FAN-Evaluator
Airflow Measuring Station

Accurate airflow measurement for demanding applications
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 duct 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

<table>
<thead>
<tr>
<th>Test Results – Rectangular Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Volume, ACFM</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>35,838</td>
</tr>
<tr>
<td>29,689</td>
</tr>
<tr>
<td>24,616</td>
</tr>
<tr>
<td>20,400</td>
</tr>
<tr>
<td>14,434</td>
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<tr>
<td>8,629</td>
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</tbody>
</table>

Test Results – Circular Stations

<table>
<thead>
<tr>
<th>Test Results – Circular Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Volume, ACFM</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>29,141</td>
</tr>
<tr>
<td>24,275</td>
</tr>
<tr>
<td>20,176</td>
</tr>
<tr>
<td>14,550</td>
</tr>
<tr>
<td>10,215</td>
</tr>
<tr>
<td>8,672</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Duct / Station Configuration</th>
<th>ASHRAE 1993 Fundamentals Handbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangular</td>
<td>25 or more points, maximum 6” or 8” apart, depending on duct size.</td>
</tr>
<tr>
<td>Circular</td>
<td>12 to 30 points, along 2 or 3 diameters.</td>
</tr>
</tbody>
</table>

**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.
**Construction Features**

- Total and Static Pressure Signal Connection Fittings
- Aluminum Honeycomb Air Straightener
- Welded 14 Ga. Galvanized Casing
- 8" Depth (10" for Beaded)
- 90° Connection Flanges
- Copper Total Pressure Central Averaging Manifold
- Offset Fechheimer Static Pressure Sensors
- Copper Total Pressure Sensing Manifold

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**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".
- Sizes > 24" and < 45".
- Sizes > 45".

**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.
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.

![Diagram showing FAN-E locations and clearance requirements]

**Minimum Installation Requirements**

- **Rectangular Duct**: 
  \[ x = \frac{2(H \times W)}{H + W} \]
- **Circular Duct**: 
  \[ x = \text{Duct Diameter} \]

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" w.c. at 2000 FPM, or .30" w.c. at 4000 FPM.

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