



Compact flow rate sensor (RAPIFLOW) Environment-resistant specifications

# FSM3 Series

LCD display

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



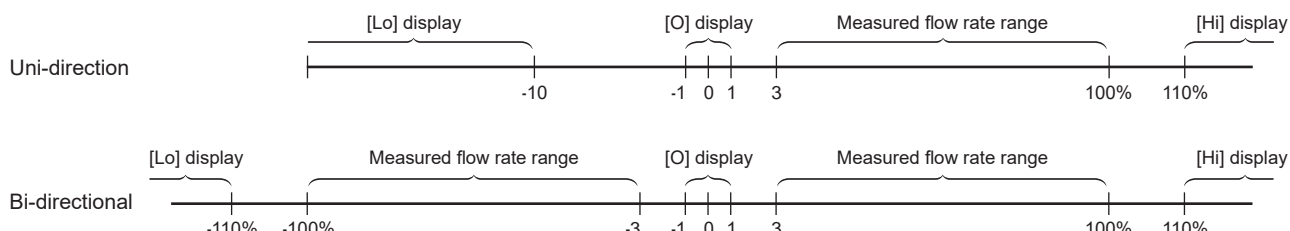
## LCD display specifications

Item		FSM3-L[B][C][D][E][F][G][H][I]-[ ]												
		[B]												
		005	010	020	050	100	200	500	101	201	501	102		
Flow direction	[C]	U	Uni-direction											
		B	Bi-direction											
Measured flow rate range (□/min) *1	[B]	U	15 to 500mL	30 to 1000mL	0.06 to 2.00L	0.15 to 5.00L	0.30 to 10.00L	0.6 to 20.0L	1.5 to 50.0L	3.0 to 100.0L	6 to 200L	15 to 500L	30 to 1000L	
		B	-500 to -15, 15 to 500mL	-1000 to -30, 30 to 1000mL	-2.00 to -0.06, 0.06 to 2.00L	-5.00 to -0.15, 0.15 to 5.00L	-10.00 to -0.30, 0.30 to 10.00L	-20.0 to -0.6, 0.6 to 20.0L	-50.0 to -1.5, 1.5 to 50.0L	-100.0 to -3.0, 3.0 to 100.0L	-200 to -6, 6 to 200L	-500 to -15, 15 to 500L	-1000 to -30, 30 to 1000L	
Display			4 digit + +4 digit 2 color LCD											
Flow rate display range (□/min) *2	[B]	U	-49 to 549mL	-99 to 1099mL	-0.19 to 2.19L	-0.49 to 5.49L	-0.99 to 10.99L	-1.9 to 21.9L	-4.9 to 54.9L	-9.9 to 109.9L	-19 to 219L	-49 to 549L	-99 to 1099L	
		B	-549 to 549mL	-1099 to 1099mL	-2.19 to 2.19L	-5.49 to 5.49L	-10.99 to 10.99L	-21.9 to 21.9L	-54.9 to 54.9L	-109.9 to 109.9L	-219 to 219L	-549 to 549L	-1099 to 1099L	
Integration display (*3)	Display range		0 to ±9999999mL			0.00 to ±99999.99L			0.0 to ±999999.9L			0 to ±9999999L		
	Pulse output rate		5mL	10mL	0.02L	0.05L	0.1L	0.2L	0.5L	1L	2L	5L	10L	
Working conditions	Applicable fluids *4		Clean air (JIS B 8392-1:2012 1.1.1 to 5.6.2), compressed air (JIS B 8392-1:2012 1.1.1 to 1.6.2), nitrogen gas											
			Argon, carbon dioxide, and gas mixture (argon + carbon dioxide)											
			Oxygen (When oxygen specification is selected, Clean-room specifications cannot be selected. Specifications automatically become oil-prohibited specifications.)											
	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 *5 (Fluid: in dry air)	Accuracy *6		Within ±3% F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measured flow rate range.")											
	Repeatability *7		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. (secondary side released to atmosphere reference)									Within ±5% F.S (0.35MPa reference)		
Response time *8			50 msec or less (setting response time OFF)											
Switch output	[G]	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 *9	[G]	A, B, C, D	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)											
		E, F, G, H	4 to 20 mA current output (connecting load impedance 0 to 300 Ω)											
Power supply voltage *10	[G]	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 *11			45 mA or less											
Lead wire			ø3.7 AWG26 equivalent x5-conductor, insulator outer diameter ø1.0											
Functions *12			①Gas switching, ②Copy function setting, ③Flow rate integration, ④Peak hold, etc.											
Degree of protection *13			IP 65 or equiv.											
Protection circuit *14			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 *15		Unrestricted in vertical/horizontal direction											
	Straight piping section *16		Not required											
Weight			Refer to page 16											

\*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: Display at each flow rate is as follows.



\*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.)

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

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, sulfur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with JIS B 8392-1:2012 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.). To maintain the function of this product, install a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil concentration 0.1 mg/m<sup>3</sup>) on the primary side (upstream side) of this product. (Refer to page 21 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: Compressed air is used for adjusting and inspecting this product. Accuracy for gas types other than air is only a guideline.

\*6: 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.

\*7: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications sheet for details.)

\*8: 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.

\*9: 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.

\*10: The power supply voltage specifications differ for the voltage output type and current output type.

\*11: 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.

\*12: 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.)

Gas	Flow direction	Full scale flow rate	Analog output	
			Voltage	Current
• Air • Nitrogen • Argon	Uni-direction	0 to 100%	1 to 5 V	4 to 20mA
	Bi-direction	-100 to 100%		
• Carbon dioxide (Type A setting)	Uni-direction	0 to 50%	1 to 3 V	4 to 12mA
	Bi-direction	-50 to 50%	2 to 4 V	8 to 16mA
• Carbon dioxide (Type B setting)	Uni-direction	0 to 50%	1 to 5 V	4 to 20mA
	Bi-direction	-50 to 50%		

The enable/disable of the "Copy function setting" can be selected at "Ⓢ Output specifications".

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

\*13: Be sure to read the precautions in "Working environment" on page 21 and "ATEX compatible" on page 26.

\*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: Accuracy may be affected by the piping conditions. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1000 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.

## How to order

FSM3 - L 005 U 4 AA 1 A 1 N - B J R - P80 - EX

Model No.

