



Model FT2 Gas Mass Flowmeter & Temperature Transmitter

- Measures gas flow rate in SCFM, NM³/hr, Lbs/hr, Kg/hr, & many more
- Wide measurement range; 100 to 1 turndown typical
- Measures process gas temperature
- 4 to 20 mA for flow rate & temperature; pulse output for flow/total
- RS232 for connecting a Palm Handheld or computer; RS422/RS485-Modbus, Profibus-DP, DeviceNet or Ethernet Modbus TCP
- Insertion and In-line 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
- Palm Handheld Terminal available to view/set readings and parameters
- 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.

FM and FMc approved!



The Fox Model FT2 Thermal Gas Mass Flowmeter and Temperature Transmitter measures two important process variables in one rugged instrument. The Model FT2 measures gas flow rate in standard units without the need for temperature or pressure compensation. It provides isolated 4 to 20 mA and pulse outputs for flow rate, and a 4 to 20 mA output for process gas temperature. The pulse output is normally used for totalization.

An optional on-board 2 line x 16 character, backlit display is available to view flow rate, total, elapsed time, process gas temperature, and alarms. The display is also used in conjunction with the Configuration Panel to configure flowmeter settings, pulse output frequency scaling, pipe area, zero flow cutoff, flow filtering (damping), display configurations, diagnostics and high or low alarm limits.

The Model FT2 is available in both insertion and in-line 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. RS232 for connecting a Palm Handheld or computer is standard. Interface options include RS422/RS485-Modbus, Profibus-DP, DeviceNet or Ethernet Modbus TCP.

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

SPECIFICATIONS

Performance Specs

Flow Accuracy:

± 1% of reading ± 0.2 % of full scale*

* Point velocity for insertion flowmeters. Fox recommends a minimum of 15 diameters of straight pipe upstream of the flowmeter and 10 diameters downstream for insertion flowmeters. Fox recommends a minimum of 8 diameters of straight pipe upstream of the flowmeter and 4 diameters downstream for inline flowmeters.

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.

Operating Specs

Units of Measurement:

SCFM, SCFH, NM³/hr, NM³/min, Kg/hr, Kg/min, Kg/sec, Lbs/d, Lbs/hr, Lbs/min, Lbs/sec, NLPH, NLPM, SLPM, SMPS, NMPS, SFPM, MMSCFD, MMSCFM, SM³/hr

Flow Rates for Insertion Flowmeter:

0 to 32,000 SFPM (163 NMPS) - Air at 70F & 1 ATM

To determine if an Insertion Flowmeter 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.

Here are flow rates for common pipe sizes:

| Pipe size | SCFM | NM ³ /hr |
|---------------|---------|---------------------|
| 1-1/2" (40mm) | 0-450 | 0-760 |
| 2" (50mm) | 0-750 | 0-1280 |
| 3" (80mm) | 0-1600 | 0-2720 |
| 6" (150mm) | 0-6400 | 0-10870 |
| 8" (200mm) | 0-11100 | 0-18860 |
| 10" (250mm) | 0-18200 | 0-30920 |
| 12" (300mm) | 0-24900 | 0-42300 |

Full Scale Flow Ranges for In-Line Flowmeters:

| Size | SCFM | NM ³ /hr |
|-------|--------|---------------------|
| 0.25" | 0-20 | 0-32 |
| 0.5" | 0-68 | 0-107 |
| .75" | 0-120 | 0-204 |
| 1" | 0-192 | 0-326 |
| 1.25" | 0-332 | 0-564 |
| 1.5" | 0-450 | 0-760 |
| 2" | 0-750 | 0-1280 |
| 2.5" | 0-1090 | 0-1855 |
| 3" | 0-1600 | 0-2720 |
| 4" | 0-2880 | 0-4893 |
| 6" | 0-6400 | 0-10870 |

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 Flowmeter:

500 psig (34.5 barg)

In-Line (1/4" through 6"):

NPT 500 psig (34.5 barg)

150# flange 230 psig (16 barg)

Check with factory for higher pressure options.

Note: Pressure ratings stated for temperature of 100°F (38°C).

Temperature:

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

HS Sensor: 32 to 400°F (0 to 204°C)

HT Sensor: 32 to 650°F (0 to 343°C)

Enclosure: -40 to 158°F (-40 to 70°C) without display, 32 to 140°F, (0 to 60°C) with display.

Input Power:

24 VDC, ± 10%, 0.75 amp standard; 85 to 250VAC
50/60Hz, 20 watts optional.

Output:

Two isolated 4 to 20 mA outputs (1 for flow & 1 for temperature); isolated pulse output 0 to 100Hz, 10 volts p/p for flow (the pulse output can be used as an isolated solid state output for alarms).

