

PRECISION FLOW METER FOR GAS APPLICATIONS

10X Series
Microturbine Flow Sensors
Model 100



APPLICATION IDEAS

- Analysis for gas chromatography
- Monitoring of bioreactors
- Emissions testing and gas sampling
- Gas measurement in food processing and packaging

Product Description

McMillan 10X Series Flow Sensors are capable of measuring extremely low flow rates. Units are available that measure gases as low as 20 mL/min and as high as 500 L/min. Full scale accuracies of $\pm 1.0\%$ or better are available on select models.

A wide variety of gases may be measured. Repeatable results are achieved using a patented Pelton-type microturbine wheel. This proven design has been providing precision results since 1988 and has developed a well-deserved reputation for continuous operational service for many years without failure.

Because of the compact size and economical cost of these products, the 10X Series Flow Sensors are suitable for a wide variety of industrial, commercial, laboratory and OEM applications. Some sample applications include measurement of air, nitrogen, and stack gases. NIST Traceable certificates are available for air only.

Principle of Operation

McMillan's microturbine wheel technology utilizes the Pelton turbine wheel concept. This design allows for the use of a miniature turbine wheel to measure flow. The wheel is supported by a very small sapphire shaft held in position by two maintenance-free bearings. Due to the light weight of both the wheel and the shaft, the microturbine wheel is virtually suspended in the flow path. This suspension effect relieves friction on the shaft and bearings, eliminating wear.

As flow passes through the device, it is directed onto the very small teeth of the wheel using a high precision nozzle (see the blue arrows in Figures 1). This nozzle is sized according to the flow range of the unit. The rotational speed of the turbine wheel increases proportionally to the volumetric flow rate.

On some 10X models (see Figure 1), the microturbine wheel has alternating white and black sections evenly spaced on its surface. As the wheel rotates (as shown with green arrows), an infrared beam (as shown with red arrows) is reflected off each white section and directed to a phototransistor which detects each reflected beam and converts them into measured pulses.

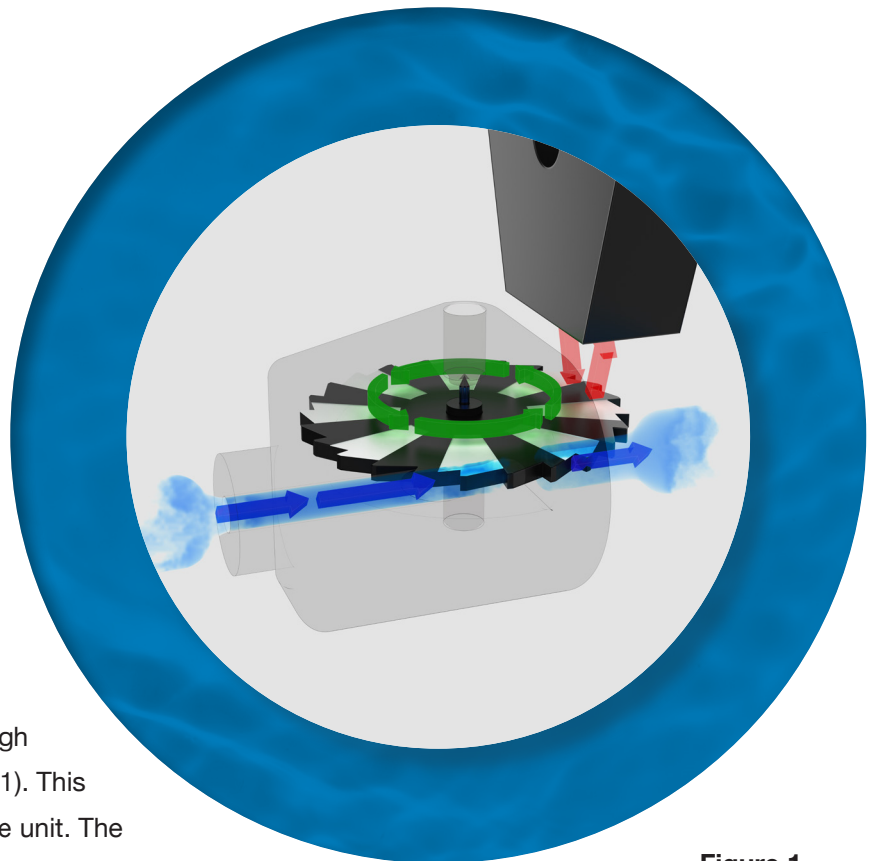


Figure 1
Representation of microturbine technology

Features and Options

FLOW RANGES*

Units are available that measure gas flow as low as 20 mL/min and as high as 500 L/min.

