Dual color with sub display at a glance

Easy-to-read 2-color display with sub display
Easy-to-see dual color with sub display!

The setting conditions are displayed on the sub display, making it much easier to keep track of operations. In addition, the digital display which switches between 2 colors lets you check the status of sensor operation at a glance.

Easy to see with the sub display!
Setting values and setting items can be checked at the same time.

Sub display
Main display

Dual color display at a glance
The display color changes in accordance with output ON / OFF operations.

High precision of ±3 % F.S.
A new rectification mechanism and Micro Electro Mechanical System (MEMS) technology allow the sensor to be mounted on a Si sensor chip (3 × 3.5 mm 0.118 × 0.138 in). This provides an extremely small heat capacity, high precision of ±3 % F.S. and high-speed response. The two temperature sensors on each side of the heater detect the heat distribution to make bidirectional detection possible.

Principle of Si sensor chip

One sensor for both intake and exhaust
A single sensor can detect flows bidirectionally. In addition, it can be set to detect flows in either the forward or reverse direction only, making it suitable for a variety of applications.

For example, using a single sensor to check chip suction
FM-200 SERIES LINE-UP

**Low flow rate type**

FM-252-4(-P) / FM-213-4(-P)
FM-253-4(-P) / FM-214-4(-P)

*Port size: ø4 mm ø0.157 in push-in
*Size: W17 × H37 × D64 mm W0.669 × H1.457 × D2.520 in
*Body material: Resin

**Medium flow rate type**

FM-254-8(-P)
FM-215-8(-P)

*Port size: ø8 mm ø0.315 in push-in
*Size: W17 × H43 × D70.6 mm W0.669 × H1.693 × D2.780 in
*Body material: Resin

**High flow rate type**

FM-255-AR2(-P) / FM-255-AG2-P
FM-216-AR2(-P) / FM-216-AG2-P

*Port size: Rc½ female thread, G½ female thread
*Size: W30 × H50 × D80 mm W1.181 × H1.969 × D3.150 in
*Body material: Aluminum

![Images represent original sizes](image-url)
Suitable for cost and quality control! Integrated output mode incorporated

The **FM-200** series can control and manage flows in a wide variety of output modes such as integrated output mode, depending on the required application.

### Integrated flow rate display

**Integrated output mode**

**Quality control**

- Controls N₂ charging volumes for electronic components
- Controls air blowing volumes, etc.

When the volume of flow of the gas being measured reaches the set integrated value, output switches to ON or OFF.

**Integrated pulse output mode**

**Cost management**

- Controls N₂ purge volumes in reflow furnaces
- Controls overall volumes of air consumed by equipment, etc.

The pulse output is generated once at every specified integrated value*. This lets you know the amount of air consumed per unit of time easily.

**Energy-saving and environmental-friendly**

The pulse output from the flow sensor can be inputted to the pulse counter of an Eco-Power Meter so that air consumption and power consumption can both be measured simultaneously.

* Integrated values are specified by range and can vary. For details, refer to "SPECIFICATIONS" (p.6).

### Instant flow rate display (Factory setting)

**Window comparator mode**

This mode is used for setting comparative output to ON or OFF at flow rates within the setting range.

**Hysteresis mode**

This mode is used for setting comparative output hysteresis to the desired level and for carrying out ON / OFF control.

**Output OFF mode**

Comparative output is forcibly maintained at OFF regardless of the setting value.

---

*For details of the KW8M Eco-Power Meter, contact Matsushita Electric Works, Ltd.*
FM-200SERIES

Suitable for cost and quality control! Integrated output mode incorporated depending on the required application.

- Integrated pulse output mode
- Integrated output mode

Power consumption can both be measured simultaneously. The pulse output from the flow sensor can be inputted to the pulse counter of an Eco-Power Meter so that air consumption and energy-saving and environmental-friendly settings can be managed.

- Cost management
- Controls air blowing
- Quality control
- Reflow furnaces for electronic components

Cost management and control of N2 purge volumes in for electronic components can be carried out to ON / OFF at flow rates within the setting range.

This mode is used for setting comparative output OFF regardless of the setting value.

