

PLUS SERIES

ELECTRA-flo

Thermal Airflow Measurement System



Accurate airflow measurement for demanding applications



AIR MONITOR
CORPORATION

System Features

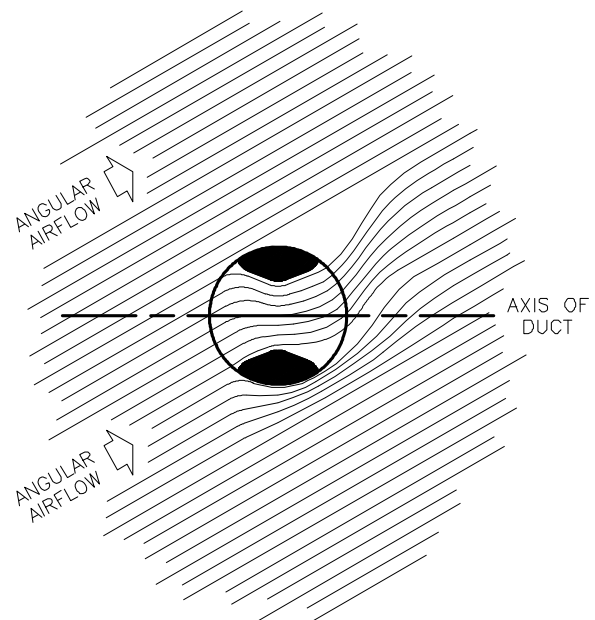
- Measurement accuracy: 2-3% of actual airflow
- 0 to 5,000 FPM (optional 0-10,000 FPM) air velocity measurement range
- Up to 32 measurement points per station or probe array
- Fully field serviceable sensors
- Rugged, hermetically sealed sensor construction for resistance to breakage and thermal shock
- 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.

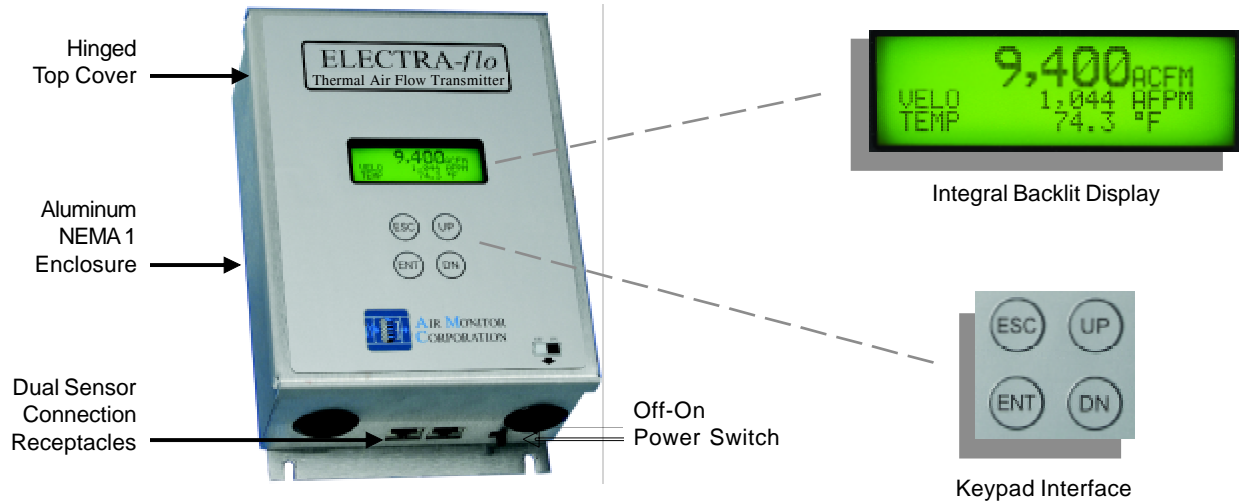
Using a combination of Computational Fluid Dynamics (CFD) modeling and extensive full-scale wind tunnel verification, the aerodynamically optimized cross section of the sensing node aperture prevents error inducing turbulence typical of sharp edged sensing tubes.



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.

