

PV 9000 SERIES ELECTRONIC FLOWMETER USER'S MANUAL

WARRANTY

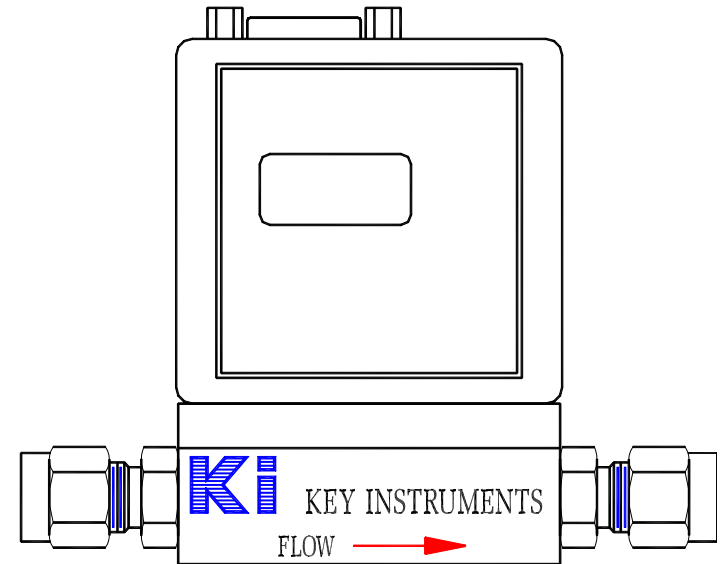
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Printed in U.S.A.
8/04
IDT153 Rev. 004



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Mounting Hole Locations

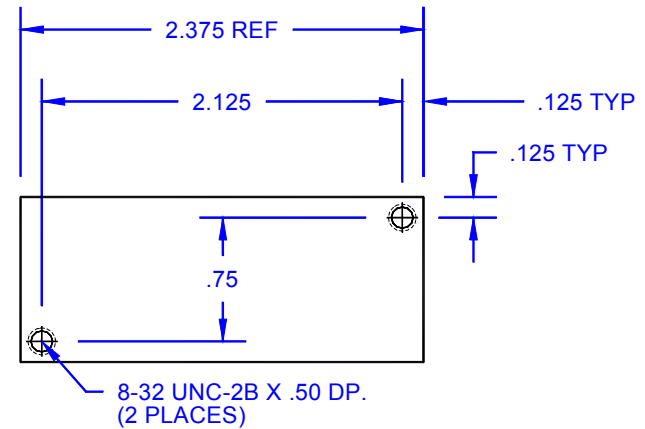


Figure 6 – Bottom View of PV Meter

Converting to Mass Flowrate

- Using the Ideal Gas Law ($PV = nRT$), the flowrate can be converted to volumetric flowrate at Standard Temperature and Pressure (STP).

- $$\frac{P_s \cdot V_s}{T_s} = \frac{P_o \cdot V_o}{T_o}$$

P_s = Standard Pressure

V_s = Volumetric Flowrate at standard conditions

T_s = Standard Temperature in Kelvin

P_o = Operating Pressure

V_o = Volumetric Flowrate at operating conditions

T_o = Operating Temperature in Kelvin

- The resulting Volumetric Flowrate at standard conditions is:

- $$V_s = V_o \cdot \frac{P_o}{P_s} \cdot \frac{T_s}{T_o}$$

- It has become common for V_s to be specified in SLPM (Standard Liters/Min), SCCM (Standard Cm^3/Min), etc. This simply means the flowrate has been calculated for STP conditions.

- To determine the Mass Flow Rate (m), multiply V_s by the density (ρ_s) at STP.

- $$m = V_s \cdot \rho_s$$

- **RS232 Serial Output** – Flowmeters with this option transmit the flowrate signal through RS232 communication. The flow signal is transmitted every 100 milliseconds in ASCII format. Flow units are defined by the flowmeter model, for example, if a 1 LPM unit indicates +1.00, then the flowrate is 1 LPM. Each data string is terminated by the carriage return character (0D hex).

Baud Rate	Start Bit	Data Bits	Stop Bits	Parity	Handshake
2400	1	8	1	None	None

- The simple BASIC program shown below is all that is needed to receive and decode the serial data from the flowmeter. In this example, the flowmeter output is connected to the serial port (COM1) of an IBM PC (or compatible computer).

```

10 ON ERROR GOTO 100
20 CLS
30 OPEN COM1:2400,N,8,1,CS,DS,CD FOR INPUT AS #1
40 INPUT #1, AS$
50 LOCATE 1,1
60 PRINT SPC(17)
70 LOCATE 1,1
80 PRINT VAL (AS$)
90 GOTO 40
100 RESUME

```

- Many communication programs (such as Windows HyperTerminal Program) can be used to read the flowmeter directly.

Environmental Conditions

Maximum Pressure	100 PSIG / 689.5 kPa
Temperature Range	10– 50 °C / 50– 122 °F
Humidity	85% Maximum; Non-condensing

Dimensions

Model	Up to 5 LPM	20 LPM	50 LPM
Height	3.47" / 8.81 cm	3.75" / 9.53 cm	3.87" / 9.83 cm
Width	4.06" / 10.31 cm	4.93" / 12.52 cm	4.93" / 12.52 cm
Depth	1.06" / 2.69 cm	1.06" / 2.69 cm	1.06" / 2.69 cm

Introduction

- The PV-Series Flowmeter accurately measures the flowrate of non-hazardous gases with an accuracy of $\pm 2\%$ of full scale. The flowrate is determined by measuring the pressure drop through a laminar flow element using an internal transducer. Since the flow is laminar through the meter, the flowrate is linearly proportional to the change in pressure.
- Each PV-Meter is calibrated using a standard traceable to **NIST**. Unless otherwise specified, this flowmeter was calibrated with air at 70° F and a barometric pressure of 29.92" Hg. The display (or output) indicates volumetric flowrate (volume per unit of time).

