FlowStar™ Airflow Sensor

ENVIRO-TEC® BY JOHNSON CONTROLS

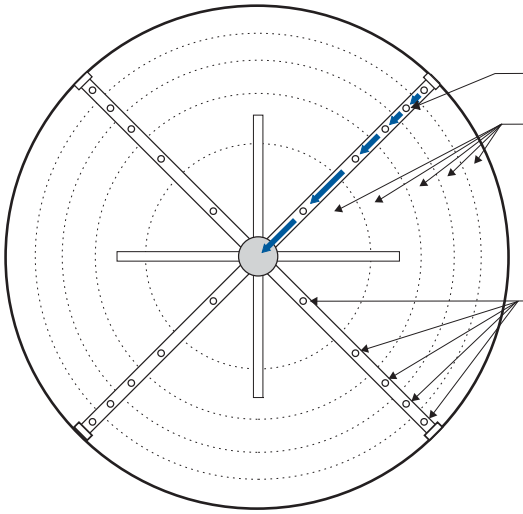
The ENVIRO-TEC® air valve features the FlowStar™ airflow sensor which has brought new meaning to airflow control accuracy. The multi-axis design utilizes between 12 and 20 sensing points that sample total pressure at center points within equal concentric cross-sectional areas, effectively traversing the air stream in two planes. Each distinct pressure reading is averaged within the center chamber before exiting the sensor to the controlling device.

This sensor adds a new dimension to the concept of signal amplification. Most differential pressure type sensors provide a signal equal to 1.5 times the equivalent velocity pressure signal. The FlowStar™ provides a differential pressure signal that is 2.5 to 3 times the equivalent velocity pressure signal. This amplified signal allows more accurate and stable airflow control at low airflow capacities. Low airflow control is critical for indoor air quality, reheat minimization, and preventing over cooling during light loads.

Unlike other sensors which use a large probe surface area to achieve signal amplification, the FlowStar™ utilizes an unprecedented streamline design which generates amplified signals unrivaled in the industry. The streamlined design also generates less pressure drop and noise.

Patent Number 5,481,925

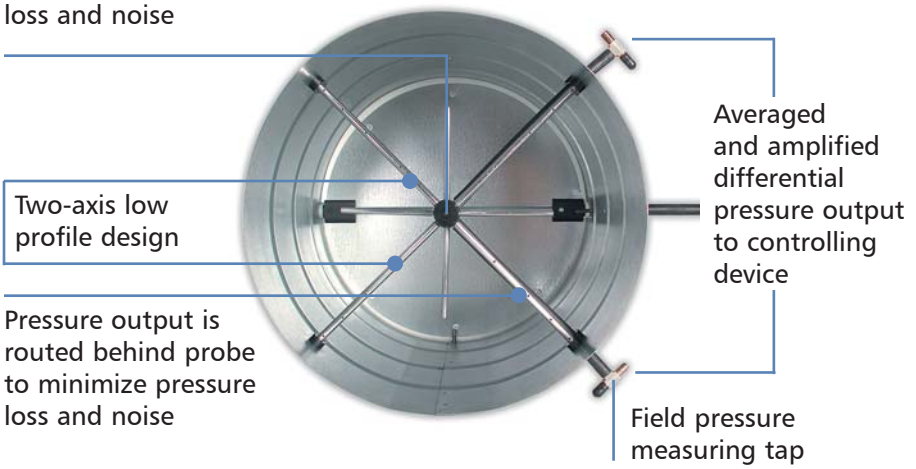
Accurate Airflow Control



Each pressure input signal is routed to the center averaging chamber

Equal concentric circular areas
- Sizes 6 & 8: 3 Circles
- Sizes 10 & 12: 4 Circles
- Sizes 14 & 16: 5 Circles (shown)

Total pressure measured at the center of each concentric circle for maximum accuracy, as outlined in ASHRAE Fundamentals Handbook.
- Sizes 6 & 8: 12 Sensing Points
- Sizes 10 & 12: 16 Sensing Points
- Sizes 14 & 16: 20 Sensing Points



Amplifying the Airflow Sensor Signal Allows Lower Minimum Airflow Setpoints

Many VAV controllers require a minimum differential pressure signal of 0.03 inch W.G. The airflow sensor should be able to generate this signal with only 400 to 450 FPM air velocity through the inlet collar.