A Display

B Flow rate range  
(Full scale flow rate)

C Flow direction

D Body material/applicable fluids

E Port size

F Piping direction

G Output specifications

H Unit specifications

I Valve Option

J Lead wire

K Mounting attachment

L Included documents

M Clean Specifications

# Option  
(ATEX Compliant)

Code	Description		
<b>A Display</b>			
L	Liquid crystal display		
<b>B Flow rate range (full scale flow rate)</b>			
005	500mL/min	500	50L/min
010	1000mL/min	101	100L/min
020	2L/min	201	200L/min
050	5L/min	501	500L/min
100	10L/min	102	1000L/min
200	20L/min		
<b>C Flow direction</b>			
U	Uni-direction		
B	Bi-direction		
<b>D Body material/applicable fluids</b>			
	Body material	Applicable fluid	
4	SUS (Environment-resistant specs)	Air (gas switchable)	
5	SUS (Environment-resistant specs)	Oxygen (oil-prohibited specs)*2	
<b>E Port size</b>			
AA	Rc1/8		
BA	Rc1/4		
CA	Rc1/2		
AF	G1/8	*3	
BF	G1/4	*3	
CF	G1/2	*3	
AC	NPT1/8		
BC	NPT1/4		
CC	NPT1/2		
<b>F Piping direction</b>			
1	Straight		
<b>G Output specifications</b>			
	Analog output	Switch output	Copy function setting
A	1 points	1 points (NPN)	Yes
B	(Voltage output)	2 points (NPN)	-
C		1-point output (PNP)	Yes
D	1-5V	2-point output (PNP)	-
E	1 points	1 points (NPN)	Yes
F	Current	2 points (NPN)	-
G	output	1-point output (PNP)	Yes
H		2-point output (PNP)	-
<b>H Unit specifications</b>			
1	SI units only		
2	With unit change function (only for overseas)*4		
<b>I Valve option</b>			
N	None		
<b>J Lead wire</b>			
A	5 conductor 1 m		
B	5 conductor 3 m		
<b>K Mounting attachment</b> *5			
Blank	None		
J	Bracket 2		
<b>L Included documents</b>			
Blank	None		
R	inspection certificate		
S	Company certification + Traceability certification		
<b>M Clean-room specifications</b> *8			
Blank	None		
P70	Anti-dust generation		
P80	Oil-prohibited		
<b># Option (ATEX Compliant)</b>			
Blank	None		
EX	ATEX Compliant		

[Example of model No.]

**FSM3-L005U4AA1A1N-BJR-P80-EX**

Model: RAPIFLOW FSM3 Series

- A Display L : Liquid crystal display
- B Flow rate range 005 : 500mL/min
- C Flow direction U : Uni-direction
- D Body material/applicable fluids 4 : SUS (environment-resistant specs)/air
- E Port size AA : Rc1/8
- F Piping direction 1 : Straight
- G Output specifications A : Analog voltage output X1, NPN switch output X1, With Copy function setting
- H Unit specifications 1 : SI units only
- I Valve option N : None
- J Lead wire B : 5 conductor 3 m
- K Mounting attachment J : Bracket 2
- L Included documents R : inspection certificate
- M Clean-room specifications P80 : Oil-prohibited
- # Option (ATEX Compliant) EX : ATEX Compliant

## ⚠ Precautions for model No. selection

- \*1: During selection, always check the compatibility table on the next page.
- \*2: 500L/min and 1000L/min cannot be selected with "3: Oxygen".
- \*3: The G thread connection shape is ISO16030-compliant.
- \*4: The model with unit change cannot be sold in Japan.
- \*5: Optional parts will come with the product. They are not pre-assembled.
- \*6: The product surface is degreased and cleaned before packaging, and heat-sealed into an antistatic bag on a clean bench (Class 1000 or more).
- \*7: P70 specifications and gas-contact sections are degreased and cleaned.
- \*8: This cannot be selected on an oxygen type (only "None" is available).
- \*9: Refer to "ATEX compatible" on page 26 for specifications.

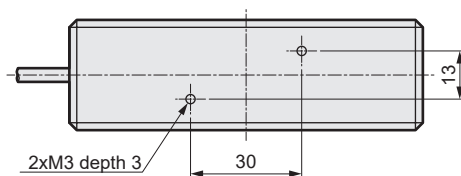
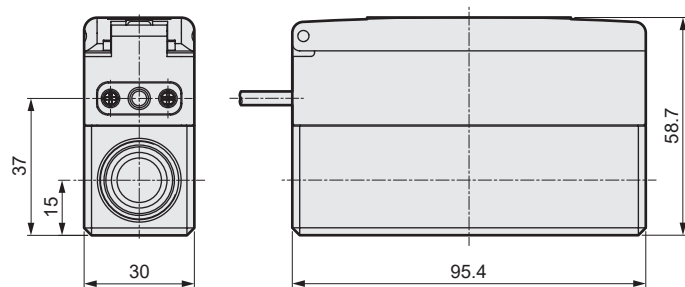
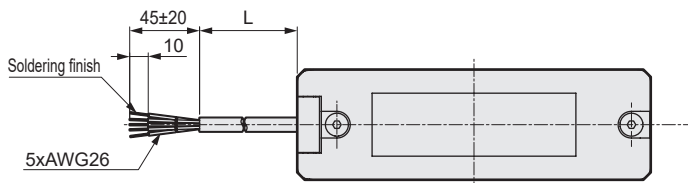
Flow rate range and port size

		E 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
B Flow rate range	005	●			●			●		
	010	●			●			●		
	020	●			●			●		
	050	●			●			●		
	100	●			●			●		
	200	●			●			●		
	500		●			●			●	
	101		●			●			●	
	201		●			●			●	
	501			●			●			●
	102			●			●			●

Dimensions

[Lead wire length]

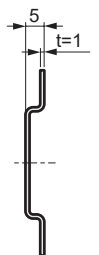
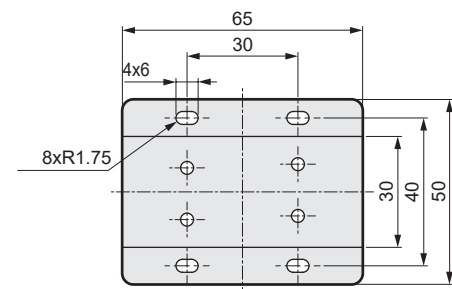
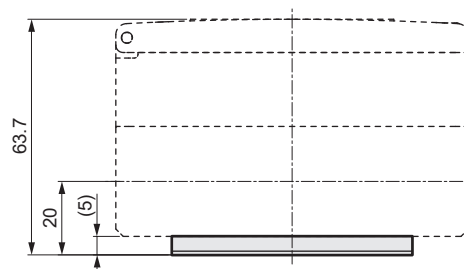
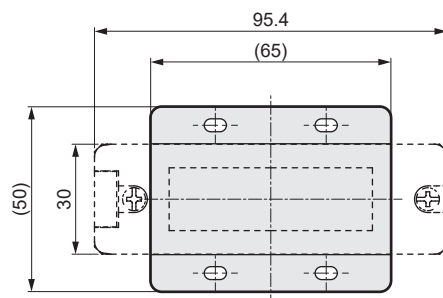
Lead wire code	L dimensions
A	1000±20
B	3000±20