- Comparative output ON
- Comparative output OFF
- Comparative output hysteresis to the desired level and for output switches to ON or OFF.

When the volume of flow of the gas being measured reaches the set integrated value, this lets you know the amount of air consumed per unit of time easily.

- Flexible installation direction
- No straight pipes needed

The rectification method used by the new mechanism makes straight pipes unnecessary at both the intake and exhaust sides.

Quick connection is possible with a cover-attached connector.

- Checking seating
- Checking suction

Flow sensors can be used for stable detection of transparent objects which were difficult to detect using photocount sensors. The nozzle can be extended for detection even in places where oil spatter occurs.

Detection of objects is possible even on conveyors with low suction pressures where air is flowing constantly (such as collet conveyors and network conveyors).

Collet
Lead frame
Flexible printed circuit board

- Equipped with a wide variety of functions for greater ease of use

- Integrated value reset function
- Analog voltage output
- Key lock function
- Rattle prevention function (Responce time setting)
- Display rate setting
- ECO mode

During integrated mode, external input allows reset of the integrated value.

1 to 5 V analog voltage output is incorporated.

Key operation can be disabled to prevent mis-operation.

The response time can be set to one of seven steps from 50 ms to approximately 1,500 ms. This prevents rattling from rapid changes in flow or from noise.

The display update period for the digital display can be changed to 250 ms, 500 ms or 1,000 ms in order to eliminate display flickering.

After approx. one minute of no operation, sensor will be switched to ECO mode. Backlight will be turned off to reduce power consumption.

- Connection
- Panel mounting bracket (Available soon)

Tight installation of multiple sensors on the panel in vertical direction is possible.

Other than the ability to carry out bidirectional detection, there are no limitations on the installation direction, making the installation very flexible.

Checking seating
Checking suction

Applications

Controlling purge gas and air blowing

By controlling purge gas and air blowing, performance and quality of the products can be maintained, while contributing to cost reduction.

Applications

Checking seating

Checking suction

No straight pipes needed

Flexible installation direction

Connection

Panel mounting bracket (Available soon)

Equipped with a wide variety of functions for greater ease of use

- Integrated value reset function
- Analog voltage output
- Key lock function
- Rattle prevention function (Responce time setting)
- Display rate setting
- ECO mode

Checking seating

Checking suction

No straight pipes needed

Flexible installation direction

Connection

Panel mounting bracket (Available soon)

Equipped with a wide variety of functions for greater ease of use
ORDER GUIDE

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Applicable fluid</th>
<th>Flow rate range</th>
<th>Model No.</th>
<th>Port size</th>
<th>Comparative output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resin body type</td>
<td></td>
<td>Clean air (Note)</td>
<td>500 ml/min.</td>
<td>FM-252-4</td>
<td>ø4 ø0.157 push-in</td>
<td>NPN Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compressed air (Note)</td>
<td>1,000 ml/min.</td>
<td>FM-252-4-P</td>
<td></td>
<td>PNP Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nitrogen gas</td>
<td>5 l/min.</td>
<td>FM-253-4</td>
<td></td>
<td>NPN Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 l/min.</td>
<td>FM-214-4</td>
<td></td>
<td>NPN Open-collector transistor</td>
</tr>
<tr>
<td>Aluminum body type</td>
<td></td>
<td></td>
<td>50 l/min.</td>
<td>FM-254-8</td>
<td>ø8 ø0.315 push-in</td>
<td>PNP Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100 l/min.</td>
<td>FM-215-8</td>
<td></td>
<td>PNP Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500 l/min.</td>
<td>FM-255-AR2</td>
<td>Rc1/2 female thread</td>
<td>NPN Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FM-255-AR2-P</td>
<td></td>
<td>PNP Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FM-255-AG2-P</td>
<td>G1/2 female thread</td>
<td>PNP Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FM-216-AR2</td>
<td>Rc1/2 female thread</td>
<td>NPN Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FM-216-AR2-P</td>
<td></td>
<td>PNP Open-collector transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FM-216-AG2-P</td>
<td>G1/2 female thread</td>
<td>PNP Open-collector transistor</td>
</tr>
</tbody>
</table>

Note: The clean air complies with JIS B 8392-1.1.1 to 5.6.2, and the compressed air complies with JIS B 8392-1.1.1 to 1.6.2.

