

# Compact flow rate sensor

RAPIFLOW® FSM3

■ Flow rate sensor



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## Diversified

### 5 gas types can be measured with just one unit

#### Gas switching function

(LCD display, IO-Link)  
(Model with full scale flow rate of 200 L/min or below)

Air, nitrogen, argon, carbon dioxide, gas mixture (Ar:CO<sub>2</sub> mixture (8:2)) is supported with this single flow rate sensor.

Gases can be switched with operation buttons

With the IO-Link specifications, gases can be switched remotely using the host controller.



\*Contact CKD Sales if you have a request for the mixing ratio.

## High performance High Performance



MEMS stands for Micro Electro Mechanical Systems and refers to ultra-compact devices based on microfabrication technology used in the manufacture of semiconductor integrated circuits.

### Clean-room specifications (Option)

Anti-dust generation packaging (P70) and oil-prohibited specifications (P80) available  
Usage according to the grade of the device is possible.

\*Refer to catalog No.CB-033SA for details.

### Outgassing supported

Because the stainless steel body does not use resin in its flow path, it is ideal for processes where outgassing is a problem.

### High precision/high-speed response

Repeatability: Within  $\pm 1\%$  F.S.  
Indicator accuracy: Within  $\pm 3\%$  F.S.  
Response time: 50 msec

### Reduction of pressure loss

Up to 50% reduction with flow path redesign

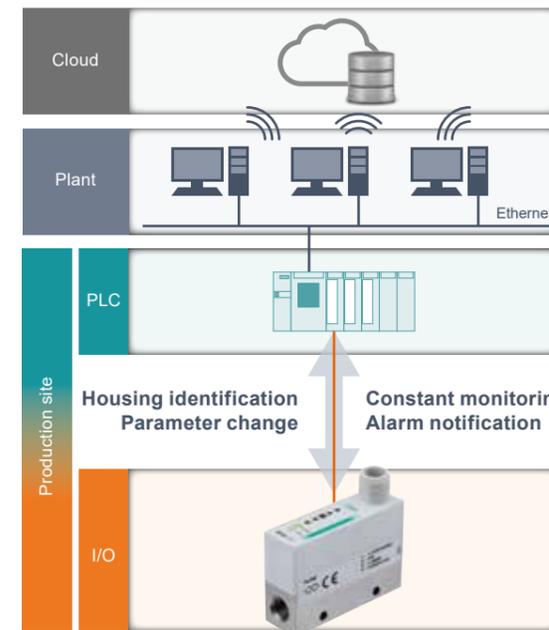
### Bi-directional fluid measurement

Contributes to reducing tact time.  
The flow direction can be measured as desired.



### IO-Link model available

IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)  
Unlike analog communication, it enables the transmission of parameters and event data.



#### Features of IO-Link

- Digital signal**: Constant monitoring via digital data is possible.
- Parameter remote control**: Parameters can be set and changed via the network, enabling remote equipment operation.
- Housing identification**: Models, serial numbers, etc., can be confirmed on the network.
- Plug & Play**: The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.
- Error notification**: Device failure and disconnection can be confirmed.
- Connection to I/O**: It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

## Easy to use User-friendly

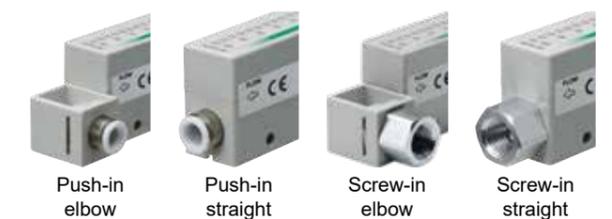
### Rotatable LCD display

Indicator can be vertically inverted



### Variety of fitting variations.

Resin body



### Easy mounting (option)

DIN rail mount

Panel mount



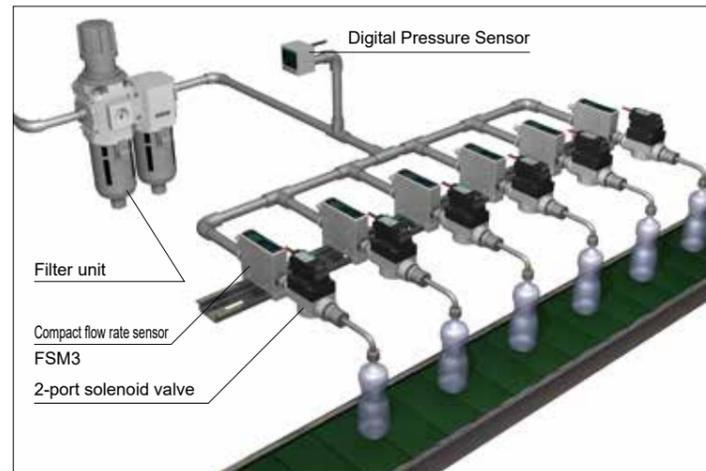
Stainless steel body



# Solution examples

## Leakage inspection

Fill the drinking water container with gas to detect the presence or absence of leakage.



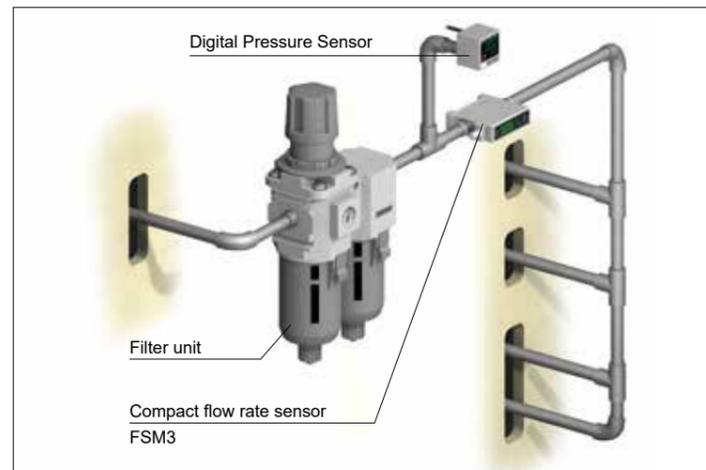
## Biochemical culture apparatus

Co:flow rate of is measured to promote the photosynthesis of organisms.



## Controlling air consumption

Monitor the air consumption of facilities that use air components.



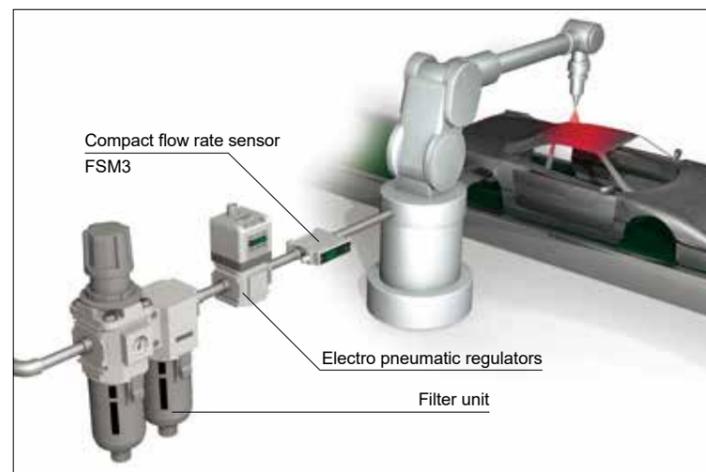
## Arc welding

Manages argon, gas mixtures (argon + carbon dioxide), and other shielding gases.



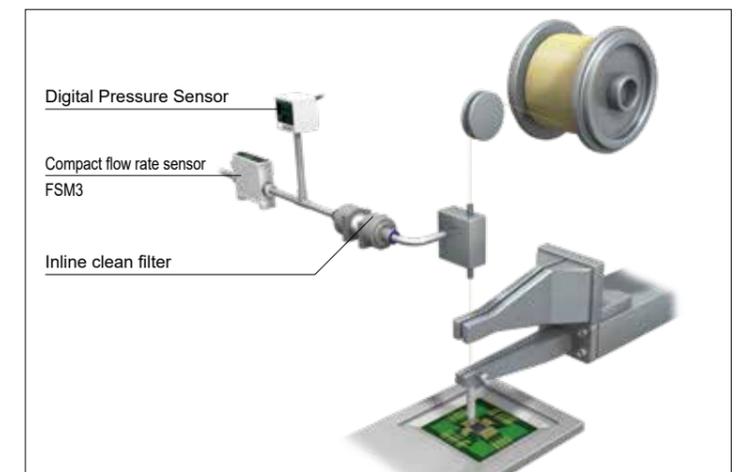
## Painting air flow rate control

Change the air pressure and controls flow rate used during coating with the electro pneumatic regulator.



## Electronic part installation

Control the tension of gold wire for installing electronic parts.



Flow rate sensor

Compact flow sensor (gas)  
Compact flow sensor (air)  
Compact flow sensor (liquid)  
Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)  
Compact flow sensor (air)  
Compact flow sensor (liquid)  
Water Manifold Unit

Ending

Ending

# Series Variation

## Compact flow rate sensor (RAPIFLOW) FSM3 Series

Appearance	Applicable fluids	Flow rate adjustment valve *2	EXA connecting fitting *3	Port size	Max. flow rate (L/min)											Page			
					0.5	1	2	5	10	20	50	100	200	500	1000				
<b>Resin body</b> LCD display Bar display IO-Link 	Air Nitrogen Carbon dioxide (*1) Argon Mixed gases (argon + carbon dioxide)	●		ø4	●	●	●	●	●	●							• LCD display Page 236  • Bar display Page 246  • IO-Link Page 254		
		●		ø6	●	●	●	●	●	●	●								
		●		ø8								●	●	●					
		●		ø10								●	●						
		●		ø1/4"								●	●	●					
		●		ø3/8								●	●						
		●	●	Rc1/8								●	●	●					
		●		Rc1/4								●	●	●					
		●		Rc1/2											●	●			
		●		NPT1/8								●	●	●					
		●		NPT1/4									●	●	●				
		●		NPT1/2												●		●	
		●		G1/8								●	●	●					
		●		G1/4									●	●	●				
		●		G1/2												●		●	
		<b>Stainless steel body</b> LCD display Bar display IO-Link 	(1) Air Nitrogen Carbon dioxide (*1) Argon Mixed gases (argon + carbon dioxide)  (2) Oxygen	●		Rc1/8	●	●	●	●	●	●							• LCD display Page 272  • Bar display Page 282  • IO-Link Page 290
●				Rc1/4							●	●	●						
				Rc1/2												●	●		
●				G1/8								●	●	●					
●				G1/4									●	●	●				
				G1/2													●	●	
●				NPT1/8								●	●	●					
●				NPT1/4									●	●	●				
				NPT1/2													●	●	
●				1/4" double barbed fitting								●	●	●	●	●			
●				1/4" JXR male fitting								●	●	●	●	●			

\*1: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range.  
 \*2: Supports LCD display.  
 \*3: Compatible with LCD display and bar display.

\*Applicable fluids are air and nitrogen only.



Compact flow rate sensor (RAPIFLOW)

# FSM3 Series

LCD display

● Resin body (flow rate range: 500 mL/min to 1000 L/min)

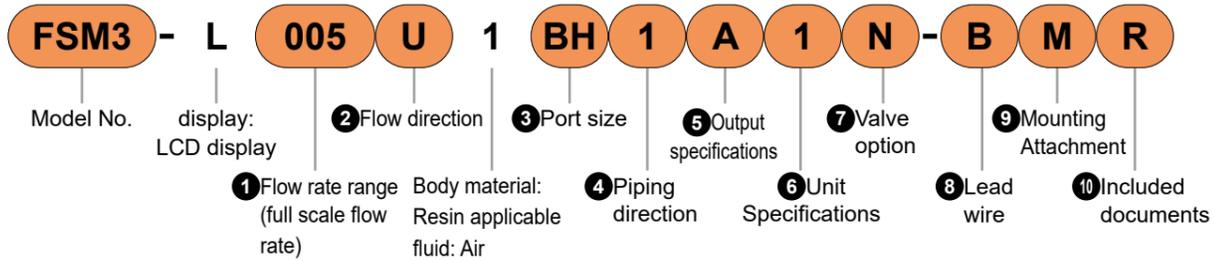


Refer to the CKD website for detailed compatible model Nos.

## FSM3 Series

Model No. Notation Method resin body (LCD display)

### Model No. Notation Method



#### 1 Flow rate range (full scale flow rate)

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min
100	10 L/min	102	1000 L/min
200	20 L/min		

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

#### 2 Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

Note: For models with flow direction "B" bi-directional, the valve option is only available without "N". Note that fittings with "T" needle valve and "E" EXA connection cannot be selected.

#### 4 Piping direction

Code	Description
1	Straight
2	Elbow

Note: Note that if you mount the elbow fitting in an upward position, it will interfere with the connector, and if you mount the elbow fitting in a downward position, it will interfere with the DIN rail mounting.

Compatibility table of flow rate range and port size, needle valve option, and EXA connection fitting

Flow rate range	Port size		Piping direction		Valve option		Unit Specifications		Lead wire		Mounting Attachment	
	BH1	CH1	DH1	EH1	HH1	JH1	BH2	CH2	DH2	EH2	HH2	JH2
005	●	●	●	●	●	●	●	●	●	●	●	●
010	●	●	●	●	●	●	●	●	●	●	●	●
020	●	●	●	●	●	●	●	●	●	●	●	●
050	●	●	●	●	●	●	●	●	●	●	●	●
100	●	●	●	●	●	●	●	●	●	●	●	●
200	●	●	●	●	●	●	●	●	●	●	●	●
500	●	●	●	●	●	●	●	●	●	●	●	●
101	●	●	●	●	●	●	●	●	●	●	●	●
201	●	●	●	●	●	●	●	●	●	●	●	●
501	●	●	●	●	●	●	●	●	●	●	●	●
102	●	●	●	●	●	●	●	●	●	●	●	●

#### 3 Port size

Description	Code
For ø4 mm tube	BH
For ø6 mm tube	CH
For ø8 mm tube	DH
For ø10 mm tube	EH
For ø1/4" tube	HH
For ø3/8" tube	JH
Rc thread	
Rc1/8	AA
Rc1/4	BA
Rc1/2	CA
G thread ISO 16030	
G1/8	AF
G1/4	BF
G1/2	CF
G thread JIS B 2351-1 O-type (*1)	
G1/8	AB
G1/4	BB
G1/2	CB
NPT thread	
NPT1/8	AC
NPT1/4	BC
NPT1/2	CC

\*1: Check the G thread connection shape with the dimensions diagrams (pages 241 to 243) when making a selection. (G thread connection shape is JIS B 2351-1 O-type compliant)

\*2: Refer to the compatibility table on the right for the combinations of the flow rate range and port size.

#### 5 Output specifications

Code	Description		
	Analog Output	Switch Output	Setting copy function
A	1 points (Voltage output) 1-5V	1 point (NPN)	Yes
B		2 point (NPN)	—
C		1-point output (PNP)	Yes
D		2-point output (PNP)	—
E	1 points Current output 4-20mA	1 point (NPN)	Yes
F		2 point (NPN)	—
G		1-point output (PNP)	Yes
H		2-point output (PNP)	—

#### 7 Valve option

Code	Description
N	None
T	With needle valve (only for models 200 L or less)
E	EXA connecting fitting (EXA sold separately)

\*1  
\*2

\*1: Connection to solenoid valves (EXA Series) is possible with the dedicated fitting. Page 267.

\*2: Be sure to set EXA to the OUT side of the product. Use a lead wire for the EXA coil option. The DIN terminal box cannot be mounted because it will cause interference. After making sure it is connected firmly, confirm that there is no external leakage.

#### 9 Mounting Attachment

Code	Description
Blank	None
H	Bracket 1 (for models 200 L or less)
J	Bracket 2 (for 500 or 1000 L models)
K	Panel mounting (for sensor products of models 200 L or less)
L	Panel mounting (for needle valves of models 200 L or less)
M	DIN rail mounting (for models 200 L or less)

\*1: Note that the bracket mounting position may interfere with the elbow fitting.

\*2: Optional parts will come with the product.

#### 6 Unit Specifications

Code	Description
1	SI units only
2	With unit switching function (only for overseas)

Note: "2" unit switching function model cannot be sold in Japan.

#### 8 Lead wire

Code	Description
Blank	None
A	5 conductor 1 m
B	5 conductor 3 m

#### 10 Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SAA)

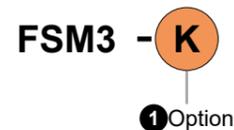
FSM3 - . . . - P70

FSM3 - . . . - P80

#### 1 Option

Code	Description
A	5-conductor lead wire 1 m (for LCD display)
B	5-conductor lead wire 3 m (for LCD display)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
K	Panel mounting kit 1 (for sensor unit models with a flow rate range below 200 L/min)
L	Panel mounting kit 2 (for needle valve integrated models with a flow rate range below 200 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

#### Model No. Notation for Options



Note: Refer to P. 262 for dimensions diagram.

Flow rate sensor

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (air)

Compact flow sensor (liquid)

Compact flow sensor (liquid)

Water Manifold Unit

Water Manifold Unit

Ending

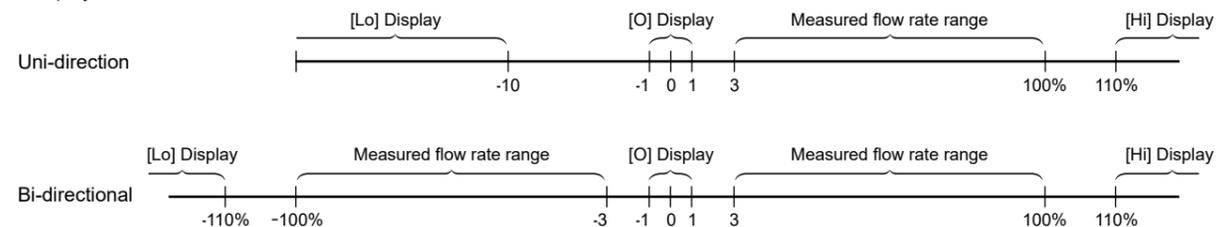
Ending

Specifications

Item		FSM3-L [1] [2] [3] [4] [5] [6] [7] [- ]											
		[1] Flow rate range (full scale flow rate) code											
		005	010	020	050	100	200	500	101	201	501	102	
Flow direction	[2]	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	[2]	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			4 digit + 4 digit 2 color LCD										
Flow rate display range (□/min) *2	[2]	U	-49 to 549 mL	-99 to 1099 mL	-0.19 to 2.19 L	-0.49 to 5.49 L	-0.99 to 10.99 L	-1.9 to 21.9 L	-4.9 to 54.9 L	-9.9 to 109.9 L	-19 to 219 L	-49 to 549 L	-99 to 1099 L
		B	-549 to 549 mL	-1099 to 1099 mL	-2.19 to 2.19 L	-5.49 to 5.49 L	-10.99 to 10.99 L	-21.9 to 21.9 L	-54.9 to 54.9 L	-109.9 to 109.9 L	-219 to 219 L	-549 to 549 L	-1099 to 1099 L
Integration display (*3)	Indicator range		0 to ±9999999 mL		0.00 to ±99999.99 L			0.0 to ±999999.9 L			0 to ±9999999 L		
	Pulse output rate		5 mL	10 mL	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L	2 L	5L	10 L
Working Conditions	Applicable fluids *4		Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Argon, carbon dioxide (*5), and gas mixture (argon + carbon dioxide)										
	Temperature range		0 to 50°C (no condensation)										
	Pressure range		-0.09 to 0.75 MPa										
	Proof pressure		1 MPa										
Operating ambient temperature / humidity			0 to 50 °C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy *6 (Fluid: in dry air)	Accuracy *7		Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
	Repeatability*8		Within ±1%F.S. (Secondary side released to atmosphere)										
	Temperature characteristics		Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
	Pressure characteristics		Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)					Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)					
Response time *9			50 msec. or less (setting response time OFF)										
Switch Output		A, B, E, F	NPN open collector output (50 mA or less, voltage drop 2.4 V or less)										
		C, D, G, H	PNP open collector output (50 mA or less, voltage drop 2.4 V or less)										
Analog Output *10	[5]	A, B, C, D	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		E, F, G, H	4-20mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *11		A, B, C, D	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		E, F, G, H	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *12			45 mA or less										
Lead wire			ø3.7, AWG26 or equivalent x 5-conductor (connector), insulator O.D. 1.0										
Functions *13			①Gas switching, ②Setting copy function, ③Flow rate integration, ④Peak hold, etc.										
Degree of Protection			IP40 or equivalent (IEC standard)										
Protection circuit *14			Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection										
Vibration resistance			10 to 150 Hz, max. 100 m/s <sup>2</sup> , X, Y, Z directions, every 2 hours										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting	Mounting orientation *15		Unrestricted in vertical/horizontal direction										
	Straight piping section *16		Not required										

\*1: The value converted to volumetric flow rate at standard conditions (20°C, 1 barometric pressure (101 kPa), 65% RH). (For gases other than air: 20°C, 1 barometric pressure (101 kPa), 0% RH)

\*2: The displays of various flow rates are as shown below.



\*3: The accumulated flow is a calculated (reference) value. When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times). (Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{5 \text{ min.}} < 1 \text{ million times}$$

When instantaneous flow rate is below 1% it is not counted as integrating flow.

\*4: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with 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, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m<sup>3</sup>) for operation. (Refer to P. 316 for details on recommended circuit.)

\*5: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range. Output type can also be selected for analog output.

Gas type	Flow direction	Measured flow rate range (□/min)										
		005	010	020	100	200	500	101	201			
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L			
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to 0.06 L	-5.00 to 0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L			
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L			

Gas type	Flow direction	Analog Output			
		Output A		Output B	
		Voltage	Current	Voltage	Current
Carbon dioxide	Uni-direction	1 to 3 V	4 to 12 mA	1 to 5 V	4 to 20 mA
	Bi-direction	2 to 4 V	8 to 16 mA	1 to 5 V	4 to 20 mA

\*6: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.

\*7: Accuracy is based on CKD's standard flow rate meter and does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.

\*8: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)

\*9: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.

\*10: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

\*11: The power supply voltage specifications differ for the voltage output type and current output type.

\*12: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

\*13: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. (Note that the 500 L/min and 1000 L/min models do not have a gas change function.)

For carbon dioxide, refer to \*5.

Gas type	Flow direction	Measured flow rate range (□/min)										
		005	010	020	100	200	500	101	201			
• Air • Nitrogen • Argon	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L			
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L			
• argon 80% + carbon dioxide 20%		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L			

The "setting copy function" can be selected under ⑤ "Output Specifications".

Note that the "External input" function is not available on models on which the "Copy function setting" is enabled.

\*14: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

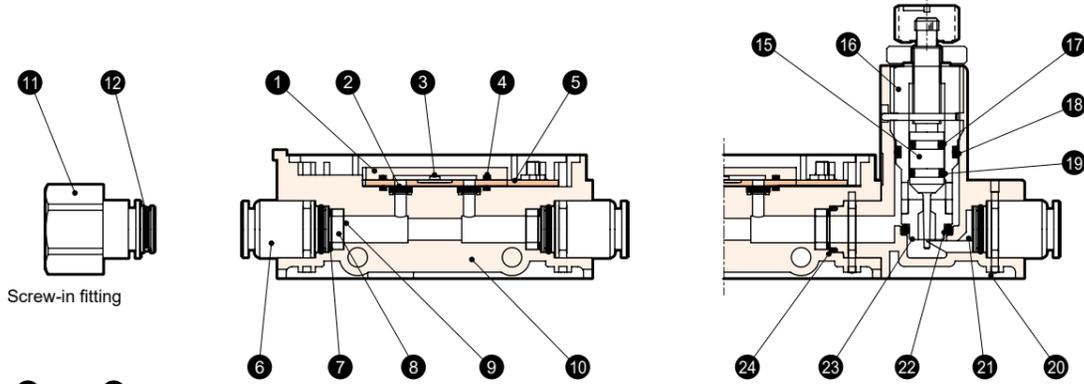
\*15: This product measures the change in heat distribution caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.

\*16: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

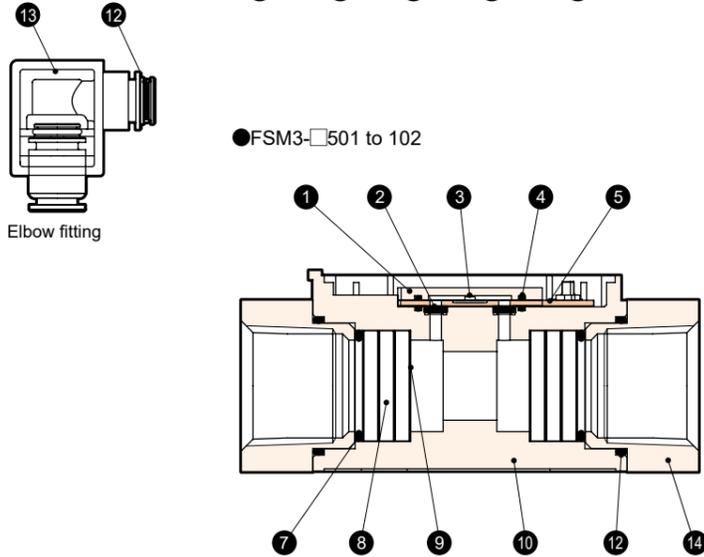
\*17: Refer to P. 245 for weight.

●FSM3-□005 to 201

With needle valve



●FSM3-□501 to 102



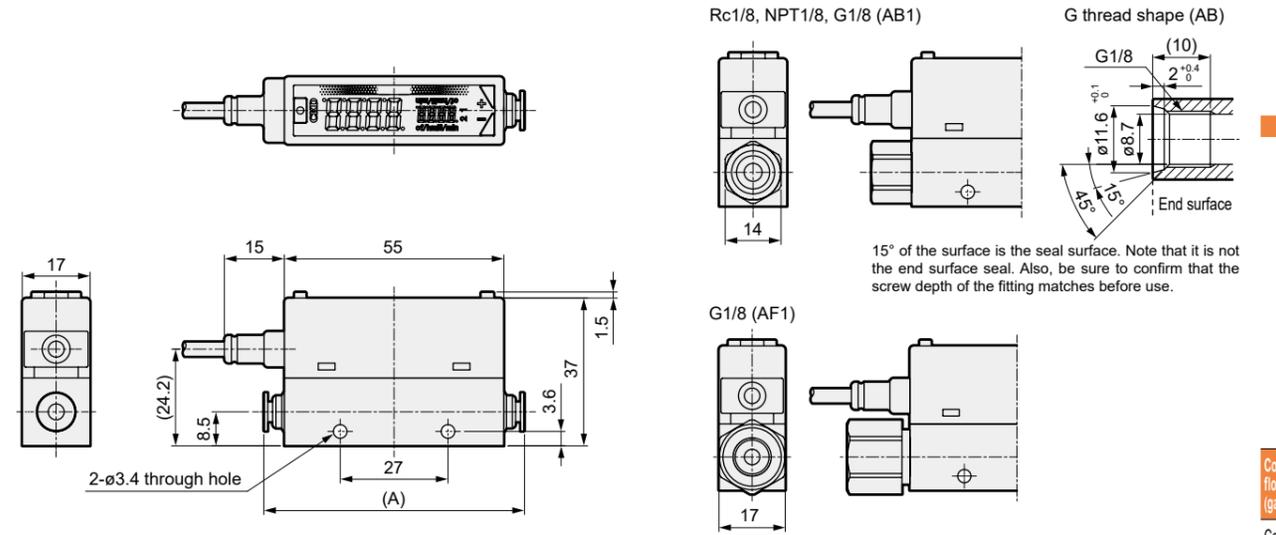
**Do not disassemble**

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	13	Elbow adaptor	Polyamide Resin
2	Filter	Stainless steel	14	Fitting	Aluminum
3	Sensor chip	Semiconductor silicon	15	Needle	Brass/nickeling
4	Gasket	Fluoro rubber	16	Needle guide	Brass/nickeling
5	Sensor board	Glass epoxy resin	17	O-ring	Fluoro rubber
6	Fitting	-	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Aluminum	20	Needle valve body	Polyamide Resin
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Polyamide Resin	22	O-ring	Fluoro rubber
11	Fitting	Aluminum	23	Orifice	Brass/nickeling
12	O-ring	Fluoro rubber	24	O-ring	Fluoro rubber

## Dimensions (LCD display)

Port size: Straight  $\phi 4$  mm,  $\phi 6$  mm,  $\phi 1/4$ ", Rc1/8, G1/8, NPT1/8

●FSM3-L121/BH1/CH1/HH1/AA1/AF1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)

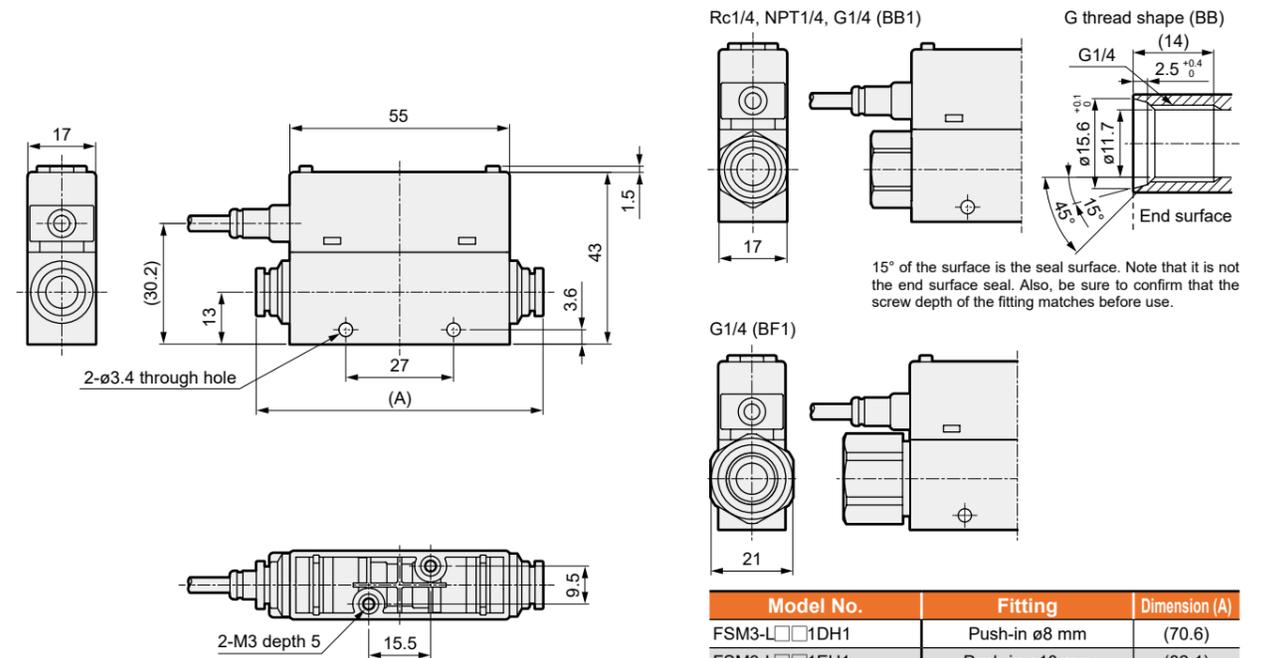


Model No.	Fitting	Dimension (A)
FSM3-□□□1BH1	Push-in $\phi 4$ mm	(65)
FSM3-□□□1CH1	Push-in $\phi 6$ mm	(67.2)
FSM3-□□□1HH1	Push-in 1/4"	(70.4)
FSM3-□□□1AA1	Rc1/8	(75)
FSM3-□□□1AF1	G1/8	(87)
FSM3-□□□1AB1	G1/8	(87)
FSM3-□□□1AC1	NPT1/8	(75)

Port size: Straight  $\phi 8$  mm,  $\phi 10$  mm,  $\phi 3/8$ ", Rc1/4, G1/4, NPT1/4

●FSM3-L121/DH1/EH1/JH1/BA1/BF1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)

\* For the EXA connection type, the secondary side (right side in the diagram below) uses a dedicated adapter. Refer to P. 267 for the external dimensions when connected.



Model No.	Fitting	Dimension (A)
FSM3-□□□1DH1	Push-in $\phi 8$ mm	(70.6)
FSM3-□□□1EH1	Push-in $\phi 10$ mm	(82.1)
FSM3-□□□1JH1	Push-in 3/8"	(83.4)
FSM3-□□□1BA1	Rc1/4	(75)
FSM3-□□□1BF1	G1/4	(89)
FSM3-□□□1BB1	G1/4	(89)
FSM3-□□□1BC1	NPT1/4	(75)

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

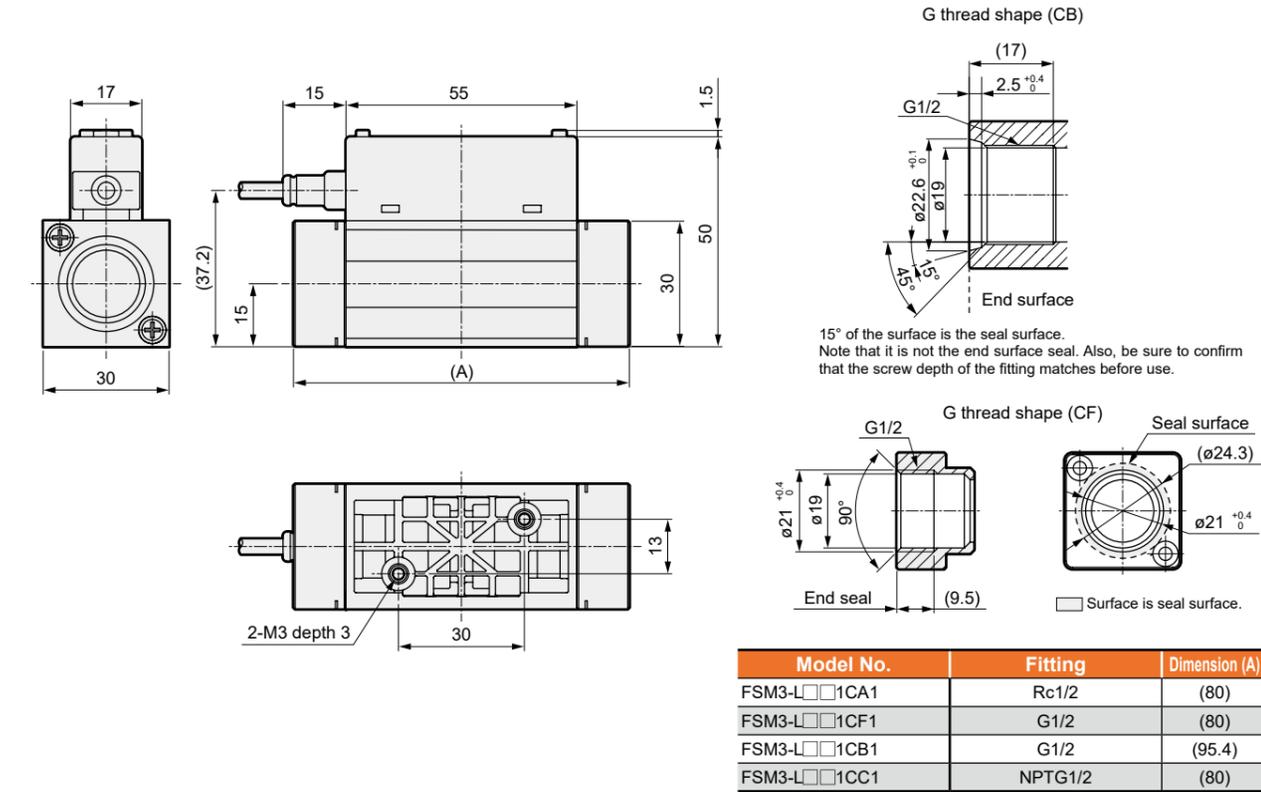
Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Port size: Straight Rc1/2, G1/2, NPT1/2

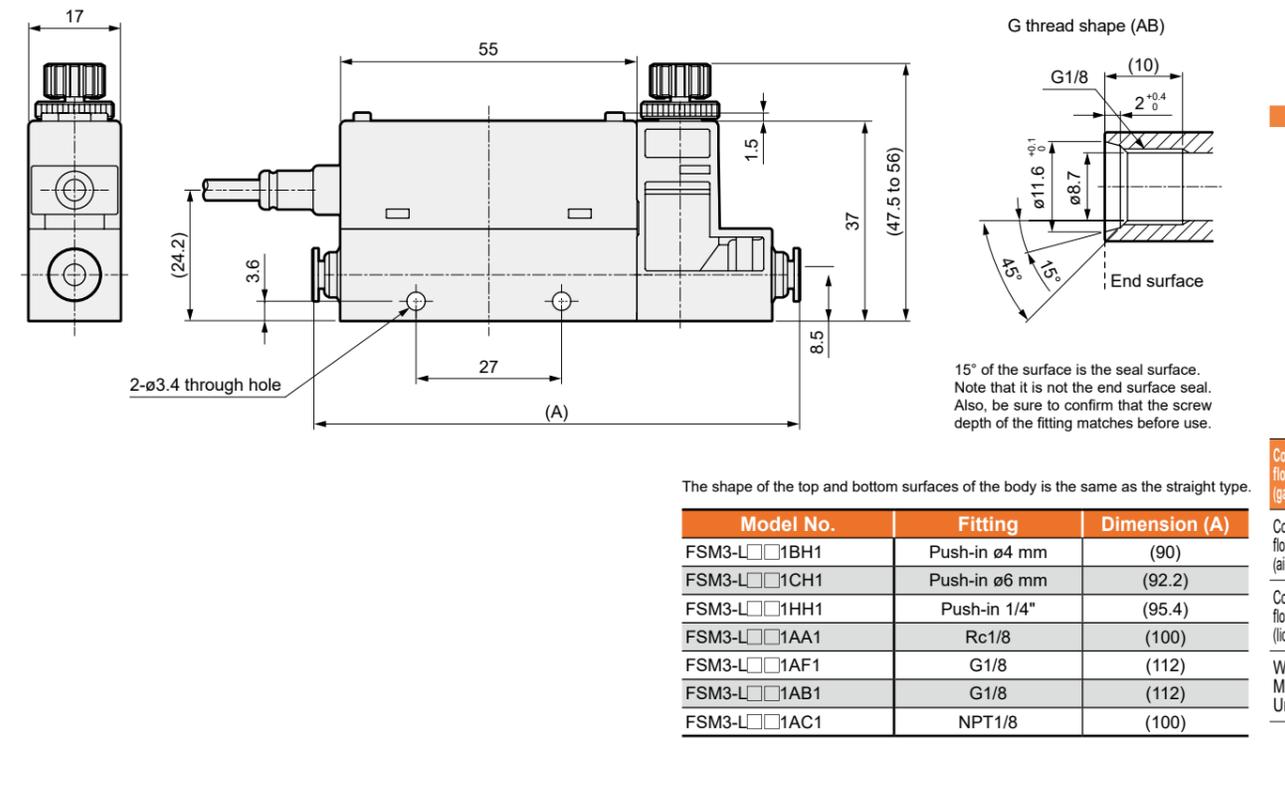
●FSM3-L121/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)



With needle valve dimensions

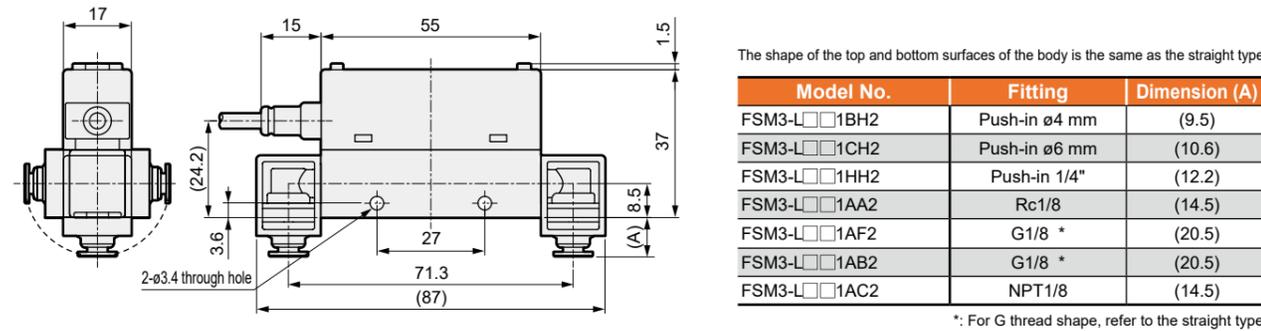
Port size: straight  $\phi 4$  mm,  $\phi 6$  mm,  $\phi 1/4$ ", Rc1/8, G1/8, NPT1/8

●FSM3-L121/BH1/CH1/HH1/AA1/AF1/AB1/AC1/67T (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



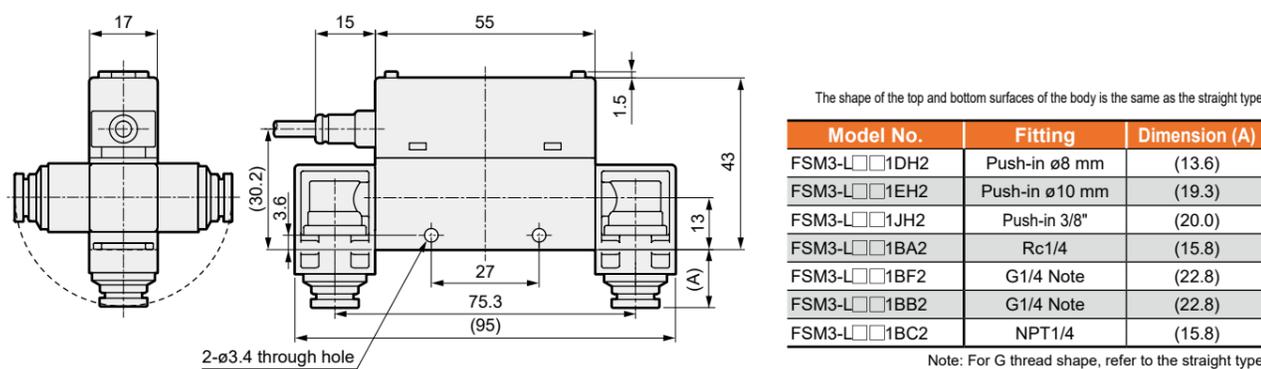
Port size: Elbow  $\phi 4$  mm,  $\phi 6$  mm,  $\phi 1/4$ ", Rc1/8, G1/8, NPT1/8

●FSM3-L121/BH2/CH2/HH2/AA2/AF2/AB2/AC2 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



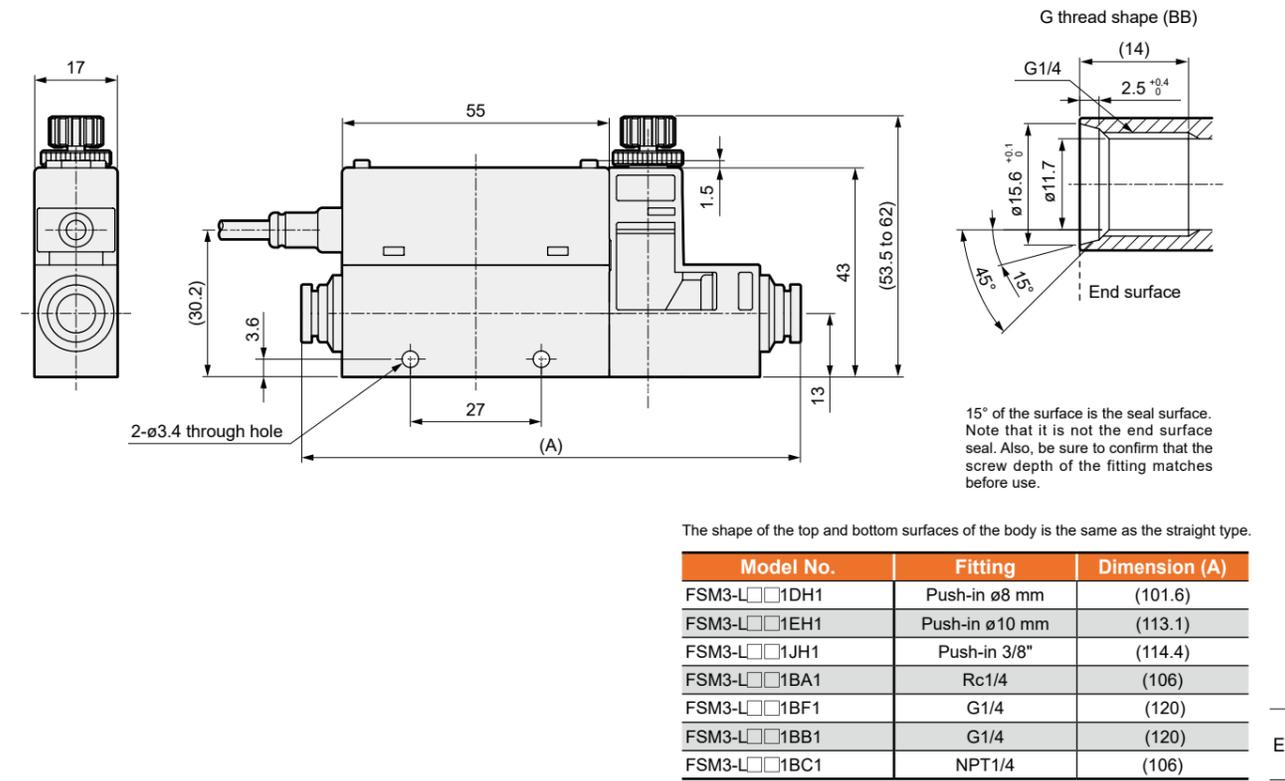
Port size: Elbow  $\phi 8$  mm,  $\phi 10$  mm,  $\phi 3/8$ ", Rc1/4, G1/4, NPT1/4

●FSM3-L121/DH2/EH2/JH2/BA2/BF2/BB2/BC2 (full scale flow rate: 50, 100, 200 L/min)



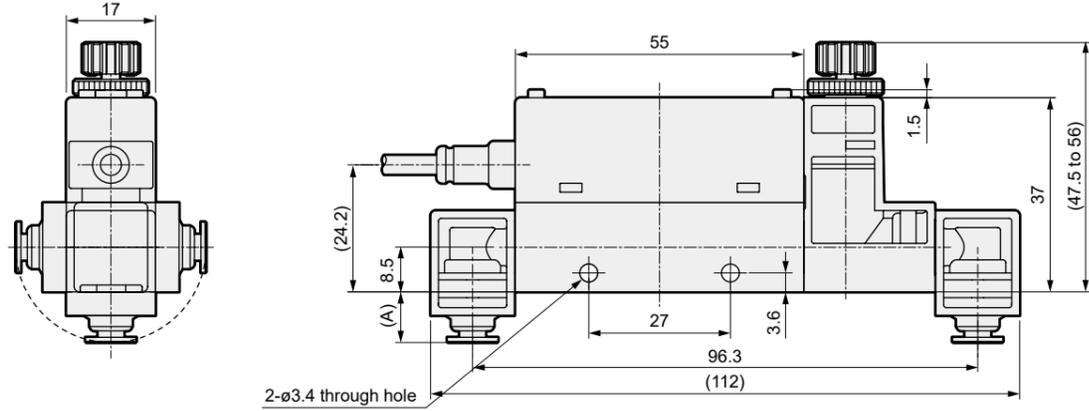
Port size: straight  $\phi 8$  mm,  $\phi 10$  mm,  $\phi 3/8$ ", Rc1/4, G1/4, NPT1/4

●FSM3-L121/DH1/EH1/JH1/BA1/BF1/BB1/BC1/67T (full scale flow rate: 50, 100, 200 L/min)



Port size: Elbow  $\varnothing 4$  mm,  $\varnothing 6$  mm,  $\varnothing 1/4$ ", Rc1/8, G1/8, NPT1/8

●FSM3-L121/BH2/CH2/HH2/AA2/AF2/AB2/AC2 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



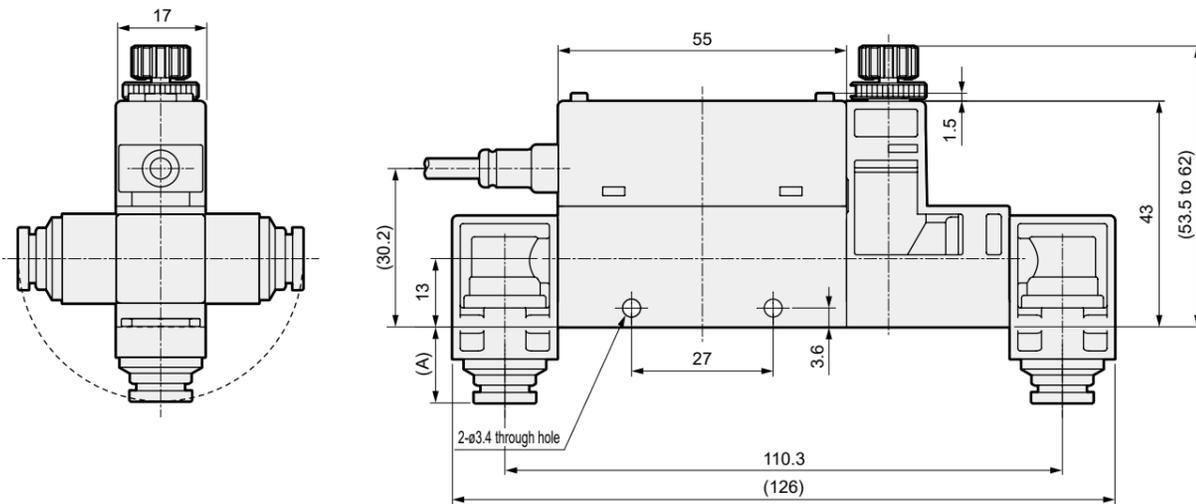
The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-L□□1BH2	Push-in $\varnothing 4$ mm	(9.5)
FSM3-L□□1CH2	Push-in $\varnothing 6$ mm	(10.6)
FSM3-L□□1HH2	Push-in 1/4"	(12.2)
FSM3-L□□1AA2	Rc1/8	(14.5)
FSM3-L□□1AF2	G1/8 *	(20.5)
FSM3-L□□1AB2	G1/8 *	(20.5)
FSM3-L□□1AC2	NPT1/8	(14.5)

\*: For G thread shape, refer to the straight type.

