

Ultrasonic Flowmeter

M-1700 Sensor



M-1700 Controller



M-1700 Series

Non-Invasive Inline Flowmeter

Features

- Accuracy $\pm 2\%$ of full scale
- Flow range of 60 to 4000 ccm
- Straight and clean (all PFA tube)
- Maintenance free (no moving parts)
- Corrosion resistant
- Simple, light weight and compact
- Easy configuration in front panel with LCD display
- Wide rangeability
- Built in linearizer
- Panel mount converter
- User adjustable time constant
- Compact size

The M-1700 Series Ultrasonic Flowmeter consists of a highly compact all PFA "straight through flow tube sensor and companion electronics. The product is designed for high accuracy flow rate measurement of liquids and for use in conjunction with Malema MFC-2600 flow control valve to create a "closed loop" control system. The M-1700 is capable of measuring flow rates from 60 to 4000 ccm with an accuracy of $\pm 2\%$ of full scale. There are no mechanical seals or moving parts and the M-1700 has non-contact transducers mounted externally on a straight tube. This straight flow tube design ensures that there are no dead volumes of fluid. The M-1700 should be mounted in the vertical direction for optimal performance. The M-1700 has tube ends connection with 1/4" flow tube size that is easy to adapt to various fittings

Applications

- Pure water and ultra-pure water in semiconductor manufacturing plants.
- CMP slurries and ultra pure fluids
- Flow measurements for chemical feeds
- Highly corrosive chemicals measurement
- Low flow measurement of liquid

Operating Principle

The fluid to be measured flows through the straight PFA tube. Two piezoelectric transducer, A & B, mounted externally on the measuring section of the flow tube generate and receive an ultrasound alternately. The sound from one Piezoelectric transducer goes through the tube wall and into the fluid at angle θ and travelling with the fluid. The sound reflected on the opposite wall is then detected by the other Piezoelectric transducer. The sound traveling along the flow is accelerated and the sound traveling against fluid is slowed. The difference in transit time of sounds is proportional to the velocity of the fluid.

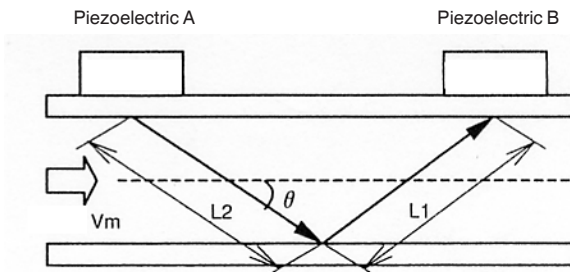


Fig. 1 Operating Principle

$$\Delta t = \frac{L_1 + L_2}{C_0 - V_m \cos \theta} - \frac{L_1 + L_2}{C_0 + V_m \cos \theta}$$