POWER

Most units may be specified to operate with either 12 VDC or 24 VDC power. Various power adapters are also available for use with 12 VDC versions.

SIGNAL OUTPUTS

Model 100 units come with a 0-5 VDC output.

ACCURACY / LINEARITY

All model 100 units have a standard accuracy specification of $\pm 3\%$ full scale including linearity. NIST traceable calibration certificates are optional.

FLUID CONNECTIONS

Units feature compression tube fittings. Fitting sizes may be selected as noted in the Ordering Information section.

ELECTRICAL CONNECTIONS

Units have an integrated 4-pin male connector. To complete connections, either a cable assembly or power adapter should be ordered.

DISPLAYS*

A variety of remote displays are available for use with the 10X Series Flow Sensors. McMillan also offers a comprehensive range of flow meters with integrated displays.

Specifications

Except where noted all specifications apply to operation at +25°C

Accuracy <small>(including linearity, best fit straight line)</small>	$\pm 3.0\%$ full scale
Repeatability	$\pm 0.5\%$ full scale
Pressure Rating	40 psig [2.7 barg]
Temperature Rating	Operating Range: 41 to 131 °F [5 to 55 °C] Storage Range: 32 to 158 °F [0 to 70 °C]
Temperature Sensitivity	$\pm 0.2\%$ full scale or less per °C
Wetted Materials	PPS 304 Stainless Steel Epoxy Glass Sapphire FKM Acetal (fittings)

Recommended Filtration	25 microns or less
Compatible Media	Non-condensing gases
0-5 VDC Output Signal	Non-isolated 2500 ohm minimum load
Power	12 VDC units: 11.5 -15 VDC @ 35 mA 24 VDC units : 22 -25 VDC @ 35 mA
Response Time	Typically < 30 seconds to 67% of final value
Certifications	CE Approved 89/336/EEC (EN 55011 & EN 50082-1) 73/23/EEC Low Voltage Directive UKCA
Ratings	IP10 (NEMA 1)
Warranty	1 Year Limited

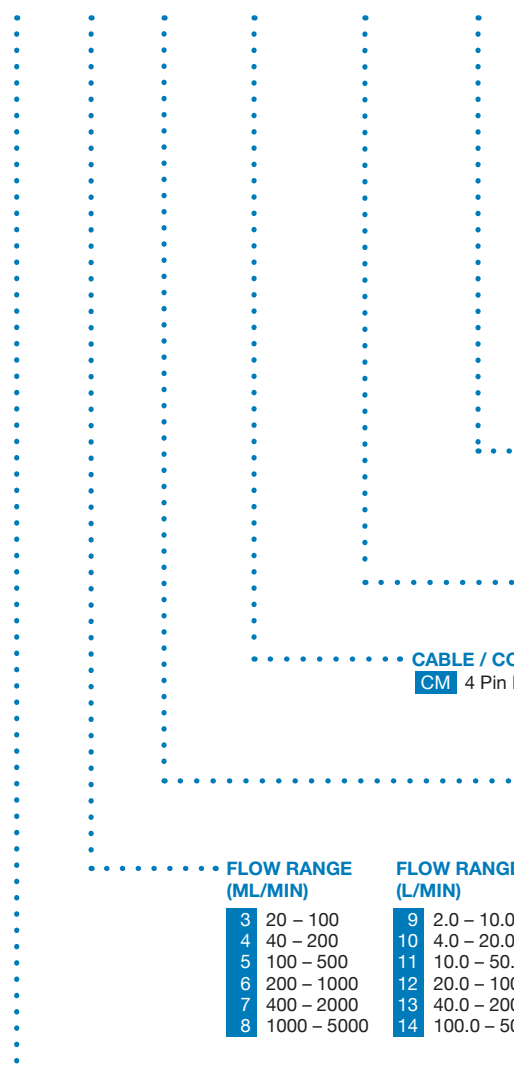
Ordering Information for Model 100

Form part number as follows:

