 point	2-point input [1] (Flow rate large side ON)	ON when higher than centre value of two input points Set-point=(input point1+input point2)/2	
	2-point input [2] (Flow rate small side ON)	OFF when higher than centre value of two input points Set-point=(input point1+input point2)/2	
	2-point inside (Range inside ON)	ON when flow rate level is within two input points. Setpoint1=input point 1 Setpoint2=input point 2	
	2-point outside (Range outside ON)	OFF when flow rate level is within two input points. Setpoint1=input point 1 Setpoint2=input point 2	

Setting of auto reference



How to take set point by key operation

- 1 point input : The set point takes the flow rate when press ∇ key for 2 sec.
- 2 point input : The upper limit takes the flow rate when press Δ key for 2 sec.
The lower limit takes the flow rate when press ∇ key for 2 sec.
- After taking, the set point is displayed.

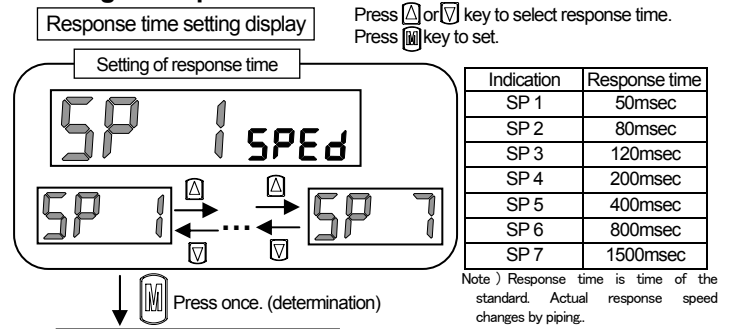
How to take set point by external input

- 1 point input : The set point takes the flow rate when external input is turned on (keep approx. 40msec.).
- 2 points input : The set point takes the flow rate when external input is turned on (keep approx. 40msec.). The big and small relations between latest two points are compared, upper limit and lower limit are distinguished automatically.

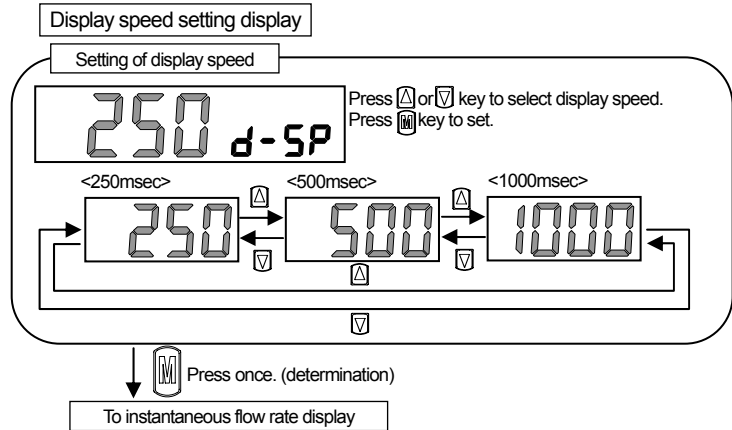
Input point (mL/min)	Lower limit (mL/min)	Upper limit (mL/min)
Initial value	0	0
1 st	123	123
2 nd	234	234
3 rd	45	234
4 th	345	345
5 th	456	456

- After taking, the set point is displayed. Also the pulse is output from CH1 for the taking confirmation.
- The set point value is cleared if power is turned OFF.

