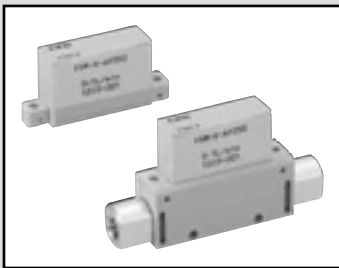


F.R.L.  
 F.R.  
 F (Filtr)  
 R (Reg)  
 L (Lub)  
 Drain  
 Separ  
 Mech  
 Press SW  
 Res press  
 exh valve  
 SlowStart  
 Anti-bac/Bac-  
 remove Filtr  
 Film  
 Resist FR  
 Oil-Prohr  
 Med  
 Press FR  
 No Cu/  
 PTFE FRL  
 Outdrs FRL  
 Adapter  
 Joiner  
 Press  
 Gauge  
 CompFRL  
 LgFRL  
 PrecsR  
 VacF/R  
 Clean FR  
 ElecPneUR  
 AirBoost  
 Speed Ctrl  
 Silncr  
 CheckV/  
 other  
 Fit/Tube  
 Nozzle  
 Air Unit  
 PrecsCompn  
 Electro  
 Press SW  
 ContactSW  
 AirSens  
 PresSW  
 Cool  
 Air Flo  
 Sens/Ctrl  
 WaterRtSens  
 TotAirSys  
 (Total Air)  
 TotAirSys  
 (Gamma)  
 Gas  
 generator  
 RefrDry  
 DesicDry  
 HiPolymDry  
 MainFiltr  
 Dischrg  
 etc  
 Ending



Miniature flow rate switch  
 RAPIFLOW

# FSM-X Series (for air/nitrogen gas)

● Flow rate range:  $\pm 0.5$ ,  $\pm 1$ ,  $\pm 5$ ,  $\pm 10$ , 0 to 0.5, 0 to 1, 0 to 5, 0 to 10 L/min



## Specifications

1 MPa = 10 bar

| Model No.                                      |   | Analog output   |             |             |             |             |             |             |             |
|--|---|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Item   |   | FSM-X-AR005   | FSM-X-AR010 | FSM-X-AR050 | FSM-X-AR100 | FSM-X-AF005 | FSM-X-AF010 | FSM-X-AF050 | FSM-X-AF100 |
| Flow rate range (L/min) (*1)                   |   | -0.5 to +0.5  | -1 to +1    | -5 to +5    | -10 to +10  | 0 to 0.5    | 0 to 1      | 0 to 5      | 0 to 10     |
| Working conditions                             | Applicable fluids (*2)                          | Clean air (JIS B 8392-1: 2012 (ISO 8573-1: 2010) [1: 1: 1 to 1: 6: 2]), nitrogen  |             |             |             |             |             |             |             |
|  | Max. working pressure MPa                       | 0.2 ( $\approx 29$ psi, 2 bar)  |             |             |             |             |             |             |             |
|  | Min. working pressure MPa                       | -0.09 ( $\approx 13$ psi, -0.9 bar)   |             |             |             |             |             |             |             |
|  | Proof pressure MPa                              | 0.3 ( $\approx 44$ psi, 3 bar)  |             |             |             |             |             |             |             |
|  | Ambient temperature/humidity $^{\circ}\text{C}$ | 0 ( $32^{\circ}\text{F}$ ) to 50 ( $122^{\circ}\text{F}$ ), 80% RH or less  |             |             |             |             |             |             |             |
|  | Working fluid temperature $^{\circ}\text{C}$    | 0 ( $32^{\circ}\text{F}$ ) to 50 ( $122^{\circ}\text{F}$ ) (no condensation)  |             |             |             |             |             |             |             |
| Storage ambient temperature $^{\circ}\text{C}$ |   | -20 ( $-4^{\circ}\text{F}$ ) to 60 ( $140^{\circ}\text{F}$ ) (no condensation)  |             |             |             |             |             |             |             |
| Output   |   | Analog output 1 point (1 to 5 V voltage output, connected load impedance 50 k $\Omega$ and over) *3   |             |             |             |             |             |             |             |
| Accuracy (*4)                                  | Linearity                                       | Non-linear characteristics  |             |             |             |             |             |             |             |
|  | Pressure characteristics                        | Bi-direction: $\pm 5\%$ F.S. or less (-0.09 ( $\approx 13$ psi) to 0.2 MPa ( $\approx 29$ psi), 0.1 MPa ( $\approx 15$ psi) reference)<br>Uni-direction: $\pm 10\%$ F.S. or less (-0.09 ( $\approx 13$ psi) to 0.2 MPa ( $\approx 29$ psi), 0.1 MPa ( $\approx 15$ psi) reference)  |             |             |             |             |             |             |             |
|  | Temperature characteristics                     | Bi-direction: $\pm 0.3\%$ F.S./ $^{\circ}\text{C}$ or less (0 ( $32^{\circ}\text{F}$ ) to 50 $^{\circ}\text{C}$ ( $122^{\circ}\text{F}$ ), 25 $^{\circ}\text{C}$ ( $77^{\circ}\text{F}$ ) reference)<br>Uni-direction: $\pm 0.6\%$ F.S./ $^{\circ}\text{C}$ or less (0 ( $32^{\circ}\text{F}$ ) to 50 $^{\circ}\text{C}$ ( $122^{\circ}\text{F}$ ), 25 $^{\circ}\text{C}$ ( $77^{\circ}\text{F}$ ) reference) |             |             |             |             |             |             |             |
|  | Reproducibility (repeatability) (*5)            | $\pm 2\%$ F.S. or less  |             |             |             |             |             |             |             |
| Response time (*6)                             |   | 5 ms or less (8 ms or less for 10 L/min)  |             |             |             |             |             |             |             |
| External leakage (*7)                          |   | 1 mL/min or less (single sensor head), 2 mL/min (with flow path block)  |             |             |             |             |             |             |             |
| Current consumption (*8)                       |   | 30 mA or less   |             |             |             |             |             |             |             |
| Power supply voltage                           |   | 24 VDC (21.6 to 26.4 VDC) ripple rate 1% or less  |             |             |             |             |             |             |             |
| Power supply voltage fluctuation               |   | $\pm 2\%$ F.S. or less (21.6 to 26.4 V)   |             |             |             |             |             |             |             |
| Lead wire                                      |   | $\phi 2.9$ mm 3-conductor ( $\phi 0.38$ mm insulator outer diameter $\phi 0.8$ mm)  |             |             |             |             |             |             |             |
| Connector                                      | Product side                                    | SM03B-SRSS-TB (JST Mfg. Co. Ltd.), without lock mechanism   |             |             |             |             |             |             |             |
| Compatible connector                           | Housing   | SHR-03V-S (JST Mfg. Co. Ltd.)   |             |             |             |             |             |             |             |
|  | Connector pin                                   | SSH-003T-P0.2-H (JST Mfg. Co. Ltd.)   |             |             |             |             |             |             |             |
| Mounting                                       | Mounting orientation                            | Unrestricted in vertical/horizontal direction   |             |             |             |             |             |             |             |
|  | Straight piping section                         | Not required  |             |             |             |             |             |             |             |
| Vibration resistance                           |   | 10 to 150 Hz, compound amplitude 1.5 mm, max. 10 G, 2 hours per X, Y, Z direction   |             |             |             |             |             |             |             |
| EMC Directive                                  |   | EN61000-6-4, EN61000-6-2  |             |             |             |             |             |             |             |
| Weight g                                       | Blank   | Approx. 4 (cable not included)  |             |             |             |             |             |             |             |
|  | H04   | Approx. 17 (cable not included)   |             |             |             |             |             |             |             |
|  | M05   | Approx. 17 (cable not included)   |             |             |             |             |             |             |             |

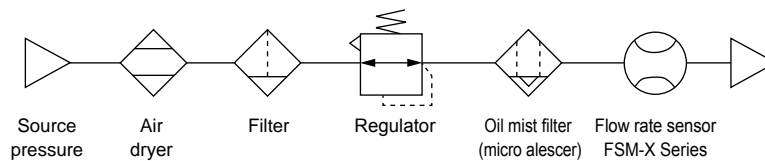
\*1: The value converted to volumetric flow rate 20°C 1 barometric pressure (101 kPa) relative humidity 65%.

\*2: Use air which does not contain corrosive elements such as chlorine, sulfur or acids.

When using compressed air, use clean air that complies with JIS B 8392-1: 2012 (ISO 8573-1: 2010) Class [1: 1: 1 to 1: 6: 2].

Compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.). To maintain the function of this product, install a filter, air dryer, and oil mist filter on the primary side (upstream side) of this product.

When using this product to confirm suction, be sure to install an air filter between the suction nozzle and this product to prevent intake of foreign matter.



\*3: The flow rate output of this product does not indicate the absolute value of the flow rate.

\* Connecting load

The output impedance of the analog output section is 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.

■ Example of calculation

- Output impedance of FSM-X  $R_o = 1\text{ k}\Omega$
- Load internal impedance  $R_x = 1\text{ M}\Omega$
- Output value =  $(1 - R_o/[R_o + R_x]) \times 100\% = (1 - [1\text{ k}\Omega/[1\text{ k}\Omega + 1\text{ M}\Omega]) \times 100\%$
- ⇒ Output value error = approx. 0.1%

\* Wiring resistance

The voltage used for this product is the voltage at the connector. When using the optional cable (FSM-X-C33), note that the voltage varies due to the cable wiring resistance (0.23 Ω/m or less).

■ Example of calculation

- Wiring resistance of optional cable (FSM-X-C33) (3 m):  $0.23\text{ }\Omega/\text{m} \times 3\text{ m} = 0.69\text{ }\Omega$
- Voltage generated between power supply and wire = Current consumption of product (=30 mA) x Wiring resistance  $0.69\text{ }\Omega = \text{approx. } 0.02\text{ V}$
- Output value error =  $0.02\text{ V}/4\text{ V}$  (full scale) = 0.5% F.S.

\*4: Calibrate the sensor using uni-direction analog output of 1 to 5 V and bi-direction analog output of 3 to 5 V.

Accuracy conditions: Temperature  $25\pm 3\text{ }^\circ\text{C}$ , power supply voltage  $24\pm 0.01\text{ VDC}$

F.S. is defined as analog output 1 to 5 V.

\*5: The average value of data taken for 20 seconds at interval of 0.5 ms when flow rate is ON is determined as a measurement value for 1 time, and the repeatability is determined by 10 continuous ON/OFF times of the flow rate.

Change over time is not included.

\*6: The time required for the output to reach 80% of the full scale of flow rate after the flow is detected. The response time varies depending on the piping conditions.

\*7: The value obtained when an internal pressure of 0.2 MPa is applied in an environment of  $25\text{ }^\circ\text{C}\pm 3\text{ }^\circ\text{C}$ . It is an initial value, not including change over time.

\*8: Current for when 24 VDC is connected, and no load is connected. Note that the current consumption may vary depending on how the load is connected.

