SECTION 25 09 23

AIR FLOW STATIONS

PART 1 PRODUCTS

1.01 ACCEPTABLE MANUFACTURS

A. EBTRON, Inc

B. Approved performance equal

C. Products included in this section

1. Airflow Measurement Devices (AMO) with Temperature Output and Airflow Alarming Capability

1.02 ACCEPTABLE MANUFACTURES

A. EBTRON, Inc. model GTx116-P+ us tge basis of design

1. Basis of Design and Acceptable Manufacutes

a) Airflow measurement devices shall use the principal of thermal dispersion and provide one self-heated bead-in-glass thermistor and one zero power bead-in-glass thermistor at each sensing mode.
   i) Thermal dispersion devices that indirectly heat a thermistor are not acceptable.

b) 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.
   i) 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.
   ii) Any product submitted as an equal shall be expected to comply with all performance capabilities and functional aspects of this specification.

c) Excluded devices:
   i) Fan inlet airflow measurement devices.
   ii) Measurement technologies using “chip-in-glass,” “chip-in-epoxy,” or other “chip” type thermistor for the heated sensor component are not acceptable.
   iii) Pitot tubes, Pitot arrays, Piezo rings and other differential pressure bases devices are not acceptable.
   iv) Vortex shedding devices are not acceptable.

B. Approved Products

1. Approved performance equal

1.03 PRODUCTS INCLUDED IN THIS SECTION

A. Airflow Measurement Devices (AMD) with Temperature Output and Airflow Alarming Capability

1. General

a. Provide one AMD for each measurement location provided on the plans, schedules and/or control diagrams to determine the average airflow rate and temperature at each measurement location.

b. Each AMD shall be provided with a microprocessor-based transmitter and one or more sensor probes.

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.

2. Sensor Probes

   a. Sensor Probes shall be contructed of gold anodized, 6063 aluminum alloy tube, 316 stainless steel tubes are available when required.

   b. Sensor probe mounting brackets shall be contructed of 304 stainless steel

   c. Probe internal wiring between the connecting cable and sensor nodes shall be Kynar coated copper.

      1) PVC jacket internal wiring is not acceptable.

   d. Probe internal wiring connections shall consist of solder joints and spot welds.

      1) Internal wiring connections shall be sealed and protected from the elements. They shall be capable of direct exposure to water without affecting instrument operaton.

      2) Connectors of any type within the probe are not acceptable.

      3) Printed circuit boards within the probe are not acceptable.

   e. Each sensor probe shall be provided with an intergral, 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.

   f. Each sensor probe shall be provided with a connector plug with gold plated pins for connection to the transmitter.

   g. Each senso probe shall contain one or more independently wired sensing nodes.

   h. Sensor node airflow and temperature calibration data shall be stored in a serial memory chip I nthe cable connecting plug and not require matching or adjustments to the transmitter in the field.

   i. 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 chop thermistors are not acceptable.

      2) Devices with exposed leads are not acceptable.

   j. Each thermistor shall be individually calibrated at a minimum of 3 temperatures to NIST-tracable temperature standards.

   k. 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 and have an accuracy of +2% of reading over the entire claibrated airflow range of Oto 5,000 FPM (25.4 m/s).

      1) Upon the request the manufacture shall submit for AMD approval a copy of the NIST report of calibration used for the reference standard used.

      2) Devices claiming NIST traceability to third party laboratories and not directly to NIST are not acceptable.

      3) Devices calibrated against standards, other that the NIST LDA are not acceptable.

   l. Accuracy shall include the combined uncertainty of the sensor nodes and transmitter.

m. The installed airflow accuracy shall be :

1) Ducts - +3% of reafin when installed in accordance with the manufactures recommended placement guidelines.

2) Non-ducted Outdoor Air intakes – better than or equal to +5% of reading when installed in accordance wit hthe manufacutes recommended placement guidelines.

n. Devices whose overall accuracy is based on induvidual accuracy specifications of the sensor probes and transmitter shall demonstrate compliance wit hthis requirement over the entire operating range.

o. Each sensor node shall have a temeprature 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) amd humidity range of Oto 100% RH

p. The number of independent senso nodes provied shall be as follows:

Area ft ^{2} [m ^{2}1	# Sensor Nodes
:,; 0.5 ($ 0.0 46)	1
> 0.5 & $ 1 ($ 0 .0 92)	2
> 1 & $ 2 (> 0.092 & :, ; 0.185)	4
> 2 & $4 [> 0.185 & :,; 0.371)	6
> 4 & $ 8 [> 0.371 & :,; 0.743)	8
> 8 & $ 12 (> 0.743 & :,; 1 . 1 1)	12
> 12 & :,; 14 [> 1.11 & :,; 1 . 30)	14
> 14 [> 1.30)	16

