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## Pitot Tube Flow Meter

# PTFM-1000 V2

### Background

The Pitot Tube Flow Meter, PTFM-1000 V2 is a standalone interface for measuring exhaust gas flow rate of combustion engines. The system uses the tried-and-tested pitot tube principle with high-frequency transducers to accurately measure highly pulsating exhaust flows with a sampling rate of 1kHz. This rapid capture rate ensures that any pulsations or exotic behaviour in an engine is measured, and the unique design of the PTFM pitot tube means reverse flows can be measured with the same guarantee of sensitivity.

The interface can be run standalone with a laptop, or seamlessly integrated to run alongside an analyser system without adding any more steps to the test cycle process.



### Key Features & Benefits

#### 900°C Exhaust Gas Limit

Allows the freedom to test engines under extreme conditions without worrying if the flow meter can handle those temperatures.

#### -1.25kPa to +7.5kPa Sensor Range

Shows both positive flow & negative flow in the tailpipe. Also, HORIBA capped the positive pressure at +7.5kPa to ensure we cause as little backpressure on your engine as possible.

#### Smart Tubes

The PTFM Tubes have a flash memory chip installed on them. This holds the tube serial number, tube type & the calibration coefficients for that tube. This chip being on the tube means you can have 1 interface box, but multiple tubes and the interface automatically updates with the data stored on the tube. Also allowing test reports to automatically report the tube used for the test.

#### 1KHz High Speed Transducers

Having fast sampling of the pressure changes in the tailpipe allows for a rapid visual representation of both positive and negative spikes that occur within a combustion engine. Lower speed sampling would miss these spikes giving you an inaccurate representation of what is actually happening inside the tailpipe.

#### Temperature Compensation

The PTFM automatically compensates to 20°C when testing so there is no need to warm up.

#### Multiple Communication Options

The PTFM has 3 connection options. LAN and RS232 for AK connections. Analogue out (0-10V with 4 configurable channels available).

#### 2 Options of Absolute Pressure Sensors

The PTFM can be purchased in 2 absolute pressure ranges supporting testing from sea level to a) 2100m or b) 4500m.

#### 8 Tubes Available up to 65m3/min

Having a large range of tubes on offer means we can support you testing small engines with a maximum exhaust flow of 2 m<sup>3</sup>/min up to high performance or large heavy duty engines with peak exhaust flow at 65 m<sup>3</sup>/min.

### Optional Features

#### High Temperature Operation

Exhaust pipe connections / seals are available for high temperature operation (900°C).

#### Exhaust Pressure Sensor

Additional sensor to measure tailpipe exhaust pressure (±10 kPa gauge).

#### Tailpipe Sample Fitting

Integrated sampling point.



### Specifications

<b>Test Vehicle / Engine</b>	Diesel (HDD, LDD), Gasoline, LPG and CNG vehicles, Ethanol, Propane, Butane
<b>Configuration</b>	Interface unit connected to pitot tube via umbilical cable. Pitot tube can be standard (0 - 230°C) or high temperature (0 - 900°C)
<b>Flow Rate Accuracy</b>	Within ±1% of full scale or ±1.5% of readings (at flow rate of 20% of full scale)
<b>Linearity</b>	Either of the following: (a) Within ±2.0% of full scale (b) Intercept: $ a_0  \leq 1.0\%$ of full scale Slope: $0.98 \leq a_1 \leq 1.02$ Standard estimated error: $SEE \leq 2.0\%$ of full scale Coefficient of determination: $r^2 \geq 0.990$
<b>Response Time</b>	<1ms
<b>Tube Attachments</b>	Pitot tube size should be selected from the following list, according to tailpipe diameter and exhaust flow rate:

Pitot Tube	Tube Diameter	Max Flow
A-Type	32.0 mm	2.0 m <sup>3</sup> /min
B-Type	42.7 mm	4.5 m <sup>3</sup> /min
C-Type	60.5 mm	10 m <sup>3</sup> /min
D-Type	76.3 mm	15 m <sup>3</sup> /min
E-Type	89.1 mm	20 m <sup>3</sup> /min
F-Type	101.6 mm	30 m <sup>3</sup> /min
G-Type	127.0 mm	45 m <sup>3</sup> /min
H-Type	152.4 mm	65 m <sup>3</sup> /min

<b>Noise</b>	Within 2.0% of full scale (at flow rate of 20% of full scale)
<b>Repeatability</b>	Within ±2.0% of readings (at flow rate of 20% of full scale)
<b>Calibration</b>	Interface calibrated every 12 months. Recommended pitot tube calibration every 12 months