

MODEL

# FT4A

## Fox Thermal Gas Mass Flow Meter

### HIGHLIGHTS

- DDC-Sensor™:  
Robust, non-cantilevered design
- Gas-SelectX®: menu of field selectable gas compositions
- Gross Heating Value and Density of Gas Mix
- Accuracy Compliant with BLM 3175 & API 14.10
- CAL-V™ Calibration Validation
- Insertion and Inline Styles
- Measures gas flow rate in SCFD, MCFD & many more
- Wide measurement range: up to 1000:1 turndown; 100:1 typical
- 4-20mA for flow rate or temperature; HART option
- Choice of second output: pulse output for flow/total or RS485 Modbus RTU
- Standard USB port
- Free FT4A View™ Software available
- Welded, 316 SS sensor and flow body construction, Carbon Steel flow body optional
- Microprocessor based, field-programmable electronics
- Standard on-board 2 line x 16 character, backlit display with configuration panel
- NIST traceable calibration
- Low-end sensitivity for vents and leak detection
- Negligible pressure drop
- FM (U.S.) & FMc (CANADIAN) approved for Class I, Div 1; ATEX/IECEx approved for Zone 1
- NEMA 4X and CE Mark
- Flow Control Innovation Award Winner
- Processing's Breakthrough Product Award Winner



## THERMAL MASS TECHNOLOGY

### FAST AND FLEXIBLE GAS FLOW MEASUREMENT

Offering you the flexibility to monitor multiple gas types at the push of a button, rotate the housing as needed for tight installations, and configure meter settings from advanced software, the Fox Thermal Model FT4A thermal mass flow meter and temperature transmitter can be used in a large variety of Oil & Gas and Industrial gas flow measurement applications.

## MODEL FT4A

### THERMAL GAS MASS FLOW METER FEATURES

The Fox Thermal Model FT4A measures gas flow rate in standard units without the need for temperature or pressure compensation. It provides an isolated 4-20mA output (with a HART option) and pulse or RS485 Modbus RTU.

With a standard on-board 2-line x 16-character, backlit display, operators can view flow rate, total, elapsed time, process gas temperature, and alarms. The display is also used in conjunction with the Configuration Panel to access flow meter settings, such as 4-20mA and pulse output scaling, pipe diameter, zero flow cutoff, flow filtering (damping), display options, and high or low alarm limits.

The Model FT4A is available in insertion and inline styles. The insertion style FT4A has a robust stainless steel probe and is easily installed by drilling a hole in the pipe and welding on a 1" NPT branch outlet. A Fox Thermal-supplied compression fitting secures the probe in place. It is supplied with 316 stainless steel wetted materials standard. Inline styles of the FT4A are available in both stainless steel and carbon steel with NPT ends, 150lb, and 300lb flange options. See Specification section for details on sizing. A USB port to connect to a computer or laptop is standard; interface options include 4-20mA, pulse, HART, and Modbus RTU (RS485).

Fox Thermal has certified cleaning and bagging procedures for flow meters to be used in oxygen applications.

### THEORY OF OPERATION

Fox Thermal Flow Meters use a constant temperature differential (constant  $\Delta T$ ) technology to measure mass flow rate of gases. The thermal mass flow sensor consists of 2 Resistance Temperature Detectors (RTD's).

The Reference RTD measures the gas temperature. The instrument electronics heat the mass flow sensor, or heated element, to a constant temperature differential (constant  $\Delta T$ ) above the gas temperature and measures the cooling effect of the gas flow. The electrical power required to maintain a constant temperature differential is directly proportional to the gas mass flow rate. The microprocessor linearizes this signal to deliver a linear 4-20mA signal.



*The Fox Thermal DDC-Sensor™ eliminates the sensor element vibration which can lead to metal fatigue and failure.*

### ADVANCED FEATURES

Suitable for harsh and hazardous environments, the instrument features:

- Robust DDC-Sensor™ Design
- Gas-SelectX® gas selection menu featuring pure gases and the new Oil & Gas Menu
- CAL-V™ Calibration Validation
- Rotatable probe: allows  $\pm 180$  degree rotation
- FM/FMc, ATEX, IECEx approvals. CE mark.
- 10-30VDC power input, standard
- NIST-traceable calibration
- Free FT4A View™ Software
- High and low alarm limits
- Wetted materials are all welded, 316 stainless steel

Perfect for Biogas, Oil & Gas, Industrial, and Wastewater applications, the Model FT4A is a superior instrument ready for your application needs.

