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## FREQUENTLY ASKED QUESTIONS

### In what industries are Fox Thermal flow meters used?

Fox Thermal Gas Mass Flow Meters are used in light and heavy industrial plants, process heating facilities, up/mid/downstream oil & gas, and Wastewater operations. Fox Thermal meters measure gas flow rates in mass (Kg/Hr, Lb/Hr) or standardized volumetric units (MSCFD, SCFM). Fox Thermal meters can measure virtually any gas flow in a wide variety of applications. Today, almost any facility will have one or more combustion processes such as a boiler, process heater, or flare. Measurement of gases to these processes can be used to improve combustion efficiencies, utilities accounting, and regulator reporting.

Another common application for Fox Thermal meters is monitoring factory compressed air lines for losses. Leaks in a compressed air systems are a common problem and the severity of losses can cost companies hundreds of thousands of dollars annually. Ideally, a Fox Thermal flow meter should be installed on each compressor upon commissioning. This allows the factory manager to establish a baseline air usage for a given level of activity. Any deviation from this baseline -- without any corresponding change in the work load -- suggests a system leak.

Other Fox Thermal applications include emissions monitoring, process heating, vent gases, flare gases, digester gases, aeration in wastewater treatment plants, laboratory gas metering, and biogas flows.

### What gases are in "Natural Gas"?

Fox Thermal uses the NAESB average for all Natural Gas mixtures: methane, ethane, propane, nitrogen, and carbon dioxide.

### Do I need to send my flow meter back to the factory to recalibrate if the process gas changes?

Fox Thermal offers the Gas-SelectX<sup>®</sup> gas selection feature on the FT1, FT4A, and FT4X flow meters. If the process gas is expected to change over time, the Gas-SelectX<sup>®</sup> feature will allow the user to choose from a list of gases or create a custom gas mix without sending the meter back to the factory for recalibration.

Any combination of gases in the Mixed Gas and Oil & Gas Menus can be mixed in 0.1% increments to create a custom gas mix. This feature can be accessed through the front panel of the meter or by using the free FT View™ software tool.

Pure Gases	Mixed Gas Menu	Oil & Gas Menu
Air	Air	Methane (C1)
Argon	Argon	Ethane (C2)
Butane	Butane	Propane (C3)
Carbon Dioxide	Carbon Dioxide	Iso Butane (C4)
Ethane	Ethane	Normal Butane (C4)
Helium	Helium	Pentanes (C5)
Hydrogen	Hydrogen	Hexanes (C6)
Methane	Methane	Heptanes (C7)
Natural Gas	Nitrogen	Octanes (C8)
Nitrogen	Oxygen	Nonanes+ (C9+)
Oxygen	Propane	Carbon Dioxide
Propane		Nitrogen

For the FT2A and FT3 models, Fox Thermal recommends a factory recalibration every two years.

### What types of gases do the meters measure?

Fox Thermal meters can be used to measure a wide range of pure gases and gas mixtures.

These include:

Pure Gases		Mixed Gases
Air	Helium	Biogas
Argon	Methane	Digester Gas
Butane	Natural Gas	Flare Gas
Carbon Dioxide	Nitrogen	Fuel Gas
Compressed air	Oxygen	Sweep Gas
Ethane	Propane	Vent Gas

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### How do I know which meter is right for me?

There are two types of Fox Thermal meters: insertion and inline styles. Insertion will work in the vast majority of applications, but when the pipe diameter is less than 1.5 inches (37mm), install an inline version. Due to the standard flow conditioners on inline models that control the flow profile, less upstream and downstream straight pipe is required. Insertion meters require a straight pipe run that is equivalent to 15 pipe diameters in length upstream from the meter -- and 10 diameters downstream. For an inline meter, the corresponding figures are 8 and 4 diameters respectively. Models FT1 & FT4A are not currently available in remote styles. Use the "Help Me Choose" feature on the Fox Thermal website to find the right model for specific needs: <https://www.foxthermal.com/configure/?HMC=open>

### How accurate are the meters?

To ensure that all Fox Thermal meters meet specified performance parameters and provide accurate, repeatable measurements, all calibrations are performed to NIST-traceable flow standards. Furthermore, all calibration equipment is subject to a meticulous metrology program that includes the selection, control, and maintenance of measurement standards.

#### FT1/FT4A/FT4X Quick Specs (see datasheets for more):

Flow Accuracy: Air:  $\pm 1\%$  R  $\pm 0.5\%$  FS  
Other gases:  $\pm 1.5\%$  R  $\pm 0.5\%$  FS  
Flow Repeatability:  $\pm 0.2\%$  of full scale  
Flow Response Time: 0.8 seconds (one time constant)  
Temp. Accuracy:  $\pm 1^\circ$  F ( $\pm 0.6^\circ$  C)  
Minimum velocity 15 SFPM.

#### FT2A/FT3 Quick Specs (see datasheets for more):

Flow Accuracy:  $\pm 1\%$  R  $\pm 0.2\%$  FS  
Flow Repeatability:  $\pm 0.2\%$  FS  
Flow Response Time: 0.9 seconds (one time constant)  
Temp. Accuracy:  $\pm 1.8^\circ$  F ( $\pm 1.0^\circ$  C) over the range -40 to 250° F (-40 to 121° C);  
 $\pm 3.6^\circ$  F ( $\pm 2.0^\circ$  C) over the range 250 to 650° F (121 to 343° C);  
Minimum velocity 50 SFPM.

### What conditions can the meter safely operate in?

The FT1, FT4A, and FT4X flow meters are FM & FMc, ATEX, IECEx for Class I, Division 1/Zone 1 areas and CE approved.