RS232 for connecting a Palm Handheld or computer; RS422/
RS485-Modbus, Profibus-DP, DeviceNet or Ethernet Modbus TCP.

Physical Specs

Sensor material:

316 stainless steel standard; Hastelloy C276 optional

Enclosure:

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.

Options: Remote NEMA 4X electronics enclosure with explosion-proof sensor j-box (See Figure 5 and Figure 5a).

Cabling:

To Fox remote enclosure: 5-conductor, 18 AWG, twisted, shielded, 100 feet maximum.

Retractor assemblies:

Packing gland assembly: 125 psig (8.6 barg) max. (See Figure 6)

High pressure (crank) retractor: NPT 600 psig (41.4 barg), ANSI 150 flange & ANSI 300 flange, no valve supplied. (See Figure 7)

Dimensional

Insertion Flowmeters:

Probe diameter: 1/2"

Equation for selecting Insertion Flowmeter probe length:

Probe length = 1/2 pipe ID (in inches) + 2" + thickness of insulation (if any) + dimension of retractor (if supplied). Round up to the next standard probe length available.

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

| Pipe Size | Probe Length |
|--|--------------|
| 1-1/2" (40mm) to 2" (50mm) | 4-inch |
| 2.5" (65mm) to 6" (150mm) | 6-inch |
| 8" (200mm) to 12" (300mm) | 9-inch |
| 14" (350mm) to 18" (450mm) | 12-inch |
| Use the equation above for larger pipe sizes | |

Probe Lengths (LL) – (See Figure 1) = 4.0(10.2), 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). Contact Fox for longer probes.

| Inline Flowmeter Dimensions – See Figures 2, 3 & 5 | | | |
|--|-------------|-------------|-------------|
| Pipe size | L | H | HH |
| 0.25" | 5.80 (14.7) | 12.5 (31.8) | 9.9 (25.1) |
| 0.5" | 12.0 (30.5) | 12.5 (31.8) | 9.9 (25.1) |
| 0.75" | 12.0 (30.5) | 12.5 (31.8) | 9.9 (25.1) |
| 1" | 15.0 (38.1) | 12.5 (31.8) | 9.9 (25.1) |
| 1.25" | 12.0 (30.5) | 12.5 (31.8) | 9.9 (25.1) |
| 1.5" | 12.0 (30.5) | 12.5 (31.8) | 9.9 (25.1) |
| 2" | 12.0 (30.5) | 12.5 (31.8) | 9.9 (25.1) |
| 2.5" | 18.0 (45.7) | 12.6 (32.0) | 10.0 (25.4) |
| 3" | 18.0 (45.7) | 12.6 (32.0) | 10.0 (25.4) |
| 4" | 18.0 (45.7) | 13.1 (33.3) | 10.5 (26.7) |
| 6" | 24.0 (61.0) | 14.2 (36.1) | 11.6 (29.5) |

Note: Dimensions in parenthesis are centimeters. For certified drawings, consult factory.

Theory of Operation

Fox Flowmeters use a Constant Temperature Differential (ΔT) technology. The sensor has two elements. The Reference RTD measures the gas temperature. The electronics heats the Heated Element above the gas temperature. It is the job of the electronics to maintain a constant ΔT between the gas temperature and the Heated Element. As mass flow increases, the increased numbers of gas molecules remove more heat from the Heated Element.

The electronics senses this temperature reduction and adds additional power to the heated element in order to maintain a constant ΔT . The amount of power delivered to the Heated Element is proportional to the mass flow rate. The microprocessor then linearizes this signal to deliver a linear output.

Pressure Drop Charts for Inline Flowmeters

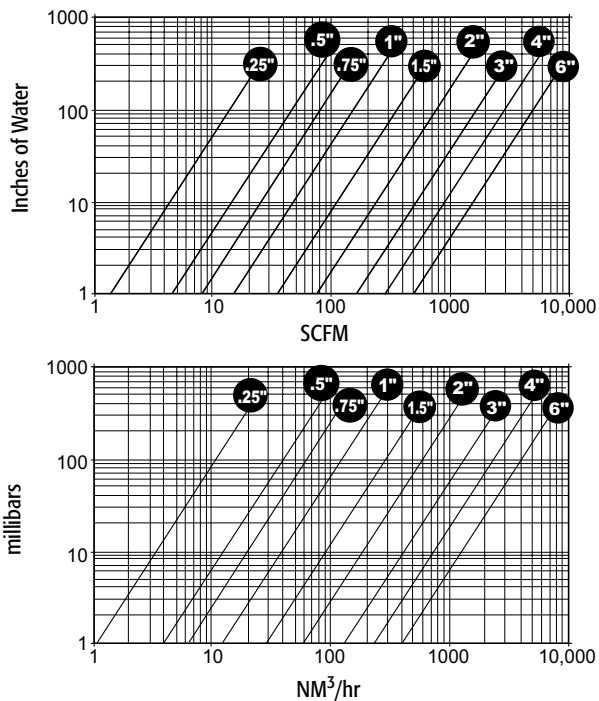


Figure 1: Insertion 4" to 36" (10.2 to 91.4 cm)