Port size: Elbow  $\varnothing 8$  mm,  $\varnothing 10$  mm,  $\varnothing 3/8$ ", Rc1/4, G1/4, NPT1/4

●FSM3-L121/DH2/EH2/JH2/BA2/BF2/BB2/BC2 (full scale flow rate: 50, 100, 200 L/min)



The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-L□□1DH2	Push-in $\varnothing 8$ mm	(13.6)
FSM3-L□□1EH2	Push-in $\varnothing 10$ mm	(19.3)
FSM3-L□□1JH2	Push-in 3/8"	(20.0)
FSM3-L□□1BA2	Rc1/4	(15.8)
FSM3-L□□1BF2	G1/4 Note	(22.8)
FSM3-L□□1BB2	G1/4 Note	(22.8)
FSM3-L□□1BC2	NPT1/4	(15.8)

Note: For G thread shape, refer to the straight type.

## Product weight

[Unit: g]

Code [3] [4]	Port size / Piping direction Description	Weight	
		Without needle valve	With needle valve
BH1	Push-in (for $\varnothing 4$ mm straight)	60	90
CH1	Push-in (for $\varnothing 6$ mm straight)	50	80
DH1	Push-in (for $\varnothing 8$ mm straight)	80	120
EH1	Push-in (for $\varnothing 10$ mm straight)	80	120
HH1	Push-in (for $\varnothing 1/4$ " straight)	60	90
JH1	Push-in (for $\varnothing 3/8$ " straight)	80	120
AA1	Rc1/8 Straight	60	90
BA1	Rc1/4 Straight	60	100
CA1	Rc1/2 Straight	120	-
AF1	G1/8 Straight	70	100
BF1	G1/4 Straight	85	125
CF1	G1/2 Straight	120	-
AB1	G1/8 Straight	60	90
BB1	G1/4 Straight	70	110
CB1	G1/2 Straight	140	-
1 VAC	NPT 1/8 Straight	50	80
BC1	NPT 1/4 Straight	60	100
CC1	NPT 1/2 Straight	120	-
BH2	Push-in (for $\varnothing 4$ mm elbow)	70	100
CH2	Push-in (for $\varnothing 6$ mm elbow)	60	90
DH2	Push-in (for $\varnothing 8$ mm elbow)	100	140
EH2	Push-in (for $\varnothing 10$ mm elbow)	100	140
HH2	Push-in (for $\varnothing 1/4$ " elbow)	70	100
JH2	Push-in (for $\varnothing 3/8$ " elbow)	100	140
AA2	Rc1/8 elbow	70	100
BA2	Rc1/4 elbow	80	120
AF2	G1/8 elbow	80	110
BF2	G1/4 elbow	105	145
AB2	G1/8 elbow	70	100
BB2	G1/4 elbow	90	130
2 VAC	NPT1/8 elbow	70	100
BC2	NPT1/4 elbow	80	120

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending



Compact flow rate sensor (RAPIFLOW)

# FSM3 Series

Bar display

● Resin body (flow rate range: 500 mL/min to 1000 L/min)

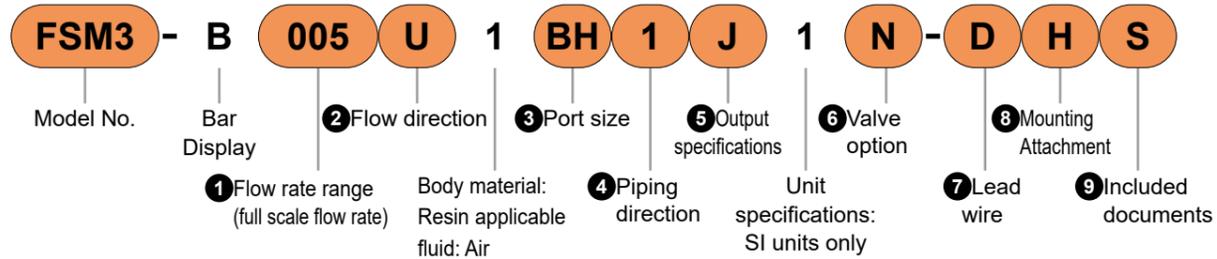


Refer to the CKD website for detailed compatible model Nos.

# FSM3 Series

Model No. Notation Method resin body (bar display)

## Model No. Notation Method



### 1 Flow rate range (full scale flow rate)

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min
100	10 L/min	102	1000 L/min
200	20 L/min		

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

### 2 Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

Note: For flow direction "B" bi-directional models, valve option is "N" only. Note that an "E" EXA connecting fitting cannot be selected.

### 3 Port size

Description	Code
For ø4 mm tube	BH
For ø6 mm tube	CH
For ø8 mm tube	DH
For ø10 mm tube	EH
For ø1/4" tube	HH
For ø3/8" tube	JH
Rc thread	
Rc1/8	AA
Rc1/4	BA
Rc1/2	CA
G thread ISO 16030	
G1/8	AF
G1/4	BF
G1/2	CF
G thread JIS B 2351-1 O-type (*1)	
G1/8	AB
G1/4	BB
G1/2	CB
NPT thread	
NPT1/8	AC
NPT1/4	BC
NPT1/2	CC

\*1: Check the G thread connection shape with the dimensions diagrams (P. 251 and 252) when making a selection. (G thread connection shape is JIS B 2351-1 O-type compliant)

\*2: Refer to the compatibility table on the right for the combinations of the flow rate range and port size.

### 4 Piping direction

Code	Description
1	Straight
2	Elbow

Note: Note that if you mount the elbow fitting in an upward position, it will interfere with the connector, and if you mount the elbow fitting in a downward position, it will interfere with the DIN rail mounting.

Compatibility table of flow rate range and port size, and EXA connection fitting

1 Flow rate range	3 Port size												4 Piping direction																					
	BH1	CH1	DH1	EH1	HH1	JH1	BH2	CH2	DH2	EH2	HH2	JH2	AA1	BA1	CA1	AA2	BA2	AF1	BF1	CF1	AF2	BF2	AB1	BB1	CB1	AB2	BB2	VAC	BC1	CC1	2 VAC	BC2		
005	●	●					●	●					●	●			●	●								●	●						●	●
010	●	●					●	●					●	●			●	●								●	●						●	●
020	●	●					●	●					●	●			●	●								●	●						●	●
050	●	●					●	●					●	●			●	●								●	●						●	●
100	●	●					●	●					●	●			●	●								●	●						●	●
200	●	●					●	●					●	●			●	●								●	●						●	●
500	●	●	●				●	●					●	●			●	●								●	●						●	●
101	●	●					●	●					●	●			●	●								●	●						●	●
201	●	●					●	●					●	●			●	●								●	●						●	●
501	●	●					●	●					●	●			●	●								●	●						●	●
102	●	●					●	●					●	●			●	●								●	●						●	●

●: Port compatibility ★: EXA connection fitting compatibility

### 5 Output specifications

Code	Description
J	Analog voltage output 1 point
K	Analog current output 1 point

Note: When using in combination with a separated display (FSM2-D), select "J" analog voltage output 1 point.

### 6 Valve option

Code	Description
N	None
E	EXA connecting fitting (EXA sold separately)

\*1  
\*2

\*1: Connection to solenoid valves (EXA series) is possible with the dedicated fitting. Refer to P. 267.

\*2: Be sure to set EXA to the OUT side of the product. Use a lead wire for the EXA coil option. The DIN terminal box cannot be mounted because it will cause interference. After making sure it is connected firmly, confirm that there is no external leakage.

### 7 Lead wire

Code	Description
Blank	None
C	4 conductor 1 m
D	4 conductor 3 m

### 8 Mounting attachment\*1, \*2

Code	Description
Blank	None
H	Bracket 1 (for models 200 L or less)
J	Bracket 2 (for 500 or 1000 L models)
M	DIN rail mounting (for models 200 L or less)

\*1: "Panel mount" option cannot be selected. Note that the bracket mounting position may interfere with the elbow fitting.

\*2: Optional parts will come with the product.

### 9 Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SA)

FSM3 - . . . . - P70

FSM3 - . . . . - P80

## Model No. Notation for Options



Note: Refer to P. 262 for dimensions diagram.

### 1 Option

Code	Description
C	4-conductor lead wire 1 m (for bar display)
D	4-conductor lead wire 3 m (for bar display)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Specifications

Item		FSM3-B [1] [2] [3] [4] [5] [6] [7] [-]											
		[1] Flow rate range (full scale flow rate) code											
		005	010	020	050	100	200	500	101	201	501	102	
Flow direction	[2]	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	[2]	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			LED bar display										
Working fluid	Applicable fluids *2		Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
	Temperature range		0 to 50°C (no condensation)										
	Pressure range		-0.09 to 0.75 MPa										
	Proof pressure		1 MPa										
Operating ambient temperature / humidity			0 to 50°C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy	Accuracy *3		Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
	Repeatability*4		Within ±1%F.S. (Secondary side released to atmosphere)										
	Temperature characteristics		Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
	Pressure characteristics		Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)						Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)				
Response time *5			50 msec. or less										
Analog Output *6		J	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		K	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *7	[5]	J	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		K	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *8			45 mA or less										
Lead wire			ø3.7 AWG26 or equivalent ×4-conductor (connector wiring), insulator outer diameter ø1.0										
Degree of Protection			IP40 or equivalent (IEC standard)										
Protection circuit *9			Power reverse connection protection										
Vibration resistance			10 to 150 Hz, max. 100 m/s <sup>2</sup> , X, Y, Z directions, every 2 hours										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting	Mounting orientation *10		Unrestricted in vertical/horizontal direction										
	Straight piping section *11		Not required										

- \*1: The value converted to volumetric flow rate at standard condition (20°C, 1 barometric pressure (101 kPa), 65% RH)
- \*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with 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, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m<sup>3</sup>) for operation. (Refer to P. 316 for details on recommended circuit.)
- \*3: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.
- \*4: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)
- \*5: The actual response time changes depending on the piping conditions.
- \*6: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
- \*7: The power supply voltage specifications differ for the voltage output type and current output type.
- \*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.
- \*9: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
- \*10: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.
- \*11: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.
- \*12: Refer to P. 253 for weight.

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

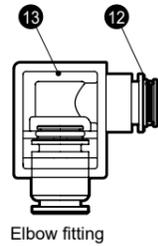
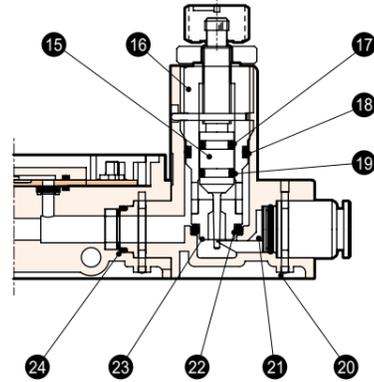
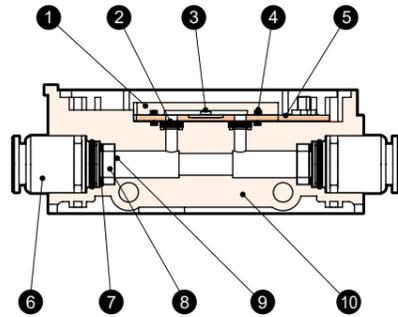
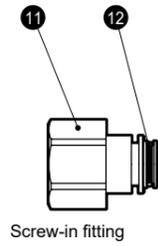
Compact flow sensor (air)

Compact flow sensor (liquid)

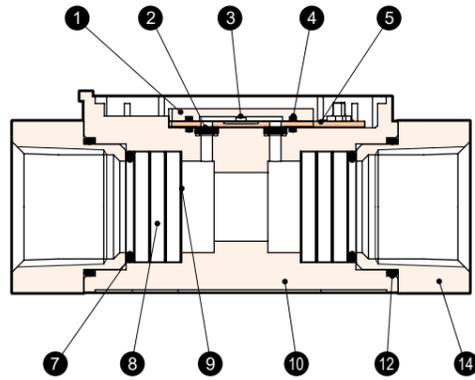
Water Manifold Unit

●FSM3-□005 to 201

With needle valve



●FSM3-□501 to 102



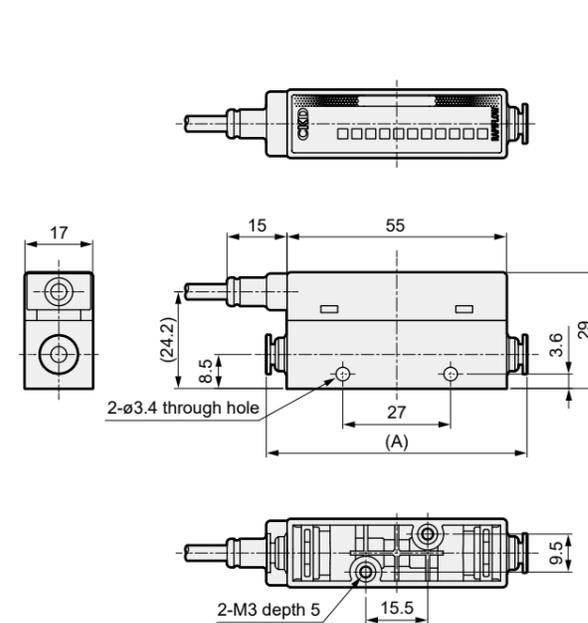
**Do not disassemble**

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	13	Elbow adaptor	Polyamide Resin
2	Filter	Stainless steel	14	Fitting	Aluminum
3	Sensor chip	Semiconductor silicon	15	Needle	Brass/nickeling
4	Gasket	Fluoro rubber	16	Needle guide	Brass/nickeling
5	Sensor board	Glass epoxy resin	17	O-ring	Fluoro rubber
6	Fitting	-	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Aluminum	20	Needle valve body	Polyamide Resin
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Polyamide Resin	22	O-ring	Fluoro rubber
11	Fitting	Aluminum	23	Orifice	Brass/nickeling
12	O-ring	Fluoro rubber	24	O-ring	Fluoro rubber

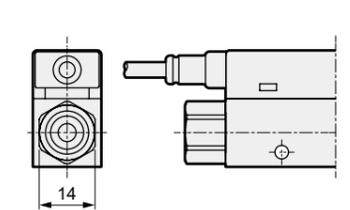
## Dimensions (bar display)

Port size: Straight  $\phi 4$  mm,  $\phi 6$  mm,  $\phi 1/4$ ", Rc1/8, G1/8, NPT1/8

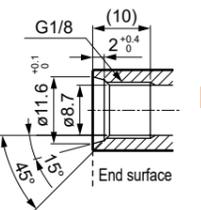
●FSM3-B121/BH1/CH1/HH1/AA1/AF1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Rc1/8, NPT1/8, G1/8 (AB1)

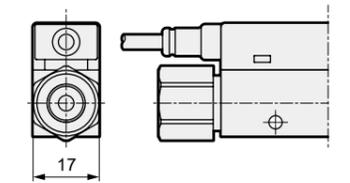


G thread shape (AB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

G1/8 (AF1)

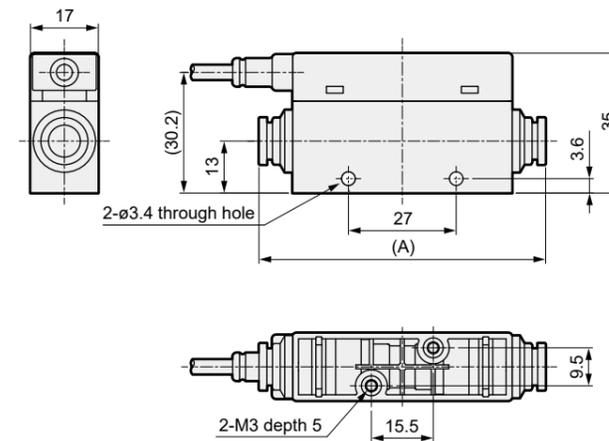


Model No.	Fitting	Dimension (A)
FSM3-B□□1BH1	Push-in $\phi 4$ mm	(65)
FSM3-B□□1CH1	Push-in $\phi 6$ mm	(67.2)
FSM3-B□□1HH1	Push-in 1/4"	(70.4)
FSM3-B□□1AA1	Rc1/8	(75)
FSM3-B□□1AF1	G1/8	(87)
FSM3-B□□1AB1	G1/8	(87)
FSM3-B□□1AC1	NPT1/8	(75)

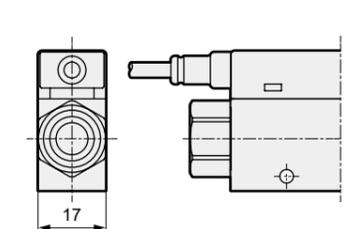
Port size: Straight  $\phi 8$  mm,  $\phi 10$  mm,  $\phi 3/8$ ", Rc1/4, G1/4, NPT1/4

●FSM3-B121/DH1/EH1/JH1/BA1/BF1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)

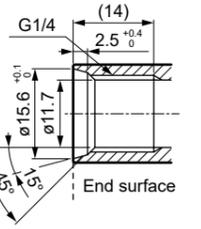
\* For the EXA connection, the dedicated adaptor is provided on the secondary side (right side in the figure below). Dimensions diagram Refer to P. 267 on how to connect.



Rc1/4, NPT1/4, G1/4 (BB1)

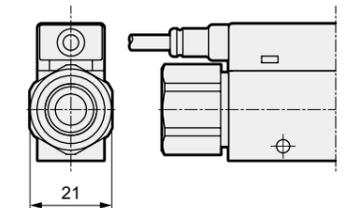


G thread shape (BB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

G1/4 (BF1)



Model No.	Fitting	Dimension (A)
FSM3-B□□1DH1	Push-in $\phi 8$ mm	(70.6)
FSM3-B□□1EH1	Push-in $\phi 10$ mm	(82.1)
FSM3-B□□1JH1	Push-in 3/8"	(83.4)
FSM3-B□□1BA1	Rc1/4	(75)
FSM3-B□□1BF1	G1/4	(89)
FSM3-B□□1BB1	G1/4	(89)
FSM3-B□□1BC1	NPT1/4	(75)

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

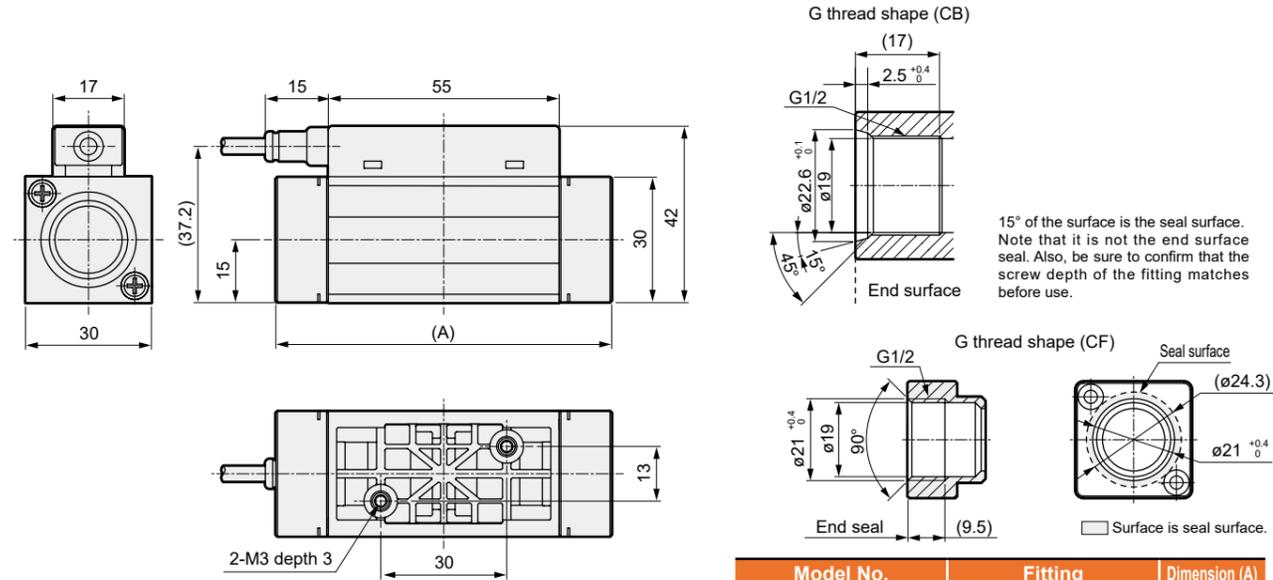
Compact flow sensor (liquid)

Water Manifold Unit

## Dimensions (bar display)

Port size: Straight Rc1/2, G1/2, NPT1/2

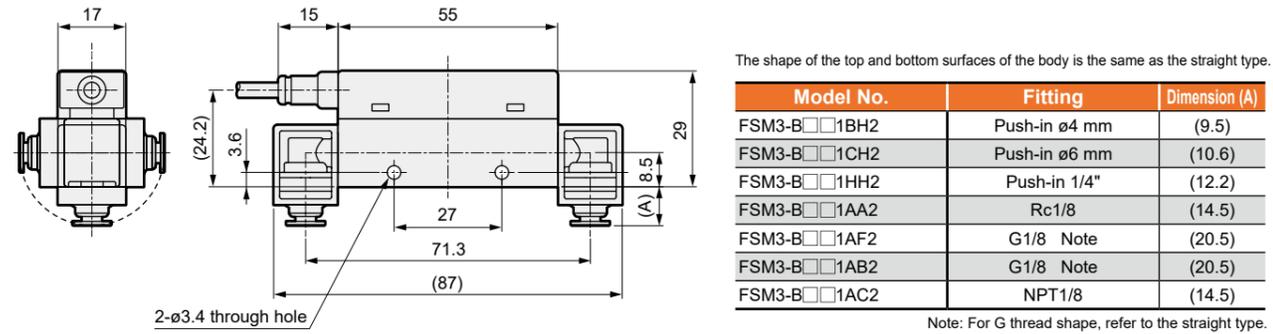
●FSM3-B111/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)



Model No.	Fitting	Dimension (A)
FSM3-B□□1CA1	Rc1/2	(80)
FSM3-B□□1CF1	G1/2	(80)
FSM3-B□□1CB1	G1/2	(95.4)
FSM3-B□□1CC1	NPT1/2	(80)

Port size: Elbow ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

●FSM3-B1111/BH2/CH2/HH2/AA2/AF2/AB2/AC2 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)

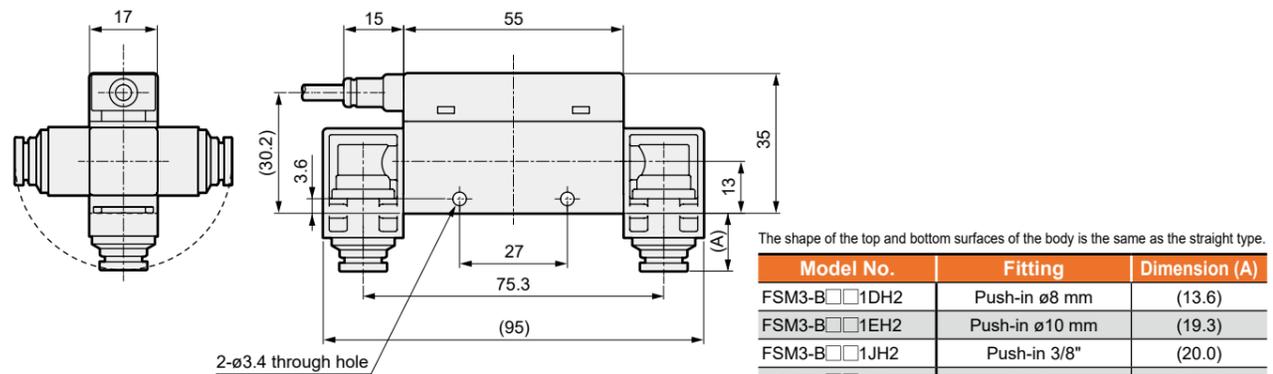


Model No.	Fitting	Dimension (A)
FSM3-B□□1BH2	Push-in ø4 mm	(9.5)
FSM3-B□□1CH2	Push-in ø6 mm	(10.6)
FSM3-B□□1HH2	Push-in 1/4"	(12.2)
FSM3-B□□1AA2	Rc1/8	(14.5)
FSM3-B□□1AF2	G1/8 Note	(20.5)
FSM3-B□□1AB2	G1/8 Note	(20.5)
FSM3-B□□1AC2	NPT1/8	(14.5)

Note: For G thread shape, refer to the straight type.

Port size: Elbow ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-B1111/DH2/EH2/JH2/BA2/BF2/BB2/BC2 (full scale flow rate: 50, 100, 200 L/min)



Model No.	Fitting	Dimension (A)
FSM3-B□□1DH2	Push-in ø8 mm	(13.6)
FSM3-B□□1EH2	Push-in ø10 mm	(19.3)
FSM3-B□□1JH2	Push-in 3/8"	(20.0)
FSM3-B□□1BA2	Rc1/4	(15.8)
FSM3-B□□1BF2	G1/4 Note	(22.8)
FSM3-B□□1BB2	G1/4 Note	(22.8)
FSM3-B□□1BC2	NPT1/4	(15.8)

Note: For G thread shape, refer to the straight type.

## Product weight

[Unit: g]

Code [3] [4]	Port size / Piping direction	Weight
	Description	
BH1	Push-in (for ø4 mm straight)	50
CH1	Push-in (for ø6 mm straight)	40
DH1	Push-in (for ø8 mm straight)	70
EH1	Push-in (for ø10 mm straight)	70
HH1	Push-in (for ø1/4" straight)	50
JH1	Push-in (for ø3/8" straight)	70
AA1	Rc1/8 Straight	50
BA1	Rc1/4 Straight	50
CA1	Rc1/2 Straight	110
AF1	G1/8 Straight	60
BF1	G1/4 Straight	75
CF1	G1/2 Straight	110
AB1	G1/8 Straight	50
BB1	G1/4 Straight	60
CB1	G1/2 Straight	130
1 VAC	NPT 1/8 Straight	50
BC1	NPT 1/4 Straight	50
CC1	NPT 1/2 Straight	110
BH2	Push-in (for ø4 mm elbow)	60
CH2	Push-in (for ø6 mm elbow)	50
DH2	Push-in (for ø8 mm elbow)	90
EH2	Push-in (for ø10 mm elbow)	90
HH2	Push-in (for ø1/4" elbow)	60
JH2	Push-in (for ø3/8" elbow)	90
AA2	Rc1/8 elbow	60
BA2	Rc1/4 elbow	70
AF2	G1/8 elbow	70
BF2	G1/4 elbow	95
AB2	G1/8 elbow	60
BB2	G1/4 elbow	80
2 VAC	NPT1/8 elbow	60
BC2	NPT1/4 elbow	70

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Ending



Compact flow rate sensor (RAPIFLOW)

# FSM3 Series

IO-Link

● Resin body (flow rate range: 500 mL/min to 1000 L/min)

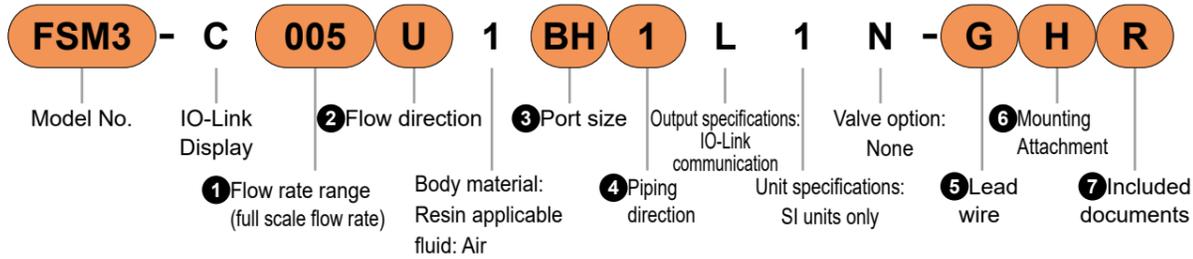


Refer to the CKD website for detailed compatible model Nos.

# FSM3 Series

Model No. Notation Method resin body (IO-Link)

## Model No. Notation Method



### 1 Flow rate range (full scale flow rate)

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min
100	10 L/min	102	1000 L/min
200	20 L/min		

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

### 2 Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

### 3 Port size

Description	Code	
Push-in	For ø4 mm tube	BH
	For ø6 mm tube	CH
	For ø8 mm tube	DH
	For ø10 mm tube	EH
	For ø1/4" tube	HH
	For ø3/8" tube	JH
Rc thread	Rc1/8	AA
	Rc1/4	BA
	Rc1/2	CA
G thread ISO 16030	G1/8	AF
	G1/4	BF
	G1/2	CF
G thread JIS B 2351-1 O-type (*1)	G1/8	AB
	G1/4	BB
NPT thread	NPT1/8	AC
	NPT1/4	BC
	NPT1/2	CC

\*1: Check the G thread connection shape with dimensions diagrams (P. 259 and 260) when making a selection. (G thread connection shape is JIS B 2351-1 O-type compliant)

\*2: Refer to the compatibility table on the right for the combinations of the flow rate range and port size.

### 4 Piping direction

Code	Description
1	Straight
2	Elbow

Note: Note that if you mount the elbow fitting in an upward position, it will interfere with the connector, and if you mount the elbow fitting in a downward position, it will interfere with the DIN rail mounting.

Compatibility table of flow rate range and port size

1 Flow rate range	3 Port size												4 Piping direction							
	BH1	CH1	DH1	EH1	HH1	JH1	BH2	CH2	DH2	EH2	HH2	JH2	AA1	BA1	CA1	AA2				
005	●	●					●	●				●	●			●				
010	●	●					●	●				●	●			●				
020	●	●					●	●				●	●			●				
050	●	●					●	●				●	●			●				
100	●	●					●	●				●	●			●				
200	●	●					●	●				●	●			●				
500	●	●	●		●		●	●	●		●	●	●	●		●				
101			●	●					●	●		●	●			●				
201			●	●					●	●		●	●			●				
501																●				
102																●				
	BA2	AF1	BF1	CF1	AF2	BF2	AB1	BB1	CB1	AB2	BB2	1 VAC	BC1	CC1	2 VAC	BC2				
005		●					●	●				●	●			●				
010		●					●	●				●	●			●				
020		●					●	●				●	●			●				
050		●					●	●				●	●			●				
100		●					●	●				●	●			●				
200		●					●	●				●	●			●				
500	●	●	●		●		●	●	●		●	●	●	●		●				
101			●	●					●	●		●	●			●				
201			●	●					●	●		●	●			●				
501																●				
102																●				

●: Port size compatibility

### 5 Lead wire

Code	Description
Blank	None
G	M12 both-end lead wire with connector (3 m)

### 6 Mounting attachment\*1, \*2

Code	Description
Blank	None
H	Bracket 1 (for models 200 L or less)
J	Bracket 2 (for 500 or 1000 L models)
M	DIN rail mounting (for models 200 L or less)

\*1: Note that the bracket mounting position may interfere with the elbow fitting.

\*2: Optional parts are provided with the product.

### 7 Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SA)

FSM3 - . . . . . P70

FSM3 - . . . . . P80

## Model No. Notation for Options



### 1 Option

Code	Description
G	M12 both-end lead wire with connector (3 m) (for IO-Link)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Note: Refer to P. 262 for dimensions diagram.

Specifications

Item		FSM3-C [1] [2] 1 [3] [4] L1N- [ ]											
		[1] Flow rate range (full scale flow rate) code											
		005	010	020	050	100	200	500	101	201	501	102	
Flow direction	[2]	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	[2]	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type		LED display (power and status indicators)											
Working fluid	Applicable fluid *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas Argon, carbon dioxide (*3), and gas mixture (argon + carbon dioxide) -											
	Temperature range	0 to 50°C (no condensation)											
	Pressure range	-0.09 to 0.75 MPa											
	Proof pressure	1 MPa											
Operating ambient temperature / humidity		0 to 50°C, 90% RH or less											
Storage temperature		-10 to 60°C											
Accuracy*4 (Fluid: in dry air)	Accuracy *5	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")											
	Repeatability *6	Within ±1%F.S. (Secondary side released to atmosphere)											
	Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)											
	Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)					Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)						
Response time *7		50 msec. or less (setting response time OFF)											
Power supply voltage		18 to 30 VDC (ripple rate 1% or less)											
Current consumption *8		45 mA or less											
Lead wire *9		M12 both-end connector lead wire (3 m), AWG23 or equivalent, 4-conductor											
Functions *10		①Gas switching, ②Flow rate integration, ③Peak hold, etc.											
Degree of Protection		IP40 or equivalent (IEC standard)											
Protection circuit *11		Power reverse connection protection											
Vibration resistance *12		10 to 150 Hz, max. 100 m/s <sup>2</sup> , X, Y, Z directions, every 2 hours											
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8											
Mounting	Mounting orientation *13	Unrestricted in vertical/horizontal direction											
	Straight piping installation section *14	Not required											

\*Refer to P. 314 for communication specifications.

- \*1: The value converted to volumetric flow rate at standard condition (20°C, 1 barometric pressure (101 kPa), 65% RH) (For gases other than air: 20°C, 1 barometric pressure (101 kPa), 0% RH)
- \*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with 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, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m<sup>3</sup>) for operation. (Refer to P. 316 for details on recommended circuit.)
- \*3: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range.

Gas type	Flow direction	Measured flow rate range (□/min)									
		005	010	020	100	200	500	101	201		
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L		
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to -0.06 L	-5.00 to -0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L		
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L		

- \*4: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.
- \*5: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.
- \*6: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)
- \*7: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.
- \*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.
- \*9: The male end is straight, and the female end is angled. (Refer to P. 262.) Tighten the M12 connector with a torque of 0.5 N·m or lower. Tightening with excessive force may lead to damage.
- \*10: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. The measurement flow rate ranges after switching are as follows. (Note that the 500 L/min and 1000 L/min models do not have a gas change function.)

Refer to Note 3 for carbon dioxide.

Gas type	Flow direction	Measured flow rate range (□/min)									
		005	010	020	100	200	500	101	201		
• Air • Nitrogen • Argon • argon 80% +carbon dioxide 20%	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L		
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L		
		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L		

The integrating flow is a reference value.  
When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times).  
(Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{5 \text{ min.}} < 1 \text{ million times}$$

- \*11: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
- \*12: A communication error might occur depending on the vibration conditions. Install this product in a place not subject to vibration.
- \*13: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.
- \*14: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.
- \*15: Refer to P. 261 for weight.

