

COMMERCIAL CATALOG

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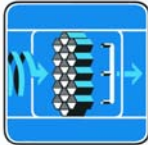
Accurate Airflow Measurement for Demanding Applications

SUMMARY of PRODUCTS

HVAC Systems Control
Airflow, Space, & Building Pressurization



Accurate airflow measurement for demanding applications



AIR MONITOR
CORPORATION

Airflow Measuring Stations



FAN-E AIRFLOW MEASURING STATION.

The FAN-E Station is a multi-point, self-averaging Pitot traverse station with integral air straightener honeycomb cell, capable of continuously measuring fan discharges or ducted airflow with a certified accuracy of 2% or better when tested according to AMCA Standard 610. The traverse station offers its high degree of measuring accuracy by virtue of log-rhebycheff sensor locations, Fechheimer Pitot sensing ports, honeycomb airflow processing, and instantaneous pneumatic averaging of multiple pressure values. The FAN-E station is designed for measurement locations with very limited straight duct runs and/or highly disturbed airflow Patent No. 3,748,901.

AMCA CERTIFIED in accordance with Standard 610.



VOLU-probe/VS AIRFLOW PROBE TRAVERSE STATION.

The VOLU-probe/VS Station utilizes one or more VOLU-probes, factory mounted in a rigid welded galvanized casing, to sense and average separate total and static pressure traverses of an air stream with a certified accuracy of +2% when tested according to AMCA Standard 610. Multiple sets of Fechheimer Pitot total and static pressure sensing ports, positioned on an equal area basis along the length of each probe, traverse the duct cross-section and average the sensed pressures in separate internal manifolds. The VOLU-probe/VS station is designed for applications having limited straight duct runs and/or moderately disturbed airflow Patent No. 4,559,835.

AMCA CERTIFIED in accordance with Standard 610.



Aluminum LO-flo PITOT TRAVERSE STATION.

The Aluminum LO-flo Station combines many features of the FAN-E and the VOLU-probe/VS Stations into a Pitot Traverse Station designed specifically to measure airflow in small round ductwork between 4" and 8" in diameter. Honeycomb air straightener combined with a multi-point, self-averaging Fechheimer Pitot flow sensing probes provide the means of measuring low air volumes of 35 to 1,700 CFM within +2% of actual airflow.



ELECTRA-flo/CM THERMAL AIRFLOW MEASURING STATION.

The ELECTRA-flo/CM Station combines thermal dispersion measurement technology with integral air straightener honeycomb cell to assure measurement accuracy within 2-3% of actual flow under extreme conditions caused by turbulent, rotating, and multi-directional airflows normally present near fan inlets or discharge ducts and directly downstream from duct elbows, transitions, etc. Each station is accompanied by an ELECTRA-flo transmitter for local data display, performing configuration and calibration, and to provide analog outputs of airflow and temperature.



VOLU-flo/OAM OUTSIDE AIR STATION.

The VOLU-flo/OAM Station is a companion component to the Monitor/Controller providing ease of installation and commissioning by mounting the Outside Reference, Inlet Airflow, and ambient temperature sensors into a rugged, welded galvanized steel casing having a layer of expanded metal of known fixed resistance. In selected applications, the known resistance-to-airflow relationship allows the combined system to be pre-calibrated at the Factory for plug-n-play operation.

Airflow Measuring Probes



VOLU-probe/1,2,3,4 AIRFLOW TRAVERSE PROBES.

The VOLU-probe Airflow Traverse Probes consist of multiple Fechheimer Pitot total and static pressure sensing ports positioned along the length of each probe to traverse the duct cross-section, average the sensed pressures in their separate internal manifolds, and provide a measurement of velocity pressure accurate to within 2-3% of actual flow. The VOLU-probe is available in externally and internally mounted, insertable/removable and self-supported versions to fit the needs of both new installations and retrofit applications ranging from commercial building HVAC to laboratory, pharmaceutical and electronics production, and health care institutions. Patent No. 4,559,835.



VOLU-probe/FI FAN INLET AIRFLOW TRAVERSE PROBE.

The VOLU-probe/FI Fan Inlet Probe consists of a pair of offset mounted traverse probes that are installed directly in the fan's inlet bell mouth at the throat location. The VOLU-probe/FI combines the air processing effect of the nozzle-shaped fan inlet bell mouth with the Fechheimer derivative of the multi-point, self-averaging Pitot to accurately measure inlet velocity pressure (and calculable air volume) with an accuracy of 3% for most fan types. The VOLU-probe/FI is available in both aluminum and stainless steel construction. Patent No. 3,733,900.



VOLU-probe/SS STAINLESS STEEL AIRFLOW TRAVERSE PROBES.

The VOLU-probe/SS Airflow Traverse Probes consist of multiple Fechheimer Pitot total and static pressure sensing ports positioned along the length of each separate side-by-side probe, to traverse the duct cross-section, average the sensed pressures in their separate manifolds, and provide a measurement of velocity pressure accurate to within 2-3% of actual flow. The VOLU-probe/SS is constructed of Type 316 stainless steel, and is available in externally and internally mounted versions to fit the needs of harsh, corrosive or high temperature applications such as fume hood and laboratory exhaust, pharmaceutical and electronics production, and industrial process exhaust. Patent No. 4,559,835.



ELECTRA-flo THERMAL PROBE ARRAY.

The ELECTRA-flo Array utilizes thermal dispersion technology in multi-point probes to measure airflow with an accuracy of 2-3% in applications having limited straight duct runs and/or moderately disturbed airflow. The rugged anodized aluminum probes have aerodynamic sensor apertures that condition turbulent airflow having pitch and yaw angles up to 30 degrees, resulting in measured point velocities within +2% of actual flow. Each probe array is accompanied by an ELECTRA-flo transmitter for local data display, performing configuration and calibration, and to provide analog outputs of airflow and temperature.



ELECTRA-flo/FI THERMAL FAN INLET AIRFLOW PROBE.

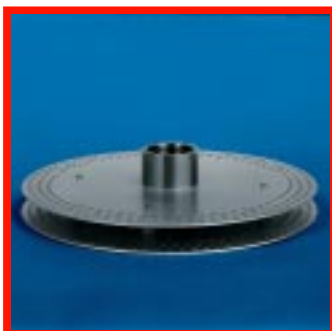
The ELECTRA-flo/FI Fan Inlet Probe utilizes dual point thermal dispersion technology sensors installed directly in the fan's inlet bell mouth at the throat location. The ELECTRA-flo's aerodynamic sensor apertures, assisted by the air processing effect of the nozzle-shaped fan inlet bell mouth, provide accurate measurement for most fan types. Anodized aluminum sensor housings and stainless steel adjustable support struts are both durable and easy to install. Each fan inlet assembly is accompanied by an ELECTRA-flo transmitter for local data display, performing configuration and calibration, and to provide analog outputs of airflow and temperature.

Outside Air Monitor, Pressure Sensors, and Meters



VOLU-flo/OAM OUTSIDE AIR MONITOR.

The VOLU-flo/OAM Outside Air Monitor was designed specifically to measure the volume of outside air being introduced into occupied building space, in compliance with the ventilation requirements of ASHRAE 62-99. The easy to install VOLU-flo/OAM can measure inlet velocities as low as 150 FPM with an accuracy of $\pm 5\%$, without being affected by the presence of directional wind and gusts. Models are available for new and retrofit installation onto most single and dual inlet package air handlers as well as many built-up systems, providing local display of data and direct analog interface with the BAS for data logging purposes and/or control of the outside air damper(s).



S.O.A.P. STATIC OUTSIDE AIR PROBE.

The S.O.A.P. static outside air probe was designed for accurate and instantaneous sensing of outside static air pressure levels without being adversely impaired by the presence of directionalized gusting wind. Typical locations are an elevated position in an outdoor parking lot, in a below ground recess (landscaped or lawn area), away from buildings, in a below ground location like a parking garage with non-forced ventilation, or on a rooftop mounted pole sufficiently elevated to be outside any anticipated wind induced pressure envelope.



S.A.P. /B,P,S,R STATIC PRESSURE SENSORS.

Available in aluminum or stainless steel construction and four separate mounting configurations, the S.A.P. family of static pressure sensors generate a steady non-pulsating output of room, space or plenum pressure.

- Model B – Electrical Junction Box Mount
- Model P – Suspended Mount via Pipe
- Model S – Surface Mount
- Model R – Recessed Flush Mount



STAT-probe STATIC PRESSURE PROBE.

The STAT-probe Static Pressure Probe consists of multiple Fechheimer static pressure sensing ports positioned along the length of the probe to traverse the duct cross-section, average the sensed static pressures in the internal manifold, and provide a measurement of static pressure accurate to within 2-3% of actual pressure. As a primary static pressure sensing means, the STAT-probe is ideally suited to meet the need for inexpensive and accurate duct static pressure measurement in both new installation and retrofit applications ranging from commercial building HVAC to laboratory, pharmaceutical and electronics production, and health care institutions.



AIRFLOW METERS.

The Airflow Meters are differential pressure, dry type gauges which are custom dual scaled in user selected units of pressure, velocity or volume to provide continuous fan and duct capacity monitoring, airflow measuring station readout, and mechanical systems operations monitoring with a measured accuracy of $\pm 2\%$.

The Airflow Meters are available in three configurations: Single meter with wall mount bracket; single meter in a portable enclosure; and, multiple meters in a central monitoring panel.

Electronic Transmitters & Transmitter-Controllers



VELTRON DP100 TRANSMITTER.

The VELTRON DP100 ultra-low differential pressure transmitter, with a 1% of Natural Span accuracy, is suited for non-critical measurement of static, differential or velocity pressure in general HVAC applications. The 2-wire, 4-20mA VELTRON DP100 is available in eight different standard and bi-polar full spans covering a range of 10.0 to 0.1 Inches w.c.



VELTRON DPT 2500 TRANSMITTER.

The VELTRON DPT 2500 ultra-low differential pressure and flow transmitter with a 0.5% of Natural Span accuracy, is designed for moderately critical HVAC applications where more than a utilitarian transmitter is desirable. In addition to being a 4-20mA DC, 2-wire transmitter available in seven different standard and bi-polar natural spans covering a range of 10.0 to 0.1 Inches w.c., the VELTRON DPT 2500 offers a selection of standard and optional features: Integral 3-way zeroing valve; built-in square root function for flow applications; custom calibratable spans down to 0.04" w.c.; NEMA 1 and 12 enclosures; and an integral 3-1/2" digital liquid crystal display.



VELTRON DPT 2500-plus TRANSMITTER.

The VELTRON DPT 2500-plus ultra-low differential pressure and flow "smart" transmitter with a 0.25% of Natural Span accuracy, is designed for demanding HVAC and process applications where high accuracy and microprocessor based functionality are needed. The VELTRON DPT 2500-plus is a 4-wire, 24VAC/VDC powered device available in nine different standard and bi-polar Natural spans covering a range of 25.0 to 0.05 IN w.c. Key features include: Microprocessor based configuration and calibration; backlit graphical LCD; analog output configurable for 0-10VDC or 4-20mA; AUTO-zero capability; adjustable digital low pass filter and 5:1 turndown capability. Optional NEMA 12 version shown.



VELTRON II TRANSMITTER.

The VELTRON II ultra-low differential pressure and flow "smart" transmitter with its 0.1% of Natural Span accuracy, is intended for the most critical and demanding HVAC and industrial applications that require the utmost accuracy and long-term stability. The VELTRON II's long list of features include: Microprocessor based configuration and calibration; four lines of process data display via the optional graphical LCD; four analog outputs individually configurable for 0-10VDC or 4-20mA; AUTO-zero capability; adjustable digital low pass filter; membrane keypad interface; 10:1 turndown capability; three-mode (P,I,1/D) controller with soft start and internal/external adjustable set points; and nine different standard and bi-polar natural spans covering a range of 25.0 to 0.05 Inches w.c.



ELECTRA-flo TRANSMITTER.

The ELECTRA-flo "smart" transmitter, when used with an ELECTRA-flo station, probe array or fan inlet probe, provides high accuracy airflow measurement utilizing multi-point thermal dispersion technology. The microprocessor based transmitter comes standard equipped with a multi-line graphical LCD for configuration, calibration and display of data; dual analog outputs of flow and temperature individually configurable for 0-10VDC or 4-20mA; LonWorks communication; digital low pass filter; individual sensor diagnostics; and, a password protected membrane keypad interface.

SUMMARY OF PRODUCTS

about Air Monitor Corporation

Air Monitor Corporation was founded in 1967 with the invention of the multi-point, self-averaging Pitot tube airflow traverse station with built-in air straightener, now generically referred to as "airflow measuring station" or "flow monitor". More than 1,000,000 Air Monitor systems have since been installed worldwide.

In 1972, the first volumetric control of airflow was demonstrated in Air Monitor's Santa Rosa laboratory, demonstrating that the combined use of its airflow measuring stations and commercial pneumatic instrumentation could successfully control duct flow rates and fan capacities at constant volume, and volumetrically synchronize the air volumes of two fan (or duct) systems.

In 1975, Air Monitor introduced the first stand-alone, functionally engineered airflow control centers utilizing ultra-low span, high accuracy pneumatic transmitter and control instrumentation.

In 1978, the first electronic transmitter with natural spans below 0.5 Inches w.c. and accuracies better than 1.0% were made available for pressurization and airflow measurement applications.

In 1980, Air Monitor introduced the first engineered control centers that utilized industrial quality electronic instrumentation and control logic capable of performing critical airflow and pressurization control applications.

In 1985, Air Monitor introduced the first multi-point, self-averaging traverse probe offering a cost effective means to retrofit existing HVAC systems with accurate flow measurement.

In 1986, AUTO-zero was created by Air Monitor, thus making available to the HVAC and Process industries transmitters capable of 0.25% of full span measurement accuracy and natural spans all the way down to 0.1 Inches w.c.

In 1989, Air Monitor introduced the first ultra-low range, multi-variable mass flow transmitter that internally compensated for the effects of process temperature and pressure, and provided

separate outputs corresponding to the process pressure, temperature, and mass flow

In 1993, The microprocessor based dedicated control center was developed, combining Air Monitor's proven high accuracy ultra-low range, AUTO-zero transmitters with the microprocessor's capability for system logic design flexibility field expandability and reconfigurability, information communication, and data processing efficiency.

In 1998, Air Monitor further expanded the performance envelope of its transmitters by offering 0.1% of natural span accuracy and span ranges as low as .05 Inches wc.

In 1999, Air Monitor offered the first flow measuring stations and probes to be independently performance tested and certified in accordance with the AMCA 610 Standard for airflow measuring stations; and Air Monitor was the first manufacturer of airflow measuring stations to employ the ASHRAE prescribed log-Tchebycheff guidelines for placement of flow measurement sensors.

In 2001, the VOLU-flo/OAM Outside Air Monitor was introduced, specifically designed for measurement and control of the volume of outside air being introduced into occupied building space, in compliance with the ventilation requirements of ASHRAE 62-99. The easy to install VOLU-flo/OAM measures inlet velocities as low as 150 FPM at an accuracy of $\pm 5\%$, without being affected by the presence of directional and gusting wind.

In 2005, Air Monitor adds the ELECTRA-flo family of thermal dispersion technology airflow measurement systems to compliment its Fechheimer Pitot products. Multi-point probes arrays, stations and fan inlet probe measure airflow with an accuracy of 2-3% in applications having limited straight duct runs and/or moderately disturbed airflow. Ideally suited for clean, dry applications having high turndown or operate at very low velocities.

Product Brochures

Airflow Measuring Stations

FAN-E Airflow Measuring Station
Aluminum LO-flo Pitot Traverse Station
VOLU-probe/VS Airflow Traverse Station
ELECTRA-flo/CM Thermal Airflow Measuring Station

Airflow Measuring Probes

VOLU-probe/1,2,3,4 Airflow Traverse Probes
VOLU-probe/FI Fan Inlet Airflow Traverse Probes
VOLU-probe/SS Stainless Steel Airflow Traverse Probes
STAT-probe Static Pressure Probe
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Pressure Sensors and Probes

S.A.P. /B,P,S,R Shield Static Air Probes
S.O.A.P. Static Outside Air Probe

Electronic Transmitters and Transmitter-Controllers

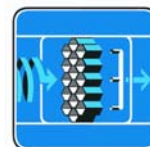
VELTRON DP100 Differential Pressure Transmitter
VELTRON DPT 2500 Differential Pressure & Flow Transmitter
VELTRON DPT 2500-plus Differential Pressure & Flow Transmitter
VELTRON II Microprocessor Based Transmitter
ELECTRA-flo Plus Thermal Airflow Measurement System

Room/Hood Monitors/Controllers, Electronic Control Systems

VOLU-flo/OAM Outside Air Monitor
SENTRY Room Pressurization Monitor & Controller

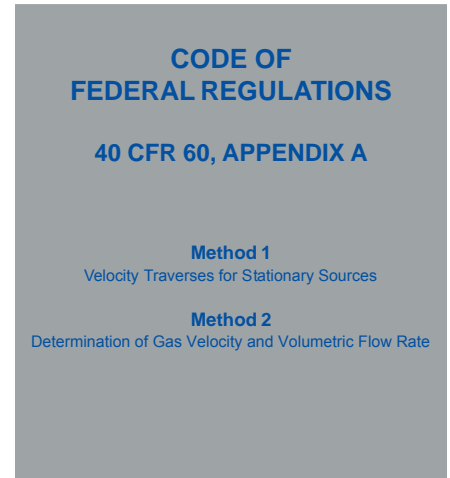
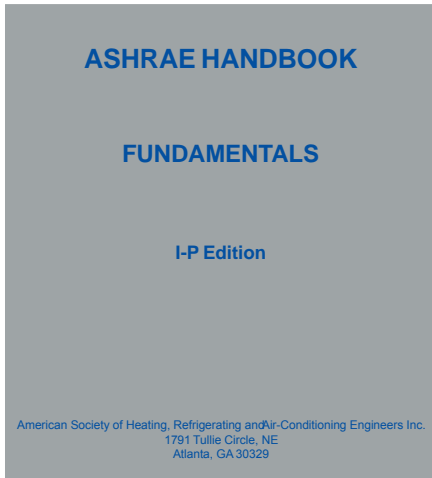
Accessory Products

Airflow Meters



STANDARDS

Velocity Traverse of Air Ducts



These Standards, and others, provide formats for the quantity and positioning of individual velocity measurements. Simply stated, these long established Standards recognize that the accuracy of any duct velocity traverse is highly dependent upon the quantity and location of the flow measuring points in a duct (or stack) cross-section. Listed below is a summary table of the duct traverse formats set forth in the above Standards. In addition, for your referral, we have reproduced portions of the text of the referenced Standards.

Duct / Station Configuration	ASHRAE HANDBOOK	AMCA PUBLICATION 203	CODE OF FEDERAL REGULATIONS
Rectangular	25 or more points, maximum 6 or 8 inches apart, depending on duct size	24 or more points, no less than 1 point per 3 square feet	9 to 16 minimum, depending on distance to flow disturbances
Circular	12 to 30 points, along 2 or 3 diameters	24 to 48 points, along 3 diameters	8 to 16 minimum, along 2 diameters, depending on distance to flow disturbances

ASHRAE HANDBOOK – FUNDAMENTALS

published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

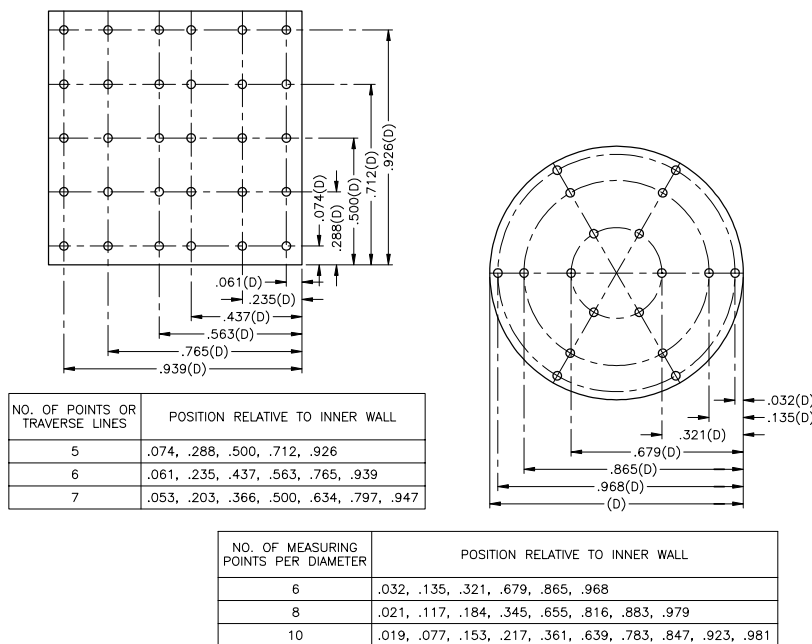
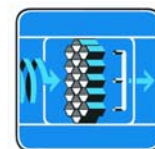


Figure 6 – Measuring Points for Round and Rectangular Duct Traverse

To determine the velocity in the traverse plane, a straight average of individual point velocities will give satisfactory results when point velocities are determined by the log-Tchebycheff rule (ISO 3966). Figure 6 shows suggested sensor locations for traversing round and rectangular ducts. For circular ducts, the log-Tchebycheff and log-linear traverse methods are similar. Log-Tchebycheff is now recommended for rectangular ducts as well. It minimizes the positive error (measured greater than actual) caused by the failure to account for losses at the duct wall. This error can occur when using the older method of equal subareas to traverse rectangular ducts.

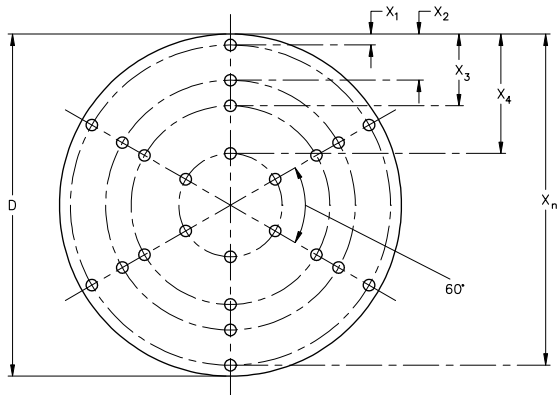
For a rectangular duct traverse, a minimum of 25 points should be measured. For a duct side less than 18 inches, locate the points at the center of equal areas not more than 6 inches apart, and use a minimum of 2 points per side. For a duct side greater than 56 inches, the maximum distance between points is 8 inches. For a circular duct traverse, the log-linear rule and three symmetrically disposed diameters may be used. Points on two perpendicular diameters may be used where access is limited.



FIELD PERFORMANCE MEASUREMENTS – PUBLICATION 203

published by the Air Movement and Control Association, Inc.
Appendix H – Distribution of Traverse Points

In order to obtain a representative average velocity in a duct, it is necessary to locate each traverse point accurately. It is recommended that the number of traverse points increase with increasing duct size. The distribution of traverse points for circular ducts, as indicated below, are based on log-linear Pitot traverse method.



$X_a = D \times K_a$

where D is the inside diameter of the duct and K_a is the factor corresponding to the duct size and the traverse point location as indicated in the table below.

Inside Dia of Duct	# of Traverse Pts in Each of 3 Dia	K_1	K_2	K_3	K_4	K_5	K_6	K_7	K_8	K_9	K_{10}	K_{11}	K_{12}	K_{13}	K_{14}	K_{15}	K_{16}
< 8 ft	8	.021	.117	.184	.345	.655	.816	.883	.978	-	-	-	-	-	-	-	-
8-12 ft	12	.014	.075	.114	.183	.241	.374	.626	.750	.817	.886	.925	.986	-	-	-	-
>12 ft	16	.010	.055	.082	.128	.166	.225	.276	.391	.609	.724	.775	.834	.872	.918	.945	.990

Figure H-1. Distribution of Traverse Points for Circular Ducts

The recommended minimum number of traverse points for rectangular ducts is indicated below in Figure H-3. For rectangular ducts with cross-sectional areas of 24 square feet and less, the recommended minimum number is 24. For cross-sectional areas greater than 24 square feet, the minimum number of points increases as indicated in Figure H-3. The points are to be located in the centers of equal areas with the areas as nearly square as practical (see Figure H-2). If the flow conditions at the traverse plane are less than satisfactory, the accuracy of the determination of flow rate may be improved by using more than the recommended minimum number of points. Fewer points may be used if the flow is very uniform; however, the maximum area covered per point should not exceed 3 square feet.

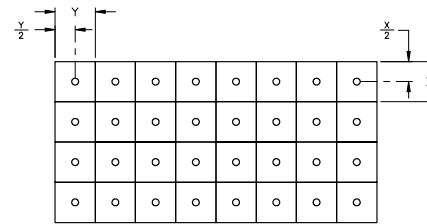


Figure H-2. Distribution of Traverse Points for Rectangular Duct

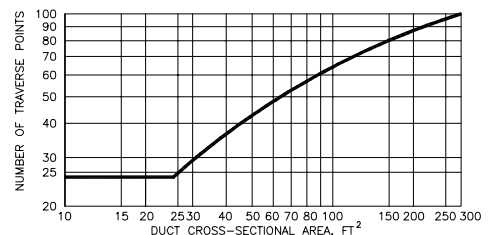


Figure H-3. Recommended Minimum Number of Traverse Points for Rectangular Ducts

CODE OF FEDERAL REGULATIONS – 40CFR60 Appendix A, Methods 1 and 2

Method 1 – Velocity Traverses for Stationary Sources

Method 2 – Determination of Gas Velocity and Volumetric Flow Rate

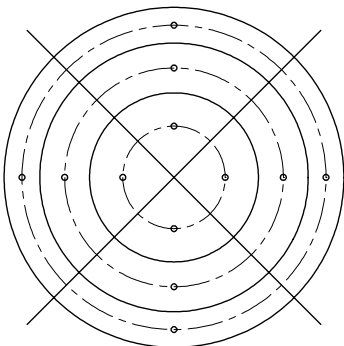


Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

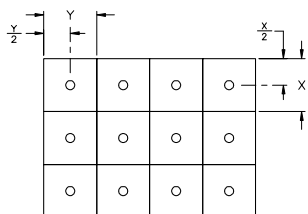


Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

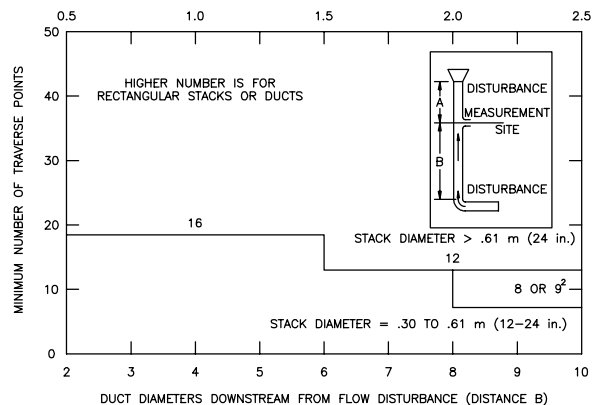
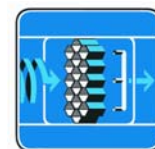


Figure 1-2. Minimum number of traverse points for velocity (non-particulate) traverses.



CONVERSION CHART

VELOCITY PRESSURE in inches of water to VELOCITY in feet per minute

Calculating Air Velocity. Fechheimer Pitot airflow stations and traverse probes measure in the same manner and magnitude as the Pitot tube, via separate signals of airstream *total pressure* and *static pressure*, in inches water column (IN w.c.). To obtain *velocity pressure* (the force generated by the velocity of the air moving in a duct), the *static pressure* must be subtracted from the *total pressure*:

$$\text{Velocity Pressure (IN w.c.)} = \text{Total Pressure (IN w.c.)} - \text{Static Pressure (IN w.c.)}$$

Air velocity, expressed in feet per minute, is a function of *velocity pressure*, converted by means of the following formula:

$$\text{Air Velocity (FPM)} = 1096.5 \times \sqrt{\frac{\text{Velocity Pressure (IN w.c.)}}{\text{Density of (Gas)}}}$$

In commercial applications where air is the gas, its density is at 70° Fahrenheit and 29.92 inches of mercury (barometric pressure), and the airflow is not compressed (under 10 IN w.c.), the formula reduces to:

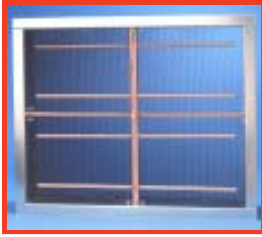
$$\text{Air Velocity (FPM)} = 4005 \times \sqrt{\text{Velocity Pressure (IN w.c.)}}$$

.001"	127	.052"	913	.102"	1279	.152"	1561	.202"	1800	.252"	2011	.302"	2200	.352"	2376	.51"	2860	1.01"	4025	1.51"	4921
.002"	179	.053"	922	.103"	1285	.153"	1567	.203"	1804	.253"	2015	.303"	2204	.353"	2379	.52"	2888	1.02"	4045	1.52"	4938
.003"	219	.054"	931	.104"	1292	.154"	1572	.204"	1809	.254"	2019	.304"	2208	.354"	2383	.53"	2916	1.03"	4064	1.53"	4954
.004"	253	.055"	939	.105"	1298	.155"	1577	.205"	1813	.255"	2023	.305"	2212	.355"	2386	.54"	2943	1.04"	4084	1.54"	4970
.005"	283	.056"	948	.106"	1304	.156"	1582	.206"	1818	.256"	2027	.306"	2215	.356"	2389	.55"	2970	1.05"	4103	1.55"	4986
.006"	310	.057"	956	.107"	1310	.157"	1587	.207"	1822	.257"	2031	.307"	2219	.357"	2393	.56"	2997	1.06"	4123	1.56"	5002
.007"	335	.058"	964	.108"	1316	.158"	1592	.208"	1827	.258"	2035	.308"	2223	.358"	2396	.57"	3024	1.07"	4142	1.57"	5018
.008"	358	.059"	973	.109"	1322	.159"	1597	.209"	1831	.259"	2039	.309"	2226	.359"	2400	.58"	3050	1.08"	4162	1.58"	5034
.009"	380	.060"	981	.110"	1328	.160"	1602	.210"	1835	.260"	2042	.310"	2230	.360"	2403	.59"	3076	1.09"	4181	1.59"	5050
.010"	400	.061"	989	.111"	1334	.161"	1607	.211"	1839	.261"	2046	.311"	2233	.361"	2406	.60"	3102	1.10"	4200	1.60"	5066
.011"	420	.062"	996	.112"	1340	.162"	1612	.212"	1844	.262"	2050	.312"	2236	.362"	2410	.61"	3127	1.11"	4219	1.61"	5082
.012"	439	.063"	1004	.113"	1346	.163"	1617	.213"	1848	.263"	2054	.313"	2239	.363"	2413	.62"	3153	1.12"	4238	1.62"	5098
.013"	457	.064"	1012	.114"	1352	.164"	1622	.214"	1853	.264"	2058	.314"	2242	.364"	2416	.63"	3179	1.13"	4257	1.63"	5114
.014"	474	.065"	1020	.115"	1358	.165"	1627	.215"	1857	.265"	2062	.315"	2245	.365"	2420	.64"	3204	1.14"	4276	1.64"	5129
.015"	491	.066"	1029	.116"	1364	.166"	1632	.216"	1862	.266"	2066	.316"	2248	.366"	2423	.65"	3229	1.15"	4295	1.65"	5144
.016"	507	.067"	1037	.117"	1370	.167"	1637	.217"	1866	.267"	2070	.317"	2251	.367"	2426	.66"	3254	1.16"	4314	1.66"	5160
.017"	522	.068"	1045	.118"	1376	.168"	1642	.218"	1870	.268"	2074	.318"	2254	.368"	2429	.67"	3279	1.17"	4332	1.67"	5175
.018"	537	.069"	1052	.119"	1382	.169"	1646	.219"	1875	.269"	2078	.319"	2257	.369"	2433	.68"	3303	1.18"	4350	1.68"	5191
.019"	552	.070"	1060	.120"	1387	.170"	1651	.220"	1879	.270"	2081	.320"	2260	.370"	2436	.69"	3327	1.19"	4368	1.69"	5206
.020"	566	.071"	1067	.121"	1393	.171"	1656	.221"	1883	.271"	2085	.321"	2264	.371"	2439	.70"	3351	1.20"	4386	1.70"	5222
.021"	580	.072"	1075	.122"	1399	.172"	1661	.222"	1887	.272"	2089	.322"	2268	.372"	2443	.71"	3375	1.21"	4405	1.71"	5237
.022"	594	.073"	1082	.123"	1404	.173"	1666	.223"	1892	.273"	2093	.323"	2272	.373"	2445	.72"	3398	1.22"	4423	1.72"	5253
.023"	607	.074"	1089	.124"	1410	.174"	1670	.224"	1896	.274"	2097	.324"	2276	.374"	2449	.73"	3422	1.23"	4442	1.73"	5268
.024"	620	.075"	1097	.125"	1416	.175"	1675	.225"	1900	.275"	2101	.325"	2280	.375"	2453	.74"	3445	1.24"	4460	1.74"	5283
.025"	633	.076"	1104	.126"	1422	.176"	1680	.226"	1905	.276"	2105	.326"	2284	.376"	2456	.75"	3468	1.25"	4478	1.75"	5298
.026"	645	.077"	1111	.127"	1427	.177"	1685	.227"	1909	.277"	2109	.327"	2289	.377"	2459	.76"	3491	1.26"	4495	1.76"	5313
.027"	658	.078"	1119	.128"	1433	.178"	1690	.228"	1913	.278"	2113	.328"	2293	.378"	2462	.77"	3514	1.27"	4513	1.77"	5328
.028"	670	.079"	1125	.129"	1439	.179"	1695	.229"	1917	.279"	2116	.329"	2297	.379"	2466	.78"	3537	1.28"	4531	1.78"	5343
.029"	682	.080"	1133	.130"	1444	.180"	1699	.230"	1921	.280"	2119	.330"	2301	.380"	2469	.79"	3560	1.29"	4549	1.79"	5359
.030"	694	.081"	1140	.131"	1449	.181"	1704	.231"	1925	.281"	2123	.331"	2304	.381"	2472	.80"	3582	1.30"	4566	1.80"	5374
.031"	705	.082"	1147	.132"	1455	.182"	1709	.232"	1929	.282"	2127	.332"	2308	.382"	2475	.81"	3604	1.31"	4583	1.81"	5388
.032"	716	.083"	1154	.133"	1461	.183"	1713	.233"	1933	.283"	2131	.333"	2311	.383"	2479	.82"	3625	1.32"	4601	1.82"	5403
.033"	727	.084"	1161	.134"	1466	.184"	1718	.234"	1937	.284"	2135	.334"	2315	.384"	2481	.83"	3647	1.33"	4619	1.83"	5418
.034"	738	.085"	1167	.135"	1471	.185"	1723	.235"	1941	.285"	2139	.335"	2318	.385"	2485	.84"	3669	1.34"	4636	1.84"	5433
.035"	749	.086"	1175	.136"	1477	.186"	1727	.236"	1945	.286"	2143	.336"	2322	.386"	2488	.85"	3690	1.35"	4653	1.85"	5447
.036"	759	.087"	1181	.137"	1482	.187"	1732	.237"	1950	.287"	2147	.337"	2325	.387"	2491	.86"	3709	1.36"	4671	1.86"	5462
.037"	770	.088"	1188	.138"	1488	.188"	1737	.238"	1954	.288"	2151	.338"	2329	.388"	2495	.87"	3729	1.37"	4688	1.87"	5477
.038"	780	.089"	1193	.139"	1493	.189"	1741	.239"	1958	.289"	2154	.339"	2332	.389"	2499	.88"	3758	1.38"	4705	1.88"	5491
.039"	791	.090"	1201	.140"	1498	.190"	1746	.240"	1962	.290"	2157	.340"	2335	.390"	2501	.89"	3779	1.39"	4722	1.89"	5506
.040"	801	.091"	1208	.141"	1504	.191"	1750	.241"	1966	.291"	2161	.341"	2338	.391"	2503	.90"	3800	1.40"	4739	1.90"	5521
.041"	811	.092"	1215	.142"	1509	.192"	1755	.242"	1970	.292"	2164	.342"	2342	.392"	2506	.91"	3821	1.41"	4756	1.91"	5535
.042"	821	.093"	1222	.143"	1515	.193"	1759	.243"	1974	.293"	2168	.343"	2345	.393"	2509	.92"	3842	1.42"	4773	1.92"	5550
.043"	831	.094"	1228	.144"	1520	.194"	1764	.244"	1978	.294"	2171	.344"	2349	.394"	2512	.93"	3863	1.43"	4790	1.93"	5564
.044"	840	.095"	1234	.145"	1525	.195"	1768	.245"	1982	.295"	2175	.345"	2352	.395"	2515	.94"	3884	1.44"	4806	1.94"	5579
.045"	849	.096"	1241	.146"	1530	.196"	1773	.246"	1987	.296"	2179	.346"	2356	.396"	2518	.95"	3904	1.45"	4823	1.95"	5593
.046"	859	.097"	1247	.147"	1536	.197"	1777	.247"	1991	.297"	2182	.347"	2360	.397"	2521	.96"	3924	1.46"	4840	1.96"	5608
.047"	868	.098"	1254	.148"	1541	.198"	1782	.248"	1995	.298"	2186	.348"	2363	.398"	2524	.97"	3945	1.47"	4856	1.97"	5623
.048"	877	.099"	1260	.149"	1546	.199"	1787	.249"	1999	.299"	2189	.349"	2366	.399"	2527	.98"	3965	1.48"	4873	1.98"	5637
.049"	887	.100"	1266	.150"	1551	.200"	1791	.250"	2003	.300"	2193	.350"	2369	.400"	2530	.99"	3985	1.49"	4889	1.99"	5651
.050"	896	.101"	1273	.151"	1556	.201"	1795	.251"	2007	.301"	2197	.351"	2372	.401"	2533	1.00"	4005	1.50"	4905	2.00"	5664

Calculating Air Volume. The *station air volume*, expressed cubic feet per minute (CFM), is the product of the *air velocity* through the airflow station and the *station area* in square feet (Ft²).

$$\text{Station Air Volume (CFM)} = \text{Air Velocity (FPM)} \times \text{Station Area (Ft}^2\text{)}$$

Air Monitor's Product Families of Flow Measurement and Pressure Sensors



FAN-E AIRFLOW MEASURING STATION.