(Base Model) - (Flow Range) (Power/Signal) - (Cable/Connector) - (Fittings) - (Options)

Example: 100-3D-CM-A2

100 - - CM - - -



MODEL
100 Plastic microturbine flow sensor for gases

FLOW RANGE (ML/MIN)	FLOW RANGE (L/MIN)
3 20 – 100	9 2.0 – 10.0
4 40 – 200	10 4.0 – 20.0
5 100 – 500	11 10.0 – 50.0
6 200 – 1000	12 20.0 – 100.0
7 400 – 2000	13 40.0 – 200.0
8 1000 – 5000	14 100.0 – 500.0

OPTIONS
NIST NIST Certificate (air only)*

CABLE / CONNECTOR
CM 4 Pin Male

FITTINGS
A2 1/8" acetal tube (flow ranges 3-6)
A4 1/4" acetal tube (flow ranges 3-9)
A6 3/8" acetal tube (flow ranges 8-11)
A7 1/2" acetal tube (flow ranges 11-14)

POWER / SIGNAL OUTPUT
B 22-25 VDC / 0-5 VDC
D 12-15 VDC / 0-5 VDC

EXAMPLE

100-3D-CM-A2 would provide a PPS-bodied microturbine flow sensor that provides an analog 0-5 VDC output signal, requires 12 VDC power, includes 1/8" acetal tube fittings, and would measure flow rates from 20 – 100 mL/min of air.

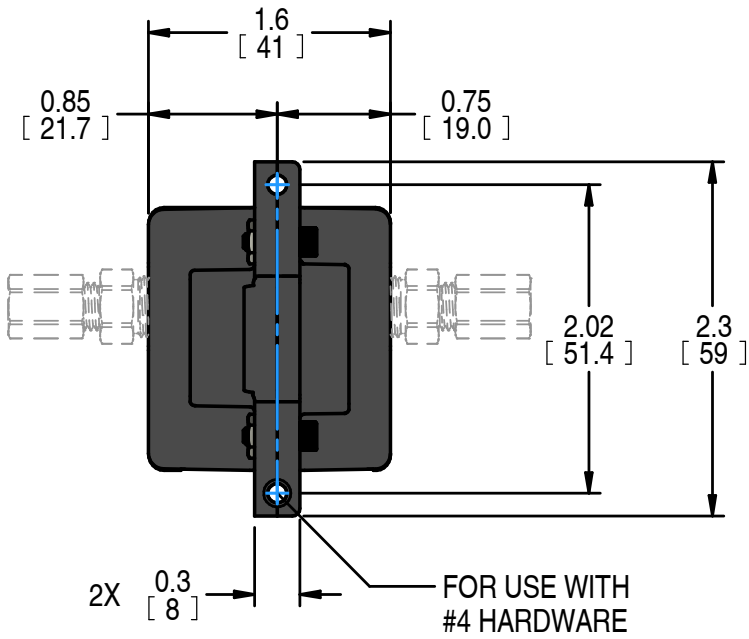
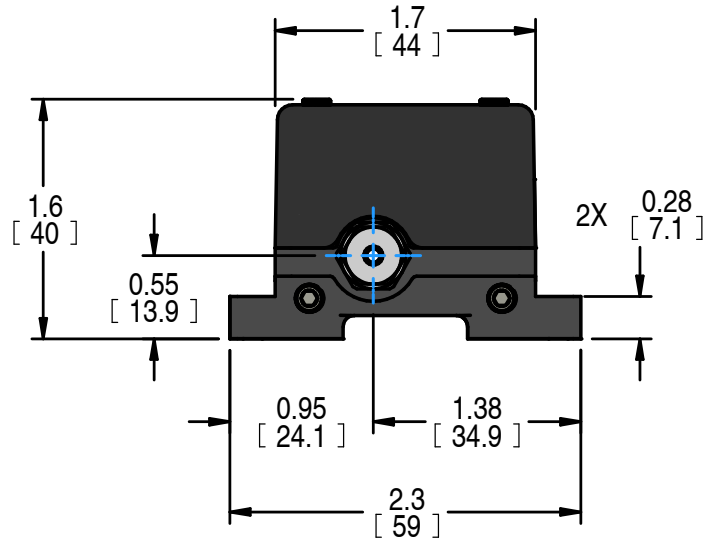
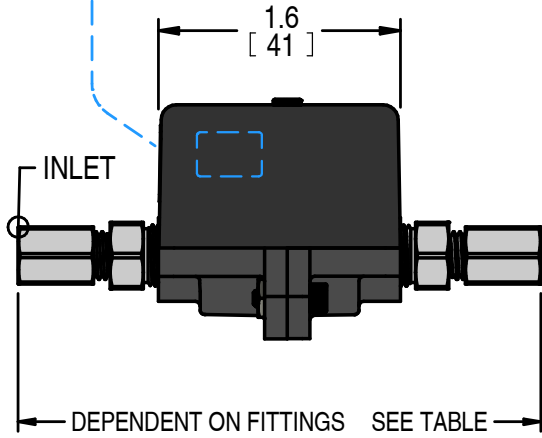
Dimensions