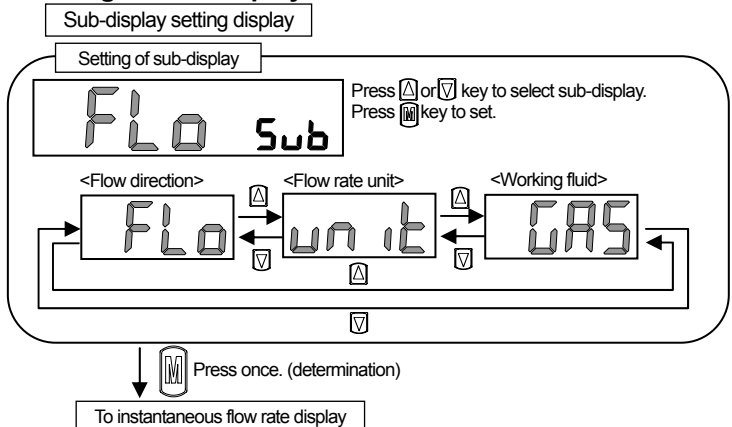
<Setting of response time>



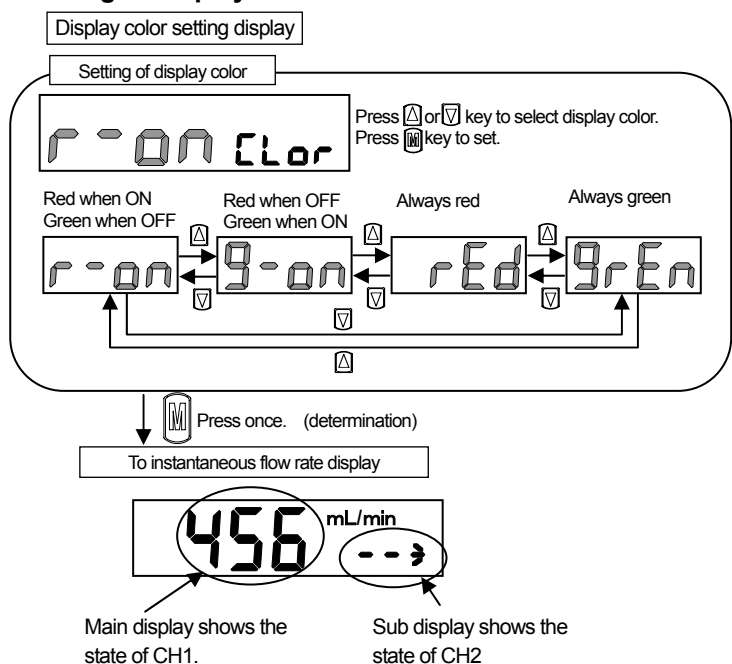
<Setting of display speed>



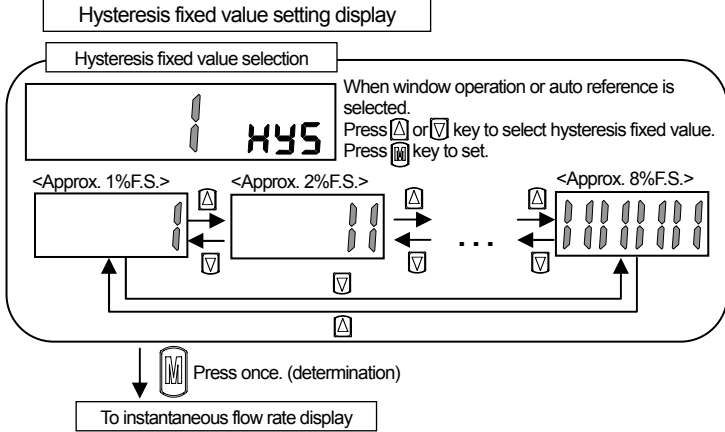
<Setting of sub-display>



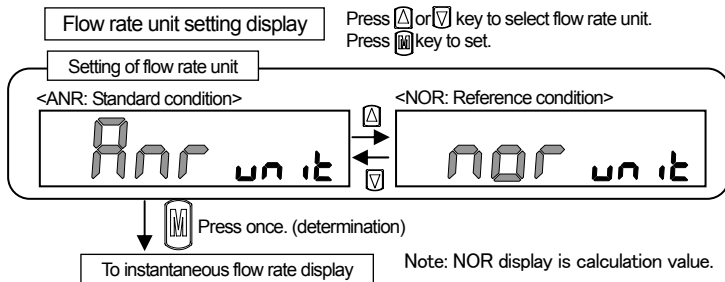
<Setting of display color>



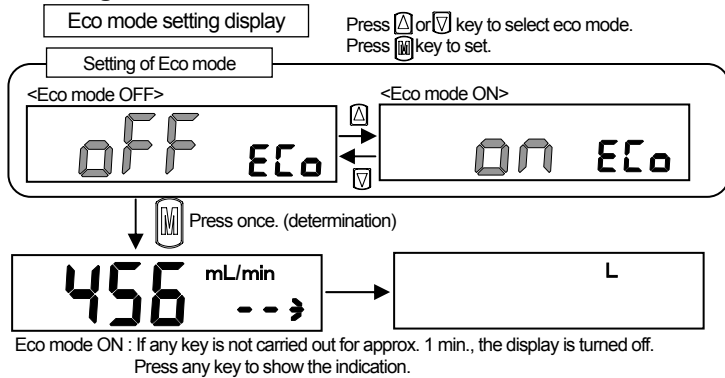
<Hysteresis fixed value selection>



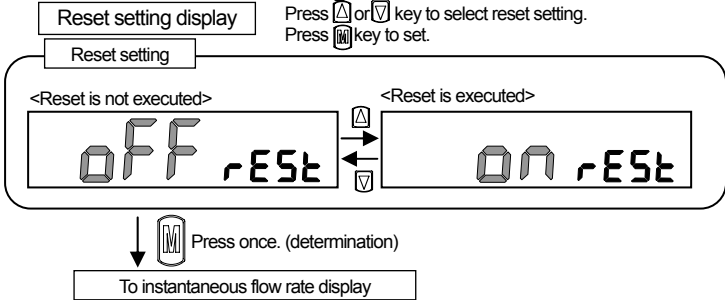
<Setting of flow rate unit.>



<Setting of Eco mode>



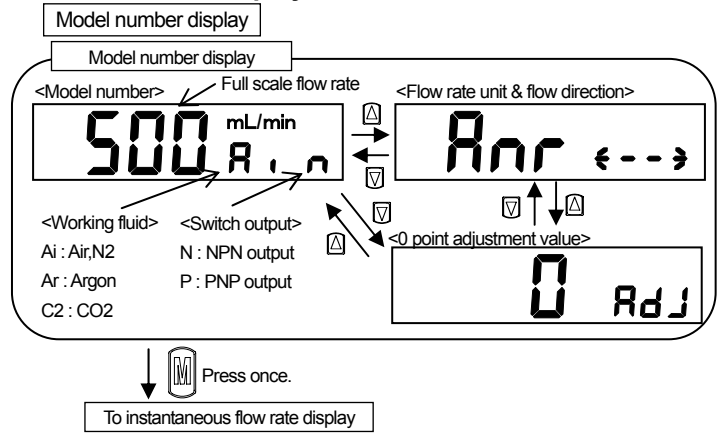
<Reset to the initial setting>



Setting at shipping out of factory

Item	Setting at shipping out of factory
Switch out put	OFF
Zero adjustment value	Zero
Integrating flow rate value	Zero
Flow direction	One-direction
Auto reference (CH2 setting)	Switch output
Response time	SP1 (50msec)
Display speed	250msec
Sub-display	Flow direction display
Displayed color	Red when ON. Green when OFF.
Hysteresis	1%FS
Flow rate unit	ANR
Eco mode	OFF

<Model number display>



[6] Troubleshooting

•Error displays and corrective action

Error indication	Cause	Corrective action
E 01	The supplied power voltage is not within the rating.	Check controller power specifications, set power voltage within the rating range, and turn power ON again.
E 02	If fluid flows during zero adjustment setting, "E 02" is indicated.	Please check that fluid doesn't flow at the time of zero adjustment setting.
E 03	An error occurred during EEPROM reading or writing.	Contact your nearest CKD Sales Office or dealer.
E 04	An error occurred during memory reading or writing.	Contact your nearest CKD Sales Office or dealer.
H ₁	Reading exceeds the upper limit of detection range. Sensor chip is broken.	Reduce the flow. Replace FSM2.
L ₀	Reading exceeds the lower limit of detection range. Sensor chip is broken.	Reduce the flow. Replace FSM2.
Switch output indicator is blinking	Switch output over current protection circuit is activated.	Check whether load current exceeds the rating, correctly connect the controller, and turn power ON again.

