



Airflow Measurement Device Guide Specification

2 PART 2 PRODUCTS

2.1 SECTION INCLUDES

A. Products included in this Section

1. Airflow Measurement Devices (AMD) for Ducts, Fan Inlets and Fan Arrays
2. Airflow Measurement Devices (AMD) for Outside Air
3. Airflow Measurement Devices (AMD) for Duct Mounted Airflow Station

2.2 ACCEPTABLE MANUFACTURERS

A. Accutrol LLC, (basis of design)

1. VorTek model VTD/VTF/VTFA transmitters
2. VorTek model VTD for ducts
3. VorTek model VTF for fan inlets
4. VorTek model VTFA for fan arrays
5. IAQ-TEK for outside air measurement
6. AccuStation model VTS for duct airflow measurement station

B. Substitution Requirements

1. Substitution request for acceptance less than 60 days prior to bid date or products submitted in non-conformance with the requirements of this specification will not be considered.
2. For any product to be considered for substitution, a written document shall be submitted to the engineer detailing exceptions and compliance, section-by-section with supporting documentation, before an approval will be considered
3. Any product submitted as an equal shall be expected to comply with all performance capabilities and functional aspects of this specification.

C. Excluded Devices:

1. Measurement technologies such as Thermal Dispersion type using multipoint "bead-in-glass" thermistors are not acceptable.
2. Measurement technologies such as Thermal Dispersion type using "chip-in-glass", "chip-in-epoxy" or "chip" type thermistors for the heated sensor component are not acceptable.
3. Transmitter and probe assemblies that state factory recalibration is required to maintain accuracy are not acceptable.
4. Airflow sensors that are affected by dust, humidity and altitude are not acceptable.

2.3 PRODUCTS INCLUDED IN THIS SECTION

A. Airflow Measurement Devices (AMD) for Ducts and Fan Inlets

- I. General
 - a. Provide one VorTek AMD measurement location as shown on the plans, schedules and/or control diagrams to determine the average airflow rate for monitoring and/or control.
 - b. Each VorTek AMD shall be provided with a microprocessor-based transmitter and one or more sensors.
 - c. Airflow measurement device shall be field configurable and adjustable to determine the average airflow rates.

2. The VTD/VTF/VTFA Transmitter
 - a. The transmitter as manufactured shall be of modular design, whereas the local display, remote display, number of probes and sensors, and BACnet are optional and only included as requested or when needed, minimizing cost for basic transmitter applications. BACnet and display shall be capable of being added in the field.
 - b. The transmitter shall have status indication LEDs for power, output, configuration port and communication indicators for BACnet.
 - c. The transmitter shall be capable of utilizing a remote display when the location of the transmitter is not accessible, connected with factory assembled cables that are available in lengths of 25', 50', 75' and 100' as required for remote digital readout locations.
 - d. The transmitter and probe/sensor assembly shall be labeled and preconfigured according to order entry details to minimize set-up in the field with full scale volume range for analog output. This information shall be provided on a factory label along with instructions to assist with installation locations.
 - e. The measurement input shall be digital and will not require an Analog-to-Digital convertor. The transmitter shall provide a scalable analog output, which is field configurable using a free intuitive graphical user interface. The output signal of the transmitter shall be industry standard electronic signals, software selectable, for 0-20mA, 4-20mA, 0-5v, 1-5v, 0-10v and 2-10v. Power requirement for the transmitter shall be 24VAC or DC.
 - f. Measurement system accuracy shall be +/- 3% of volumetric airflow rate with recommended sensor density, installation distribution and proper upstream requirements. Individual sensor accuracy shall be +/- 2% of reading to NIST-traceable standards. Measurement system accuracy of duct airflow measurement shall be +/-3% of volumetric airflow rate; +/-5% of reading for fan inlet and fan array systems.
 - g. Configuration parameters and adjustments shall be accessible via a free Graphical User interface (GUI) PC application that connects to the transmitter locally, or through the remote display via a standard USB Mini B port. This GUI application shall be available to the technician or the balancer via a free download, thereby reducing start-up and commissioning time without dependence on factory trained personnel to be onsite for this

work. Menu driven interfaces using push button and simple alpha numeric display are not acceptable. The transmitter shall be capable of configuration without an external power supply via USB power to configure the output signal range, signal type, BACnet addressing and Baud rates. Transmitters requiring external power for setup are not acceptable.