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

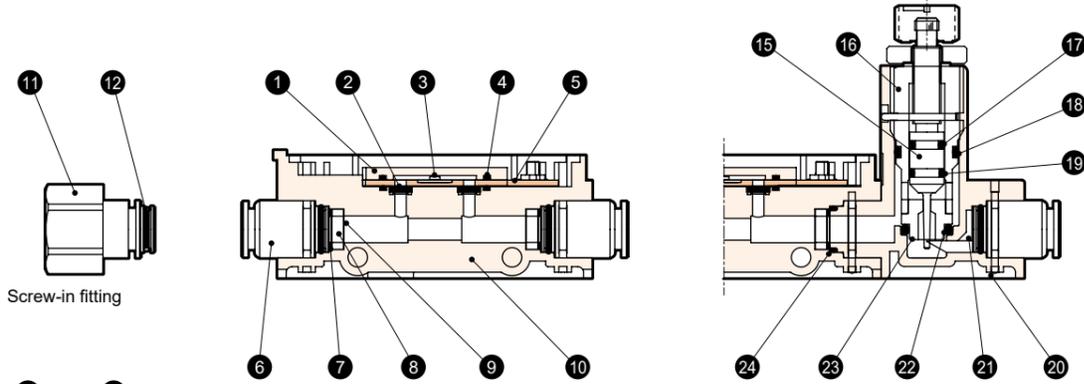
Compact flow sensor (air)

Compact flow sensor (liquid)

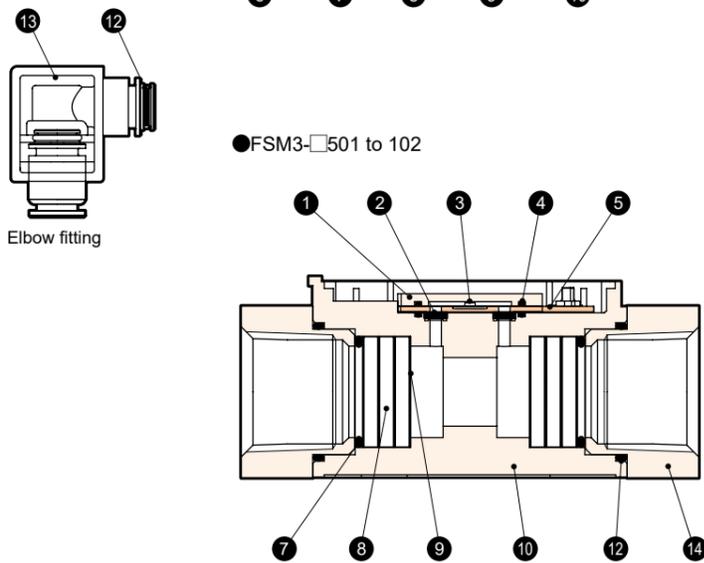
Water Manifold Unit

●FSM3-□005 to 201

With needle valve



●FSM3-□501 to 102



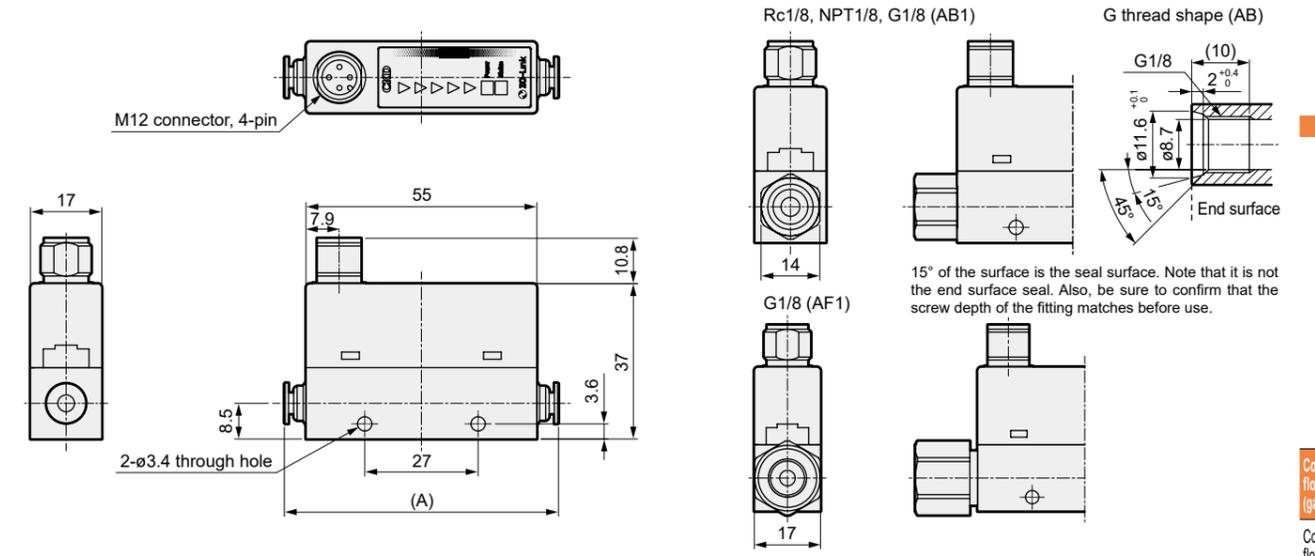
**Do not disassemble**

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	13	Elbow adaptor	Polyamide Resin
2	Filter	Stainless steel	14	Fitting	Aluminum
3	Sensor chip	Semiconductor silicon	15	Needle	Brass/nickeling
4	Gasket	Fluoro rubber	16	Needle guide	Brass/nickeling
5	Sensor board	Glass epoxy resin	17	O-ring	Fluoro rubber
6	Fitting	-	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Aluminum	20	Needle valve body	Polyamide Resin
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Polyamide Resin	22	O-ring	Fluoro rubber
11	Fitting	Aluminum	23	Orifice	Brass/nickeling
12	O-ring	Fluoro rubber	24	O-ring	Fluoro rubber

## Dimensions diagram (IO-Link)

Port size: Straight  $\phi 4$  mm,  $\phi 6$  mm,  $\phi 1/4$ ", Rc1/8, G1/8, NPT1/8

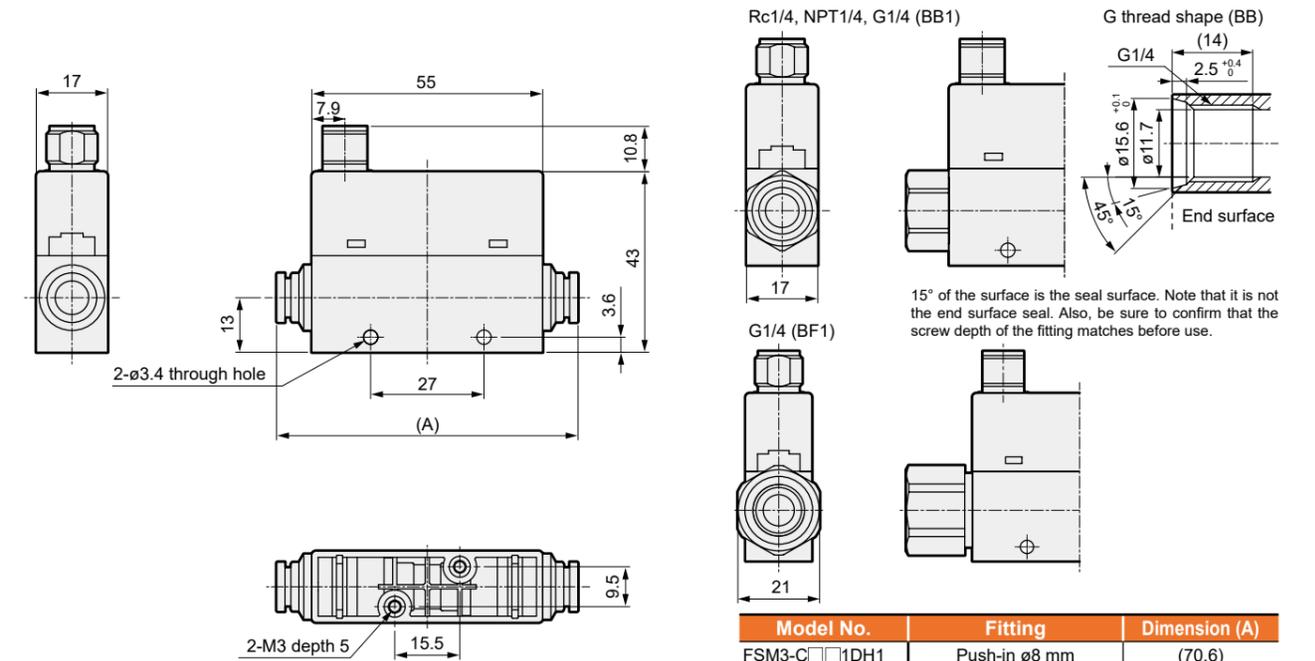
●FSM3-C□1□2/BH1/CH1/HH1/AA1/AF1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Model No.	Fitting	Dimension (A)
FSM3-C□1□2BH1	Push-in $\phi 4$ mm	(65)
FSM3-C□1□2CH1	Push-in $\phi 6$ mm	(67.2)
FSM3-C□1□2HH1	Push-in 1/4"	(70.4)
FSM3-C□1□2AA1	Rc1/8	(75)
FSM3-C□1□2AF1	G1/8	(87)
FSM3-C□1□2AB1	G1/8	(87)
FSM3-C□1□2AC1	NPT1/8	(75)

Port size: Straight  $\phi 8$  mm,  $\phi 10$  mm,  $\phi 3/8$ ", Rc1/4, G1/4, NPT1/4

●FSM3-C□1□21/DH1/EH1/JH1/BA1/BF1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)



Model No.	Fitting	Dimension (A)
FSM3-C□1□21DH1	Push-in $\phi 8$ mm	(70.6)
FSM3-C□1□21EH1	Push-in $\phi 10$ mm	(82.1)
FSM3-C□1□21JH1	Push-in 3/8"	(83.4)
FSM3-C□1□21BA1	Rc1/4	(75)
FSM3-C□1□21BF1	G1/4	(89)
FSM3-C□1□21BB1	G1/4	(89)
FSM3-C□1□21BC1	NPT1/4	(75)

Flow rate sensor

Compact flow sensor (gas)  
Compact flow sensor (air)  
Compact flow sensor (liquid)  
Water Manifold Unit

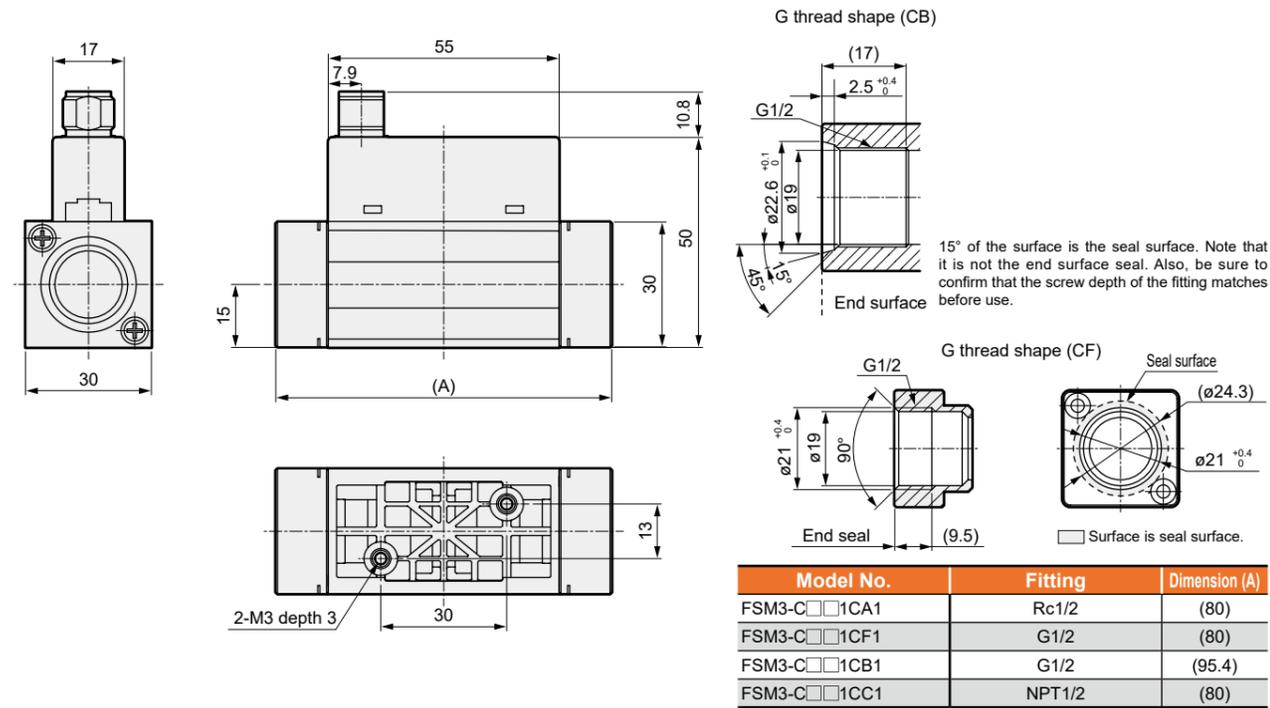
Flow rate sensor

Compact flow sensor (gas)  
Compact flow sensor (air)  
Compact flow sensor (liquid)  
Water Manifold Unit

## Dimensions diagram (IO-Link)

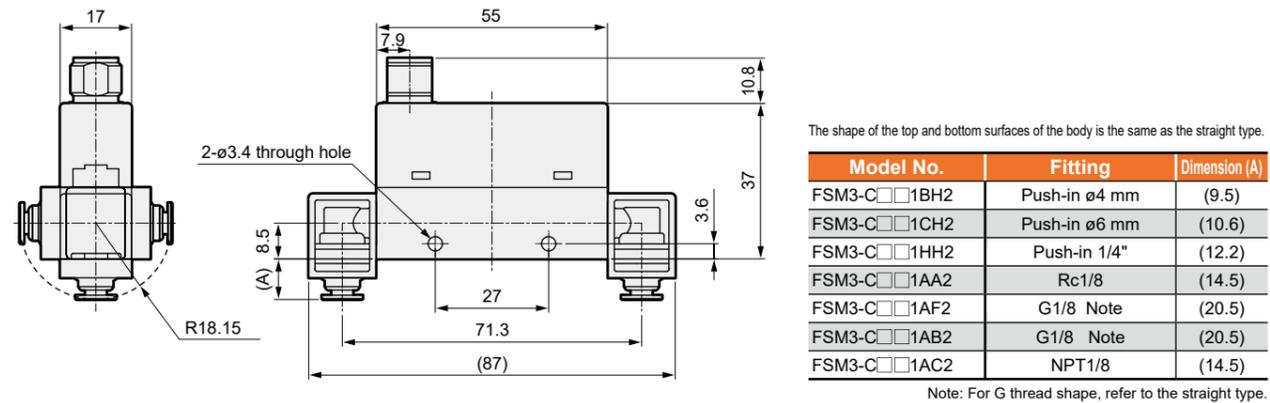
Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-C□□1/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)



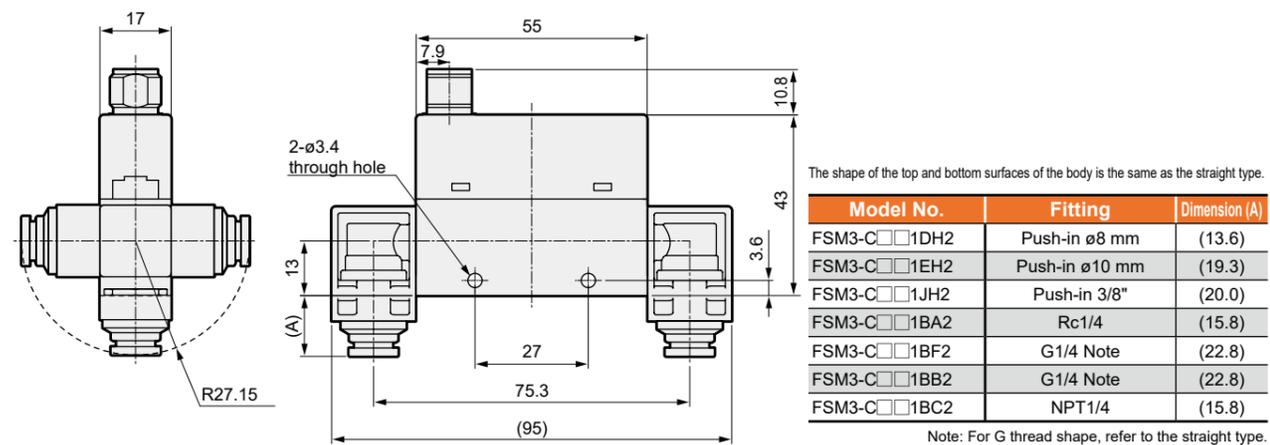
Port size: Elbow ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

●FSM3-C□□1/BH2/CH2/HH2/AA2/AF2/AB2/AC2 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Elbow ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-C□□1/DH2/EH2/JH2/BA2/BF2/BB2/BC2 (full scale flow rate: 50, 100, 200 L/min)



## Product weight

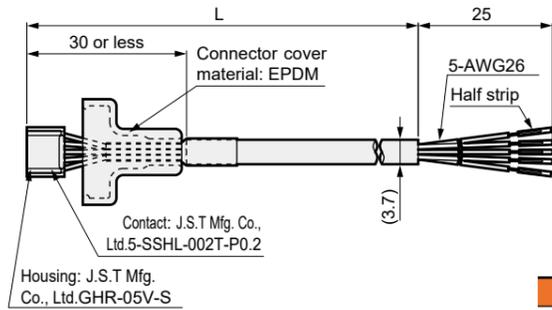
[Unit: g]

Code [3] [4]	Port size / Piping direction	Weight
	Description	
BH1	Push-in (for ø4 mm straight)	50
CH1	Push-in (for ø6 mm straight)	50
DH1	Push-in (for ø8 mm straight)	80
EH1	Push-in (for ø10 mm straight)	80
HH1	Push-in (for ø1/4" straight)	50
JH1	Push-in (for ø3/8" straight)	80
AA1	Rc1/8 Straight	50
BA1	Rc1/4 Straight	60
CA1	Rc1/2 Straight	120
AF1	G1/8 Straight	70
BF1	G1/4 Straight	85
CF1	G1/2 Straight	120
AB1	G1/8 Straight	60
BB1	G1/4 Straight	70
CB1	G1/2 Straight	140
1 VAC	NPT 1/8 Straight	50
BC1	NPT 1/4 Straight	60
CC1	NPT 1/2 Straight	120
BH2	Push-in (for ø4 mm elbow)	60
CH2	Push-in (for ø6 mm elbow)	60
DH2	Push-in (for ø8 mm elbow)	90
EH2	Push-in (for ø10 mm elbow)	100
HH2	Push-in (for ø1/4" elbow)	60
JH2	Push-in (for ø3/8" elbow)	100
AA2	Rc1/8 elbow	60
BA2	Rc1/4 elbow	80
AF2	G1/8 elbow	80
BF2	G1/4 elbow	105
AB2	G1/8 elbow	70
BB2	G1/4 elbow	90
2 VAC	NPT1/8 elbow	60
BC2	NPT1/4 elbow	80

## Resin body optional products

### Option dimensions diagram (lead wire)

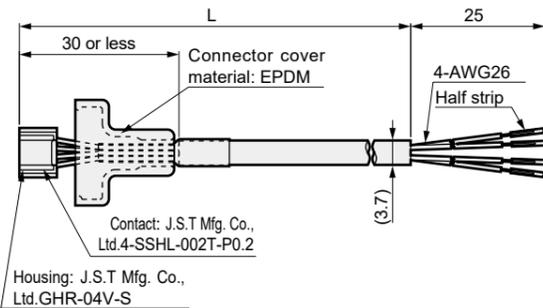
- 5-conductor lead wire (for LCD display, for separated display)  
FSM3-A,B



Model No.	L dimensions	Weight (g)
FSM3-A	1040±20	21
FSM3-B	3040±20	57

Terminal No.	Cable color
1	Brown
2	Black
3	White
4	Gray
5	Blue

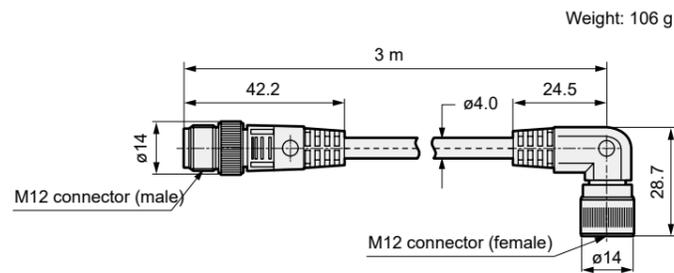
- 4-conductor lead wire (for bar display)  
FSM3-C,D



Model No.	L dimensions	Weight (g)
FSM3-C	1040±20	19
FSM3-D	3040±20	52

Terminal No.	Cable color
1	Brown
2	Black
3	White
4	Blue

- M12 both-end lead wire with connector (for IO-Link)  
FSM3-G



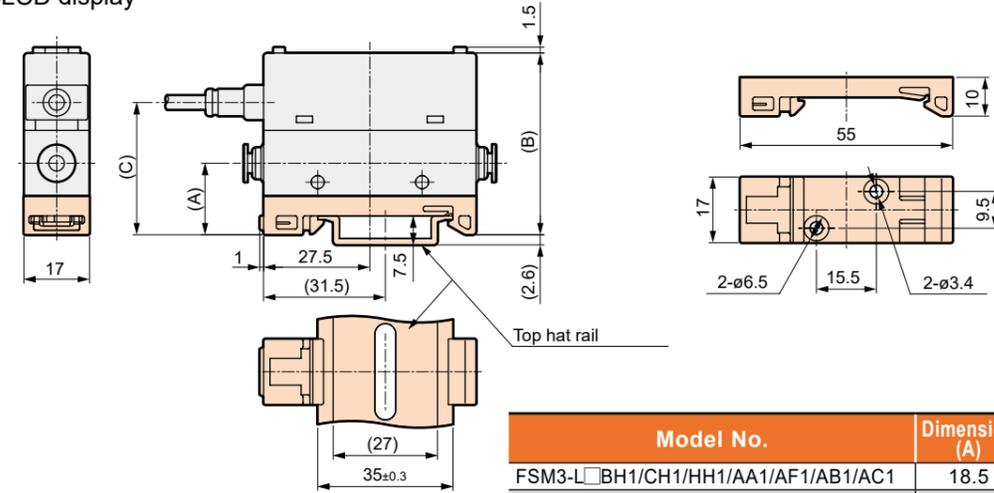
Terminal No.	Cable color
1	Brown
2	White
3	Blue
4	Black

### Option dimensions diagram (DIN rail mounting kit)

FSM3-M

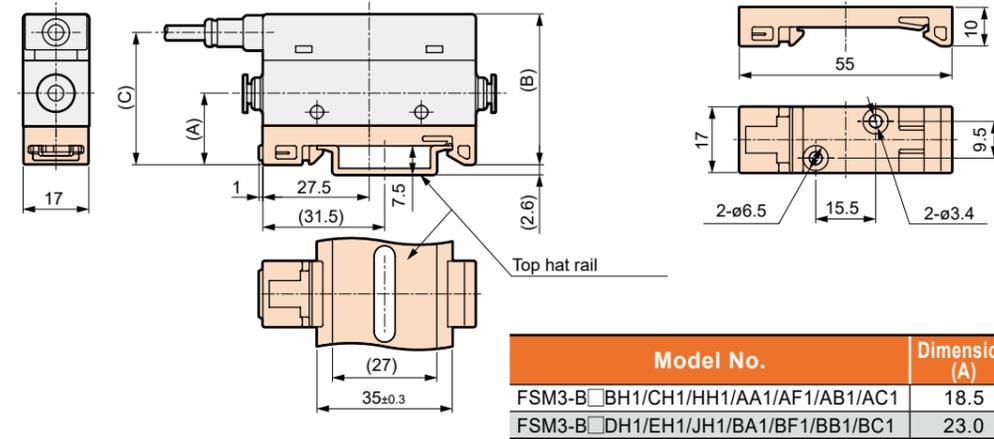
Discrete weight: 7 g

- LCD display



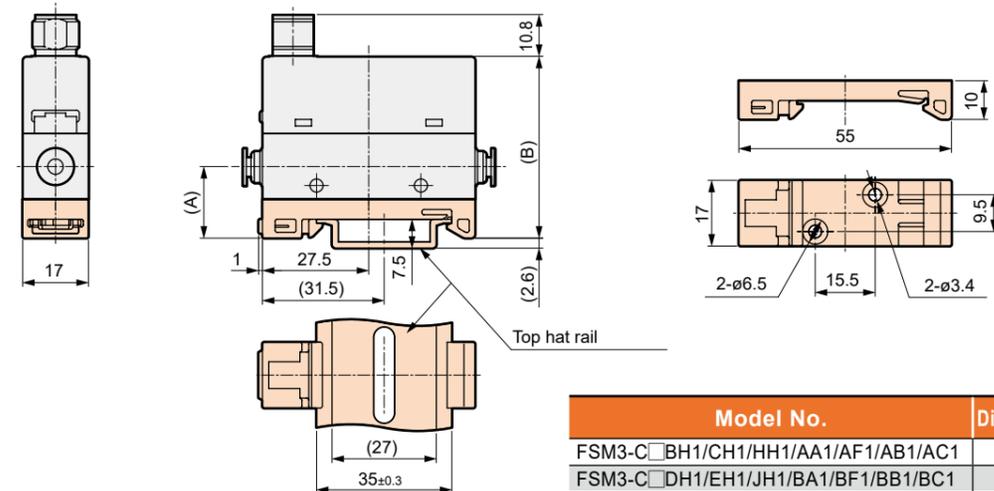
Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-L□BH1/CH1/HH1/AA1/AF1/AB1/AC1	18.5	47	34.2
FSM3-L□DH1/EH1/JH1/BA1/BF1/BB1/BC1	23.0	53	40.2

- Bar display



Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-B□BH1/CH1/HH1/AA1/AF1/AB1/AC1	18.5	39	34.2
FSM3-B□DH1/EH1/JH1/BA1/BF1/BB1/BC1	23.0	45	40.2

- IO-Link



Model No.	Dimension (A)	Dimension (B)
FSM3-C□BH1/CH1/HH1/AA1/AF1/AB1/AC1	18.5	47
FSM3-C□DH1/EH1/JH1/BA1/BF1/BB1/BC1	23.0	53

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Ending

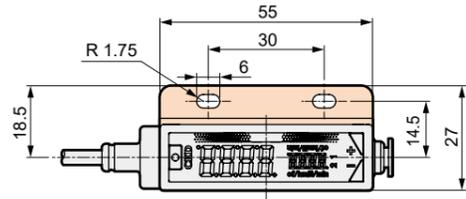
Resin body

Option dimensions diagram (for models with bracket 1: 200 L or less)

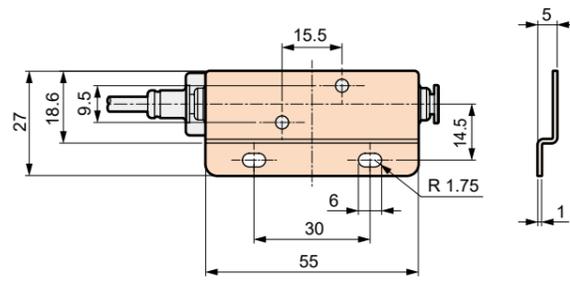
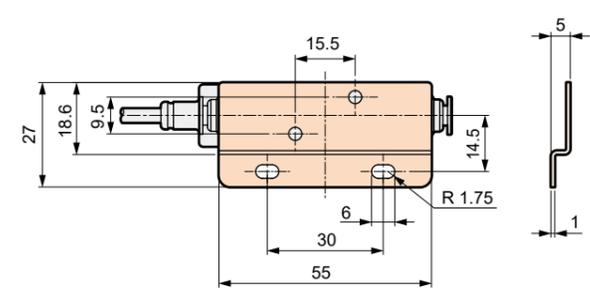
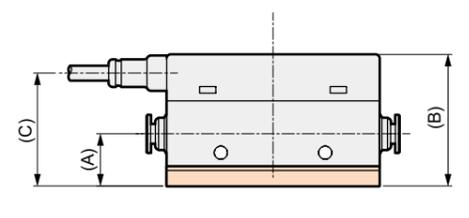
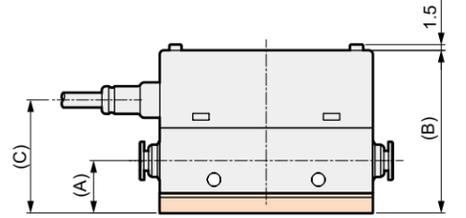
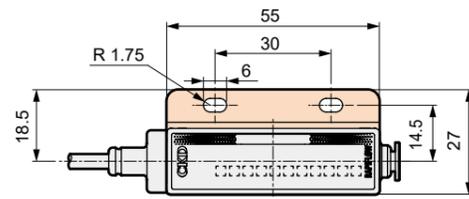
FSM3-H

Discrete weight: 13 g

●LCD display



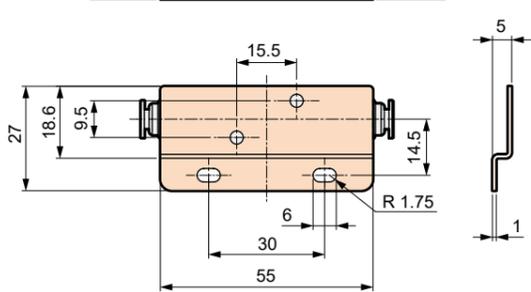
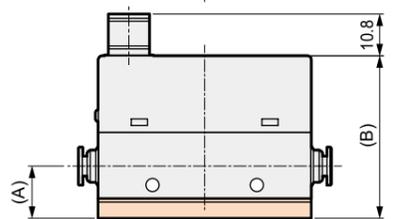
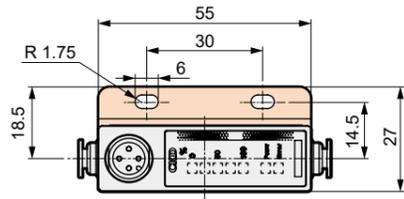
●Bar display



Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-L□BH1/CH1/HH1/AA1/AF1/AB1/AC1	13.5	42	29.2
FSM3-L□DH1/EH1/JH1/BA1/BF1/BB1/BC1	18.0	48	35.2

Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-B□BH1/CH1/HH1/AA1/AF1/AB1/AC1	13.5	34	29.2
FSM3-B□DH1/EH1/JH1/BA1/BF1/BB1/BC1	18.0	40	35.2

●IO-Link



Model No.	Dimension (A)	Dimension (B)
FSM3-C□BH1/CH1/HH1/AA1/AF1/AB1/AC1	13.5	42
FSM3-C□DH1/EH1/JH1/BA1/BF1/BB1/BC1	18.0	48

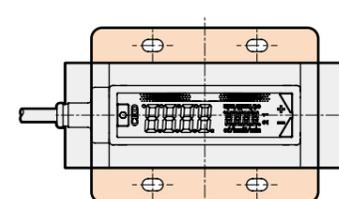
Resin body optional dimensions diagram

Option dimensions diagram (for models with bracket 2: 500 L or 1000 L)

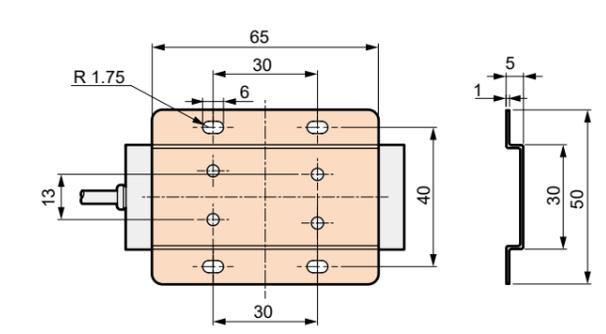
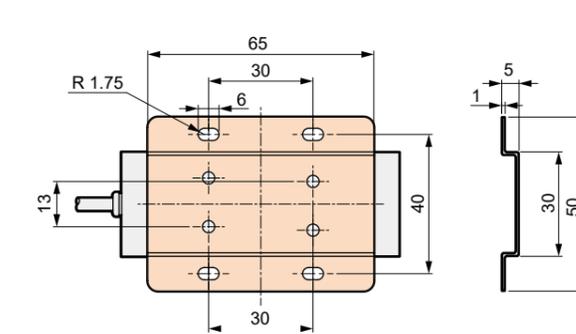
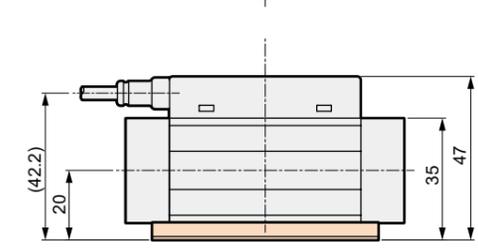
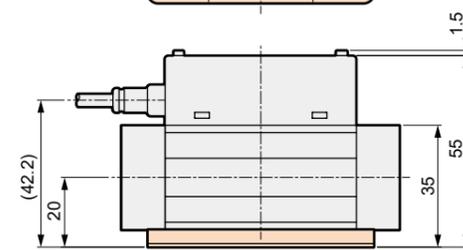
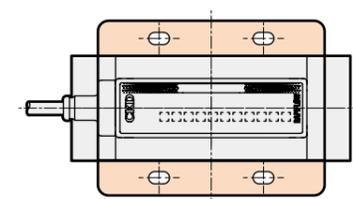
FSM3-J

Discrete weight: 28 g

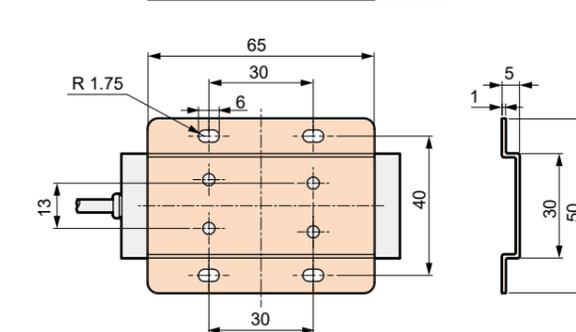
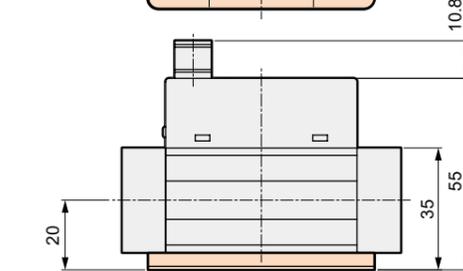
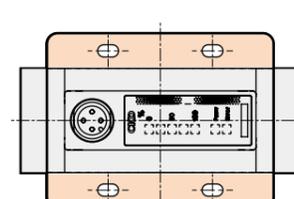
●LCD display



●Bar display



●IO-Link



Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

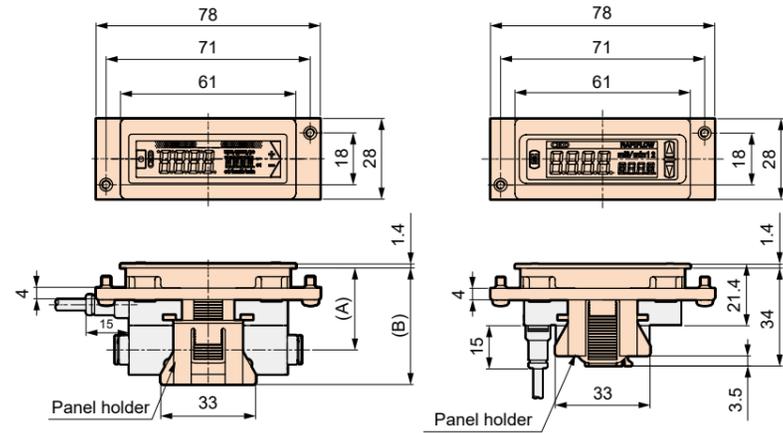
Ending

## Option dimensions diagram (panel mounting kit)

### ● Panel mounting kit 1 (for LCD display, separated display) FSM3-K

- LCD display
- Separated display

Unit weight: 21g



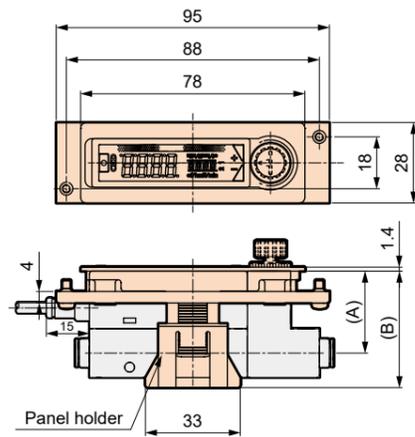
[Panel cut dimension]  
In case of single installation

In the case of close mounting

### ● Panel mounting kit 2 (for needle valve integrated model) FSM3-L

- Integrated needle valve

Unit weight: 24 g



[Panel cut dimension]  
In case of single installation

Model No.	Dimension (A)	Dimension (B)
FSM3-□□□□/BH/CH/HH/AA/AF/AB/AC/AD/AE/□□□□/N/T	28.5	40.5
FSM3-□□□□/DH/EH/JH/BA/BF/BB/BC/BD/BE/□□□□/N/T	30	46.5

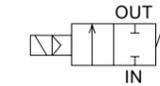
# EXA Series Screw-in connection body

## Connection image

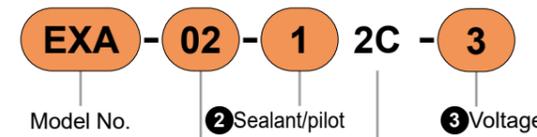


## Circuit diagram Symbol

- NC (normally closed)



## Model No. Notation Method



\*1: Contact CKD for G thread and NPT thread support.  
\*2: Refer to the FSM3 instruction manual for the connection method to FSM3.

### 1 Port size

Code	Description
02	Rc1/4
03	Rc3/8

### 2 Sealant/pilot operated combination

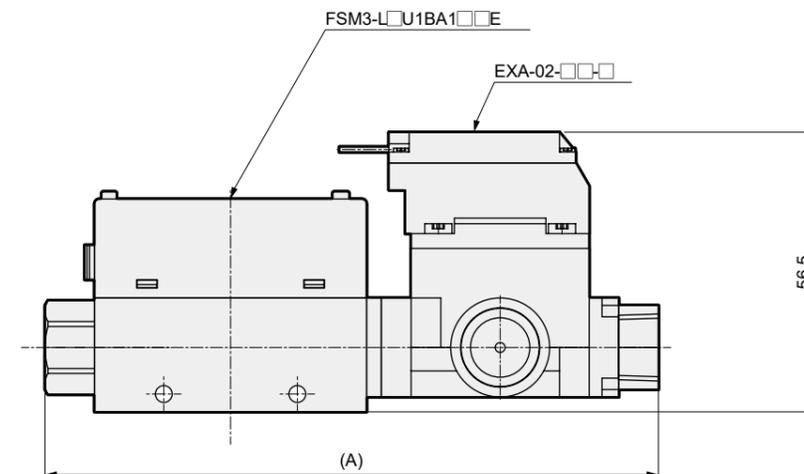
Code	Description
0	H-NBR, internal exhaust specifications
1	H-NBR/external exhaust specifications

Note: Check the pressure specifications.

### 3 Voltage

Code	Description
1	480 VAC
3	24 VDC
4	12 VDC

## FSM3 connection dimensions



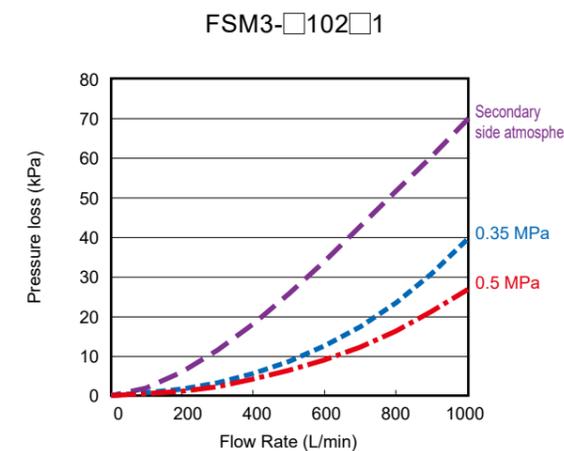
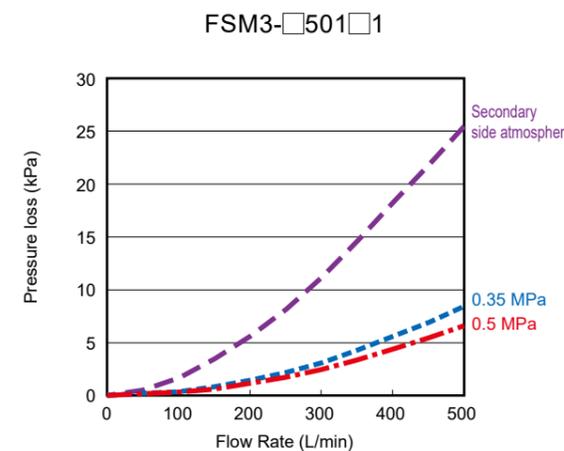
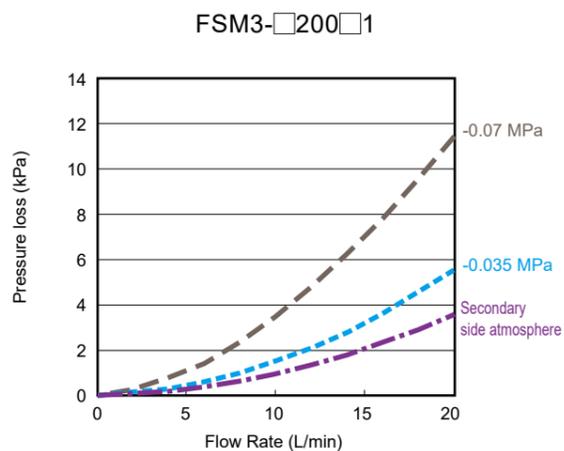
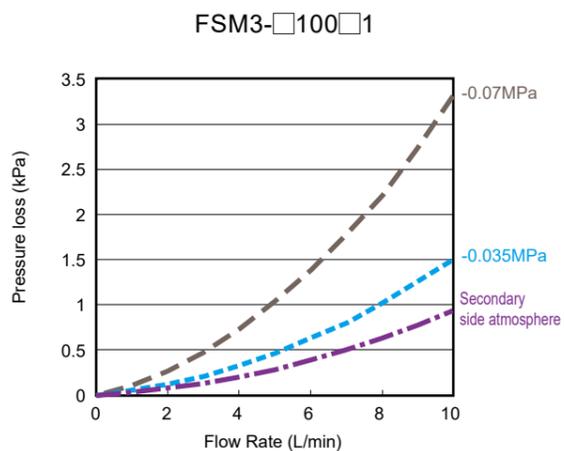
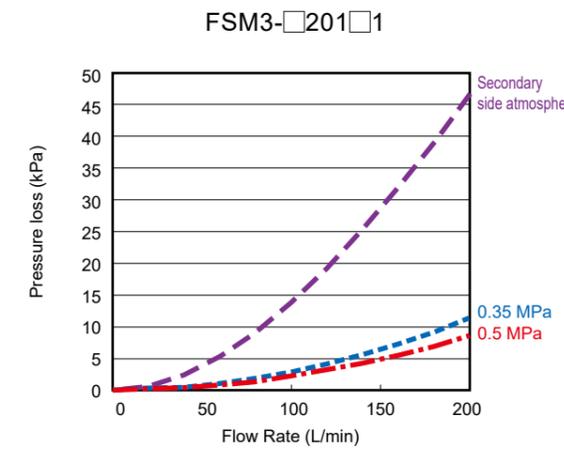
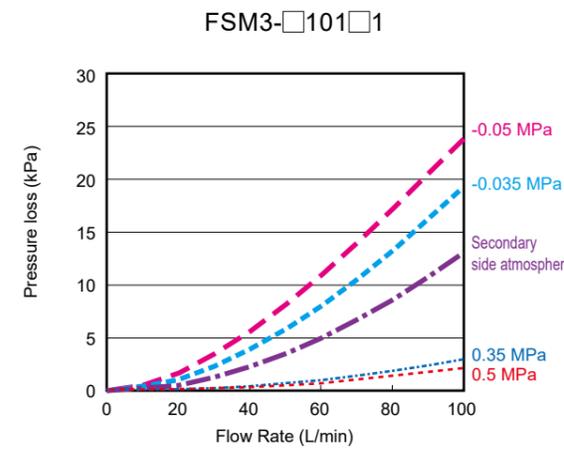
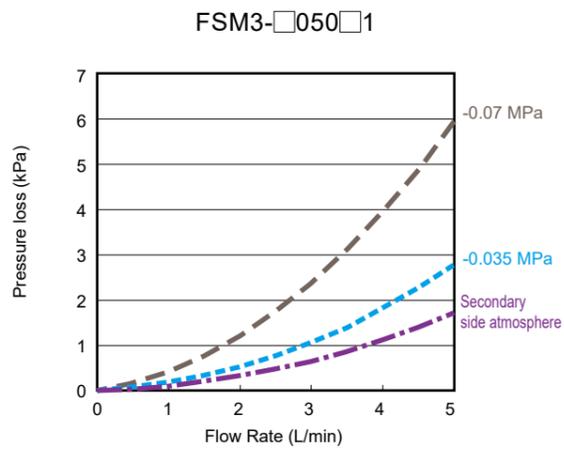
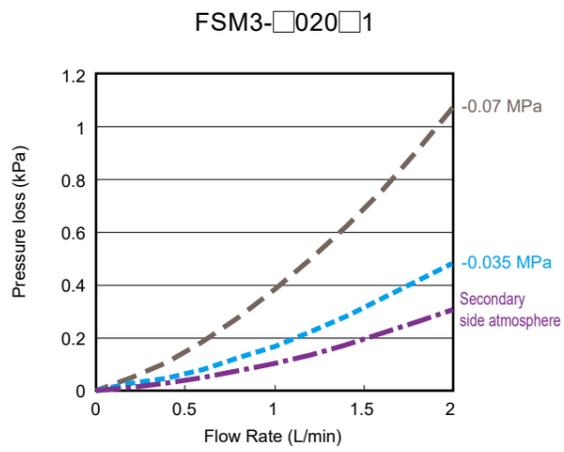
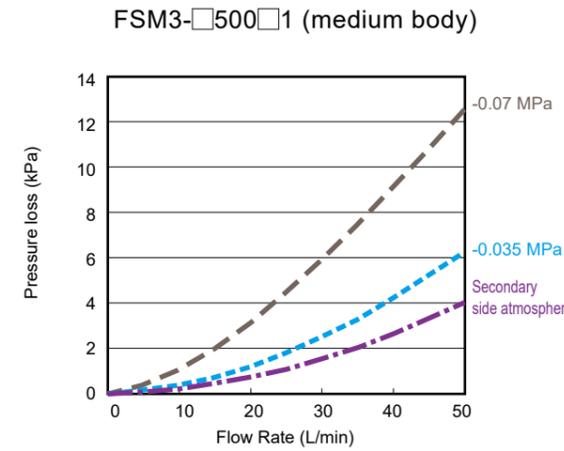
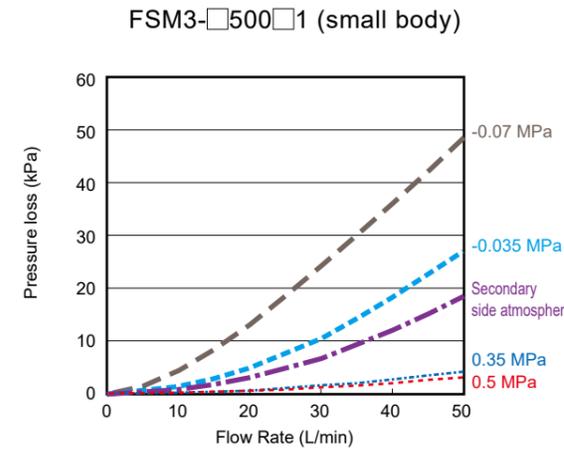
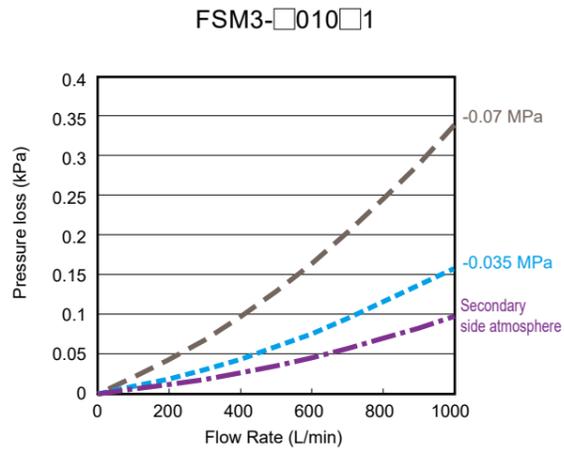
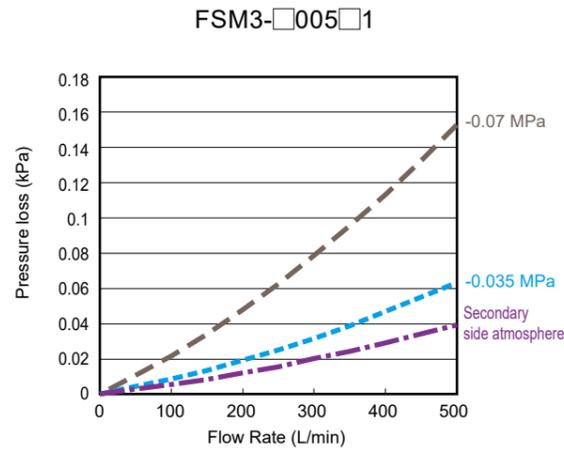
Configuration	Dimension (A)
FSM3+EXA-02	124
FSM3+EXA-03	130

Flow rate sensor

Compact flow sensor (gas)  
Compact flow sensor (air)  
Compact flow sensor (liquid)  
Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)  
Compact flow sensor (air)  
Compact flow sensor (liquid)  
Water Manifold Unit



The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.  
Ending Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41

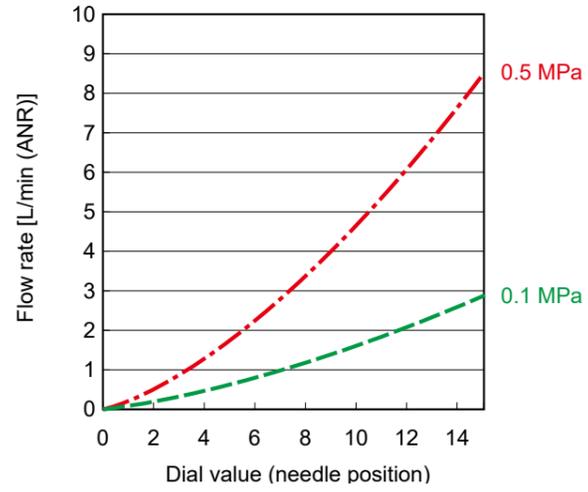
The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.  
Ending Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41 (excluding 501 and 102)

# FSM3 Series

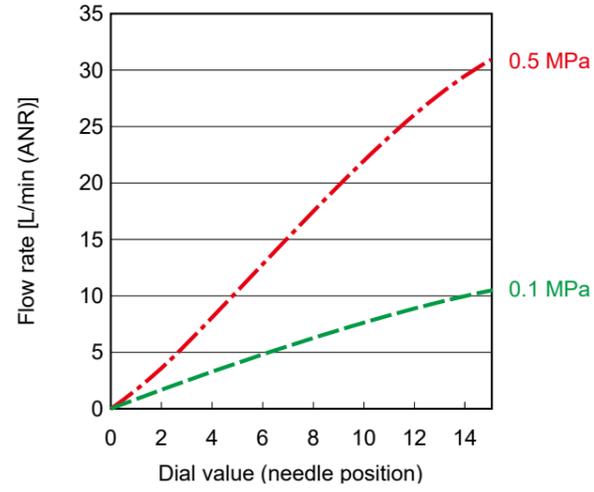
Resin body

## Needle valve flow characteristics (Resin body, for air, nitrogen gas)

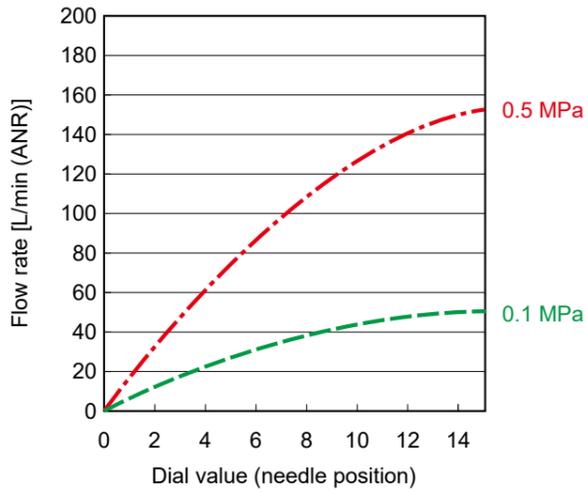
●FSM3-L005/010/020



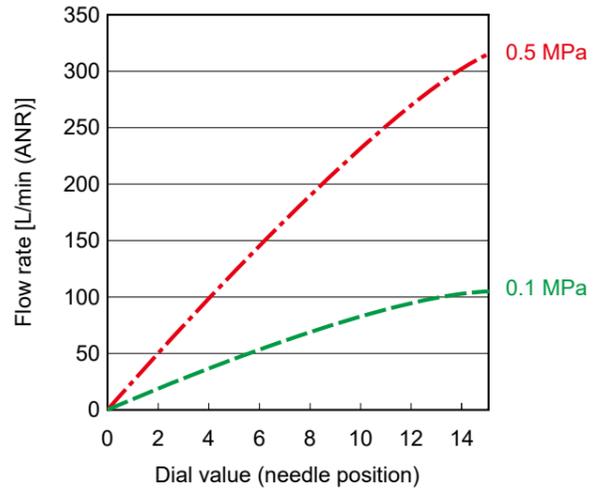
●FSM3-L050/100



●FSM3-L200/500-H04/H06



●FSM3-L500/101/201-H08/H10



MEMO

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit



Compact flow rate sensor (RAPIFLOW)

# FSM3 Series

LCD display

● Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)



Refer to the CKD website for detailed compatible model Nos.