Multi-point, self-averaging, Pitot traverse station with integral air straightener-equalizer honeycomb cell. Capable of continuously measuring fan discharges or ducted airflow with an accuracy of two percent or better.

AMCA CERTIFIED in accordance with Standard 610.



VOLU-PROBE/1,2,3,4 AIRFLOW TRAVERSE PROBES.

Multi-point, self-averaging, Pitot Fechheimer airflow traverse probes with integral airflow direction correcting design. Four mounting configurations to fit every application.

AMCA CERTIFIED in accordance with Standard 610.



VOLU-PROBE/FI FAN INLET AIRFLOW PROBES.

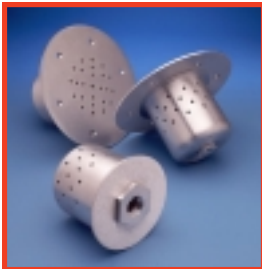
Multi-point, self-averaging, Pitot Fechheimer airflow probes with integral airflow direction correcting design. For mounting directly in the inlet cones or bellmouth of centrifugal or vane-axial fans to measure fan capacities within three percent of actual flow.



VOLU-PROBE/VS AIRFLOW PROBE TRAVERSE STATIONS.

Multi-point, self-averaging, Pitot Fechheimer airflow probes factory mounted in a flanged sheet metal casing, with interconnecting tubing. Capable of measuring ducted airflow within two percent accuracy without using an air straightener or incurring significant resistance to airflow.

AMCA CERTIFIED in accordance with Standard 610.



S.A.P./1,2,3 and S.O.A.P. STATIC PRESSURE SENSORS.

Available in three separate mounting configurations, the S.A.P. family of static pressure sensors generate a steady, non-pulsating output of room, space or plenum pressure.

The S.O.A.P. was designed to accurately sense outside atmospheric air pressure.



STAT-PROBE STATIC PRESSURE TRAVERSE PROBE.

Multi-point, self-averaging, Fechheimer static pressure traverse probe for accurate sensing of duct or system static pressure in the presence of turbulent or rotational airflows.

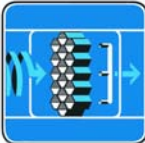


FAN-Evaluator

Airflow Measuring Station



Accurate airflow measurement for demanding applications



AIR MONITOR CORPORATION

FAN-Evaluator

Product Description

The FAN-E is a multi-point, self-averaging Pitot traverse station with integral air straightener-equalizer honeycomb cell, capable of continuously measuring fan discharges or ducted airflow with an accuracy of 2% or better. The FAN-E derives its high degree of measurement accuracy from a combination of precision sensor locations, honeycomb airflow processing, pneumatic averaging of

a large number of sensed airflow pressures, and patented "symmetrical averaging" (Patent No. 3,685,355), which requires that all stages in the averaging process occur at a point where there is a balanced array of sensors present, thereby assuring that each sensed pressure is given the same "equal weight" in the averaging process as other sensed pressures.

2% Certified Measurement Accuracy



Air Monitor Corporation certifies that the FAN-Evaluator Airflow Measuring Station shown herein is licensed to bear the AMCA Certified Ratings Seal – Airflow Measurement Station Performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 611 and comply with the requirements of the AMCA Certified Ratings Program.

Performance ratings include the effect of an integral air equalizer-straightener cell in the AMS.

Test Data

Model. FAN-E and FAN-E/SS

Type. Differential Pressure

Conversion Formula. $Velocity = 1096 \sqrt{\frac{AMS \text{ Velocity Pressure}}{Air \text{ Density}}}$

Sizes & Shapes Tested. 36" x 36" Rectangular; 36" dia. Circular

Applicable Sizes Rated. Rectangular stations with cross-sectional areas between 4.5 and 18.0 square feet.
Circular stations with cross-sectional areas between 3.5 and 14.1 square feet.

Test Setup. AMCA Standard 610, Figure 1

Test Results – Rectangular Stations

Reference Volume, ACFM	Reference Velocity, AFPM	% Accuracy	Airflow Resistance IN w.c.
35,838	3,982	1.72	.297
29,689	3,299	1.59	.225
24,616	2,735	1.51	.158
20,400	2,267	1.14	.089
14,434	1,604	0.84	.046
8,629	959	2.08	.021

Test Results – Circular Stations

Reference Volume, ACFM	Reference Velocity, AFPM	% Accuracy	Airflow Resistance IN w.c.
29,141	4,123	0.64	.272
24,275	3,434	– 0.17	.200
20,176	2,854	– 0.51	.112
14,550	2,058	– 0.77	.067
10,215	1,445	0.33	.038
8,672	1,227	1.24	.021

How It Works

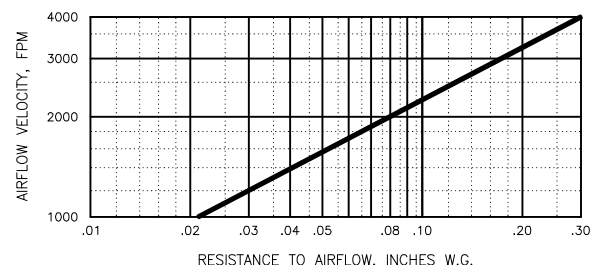
Log-Tchebycheff Sensor Location. A high concentration of total and static pressure sensors positioned according to the log-Tchebycheff rule sense the multiple and varying flow components that constitute the airstream's velocity profile. The log-Tchebycheff's perimeter weighted sensor pattern is utilized to minimize the positive error (measurements greater than actual) caused by the failure to account for slower velocities at the duct wall when using traditional equal area sensor locations. Spacing of total pressure sensors is per *ASHRAE 1993 Fundamentals Handbook* which is summarized below. Since the static pressure across the station is relatively uniform, a lesser number of static pressure sensors are utilized to minimize unrecovered pressure drop.

Duct / Station Configuration	ASHRAE 1993 Fundamentals Handbook
Rectangular	25 or more points, maximum 6" or 8" apart, depending on duct size.
Circular	12 to 30 points, along 2 or 3 diameters.

Fechheimer Pitot Flow Measurement. The FAN-E operates on the Fechheimer Pitot derivative of the multi-point, self-averaging Pitot principle to measure the total and static pressure components of airflow. Total pressure sensing ports with patented (U.S. Patent No. 4,559,835) chamfered entrances, and Fechheimer pairs of offset static pressure sensing ports combine to minimize the effect of directional airflow. When located downstream of honeycomb airflow processing cell, the Fechheimer Pitot method is extremely effective at accurately measuring airflow in limited straight duct runs.

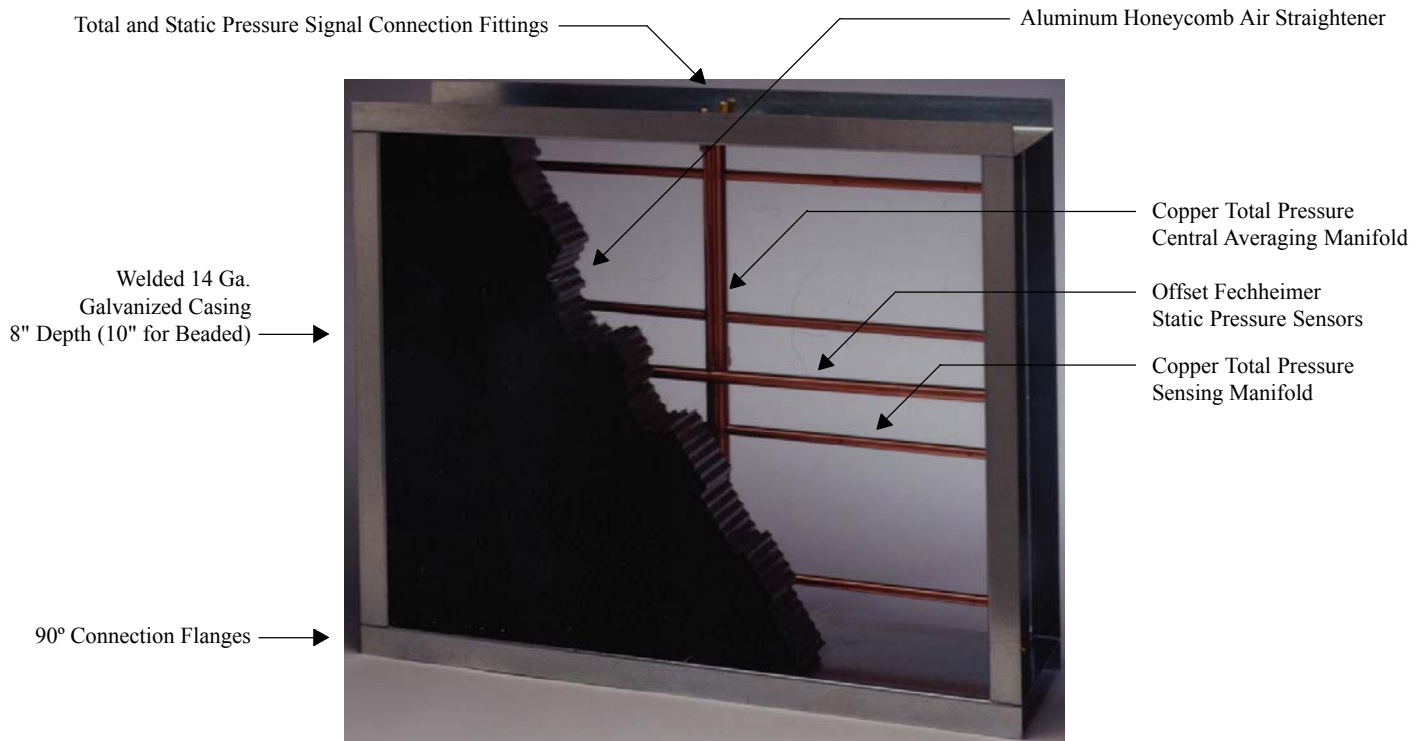
Airflow Processing. To assure extremely high levels of measuring accuracy (2% of actual flow or better) under extreme conditions caused by turbulent, rotating, and multi-directional airflows normally present near fan inlets or discharge ducts and directly downstream from duct elbows, transitions, etc., the FAN-E uses open, parallel cell, honeycomb panels to "process" the air into straightened flow just prior to the total pressure measurement plane. These honeycomb panels sharply reduce the need for long, straight runs of duct before and after the station to obtain accurate flow measurement.

Negligible Airflow Resistance. The FAN-E airflow measuring station is designed to function while producing a minimum of resistance to airflow, due to the unique honeycomb air straightener-equalizer section having a free area of 96.6%. The unique, non-restrictive characteristic of the FAN-E is seen in the Resistance vs. Airflow Velocity graph below. The values indicated are total resistance and do not include any allowances for static regain (a potential 20% reduction to the values).



Airflow Measuring Station

Construction Features



Specifications

Configurations.

Rectangular, Circular, and Flat Oval.

Accuracy.

2% of actual flow.

Operating Temperature.

Continuous operation to 300°F.

Casing.

Rectangular. 14 gauge galvanized sheet metal, intermittent welded casing sealed with metal caulking.

Circular and Flat Oval. 18 gauge galvanized sheet metal, spot welded casing seams.

Casing Depth.

8" deep for stations with 90° flanges.

10" deep, 8" from bead-to-bead for stations with beaded edges.

Flanges.

Rectangular. 1-1/2" wide, 90° formed. Sizes up to 144" x 144".

Circular and Flat Oval.

Sizes 10" to 24". 1" wide flanges, or beaded edge.

Sizes > 24" and < 45". 1-1/2" wide flange.

Sizes > 45". 3/16" x 2" bar stock flanges.

Air Equalizer – Straightener Cell.

Corrosion resistant 3003 aluminum. 3" deep x 1/2" cell.

Total Pressure Manifold.

Copper tubing assembled with 50/50 tin/lead solder.

Galvanized mounting and support brackets.

Static Pressure Header and Sensors.

Copper tubing. Galvanized mounting bracket.

Connection Fittings.

1/4" brass compression type located on the long dimension of rectangular and flat oval stations.

Special Construction.

Casing and Flanges: Aluminum, Carbon Steel, Stainless Steel, PVC and Fiberglass, Hastelloy, Inconel.

Air Equalizer–Straightener Cell: Type 304 and 316 Stainless Steel, Carbon Steel, PVC, Hastelloy.

Total and Static Pressure Manifolds: Type 316 Stainless Steel, Hastelloy, Inconel, PVC, Kynar.

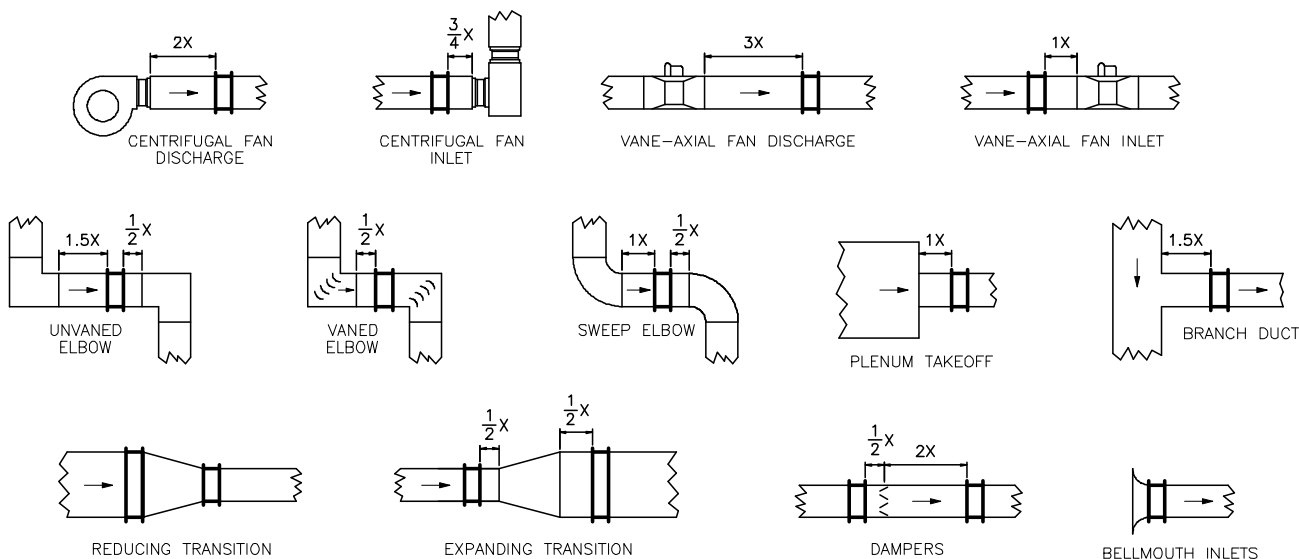
Connection Fittings: Stainless Steel, Hastelloy, Nylon.

Contact the Factory for special construction stations using the above listed and other materials.

FAN-Evaluator

Minimum Installation Requirements

Note: FAN-E locations shown are not ideal. The locations indicate the **minimum** clearance required from air turbulence producing sources. Wherever possible, the FAN-E should be installed where greater runs of straight duct (or clearances) than shown below exist.



Rectangular Duct: $x = \frac{2(H \times W)}{H + W}$

Circular Duct: $x = \text{Duct Diameter}$

Suggested Specification

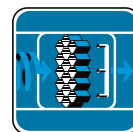
Provide where indicated, airflow measuring station(s) capable of continuously monitoring the fan or duct capacities (air volumes) they serve.

Each airflow measuring station shall contain multiple total and static pressure sensors positioned in a log-Tchebycheff pattern. Rectangular stations having a cross-section greater than 4 square feet will have a minimum of 25 points of measurement. For stations having a dimension less than 18", locate the points of measurement at the center of equal areas not more than 6" apart, and use a minimum of two measurement points per side. For a station having a dimension greater than 56", the maximum distance between measurement points will be 8". For circular ducts having a diameter of 18" or greater, locate measurement points on three systematically disposed diameters. For round stations smaller than 18", locate the measurement points on two perpendicular diameters.

The airflow measuring station(s) shall be fabricated of a minimum of 14 ga. galvanized steel, welded casing in 8" depth with 90° connecting flanges in a configuration and size equal to that of the duct it is mounted into. Each station shall be complete with an open parallel cell air straightener-equalizer honeycomb mechanically fastened to the casing, and external signal connection fittings. An identification label shall be placed on each station casing listing the model number, size, area, and specified airflow capacity.

Stations shall be AMCA certified and be capable of measuring the airflow rates within an accuracy of ±2%. The maximum allowable unrecovered pressure drop caused by the station shall not exceed .085" wc. at 2000 FPM, or .30" wc. at 4000 FPM.

The airflow measuring station(s) shall be the FAN-Evaluator as manufactured by Air Monitor Corporation, Santa Rosa, California.



Aluminum LO-flo

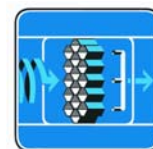
Pitot Traverse Station

Air Monitor's Aluminum LO-flo Pitot Traverse Station is a flow traverse station that combines honeycomb air straightener-equalizer with proven multi-point, self-averaging Pitot technology. The Aluminum LO-flo provides the means of measuring low air volumes of 20 to 1700 CFM in small diameter round ducts, within 2% of actual airflow.



Product Specification

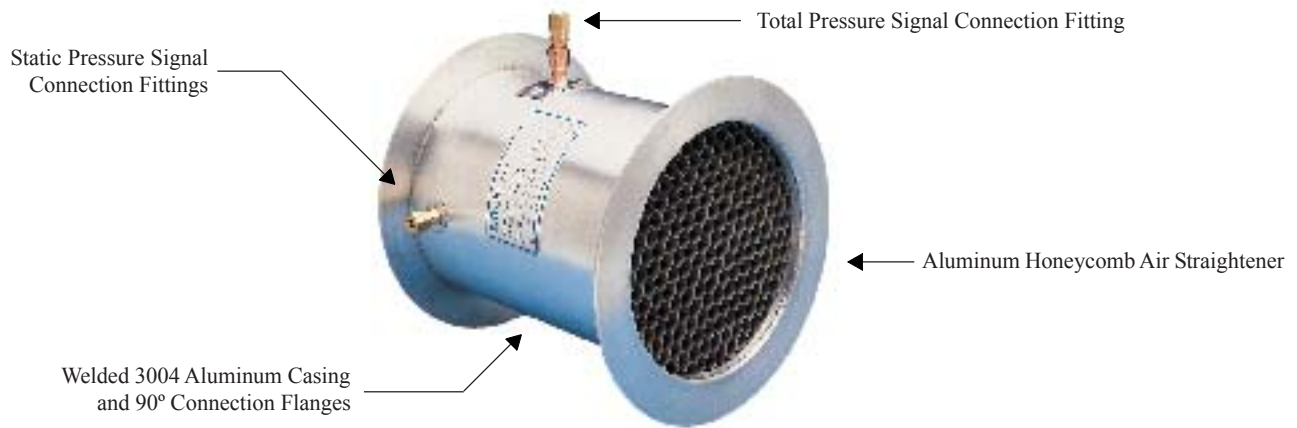
- **Accuracy.** 2% of actual flow.
- **Casing.** Type 3004, .065" wall aluminum tube.
- **Flanges.** 1" wide, .08" thick aluminum sheetmetal, fusion welded to the casing.
- **Air Equalizer – Straightener.** Corrosion resistant 3003 aluminum. 3" deep x 3/8" cell.
- **Static Pressure Probe.** Copper tubing with 50/50 tin/lead solder.
- **Total Pressure Header.** Copper tubing assembled with 50/50 tin/lead solder. Stainless steel mounting bracket.
- **Connection Fittings.** 1/4" brass compression type standard. Other barb and compression fittings available.
- **Operating Temperature.** Continuous operation to 300°F.
- **Casing Depth.** 8" deep on flanged unit. 10" deep on non-flanged unit.



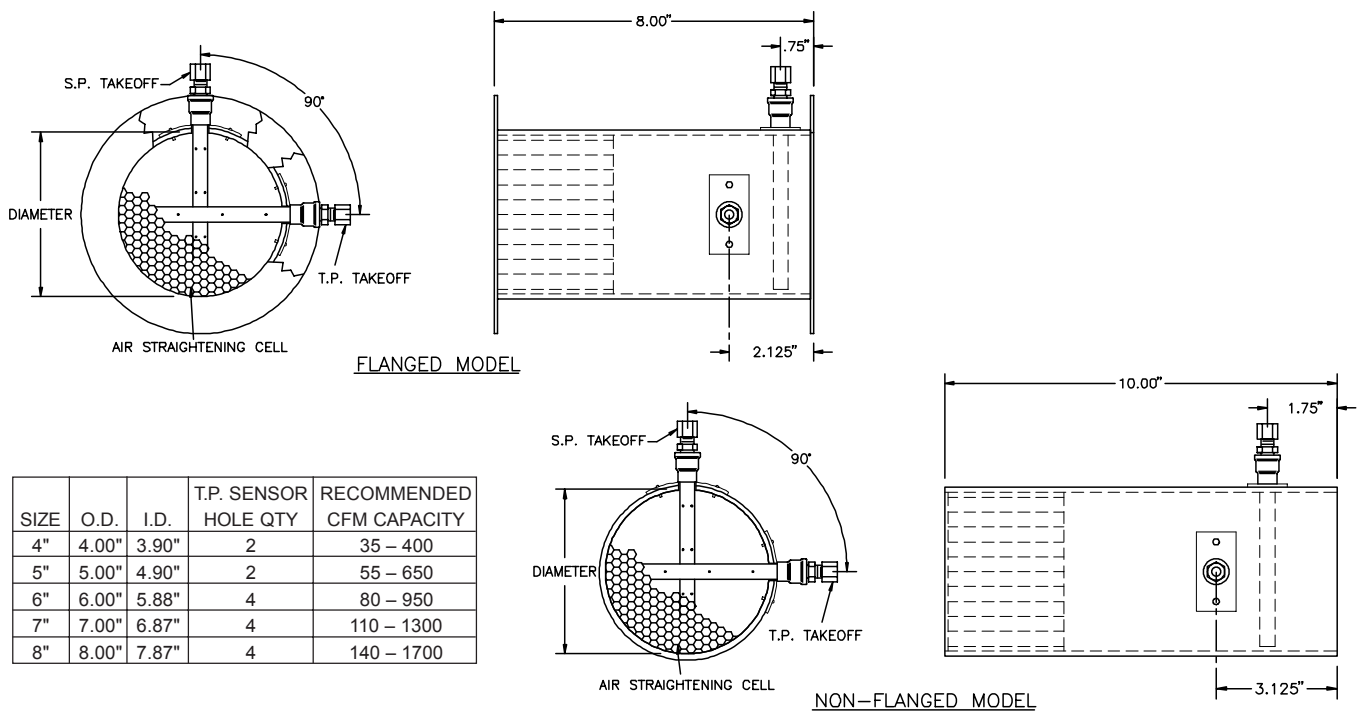
AIR MONITOR
CORPORATION

Aluminum LO-flo Pitot Traverse Station

Construction Features



Dimensional Specification



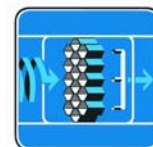
Suggested Specification

Provide where indicated, a Pitot traverse station with integral flow conditioner for continuous measurement of air volume.

Each flow traverse station shall contain a flow straightener-equalizer consisting of open cell aluminum honeycomb having a minimum cell size to length ratio of 8 to 1 to minimize the effects of turbulent and rotational flows. The Pitot total pressure sensors shall be positioned at the centers of equal concentric areas on the averaging probe; the static pressure sensor will be a bullet nose type probe.

The station's casing shall be of all welded construction using 3000 series aluminum.

The traverse station shall be capable of measuring airflow volumes within 2% of actual flow, and shall be the Aluminum LO-flo Pitot Traverse Station as manufactured by Air Monitor Corporation, Santa Rosa, California.



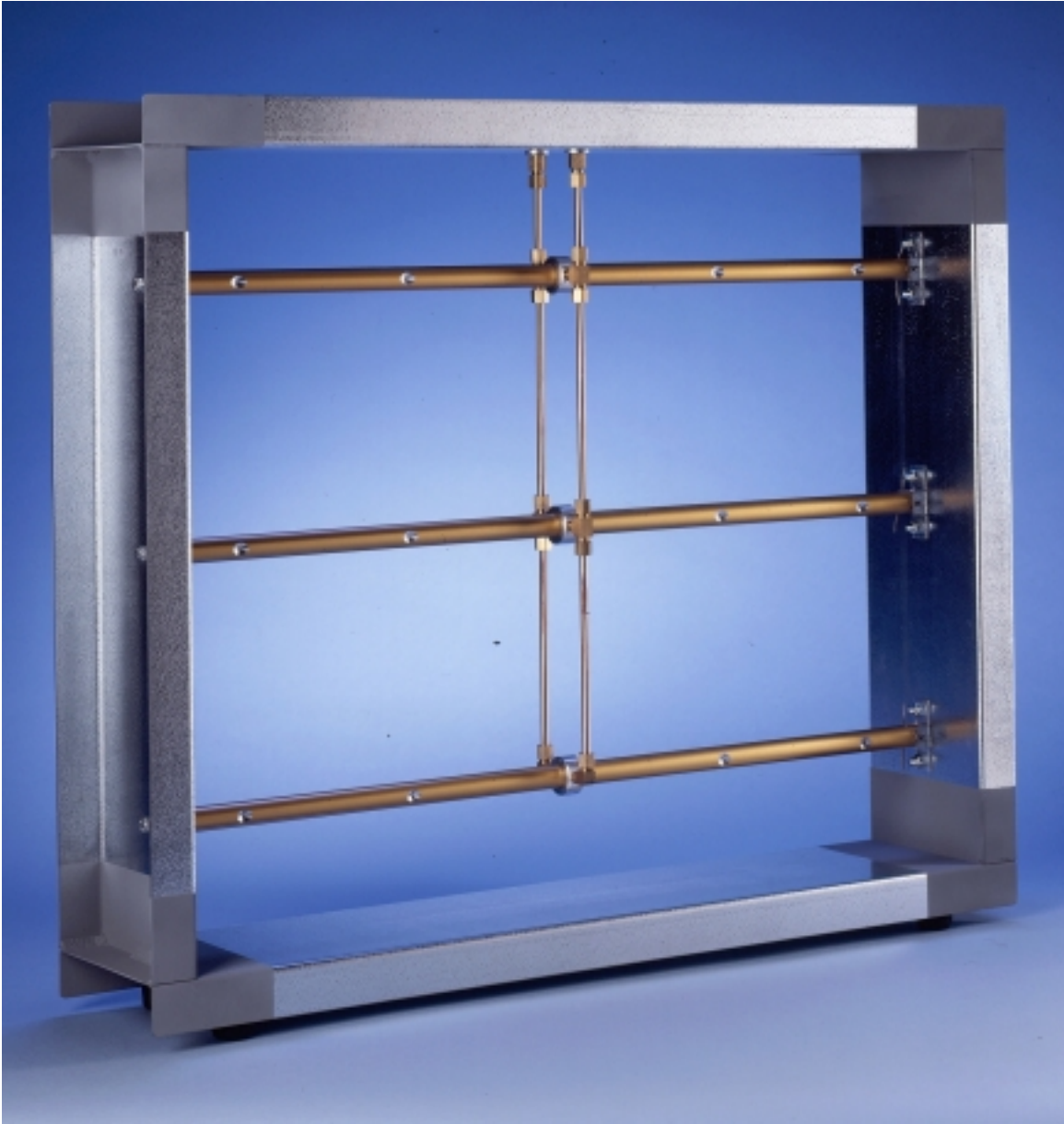
VOLU-probe/VS

Airflow Traverse Station

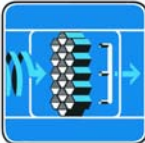
AMCA
CERTIFIED
RATINGS

AIRFLOW
MEASUREMENT
STATION
AIR
PERFORMANCE

AIR
MOVEMENT
AND CONTROL
ASSOCIATION
INTERNATIONAL, INC. ®



Accurate airflow measurement for demanding applications



**AIR MONITOR
CORPORATION**

VOLU-probe/VS

Product Description

The VOLU-probe/VS Airflow Traverse Station utilizes one or more VOLU-probe Airflow Traverse Probes, factory mounted in a rigid welded galvanized casing, to sense and average separate total and static pressure traverses of an airstream. Multiple sets of total and static pressure sensing points, positioned along the length of each VOLU-probe on an equal area basis, traverse the airstream and average the sensed pressures in separate internal manifolds. Factory installed static and total pressure signal tubing connect the

individual VOLU-probes together, terminating at the galvanized casing for field connection. The VOLU-probe/VS is suited for installations in ductwork, fan inlets, etc., operating at temperatures ranging from -20 to 200°F. As a primary flow sensing means, the VOLU-probe/VS can be used in applications ranging from commercial building HVAC to laboratory, pharmaceutical and electronics production, and health care institutions.

2% Certified Measurement Accuracy



Air Monitor Corporation certifies that the VOLU-probe/VS Airflow Traverse Station shown herein is licensed to bear the AMCA Certified Ratings Seal – Airflow Measurement Station Performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 611 and comply with the requirements of the AMCA Certified Ratings Program.

Test Data

Model. VOLU-probe/VS

Type. Differential Pressure

Conversion Formula. $Velocity = 1096 \sqrt{\frac{AMS \text{ Velocity Pressure}}{Air \text{ Density}}}$

Sizes & Shapes Tested. 36" x 36" Rectangular; 36" dia. Circular

Applicable Sizes Rated. Rectangular stations with cross-sectional areas between 4.5 and 18.0 square feet; Circular stations with cross-sectional areas between 3.5 and 14.1 square feet.

Test Setup. AMCA Standard 610, Figure 1

Test Results – Rectangular Stations

Reference Volume, ACFM	Reference Velocity, AFPM	% Accuracy	Airflow Resistance IN w.c.
35,134	4,015	0.53	.082
31,391	3,488	0.45	.064
26,018	2,891	0.39	.044
19,456	2,162	0.23	.028
13,971	1,552	0.10	.013
8,832	981	-1.40	.005

Test Results – Circular Stations

Reference Volume, ACFM	Reference Velocity, AFPM	% Accuracy	Airflow Resistance IN w.c.
29,602	4,188	1.03	.066
24,915	3,525	0.97	.047
18,728	2,649	0.30	.033
14,463	2,046	0.15	.017
10,455	1,479	0.16	.010
8,285	1,172	-1.37	.005

How It Works

The VOLU-probe/VS operates on the Fechheimer Pitot derivative of the multi-point, self-averaging Pitot principle to measure the total and static pressure components of airflow. Total pressure sensing ports, with chamfered entrances to eliminate air direction effect, are located on the leading surface of the individual VOLU-probes to sense the impact pressure (P_t) of the approaching airstream (see Figure 2). Fechheimer pairs of static pressure sensing ports, positioned at designated angles offset from the flow normal vector, minimize the error inducing effect of directionalized airflow. As the flow direction veers from the normal, one static sensor is exposed to a higher pressure ($P_s + \text{part of } P_t$), whereas the other

static sensor experiences a lower pressure ($P_s - \text{part of } P_t$) of the same magnitude, thereby canceling out the undesired effect of partial total pressure (P_t). It is this unique design of offset static pressure and chamfered total pressure sensors (see Figure 1) that makes the VOLU-probe/VS insensitive to approaching multi-directional, rotating airflow with yaw and pitch up to 30° from straight flow, thereby assuring the accurate measurement of the sensed airflow rate without the presence of an airflow straightener upstream. This unique design of the VOLU-probe/VS is covered by U.S. Patent No. 4,559,835.

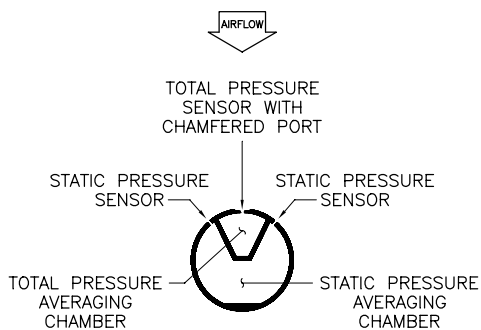


Figure 1

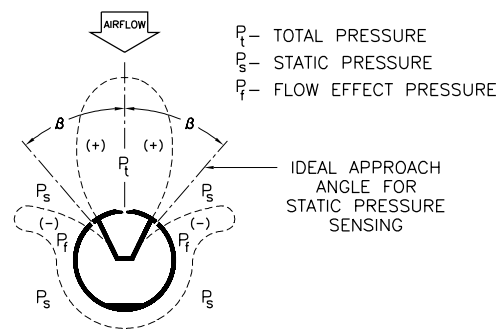
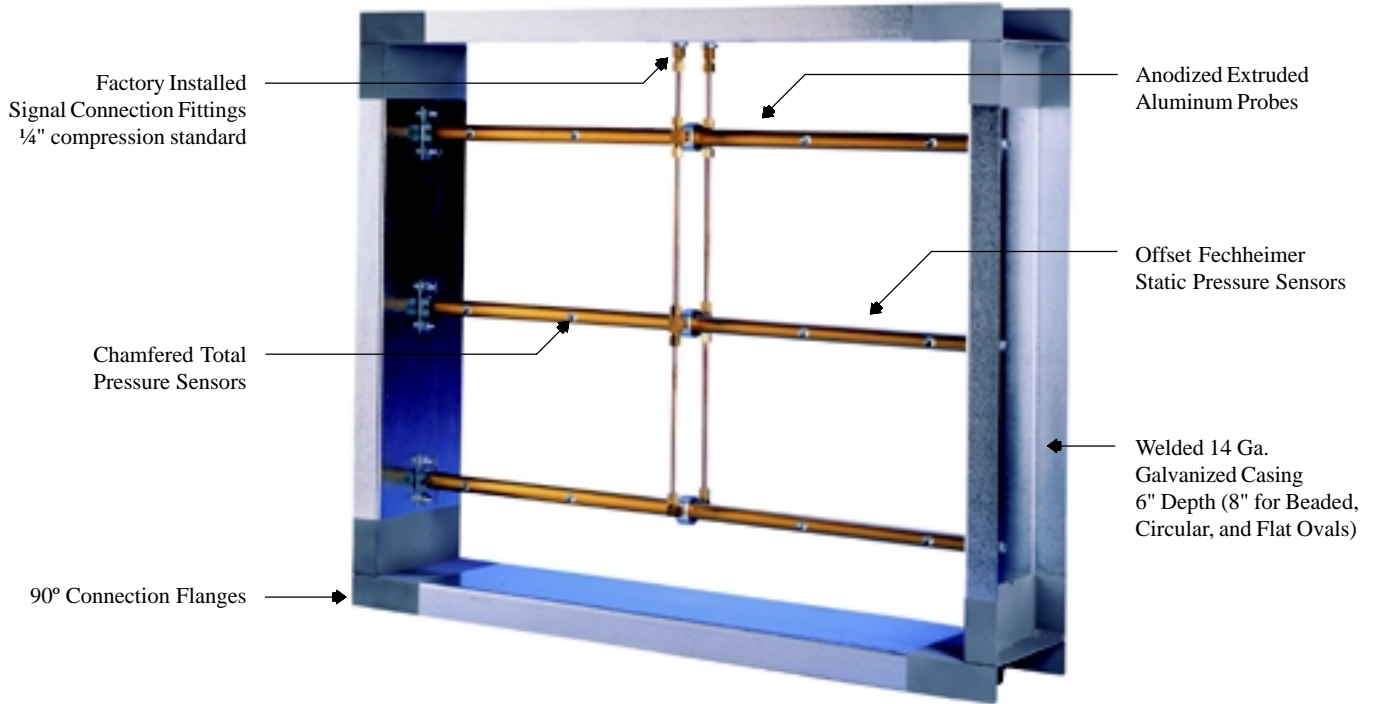


Figure 2

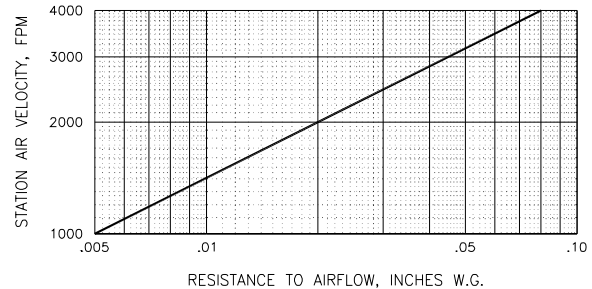
Airflow Traverse Station

Construction Features



Airflow Resistance

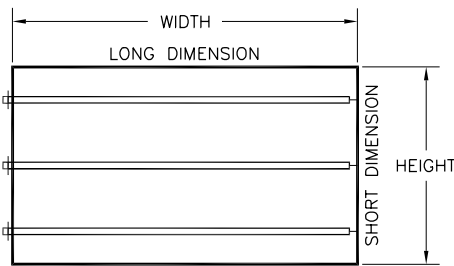
Negligible Resistance to Airflow. The VOLU-probe/VS cylindrical configuration and smooth surface free of external sensor protrusions permit the airstream to flow unrestricted around and between the installed traverse probes, creating a very minimal resistance to airflow.



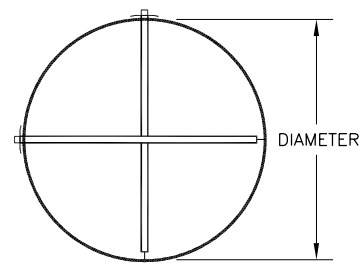
Traverse Probe Quantities

When installed per Air Monitor's Minimum Installation Requirements (see Page 4), the quantity and placement of individual

probes in a VOLU-probe/VS Airflow Traverse Station (see below) will produce assured measuring accuracy of $\pm 2\%$ of actual airflow.