Δt : Transit time difference

C_0 : Velocity of sound

V_m : Fluid velocity

Sensor Specifications

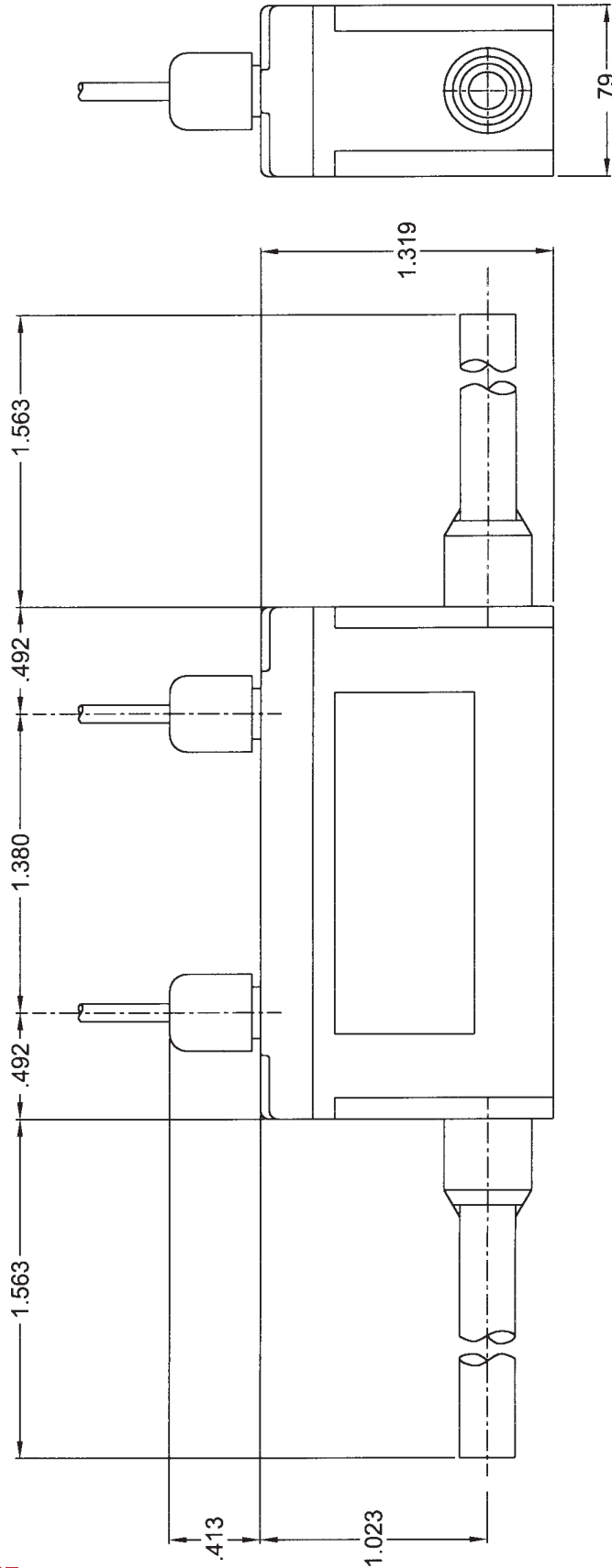
Type	T2 (1/4")
Measuring Range	60 - 4000 ccm
Pipe Sizes (OD x ID)	6.36 x 4.35 mm
Accuracy	+/- 2% F.S. (by water)
Measuring Medium	Water, Slurry, Ultrapure fluids etc
Measuring Temperature	50 - 104 Deg F (10 - 40 Deg C)
Pressure	0 - 0.5 MPa (75 Psig maxm.)
Wet Material	PFA
Housing Material	PVDF
Connection	PFA tube end
Weight	Approx. 0.661 lbs
Cable Length	5m

Controller Specifications

Method	Ultrasonic Transmitting Time Difference
Operating Conditions	Temperature 32 - 122 F Humidity: 30 - 80 % RH (without dew)
Output	1) 4 - 20 mA (Load resistance 0 to 500 ohms) or 0 to 10V 2) Scaled Pulse Open collector max. 30 V DC, max 20mA Pulse Width: 0.5 ms (Max. 1000 Hz) 50 ms (Max. 10 Hz) 100 ms (Max. 5 Hz) 3) Alarm/Preset count Open collector (2 points) Max. 30 V DC, max. 20mA
Installation	Panel Mount
Low Cut-off	0 to 10% of full scale (adjustable)
Linearizer	15 line-segment approximation
Display	LCD / 2 line 16 digit alphanumeric Flow rate, Total flow, and Flow velocity
Alarm	2 LED
Data Entry	By 4 key switches in front panel of controller
Power	24 V DC +/- 10%, 150 mA (1.5 A/starting)
Enclosure Classification	IP20 (Indoor use)
Materials	Panel - ABS, Housing - steel
Color	Panel - gray, Housing - black
Dimensions	3.80" W x 1.90" H x 6.59" D
Weight	Approx. 1.1 lbs

