SECTION 230923.14 FLOW INSTRUMENTS

Data contained in this guide specification may be placed in either of the following sections, depending on the specifics of the system design, or incorporated within the next higher level controls specifications (230923.14 FLOW INSTRUMENTS or even higher in 230923 DIRECT DIGITAL CONTROL (DDC) SYSTEMS FOR HVAC).

PART 2 PRODUCTS

2.1 SECTION INCLUDES

A. Acceptable Manufacturers
   1. EBTRON, Inc.
   2. Approved performance equal
B. Products Included in this Section
   1. Fan Airflow Measurement Devices (AMD) with Temperature and Airflow Alarming Capability

2.2 ACCEPTABLE MANUFACTURERS

A. EBTRON, Inc. model HTx104-F is the basis of design
   1. Basis of Design and Acceptable Manufacturers
      a. Airflow measurement devices shall use the principle of thermal dispersion and provide one self-heated bead-in-glass thermistor and one zero power bead-in-glass thermistor at each sensing node.
         1) Thermal dispersion devices that indirectly heat a thermistor are not acceptable.
      b. Substitution requests 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.
         1) 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.
         2) 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 using “chip-in-glass”, “chip-in-epoxy” or other “chip” type thermistors for the heated sensor component are not acceptable.
         2) Pitot tubes, Pitot arrays, piezo-rings and other differential pressure measurement devices.
         3) Vortex shedding airflow measurement devices.
B. Products approved
   1. Approved performance equals.

2.3 PRODUCTS INCLUDED IN THIS SECTION

A. Airflow Measurement Devices (AMD) with Temperature Output and Airflow Alarming Capability
   1. General:
      a. Provide one AMD with temperature output and airflow alarming capability where indicated on the plans, schedules and/or control diagrams to determine the average airflow rate and temperature of each fan at each measurement location.
      b. Each AMD shall be provided with a microprocessor-based transmitter and one or more sensor probes capable of independently processing up to 4 independently wired sensor nodes contained in one or more probe assemblies per measurement location. .
         1) Devices that have electronic signal processing components on or in the sensor probe are not acceptable.

c. Airflow measurement shall be field configurable to determine the average Actual or Standard mass airflow rate.
    1) Actual airflow rate calculations shall have the capability of being corrected by the transmitter for altitudes other than sea level.
d. Temperature measurement shall be field configurable to provide either the velocity-weighted average temperature as the default, or simple arithmetic average temperature.

2. Sensor Probes:
    a. Sensor probes shall consist of one sensor node mounted on a 304 stainless steel block with two adjustable zinc plated steel rods connected to 304 stainless steel pivoting mounting feet.
    b. Sensor node internal wiring connections shall be sealed and protected from the elements and suitable for direct exposure to water.
    c. Each sensor probe shall be provided with an integral, FEP jacket, plenum rated CMP/CL2P, UL/cUL Listed cable rated for exposures from -67°F to 392 °F (-55° C to 200° C) and continuous and direct UV exposure.
        1) Plenum rated PVC jacket cables are not acceptable.
    d. Sensor node airflow and temperature calibration data shall be stored in a serial memory chip in the cable connecting plug and not require matching or adjustments to the transmitter.
    e. Each sensor node shall be provided with two bead-in-glass, hermetically sealed thermistors potted in a marine grade waterproof epoxy with sensor housings constructed of glass-filled polypropylene. Upon request, the manufacture shall provide a written independent laboratory test result of 100% survival rate in a 30 day saltwater and acid vapor test.
        1) Devices that use epoxy or glass encapsulated chip thermistors are not acceptable.
    f. Each thermistor shall be individually calibrated at a minimum of 3 temperatures to NIST-traceable temperature standards.
    g. Each sensing node shall have an airflow accuracy of ±2% of reading over a calibrated range of 0 to 10,000 FPM (50.8 m/s).
    h. Each sensor node shall be individually calibrated at 16 measurement points to airflow standards directly calibrated at NIST to the NIST Laser Doppler Anemometer (LDA) primary velocity standard.
        1) Upon request the manufacture shall submit for AMD approval a copy of the NIST report of calibration used for the reference standard used.
            (i) Devices claiming NIST traceability to third party laboratories and not directly to NIST are not acceptable
    i. Each sensing node shall have a temperature accuracy of ±0.15° F (0.08° C) over an operating range of -20° F to 160° F (-28.9° C to 71.1° C) and humidity range of 0 to 100% RH.
    j. The number of independent sensor nodes provided for SWSI and DWDI fans shall be 2 probes x 1 sensor node/per probe in each fan inlet