FOR SQUARE AND RECTANGULAR DUCTS



FOR CIRCULAR DUCTS

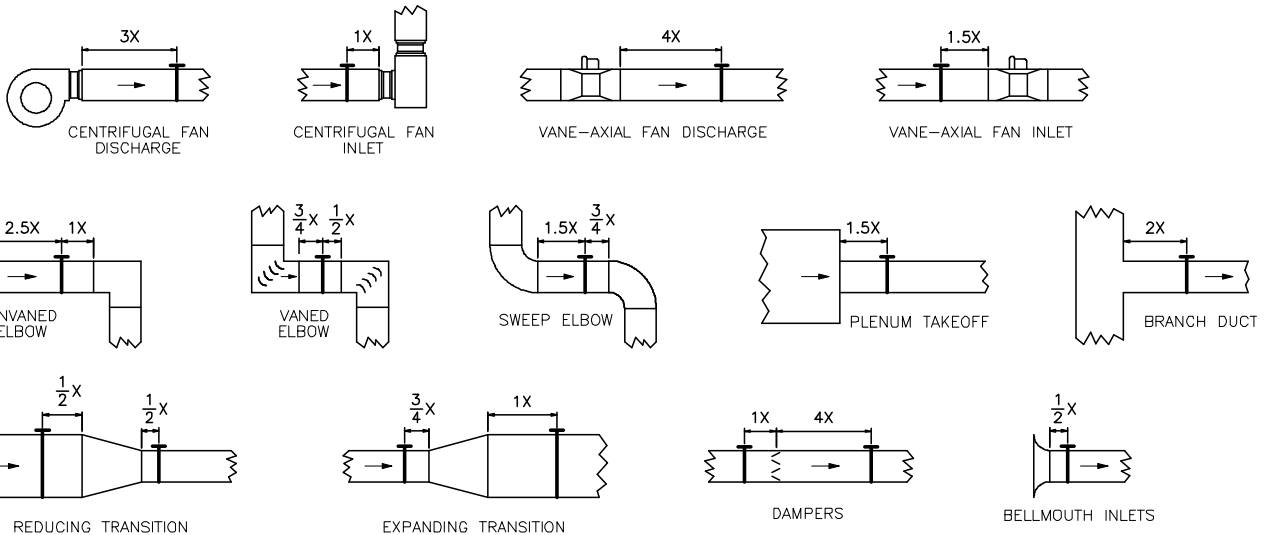
Height Dimension	Min. Qty of VOLU-probes Recommended	Height Dimension	Min. Qty of VOLU-probes Recommended
8" to 12"	1	> 54" to 84"	4
> 12" to 30"	2	> 84" to 120"	5
> 30" to 54"	3	> 120" to 180"	6

Height Dimension	Min. Qty of VOLU-probes Recommended
8" to 18"	1
> 18" to 72"	2
> 72"	3

VOLU-probe/VS

Minimum Installation Requirements

Note: VOLU-probe/VS locations shown are **not** ideal. The locations indicate the **minimum** clearance required from air turbulence producing sources. Wherever possible, the VOLU-probe/VS should be installed where greater runs of straight duct (or clearances) than shown below exist.



Rectangular Duct: $x = \frac{2(H \times W)}{H + W}$

Circular Duct: $x = \text{Duct Diameter}$

Suggested Specification

Provide where indicated, airflow traverse stations capable of continuously measuring the fan or duct capacities (air volumes) they serve.

Each airflow traverse probe mounted within the station shall contain multiple total and static pressure sensors located along its exterior surface, and internally connected to their respective averaging manifolds. The flow sensors shall not protrude beyond the surface of the probe(s), and shall be the offset (Fechheimer) type for static pressure and the chamfered impact type for total pressure measurement. The airflow station's measured accuracy shall not be affected by directional flow having yaw and/or pitch angles up to 30°.

The airflow measuring station(s) shall have a 14 ga. [18 ga. for circular units] galvanized steel, 6" deep welding casing with 90°

connecting flanges. Total and static pressure sensors shall be located at the centers of equal areas (for rectangular ducts) or at equal concentric area centers (for circular ducts) across the station's face area.

Stations shall be AMCA certified and be capable of measuring the airflow rates within an accuracy of ±2% without the use of correction factors. The maximum allowable unrecovered pressure drop caused by the station shall not exceed .025" w.c. at 2000 FPM, or .085" w.c. at 4000 FPM.

The airflow traverse station shall be the VOLU-probe/VS as manufactured by Air Monitor Corporation, Santa Rosa, California.



VOLU-trol/F

Pitot Measurement / Control Station

The VOLU-trol/F is a multi-point, self-averaging Pitot measurement/control station with integral air straightener-equalizer honeycomb cell, and integral control damper capable of continuously measuring and controlling ducted airflow with an accuracy of 2% or better. The VOLU-trol/F derives its high degree of accuracy from a combination of precision sensor locations, honeycomb airflow processing, pneumatic averaging of a large number of sensed airflow pressures and patented symmetrical averaging (Patent No. 3,685,355), which requires that all stages in the averaging process occur at a point where there is a balanced array of sensors present, thereby assuring that each sensed pressure is given equal weight in the averaging process. With no maximum size or capacity limits, the VOLU-trol/F affords a high degree of flexibility in VAV system design. The VOLU-trol/F is very well suited to VAV applications where control of noise and installed system cost is important.



Specifications

- Configurations. Rectangular and circular.
- Accuracy. 2% of actual airflow.
- Operating Temperature. Continuous operation to 120°F.
- Air Equalizer-Straightener Cell. Corrosion resistant 3003 aluminum. 3" deep x 1/2" cell.
- Total Pressure Manifold. Copper tubing assembled with 50/50 tin/lead solder. Galvanized mounting and support brackets.
- Static Pressure Header and Sensors. Copper tubing. Galvanized mounting bracket.
- Connection Fittings. 1/4" brass compression type located on the long dimension of rectangular stations.
- Damper Blades. 14 ga galvanized sheet metal, parallel to width dimension.
- Damper Bearings. Bronze.
- Damper Linkage. External, mechanical.
- Casing Depth. 24"
- Casing. Rectangular. 14 gauge galvanized sheetmetal, intermittent welded casing with metal caulking.
Circular. 18 gauge galvanized sheetmetal, spot welded casing seams.
- Flanges. Rectangular. 1-1/2" wide, 90° formed. Sizes up to 144" x 144"
Circular. Sizes 10" to 24" 1" wide flanges or beaded edge
Sizes >24" and <45" 1-1/2" wide flanges
Sizes > 45" 3/16" x 2" bar stock flanges
- Optional Construction. Air Equalizer-Straightener. Type 304 & 316 Stainless Steel
Total & Static Pressure Manifolds. Type 316 Stainless Steel
Casing, Flanges, Damper. Aluminum & Stainless Steel
Connection Fittings. Stainless Steel
Damper Actuator. Electronic & Pneumatic

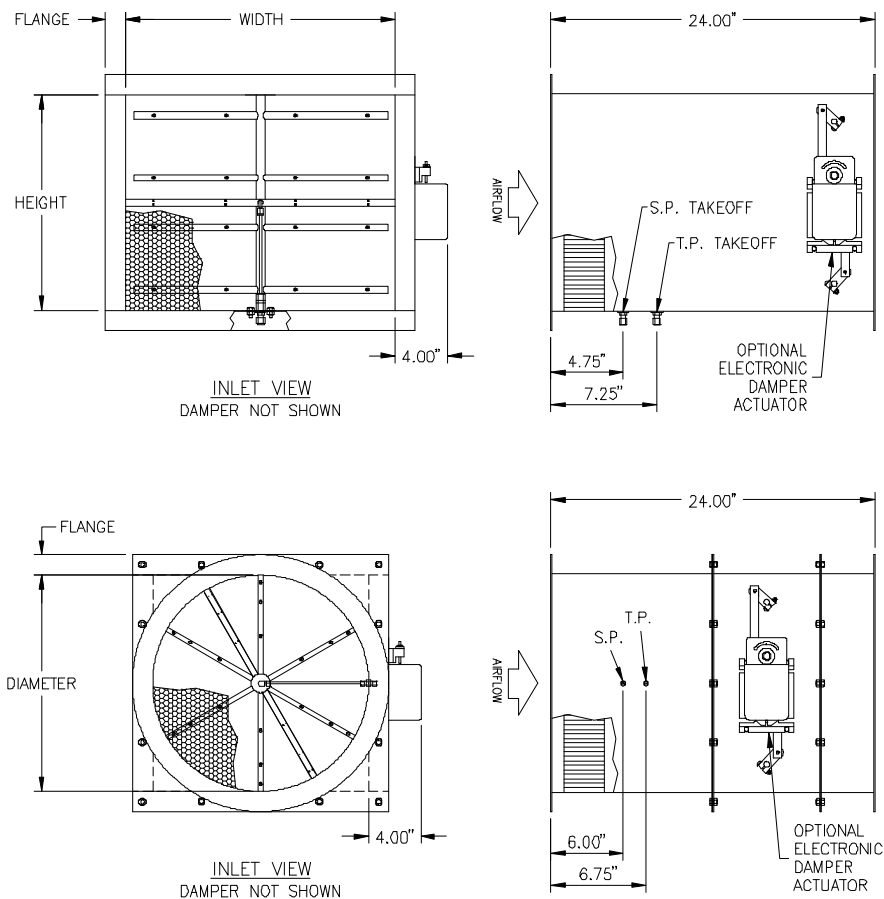
Accurate airflow measurement for demanding applications



AIR MONITOR
CORPORATION

VOLU-trol/F Pitot Measurement/Control Station

Dimensional Specification



Suggested Specification

Provide where indicated, airflow measurement/control station(s) capable of continuously monitoring and controlling the duct capacities (air volumes) they serve.

Each airflow measurement/control station shall contain multiple total and static pressure sensors positioned in a log-Tchebycheff pattern. Rectangular stations having a cross-section greater than 4 square feet will have a minimum of 25 points of measurement. For stations having a dimension less than 18", locate the points of measurement at the center of equal areas not more than 6" apart, and use a minimum of two measurement points per side. For a station having a dimension greater than 56", the maximum distance between measurement points will be 8". For circular ducts having a diameter of 18" or greater, locate measurement points on three systematically disposed diameters. For round stations smaller than 18", locate the measurement points on two perpendicular diameters.

The airflow measurement/control station(s) shall be fabricated of a minimum of 14 [18] ga. galvanized steel, welded casing in 24" depth with 90° connecting flanges in a configuration and size equal to that of the duct it is mounted

into. Each station shall be complete with an open parallel cell air straightener-equalizer honeycomb mechanically fastened to the casing and external signal connection fittings.

Damper blades shall be fabricated of 14 ga. galvanized sheet metal and arranged parallel to the width dimension of the station. Damper shall include bronze bearings and external mechanical linkage. [Damper shall include (pneumatic, electronic) actuator].

An identification label shall be placed on each station casing listing model number, size, area, and specified airflow capacity.

The airflow measurement section shall be AMCA certified and capable of measuring the airflow rates within an accuracy of $\pm 2\%$.

The airflow measurement/control station(s) shall be the VOLU-trol/F as manufactured by Air Monitor Corporation, Santa Rosa, California.



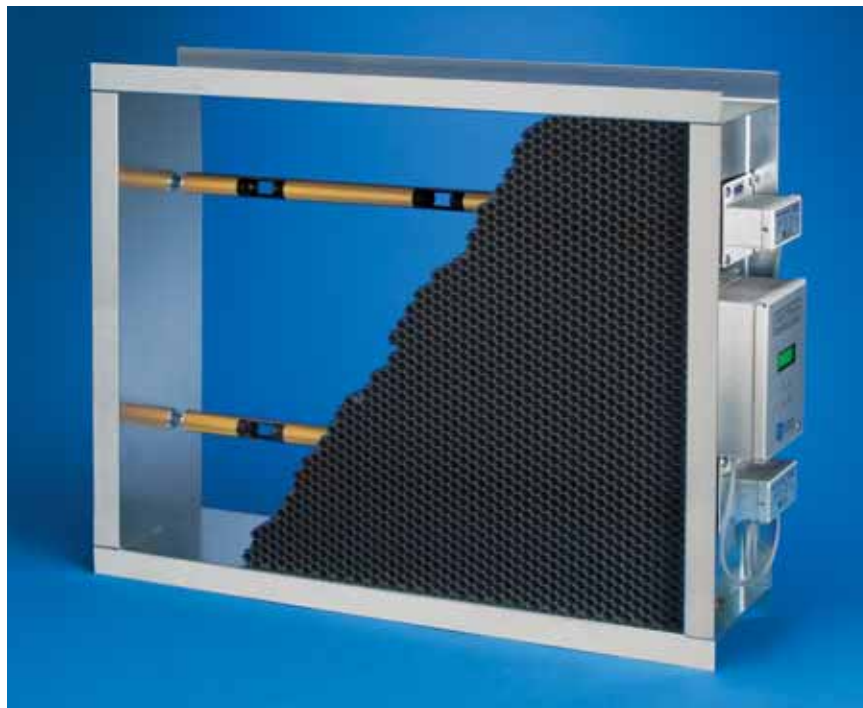
PLUS SERIES

ELECTRA-flo/CM

Thermal Airflow Measuring Station

To assure high measurement accuracy (2-3% of actual flow or better) under extreme conditions caused by turbulent, rotating, and multi-directional airflows normally present near fan inlets or discharge ducts and directly downstream from duct elbows, transitions, etc., the ELECTRA-flo/CM uses a honeycomb air

straightener to process the air into velocity vectors parallel with the duct's axis immediately upstream of the plane of measurement. This airflow processing sharply reduces the need for long, straight runs of duct before and after the station to obtain accurate flow measurement.



System Features

- 2% of reading sensor accuracy
- 0 to 5,000 FPM airflow measurement range
- Up to 32 measurement points per station
- Fully field serviceable sensors
- Rugged, anodized probe construction
- Optional LonWorks® communication protocol
- Dual analog outputs (4-20mA, 0-5VDC or 0-10VDC) for airflow and temperature
- High visibility backlit LCD can be mounted up to 100' from the station
- Individual sensor self-diagnostics
- Selectable display of individual sensor velocity and temperature
- Password protected membrane keypad for easy access to all transmitter functions
- Accuracy to within 2-3% of actual airflow
- Integral corrosion resistant 3003 aluminum honeycomb air straightener for stations located in highly disturbed airflow
- CFD (Computational Fluid Dynamics) and wind tunnel optimized sensor aperture design ensures accurate airflow measurement in angular flow conditions

Accurate airflow measurement for demanding applications

For additional information, refer to the ELECTRA-flo Plus Series product brochure.

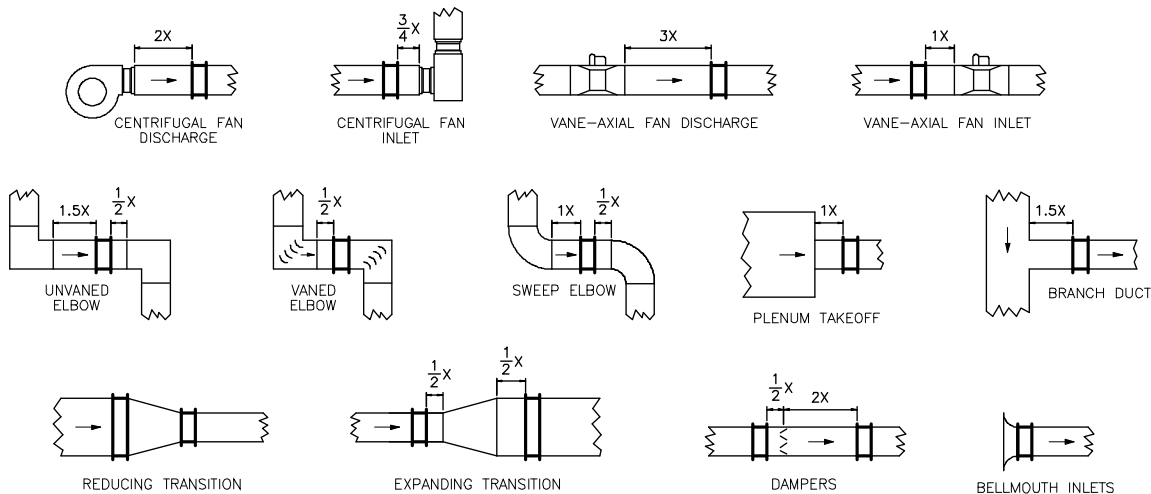


**AIR MONITOR
CORPORATION**

ELECTRA-flo™/CM

Minimum Installation Requirements

These installation locations indicate the **minimum** clearance from a source of airflow disturbance. If more than the minimum is available, proportionally adjust the upstream and downstream clearances. Avoid locating the ELECTRA-flo/CM where it will be subjected to condensation from a coil or humidifier. Contact Air Monitor's Applications Engineering Department to discuss sub-minimum installation.



Probe & Sensor Quantities

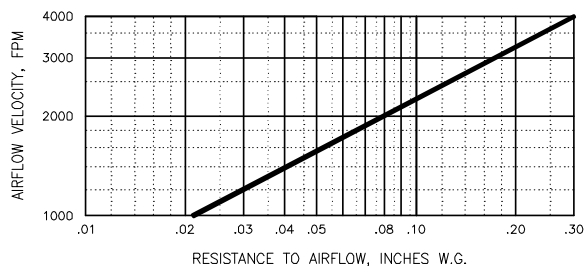
The quantity of sensing points, in conjunction with adherence to minimum installation requirements, assures a system accuracy within 2-3% of actual airflow. The charts indicate the number of probes/sensors per probe in any size ELECTRA-flo/CM station.

Duct Diameter	Number of Probes / Sensors Per Probe
8 to <12	1/1
12 to <18	1/2
18 to <36	2/2
36 to <48	2/4
48 to <60	2/6
60 to <90	3/6
90 to 120	4/6

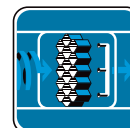
		Long Dimension in Inches															
		12	18	24	30	36	42	48	54	60	72	84	96	120	Short Dimension in Inches		
Short Dimension in Inches	12	1/2	1/2	1/3	1/3	1/3	1/4	1/4	1/5	1/5	1/6	1/7	1/8	1/8			
	18		2/2	2/3	2/3	2/3	2/4	2/4	2/5	2/5	2/6	2/7	2/8	2/8			
	24			2/3	2/3	2/4	2/4	2/5	2/5	2/6	2/7	2/8	2/8				
	30				2/3	2/3	2/4	2/4	2/5	2/5	2/6	2/7	2/8	2/8			
	36					3/3	3/4	3/4	3/5	3/5	3/6	3/7	3/8	3/8			
	42						3/4	3/4	3/5	3/5	3/6	3/7	3/8	3/8			
	48							3/4	3/5	3/5	3/6	3/7	3/8	3/8			
	54								3/5	3/5	3/6	3/7	3/8	3/8			
	60									4/5	4/6	4/7	4/8	4/8			
	72										4/6	4/7	4/8	4/8			
	84											4/7	4/8	4/8			
	96												4/8	4/8			
120													4/8				

Number of Probes / Sensors Per Probe

Negligible Airflow Resistance



The integral honeycomb airflow straightener allows the installation of the ELECTRA-flo/CM in adverse locations with minimal to no up stream or downstream straight run of ductwork. The non-restrictive nature of the honeycomb results in the extremely low resistance to airflow indicated in the Resistance vs. Airflow Velocity graph.



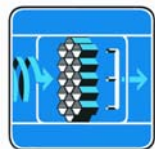


VOLU-probe

Pitot Airflow Traverse Probes



Accurate airflow measurement for demanding applications



AIR MONITOR CORPORATION

VOLU-probe

Product Description

The VOLU-probe Pitot Airflow Traverse Probe is ideally suited for both new installations and retrofit applications requiring accurate airflow measurement in locations having limited straight duct runs. Multiple sets of total and static pressure sensing ports, positioned along the entire length of the VOLU-probe on an equal area basis, traverse the airstream and average the sensed pressures in separate internal manifolds. An array of VOLU-probes are used to properly

sense the typically stratified flow to provide an equal area traverse of an entire duct cross-section. The VOLU-probe is suited for installations in ductwork, fan inlets, sound attenuators, etc., operating at temperatures up to 200°F. As a primary flow sensing means, the VOLU-probe can be used in applications ranging from commercial building HVAC to laboratory, pharmaceutical and electronics production, and health care institutions.

2% Certified Measurement Accuracy



Air Monitor Corporation certifies that the VOLU-probe Airflow Traverse Probe shown herein is licensed to bear the AMCA Certified Ratings Seal – Airflow Measurement Station Performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 611 and comply with the requirements of the AMCA Certified Ratings Program.

Test Data

Model. VOLU-probe
Type. Differential Pressure

Conversion Formula. $Velocity = 1096 \sqrt{\frac{AMS \text{ Velocity Pressure}}{Air \text{ Density}}}$

Sizes & Shapes Tested. 36" x 36" Rectangular; 36" dia. Circular
Applicable Sizes Rated. Rectangular ductwork with cross-sectional areas between 4.5 and 18.0 square feet; Circular ductwork with cross-sectional areas between 3.5 and 14.1 square feet.

Test Setup. AMCA Standard 610, Figure 1

Test Results – Rectangular Stations

Reference Volume, ACFM	Reference Velocity, AFPM	% Accuracy	Airflow Resistance IN w.c.
35,134	4,015	0.53	.082
31,391	3,488	0.45	.064
26,018	2,891	0.39	.044
19,456	2,162	0.23	.028
13,971	1,552	0.10	.013
8,832	981	-1.40	.005

Test Results – Circular Stations

Reference Volume, ACFM	Reference Velocity, AFPM	% Accuracy	Airflow Resistance IN w.c.
29,602	4,188	1.03	.066
24,915	3,525	0.97	.047
18,728	2,649	0.30	.033
14,463	2,046	0.15	.017
10,455	1,479	0.16	.010
8,285	1,172	-1.37	.005

How It Works

The VOLU-probe operates on the Fechheimer Pitot derivative of the multi-point, self-averaging Pitot principle to measure the total and static pressure components of airflow. Total pressure sensing ports, with chamfered entrances to eliminate air direction effects, are located on the leading surface of the VOLU-probe to sense the impact pressure (P_t) of the approaching airstream (see Figure 2). Fechheimer pair of static pressure sensing ports, positioned at designated angles offset from the flow normal vector, minimize the error inducing effect of directionalized airflow. As the flow direction veers from the normal, one static sensor is exposed to a higher

pressure ($P_s + \text{part of } P_t$), whereas the other static sensor experiences a lower pressure ($P_s - \text{part of } P_t$) of the same magnitude, thereby canceling out the undesired effect of partial total pressure (P_t). It is this unique design of offset static pressure and chamfered total pressure sensors (see Figure 1) that makes the VOLU-probe insensitive to approaching multi-directional, rotating airflow with yaw and pitch up to 30° from straight flow, thereby assuring the accurate measurement of the sensed airflow rate without the presence of an airflow straightener upstream. This unique design of the VOLU-probe is covered by U.S. Patent No. 4,559,835.

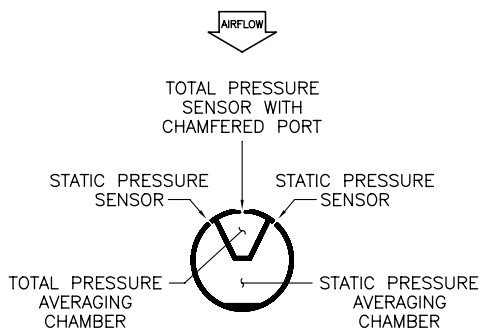


Figure 1

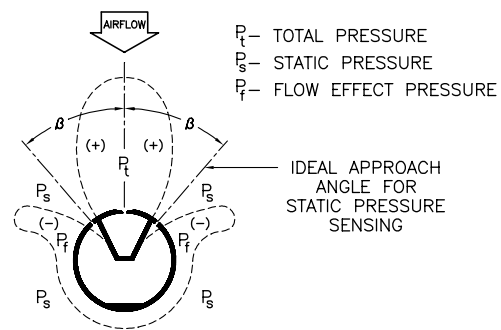


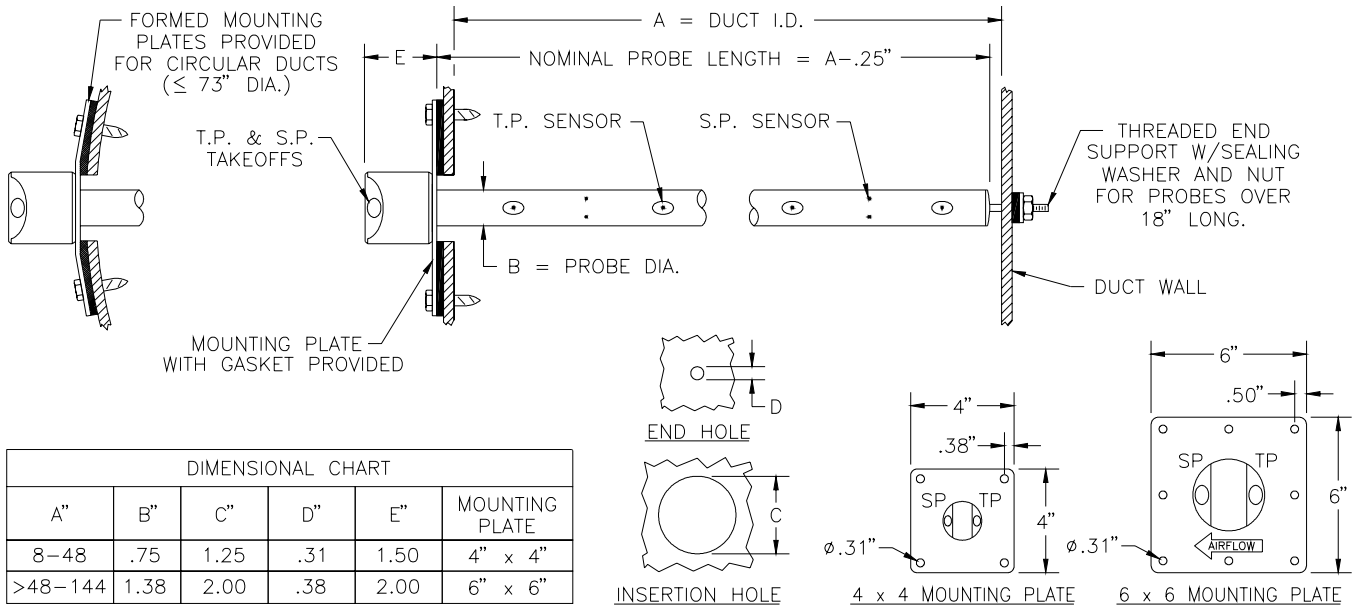
Figure 2

VOLU-probe/1 & 2

VOLU-probe/1 – Externally Mounted

The VOLU-probe/1 is designed for mounting in ducts by drilling two holes in opposing walls, without the need to enter those structures.

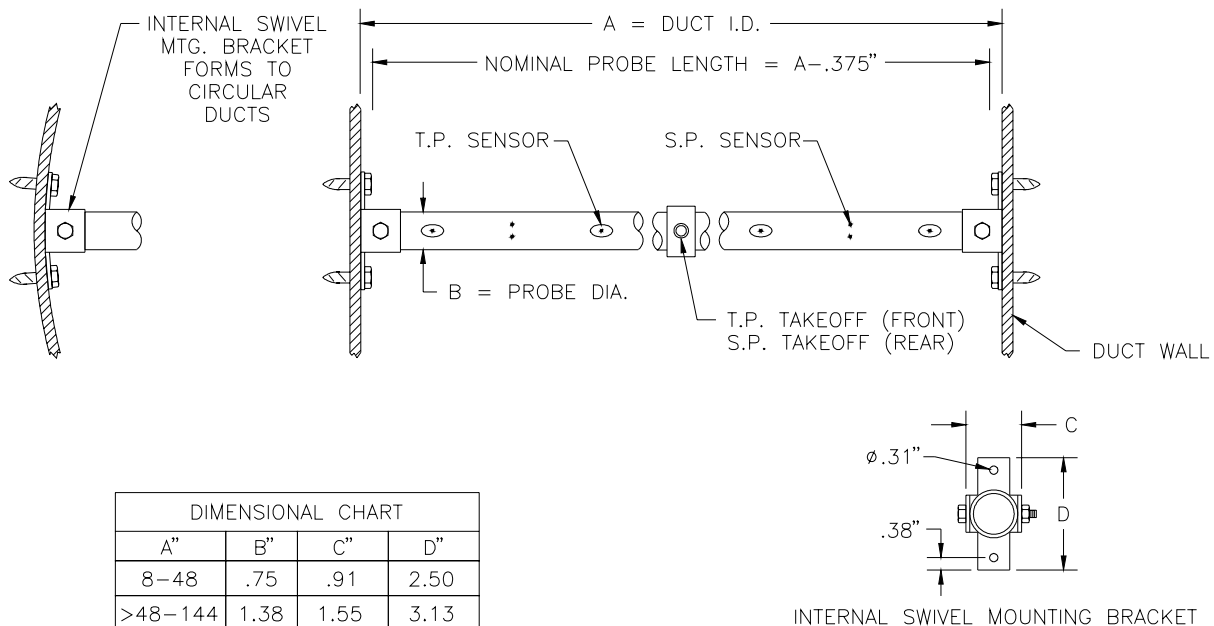
The VOLU-probe/1 is furnished with a threaded end support, gasketed washer and nut, and a mounting plate with signal take-off 1/8" FPT connections.



VOLU-probe/2 – Internally Mounted

The VOLU-probe/2 is designed for larger ducts where the size permits entry for installation, or where duct external accessibility or clearance is insufficient to permit probe mounting from outside of the duct.

The VOLU-probe/2 is furnished with interior mounting end support plates, and midpoint signal take-off 1/8" FPT connections.

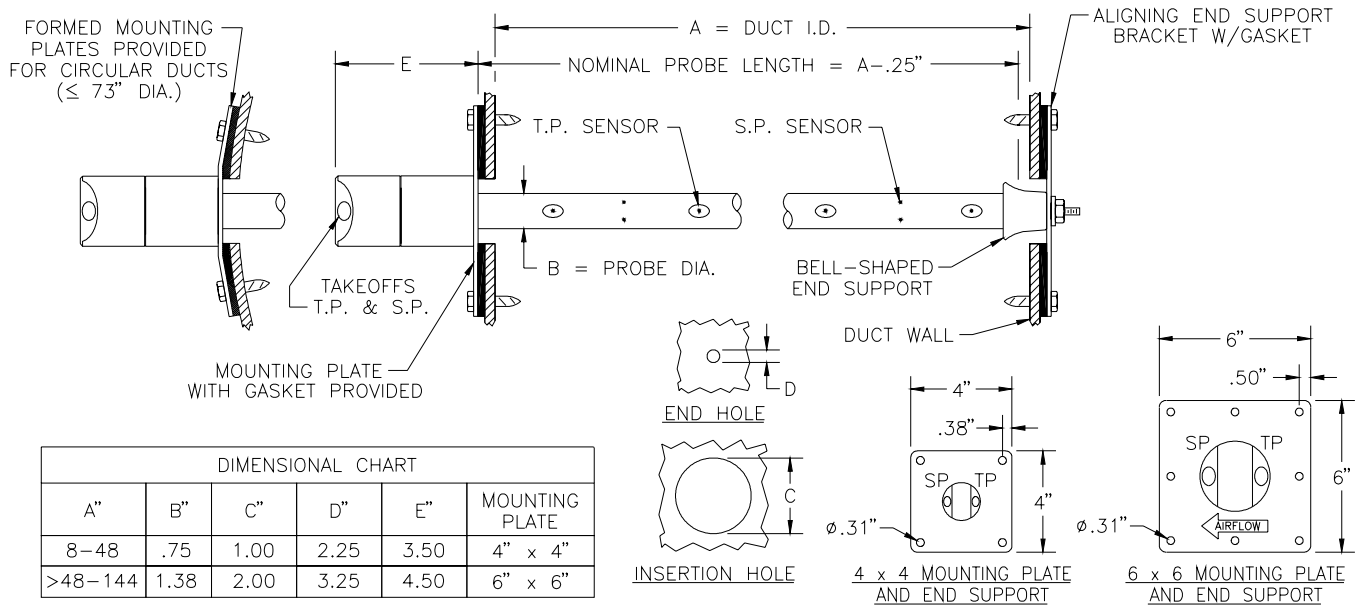


VOLU-probe/3 & 4

VOLU-probe/3 – Insertable/Removable

The VOLU-probe/3 is designed for mounting in ducts where periodic probe removal may be required for cleaning and/or inspection.

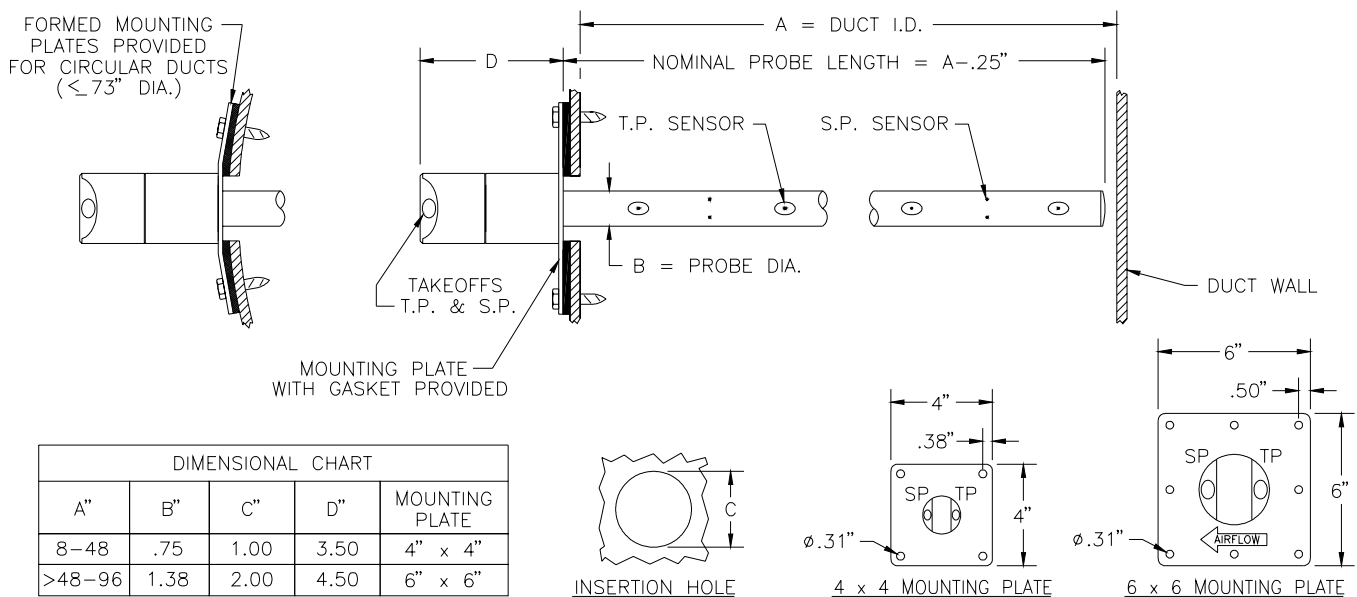
The VOLU-probe/3 is furnished with a bell-shaped end support for ease of reinsertion.



VOLU-probe/4 – Self-Supported

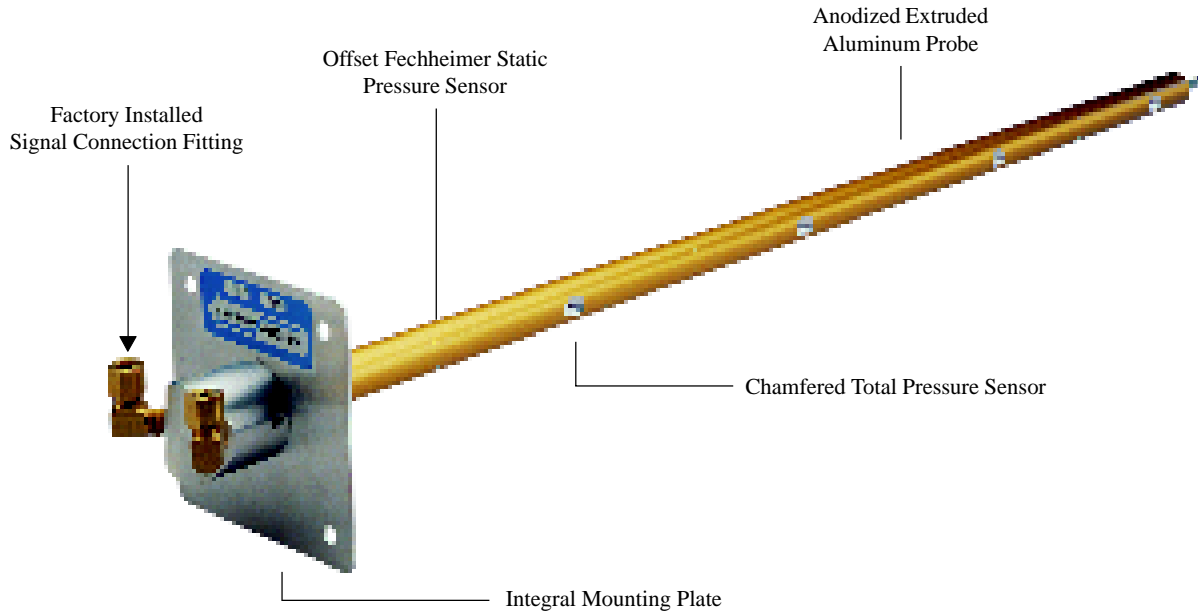
The VOLU-probe/4 is designed for industrial HVAC and process air applications where the duct casing is of sufficiently heavy gauge or plate construction to support the cantilevered weight of this self-supported VOLU-probe.

The VOLU-probe/4 requires no end support and is ideal where periodic removal of the probe may be required for cleaning and/or inspection.



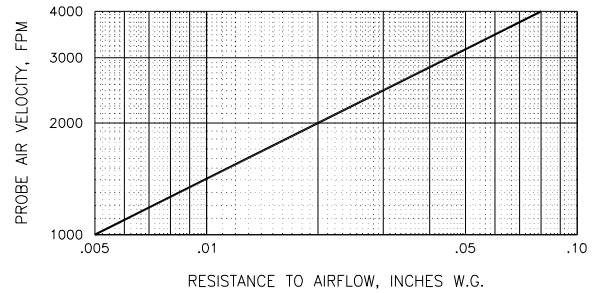
Airflow Traverse Probes

Construction Features



Airflow Resistance

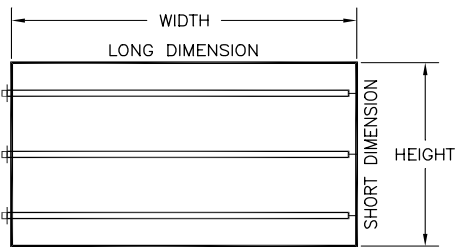
Negligible Resistance to Airflow. The VOLU-probe's cylindrical configuration and smooth surface free of external sensor protrusions permit the airstream to flow unrestricted around and between the installed traverse probe, creating a very minimal if not negligible resistance to airflow.