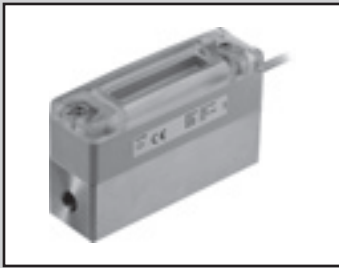


Optional dimensions

● FSM3-J

Bracket 2





Compact flow rate sensor (RAPIFLOW) Environment-resistant specifications

# FSM3 Series

Bar display

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



## Bar display specifications

Item		FSM3-B[B][C][D][E][F][G][H][I]-[ ]												
		[B]												
		005	010	020	050	100	200	500	101	201	501	102		
Flow direction	[C]	U	Uni-direction											
		B	Bi-direction											
Measured flow rate range (□/min) *1	[B]	U	15 to 500mL	30 to 1000mL	0.06 to 2.00L	0.15 to 5.00L	0.30 to 10.00L	0.6 to 20.0L	1.5 to 50.0L	3.0 to 100.0L	6 to 200L	15 to 500L	30 to 1000L	
		B	-500 to -15, 15 to 500mL	-1000 to -30, 30 to 1000mL	-2.00 to -0.06, 0.06 to 2.00L	-5.00 to -0.15, 0.15 to 5.00L	-10.00 to -0.30, 0.30 to 10.00L	-20.0 to -0.6, 0.6 to 20.0L	-50.0 to -1.5, 1.5 to 50.0L	-100.0 to -3.0, 3.0 to 100.0L	-200 to -6, 6 to 200L	-500 to -15, 15 to 500L	-1000 to -30, 30 to 1000L	
Display		LED bar display												
Working conditions	Applicable fluids *2	Clean air (JIS B 8392-1:2012 1.1.1 to 5.6.2), compressed air (JIS B 8392-1:2012 1.1.1 to 1.6.2), nitrogen gas Oxygen (When oxygen specification is selected, ⓂClean-room specifications cannot be selected. Specifications automatically become oil-prohibited specifications.)												
	Temp 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 "measured flow rate range.")												
	Repeatability *4	Within ±1% F.S. (Secondary side released to atmosphere)												
	Temp characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)												
	Pressure characteristics	Within ±5%F.S. (secondary side released to atmosphere reference)										Within ±5% F.S (0.35MPa reference)		
Response time *5		50 msec or less												
Analog output *6	[G]	J	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)											
		K	4 to 20 mA current output (connecting load impedance 0 to 300 Ω)											
Power supply voltage *7	[G]	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 equivalent x4-conductor, insulator outer diameter ø1.0												
Degree of protection *9		IP 65 or equiv.												
Protection circuit *10		Power reverse connection protection												
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2												
Mounting	Mounting orientation *11	Unrestricted in vertical/horizontal direction												
	Straight piping section *12	Not required												
Weight		Refer to page 16												

- \*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: 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 using compressed air, use clean air that complies with JIS B 8392-1:2012 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.). To maintain the function of this product, install a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil concentration 0.1 mg/m<sup>3</sup>) on the primary side (upstream side) of this product. (Refer to the recommended circuit on page 21.) 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 CKD's standard flow rate meter. It does not show absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of  $\pm 3\%$  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 k $\Omega$ . 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 21 and "ATEX compatible" on page 26.
- \*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 1000 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.

## How to order

**FSM3 - B 005 U 4 AA 1 J 1 N - D J S - P70 - EX**

Model No.

**A** Display

**B** Flow rate range  
(Full scale flow rate)

**C** Flow direction

**D** Body material/applicable fluids

**E** Port size

**F** Piping direction

**G** Output specifications

**H** Unit specifications

**I** Valve  
Option

**J** Lead wire

**K** Mounting attachment

**L** Included documents

**M** Clean  
Specifications

**N** Option  
(ATEX Compliant)

Code	Description		
<b>A Display</b>			
B	Bar display		
<b>B Flow rate range (full scale flow rate)</b>			
005	500mL/min	500	50L/min
010	1000mL/min	101	100L/min
020	2L/min	201	200L/min
050	5L/min	501	500L/min
100	10L/min	102	1000L/min
200	20L/min		
<b>C Flow direction</b>			
U	Uni-direction		
B	Bi-direction		
<b>D Body material/applicable fluids</b>			
	Body material	Applicable fluid	
4	SUS (Environment-resistant specs)	Air	
5	SUS (Environment-resistant specs)	Oxygen (oil-prohibited specs) *3	
<b>E Port size</b>			
AA	Rc1/8		
BA	Rc1/4		
CA	Rc1/2		
AF	G1/8	*4	
BF	G1/4	*4	
CF	G1/2	*4	
AC	NPT1/8		
BC	NPT1/4		
CC	NPT1/2		
<b>F Piping direction</b>			
1	Straight		
<b>G Output specifications</b> *2			
J	Analog voltage outputx 1 point		
K	Analog current outputx 1 point		
<b>H Unit specifications</b>			
1	SI units only		
<b>I Valve option</b>			
N	None		
<b>J Lead wire</b>			
C	4 conductor 1 m		
D	4 conductor 3 m		
<b>K Mounting attachment</b> *5			
Blank	None		
J	Bracket 2		
<b>L Included documents</b>			
Blank	None		
R	inspection certificate		
S	Company certification + traceability certificate		
<b>M Clean-room specifications</b> *8			
Blank	None		
P70	Anti-dust generation		*6
P80	Oil-prohibited		*7
<b>N Option (ATEX Compliant)</b>			
Blank	None		
EX	ATEX Compliant		

[Example of model No.]

**FSM3-B005U4AA1J1N-DJS-P70-EX**

Model: RAPIFLOW FSM3 Series

- A** Display                    B : Bar display
- B** Flow rate range        005 : 500mL/min
- C** Flow direction         U : Uni-direction
- D** Body material/applicable fluids    4 : SUS (environment-resistant specifications)/air
- E** Port size                AA : Rc1/8
- F** Piping direction        1 : Straight
- G** Output specifications    J : Analog voltage output X1
- H** Unit specifications     1 : SI units only
- I** Valve option            N : None
- J** Lead wire                D : 4 conductor 3 m
- K** Mounting attachment    J : Bracket 2
- L** Included documents    S : Company certification + traceability certificate
- M** Clean-room specifications    P70 : Anti-dust generation
- N** Option (ATEX Compliant)    EX : ATEX Compliant

### ⚠ Precautions for model No. selection

- \*1: Refer to the correspondence table on the following page when selecting the model.
- \*2: When using in combination with a separated display (FSM2-D), select "J".
- \*3: 500L/min and 1000L/min cannot be selected with "3: Oxygen".
- \*4: The G thread connection shape is ISO16030-compliant.
- \*5: Optional parts are provided with the product. They are not pre-assembled.
- \*6: The product surface is degreased before packaging and heat sealed into an antistatic bag on the clean bench (Class 1000 and over).
- \*7: P70 specifications and gas-contact sections are degreased and cleaned.
- \*8: This cannot be selected on an oxygen type (blank only).
- \*9: Refer to "ATEX compatible" on page 26 for specifications.