Accessory
- CN-F15-C1 (Connector attached cable 1 m 3.281 ft)

OPTIONS

<table>
<thead>
<tr>
<th>Designation</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor mounting bracket</td>
<td>MS-FM2-1</td>
<td>Allows resin body type sensor to be installed on the flooring.</td>
</tr>
<tr>
<td></td>
<td>MS-FM2-2</td>
<td>Allows aluminum body type sensor to be installed on the flooring.</td>
</tr>
<tr>
<td>Panel mounting bracket</td>
<td>MS-FM2-3</td>
<td>Allows resin body type sensor to be installed to panels. Multiple sensors can also be mounted closely.</td>
</tr>
</tbody>
</table>

Sensor mounting bracket
- MS-FM2-1

Recommended vacuum filter
Manufactured by Nihon Pisco Co., Ltd.
VFU1-44-15P (Element length 15 mm 0.591 in)
VFU1-44-25P (Element length 25 mm 0.984 in)
VFE015B01 (Filter element for refill, length 15 mm 0.591 in)
VFE025B01 (Filter element for refill, length 25 mm 0.984 in)

Note: Contact the manufacturer for details of the recommended products.
### SPECIFICATIONS

#### Individual specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Model No.</th>
<th>Full scale flow rate (Note 1)</th>
<th>Display range (Note 2)</th>
<th>Setting and display resolution</th>
<th>Specified integrated value</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>FM-252-4-(P)</td>
<td>500 mℓ/min.</td>
<td>–550 to +550 mℓ/min.</td>
<td>1 mℓ/min.</td>
<td>5 mℓ</td>
<td>Net weight: 50 g approx., Gross weight: 115 g approx.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FM-213-4-(P)</td>
<td>1,000 mℓ/min.</td>
<td>–1,100 to +1,100 mℓ/min.</td>
<td>0.01 mℓ/min.</td>
<td>10 mℓ</td>
<td>Net weight: 70 g approx., Gross weight: 135 g approx.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FM-253-4-(P)</td>
<td>5 ℓ/min.</td>
<td>–5.5 to +5.5 ℓ/min.</td>
<td>0.1 ℓ/min.</td>
<td>0.05 ℓ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FM-214-4-(P)</td>
<td>10 ℓ/min.</td>
<td>–11 to +11 ℓ/min.</td>
<td>0.1 ℓ/min.</td>
<td>0.1 ℓ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FM-254-8-(P)</td>
<td>50 ℓ/min.</td>
<td>–55 to +55 ℓ/min.</td>
<td>0.5 ℓ/min.</td>
<td>0.5 ℓ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FM-215-8-(P)</td>
<td>100 ℓ/min.</td>
<td>–110 to +110 ℓ/min.</td>
<td>1 ℓ/min.</td>
<td>1 ℓ</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Port size</th>
<th>Display</th>
<th>Linearity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ø4 ø0.157 push-in</td>
<td>Within ±3 % F.S. (F.S. = 1 mℓ, 10 ℓ/min. flow rate range)</td>
<td>Within ±3 % F.S. (F.S. = 5 ℓ, 10 ℓ/min. flow rate range)</td>
</tr>
<tr>
<td></td>
<td>ø8 ø0.315 push-in</td>
<td>Within ±1 % F.S. (F.S. = 10 ℓ/min. flow rate range)</td>
<td>Within ±1 % F.S. (F.S. = 10 ℓ/min. flow rate range)</td>
</tr>
</tbody>
</table>