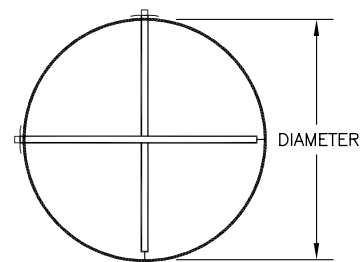
Traverse Probe Quantities

When installed per Air Monitor's Minimum Installation Requirements (see Page 6), the quantity and placement of the VOLU-probe airflow traverse probe for a given duct size and configuration

(round or rectangular) will produce assured measuring accuracies of $\pm 2\%$ of actual flow.



FOR SQUARE AND RECTANGULAR DUCTS



FOR CIRCULAR DUCTS

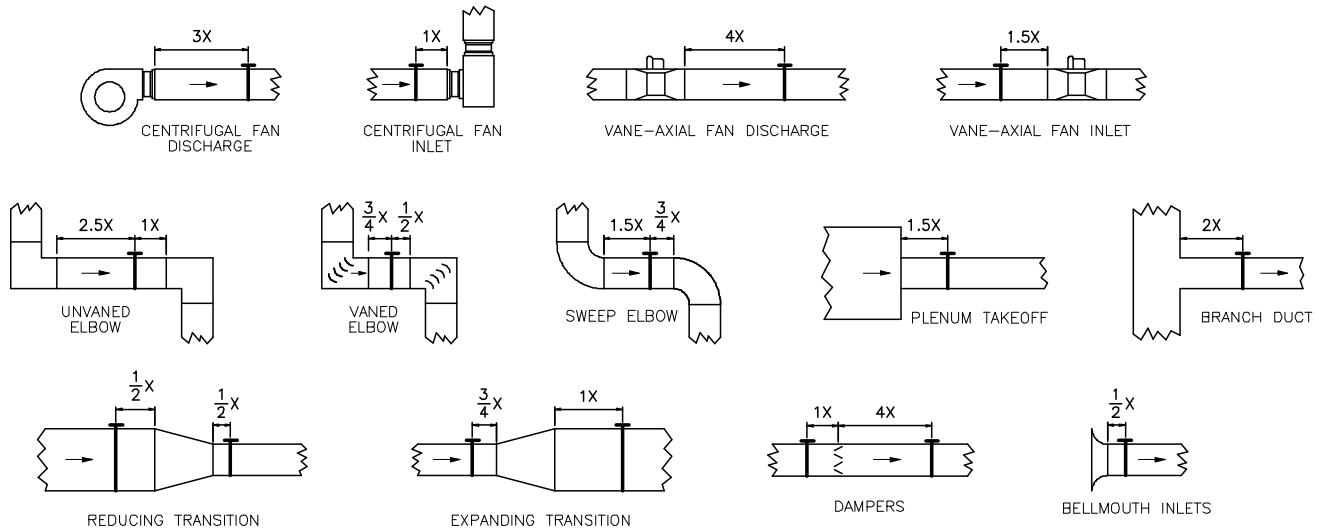
Height Dimension	Min. Qty of VOLU-probes Recommended	Height Dimension	Min. Qty of VOLU-probes Recommended
8" to 12"	1	> 54" to 84"	4
> 12" to 30"	2	> 84" to 120"	5
> 30" to 54"	3	> 120" to 180"	6

Height Dimension	Min. Qty of VOLU-probes Recommended
8" to 18"	1
> 18" to 72"	2
> 72"	3

VOLU-probe

Minimum Installation Requirements

Note: VOLU-probe locations shown are **not** ideal. The locations indicate the **minimum** clearance required from air turbulence producing sources. Wherever possible, the VOLU-probe should be installed where greater runs of straight duct (or clearances) than shown below exist.



$$\text{Rectangular Duct: } x = \frac{2(H \times W)}{H + W}$$

$$\text{Circular Duct: } x = \text{Duct Diameter}$$

Suggested Specification

Provide where indicated, an array of airflow traverse probes capable of continuously monitoring the fan or duct capacities (air volumes) they serve.

Each airflow traverse probe shall contain multiple total and static pressure sensors located along the exterior surface of the cylindrical probe and internally connected to their respective averaging manifolds. The flow sensors shall not protrude beyond the surface of the probe(s), and shall be the offset (Fechheimer) type for static pressure and the chamfered impact type for total pressure measurement. The airflow sensing probe's measurement accuracy shall not be affected by directional flow having pitch and/or yaw angles up to 30°. Each airflow traverse probe shall be of extruded aluminum construction and furnished with mounting plate(s), gasket, and signal fittings suitable for HVAC duct installation.

Total and static pressure sensors shall be located at the centers of equal areas (for rectangular ducts) or at equal concentric area centers (for circular ducts) along the probe length.

Probes shall be AMCA certified and be capable of measuring the airflow rates within an accuracy of $\pm 2\%$ without the use of correction factors. The maximum allowable unrecovered pressure drop caused by the probes shall not exceed .025" w.c. at 2000 FPM, or .085" w.c. at 4000 FPM.

The airflow traverse probe shall be the VOLU-probe[1./2./3./4] as manufactured by Air Monitor Corporation, Santa Rosa, California.

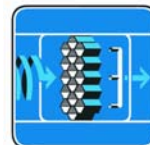


VOLU-probe/SS

Stainless Steel Pitot Airflow Traverse Probes



Accurate airflow measurement for demanding applications



**AIR MONITOR
CORPORATION**

VOLU-probe/SS

Product Description

The VOLU-probe/SS Stainless Steel Pitot Airflow Traverse Probe is ideally suited for new installations or retrofit applications requiring accurate airflow measurement in locations having limited straight duct runs. Multiple sets of total and static pressure sensing ports along the entire length of the VOLU-probe/SS traverse the airstream in a single line across the duct, and average the sensed pressures in separate manifolds. An array of VOLU-probe/SS

probes are used to properly sense the typically stratified flow to provide an equal area traverse of an entire duct cross-section. The VOLU-probe/SS is suited for clean or harsh and particulate laden applications, operating at temperatures ranging from -20 to 900°F. As a primary flow sensing means, the VOLU-probe/SS can be used in industrial process applications ranging from power generation (combustion airflow), fiber quenching, process drying, emission monitoring, etc.

How It Works

The VOLU-probe/SS operates on the Fechheimer Pitot derivative of the multi-point, self-averaging Pitot principle to measure the total and static pressure components of airflow. Total pressure sensing ports, with chamfered entrances to eliminate air direction effects, are located on the leading surface of the VOLU-probe/SS to sense the impact pressure (P_t) of the approaching airstream (see Figure 2). Fechheimer pair of static pressure sensing ports, positioned at designated angles offset from the flow normal vector, minimize the error inducing effect of directionalized airflow. As the flow direction veers from the normal, one static sensor is exposed to a higher pressure ($P_s + \text{part of } P_t$), whereas the other

static sensor experiences a lower pressure ($P_s - \text{part of } P_t$) of the same magnitude, thereby canceling out the undesired effect of partial total pressure (P_t). It is this unique design of offset static pressure and chamfered total pressure sensors (see Figure 1) that make the VOLU-probe/SS insensitive to approaching multi-directional, rotating airflow with yaw and pitch up to 30° from straight flow, thereby assuring the accurate measurement of the sensed airflow rate without the presence of an airflow straightener upstream. This unique design of the VOLU-probe/SS is covered by U.S. Patent No. 4,559,835.

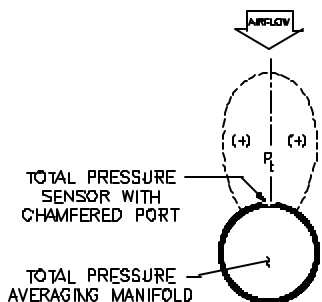


Figure 1

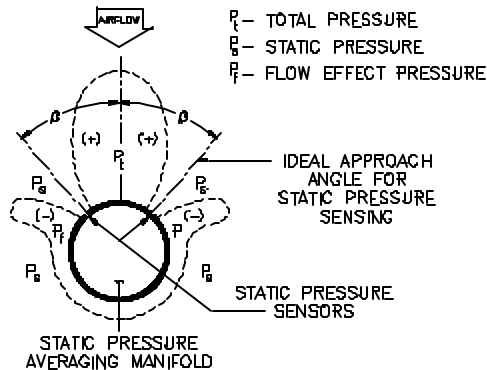
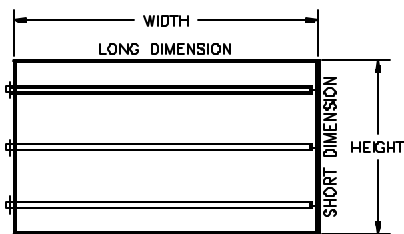


Figure 2

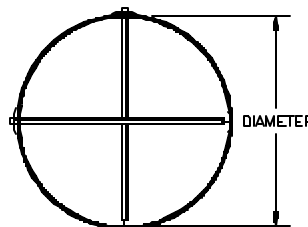
Accuracy

All recognized flow measurement standards (ASHRAE Fundamentals, AMCA Publication 203, Industrial Ventilation Manual, 40CFR60, etc.) agree that accurate airflow measurement is highly dependent upon the quantity and pattern of sensing points in the airstream, and the relative position of the sensing points to upstream/downstream flow disturbances.

When installed per Air Monitor's Minimum Installation Requirements (see back page), the minimum quantity and placement of VOLU-probe/SS airflow traverse probes shown below will produce assured measuring accuracies of $\pm 2-3\%$ of actual airflow.



FOR SQUARE AND RECTANGULAR DUCT



FOR CIRCULAR DUCT

HEIGHT DIMENSION	MINIMUM QTY. OF VOLU-probes RECOMMENDED	HEIGHT DIMENSION	MINIMUM QTY OF VOLU-probes RECOMMENDED
8" TO 12"	1	>54" TO 84"	4
>12" TO 30"	2	>84" TO 120"	5
>30" TO 64"	3	>120" to 180"	6

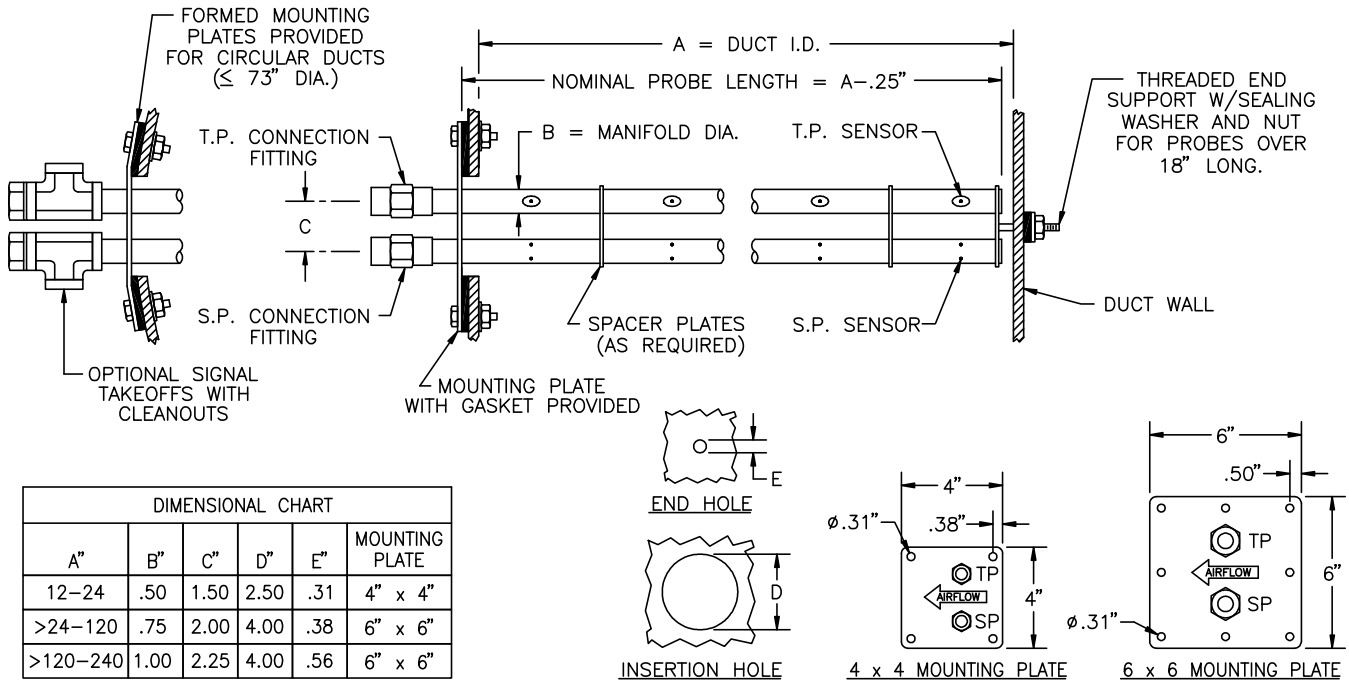
DIAMETER	MINIMUM QTY OF VOLU-probes RECOMMENDED
8" TO 18"	1
>18" TO 72"	2
>72" +	3

VOLU-probe/1SS & 2SS

VOLU-probe/1SS – Externally Mounted

The VOLU-probe/1SS is designed for mounting in ducts or stacks by drilling two holes in opposing walls, without the need to enter those structures.

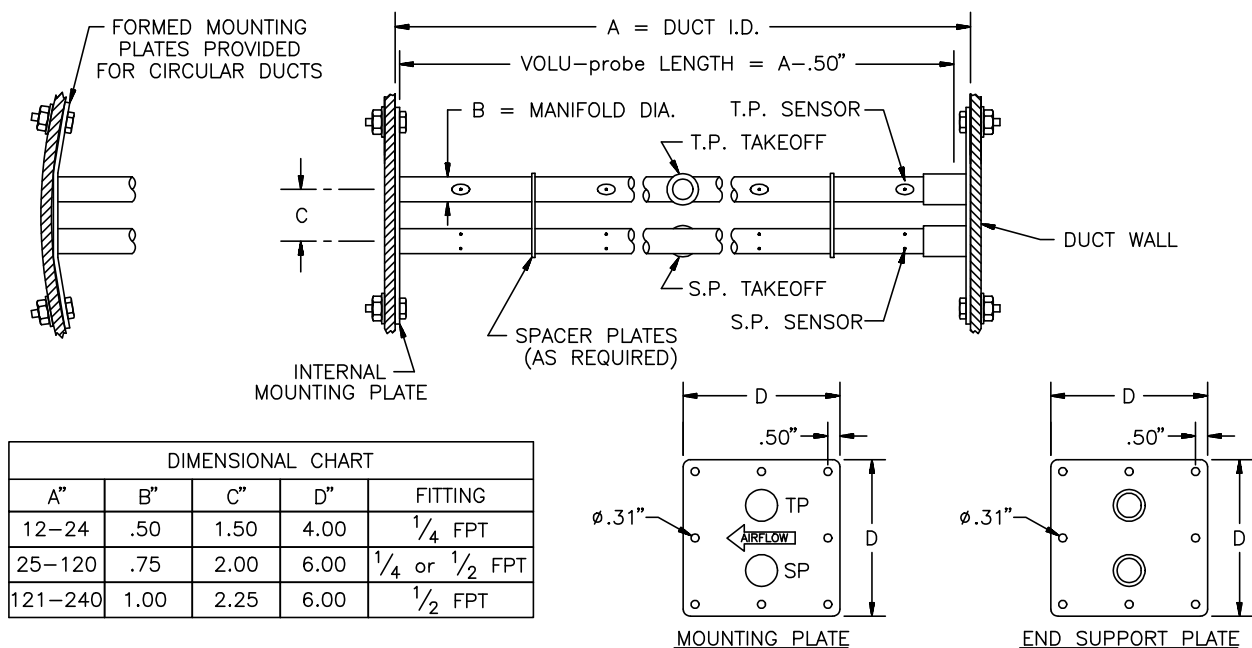
The VOLU-probe/1SS is furnished with a threaded end support, gasketed washer and nut, and a mounting plate with signal take-off FPT connections, all fabricated of type 316 stainless steel.



VOLU-probe/2SS – Internally Mounted

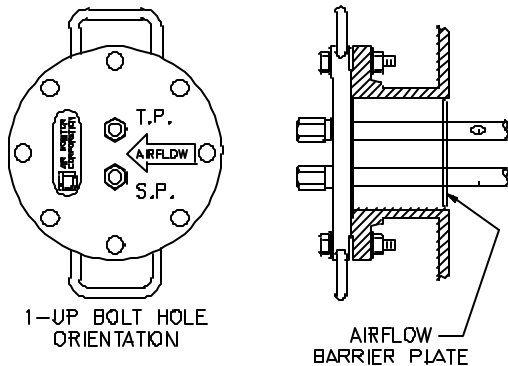
The VOLU-probe/2SS is designed for larger ducts or stacks where the size permits entry for installation, or where duct external accessibility or clearance is insufficient to permit probe mounting from outside the duct.

The VOLU-probe/2SS is furnished with interior mounting and end support plates, and midpoint signal take-off FPT connections, all fabricated of type 316 stainless steel.



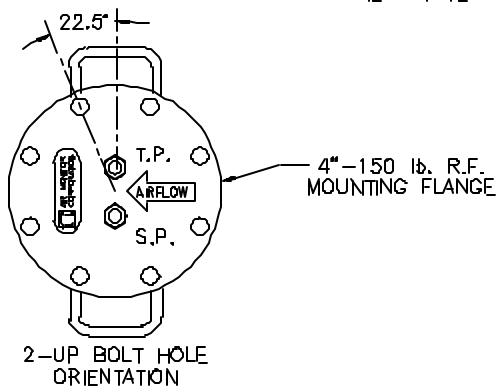
VOLU-probe/SS Options

VOLU-probe/SS – Construction Options



1-UP BOLT HOLE ORIENTATION

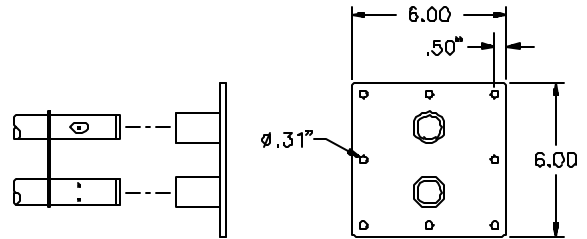
AIRFLOW BARRIER PLATE



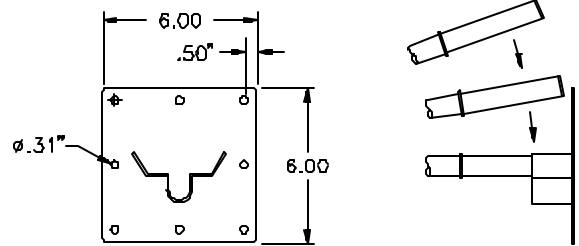
2-UP BOLT HOLE ORIENTATION

4" - 150 lb. R.F. MOUNTING FLANGE

150 lb. Mounting Flange

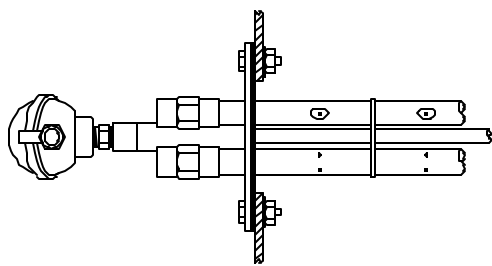


SOCKET

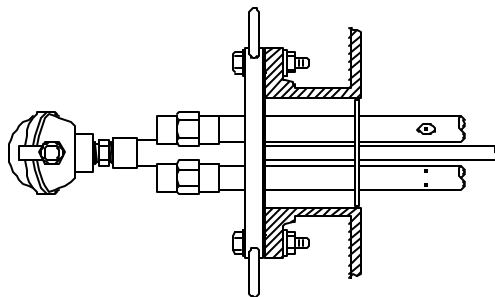


Y-SHAPED

Probe End Supports

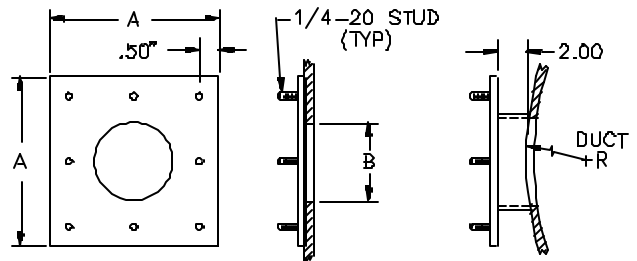


WITH STANDARD MOUNTING PLATE

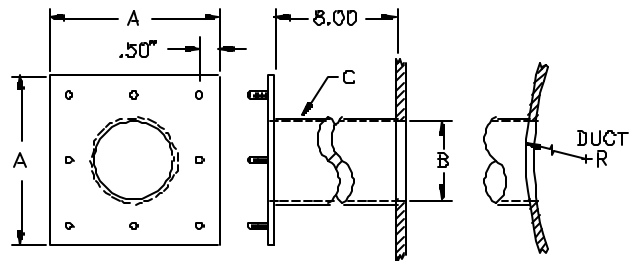


WITH 150lb MOUNTING FLANGE

Temperature Probe



STANDARD



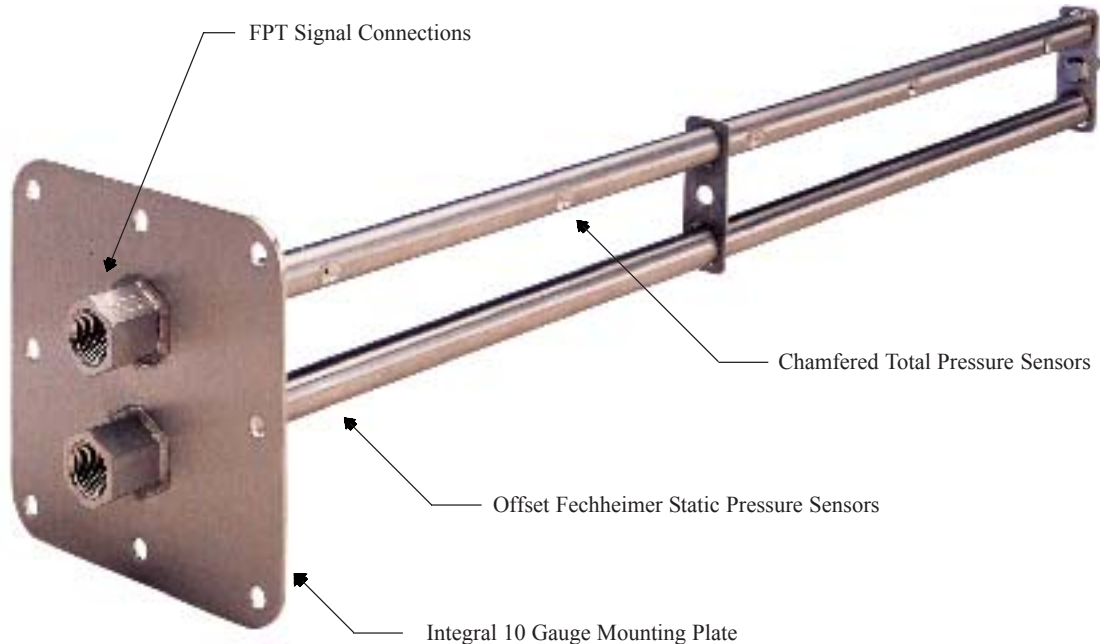
EXTENDED

DIMENSIONAL CHART			
PROBE LENGTH	A"	B"	C (PIPE)
12-24	4.00	Ø2.00	2" SCH 40
25-240	6.00	Ø4.00	4" SCH 40

Companion Mounting Plates

Stainless Steel Airflow Traverse Probes

Construction Features



Features

No Air Straighteners Required. The VOLU-probe/SS unique dual offset static pressure sensor and patented chamfered total pressure sensor design permit the accurate measurement of the airflow rate in highly turbulent flow locations (with directional yaw and pitch varying up to 30° from the duct's longitudinal axis) without the need for upstream air straightening means.

Offered in Two Models. The VOLU-probe/SS is offered in two basic configurations to facilitate installation in new or existing ducts or stacks; the Model 1 for external mounting, and the Model 2 for internal mounting.

Negligible Resistance to Airflow. The VOLU-probe/SS cylindrical configuration and smooth surface free of external sensor protrusions permit the airstream to flow unrestricted around and between the installed traverse probes, creating a very minimal, if not negligible resistance to airflow (Ex: 0.046 IN w.c. at 2000 fpm air velocity).

Performs Equal-Weighted Averaging of Flow Signals. Through the use of separate averaging manifolds, the VOLU-probe/SS instantaneously averages, on an equal-weighted basis, the multiple pressures sensed along the length of the probe, producing separate "averaged" total pressure and static pressures at the probe's external signal connections.

Provides for Equal Area Traverse. Each VOLU-probe/SS contains multiple total and static pressure sensors specifically and precisely located along the length of the probe to provide an equal area traverse of ducted airflow. For rectangular duct configurations, the sensors are spaced at equal distances along the probe. For circular duct configurations, the sensors are located at the centers of the equivalent concentric area along the probe.

True Velocity Pressure Measurement. The total and static pressure components of airflow measured by the VOLU-probe/SS can be directly converted in velocity pressure (and velocity) without the use of correction factors, thereby facilitating flow verification with a Pitot tube or other hand held instrumentation.

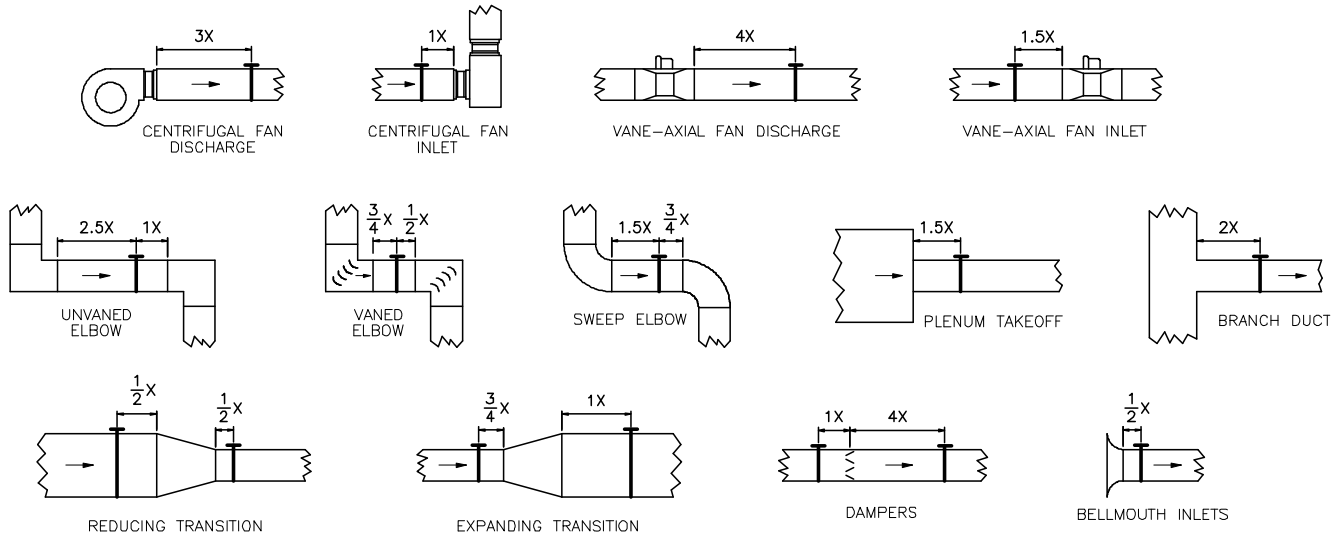
No Sensor Protrusions. The VOLU-probe/SS total and static pressure sensors are all contained within the confines of the external surface of the probe. There are no protruding sensors to be bent, broken, or otherwise damaged during installation or possible subsequent removal for inspection or cleaning.

Rugged Construction Assures Long Service Life. The standard VOLU-probe/SS is fabricated from Type 316 stainless steel using all welded construction. See Page 4 for construction options, and contact Factory for alternate materials of construction such as Hastelloy, Inconel, Kynar, PVC, etc.

VOLU-probe/SS

Minimum Installation Requirements

Note: VOLU-probe/SS locations shown are **not** ideal. The locations indicate the **minimum** clearance required from air turbulence producing sources. Wherever possible, the VOLU-probe/SS should be installed where greater runs of straight duct (or clearances) than shown below exist.



$$\text{Rectangular Duct: } x = \frac{2(H \times W)}{H + W}$$

$$\text{Circular Duct: } x = \text{Duct Diameter}$$

Suggested Specification

Provide where indicated an array of airflow traverse probes capable of continuously monitoring the stack or duct capacities (air volumes) it serves.

Each airflow traverse probe shall contain multiple total and static pressure sensors and internally connected to their respective averaging manifolds. The flow sensors shall not protrude beyond the surface of each probe, and shall be the offset (Fechheimer) type for static pressure and the chamfered impact type for total pressure measurement. The airflow sensing probe's measurement accuracy shall not be affected by directional flow having pitch and/or yaw angles up to 30°.

Each airflow traverse probe shall be fabricated of type 316 stainless steel, all welded construction, and shall be furnished with the flat or curved plate mounting means. In addition, access ports and accessory

hardware shall be provided to facilitate external installation of the probe and end support (if required), yet permitting easy probe removal for inspection, etc.

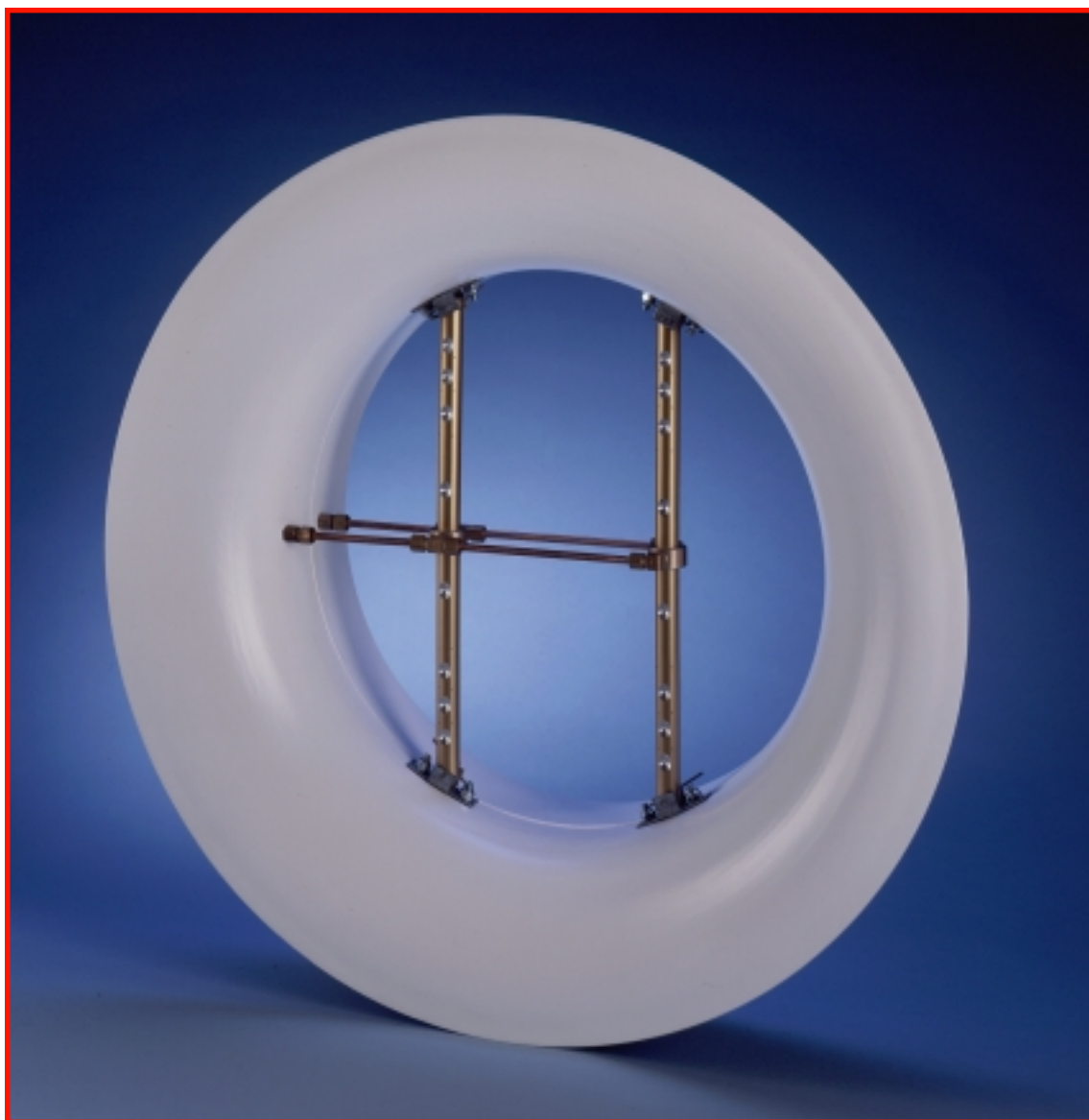
The airflow traverse probe shall not induce a pressure drop in excess of 0.046 IN w.c. at 2000 FPM, nor measurably contribute to sound levels within the duct. Total and static pressure sensors shall be located at the centers of equal areas (for rectangular duct) or at equal concentric area centers (for circular ducts) along the probe length. The airflow traverse probe shall be capable of producing steady, non-pulsating signals of total and static pressure without need for flow corrections or factors, with an accuracy of 2-3% of actual flow, over a velocity range of 400 to 4000 FPM.

The airflow traverse probe(s) shall be the VOLU-probe [1SS, 2SS] as manufactured by Air Monitor Corporation, Santa Rosa, California.



VOLU-probe/FI

Fan Inlet Airflow Traverse Probe



Accurate airflow measurement for demanding applications



AIR MONITOR
CORPORATION

VOLU-probe/FI

Product Description

The VOLU-probe/FI Fan Inlet Airflow Traverse Probe consists of a set of two offset mounted traverse probes, each with multiple sensors formulated on a concentric area basis. The VOLU-probe/FI combines the air processing effect of the nozzle-shaped fan inlet bellmouth with its unique Fechheimer Pitot derivative of the multi-point, self-averaging Pitot to accurately measure inlet velocity pressure (and calculable air volume) for most types of fans.

The VOLU-probe/FI probes are mounted directly in the inlet bellmouth at the throat (minimum diameter). When mounted per Factory recommendations, the measurement capability of the VOLU-probe/FI is not impaired by inlet screens, fan shafts, drive pulleys, guards, adjustable blade pitch (vane-axial fans), etc., downstream of the probe location.

How It Works

The VOLU-probe/FI operates on the principle of a multi-point, self-averaging Pitot tube to measure the total pressure and static pressure components of airflow. Total pressure sensing ports, with chamfered entrances to eliminate air direction effects, are located on the leading surface of the VOLU-probe/FI to sense the impact pressure (P_t) of the approaching airstream (see Figure 2). Pairs of static pressure sensing ports, positioned at the ideal angle on opposing surfaces of the probe, minimize the error inducing effect of directionalized airflow. As the flow direction veers from the normal, one static sensor is exposed to a higher pressure ($P_s + \text{part of } P_t$), whereas the

other static sensor experiences a lower pressure ($P_s - \text{part of } P_t$) of the same magnitude, thereby balancing out the undesired effect of total pressure (P_t). It is this unique design of offset static pressure and chamfered total pressure sensors (see Figure 1) that makes the VOLU-probe/FI insensitive to approaching multi-directional, rotating airflow with yaw and pitch up to 30° from straight flow, thereby assuring the accurate measurement of the sensed airflow rate without the presence of an airflow straightener upstream. This unique design of the VOLU-probe/FI is covered by U.S. Patent No. 4,559,835.

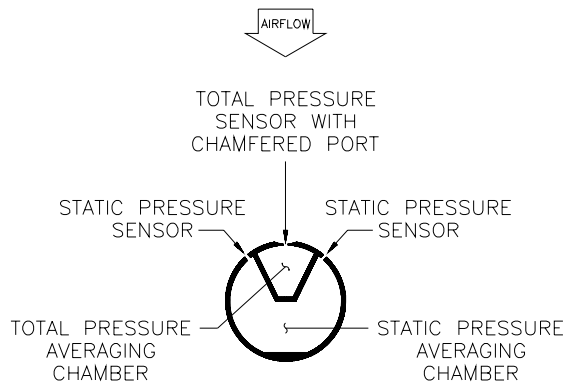


Figure 1

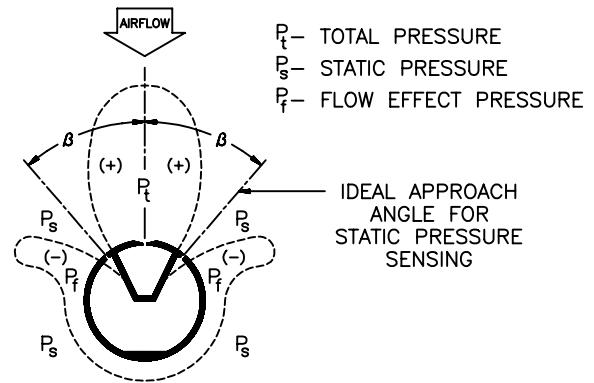


Figure 2

Features

Extruded Aluminum, Anodized Construction. The standard VOLU-probe/FI is constructed of anodized extruded aluminum. The exterior surface of the probe has an anodized finish which prevents the forming of aluminum oxide, and inhibits the effect of many corrosive atmospheres. VOLU-probe/FI's for fan inlets smaller than 20" in diameter are constructed using copper tubing. The VOLU-probe/FI is also available in Type 316 stainless steel, PVC, Kynar, and other materials of construction.

Performs Equal-Weighted Averaging of Flow Signals. The VOLU-probe/FI instantaneously averages, on an equal-weighted basis, all the pressures sensed at the multiple total and static pressure sensors along the length of its probes, in the respective averaging manifolds provided, producing final "averaged" total and static pressure values which are transmitted to the probe's external signal fittings.

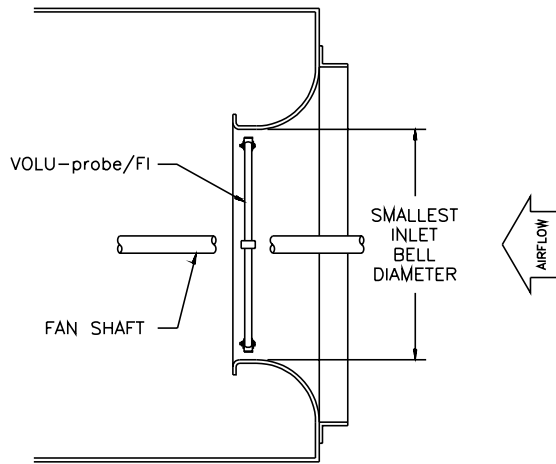
Measurement Accuracy. When correctly installed per Air Monitor's recommended methods and positions, the VOLU-probe/FI fan inlet probe will produce assured measuring accuracy of 3% of actual flow, without significantly impacting fan performance or contributing to fan generated noise.