## FSM3 Series

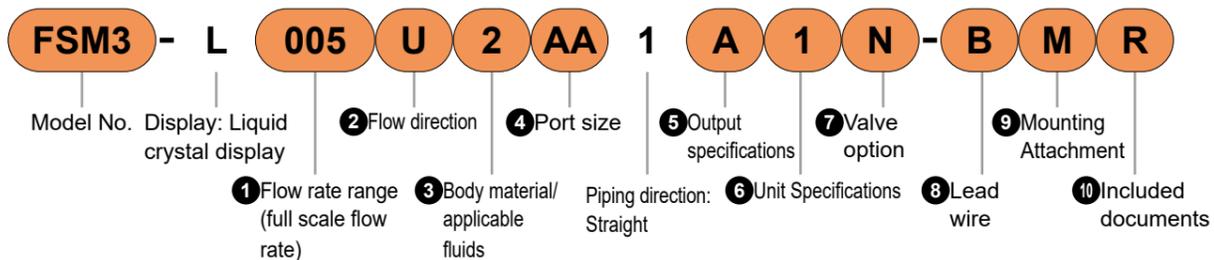
Model No. Notation Method stainless steel body (LCD display)

Compatibility table of flow rate range and port size

		4 Port size																
		AA	BA	CA	AF	BF	CF	AB	BB	CB	AC	BC	CC	AD	BD	AE	BE	
		Rc1/8	Rc1/4	Rc1/2	G1/8	G1/4	G1/2	G1/8	G1/4	G1/2	NPT1/8	NPT1/4	NPT1/2	1/4" double barbed fitting	1/4" JXR male fitting			
1 Flow rate range	005	●	○		●	○		●	○		●	○		●	○	●	○	
	010	●	○		●	○		●	○		●	○		●	○	●	○	
	020	●	○		●	○		●	○		●	○		●	○	●	○	
	050	●	○		●	○		●	○		●	○		●	○	●	○	
	100	●	○		●	○		●	○		●	○		●	○	●	○	
	200	●	○		●	○		●	○		●	○		●	○	●	○	
	500	●	○	●	○	●	○	●	○	●	○	●	○	●	○	●	○	
	101		●	○		●	○		●	○		●	○		●	○	●	○
	201		●	○		●	○		●	○		●	○		●	○	●	○
	501			●				●			●			●			●	
	102			●				●			●			●			●	

●: Port size compatibility ○: Needle valve option supported

### Model No. Notation Method



#### 1 Flow rate range (full scale flow rate) \*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

\*1: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.

\*2: For 500L/min and 1000L/min, 3 Oxygen cannot be selected under Applicable Fluids.

#### 2 Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

Note: For models with flow direction "B" bi-directional, the 7 valve option is only available without "N". Note that models with a "T" needle valve cannot be selected.

#### 3 Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
2	SUS	Air (Gas can be changed)
3		Oxygen (oil-prohibited specifications) *1, *2

\*1: 1 oxygen cannot be selected with the flow rate ranges for "501" is 500 L/min and for "102" is 1000 L/min.

\*2: The "3" oxygen model is only available without "N" 7 valve option. Note that models with a "T" needle valve cannot be selected.

#### 4 Port size

Description	Code	
Rc thread	Rc1/8	AA
	Rc1/4	BA
	Rc1/2	CA
G thread ISO 16030	G1/8	AF
	G1/4	BF
	G1/2	CF
G thread JIS B 2351-1 O-type (*1)	G1/8	AB
	G1/4	BB
	G1/2	CB
NPT thread	NPT1/8	AC
	NPT1/4	BC
	NPT1/2	CC
1/4" Double barbed fitting	50 L/min or less	AD
	50 to 200 L/min	BD
1/4" JXR male fitting	50 L/min or less	AE
	50 to 200 L/min	BE

#### 5 Output specifications

Code	Description		
	Analog Output	Switch Output	Setting copy function
A		1 point (NPN)	Yes
B	1 points (Voltage output) 1-5 V	2 point (NPN)	—
C		1-point output (PNP)	Yes
D		2-point output (PNP)	—
E	1 points Current output 4-20 mA	1 point (NPN)	Yes
F		2 point (NPN)	—
G		1-point output (PNP)	Yes
H		2-point output (PNP)	—

#### 6 Unit Specifications

Code	Description
1	SI units only
2	With unit change function (For overseas only)

Note: The model with unit change function of "2" cannot be sold in Japan.

#### 7 Valve option

Code	Description
N	None
T	With needle valve (Only for models 200 L or less)

Note: Models with 2 flow direction "B" bidirectional and models with oxygen as the 3 applicable fluid are only available without "N". Note that models with a "T" needle valve cannot be selected.

#### 8 Lead wire

Code	Description
Blank	None
A	5 conductor 1 m
B	5 conductor 3 m

#### 9 Mounting Attachment

Code	Description
Blank	None
H	Bracket 1 (For models 200 L or less)
J	Bracket 2 (For 500 L and 1000 L models)
K	Panel mount (For sensor products of models 200 L or less)
L	Panel mount (For needle valves of models 200 L or less)
M	DIN rail mount (For models 200 L or less)

Note: Optional parts will come with the product.

#### 10 Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

#### Clean-room specifications

(Catalog No. CB-033SA)

FSM3-...-P70

FSM3-...-P80

#### Specifications for Rechargeable Batteries

(Catalog No. CC-1226AA)

Conforms to CKD P4 Series equivalent specifications as standard. (Excluding models with needle valves)

### Model No. Notation for Options

FSM3 - K

1 Option

Note: Refer to P. 298 for dimensions diagram.

### 1 Option

Code	Description
A	5-conductor lead wire 1 m (for LCD display)
B	5-conductor lead wire 3 m (for LCD display)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
K	Panel mounting kit 1 (for sensor unit models with a flow rate range below 200 L/min)
L	Panel mounting kit 2 (for needle valve integrated models with a flow rate range below 200 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Flow rate sensor

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

\*1: Check the G thread connection shape with dimensions diagrams (pages 277 to 279) when selecting. (G thread connection shape is JIS B 2351-1 O-type compliant)

\*2: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.

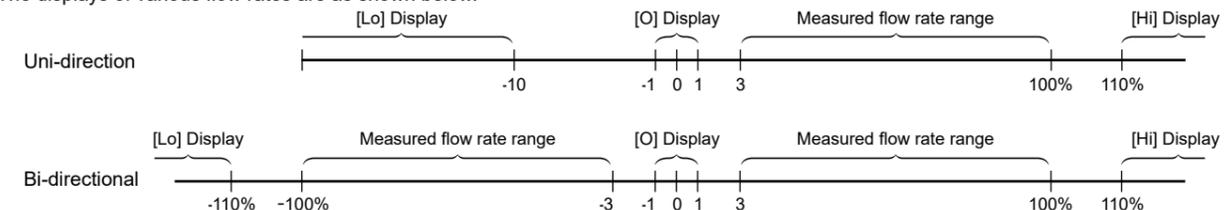
Ending

Specifications

Item		FSM3-L [1] [2] [3] [4] [5] [6] [7] [-] [ ]										
		[1] Flow rate range (full scale flow rate) code										
		005	010	020	050	100	200	500	101	201	501	102
Flow direction	[2]	Uni-direction										
		Bi-direction										
Measured flow rate range (□/min) *1	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
	B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type		4 digit + 4 digit 2 color LCD										
Flow rate display range (□/min) *2	U	-49 to 549 mL	-99 to 1099 mL	-0.19 to 2.19 L	-0.49 to 5.49 L	-0.99 to 10.99 L	-1.9 to 21.9 L	-4.9 to 54.9 L	-9.9 to 109.9 L	-19 to 219 L	-49 to 549 L	-99 to 1099 L
	B	-549 to 549 mL	-1099 to 1099 mL	-2.19 to 2.19 L	-5.49 to 5.49 L	-10.99 to 10.99 L	-21.9 to 21.9 L	-54.9 to 54.9 L	-109.9 to 109.9 L	-219 to 219 L	-549 to 549 L	-1099 to 1099 L
Integration display *3	Indicator range	0 to ±9999999 mL		0.00 to ±99999.99 L			0.0 to ±999999.9 L			0 to ±9999999 L		
	Pulse output rate	5 mL	10 mL	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L	2 L	5L	10 L
Working Conditions	Applicable fluid *4	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas Argon, carbon dioxide (*5), and gas mixture (argon + carbon dioxide) - Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.) -										
	Temperature range	0 to 50°C (no condensation)										
	Pressure range	-0.09 to 1.00 MPa										-0.09 to 0.75 MPa
	Proof pressure	1.5 MPa										
Operating ambient temperature / humidity		0 to 50 °C, 90% RH or less										
Storage temperature		-10 to 60°C										
Accuracy *6 (fluid: in dry air)	Accuracy *7	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
	Repeatability*8	Within ±1%F.S. (Secondary side released to atmosphere)										
	Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
	Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)					Within ±5% F.S (-0.09 to 0.7 MPa, base temperature 0.35 MPa)					
Response time *9		50 msec. or less (setting response time OFF)										
Switch Output	A, B, E, F	NPN open collector output (50 mA or less, voltage drop 2.4 V or less)										
	C, D, G, H	PNP open collector output (50 mA or less, voltage drop 2.4 V or less)										
Analog Output *10	A, B, C, D	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
	E, F, G, H	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *11	A, B, C, D	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
	E, F, G, H	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *12		45 mA or less										
Lead wire		ø3.7, AWG26 or equivalent x 5-conductor (connector), insulator O.D. 1.0										
Functions *13		①Gas switching, ②Setting copy function, ③Flow rate integration, ④Peak hold, etc.										
Degree of Protection		IP40 or equivalent (IEC standard)										
Protection circuit *14		Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection										
Vibration resistance		10 to 150 Hz, max. 100 m/s <sup>2</sup> , X, Y, Z directions, every 2 hours										
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting	Mounting orientation *15	Unrestricted in vertical/horizontal direction										
	Straight piping section *16	Not required										

\*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65% RH). (For gases other than air: 20°C, 1 barometric pressure (101 kPa), relative humidity 0% RH)

\*2: The displays of various flow rates are as shown below.



\*3: The accumulated flow is a calculated (reference) value. When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times). (Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{5 \text{ min.}} < 1 \text{ million times}$$

When instantaneous flow rate is below 1% it is not counted as integrating flow.

\*4: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with 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, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m<sup>3</sup>) for operation. (Refer to P. 316 for details on recommended circuit.) The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

\*5: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range. Output type can also be selected for analog output.

Gas type	Flow direction	Measured flow rate range (□/min)									
		005	010	020	100	200	500	101	201		
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L		
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to 0.06 L	-5.00 to 0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L		
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L		

Gas type	Flow direction	Analog Output			
		Output A		Output B	
		Voltage	Current	Voltage	Current
Carbon dioxide	Uni-direction	1 to 3 V	4 to 12 mA	1 to 5 V	4 to 20 mA
	Bi-direction	2 to 4 V	8 to 16 mA	1 to 5 V	4 to 20 mA

\*6: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.

\*7: Accuracy is based on CKD's standard flow rate meter and does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.

\*8: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)

\*9: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.

\*10: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

\*11: The power supply voltage specifications differ for the voltage output type and current output type.

\*12: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

\*13: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. (Note that the 500 L/min and 1000 L/min models do not have a gas change function.) For carbon dioxide, refer to \*5.

Gas type	Flow direction	Measured flow rate range (□/min)									
		005	010	020	100	200	500	101	201		
• Air • Nitrogen • Argon	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L		
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L		
• argon 80% + carbon dioxide 20%		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L		

The "setting copy function" can be selected under "5 Output Specifications".

Note that the "External input" function is not available on models on which the "Copy function setting" is enabled.

\*14: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

\*15: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.

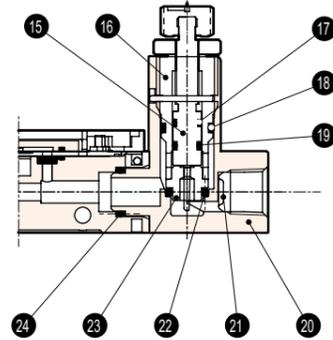
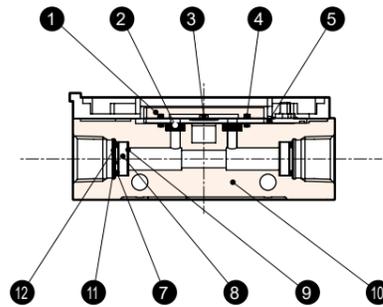
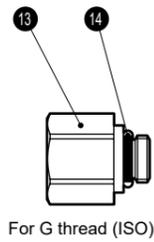
\*16: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

\*17: Refer to P. 280 for weight.

Flow rate sensor

●FSM3-□005 to 201

With needle valve

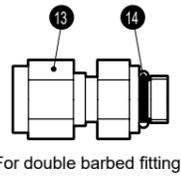


Compact flow sensor (gas)

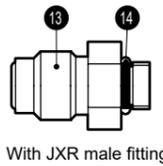
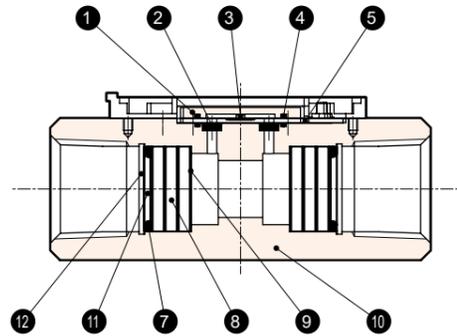
Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit



●FSM3-□501 to 102



**Do not disassemble**

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	14	O-ring	Fluoro rubber
2	Filter	Stainless steel	15	Needle	Stainless steel
3	Sensor chip	Semiconductor silicon	16	Needle guide	Stainless steel
4	Gasket	Fluoro rubber	17	O-ring	Fluoro rubber
5	Sensor board	Aluminum	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Stainless steel	20	Needle valve body	Stainless steel
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Stainless steel	22	O-ring	Fluoro rubber
11	O-ring holder	Stainless steel	23	Orifice	Tetra fluoro resin
12	C-snap ring	Stainless steel	24	O-ring	Fluoro rubber
13	Fitting	Stainless steel			

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

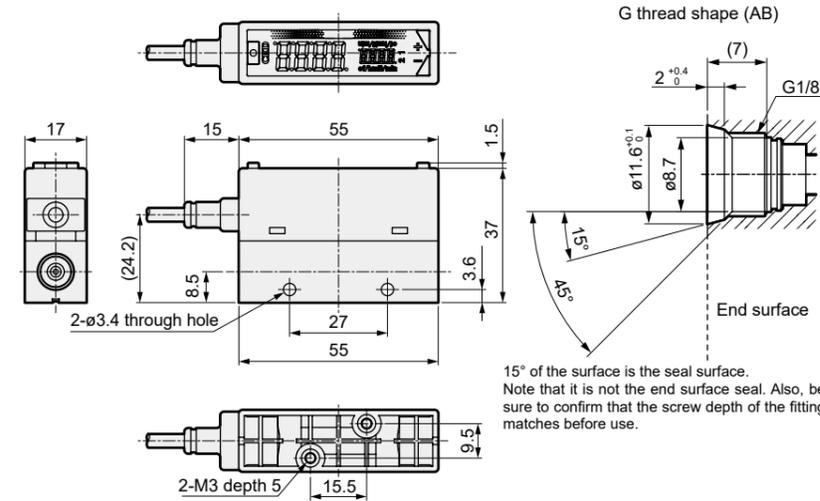
Compact flow sensor (liquid)

Water Manifold Unit

Port size: Straight Rc1/8, G1/8, NPT1/8

●FSM3-L12<sup>2</sup>/<sub>3</sub>/AA1/AB1/AC1

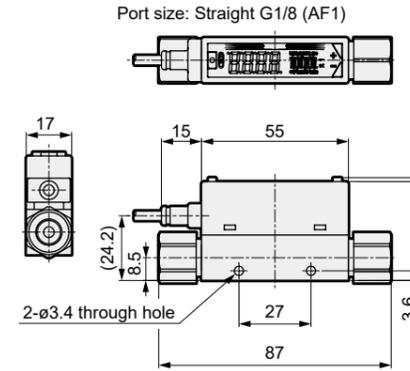
(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight G1/8

●FSM3-L12<sup>2</sup>/<sub>3</sub>/AF1

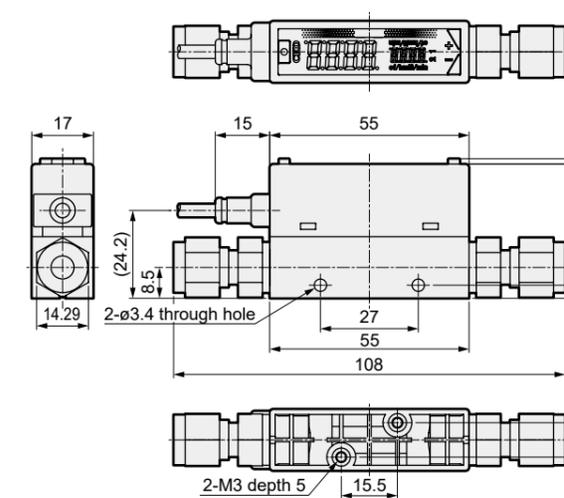
(Full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" double barbed fitting

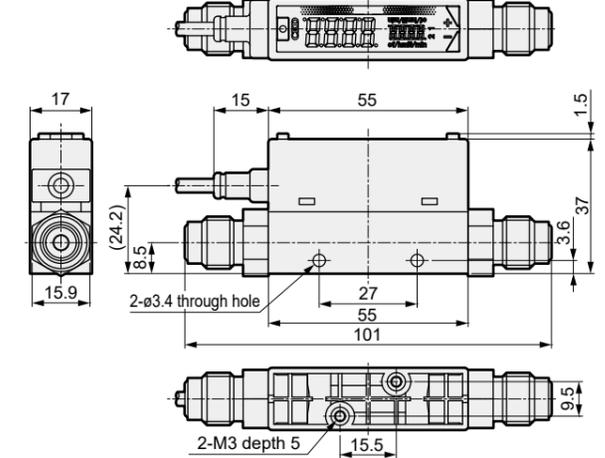
●FSM3-L12<sup>2</sup>/<sub>3</sub>/AD1

(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" JXR male fitting

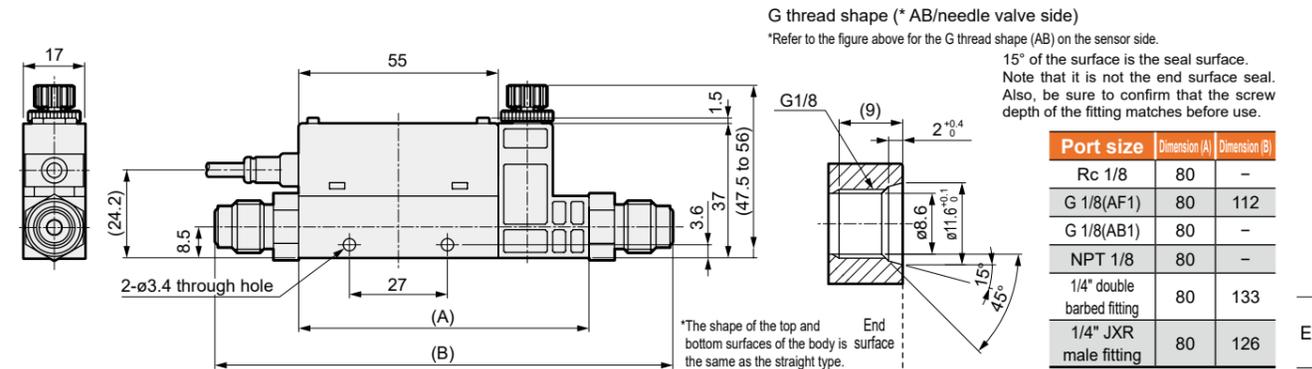
●FSM3-L12<sup>2</sup>/<sub>3</sub>/AE1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



With needle valve dimensions

Port size: Rc1/8, G1/8, NPT1/8, 1/4" double barbed fitting, 1/4" JXR male fitting

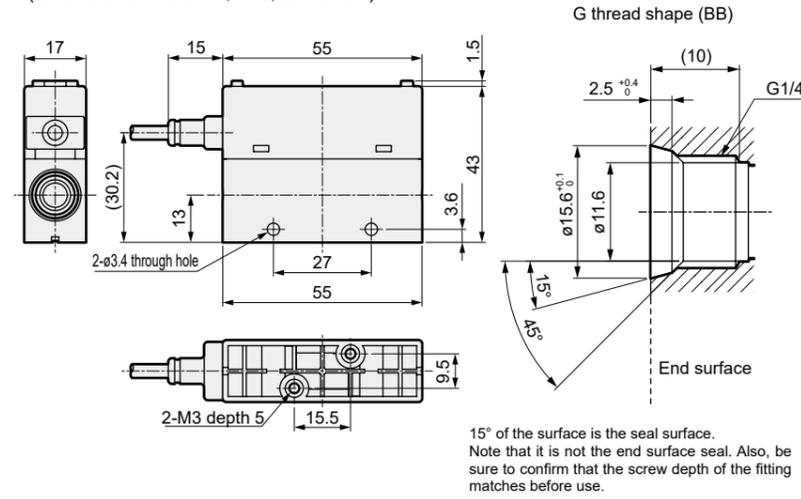
●FSM3-L12<sup>2</sup>/<sub>3</sub>/AA1/AF1/AB1/AC1/AD/AE56T (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight Rc1/4, G1/4, NPT1/4

●FSM3-L12<sup>2</sup>3/BA1/BB1/BC1

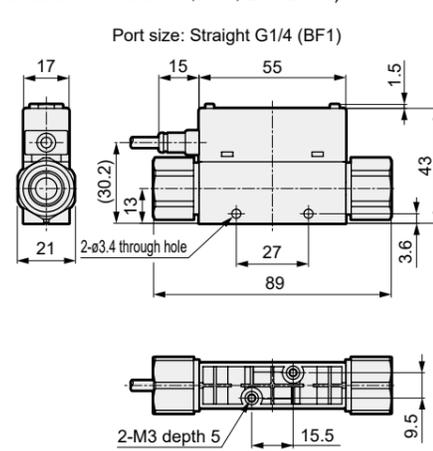
(full scale flow rate: 50, 100, 200 L/min)



Port size: Straight G1/4 (BF1)

●FSM3-L12<sup>2</sup>3/BF1

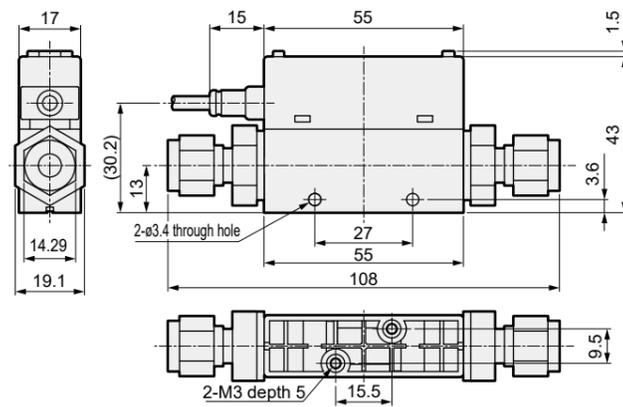
(full scale flow rate: 50, 100, 200 L/min)



Port size: Straight 1/4" double barbed fitting

●FSM3-L12<sup>2</sup>3/BD1

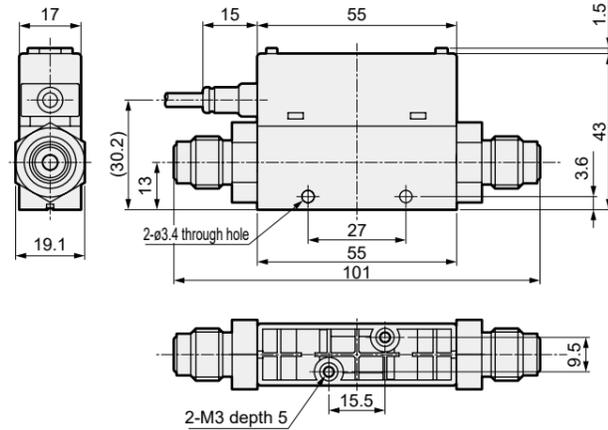
(full scale flow rate: 50, 100, 200 L/min)



Port size: Straight 1/4" JXR male fitting

●FSM3-L12<sup>2</sup>3/BE1

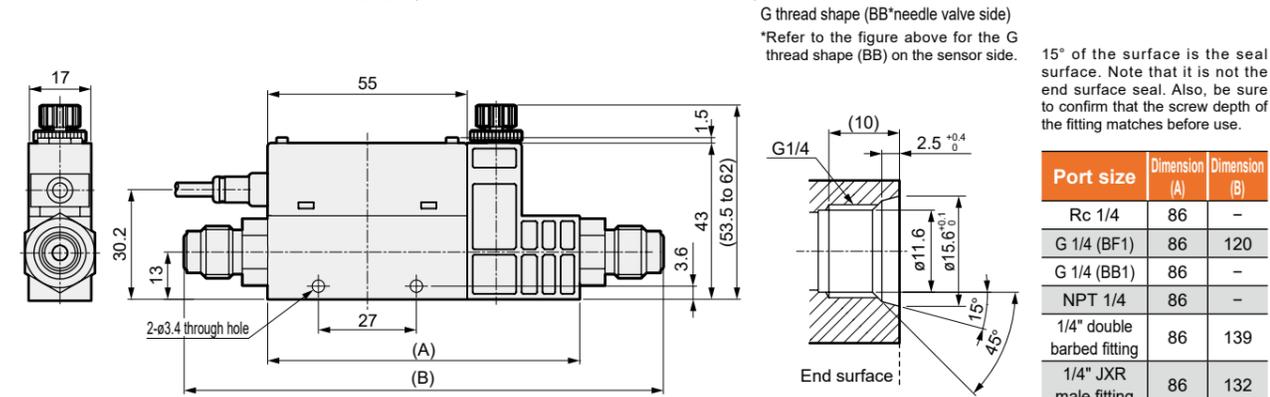
(full scale flow rate: 50, 100, 200 L/min)



## With needle valve dimensions

Port size: Rc1/4, G1/4, NPT1/4, 1/4" double barbed fitting, 1/4" JXR male fitting

●FSM3-L23/BA1/BF1/BB1/BC1/BD/BE56T (full scale flow rate: 50, 100, 200 L/min)

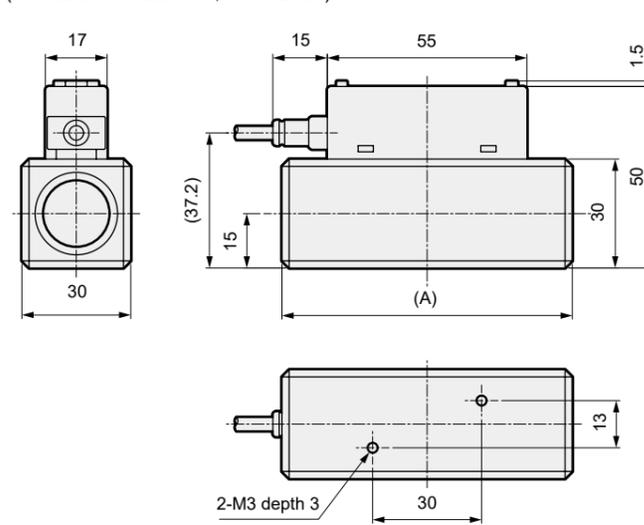


\*The shape of the top and bottom surfaces of the body is the same as the straight type.

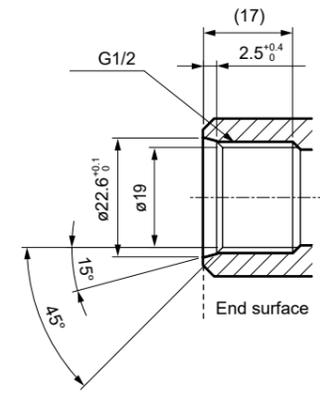
Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-L122/CA1/CF1/CB1/CC1

(full scale flow rate: 500, 1000 L/min)



G thread shape (CB)



Model No.	Port size	Dimension (A)
FSM3-L□□2CA1	Rc1/2	(80)
FSM3-L□□2CF1	G1/2	(80)
FSM3-L□□2CB1	G1/2	(95.4)
FSM3-L□□2CC1	NPT1/2	(80)

# FSM3 Series

Stainless steel body (LCD display)

Product weight

[Unit: g]

Code [4]	Port size Description	Weight	
		Without needle valve	With needle valve
AA	Rc1/8 Straight	100	165
BA	Rc1/4 Straight	115	200
CA	Rc1/2 Straight	420	-
AF	G1/8 Straight	155	220
BF	G1/4 Straight	190	275
CF	G1/2 Straight	420	-
AB	G1/8 Straight	100	165
BB	G1/4 Straight	110	195
CB	G1/2 Straight	440	-
AC	NPT 1/8 Straight	100	165
BC	NPT 1/4 Straight	115	200
CC	NPT 1/2 Straight	420	-
AD	1/4" double barbed fitting (500 mL/min to 50 L/min)	155	220
BD	1/4" double barbed fitting (50 L/min to 200 L/min)	190	275
AE	1/4" JXR male fitting (500 mL/min to 50 L/min)	155	220
BE	1/4" JXR male fitting (50 L/min to 200 L/min)	190	275

MEMO

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit



Compact flow rate sensor (RAPIFLOW)

# FSM3 Series

Bar display

● Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)



Refer to the CKD website for detailed compatible model Nos.

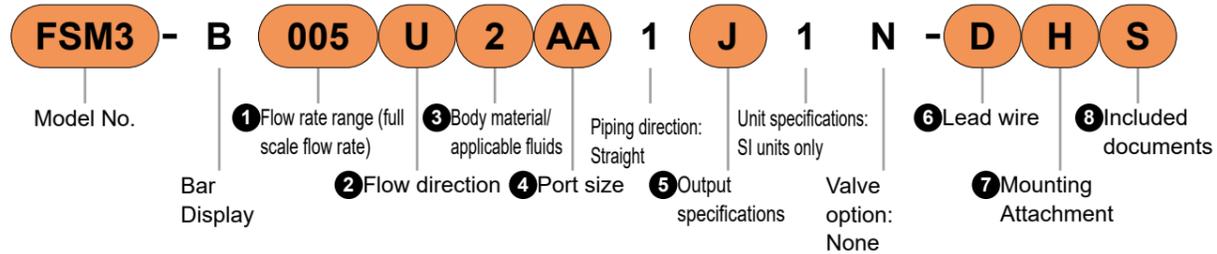
# FSM3 Series

Model No. Notation Method stainless steel body (bar display)

Compatibility table of flow rate range and port size

		4 Port size															
		AA	BA	CA	AF	BF	CF	AB	BB	CB	AC	BC	CC	AD	BD	AE	BE
		Rc1/8	Rc1/4	Rc1/2	G1/8	G1/4	G1/2	G1/8	G1/4	G1/2	NPT1/8	NPT1/4	NPT1/2	1/4" double barbed fitting	1/4" JXR male fitting		
1 Flow rate range	005	●			●			●			●			●		●	
	010	●			●			●			●			●		●	
	020	●			●			●			●			●		●	
	050	●			●			●			●			●		●	
	100	●			●			●			●			●		●	
	200	●			●			●			●			●		●	
	500	●	●		●			●		●		●		●		●	●
	101		●					●		●				●		●	●
	201		●					●		●				●		●	●
	501			●				●			●			●			●
102			●				●			●			●			●	

## Model No. Notation Method



### 1 Flow rate range (full scale flow rate)\*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

### 2 Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

### 3 Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
2	SUS	Air
3		Oxygen (oil-prohibited specifications) *1

\*1: 1 oxygen cannot be selected with the flow rate ranges for "501" is 500 L/min and for "102" is 1000 L/min.

\*1: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.

\*2: 2 Applicable fluid "3" oxygen cannot be selected for 500 L/min and 1000 L/min.

### 4 Port size

Description	Code	
Rc thread	Rc1/8	AA
	Rc1/4	BA
	Rc1/2	CA
G thread ISO 16030	G1/8	AF
	G1/4	BF
	G1/2	CF
G thread JIS B 2351-1 O-type (*1)	G1/8	AB
	G1/4	BB
	G1/2	CB
NPT thread	NPT1/8	AC
	NPT1/4	BC
	NPT1/2	CC
1/4" Double barbed fitting	50 L/min or less	AD
	50 to 200 L/min	BD
1/4" JXR male fitting	50 L/min or less	AE
	50 to 200 L/min	BE

\*1: Check the G thread connection shape with dimensions diagrams (P. 287 and 288) when selecting. (G thread connection shape is JIS B 2351-1 O-type compliant)

\*2: Refer to the compatibility table on the following page for combinations of the flow rate range and port size.

### 5 Output specifications

Code	Description
J	Analog voltage output 1 point
K	Analog current output 1 point

Note: When using in combination with a separated display (FSM2-D), select "J".

### 6 Lead wire

Code	Description
Blank	None
C	4 conductor 1 m
D	4 conductor 3 m

### 7 Mounting Attachment

Code	Description
Blank	None
H	Bracket 1 (for models 200 L or less)
J	Bracket 2 (for 500 or 1000 L models)
M	DIN rail mounting (for models 200 L or less)

Note: Optional parts are provided with the product.

### 8 Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SA)

Specifications for Rechargeable Batteries (Catalog No. CC-1226AA)

Conforms to CKD P4 Series equivalent specifications as standard.

FSM3 - . . . . - P70

FSM3 - . . . . - P80

## Model No. Notation for Options

FSM3 - H

1 Option

### 1 Option

Code	Description
C	4-conductor lead wire 1 m (for bar display)
D	4-conductor lead wire 3 m (for bar display)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Note: Refer to P. 298 for dimensions diagram.

Flow rate sensor

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Ending

Specifications

Item		FSM3-B[ 1 ] [ 2 ] [ 3 ] [ 4 ] [ 5 ] 1N-[ ]											
		[ 1 ] Flow rate range (full scale flow rate) code											
		005	010	020	050	100	200	500	101	201	501	102	
Flow direction	2	U	Uni-direction										
		B	Bi-direction										
Measurement flow rate range (xxx/min)*1	2	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type		LED bar display											
Working Conditions	Applicable fluid *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)											
	Temperature range	0 to 50°C (no condensation)											
	Pressure range	-0.09 to 1.00 MPa										-0.09 to 0.75 MPa	
	Proof pressure	1.5 MPa											
Operating ambient temperature / humidity		0 to 50°C, 90% RH or less											
Storage temperature		-10 to 60°C											
Accuracy	Accuracy *3	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")											
	Repeatability *4	Within ±1%F.S. (Secondary side released to atmosphere)											
	Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)											
	Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)										Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)	
Response time *5		50 msec. or less											
Analog Output	*6	J	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		K	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *7	*5	J	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		K	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *8		45 mA or less											
Lead wire		ø3.7 AWG26 or equivalent *4-conductor (connector wiring), insulator outer diameter ø1.0											
Degree of Protection		IP40 or equivalent (IEC standard)											
Protection circuit *9		Power reverse connection protection											
Vibration resistance		10 to 150 Hz, max. 100 m/s <sup>2</sup> , X, Y, Z directions, every 2 hours											
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8											
Mounting	Mounting orientation *10	Unrestricted in vertical/horizontal direction											
	Straight piping section *11	Not required											

- \*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65% RH) (for gas types other than air, 20°C, 1 barometric pressure (101 kPa), relative humidity 0% RH)
- \*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with 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, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m<sup>3</sup>) for operation. (Refer to P. 316 for details on recommended circuit.) The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.
- \*3: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.
- \*4: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)
- \*5: The actual response time changes depending on the piping conditions.
- \*6: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
- \*7: The power supply voltage specifications differ for the voltage output type and current output type.
- \*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.
- \*9: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
- \*10: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.
- \*11: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.
- \*12: Refer to P. 289 for weight.

