# FDM06-P
# Average Flow Thermal Mass Transmitter



High Temp. type

## | Features |

- High Sensitivity, Low Pressure Loss, Detects Minute Airflow Changes
- No Compensation Needed, Direct Flow Output
- Sizes 1″~ 40″, Easy Installation
- ±1.5% F.S. Accuracy, 16 bar Pressure Resistance
- Analog, Relay, RS-485 Outputs
- Suitable for various types of gases ($N_2$, Ar, $CO_2$, etc.)

## | Applications |

Compressed Air System Management / Optimization of Air Compressors & Pneumatic Equipment Efficiency / Air Dryer Flow Control / Process Gas Consumption Monitoring ($N_2$, Ar, $CO_2$, etc.) / Pipeline Leak Detection & Alerts / HVAC Duct Monitoring / Smart Manufacturing Energy Management / Cleanroom Airflow Monitoring / Biotech & Pharmaceutical Gas Supply Stability Monitoring / Food Processing Gas Filling & Packaging Monitoring

# | Specification |

## Input

| | |
|---|---|
| Sensor type | Hot-wire sensor |
| Turndown ratio | 100 : 1 |
| Measuring range | 0 ... 60 m/s |

## Output

| | |
|---|---|
| Output signal | 4 ... 20 mA / 0 ... 10 V / Relay / RS-485 |
| Signal connection | 3-wire |
| Warm-up time | 60 sec |
| Response time | t90≦6 sec |
| Load resistance | Current outpu : ≦500 Ω |
| | Voltage output : ≧10 KΩ |

## Communication

| | |
|---|---|
| Communication methods & protocol | RS-485 Modbus RTU |
| RS-485 baud rate | 9600、19200、38400、57600、115200 bps |

## Accuracy

| | |
|---|---|
| Accuracy | 0.5 ... 60 m/s : ±(1.5% of mv + 0.8 m/s) |
| Temp. influence | 0.2% / °C |
| Uncertainty of factory calibration | ±1% |

*The measurement range is defined at the standard condition(1013 mbar, 20°C).
*mv = measured value

## Environmental

| | |
|---|---|
| Medium | Non-corrosion gas |
| Operating Temp. | 0 ... 50°C / 0 ... 180°C(High Temp. type) |
| Operating Humidity | 20 ... 90%RH(Non-condensing) |
| Storage Temp. | -20 ... +60°C |
| Operating pressure | 16 bar |

## Electrical

| | |
|---|---|
| Power supply | DC 24 V ±10% |
| Current consumption | 24 V : 110 mA |
| Relay capacity | Max current : 6 A |
| | Max voltage : DC 24 V (DC 36 V Max) |
| Electrical connection | M12 8P connector |

## Installation

| | |
|---|---|
| Installation | PT 3/4" movable thread, PT 1/2" movable thread |

## Display

| | |
|---|---|
| Display readout | 0 ... 99999999 (Cumulative flow : 8-digit) |
| | 0 ... 99999 (Instantaneous flow : 5-digit) |
| Decimal point | Button |
| Sampling time | 1 cycle/sec |
| Unit | m/s、ft/s、L/min、$m^3$/min、$m^3$/h、mL、L |
| | $m^3$、$ft^3$、$inch^3$、gal、uk gal |
| Response time adjustment range | 0.5 ... 300 sec |

## Certification

| | |
|---|---|
| Certification | CE |

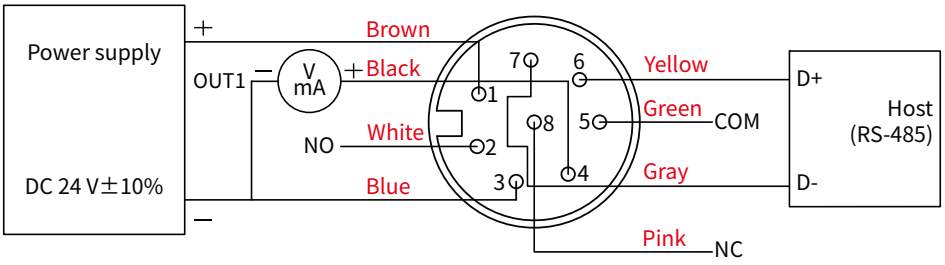
## Protection

| | |
|---|---|
| IP rating | IP65 |
| Electrical protection | ■ Reverse polarity ■ Over-voltag |

## Material

| | |
|---|---|
| Housing | Aluminum alloy |
| Probe | SUS316 |

# | Diagram |




*Please make sure the product and the device which connect with RS-485 are on common ground, avoid damaged product.