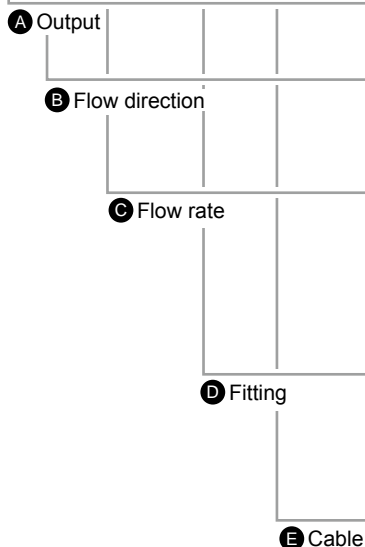
|                           |
|---------------------------|
| F.R.L.                    |
| F.R.                      |
| F (Filtr)                 |
| R (Reg)                   |
| L (Lub)                   |
| Drain Separ               |
| Mech Press SW             |
| Res press exh valve       |
| SlowStart                 |
| Anti-bac/Bac-remove Filtr |
| Film Resist FR            |
| Oil-ProhR                 |
| Med Press FR              |
| No Cu/ PTFE FRL           |
| Outdrs FRL                |
| Adapter Joiner            |
| Press Gauge               |
| CompFRL                   |
| LgFRL                     |
| PrecsR                    |
| VacF/R                    |
| Clean FR                  |
| ElecPneuR                 |
| AirBoost                  |
| Speed Ctrl                |
| Silncr                    |
| CheckV/ other             |
| Fit/Tube                  |
| Nozzle                    |
| Air Unit                  |
| PresCompn                 |
| Electro Press SW          |
| ContactSW                 |
| AirSens                   |
| PresSW Cool               |
| Air Flo Sens/Ctrl         |
| WaterRISens               |
| TotAirSys (Total Air)     |
| TotAirSys (Gamma)         |
| Gas generator             |
| RefrDry                   |
| DesicDry                  |
| HiPolymDry                |
| MainFiltr                 |
| Dischrg etc               |
| Ending                    |

## F.R.L. How to order

- F.R.
- F (Filtr)
- R (Reg)
- L (Lub)
- Drain Separ
- Mech Press SW
- Res press exh valve
- SlowStart
- Anti-bac/Bac-remove Filtr
- Film Resist FR
- Oil-ProhR
- Med Press FR
- No Cu/PTFE FRL
- Outdrs FRL
- Adapter Joiner
- Press Gauge
- CompFRL
- LgFRL
- PrecsR
- VacF/R
- Clean FR
- ElecPneur
- AirBoost
- Speed Ctrl
- Silncr
- CheckV/other
- Fit/Tube
- Nozzle
- Air Unit
- PrecsCompn
- Electro Press SW
- ContactSW
- AirSens
- PresSW Cool
- Air Flo Sens/Ctrl
- WaterRtSens
- TotAirSys (Total Air)
- TotAirSys (Gamma)
- Gas generator
- RefrDry
- DesicDry
- HiPolymDry
- MainFiltr
- Dischrg etc
- Ending

● Body  
**FSM-X - A F 005 - H04 - 3**

Model No.



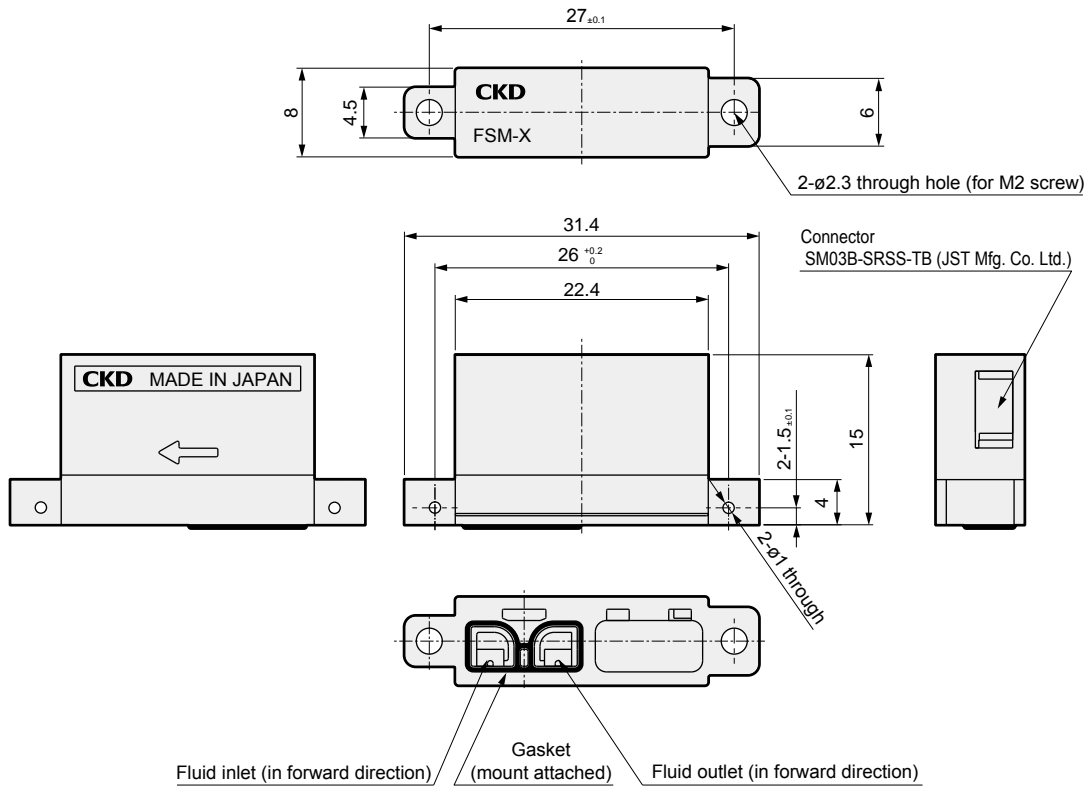
| Code                    | Description                                  |
|-------------------------|--|
| <b>A Output</b>         |  |
| A                       | Analog output                                |
| <b>B Flow direction</b> |  |
| F                       | Uni-direction                                |
| R                       | Bi-direction                                 |
| <b>C Flow rate</b>      |  |
| 005                     | Full scale: 0.5 L/min                        |
| 010                     | Full scale: 1 L/min                          |
| 050                     | Full scale: 5 L/min                          |
| 100                     | Full scale: 10 L/min                         |
| <b>D Fitting</b>        |  |
| Blank                   | Single sensor head (without fitting)         |
| H04                     | With flow path block (ø4 mm push-in fitting) |
| M05                     | With flow path block (M5)                    |
| <b>E Cable</b>          |  |
| Blank                   | Without cable                                |
| 3                       | Cable with connector (3-conductor, 3 m)      |

● Options  
**FSM-X - C33**

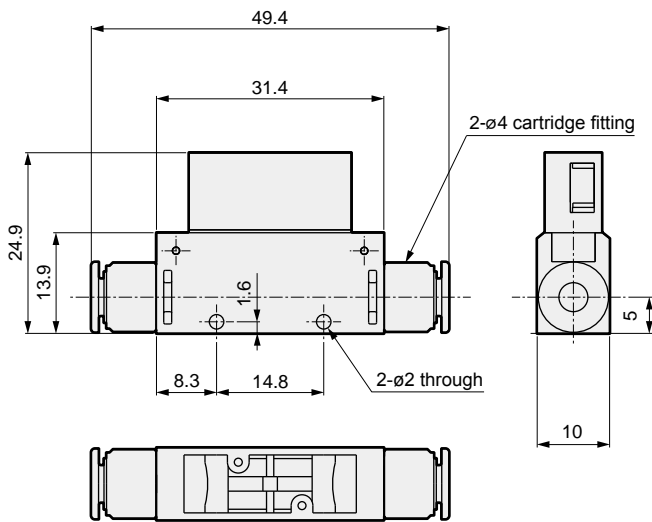
| Cable |   |
|-------|---|
| C33   | Cable with connector (3-conductor, 3 m) |

## Dimensions

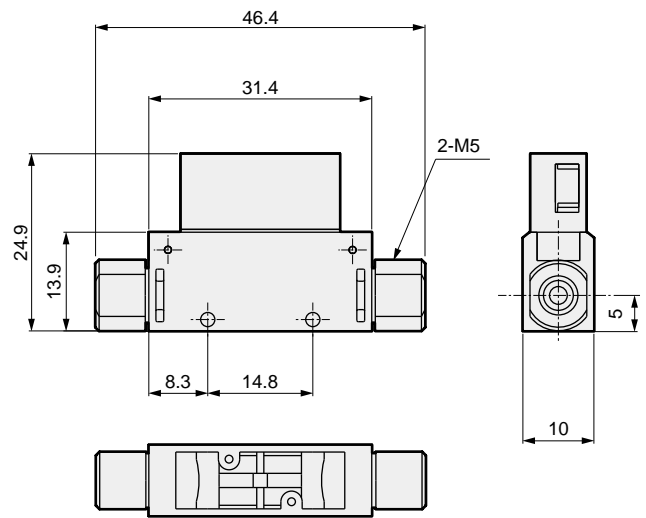
● Discrete sensor head



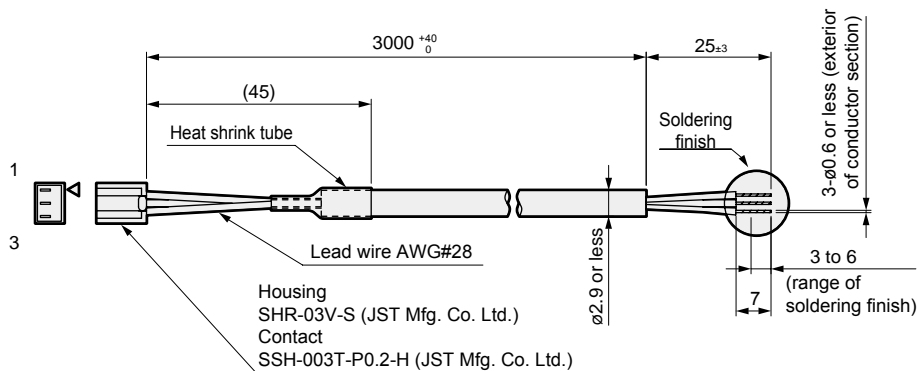
● With flow path block  
- With  $\phi 4$  push-in fitting