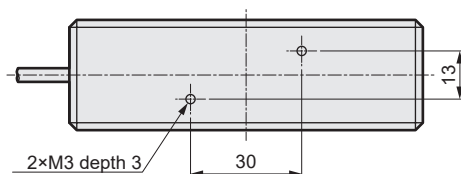
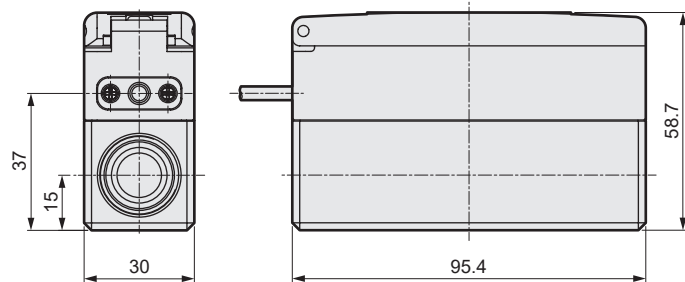
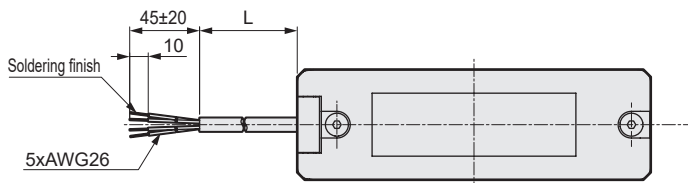
## Flow rate range and port size

		E 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
B Flow rate range	005	●			●			●		
	010	●			●			●		
	020	●			●			●		
	050	●			●			●		
	100	●			●			●		
	200	●			●			●		
	500		●			●			●	
	101		●			●			●	
	201		●			●			●	
	501			●			●			●
	102			●			●			●

## Dimensions

[Lead wire length]

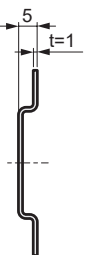
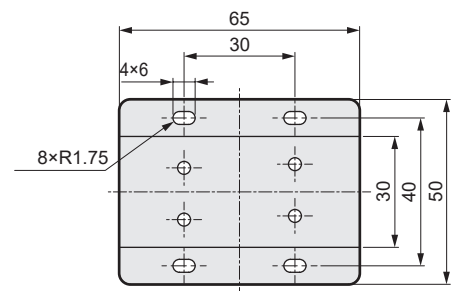
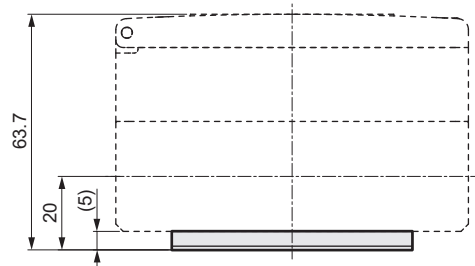
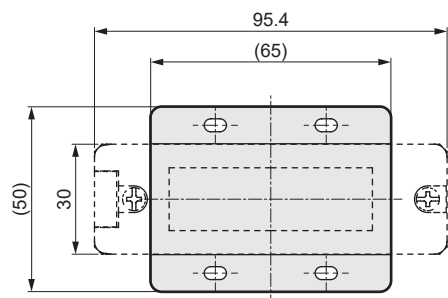
Lead wire code	L dimensions
C	1000±20
D	3000±20



## Optional dimensions

● FSM3-J

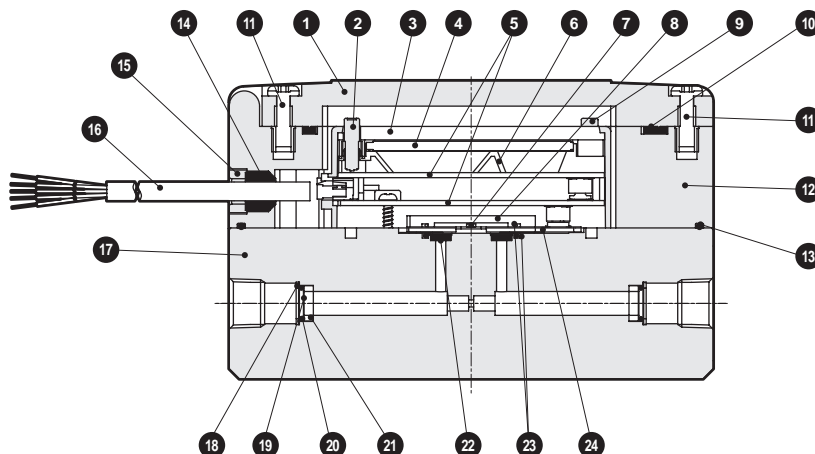
Bracket 2





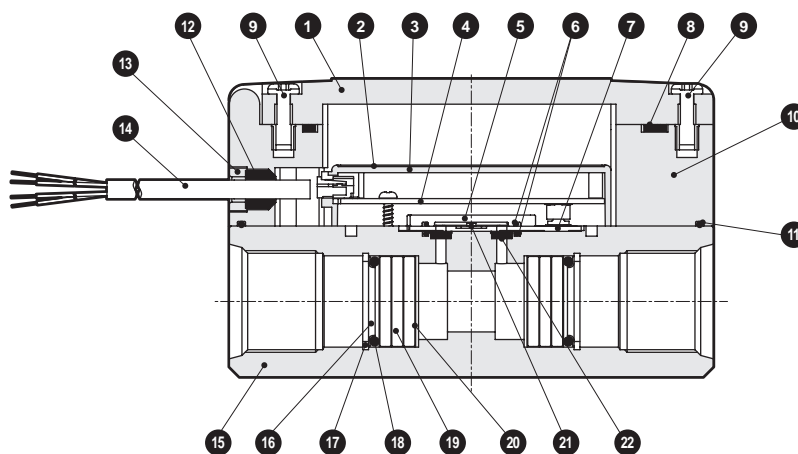
## Internal structure

### ● LCD display FSM3-L



Part number	Part name	Material	Part number	Part name	Material
1	Protective cover	PC Polycarbonate resin	13	Packing	FKM Fluoro rubber
2	Switch	EPDM Ethylene propylene rubber	14	Cable packing	FKM Fluoro rubber
3	Liquid crystal cover	PMMA Acrylic resin	15	Packing holder	PC Polycarbonate resin
4	Liquid crystal	-	16	Cable	-
5	Electronic circuit board	- Glass epoxy resin	17	Sensor body	SUS316L Stainless steel
6	Circuit board holder	PC Polycarbonate resin	18	C-snap ring	SUS304 Stainless steel
7	Sensor chip	- Semiconductor silicon	19	Filter	SUS304 Stainless steel
8	Sensor cover	SUS316 or equiv. Stainless steel	20	O-ring	FKM Fluoro rubber
9	Switch	EPDM Ethylene propylene rubber	21	Spacer	SUS304 Stainless steel
10	Gasket	- Silicone rubber sponge	22	Filter	SUS304 Stainless steel
11	Cover bolt	SUSXM7 Stainless steel	23	O-ring	FKM Fluoro rubber
12	Protective case	PC Polycarbonate resin	24	Sensor board	- Alumina

### ● Bar display FSM3-B

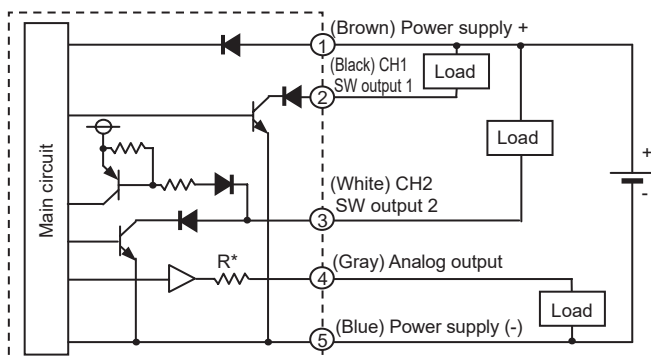


Part number	Part name	Material	Part number	Part name	Material
1	Protective cover	PC Polycarbonate resin	12	Cable packing	FKM Fluoro rubber
2	Front sheet	- PET film	13	Packing holder	PC Polycarbonate resin
3	Case	PA Polyamide resin	14	Cable	-
4	Electronic circuit board	- Glass epoxy resin	15	Sensor body	SUS316L Stainless steel
5	Sensor cover	SUS316 or equiv. Stainless steel	16	O-ring holder	SUS304 Stainless steel
6	Gasket	FKM Fluoro rubber	17	C-snap ring	SUS304 Stainless steel
7	Sensor board	- Alumina	18	O-ring	FKM Fluoro rubber
8	Gasket	- Silicone rubber sponge	19	Spacer	SUS304 Stainless steel
9	Cover bolt	SUSXM7 Stainless steel	20	Filter	SUS304 Stainless steel
10	Protective case	PC Polycarbonate resin	21	Sensor chip	- Semiconductor silicon
11	Packing	FKM Fluoro rubber	22	Filter	SUS304 Stainless steel

