Air Flow Measuring Station With Pneumatic Damper
MODEL 861 AFS

BULLETIN 861-b

Entrance to Flow Station

Damper Discharge

Product Description

The Waddell Airflow Station is designed to meet the stringent airflow measurement needs for our Waddell Pneumatic Damper. The flow station includes the time proven 861 differential pressure probe and, if desired, honeycomb for flow straightening.

The flow station is available in galvanized material, aluminum or stainless steel.

Accessories

Transmitters
Signal surge suppressors

Benefits

Accurate airflow measurement through a wide range of flows
Unusually accurate at very low flows
Accurate readings in confined spaces

Applications

Volumetric Tracking
Room supply Air Systems
Clean Spaces
Research Laboratories

Product Application and Availability

For application assistance please refer to Bulletin 861.

The Waddell Airflow Station is often applied as a stand-alone flow station for system monitoring. Contact your local representative or our engineering department for application assistance.

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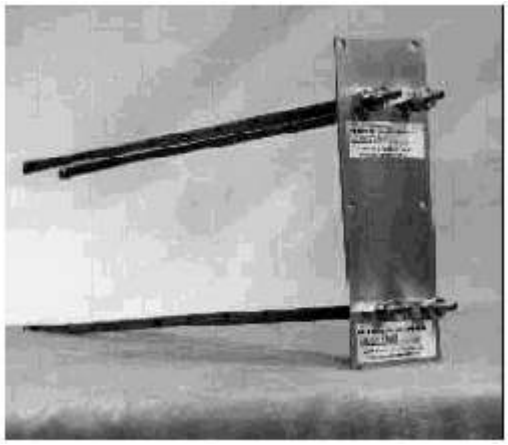
Air Flow Measuring Probe Differential Pressure

BULLETIN 861



Principals of Design

Waddell has combined several well-known fundamentals to provide an extended range differential pressure probe.

The impact (upstream) pressure enters a series of orifices that are designed with a profile similar to a bell mouth. The bell mouth shape not only minimizes the entrance losses but also minimizes the effect of skewed flow (sometimes called yaw). The twin entering and discharge transport tubes are oversized to reduce internal pressure resistance. The discharge holes are located at the point of maximum negative pressure. The twin tube concept magnifies the normal velocity pressure signal. This expanded signal will permit sensing lower flow rates than normal Pitot tube based devices. We define this expanded signal as a sense signal and use this term in our performance charts.

Benefits

Simple Rugged Construction
Accurate through a Wide Velocity Range
Repetitive Output

Application

Supply Air Dampers
VAV Fume Exhaust Hoods
Zone/Floor Control Dampers

Typical Systems

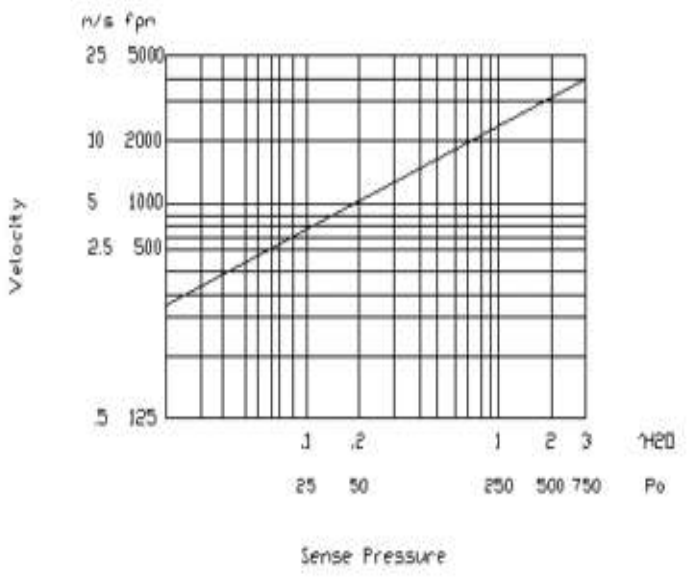
This probe is designed specifically for small ducts with uneven velocity profiles. These applications are found in buildings with high density mechanical services such as research laboratories, pharmaceutical manufacturing spaces and microcircuit processing. These probes can be used with equal accuracy as a probe mounted in existing duct work or as an as-assembled air flow station with flow straightening vanes (honeycomb). The designer must review the specific application for the need for flow straighteners in either a new or existing application.

Advantages of the Differential Pressure Based Probe

This probe configuration is a time proven design and is based on the dependable Pitot tube. The measurement of the pressure differences between the total and static pressures is indicative of the velocity or dynamic pressure of the air stream. The dynamic pressure of the air stream is related (by the square root) to the velocity in the duct system. By properly shaping and orienting the entering and discharge ports the difference between the signals can be increased and the range of measurement can also be increa

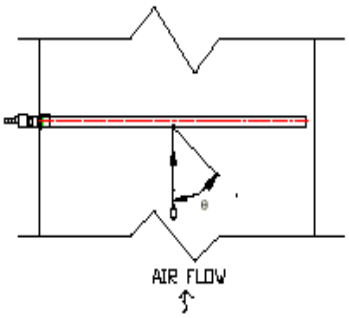
Performance Notes

The probe will magnify the duct velocity pressure by a factor of 2.2 times. We call this pressure the sense pressure and our performance chart is based on sense pressure not the normal velocity pressure.
We suggest that the minimum airflow be estimated so the low pressure signals will be within the capability of the transmitter.



Velocity (ft/min)=3150(ΔP)^.5 Velocity (m/s)=1.00(ΔP)^.5

Effect of Yaw



θ	Error in Sense Pressure
0°	0%
10°	-4%
20°	-9%
30°	-11%

This performance data is based on the airflow entering the probe with uniform velocity contours and at a zero degree angle.

System Design Recommendations

A common rule of thumb has been to locate the flow station 2 to 3 duct diameters downstream of any flow disturbances (such as elbows). For more dependable flow station performance the velocity contours as well as minimum and maximum velocity values should always be considered. The need for this extra effort is based on the standardized method of testing (such as the AMCA Standard 601-95 fig. 1) which requires 6 straight duct diameters to assure optimum and repetitive test results. “Real Life” systems are never ideal so the effect of the system on the accuracy of the flow station should be evaluated for errors. Some of these system effects are minimized by adding flow straighteners such as a honeycomb, turning vanes, etc. These devices can help equalize turbulence but often do not provide a uniform velocity profile. Location in condensing atmospheres, such as down-stream of cooling coils, is not recommended. Dusty atmospheres can be compensated for by using a purge device; although the particle density and the size of the particles should be estimated.

Effect of Yaw

The effect of yaw (skewed) flow is the error of the signal as the velocity entrance angle increases from 0 degrees. Yaw effects are found when stations are installed directly downstream of various flow disturbances. The influence of yaw decreases as the velocity decreases below 1000 ft/min and increases with increasing velocities.

Availability of Materials

For non-corrosive and normal temperatures several materials are quite satisfactory. These include Cop-per, Aluminum and Plastic (CPVC, Acetate or FRP). Local codes may indicate a preference. For higher temperatures (above say 150°F) stainless steel can be considered. For abrasive conditions, a hard surfaced material such as stainless steel should be evaluated.

Accessories that may be Considered

Pressure transmitters with Auto Zeroing capabilities, purges for dusty atmospheres as well as special configurations are additionally available.

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