· With M5



● Optional cable

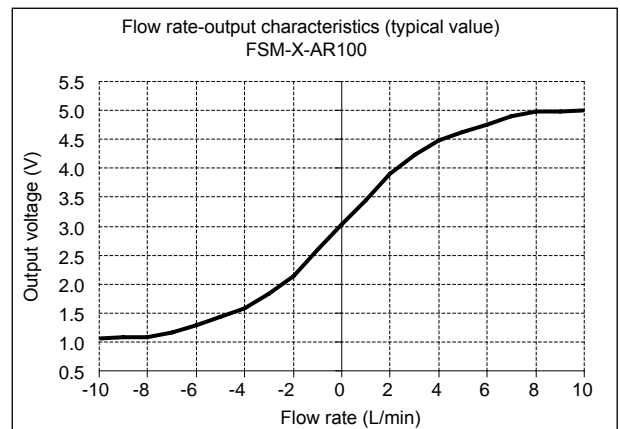
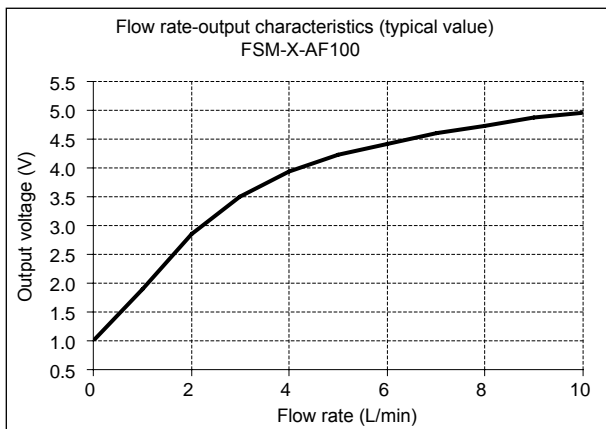
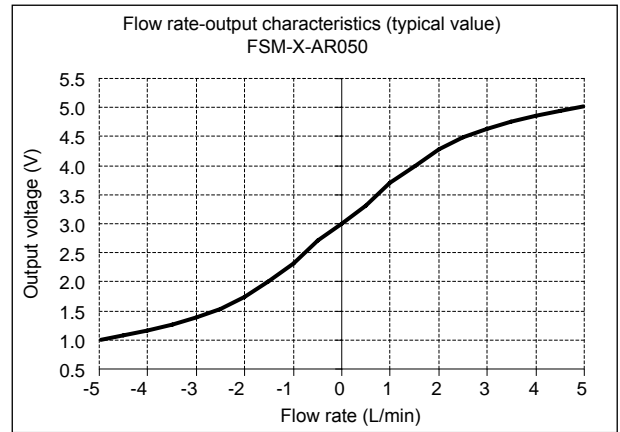
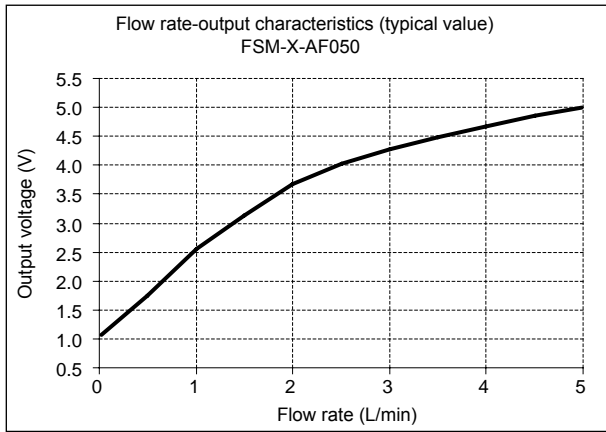
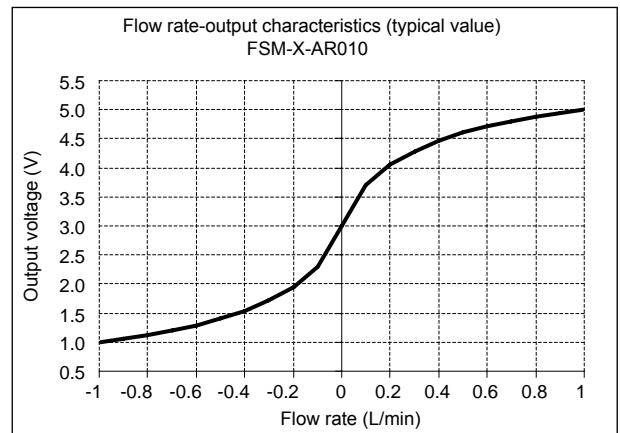
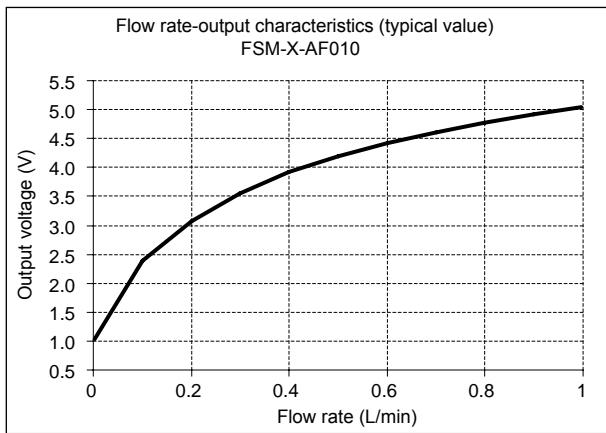
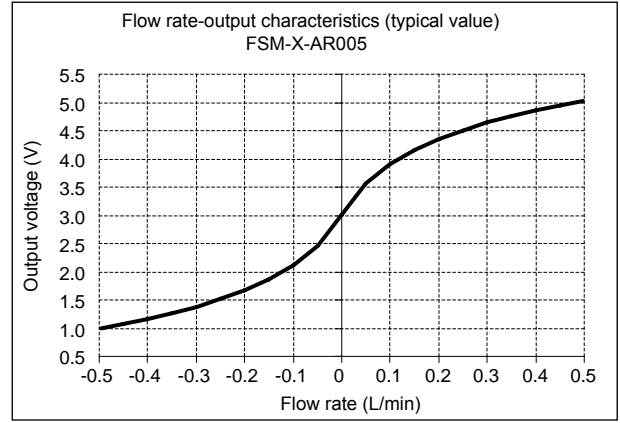
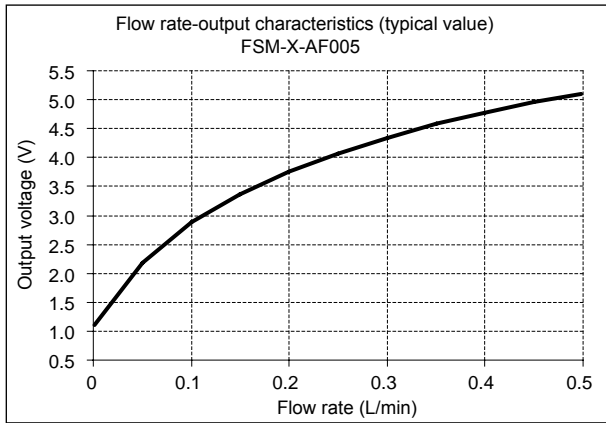


| Pin No. | Line  | Type of signal           |
|---------|-------|--------------------------|
| 1       | Brown | Power supply + 24 VDC    |
| 2       | Blue  | Power supply - GND       |
| 3       | Black | Analog output (1 to 5 V) |

- F.R.L.
- F.R.
- F (Filtr)
- R (Reg)
- L (Lub)
- Drain Separ
- Mech Press SW
- Res press exh valve
- SlowStart
- Anti-bac/Bac-remove Filtr
- Film Resist FR
- Oil-ProhR
- Med Press FR
- No Cu/ PTFE FRL
- Outdrs FRL
- Adapter Joiner
- Press Gauge
- CompFRL
- LgFRL
- PrecsR
- VacF/R
- Clean FR
- ElecPneuR
- AirBoost
- Speed Ctrl
- Silncr
- CheckV/ other
- Fit/Tube
- Nozzle
- Air Unit
- PrecsCompn
- Electro Press SW
- ContactSW
- AirSens
- PresSW Cool
- Air Flo Sens/Ctrl
- WaterRISens
- TotAirSys (Total Air)
- TotAirSys (Gamma)
- Gas generator
- RefrDry
- DesicDry
- HiPolymDry
- MainFiltr Dischrg etc
- Ending

## F.R.L. Analog output characteristics (reference value)

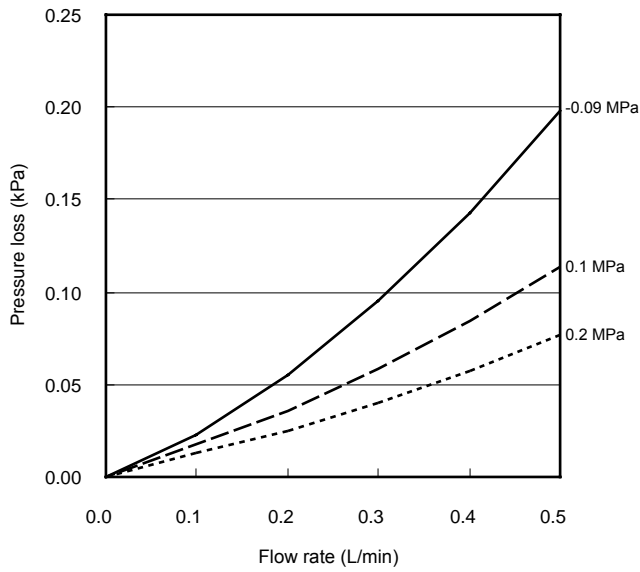
- F.R.
- F (Filtr)
- R (Reg)
- L (Lub)
- Drain Separ
- Mech Press SW
- Res press exh valve
- SlowStart
- Anti-bac/Bac-remove Filtr
- Film Resist FR
- Oil-Prohr
- Med Press FR
- No Cu/ PTFE FRL
- Outdrs FRL
- Adapter Joiner Press Gauge
- CompFRL
- LgFRL
- PrecsR
- VacF/R
- Clean FR
- ElecPneur
- AirBoost
- Speed Ctrl
- Silncr
- CheckV/other
- Fit/Tube
- Nozzle
- Air Unit
- PrecsCompn
- Electro Press SW
- ContactSW
- AirSens
- PresSW Cool
- Air Flo Sens/Ctrl
- WaterRtSens
- TotAirSys (Total Air)
- TotAirSys (Gamma)
- Gas generator
- RefrDry
- DesicDry
- HiPolymDry
- MainFiltr
- Dischrg etc
- Ending



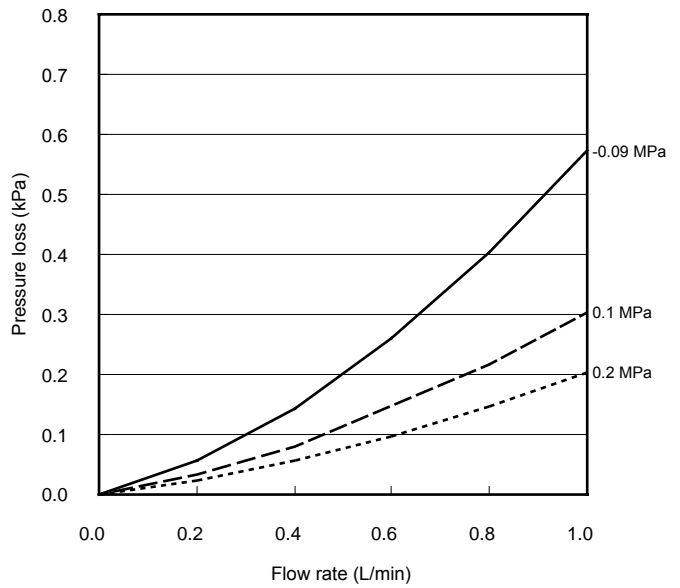
\* The output voltage may vary depending on the working pressure or piping conditions.

### Pressure loss characteristics

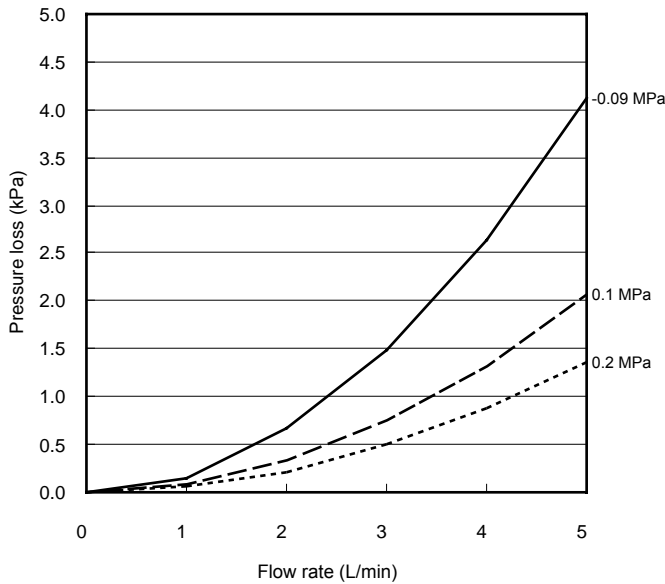
● FSM-X-AF005-H04



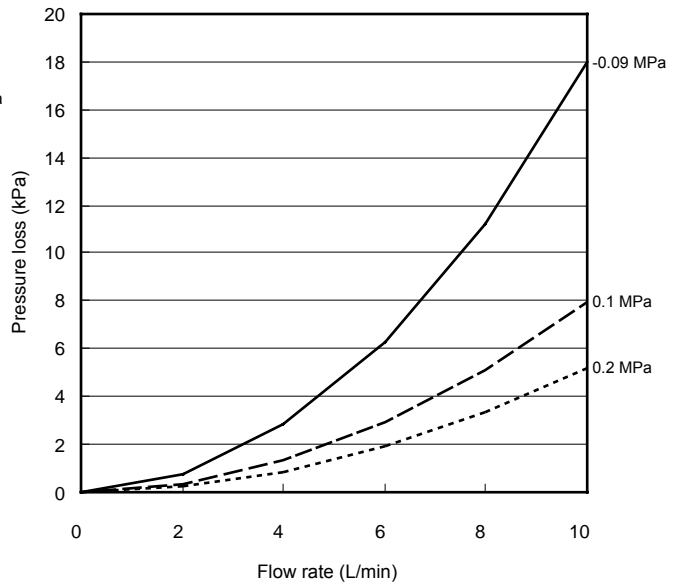
● FSM-X-AF010-H04



● FSM-X-AF050-H04



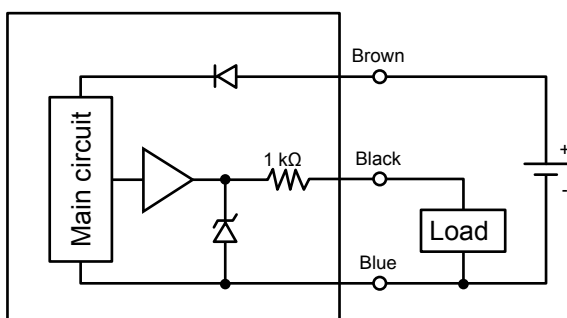
● FSM-X-AF100-H04



\* The pressure loss may increase depending on the piping conditions.