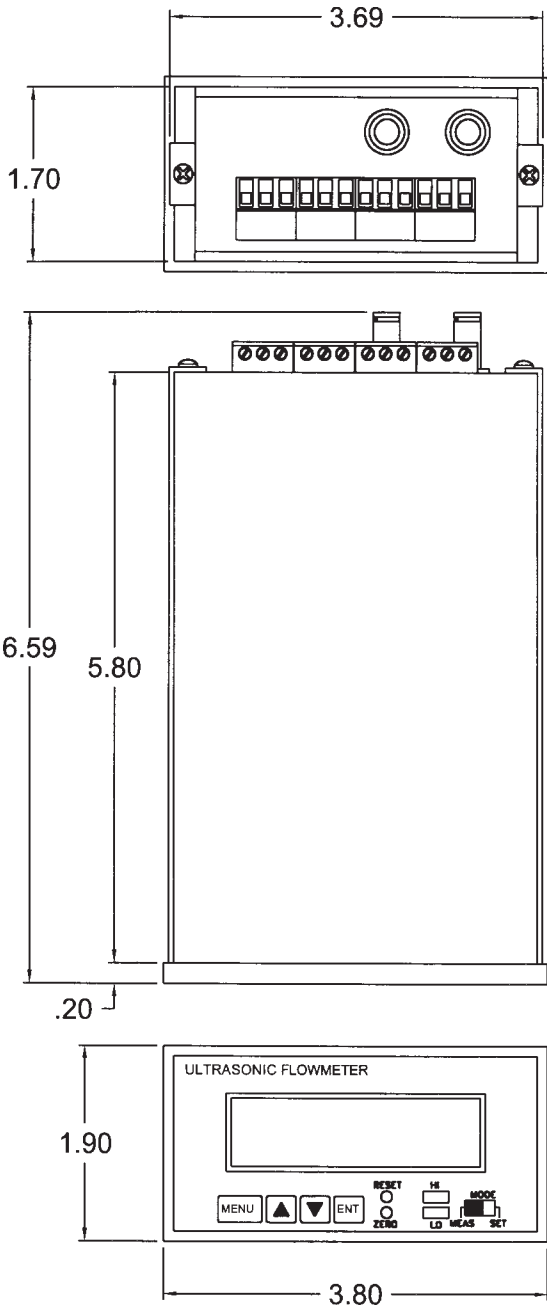
Ultrasonic Flowmeter

Dimensional Drawing (Sensor)



Dimensions in inches

Dimensional Drawing (Controller)



Ultrasonic Flowmeter

Terminal Block Connections

No	Polarity	Connection
1	+	Current output (4 to 20 mA)
2	-	
3	+	Pulse output (Open Collector)
4	-	
5	+	Flow rate alarm (H) or Preset total (HH) (Open Collector)
6	-	
7	+	Flow rate alarm (L) or Preset total (H) (Open Collector)
8	+	Reset total
9	-	
10	GND	Ground
11	0 V	Power supply (24 V DC)
12	24 V	

Cautions

Installation Area for Flow Detector: Select the area of pipe where no air or gas bubbles exist in the flow.

Mounting of Flow Detector: Flow detector can be mounted horizontally, vertically or at a slant. However, the flow tube must always be filled with liquid.

Location of Control Valve: If a flow control valve is installed in the piping, it should be located on the downstream side of the flow detector to maintain a high fluid pressure.

Noise Suppression: All electrical noise sources near the flowmeter, such as power relays or solenoid valves, should be fitted with a surge suppressor.

Signal Cable Wiring: Keep signal cables away from high voltage or high current power cables to avoid induced electrical noise.

Ordering Information

Standard part Numbering						Options				
M	-	Model	-	Material	Tube Size	Connection	-	Cable Length	Analog Output	Future Option
M	-	1700	-	T - PFA	2- 1/4" tube	1 - Tube End Connection	-	0 - 5 m (Std) 1 - 10 m	1 - Voltage Output 2 - Current Output	0