

User's Guide



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HHP-401 Series Digital Manometer



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The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

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

DIGITAL MANOMETER, HHP-401 Series

Specifications

Ranges, in inches of water column	: .1", .2", .5", 1.0", 2.0", 5.0", 10.0"
Accuracy	+/- 1% of range plus 1 digit
Resolution	.001" for ranges to 1.0", .01" for ranges from 2.0" to 10.0"
Connections	Metal fittings for 3/32" or 3/16" flexible tubing
Display	LCD, .5" digit height
Low battery indicator	The symbol "BAT" appears on display
Battery	One 9 Volts, alkaline
Battery life	200 hours
Operating temperature range	0°C to +50°C (+32°F to +122°F)
Storage temperature	-20°C to +70°C (-4°F to +160°F)
Standard accessories	9V battery
Optional accessories	Carrying case with two lengths of rubber tubing, one insertion tube, two static pressure tips, one 6 " insertion length Pitot tube. Longer Pitot tubes to 60" are available

Warning: This device is for use with air or non corrosive, non explosive gases only.

Warning: Care should be taken not to exceed the maximum overpressure.

Maximum Safe Momentary Overpressure Table			
Range		Overpressure	
English	Metric	English	Metric
0.100 - 1.00" H ₂ O	25 to 250 Pa	8" H ₂ O	2 kPa
2.00 - 10.0" H ₂ O	0.5 to 2.5 kPa	5 psid	35 kPa
11.00" H ₂ O - 5 psid	2.7 to 35 kPa	20 psid	140 kPa

General instructions

- 1) Turn manometer on.
- 2) If low battery signal is displayed, replace battery located in compartment on back of manometer.
- 3) Turn zero adjustment thumbwheel until display indicates zero.
- 4) Manometer is now ready to operate. Use as follows:

Static pressure

For measurements of static pressure in ducts, it is recommended that a static pressure tip or the static connection of a Pitot tube be used (see fig.1). Run tubing from static tip to high pressure port of manometer. A positive reading indicates pressure above atmospheric pressure; a negative reading, a pressure below atmospheric pressure.

Insertion tube

The insertion tube may be used to measure static pressure where flow is relatively slow, smooth and without turbulence. The opening of the tube must be perpendicular to the direction of the flow (see fig.1). If turbulence exists, impingement, aspiration or unequal distribution of moving air at the opening can reduce accuracy of readings significantly.

Air filter test

Connect manometer differentially across filter with static tips pointing upstream to eliminate the possibility of error due to air velocity. Connect the tubing from the static tip downstream of the

filter to the low pressure port of the manometer and the tubing from the static tip upstream of the filter to the high pressure port of the manometer.

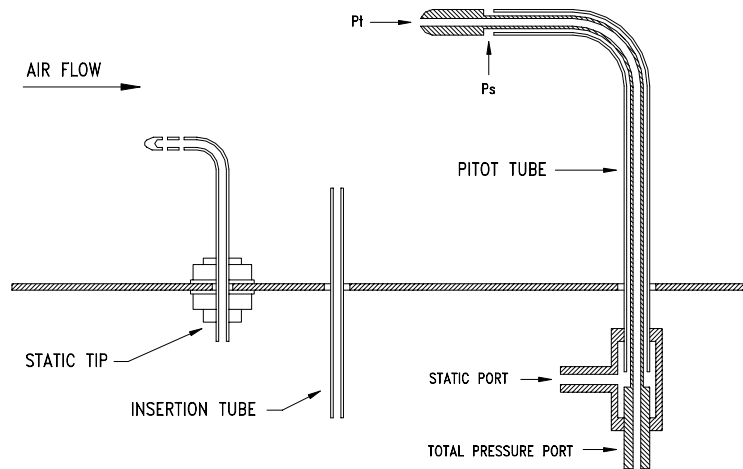


Figure 1

Air velocity measurement

- 1) Connect total pressure port (Pt) of Pitot tube to high pressure port of manometer and static port (Ps) to low pressure port to read velocity pressure.
- 2) Insert Pitot tube in duct with tip pointing upstream and make a traverse according to fig. 2. Refer to chart of fig. 3 to determine air velocity for each traverse point at standard conditions 70°F and 29.92 inches of mercury barometric pressure with a resulting density of .075 Lb/cu.ft) or use following formulas to compute air velocity at conditions other than standard. The velocities are then averaged.

Note - For very small round pipes, a center reading is frequently sufficient to obtain reasonable accuracy. For ducts 6 to 10 inches in diameter and average velocities of 1000 to 3000 ft/min, the center velocity pressure reading may be multiplied by .81 to obtain the average velocity pressure. This method is not recommended for either accurate results or very high (or low) velocities.

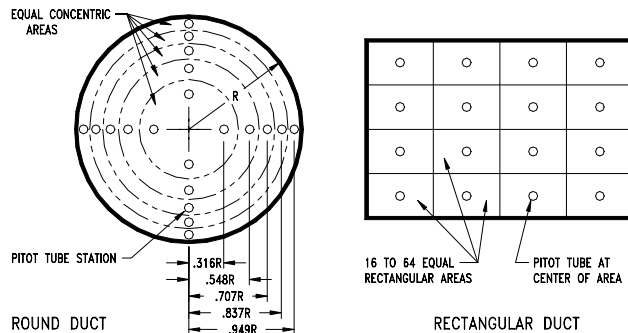


Fig.2 – Traverse on round and square duct areas.

Note - Install a straightener at 6 duct diameters downstream from the beginning of straight portion of duct and take velocity pressure reading 7 1/2 duct diameters down-stream from the beginning of this straight portion to insure correct Pitot tube readings.

$$\text{Air velocity} = 1096.2 \sqrt{\frac{P_v}{D}}$$

where P_v = velocity pressure, in inches of water
 D = air density, in Lb/cu.ft

$$\text{Air density} = \frac{1.325 P_b}{460 + ^\circ F}$$

where P_b = barometric pressure in inches of mercury
 $^\circ F$ = temperature in degrees Fahrenheit

To determine air flow : $Q = AV$

where Q = flow, in cu.ft. per min.
 A = duct area, in square ft.
 V = velocity, in ft. per min.

Note - For rectangular ducts, divide up the total area into a large number of small equal areas and take a velocity pressure reading in the center of each small area. The number of readings should not be less than 16 and need not be more than 64. When less than 64 readings are taken, the number of equal spaces should be such that the centers of the areas are not more than 6 inches apart.

VELOCITY PRESSURE, Inches of water

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
		400	566	694	801	896	981	1060	1133	1202
	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0		1266	1790	2192	2532	2830	3101	3349	3580	3707
1	4003	4198	4385	4564	4736	4902	5063	5219	5370	5517
2	5661	5801	5937	6070	6201	6329	6454	6577	6698	6816
3	6933	7048	7160	7271	7381	7488	7595	7699	7803	7905
4	8006	8105	8203	8300	8396	8491	8585	8678	8770	8860
5	8950	9039	9128	9215	9302	9387	9472	9556	9640	9723
6	9805	9886	9967	10047	10126	10205	10283	10361	10438	10514
7	10590	10666	10741	10815	10889	10962	11035	11107	11179	11251
8	11322	11392	11462	11532	11601	11670	11738	11806	11874	11941
9	12008	12075	12141	12207	12272	12337	12402	12467	12531	12594
10	12658	12721	12784	12846	12909	12970	13032	13093	13154	13215

Figure 3 – Velocities (ft/min) for dry air at various pressures @70°F and 29.92 inches of Hg barometric pressure

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 which wear are not warranted, including but 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.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

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.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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