•Troubleshooting (Other than error displays)

Trouble	Cause	Corrective action
No flow display (No analog output)	Breakage of wire.	Replace FSM2. Recheck/repair external wiring.
	Wrong connection of power source.	Connect the rated power source correctly.
	Malfunction caused by noise.	Keep FSM2 main body and cable away from noise source.
	Output circuit is broken. FSM2 is broken.	Replace FSM2. Replace FSM2.
Flow display remains 0. (Analog output remains 1V or 3V)	Flow path clogged by foreign matter.	Remove foreign matter and install filter at primary side of FSM2.
	Leakage	Check and correct piping.
Flow display does not reach 0. (Analog output does not make 1V or 3V)	Foreign matter sticking to sensor chip.	Replace FSM2.
	Malfunction caused by noise.	Keep FSM2 main body and cable away from the noise source.
Poor precision	Sensor chip is broken.	Replace FSM2.
	Foreign matter sticking to sensor chip.	Replace FSM2.
Flow display is not stable. (Analog output is not stable. Output is chattering.)	Malfunction caused by noise.	Keep FSM2 main body and cable away from the noise source.
	Pulsation of air. Fault in power source (not enough voltage/capacity)	Reduce pulsation by installing tank, etc. Change the response time. Change the display speed.
	Pulsation of air.	Change the hysteresis.
	Fault in power source (not enough voltage/capacity)	Supply rated voltage. Provide power source with enough capacity.
It doesn't move at power supply on by abnormal display.	Malfunction caused by noise.	Keep FSM2 main body and cable away from noise source.
	It turned on power with the button had been pushed.	The power supply is put again without pushing the button.

[7] Specifications

Integrated indicator type (Resin body)

Discontinue

Model no.			Integrated needle valve type (Resin body) FSM2-[*1][*2][*3][*4]-[*5]N-[*6]									
Descriptions												
Full scale flow rate			005	010	020	050	100	200	500	101	201	
Full scale flow rate Note 1	*4	005	500mL/min	●								
		010	1L/min		●							
		020	2L/min			●						
		050	5L/min				●					
		100	10L/min					●				
		200	20 L/min						●			
		500	50 L/min							●		
		101	100 L/min								●	
Port size/ Body material	*5	H04	Φ4 push-in / resin	●	●	●	●	●	●			
		H06	Φ6 push-in / resin	●	●	●	●	●	●			
		H08	Φ8 push-in / resin							●		
		H10	Φ10 push-in/ resin								●	
Flow rate display Note 1,2	Type of display		Dual (2×4-digit 7-segment) Two-color LCD									
	Flow rate range	*3	F	0 to 500 mL/min	0 to 1000 mL/min	0 to 2.00 L/min	0 to 5.00 L/min	0 to 10.00 L/min	0 to 20.0 L/min	0 to 50.0 L/min	0 to 100.0 L/min	0 to 200 L/min
	Display resolution			1mL/min		0.01L/min		0.1L/min		1L/min		
Integrating function Note 3,7	Flow rate range			9999999mL		99999.99L		999999.9L		9999999L		
	Display resolution			1mL		0.01L		0.1L		1L		
	Integrating pulse output rate			5mL	10mL	0.02L	0.05L	0.1L	0.2L	0.5L	1L	2L
Working conditions	Working fluid		Note 4 Clean air (JIS B 8392-1.1.1 to 5.6.2), Compressed air (JIS B 8392-1.1.1~1.6.2), and Nitrogen gas									
	Maximum working pressure		0.7MPa									
	Minimum working pressure		-0.09MPa									
	Withstanding pressure		1.0MPa									
	Ambient temperature / humidity		0 to 50°C and 90% RH or less									
	Working fluid temperature		0 to 50°C (to be no dew condensation.)									
Accuracy	Flow rate range		3 to 100% F.S.									
	Linearity (display / analog output)		±3% F.S. or less (25°C, 1 atmospheric pressure)									
	Pressure characteristics		±5% F.S. or less (-0.09 to 0.7MPa, 25°C, 1 atmospheric pressure criteria)									
	Temperature characteristics		±0.2% F.S./°C or less (15 to 35°C, 25°C criteria)									
	Repeatability		±1% F.S. or less									
Response time			Note3 50ms or less									
Output	Switch output	*1	N	2 points (NPN open collector output, 50mA or less, voltage drop 2.4V or less)								
		P	2 points (PNP open collector output, 50mA or less, voltage drop 2.4V or less)									
	Analog output	*2	V	1 point (1 to 5V voltage output and connected load impedance 50kΩ and over)								
		A	1 point (4 to 20mA current output and connected load impedance 300Ω or less)									
Power supply voltage		*2	V	DC12/24V (10.8 to 26.4V)								
			A	DC24V (21.6 to 26.4V)								
Current consumption			Note8 50mA or less									
Lead wire			φ 3.7 AWG26×5									
Functions			Flow rate display, flow rate display-peak hold, switch output and analog output. Outside diameter of insulator is Φ 1.0									
Installation attitude			Both vertical and horizontal									
Strait piping section			Not required									
Protective structure			IEC standards IP40									
Protective circuit			Note9 Power supply and switch output reverse connection protections, and switch output load short-circuit protection									
EMC instruction			Acceptable goods									
Mass (Only the main body)	*5	H04	Approx. 80g									
		H06	Approx. 80g									
		H08	Approx. 110g									
		H10	Approx. 115g									
Clean specification	*6	P70	Particle occurrence prevention Note10									
		P80	Oil treatment prohibited Note11									