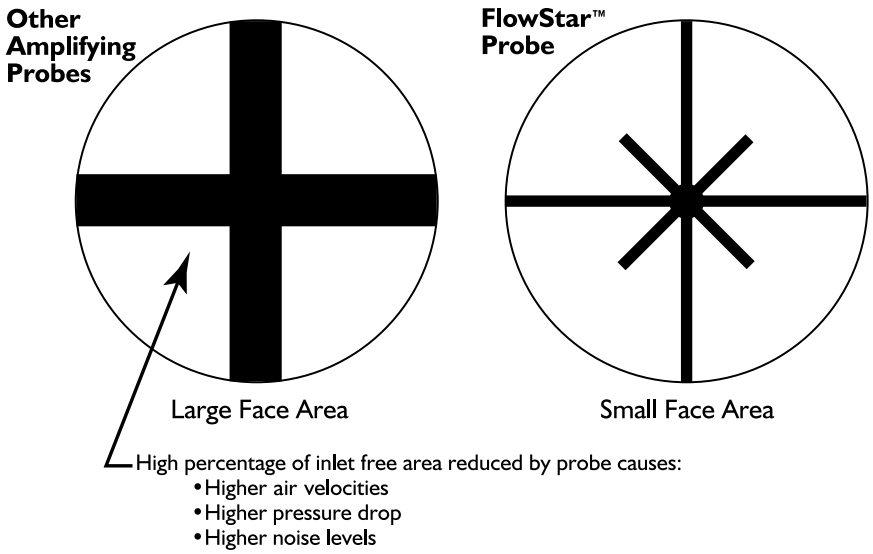
Conventional airflow sensors without amplification capabilities require approximately 700 FPM to generate a 0.03 inch W.G. signal. If 700 FPM represents a 20% minimum condition, the inlet velocity would be 3500 FPM at the maximum airflow setpoint. This results in extremely noisy conditions. In addition, the airflow sensor should generate a differential pressure range of at least one inch W.G. over the operating range of the terminal unit.

Specifying a VAV Terminal Airflow Sensor

The VAV schedule should specify the minimum and maximum airflow setpoints, maximum sound power levels, and maximum air pressure loss for each terminal. The specification for the VAV terminal must detail the required performance of the airflow sensor. For maximum building occupant satisfaction, the VAV system designer should specify the terminal unit airflow sensor as shown below.

Suggested Specification

Differential pressure airflow sensor shall traverse the duct using the equal cross sectional area or log-linear traverse method along two perpendicular diameters. Single axis sensor shall not be acceptable for duct diameters 6" or larger. A minimum of 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.5 times the equivalent velocity pressure signal obtained from a conventional pitot tube. The sensor shall develop a differential pressure of 0.03" W.G. at an air velocity of $\leq$ 450 FPM.



"Saving Face"

Some airflow sensor designs amplify the velocity by enlarging the sensor face area (above). This method amplifies the velocity pressure in two ways:

- The static pressure immediately behind the sensor is reduced by substantially obstructing the airflow pattern.
- The free area of the inlet collar is considerably reduced by the large face area of the sensor. The resulting higher air velocity generates a higher velocity pressure.

Additionally, larger face areas create negative side effects such as higher terminal sound levels and increased pressure drop which raises power consumption on the central fan.

Retrofitting a Building To Meet New IAQ Standards

With the Model RFT-MS Airflow Measuring Station

The FlowStar™ sensor is available as a stand-alone airflow measuring station. The Model RFT-MS is a short circular sheetmetal sleeve that can be easily attached to any VAV terminal with a round inlet. The old sensor can be removed and the FlowStar™ then connected to the existing controller.

Due to the accuracy of the FlowStar™, air balancing does not require time consuming duct traverses. The RFT-MS is provided with field balancing taps and an airflow calibration chart. Maximum and minimum airflow setpoints can be quickly calibrated using a differential pressure gauge.

Stock ID: SS-FLOWSTAR Part No. PX-00-0157

Johnson Controls