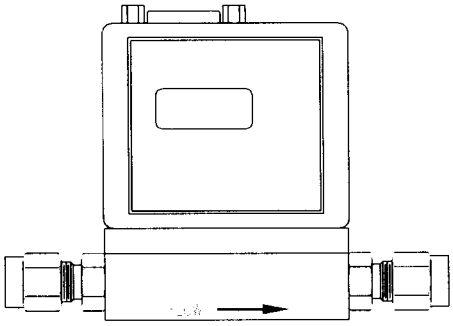
FDP10 SERIES
VOLUMETRIC FLOWMETERS

INSTRUCTION SHEET

M-3235 / 0905

FDP SERIES
ELECTRONIC FLOWMETER
USER'S MANUAL



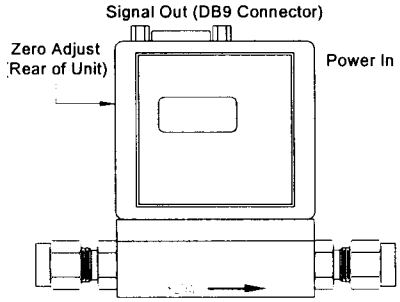
CAUTION

THIS FLOWMETER IS DESIGNED FOR USE WITH NON-HAZARDOUS GASES AT PRESSURES UP TO 100 PSI (690 KPA) AND TEMPERATURES UP TO 150 °F (65 °C). DO NOT USE HAZARDOUS GASES AND DO NOT EXCEED TEMPERATURE OR PRESSURE LIMITS. USE WITH HAZARDOUS GASES OR EXCEEDING THE PRESSURE AND TEMPERATURE LIMITS MAY CAUSE FAILURE WHICH COULD RESULT IN INJURY.

Introduction:

- The FDP-Series Flowmeter accurately measures the flowrate of non-hazardous gases with an accuracy of ± 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 FDP-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: FDP



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

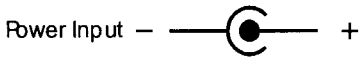


Figure 2: Power Circuit

Flow Connection:

- The flowmeter is provided with compression fittings. If other connections are required, the fittings can be replaced with any fitting having ⅛ or ¼" 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 FDP Meters are equipped with a DB9 connector. Depending on the model, the pins function differently. The Pin Functions for each model are as follows:

Model / *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		--

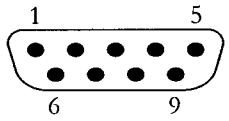


Figure 3: Male DB9 Connector

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. 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)

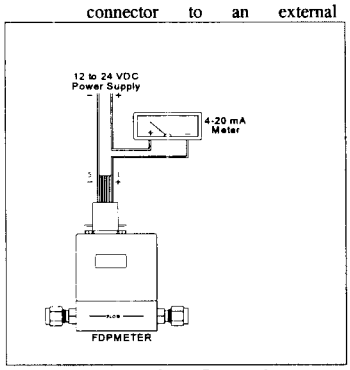


Figure 4: Voltage Meter Connection

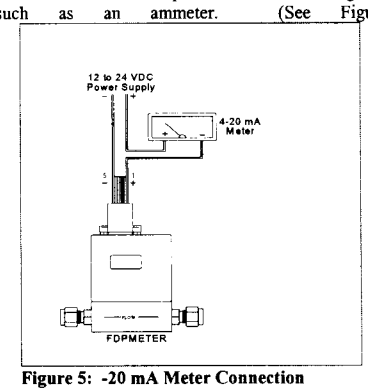


Figure 5: -20 mA Meter Connection

- **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, A$
50 LOCATE 1,1
60 PRINT SPC(17)
70 LOCATE 1,1
80 PRINT VAL (A$)
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

Mounting Hole Locations

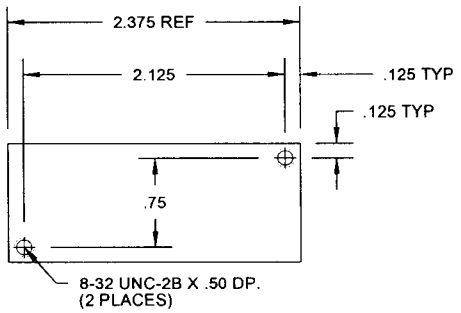


Figure 6 – Bottom View of FDP Meter

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.

$$m = V_s \cdot \rho_s$$

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omega.com	info@omega.com

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Canada:
976 Bergar
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Mexico:
En Español: (001) 203-359-7803 e-mail: espanol@omega.com
FAX: (001) 203-359-7807 info@omega.com.mx

Servicing Europe:

Benelux:
Postbus 8034, 1180 LA Amstelveen, The Netherlands
Tel: +31 (0)20 3472121 FAX: +31 (0)20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: sales@omegaeng.nl

Czech Republic:
Frystatska 184, 733 01 Karviná, Czech Republic
Tel: +420 (0)59 6311899 FAX: +420 (0)59 6311114
Toll Free: 0800-1-66342 e-mail: info@omegashop.cz

France:
11, rue Jacques Cartier, 78280 Guyancourt, France
Tel: +33 (0)1 61 37 2900 FAX: +33 (0)1 30 57 5427
Toll Free in France: 0800 4 466 342
e-mail: sales@omega.fr

Germany/ Austria:
Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
Tel: +49 (0)7056 9398-0 FAX: +49 (0)7056 9398-29
Toll Free in Germany: 0800 639 7678
e-mail: info@omega.de

United Kingdom: ISO 9002 Certified
One Omega Drive, River Bend Technology Centre
Northbank, Irlam, Manchester
M44 5BD United Kingdom
Tel: +44 (0)161 777 6611 FAX: +44 (0)161 777 6622
Toll Free in United Kingdom: 0800-488-488
e-mail: sales@omega.co.uk

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WARNING: These products are not designed for use in, and should not be used for, human applications.

MADE

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

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1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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