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

Note2: Flow rate display is only the read within rough± 1%F.S.

Note3: Integrated flow display is reference value.

Note4: When using compressed air, use clean air complying with JIS B 8392-1:2003 class over 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage (water, oxidized oil, foreign matter, etc.). Install a filter (filtration rating: 5µm), air dryer (minimum pressure dew point 10°C or less) and oil mist filter (maximum oil concentration 0.1mg/m³) on the primary side of the product to maintain product function.

When using for purposes other than compressed air, use dry gas that does not contain corrosive elements such as chlorine, sulfur or acids, and clean gas that does not contain dust or oil mist.

Note5: The response time can be selected from 50ms to 1500ms.

Note6: Current consumption is different according to the state of the load.

Note7: Integrated flow value is reset by turning power off.

Note8: Current consumption is characteristics 24VDC and no load. It is changed by load. Please note it.

Note9: This product's protective circuit is effective only for specific incorrect connections and load short-circuits. It does not necessarily provide protection for all incorrect connections.

Note10:<P70>Particle occurrence prevention (It is washing of remove fat to surface of product before it wraps it. And heat seal wrapping to antistatic bag inside clean work station.(Class:100 or more))

Note11:<P80>Oil treatment prohibited (In addition to the P70 specification, It is washing of removing fat to touching gas. Please refer, Touching gas material is internal structural chart.)

Discontinue

Integrated indicator type (Stainless body)