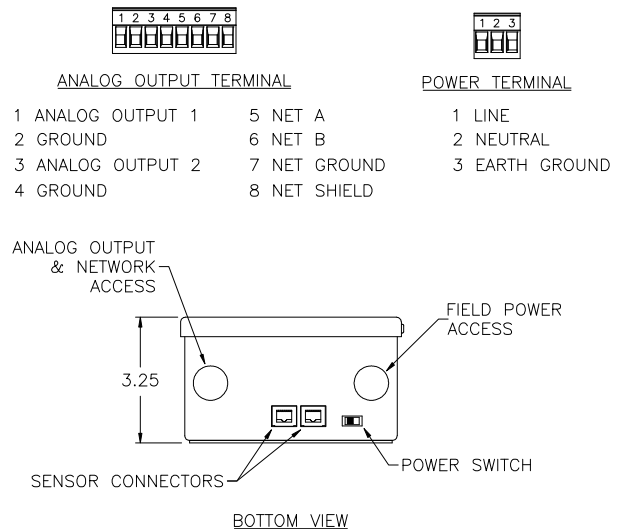
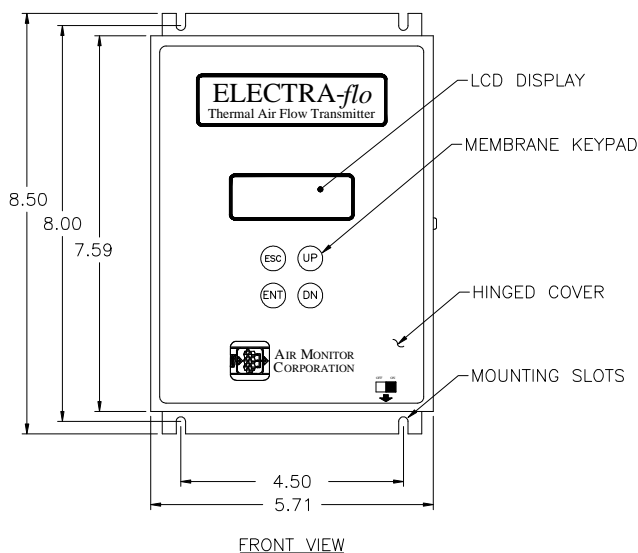
ELECTRA-flo™ "Smart" Transmitter

Construction Features



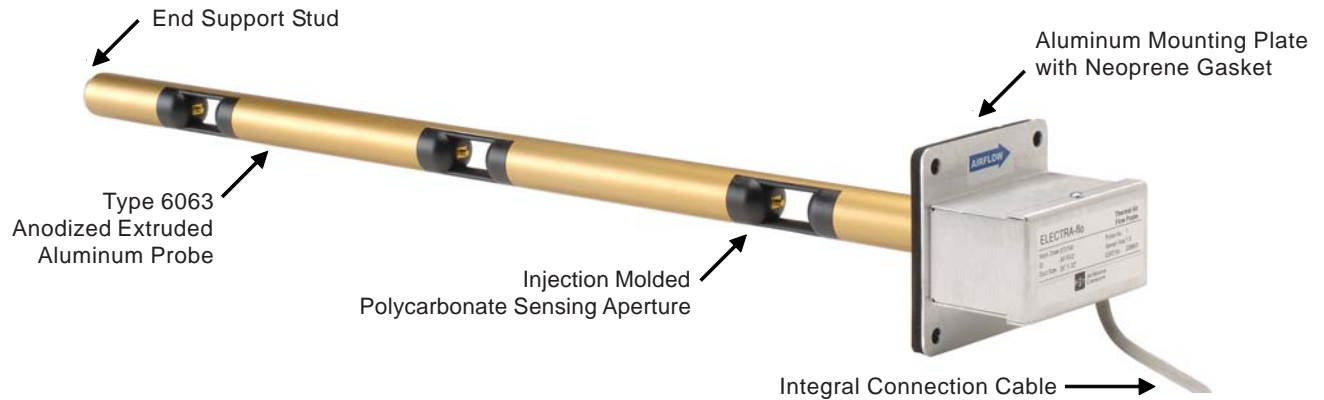
- **Continuous Display of Process.** The ELECTRA-flo comes equipped with a multi-line, backlit, graphical LCD for use during transmitter configuration and calibration, and to display multiple measured processes in engineering units. The LCD provides one line having double width and height characters 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 4-20mA by means of jumpers. BACnet or LonWorks® 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



