



Model FT2A Gas Mass Flow Meter For Industrial & Wastewater Applications

- Measures gas flow rate in SCFM, NM³/HR, LBS/HR, KG/HR, & many more
- Wide measurement range; 100:1 turndown typical
- Measures process gas temperature
- 4-20mA for flow rate & temperature; pulse output for flow/total
- USB port to connect to a PC standard; RS485-Modbus, BACnet MS/TP, Profibus-DP, DeviceNet or Ethernet Modbus TCP
- Insertion and Inline models
- Welded, 316 SS sensor construction; Hastelloy C276 optional
- Microprocessor based, field programmable electronics
- On-board 2 line x 16 character, backlit display with configuration panel to view/set readings and parameters
- Free FT2A View™ Software available
- NIST traceable calibration
- Low-end sensitivity for leak detection
- Negligible pressure drop
- No moving parts design
- FM (U.S.) & FMc (CANADIAN) approved for Class I, II, III, Division 2, Groups A, B, C, D, E, F, G T4A hazardous locations. NEMA 4X and CE approved.
- EMI Certification to: EN 61326-1:2006
- LVD Certification to: EN 61010-1:2010
- Pressure Equipment Directive: 97/23/EC
- Weld Testing: EN ISO 15614-1 and EN ISO 9606-1, ASME B31.3

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Model FT2A

Thermal Mass Flow Meter & Temperature Transmitter



Fox Model FT2A Gas Mass Flow Meter & Temperature Transmitter

The Fox Model FT2A measures gas flow rate in standard units without the need for temperature or pressure compensation. It provides isolated 4-20mA and pulse outputs for flow rate, and a 4-20mA output for process gas temperature. The pulse output is normally used for totalization.

With an 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 configure flow meter settings, pulse output frequency scaling, pipe area, zero flow cutoff, flow filtering (damping), display configurations, diagnostics and high or low alarm limits.

The Model FT2A is available in both insertion and inline models. The insertion meter is easily installed by drilling a 3/4" hole in the pipe and welding on a 3/4" NPT coupling. A Fox-supplied compression fitting secures the probe in place. The inline model is available in 1/4-inch to 6-inch sizes and includes built-in flow conditioners that eliminate the need for long, straight pipe runs. The meter can be ordered with flange or NPT end connections.

Both models are supplied with 316 stainless steel wetted materials standard or Hastelloy C-276 as an option (inline flow bodies also available in carbon steel). A USB port to connect to a computer or laptop is standard; interface options include RS485-Modbus, BACnet MS/TP, Profibus-DP, DeviceNet or Ethernet Modbus TCP.

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

THERMAL MASS TECHNOLOGY

Theory of Operation

Fox Thermal Flow Meters use a constant temperature differential (constant ΔT) technology to measure mass flow rate of air and gases. The thermal mass flow sensor consists of two Resistance Temperature Detectors (RTD's). The sensor elements are constructed of a reference grade platinum wire wound around ceramic mandrels that are inserted into stainless steel or Hastelloy tubes.

The Reference RTD measures the gas temperature. The instrument electronics heat the mass flow sensor, or heated element, to a constant temperature differential (constant ΔT) 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.

NIST Traceable Factory Calibration

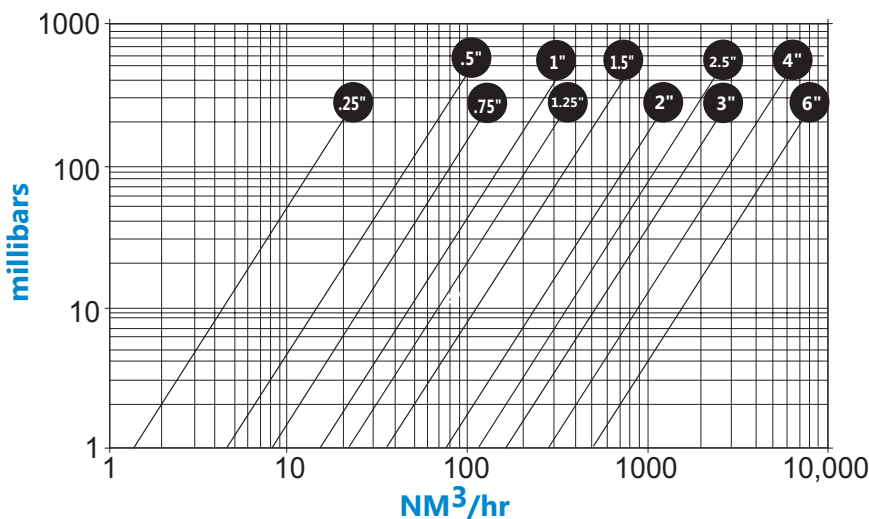
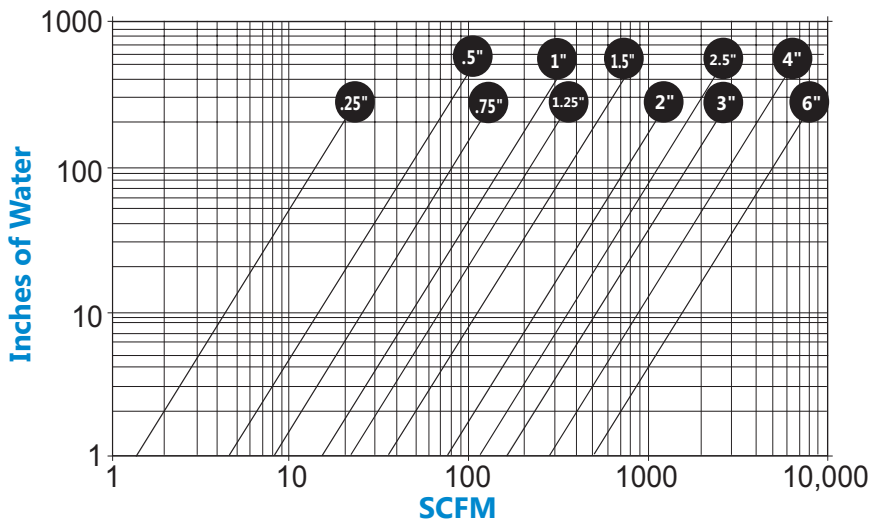
Fox calibrations are performed with NIST traceable flow standards. Whether you require a straightforward air calibration or a complex mixed gas calibration, our goal is to achieve the highest accuracy and the fastest turnaround time.