Descriptions			Model no.	Integrated indicator type (Stainless body) FSM2-[*1][*2][*3][*4]-[*5][*6]									
			Full scale flow rate	005	010	020	050	100	200	500	101	201	
Full scale flow rate Note 1	*4	005	500mL/min	●									
		010	1L/min		●								
		020	2L/min			●							
		050	5L/min				●						
		100	10L/min					●					
		200	20 L/min						●				
		500	50 L/min							●			
		101	100 L/min								●		
	201	200 L/min									●		
Poet size/ Body material	*5	S06	Rc1/8 / Stainless	●	●	●	●	●	●	●	(only Air, Ar)		
		S08	Rc1/4 / Stainless								●	● (only Air, Ar)	
Flow rate display Note 1, 2	Type of display		Dual (2×4-digit 7-segment) Two-color LCD										
	Flow rate range	*3	F	0 to 500 mL/min	0 to 1000 mL/min	0 to 2.00 L/min	0 to 5.00 L/min	0 to 10.00 L/min	0 to 20.0 L/min	0 to 50.0 L/min	0 to 100.0 L/min	0 to 200 L/min	
	Display resolution			1mL/min			0.01L/min			0.1L/min			1L/min
Integrating function Note 3, 7	Flow rate range		9999999mL			99999.99L			999999.9L			9999999L	
	Display resolution		1mL			0.01L			0.1L			1L	
	Integrating pulse output rate		5mL	10mL	0.02L	5mL	10mL	0.02L	5mL	10mL	2L		
Working conditions	Working fluid Note 4	*6	Blank	Clean air (JIS B 8392-1.1.1 to 5.6.2), Compressed air (JIS B 8392-1.1.1~1.6.2), and Nitrogen gas									
			AR	Argon									
			C2	Carbon dioxide									
	Maximum working pressure		1.0MPa										
	Minimum working pressure		-0.09MPa										
	Withstanding pressure		1.5MPa										
	Ambient temperature / humidity		0 to 50°C and 90%RH or less										
Working fluid temperature		0 to 50°C (to be no dew condensation.)											
Accuracy	Flow rate range		3 to 100%F.S.										
	Linearity (display / analog output)		±3%F.S. or less (25°C, 1 atmospheric pressure)										
	Pressure characteristics		±5%F.S. or less (-0.09 to 0.7MPa, 25°C, 1 atmospheric pressure criteria)										
	Temperature characteristics		±0.2%F.S./°C or less (15 to 35°C, 25°C criteria)										
	Repeatability		±1%F.S. or less										
Response time Note3			50ms or less										
Output	Switch output	*1	N	2 points (NPN open collector output, 50mA or less, voltage drop 2.4V or less)									
			P	2 points (PNP open collector output, 50mA or less, voltage drop 2.4V or less)									
	Analog output	*2	V	1 point (1 to 5V voltage output and connected load impedance 50kΩ and over)									
			A	1 point (4 to 20mA current output and connected load impedance 300Ω or less)									
Power supply voltage	*2	V	DC12 to 24V (10.8 to 26.4V)										
		A	DC24V (21.6 to 26.4V)										
Current consumption Note8			50mA or less										
Lead wire			φ3.7 AWG26×5										
Functions			Flow rate display, flow rate display-peak hold, switch output and analog output, Outside diameter of insulator is Φ 1.0										
Installation attitude			Both vertical and horizontal										
Strait piping section			Not required										
Protective structure Note 9			IEC standards IP40										
Protective circuit Note5			Power supply and switch output reverse connection protections, and switch output load short-circuit protection										
EMC instruction			Acceptable goods										
Mass (Only the main body)	*5	S06	Approx. 160g										
		S08	Approx. 200g										
Clean specification	*7	P70	Particle occurrence prevention Note10										
		P80	Oil treatment prohibited Note11										

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

Note2: Flow rate display is only the read within rough±1%F.S.

Note3: Integrated flow display is reference value.

Note4: When using compressed air, use clean air complying with JIS B 8392-1:2003 class over 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage (water, oxidized oil, foreign matter, etc.). Install a filter (filtration rating: 5µm), air dryer (minimum pressure dew point 10°C or less) and oil mist filter (maximum oil concentration 0.1mg/m³) on the primary side of the product to maintain product function.

When using for purposes other than compressed air, use dry gas that does not contain corrosive elements such as chlorine, sulfur or acids, and clean gas that does not contain dust or oil mist.

Note5: The response time can be selected from 50ms to 1500ms.

Note6: Current consumption is different according to the state of the load.

Note7: Integrated flow value is reset by turning power off.

Note8: Current consumption is characteristics 24VDC and no load. It is changed by load. Please note it.

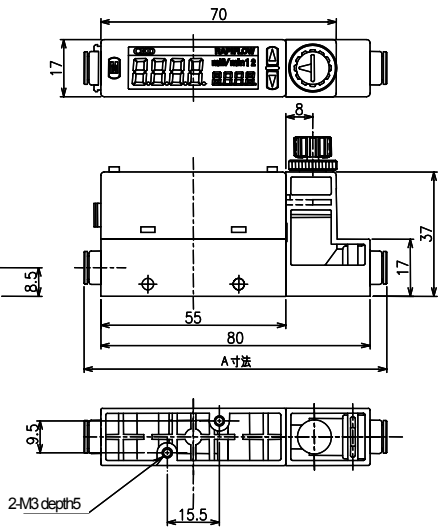
Note9: This product's protective circuit is effective only for specific incorrect connections and load short-circuits. It does not necessarily provide protection for all incorrect connections.

Note10:<P70>Particle occurrence prevention (It is washing of remove fat to surface of product before it wraps it. And heat seal wrapping to antistatic bag inside clean work station.(Class:100 or more))

Note11:<P80>Oil treatment prohibited (In addition to the P70 specification, It is washing of removing fat to touching gas. Please refer, Touching gas material is internal structural chart.)