Basic unit configurations are shown. Contact the factory or an authorized representative for dimensions of units not shown. All dimensions shown in inches [mm] unless otherwise noted.

100 (RANGES 3-9):



4-PIN CONNECTOR
LOCATED ON BACK

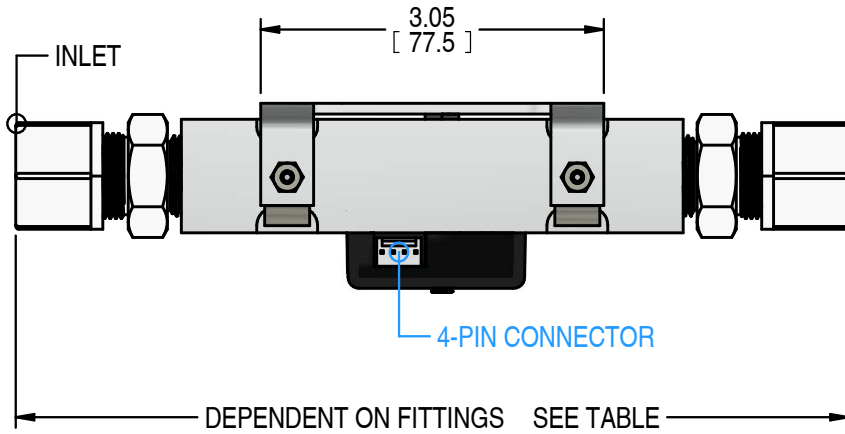


OVERALL LENGTH TABLE			
FITTING	A2	A4	A6
LENGTH	3.5 [87.9]	3.9 [99.3]	4.4 [111.5]