- h. The transmitter shall have the ability through the GUI, to display the measured velocity at each sensor and display it in an array representing the arrangement in the duct showing the actual air flow profile for evaluation purposes.
- i. The transmitter shall have the ability through the GUI, to provide a simple calculator for the balancer's field adjustment.
- j. The transmitter shall have the ability to be configured in either Imperial or Metric units for velocity, volume and area of measurement, and will carry through to BACnet when required.
- k. The transmitter shall have the ability through the GUI, to provide an individual record of configuration and adjustments in the field of the transmitter for documentation purposes, including, tag information, duct measurements, sensor configuration, output scaling and signal type, balancer adjustment, BACnet setup, and field notes which can either be printed or saved to a file.
- l. The transmitter shall be CE Marked and RoHS compliant.
- m. The transmitter shall be energy efficient and shall consume no more than 5VA when powered by a 24VAC transformer.

3. The VTD Duct Probes

- a. Sensors shall be mounted parallel to the air stream, on probes that span the width of the duct, and are supported at both ends when longer than 14" total. Individual airflow sensors shall be of rugged construction, and shall not require special handling during installation. Where utilized in corrosive air streams, sensors and support bars shall be manufactured of aluminum/polycarbonate, 304SS/303SS, 304SS/303SS High Temp and PTFE coated aluminum/polycarbonate as required to match the ductwork material.
- b. The airflow probe/sensor assemblies shall be manufactured so that they are easily removed from the duct for inspection. Air flow sensors that require access doors for inspection are unacceptable.
- c. Each velocity sensor shall have a frequency output signal that is linear to the airflow velocity, which does not require the microprocessor to linearize the output signal. Sensors that require a microprocessor to linearize the output signal are unacceptable.
- d. Individual velocity sensors shall not be affected by dust, temperature, pressure, or humidity. The sensors shall be passive in nature, with no active parts within the air stream. Measurement technologies such as Thermal Dispersion type using multipoint "bead-in-glass" thermistors are not

acceptable. The output from individual sensors shall be linear with respect to airflow velocity and shall be capable of sensing airflow in one direction only. The velocity sensors shall not require individual calibration to match to a curve, such as thermal dispersion, as the sensor output is inherently linear to velocity.

- e. Sensor density will be according to factory recommendations to provide stated system accuracy. Applications using less sensing points are unacceptable.
- f. Velocity measurements from individual sensors shall be summed by an arithmetic average in the associated airflow transmitter. The transmitter shall be connected to the probes via standard 10 foot factory-assembled cables, provided by the Accutrol representative, and are available in optional lengths of 25', 50', 75' and 100' as required for remote transmitter locations.
- g. Differential pressure based devices for duct airflow measurement such as Pitot tubes, Pitot arrays and Piezo rings are not acceptable due to factory recommended inspections for cleaning.

4. The VTF Fan Inlet Sensors

- a. Sensors shall be mounted parallel to the air stream, on the apex of the fan inlet bell. Individual airflow sensors shall be of rugged construction, and shall not require special handling during installation.
- b. The airflow sensor assemblies shall be easily removed from the fan for inspection.
- c. Sensor electronics enclosure shall be IP66 rated with watertight cable connections.
- d. Each sensor shall have a frequency output signal that is linear to the airflow velocity, which does not require the microprocessor to linearize the output signal. Sensors that require a microprocessor to linearize the output signal are unacceptable.
- e. Individual sensors shall not be affected by dust, temperature, pressure, or humidity. The sensors shall be passive in nature, with no active parts within the air stream. Measurement technologies such as Thermal Dispersion type using multipoint "bead-in-glass" thermistors are not acceptable. The output from individual sensors shall be linear with respect to airflow velocity and shall be capable of sensing airflow in one direction only. The velocity sensors shall not require individual calibration to match to a curve, such as thermal dispersion, as the sensor output is inherently linear to velocity.
- f. Velocity measurements from individual sensors shall be summed by an arithmetic average in the associated airflow transmitter. The transmitter shall be connected to the sensor electronics via standard 25-foot factory-assembled cables with a watertight connector on the sensor electronics, provided by the Accutrol representative, and are available in optional lengths of 50', 75' and 100' as required for remote transmitter locations.

- g. Differential pressure based devices for fan inlet airflow measurement such Piezo rings are not acceptable.