No Sensor Protrusions. The VOLU-probe/FI's total and static pressure sensors are all contained within the confines of the external surface of the probe. There are no protruding sensors to be bent, broken, or otherwise damaged during installation or with continuous fan operation.

No Correction of Calibration Factors. The VOLU-probe/FI produces velocity pressure (total and static pressure) signals that are identical in basic magnitude to those obtained with the use of a Pitot tube or airflow measuring station and, therefore, do not require the application of any calibration factors.

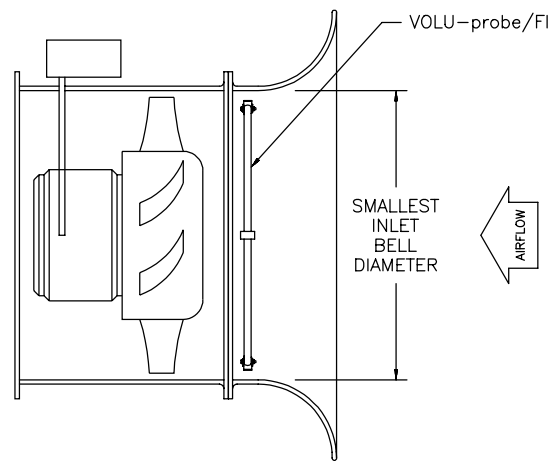
Fan Inlet Airflow Traverse Probe

Standard Fan Inlet Configurations



Note. Where double width, double inlet centrifugal fans are utilized in HVAC system design, a set of the offset-mounted VOLU-probe/FI fan inlet airflow traverse probes must be mounted in each of the two fan inlets and interconnected via signal tubing.

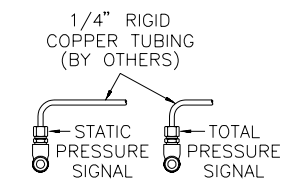
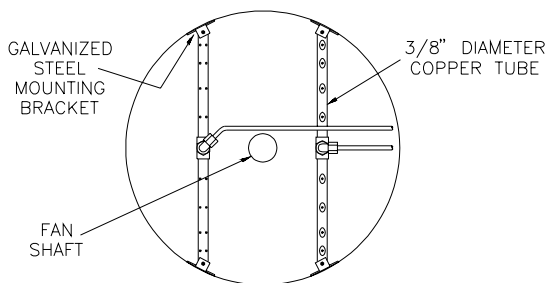
CENTRIFUGAL FANS



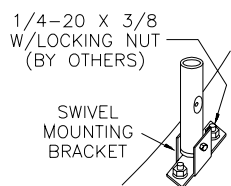
Note. When vane-axial fans are installed in a ducted configuration on the inlet side, the application may require the use of the VOLU-probe/1 designed for ducted airflow. Contact Factory for recommendation.

VANE-AXIAL FANS

Dimensional and Construction Information

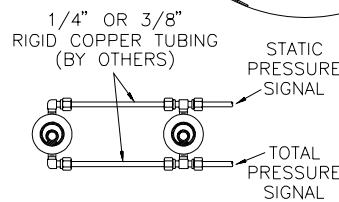
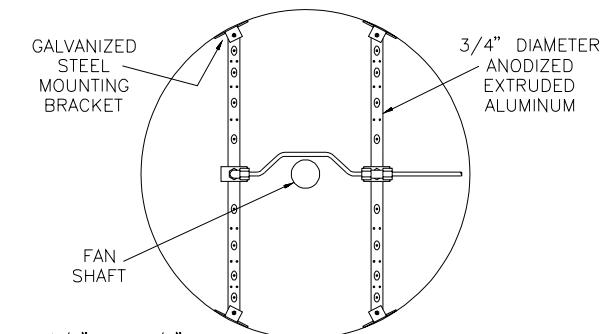


SIGNAL CONNECTION DETAIL

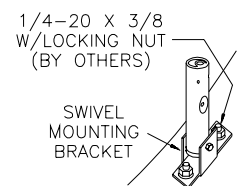


MOUNTING DETAIL

FOR INLETS LESS THAN 20" IN DIAMETER



SIGNAL CONNECTION DETAIL



MOUNTING DETAIL

FOR INLETS 20" IN DIAMETER OR LARGER

VOLU-probe/FI

Application and Sizing

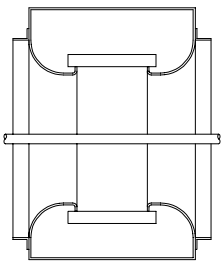
To apply the VOLU-probe/FI to fan inlets, the following determinations must be made:

1. The VOLU-probe/FI was designed specifically to mount in the minimum diameter point of the fan inlet bell. Mounting at any other location on the inlet bell will produce a repeatable flow signal that may require a field determined factor to correlate to actual fan output.
2. When ordering, provide the minimum diameter (mounting location) of the fan inlet bellmouth. DO NOT provide fan wheel diameter.
3. When ordering, advise the presence and size of any fan shaft in the inlet.
4. Due to variations in fan design and construction, contact the Factory regarding application suitability for installation on fans having inlet vanes or dampers, extra large motor shafts, motor mountings in the fan inlet, and any auxiliary equipment that could interfere with probe mounting and connecting tubing.

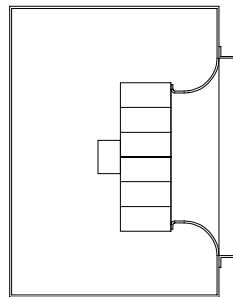
Approved Fan Inlet Installations

It is recognized that any obstruction, depending on the obstruction cross-sectional area versus the fan inlet area ratio, has the potential to affect fan output performance. This factor should be given consideration during the process of fan size selection.

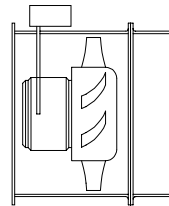
Air Monitor's VOLU-probe/FI has been specifically engineered with three different size inlet probes so as to minimize any impact on operating performance for fans of the types shown below.



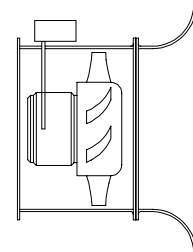
CENTRIFUGAL FAN



PLUG FAN



DUCTED VANE AXIAL



VANE AXIAL
WITH BELLMOUTH

Note: On fans with ducted inlets, the VOLU-probe/FI must still be mounted in the fan inlet bell; otherwise, refer to the VOLU-probe/1,2,3,4 brochure for ducted airflow probes.

Suggested Specification

Fan Inlet Airflow Traverse Probes. Provide on the indicated fans, airflow traverse probes mounted in the fan inlets capable of continuously measuring the air handling capacity (air volume) of the respective centrifugal [or plug, vane-axial] fan(s).

The fan inlet airflow traverse probes shall contain multiple total and static pressure sensors placed at concentric area centers along the exterior surface of the cylindrical probes and internally connected to their respective averaging manifolds. Sensors shall not protrude beyond the surface of the probe, nor be adversely affected by particle contamination normally present in building system airflows.

The fan inlet airflow traverse probes shall have symmetrical averaging signal takeoffs, and shall be of aluminum construction

with hard anodized finish [copper construction] with galvanized steel mounting hardware.

The fan inlet airflow traverse probes shall not significantly impact fan performance or contribute to fan generated noise levels. The probes shall be capable of producing steady, non-pulsating signals of standard total and static pressure, without need for flow corrections or factors, with an accuracy of 3% of actual flow over a fan operating range of 6 to 1 capacity turndown.

The fan inlet airflow traverse probes shall be the VOLU-probe/FI as manufactured by Air Monitor Corporation, Santa Rosa, California.



STAT-probe

Static Pressure Traverse Probe

Air Monitor's STAT-probe Static Pressure Traverse Probe is ideally suited for both new installations and retrofit applications requiring accurate static pressure measurement in locations having limited straight duct runs. Multiple sets of static pressure sensing ports positioned along the entire length of the STAT-probe traverse the airstream in a single line across the duct, and average the sensed pressures in an internal manifold. The STAT-probe is suited for installation in ductwork operating at temperatures up to 200°F. As a primary static pressure sensing means, the STAT-probe can be used in applications ranging from commercial building HVAC to laboratory, pharmaceutical and electronics production, and health care institutions.

Product Specifications

Accuracy. $\pm 2-3\%$; dependent upon quantity and placement of probes to achieve traverse of ducted airflow.

Outputs. Averaged signal of static pressure.

Operating Velocity. 100 to 10,000 FPM.

Directional Sensitivity. Not measurably affected by directional airflows with pitch and yaw angles up to 30°.

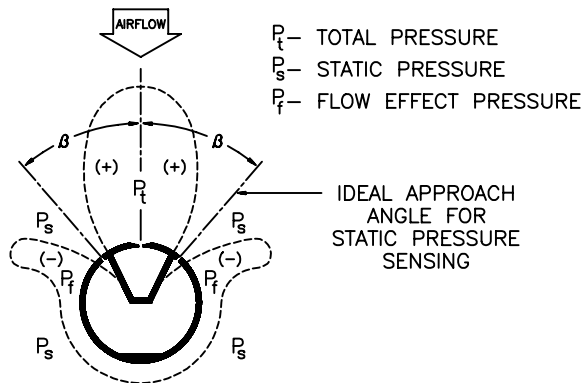
Traverse Pattern. On an equal area basis for rectangular probes. On an equal concentric area basis for circular probes.

Resistance. Less than 0.1 times the velocity pressure head at probe operating velocity.

Construction. Type 6063 anodized aluminum extrusion in $\frac{3}{4}$ " and $1\frac{3}{8}$ " diameters. Aluminum mounting plate. Plated steel fasteners. Standard gasket is neoprene; high temperature gasket is silicone rubber.



How It Works



The STAT-probe operates on the Fechheimer derivative of the multi-point, self-averaging Pitot principle to measure the static pressure component of airflow. Fechheimer pairs of static pressure sensing ports, positioned at designated angles offset from the flow normal vector, minimize the error inducing effect of directionalized airflow. As the flow direction veers from the normal, one static sensor is exposed to a higher pressure ($P_s + \text{part of } P_t$), whereas the other static sensor experiences a lower pressure ($P_s - \text{part of } P_t$) of the same magnitude, thereby canceling out the undesired effect of partial total pressure (P_t). It is this unique design of offset static pressure sensors that makes the STAT-probe insensitive to approaching multi-directional, rotating airflow with yaw and pitch up to 30° from straight flow, thereby assuring the accurate measurement of the sensed static pressure without the presence of an airflow straightener upstream.

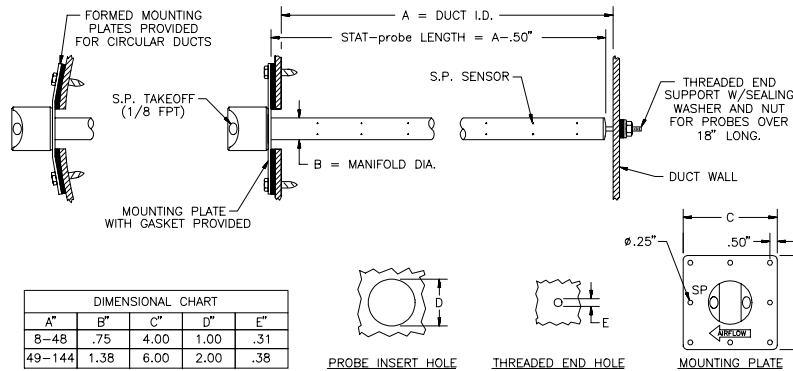
Accurate airflow measurement for demanding applications



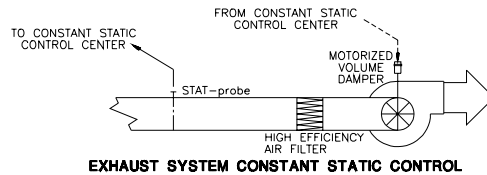
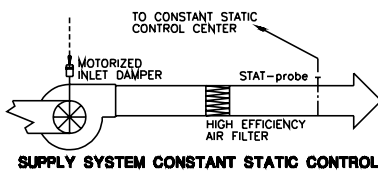
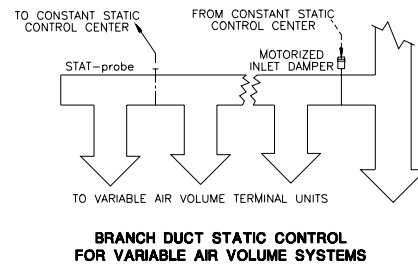
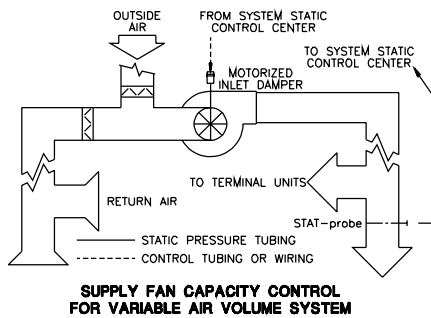
**AIR MONITOR
CORPORATION**

STAT-probe Static Pressure Traverse Probe

Dimensional Specifications



Applications



Design and Installation Guide

Turbulent Airflow. The dual offset static sensor design of the STAT-probe will permit accurate sensing of duct static pressure even in the presence of turbulent and rotational airflows with a maximum 30° yaw and pitch.

Airborne Contaminants. The level of air filtration and cleanliness associated with commercial HVAC systems is satisfactory for operation of the STAT-probe.

Stratified Airflow. The STAT-probe should be mounted so that the probe is across the stratified airflow – not parallel to the flow.

Air Temperature. The STAT-probe, constructed of 6063-T5 anodized aluminum extrusion, is designed to operate in air systems with temperatures up to 200°F.

Direction of Airflow. An arrow indicating the direction of airflow is on the STAT-probe mounting plate to assure proper installation.

Suggested Specification

Provide where indicated duct static traverse probe(s) capable of continuously monitoring the duct or system static pressure it serves.

Each duct static traverse probe(s) shall contain multiple static pressure sensors located along the exterior surface of the cylindrical probe. Said sensors shall not protrude beyond the surface of the probe. The duct static traverse probe(s) shall be of extruded aluminum construction and (except for 3/4" dia. probes with lengths of 24" or less) be complete with threaded end support rod, sealing

washer and nut, and mounting plate with gasket and static pressure signal fitting. The static traverse probe(s) shall be capable of producing a steady, non-pulsating signal of standard static pressure, without need for correction factors, with an instrument accuracy of 1%.

The duct static pressure traverse probe(s) shall be the STAT-probe as manufactured by Air Monitor Corporation, Santa Rosa, California.



ELECTRA-flo / FI

Thermal Fan Inlet Airflow System



System Features

- 2% of reading sensor accuracy
- Mount directly in the inlet of centrifugal or vane axial fans
- Adjustable length support struts simplify ordering and installation
- 0 to 5,000 FPM airflow measurement range
- Two sensors per fan inlet
- Fully field serviceable sensors
- Rugged, anodized probe construction
- Optional LonWorks® communication protocol
- Dual analog outputs (4-20mA, 0-5VDC or 0-10VDC) for airflow and temperature
- Individual sensor self-diagnostics
- High visibility backlit LCD can be mounted up to 100' from station or probe array
- Selectable display of individual sensor velocity and temperature
- Password protected membrane keypad for easy access to all transmitter functions
- Installed accuracy, typically 3-10% of airflow. 2-3% accuracy with field adjustment
- CFD (Computational Fluid Dynamics) and wind tunnel optimized sensor aperture design ensures accurate airflow measurement in angular flow conditions

Accurate airflow measurement for demanding applications



**AIR MONITOR
CORPORATION**

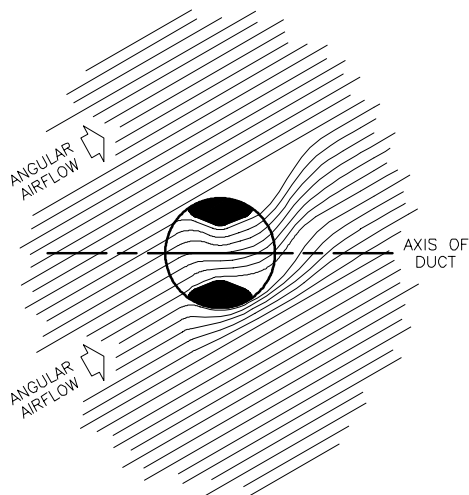
ELECTRA-flo™/FI

How It Works

The ELECTRA-flo utilizes thermal dispersion technology to measure airflow. As air moves across the surface of an elevated temperature sensor, heat is transferred from the sensor to the airflow in a mathematically defined relationship between heat transfer rate and airflow velocity.

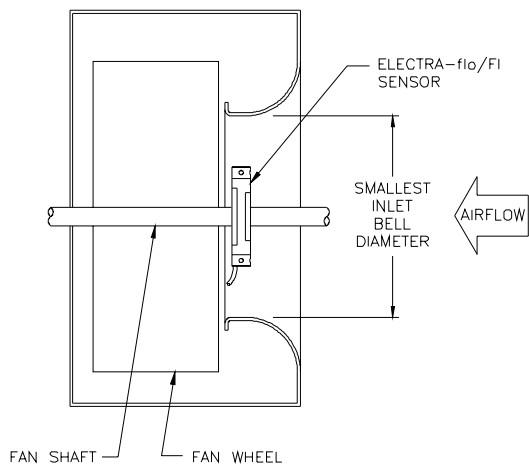
Each ELECTRA-flo sensing node utilizes a pair of precision matched thermistors. One functions as a reference sensor measuring the ambient air temperature at the sensing node location, and the other thermistor is heated to a preset temperature differential (ΔT) above the ambient air temperature. Airflow velocity is determined using the measured ambient air temperature, the known heat transfer characteristics of the heated thermistor, and the power consumed to maintain the ΔT between the two thermistors.

Using a combination of Computational Fluid Dynamics (CFD) modeling and extensive full-scale wind tunnel verification, the aerodynamically optimized cross section of the sensing node aperture prevents error inducing turbulence typical of sharp edged sensing tubes.

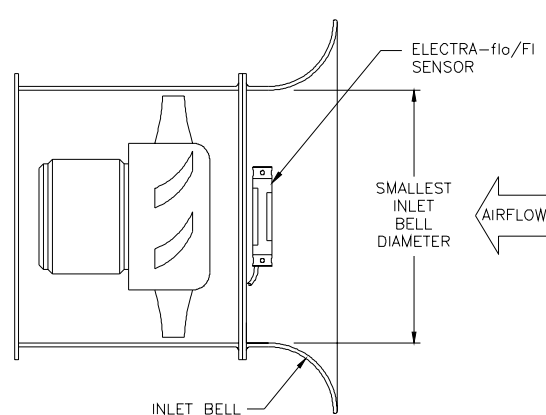


The aperture's injection molded shape has been engineered to minimize the angular flow effects naturally present in any duct. The flared aperture captures a representative sample of the ducted airflow, while the contoured leading edges prevent the creation of vortices. The center cross section of the aperture functions in the same manner as a venturi. It stabilizes and flattens the velocity profile at the point of measurement ensuring the airflow maintains full contact with the sensing thermistors. The flow conditioning characteristic of the aperture compensates for turbulent airflow with pitch and/or yaw angles up to ± 30 degrees and produces an accuracy of $\pm 2\%$ of reading for each ELECTRA-flo sensor.

Applications



Where double inlet centrifugal fans are utilized in HVAC system design, a set of ELECTRA-flo/FI probes must be mounted in each fan inlet.



When vane-axial fans are installed in a ducted configuration on the inlet side, the application may require the use of the ELECTRA-flo designed for ducted airflow. Contact Factory for recommendation.

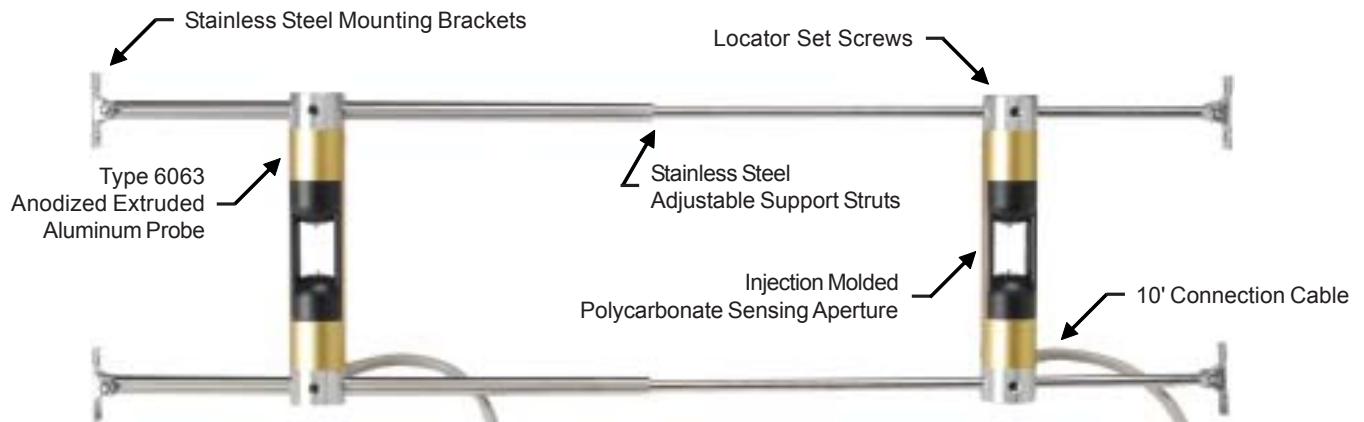
Probe Size Selection

ELECTRA-flo/FI probes are ordered based upon the fan's minimum inlet diameter where the probes are to be mounted. Based upon the inlet diameter, select one of the eight adjustable standard sizes. The chart indicates the range of minimum inlet diameters that each standard size can accommodate.

Range Designator	A	B	C	D	E	F	G	H
Min Inlet Diameter	10.00"	13.00"	17.00"	24.00"	36.00"	48.00"	60.00"	72.00"
Max Inlet Diameter	12.99"	16.99"	23.99"	35.99"	47.99"	59.99"	71.99"	83.99"

ELECTRA-flo™/FI

Construction Features



Product Application

To apply the ELECTRA-flo/FI to fan inlets, the following determinations must be made:

1. The ELECTRA-flo/FI was designed specifically to mount in the minimum diameter point of the fan inlet bell.
2. When ordering, provide the minimum diameter (mounting location) of the fan inlet bellmouth. DO NOT provide fan wheel diameter.
3. When ordering, advise the presence and size of any fan shaft in the inlet.
4. Due to variations in fan design and construction, contact the Factory regarding application suitability for installation on fans having inlet vanes or dampers, extra large motor shafts, motor mounting in the fan inlet, and any auxiliary equipment that could interfere with probe mounting and connecting tubing.

Performance Specifications

SYSTEM

- Flow Accuracy. 3-10% of actual airflow, as installed
2-3% of actual airflow, with field adjustment
- Temperature Accuracy. $\pm 0.1^\circ\text{F}$ of air temperature

PROBE ASSEMBLY

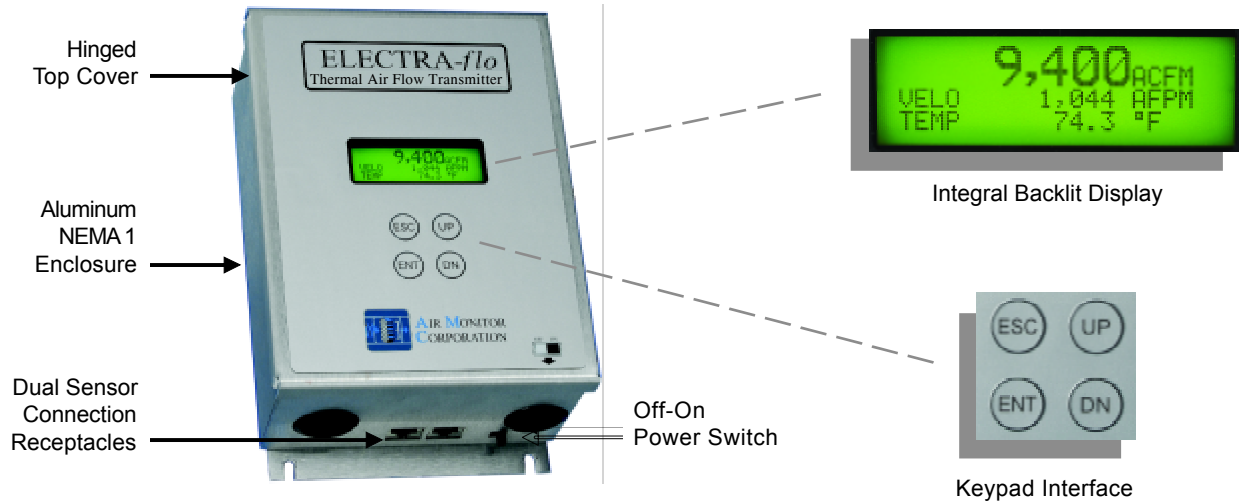
- Sensor Accuracy. Velocity. $\pm 2\%$ of reading
Temperature. $\pm 0.1^\circ\text{F}$
- Sensor Assembly. Injection molded polycarbonate
- Sensor Type. Sealed thermistor
- Sensor Signal Processing. Via microprocessor in each sensor, with calibration data stored in non-volatile memory. Built in 12 bit A/D conversion.
- Number of Calibration Points Per Sensor. 6
- Velocity Calibration Range. 0 to 10,000 FPM
- Humidity Range. 0 to 99.5% RH, non-condensing
- Sensor Mounting. Via stainless steel mounting brackets and support struts
- Probe to Transmitter Signal Connections. Via a shielded cable with RJ-45 connection. Standard length is 10', with optional 50' and 100' lengths.
- Number of Sensors Per Fan Inlet. 2

TRANSMITTER

- Display. Backlit graphical LCD. $\frac{3}{4}'' \times 2\frac{1}{2}''$ display size. Field selectable in U.S. or S.I. units for velocity/flow and temperature.
- Configuration Access. By means of enclosure cover mounted membrane keypad. Password protected.
- Power Supply. 24VAC (20-28VAC) or 24VDC (20-40VDC), with automatic selection.
- Power Consumption. 21-26VA, dependent upon whether the fan is single or dual inlet.
- Circuit Protection. Power input is isolated, fused, and reverse polarity protected.
- Analog Outputs. Dual outputs, field configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC.
- Analog Output Scaling. Field adjustable digital scaling.
 - Velocity Range: 0 to 5,000 FPM
 - Temperature Range: 0 to 140°F
- Analog Output Resolution. 0.02%
- Analog Output Filtering. Field adjustable digital low pass filter
- Network Output Communication. LonWorks® Free Topology
- Humidity Limits. 0 to 99.5% RH, non-condensing
- Temperature Limits. -20°F to 180°F Storage
 -20°F to 140°F Operating
- Enclosure. NEMA 1 aluminum with hinged cover

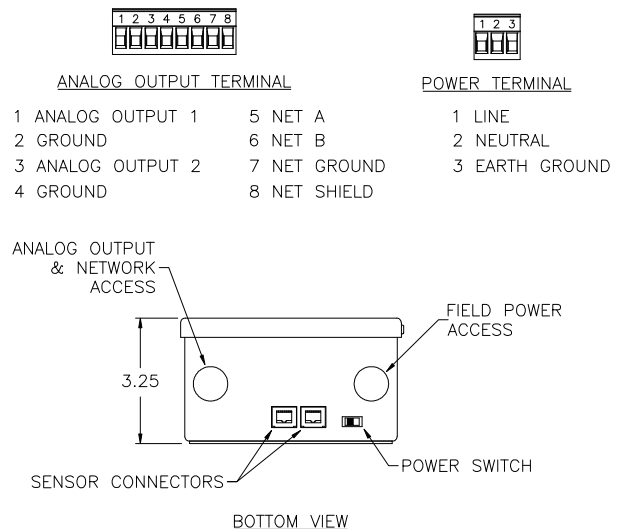
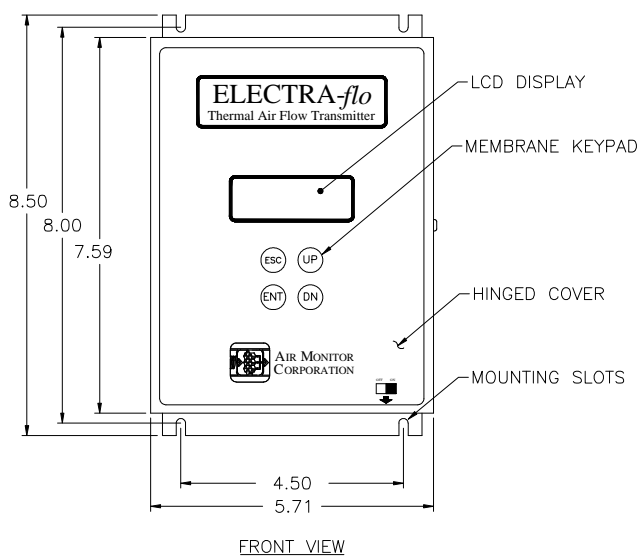
ELECTRA-flo™ "Smart" Transmitter

Construction Features



- **Continuous Display of Process.** The ELECTRA-flo comes equipped with a multi-line, backlit, graphical LCD for use during transmitter configuration and calibration, and to display multiple measured processes in engineering units. The LCD provides one line having double width and height characters for high visibility plus two 20 digit lines having standard size characters, and various descriptors for transmitter operating status.
- **Output Communication.** Standard dual analog outputs can be individually configured for 0-5VDC, 0-10VDC or 4-20mA by means of jumpers. LonWorks® Free Topology is available as an option.
- **Multiple Operating Power Selections.** Standard input power can be either 24VAC or 24VDC with automatic detection and selection.
- **Output Signal Filtering.** To eliminate flow signal pulsations, the ELECTRA-flo transmitter is equipped with a user selectable digital low pass noise filter.
- **Enclosure.** The ELECTRA-flo transmitter is furnished in a NEMA 1 aluminum enclosure with a hinged cover and internal plug-in type terminal strip for ease of field wiring.
- **Individual Sensor Diagnostics.** The ELECTRA-flo transmitter is able to detect any sensor that is operating outside factory preset tolerances, remove that sensor's measured values from the overall airflow average, and generate a visual fault alarm on the LCD.
- **Membrane Keypad Interface.** All transmitter configuration, scaling, and diagnostic functions can be performed by means of a password protected, cover mounted membrane keypad.

Dimensional Information



S.A.P.

Shielded Static Air Probes

The Air Monitor S.A.P. family of static air probes is designed for room or space pressurization applications where it is essential that the static pressure level within a room or space, and that of a reference pressure (corridor, adjacent space, outdoor location, etc.), be accurately sensed, free of pulsations or effects of air movement in the vicinity of the sensing probe(s). The S.A.P. can also be utilized to sense the static pressure within fan inlet and discharge plenums or large ducts, where the presence of multi-directional and turbulent airflows prohibit the use of flow sensitive static pressure tips or probes.

Performance Specifications

- Engineered sensing ports and integral volume chamber suppress minor room, space or plenum pressure pulsations, providing a steady (non-noisy) static pressure signal.
- Capable of sensing room, space or plenum pressures within 1% of actual static pressure.
- Measurement accuracy is unaffected by airflows up to 1,000 FPM from a 360° radial source.
- Available in aluminum or Type 316 stainless steel construction.
- Self draining sensing ports for applications where room or space washdown is required.
- Available in four mounting configurations:
 - S.A.P./B – Electrical Junction Box Mount
 - S.A.P./P – Suspended Mount via 1/2" Pipe
 - S.A.P./S – Surface Mount
 - S.A.P./R – Recessed Flush Mount



Suggested Specification

Shielded Room and Space Static Pressure Sensor

Provide for each room or space, a shielded static pressure sensor suitable for surface [recessed flush; suspended; junction box; external flush] mounting, complete with multiple sensing ports, pressure impulse suppression chamber, airflow shielding, and 1/8" FPT [1/2" FPT (for S.A.P./P)] takeoff fitting, all contained in an aluminum [316 stainless steel] casing, with brushed finish on exposed surfaces. These probes shall be capable of sensing the static pressure in the proximity of the sensor to within 1% of the actual pressure value while being subjected to a maximum airflow of 1,000 FPM from a 360° radial source.

The shielded room or space static pressure sensors shall be the S.A.P. [B /P /S /R] shielded static air probe as manufactured by Air Monitor Corporation, Santa Rosa, California.

Shielded Plenum or Duct Static Pressure Sensor

Provide where indicated for each plenum [duct], two shielded static pressure sensors suitable for mounting externally on the plenum [duct] wall in opposing positions. The plenum [duct] pressure sensors shall be complete with multiple sensing ports, pressure impulse suppression chamber, airflow shielding, and 1/8" FPT takeoff fitting, all contained in an aluminum [316 stainless steel] casing, with brushed finish on exposed surfaces. These probes shall be capable of sensing the static pressure of the plenum or duct in the proximity of the sensor to within 1% of the actual pressure value.

The shielded plenum or duct static pressure sensors shall be the S.A.P./R shielded static air probe as manufactured by Air Monitor Corporation, Santa Rosa, California.

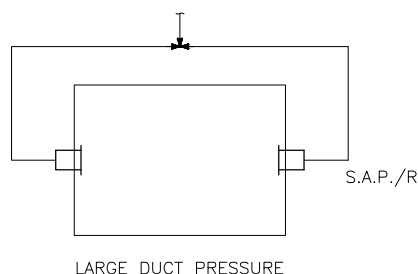
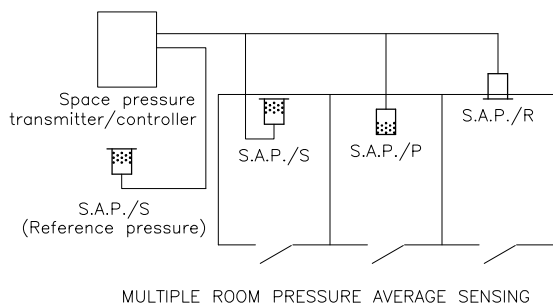
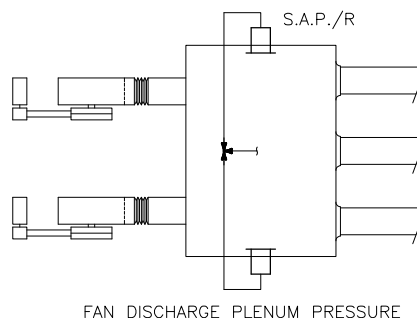
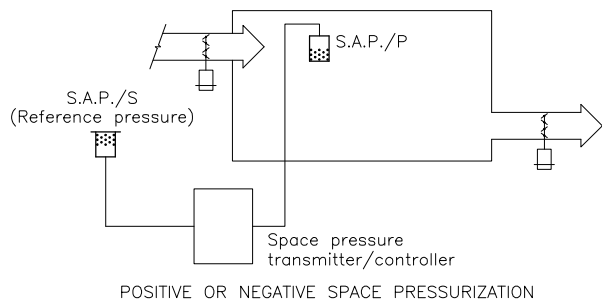
Accurate airflow measurement for demanding applications



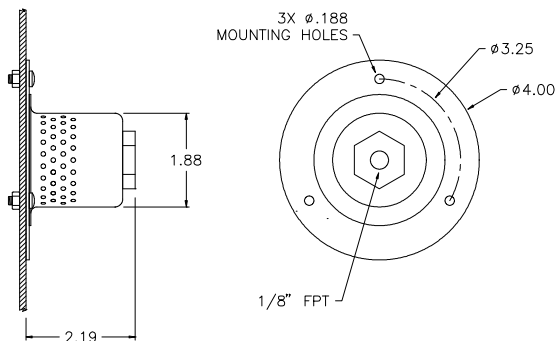
**AIR MONITOR
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S.A.P. – Shielded Static Air Probes

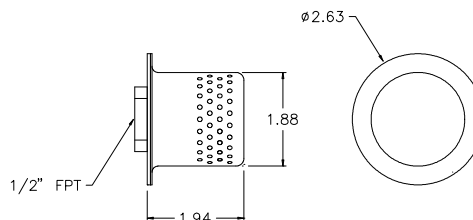
Application Examples



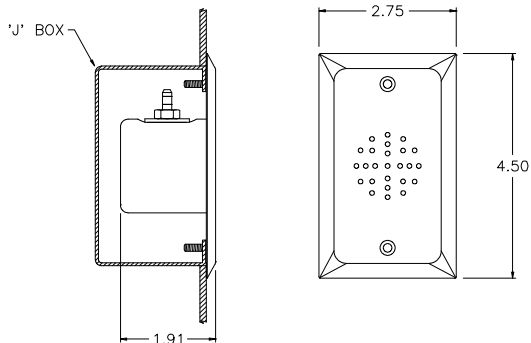
Construction / Dimensional Data



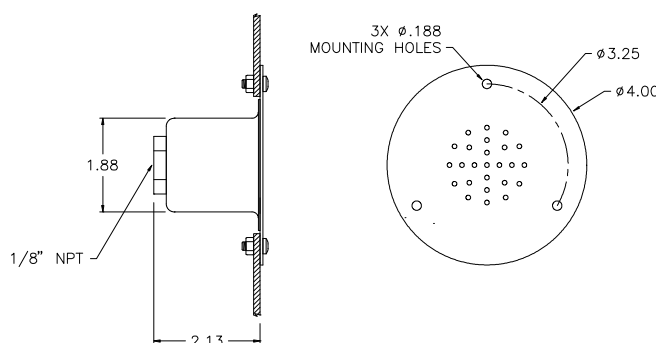
S.A.P./S Surface mount; 1/8" FPT signal connection



S.A.P./P Suspended mount via 1/2" pipe; 1/2" FPT signal connection



S.A.P./B Recessed flush mount via electrical junction box (provided by others)



S.A.P./R Recessed flush mount; 1/8" FPT signal connection



S.O.A.P.