The Fox Calibration Lab employs a wide range of gases, gas mixtures, temperatures, pressures and line sizes to simulate actual fluid and process conditions. This real-world approach improves installed accuracy and minimizes measurement uncertainty.

PRESSURE DROP

Pressure Drop Charts for Inline Flow Meters

As seen in the charts below, pressure drop is negligible and energy losses are minimal.

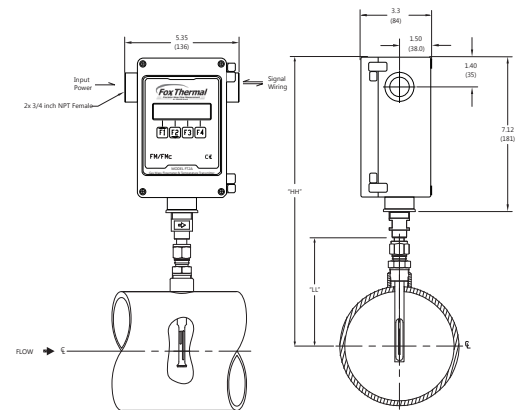


DIMENSIONS

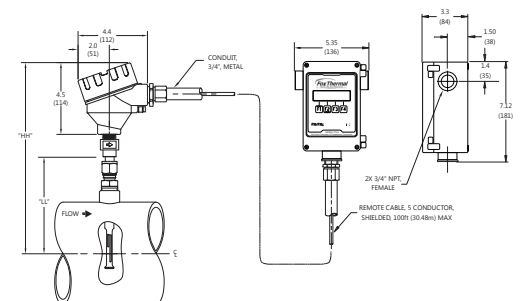
Meter Dimensional Drawings

The FT2A is available in many different configurations. An example of the local insertion and remote inline flange configurations are shown below. To see more configurations, visit our website at www.foxthermal.com/literature/

Local Insertion



Remote Insertion



Dimensional

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 on previous page for larger pipe sizes	

Probe Lengths (LL) 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)	

Insertion Flow Meters: Probe diameter: ½"

Equation for selecting insertion flow meter probe length:
 Probe length = ½ pipe ID (in inches) + 2" + thickness of insulation (if any) + dimension of retractor (if supplied).
 Round up to the next standard probe length available.

Contact Fox for longer probes.

Inline Flow Meter Dimensions		
Pipe size	L	HH
0.25"	5.80 (147)	9.9 (251)
0.5"	12.0 (305)	9.9 (251)
0.75"	12.0 (305)	9.9 (251)
1"	12.0 (381)	9.9 (251)
1.25"	12.0 (305)	9.9 (251)
1.5"	12.0 (305)	9.9 (251)
2"	12.0 (305)	9.9 (251)
2.5"	18.0 (457)	10.0 (254)
3"	18.0 (457)	10.0 (254)
4"	18.0 (457)	10.5 (267)
6"	24.0 (610)	11.6 (295)

Note: Dimensions are in inches (mm). For certified drawings, consult factory or view at www.foxthermal.com/literature/



APPROVALS & SPECIFICATIONS

Approvals

CE: Approved

EMC Directive; 2004/108/EC
 Emissions and Immunity Testing; EN61326-1:2008
 Low Voltage Directive (LVD): 2006/95/EC
 Product Safety Testing; EN 61010-1: 2010
 Pressure Equipment Directive: 97/23/EC
 Weld Testing: EN ISO 15614-1 and EN ISO 9606-1, ASME B31.3

FM and FMc: Approved

Class I, II, III, Division 2, Groups A, B, C, D, E, F, G, T4A
 hazardous locations.
 NEMA 4X Approved

NOTE! The EU Pressure Equipment Directive (PED) requires that the minimum ambient and fluid temperature rating for carbon steel flow bodies not be below -29C.