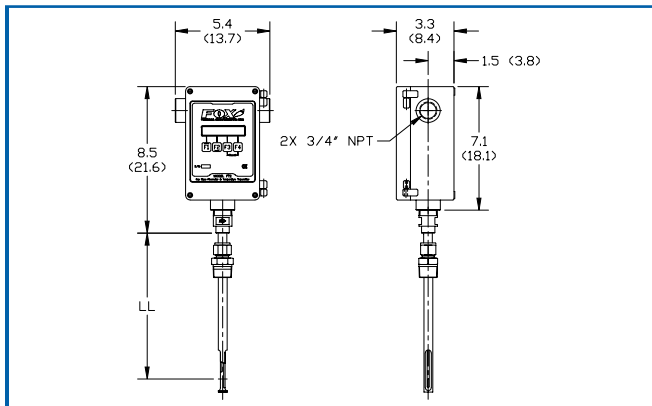
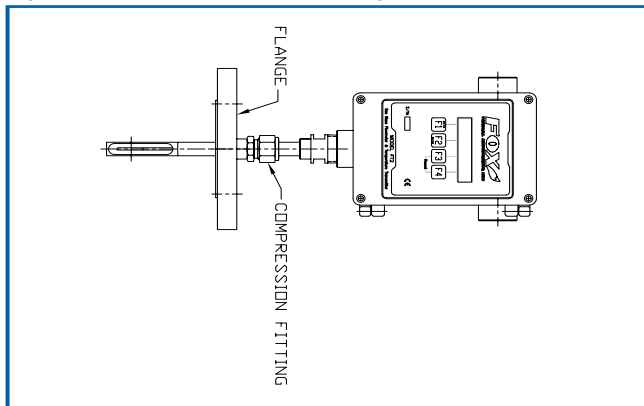


Figure 2: Insertion with 150# Flanges – sizes 4" to 36"



DIAGRAMS

Figure 3: In-Line with NPT Fittings – sizes 0.25" to 6"

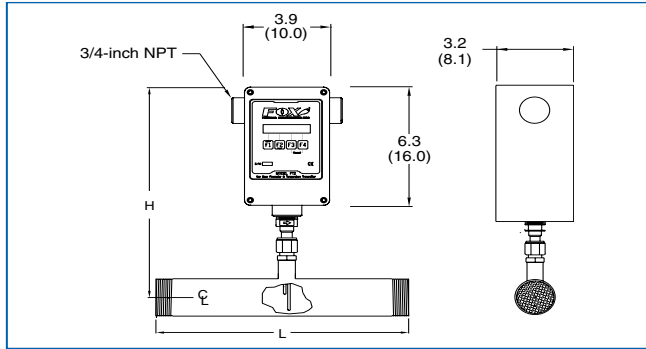


Figure 4: In-Line with 150# Flanges – sizes 0.5" to 6"