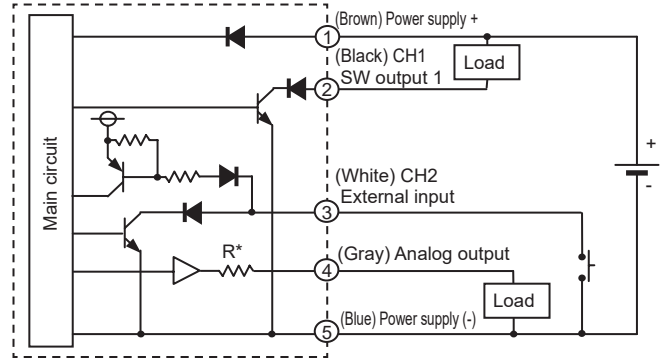
## Example of internal circuit and load connection

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

[CH2 is used as SW output]



[CH2 is used as external input]

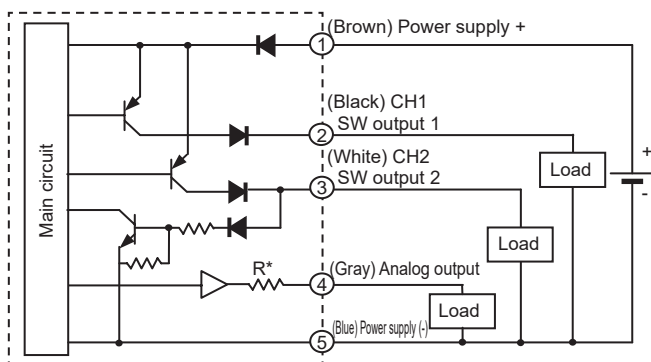


\* Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

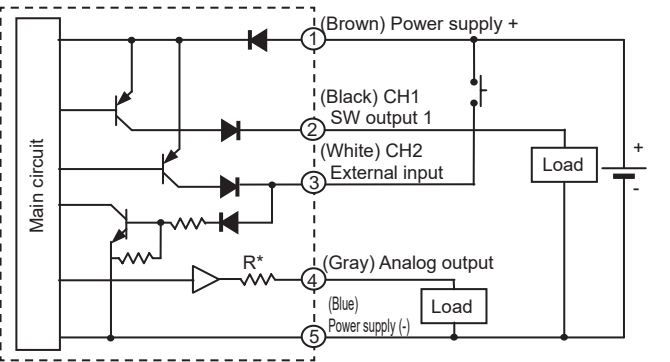
Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (Switch output 1: max. 50 mA)
③	White	CH2 (switch output 2: max. 50 mA, or external input)
④	Gray	Analog output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: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

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

[CH2 is used as SW output]



[CH2 is used as external input]

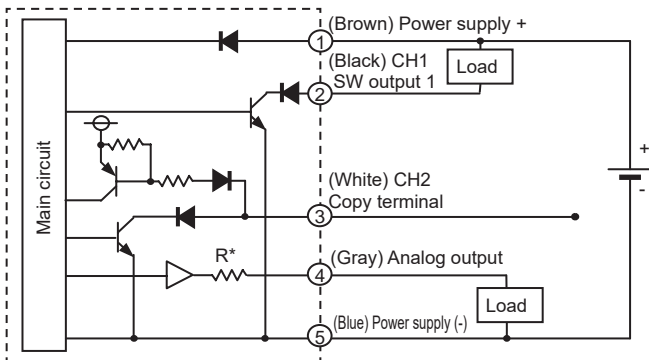


\* Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

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 to 20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

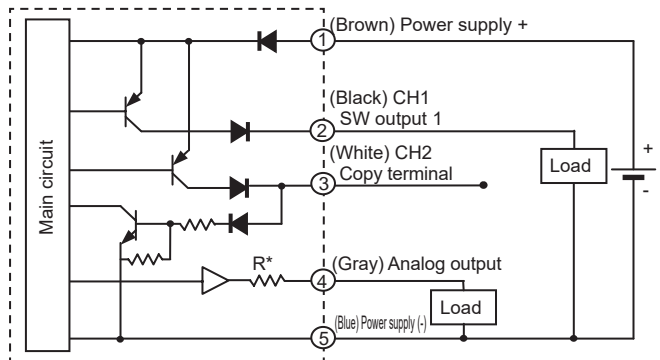
## Example of internal circuit and load connection

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



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

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

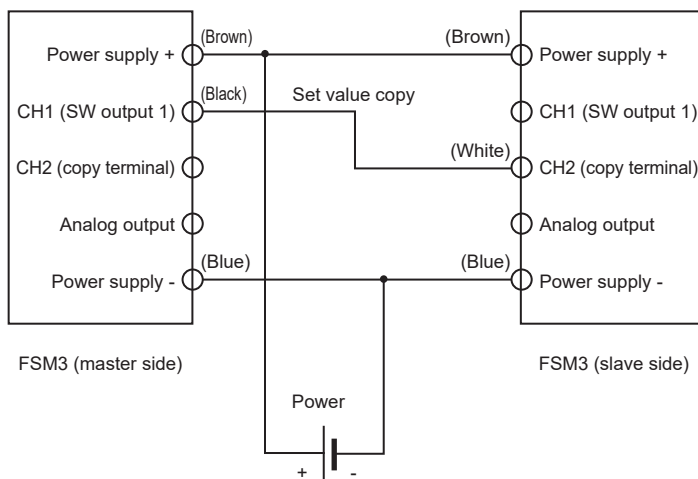


\* Analog output voltage output R: approx. 1 kΩ  
Current output R: approx. 100 Ω

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 to 20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

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

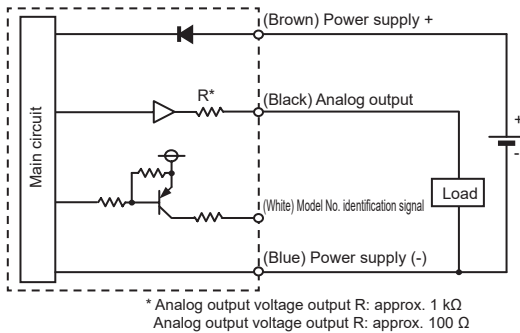
[When using copy function setting]



Connect CH1 (SW output 1) on the master side to CH2 (copy terminal) on the slave side and power ON the sensor to use the copy function setting (F93). Note that this connection can only be used when using the copy function setting. 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 FSM3 may malfunction. Never use the product while connected to the copy terminal.