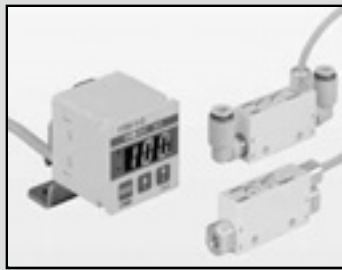
### Example of internal circuit and load connection

● FSM-X (analog output)



| Line color | Description   |
|------------|---|
| Brown      | Power supply 24 VDC   |
| Blue       | 0 V(GND)  |
| Black      | Analog output: (1 to 5 V)<br>connected load impedance 50 kΩ or more |

- F.R.L.
- F.R.
- F (Filtr)
- R (Reg)
- L (Lub)
- Drain Separ
- Mech Press SW
- Res press exh valve
- SlowStart
- Anti-bac/Bac-remove Filtr
- Film Resist FR
- Oil-ProhR
- Med Press FR
- No Cu/ PTFE FRL
- Outdris FRL
- Adapter Joiner
- Press Gauge
- CompFRL
- LgFRL
- PrecsR
- VacF/R
- Clean FR
- ElecPneuR
- AirBoost
- Speed Ctrl
- Silncr
- CheckV/ other
- Fit/Tube
- Nozzle
- Air Unit
- PresCompn
- Electro Press SW
- ContactSW
- AirSens
- PresSW Cool
- Air Flo Sens/Ctrl
- WaterRSens
- TotAirSys (Total Air)
- TotAirSys (Gamma)
- Gas generator
- RefrDry
- DesicDry
- HiPolymDry
- MainFiltr
- Dischrg etc
- Ending



Miniature flow rate sensor  
**RAPIFLOW**  
 analog output/switch output

# FSM-V Series (for air/nitrogen gas)

● Flow rate range:  $\pm 0.05$ ,  $\pm 0.1$ ,  $\pm 0.5$ ,  $\pm 1$ ,  $\pm 5$ ,  $\pm 10$  L/min



## Sensor body specifications

1 MPa  $\approx$  145.0 psi, 1 MPa = 10 bar

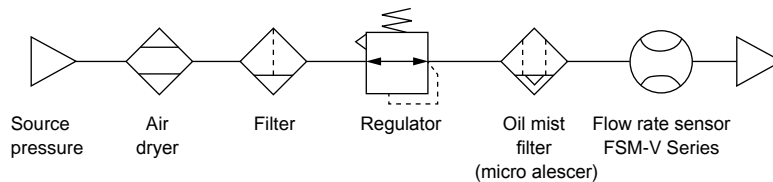
| Model No.                        | Analog output  |  |                   |                   |                        |               | Switch output   |                             |                             |                             |                             |                             |  |
|----------------------------------|--|--|-------------------|-------------------|------------------------|---------------|---|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--|
|                                  | FSM-V-A-R0005  | FSM-V-A-R0010  | FSM-V-A-R0050     | FSM-V-A-R0100     | FSM-V-A-R0500          | FSM-V-A-R1000 | FSM-V- $\frac{N}{P}$ -R0005   | FSM-V- $\frac{N}{P}$ -R0010 | FSM-V- $\frac{N}{P}$ -R0050 | FSM-V- $\frac{N}{P}$ -R0100 | FSM-V- $\frac{N}{P}$ -R0500 | FSM-V- $\frac{N}{P}$ -R1000 |  |
| Flow rate range (L/min) *6       | -0.05 to +0.05   | -0.1 to +0.1   | -0.5 to +0.5      | -1 to +1          | -5 to +5               | -10 to +10    | -0.05 to +0.05  | -0.1 to +0.1                | -0.5 to +0.5                | -1 to +1                    | -5 to +5                    | -10 to +10                  |  |
| (Ref) Nozzle for suction/release | $\phi 0.1$ nozzle  |  | $\phi 0.2$ nozzle | $\phi 0.3$ nozzle | Collet nozzle          |               | $\phi 0.1$ nozzle   |                             | $\phi 0.2$ nozzle           | $\phi 0.3$ nozzle           | Collet nozzle               |                             |  |
| Working conditions               | Applicable fluid   | Clean air (JIS B 8392-1:2012 (ISO 8573-1:2010) [1: 1 to 1 to 1: 6: 2]), compressed air (JIS B 8392-1: 2012 (ISO 8573-1: 2010) [1: 1 to 1 to 1: 6: 2]), *1 nitrogen gas |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
|                                  | Max. working pressure MPa  | 0.2 ( $\approx$ 29 psi, 2 bar)   |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
|                                  | Min. working pressure MPa  | -0.09 ( $\approx$ -13 psi, -0.9 bar)   |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
|                                  | Proof pressure MPa   | 0.3 ( $\approx$ 44 psi, 3 bar)   |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
|                                  | Ambient temperature/humidity °C  | 0 (32°F) to 50 (122°F), 90% RH or less (no condensation)   |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
|                                  | Working fluid temperature °C   | 0 (32°F) to 50 (122°F)   |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
| Display                          | Power display (green)  |  |                   |                   |                        |               | Power display (green), switch output display (yellow)   |                             |                             |                             |                             |                             |  |
| Output                           | Analog output 1 point *2<br>(1 to 5 V voltage output, connecting load impedance 50 k $\Omega$ and over) *7 |  |                   |                   |                        |               | Switch output 2 points *3<br>(NPN or PNP open collector output, 30 VDC or less and 50 mA or less, PLC/relay compatible) |                             |                             |                             |                             |                             |  |
| *4 Accuracy                      | Linearity  | $\pm 5\%$ F.S. or less (0.1 MPa ( $\approx$ 15 psi), flow rate range $\pm 100\%$ F.S.)   |                   |                   |                        |               |   | -                           |                             |                             |                             |                             |  |
|                                  | Pressure characteristics   | $\pm 5\%$ F.S. or less (-0.09 to 0.2 MPa, 0.1 MPa reference)   |                   |                   |                        |               |   | -                           |                             |                             |                             |                             |  |
|                                  | Temperature characteristics  | $\pm 0.2\%$ F.S./°C or less (15 (59°F) to 35°C (95°F), 25°C (77°F) reference)  |                   |                   |                        |               |   | -                           |                             |                             |                             |                             |  |
|                                  | Repeatability  | $\pm 1\%$ F.S. or less   |                   |                   | $\pm 2\%$ F.S. or less |               |   | $\pm 2\%$ F.S. or less      |                             |                             |                             |                             |  |
| Response time                    | 5 ms or less (discrete sensor/when 90% of the final attained output voltage is reached) *5                 |  |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
| Power supply voltage             | 12/24 VDC (10.8 to 26.4 V)   |  |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
| Current consumption              | 30 mA or less  |  |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
| Lead wire                        | $\phi 2.6$ 3-conductor (0.15mm <sup>2</sup> insulator outer diameter $\phi 0.81$ ) 3 m                     |  |                   |                   |                        |               | $\phi 2.6$ 4-conductor (0.15mm <sup>2</sup> insulator outer diameter $\phi 0.81$ ) 3 m                                  |                             |                             |                             |                             |                             |  |
| Mounting                         | Mounting orientation   | Unrestricted in vertical/horizontal direction  |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
|                                  | Straight piping section  | Not required   |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
| Degree of protection             | IEC standards IP40   |  |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
| Vibration resistance             | 10 to 150 Hz, compound amplitude 1.5 mm, max. 10 G, 2 hours per X, Y, Z direction                          |  |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
| EMC Directive                    | EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8  |  |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |
| Weight                           | g Approx. 8 (excluding lead wire and fitting)  |  |                   |                   |                        |               |   |                             |                             |                             |                             |                             |  |

\*1: Use air which does not contain corrosive elements such as chlorine, sulfur or acids.

When using compressed air, use clean air that complies with JIS B 8392-1: 2012 (ISO 8573-1: 2010) Class [1: 1: 1 to 1: 6: 2].

Compressed air from the compressor contains drainage (water, oil 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 content 0.1 mg/m<sup>3</sup>) on the primary side (upstream side) of this product.

When using this product to confirm suction, be sure to install an air filter (filtration rating 30 mm or less) between the suction nozzle and the product to prevent intake of foreign matter.



\*2: The analog output indicates 3 V when the flow rate is 0, and changes to 5 V when the fluid flows to the right (when the lead wire is to the right of the body). In addition, it changes to 1 V with reverse flow.

\*3: The switch output uses the method of one boundary-value determination with fixed hysteresis, and can be set with all flow rate ranges by rotating the trimmer. In addition, the operation modes of OUT1 and OUT2 are opposite to each other.

\*4: Calibrate the sensor at 1 to 5 V.

Accuracy conditions: Temperature 25 $\pm$ 3°C, power supply voltage 24 $\pm$ 0.01 VDC

F.S. (full scale) in these specifications indicates the flow rate range. For example, the F.S. for flow rate range of -10 to +10 L/min is 20 L/min.

\*5: The response time varies depending on the piping conditions.

\*6: The value converted to volumetric flow rate 20°C 1 barometric pressure (101 kPa) relative humidity 65%.

\*7: The output impedance of the analog output section is 1 k $\Omega$ . If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using.