#### Common specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Model No.</th>
<th>Rated pressure</th>
<th>Pressure withstandability</th>
<th>Applicable fluid</th>
<th>Supply voltage</th>
<th>Current consumption</th>
<th>Comparative outputs (Note 1)</th>
<th>Output modes</th>
<th>Short-circuit protection</th>
<th>Response time</th>
<th>Analog voltage output</th>
<th>Repeatability</th>
<th>Linearity</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C1</td>
<td>FM-2-4-P</td>
<td>–0.09 to +0.7 MPa</td>
<td>1 MPa</td>
<td>Clean air (Note 3), compressed air (Note 3), nitrogen gas</td>
<td>12 to 24 V DC ± 10 %</td>
<td>Normal mode: 60 mA or less, ECO mode: 40 mA or less</td>
<td>NPN open-collector transistor: Maximum sink current: 50 mA or less, Applied voltage: 26.4 V DC or less (between comparative output and 0 V)</td>
<td>Output OFF mode, window comparator mode, hysteresis mode, integrated output mode, integrated pulse output mode</td>
<td>Window comparator mode: 1 to 8 % F.S. approx. (variable) (Factory settings: approx. 1 % F.S.), Hysteresis mode: Variable (minimum 1 digit)</td>
<td>50 ms, 80 ms, 120 ms, 200 ms, 400 ms, 800 ms, 1,500 ms, selectable by key operation</td>
<td>Output voltage: 1 to 5 V, Output impedance: 1 kΩ approx. [Refer to &quot;Analog voltage output&quot; (p.7) for more details.]</td>
<td>Within ±1 % F.S.</td>
<td>Within ±3 % F.S. (Ambient temperature +25 °C ±77 °F, flow rate range 3 to 100 % F.S., atmospheric criteria on secondary side)</td>
<td>4 digits + 4 digits 2-color LCD display (Display refresh rate: 250 ms, 500 ms, 1,000 ms, selectable by key operation)</td>
</tr>
</tbody>
</table>

#### Notes:
1. Converted to volumetric flow at +20 °C ±68 °F and 1 atmospheric pressure (101 kPa).
2. The display flow rate range is the case when setting to bi-direction at the flow direction setting. When the flow direction is set to one-side forward direction or one-side reverse direction, the negative side of the display flow rate range shows 10 % of the full-scale (F.S.).
3. The clean air complies with JIS B 8392-1.1.1 to 5.6.2, and the compressed air complies with JIS B 8392-1.1.1 to 1.6.2.
4. As a varistor (clamping voltage: approx. 40 V) is connected to the aluminum body type, do not apply voltage higher than the rated voltage of the sensor.
### I/O Circuit and Wiring Diagrams

#### FM-2□

**NPN Output Type**

**I/O Circuit Diagram**

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Color Code of Connector Attached Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D1</strong></td>
<td>Brown</td>
</tr>
<tr>
<td><strong>D2</strong></td>
<td>Black (CH1 Comparator output 1)</td>
</tr>
<tr>
<td><strong>D3</strong></td>
<td>White (CH2 Comparator output 2)</td>
</tr>
<tr>
<td><strong>D4</strong></td>
<td>Blue (Analog voltage output)</td>
</tr>
</tbody>
</table>

**Internal Circuit**

- Varistor (Note 1)
- 1 kΩ approx.

**User's Circuit**

- 50 mA max.
- 12 to 24 V DC ± 10%

**Notes:**

1. As for the aluminum body type, varistor (clamping voltage approx. 40 V) is connected between the internal power circuit and the metal body to prevent breakdown of the sensor. Connect the metal body to +V of power supply or to frame ground (F.G.) of a device that is connected to 0 V. High potential and insulation resistance tests between the internal power circuit and the metal body must not be done.

2. Short-circuit protection is not incorporated into the analog voltage output. Do not connect the power supply or capacitive load directly to the analog voltage output.

**Symbols:**

- D1 to D4: Reverse supply polarity protection diode
- Tr1, Tr2: PNP output transistor
- Tr3: NPN input transistor

#### FM-2□-P

**PNP Output Type**

**I/O Circuit Diagram**

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Color Code of Connector Attached Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D1</strong></td>
<td>Brown</td>
</tr>
<tr>
<td><strong>D2</strong></td>
<td>Black (Comparator output 1)</td>
</tr>
<tr>
<td><strong>D3</strong></td>
<td>White (Comparator output 2)</td>
</tr>
<tr>
<td><strong>D4</strong></td>
<td>Blue (Analog voltage output)</td>
</tr>
</tbody>
</table>

**Internal Circuit**

- Varistor (Note 1)
- Approx. 1 kΩ

**User's Circuit**

- 50 mA max.
- 12 to 24 V DC ± 10%

**Notes:**

1. As for the aluminum body type, varistor (clamping voltage approx. 40 V) is connected between the internal power circuit and the metal body to prevent breakdown of the sensor. Connect the metal body to +V of power supply or to frame ground (F.G.) of a device that is connected to 0 V. High potential and insulation resistance tests between the internal power circuit and the metal body must not be done.

