AMERICAN AUTO-MATRIX®

AUTO-FLOW®

AF-XPP

AF-XPP℠ Cross Pitot Primary

DESCRIPTION

The Cross Pitot Primary (AF-XPP) offers a significant advancement in air flow measurement. It uses four proven techniques to maximize reliability and accuracy.

1. The pitot is internally manifolded into a measurement system that averages all four flow quadrants. A sensor measuring in all four quadrants is more likely to measure correctly than one that only measures the flow in one plane.
2. By using the Parallel Plate Pitot as the sensing element, the pitot's maximum velocity range and accuracy are enhanced, particularly in the low range. The AF-XPP will operate in a poor profile air stream similar to a pitot with "honeycomb" or straightening vanes, but without the plugging problems usually associated with them.
3. By installing the pitot in a thick-walled duct section, a beta ratio (the ratio of the measurement section to the entrance section) of less than one can be obtained. This technique makes the measurement section less sensitive to upstream conditions, and due to it's structural stiffness, the internal area less likely to be affected by installation.
4. The pitot's uniquely ported total-pressure sensing holes allow the pitot to perform a velocity vs typical pressure average. This results in a pitot that is more accurate under poor duct profile conditions and reduces the requirements for a straight duct run.
5. Sensing holes are positioned in the "equal sensing area" pattern.

View of Cross Pitot (AF-XPP) inside duct section
NOTE: AF-XPP does NOT include duct section

ADVANTAGES

- Accuracy
- Low unrecovered pressure loss
- Resists plugging
- Low "noise" operation
- All materials in contact with the flowing stream made of chemically inert PVC or polypropylene
- In-place calibration not normally required but is recommended

AF-XPP SPECIFICATIONS

Maximum Static Pressure	15 psig (103 kPa)
Maximum Operating Temp	160˚ F (70˚ C)
Wetted Materials	PVC pitot
Output Connections	1/8 in. FNPT
Velocity Range	50 to 6000 fpm (0.254 to 30.5 m/s)
Unrecovered Pressure Loss	0.1 x velocity pressure
Accuracy Over any 5:1 flow range	1% (includes linearity and hysteresis)
Relative Accuracy 5:1 flow range	accuracy as compared to the customer stated reference ±1% with standard upstream conditions (testing may be required)

APPLICATIONS

- Continuous air flow control
- Continuous air or compatible gas measurement
- Mass flow measurement (with temperature correction)
- Laboratory exhaust flow
- Room supply flow control / exhaust flow control
- Room or building air volume measurement
- Volumetric synchronization of laboratories and buildings
- Monitoring test facilities
- Measuring for regulatory compliance

OPERATION

Due to the velocity averaging aspect of the specifically ported total-pressure sensing holes, the AF-XPP only requires a straight duct run equal to 2 diameters upstream and equal to 1 diameter downstream. Operation with other than standard conditions will require in-place calibration for maximum accuracy. The flow control system can easily accommodate temperature input for mass flow calculations. Temperature effects the pitot's mass flow measurement by about 1%/10° F (1%/5.6° C).

CALCULATIONS

General Relationship: $Q = V \times A_a$
where Q is volume flow, V is velocity, and A_a is effective area of the duct

Example: Air at standard conditions inside an AF-XPP-10 with A_a= 0.429 ft², and 800 cfm:

$$V = 4005 \times \sqrt{\Delta h}$$

$$Q = A_E \times 4005 \times \sqrt{\Delta h}$$

$$\Delta h = \left\{\frac{Q}{A_E \times 4005}\right\}^2 = \left\{\frac{800}{.429 \times 4005}\right\}^2 = 0.212 \text{ in. wc}$$

Conversely, if a 0.25 in. wc transmitter were on this pitot, full scale flow at standard conditions would be:

$$Q = A_E \times 4005 \times \sqrt{\Delta h} = 0.429 \times 4005 \times \sqrt{0.25} = 859 \text{ cfm}$$

A more general relationship for V for any fluid is:

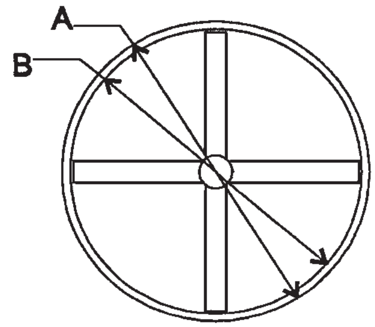
$$V = 1097 \times \sqrt{\frac{\Delta h}{\rho}}$$

where ρ is density (lb/ft³) and Δh is differential pressure (in. wc). Also, for dry air:

$$P = \frac{1.325 \times P_B}{T}$$

Where P_B is barometric pressure in inches of mercury, and T is absolute temperature in °R (460 + °F)

PHYSICAL DIMENSIONS



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NOM	A	B	AE
8.0 (20.32)	8.63 (21.92)	7.94 (20.17)	0.258 (239.71)
10.0 (25.40)	10.75 (27.31)	9.98 (25.35)	0.429 (398.57)
12.0 (30.48)	12.75 (32.39)	11.89 (30.20)	0.638 (592.76)

ORDERING INFORMATION

AF-XPP-XX : Cross Flow Pitot Assembly

American Auto-Matrix products and systems are manufactured and installed under one or more of the following US patents and/or others that may apply.
5,764,579; 6,272,399; 5,920,488; 5,946,221; 5,481,919; 5,402,687; 5,415,583

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Part No : 1E-05-00-0109

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