## ADVANCED TECHNOLOGY

### DDC-SENSOR™

The Fox Thermal DDC-Sensor™ is the state-of-the-art sensor technology used in the Fox Thermal Model FT4A Thermal Gas Flow Meter. The DDC-Sensor™, a Direct Digitally Controlled sensor, is unlike other thermal flow sensors available on the market. Instead of using traditional analog circuitry, the DDC-Sensor™ is interfaced directly to the FT4A microprocessor for more speed and programmability. The DDC-Sensor™ accurately responds to changes in process variables (gas flow rate, pressure, and temperature) to determine mass flow rate, totalized flow, and temperature.

Fox Thermal's DDC-Sensor™ provides a technology platform for calculating accurate gas correlations. The FT4A correlation algorithms allow the meter to be calibrated on a single gas in the factory while providing the user the ability to select other gases or gas mixes in the Gas-SelectX® menu. Fox Thermal's Model FT4A with its DDC-Sensor™ and advanced correlation algorithm provides an accurate, multi-gas-capable thermal gas flow meter.

### EXPANSION OF THE GAS-SELECTX® MENU

Customers need a fast solution to their monitoring needs. For these cases, Fox Thermal has developed the Gas-SelectX® gas menu feature for the Model FT4A flow meter. Gas-SelectX® allows the user to choose from a menu of several common gases or gas mixtures for their application.

Visit the [Fox Thermal website](#) to view the gases available for the FT4A.

The meter's proprietary algorithms allow the user to switch gases or gas mixes in the field, as needed. The Pure and Mixed Gas Menus make the FT4A ideal for measurement of digester gas, Liquefied Petroleum Gas LPG and a variety of other biogases. With the addition of the O&G Menu on the Model FT4A, Gas-SelectX® can be used in upstream Oil & Gas applications. Whether you need to measure natural gas, air, flare gas, vent gas, or digester gas, the FT4A brings these options and more to the user with a push of a button.

### CAL-V™

For customers that need a quick and easy way to verify the calibration of the meter in the field, the Model FT4A offers the CAL-V™ feature. This feature can be accessed and run through the meter's standard display and configuration panel, Modbus, or the FT4A View™ Software. The test takes less than 5 minutes to run and produces a pass/fail result at the conclusion of the test. A fail result may indicate either a dirty sensor or the need to recalibrate.

If the CAL-V™ test is performed using the FT4A View™ software, a Calibration Validation Certificate can be produced at the conclusion of the test. The certificate will show the date and time of the test along with meter data such as firmware version, meter serial number, configuration settings, and currently selected gas/gas mix. This in-situ calibration validation helps operators comply with environmental mandates and eliminates the cost and inconvenience of annual factory calibration.

### FT4A VIEW™ SOFTWARE

Fox Thermal has developed advanced software - FT4A View™ - a free PC-compatible application available for download from the Fox Thermal website. Connect your laptop, PC, or control station to the meter using the USB port interface to access the meter's data and configure the meter's settings.

FT4A View™ allows:

- Quick access to all configuration parameters and available gas selections
- Selection of measurement units, flow and temperature ranges, alarm settings and more
- Display of alarm codes
- Storage of meter configurations to a file that can be archived
- Raw data to be viewed in order to diagnose or troubleshoot your meter
- Data logging to an Excel™ spreadsheet
- View gross heating value and density of gas mix

## DIMENSIONS

### INSERTION STYLES

Assuming there is no insulation or retractor, Fox recommends the following probe lengths:

Pipe Size	Probe Length
1.5" (40mm) to 6" (150mm)	6-inch
8" (200mm) to 12" (300mm)	9-inch
14" (350mm) to 18" (450mm)	12-inch

Use the equation below for larger pipe sizes

Probe Lengths in inches (cm) =	
6.0 (15.2)	9.0 (22.9)
12.0 (30.5)	15.0 (38.1)
18.0 (45.7)	24.0 (61.0)
30.0 (76.2)	36.0 (91.4)

### EQUATION

Equation for selecting insertion flow meter probe length:

Probe length = ½ pipe ID (in inches) + 3" + thickness of insulation (if any) + 10" (for retractor if supplied). Round up to the next standard probe length available.