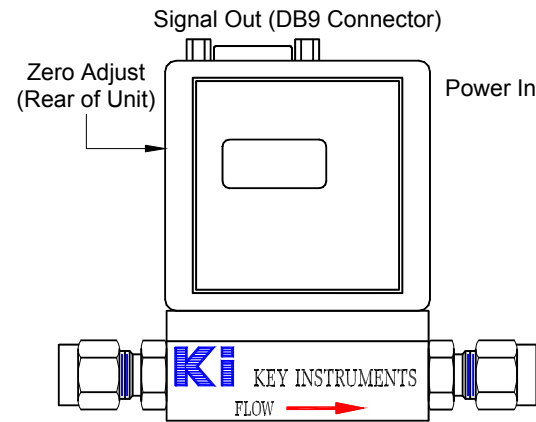


Figure 1: PV Meter

Power Supply Connection

- Any adapter providing a minimum DC output of 12 volts (max 24 volts) will power this flowmeter through the power jack (See Figure 1) on the side of the case following the polarity convention shown in Figure 2. The electronic circuit is protected against reverse polarity up to a supply voltage of 15 volts.

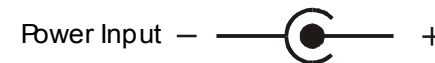


Figure 2: Power Circuit

- 4-20 mA output meters **must be** powered via the DB9 connector. See Figure 5 for proper power connections for these meters.

Flow Connection

- The flowmeter is provided with compression fittings. If other connections are required, the fittings can be replaced with any fitting having $\frac{1}{8}$ or $\frac{1}{4}$ " MNPT (>5 LPM) thread. Care should be taken to seal the threads of the alternate fittings and prevent damage to the flowmeter body.

Field Adjustments

- The zero adjusting screw is located on the rear of the case as shown in Figure 1. Small adjustments can be made by turning the potentiometer for zero alignment. The span adjustment is factory preset and located inside the meter body. Tampering with the span settings will void the warranty.

Output Signals

- The PV Meters are equipped with a DB9 connector. Depending on the model, the pins function differently. The Pin Functions for each model are as follows:

Pin #	0-5 VDC \ 4-20 mA Output	Display with 0-5 VDC \ RS232 Output
1	Power In	Power In
2	--	TXD, Serial Output
3	--	--
4	--	--
5	Signal & Power Ground	Power Ground
6	--	--
7	--	--
8	5 VDC Output	5 VDC Output
9	--	--

- Voltage Output** – Flowmeters with the voltage output provide a 5 VDC output span. This voltage is 0 V for zero flow and 5 V for full-scale flow.

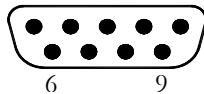


Figure 3: Male DB9 Connector

The output voltage is linear over the entire range and is available through the DB9 connector. (See Figure 4)

- Current Output** – Current output flowmeters provide an output span that ranges from 4 mA – 20 mA. The flowmeter draws 4 mA at zero flow and 20 mA at the full scale flow value. The linear output is transmitted through the DB9 connector to an external device, such as an ammeter. (See Figure 5)

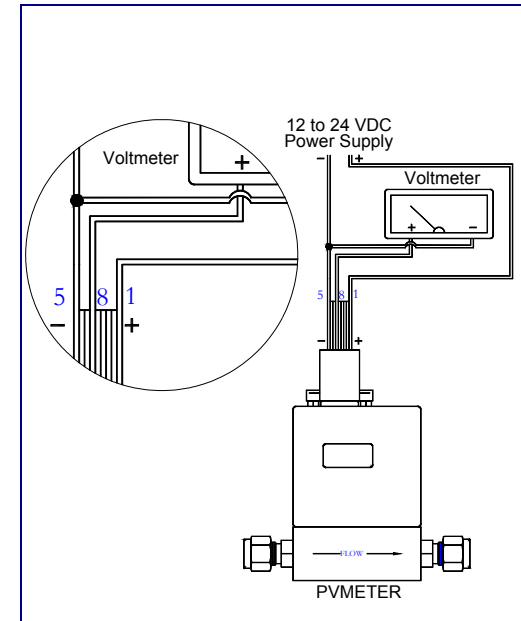


Figure 4: Voltage Meter Connection

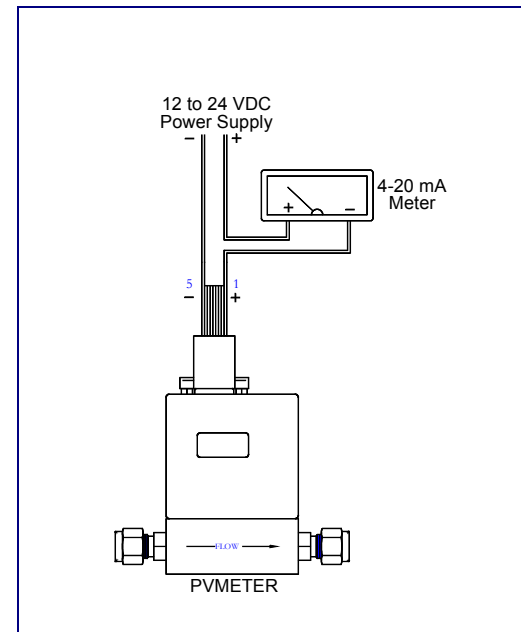


Figure 5: 4-20 mA Meter Connection