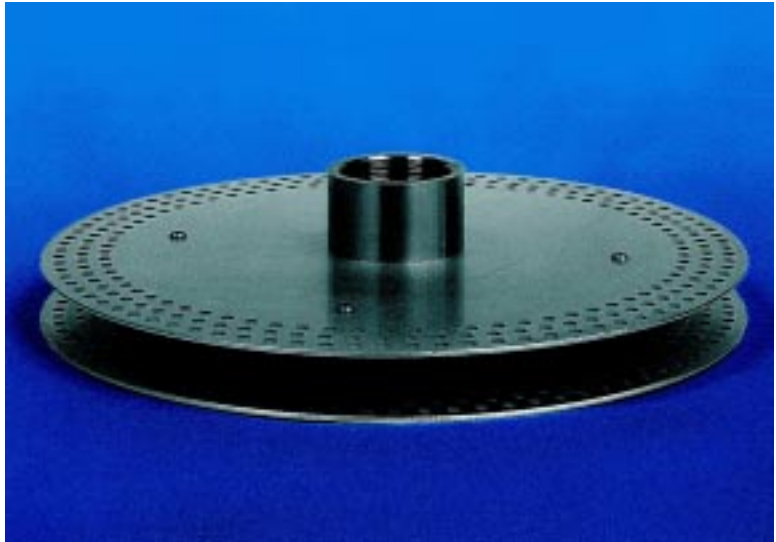
Static Outside Air Probe

Product Description

Air Monitor's S.O.A.P. static outside air probe is designed for accurate and instantaneous sensing of outside static air pressure levels.

To optimize the performance of the S.O.A.P., it must be located away from all structures and obstacles of sufficient size to create a wind induced pressure envelope. Typical locations are on an elevated position in an outdoor parking lot, in a below ground recess (landscaped or lawn area), away from buildings, in a below ground location like a parking garage with non-forced ventilation, or on a rooftop mounted pole sufficiently elevated to be outside any anticipated wind induced pressure envelope.

The circular shape of the S.O.A.P. presents a 360° radial entrance for the flow of air (wind) through the sensor. The perforations located on the entering air edges of the parallel plates act as a means of diffusing the entering airflow to minimize the effect of non-horizontal flow on the sensor performance, thereby permitting entry flows with approach angles up to 60° from the horizontal without affecting the accuracy of the pressure measurement. The perforations located near the center of the bottom plate opposite the signal connection serve to relieve the venturi effect that will develop with higher airflow rates (winds) through parallel plates, thereby permitting non-pulsating sensing in the presence of high wind gusts. It is the combined action of the above unique design features of the S.O.A.P. static outside air probe that permits it to sense the outside atmospheric air pressure to within 1% of the actual value when being subjected to varying horizontal radial wind flows with velocities up to 40 miles per hour and sense within 2% and 3% when subjected to similar wind flows having approach angles up to 30° and 60° to the horizontal respectively.



Product Features

- Capable of sensing the outside atmospheric air pressure to within 1% of the actual value.
- Sensing accuracy not affected by wind velocities up to 40 miles per hour.
- Unique circular parallel plate design maintains sensing accuracy regardless of flow (wind) direction or pattern.
- Perforations on plate edges diffuse the effect of wind approach angles on sensor performance.
- Operation not affected nor impaired by rain or snow.
- Made entirely of Type 316 stainless steel.
- Construction has no moving parts nor required maintenance.
- Mounting via 2" FPT stainless steel connection fitting.

Accurate airflow measurement for demanding applications



**AIR MONITOR
CORPORATION**

S.O.A.P. Static Outside Air Probe

The Need for a Stable, Common Pressure Reference

For the accurate measurement and/or control of room, laboratory, space, or building pressurization, it is essential that these sensed pressure levels be referenced to a common pressure. Ideally, that reference is the outdoors. But the usual outdoor sensor, because of its design, has to be

shielded from the wind, and often ends up located where it will be subjected to the pressure envelope developed by the wind's effect upon the building, refer to Figure 1 below. The magnitude of the pressure envelope that can be created by various wind velocities is also shown below.

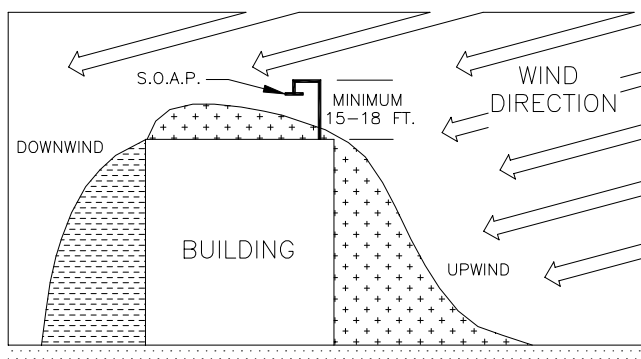
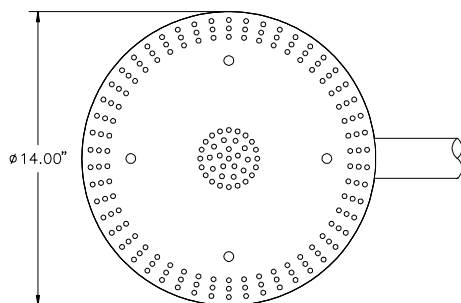


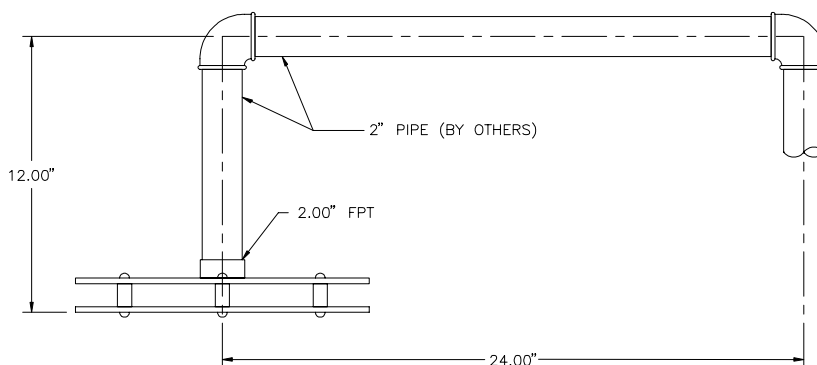
Figure 1

WIND VELOCITY MILES PER HOUR	UPWIND SIDE INCHES W.C.	DOWNWIND SIDE INCHES W.C.
10	0.035	- 0.015
15	0.088	- 0.025
20	0.14	- 0.050
25	0.22	- 0.065
30	0.30	- 0.090
35	0.42	- 0.125
40	0.54	- 0.180
45	0.70	- 0.260
50	0.85	- 0.340
55	1.06	- 0.425
60	1.28	- 0.540
65	1.70	- 0.700

Dimensional Specification



BOTTOM VIEW



SIDE VIEW

Suggested Specification

Provide for the room or space static pressure indicating or controlling systems an outdoor static pressure sensor constructed of 10 ga. Type 316 stainless steel with a 2" diameter FPT connection.

The outdoor air probe shall be capable of sensing the outside atmospheric air pressure to within 2% of the actual value when

subjected to radial wind velocities up to 40 miles per hour with approach angles up to 30° to the horizontal.

The static outside air probe shall be the S.O.A.P. as manufactured by Air Monitor Corporation, Santa Rosa, California.



**AIR MONITOR
CORPORATION**

VELTRON DPT 2500

Ultra-Low Differential Pressure and Flow Transmitter

The VELTRON DPT 2500 is both a differential pressure and flow transmitter. As a differential pressure transmitter, the VELTRON DPT 2500 converts static or differential pressure signals into a 4-20mA DC output linear to the sensed pressure. By means of a user selectable integral square root function, the VELTRON DPT 2500 converts the total and static pressure signals from a flow element into a 4-20mA DC output linear to airflow velocity or volume.

Performance Specifications

- Accuracy. $\pm 0.5\%$ of Natural Span, including non-linearity, hysteresis, and non-repeatability.
- Ranges.

Natural Spans	Bi-Polar Natural Spans
0 to 10.00 IN w.c.	-10.00 to 10.00 IN w.c.
0 to 5.00 IN w.c.	- 5.00 to 5.00 IN w.c.
0 to 2.00 IN w.c.	- 2.00 to 2.00 IN w.c.
0 to 1.00 IN w.c.	- 1.00 to 1.00 IN w.c.
0 to 0.50 IN w.c.	- 0.50 to 0.50 IN w.c.
0 to 0.25 IN w.c.	- 0.25 to 0.25 IN w.c.
0 to 0.10 IN w.c.	- 0.10 to 0.10 IN w.c.
- Temperature Effect. Zero: 0.015% of Natural Span/ $^{\circ}$ F
Span: 0.015% of Natural Span/ $^{\circ}$ F
- Power Supply. 14-40VDC.
- Power Consumption. 0.5 watts at 24VDC.
- Output Signal. 4-20mA DC, 2-wire configuration.
- Maximum Overpressurization. 25 psig.
- Temperature Limits. +40 $^{\circ}$ F to 120 $^{\circ}$ F Operating.



Features

Custom Calibrated Spans. The VELTRON DPT 2500 has built-in span adjustment capability to permit matching the transmitter's calibrated span to the process maximum operating condition. The transmitter can be Factory or field calibrated as low as 40% of its Natural Span.

Accuracy. The VELTRON DPT 2500 is capable of maintaining an accuracy of 0.5% of Natural Span. For a span of 0 to 0.10 IN w.c., this is equivalent to an output accuracy of ± 0.0005 IN w.c. differential pressure or ± 6.33 FPM velocity.

Primary Signal Noise Filter. To eliminate background noise and pulsations from the flow signal, the VELTRON DPT 2500 is equipped with a user selectable low pass filter.

Integral Zeroing Means. Each VELTRON DPT 2500 is furnished with a built-in 3-way zeroing valve, permitting the transmitter to be zeroed by simply positioning the valve switch, eliminating the potential of transmitter damage that can occur during disconnecting and reconnecting input signal lines.

Continuous Display of Process (optional). The VELTRON DPT 2500 can be equipped with a 3½ digit Liquid Crystal Display (LCD) to provide a continuous readout of the measured process in engineering units (Inches w.c., SCFM, lbs/hr, etc.).

Linear-to-Flow (Velocity and Volume) Output Signal. The VELTRON DPT 2500 incorporates a user selectable integral square root extractor capable of automatically using the square root of the differential pressure signal from a flow station or probe array to produce an output signal linear to flow (velocity). In addition, an integral multiplier circuit permits scaling of the output signal magnitude to produce a signal linear and scaled to air volume.

NEMA 12 Enclosure for Harsh Environments. The VELTRON DPT 2500I is furnished with a NEMA 12 steel enclosure with bulkhead signal connection fittings, quick release latch, conduit connection port, and internal tubing, wiring, and terminal strip. Enclosure is also furnished with oil-resistant gasket and integral mounting plate. Contact Factory for other enclosure options.

Accurate airflow measurement for demanding applications



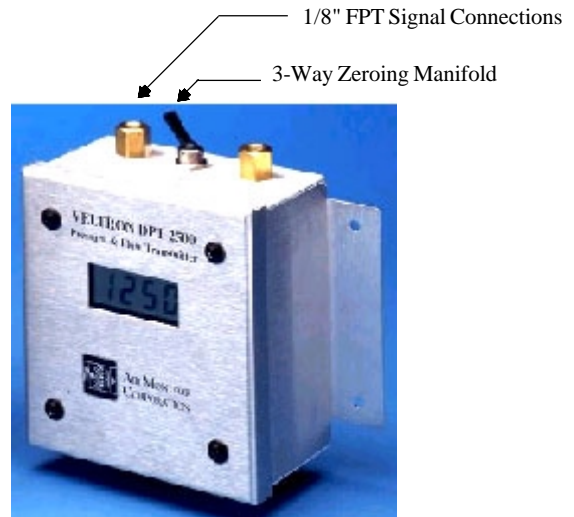
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VELTRON DPT 2500

Construction Features

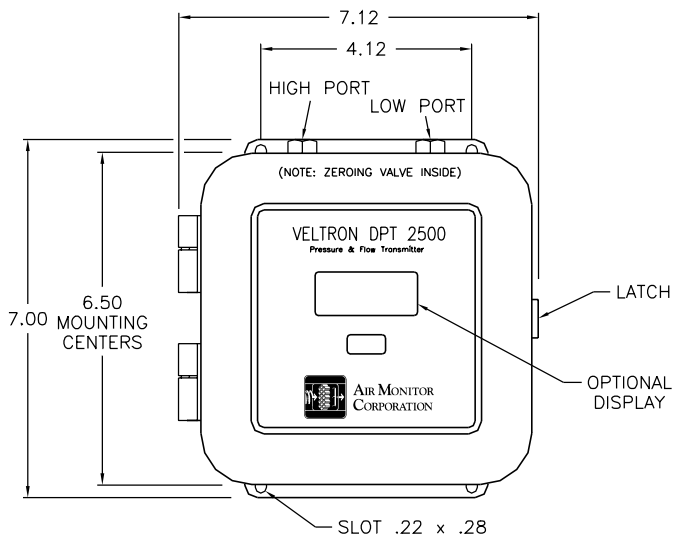


VELTRON DPT 2500I-D

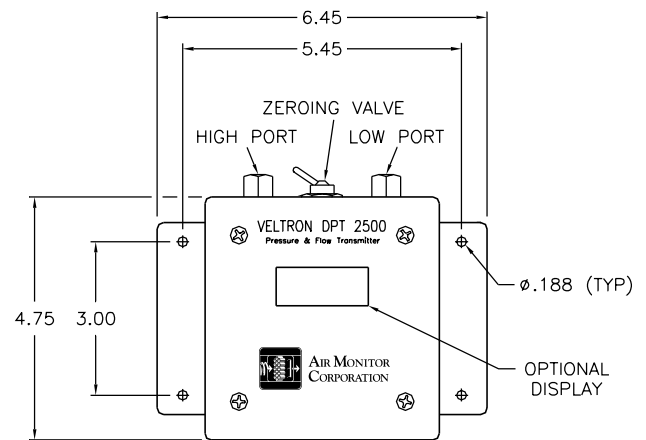


VELTRON DPT 2500-D

Dimensional Specifications



VELTRON DPT 2500I



VELTRON DPT 2500

Suggested Specification

The transmitter shall have an accuracy of $\pm 0.5\%$ of Natural Span and be furnished with a built-in 3-way zeroing valve, user selectable square root function, and integral $3\frac{1}{2}$ digit scalable LCD for display of measured process. The transmitter shall be housed in a NEMA 1 aluminum [NEMA 12 steel] enclosure with universal $\frac{1}{8}$ " signal connection ports.

The transmitter shall be the VELTRON DPT 2500 [2500I] as manufactured by Air Monitor Corporation, Santa Rosa, California.



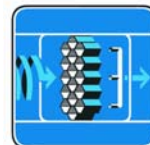
NEW
0.25% ACCURACY

VELTRON DPT 2500-*plus*

**Microprocessor Based
Ultra-Low Differential Pressure and Flow Transmitter**



Accurate airflow measurement for demanding applications



**AIR MONITOR
CORPORATION**

VELTRON DPT 2500-*plus*

with Automatic Zeroing Circuit

The VELTRON DPT 2500-*plus* transmitter is furnished with an automatic zeroing circuit capable of electronically adjusting the transmitter zero at predetermined time intervals while simultaneously holding the transmitter output signal.

The automatic zeroing circuit eliminates all output signal drift due to thermal, electronic or mechanical effects, as well as the need for initial or periodic transmitter zeroing. For transmitters operating in a moderately steady temperature location (thus no thermally

induced span drift), this automatic zeroing function essentially produces a "self-calibrating" transmitter. The automatic zeroing circuit will re-zero the transmitter to within 0.1% of its operating span; for a transmitter with a 0.02 IN w.c. operating span, this represents a zeroing capability within 0.00002 IN w.c.

To permit manual calibration of the VELTRON DPT 2500-*plus*, an electronic switch is provided to permit manual positioning of the zeroing valve.

Performance Specifications

Transmitter

Ranges.	Natural Spans	Bi-Polar Natural Spans
	0 to 25.00 IN w.c.	
	0 to 10.00 IN w.c.	-10.00 to 10.00 IN w.c.
	0 to 5.00 IN w.c.	- 5.00 to 5.00 IN w.c.
	0 to 2.00 IN w.c.	- 2.00 to 2.00 IN w.c.
	0 to 1.00 IN w.c.	- 1.00 to 3.00 IN w.c.
	0 to 0.50 IN w.c.	- 0.50 to 0.50 IN w.c.
	0 to 0.25 IN w.c.	- 0.25 to 0.25 IN w.c.
	0 to 0.10 IN w.c.	- 0.10 to 0.10 IN w.c.
	0 to 0.05 IN w.c.	- 0.05 to 0.05 IN w.c.

Accuracy.

0.25% of Natural Span, including non-linearity, hysteresis, deadband, and non-repeatability.

Span Rangeability.

The calibrated span can be down ranged to 40% of the Natural Span.

Stability.

±0.5% of Natural Span for six months.

Transducer Response Time.

0.5 second to reach 98% of a step change.

Temperature Effect.

Zero. None; corrected by AUTO-zero.
Span. 0.015% of Full Span/°F.

Mounting Position Effect.

None; corrected by AUTO-zero.

Span and Zero Adjustment.

Digital, via internally located push-buttons.

Automatic Zeroing.

Accuracy. Within 0.1% of calibrated span.
Frequency. Every 1 to 24 hours on 1 hour intervals.

Low Pass Filtration.

Response time to reach 98% of a step change is adjustable from 0.5 to 250.0 seconds.

Max Zero Elevation.

100% of Natural Full Span. Requires bi-polar transducer.

Max Zero Suppression.

50% of Natural Full Span. Requires bi-polar transducer.

Overpressure and Static Pressure Limit.

25 psig.

Temperature Limits.

-20 to 180°F Storage; +40 to 140°F Operating.

Humidity Limits.

0-95% RH, non-condensing.

Display.

Backlit, graphical LCD providing single line of data display.

Analog Output.

Single transmitter output individually configurable via jumpers for 0-5VDC, 0-10VDC, or 4-20mADC.

Power Supply.

24VAC (16-28VAC) or 24VDC (16-40VDC).

Power Consumption.

8VA at 24VAC; 6VA at 24VDC.

Circuit Protection.

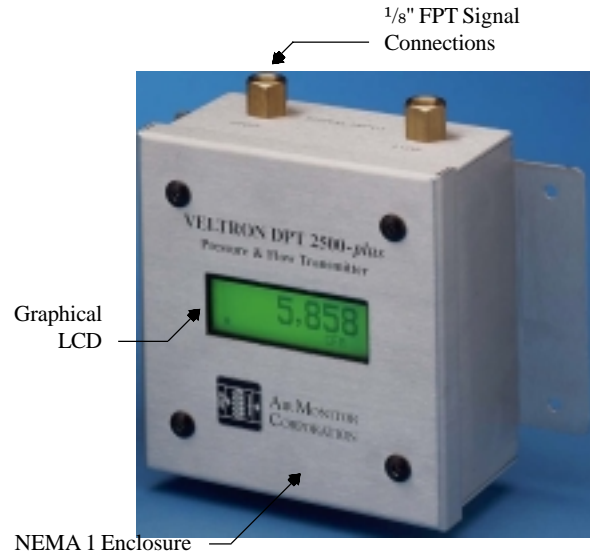
Power input is isolated, fused, and reverse polarity protected.

Ultra-Low Differential Pressure & Flow Transmitter

Construction Features



VELTRON DPT 2500-*plus* – NEMA 12



VELTRON DPT 2500-*plus* – NEMA 1

Features

Accuracy. The VELTRON DPT 2500-*plus* is designed to maintain an accuracy of 0.25% of Natural Span. For a span of 0 to 0.05 IN w.c., this accuracy is equivalent to an output accuracy of ± 0.000125 IN w.c. differential pressure or $\pm 0.1.12$ FPM velocity at span.

Continuous Display of Process. The VELTRON DPT 2500-*plus* is equipped with a backlit, graphical LCD for use during the configuration and calibration process, and to display the transmitter output during normal operating mode. During normal operation, the LCD displays the transmitter output with 0.45 inch high characters.

Analog Communication. Output signal can be individually configured for 0-5VDC, 0-10VDC, or 4-20mADC by means of jumpers.

Electronic Respanning. The VELTRON DPT 2500-*plus* operating span can be electronically selected anywhere between the Natural Span and 40% of Natural Span, without having to perform recalibration involving an external pressure source.

Primary Signal Noise Filter. To eliminate background noise and pulsations from the flow signal, the VELTRON DPT 2500-*plus* is equipped with a user selectable digital low pass filter.

Microprocessor Based Functionality. The VELTRON DPT 2500-*plus*' on-board microprocessor performs the functions of operating parameter selection, transmitter configuration, input/output and display signal scaling, and transducer calibration.

High Turndown Ratio Operation. The VELTRON DPT 2500-*plus*, with its high level of accuracy and automatic zeroing circuitry, can maintain linear output signals on applications requiring velocity turndown of 10 to 1.

Multiple Operating Power Selections. Standard input power supplied to the VELTRON DPT 2500-*plus* can be either 24VAC or 24VDC via automatic selection.

Enclosure. The VELTRON DPT 2500-*plus* is furnished in a NEMA 1 aluminum enclosure with internal wire terminations. For harsh environments, the VELTRON DPT 2500-*plus* is available with a NEMA 12 steel enclosure with bulkhead signal connection fittings, quick release latch, conduit connection port, and internal tubing, wiring, and terminal strip. The enclosure is also furnished with an oil-resistant gasket and integral mounting plate.

VELTRON DPT 2500-plus

Physical Specifications

Signal Connections.

High and low pressure, 1/8" FPT.

Electrical Connections.

Internal terminals.

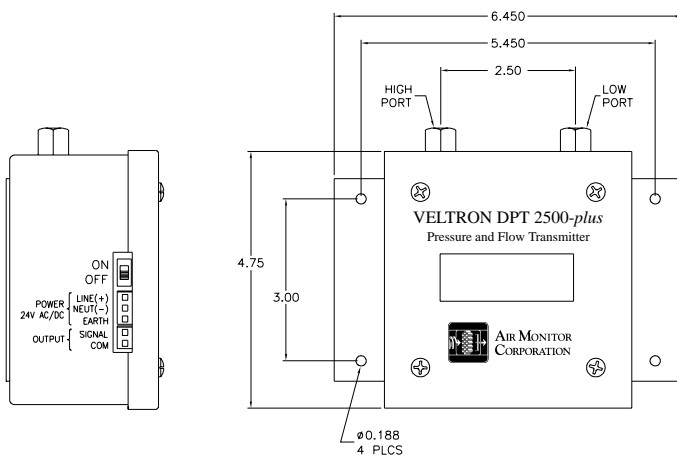
Enclosure.

NEMA 1 aluminum enclosure. NEMA 4 & 12 optional.

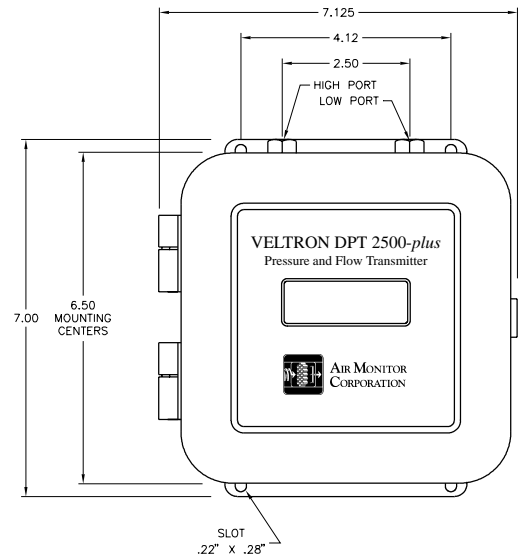
Weight.

4.1 lbs.

Dimensional Specifications



VELTRON DPT 2500-plus – NEMA 1



VELTRON DPT 2500-plus – NEMA 12

Suggested Specification

The transmitter shall be capable of receiving flow signals (total and static pressure) from an airflow station or probe array and produce an output linear and scaled for air volume, velocity, differential pressure, etc.

The transmitter shall contain an integral multi-line digital display for use during the configuration and calibration process, and to display one transmitter output during normal operating mode. All transmitter configuration, parameter setting, zero and span calibration, plus display formatting and scaling will be performed digitally in the on-board microprocessor via input pushbuttons.

The transmitter will be available in multiple natural spans covering the range of 0.05 IN w.c. to 25.0 IN w.c. with an accuracy of 0.25% of natural span. The transmitter shall be furnished with a transducer automatic zeroing circuit and be capable of maintaining linear output signals on applications requiring 10 to 1 velocity turndown.

The transmitter shall be the VELTRON DPT 2500-plus as manufactured by Air Monitor Corporation, Santa Rosa, California.



VELTRON II

Microprocessor Based Pressure & Flow "Smart" Transmitter



Accurate airflow measurement for demanding applications



**AIR MONITOR
CORPORATION**

VELTRON II

with Automatic Zeroing Circuit

The VELTRON II transmitter is furnished with an automatic zeroing circuit capable of electronically adjusting the transmitter zero at predetermined time intervals while simultaneously holding the transmitter output signal.

The automatic zeroing circuit eliminates all output signal drift due to thermal, electronic or mechanical effects, as well as the need for initial or periodic transmitter zeroing. For transmitters operated in temperature controlled spaces (with no thermal effect upon span),

this automatic zeroing function essentially produces a "self-calibrating" transmitter. The automatic zeroing circuit will re-zero the transmitter to within 0.1% of its operating span; for a transmitter with a 0.02 IN w.c. operating span, this represents a zeroing capability within 0.00002 IN w.c.

To permit manual calibration of the VELTRON II, an electronic switch is provided to permit manual positioning of the zeroing valve.

Performance Specification

Ranges.	Natural Spans	Bi-Polar Natural Spans
	0 to 25.00 IN w.c.	
	0 to 10.00 IN w.c.	-10.00 to 10.00 IN w.c.
	0 to 5.00 IN w.c.	- 5.00 to 5.00 IN w.c.
	0 to 2.00 IN w.c.	- 2.00 to 2.00 IN w.c.
	0 to 1.00 IN w.c.	- 1.00 to 3.00 IN w.c.
	0 to 0.50 IN w.c.	- 0.50 to 0.50 IN w.c.
	0 to 0.25 IN w.c.	- 0.25 to 0.25 IN w.c.
	0 to 0.10 IN w.c.	- 0.10 to 0.10 IN w.c.
	0 to 0.05 IN w.c.	- 0.05 to 0.05 IN w.c.

Accuracy. 0.1% of Natural Span, including non-linearity, hysteresis, deadband, and non-repeatability

Span Rangeability. The calibrated span can be down ranged to 40% of the Natural Span.

Stability. $\pm 0.5\%$ of Natural Span for six months.

Transducer Response Time. 0.5 second to reach 98% of a step change.

Temperature Effect. Zero. None; corrected by AUTO-zero. Span. 0.015% of Full Span/ $^{\circ}$ F.

Mounting Position Effect. None; corrected by AUTO-zero.

Functional Specification

Digital Outputs. Form C dry contacts rated for 3 amps at 24VAC/VDC for optional HI/LO alarm. Dual Form A dry contacts rated for 3 amps at 24VAC/VDC for AUTO-purge activation and acknowledgment.

Digital Inputs. Dry contact for AUTO-purge external start.

Analog Outputs. Dual transmitter outputs are individually configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. Two additional outputs are optionally available.

Analog Inputs. A single input is field configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. For use with optional special function.

Network Communication. Optional ModBus TCP/IP over Ethernet or LonWorks.

Power Supply. Standard 24VAC (20-28VAC) or 24VDC (20-40VDC). Optional 120VAC (100-132VAC), via external transformer.

Power Consumption. Standard: 18VA at 24VAC; 13VA at 24VDC; 36VA at 120VAC. With AUTO-purge Management: 54VA at 24VAC; 48VA at 24VDC; 108VA at 120VAC.

Overpressure and Static Pressure Limit. 25 psig.

Low Pass Filtration. Response time to reach 98% of a step change is adjustable from 2.0 to 250.0 seconds.

Automatic Zeroing. Accuracy. Within 0.1% of calibrated span. Frequency. Every 1 to 24 hours on 1 hour intervals.

Circuit Protection. Power input is isolated, fused, and reverse polarity protected.

Span and Zero Adjustment. Electronic adjustment via keypad.

Display. Standard 2 line x 20 characters LCD provides one line of data display. Optional (standard on MASS-tron II) backlit, graphical LCD provides indication of up to four process variables. Triple-size digits for main process variable, standard size characters for the other process variables.

Humidity Limits. 0-95% RH, non-condensing.

Temperature Limits. -20 to 180 $^{\circ}$ F Storage. +40 to 140 $^{\circ}$ F Operating.

Ultra-Low Differential Pressure & Flow "Smart" Transmitter

Construction Features



Features

Accuracy. The VELTRON II is designed to maintain an accuracy of 0.1% of Natural Span. For a span of 0 to 0.05 INw.c., this accuracy is equivalent to an output accuracy of ± 0.00005 IN w.c. differential pressure or 0.45 FPM velocity at span.

Continuous Display of Process. All VELTRON II's are equipped with a 2x20 liquid crystal display (LCD) for use during the configuration and calibration process, and to display one transmitter output during normal operating mode. Standard on the MASS-tron and optional for both the VELTRON II and VEL-trol II is a multi-line, backlit, graphical LCD providing up to four lines of data display, with each line individually scalable in user selectable format and units of measure. For high visibility, the main process variable (flow) is displayed with easy-to-read, triple-size digits. Other process variables are displayed with standard size digits.

Analog Communication. Each analog input and output signal can be individually configured for 0-5VDC, 0-10VDC, or 4-20mA DC by means of a single jumper.

Electronic Respanning. The VELTRON II operating span can be electronically selected anywhere between the Natural Span and 40% of Natural Span, without having to perform recalibration involving an external pressure source.

Primary Signal Noise Filter. To eliminate background noise and pulsations from the flow signal, the VELTRON II is equipped with a user selectable digital low pass filter.

High Turndown Ratio Operation. The VELTRON II, with its high level of accuracy and automatic zeroing circuitry can maintain linear output signals on applications requiring velocity turndown of 10 to 1 (equal to a velocity pressure turndown of 100 to 1).

Microprocessor Based Functionality. The VELTRON II's on-board microprocessor performs the functions of operating parameter selection, transmitter configuration, input/output and display signal scaling, and transducer calibration. Imbedded software performs span, flow, and 3-point "K" factor calculations. Input to the microprocessor is via pushbutton.

AUTO-purge Management (optional). For "dirty air" applications requiring the use of an Air Monitor AUTO-purge system, the VELTRON II provides the capabilities of establishing purge frequency and duration while giving the user a choice of either internally timed cycle frequency or externally triggered purge initiation. During the purge cycle all transmitter outputs are maintained at their last value prior to the start of the purge cycle.

Special Functions and Alarm Capability. The VELTRON II is capable of performing one of five special application functions using a second transmitter as an input: Summed flow, flow differential, low signal select, high signal select, or percent deviation. The special function output can be both displayed and provided as an analog output signal. Alarms related to the measured process can be configured for one of three modes: Low/LowHigh/Low, and High/High.

Multiple Operating Power Selections. Standard input power supplied to the VELTRON II can be either 24VAC or 24VDC via automatic selection. An optional 120VAC external power transformer (UL listed) can be provided.

Enclosure. The VELTRON II is furnished in a NEMA1 aluminum enclosure with external, unitary plug in terminal strips for ease of installation and removal. An optional junction box is available for applications requiring enclosed field wiring.

MASS-tron II

Via the addition of both process temperature and pressure compensation, the ultra high accuracy VEITRON II becomes the MASS-tron II multi-variable mass flow transmitter. The process temperature input is an analog signal from a remote 4-wire or loop powered temperature transmitter; with the MASS-tron II having the capability of performing the linearization. The process pressure is measured by means of an internal absolute pressure transducer connected to the transmitter's static pressure signal input.

Performance Specifications

In addition to those available with the VEITRON II, the MASS-tron II includes these performance specifications:

Analog Output. 0-5VDC, 0-10VDC or 4-20mA for process differential pressure, temperature, and absolute pressure.

Analog Input. 0-5VDC, 0-10VDC or 4-20mA for process temperature.

Temperature Compensation Selection. Pushbutton selection of linearized or non-linearized input, thermocouple or 100 ohm platinum RTD temperature sensor type:

Type E	-50 to 1750°F	-50 to 950°C
Type T	-50 to 750°F	-50 to 400°C
Type J	-50 to 2000°F	-50 to 1090°C
Type K	-50 to 2000°F	-50 to 1090°C
RTD	-50 to 1500°F	-50 to 815°C

Pressure Compensation. Absolute pressure (atmospheric or duct static), up to 60 IN Hg.



*Shown with standard 4-line graphic LCD

VEL-trol II



*Shown with optional 4-line graphic LCD

The VEL-trol II incorporates a controller into the ultra high accuracy VELTRON II transmitter, providing the three modes of proportional, integral reset, and inverse derivative to permit the controller to be tuned to the extreme dynamics of critical airflow and pressurization control processes. The selection of the P, I, 1/D tuning parameters is accomplished using the password protected membrane switch pushbuttons on the front of the enclosure. By means of a dry contact input, the controller operating set point can be switched from the internal fixed setpoint to an externally provided fixed or variable input.

Performance Specifications

In addition to those available with the VEITRON II, the VEL-trol II includes these performance specifications:

Analog Output. 0-5VDC, 0-10VDC or 4-20mA for controller output.

Analog Input. 0-5VDC, 0-10VDC or 4-20mA for controller external setpoint.

Digital Input. Dry contact for soft start command.

Specifications

Physical Specifications

Signal Connections.

High and low pressure, 1/8" FP T.

Electrical Connections.

External terminal strip with plug-in connectors. Optional terminal strip enclosure with dual 3/4" (.875" actual) conduit connections.

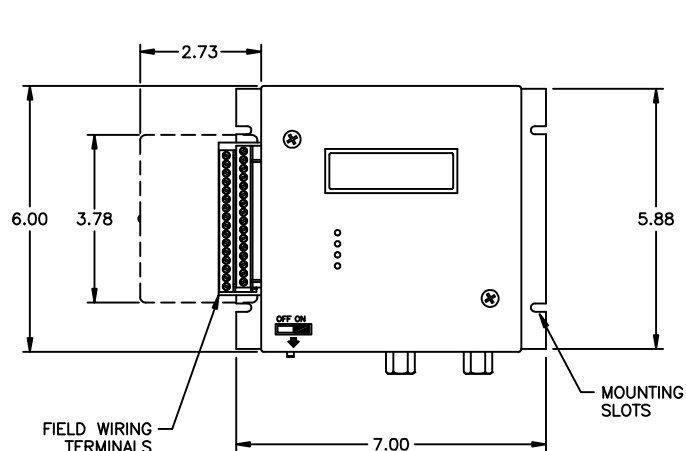
Enclosure.

NEMA 1 aluminum enclosure.

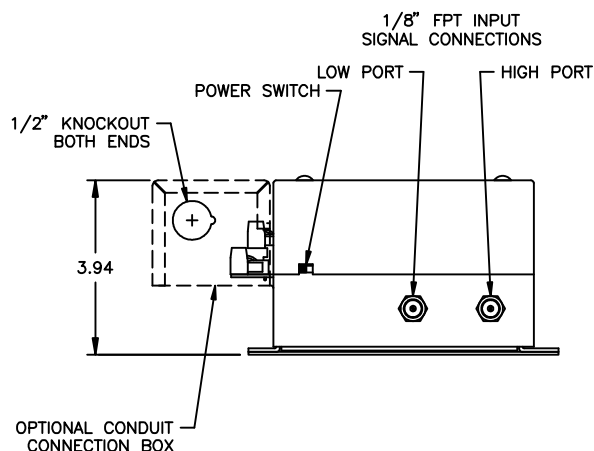
Weight.

4.1 lbs.

Dimensional Specifications



FRONT VIEW



BOTTOM VIEW

Suggested Specification

The transmitter shall be capable of receiving flow signals (total and static pressure) from an airflow station or probe array and produce dual outputs linear and scaled for air volume, velocity, differential pressure, etc.

The transmitter shall contain an integral multi-line digital display for use during the configuration and calibration process, and to display one transmitter output during normal operating mode. All transmitter configuration, parameter setting, zero and span calibration, plus display formatting and scaling will be performed digitally in the on-board microprocessor via input pushbuttons.

The transmitter will be available in multiple natural spans covering the range of 0.05 INw.c. to 10.0 INw.c. with an accuracy of 0.1% of natural span. The transmitter shall be furnished with a transducer automatic zeroing circuit and be capable of maintaining linear output signals on applications requiring 10 to 1 velocity (100 to 1 pressure) turndown.

The transmitter shall be capable of having its operating span electronically selected without having to perform recalibration involving an external pressure source.

(Optional) The transmitter shall be capable of receiving an external temperature input, internally perform density correction for the process absolute pressure and temperature, and provide individual analog outputs linear and scaled for standard air volume or mass flow, temperature and absolute pressure.

(Optional) The transmitter shall include an integraP,I,1/D three-mode controller capable of controlling at a user selectable internal or external setpoint, and providing an analog output control signal.

(Optional) The transmitter will provide the means of managing a system for automatic high pressure purge of the airflow station or probe array, with user selectable purge frequency and duration, while maintaining the last transmitter output during the purge cycle.

(Optional) Using a second transmitter as an input, the internal microprocessor can perform a summed flow, flow differential, low signal select, high signal select or percent deviation calculation, with the result being displayed and provided as an analog output signal.

The transmitter shall be the VELTRON II [MASS-tron II or VEL-trol II] as manufactured by Air Monitor Corporation, Santa Rosa, California.

Air Monitor's Product Families of Flow Measurement and Pressure Products



FAN-E AIRFLOW MEASURING STATION.

Multi-point, self-averaging, Pitot traverse station with integral air straightener-equalizer honeycomb cell. Capable of continuously measuring fan discharges or ducted airflow with an accuracy of 2% or better

AMCA CERTIFIED in accordance with Standard 610 for airflow measurement station performance.



VOLU-PROBE /1, 2, 3, 4 AIRFLOW TRAVERSE PROBES & STATIONS.

Multi-point, self-averaging, Pitot Fechheimer airflow traverse probes and stations with integral airflow direction correcting design ensures accurate measurement. Various mounting configurations to fit every application.

AMCA CERTIFIED in accordance with Standard 610 for airflow measurement station performance.