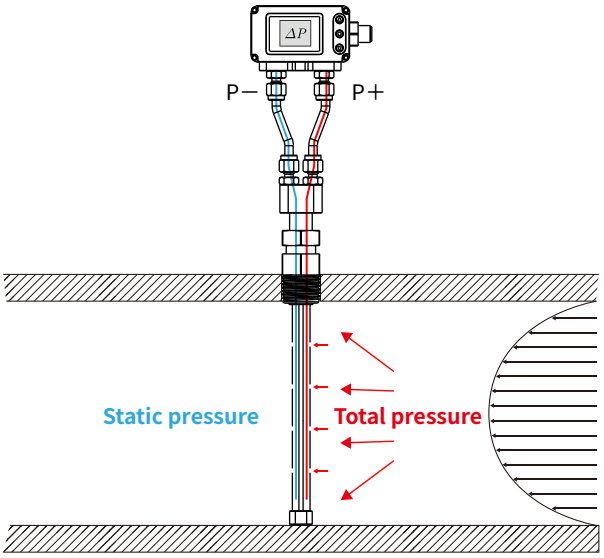
# | Wind Tunnel Calibration System |

The wind tunnel calibration system provides a stable and standardized environment for calibration, is not affected by external factors, and has an automated detection system to greatly improve calibration accuracy and reliability. It follows the operating standards of ISO/IEC 17025 and a calibration report can be purchased separately.

# | Measurement Principle | Combining Pitot Tube and Thermal Mass Flow Sensing Technology

## ■ Pitot tube

Measures the pressure difference between the total pressure and the static pressure to calculate the fluid velocity. The difference between total pressure and static pressure is the dynamic pressure, which is caused by the fluid's velocity. Dynamic pressure is proportional to the square of the air velocity, thus allowing calculation of fluid velocity through the measured dynamic pressure.




The averaging pitot tube

■ Formula

$$V = K\sqrt{\frac{2}{\varrho}\Delta P}$$

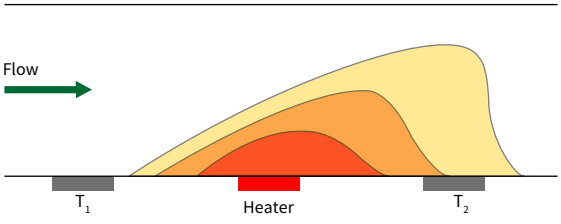
$$Q_v = K\varepsilon A\sqrt{\frac{2}{\varrho}\Delta P}$$

$$Q_m = Q_v \times \varrho$$

$V$ = Velocity
$\Delta P$ = Difference between total pressure and static pressure
$\varrho$ = Density
$K$ = Calibration factor
$Q_v$ = Volumetric flow rate
$Q_m$ = Mass flow rate
$\varepsilon$ = Inflation coefficient
$A$ = Cross-sectional area

## ■ Hot-wire type differential pressure measurement

The FDM06-P adopts a hot-wire type differential pressure sensor combined with a Venturi tube. It calculates the flow rate by measuring the differential pressure at two points in the Venturi tube. Hot-wire type differential pressure measurement technology calculates the pressure difference by measuring the air flow rate. When there is a pressure difference between two measurement points, air flows from the high-pressure side to the low-pressure side through a channel inside the transmitter. The channel contains a heating element and two temperature sensors. By comparing the heating and temperature changes, the air flow rate can be precisely measured, which in turn allows the calculation of the pressure difference. This technology can detect extremely low air flow rates, making it possible to precisely measure small pressure differences. Additionally, hot-wire type measurement technology has the characteristic of low zero-point drift, meaning the transmitter can maintain a stable initial zero point even after prolonged use, ensuring measurement precision and reliability.