**Note:** Contact Fox for longer probes.

## APPROVALS

**CE Mark: Approved**

EMC Directive: 2014/30/EU

Electrical Equipment for Measurement, Control and Lab Use:  
EN61326-1:2013

EU Directive: 2014/68/EU

Weld Testing: EN ISO 15614-1 and EN ISO 9606-1, ASME B31.3

**FM (U.S.) & FMc (CANADA): Approved**

Class I, Division 1, Groups B, C, D; Class II, Division 1, Groups E, F, G; and Class III, Division 1; T4, Ta = -40° to 70°C; Class I, Zone 1, AEx/Ex db IIB + H2 T4; Gb Ta = -40°C to 70°C; Type 4X, IP66/67



Try the Fox Thermal online configurator to request a quote for a meter suited for your specific process conditions.

[foxthermal.com/configure](http://foxthermal.com/configure)

SALES@FOXTHERMAL.COM | (831) 384-4300

### INLINE STYLES

Inline pipe sizes, materials, and end connections are listed in the table below.

Inline pipe sizes in inches =														
0.75	○	●	◐	◑	1.00	○	●	◐	◑	1.25	○	●	◐	◑
1.50	○	●	◐	◑	2.00	○	●	◐	◑	2.50	○	●	◐	◑
3.00	○	●	◐	◑	4.00	○	●	◐	◑	6.00	○	●	◐	◑

○= SS ●= CS ◐= NPT Ends ◑= 150lb flanges ◒= 300lb flanges

**Note:** See [FT4A Model Codes](#) document for more information.

**Note:** Inline flow bodies include built-in flow conditioners. [FC20 Flow Conditioners](#) are available as an option for insertion flow meters.

### PROBE DIAMETER

Insertion and inline flow Meters: Probe diameter: ¾"

### DRAWINGS

See [FT4A Dimensional Drawings](#) on Fox Thermal website.

**ATEX (FM16ATEX0013X): Approved**

II 2 G Ex db IIB + H2 T4; Gb Ta = -40°C to 70°C; IP66/67

II 2 D Ex tb IIIC T135°C; Db Ta = -40°C to 70°C; IP66/67

**IECEx (IECEx FMG 16.0010X): Approved**

Ex d IIB + H2 T4; Gb Ta = -40°C to 70°C; IP66/67

Ex tb IIIC T135°C; Db Ta = -40°C to 70°C; IP66/67

**ATEX and IECEx Standards:**

EN 60079-0:2012 + A11:2013

IEC 60079-0:2011

EN 60079-1:2014

IEC 60079-1:2014

EN 60079-31:2014

IEC 60079-31:2013

EN 60529:1991 + A1:2000

IEC 60529:2001

# SPECIFICATIONS

## PERFORMANCE SPECS

### Flow Accuracy:

Air:  $\pm 1\%$  of reading  $\pm 0.2\%$  of full scale  
Other gases:  $\pm 1.5\%$  of reading  $\pm 0.5\%$  of full scale  
Accuracy specification applies to customer's selected flow range  
Maximum range: 15 to 60,000 SFPM (0.07 to 280 NMPS)  
Minimum range: 15 to 1,000 SFPM (0.07 to 4.7 NMPS)  
Straight, unobstructed pipe requirement:

- Insertion: 15 diameters upstream 10 downstream
- Inline: 8 diameters upstream, 4 downstream

### Gross Heating Value Uncertainty:

$\pm 0.01\%$  on mass basis;  $\pm 1.0\%$  on volume basis

### Flow Repeatability:

$\pm 0.2\%$  of full scale

### Flow Response Time:

0.8 seconds (one time constant)

### Temperature Accuracy:

$\pm 1^\circ\text{F}$  ( $\pm 0.6^\circ\text{C}$ )

### Calibration:

Factory Calibration to NIST traceable standards

### CAL-V™:

In-situ, operator-initiated calibration validation

## OPERATING SPECS

### Gas-SelectX® Gas Selections:

Pure Gas, Mixed Gas, and Oil & Gas Mixed Gas Menus to suit any application. See the [Fox Thermal website](#) for more information on availability of current gases.