■ Example of calculation

· Output impedance of FSM-V Ro = 1 k $\Omega$

· Load internal impedance Rx = 1 M $\Omega$

· Output value =  $(1 - Ro/(Ro + Rx)) \times 100\% = (1 - [1 \text{ k}\Omega / (1 \text{ k}\Omega + 1 \text{ M}\Omega)]) \times 100\%$

⇒ Output value error = approx. 0.1%

### Separated display specifications (dedicated for analog output) \*7

| Model No.                              | Separated display  |  |  |  |  |  |
|--|--|--|--|--|--|--|
| Item                                   | FSM-V-D <sup>N</sup> / <sub>P</sub> -R0005   | FSM-V-D <sup>N</sup> / <sub>P</sub> -R0010 | FSM-V-D <sup>N</sup> / <sub>P</sub> -R0050 | FSM-V-D <sup>N</sup> / <sub>P</sub> -R0100 | FSM-V-D <sup>N</sup> / <sub>P</sub> -R0500 | FSM-V-D <sup>N</sup> / <sub>P</sub> -R1000 |
| Linkable analog output model No.       | FSM-V-A-R0005  | FSM-V-A-R0010                              | FSM-V-A-R0050                              | FSM-V-A-R0100                              | FSM-V-A-R0500                              | FSM-V-A-R1000                              |
| Display                                | Display  |  |  |  |  |  |
|  | Flow rate display (7-segment 3-digit orange), operation and switch output display (orange)   |  |  |  |  |  |
|  | Min. display unit *8   | 0.1 ml/min *7                              | 1 ml/min *7                                | 0.01 l/min *7                              | 0.1 l/min *7                               | 0.1 l/min *7                               |
| Output                                 | Switch output 2 points<br>(NPN or PNP open collector output, 30 VDC or less/50 mA or less, voltage drop 2.4 V, PLC/relay compatible)<br>Analog output 1 point<br>(1 to 5V voltage output, connected load impedance 50 kΩ and over) |  |  |  |  |  |
| Power supply voltage                   | 12/24 VDC(10.8 to 26.4V)   |  |  |  |  |  |
| Current consumption                    | 50 mA or less (display only)   |  |  |  |  |  |
| Lead wire                              | ø3.7 5-conductor (0.2mm <sup>2</sup> insulator outer diameter ø1.0) 1 m  |  |  |  |  |  |
| Functions                              | Flow rate display, flow rate display peak hold, switch output, analog output   |  |  |  |  |  |
| Operating ambient temperature/humidity | 0 (32°F) to 50°C (122°F), 85% RH or less (no condensation)   |  |  |  |  |  |
| Degree of protection                   | IEC standards IP40   |  |  |  |  |  |
| EMC Directive                          | EN55011,EN61000-6-2,EN61000-4-2/3/4/6/8  |  |  |  |  |  |
| Weight                                 | g  | Approx. 55 (including lead wire 1 m)       |  |  |  |  |

\*7: The separated display is dedicated for analog output. Note that the switch output cannot be connected.

\*8: This indicates min. display unit of flow rate, and does not guarantee indicator accuracy.

|                           |
|---------------------------|
| F.R.L.                    |
| F.R.                      |
| F (Filtr)                 |
| R (Reg)                   |
| L (Lub)                   |
| Drain Separ               |
| Mech Press SW             |
| Res press exh valve       |
| SlowStart                 |
| Anti-bac/Bac-remove Filtr |
| Film Resist FR            |
| Oil-ProhR                 |
| Med Press FR              |
| No Cu/ PTFE FRL           |
| Outdrs FRL                |
| Adapter Joiner            |
| Press Gauge               |
| CompFRL                   |
| LgFRL                     |
| PrecsR                    |
| VacF/R                    |
| Clean FR                  |
| ElecPneuR                 |
| AirBoost                  |
| Speed Ctrl                |
| Silncr                    |
| CheckV/ other             |
| Fit/Tube                  |
| Nozzle                    |
| Air Unit                  |
| PresCompn                 |
| Electro Press SW          |
| ContactSW                 |
| AirSens                   |
| PresSW Cool               |
| Air Flo Sens/Ctrl         |
| WaterRSens                |
| TotAirSys (Total Air)     |
| TotAirSys (Gamma)         |
| Gas generator             |
| RefrDry                   |
| DesicDry                  |
| HiPolymDry                |
| MainFiltr                 |
| Dischrg etc               |
| Ending                    |



- F.R.L.
- F.R.
- F (Filtr)
- R (Reg)
- L (Lub)
- Drain Separ
- Mech Press SW
- Res press exh valve
- SlowStart
- Anti-bac/Bac-remove Filtr
- Film Resist FR
- Oil-Prohr
- Med Press FR
- No Cu/PTFE FRL
- Outdrs FRL
- Adapter Joiner Press Gauge
- CompFRL
- LgFRL
- PrecsR
- VacF/R
- Clean FR
- ElecPneUR
- AirBoost
- Speed Ctrl
- Silncr
- CheckV/other
- Fit/Tube
- Nozzle
- Air Unit
- PrecsCompn
- Electro Press SW
- ContactSW
- AirSens
- PresSW Cool
- Air Flo Sens/Ctrl
- WaterRtSens
- TotAirSys (Total Air)
- TotAirSys (Gamma)
- Gas generator
- RefrDry
- DesicDry
- HiPolymDry
- MainFiltr
- Dischrg etc
- Ending

## How to order

### ● Sensor body

**FSM - V - A H 3 - R0005 - H2**

Model No.

**A** Output

**B** Lead wire leadout direction

**C** Lead wire length

**D** Flow rate

**E** Fitting

| Code                                 | Description  |
|--------------------------------------|--|
| <b>A Output</b>                      |  |
| A                                    | Analog output  |
| N                                    | Switch output (NPN)  |
| P                                    | Switch output (PNP)  |
| <b>B Lead wire leadout direction</b> |  |
| H                                    | Straight   |
| V                                    | L-shaped   |
| <b>C Lead wire length</b>            |  |
| 3                                    | 3 m  |
| <b>D Flow rate</b>                   |  |
| R0005                                | ±0.05 L/min  |
| R0010                                | ±0.1 L/min   |
| R0050                                | ±0.5 L/min   |
| R0100                                | ±1 L/min   |
| R0500                                | ±5 L/min   |
| R1000                                | ±10 L/min  |
| <b>E Fitting</b>                     |  |
| H2                                   | Straight ø1.8 fiber tube ( <b>D</b> R1000 type cannot be selected) |
| H4                                   | Straight ø4 push-in  |
| HL4                                  | L-shaped ø4 push-in  |
| M5                                   | Port size M5   |

### ● Separated display (dedicated for analog output)

**FSM - V - D N - R0050**

Model No.

**A** Switch output

**B** Flow rate

| Code                   | Description |
|------------------------|-------------|
| <b>A Switch output</b> |             |
| N                      | NPN output  |
| P                      | PNP output  |
| <b>B Flow rate</b>     |             |
| R0005                  | ±0.05 L/min |
| R0010                  | ±0.1 L/min  |
| R0050                  | ±0.5 L/min  |
| R0100                  | ±1 L/min    |
| R0500                  | ±5 L/min    |
| R1000                  | ±10 L/min   |

\* Refer to pages 1468 to 1474 for operation and dimensions, etc.

### ● Mounting bracket for separated display

**PPD3 - KL-D**

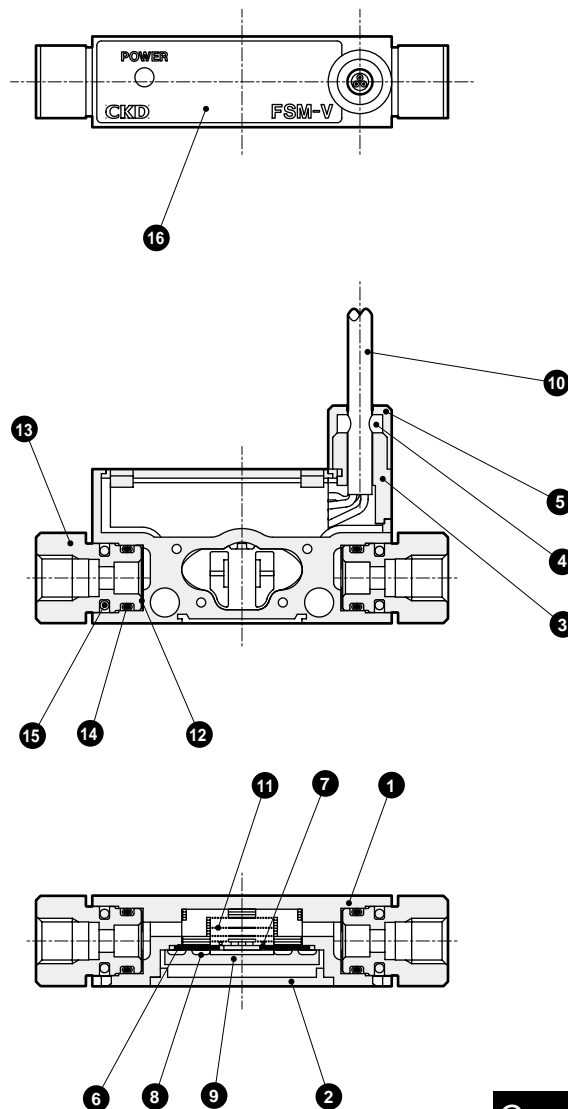
**A** Mounting bracket kit

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

\* Refer to pages 1468 and 1469 for dimensions and mounting dimensions of mounting bracket.

### Internal structure and parts list

- FSM-V-□□3-R□-M5/for analog output  
(switch output also has the same internal structure)



**Cannot be disassembled**

| No. | Part name        | Material                   | No. | Part name                | Material                              |
|-----|------------------|----------------------------|-----|--------------------------|---------------------------------------|
| 1   | Body             | Polybutylene terephthalate | 9   | Electronic circuit board | Glass epoxy resin                     |
| 2   | Case             | Polybutylene terephthalate | 10  | Lead wire                | Halogen-free polyethylene resin blend |
| 3   | Lead wire holder | Polybutylene terephthalate | 11  | Rectifier                | Stainless steel                       |
| 4   | Bush             | Nitrile rubber             | 12  | Filter                   | Stainless steel                       |
| 5   | Bush holder      | Aluminum alloy             | 13  | Cartridge fitting (M5)   | Aluminum alloy                        |
| 6   | Sensor gasket    | Fluoro rubber              | 14  | O-ring                   | Nitrile rubber                        |
| 7   | Sensor chip      | Silicone                   | 15  | Fitting fixing pin       | Stainless steel                       |
| 8   | P-TITE screw     | Steel (zinc plating)       | 16  | Front sheet              | Polyester film                        |

\*1: The analog output and the switch output differ in appearance of the front sheet section.

- Separated display FSM-V-D□□-R□□

Refer to page 1468 for internal structure.

|                            |
|----------------------------|
| F.R.L.                     |
| F.R.                       |
| F (Filtr)                  |
| R (Reg)                    |
| L (Lub)                    |
| Drain Separ                |
| Mech Press SW              |
| Res press exh valve        |
| SlowStart                  |
| Anti-bac/Bac-remove Filtr  |
| Film Resist FR             |
| Oil-ProhR                  |
| Med Press FR               |
| No Cu/ PTFE FRL            |
| Outdrs FRL                 |
| Adapter Joiner Press Gauge |
| CompFRL                    |
| LgFRL                      |
| PreCsR                     |
| VacF/R                     |
| Clean FR                   |
| ElecPneuR                  |
| AirBoost                   |
| Speed Ctrl                 |
| Silncr                     |
| CheckV/ other              |
| Fit/Tube                   |
| Nozzle                     |
| Air Unit                   |
| PreCsCompn                 |
| Electro Press SW           |
| ContactSW                  |
| AirSens                    |
| PresSW Cool                |
| Air Flo Sens/Ctrl          |
| WaterRISens                |
| TotAirSys (Total Air)      |
| TotAirSys (Gamma)          |
| Gas generator              |
| RefrDry                    |
| DesicDry                   |
| HiPolymDry                 |
| MainFiltr                  |
| Dischrg etc                |
| Ending                     |