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

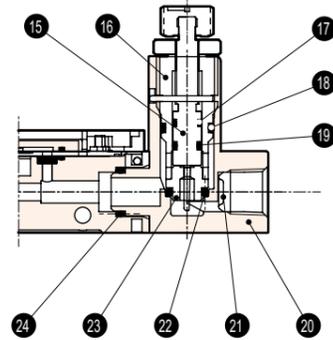
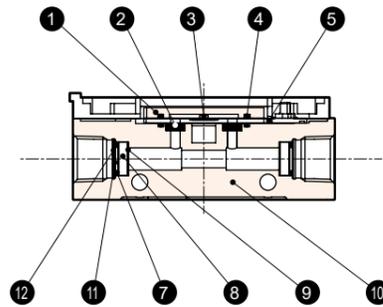
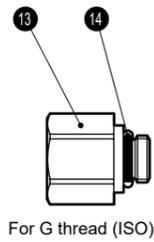
Compact flow sensor (air)

Compact flow sensor (liquid)

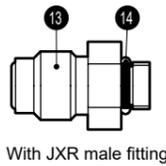
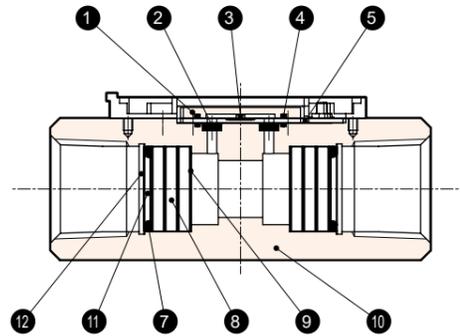
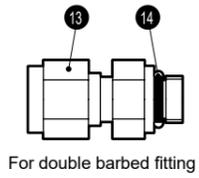
Water Manifold Unit

●FSM3-□005 to 201

With needle valve



●FSM3-□501 to 102

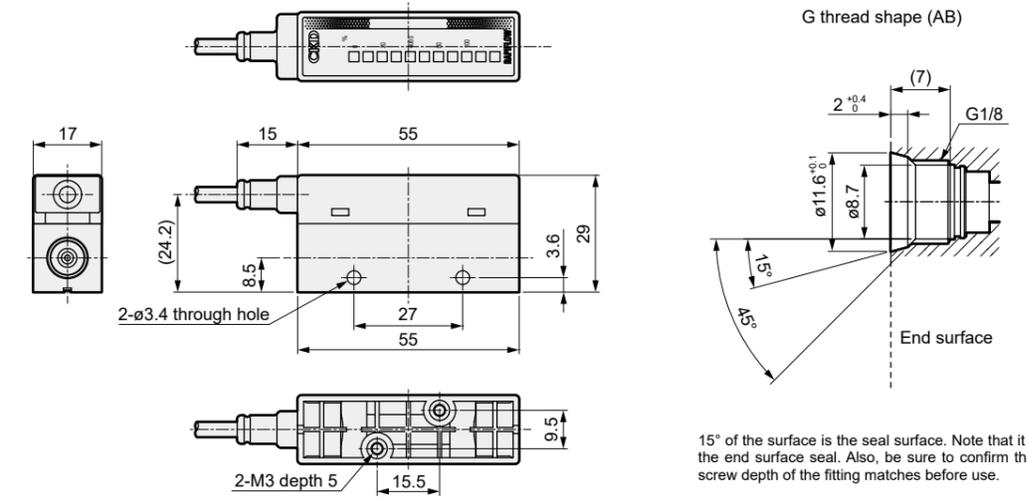


**Do not disassemble**

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	14	O-ring	Fluoro rubber
2	Filter	Stainless steel	15	Needle	Stainless steel
3	Sensor chip	Semiconductor silicon	16	Needle guide	Stainless steel
4	Gasket	Fluoro rubber	17	O-ring	Fluoro rubber
5	Sensor board	Aluminum	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Stainless steel	20	Needle valve body	Stainless steel
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Stainless steel	22	O-ring	Fluoro rubber
11	O-ring holder	Stainless steel	23	Orifice	Tetra fluoro resin
12	C-snap ring	Stainless steel	24	O-ring	Fluoro rubber
13	Fitting	Stainless steel			

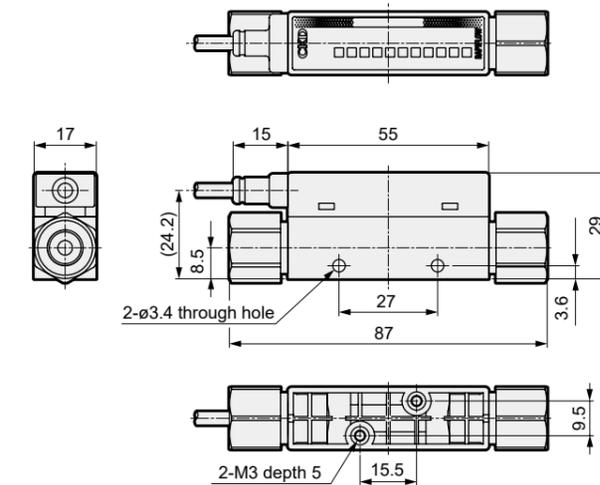
Port size: Straight Rc1/8, G1/8, NPT1/8

●FSM3-B12<sup>2</sup><sub>3</sub>/AA1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight G1/8

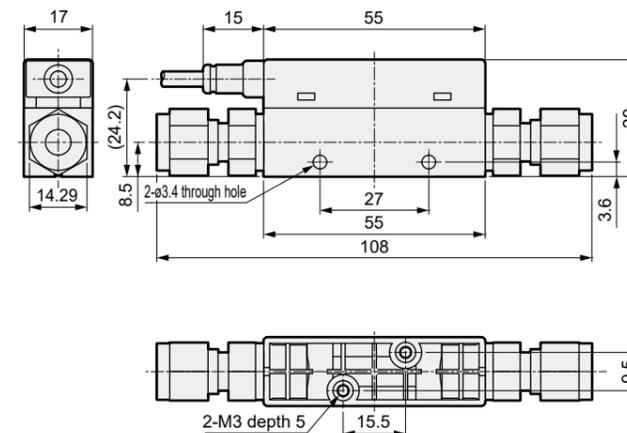
●FSM3-B2<sup>3</sup>/AF1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" double barbed fitting

●FSM3-B12<sup>2</sup><sub>3</sub>/AD1

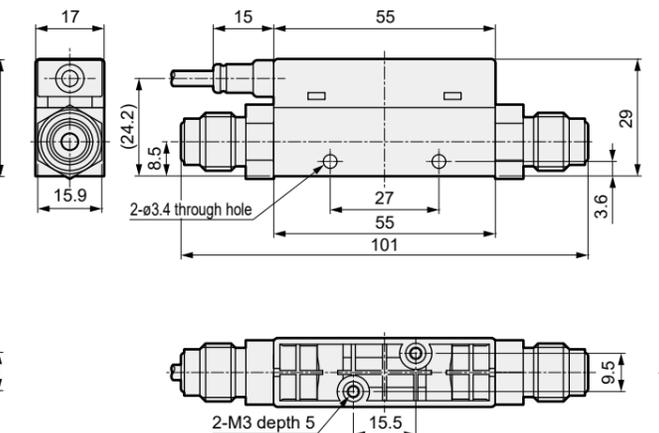
(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" JXR male fitting

●FSM3-B12<sup>2</sup><sub>3</sub>/AE1

(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

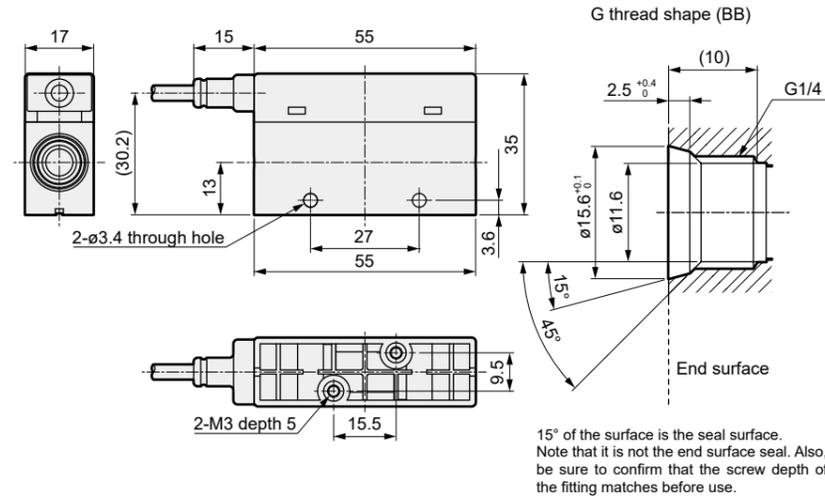
Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

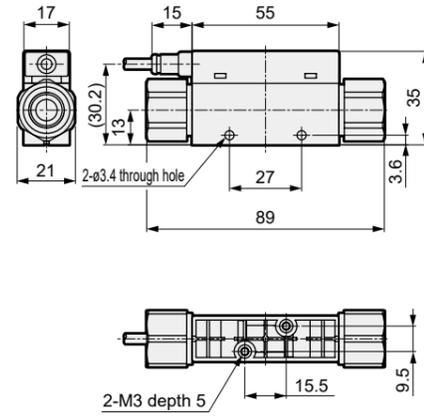
Port size: Straight Rc1/4, G1/4, NPT1/4

●FSM3-B1□□2<sub>3</sub>/BA1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)



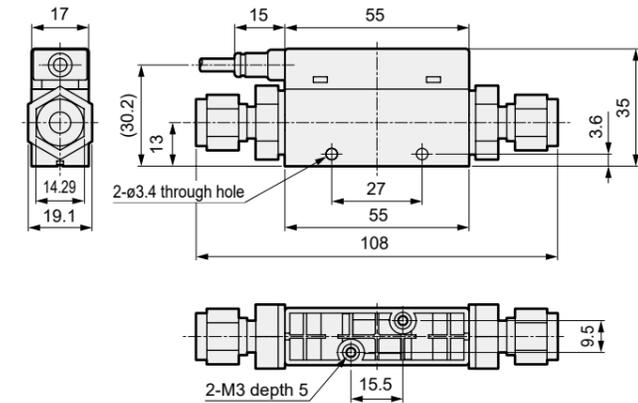
Port size: Straight G1/4

●FSM3-B1□□2<sub>3</sub>/BF1 (full scale flow rate: 50, 100, 200 L/min)



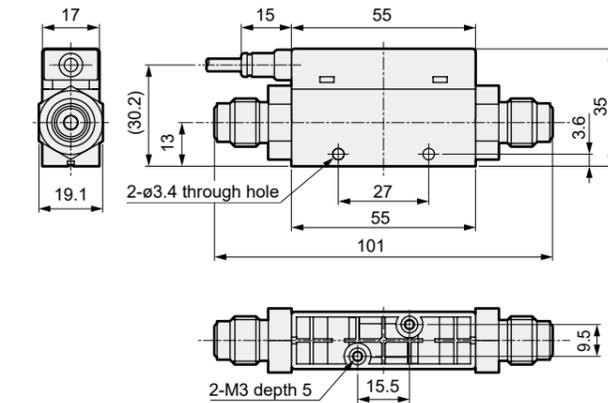
Port size: Straight 1/4" double barbed fitting

●FSM3-B1□□2<sub>3</sub>/BD1 (full scale flow rate: 50, 100, 200 L/min)



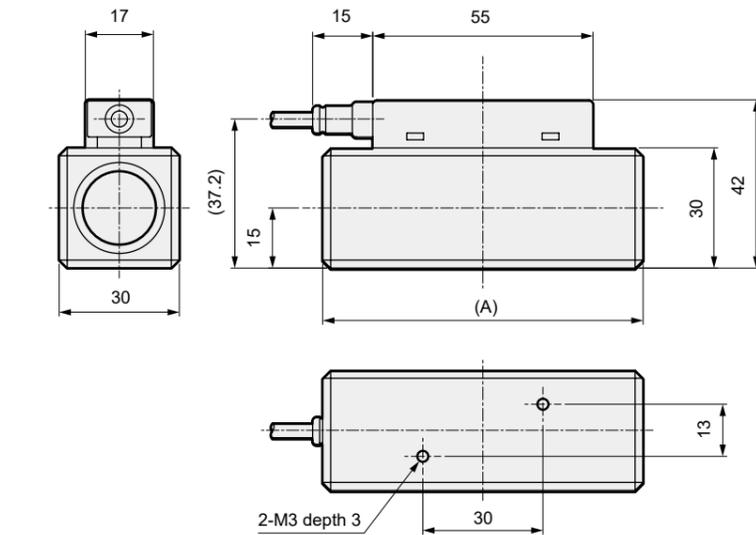
Port size: Straight 1/4" JXR male fitting

●FSM3-B1□□2<sub>3</sub>/BE1 (full scale flow rate: 50, 100, 200 L/min)

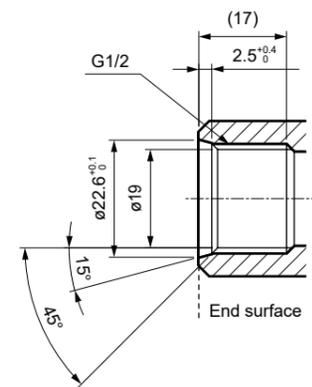


Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-B2□□2CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)



G thread shape (CB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Model No.	Port size	Dimension (A)
FSM3-B□□2CA1	Rc1/2	(80)
FSM3-B□□2CF1	G1/2	(80)
FSM3-B□□2CB1	G1/2	(95.4)
FSM3-B□□2CC1	NPT1/2	(80)

[Unit: g]

Code [4]	Port size Description	Weight
AA	Rc1/8 Straight	90
BA	Rc1/4 Straight	105
CA	Rc1/2 Straight	410
AF	G1/8 Straight	145
BF	G1/4 Straight	180
CF	G1/2 Straight	410
AB	G1/8 Straight	90
BB	G1/4 Straight	100
CB	G1/2 Straight	430
AC	NPT 1/8 Straight	90
BC	NPT 1/4 Straight	105
CC	NPT 1/2 Straight	410
AD	1/4" double barbed fitting (500 mL/min to 50 L/min)	145
BD	1/4" double barbed fitting (50 L/min to 200 L/min)	180
AE	1/4" JXR male fitting (500 mL/min to 50 L/min)	145
BE	1/4" JXR male fitting (50 L/min to 200 L/min)	180

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit



Compact flow rate sensor (RAPIFLOW)

# FSM3 Series

IO-Link

● Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)



Refer to the CKD website for detailed compatible model Nos.

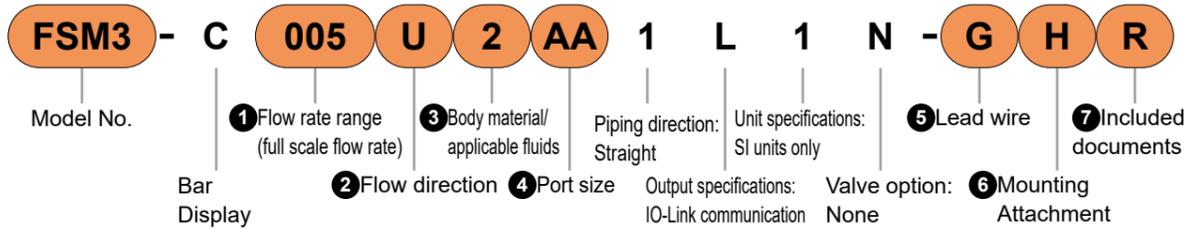
# FSM3 Series

Model No. Notation Method stainless steel body (IO-Link)

Compatibility table of flow rate range and port size

		4 Port size															
		AA	BA	CA	AF	BF	CF	AB	BB	CB	AC	BC	CC	AD	BD	AE	BE
		Rc1/8	Rc1/4	Rc1/2	G1/8	G1/4	G1/2	G1/8	G1/4	G1/2	NPT1/8	NPT1/4	NPT1/2	1/4" double barbed fitting	1/4" JXR male fitting		
1 Flow rate range	005	●			●			●			●			●		●	
	010	●			●			●			●			●		●	
	020	●			●			●			●			●		●	
	050	●			●			●			●			●		●	
	100	●			●			●			●			●		●	
	200	●			●			●			●			●		●	
	500	●	●		●	●		●	●		●	●		●	●	●	●
	101		●			●			●			●			●		●
	201		●			●			●			●			●		●
	501			●				●			●			●			
102			●				●			●			●				

## Model No. Notation Method



### 1 Flow rate range (full scale flow rate)\*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

\*1: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.

\*2: 3 Applicable fluid "3" oxygen cannot be selected for 500 L/min and 1000 L/min.

### 2 Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

### 3 Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
2	SUS	Air
3		Oxygen (oil-prohibited specifications)

Note: 1 oxygen cannot be selected with the flow rate ranges for "501" is 500 L/min and for "102" is 1000 L/min.

### 4 Port size

Description	Code	
Rc thread	Rc1/8	AA
	Rc1/4	BA
	Rc1/2	CA
G thread ISO 16030	G1/8	AF
	G1/4	BF
	G1/2	CF
G thread JIS B 2351-1 O-type (*1)	G1/8	AB
	G1/4	BB
	G1/2	CB
NPT thread	NPT1/8	AC
	NPT1/4	BC
	NPT1/2	CC
1/4" double barbed fitting	50 L/min or less	AD
	50 to 200 L/min	BD
1/4" JXR male fitting	50 L/min or less	AE
	50 to 200 L/min	BE

\*1: Check the G thread connection shape with dimensions diagrams (pages 295 and 296) when making a selection. (G thread connection shape is JIS B 2351-1 O-type compliant)

\*2: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.

### 5 Lead wire

Code	Description
Blank	None
G	M12 both-end lead wire with connector (3 m)

### 6 Mounting Attachment

Code	Description
Blank	None
H	Bracket 1 (for models 200 L or less)
J	Bracket 2 (for models of 500 or 1000 L models)
M	DIN rail mounting (for models 200 L or less)

Note: Optional parts will come with the product.

### 7 Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SA)

Specifications for Rechargeable Batteries (Catalog No. CC-1226AA)

Conforms to CKD P4 Series equivalent specifications as standard.

FSM3 - . . . . - P70

FSM3 - . . . . - P80

## Model No. Notation for Options

FSM3 - H

1 Option

### 1 Option

Code	Description
G	M12 both-end lead wire with connector (3 m) (for IO-Link)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Note: Refer to P. 298 for dimensions diagram.

Flow rate sensor

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Ending

IO-Link specifications

Item		FSM3-C [1] [2] [3] [4] 1L1N-[]											
		[1] Flow rate range (full scale flow rate) code											
		005	010	020	050	100	200	500	101	201	501	102	
Flow direction	②	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	②	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type		LED display (power and status indicators)											
Working Conditions	Applicable fluid *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas											
		Argon, carbon dioxide (*3), and gas mixture (argon + carbon dioxide)											
	Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)												
	-												
Temperature range	0 to 50°C (no condensation)												
	Pressure range	-0.09 to 1.00 MPa										-0.09 to 0.75 MPa	
		1.5 MPa											
Proof pressure		1.5 MPa											
Operating ambient temperature / humidity		0 to 50°C, 90% RH or less											
Storage temperature		-10 to 60°C											
Accuracy *4	Accuracy *5	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")											
	Repeatability *6	Within ±1%F.S. (Secondary side released to atmosphere)											
	Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)											
	Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)					Within ±5%F.S. (-0.09 to 0.7 MPa, 0.35 MPa reference)						
Response time *7		50 msec. or less (setting response time OFF)											
Power supply voltage		18 to 30 VDC (ripple rate 1% or less)											
Current consumption *8		45 mA or less											
Lead wire *9		M12 both-end connector lead wire (3 m), AWG23 or equivalent, 4-conductor											
Functions *10, *11		①Gas switching, ②Flow rate integration, ③Peak hold, etc.											
Degree of Protection		IP40 or equivalent (IEC standard)											
Protection circuit *12		Power reverse connection protection											
Vibration resistance *13		10 to 150 Hz, max. 100 m/s <sup>2</sup> , X, Y, Z directions, every 2 hours											
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8											
Mounting	Mounting orientation *14	Unrestricted in vertical/horizontal direction											
	Straight piping section *15	Not required											

\*Refer to P. 314 for communication specifications.

- \*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65%). (For gases other than air: 20°C, 1 barometric pressure (101 kPa), 0% RH)
- \*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with 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, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m<sup>3</sup>) for operation. (Refer to P. 316 for details on recommended circuit.)  
The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.
- \*3: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range.

Gas type	Flow direction	Measured flow rate range (□/min)									
		005	010	020	100	200	500	101	201		
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L		
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to -0.06 L	-5.00 to -0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L		
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L		

- \*4: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.
- \*5: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.
- \*6: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)
- \*7: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.
- \*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.
- \*9: The male end is straight, and the female end is angled. (Refer to P. 298.) Tighten the M12 connector with a torque of 0.5 N·m or lower. Tightening with excessive force may lead to damage.
- \*10: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. The measurement flow rate ranges after switching are as follows. (Note that the gas-type cannot be changed with the oxygen, 500 L/min, and 1000 L/min models.)  
Refer to Note 3 for carbon dioxide.

Gas type	Flow direction	Measured flow rate range (□/min)									
		005	010	020	100	200	500	101	201		
• Air • Nitrogen • Argon • argon 80% + carbon dioxide 20%	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L		
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L		
		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L		

- \*11: The accumulated flow is a calculated (reference) value. When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times). (Changes to the settings are counted in number of accesses.)  
Number of saves =  $\frac{\text{Usage time}}{5 \text{ min.}}$  < 1 million times  
When the instantaneous flow rate is 1% or less, the flow rate is counted as integrated flow rate.
- \*12: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
- \*13: A communication error might occur depending on the vibration conditions. Install this product in a place not subject to vibration.
- \*14: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.
- \*15: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.
- \*16: Refer to P. 297 for weight.

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

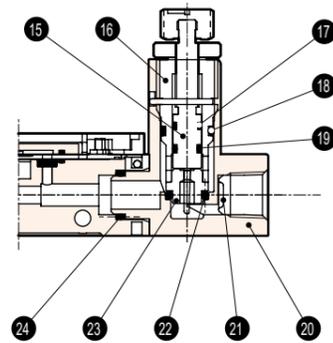
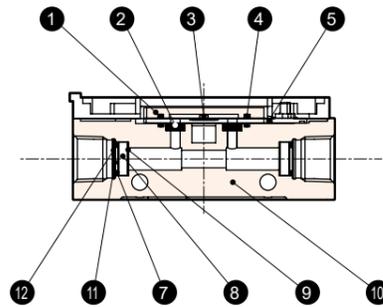
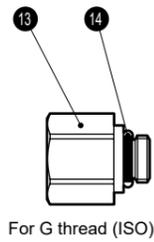
Compact flow sensor (liquid)

Water Manifold Unit

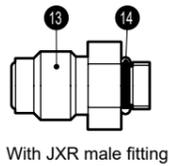
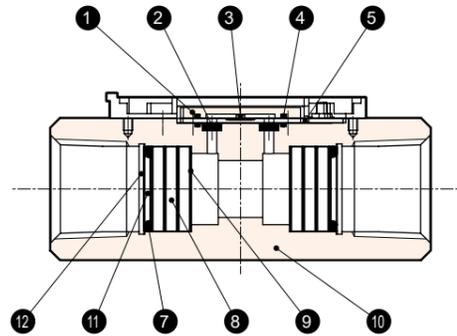
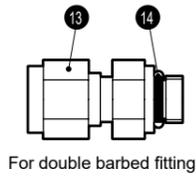
Flow rate sensor

●FSM3-□005 to 201

With needle valve



●FSM3-□501 to 102



**Do not disassemble**

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	14	O-ring	Fluoro rubber
2	Filter	Stainless steel	15	Needle	Stainless steel
3	Sensor chip	Semiconductor silicon	16	Needle guide	Stainless steel
4	Gasket	Fluoro rubber	17	O-ring	Fluoro rubber
5	Sensor board	Aluminum	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Stainless steel	20	Needle valve body	Stainless steel
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Stainless steel	22	O-ring	Fluoro rubber
11	O-ring holder	Stainless steel	23	Orifice	Tetra fluoro resin
12	C-snap ring	Stainless steel	24	O-ring	Fluoro rubber
13	Fitting	Stainless steel			

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

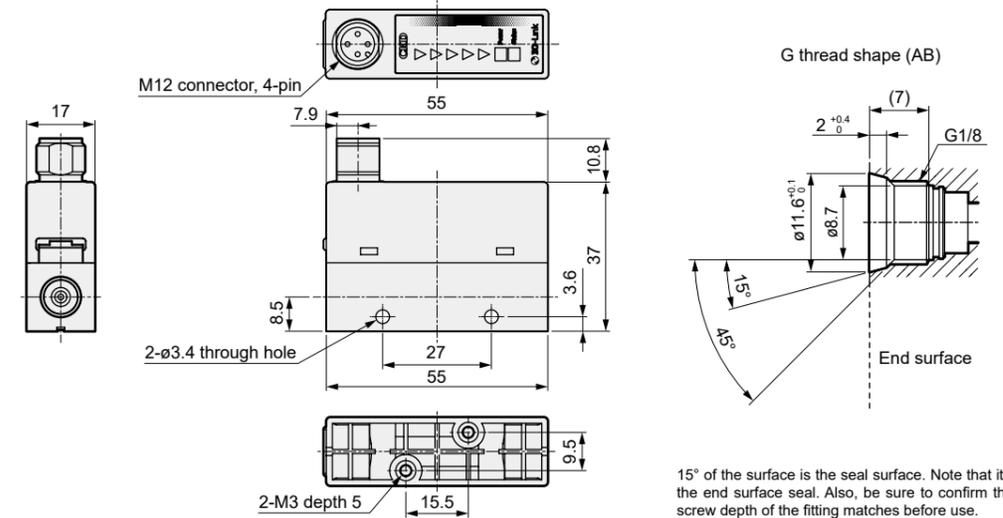
Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

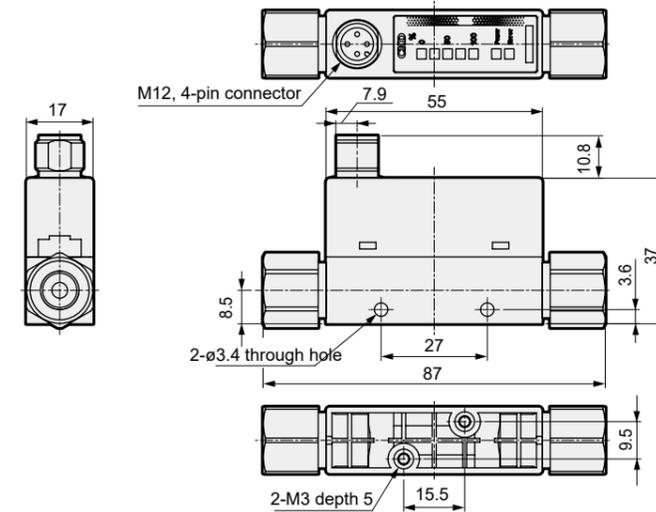
Port size: Straight Rc1/8, G1/8, NPT1/8

●FSM3-C1□2<sup>3</sup>/AA1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight G1/8

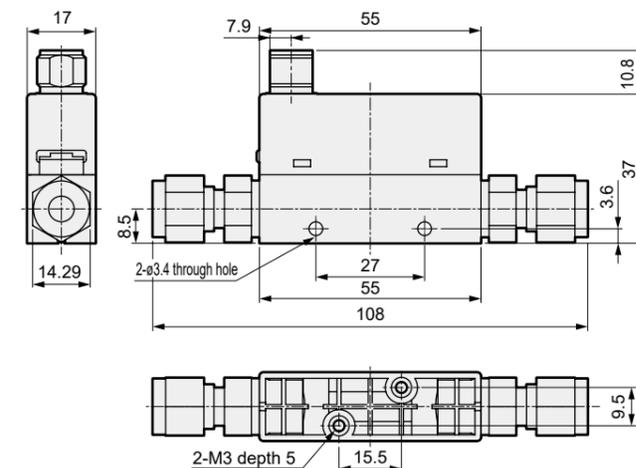
●FSM3-C1□2<sup>3</sup>/AF1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" double barbed fitting

●FSM3-C1□2<sup>3</sup>/AD1

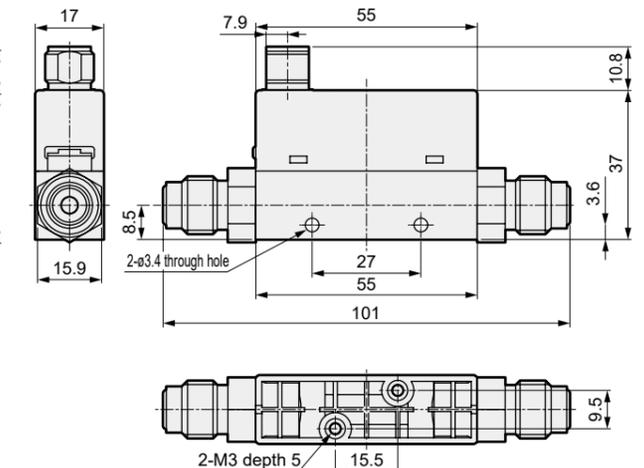
(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" JXR male fitting

●FSM3-C1□2<sup>3</sup>/AE1

(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Ending

Ending

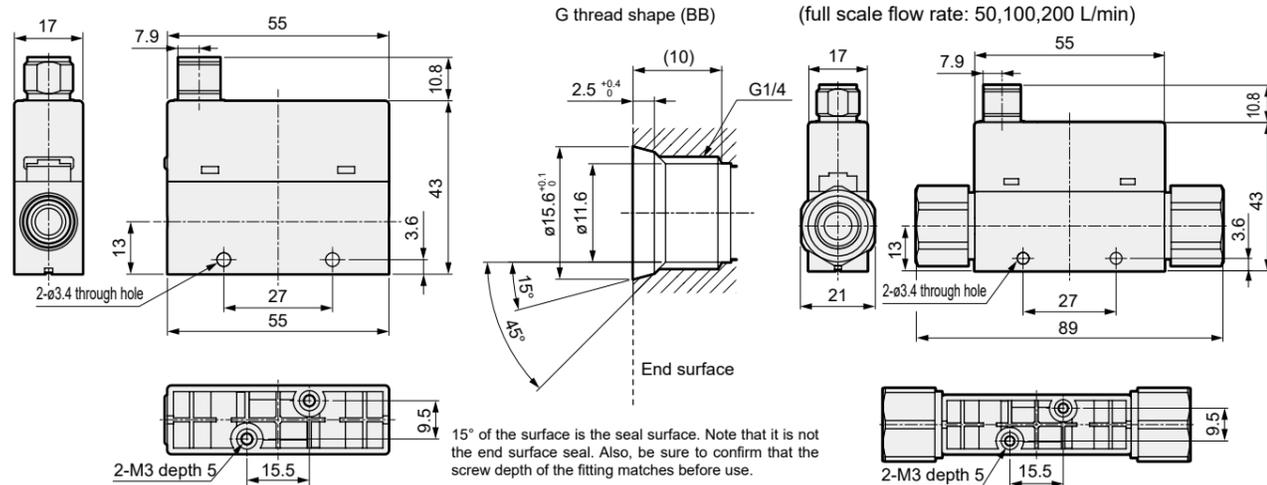
## Dimensions diagram (IO-Link/flow rate range: 50 L/min to 1000 L/min)

Port size: Straight Rc1/4, G1/4, NPT1/4

●FSM3-C1123/BA1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)

Port size: Straight G1/4

●FSM3-C1123/BF1 (full scale flow rate: 50, 100, 200 L/min)

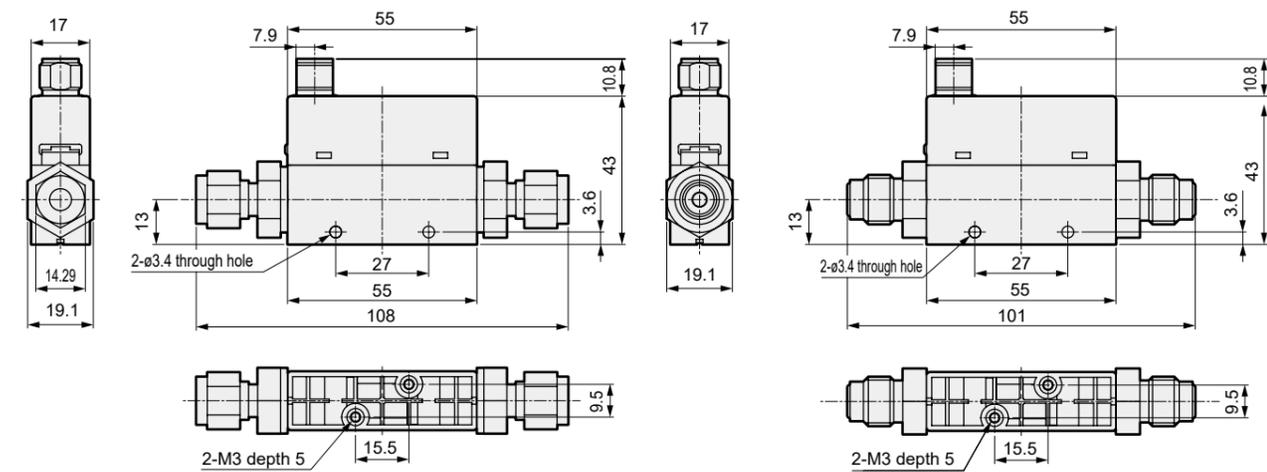


Port size: Straight 1/4" double barbed fitting

●FSM3-C1123/BD1 (full scale flow rate: 50, 100, 200 L/min)

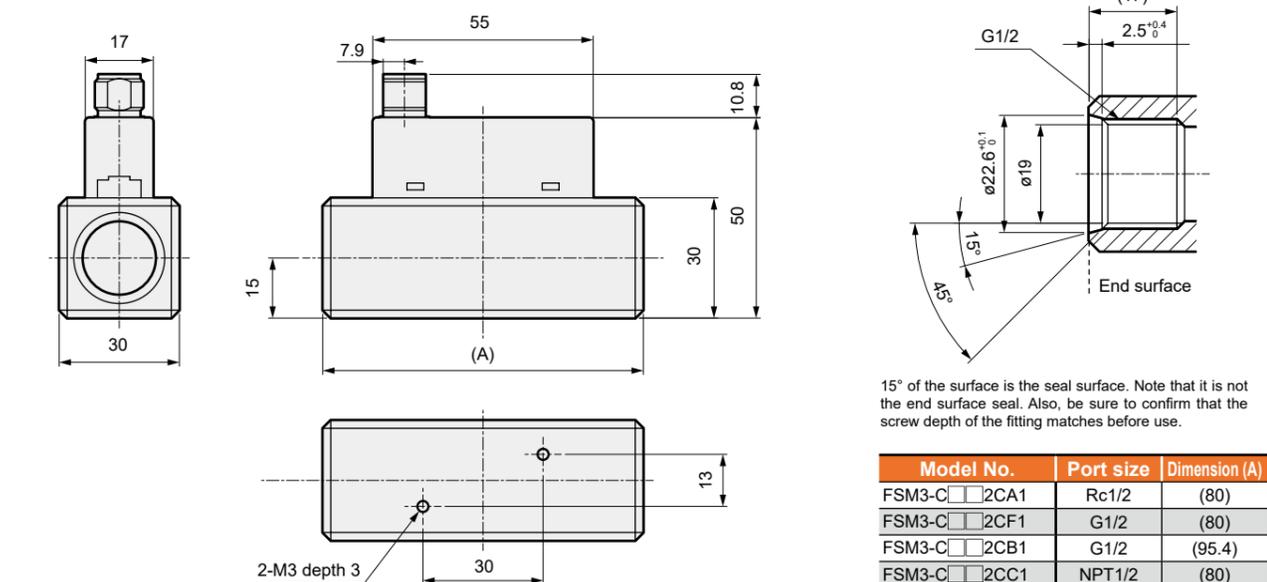
Port size: Straight 1/4" JXR male fitting

●FSM3-C1123/BE1 (full scale flow rate: 50, 100, 200 L/min)



Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-C1122/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)



Model No.	Port size	Dimension (A)
FSM3-C1122CA1	Rc1/2	(80)
FSM3-C1122CF1	G1/2	(80)
FSM3-C1122CB1	G1/2	(95.4)
FSM3-C1122CC1	NPT1/2	(80)

## Product weight

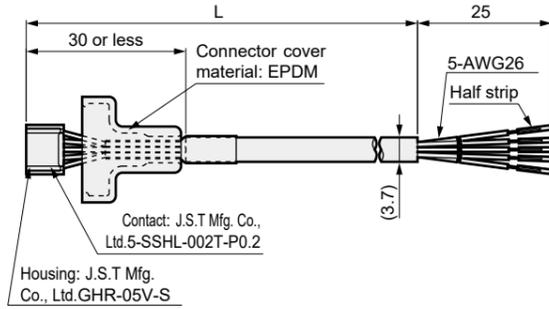
[Unit: g]

Code [4]	Port size Description	Weight
AA	Rc1/8 Straight	95
BA	Rc1/4 Straight	110
CA	Rc1/2 Straight	420
AF	G1/8 Straight	150
BF	G1/4 Straight	185
CF	G1/2 Straight	420
AB	G1/8 Straight	95
BB	G1/4 Straight	105
CB	G1/2 Straight	440
AC	NPT 1/8 Straight	95
BC	NPT 1/4 Straight	110
CC	NPT 1/2 Straight	420
AD	1/4" double barbed fitting (500 mL/min to 50 L/min)	150
BD	1/4" double barbed fitting (50 L/min to 200 L/min)	190
AE	1/4" JXR male fitting (500 mL/min to 50 L/min)	150
BE	1/4" JXR male fitting (50 L/min to 200 L/min)	190

## Stainless steel body optional products

### Option dimensions diagram (lead wire)

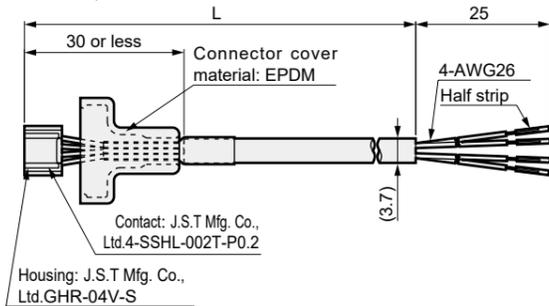
- 5-conductor lead wire (for LCD display, for separated display)  
FSM3-A, B



Model No.	L dimensions	Weight (g)
FSM3-A	1040±20	21
FSM3-B	3040±20	57

Terminal No.	Cable color
1	Brown
2	Black
3	White
4	Gray
5	Blue

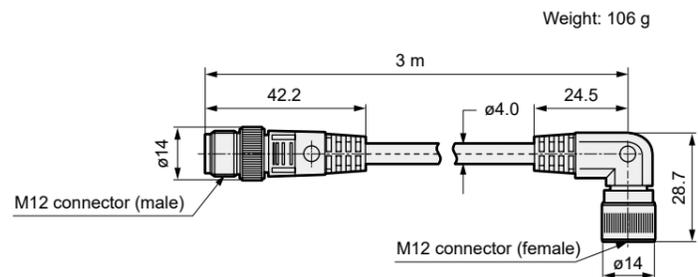
- 4-conductor lead wire (for bar display)  
FSM3-C, D



Model No.	L dimensions	Weight (g)
FSM3-C	1040±20	19
FSM3-D	3040±20	52

Terminal No.	Cable color
1	Brown
2	Black
3	White
4	Blue

- M12 both-end lead wire with connector (for IO-Link)  
FSM3-G



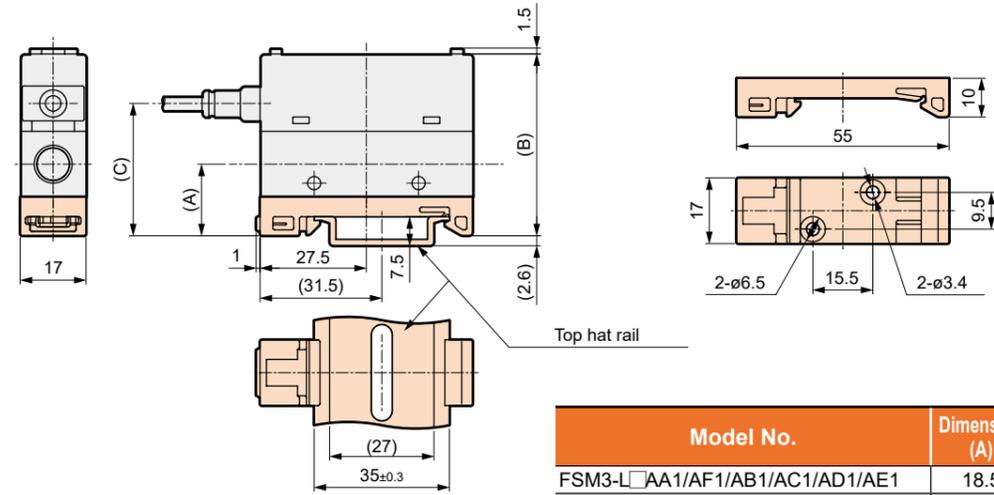
Terminal No.	Cable color
1	Brown
2	White
3	Blue
4	Black

### Option dimensions diagram (DIN rail mounting kit)

FSM3-M

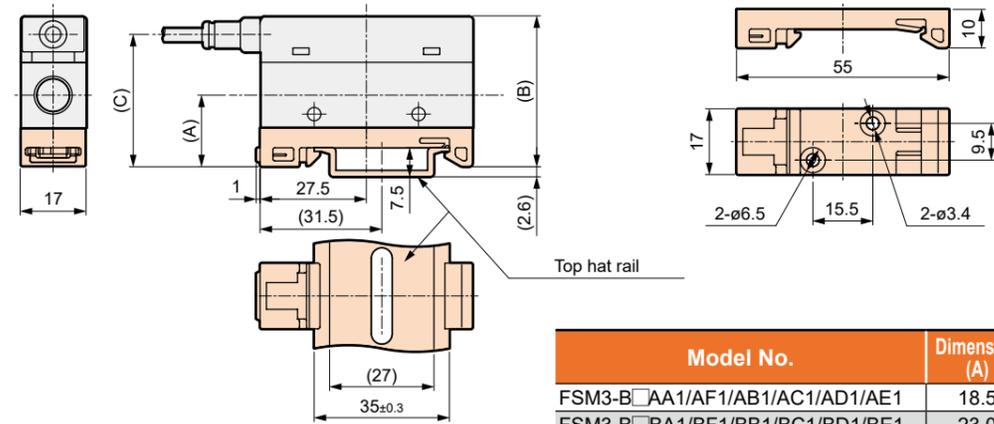
Discrete weight: 7 g

- LCD display



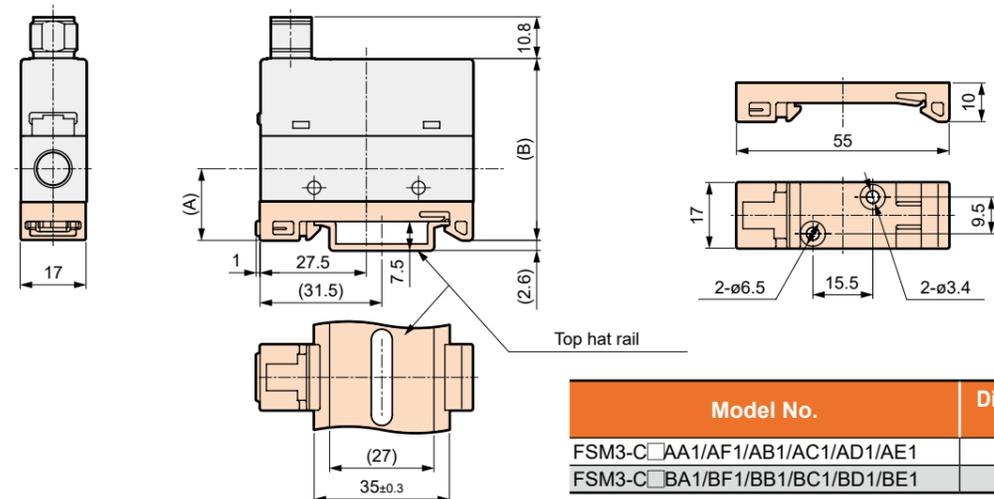
Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-L AA1/AF1/AB1/AC1/AD1/AE1	18.5	47	34.2
FSM3-L BA1/BF1/BB1/BC1/BD1/BE1	23.0	53	40.2

- Bar display



Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-B AA1/AF1/AB1/AC1/AD1/AE1	18.5	39	34.2
FSM3-B BA1/BF1/BB1/BC1/BD1/BE1	23.0	45	40.2

- IO-Link



Model No.	Dimension (A)	Dimension (B)
FSM3-C AA1/AF1/AB1/AC1/AD1/AE1	18.5	47
FSM3-C BA1/BF1/BB1/BC1/BD1/BE1	23.0	53