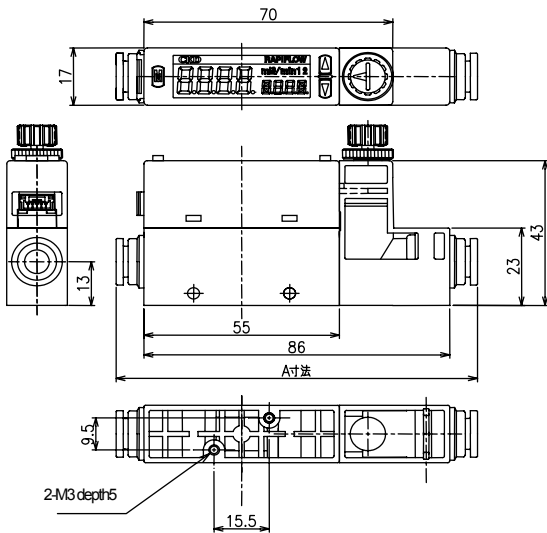
[8] Dimensions

Integrated indicator type Port size: $\Phi 4$ 、 $\Phi 6$ Push-in
 •FSM2-N/P[]-H04/H06[]



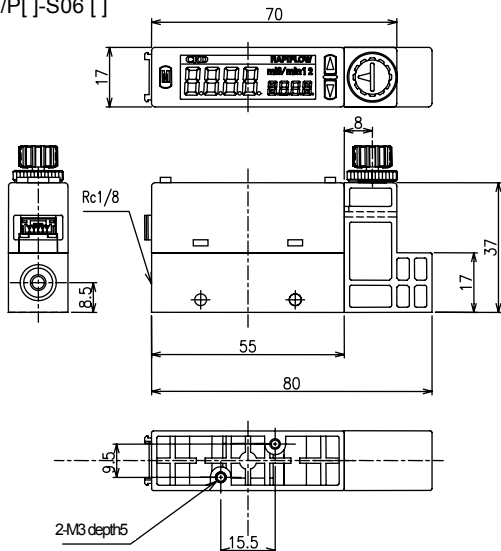
Model No.	Port size	Dimension (A)
FSM2-[]-H04[]	$\Phi 4$ push-in	89
FSM2-[]-H06[]	$\Phi 6$ push-in	90

Integrated needle valve type Port size: $\Phi 8$ 、 $\Phi 10$ Push-in
 •FSM2-N/P[]-H08/H10[]



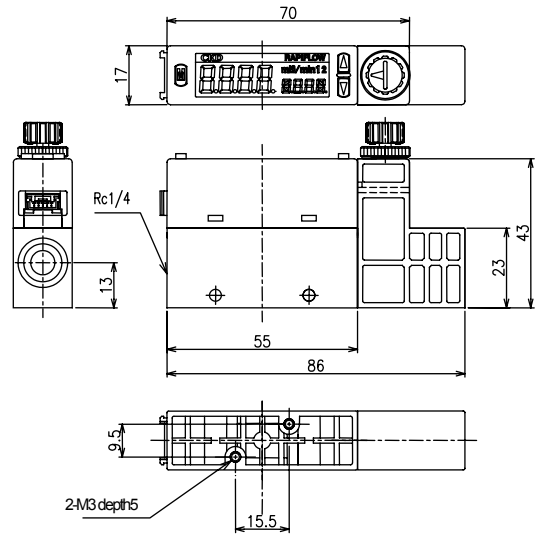
Model No.	Port size	Dimension (A)
FSM2-[]-H08[]	$\Phi 8$ push-in	101.6
FSM2-[]-H10[]	$\Phi 10$ push-in	113.1

Integrated needle valve type Port size: Rc1/8
 •FSM2-N/P[]-S06[]