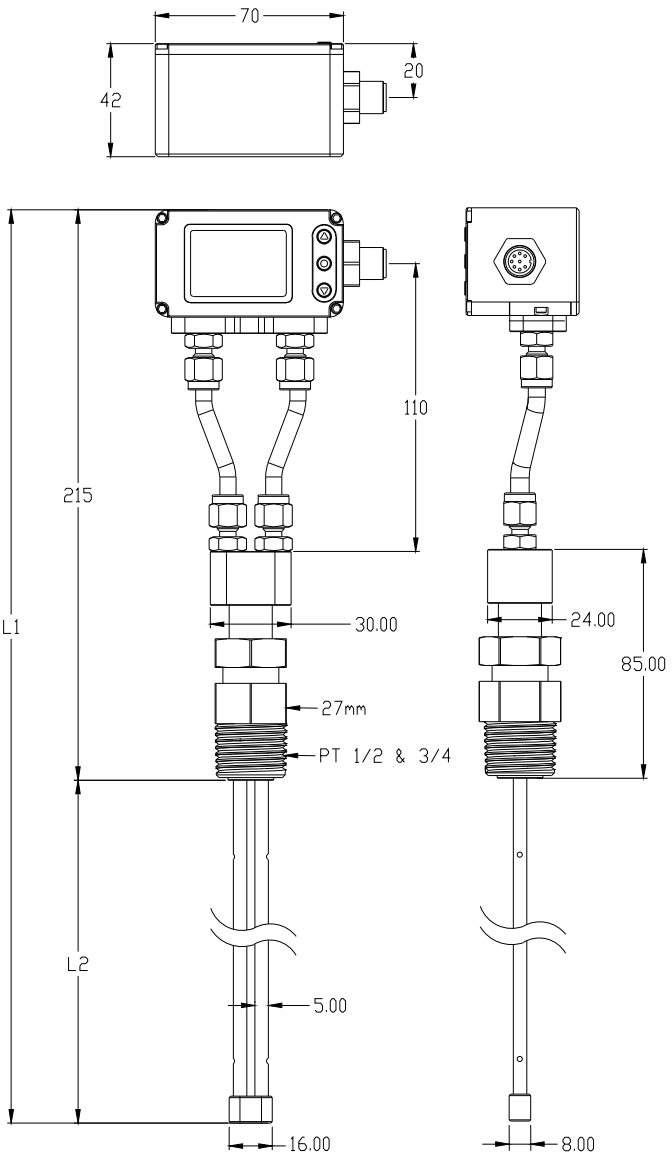

■ Formula

$$P = A + B \cdot V^n$$

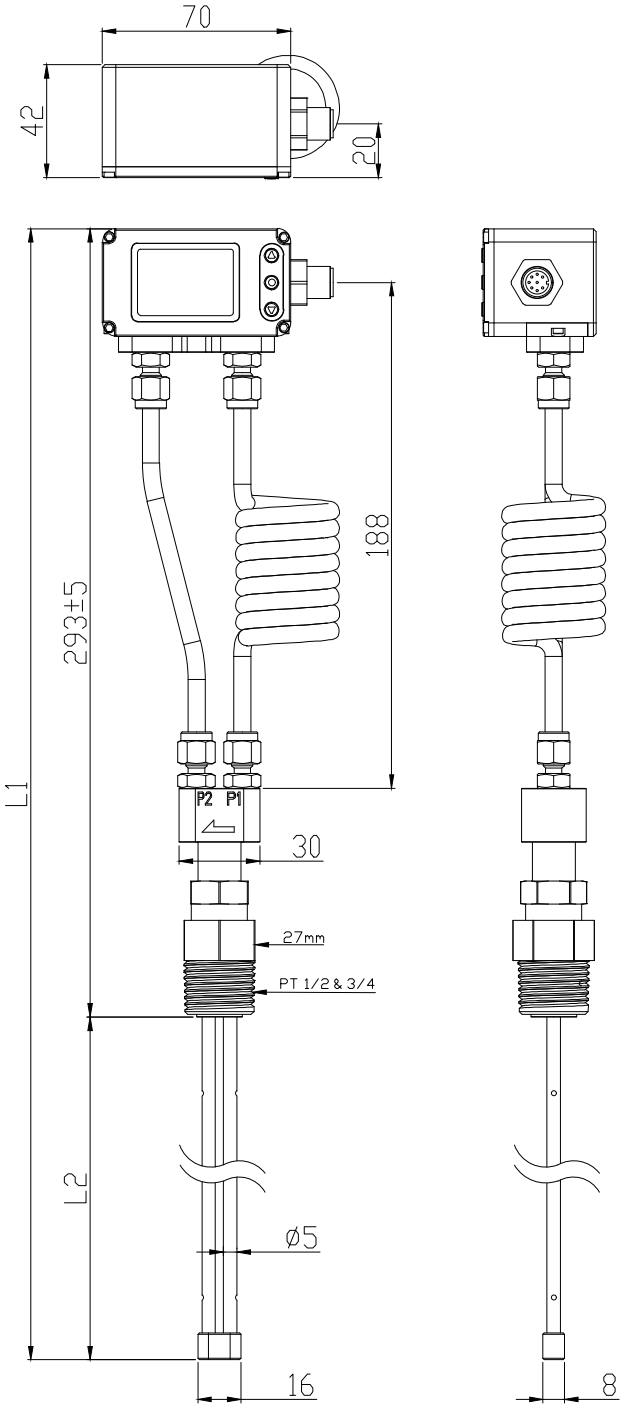
$P$ : Heating power
$A$ : Power loss with no flow
$V$ : Velocity
$B$ : Fluid velocity
$n$ : Velocity exponent