Performance Specs

Flow Accuracy:

Inline meter: ± 1% of reading ± 0.2% of full scale.
 Insertion meter: ± 1% of reading ± 0.2% of full scale.
 Straight, unobstructed pipe requirement:
 Inline: 8 diameters upstream; 4 downstream.
 Insertion: 15 diameters upstream; 10 downstream.
 Insertion (¼" size): 6" (152mm) upstream & downstream

Flow Repeatability: ± 0.2% of full scale

Flow Response Time: 0.9 seconds (one time constant)

Temperature Accuracy:

± 1.8° F (± 1.0° C) over -40 to 250° F (-40 to 121° C);
 ± 3.6° F (± 2.0° C) over 250 to 650° F (121 to 343° C).
 Minimum velocity 60 SFPM.



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SPECIFICATIONS

Operating Specs

Units of Measurement (field-selectable):

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

Flow Rates for Insertion Flow Meters:

15 to 60,000 SFPM (0.07 to 280 NMPS) - Air at 70°F (20°C) & 1 ATM

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

To determine if an insertion flow meter will operate properly, divide the maximum flow rate by the pipe area. The application is acceptable if the velocity is within the velocity range above.

Typical Flow Ranges for Insertion Flow Meters			
Pipe size	SCFM	MSCFD	NM ³ /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

Flow Ranges for Inline Flow Meters			
Size	SCFM	MSCFD	NM ³ /hr
0.25"	0 - 10	0 - 10.8	0 - 11.8
0.5"	0 - 90	0 - 180	0 - 200
0.75"	0 - 180	0 - 320	0 - 350
1"	0 - 320	0 - 520	0 - 570
1.25"	0 - 580	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 - 3,080	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: Standard conditions of air at 70°F and one atmosphere. Consult factory for other gases and for flow ranges above and below those listed above.

Gas Pressure (maximum):

Insertion: 500 psig (34.5 barg)
 316 SS inline with NPT ends: 500 psig (34.5 barg)
 316 SS inline with 150 lb. flanges: 230 psig (16 barg)
 CS inline with NPT ends: 300 psig (20.1 barg)
 CS inline with 150 lb. flanges: 285 psig (19.7 barg)
 Retractor: 125 psig (8.6 barg)
 High pressure retractor: NPT 600 psig (41.4 barg), ANSI 150 flange & ANSI 300 flange, no valve supplied.

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:

Std sensor: -40 to 250°F (-40 to 121°C)

HT Sensor: -40 to 650°F (-40 to 343°C)

Enclosure: -40 to 158°F (-40 to 70°C) DC Power*
 -4 to 158°F (-20 to 70°C) AC Power

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

Remote sensor junction box ambient temperature: -40 to 212°F (-40 to 100°C)

Input Power (without the Anybus serial communication option):

24VDC \pm 10%, 0.4 Amps (standard DC Power)

100 to 240VAC \sim (+10%/-15%), 50-60Hz, 0.2 Amps (with AC power option)

Input Power (with Anybus serial communication option):

24VDC \pm 10%, 0.7 Amps (standard DC Power)

100 to 240VAC \sim (+10%/-15%), 50-60Hz, 0.2 Amps (with AC power option)

Note: Fluctuations of AC and DC power supply are not to exceed \pm 10% of rating.

Class I Equipment (Electrical Grounding Required for Safety).

Installation (Over-voltage) Category II for transient over-voltages.

Outputs:

Two isolated 4-20mA outputs (output one is for flow rate & output two is programmable for flow rate or temperature); fault indication per NAMUR NE43.

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

Serial Communication:

USB connector for connecting to a laptop or computer is standard; free PC-based software tool - FT2A View™ - provides complete configuration, remote process monitoring and data logging functions.

Optional isolated communication outputs: RS485-Modbus, BACnet MS/TP, Profibus-DP, DeviceNet or Ethernet Modbus TCP.

4-20mA Loop Verification:

Simulation mode used to align 4-20mA output with the input to customer's PLC/DCS.

Physical Specs

Sensor Material:

316 stainless steel standard; Hastelloy C276 optional

Inline Flow Body Material:

316 Stainless Steel flow bodies standard; Optional A106 Grade B carbon steel flow bodies and A105 flanges.

Enclosure:

NEMA 4X, aluminum, dual conduit entries with 3/4" NPT or optional M20 x 1.5mm.

Remote Sensor Cable:

5-conductor, 18 AWG, twisted, shielded, 100 feet maximum.

Retractor Assemblies:

Packing gland assembly: 125 psig (8.6 barg) max.
 High pressure (crank) retractor: NPT 600 psig (41.4 barg), ANSI 150 flange & ANSI 300 flange, no valve supplied.