Dust Concentration Meter

To Sense Breaks or Tears in Filter Bags, to Improve Product Quality, and to Eliminate related Environmental and Safety Risks

Triboelectric Dust Monitor

PFM Series
Excellent Sensor to Protect Life and the Environment

Particles in the air are a concern for the production lines of each and every industry. Leakage and mixing of particles such as dust are serious concerns for environmental quality, traceability of products, and improvements in productivity. Since dust deposits have been recently recognized as a safety issue, the timely detection of leaks and the continuous monitoring of dust concentrations are crucial. The Matsushima PFM dust monitors can be used to measure the concentration of dust and other air particles under various conditions.

**High Performance**

*Produces the same high performance as optical systems at lower cost.*

- Nine monitoring levels of dust concentration.
- Detects solid particles with diameters from 0.3 μm to 100 μm.
- Provides level alarm signal (1C with compact type, 2C with remote type) as well as fault alarm signal (1C).
- Requires no additional equipment such as an air purge and cooling system (Max process temperature: 250°C)
- For high-pressure applications up to 200 kPa.

**Easy to use**

*Requires no special training or skills. Easy to install and to adjust.*

- Simply use the switches to select the monitoring level of dust concentration and to adjust the sensitivity.
- Easily adjust concentration monitoring levels with a digital display for viewing (standard).
- Two styles are available: a sensor with an integrated transducer or a non-integrated type.
- Changeable probe length from 300 mm to 1000 mm. (Can be extended to 1000 mm for special orders.)
  * : Measurement range, integration time, and contact output can be adjusted.

**Easy Maintenance**

*All components are made in Japan for ensured high quality and excellent customer service.*

- Requires only periodic cleaning of the probe for maintenance. (Approximately every three months under normal operation conditions.)
- Uses advanced digital technology for high quality and reliability.
- Speedy and accurate service including calibration support.
- Easy replacement of damaged probes.

![Comparison of Dust Concentration Levels](image)

The Matsushima PFM dust monitor can measure the dust concentration as accurately as a high-cost optical sensor under the same conditions.
**Operation Principles**

When solid particles such as dust in gas emissions come into contact or pass through the triboelectric probe, a charge transfer is produced in the probe. The charge is converted to a current signal, and a measurement signal ranging from 4 mA to 20 mA DC in proportion to the amount of particles is output.

**Applications for Dust-collecting Equipment and Others**

Possible to monitor multiple dust collectors

It is possible to monitor multiple dust collectors by utilizing timing of periodical backwashing impulse.

- **Cement Factories**
  - For coal ash and other raw materials.
  - For cement and concrete products.
  - For kilns, AQ(C Air-quality Control) systems, and other equipment.
  - For slag- and fly ash.

- **Ironworks**
  - For steel sintering.
  - For casting.
  - For coke ovens.
  - For recycling-related facilities such as those for waste disposal of plastics.

- **Chemical Factories**
  - For catalyzation.
  - For smoke removal.

- **Automobile Factories**
  - For casting.

- **Waste incineration Plants**
  - For monitoring the environment.
  - For incinerators.
  - For fusion furnaces.
  - For high-temperature incinerators used to cut emissions such as dioxins.

- **Rubber and Carbon Factories**
  - For monitoring of dust accumulation in ducts.
  - For handling raw materials.

- **Fertilizer Plants**
  - For preventing mixture of fertilizers.

- **Spice and Paint Factories**
  - For traceability-related equipment.

- **Gas Extraction**
  - For monitoring the environment.
  - For incinerators.
  - For fusion furnaces.
  - For high-temperature incinerators used to cut emissions such as dioxins.

- **Automobile Factories**
  - For casting.

- **Other Dust-collecting Equipment**

*Teflon-coated probe*

**Dramatically improved anti-corrosion performance**

Life of the probe can be extended dramatically with this teflon-coated probe even in emission of corrosive gas (chlorine, sulfurous, nitric acid, and others). Teflon coating is also effective for reducing dust adhesion.

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of coating</td>
<td>Probe (part exposed to gases)</td>
</tr>
<tr>
<td>Coating material</td>
<td>Conductive Teflon</td>
</tr>
<tr>
<td>Coating thickness</td>
<td>40 μm</td>
</tr>
</tbody>
</table>
Triboelectric dust monitor with concentration-level correction

**Easy correction to a close approximation of values obtained by JIS-equivalent methods**

By simply entering a concentration correction factor to the current signal representing the amount of particles measured by the sensor, the output value can be corrected to an actual dust concentration level approximation that may be obtained by lab measurement standard. (Range of correction: 0.1 to 2.0 times) Continuous monitoring is possible at a lower cost compared with the lab and optical systems.

![Before Correction vs. After Correction](image)

Transducer for Remote Type PFM-KCU12, PFM-KCU14

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Triboelectric dust monitor for high-temperature applications

**Can be used in applications at a maximum process temperature of 400°C!**

Radiation fin protect the sensor from the heat, so the concentration levels of dust can be measured at a process temperature of 400°C. The probe can be used for dust collectors installed at waste incinerators and fusion furnaces where measuring dust is difficult.