# | Dimension | Unit : mm

## Ambient Temp. type (0 ... 50°C)




## High Temp. type (0 ... 180°C)




| | L1 (Ambient Temp. type) | L1 (High Temp. type) | L2 |
|---|---|---|---|
| DN25 (1") | 240 mm | 318 mm | 25 mm |
| DN50 (2") | 265 mm | 343 mm | 50 mm |
| DN100 (4") | 315 mm | 393 mm | 100 mm |
| DN150 (6") | 365 mm | 443 mm | 150 mm |
| DN200 (8") | 415 mm | 493 mm | 200 mm |
| DN250 (10") | 465 mm | 543 mm | 250 mm |
| DN300 (12") | 515 mm | 593 mm | 300 mm |
| DN450 (18") | 665 mm | 743 mm | 450 mm |
| DN600 (24") | 815 mm | 893 mm | 600 mm |
| DN800 (32") | 1015 mm | 1093 mm | 800 mm |
| DN1000 (40") | 1215 mm | 1293 mm | 1000 mm |

# | Air Velocity / Volume Conversion Table |

*Airflow conversion is adjusted using PF (Profile Factor) values, typically measured on-site, with a recommended range of 0.7 to 1.
*The measurement range is defined at the standard condition(1013 mbar, 20°C).

| ID of pipe | Air velocity inside pipe | | |
|---|---|---|---|
| | 20m/s | 40m/s | 60m/s |
| DN25 (1") | 35.3 $m^3/h$ | 70.7 $m^3/h$ | 106 $m^3/h$ |
| DN50 (2") | 141.4 $m^3/h$ | 282.7 $m^3/h$ | 424.1 $m^3/h$ |
| DN100 (4") | 565.5 $m^3/h$ | 1131 $m^3/h$ | 1696.5 $m^3/h$ |
| DN150 (6") | 1272.3 $m^3/h$ | 2544.7 $m^3/h$ | 3817 $m^3/h$ |
| DN200 (8") | 2262 $m^3/h$ | 4523.9 $m^3/h$ | 6785.9 $m^3/h$ |
| DN250 (10") | 3534.3 $m^3/h$ | 7068.6 $m^3/h$ | 10602.9 $m^3/h$ |
| DN300 (12") | 5089.4 $m^3/h$ | 10178.8 $m^3/h$ | 15268.2 $m^3/h$ |
| DN450 (18") | 11451.1 $m^3/h$ | 22902.3 $m^3/h$ | 34353.4 $m^3/h$ |
| DN600 (24") | 20357.6 $m^3/h$ | 40715.1 $m^3/h$ | 61072.7 $m^3/h$ |
| DN800 (32") | 36191.2 $m^3/h$ | 72382.5 $m^3/h$ | 108573.7 $m^3/h$ |
| DN1000 (40") | 56548.8 $m^3/h$ | 113097.6 $m^3/h$ | 169646.4 $m^3/h$ |

# | Ordering Guide |

FDM06 — [Connection] [Range] [Output] [Length] — [Movable thread] [Display & Other]

Connection:
- P : Average Flow

Range:
- 20 : 20 m/s
- 40 : 40 m/s
- 60 : 60 m/s

Output:
- 2 : 4 ... 20 mA+RS-485+Relay
- 3 : 0 ... 10 V+RS-485+Relay

Length:
- 025 : 1" (25 mm)
- 050 : 2" (50 mm)
- 100 : 4" (100 mm)
- 150 : 6" (150 mm)
- 200 : 8" (200 mm)
- 250 : 10" (250 mm)
- 300 : 12" (300 mm)
- 450 : 18" (450 mm)
- 600 : 24" (600 mm)
- 800 : 32" (800 mm)
- 1000 : 40" (1000 mm)

Movable thread:
- R1 : 1/2"PT
- R2 : 3/4"PT

Display & Other:
- A: Flow Velocity
- B: Flow Rate
- C: Flow Velocity + Flow Rate
- W: Flow Rate + Totalized Flow
- H : High Temp. type (0 ... 180°C)

# | Additional Option Test Report | For more detailed information please contact us.

## ■ILAC / TAF

YUDEN-TECH CO.,LTD. Calibration Laboratory - ( ILAC / TAF ) Test report.
(TAF accreditation : 3032, complying with ISO / IEC 17025 ) TAF has mutual recognition arrangement with ILAC MRA

| Project | Measurand level or range |
|---|---|
| Air velocity transmitter | 0.2 m/s ... 60 m/s |

## ■ISO 9001

| Project | Measurand level or range |
|---|---|
| Air velocity / Air volume | Air velocity : ≦ 120 m/s |
| | Air volume : 0.5 $m^3/h$ ... 1000 $m^3/h$ |