VOLU-PROBE/FI FAN INLET AIRFLOW PROBES.

Multi-point, self-averaging, Pitot Fechheimer airflow probes with integral airflow direction correcting design.

For mounting directly in the inlet cones or bellmouth of centrifugal or vane-axial fans to measure fan capacities within 3% of actual flow



VOLU-probe/SS STAINLESS STEEL AIRFLOW TRAVERSE PROBES.

Multi-point, self-averaging, Pitot-Fechheimer airflow traverse probes with integral airflow direction correcting design. Constructed of type 316 stainless steel and available in externally and internally mounted versions for harsh, corrosive or high temperature applications such as fume hood, laboratory exhaust, pharmaceutical, and clean room production and dirty industrial process applications.



S.A.P. /B, P, S, R STATIC PRESSURE SENSORS.

Available in four separate mounting configurations, the S.A.P family of static pressure sensors generate a steady non-pulsating output of room, space or plenum pressure.

S.A.P. sensors are available in aluminum or stainless steel construction.



VOLU-flu/OAM OUTSIDE AIR MONITOR.

Monitor/Controller designed to accurately measure outside air to assist in meeting air ventilation requirements of ASHRAE 62-99. Capable of accurate measurement throughout flow turndown range of 16:1 and unaffected by rain, wind, and airborne debris. Optional measurement station provides simple installation and commissioning.



PLUS SERIES

ELECTRA-flo

Thermal Airflow Measurement System



Accurate airflow measurement for demanding applications



AIR MONITOR
CORPORATION

System Features

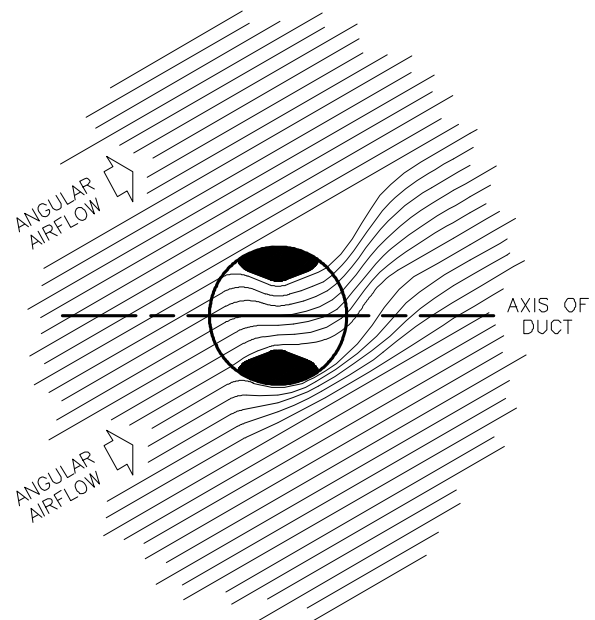
- Measurement accuracy: 2-3% of actual airflow
- 0 to 5,000 FPM (optional 0-10,000 FPM) air velocity measurement range
- Up to 32 measurement points per station or probe array
- Fully field serviceable sensors
- Rugged, hermetically sealed sensor construction for resistance to breakage and thermal shock
- Optional BACnet or LonWorks® communication protocols
- Dual analog outputs (4-20mA, 0-5VDC or 0-10VDC) for airflow and temperature
- Individual sensor self-diagnostics
- High visibility backlit LCD can be mounted up to 100' from station or probe array
- Selectable display of individual sensor velocity and temperature
- Password protected membrane keypad for easy access to all transmitter functions
- Insertion, fan inlet, and station mounted probes to suit application requirements
- Optional integral honeycomb cell for stations located in highly disturbed airflow
- CFD (Computational Fluid Dynamics) and wind tunnel optimized sensor aperture design ensures accurate airflow measurement in angular flow conditions

How It Works

The ELECTRA-flo utilizes thermal dispersion technology to measure airflow. As air moves across the surface of an elevated temperature sensor, heat is transferred from the sensor to the airflow in a mathematically defined relationship between heat transfer rate and airflow velocity.

Each ELECTRA-flo sensing node utilizes a pair of precision matched thermistors. One functions as a reference sensor measuring the ambient air temperature at the sensing node location, and the other thermistor is heated to a preset temperature differential (ΔT) above the ambient air temperature. Airflow velocity is determined using the measured ambient air temperature, the known heat transfer characteristics of the heated thermistor, and the power consumed to maintain the ΔT between the two thermistors.

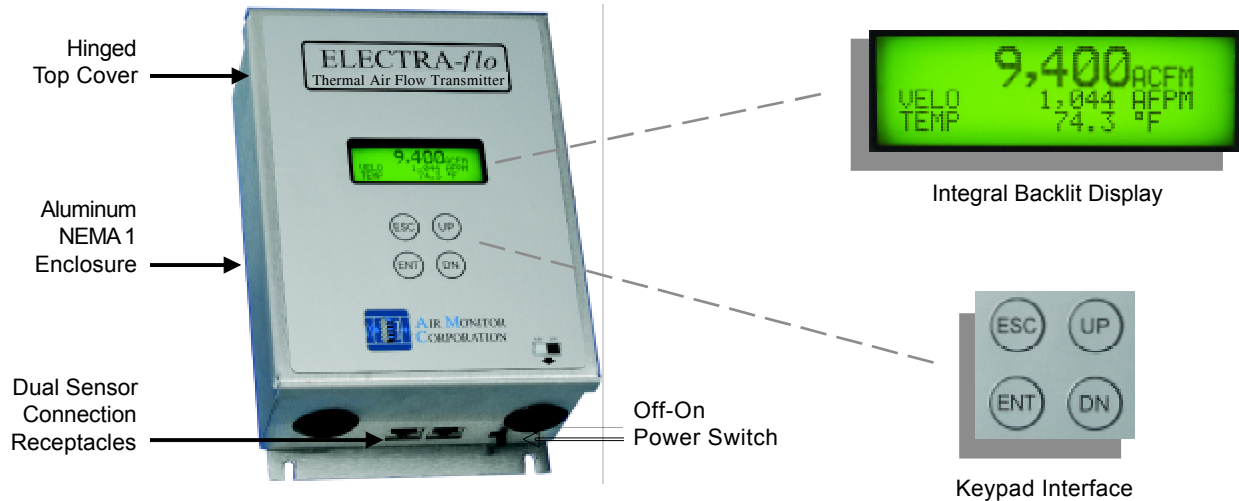
Using a combination of Computational Fluid Dynamics (CFD) modeling and extensive full-scale wind tunnel verification, the aerodynamically optimized cross section of the sensing node aperture prevents error inducing turbulence typical of sharp edged sensing tubes.



The aperture's injection molded shape has been engineered to minimize the angular flow effects naturally present in any duct. The flared aperture captures a representative sample of the ducted airflow, while the contoured leading edges prevent the creation of vortices. The center cross section of the aperture functions in the same manner as a venturi. It stabilizes and flattens the velocity profile at the point of measurement ensuring the airflow maintains full contact with the sensing thermistors. The flow conditioning characteristic of the aperture compensates for turbulent airflow with pitch and/or yaw angles up to ± 30 degrees and produces an accuracy of $\pm 2\%$ of reading for each ELECTRA-flo sensor.

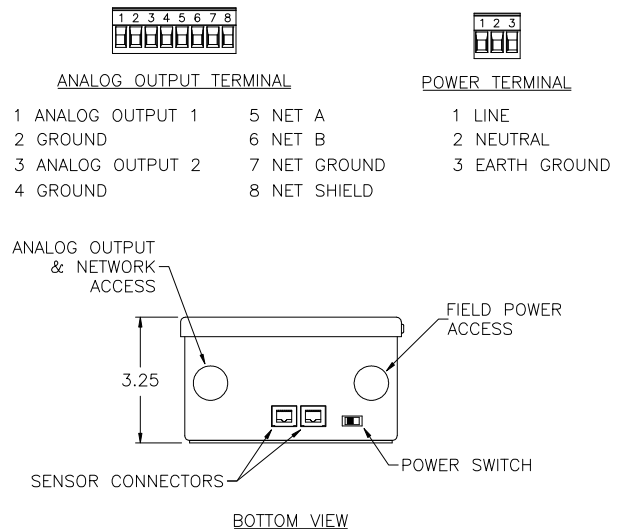
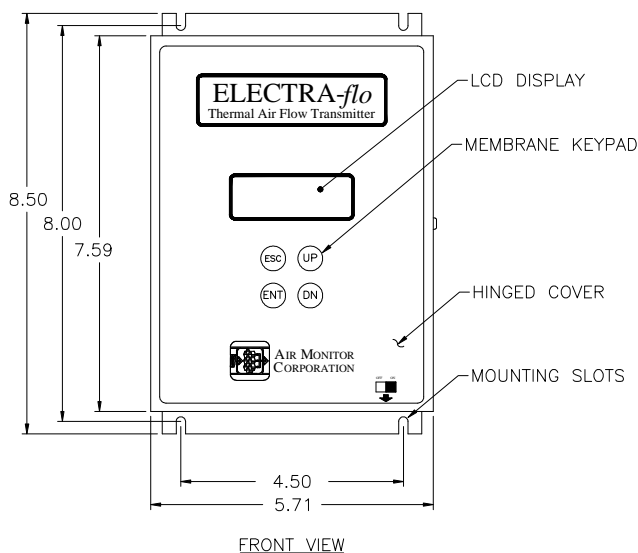
ELECTRA-flo™ "Smart" Transmitter

Construction Features



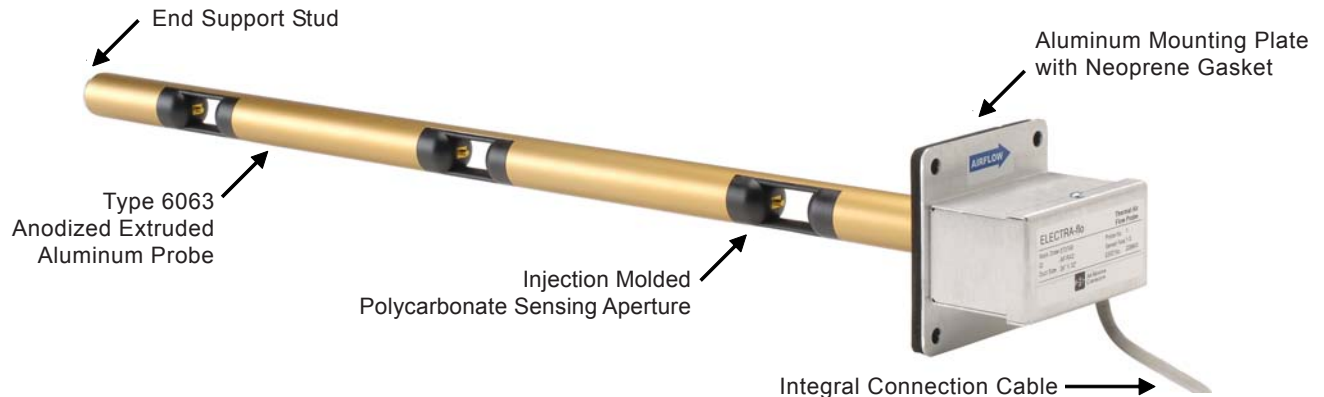
- **Continuous Display of Process.** The ELECTRA-flo comes equipped with a multi-line, backlit, graphical LCD for use during transmitter configuration and calibration, and to display multiple measured processes in engineering units. The LCD provides one line having double width and height characters for high visibility plus two 20 digit lines having standard size characters, and various descriptors for transmitter operating status.
- **Output Communication.** Standard dual analog outputs can be individually configured for 0-5VDC, 0-10VDC or 4-20mADC by means of jumpers. BACnet or LonWorks® is available as an option.
- **Multiple Operating Power Selections.** Standard input power can be either 24V AC or 24VDC with automatic detection and selection.
- **Output Signal Filtering.** To eliminate flow signal pulsations, the ELECTRA-flo transmitter is equipped with a user selectable digital low pass noise filter.
- **Enclosure.** The ELECTRA-flo transmitter is furnished in a NEMA 1 aluminum enclosure with a hinged cover and internal plug-in type terminal strip for ease of field wiring.
- **Individual Sensor Diagnostics.** The ELECTRA-flo transmitter is able to detect any sensor that is operating outside factory preset tolerances, remove that sensor's measured values from the overall airflow average, and generate a visual fault alarm on the LCD.
- **Membrane Keypad Interface.** All transmitter configuration, scaling, and diagnostic functions can be performed by means of a password protected, cover mounted membrane keypad.

Dimensional Information



ELECTRA-flo™ Probe

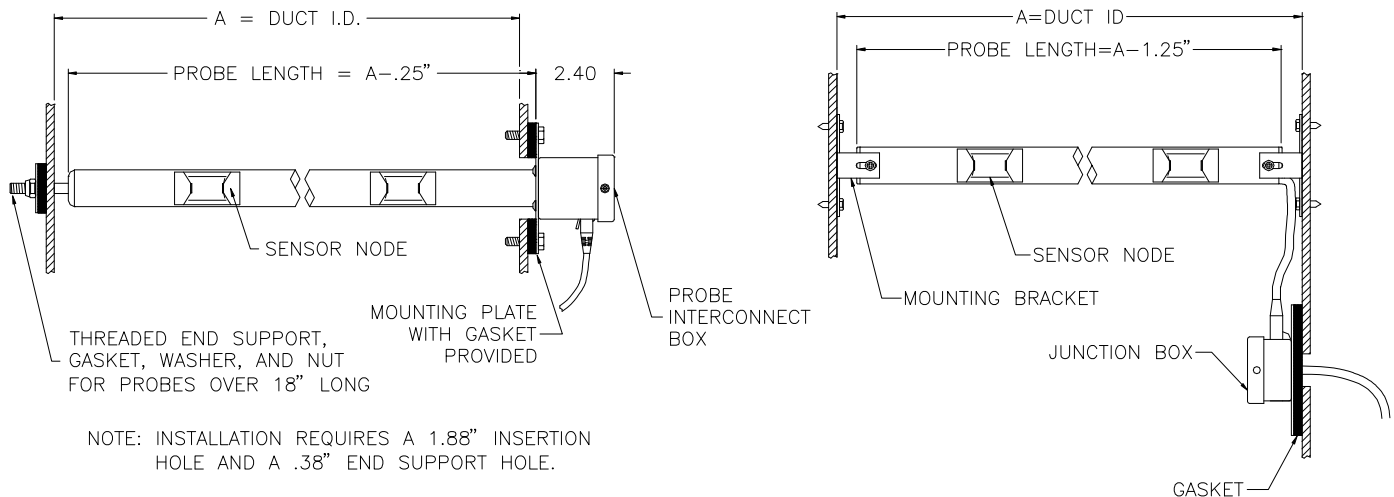
Construction Features



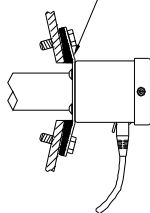
Features

- **Sensor Accuracy.** Each sensor measures airflow within 2% of the actual point velocity and temperature within $\pm 0.1^\circ\text{F}$.
- **Field Serviceability.** Sensor node replacement is as simple as snapping out the old sensor and snapping in the new replacement. With calibration data stored at each sensing node the probe does not require subsequent calibration at the Factory or in a wind tunnel.
- **Sensor Microprocessor.** Each ELECTRA-flo sensor node is directly connected to a microprocessor for storage of sensor calibration data and to locally determine point velocity and temperature measurement. Dedicated microprocessors eliminate the loss of signal resolution associated with traditional analog to digital conversion and the need for data multiplexing at the transmitter. All velocity and temperature measurements from as many as 32 sensor nodes are communicated over a single daisy-chained data buss.

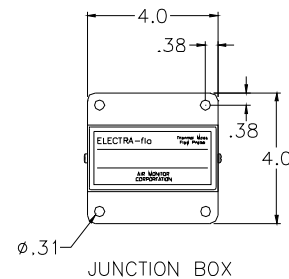
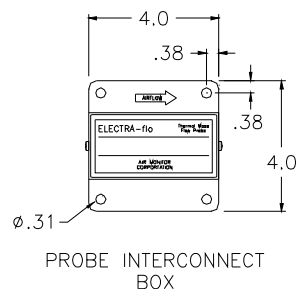
Dimensional Specifications



FORMED MOUNTING PLATES PROVIDED FOR CIRCULAR DUCTS



EXTERNAL MOUNT



INTERNAL MOUNT

ELECTRA-flo™

Probe & Sensor Quantities

The quantity of sensing points, in conjunction with adherence to minimum installation requirements, assures a measurement accuracy within 2-3% of actual airflow. The charts indicate the number of probes and sensors per probe in any size ELECTRA-flo probe array or ELECTRA-flo/M station.

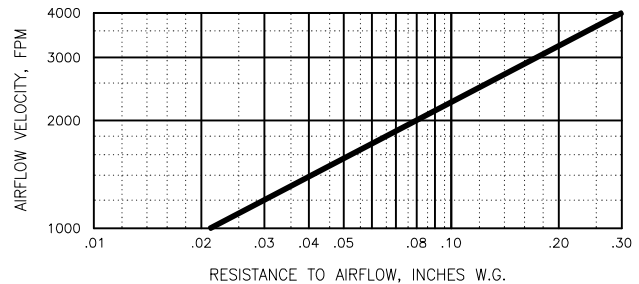
Duct Diameter	Number of Probes / Sensors Per Probe
8 to <12	1/1
12 to <18	1/2
18 to <36	2/2
36 to <48	2/4
48 to <60	2/6
60 to <90	3/6
90 to 120	4/6

		Long Dimension in Inches												
		12	18	24	30	36	42	48	54	60	72	84	96	120
Short Dimension in Inches	12	1/2	1/2	1/3	1/3	1/3	1/4	1/4	1/5	1/5	1/6	1/7	1/8	1/8
	18		2/2	2/3	2/3	2/3	2/4	2/4	2/5	2/5	2/6	2/7	2/8	2/8
	24			2/3	2/3	2/3	2/4	2/4	2/5	2/5	2/6	2/7	2/8	2/8
	30				2/3	2/3	2/4	2/4	2/5	2/5	2/6	2/7	2/8	2/8
	36					3/3	3/4	3/4	3/5	3/5	3/6	3/7	3/8	3/8
	42						3/4	3/4	3/5	3/5	3/6	3/7	3/8	3/8
	48							3/4	3/5	3/5	3/6	3/7	3/8	3/8
	54								3/5	3/5	3/6	3/7	3/8	3/8
	60									4/5	4/6	4/7	4/8	4/8
	72										4/6	4/7	4/8	4/8
84											4/7	4/8	4/8	
96												4/8	4/8	
120													4/8	

Number of Probes / Sensors Per Probe

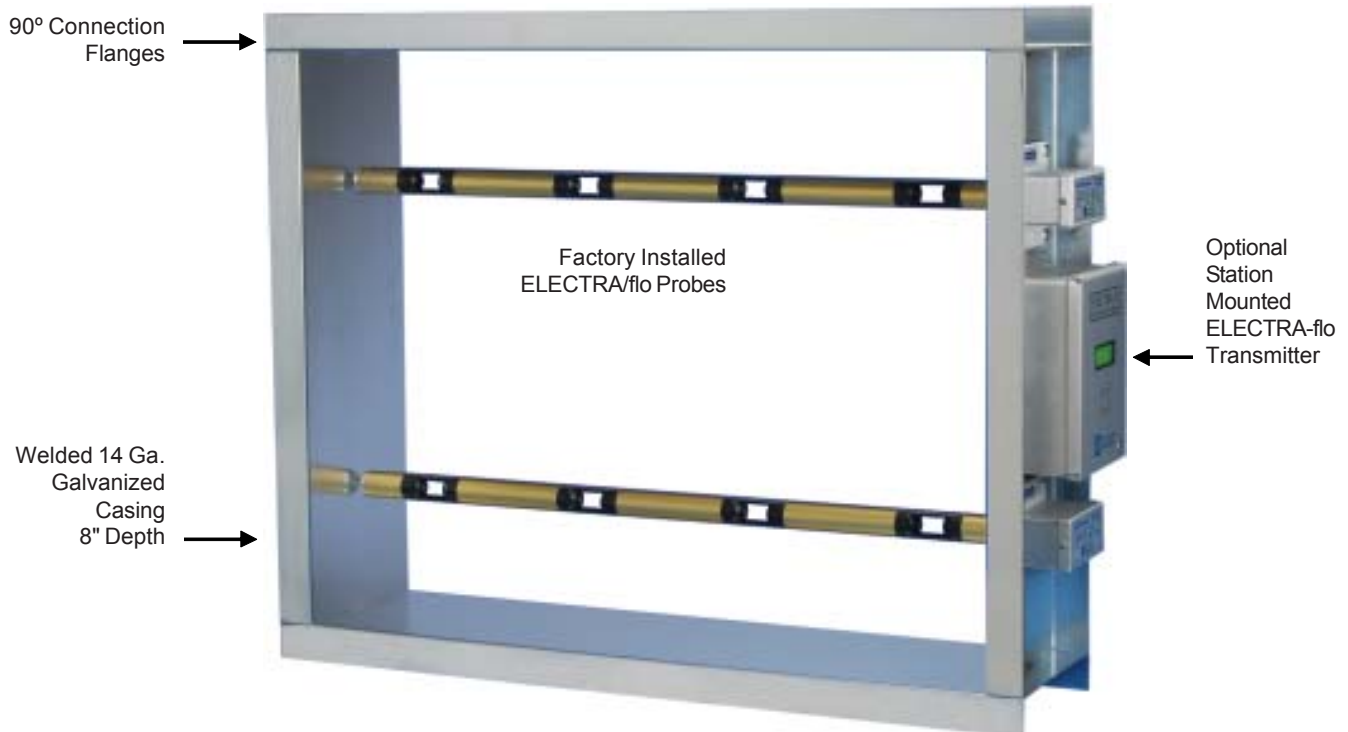
Airflow Resistance

Negligible Resistance to Airflow. The ELECTRA-flo's cylindrical configuration and smooth surface free of external sensor protrusions permit the airstream to flow unrestricted around and between the installed traverse probe, creating a very minimal if not negligible resistance to airflow.



ELECTRA-flo/M Station – Construction Features

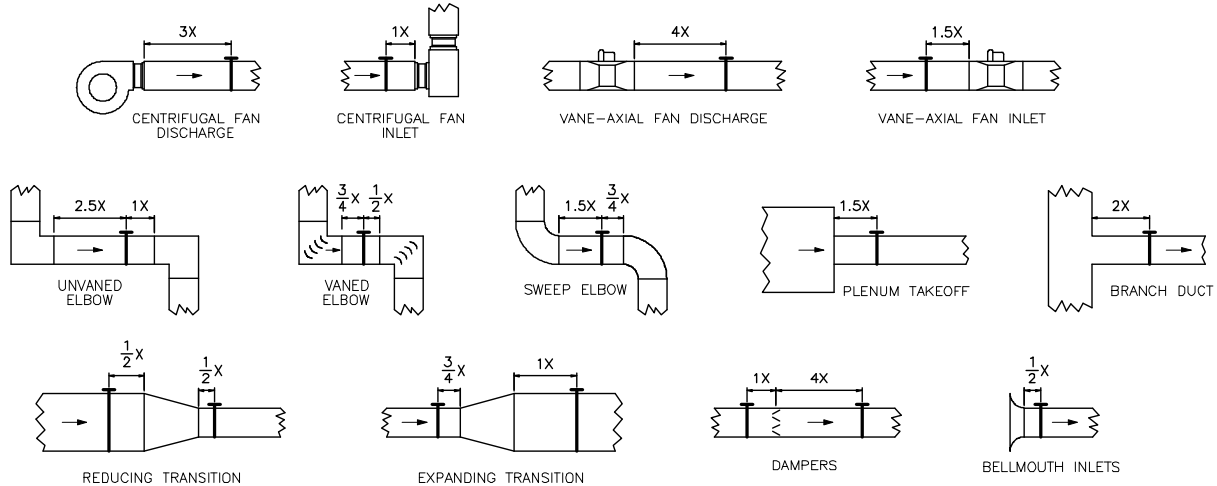
ELECTRA-flo Probes + Casing + Transmitter = Ease of Installation



ELECTRA-flo™ Station

Minimum Installation Requirements

These installation locations indicate the **minimum** clearance from a source of airflow disturbance. If more than the minimum is available, proportionally adjust the upstream and downstream clearances. Avoid locating the ELECTRA-flo where it will be subjected to condensation from a coil or humidifier. Contact Air Monitor's Applications Engineering Department to discuss sub-minimum installation.



$$\text{Rectangular Duct: } x = \frac{2(H \times W)}{H + W}$$

$$\text{Circular Duct: } x = \text{Duct Diameter}$$

Performance Specifications

SYSTEM

- Flow Accuracy. $\pm 2\text{-}3\%$ of actual airflow
- Temperature Accuracy. $\pm 0.1^\circ\text{F}$ of air temperature

PROBE ASSEMBLY

- Sensor Accuracy. Velocity: $\pm 2\%$ of reading
Temperature: $\pm 0.1^\circ\text{F}$
- Sensor Assembly. Injection molded polycarbonate
- Sensor Type. Hermetically sealed thermistor
- Sensor Signal Processing. Via microprocessor in each sensor node, with calibration data stored in non-volatile memory. Built in 12 bit A/D conversion.
- Number of Calibration Points Per Sensor. 6
- Velocity Calibration Range. 0 to 5,000 FPM (optional 0-10,000 FPM)
- Humidity Range. 0 to 99.5% RH, non-condensing
- Mounting. Via 4" x 4" aluminum plate, 1/4" closed cell neoprene gasket and end support stud for probes longer than 18"
- Probe to Probe Signal Connection. An integral cable with RJ-45 connection for signal and power. Multiple probes connect in serial configuration.
- Probe to Transmitter Signal Connections. Via a single shielded cable with RJ-45 connection. Standard length is 10', with optional 50' and 100' lengths.
- Probe Size Range. 8" to 120"
- Maximum Number of Sensors Per Probe. 16
- Sensor Pattern. Equal area is standard. Log-Tchebycheff is optional.

TRANSMITTER

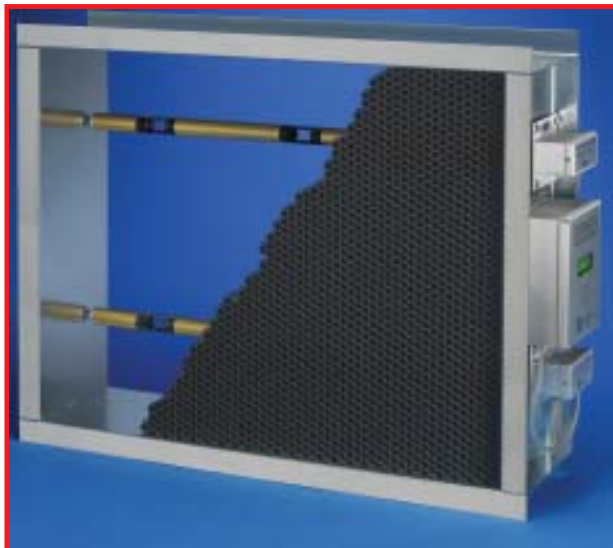
- Maximum Number of Sensors. 32 total sensors per probe array or measuring station.
- Display. Backlit graphical LCD. 3/4" x 2-1/2" display size. Field selectable in U.S. or S.I. units for velocity/flow and temperature.
- Configuration Access. By means of enclosure cover mounted membrane keypad. Password protected.
- Power Supply. 24VAC (20-28VAC) or 24VDC (20-40VDC) with automatic selection.
- Power Consumption. 16-90VA, dependent upon the quantity (1 to 32) of sensors in the probe array or station.
- Circuit Protection. Power input is isolated, fused, and reverse polarity protected.
- Analog Outputs. Dual outputs, field configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mA DC.
- Analog Output Scaling. Field adjustable digital scaling
 - Velocity Range: 0 to 5,000 FPM
 - Temperature Range: 0 to 140°F
- Analog Output Resolution. 0.02%
- Analog Output Filtering. Field adjustable digital low pass filter
- Network Output Communication. Optional BACnet or LonWorks®
- Humidity Limits. 0 to 99.5% RH, non-condensing
- Temperature Limits. -20°F to 180°F Storage
 -20°F to 140°F Operating
- Enclosure. NEMA 1 aluminum with hinged cover

Suggested Guide Specification

- Where indicated on the plans, provide airflow/temperature stations or probe arrays cap able of continuously measuring airflow velocity/volume and temperature.
- Each station or probe array shall consist of one or more multi-point measuring probes and a single microprocessor based transmitter. The transmitter shall be supplied by the same manufacturer as the measuring station or probe array.
- Each multi-point probe shall be assembled using heavy wall anodized aluminum tubing, aluminum mounting plates, aerodynamically optimized molded sensing apertures to ensure accurate measurement in angular airflow conditions, and neoprene mounting gasket.
- Station or probe array shall be connected to the transmitter using a single cable, of up to 100' in length, included with the transmitter.
- Each stand-alone sensing point shall use an ambient temperature thermistor and an externally heated thermistor to determine the point velocity and temperature. Automatic equal area averaging of the individual point measurements shall be performed in the transmitter.
- Each airflow sensor shall have an operating range of 5,000 FPM, with a NIST traceable accuracy of $\pm 2\%$ of reading for velocity measurement and 0.1°F for temperature measurement.
- The number of sensors for each rectangular station or probe array shall be:

Station Area	Sensor Density
1 to <15 Sq. Ft.	1.50 Sq. Ft. Per Sensor
15 to <30 Sq. Ft.	1.67 Sq. Ft. Per Sensor
30 to <60 Sq. Ft.	2.10 Sq. Ft. Per Sensor
60 to 100 Sq. Ft.	3.13 Sq. Ft. Per Sensor
- Individual sensors shall be fully field serviceable without need for field calibration, not requiring that the probe be returned to the Factory for repair and/or calibration.
- Each transmitter shall be capable of averaging as many as thirty-two (32) sensors.
- The transmitter will have a high visibility backlit LCD for display of either the averaged or individual sensor airflow and temperature measurements, in user selectable units of measure. The transmitter shall be factory configured to output duct air volume for plug and play operation.
- All transmitter configuration, scaling, and diagnostic functions shall be performed by means of a password protected, cover mounted membrane keypad.
- Transmitter outputs shall be dual analog (4-20mA, 0-5VDC or 0-10VDC) for airflow and temperature with optional BACnet or LonWorks® communication interface.
- The operating temperature range of the transmitter shall be from -20° to 140°F. The transmitter shall be located where it will be sheltered from water or weather.
- Input power to each transmitter shall be 24VAC/24VDC.
- Stations shall have a 14 ga. [18 ga. for circular units] galvanized steel, 8" deep, welded casing with 90° formed flanges. [Each station will have 1/2" hex, 3" deep aluminum honeycomb air straightener positioned upstream of the measuring probes]. Transmitter shall be provided integrally mounted to the station or with interconnect cable for remote mounting up to 100' away.
- When installed per the manufacturer's minimum installation requirements, the transmitter with accompanying station or probe array shall measure with an accuracy of $\pm 2-3\%$ of actual airflow.
- The acceptable manufacturer is Air Monitor Corporation, and the product is the ELECTRA-flo [ELECTRA-flo/M or ELECTRA-flo/CM].

Other ELECTRA-flo Products



ELECTRA-flo/CM



ELECTRA-flo/FI

Air Monitor's Product Families of Flow Measurement and Pressure Products



FAN-E AIRFLOW MEASURING STATION. AMCA CERTIFIED

The FAN-E Station is a multi-point, self-averaging Pitot traverse station with integral air straightener honeycomb cell, capable of continuously measuring fan discharges or ducted airflow with a certified accuracy of 2% or better when tested according to AMCA Standard 610. The traverse station offers its high degree of measuring accuracy by virtue of log-Pitot sensor locations, Fechheimer Pitot sensing ports, honeycomb airflow processing, and instantaneous pneumatic averaging of multiple pressure values. The FAN-E station is designed for measurement locations with very limited straight duct runs and/or highly disturbed airflow. Patent No. 3,748,901.



VOLU-PROBE /1, 2, 3, 4 AIRFLOW TRAVERSE PROBES.

The VOLU-probe Airflow Traverse Probes consist of multiple Fechheimer Pitot total and static pressure sensing ports positioned along the length of each probe to traverse the duct cross-section, average the sensed pressures in their separate internal manifolds, and provide a measurement of velocity pressure accurate to within 2-3% of actual flow. The VOLU-probe is available in externally and internally mounted, insertable/removable and self-supported versions to fit the needs of both new installations and retrofit applications ranging from commercial building HVAC to laboratory, pharmaceutical and electronics production, and health care institutions. Patent No. 4,559,835.



VOLU-PROBE/FI FAN INLET AIRFLOW PROBES.

The VOLU-probe/FI Fan Inlet Probe consists of a pair of offset mounted traverse probes that are installed directly in the fan's inlet bell mouth at the throat location. The VOLU-probe/FI combines the air processing effect of the nozzle-shaped fan inlet bell mouth with the Fechheimer derivative of the multi-point, self-averaging Pitot to accurately measure inlet velocity pressure (and calculable air volume) with an accuracy of 3% for most fan types. The VOLU-probe/FI is available in both aluminum and stainless steel construction. Patent No. 3,733,900.



VELTRON DPT 2500-plus TRANSMITTERS.

The VELTRON DPT 2500-plus ultra-low differential pressure and flow "smart" transmitter, with a 0.25% of Natural Span accuracy, is designed for demanding HVAC and process applications where high accuracy and microprocessor based functionality are needed. The VELTRON DPT 2500-plus is a 4-wire, 24VAC/VDC powered device available in nine different standard and bipolar Natural spans covering a range of 25.0 to 0.05 IN w. Key features include: Microprocessor based configuration and calibration; backlit graphical LCD; analog output configurable for 0-10VDC or 4-20mA; AUTO-zero capability; adjustable digital low pass filter and 5:1 turndown capability. Optional NEMA 12 version shown.



S.A.P. /B, P, S, R STATIC PRESSURE SENSORS.

Available in aluminum or stainless steel construction and four separate mounting configurations, the S.A.P. family of static pressure sensors generate a steady, non-pulsating output of room, space or plenum pressure.

Model B – Electrical Junction Box Mount

Model S – Surface Mount

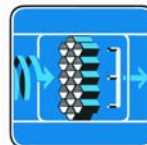
Model P – Suspended Mount via Pipe

Model R – Recessed Flush Mount



VOLU-flo/OAM OUTSIDE AIR STATION.

The VOLU-flo/OAM Station is a companion component to the Monitor/Controller providing ease of installation and commissioning by mounting the Outside Reference, Inlet Airflow, and ambient temperature sensors into a rugged, welded galvanized steel casing having a layer of expanded metal of known fixed resistance. In selected applications, the known resistance-to-airflow relationship allows the combined system to be pre-calibrated at the Factory for plug-n-play operation.



VOLU-flo / OAM

Outside Air Monitor



Accurate airflow measurement for demanding applications



AIR MONITOR
CORPORATION

VOLU-flo/OAM

How It Works

The measurement of OutsideAir presents a variety of challenges that cannot be overcome utilizing the standard Pitot and thermal technologies. Among these challenges are:

- The total absence of any upstream/downstream straight duct run to obtain accurate and/or repeatable measurement.
- The potential for outside air temperature variances of 150+ °F in certain climatic zones and installed locations ranging from sea level to 5,000+ feet elevation make a temperature and altitude air density compensating system necessary
- Airborne particulate and condensing moisture transported by outside air will impair the functionality and accuracy of both thermal and standard Pitot based technologies.
- Varying directional wind loads and gusts cause fluctuating airflow measurements.

- Airflow velocities often down to 150 FPM are below the recommended operating range of standard Pitot technologies.

The VOLU-flo/OAM has been specifically designed to measure the airflow rate within $\pm 5\%$ of actual airflow in all of these challenging conditions by measuring the *pressure drop* across a fixed inlet resistance device, such as a louver, layer of expanded metal, etc.

The VOLU-flo/OAM consists of an Outside Reference Sensor and an Inlet Airflow Sensor, both specially designed to be unaffected by dirt or moisture, plus a temperature sensor and a microprocessor-based Monitor/Controller which converts the measured pressure drop and temperature to actual airflow utilizing proprietary algorithms, density compensation, and signal conditioning.

Components and Features



Monitor/Controller Module

Standard and Expanded Ranges. With its 4:1 range of measurement, the Standard VOLU-flo/OAM is ideally suited for *minimum outside air* applications, while the Expanded VOLU-flo/OAM's 16:1 range of measurement will cover the full range of outside air, from the *minimum set-point* to design *maximum*.

Microprocessor Based Functionality. All functions of monitor configuration, output and display scaling, calibration, and controller tuning are performed by the VOLU-flo/OAM's on-board microprocessor. All input to the microprocessor is via four pushbuttons and menu selections.

Air Density Correction. The VOLU-flo/OAM corrects measured inlet airflow for ambient temperature variances by means of an integral 100 ohm platinum RTD temperature sensor and corrects for atmospheric pressure by entering site altitude into the microprocessor during initial system start-up.

Continuous Display of Process. A standard 2x20 liquid crystal display (LCD) is used during the configuration and calibration of the VOLU-flo/OAM, and provides a means to display two measured processes (volume, velocity, temperature) during normal operation.

BAS Interface. While the VOLU-flo/OAM is capable of operating as a stand-alone monitor/controller, a wide variety of inputs and outputs were designed into the Monitor/Controller Module to

facilitate coordinated operation with a facility building automation system (BAS). Interfaces with the BAS include:

- Digital inputs for fan system start status, switching to economizer setpoint, or to use the BAS provided adjustable operating setpoint.
- Digital outputs for high and low alarms, triggered when the measured airflow falls outside of a user selectable deadband around the control setpoint.
- Dual analog output; a 4-20mADC output corresponding to measured inlet airflow, and a damper controller output field configurable for 0-5VDC, 0-10VDC, or 4-20mADC via jumpers.
- An analog input, field selectable for 0-5VDC, 0-10VDC, or 4-20mADC via jumper, that is used as the controller setpoint.

Enclosures. The VOLU-flo/OAM is offered in four different enclosure packages to fit any application and installation:

- NEMA 1 rated, painted carbon steel enclosure designed to be located indoors or inside the air handler
- NEMA 4 rated, painted carbon steel enclosure designed for outdoor locations where the ambient temperature is consistently at 32°F and above.
- NEMA 4 rated and insulated enclosure which includes a thermostatically controlled enclosure heater. For outdoor locations where the ambient temperatures may go as low as -40°F.
- OEM mounting arrangement that permits the Monitor/Controller Module to be mounted into an existing OEM enclosure.