![Radiation fin protect the sensor from the heat](image)
### Specifications

#### Sensor

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Sensor with Integrated Transducer</th>
<th>Remote Type Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Number</td>
<td>PFM-M01E</td>
<td>PFM-M11P</td>
</tr>
<tr>
<td></td>
<td>Standard</td>
<td>High-temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explosion-Proof</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type (Ex ia IB 14)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Construction</th>
<th>Sensor with integrated transducer</th>
<th>Sensor and transducer are separately installed.</th>
<th>Sensor, transducer &amp; Zener Barrier are separately installed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. Mass</td>
<td>2.1 kg</td>
<td>1.3 kg</td>
<td>2.1 kg</td>
</tr>
<tr>
<td>Power Supply</td>
<td>80 to 240 VAC 50/60 Hz</td>
<td>From transducer</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>4 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dedicated Signal Cable Length</td>
<td>—</td>
<td>5 m (standard). Can be extended to 100 m for special orders.</td>
<td></td>
</tr>
<tr>
<td>Concentration Level Display</td>
<td>10-segment LED</td>
<td>On remote transducer</td>
<td></td>
</tr>
<tr>
<td>Contact Output</td>
<td>1a for limit 1b for fault (Contact capacity: 250 VAC, 2 A 30 VDC, 2 A)</td>
<td>From transducer</td>
<td></td>
</tr>
<tr>
<td>Analog Output</td>
<td>4 mA to 20 mA DC (Load resistance: 500Ω max)</td>
<td>From transducer</td>
<td></td>
</tr>
<tr>
<td>Enclosure</td>
<td>Protection rating: IP65</td>
<td>Dust-proof/drip-proof*</td>
<td></td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>−20 to +65°C (Without condensation)</td>
<td>−20 to +60°C (Without condensation)</td>
<td></td>
</tr>
</tbody>
</table>

#### Transducer for Remote Type

<table>
<thead>
<tr>
<th>Transducer Type</th>
<th>Standard</th>
<th>With Concentration-level Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Number</td>
<td>PFM-KCU11</td>
<td>PFM-KCU12</td>
</tr>
<tr>
<td></td>
<td>Standard</td>
<td>With Concentration-level Correction</td>
</tr>
<tr>
<td></td>
<td>PFM-KCU01</td>
<td>PFM-KCU02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Standard</th>
<th>With Concentration-level Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.7 kg</td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>110 VAC or 220 VAC, −15 to +10%, 50/60 Hz*</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>7 VA</td>
<td></td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>−20 to +50°C (Without condensation)</td>
<td></td>
</tr>
<tr>
<td>Concentration Level Display</td>
<td>4 digit 7 seg LED</td>
<td></td>
</tr>
<tr>
<td>Contact Output</td>
<td>1cX2 for limit 1c for fault (Contact capacity: 250 VAC, 2 A)</td>
<td></td>
</tr>
<tr>
<td>Analog Output</td>
<td>4 mA to 20 mA DC (Load resistance: 500Ω max)</td>
<td></td>
</tr>
<tr>
<td>Correction Range</td>
<td>0.1 to 2.0 times (at 0.1 intervals)</td>
<td></td>
</tr>
<tr>
<td>Measurement Range</td>
<td>9 levels</td>
<td></td>
</tr>
<tr>
<td>Data Averaging</td>
<td>Time setting up to 30 seconds</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Wall or DIN rail mounting</td>
<td></td>
</tr>
</tbody>
</table>

#### Zener Barrier

- **Model Number**: Z961/Z964
- **Explosion-proof enclosure**: (Ex ia) IIB
- **Protection class**: IP20
- **Uo**: 17.4 V
- **Io**: 180.3 mA
- **Po**: 430 mW
- **Um**: 250 VAC 50/60 Hz
- **VDC**: 250
- **Ambient Temperature**: −20 to +60°C (Without condensation and freeze)
- **Ambient humidity**: 75% max.
- **Mass**: 150 g

*Note: For a single detector, 2 zener barriers are the system configuration of explosion-proof intrinsic safety. Connecting the earth of the zener barrier to the DIN rail & connect the earth separately by A-class grounding.

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*Housing cover and lead outlet must be closed.
Sensor with Integrated Transducer
[Standard] PFM-M01E

**Wiring**

<table>
<thead>
<tr>
<th>Input</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Output 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>5V DC</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<tr>
<td></td>
<td>@</td>
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Mounting Boss R1
Housing: Aluminum Casting
Earth Terminal M4 (Note4)

- **Probe:** SUS316L (Note3)
- **Insulator:** PTFE
- **Mounting Holes:** 4 × 5-mm dia.
- **Radiation fin:** Aluminum
- **One-inch Socket:** 43 mm Long

**Notes:**
1. The minimum space (A) between the socket and the insulator must be 10 mm.
2. Do not touch the probe with bare hands.
3. Use a shielded cable for the signal cable.
4. Be sure to ground the ground terminal.
5. Use a shielded cable for the signal cable.
6. Please set it up in the non-hazardous area.

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