PRODUCT INFORMATION

FLOW MEASUREMENT WITH THE PTE-1 AND ST-2H

There are currently a number of ways flow is measured in typical industrial/commercial applications.

- Pitot Tubes: A pitot tube measure velocity pressure and static pressure. From these measurements (and knowing the K factor of the pitot tube and the density of the gas), flow can be calculated.

- Annubars: Provides a pitot tube "array" which averages the pressure over a cross section of conduit through which the flow is traveling.

For these two technologies, a flow formula has been installed in the handheld calibrator firmware.

Other technologies are:

- Orifice Plates
- Hot Wire Anemometers
- Venturi Tubes
- Flow Nozzles
- Vortex Shredders
- Turbine Meters
- PD Meters

Currently the handheld calibrator does not have formulas, in firmware, for calculation of flow in these processes.

However, where the pressure measurements are a part of the flow calculations with other flow measurement technologies (such as orifice plates), the handheld calibrator can:

– take pressure data
– download the data into a PC
– have the handheld calibrator pressure data and other input requirements processed by spreadsheet formula to provide flow measurements.

When using pitot tube and annubar technologies, velocity is calculated by the following formula:

$$\text{Velocity} = 1096.7 \times K \times \sqrt{\frac{\text{Velocity Pressure}}{\text{Density}}}$$

Velocity pressure is defined to be the pressure generated within a pitot tube which is strictly related to the velocity of the fluid being measured. This velocity pressure is also equal to the total pitot tube pressure minus the static pressure within the system. "Static" pressure can be thought of as the pressure within the system at "0" velocity.

The handheld calibrator can very accurately measure:

- Total Pressure
- Static

Accuracy of these pressure measurements will depend on the handheld calibrator module type and the pressure range:

– .06% of span for HQS-1 sensor modules
(ranges 0/.25 in.H_2O to 0/200 in.H_2O

However, we cannot control the accuracy of the other factors in the equation:

– Density which will vary with temperature, humidity and barometric pressure
– K factor which is the factor provided by the manufacturer of the annubar or pitot tube. Typical "default" values of these K factors are:
- .66 for annubar readings in a circular cross section page
- .60 for annubar readings in a rectangular cross section passage
- 1.0 for pitot tubes

There are also "installation" requirements which may affect the accuracy of the velocity measurement. Typical installation considerations are:

– Location of the pitot tube (or annubar) from upstream or downstream obstructions such as elbows
– Presence of turbulent flow
– Ratio of pitot tube diameter to duct diameter
– Angular position of a pitot tube in relation to the flow stream
– Position of a pitot tube in relation to the center of the duct
– Position of a pitot tube in relation to duct walls
– Use of flow leveling devices upstream of flow.

In summary, we can guarantee the accuracy of the proper measurements. However, we cannot guarantee the accuracy of the other flow formula inputs or ensure the capability of the installation. With this in mind, flow measurement accuracy should take into consideration all of the above factors and is best determined by the end user.