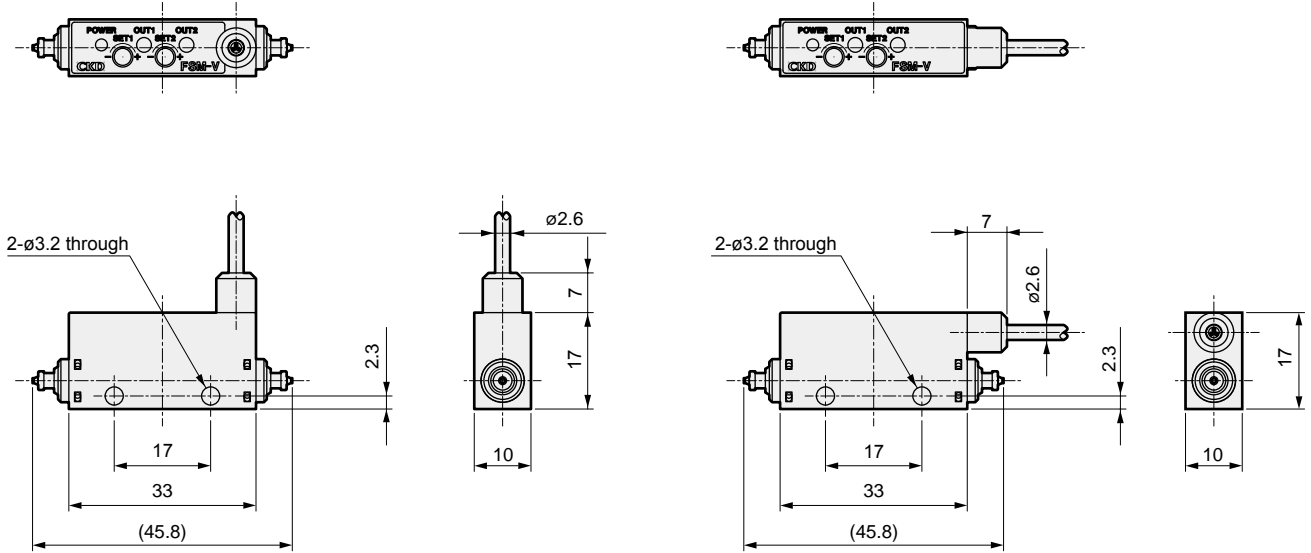


## F.R.L. Dimensions (common to analog output and switch output)

|                       |
|-----------------------|
| F.R.                  |
| F (Filtr)             |
| R (Reg)               |
| L (Lub)               |
| Drain Separ           |
| Mech Press SW         |
| Res press exh valve   |
| SlowStart             |
| Anti-bac/remove Filtr |
| Film Resist FR        |
| Oil-ProhR             |
| Med Press FR          |
| No Cu/ PTFE FRL       |
| Outdrs FRL            |
| Adapter Joiner        |
| Press Gauge           |
| CompFRL               |
| LgFRL                 |
| PrecsR                |
| VacF/R                |
| Clean FR              |
| ElecPneur             |
| AirBoost              |
| Speed Ctrl            |
| Silncr                |
| CheckV/ other         |
| Fit/Tube              |
| Nozzle                |
| Air Unit              |
| PrecsCompn            |
| Electro Press SW      |
| ContactSW             |
| AirSens               |
| PresSW Cool           |
| Air Flo Sens/Ctrl     |
| WaterRtSens           |
| TotAirSys (Total Air) |
| TotAirSys (Gamma)     |
| Gas generator         |
| RefrDry               |
| DesicDry              |
| HiPolymDry            |
| MainFiltr             |
| Dischrg etc           |
| Ending                |

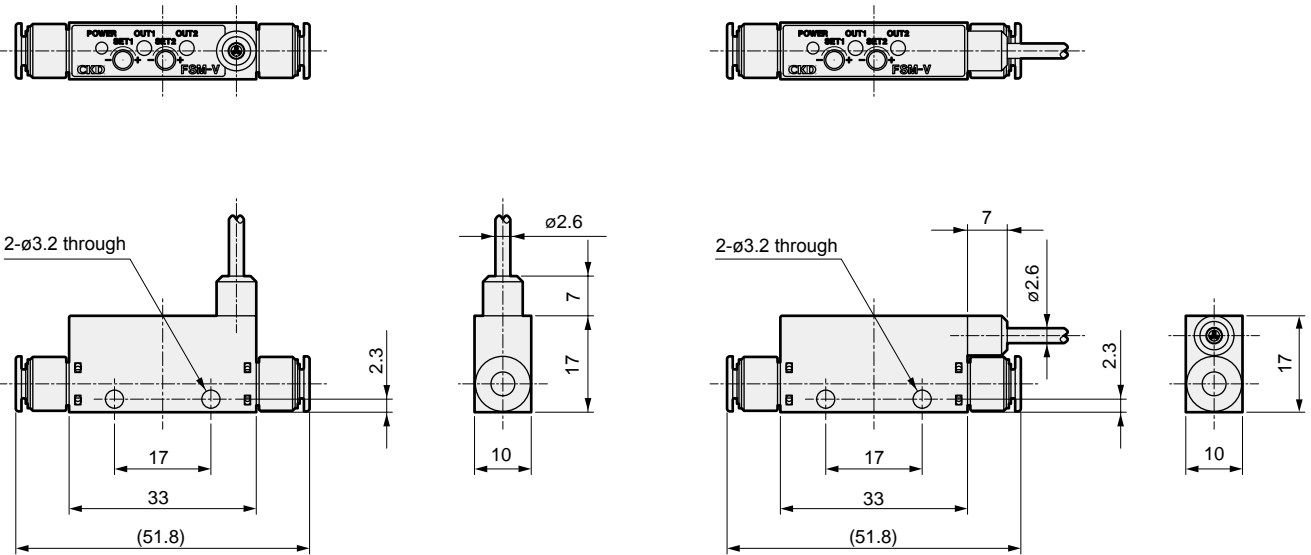
● FSM-V-□V3-R□-H2  
(Radial lead wire, straight  $\phi 1.8$  fiber tube)

● FSM-V-□H3-R□-H2  
(Axial lead wire, straight  $\phi 1.8$  fiber tube)



● FSM-V-□V3-R□-H4  
(Radial lead wire, straight  $\phi 4$  push-in)

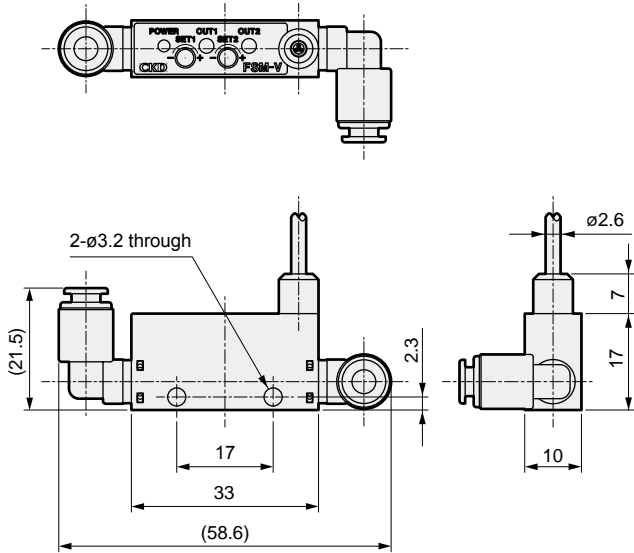
● FSM-V-□H3-R□-H4  
(Axial lead wire, straight  $\phi 4$  push-in)



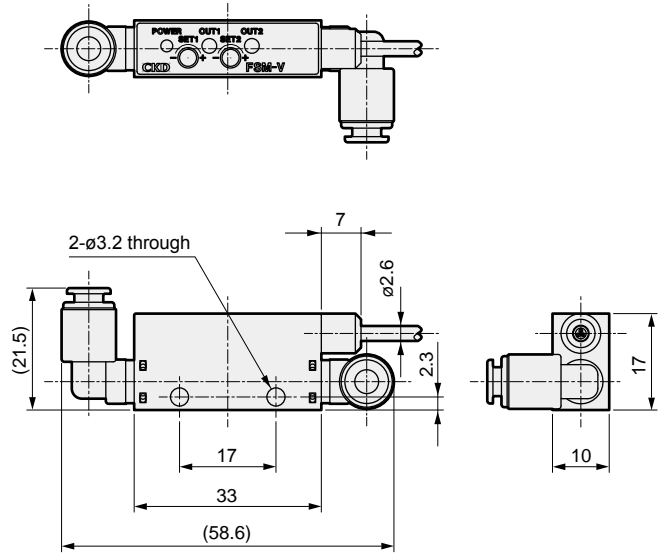
\* The analog output and the switch output differ in appearance of the front sheet section.

### Dimensions

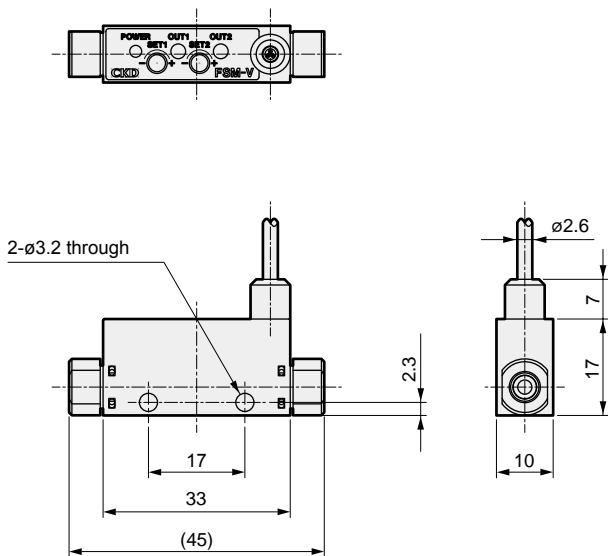
- FSM-V-□V3-R□-HL4  
(Radial lead wire, L-shaped ø4 push-in)



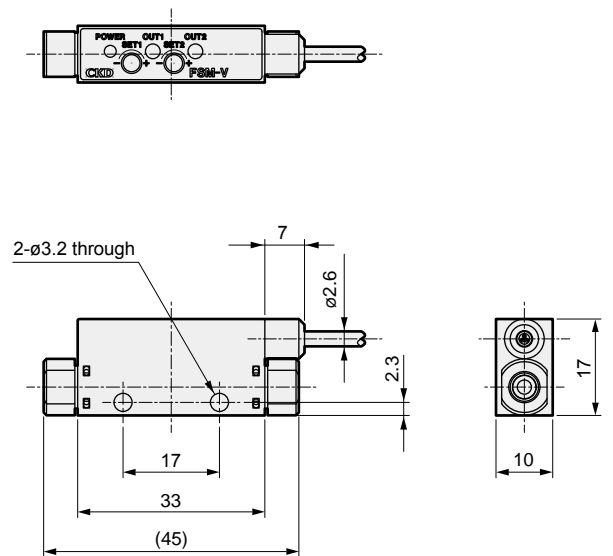
- FSM-V-□H3-R□-HL4  
(Axial lead wire, L-shaped ø4 push-in)



- FSM-V-□V3-R□-M5  
(Radial lead wire, port size M5)



- FSM-V-□H3-R□-M5  
(Lead wire straight, port size M5)