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

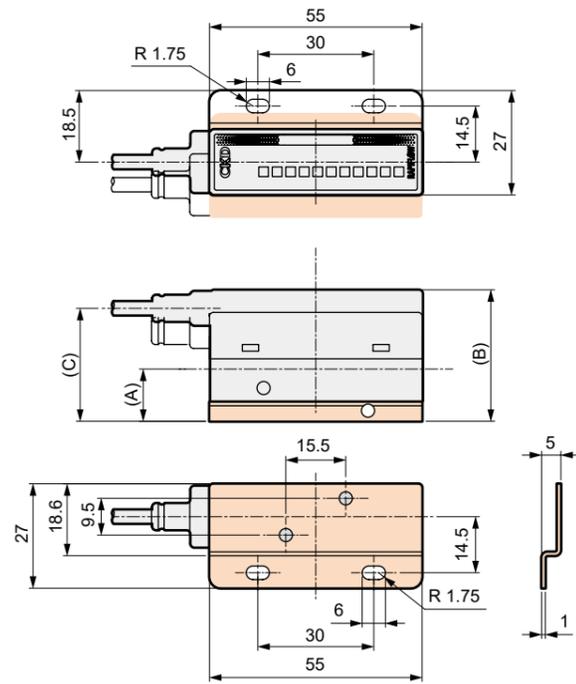
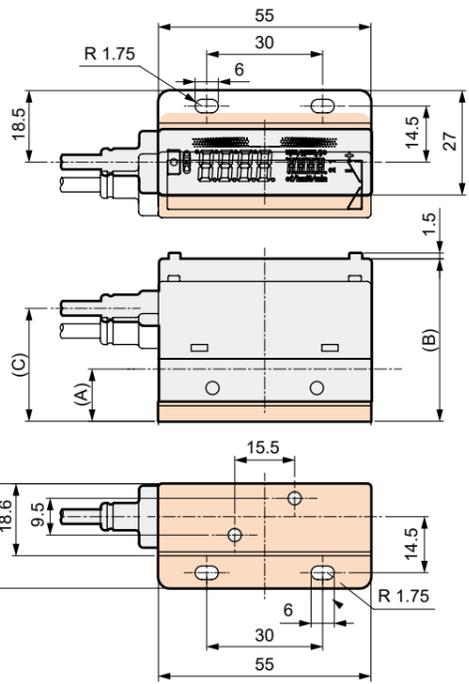
Ending

FSM3-H

Discrete weight: 13 g

●LCD display

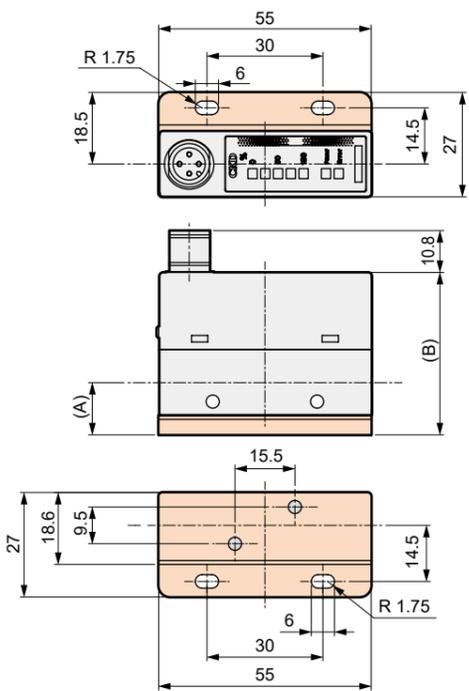
●Bar display



Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-L□AA1/AF1/AB1/AC1/AD1/AE1	13.5	42	29.2
FSM3-L□BA1/BF1/BB1/BC1/BD1/BE1	18.0	48	35.2

Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-B□AA1/AF1/AB1/AC1/AD1/AE1	13.5	34	29.2
FSM3-B□BA1/BF1/BB1/BC1/BD1/BE1	18.0	40	35.2

●IO-Link



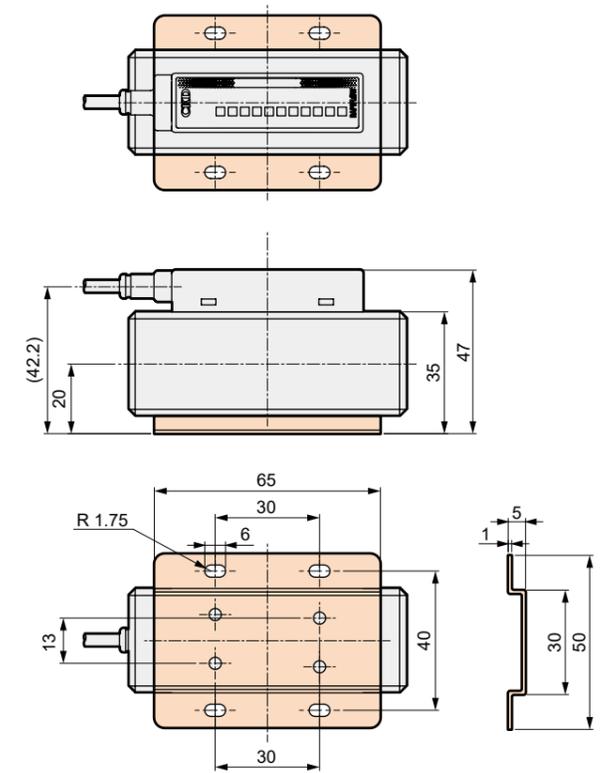
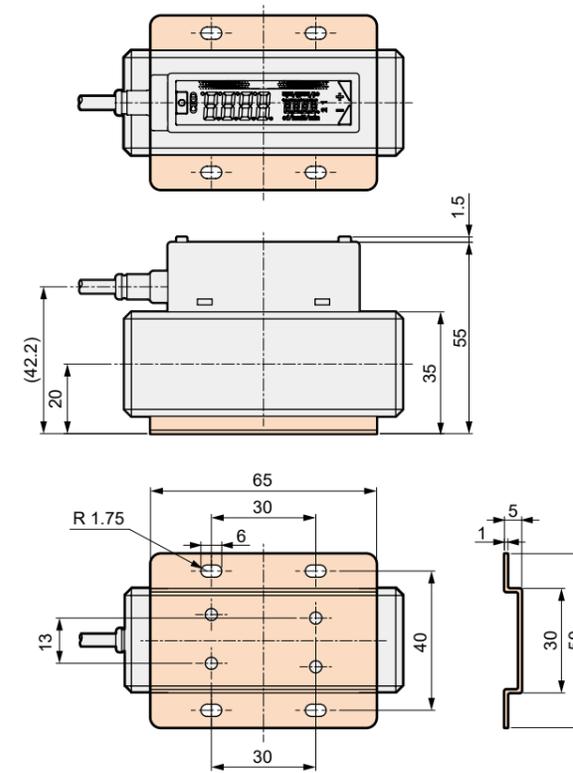
Model No.	Dimension (A)	Dimension (B)
FSM3-C□AA1/AF1/AB1/AC1/AD1/AE1	13.5	42
FSM3-C□BA1/BF1/BB1/BC1/BD1/BE1	18.0	48

FSM3-J

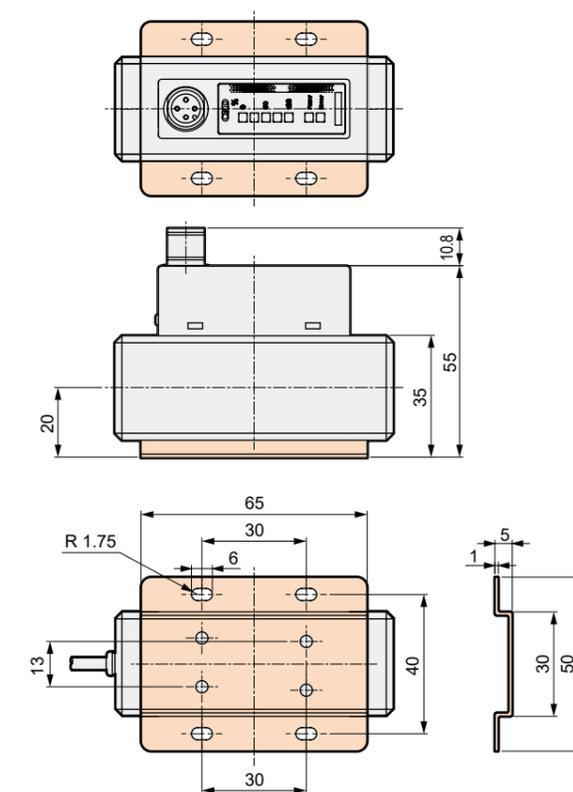
Discrete weight: 28 g

●LCD display

●Bar display



●IO-Link



Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

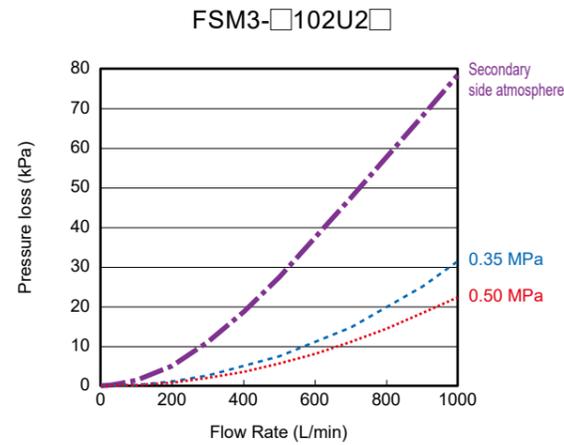
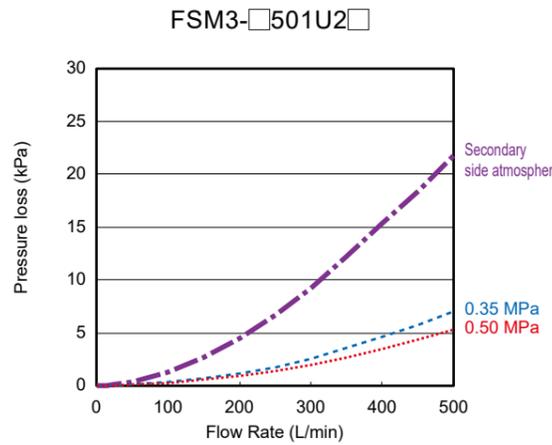
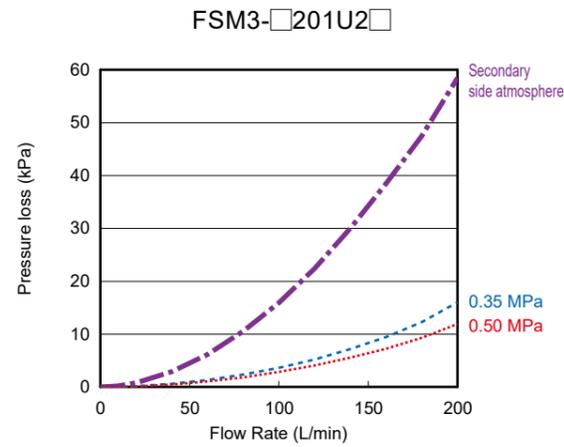
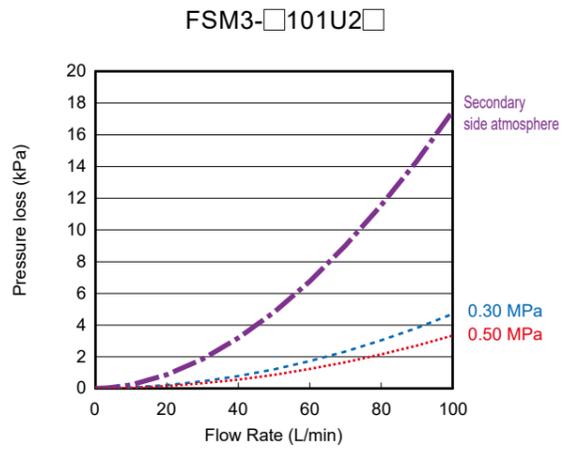
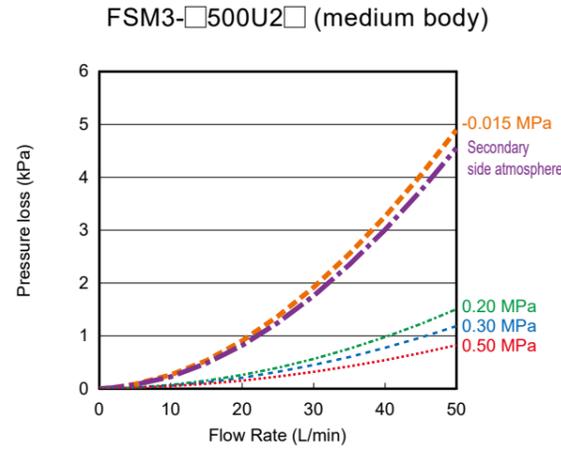
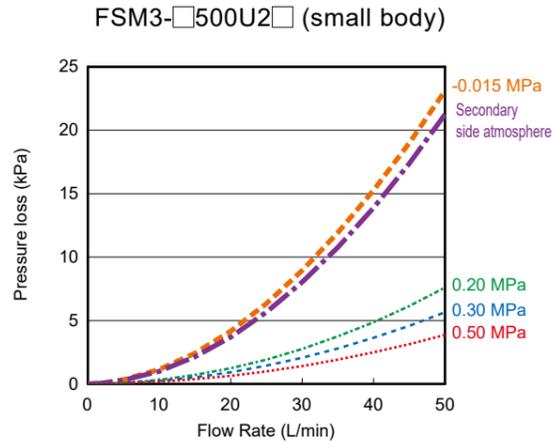
Compact flow sensor (liquid)

Water Manifold Unit

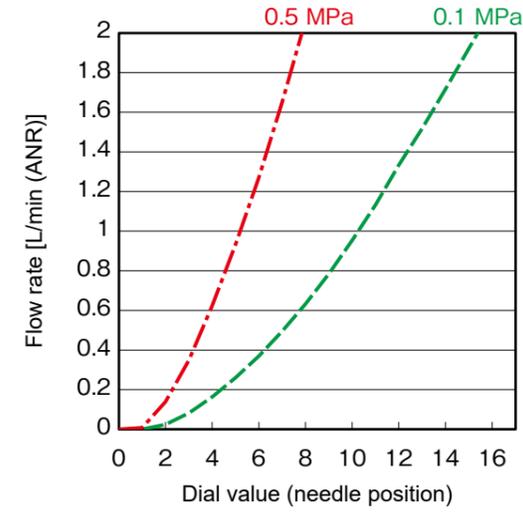
Ending

Ending

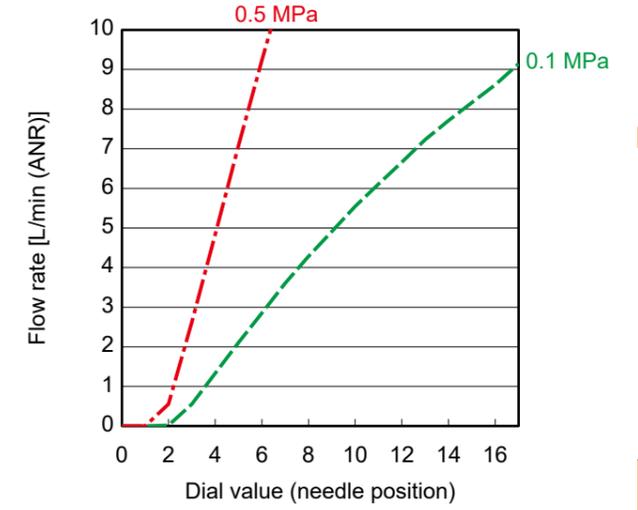




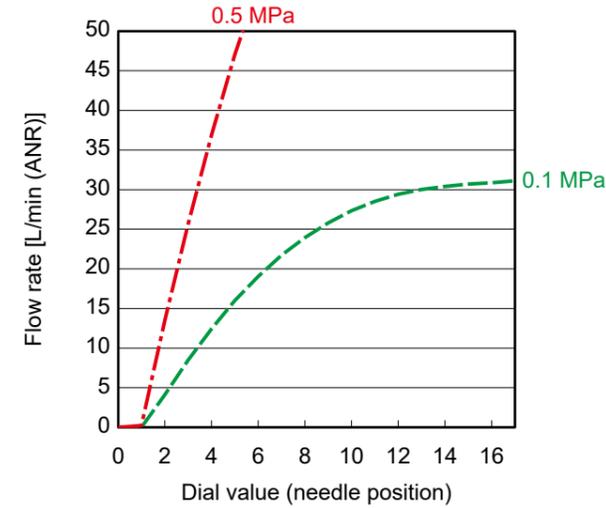
●FSM3-L005/010/020U2AA



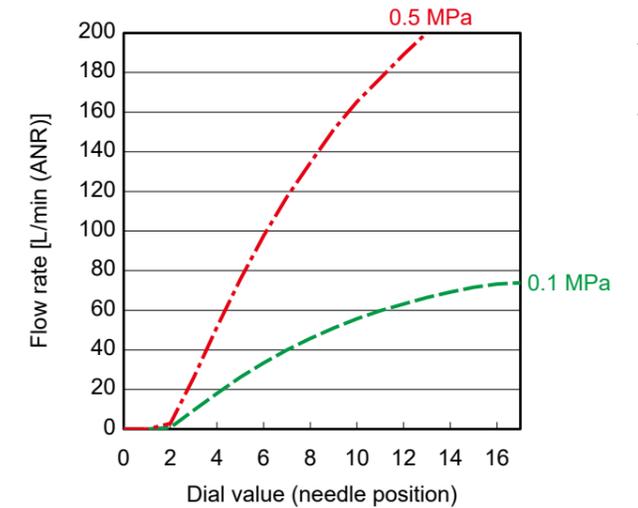
●FSM3-L050/100U2AA



●FSM3-L200/500U2AA



●FSM3-L500/101/201U2BA

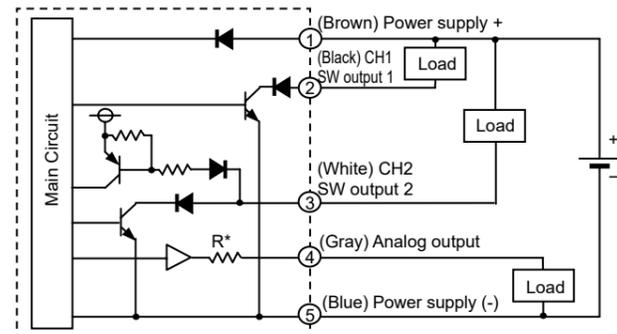


The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.  
 Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41, oxygen: 1.11  
 (Excluding flow rate range (full scale flow rate) "501" and "102")

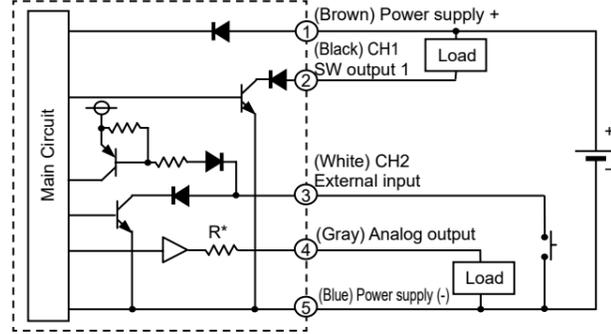
Example of internal circuit and load connection

●FSM3-L□□□□□B/F/□□ (LCD display type NPN output)

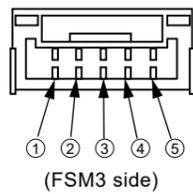
[When using CH2 as SW output]



[CH2 is used as external input]



\*Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

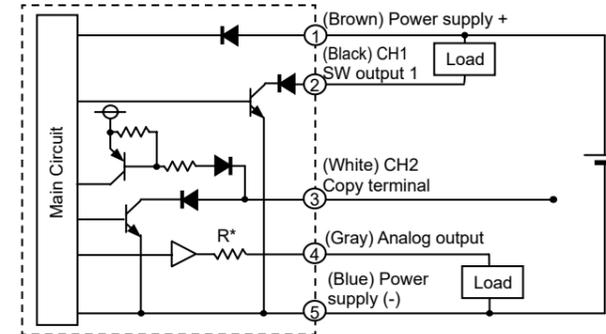


Terminal No.	Option Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1: max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

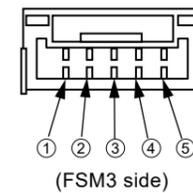
Example of internal circuit and load connection

●FSM3-L□□□□□A/E/□□ (LCD display, NPN output, with setting copy function)

(LCD display, NPN output, with setting copy function)



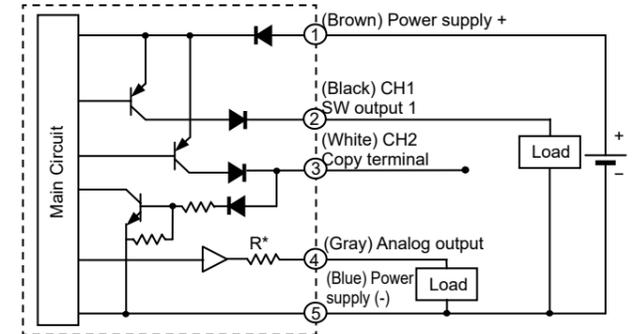
\*Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω



Terminal No.	Option Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1: max 50 mA)
③	White	CH2 (copy terminal)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM3-L□□□□□C/G/□□ (LCD display, PNP output, with setting copy function)

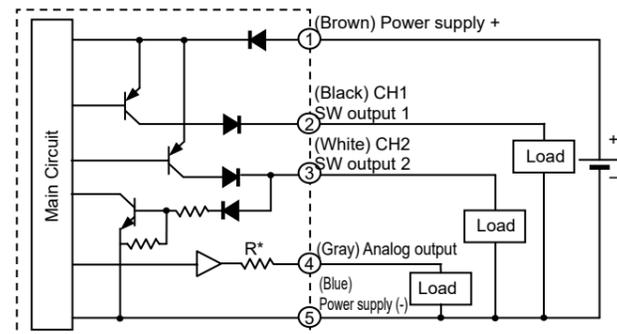
(LCD display, PNP output, with setting copy function)



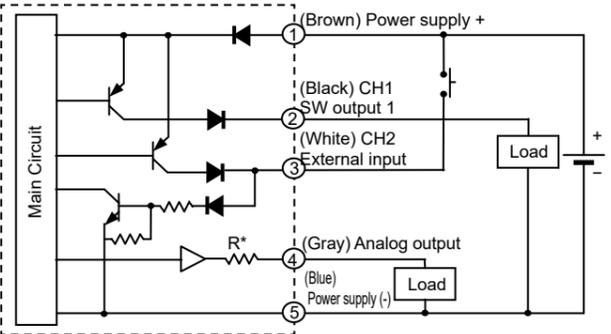
\*Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

●FSM3-L□□□□□D/H/□□ (LCD display type PNP output)

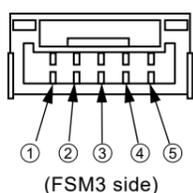
[When using CH2 as SW output]



[CH2 is used as external input]



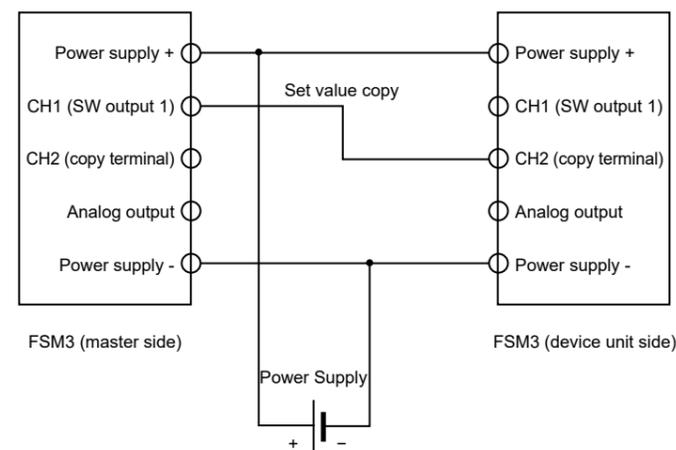
\*Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω



Terminal No.	Option Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1: max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM3-L□□□□□A/C/E/G/□□ (LCD display, with setting copy function)

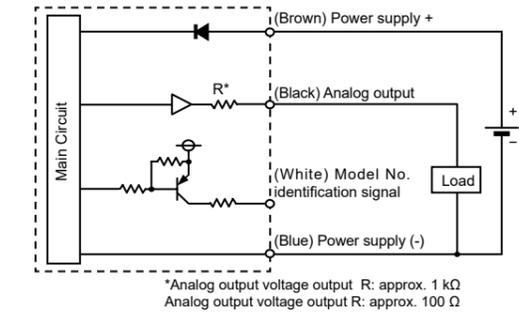
[When using the setting copy function]



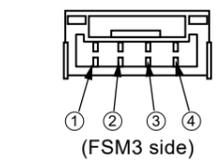
Connect CH1 (SW output 1) on the master side to CH2 (copy terminal) on the device unit side and power ON the sensor to use the setting copy function (F93). Note that this connection can only be used when using the setting copy function. As with the load connection example above, if copying is performed with the load connected to CH1, or the switch is operated with CH1 and CH2 connected, the device side may operate unexpectedly or breakdown the device and FSM3. Never use the product while connected to the copy terminal.

Example of internal circuit and load connection

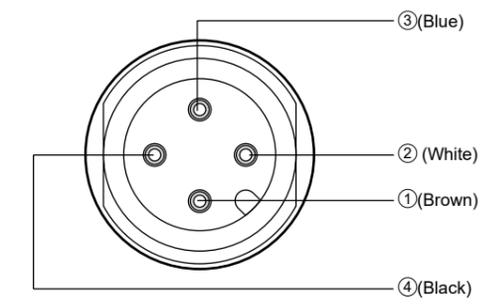
●FSM3-B□□□□□J/K/□□ (bar display)



Terminal No.	Option Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	Analog Output Voltage output: 1-5 V Load impedance 50 kΩ and over Current output: 4-20 mA Load impedance 300 Ω or less
③	White	Model identification signal: do not connect when using as a single unit
④	Blue	Power supply - (GND)

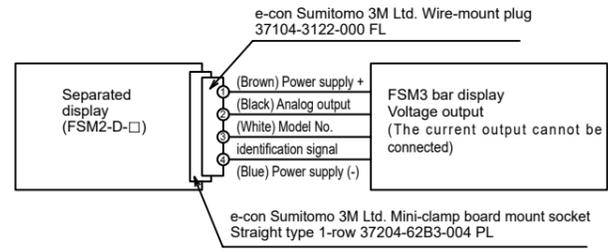


●FSM3-C□□□□□L□□ (IO-Link type)

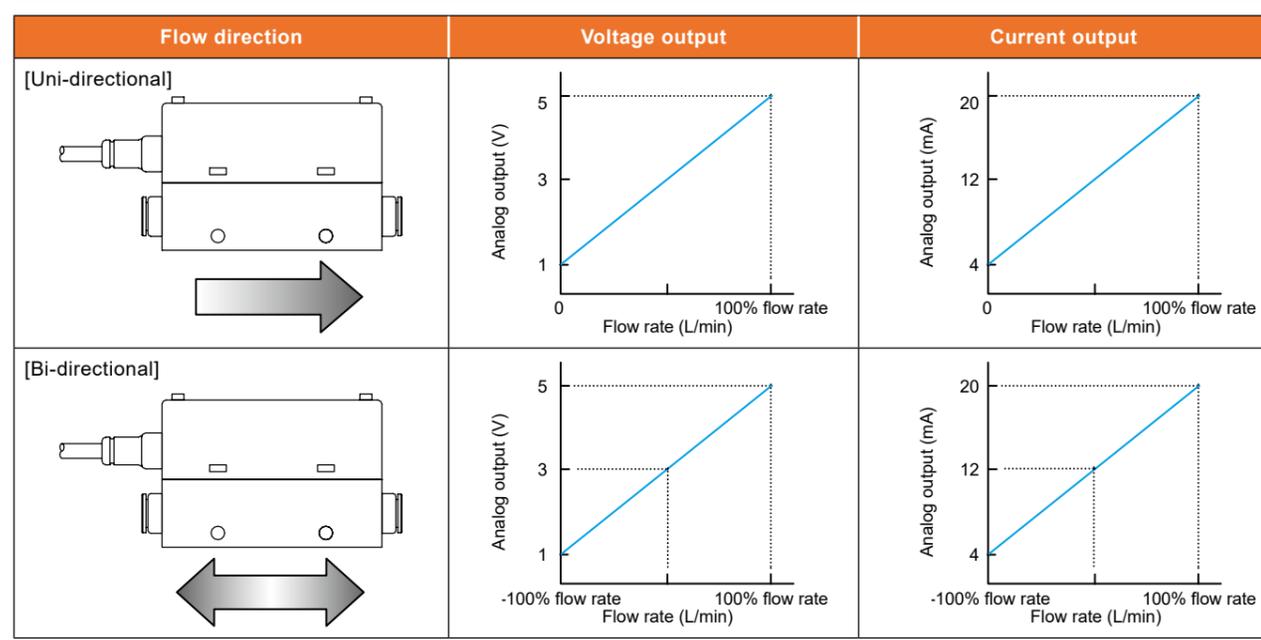


Terminal No.	Lead wire color	Name
①	Brown	Power supply + (18 to 30 V)
②	White	N.C.
③	Blue	Power supply - (GND)
④	Black	C/Q (IO-Link)

●Connecting the separate display and the FSM3 bar display



Analog output characteristics



\*1: The full scale of the uni-directional-type is 0 to 100%, and full scale of the bi-directional-type is -100% to 100%. With the integrated display bi-directional type, output can be changed to uni-direction. The value after switching is a reference value. For details, refer to P. 311.  
 \*2: When switched to carbon dioxide, for analog output refer to P. 239.  
 \*3: Analog output is available even outside the measurement flow rate range. Although the accuracy is not guaranteed, the lower and upper limits for voltage can be output at about 0.6 V and 5.4 V, respectively, and the lower and upper limits for current can be output at about 2.4 mA and 21.6 mA, respectively. For bi-direction, the lower and upper limits for voltage can be output at about 0.8 V and 5.2 V, respectively, while the lower and upper limits for current can be output at about 3.2 mA and 20.8 mA, respectively.

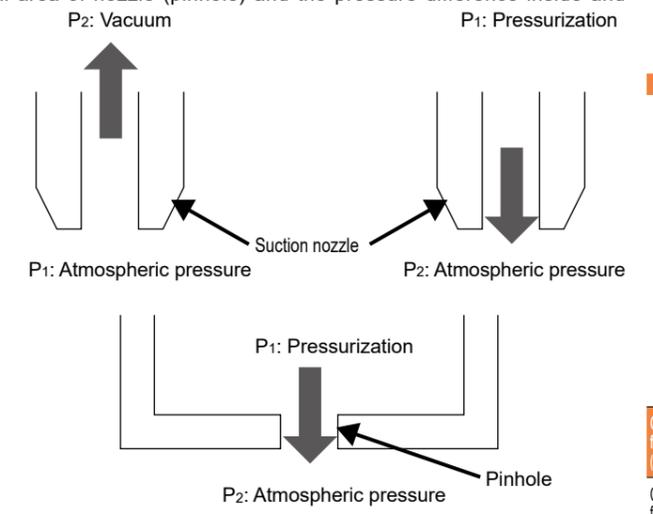
Flow rate sensor selection method

Use as a guideline for selection of the flow rate range when using the flow rate sensor for suction nozzle suction/release confirmation or leakage inspection.

The flow rate can be calculated using the effective cross-sectional area of nozzle (pinhole) and the pressure difference inside and outside the nozzle.

- P1 ≥ 1.89P2 (acoustic velocity)  
Q = 113.2 × S × P1
- P1 < 1.89P2 (subsonic velocity)  
Q = 226.4 × S × √P2 (P1 - P2)

Q : Flow rate L/min  
 P1 : Primary side absolute pressure MPa  
 P2 : Secondary side absolute pressure MPa  
 S : Effective cross-sectional area of nozzle (pinhole) mm<sup>2</sup>



●Example of calculation

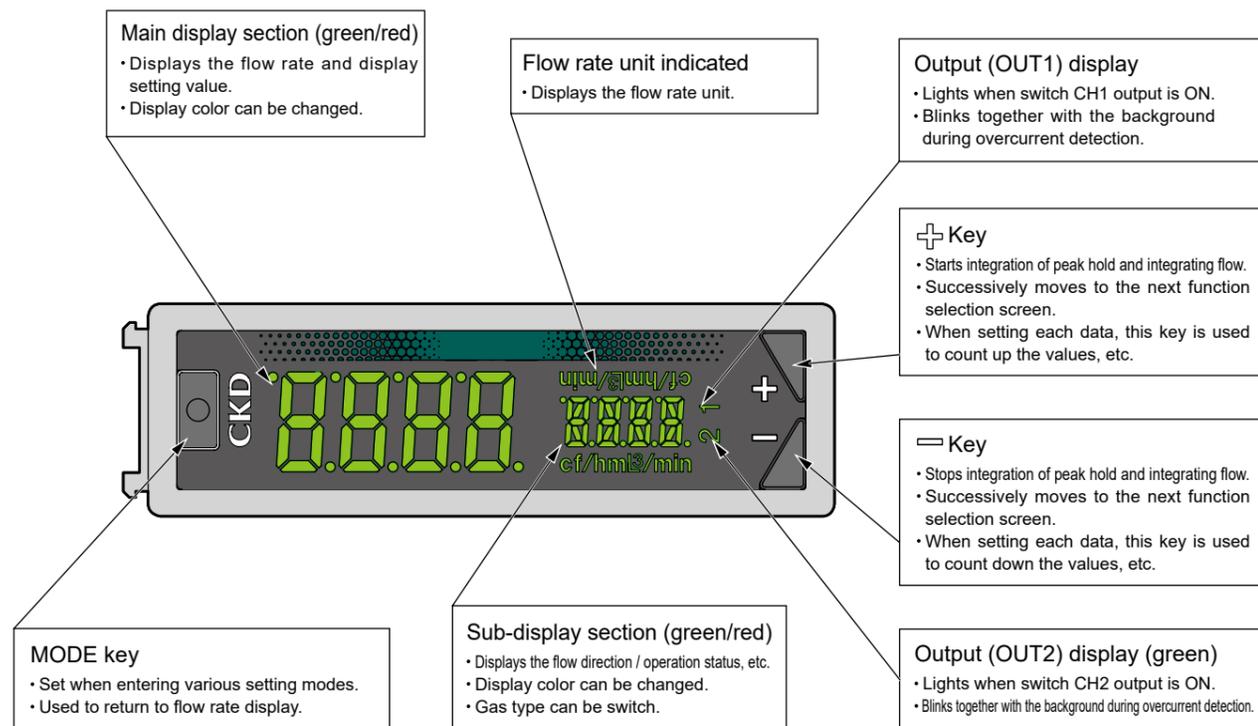
The calculated value of flow rate when the nozzle diameter is 0.1 to 2 φ and P2 is varied is shown in the figure below.

	P1 (MPa) Absolute pressure	P1 (MPa) Gauge pressure	P2 (MPa) Absolute pressure	P2 (MPa) Gauge pressure	Acoustic velocity/subsonic velocity	Calculated flow rate value (L/min)								
						φ0.1	φ0.2	φ0.3	φ0.4	φ0.5	φ0.7	φ1	φ1.5	φ2
Vacuum	0.1013	0	0.0313	-0.07	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0413	-0.06	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0513	-0.05	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0613	-0.04	Subsonic velocity	0.088	0.352	0.792	1.408	2.200	4.312	8.800	19.801	35.202
	0.1013	0	0.0713	-0.03	Subsonic velocity	0.082	0.329	0.740	1.315	2.055	4.028	8.220	18.494	32.878
	0.1013	0	0.0813	-0.02	Subsonic velocity	0.072	0.287	0.645	1.147	1.792	3.512	7.166	16.125	28.666
Blow (leakage inspection)	0.1013	0	0.0913	-0.01	Subsonic velocity	0.054	0.215	0.483	0.859	1.343	2.631	5.370	12.083	21.480
	0.1113	0.01	0.1013	0	Subsonic velocity	0.057	0.226	0.509	0.905	1.414	2.772	5.657	12.727	22.626
	0.1213	0.02	0.1013	0	Subsonic velocity	0.080	0.320	0.720	1.280	2.000	3.920	8.000	17.999	31.998
	0.1413	0.04	0.1013	0	Subsonic velocity	0.113	0.453	1.018	1.810	2.828	5.543	11.313	25.454	45.252
	0.1613	0.06	0.1013	0	Subsonic velocity	0.139	0.554	1.247	2.217	3.464	6.789	13.856	31.175	55.423
	0.1813	0.08	0.1013	0	Subsonic velocity	0.160	0.640	1.440	2.560	4.000	7.840	15.999	35.998	63.996
	0.2013	0.1	0.1013	0	Acoustic velocity	0.179	0.716	1.610	2.862	4.472	8.765	17.888	40.248	71.552
	0.3013	0.2	0.1013	0	Acoustic velocity	0.268	1.071	2.410	4.284	6.694	13.119	26.774	60.242	107.096
	0.4013	0.3	0.1013	0	Acoustic velocity	0.357	1.426	3.209	5.706	8.915	17.474	35.660	80.236	142.641
	0.5013	0.4	0.1013	0	Acoustic velocity	0.445	1.782	4.009	7.127	11.137	21.828	44.547	100.230	178.186
0.6013	0.5	0.1013	0	Acoustic velocity	0.534	2.137	4.809	8.549	13.358	26.182	53.433	120.224	213.731	

(CAUTION)  
 ●If there is a leak in the piping etc., the actual flow rate will be larger than the calculated value. When selecting the flow rate, consider the amount of leakage in the piping.  
 ●If there is a portion thinner than the suction nozzle diameter in the middle of the piping, the flow rate may be reduced, resulting in a flow rate lower than the calculated value. In addition, suction confirmation, etc., may become impossible.  
 ●The effective cross-sectional area is only a guideline. When the nozzle is long and thin, the effective cross-sectional area becomes smaller than the opening area.  
 ●The response time is determined by the inner volume of the piping from the flow rate sensor to suction nozzle (pinhole). For high-speed detection, reduce the inner volume of the piping as much as possible by installing a flow rate sensor near the suction nozzle, etc.

Names and functions of display/operation section (LCD display)

Indicator section name



Names and functions of display/operation section (LCD display)

The function and various settings may be performed during normal flow rate display or after entering each mode. The modes are also divided into Maintenance mode, SET mode, and Setting Monitor mode according to the frequency of use.

Normal Operation (RUN mode)

Item	Explanation	Default setting
Instantaneous flow rate display	Indicators the instantaneous flow rate.	Indicator (measurement)
Peak hold function	Max. and min. values for the flow rate within a set interval are displayed.	Hidden (Stopped)
CO <sub>2</sub> Discharge rate display	By setting the power, discharge pressure, and flow rate of the compressor, as well as the power ↔CO <sub>2</sub> conversion coefficient, you can learn how much CO <sub>2</sub> is being discharged. (reference value obtained by calculation) Available only when the gas type is set to air.	Hidden (Stopped)
Accumulated flow display	The accumulated flow can be displayed. The switch output function includes a function to turn the switch ON/OFF at a level higher than the recommended cumulative value, and an integrated pulse function to output the pulse at a set cumulative value.	Non-display (measurement)

SET mode

No.	Item	Explanation	Default setting
F.01	Selection of CH1 operation	Select the CH1 feature. Switch output operation and integrated pulse settings can be set.	Without switch output
F.02	Selection of CH2 operation	Select the CH2 feature. Select whether to use CH2 as a switch output, or to use as an external input (integrated value reset/auto reference).	Without switch output
F.03	Integrating function settings	You can choose to acquire integrating flow values consecutively or at set times. You can also choose to keep the data or not.	Continuous acquisition: Data hold OFF
F.04	Sub-screen display setting	Sets the display method for the sub-display. The display can be switched to "flow direction", "reference state", "gas type", or "numbering display".	Flow direction
F.05	Indicator color setting	Set the display color. (red, green) Display color can be set for normal display and when switch output is ON.	At normal: Green At switch ON: Red
F.06	Setting flow direction (bi-directional only)	Setting the flow direction. Setting available for bi-directional, one-sided forward direction or one-sided reverse direction.	Bi-direction
F.07	Indicator inversion function	The LCD display can be vertically inverted.	Standard display
F.08	Reference state setting	Select from the standard state or reference state. Standard condition (ANR): flow rate converted to volume at 20°C, 1 atm, 65%RH (For gas-types other than air: 20 °C, 1 barometric pressure, 0% RH) Reference condition (NOR): flow rate converted to volume at 0°C, 1 atm, 0% RH	ANR
F.09	Unit setting (overseas models only)	The units can be set. Can be selected from L/min, cf/h (cf/min).	Domestic model: L/min Overseas model: L/min
F.10	Indicator cycle setting	The digital display refresh cycle can be set in three stages from 0.25 sec to 1 sec. If the display flickers, it can be improved by increasing the display refresh cycle.	0.5 sec
F.11	Setting response time of analog output	Set the response time. The response can be set in seven steps from 0.05 sec to 1.50 sec. Chattering and mis-operation caused by sudden flow rate changes or noise are prevented.	0.05 sec
F.12	Numbering setting	You can set the numbering.	0000
F.13	Gas switching	The measured gas can be switched. (Model with full scale flow rate of 200 L/min or below) (O <sub>2</sub> The gas type cannot be switched.)	Air
F.14	Setting ECO mode	An ECO mode can be set. If the buttons are not operated for approx. 1 minute, the eco mode will activate and turn OFF the display's backlight. Current consumption can be reduced with this mode.	OFF
F.15	CO <sub>2</sub> Discharge rate calculation setting	CO <sub>2</sub> The discharge rate calculation can be set. Power, discharge pressure, flow rate, C of the compressor O <sub>2</sub> Set the conversion factor.	• Power: 0.20 KW • Pressure: 0.10 MPa • Flow rate: 100 L/min • Conversion factor: 0.000kg (CO <sub>2</sub> ) / kwh
F.16	Lock setting	Key lock method and PIN method can be set. Use selectively depending on the working environment.	OFF
F.17	Peak hold setting	You can choose to acquire peak bottom values consecutively or at set times. You can also choose to keep the data or not.	Continuous acquisition: Data hold OFF

Maintenance mode

No.	Item	Explanation	Default setting
F.91	Forced output function	Forces the switch output to turn ON and is used to check the initial operation of wiring connections and input devices.	-
F.92	Zero adjustment	The zero point deviation is compensated.	Adjust value: 000
F.93	Setting copy function	Set values can be copied if the model supports copying between two FSM3's. (Copying is only possible between products with the same model No.)	-
F.99	Reset function	Returns the settings to the default settings.	-

Setting Monitor mode

Item	Explanation	Default setting
Settings monitor function	You can check the settings made in the SET mode. (Setting details cannot be edited.)	-

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

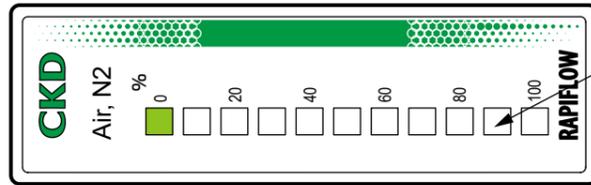
Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Names and functions of display/operation section (bar display-type)

●Indicator section name



Flow bar display  
 • Lights according to flow rate.  
 • Blinks at overflow.

[Display example] Display for FSM3-B101

Flow rate	Uni-direction	Bi-directional
0%		
+60% (Forward direction)		
+110% (Forward direction) Blinks at overflow. *Blinks at +110%F.S. and over.		
-10% (Reverse direction)		
-110% (Reverse direction)		

MEMO

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

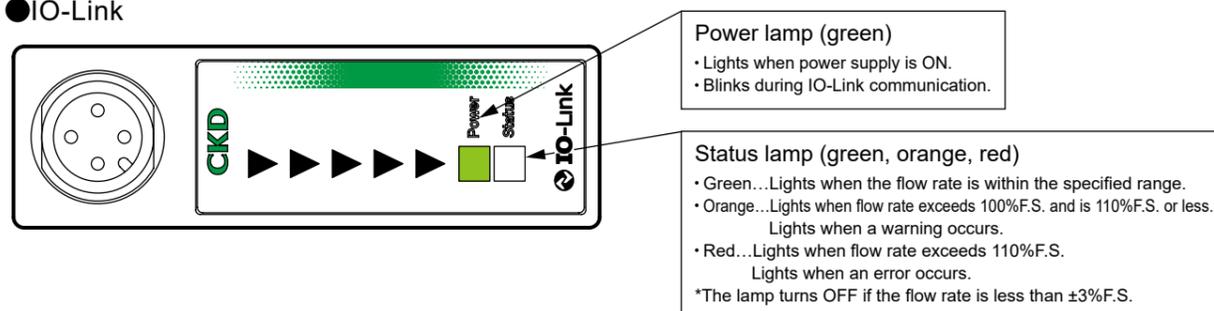
Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Names and functions of display/operation section (IO-Link)

●IO-Link



●Communication specifications

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM2 (38.4 kbps)
Port	Class A
Process data length (input)	4 byte
Process data length (output)	0 byte
Min. cycle time	5 ms
Data storage	1 kbyte
SIO mode support	None

Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Data name	MSB															LSB
Data range	Instantaneous flow rate															
Format	Refer to Table 1															
Format	Integer16															

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Error	WARNING	-	-	-	-	Switch Output		Vacant							
Data range	True/False						2	1								
Format	Boolean															

Data range (Table 1)

		005	010	020	050	100	200	500	101	201	501	102
Data range (□/min)	U	-50 to 550 mL	-100 to 1100 mL	-0.20 to 2.20 L	-0.50 to 5.50 L	-1.00 to 11.00 L	-2.0 to 22.0 L	-5.0 to 55.0 L	-10.0 to 110.0 L	-20 to 220 L	-50 to 550 L	-100 to 1100 L
	B	-550 to 550 mL	-1100 to 1100 mL	-2.20 to 2.20 L	-5.50 to 5.50 L	-11.00 to 11.00 L	-22.0 to 22.0 L	-55.0 to 55.0 L	-110.0 to 110.0 L	-220 to 220 L	-550 to 550 L	-1100 to 1100 L

\* When setting the gas type to CO<sub>2</sub>, the data range changes. Please refer to P. 293.