3. Transmitter
    a. A remotely located microprocessor-based transmitter shall be provided for each measurement location.
    b. All printed circuit board interconnects, edge fingers, and test points shall be gold plated.
    c. All printed circuit boards shall be electroless nickel immersion gold (ENIG) plated.
    d. All integrated circuitry shall be temperature rated as ‘industrial-grade’. Submissions containing ‘commercial-grade’ integrated circuitry are not acceptable.
    e. The transmitter shall be capable of determining the average airflow rate and temperature of the sensor nodes.

1) Separate integration buffers shall be provided for display airflow output, and airflow signal output (analog and network).

f. The transmitter shall be capable of providing a low and/or high airflow alarm output with user-defined set point and % of set point tolerance. Alarm shall be capable of being manually or automatically reset and low-limit cutoff value may be selected to disable the alarm. An alarm delay function shall also be field defined.

g. The transmitter shall be capable of identifying an AMD malfunction via the system status alarm and ignore any sensor node that is in a fault condition.

h. The transmitter shall be capable of field configuration, diagnostics and include Field Output Adjustment software, all using an on-board pushbutton interface and the LCD display. Field Output Adjustment Wizard shall allow for a one or two point field adjustment to factory calibration for installations that require adjustment.

i. The transmitter shall be provided with a 16-character, alpha-numeric, LCD display.
   1) The airflow rate, temperature, high and/or low airflow set point alarm and system status alarm shall be visible on the display.

j. The transmitter shall be provided with communications [select one of the following prior to order entry]
   1) Two field selectable (0-5/0-10 VDC or 4-20mA), scalable, isolated and over-current protected analog output signals (AO1=airflow, AO2=temperature or alarm), or
   2) One isolated RS-485 (field selectable BACnet MS/TP or Modbus RTU) network connection.

k. Analog signal capability shall include two output terminals: the first (AO1), shall provide the total airflow rate; while the second output (AO2) shall be field configurable to provide one of the following:
   1) temperature
   2) low and/or high user-defined airflow set point alarm; or
   3) system status alarm

l. Network RS-485 (field selectable BACnet MS/TP or Modbus RTU) network communications shall provide: the average airflow rate, average temperature, low and/or high airflow set point alarm, system status alarm, individual sensor node airflow rates and individual sensor node temperatures.

m. The transmitter shall have an on-off power switch. Isolation transformers shall not be required.

n. The transmitter shall be powered by 24 VAC (22.8 to 26.4 under load) @11 V-A maximum and use a power supply that is over-current and over-voltage protected.

o. The transmitter shall use a “watchdog” timer circuit to ensure automatic reset after power disruption, transients and brown-outs.

p. Each transmitter shall have an operating range of -20° F to 120° F (-28.9° C to 48.9° C) and humidity range of 5 to 95% RH.

4. Listings and Certifications
   a. The AMD shall be UL/cUL 873 Listed as an assembly.
      1) Devices claiming compliance with the UL Listing based on individual UL component listing are not acceptable.
   b. All network-capable AMD models supplied with RS-485 interface and BACnet protocol shall be BTL Listed. *[Applies only to HTN104-F]*

c. The AMD shall be tested for compliance with the EMC Directive's requirements and be certified to carry the CE Mark for European Union Shipments.

PART 3 EXECUTION

3.1 SECTION INCLUDES

A. Installation

3.2 INSTALLATION

A. Install in accordance with manufacturer's placement guidelines.