1). A total of 4 probes shall be required for openings with an aspect ration:,; 1.5 and with an area:?: 25 ft. ^{2} (:?: 2.32 m^2)

3. Tranmistter

a. A remotely located microprocessor based transmitter shall be provided for each measurement location.

b. The transmitter shall be comprised of a main circuit board and interchangeable interface card.

c. All printed circuit board interconnects, edge fingers, receptacle plug pins and PCB test points shall be gold plated.

d. All printed circuit boards shall be electoless nickel immersion gold (ENIG) plated.

e. All integrated circuitry shall be temperature rated as “industrial-grade.” Submissions containing ‘commercial-grade’ circuitry are not acceptable.

f. The transmitter shall be capable of fetermining the airflow rate and temperature average of all connected sensor nodes in an array for a single location.

a. Sperate integration buffers shall be provided for display airflow output, airflow signal output (analog and network) and individual sensor outout (Bluetooth).

g. The transmitter shall be capable of providing a high and/or low airflow alarm with user-defined set point and % of set point tolerance. Alarm shall be cpaalbe of being manually or automatically reset and low – limit citoff calue may be slected to disable the alarm, an alarm delay function shall also be field defined.
h. The transmitter shall be capable of identifying an AMD malfuntion via the system status alarm and ignore sensor node that is in a fault condition.
i. The transmitter shall be capable of field configuation, diagnostic and include Field Output Adjustment Wizard that allows for a one or two point field adjustment to factory calibration for installations that require adjustment.
j. The transmitter shall be provided wit ha 16-character, alpha-numeric, LCD display.
k. The transmitter shall be provided wit hone of the following output options:
    a. Two field selectable (0-5/10-10 VDC or 4-20mA), scalable, isolated and over-current protected analog output signals (AO1=airflow, AO2=temperature or alarm) and one RS-495 BACnet/Modbus connections, or
    b. Two field selectable (0-5/10-10 VDC or 4-20mA), scalable, isolated and over-current protected analog output signals (AO1=airflow, AO2=temperature or alarm) and one Ethernet BACnet/Modbus connection, or one isolated RS-485 (field selectable BACnet MS/TP or Modbus RTU) network connection, or
    c. Two field selectable (0-5/10-10 VDC or 4-20mA), scalable, isolated and over-current protected analog output signals (AO1=airflow, AO2=temperature or alarm) and one proprietary wireless connection to EBTRON “Commisioner” based devices, or
    d. One RS 485 BACnet/Modbus network connection and one Ethernet BACnet/Modbus or
    e. One Lonworks Free Topology network connection, or
    f. One thumb drive data logger (no output).
l. The analog signal cpability shall include two output terminals: the first (AO1), shall provide the total airflow and the second output (AO2) shall be field configurable to provide one of the following:
    a. Temperature
    b. Low and/or high airflow user-defined set point alarm, or
    c. System status alarm
m. The network communicaiton RS-485 (BACnet MS/TP or Modbus RTU) or Ethernet (BACnet Ethernet or BACnet IP, Modbus RCP and TCP/IP) shall provide: the average airflow rate, temperature, hi and/or low airflow setpoint alarm, system status alrarm, individual sensor node airflow rates and individual sensor node temeperatue. Individual node airflow rates and temperatures shall NOT be available via the network with Lon.
n. The transmitter shall be prodied wit ha Bluetooth low energy interface card to interface with Android or iOS devices. Provide free Android or iOS software that allows real-time airflow and temperature monitoring and airflow and temperature traverses. Software shall capture, save or e-mail airflow and temperature data, transmitter settings and diagnotsics information.
o. The transmitter shall have an on-off power switch. Isolation transformers shall not be required.
p. The transmitter shall be powered by 24 VAC (22.8 to 26.4 under load) @20 maximum and use a switching power supply that is over-current and over-voltage protected.
q. The transmitter shall use a “watchdog” timer circuit to ensure automatic reset after power disruption, transients and brown-outs.
r. Each transmitter shall have an operating temperature 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 AMO shall be UL/cUL 873 listed as an assembly.
        i. Devices claiming complance wit the UL listing based on individual UL component listing are not acceptable.

b. All network-capable AMO models supplied with RS-485 interface and BACnet protocol shall by BTL listed.
c. The AMO shall be tested for compliance wit hteh EMC Directive's requirement and be certified to carry the CE Mark for European Union Shipments.

1.04 EXECUTION

A. Installation

1. Install in accordance with manufacutre's placement guildlines. A written report shall be submitted to the consulting mechanical engineer if any discrepancies are found.

END OF SECTION 25 09 23