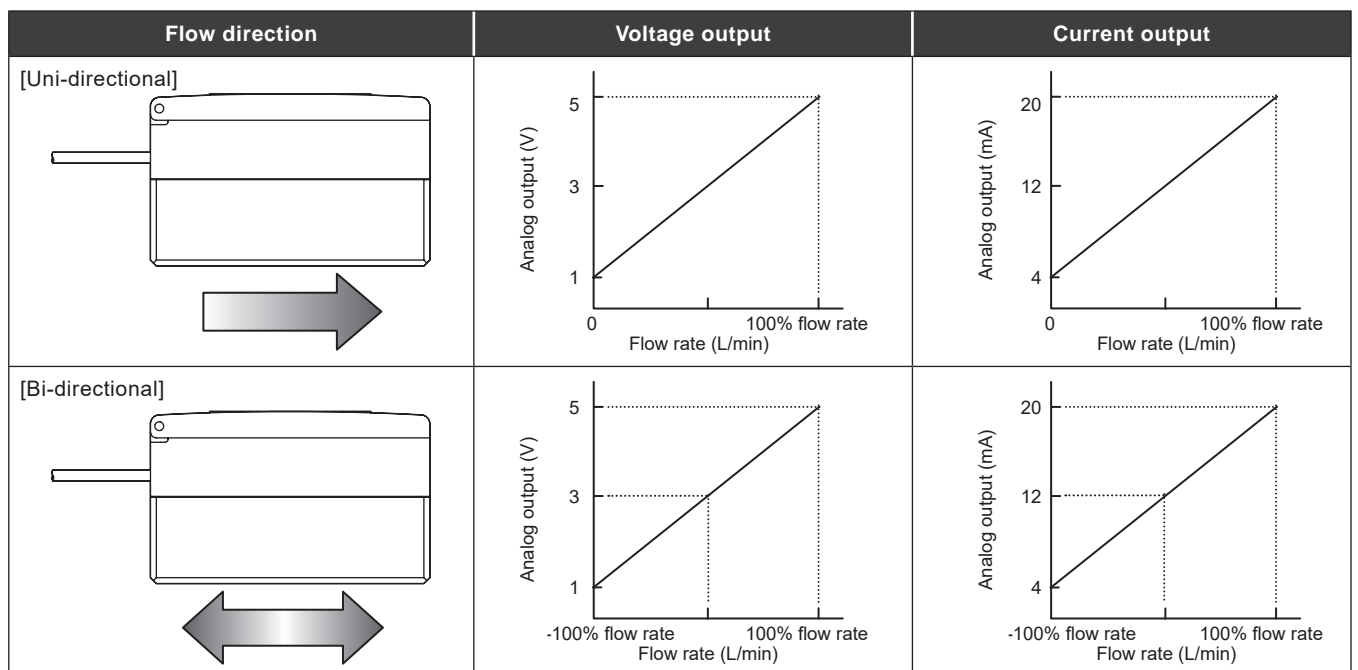
## Example of internal circuit and load connection

● FSM3-B □□□□□J/K/ □□ (bar display)



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

## Analog output characteristics

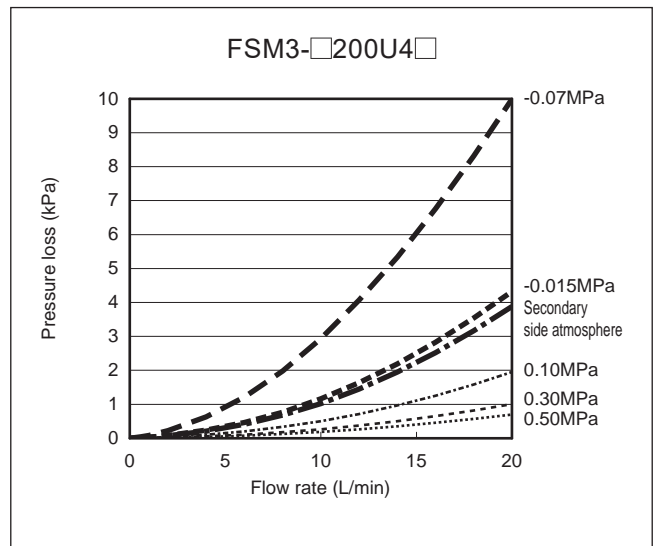
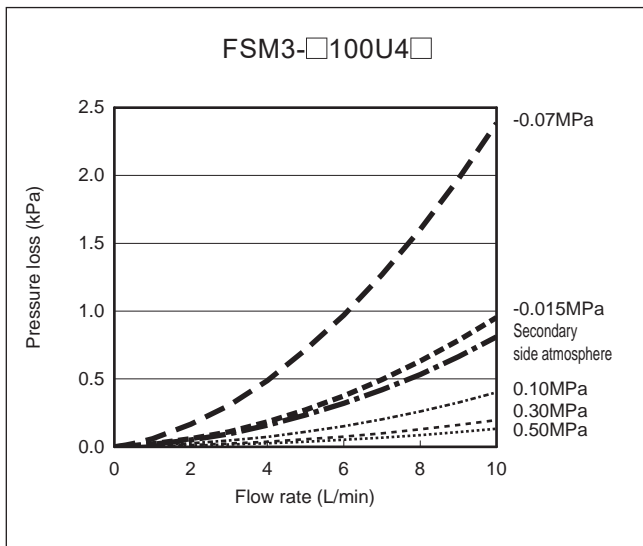
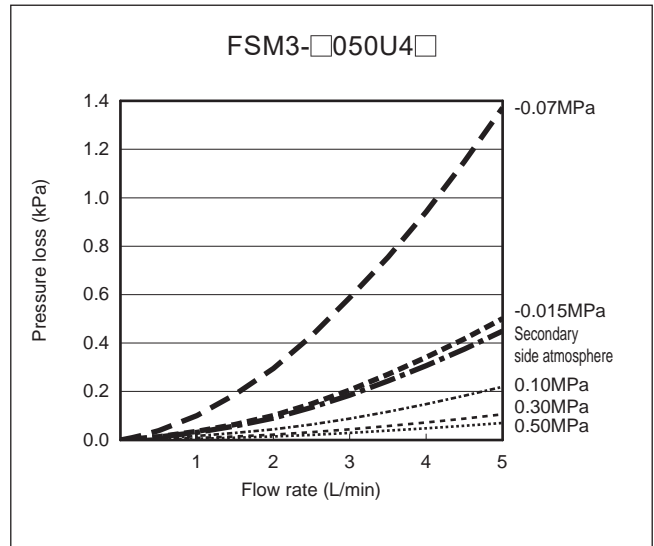
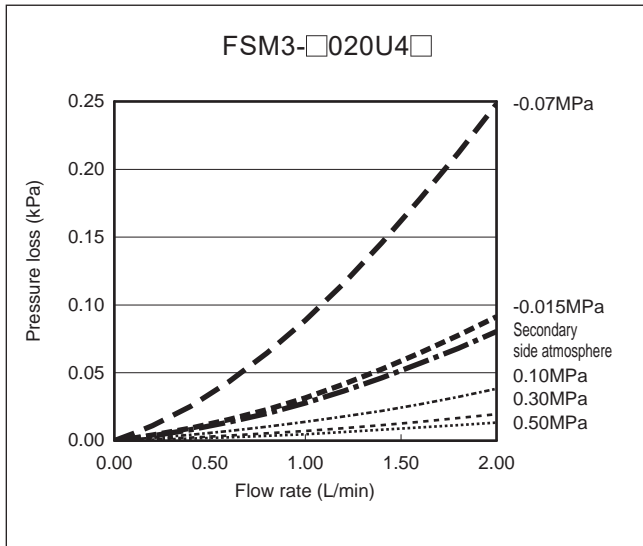
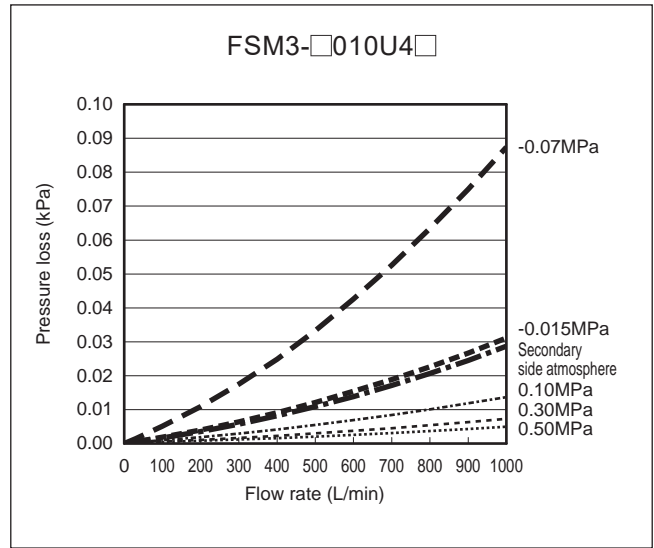
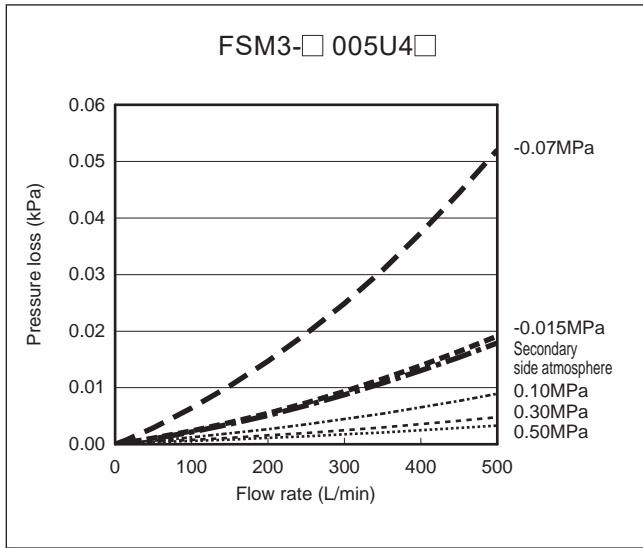