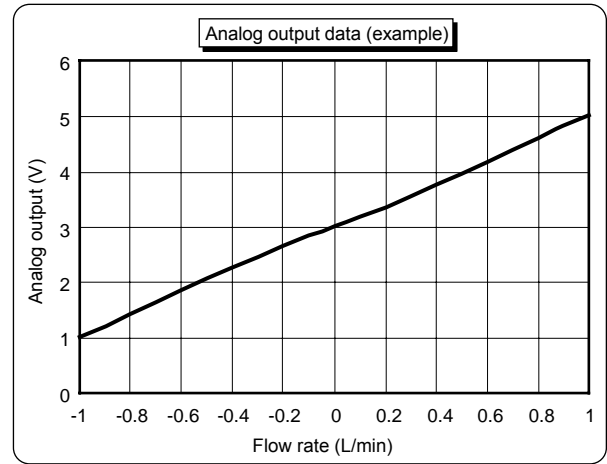
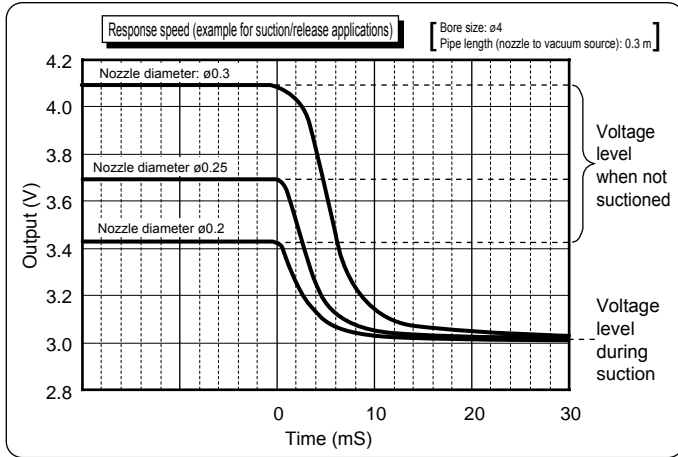


\* The analog output and the switch output differ in appearance of the front sheet section.

|                            |
|----------------------------|
| F.R.L.                     |
| F.R.                       |
| F (Filtr)                  |
| R (Reg)                    |
| L (Lub)                    |
| Drain Separ                |
| Mech Press SW              |
| Res press exh valve        |
| SlowStart                  |
| Anti-bac/Bac-remove Filtr  |
| Film Resist FR             |
| Oil-ProhR                  |
| Med Press FR               |
| No Cu/ PTFE FRL            |
| Outdris FRL                |
| Adapter Joiner Press Gauge |
| CompFRL                    |
| LgFRL                      |
| PrecsR                     |
| VacF/R                     |
| Clean FR                   |
| ElecPneuR                  |
| AirBoost                   |
| Speed Ctrl                 |
| Silncr                     |
| CheckV/ other              |
| Fit/Tube                   |
| Nozzle                     |
| Air Unit                   |
| PresCompn                  |
| Electro Press SW           |
| ContactSW                  |
| AirSens                    |
| PresSW Cool                |
| Air Flo Sens/Ctrl          |
| WaterRSens                 |
| TotAirSys (Total Air)      |
| TotAirSys (Gamma)          |
| Gas generator              |
| RefrDry                    |
| DesicDry                   |
| HiPolymDry                 |
| MainFiltr                  |
| Dischrg etc                |
| Ending                     |

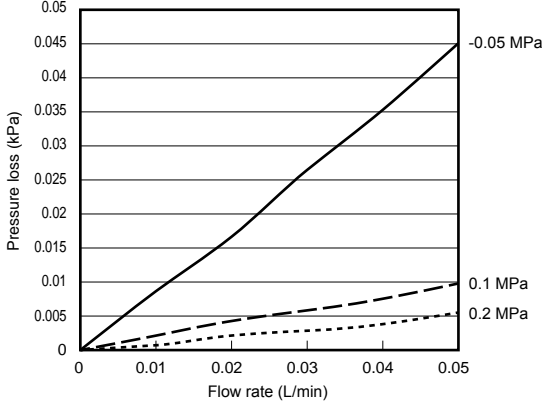
## F.R.L. Analog output characteristics

### F.R. ● FSM-V-A-R0100

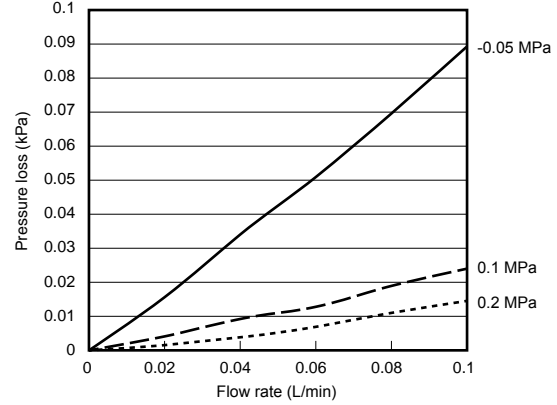


## Pressure loss characteristics

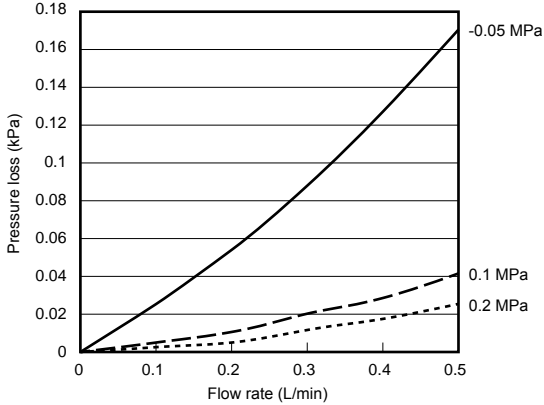
### ● FSM-V-□-R0005-H4



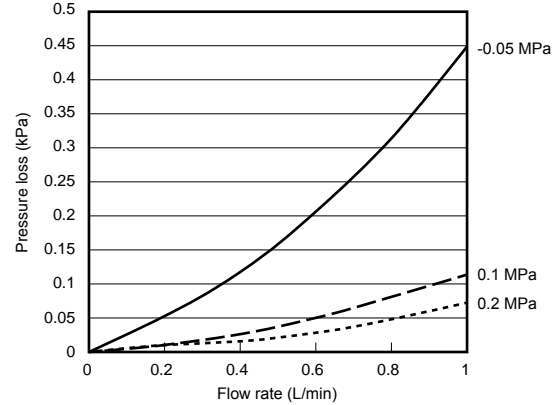
### ● FSM-V-□-R0010-H4



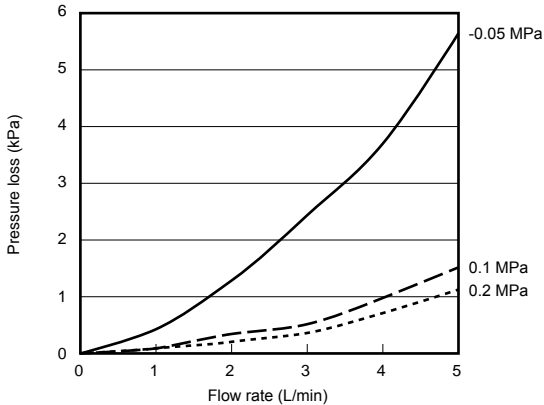
### ● FSM-V-□-R0050-H4



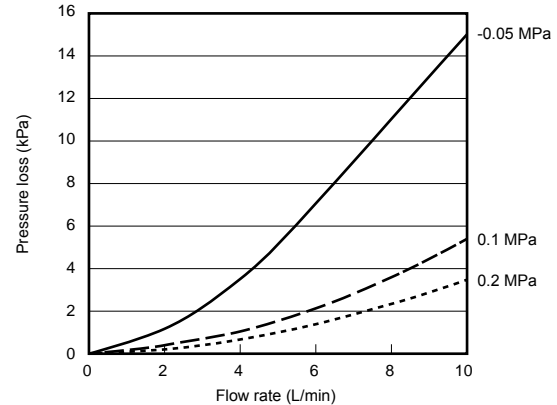
### ● FSM-V-□-R0100-H4



### ● FSM-V-□-R0500-H4



### ● FSM-V-□-R1000-H4

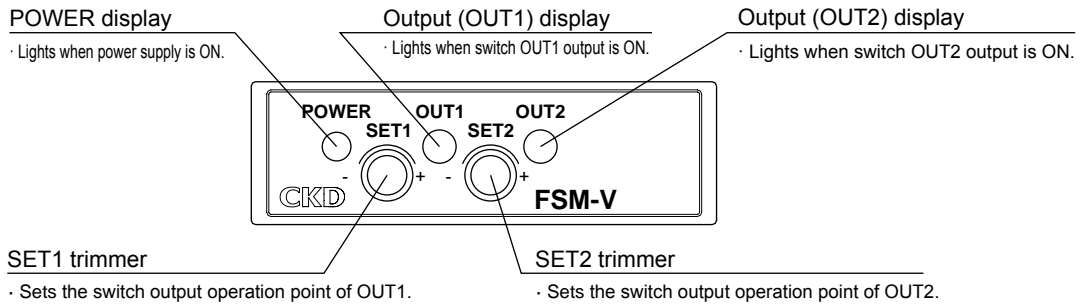


\* When using the fiber tube, the pressure loss may increase depending on the piping conditions.

- F.R.L.
- F.R.
- F (Filtr)
- R (Reg)
- L (Lub)
- Drain Separ
- Mech Press SW
- Res press exh valve
- SlowStart
- Anti-bac/Bac-remove Filtr
- Film Resist FR
- Oil-Prohr
- Med Press FR
- No Cu/PTFE FRL
- Outdrs FRL
- Adapter Joiner
- Press Gauge
- CompFRL
- LgFRL
- PrecsR
- VacF/R
- Clean FR
- ElecPneuR
- AirBoost
- Speed Ctrl
- Silncr
- CheckV/other
- Fit/Tube
- Nozzle
- Air Unit
- PrecsCompn
- Electro Press SW
- ContactSW
- AirSens
- PresSW Cool
- Air Flo Sens/Ctrl
- WaterRtSens
- TotAirSys (Total Air)
- TotAirSys (Gamma)
- Gas generator
- RefrDry
- DesicDry
- HiPolymDry
- MainFiltr
- Dischrg etc
- Ending

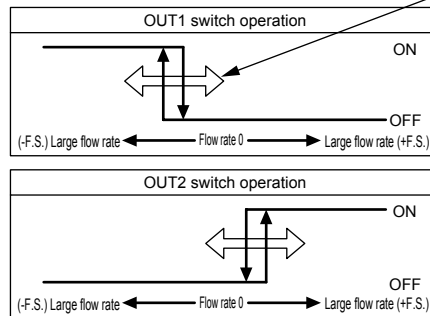
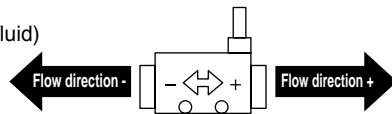
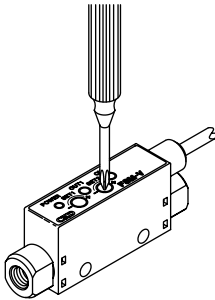
### Names, functions and setting method of operation section

#### ● Switch output



#### Switch setting method (switch operation and flow direction of fluid)

- Rotate the trimmers of SET1 and SET2 to set ON/OFF of 2 switch output points (OUT1/OUT2). Note that the switch operations at 2 output points differ as indicated in the figure at right.
- Use a Phillips screwdriver for 0 bit.



#### Trimmer setting



- (Precautions)
- The hysteresis of the switch output is a fixed value (10% F.S. or less).
  - Do not press the trimmer forcibly with the screwdriver. The trimmer will be damaged.