2. Short-circuit protection is not incorporated into the analog voltage output. Do not connect the power supply or capacitive load directly to the analog voltage output.

**Symbols:**

- D1 to D4: Reverse supply polarity protection diode
- Tr1, Tr2: PNP output transistor
- Tr3: NPN input transistor
### PRESSURE LOSS CHARACTERISTICS (TYPICAL)

![Graphs showing pressure loss characteristics for different flow rates and pressures.](image)

### PRECAUTIONS FOR PROPER USE

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

### Terminal arrangement diagram

![Diagram of terminal arrangement of the connectors of this product](image)

#### Part description

- **MODE key**
- **Main display** (Green / Red)
- **Comparative output 1 indicator** (Green)
- **Comparative output 2 indicator** (Green)
- **UP key**
- **DOWN key**
- **Forward direction display** (Note 1)
- **Connector area for piping** (Note 2)
- **Connector area for connector attached cable**

#### Connector pin No. | Color code of the connector attached cable | Terminal
---|---|---
1 | Brown | +V
2 | Black | CH1 (comparative output 1)
3 | White | CH2 (comparative output 2 / external input)
4 | Gray | Analog voltage output
5 | Blue | 0 V

**Notes:**
1) Direction of the arrow indicates the forward direction of flow rate when setting the flow direction to bi-direction or one-side forward direction. When setting the flow direction to one-side reverse direction, a direction opposite to the forward direction display will be the forward direction of the flow rate.

2) ø4 mm ø0.157 in push-in joint / ø8 mm ø0.315 in push-in joint is incorporated in FM-□-4 (-P) / FM-□-8 (-P), respectively. The push-in joint is not incorporated in the aluminum body type.
PRECAUTIONS FOR PROPER USE

Mounting

- This product can be installed facing up or down or to the left or right.

Horizontal mounting

- Use M3 screws, and the tightening torque should be 0.5 N·m.

<Resin body type>

- Material of tube | Tube diameter (mm in) | Allowable diameter
- Polyamide | ø4 ø0.157, ø8 ø0.315 | Within ±0.1 mm ±0.004 in
- Polyurethane | ø4 ø0.157 | Within ±0.1 mm ±0.004 in
  | ø8 ø0.315 | Within +0.1 / -0.15 mm ±0.004 in / -0.006 in

Before using this product, make sure to check that the tube is firmly inserted.

Vertical mounting

- Use M3 screws, and the tightening torque should be 0.5 N·m.

<Resin body type> <Aluminum body type>

- When using sensor mounting bracket

When using sensor mounting bracket

- When mounting the product on the sensor mounting bracket **MS-FM2-1** (optional) or **MS-FM2-2** (optional), use the M3 screws (length 6 mm 0.236 in) attached to the sensor mounting bracket. The tightening torque should be 0.5 N·m. Use M3 screws to mount the sensor mounting bracket on a sensing surface.

Wiring

- Make sure that the power supply is OFF during wiring.
- Take care that wrong wiring will damage this product.
- Take care if applying voltage exceeding the rated range, or connecting to AC power supply, this product may break or burn.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this sensor, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Extension up to total 10 m 32.808 ft is possible with 0.3 mm², or more, cable.
- Make sure that stress by forcible bend or pulling is not applied directly to the sensor cable joint.