\*1: The full scale of the uni-directional type is 0 to 100%, and full scale of the bi-directional type is -100% to 100%. With the integrated display bi-directional type, output can be changed to uni-direction. The value after switching is a reference value. Refer to page 18 for details.

\*2: Refer to page 2 for analog output when switching to carbon dioxide.

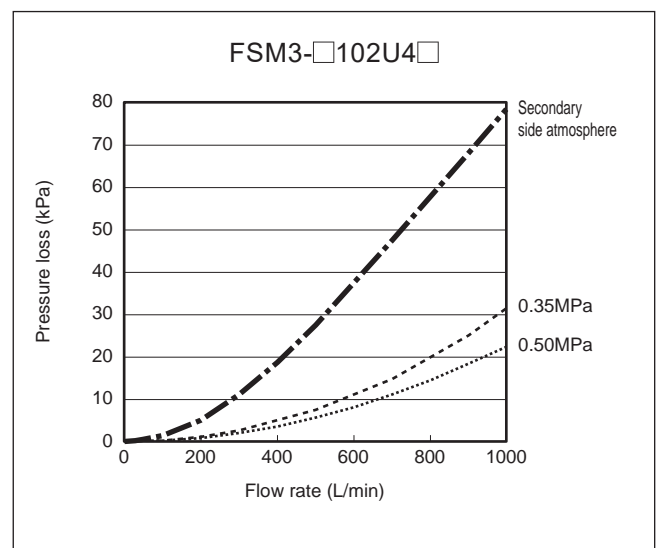
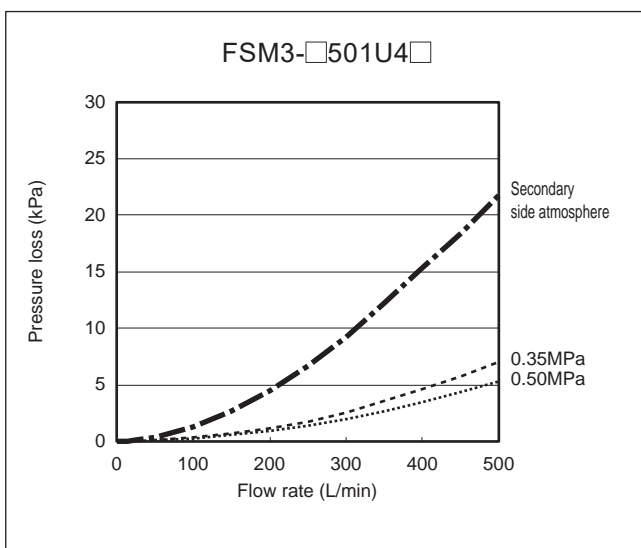
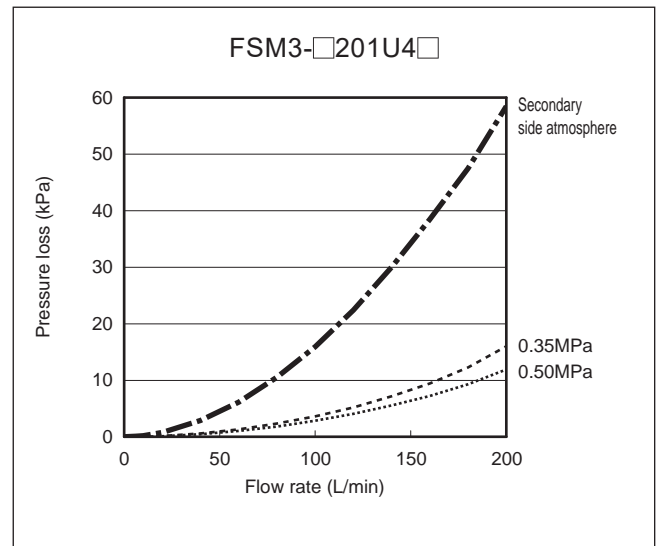
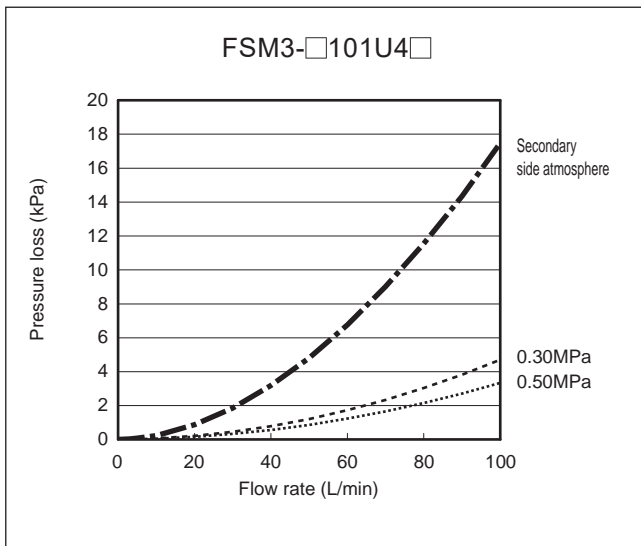
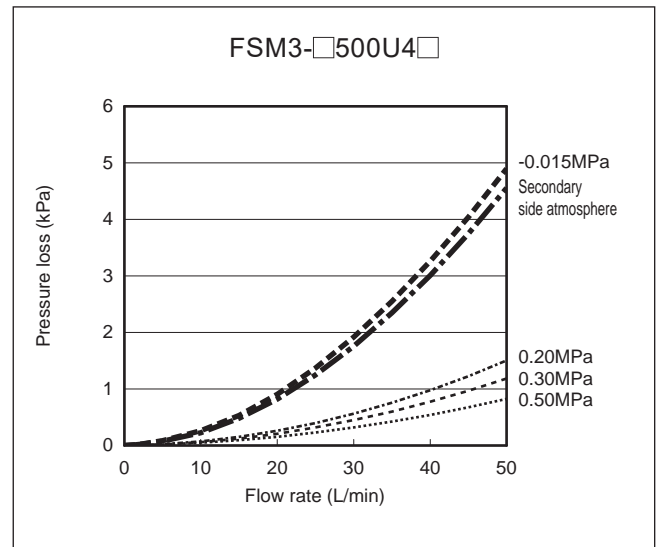
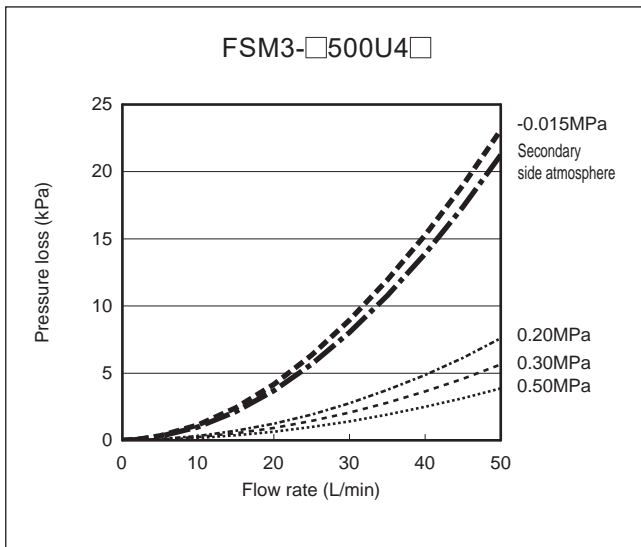
\*3: Analog output is available even outside the measurement flow rate range. Although the accuracy is not guaranteed, the lower and upper limits for voltage can be output at about 0.6V and 5.4V, respectively, while the lower and upper limits for current can be output at about 2.4mA and 21.6mA, respectively.