5. The VTFA Fan Array Sensors

- a. Sensors shall be mounted parallel to the air stream, on the apex of the fan inlet bell. Individual airflow sensors shall be of rugged construction, and shall not require special handling during installation.
- b. The airflow sensor assemblies shall be easily removed from the fan for inspection.
- c. Sensor electronics enclosure shall be IP66 rated with watertight cable connection.
- d. Up to four sensors shall be connected to the electronics enclosure by means of watertight conduit of equal length of no more than 30". Each sub-array may be composed of up to four sensors.
- e. Up to four sub-arrays may be connected to the transmitter electronics which may serve up to 16 fans.
- f. Each volume sensor shall have a frequency output signal that is linear to the airflow velocity, which does not require the microprocessor to linearize the output signal. Sensors that require a microprocessor to linearize the output signal are unacceptable.
- g. Individual volume sensors shall not be affected by dust, temperature, pressure, or humidity. The sensors shall be passive in nature, with no active parts within the air stream. Measurement technologies such as Thermal Dispersion type using multipoint "bead-in-glass" thermistors are not acceptable. The output from individual sensors shall be linear with respect to airflow velocity and shall be capable of sensing airflow in one direction only. The velocity sensors shall not require individual calibration to match to a curve, such as thermal dispersion, as the sensor output is inherently linear to velocity.
- h. Volume measurements from individual sensors shall be summed in the associated airflow transmitter. The transmitter shall be connected to the sub-arrays via standard 25 foot factory-assembled cables, provided by the Accutrol representative, and are available in optional lengths of 50', 75' and 100' as required for remote transmitter locations.
- i. Total fan array flow volume shall be transmitted to the Building Management System by analog signal, which shall be configurable with the Accutrol Insight Software package. Individual fan flow values shall be available with the inclusion of an optional BACnet interface card.
- j. Differential pressure based devices for fan inlet airflow measurement such Piezo rings are not acceptable.

- B. Airflow Measurement Devices (AMD) for low-velocity turbulent airstreams at the AHU intake.

- I. General
 - a. Provide IAQ-TEK measurement location as shown on the plans, schedules and/or control diagrams to determine the average airflow rate for monitoring and/or control of Outside Air.
 - b. Each IAQ-TEK shall be provided with a microprocessor-based I/O Module and one or more transducers which include a differential pressure sensor.
 - c. Pressure sensor shall be HPIS® type.
 - d. Airflow measurement shall be field configurable and adjustable to determine the average airflow rates.
 - e. Each IAQ-TEK measurement location shall be comprised of a set of probes to properly sample the airstream in difficult to measure locations.
2. Velocity Sensing Probes:
 - a. Use: Large area impact probes designed to be mounted in areas where turbulence is expected such as in the discharge of louvers, inside rain hoods, after filter banks, before coils, or upstream of outdoor air intake dampers. Probes shall generate a differential pressure in response to the air velocity which they are subject to. Small area duct probes such as pitot and thermal dispersion are unacceptable due to inaccuracies caused by air turbulence.
 - b. Velocity Range: Velocity range is dependent on the pressure range selected. Each unique pressure range will be able to handle different velocity ranges.
 - c. Quantity: Probes are to be provided in the minimum quantity recommended by the manufacturer for the specific area to be monitored.
 - d. Mounting: Probes shall be provided with any special hardware required to ensure secure mounting. Mounting hardware shall be 304SS. Galvanized or aluminum hardware shall be unacceptable. Probe shall be mounted to minimize extreme angular velocities. Installer to follow manufacturer's mounting instructions.
 - e. Orientation: Probe must be located facing into air stream and isolated from return airflow. Pressure connection barbs must be upright.
 - f. Material: Kydex plastic ABS/PVC compound with UL ratings of UL-94-V0.
 - g. Pressure Connections: 1/4 inch barbed connections shall be provided for high and low pressure sensing.
 - h. Cleaning: Probes shall be able to withstand periodic wash-down with water without a degradation in signal quality.
 - i. Humidity: Probes shall not be affected by high levels of water vapor, including entrained rain and fog. Thermal devices shall not be acceptable due to condensation affecting the operation of the unit.
3. Outdoor Air Transducer Assembly
 - a. Style: HPIS transducer, ambient temperature sensor, humidity sensor and Barometric pressure sensor.
 - b. Range: Differential pressure range shall be selected for the corresponding air velocity range being measured.
 - c. Temperature range: Transducer shall be capable of operating over the range of -40 to 120 degrees F without any temperature induced errors including zero or span shift.
 - d. Environment: HPIS element shall be mounted in a sealed NEMA 4 enclosure, suitable for mounting in the outdoor air plenum.