### Units of Measurement (field-selectable):

SCFM, SCFH, NM3/M, NM3/H, NM3/D, NLPS, NLPM, NLPH, MCFD, MSCFD, SCFD, MMSCFD, MMSCFM, SM3/D, SM3/H, SM3/M, LB/S, LB/M, LB/H, LB/D, KG/S, KG/M, KG/H, SLP/M, MT/H

### Gas Pressure (maximum; at 100°F):

Insertion meter: 740 psig (51.02 barg)  
316 SS inline w/NPT ends: 500 psig (34.5 barg)  
316 SS inline w/150lb flanges: 230 psig (16 barg)  
316 SS inline w/300lb flanges: 600 psig (41 barg)  
CS inline w/NPT ends: 300 psig (21 barg)  
CS inline w/150lb flanges: 285 psig (20 barg)  
CS inline w/300lb flanges: 740 psig (51 barg)  
Retractor: 150 psig (10.3 barg) max.

Notes:

- Check with factory for higher pressure options.
- When teflon ferrule option ordered, gas pressure is 60psig (4.1 barg) maximum.
- Pressure ratings stated for temperature of 100°F (38°C).

### Relative Humidity:

90% RH maximum; non-condensing

### Temperature:

DDC-Sensor™: -40 to 250°F (-40 to 121°C)

Enclosure: -40 to 158°F (-40 to 70°C)\*

\*NOTE! Display dims below -4°F (-20°C); function returns once temperature rises again.

### 4-20mA and Pulse Verification:

Simulation mode used to align 4-20mA output and pulse output (if ordered) with the input to customer's PLC/DCS.

### Input power:

12 to 28 VDC, 6 watts max. (CE requirement)

Full input power range: 10 to 30 VDC.

### Outputs:

One standard isolated 4-20mA output for flow or temperature; fault indication per NAMUR NE43; HART communication option.

Second output for pulse or Modbus RTU (RS485).

Isolated pulse output: 5 to 24VDC, 10mA max., 0 to 100Hz for flow (the pulse output can be used as an isolated solid state output for alarms).

### Flow Velocity Range:

15 to 60,000 SFPM (0.07 to 280 NMPS)

Turndown: up to 1000:1; 100:1 typical

### Flow Ranges - Insertion Meters

Pipe Diameter	SCFM	MSCFD	NM3/Hr
1.5" (40mm)	0 - 840	0 - 1,220	0 - 1,325
2" (50mm)	0 - 1,400	0 - 2,020	0 - 2,210
2.5" (63mm)	0 - 2,000	0 - 2,880	0 - 3,150
3" (80mm)	0 - 3,100	0 - 4,440	0 - 4,890
4" (100mm)	0 - 5,300	0 - 7,650	0 - 8,360
6" (150mm)	0 - 12,000	0 - 17,340	0 - 18,930
8" (200mm)	0 - 20,840	0 - 30,020	0 - 32,870
10" (250mm)	0 - 32,800	0 - 47,250	0 - 51,740
12" (300mm)	0 - 46,600	0 - 67,180	0 - 73,500

NOTE! To determine if the FT4A will operate accurately in other pipe sizes, divide the maximum flow rate by the pipe area. The application is acceptable if the resulting velocity is within the velocity range above. Check Fox Thermal website for velocity calculator.

### Flow Ranges - Inline Meters

Pipe Diameter	SCFM	MSCFD	NM3/Hr
0.75"	0 - 220	0 - 320	0 - 350
1"	0 - 360	0 - 520	0 - 570
1.25"	0 - 625	0 - 900	0 - 990
1.5"	0 - 840	0 - 1,220	0 - 1,325
2"	0 - 1,400	0 - 2,020	0 - 2,210
2.5"	0 - 2,000	0 - 2,880	0 - 3,150
3"	0 - 3,100	0 - 4,440	0 - 4,890
4"	0 - 5,300	0 - 7,650	0 - 8,360
6"	0 - 12,000	0 - 17,340	0 - 18,930

NOTE! Consult factory for flow ranges above those listed. Inline meters above 2,500 SCFM (3,950 NM3/H) may require third party calibration. Contact Fox Thermal.

### Serial Communication:

USB connector for connecting to a laptop or computer is standard. Optional isolated communication outputs: Modbus RTU (RS485). Free PC-based software tool - FT4A View™ - provides complete configuration, remote process monitoring and data logging functions.

## PHYSICAL SPECS

### Probe diameter:

$\frac{3}{4}"$

### Sensor Material:

316 stainless steel

### Enclosure:

NEMA 4X, aluminum, dual  $\frac{3}{4}"$  FNPT conduit entries.





Make downtime a thing of the past.

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