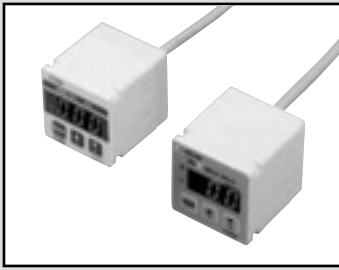
#### ● Separated display

Refer to page 1471 for name, function and operation of the separated display.

|                            |
|----------------------------|
| F.R.L.                     |
| F.R.                       |
| F (Filtr)                  |
| R (Reg)                    |
| L (Lub)                    |
| Drain Separ                |
| Mech Press SW              |
| Res press exh valve        |
| SlowStart                  |
| Anti-bac/Bac-remove Filtr  |
| Film Resist FR             |
| Oil-ProhR                  |
| Med Press FR               |
| No Cu/ PTFE FRL            |
| Outdrs FRL                 |
| Adapter Joiner Press Gauge |
| CompFRL                    |
| LgFRL                      |
| PrecsR                     |
| VacF/R                     |
| Clean FR                   |
| ElecPneuR                  |
| AirBoost                   |
| Speed Ctrl                 |
| Silncr                     |
| CheckV/ other              |
| Fit/Tube                   |
| Nozzle                     |
| Air Unit                   |
| PresCompn                  |
| Electro Press SW           |
| ContactSW                  |
| AirSens                    |
| PresSW Cool                |
| Air Flo Sens/Ctrl          |
| WaterRISens                |
| TotAirSys (Total Air)      |
| TotAirSys (Gamma)          |
| Gas generator              |
| RefrDry                    |
| DesicDry                   |
| HiPolymDry                 |
| MainFiltr                  |
| Dischrg etc                |
| Ending                     |

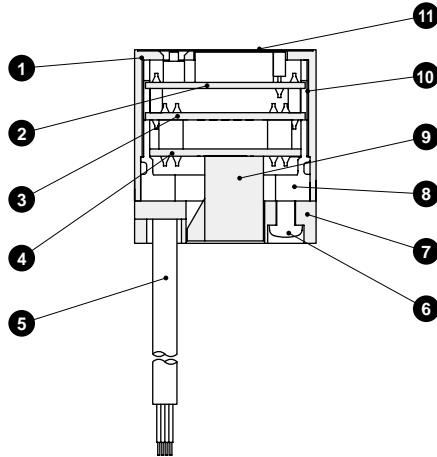
Separated display

# FSM-V-D Series (for FSM-V)



## Internal structure and parts list

### ● FSM-V-D (Separated display)



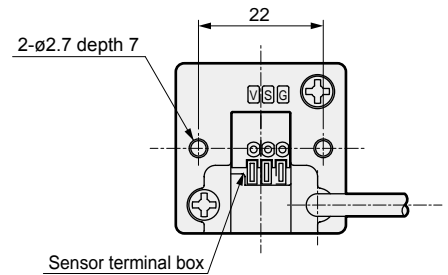
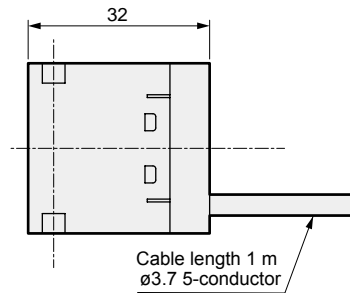
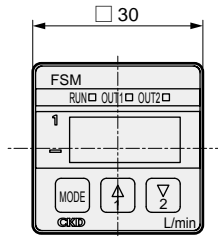
| No. | Part name           | Material                         |
|-----|---------------------|----------------------------------|
| 1   | On the case         | Polybutylene terephthalate       |
| 2   | Display base        | Glass epoxy resin                |
| 3   | CPU board           | Glass epoxy resin                |
| 4   | Sensor board        | Glass epoxy resin                |
| 5   | Lead wire (1 m)     | Polyvinyl chloride               |
| 6   | Thread              | Copper alloy/nickeling           |
| 7   | Back surface cover  | Polybutylene terephthalate       |
| 8   | Inside the case     | Polybutylene terephthalate       |
| 9   | Terminal block      | Polyamide/copper alloy (plating) |
| 10  | Shield sheet        | Aluminum                         |
| 11  | Front surface sheet | Polyester film                   |

**Cannot be disassembled**

## Dimensions

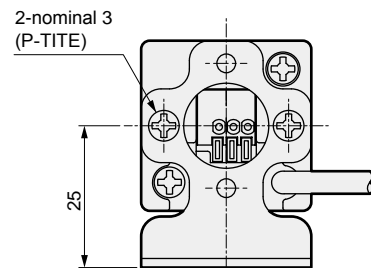
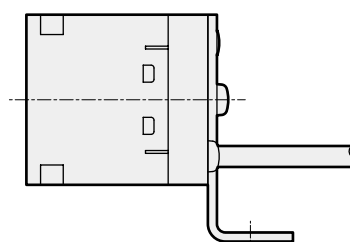
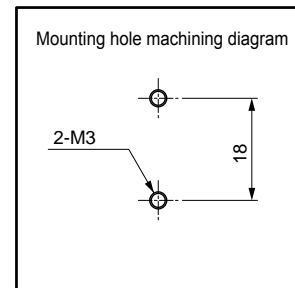
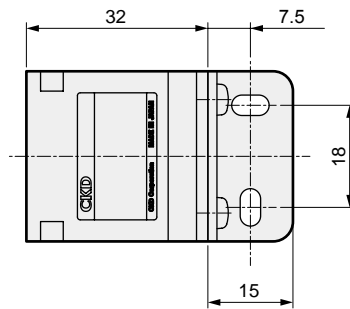


### ● FSM-V-D



## Mounting bracket dimensions

### ● One-side mounting foot attached (PPD3-KL-D) \* L shaped bracket, mounting screws 2 pcs.

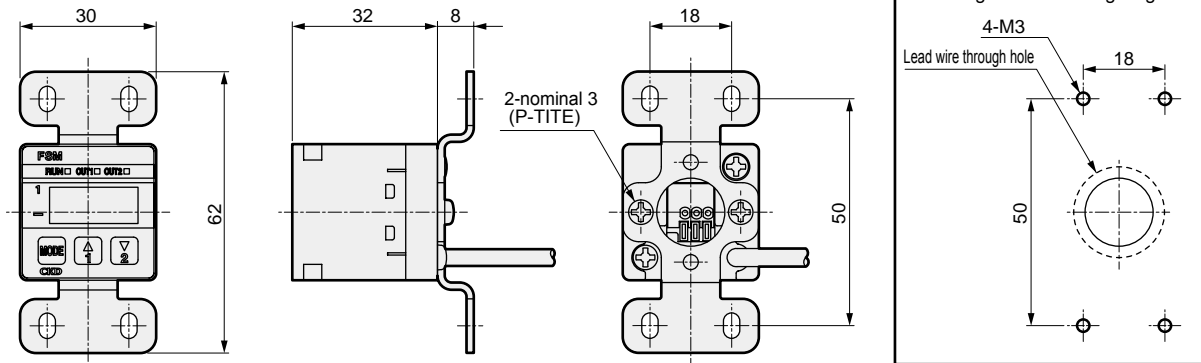


This mounting bracket can be mounted at 90° intervals to the switch body. Determine the mounting direction according to the mounting location.

- F.R.L.
- F.R.
- F (Filtr)
- R (Reg)
- L (Lub)
- Drain
- Separ
- Mech
- Press SW
- Res press
- exh valve
- SlowStart
- Anti-bac/Bac-
- remove Filtr
- Film
- Resist FR
- Oil-Prohr
- Med
- Press FR
- No Cu/
- PTFE FRL
- Outdrs FRL
- Adapter
- Joiner
- Press
- Gauge
- CompFRL
- LgFRL
- PrecsR
- VacF/R
- Clean FR
- ElecPneur
- AirBoost
- Speed Ctrl
- Silncr
- CheckV/
- other
- Fit/Tube
- Nozzle
- Air Unit
- PrecsCompn
- Electro
- Press SW
- ContactSW
- AirSens
- PresSW
- Cool
- Air Flo
- Sens/Ctrl
- WaterRtSens
- TotAirSys
- (Total Air)
- TotAirSys
- (Gamma)
- Gas
- generator
- RefrDry
- DesicDry
- HiPolymDry
- MainFiltr
- Dischrg
- etc
- Ending

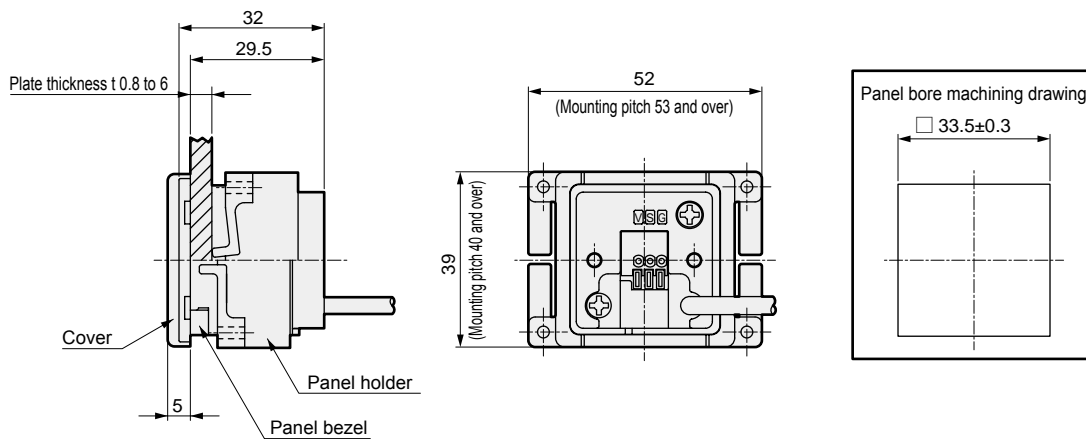
## Mounting bracket dimensions

- Two-side mounting foot attached (PPD3-KD-D)  
\* D type bracket, mounting screws 2 pcs.



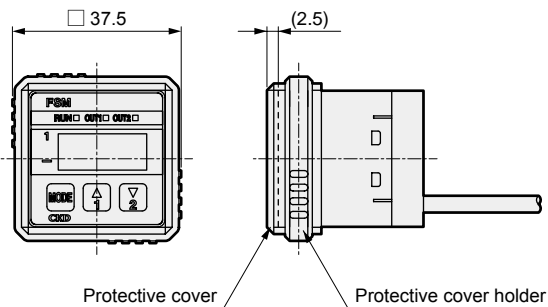
This mounting bracket can be mounted at 90° intervals.  
Determine the mounting direction according to the mounting location.

- Panel mounting bracket set with cover (PPD3-KHS-D)  
\* Panel bezel, panel holder, panel key, panel cover



The mounting direction of the panel holder can be changed by 90°.

- Operation protective cover attached (PPD3-KC)  
\* Protective cover, protective cover holder



Note: Cannot be combined with PPD3-KHS-D.

|                           |
|---------------------------|
| F.R.L.                    |
| F.R.                      |
| F (Filtr)                 |
| R (Reg)                   |
| L (Lub)                   |
| Drain Separ               |
| Mech Press SW             |
| Res press exh valve       |
| SlowStart                 |
| Anti-bac/Bac-remove Filtr |
| Film Resist FR            |
| Oil-ProhR                 |
| Med Press FR              |
| No Cu/ PTFE FRL           |
| Outdrs FRL                |
| Adapter Joiner            |
| Press Gauge               |
| CompFRL                   |
| LgFRL                     |
| PrecsR                    |
| VacF/R                    |
| Clean FR                  |
| ElecPneuR                 |
| AirBoost                  |
| Speed Ctrl                |
| Silncr                    |
| CheckV/ other             |
| Fit/Tube                  |
| Nozzle                    |
| Air Unit                  |
| PresCompn                 |
| Electro Press SW          |
| ContactSW                 |
| AirSens                   |
| PresSW Cool               |
| Air Flo Sens/Ctrl         |
| WaterRSens                |
| TotAirSys (Total Air)     |
| TotAirSys (Gamma)         |
| Gas generator             |
| RefrDry                   |
| DesicDry                  |
| HiPolymDry                |
| MainFiltr                 |
| Dischrg etc               |
| Ending                    |