- e. Pressure Connections: 1/4 inch brass barbed connections shall be provided for high and low pressure sensing.
 - f. Electrical Connections: A weather tight connection to the transducer shall be provided with a weatherproof factory-cable assembly and connector. Cable shall be plenum rated.
 - g. Humidity: Transducer shall be protected from condensation in sensing chamber and connection tubing when transducer temperature is lower than the dew point of the measured air stream.
4. I/O Module with Touchscreen Electronics:
- a. Style: Microprocessor based electronics including integral touchscreen display and capacity for up to two separate pressure inputs.
 - b. Function: Receive signals from transducer(s) and probes, calculate outdoor air volume, airflow velocity, temperature, humidity, barometric pressure, and enthalpy. The device shall display information to the user, allow start-up and configuration of basic parameters, transmit information to building automation system by analog output, and/or discrete communication network, perform self-diagnostics, and alarm on selectable limits.
 - c. Display: A color, touch-screen display shall be provided and shall be backlit for use in low light areas.
 - d. Temperature range: I/O Module with Touchscreen shall be capable of operating over the range of -4 to 120 degrees F.
 - e. Calculations: I/O Module with Touchscreen shall perform calculations including differential pressure to velocity and velocity to volume conversions, enthalpy; and correct for altitude, intake air temperature, barometric pressure.
 - f. Analog Outputs: I/O Module with Touchscreen shall provide industry configurable analog outputs for corrected volume and outdoor air temperature, or other selectable parameters. Scaling of volume all outputs shall be adjustable by the user.
 - g. Contact Outputs: Two dry-contact outputs shall be available which will be normally energized and shall indicate either an alarm condition or unit problem.
 - h. Touchscreen Setup: The I/O Module with Touchscreen shall include a password protected color, touchscreen interface to lead the building automation contractor, test and balance contractor, and/or user through the steps necessary to adjust basic configuration parameters.
 - i. Accutrol Insight configuration: Troubleshooting and customization of the device shall be performed with Insight software by Accutrol. Diagnostic functions shall be provided to assist in troubleshooting connections.

C. Airflow Measurement Devices (AMD) for Duct Mounted Airflow Station

I. General

- a. Provide one AccuStation model VTS duct measurement location as shown on the plans, schedules and/or control diagrams to determine the airflow rate for monitoring and/or control.
- b. Each AccuStation VTS shall be provided with a microprocessor-based transmitter and two sensors.

- c. Airflow measurement device shall be field configurable and adjustable to determine the average airflow rates.

2. Design

- a. The compression section shall divide the airstream into at least two separate airstreams. Each airstream shall be approximately equal in size and the total open area shall be approximately 50% of the duct open area. The divided sections shall cause compression therefore creating a more laminar flow for better airflow measurement and turndown. The compression section shall be of an aerodynamic shape with a static regain section to insure minimal pressure drop. The airflow station shall not require any duct straight runs either upstream or downstream of the station to achieve required specified performance.
- b. The airflow measurement station shall be capable of being mounted in any position (360° mounting plane) in ductwork.
- c. Airflow measurement station body material for non-corrosive service such as for Supply and Return or Exhaust shall be 16-gauge aluminum. The airflow measurement station shall be available in 20-gauge 304SS and 316SS when installed for corrosive service.
- d. The airflow measurement station shall be complete with a digital vortex type airflow sensing device providing true airflow feedback for the system.
- e. Individual velocity sensors shall not be affected by dust, temperature, pressure, or humidity. The sensors shall be passive in nature, with no active parts within the air stream. The output from individual sensors shall be linear with respect to airflow velocity and shall be capable of sensing airflow in one direction only. The velocity sensors shall not require calibration.
- f. The airflow sensors shall be easily accessible in the airflow station for inspection without removing station from the duct. Airflow stations provided without built in inspection ports will not be acceptable.
- g. Sensing methods employing thermal devices in the airstream shall not be acceptable due to their susceptibility to dust and dirt buildup in airstream.
- h. Airflow station shall be capable of BACnet MS/TP option if required for information sharing.
- i. Airflow station shall be capable of provision/connection to factory provided remote monitor w/ airflow display if required.
- j. Airflow station shall be capable of configuration of Analog Output signal in the field through software (no jumpers). Connection between the airflow station and the computer shall be provided through a USB "C" Type port located on the station.