\* Download the IO-Link setting file (IODD) from the CKD website (<https://www.ckd.co.jp/en/>).

●Explanation of functions (IO-Link)

Item	Explanation	Default setting
Instantaneous flow rate display	Indicators the instantaneous flow rate.	-
Accumulated flow display	Indicators the integrating flow counted after indicating to start logging.	Stop
Instantaneous flow rate peak value display (Peak hold function)	Indicators the maximum and minimum instantaneous flow rate values during the period between indicating to start logging and stop logging.	Stop
Error display	Indicators the error details.	-
Warning display (WARNING)	Indicators the warning details.	-
Power ON time display	Indicators the total power ON time from the start of use. This time is not reset even if the power turns OFF. (Also not reset when using the reset setting.)	-
Switch output function	The switch output operation function can be set. This function can be used to monitor whether the flow rate is within the set range or monitor whether it exceeds the set flow rate.	Not set
Flow rate standard setting	The flow rate standard can be selected. Standard condition (ANR): Converted into volumetric flow rate at 20°C, 1 barometric pressure, 65% RH (For gases other than air: 20°C, 1 barometric pressure, 0% RH) Standard condition (NOR): Converted into volumetric flow rate at 0°C, 1 barometric pressure, 0% RH	ANR
Gas switching	The measured gas can be switched. (For models with a full-scale flow rate of 200 L/min or less. Gas type switching is not available for the O <sub>2</sub> type.)	Air
Change travel average (Setting response time)	The travel average when measuring can be set. The average can be set in seven steps from 50 msec. to 1500 msec. Chattering and mis-operation caused by sudden flow rate changes or noise are prevented.	50 msec
Lock setting	Parameter Lock can be set, which disables changing the parameters of the unit. Data Storage Lock can be set, which prohibits uploading and downloading set values to the master. (Parameter Lock and Data Storage Lock and be set simultaneously)	Not set
Zero adjustment	The zero point deviation is compensated. (Within ±10% F.S.)	Not set
Data storage function	Uploading set values to the master and downloading set values from the master are possible. (Can be copied by the same model No.)	-
Reset function	Returns the settings to the factory settings. (Cannot reset while Parameter Lock is enabled)	-
Unit identification function	Models, serial numbers, etc., can be confirmed on the network.	-

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit



# Pneumatic components (sensors) Safety Precautions

Be sure to read this section before use.  
For general pneumatic components precautions, refer to Intro 17 for details.

## Product-specific cautions: Compact flow rate sensor FSM3 Series

### Design / Selection

#### Working fluids

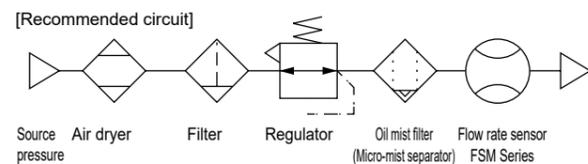
##### ⚠ DANGER

- Never use this product with flammable fluids.

##### ⚠ WARNING

- This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. Intended applications include industrial sensors.
- Do not use fluids which are not applicable.
- Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.
- When installing the product during piping or fitting assembly, use the above clean gas for the fluid used to blow out for cleaning. Check that foreign matter does not enter the product from the port of the product. When using compressed air in this process, use clean air compliant with the air quality listed in the following item (ISO 8573-1 Class 2010 1.1.1 to 1.6.2).
- When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Since compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), attach a filter, an air dryer and an oil mist filter (Micro-mist separator) to the primary side (upstream) of the sensor. The sensor's mesh rectifies flow in the pipe. It does not filter out foreign matter, so provide a filter.

- When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Since compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), attach a filter, an air dryer and an oil mist filter (Micro-mist separator) to the primary side (upstream) of the sensor. The sensor's mesh rectifies flow in the pipe. It does not filter out foreign matter, so provide a filter.



- Depending on the fluid, retaining the fluid for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

#### Working pressure / flow rate range

Applications exceeding the max. working pressure and specified flow rate range may result in breakdown. Use this product only within the specified range. If energized in a vacuum state of -0.09 MPa or less, the sensor's heat dissipation will suffer, leading to degradation of the sensor.

- When using a valve on the primary side of the sensor, use only valves with oil-prohibited specifications. This sensor could malfunction or fail if exposed to splattering grease, oil, etc. As friction powder may be generated depending on the valve, mount a filter to prevent the powder from entering the sensor.

- The sensor for oxygen gas is a custom model. To prevent ignition accidents, treat the inside of the flow paths on oxygen models in accordance with oil free specifications. Do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

- When using liquefied gas such as carbon dioxide, always vaporize it first. Failure may result if liquefied gas enters the product.

#### Working environment

##### ⚠ DANGER

- Flammable environment**  
Never use this product in an explosive gas atmosphere. The structure is not explosion-proof, and explosions or fires could occur.

##### ⚠ WARNING

- Corrosive environment**  
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

- Ambient/fluid temperatures**  
Use at ambient/fluid temperatures within the specified range of 0 to 50°C. Even if the temperature is within the specified range, do not use this product if the ambient temperature and fluid temperature could suddenly change and cause dew to condense.

#### Drip-proof environment

The degree of protection of this product is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body.

#### Flow rate unit

##### ⚠ CAUTION

- This product's flow rate is measured at a mass flow rate unaffected by temperature or pressure. The unit is L/min, but this is the display when the mass flow rate is converted to volumetric flow rate at 20°C 1 atmosphere (101 kPa) relative humidity 65%RH. (Conditions for gas-types other than air are 20 °C, 1 barometric pressure (101 kPa), relative humidity 0%)

#### Overflow

##### ⚠ CAUTION

- With each series, no problem will occur in the sensor, even in an overflow double the measured range. If dynamic pressure is applied near the maximum working pressure (when a pressure difference exceeding the max. working pressure is applied between primary and secondary sides), a problem could occur with the sensor. When dynamic pressure is applied, such as when filling a workpiece for leakage inspection, be sure to provide a bypass circuit or a squeezer to prevent dynamic pressure from being applied to the sensor.

#### Needle valve integrated

##### ⚠ CAUTION

- This valve cannot be used as a stop valve that requires no leakage. Slight leakage is allowed for in the product specifications.
- The needle valve does not change linearly along with the rotation speed, so be sure to use it as fixed restriction.
- Vibration could cause the needle to turn and the flow rate to change.

#### Use for suction confirmation, etc.

##### ⚠ CAUTION

- Mount an air filter upstream from suction in compliance with the working status to prevent the entry of foreign matter.
- Use the product under conditions where no condensation occurs in the piping, taking into consideration the dew point of the atmosphere and the ambient temperature of the product.
- When this product is used for vacuum applications such as air supply, do not bend the tube near the push-in fitting. If stress is applied to the tube near the push-in fitting, insert an insert ring into the tube, and connect the tube to the push-in fitting.
- Select the flow rate range based on the operating vacuum pressure and suction nozzle.
- Response speed may be delayed by the piping volume between the suction nozzle and this product. In this case, take countermeasures to reduce piping capacity.
- When the suction confirmation sensor is switched from a pressure sensor (switch) to a flow rate sensor (switch), sensor output (switch output) logic will be reversed. (Refer to the drawing below.) Note that the PLC sequence program must be changed or revised. If source pressure or vacuum source is not supplied when device power is turned ON, "flow rate 0" = "sensor output (switch output) ON" status is set at the flow rate sensor (switch). Check that this occurs with the PLC sequence program, etc.

	Pressure sensor (switch)	Flow rate sensor (switch)
	ON at setting value or more	ON at setting value or less
Suction confirmation		
	Atmospheric pressure side   High vacuum side	Flow rate 0 side   High flow rate side

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Ending

Piping

**CAUTION**

Do not install a pressure reducing valve (regulator), solenoid valve, etc. immediately before this product. Deflected currents may occur and cause errors. Provide a straight pipe with approx. 10 times the bore size when necessary.

The resin body screw-in fittings of this product are compliant with push-in fittings for pneumatic pressure. Do not use this product for pneumatic pressure circuits with steel pipe connections. If this product is used for steel pipe connection, the misalignment of the IN side steel pipe bore and OUT side steel pipe bore will cause excessive force to be applied to the body, as well as external leakage, risking damage to the product.

Connect a fitting even when using the metal body with the out side opened. The port filter could come off.

Do not rotate fittings while fluid pressure is still applied to this product. The sealant parts could seize or wear, leading to external leakage.

The resin body elbow fitting or screw-in fitting (1/8, 1/4) can be rotated about 10 times, but it cannot be rotated further or constantly. Do not rotate it beyond the required number of times. Rotating the sealant more than necessary may cause the sealant to bite or wear, and lead to external leakage.

Establish the installation method, piping order, and fitting assembly method from the design stage before use. Check that sealing tape, sealant, and foreign matter do not enter the product during installation and fitting assembly. In particular, freshly piped sections may contain unexpected foreign matter. Be sure to discharge air with air blow, etc., before installing this product.

Mounting

**CAUTION**

The LCD display flow rate meter uses a liquid crystal display. This may be difficult to read depending on the angle.

Do not install multiple product bodies in close contact. The generation of heat on each part could cause the product's temperature to rise, hastening changes in characteristics or deterioration of the resin material. When using the products in a row, set intervals of distance of 10 mm and over.

Although the mounting is "unrestricted in vertical/horizontal direction", the flow rate may vary depending on difference in the mounting orientation or piping conditions.

If you mount the elbow fitting in a downward position, it may interfere with the DIN rail mounting.

The bracket mounting position may interfere with the elbow fitting.

The inside of the upper resin case of this product contains wiring parts, including the electronic circuit board. If stress is applied to the resin case during installation, fitting installation, and piping, stress will be transmitted internally as well, and internal parts may be damaged. Establish from the design stage, mounting methods that do not apply stress to the resin case area or fitting mounting methods before use.

Wiring

**WARNING**

Install the product and wiring as far away as possible from sources of noise such as power distribution wires. Provide separate countermeasures for surge applied to the power cable. The display or output could fluctuate.

The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using. (The analog/current output type is excluded.)

Example of calculation

(FSM3-voltage output impedance:  $R_o = 1\text{ k}\Omega$   
 Load internal impedance:  $R_x = 1\text{ M}\Omega$ )

$$\text{Output value} = \left(1 - \frac{R_o}{R_o + R_x}\right) \times 100\%$$

$$= \left(1 - \frac{1\text{ k}\Omega}{1\text{ k}\Omega + 1\text{ M}\Omega}\right) \times 100\% \Rightarrow \text{Output value error approx. } 0.1\%$$

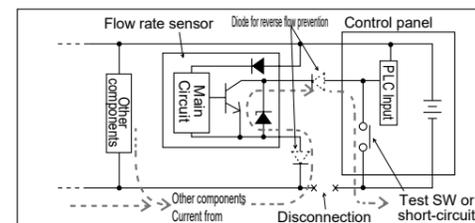
Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated power supply could result in electrical shock. If power is not stabilized, the peak value could be exceeded. This could damage the product or impair accuracy.

The power supply for the metal body (stainless steel body) type is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. Between the metal body internal power circuit and metal body, a varistor (limit voltage approx. 40 V) is connected to prevent dielectric breakdown of the sensor. Do not conduct a withstand voltage test or insulation resistance test between the internal power circuit and metal body. Disconnect wiring first if this testing is required. An excessive potential difference between power and metal body will burn internal parts. After installing, connecting and wiring the metal body, electrical welding of the equipment/frame or short-circuit accidents, etc., could cause welding current, excessive high voltage caused by welding, or surge voltage, etc., to run through the wiring, ground wire, or fluid path connected between such devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

Check that stress (7 N and over) is not directly applied to lead wire leadouts or connectors.

**CAUTION**

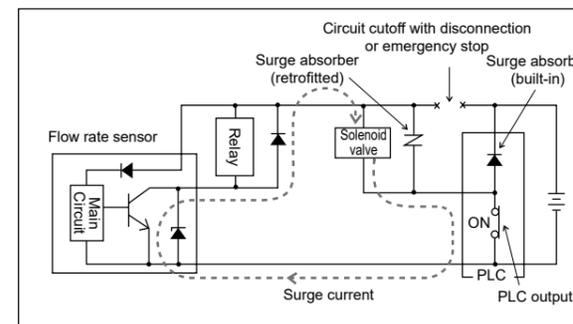
Pay attention to reverse currents caused by disconnected wires and wiring resistance. If other devices, including a flow rate sensor, are connected to the same power supply as the flow rate sensor, and the switch output wire and power cable negative (-) side are short-circuited to check the operation of the control panel input unit, or if the power cable negative (-) side is disconnected, reverse current could flow to the flow rate sensor's switch output circuit and cause damage.



Take the following measures to prevent damage caused by reverse current:

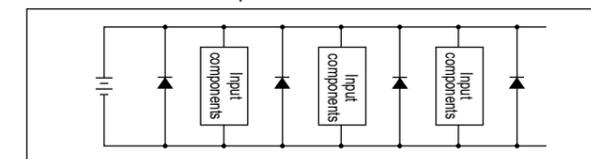
- Avoid centralizing current at the power cable, especially the minus side power cable, and use as thick a cable as possible.
- Limit the number of devices connected to the same power source as the flow rate sensor.
- Insert a diode parallel to the flow rate sensor's output line to prevent reverse current.
- Insert a diode parallel to the flow rate sensor power wire's negative (-) side to prevent reverse current.

Pay attention to surge current flow-around. When flow rate sensor power is shared with an inductive load that generates surges, such as a solenoid valve or relay, if the circuit is cut off while the inductive load is functioning, surge current could enter the switch output circuit and cause damage depending on where the surge absorber is installed.



Take the measures below to prevent damage from sneak surge current.

- Separate the power supply for output including the inductive load, such as the solenoid valve and relay, and input, such as the flow rate sensor.
- If a separate power supply cannot be used, directly install a surge absorption element for all inductive loads. Consider that the surge absorber connected to the PLC, etc., protects only the individual device.
- Connect a surge absorber to places on the power wiring shown in the figure below, as a measure against disconnections in unspecified areas.



When the devices are connected to a connector, the output circuit could be damaged by the above phenomenon if the connector is disconnected while the power is ON. Turn power OFF before connecting or disconnecting the connector.

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

## Other

### ⚠ WARNING

#### ■ CE-compliance working conditions

This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard.

#### Conditions

- The evaluation of this product is performed by using a lead wire that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

- Output accuracy is affected by self-heating due to energization as well as temperature characteristics. Provide a standby time (5 minutes or more) after turning the power ON for use.

- Immediately after power is turned ON, flow rate detection switch operation is not performed for approx. 5 seconds to complete self-diagnosis. Provide a control circuit/program that ignores signals for at least two seconds after power is turned ON.

### ⚠ CAUTION

- The flow path is not completely free of dust generation, so if dust generation is a problem, a final clean filter should be used in conjunction.
- If the actual flow rate is fluctuating, the measured flow rate value also fluctuates. Increase the FSM3 display cycle or response time, or average the analog output on the device. In particular, note that it can easily occur if a control valve such as a solenoid valve is opened and closed at a high frequency in a short time or near a pump.

- Measuring the pulsating flow rate may cause errors in the measured flow rate. Restrict the flow rate with the fixed orifice and needle valve, etc., and use in a laminar flow state (normal flow without irregular fluctuations).
- The flow rate measured with the gas switching function is a reference value calculated inside the product based on the converted value. Accuracy other than in air mode is a guideline.
- This product uses a micro-sensor chip, and must be installed where it will not be subject to dropping, impact or vibration. Treat the product as a precision components during installation and transportation.
- Use the product within the rated flow range.
- Use within the working pressure.
- Analog output continues even if the flow rate range is exceeded. With the LCD display, "Hi" or "Lo" will be displayed. With the bar display, the bar display will blink. Note that this is outside the guaranteed precision.
- The accuracy may vary from the initial status depending on the working environment or working conditions. It is recommended to check the operation of the product periodically.
- Since the sensor chip will change its detection flow rate due to deterioration after prolonged use, periodic inspections should be performed.

## MEMO

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (<https://www.ckd.co.jp/kiki/en/>) → "Model No." → Instruction Manual

# Compact flow rate sensor Environment-resistant specifications

## RAPIFLOW® FSM3

■ Flow rate sensor



### CONTENTS

Product Introduction	324
● LCD display	326
● Bar display	332
⚠ Safety Precautions	347

## Dust-proof / Water-resistant structure IP65



### Can be used in environments where it is exposed to dust or water

Has the degree of protection of IP65 or equivalent. This valve can be used safely even if water is applied to the environment where dust is present, during maintenance and cleaning.



### ATEX Directive compliant (Option)

Refer to "ATEX compatible" on P. 352 for specifications.



With the LCD display, button operation is possible by opening the cover.

\*The protective structure will not be used when the cover is opened.

### High precision/high-speed response

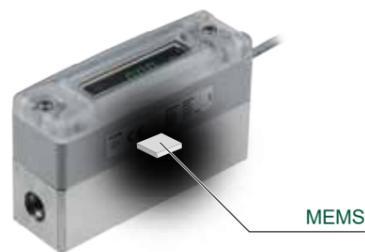
Repeatability: Within  $\pm 1\%$  F.S.  
Indicator accuracy: Within  $\pm 3\%$  F.S.  
Response time: 50 msec

### Bi-directional fluid measurement

Contributes to reducing tact time.  
The flow direction can be measured as desired.



## High performance



MEMS stands for Micro Electro Mechanical Systems and refers to ultra-compact devices based on microfabrication technology used in the manufacture of semiconductor integrated circuits.

### Clean-room specifications (Option)

Anti-dust generation packaging (P70) and oil-prohibited specifications (P80) available  
Usage according to the grade of the device is possible.  
\*Refer to catalog No.CB-033SA for details.

### Outgassing supported

Because the flow path is not resin, it is ideal for processes where outgassing is a problem.

## Diversity

### Five-types of gases can be measured with just one unit

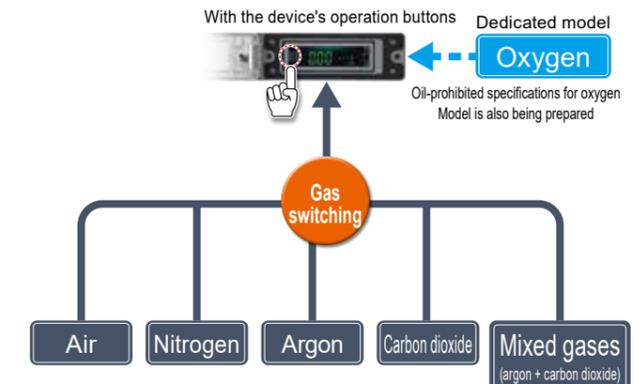
#### Gas switching function

(LCD display) (Model with full scale flow rate of 200 L/min or below:)

Air, nitrogen, argon, carbon dioxide, gas mixture (Mixing ratio Ar: CO<sub>2</sub> (8:2)) can be supported with the single flow rate sensor.

Gases can be switched with operation buttons

\*Contact CKD Sales if you have a request for the mixing ratio.



## Solution examples

### Painting air flow rate control

Change the air pressure and controls flow rate used during coating with the electro pneumatic regulator.



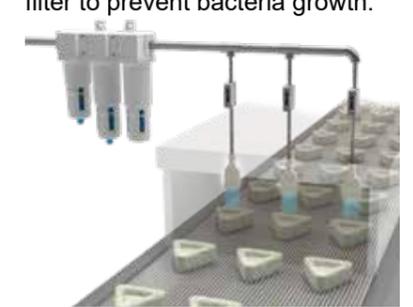
### Arc welding

Manages argon, gas mixtures (argon + carbon dioxide), and other shielding gases.



### Cooling cooked rice

After cooking, rice is cooled over a short period using safe compressed air that has been filtered with a bacteria-removing filter to prevent bacteria growth.



### Series Variation

Appearance	Applicable Fluid	Connection Port Size	Max. flow rate (L/min)										Page			
			0.5	1	2	5	10	20	50	100	200	500		1000		
 FSM3 Series	① Air Nitrogen Carbon dioxide Argon Mixed gases (Argon + Carbon dioxide)	Rc1/8	●	●	●	●	●	●							• LDC display P. 326  • Bar display P. 332	
		Rc1/4							●	●	●					
		Rc1/2										●	●			
		G1/8	●	●	●	●	●	●								
		G1/4							●	●	●					
	G1/2										●	●				
	② Oxygen	NPT1/8	●	●	●	●	●	●								
		NPT1/4							●	●	●					
		NPT1/2										●	●			
														●		●
														●	●	

Compatible with clean-room specifications P70 and P80 Series.

\*Refer to catalog No.CB-033SA for details.

\* Applicable fluids are air and nitrogen only.



Compact flow rate sensor (RAPIFLOW) Environment-resistant specifications

# FSM3 Series

LCD display

●Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)

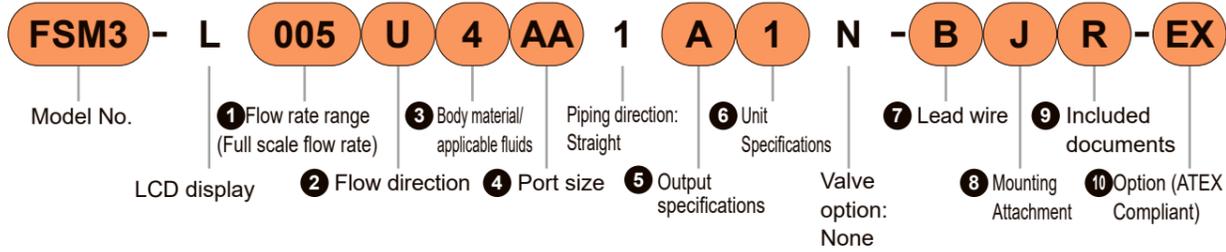


Refer to the CKD website for detailed compatible model Nos.

# FSM3 Series

Model No. Notation Method environment-resistant specifications (LCD display)

## Model No. Notation Method



### 1 Flow rate range (full scale flow rate)\*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

\*1: Refer to the compatibility table below for combinations of the flow rate range and port size.

\*2: For 500 L/min and 1000 L/min, "5" Oxygen cannot be selected for 3 Applicable fluids.

### 3 Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
4	SUS (Environment-resistant specifications)	Air (Gas can be changed)
5		Oxygen (oil-prohibited specifications)*1

\*1: "5" oxygen cannot be selected with the 1 flow rate ranges "501" 500 L/min and "102" 1000 L/min.

### 2 Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

### 4 Port size

Description	Code
	Rc thread
G thread ISO16030	AF BF CF
NPT thread	AC BC CC

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

## Compatibility table of flow rate range and port size

1 Flow rate range	4 Port size									
	AA Rc1/8	BA Rc1/4	CA Rc1/2	AF G1/8	BF G1/4	CF G1/2	AC NPT1/8	BC NPT1/4	CC NPT1/2	
005	●			●			●			
010	●			●			●			
020	●			●			●			
050	●			●			●			
100	●			●			●			
200	●			●			●			
500		●			●			●		
101		●			●			●		
201		●			●			●		
501			●			●			●	
102			●			●			●	

### 5 Output specifications

Code	Description		
	Analog Output	Switch Output	Setting copy function
A	1 points (Voltage output) 1-5V	1 point (NPN)	Yes
B		2 point (NPN)	—
C		1-point output (PNP)	Yes
D		2-point output (PNP)	—
E	1 points Current output 4-20mA	1 point (NPN)	Yes
F		2 point (NPN)	—
G		1-point output (PNP)	Yes
H		2-point output (PNP)	—

### 7 Lead wire

Code	Description
A	5 conductor 1 m
B	5 conductor 3 m

### 9 Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Company certification + Traceability certification

Clean-room specifications (Catalog No.CC-1537A)

FSM3 - . . . . . P70

FSM3 - . . . . . P80

## Model No. Notation for Options

●Bracket Discrete

FSM3 - J

### 6 Unit Specifications

Code	Description
1	SI units only
2	With unit switching function (only for overseas)

Note: "2" unit switching function model cannot be sold in Japan.

### 8 Mounting Attachment

Code	Description
Blank	None
J	Bracket 2

Note: Optional parts are provided with the product.

### 10 Option (ATEX Compliant)

Code	Description
Blank	None
EX	ATEX Compliant

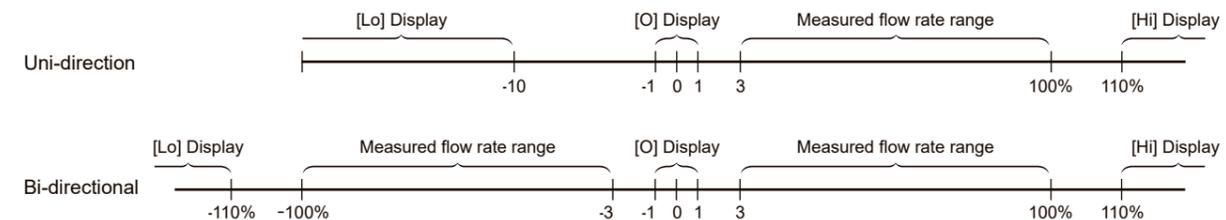
Note: Refer to "ATEX compatible" on Page 352 for specifications. ATEX-compliant products are available only in Europe.

Specifications

Item		FSM3-L [1] [2] [3] [4] 1 [5] [6] N-[ ]											
		[1] Flow rate range (full scale flow rate) code											
		005	010	020	050	100	200	500	101	201	501	102	
Flow direction	②	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	②	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type		4 digit + 4 digit 2 color LCD											
Flow rate display range (□/min) *2	②	U	-49 to 549 mL	-99 to 1099 mL	-0.19 to 2.19 L	-0.49 to 5.49 L	-0.99 to 10.99 L	-1.9 to 21.9 L	-4.9 to 54.9 L	-9.9 to 109.9 L	-19 to 219 L	-49 to 549 L	-99 to 1099 L
		B	-549 to 549 mL	-1099 to 1099 mL	-2.19 to 2.19 L	-5.49 to 5.49 L	-10.99 to 10.99 L	-21.9 to 21.9 L	-54.9 to 54.9 L	-109.9 to 109.9 L	-219 to 219 L	-549 to 549 L	-1099 to 1099 L
Integration display (*3)		Indicator range	0 to ±9999999 mL		0.00 to ±99999.99 L			0.0 to ±999999.9 L			0 to ±9999999 L		
		Pulse output rate	5 mL	10 mL	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L	2 L	5L	10 L
Working Conditions		Applicable fluid *4	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Argon, carbon dioxide (*5), and gas mixture (argon + carbon dioxide)										
			Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)										
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 1.00 MPa										-0.09 to 0.75 MPa
		Proof pressure	1.5 MPa										
Operating ambient temperature / humidity		0 to 50 °C, 90% RH or less											
Storage temperature		-10 to 60°C											
Accuracy *6 (Fluid: in dry air)		Accuracy *7	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability *8	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)					Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)					
Response time *9		50 msec. or less (setting response time OFF)											
Switch Output		A, B, E, F	NPN open collector output (50 mA or less, voltage drop 2.4 V or less)										
		C, D, G, H	PNP open collector output (50 mA or less, voltage drop 2.4 V or less)										
Analog Output *10	⑤	A, B, C, D	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		E, F, G, H	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *11		A, B, C, D	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		E, F, G, H	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *12		45 mA or less											
Lead wire		ø3.7 AWG26 or equivalent *5-conductor, insulator outer diameter ø1.0											
Functions *13		①Gas switching, ②Setting copy function, ③Flow rate integration, ④Peak hold, etc.											
Degree of protection *14		IP65Equivalent											
Protection circuit *15		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											
Mounting	Mounting orientation *16	Unrestricted in vertical/horizontal direction											
	Straight piping section *17	Not required											
Weight		Refer to P. 303.											

\*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65% RH). (For gases other than air: 20°C, 1 barometric pressure (101 kPa), relative humidity 0% RH)

\*2: The displays of various flow rates are as shown below.



\*3: The accumulated flow is a calculated (reference) value. When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times). (Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{5 \text{ min.}} < 1 \text{ million times}$$

When instantaneous flow rate is below 1% it is not counted as integrating flow.

\*4: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO8573-1 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, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m³) for operation. (Refer to P. 347 for details on recommended circuit.) The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

\*5: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range. Output type can also be selected for analog output.

Gas type	Flow direction	Measured flow rate range (□/min)										
		005	010	020	100	200	500	101	201			
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L			
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to 0.06 L	-5.00 to 0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L			
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L			

Gas type	Flow direction	Analog Output			
		Output A		Output B	
		Voltage	Current	Voltage	Current
Carbon dioxide	Uni-direction	1 to 3 V	4 to 12 mA	1 to 5 V	4 to 20 mA
	Bi-direction	2 to 4 V	8 to 16 mA	1 to 5 V	4 to 20 mA

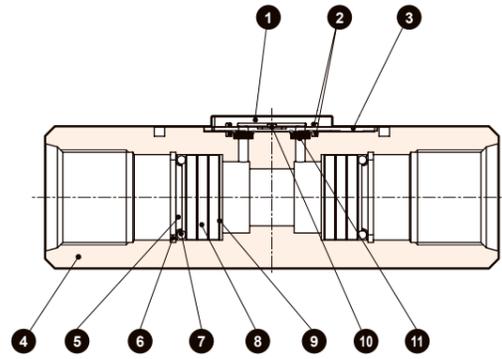
- \*6: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.
- \*7: Accuracy is based on CKD's standard flow rate meter and does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.
- \*8: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)
- \*9: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.
- \*10: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
- \*11: The power supply voltage specifications differ for the voltage output type and current output type.
- \*12: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.
- \*13: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. Full scale flow rate and analog output after changing gas is as follows. (Note that the gas change function cannot be set with the oxygen, 500 L/min, and 1000 L/min models.) For carbon dioxide, refer to \*5.

Gas type	Flow direction	Measured flow rate range (□/min)										
		005	010	020	100	200	500	101	201			
• Air • Nitrogen • Argon	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L			
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L			
• argon 80% + carbon dioxide 20%		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L			

The "setting copy function" can be selected under "⑤Output Specifications". Note that the "External input" function is not available on models on which the "Copy function setting" is enabled.

- \*14: Be sure to read the precautions in "Working environment" on P. 347 and "ATEX compatible" on P. 352.
- \*15: The protection circuitry in this product is only effective against certain misconnections and short-circuits in the load and does not protect against all misconnections.
- \*16: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.
- \*17: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

● LCD display FSM3-L



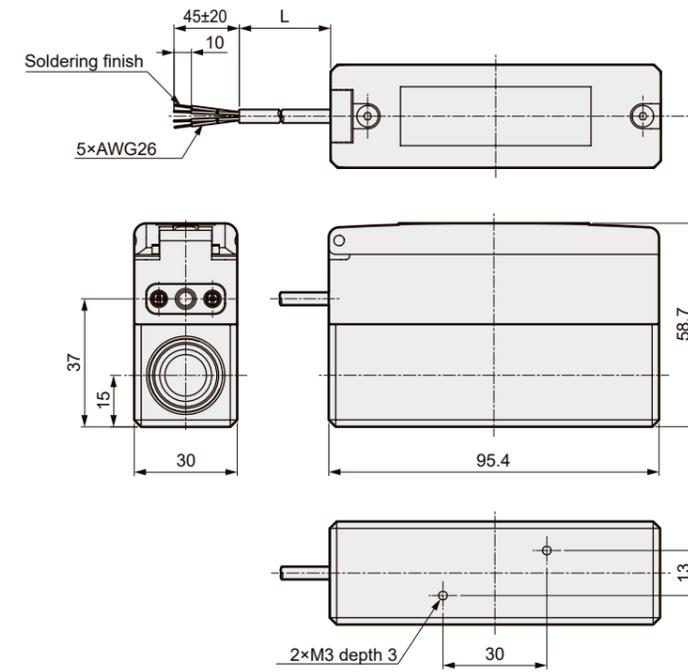
Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	SUS316 or equivalent	7	O-ring	FKM
2	Gasket	FKM	8	Spacer	SUS304
3	Sensor board	—	9	Filter	SUS304
4	Sensor body	SUS316L	10	Sensor chip	—
5	O-ring holder	SUS304	11	Filter	SUS304
6	C-snap ring	SUS304			

Product weight

[Unit: g]

Code [4]	Port size		Weight
	Description		
AA	Rc1/8 Straight		750
BA	Rc1/4 Straight		690
CA	Rc1/2 Straight		590
AF	G1/8 Straight		750
BF	G1/4 Straight		690
CF	G1/2 Straight		590
AC	NPT 1/8 Straight		750
BC	NPT 1/4 Straight		690
CC	NPT 1/2 Straight		590

Dimensions

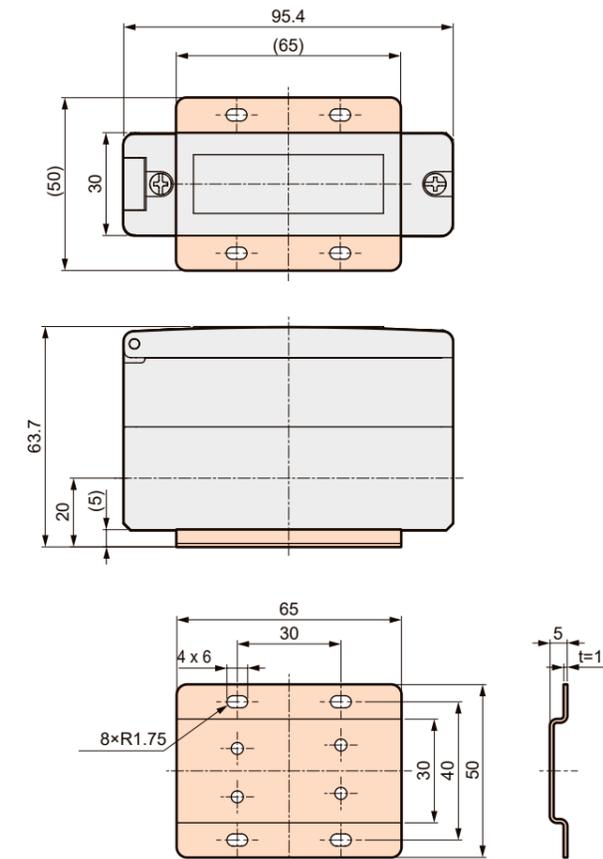


[Lead wire length]

Lead wire code	L dimensions
A	1000±20
B	3000±20

Optional dimensions

●FSM3-J  
Bracket 2



Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit



Compact flow rate sensor (RAPIFLOW) Environment-resistant specifications

# FSM3 Series

Bar display

●Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)

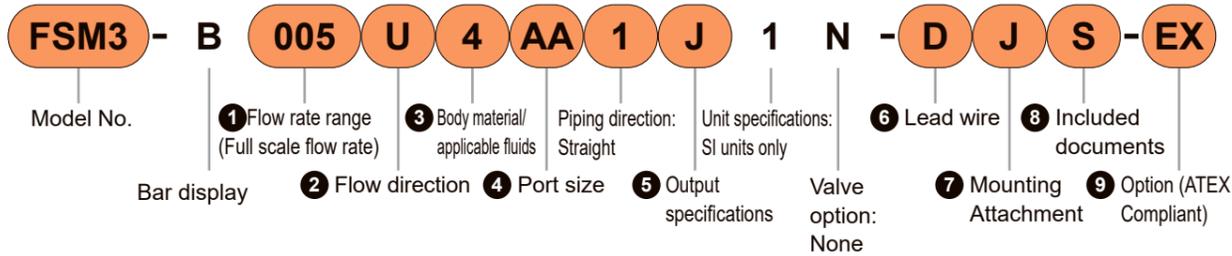


Refer to the CKD website for detailed compatible model Nos.

# FSM3 Series

Model No. Notation Method environment-resistant specifications (bar display)

## Model No. Notation Method



### 1 Flow rate range (full scale flow rate)\*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

\*1: Refer to the compatibility table below for combinations of the flow rate range and port size.

\*2: For 500 L/min and 1000 L/min, "5" Oxygen cannot be selected for 3 Applicable fluids.

### 2 Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

### 3 Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
4	SUS (Environment-resistant specifications)	Air
5		Oxygen (Oil-prohibited specifications) *1

\*1: For 1 Flow rate range "501" 500 L/min and "102" 1000 L/min, "5" oxygen cannot be selected.

### 4 Port size

Description	Code	
	Rc thread	AA BA CA
G thread ISO16030	AF BF CF	
	NPT thread	AC BC CC

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

## Compatibility table of flow rate range and port size

Flow rate range	Port size									
	AA	BA	CA	AF	BF	CF	AC	BC	CC	
	Rc1/8	Rc1/4	Rc1/2	G1/8	G1/4	G1/2	NPT1/8	NPT1/4	NPT1/2	
005	●			●			●			
010	●			●			●			
020	●			●			●			
050	●			●			●			
100	●			●			●			
200	●			●			●			
500		●			●			●		
101		●			●			●		
201		●			●			●		
501			●			●			●	
102			●			●			●	

### 5 Output specifications

Code	Description
J	Analog voltage output × 1 point
K	Analog current output × 1 point

Note: When using in combination with a separated display (FSM2-D), select "J".

### 6 Lead wire

Code	Description
C	4 conductor 1 m
D	4 conductor 3 m

### 7 Mounting Attachment

Code	Description
Blank	None
J	Bracket 2 

Note: Optional parts will come with the product.

### 8 Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Company certification + Traceability certification

### 9 Option (ATEX Compliant)

Code	Description
Blank	None
EX	ATEX Compliant

Note: Refer to "ATEX compatible" on Page 352 for specifications. ATEX-compliant products are available only in Europe.

Clean-room specifications (Catalog No. CC-1537A)

FSM3 - . . . . . P70

FSM3 - . . . . . P80

## Model No. Notation for Options

●Bracket Discrete

FSM3 - J

Flow rate sensor

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Specifications

Item		FSM3-B [1] [2] [3] [4] [5] [6] N-[ ]											
		[1] Flow rate range (full scale flow rate) code											
		005	010	020	050	100	200	500	101	201	501	102	
Flow direction	②	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	②	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type		LED bar display											
Working Conditions	Applicable fluid *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)											
	Temperature range	0 to 50°C (no condensation)											
	Pressure range	-0.09 to 1.00 MPa										-0.09 to 0.75 MPa	
	Proof pressure	1.5 MPa											
Operating ambient temperature / humidity		0 to 50°C, 90% RH or less											
Storage temperature		-10 to 60°C											
Accuracy	Accuracy *3	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")											
	Repeatability *4	Within ±1%F.S. (Secondary side released to atmosphere)											
	Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)											
	Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)										Within ±5%F.S. (-0.09 to 0.7 MPa, 0.35 MPa reference)	
Response time *5		50 msec. or less											
Analog Output *6	⑤	J	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		K	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *7		J	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		K	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *8		45 mA or less											
Lead wire		ø3.7 AWG26 or equivalent × 4-conductor, insulator outer diameter ø1.0											
Degree of protection *9		IP65Equivalent											
Protection circuit *10		Power reverse connection protection											
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8											
Mounting	Mounting orientation *11	Unrestricted in vertical/horizontal direction											
	Straight piping section *12	Not required											
Weight		Refer to P. 303.											