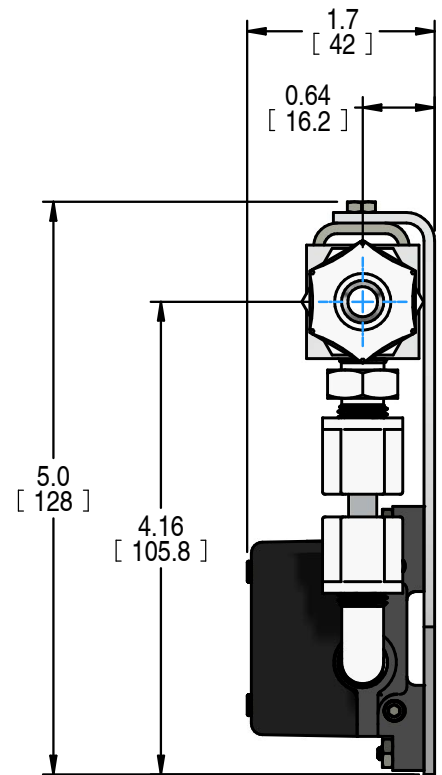
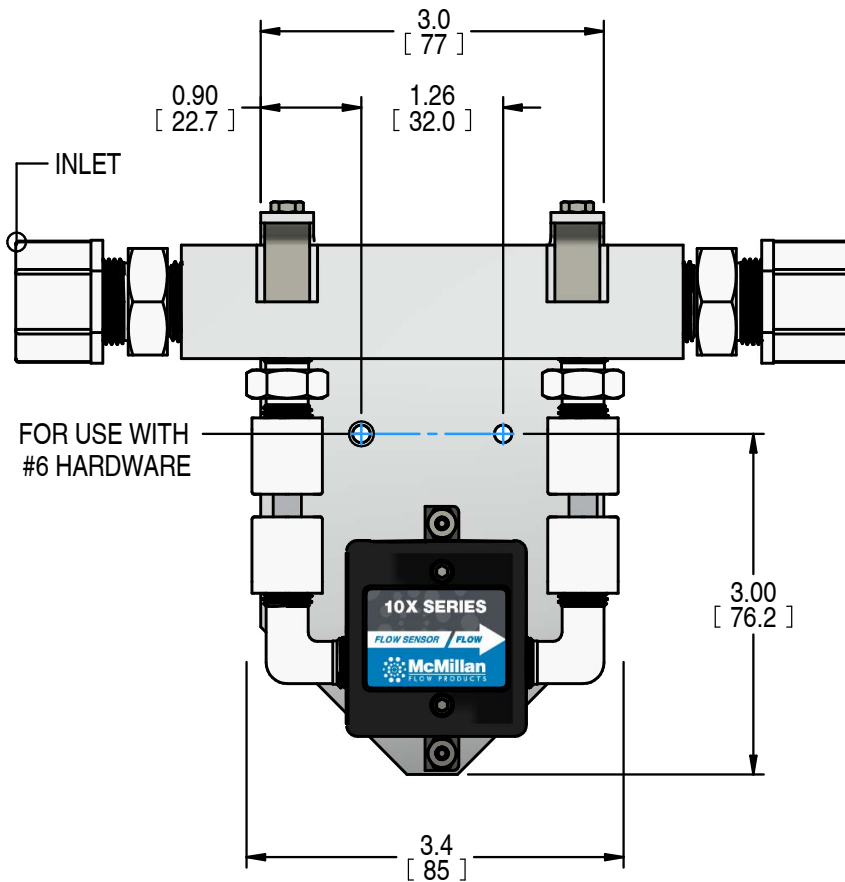
Dimensions

Basic unit configurations shown. Contact factory or an authorized representative for dimensions of units not shown. All dimensions shown in inches [mm] unless otherwise noted.

100 (RANGES 10-14):



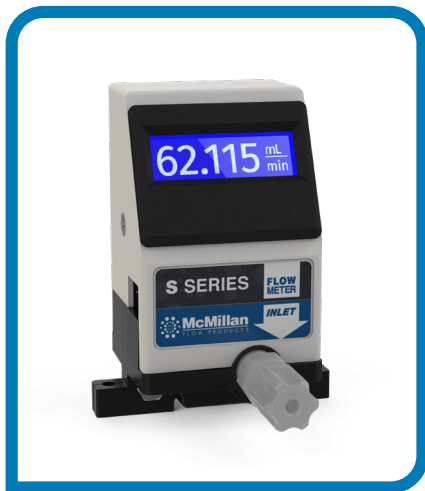
OVERALL LENGTH TABLE		
FITTING	A6	A7
LENGTH	7.0 [177.5]	7.4 [188.1]



Related Accessories

CODE	DESCRIPTION
100-17T	Mating cable for CM option with pigtail leads, 36" length [92 cm]
110-00-08T	115 VAC power adapter, includes signal cable
110-00-18T	230 VAC power adapter, includes signal cable

Related Products



S Series Flow Meters

Flow meters with integrated flow rate display



Model 275 Display

Digital panel display for use with the 10X



50X Flow Meters

Thermal mass flow sensors and meters for gases