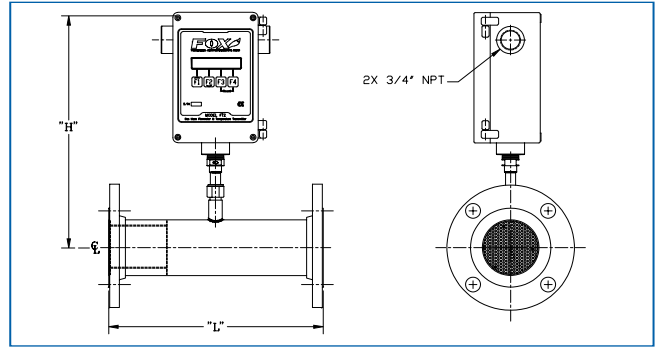


Figure 5: Remote Enclosure - INLINE

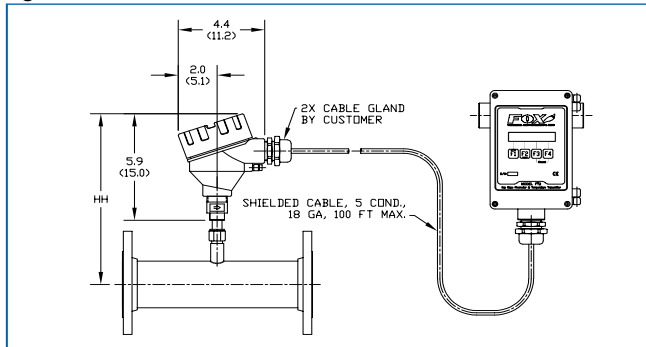


Figure 5A: Remote Enclosure - INSERTION

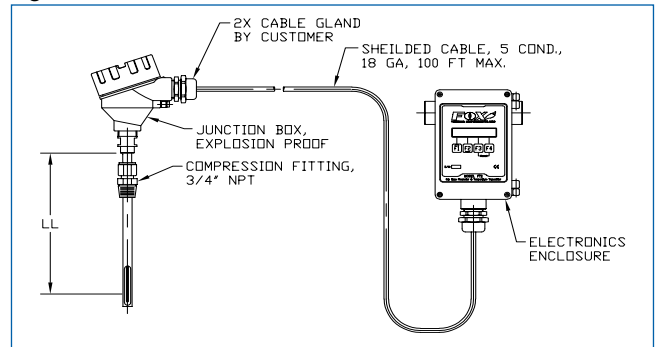


Figure 6: Packing gland assembly - 125 psig (8.6 barg) maximum

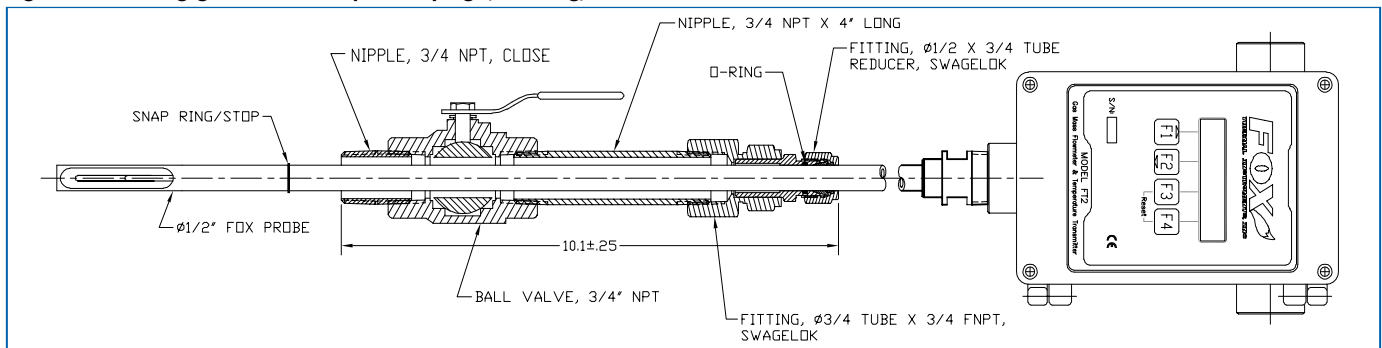
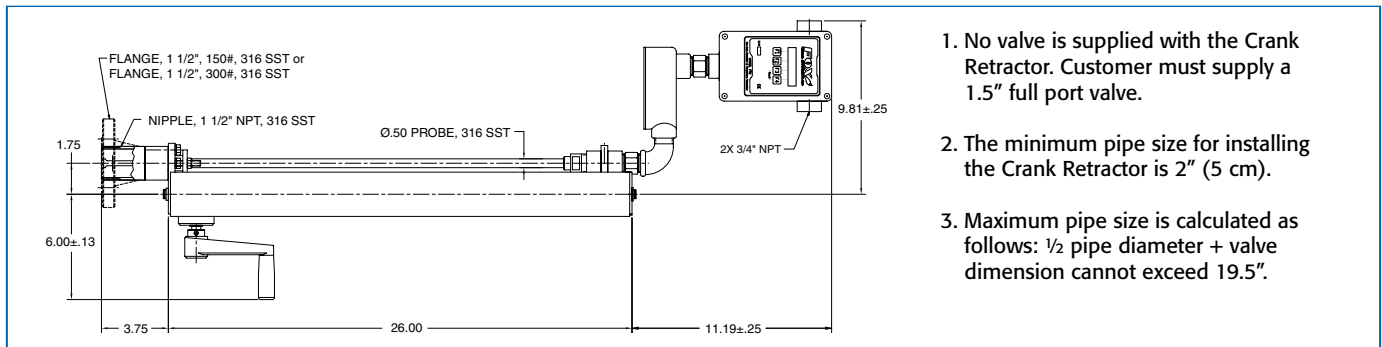


Figure 7: Crank Retractor - NPT 600 psig (41.4 barg), ANSI 150 & ANSI 300



1. No valve is supplied with the Crank Retractor. Customer must supply a 1.5" full port valve.
2. The minimum pipe size for installing the Crank Retractor is 2" (5 cm).
3. Maximum pipe size is calculated as follows: 1/2 pipe diameter + valve dimension cannot exceed 19.5".



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