## Pressure loss characteristics (air)



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

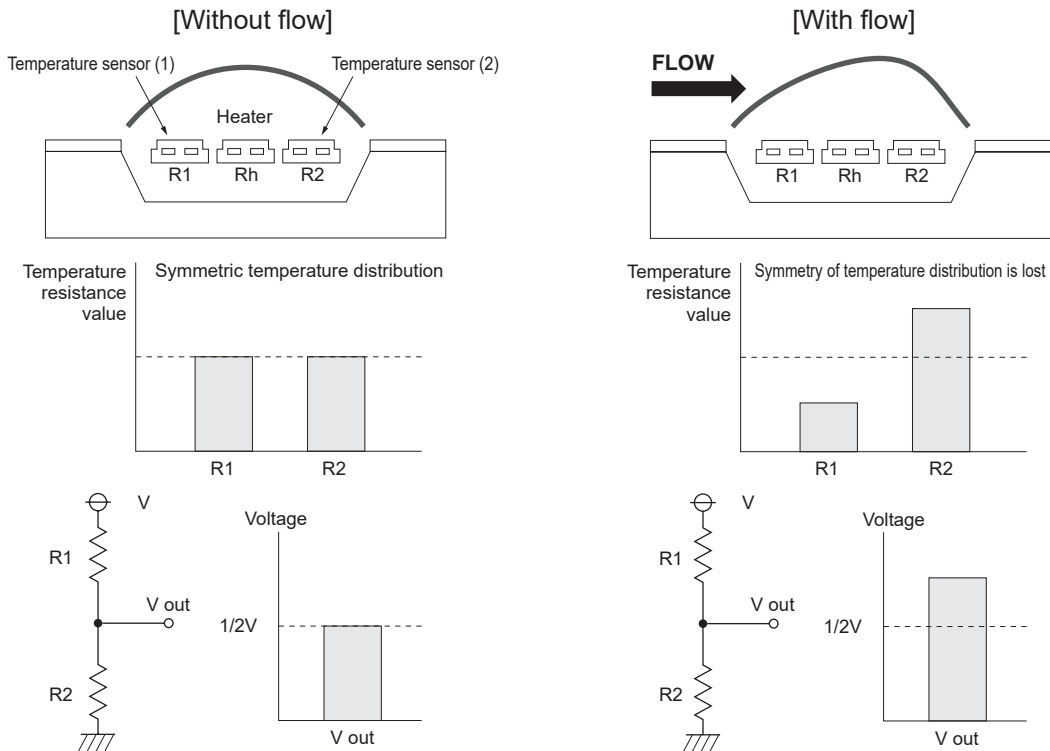
### Pressure loss characteristics (air)



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 (excluding flow rate range (full scale flow rate) of 501 and 102)

## Measurement principle of FSM3 Series

The FSM3 Series incorporates a platinum sensor chip machined with silicon micro-machining. The sensor is thermally insulated from the silicon substrate. The heating capacity is extremely low, enabling high sensitivity with a high-speed response. At the sensor, two temperature sensors are arranged with a heater in between. Platinum, which has a resistance that changes based on temperature, is used for the temperature sensor. When the heater is turned ON and heating occurs, the temperature distribution is symmetrical to the center of the heater if there is no flow. When flow is received, the symmetrical property of the temperature distribution is lost, temperature upstream from the heater drops, and temperature downstream rises. This temperature difference appears as the difference in temperature sensor resistance, and varies with the flow rate. When the flow is reversed, the temperature difference (difference in resistance) will be inverted. By using this method, the bi-directional flow rate can be detected. This method is suitable for detecting a relatively small flow rate.



Product weight

[Unit: g]

Fitting		LCD display	Bar display
Model No.	Description		
AA1	Rc1/8 Straight	750	740
BA1	Rc1/4 Straight	690	680
CA1	Rc1/2 Straight	590	580
AF1	G1/8 Straight	750	740
BF1	G1/4 Straight	690	680
CF1	G1/2 Straight	590	580
1 VAC	NPT 1/8 Straight	750	740
BC1	NPT 1/4 Straight	690	680
CC1	NPT 1/2 Straight	590	580