- \*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65% RH) (Conditions for gas-types other than air are 20 °C, 1 barometric pressure (101 kPa), relative humidity 0%)
- \*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with 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, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m<sup>3</sup>) for operation. (Refer to P. 347 for details on recommended circuit.) The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.
- \*3: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.
- \*4: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)
- \*5: The actual response time changes depending on the piping conditions.
- \*6: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
- \*7: The power supply voltage specifications differ for the voltage output type and current output type.
- \*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.
- \*9: Be sure to read the precautions in "Working environment" on Page 347 and "ATEX compatible" on P. 352.
- \*10: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
- \*11: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.
- \*12: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

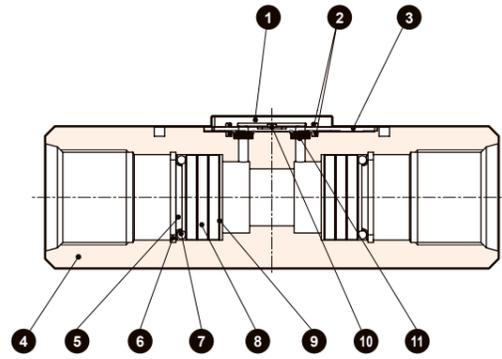
Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

●Bar display FSM3-B



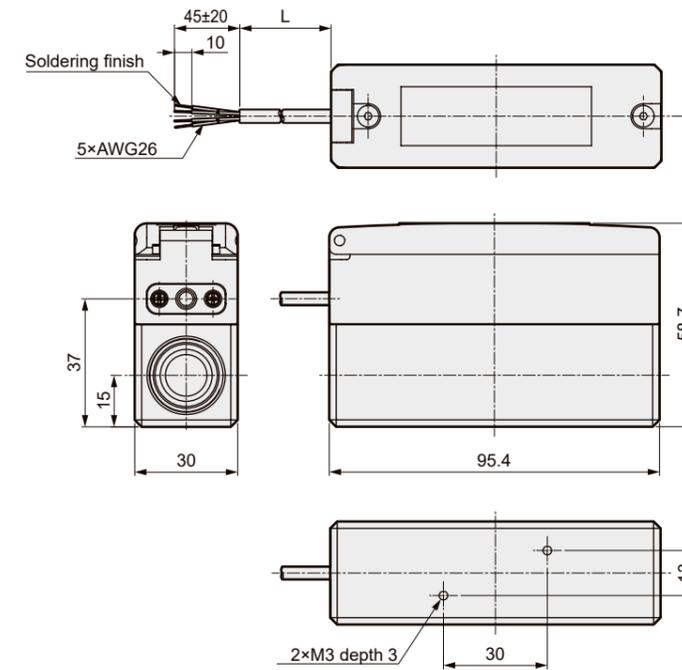
Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	SUS316 or equivalent	7	O-ring	FKM
2	Gasket	FKM	8	Spacer	SUS304
3	Sensor board	—	9	Filter	SUS304
4	Sensor body	SUS316L	10	Sensor chip	—
5	O-ring holder	SUS304	11	Filter	SUS304
6	C-snap ring	SUS304			

Product weight

[Unit: g]

Code [4]	Port size		Weight
	Description		
AA	Rc1/8 Straight		740
BA	Rc1/4 Straight		680
CA	Rc1/2 Straight		580
AF	G1/8 Straight		740
BF	G1/4 Straight		680
CF	G1/2 Straight		580
AC	NPT 1/8 Straight		740
BC	NPT 1/4 Straight		680
CC	NPT 1/2 Straight		580

Dimensions

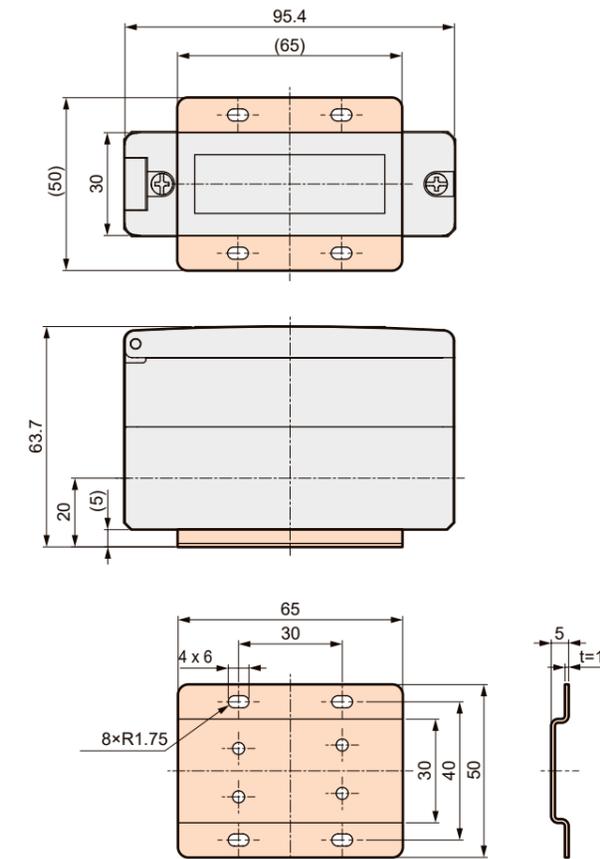


[Lead wire length]

Lead wire code	L dimensions
C	1000±20
D	3000±20

Optional dimensions

●FSM3-J  
Bracket 2



Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

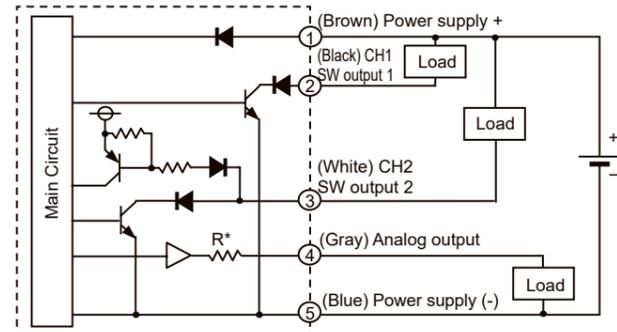
Compact flow sensor (liquid)

Water Manifold Unit

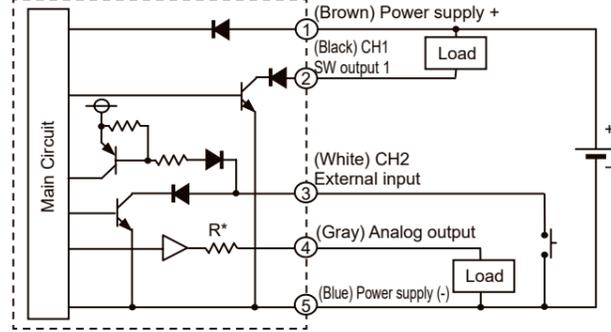
Example of internal circuit and load connection

●FSM3-L□□□□□B/F/□□ (LCD display type NPN output)

[When using CH2 as SW output]



[CH2 is used as external input]

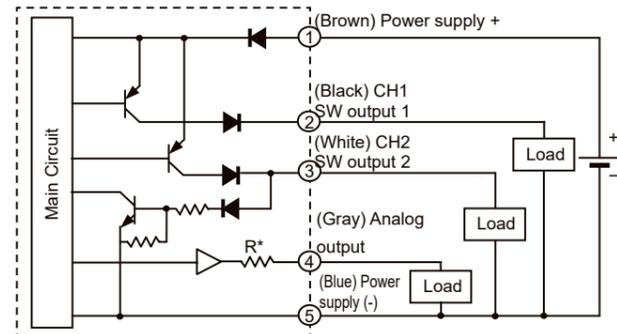


\*Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

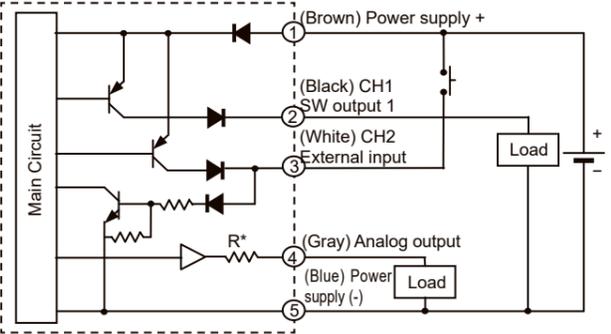
Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1: max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM3-L□□□□□D/H/□□ (LCD display type PNP output)

[When using CH2 as SW output]



[CH2 is used as external input]



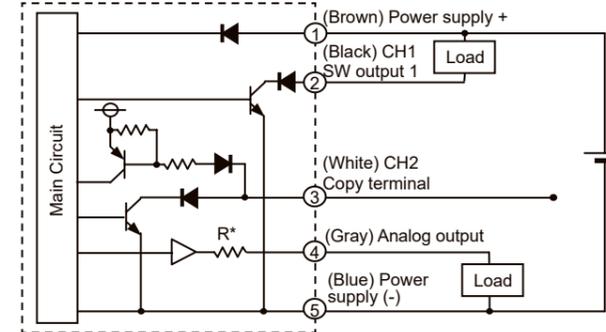
\*Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1: max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

Example of internal circuit and load connection

●FSM3-L□□□□□A/E/□□ (LCD display, NPN output, with setting copy function)

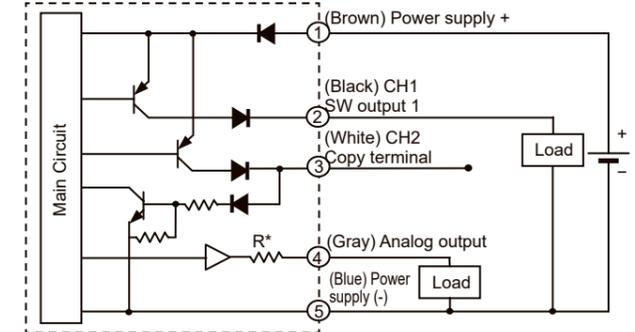
(LCD display, NPN output, with setting copy function)



\*Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

●FSM3-L□□□□□C/G/□□ (LCD display, PNP output, with setting copy function)

(LCD display, PNP output, with setting copy function)

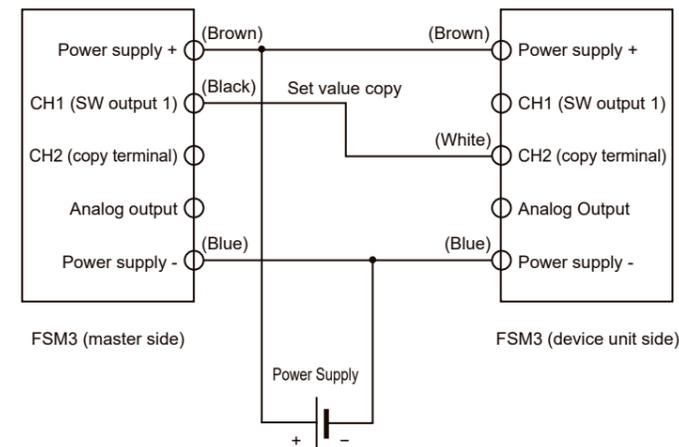


\*Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1: max 50 mA)
③	White	CH2 (copy terminal)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM3-L□□□□□A/C/E/G/□□ (LCD display, with setting copy function)

[When using the setting copy function]



Connect CH1 (SW output 1) on the master side to CH2 (copy terminal) on the device unit side and power ON the sensor to use the setting copy function (F93). Note that this connection can only be used when using the setting copy function. As in the above load connection example, if copying is performed with the load connected to CH1 or the switch is operated with CH1 and CH2 connected, the device may operate unexpectedly or the device and NS-QFS may breakdown. Never use the product while connected to the copy terminal.

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

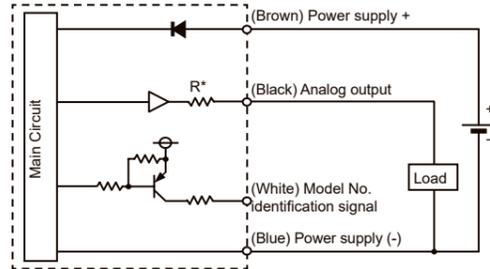
Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Example of internal circuit and load connection

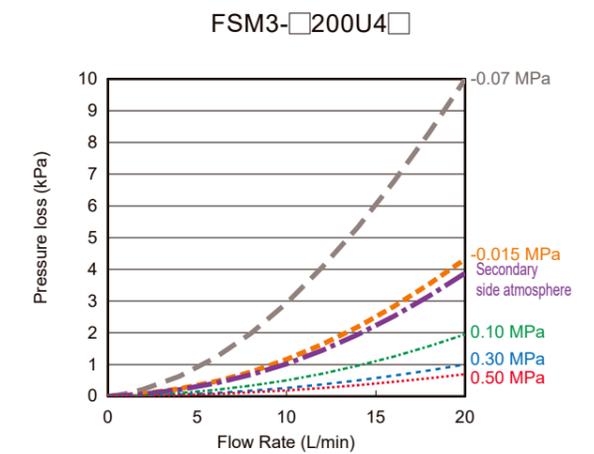
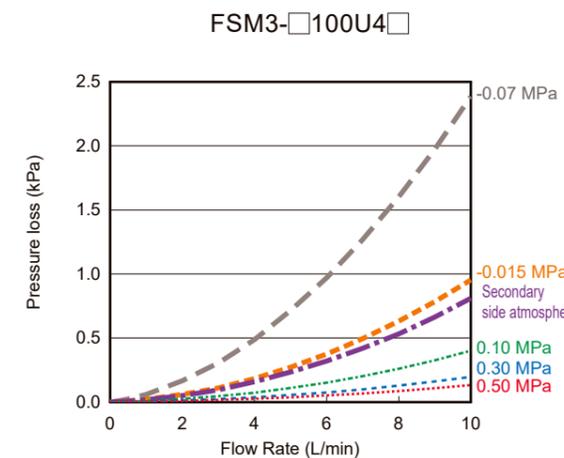
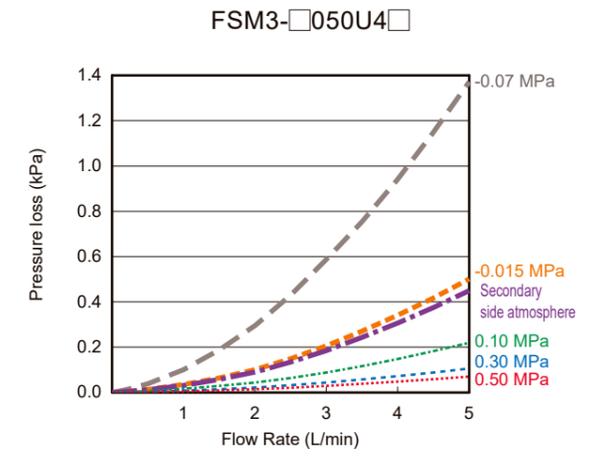
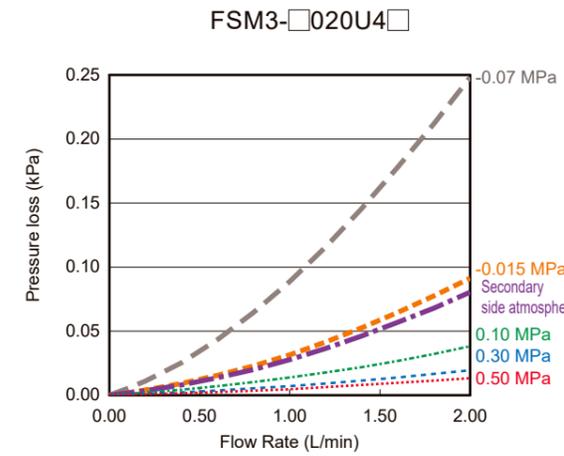
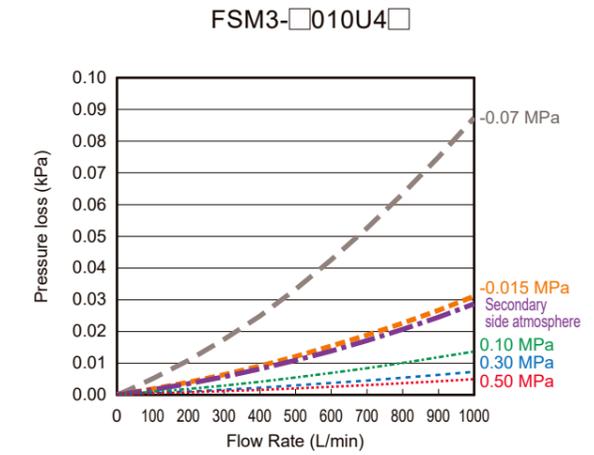
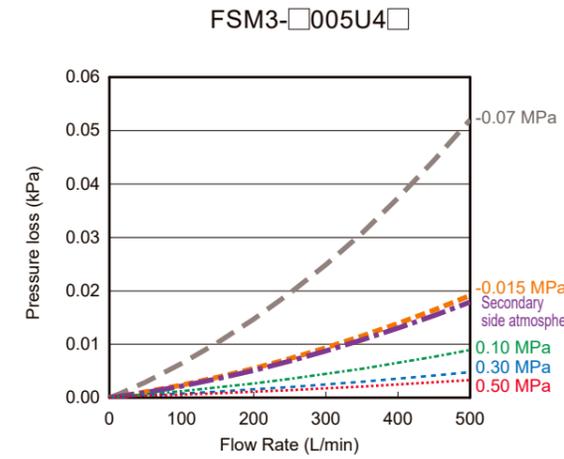
●FSM3-B□□□□□J/K/□□ (bar display)



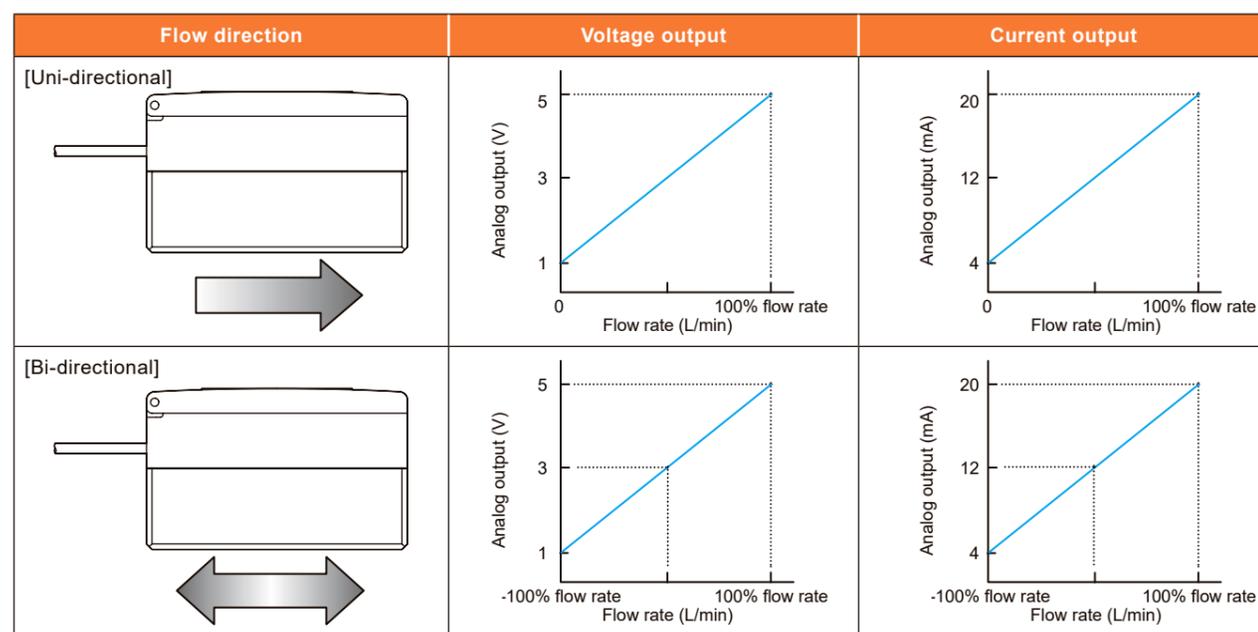
\*: Analog output voltage output R: approx. 1 kΩ  
Analog output voltage output R: approx. 100 Ω

Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	Analog Output Voltage output: 1-5 V Load impedance 50 kΩ and over Current output: 4-20 mA Load impedance 300 Ω or less
③	White	Model identification signal: do not connect when using as a single unit
④	Blue	Power supply - (GND)

Pressure loss characteristics (air)



Analog output characteristics



\*1: The full scale of the uni-directional-type is 0 to 100%, and full scale of the bi-directional-type is -100% to 100%. With the integrated display bi-directional type, output can be changed to uni-direction. The value after switching is a reference value. Refer to P. 345 for details.

\*2: Refer to P. 329 for analog output when carbon dioxide is switched to.

\*3: Analog output is available even outside the measurement flow rate range. Although the accuracy is not guaranteed, the lower and upper limits for voltage can be output at about 0.6 V and 5.4 V, respectively, and the lower and upper limits for current can be output at about 2.4 mA and 21.6 mA, respectively. For bi-direction, the lower and upper limits for voltage can be output at about 0.8 V and 5.2 V, respectively, while the lower and upper limits for current can be output at about 3.2 mA and 20.8 mA, respectively.

The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline. Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41, oxygen: 1.11

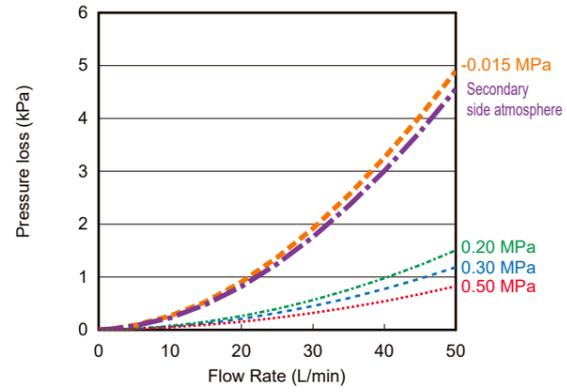
# FSM3 Series

Environment-resistant specifications

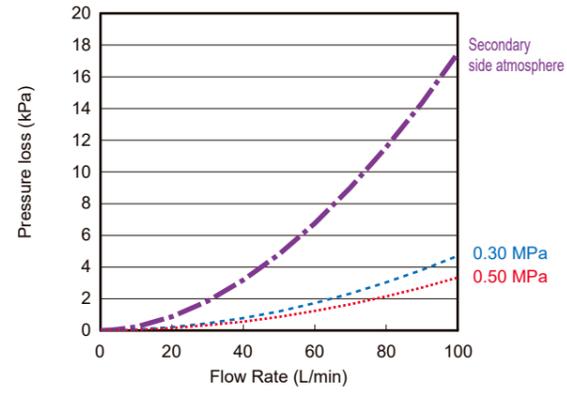
Pressure loss characteristics (air)

MEMO

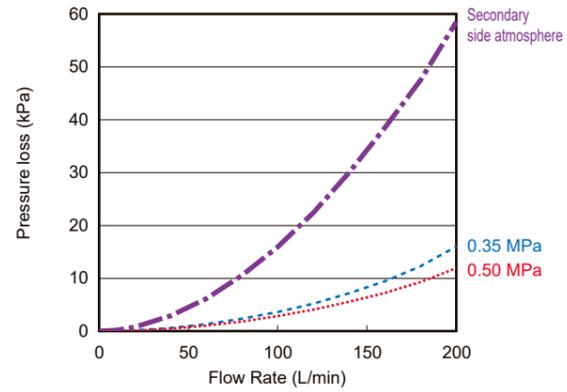
FSM3-□500U4□



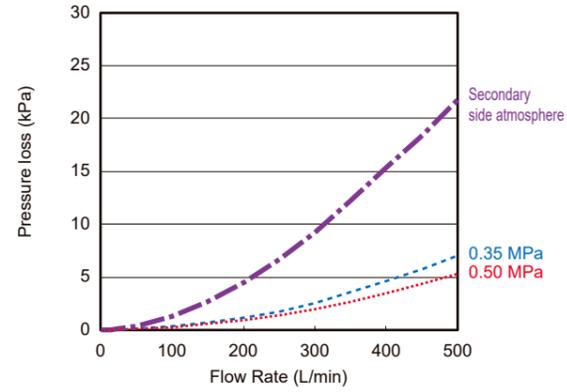
FSM3-□101U4□



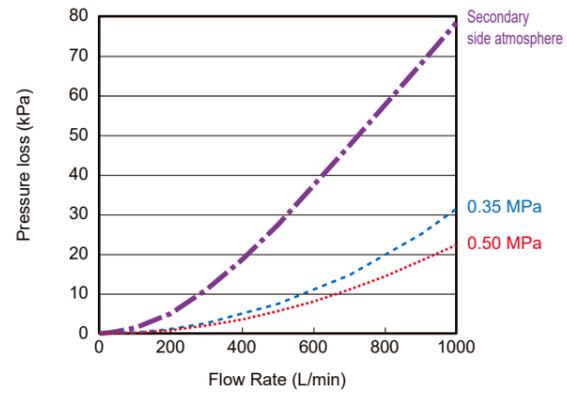
FSM3-□201U4□



FSM3-□501U4□



FSM3-□102U4□



The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.  
 Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41, oxygen: 1.11  
 (Excluding flow rate range (full scale flow rate) 501 and 102)

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

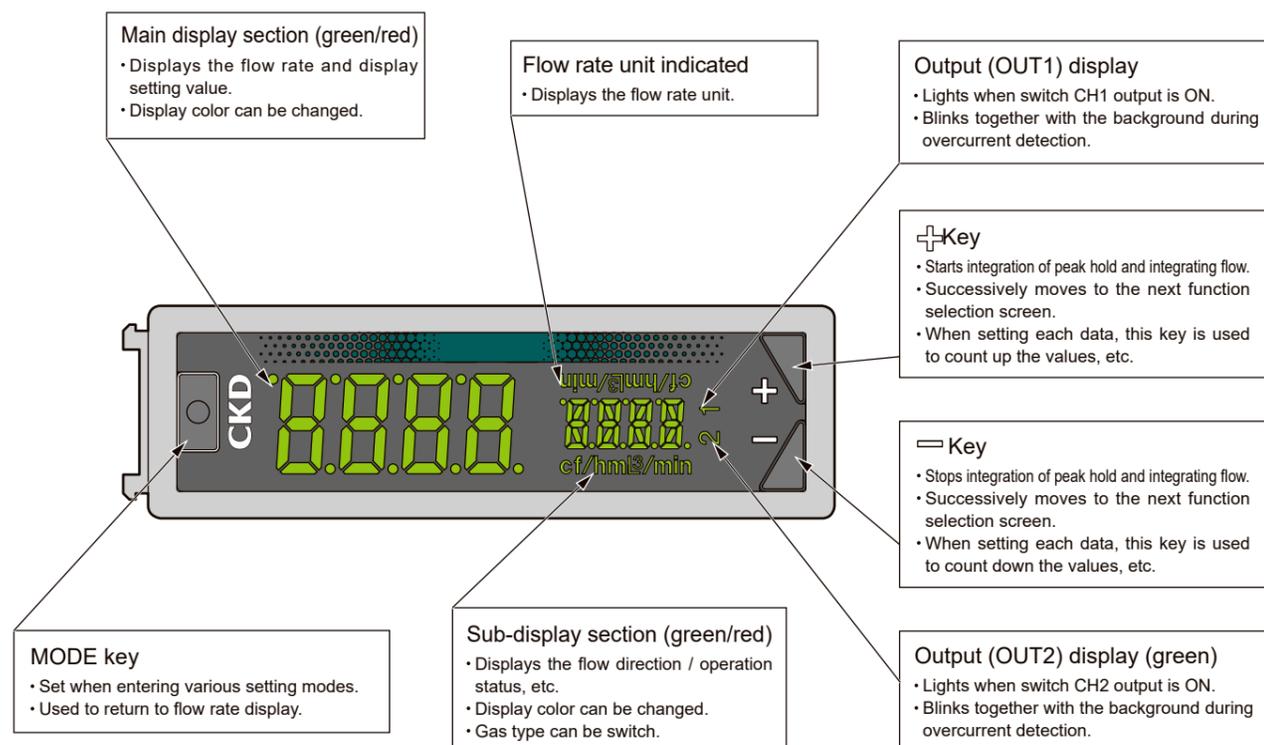
Compact flow sensor (liquid)

Water Manifold Unit

Ending

Names and functions of display/operation section (LCD display)

Indicator section name



Names and functions of display/operation section (LCD display)

The function and various settings may be performed during normal flow rate display or after entering each mode. The modes are also divided into Maintenance mode, SET mode, and Setting Monitor mode according to the frequency of use.

Normal Operation (RUN mode)

Item	Explanation	Default setting
Instantaneous flow rate display	Indicators the instantaneous flow rate.	Indicator (measurement)
Peak hold function	Max. and min. values for the flow rate within a set interval are displayed.	Hidden (Stopped)
CO <sub>2</sub> Discharge rate display	By setting the power, discharge pressure, and flow rate of the compressor, as well as the power ↔CO <sub>2</sub> conversion coefficient, you can learn how much CO <sub>2</sub> is being discharged. (reference value obtained by calculation) This is available only when the gas-type is set to air.	Hidden (Stopped)
Accumulated flow display	The accumulated flow can be displayed. The switch output function includes a function to turn the switch ON/OFF at a level higher than the recommended cumulative value, and an integrated pulse function to output the pulse at a set cumulative value.	Non-display (measurement)

SET mode

No.	Item	Explanation	Default setting
F.01	Selection of CH1 operation	Select the CH1 feature. Switch output operation and integrated pulse settings can be set.	No switch output
F.02	Selection of CH2 operation	Select the CH2 feature. Select whether to use CH2 as a switch output, or to use as an external input (integrated value reset/auto reference).	No switch output
F.03	Integrating function settings	You can choose to acquire integrating flow values consecutively or at set times. You can also choose to keep the data or not.	Continuous acquisition: Data hold OFF
F.04	Sub-screen display setting	Sets the display method for the sub-display. The display can be switched to "flow direction", "reference state", "gas type", or "numbering display".	Flow direction
F.05	Indicator color setting	Set the display color. (red, green) Display color can be set for normal display and when switch output is ON.	At normal: Green At switch ON: Red
F.06	Flow rate direction setting (Bi-directional only)	Setting the flow direction. Setting available for bi-directional, one-sided forward direction or one-sided reverse direction.	Bi-direction
F.07	Indicator inversion function	The LCD display can be vertically inverted.	Standard display
F.08	Reference state setting	Select from the standard state or reference state. Standard condition (ANR): flow rate converted to volume at 20°C, 1 atm, 65%RH (For gas-types other than air: 20 °C, 1 barometric pressure, 0% RH) Reference condition (NOR): flow rate converted to volume at 0°C, 1 atm, 0% RH	ANR
F.09	Unit setting (For overseas only)	The units can be set. Can be selected from L/min, cf/h (cf/min).	Domestic model: L/min Overseas model: L/min
F.10	Indicator cycle setting	The digital display refresh cycle can be set in three stages from 0.25 sec to 1 sec. If the display flickers, it can be improved by increasing the display refresh cycle.	0.5 sec
F.11	Analog output Setting response time	Set the response time. The response can be set in seven steps from 0.05 sec to 1.50 sec. Chattering and mis-operation caused by sudden flow rate changes or noise are prevented.	0.05 sec
F.12	Numbering setting	You can set the numbering.	0000
F.13	Gas switching	The measured gas can be switched. (Model with full scale flow rate of 200 L/min or below) (O <sub>2</sub> The gas type cannot be switched.)	Air
F.14	Setting ECO mode	An ECO mode can be set. If the buttons are not operated for approx. 1 minute, the eco mode will activate and turn OFF the display's backlight. Current consumption can be reduced with this mode.	OFF
F.15	CO <sub>2</sub> Discharge rate calculation setting	CO <sub>2</sub> The discharge rate calculation can be set. Power, discharge pressure, flow rate, C of the compressor O <sub>2</sub> Set the conversion factor.	• Power: 0.20 KW • Pressure: 0.10 MPa • Flow rate: 100 L/min • Conversion factor: 0.000kg (CO <sub>2</sub> ) / kwh
F.16	Lock setting	Key lock method and PIN method can be set. Use selectively depending on the working environment.	OFF
F.17	Peak hold setting	You can choose to acquire peak bottom values consecutively or at set times. You can also choose to keep the data or not.	Continuous acquisition: Data hold OFF

Maintenance mode

No.	Item	Explanation	Default setting
F.91	Forced output function	Forces the switch output to turn ON and is used to check the initial operation of wiring connections and input devices.	-
F.92	Zero adjustment	The zero point deviation is compensated.	Adjust value: 000
F.93	Setting copy function	Set values can be copied if the model supports copying between two FSM3's. (Copying is only possible between products with the same model No.)	-
F.99	Reset function	Returns the settings to the default settings.	-

Setting Monitor mode

Item	Explanation	Default setting
Settings monitor function	You can check the settings made in the SET mode. (Setting details cannot be edited.)	-

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)

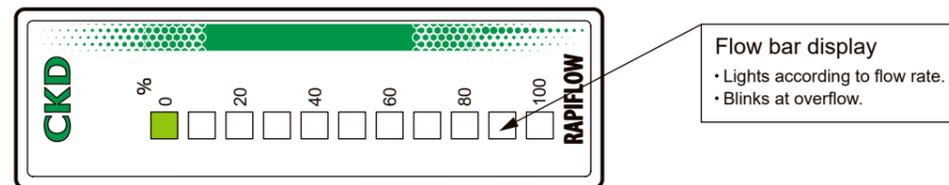
Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

## Names and functions of display/operation section (bar display-type)

### Indicator section name



[Display example] Display for FSM3-B101□□□□□□□□.

Flow rate	Uni-direction	Bi-directional
0		
60 (Forward direction)		
+110% (Forward direction) Blinks at overflow. *Blinks at +110%F.S. and over.		
-10% (Reverse direction)		
-110% (Reverse direction)		



Pneumatic components (sensors)

## Safety Precautions

Be sure to read this section before use.

For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Compact flow rate sensor FSM3 Series Environment-resistant specifications

### Design / Selection

#### Working fluids

#### ⚠ DANGER

- Never use this product with flammable fluids.

#### ⚠ WARNING

- This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. Intended applications include industrial sensors.

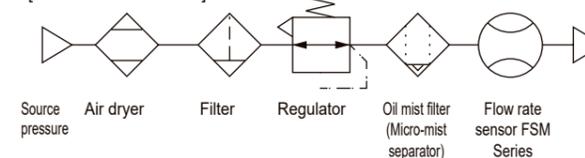
- Do not use fluids which are not applicable.

- Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.

- When installing the product during piping or fitting assembly, use the above clean gas for the fluid used to blow out for cleaning. Check that foreign matter does not enter the product from the port of the product. When using compressed air in this process, use clean air compliant with the air quality listed in the following item (ISO 8573-1 Class 2010 1.1.1 to 1.6.2).

- When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Since compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), attach a filter, an air dryer and an oil mist filter (Micro-mist separator) to the primary side (upstream) of the sensor. The sensor's mesh rectifies flow in the pipe. It does not filter out foreign matter, so provide a filter.

[Recommended circuit]



- Depending on the fluid, retaining the fluid for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

#### Working pressure/flow rate range

Applications exceeding the max. working pressure and specified flow rate range may result in breakdown. Use this product only within the specified range. If energized in a vacuum state of -0.09 MPa or less, the sensor's heat dissipation will suffer, leading to degradation of the sensor.

- When using a valve on the primary side of the sensor, use only valves with oil-prohibited specifications. This sensor could malfunction or fail if exposed to splattering grease, oil, etc. As friction powder may be generated depending on the valve, mount a filter to prevent the powder from entering the sensor.

- The sensor for oxygen gas is a custom model. To prevent ignition accidents, treat the inside of the flow paths on oxygen models in accordance with oil free specifications. Do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

- When using liquefied gas such as carbon dioxide, always vaporize it first. Failure may result if liquefied gas enters the product.

#### Working environment

#### ⚠ DANGER

- Flammable environment  
Refer to "ATEX Compliance" on P. 352 for safety precautions.

#### ⚠ WARNING

- Corrosive environment  
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

#### Ambient/fluid temperatures

Use at ambient/fluid temperatures within the specified range of 0 to 50°C. Even if the temperature is within the specified range, do not use this product if the ambient temperature and fluid temperature could suddenly change and cause dew to condense.

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

Ending

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

Ending

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■ Degree of protection

The degree of protection of this product is equivalent to IP65. This product employs a dust-proof, waterproof structure that provides reliability during maintenance and cleaning, during which it may be exposed to water splashing. Note that this product cannot be used in environments where it will be constantly exposed to water, or in water or where water or oil may exude violently. Also refer to the precautions regarding "explosion-proof structures and protective structures" on Page 351 for design and selection.

Flow rate unit

⚠ CAUTION

■ This product's flow rate is measured at a mass flow rate unaffected by temperature or pressure. The unit is L/min, but this is the display when the mass flow rate is converted to volumetric flow rate at 20°C 1 atmosphere (101 kPa) relative humidity 65%RH. (Conditions for gas-types other than air are 20°C, 1 barometric pressure (101 kPa), relative humidity 0%)

Overflow

⚠ CAUTION

■ With each series, no problem will occur in the sensor, even in an overflow double the measured range. If dynamic pressure is applied near the maximum working pressure (when a pressure difference exceeding the max. working pressure is applied between primary and secondary sides), a problem could occur with the sensor. When dynamic pressure is applied, such as when filling a workpiece for leakage inspection, be sure to provide a bypass circuit or a squeezer to prevent dynamic pressure from being applied to the sensor.

Use for suction confirmation, etc.

⚠ CAUTION

- Mount an air filter upstream from suction in compliance with the working status to prevent the entry of foreign matter.
- Use the product under conditions where no condensation occurs in the piping, taking into consideration the dew point of the atmosphere and the ambient temperature of the product.
- Select the flow rate range based on the operating vacuum pressure and suction nozzle.
- Response speed may be delayed by the piping volume between the suction nozzle and this product. In this case, take countermeasures to reduce piping capacity.
- When the suction confirmation sensor is switched from a pressure sensor (switch) to a flow rate sensor (switch), sensor output (switch output) logic will be reversed. (Refer to the drawing below.) Note that the PLC sequence program must be changed or revised. If source pressure or vacuum source is not supplied when device power is turned ON, "flow rate 0" = "sensor output (switch output) ON" status is set at the flow rate sensor (switch). Check that this occurs with the PLC sequence program, etc.

	Pressure sensor (switch)	Flow rate sensor (switch)
	ON at setting value or more	ON at setting value or less
Suction confirmation		

Piping

⚠ CAUTION

- Do not install a pressure reducing valve (regulator), solenoid valve, etc. immediately before this product. Deflected currents may occur and cause errors. Provide a straight pipe with approx. 10 times the bore size when necessary.
- Be sure to connect a fitting even when using with the OUT side opened. The port filter could come off.
- Do not rotate fittings while fluid pressure is still applied to this product. The sealant parts could seize or wear, leading to external leakage.
- Establish the installation method, piping order, and fitting assembly method from the design stage before use. Check that sealing tape, sealant, and foreign matter do not enter the product during installation and fitting assembly. In particular, freshly piped sections may contain unexpected foreign matter. Be sure to discharge air with air blow, etc., before installing this product.

Mounting

⚠ CAUTION

- The LCD display flow rate meter uses a liquid crystal display. This may be difficult to read depending on the angle.
- Do not install multiple product bodies in close contact. The generation of heat on each part could cause the product's temperature to rise, hastening changes in characteristics or deterioration of the resin material. When using the products in a row, set intervals of distance of 10 mm and over.
- Although the mounting is "unrestricted in vertical/horizontal direction", the flow rate may vary depending on difference in the mounting orientation or piping conditions.

Wiring

⚠ WARNING

- Install the product and wiring as far away as possible from sources of noise such as power distribution wires. Provide separate countermeasures for surge applied to the power cable. The display or output could fluctuate.
- The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using. (The analog/current output type is excluded.)

Example of calculation

$$\begin{aligned} & \left( \begin{array}{l} \text{FSM3-voltage output impedance: } R_o = 1\text{k}\Omega \\ \text{Load internal impedance: } R_x = 1\text{M}\Omega \end{array} \right) \\ & \text{Output value} = \left( 1 - \frac{R_o}{R_o + R_x} \right) \times 100\% \\ & = \left( 1 - \frac{1\text{k}\Omega}{1\text{k}\Omega + 1\text{M}\Omega} \right) \times 100\% \Rightarrow \text{approx. } 0.1\% \end{aligned}$$

- Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated power supply could result in electrical shock. If power is not stabilized, the peak value could be exceeded. This could damage the product or impair accuracy.
- The power supply is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. Between the internal power circuit and metal body, a varistor (limit voltage approx. 40 V) is connected to prevent dielectric breakdown of the sensor. Do not conduct a withstand voltage test or insulation resistance test between the internal power circuit and metal body. Disconnect wiring first if this testing is required. An excessive potential difference between power and metal body will burn internal parts. An excessive potential difference between the power supply and product housing will burn internal parts. After installing, connecting and wiring the unit, electrical welding of the device/frame, short-circuit accidents, etc., could cause welding current, excessively high voltage caused by welding, or surge voltage, etc., to run through the wiring, ground wire, or fluid path connected between the above devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

- Check that stress (10 N and over) is not directly applied to lead wire leadouts.

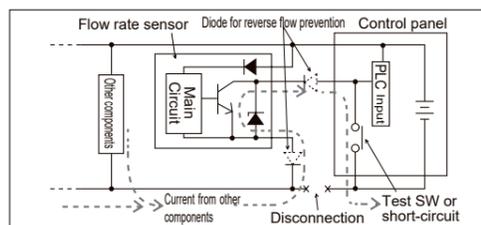
Flow rate sensor

Compact flow sensor (gas)  
Compact flow sensor (air)  
Compact flow sensor (liquid)  
Water Manifold Unit

Flow rate sensor

Compact flow sensor (gas)  
Compact flow sensor (air)  
Compact flow sensor (liquid)  
Water Manifold Unit

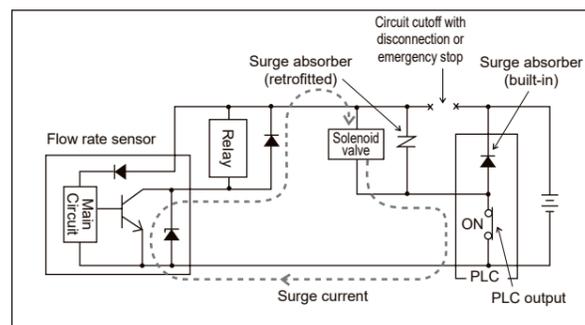
■ Pay attention to reverse currents caused by disconnected wires and wiring resistance. If other devices, including a flow rate sensor, are connected to the same power supply as the flow rate sensor, and the switch output wire and power cable negative (-) side are short-circuited to check the operation of the control panel input unit, or if the power cable negative (-) side is disconnected, reverse current could flow to the flow rate sensor's switch output circuit and cause damage.



■ Take the following measures to prevent damage caused by reverse current:

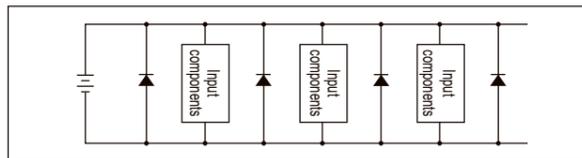
- ① Avoid centralizing current at the power cable, especially the minus side power cable, and use as thick a cable as possible.
- ② Limit the number of devices connected to the same power source as the flow rate sensor.
- ③ Insert a diode parallel to the flow rate sensor's output line to prevent reverse current.
- ④ Insert a diode parallel to the flow rate sensor power wire's negative (-) side to prevent reverse current.

■ Pay attention to surge current flow-around. When flow rate sensor power is shared with an inductive load that generates surges, such as a solenoid valve or relay, if the circuit is cut off while the inductive load is functioning, surge current could enter the switch output circuit and cause damage depending on where the surge absorber is installed.



Take the measures below to prevent damage from sneak surge current.

- ① Separate the power supply for output including the inductive load, such as the solenoid valve and relay, and input, such as the flow rate sensor.
- ② If a separate power supply cannot be used, directly install a surge absorption element for all inductive loads. Consider that the surge absorber connected to the PLC, etc., protects only the individual device.
- ③ Connect a surge absorber to places on the power wiring shown in the figure below, as a measure against disconnections in unspecified areas.



When the devices are connected to a connector, the output circuit could be damaged by the above phenomenon if the connector is disconnected while the power is ON. Turn power OFF before connecting or disconnecting the connector.

### Other

#### ⚠ WARNING

##### ■ CE-compliance working conditions

This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:

##### Conditions

- The evaluation of this product is performed by using a lead wire that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■ Output accuracy is affected by self-heating due to energization as well as temperature characteristics. Provide a standby time (5 minutes or more) after turning the power ON for use.

■ Immediately after power is turned ON, flow rate detection switch operation is not performed for approx. 5 seconds to complete self-diagnosis. Provide a control circuit/program that ignores signals for at least two seconds after power is turned ON.

#### ⚠ CAUTION

■ The flow path is not completely free of dust generation, so if dust generation is a problem, a final clean filter should be used in conjunction.

■ If the actual flow rate is fluctuating, the measured flow rate value also fluctuates. Increase the FSM3 display cycle or response time, or average the analog output on the device. In particular, using a circuit that opens and closes the control valve such as a solenoid valve frequently in a short time or near a pump is likely to cause damage.

■ Measuring the pulsating flow rate may cause errors in the measured flow rate. Use the fixed orifice and needle valve, etc., to restrict the flow rate and set the laminar flow state (normal flow without irregular fluctuations).

■ The flow rate measured with the gas switching function is a reference value calculated inside the product based on the converted value. Accuracy other than in air mode is a guideline.

■ This product uses a micro-sensor chip, and must be installed where it will not be subject to dropping, impact or vibration. Handle this product as a precision component during installation and transportation.

■ Use the product within the rated flow range.

■ Use within the working pressure.

■ Analog output continues even if the flow rate range is exceeded. With the LCD display, "Hi" or "Lo" will be displayed. With the bar display, the bar display will blink. Note that this is outside the guaranteed precision.

■ The accuracy may vary from the initial status depending on the working environment or working conditions. It is recommended to check the operation of the product periodically.

■ Since the sensor chip will change its detection flow rate due to deterioration after prolonged use, periodic inspections should be performed.

■ The explosion-proof and protective structures function with the protective cover (transparent cover) correctly attached. Regularly confirm that the cover bolt (M3) for fixing the protective cover is tightened to the following torque. Also, when opening and closing the protective cover, make sure that there is no floating or displacement of the protective cover and that there is no adhered foreign matter, etc., on the seal surface. Tighten and fix with the following torque.

Cover bolt tightening torque: 0.6 N·m ±10%

# FSM3 Series

Environment-resistant specifications

## ATEX Compliance

■ The following are supported.

II 3 G Ex ec II C T6 Gc 0°C ≤ Ta ≤ 50°C

■ Working conditions

- 1) There is a risk of static electric discharge. Attach to grounded metal and wipe with a wet cloth.
- 2) Use in a clean environment with a contamination level of 2 or more.
- 3) This product's cable fixing parts do not have sufficient fixing functions. Provide the cable with an additional retainer function to ensure that tension is not transmitted to the end when using.
- 4) The protective cover of this product can be opened and closed, but it has an explosion-proof structure only when the protective cover is closed and the cover bolt is tightened with the specified torque. Cover bolt tightening torque: 0.6 N·m±10%

■ Fluid temperature rating

The temperature of the fluid measured for explosion-proof specifications is 50°C.

■ ATEX command 2014/34/EU

EN standards for explosive atmospheres

EN IEC 60079-0:2018

EN IEC 60079-7:2015/A1:2018

### ⚠ WARNING

- Do not remove or insert cables while energized in an explosive atmosphere.
- Do not loosen the cover bolt while energized in an explosive atmosphere. Also, do not open the protective cover.
- Do not disassemble or modify the product.

### ⚠ CAUTION

- The separated display (FSM2-D) is not compliant with the ATEX standard.  
When using the separated display (FSM2-D) together, install it outside the explosive atmosphere.

MEMO

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (<https://www.ckd.co.jp/kiki/en/>) → "Model No." → [Instruction Manual](#)

Flow rate sensor

Compact flow sensor (gas)

Compact flow sensor (air)

Compact flow sensor (liquid)

Water Manifold Unit

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