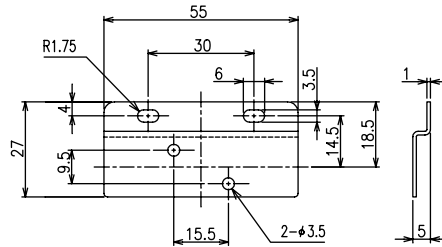


Discontinue

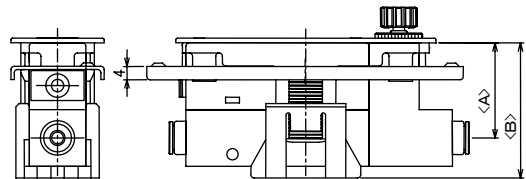
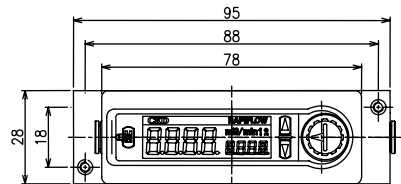
Integrated needle valve type Port size: Rc1/4
 •FSM2-N/P[]-S08[]



Bracket
 Model No: FSM2-LB1



Model No: FSM2-KHS-N
 How to panel mount

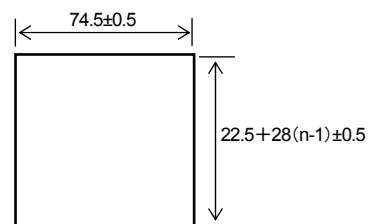
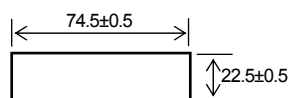


Model No.	Dimension(A)	Dimension(B)
FSM2-□-H04/H06/S06□N	28.5	40.5
FSM2-□-H08/H10/S08□N	30.0	46.5

Panel hold matching Fig (Plate thickness t0.8 to 6)

<Single mount>

<Sticking mount>



[9]How to order

Discontinue

FSM2 - **N** **V** **R** **005** - **S06** **AR** **1** **B** **K** **N** - **P70**
 [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11]

[1]Output type		[2]Analog output type		[3]Flow direction		[4]Flow rate range (full scale flow rate)	
N	Integrated indicator type Switch output(NPN): 2points Analog output: 1point	V	1 to 5V	F	Bi-directional	005	500 mL/min
		A	4 to 20mA			010	1 L/min
P	Integrated indicator type Switch output(PNP): 2points Analog output: 1point					020	2 L/min
						050	5 L/min
						100	10 L/min
						200	20 L/min
						500	50 L/min
						101	100 L/min
						201	200 L/min

[5]Port size(body material)		[6]Working fluid		[7]Cable		[8]Bracket		[9] Traceability	
H04	Φ4 push-in (resin)	Blank	Air, Nitrogen gas	Blank	None	Blank	None	Blank	None
H06	Φ4 push-in (resin)	AR	Argon	1	1m	B	With bracket	T	Traceability certificate, system diagram, inspection results included
H08	Φ4 push-in (resin)	C2	Carbon dioxide	3	3m	P	Panel mount		
H10	Φ4 push-in (resin)							K	Inspection results included
S06	Rc1/8 (stainless)								
S08	Rc1/4 (stainless)								

[10]Needle valve		[11]Clean	
N	Needle valve	Blank	none
		P70	Particle occurrence prevention
		P80	Oil treatment prohibited

• Combination of flow rate range, port size, and working fluid

		[5]Port size(body material)					
		H04	H06	H08	H10	S06	S08
[4]Flow rate range	005	●	●			●○△	
	010	●	●			●○△	
	020	●	●			●○△	
	050	●	●			●○△	
	100	●	●			●○△	
	200	●	●			●○△	
	500		●			●○	●○△
	101			●	●		●○△
	201			●	●		●

[6]Working fluid

- : Air, Nitrogen gas
- : Argon
- △ : Carbon dioxide
- : None

• Table for clean specification

		[5]Port size(body material)					
		H04	H06	H08	H10	S06	S08
[11]Clean	P70	●	●	●	●	●	●
	P80	●	●			●	●

[11]Clean

- : Lineup
- : None

Discrete option model

FSM2 - **LB1**-**P70**
 [12] [13]

[12]Option		[13]Clean	
LB1	Bracket (for port sizeΦ4,6,8,10, Rc1/8, Rc1/4,)	Blank	none
C51	1m (for Integrated indicator type)	P70	Particle occurrence prevention
C53	3m (for Integrated indicator type)		
KHS-N	Panel mount kit		

CKD Corporation

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<http://www.ckd.co.jp>

We reserve the right to change dimensions, specifications and design without notice.

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