Others

- This product has been developed / produced for industrial use only.
- This product is for use in air and nitrogen only. Do not use this product for other fluids since the sensing accuracy cannot be guaranteed.
**PRECAUTIONS FOR PROPER USE**

- Take care if foreign materials are mixed in the sensing part, the product may break.
- Do not use this product for commercial purposes since the product does not comply with International System of Units (SI).
- Do not apply pressure that exceed resistant-pressure.
- Do not use during the initial transient time (approx. 5 sec.) after the power supply is switched ON.
- The specifications may not be satisfied in a strong magnetic field.
- Accuracy of the display and the analog voltage output is influenced by self-heating by applying current other than the temperature characteristics. Standby time (5 min. or more after applying current) should be taken when using the product.
- This product is suitable for indoor use only.
- Do not use this product in places having excessive vapor, dust, etc., or where it may come in contact with corrosive gas, etc.
- Take care that the product does not come in contact with water, oil, grease, or organic solvents such as thinner, etc., strong acid or alkaline.
- Do not drop the product or apply hard shock. This can cause product breakage.

**FLOW SENSOR SELECTION**

- If using a flow sensor for tasks such as checking suction and release from suction nozzles and sensing leaks, use the flow range setting table as a guide. The effective cross-section area of the nozzle (pinhole) and the difference in pressure inside and outside the nozzle can be used to calculate the flow.

<Calculation example>

The flow calculation value for a nozzle diameter of ø0.1 to ø2.0 mm ø0.004 to ø0.080 in when P2 is varied is shown in the table below.

<table>
<thead>
<tr>
<th>Suction</th>
<th>P1(MPa)</th>
<th>P2(MPa)</th>
<th>P2(MPa)</th>
<th>Acoustic velocity</th>
<th>Sub-acoustic velocity</th>
<th>Effective cross-section area of nozzle (pinhole)</th>
<th>Calculated flow value (ℓ/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.1013</td>
<td>0.0313</td>
<td>0</td>
<td>0.079</td>
<td>0.015</td>
<td>ø0.004 in</td>
<td>9.002 20.254 36.007</td>
</tr>
<tr>
<td></td>
<td>0.0113</td>
<td>0.0101</td>
<td>0</td>
<td>0.046</td>
<td>0.009</td>
<td>ø0.008 in</td>
<td>9.002 20.254 36.007</td>
</tr>
<tr>
<td></td>
<td>0.0121</td>
<td>0.0113</td>
<td>0</td>
<td>0.051</td>
<td>0.020</td>
<td>ø0.012 in</td>
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Notes: 1) In case of any leakage from tubes, etc., actual values will differ greatly from calculated values. When measuring flows, make sure that there is no leakage from any tubes.
2) In case of any points in the tubes which are narrower than the diameter of the suction nozzle, flow will be restricted and may turn out to be lower than the calculated values. In addition, suction verification may not be possible in such cases.
3) The effective cross-section area is a guide only. If the nozzle is long and narrow, the effective cross-section area may be smaller than the area at the tip of the nozzle.
4) Response times are determined by the internal volume of the tube from the flow sensor to the suction nozzle (pinhole). If carrying out high-speed sensing, reduce the internal volume of the tube as much as possible such as by locating the flow sensor as close as possible to the suction nozzle.

**DIMENSIONS (Unit:mm in)**

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.com
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**DIMENSIONS (Unit:mm in)**

**FM-2□-A□-(P)**

![Image of FM-2□-A□-(P) sensor mounting bracket (Optional)](image)

<table>
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<th>Note: FM-2□-AG2-P has G½ female thread.</th>
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**CN-F15-C1**

![Image of CN-F15-C1 connector attached cable (Optional)](image)

| 1.040 |
| 30 1.181 |
| 0.197 |

**MS-FM2-1**

![Image of MS-FM2-1 sensor mounting bracket (Optional)](image)

| Material: Cold rolled carbon steel (SPCC)(Nickel plated) |
| Two M3 (length 6 mm 0.236 in) screws with washers are attached. |

**MS-FM2-2**

![Image of MS-FM2-2 sensor mounting bracket (Optional)](image)

| Material: Cold rolled carbon steel (SPCC)(Nickel plated) |
| Two M3 (length 6 mm 0.236 in) screws with washers are attached. |

**Assembly dimensions**

**Mounting drawing with FM-252-4**

![Image of Assembly dimensions with FM-252-4](image)

**Mounting drawing with FM-255-AR2**

![Image of Assembly dimensions with FM-255-AR2](image)

All information is subject to change without prior notice.

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