ELECTRA-flo™ Probe

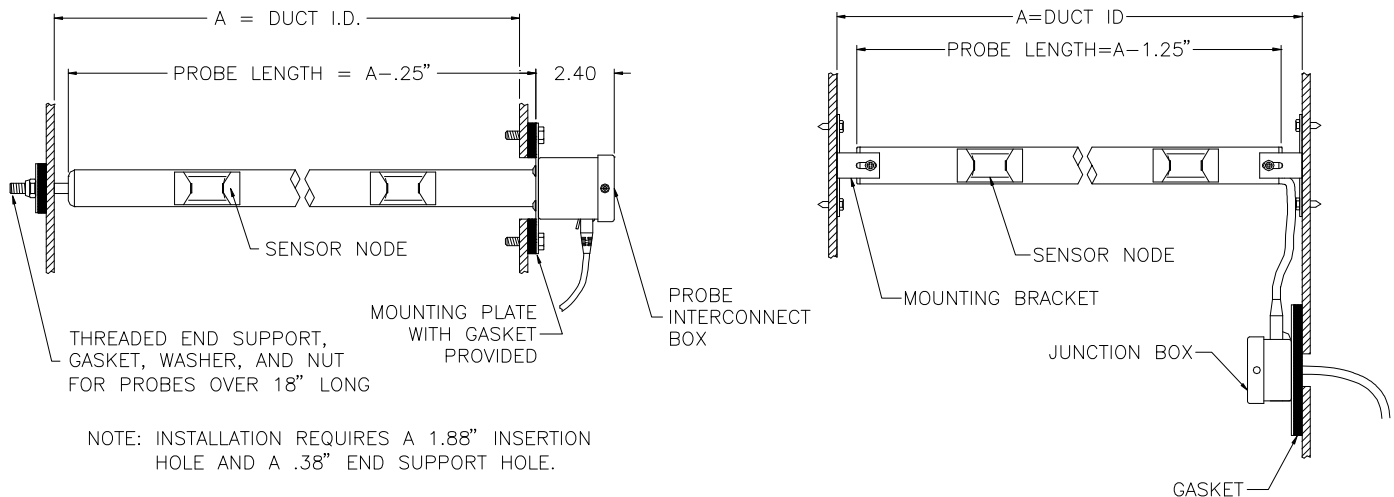
Construction Features



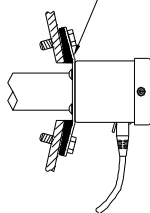
Features

- **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.

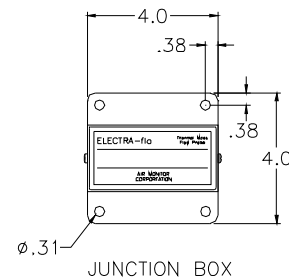
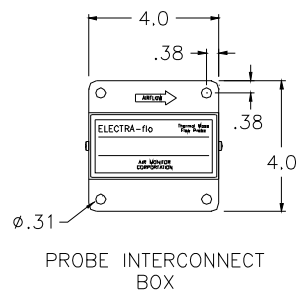
Dimensional Specifications



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.

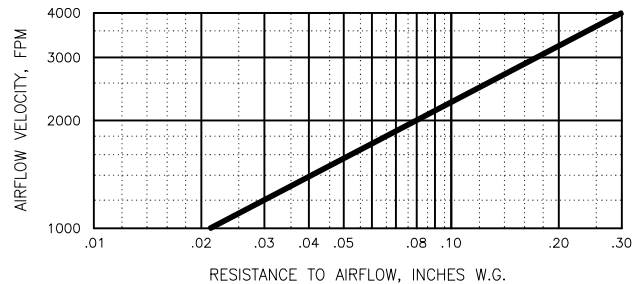
Duct Diameter	Number of Probes / Sensors Per Probe
8 to <12	1/1
12 to <18	1/2
18 to <36	2/2
36 to <48	2/4
48 to <60	2/6
60 to <90	3/6
90 to 120	4/6