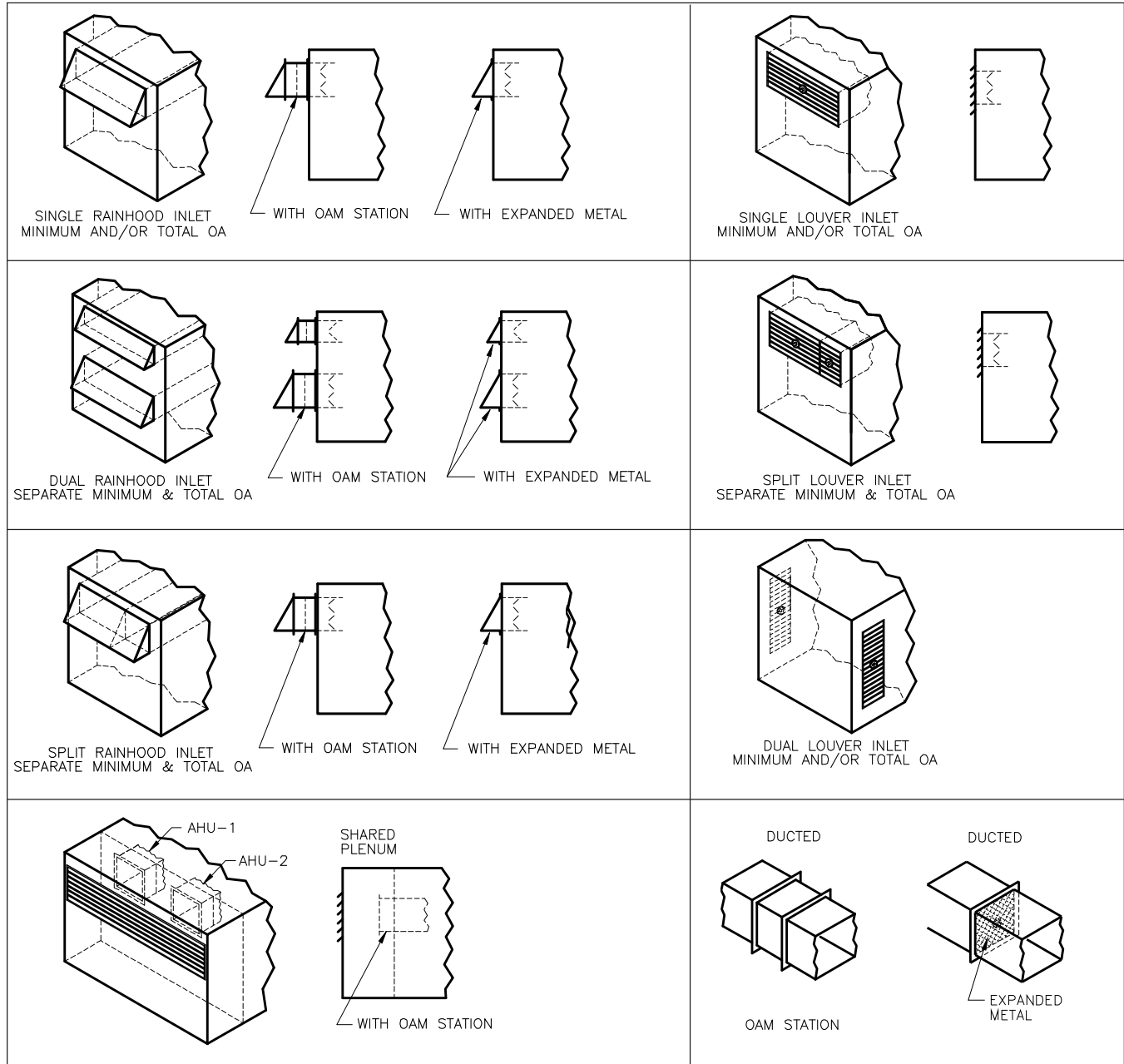
NEMA 1 Enclosure

Outside Air Monitor

Typical Application Guide

The VOLU-flo/OAM Monitor/Controller can be applied to most single, dual, and split inlets found on air handlers and built-up systems. Depicted below are the most commonly encountered

inlet configurations. Contact the Factory with any unique configuration or those that do not meet the stated Minimum Installation Requirements.



Minimum Installation Requirements

The VOLU-flo/OAM was designed for installation on packaged air handlers and built-up systems where the outside air intake is outfitted with an OAM Station, inlet louver or some fixed resistance device that produces at least 0.06" wc. pressure drop at 600 FPM. For systems not so equipped, contact the Factory for application suitability.

- The Outside Reference Sensor is to be located upstream of, and mounted in the center of the louver or fixed resistance device.
- The Inlet Airflow Sensor must be located downstream of any inlet louver or fixed resistance device, and upstream of the outside air intake control damper.
- The OAM Station must be positioned upstream of the outside air intake control damper.

VOLU-flo/OAM

Sensors

Outside Reference Sensor. The patented design of the Outside Reference Sensor is unaffected by wind gusts or directionality, thus providing an accurate point of reference for measuring the differential pressure created by the airflow entering the inlet.



Outside Reference Sensor

Unaffected by Dirt and Moisture. The VOLU-flo/OAM does not utilize heated thermal sensors or pressure measuring ports that face into the airstream, thereby avoiding measurement instability caused by the variable presence of moisture, and measurement accuracy degradation due to

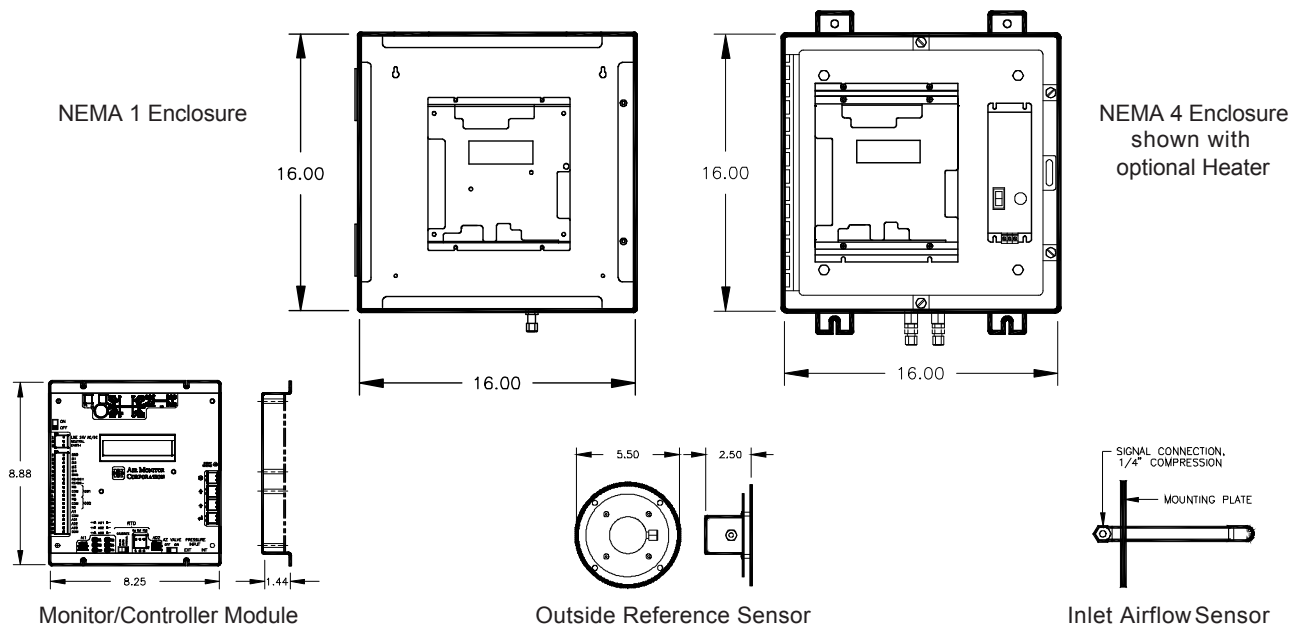
dirt build-up around pressure sensor ports or on thermal sensor surfaces.

Stainless Steel Construction. The Outside Reference Sensor and Inlet Airflow Sensor are both constructed of type 316 stainless steel materials to resist corrosion due to the presence of salt or chemicals in the air. In addition, the signal connections on these two sensors and those on the NEMA enclosure are stainless steel, as is the exterior of the platinum RTD.



Inlet Airflow Sensor

Dimensional Specifications



NEMA 1 Enclosure

NEMA 4 Enclosure shown with optional Heater

Monitor/Controller Module

Outside Reference Sensor

Inlet Airflow Sensor

Suggested Specification

The monitor/controller shall be capable of direct measurement of airflow through an outside air inlet and produce dual outputs; one representing the measured airflow and the other to control the inlet damper.

The monitor/controller shall contain an integral multi-line liquid crystal display for use during the configuration and calibration processes, and to display two measured processes (volume, velocity, temperature) during normal operation. All configuration, output scaling, calibration, and controller tuning will be performed digitally in the on-board microprocessor via input pushbuttons.

The monitor/controller shall measure inlet airflow with an accuracy of $\pm 5\%$ of reading over a range of 150-600 FPM, 250-1,000 FPM, 500-2,000 FPM, and 150-2,000 FPM and not have its reading affected by the presence of directional or gusting wind. Measured airflow shall be density corrected for ambient

temperature variances, and atmospheric pressure due to site altitude.

The monitor/controller shall interface with existing building automation systems (BAS), accepting inputs for fan system start, economizer mode operation, and an external controller setpoint, and provide flow deviation alarm outputs.

The sensors shall be constructed of materials that resist corrosion due to the presence of salt or chemicals in the air; all non-painted surfaces shall be constructed of stainless steel. The electronics enclosure shall be NEMA 1 [NEMA 4; NEMA 4 with enclosure heater and insulation].

The monitor/controller shall be the VOLU-flo/OAM as manufactured by Air Monitor Corporation, Santa Rosa, California.

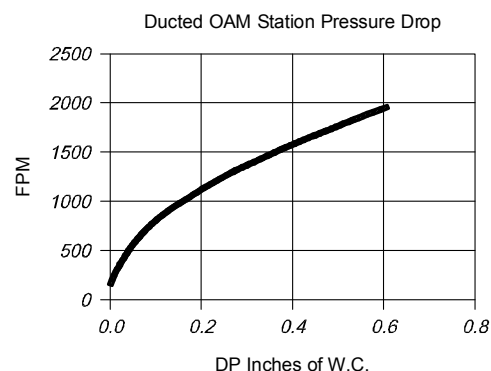
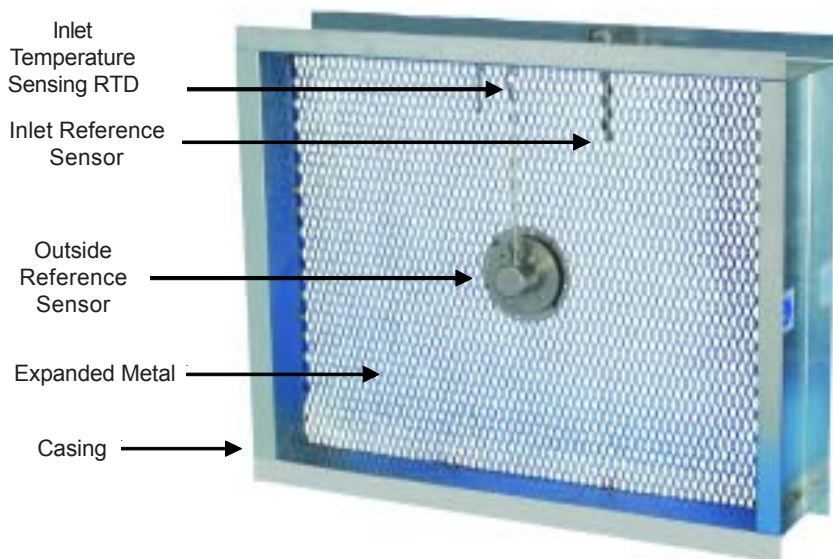
Outside Air Monitor

VOLU-flo/OAM Station

The VOLU-flo/OAM Station has been designed for ease of installation and commissioning by Factory mounting its sensors onto a layer of expanded metal of known fixed resistance welded into a galvanized sheet metal casing. In selected applications,

the known fixed resistance of the VOLU-flo/OAM Station allows the overall System to be pre-calibrated at the Factory for plug-n-play operation.

Construction Features



Performance Specifications

Monitor

Accuracy. $\pm 5\%$ of actual airflow for velocities above 150 FPM.

Range.

Standard: Provides 4:1 range of measurement.

Expanded: Provides 16:1 range of measurement

Temperature Limits.

-20 to 180°F Storage.

+32 to 120°F Operating, standard.

-40 to 120°F Operating, with optional enclosure heater

Signal Connections. 1/4" compression type, stainless steel.

Analog Input/Outputs

Analog Input. A single input is field configurable via jumper for 0-5VDC, 0-10VDC or 4-20mADC. For use as the external controller setpoint.

Analog Outputs. Dual outputs; one 4-20mADC and the other configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. For measured airflow and damper controller outputs.

Digital Inputs/Outputs

Digital Inputs. Three dry contact inputs; fan system status, economizer mode, and external controller setpoint.

Digital Outputs. Dual Form C dry contacts rated for 3 amps at 24VDC for alarm outputs to the BAS.

Indication

Display. Standard 2x20 character LCD provides two lines of data display.

Power

Power Supply.

Standard: 24VAC (20-28VAC) or 24VDC (20-40VDC).

Optional: 120VAC (100-132VAC), with enclosure heater

Power Consumption.

Standard: 18VA @ 24VAC; 13VA at 24VDC.

Optional: 336VA @ 120VAC, includes enclosure heater

Circuit Protection. Power input is isolated, fused, and reverse polarity protected.

Model Selection Guide

VOLU-flo OAM –



S – Single Inlet
D – Dual Inlet

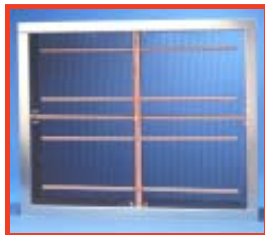


O – For mounting in OEM cabinet
1 – NEMA 1
4 – NEMA 4
H – NEMA 4 with heater



S – Standard 4:1 Range
E – Expanded 16:1 Range

Air Monitor's Product Families of Flow Measurement and Pressure Sensors



FAN-E AIRFLOW MEASURING STATION.

Multi-point, self-averaging, Pitot traverse station with integral air straightener-equalizer honeycomb cell. Capable of continuously measuring fan discharges or ducted airflow with an accuracy of 2% or better

AMCA CERTIFIED in accordance with Standard 610 for airflow measurement station performance.



VOLU-PROBE /1, 2, 3, 4 AIRFLOW TRAVERSE PROBES & STATIONS.

Multi-point, self-averaging, Pitot Fechheimer airflow traverse probes and stations with integral airflow direction correcting design ensures accurate measurement. Various mounting configurations to fit every application.

AMCA CERTIFIED in accordance with Standard 610 for airflow measurement station performance.



VOLU-PROBE/FI FAN INLET AIRFLOW PROBES.

Multi-point, self-averaging, Pitot Fechheimer airflow probes with integral airflow direction correcting design.

For mounting directly in the inlet cones or bellmouth of centrifugal or vane-axial fans to measure fan capacities within 3% of actual flow



VELTRON DPT 2500-plus TRANSMITTERS.

Microprocessor based differential pressure and flow transmitters offering high accuracy ($\pm 0.25\%$ F.S.) and ultra-low ranges (0-0.05 IN WC.).

Standard features include backlit graphical LCD, AUTO-zero, and electronic re-spanning.



S.A.P. /B, P, S, R STATIC PRESSURE SENSORS.

Available in four separate mounting configurations, the S.A.P family of static pressure sensors generate a steady non-pulsating output of room, space or plenum pressure.

S.A.P. sensors are available in aluminum or stainless steel construction.



ELECTRA-flo THERMAL AIRFLOW MEASUREMENT SYSTEM.

Multi-point thermal dispersion airflow measurement probes, stations, and stations with integral air straightening honeycomb cell.

Capable of measuring fan and ducted airflow and temperature with an accuracy of 2-3% or better



SENTRY

Room Pressurization Monitor & Controller

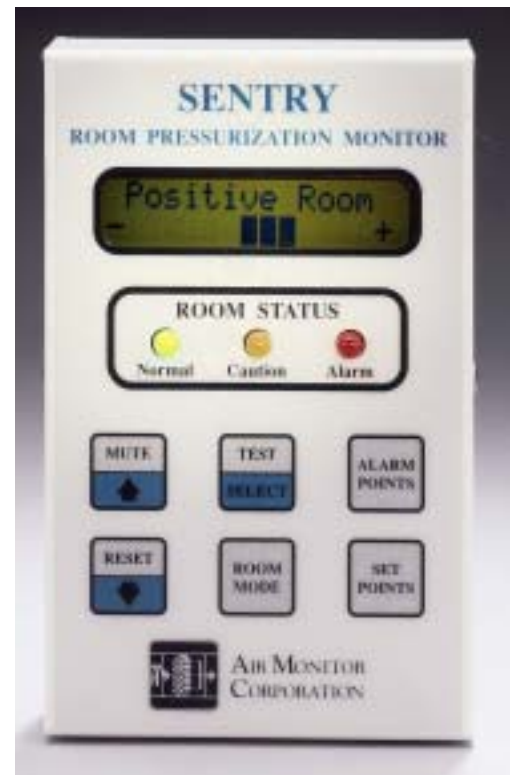
Air Monitor's SENTRY Room Pressurization Monitor & Controller is designed to perform continuous monitoring and control of the differential pressure or rate of airflow between adjacent spaces in laboratories, operating rooms, and patient isolation areas to ensure the well being and safety of patients, medical staff, and laboratory personnel.

System Components

The SENTRY monitor system is composed of three primary components: Operator/technician keypad, combination transmitter I/O enclosure, and flow/pressure sensing ports. Also provided is the 14' interconnecting cable between the keypad and transmitter I/O enclosure, 25' of 1/2" diameter signal tubing, and all necessary mounting hardware.

Operator/Technician Keypad – Features/Functions

- 2x16 character LCD display is used during set-up and to provide operating status information. During operation the LCD display shows the room mode (positive, negative, unoccupied, purge) and digital display of actual room condition in Inches wc. or FPM. The LCD display updates every 0.5 second.
- Room status LEDs in green, yellow, and red depict normal, caution, and alarm conditions. LEDs protrude from the front of the keypad for extended visibility.
- Accepts dry contact input to "hold" controller output during entry into room.
- Alarm time delay selection range is 0 to 30 seconds in one second increments.
- Keypad dimensions are 5.25"(h) x 6.38"(w) x 1.25"(d), and mounts directly to a standard 2x4 electrical junction box.
- Choice of operating in Inches w.c. or FPM.
- Local audio alarm with mute and reset buttons. Alarm active/inactive and latching/non-latching is technician selected during set-up via keypad DIP switch.
- Choice of four range selections are available, technician selected during set-up via DIP switch. For pressure, the choices are: $\pm 0.005"$, $\pm 0.015"$, $\pm 0.035"$, and $\pm 0.10"$. For FPM, the choices are: ± 250 , ± 450 , ± 650 , and ± 1150 FPM.
- Auxiliary dry contact input to permit remote changing from a room pressurization control setpoint to "unoccupied". Separate unoccupied setpoints for positive room and negative room.
- Technician selectable control setpoints for positive and negative room modes with individual HI and LO alarm points for each room pressurization control setpoint. Preset purge mode at maximum controller output.
- Choice of three different methods for selecting room mode. Local selection of room mode can be performed via the keypad (password protected) or optional three position key switch. External selection of room mode via the BAS or nurse's station can be accomplished by a three position switch.
- Two levels of password: Operator and Technician. Passwords are technician programmed via keypad during set-up. An internal keypad DIP switch permits bypass and resetting passwords if custom selections are forgotten. Passwords are four character alpha, usage is optional, and can be bypassed via DIP switch.



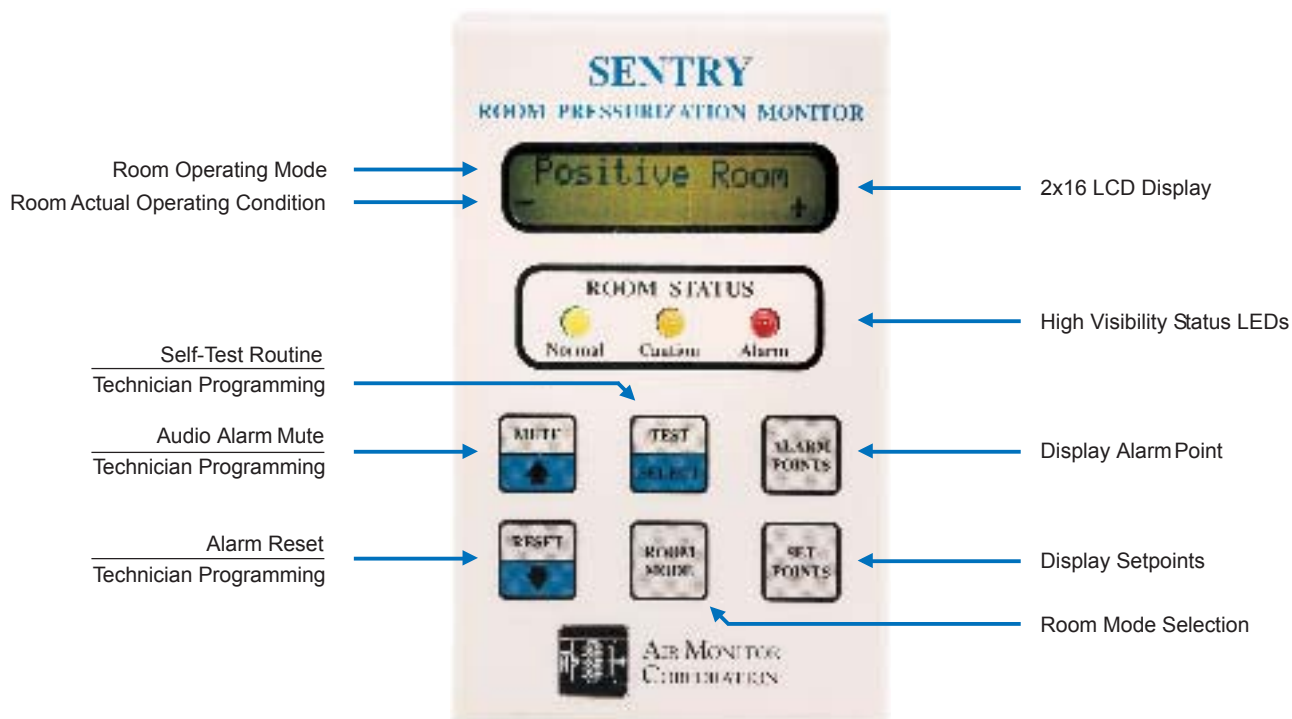
Accurate airflow measurement for demanding applications



AIR MONITOR
CORPORATION

SENTRY

Keypad External Features



Transmitter I/O Enclosure – Features & Functions

- Contains a high accuracy , thermal massflow sensor capable of sensing transfer airflow rate bi-directionally .
- All field input and output wiring, flow signal port, and power connections terminate in the transmitter enclosure.
- On-board microprocessor manages all monitor and controller functions, permits technician configuration and calibration via pushbutton programming.
- Transmitter range is technician selected via DIP switch.
- The analog output signals for the transmitter and controller are 4-20mA, self-powered, grounded load.
- The digital output for alarm transmission to the BAS is a Form C dry cont act rated for 5 amps at 24V AC/VDC or 120VAC. Digit al outputs are provided to activate alarm light and audio at a remote nurse's station.
- Digital inputs can be received from the BAS or nurse's station to permit remote change of the room mode to unoccupied, remote alarm mute/reset, and to remotely select positive, negative, or purge room mode.
- Standard power requirement is 24V AC. A 120VAC option is available via a st and-alone auxiliary transformer .
- Enclosure is 9-1/2" x 9-1/2" x 3", NEMA 1 rated.

Flow Sensors – Features & Functions

- Designed for ease of installation in the room and reference space ceilings.
- Small size is visually unobtrusive to permit selection of optimum location.
- Sensor inlet screen protects the massflow sensor from airborne particulate.
- Below ceiling access facilitates periodic cleaning.

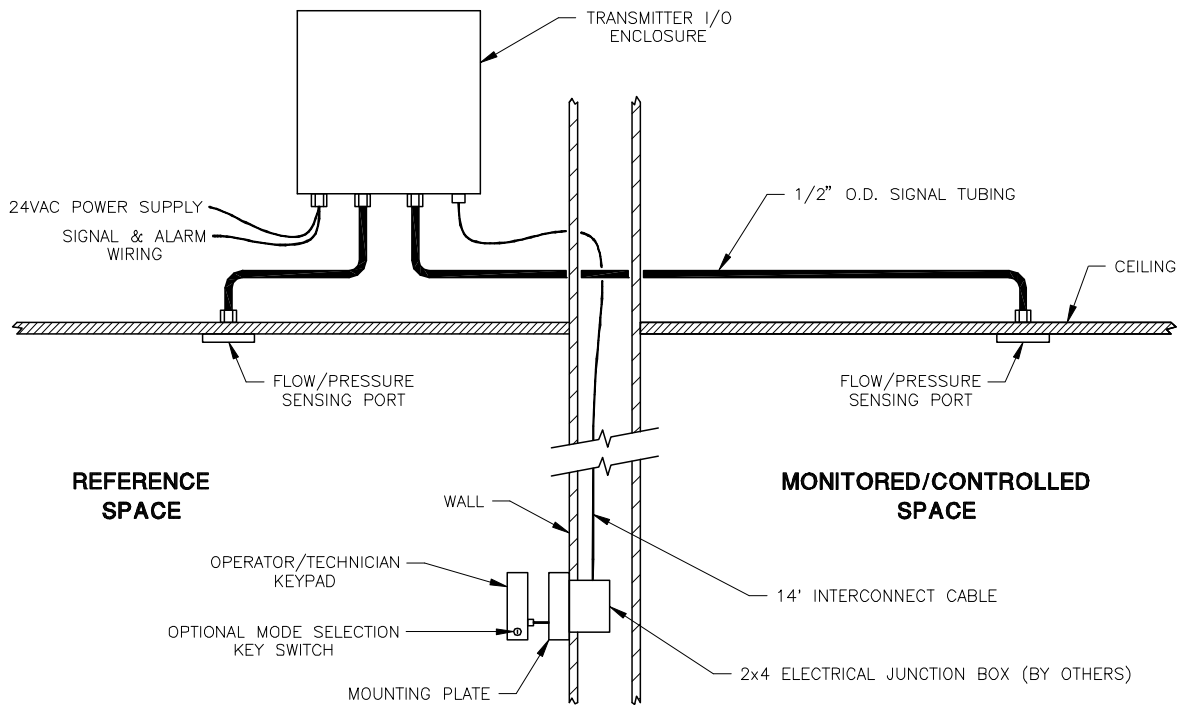
Nurse's Station (optional) – Features & Functions

Custom nurse's station monitoring panels will be designed on a per application basis to meet customer specifications for wall or table mount, number of monitored units, color , etc. Each room could have any or all of the following at the nurse's st ation:

- Green/red light to indicate safe/alarm condition.
- Audio alarm.
- Pushbutton for alarm mute, and alarm reset.
- Engraved labels for room and function identification.
- 3-way key switch to change room mode between positive, negative, and purge.
- Pushbutton to change room between occupied and unoccupied modes.

Room Pressurization Monitor & Controller

Physical Installation



System Operation

The 1/2" diameter tubing connecting the transmitter I/O enclosure to the flow/pressure sensors mounted in the room and reference space ceilings creates an airflow pathway through the bi-directional thermal massflow sensor.

The differential pressure between the room and reference space creates a condition where the very low volume airflow occurring between the two flow/pressure sensors is directly measured by the massflow sensor and electronically converted into pressure units of Inches w.c. or velocity units in FPM. The measured flow and directional data are compared within the microprocessor to the technician programmed operating and alarm setpoints to determine whether the room operating condition falls within safe, caution, or alarm ranges.

During normal operation the keypad provides three forms of visual data: The room operating mode (positive, negative, purge, and unoccupied); a digital display of the measured room operating point; and three high visibility LEDs to indicate normal (green), caution (yellow), and alarm (red) conditions. Additionally, the keypad has an audio alarm that can be technician configured to be active or silent, latching or non-latching.

Available to the BAS for remote monitoring is a 4-20mA output of the room's operating condition in Inches w.c. or FPM plus a Form C dry contact to provide failsafe alarm notification. If desired a monitoring panel at the nurse's station can be sent signals to activate both audio and lighted alarms. Remote alarm mute and alarm reset can be accomplished

from the BAS, nurse's station, or both via momentary dry contact input.

Switching of the room operating mode can be achieved in one of three ways: Locally via password protected keypad MODE button or optional three-way keyed selector switch; or remotely via three-way selector switch at the BAS or nurse's station. When one of the room mode selector methods is designated via DIP switch, the other methods are disabled.

If the actual room pressure is between the control setpoint and the midpoint between the setpoint and alarm point, the green NORMAL LED will be lit. If the actual operating point is between the midpoint and the alarm point, the yellow CAUTION LED will be lit. If the alarm point is reached and the alarm condition persists beyond the programmed delay period, the red ALARM LED will become lit and the optional local audio and/or remote alarms will be engaged. The keypad MUTE button or remote dry contact can silence the audio alarm. If alarm latching has been selected, the alarm condition must be corrected by the room pressure returning to CAUTION or NORMAL room status levels and the RESET button pushed or a second remote dry contact received.

The optional controller function permits the SENTRY to perform single loop control as well as monitor the room operating condition. Two control options are available: Three-mode control providing a 4-20mADC output signal or tri-state (floating point) control via separate decreasing and increasing output relay contacts. The choice of the controller mode and selection of tuning parameters is technician programmed via the keypad DIP switch.

Performance Specifications

Ranges.	Pressure Selections	Velocity Selections
	0 to ± .005 Inches w.c.	0 to ± 250 FPM
	0 to ± .015 Inches w.c.	0 to ± 450 FPM
	0 to ± .035 Inches w.c.	0 to ± 650 FPM
	0 to ± .100 Inches w.c.	0 to ± 1150 FPM

Measurement Resolution. ±0.05% of full scale range (Inches w.c. or FPM).

Measurement Rate. 10 readings per second.

Sensor Response Time. 1 millisecond for a 10% to 90% signal change; 3 milliseconds maximum.

Temperature Limits. -20 to 180°F storage; +32 to 120°F operating.

Display. Standard 2 line x 16 character LCD provides operating mode and digital display of room operating point in Inches w.c. or FPM. Separate green, yellow and red LEDs indicate normal, caution, and alarm room status. Display is updated every 0.5 second.

Power Consumption. 6.0VA at 24VAC.

Digital Inputs. Individual dry contact remote input for alarm mute/reset, external output hold, room status select, and occupied/unoccupied. Six individual keypad pushbuttons for MUTE/UP, RESET/DOWN, TEST/SELECT, ROOM MODE, SETPOINTS, and ALARM POINTS.

Analog Outputs. Transmitter and controller outputs are 4-20mA, self-powered, grounded load (800 ohm maximum load), 0.05% Full Scale resolution.

Digital Outputs. Form C dry contact for alarm output and dual Form A contacts for tri-state (floating point) controller output. Contacts rated for 5 amps at 24VAC/VDC or 120VAC. Remote audio alarm and alarm light switching rated for 100mA at 24VDC.

Circuit Protection. Power input is fused. Polarity continuity must be maintained when multiple units are powered from the same source.

Power Supply. Standard 24VAC (20-28VAC) or optional 120VAC (100-132VAC) via stand-alone auxiliary transformer.

Suggested Specification

The room pressurization monitor shall be capable of monitoring [and controlling] the differential pressure between a room and reference area and provide both pressurization and alarm outputs for remote monitoring.

The operator/technician keypad shall contain an integral 2x16 digital display for use during the configuration and calibration process and display during normal use both the room operating mode (positive, negative, unoccupied, purge) and the actual room condition in Inches w.c. or FPM. The face of the keypad shall also have high visibility room status LEDs in green, yellow, and red depicting normal, caution, and alarm conditions.

All monitor set-up, calibration, alarm configuration, [control loop tubing,] and password selection will be performed using the membrane pushbuttons with tactile feedback and LCD display to provide input to the on-board microprocessor.

The monitor's alarms shall provide the following technician configurable selections: Latching/non-latching, active/inactive, audible/muted, with time delay selectable in one second increments up to 30 seconds, and separate HI/LO alarm points for each room pressurization mode. Remote alarm notification will be via a Form C dry contact.

Three different methods for selecting room mode will be provided: Via password protected keypad access, optional three position key switch, or remotely via dry contact from the BAS or nurse's station.

[Optional] The controller function shall perform single loop pressurization control via a three-mode 4-20mA or tri-state (floating point) output.

The monitor/controller shall be the SENTRY as manufactured by Air Monitor Corporation, Santa Rosa, California.



Airflow Meters

Stationary and Panel Mounted



Performance Specifications

Accuracy. Rated at 70°F, $\pm 2.0\%$ for 1.0" to 6.0" w.c. range; $\pm 3.0\%$ for 0.50" w.c. range; $\pm 4.0\%$ for 0.25" w.c. range.

Temperature Limits. 20°F to 140°F Operating.

Overpressurization Limit. -20" Hg to 15 pig on either side of diaphragm.

Features

Ease of Installation. Factory mounted, pre-tubed, and calibrated for ease of field installation. Customer specified signal connection fittings included.

Indication. Each meter serves as a visual monitor of the HVAC system and fan operation and can indicate slipping or broken fan belts, fan of due to overload, closed fire dampers, failing fan bearing, open access door, erratic controls performance, etc.

Custom Scaling. Meter faces custom scaled in user selectable volume, velocity, and/or pressure engineering units of measure.

Identification Label. Each meter is provided with an application specific, engraved, plastic data plate stating the system, the airflow station number, and the maximum meter range.

Accurate airflow measurement for demanding applications



AIR MONITOR
CORPORATION

Airflow Meters

Construction Features

Stationary Meter

Type. Stationary.

Gauge. Diaphragm activated, differential pressure.

Enclosure. Anodized aluminum, NEMA 1.

Signal Fittings. Brass barbed fittings for 1/4" O.D. tubing. Other fittings available.

Display. Custom, dual scaled display of process.

Meter Panel

Type. Door mounted (minimum of two meters per panel).

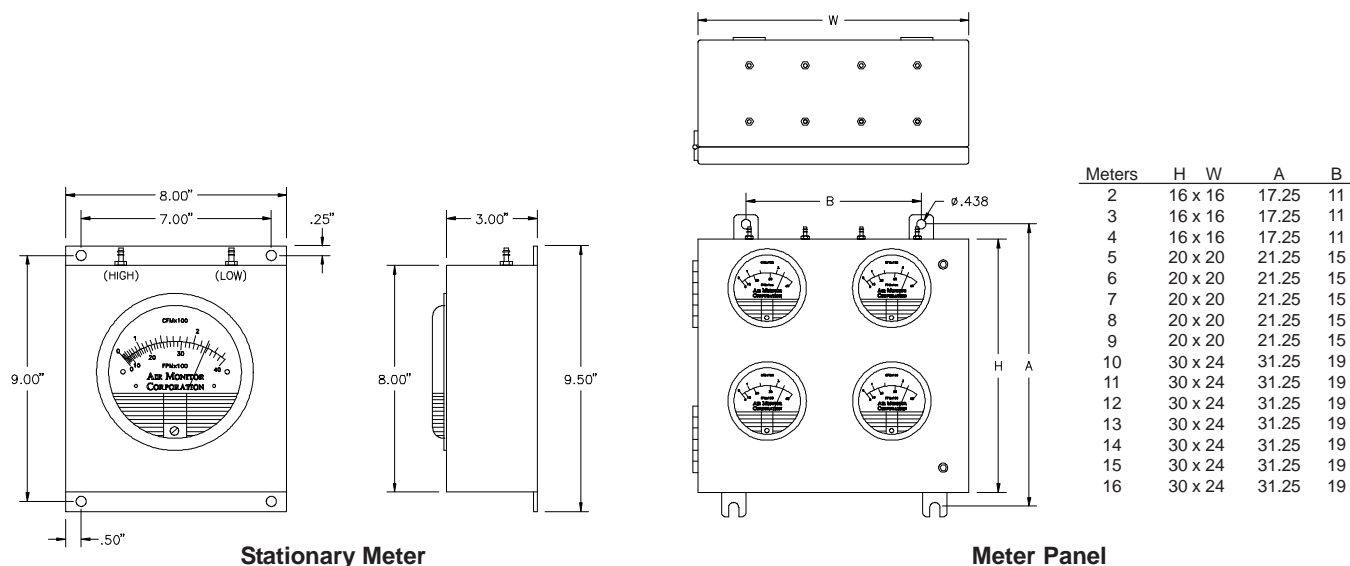
Gauge. Diaphragm activated, differential pressure.

Enclosure. NEMA 1 steel with polyurethane paint finish.

Signal Fittings. 1/4" brass compression. Other fittings available.

Display. Custom, dual scaled display of process.

Dimensional Specifications



Stationary Meter. Provide where indicated a stationary meter consisting of a dual-scale, diaphragm-actuated, differential pressure gauge mounted in an anodized aluminum enclosure. Gauges to be custom scaled to read in user selected volume, velocity, and/or pressure units of measure. Meter to be complete with internal tubing, [specify type] signal connection fittings, wall mounting brackets, and furnished with a plastic data plate listing the system, the airflow station number, and the maximum scheduled air volume.

The meter shall be the Stationary Meter as manufactured by Air Monitor Corporation, Santa Rosa, California.

Meter Panel. Provide where indicated a meter panel consisting of multiple dual-scale, diaphragm-actuated, differential pressure gauges mounted in a NEMA 1 steel enclosure. Gauges to be custom scaled to read in user selected volume, velocity, and/or pressure units of measure. Meter to be complete with internal tubing, [specify type] signal connection fittings, wall mounting brackets, and furnished with a plastic data plate listing for each gauge, the system, the airflow station number, and the maximum scheduled air volume.

The central panel shall be the Meter Panel as manufactured by Air Monitor Corporation, Santa Rosa, California.