The FT2A meter is FM and FMc approved for Class I, II, III, Division 2, Groups A, B, C, D, E, F, G, T4A hazardous locations.

The Fox FT3 meter is FM & FMc, ATEX, IECEx for Class I, Division 1/Zone 1 areas and CE approved.

See the specific product datasheet for detailed agency approval information.

### What are the probes constructed of?

The standard probe is made of 316 stainless steel. For extremely corrosive environments, Hastelloy C-276 is the preferred option (available on Models FT2A and FT3).

### What is the minimum flow rate that your sensors can measure accurately?

Minimum and maximum flow rates are 15 - 60,000 SFPM (FT2A & FT3) and 15 - 25,000 SFPM (FT1).

### What size pipes can your meters measure in?

One quarter inch (6.5mm) is the smallest Fox Thermal inline meter and can measure as low as 0.035 SCFM (0.055 NM3/H). Special length probes are available for measuring exhaust gases in large ducts.

### What are the advantages of a remote unit?

A remote unit separates the sensor from the meter electronics. One advantage is that the electronics enclosure can be mounted such that the display is easy to read and the configuration buttons are easy to operate. Additionally, the probe junction box can be mounted in an area where the ambient temperature is in a range of -40° to 212°F (-40° to 100°C). Remote options are available for Models FT2A, FT3, and FT4X.



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### What advantages do Fox Thermal meters offer over competitors?

The Fox Thermal PowerPro™ Sensor, available on Models FT2A and FT3, offers higher accuracy and a wide turndown ratio of up to 1000:1 (100:1 typical). It can operate in velocities up to 60,000 SFPM – almost twice that of competitors units – while still performing accurately in very low flow applications.

The Fox Thermal DDC-Sensor™, available on Models FT1, FT4A, and FT4X, is a Direct Digitally Controlled sensor that interfaces directly with the microprocessor to allow more speed and programmability. It also provides a technology platform for calculating accurate gas correlations.

The Gas-SelectX® gas selection menu available on Model FT1, with an expanded selection available on the FT4A and FT4X models, uses a correlation algorithm from one calibration to allow the meter to measure multiple pure gases and gas mixtures.

Models FT1, FT3, FT4A, and FT4X offer an in-situ Calibration Validation feature. This feature allows the operator to confirm that the meter is running accurately in the field, without the need to send the meter back for annual factory calibrations. Calibration Validation certificates can be printed if the free FT View™ software is used to initiate the tests. This feature is of particular value in environmental monitoring applications where periodic calibration verification is mandated.

The Model FT4X offers an advanced data logger for use in oil & gas applications. It includes 40 daily totals (24-hour totals), settable Contract Time to define the Contract Day, time/date stamped alarm/event logs, a 7-year history, and a power off totalizer.

### Is it portable?

Yes. Many users will move the meter around the plant when conducting compressed air surveys or energy audits. For installation into various different pipe sizes, Fox offers a Teflon ferrule for process connection (max. pressure of 60 psig).

### Is the sensor robust?

The 3rd generation DDC-Sensor™ used in the FT1, FT4A, and FT4X is especially robust because of its non-cantilevered (welded at only one end) design. The sensor elements are welded to the probe at both ends making it significantly tolerant to vibration and particles in the flow stream.

### Can Fox Thermal meters be used to measure flow of liquids or steam?

No, Fox Thermal meters operate in all types of gases, but a thermal mass flow meter is not designed to measure liquid or steam flows. The gas can be “wet” -- so long as it is non-condensing. Droplets forming on the sensor element will affect its reading and may cause the meter to display an error code.

To lessen the chance of moisture forming on the tip, the meter can be installed from underneath the pipe. This allows any moisture to flow downwards, away from the tip, due to gravity.

If you need a flow meter to measure liquids or steam, please explore other ONICON brand flow meters at [www.onicon.com](http://www.onicon.com).

### Can the meter handle pulsations?

Yes. With a 0.8 - 0.9 second response time, Fox Thermal meters can quickly react to fluctuations in the gas stream.

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### How often is calibration required?

In the case of monitoring emissions for EPA regulation requirements, the EPA states that calibration for Thermal Mass Flow Meters must be performed per manufacturer specifications. If using Calibration Validation, it is recommended that this test be performed annually.

### Can we connect it to a SCADA system?

Yes. A 4-20mA, pulse output, and a USB port are standard on all Fox Thermal models.

Communication options available:

	FT1	FT2A	FT3	FT4A	FT4X
Modbus RTU (RS485)	•	•	•	•	•
BACnet MS/TP (RS485)	•	•			
HART	•		•	•	•
Profibus-DP		•			
DeviceNet		•			
Ethernet Modbus TCP		•			

### Can it help us with reporting emissions to the EPA on a monthly or quarterly basis?

Yes. All Fox Thermal meters are EPA compliant for emissions monitoring applications.

In addition, the Calibration Validation feature is of particular value in environmental applications such as flare and vents where periodic calibration validation is mandated. The test allows operators to validate the calibration and accuracy of the meter in the field without the need to send the meter back for annual factory calibrations. These tests also allow the operator to print out Calibration Validation certificates for each of the tests if the free software is used to initiate the tests. These tests can be performed as often as needed to comply with local, regional, or national emissions reporting requirements.

### Is there an easy way to determine which Fox Thermal flow meter model is right for a specific process or application?

Yes. Use the "Help Me Choose a Meter" feature under the "Products" tab on the Fox Thermal website: <https://www.foxthermal.com/configure/?HMC=open>

Then, use the online Product Configurator to enter the process conditions and specify sizing. The Configurator will assign an AppID to your data submission. This AppID can be sent to Fox Thermal or a Fox Thermal rep for a free quote.



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