		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

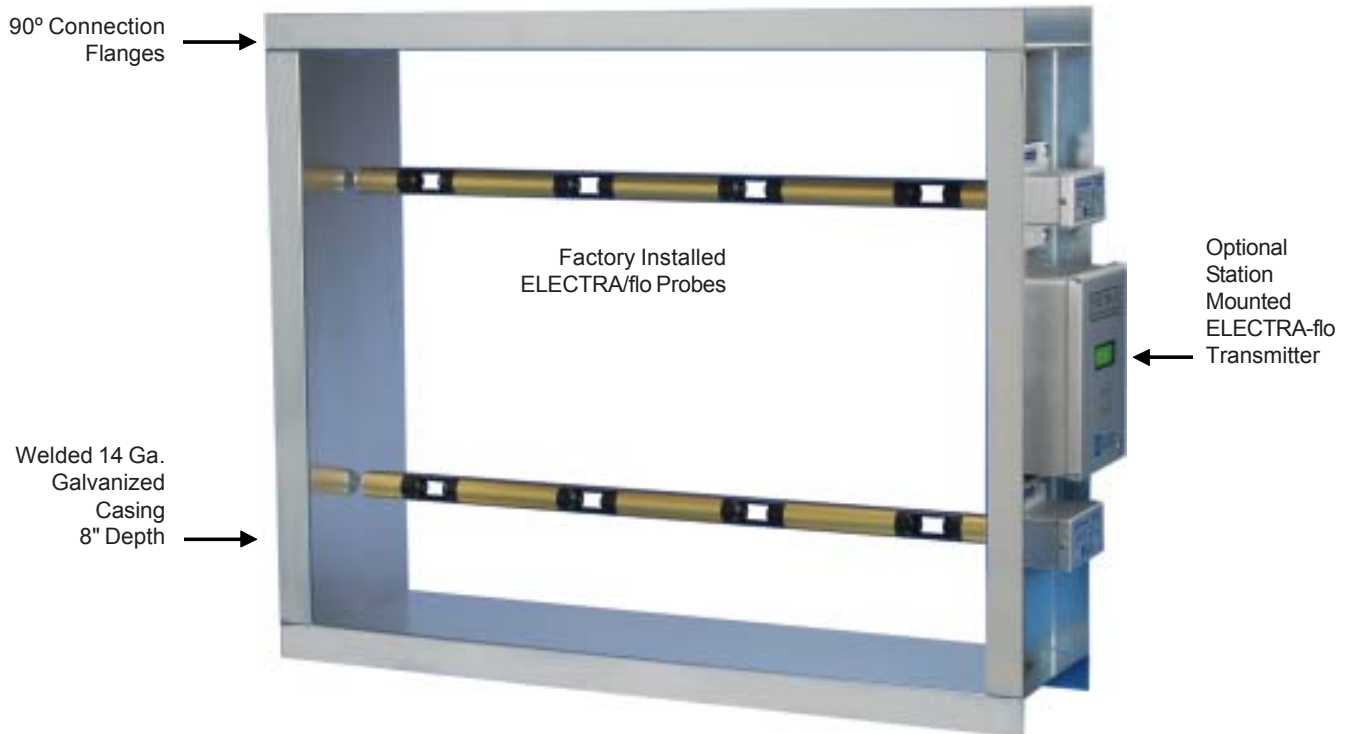
Airflow Resistance

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

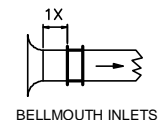
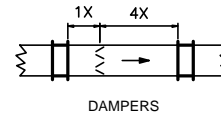
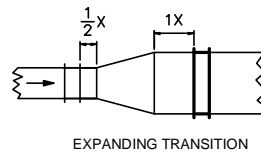
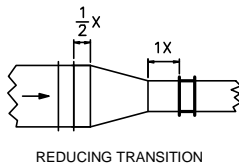
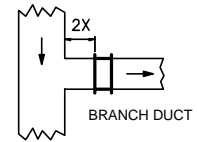
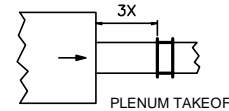
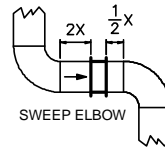
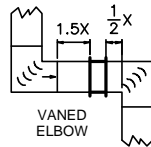
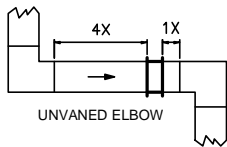
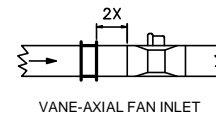
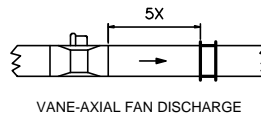
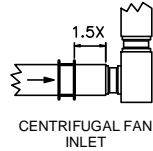
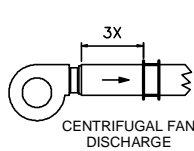
ELECTRA-flo Probes + Casing + Transmitter = Ease of Installation



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. $\pm 2-3\%$ 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 95% 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

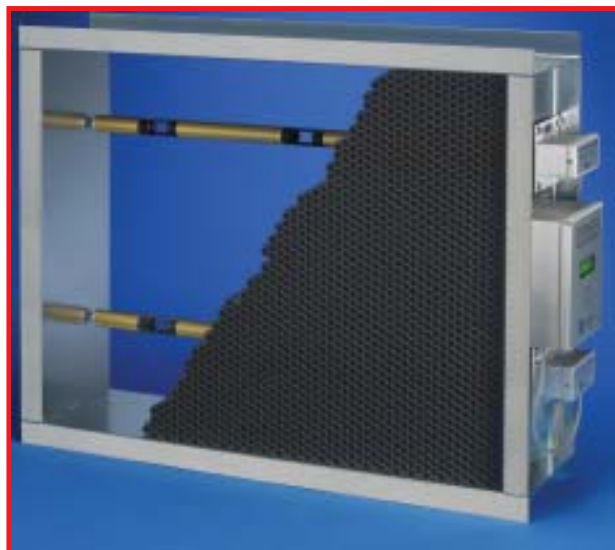
- Maximum Number of Sensors. 32 total sensors per probe array or measuring station.
- Display. Backlit graphical LCD. 3/4" x 2-1/2" display size. Field selectable in U.S. or S.I. units for velocity/flow and temperature.
- Configuration Access. By means of enclosure cover mounted membrane keypad. Password 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 4-20mADC.
- 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. Optional BACnet or LonWorks®
- Humidity Limits. 0 to 95% 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 capable 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



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-Tchebycheff 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.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.



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.

