

PART 2 PRODUCTS

2.1 PRODUCTS INCLUDED IN THIS SECTION

- A. RS-485 network (BACnet MS/TP or Modbus-RTU) combination CO₂/RH/Temperature measuring devices, wall mounted

2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with performance and design requirements of this Section, provide products that comply with this specification by one of the following vendors:
1. GreenTrol Automation, Inc. Model GS-300-N/CO₂/RH/T (basis of design)
 2. Alternatives requesting acceptance as equal less than 60 days prior to bid date or products submitted in non-conformance with the requirements of this specification will not be considered.
 - a) For any product to be considered for substitution, a written section-by-section document detailing exceptions and compliance shall be submitted to the Engineer before approval will be considered.

2.3 NETWORK COMBINATION SENSORS

- A. Provide RS-485 network (BACnet MS/TP or Modbus-RTU) combination CO₂/RH/Temperature measuring devices for mounting where indicated on the plans.
- B. Each combination sensor shall consist of an integrated system of three or more environment sensing functions in a wall mounted package, with an integral microprocessor-based design capable of continuous operation despite failure of a single sensor node per measurement location.
- C. Combination sensors shall have an environmental operating range of no less than 32 – 122° F (0 – 50° C) and 0 – 95% RH, non-condensing.
- D. CO₂ Sensor Design and Performance
1. CO₂ measurement shall be accomplished with Non-Dispersive Infrared (NDIR) technology using gold plated optics and diffusion sampling.
 2. CO₂ measurement uncertainty shall be no greater than ±75 ppm (or ±7% of Reading <500 ppm and ±7.5% for 800 – 1,200 ppm) at 77° F (25° C) for a CO₂ measurement range of at least 400 – 2,000 ppm.
 3. CO₂ measurement stability shall be <2% FS over the expected 15 year life of the typical sensor.
 4. Each CO₂ sensor node shall be factory calibrated and shall have the capability to automatically self-calibrate during operation.
 5. Each CO₂ sensor node shall have two calibration ports for field calibration using an external nitrogen source.
- E. Relative Humidity (RH) Sensor Design and Performance
1. Each RH sensor node shall measure ambient RH using planar laminated, electrolytic polymer capacitor technology.
 2. RH measurement range shall be 0 – 100% RH, non-condensing.
 3. RH measurement accuracy shall be ±2% from 20% – 80%RH at 77° F (25° C). Outside of this normal RH operating range, accuracy shall be ±3%.
 4. RH output resolution shall be at least 0.4% of Reading.
- F. Temperature Sensor Design and Performance
1. Each temperature sensor node shall sense changes using integral bandgap voltage reference circuitry and perfectly proportional to absolute temperature (PTAT) ΔV technology.
 2. Temperature measurement accuracy shall be equal to or greater than ±1.08° F at 77° F (±0.6° C at 25° C)
 3. The operating temperature range shall be at least -58° F to 302° F (-50° C to 150° C).
 4. Output resolution shall be at least 0.36° F (0.2° C).
- G. Power, Connectivity and Communications
1. The combination sensor shall be capable of communicating with other devices using an RS-485 standard interface using either BACnet-MS/TP protocol implemented as a Master node or Modbus RTU protocol.
 - a) Communication speed shall be field-selectable between 9.6, 19.2, 38.4 and 76.8 kBaud.
 2. BACnet devices shall implement the open protocol in compliance of the requirements of ASHRAE Standard 135-2008.
 3. The combination sensor shall be capable of field set-up and configuration using a simple dip-switch interface.

4. The combination sensor shall operate on 24 VAC (22.8 to 26.4 VAC), 50/60Hz.
 - a) The combination sensor design shall include protection from over voltage, over current transients and power surges.
 - b) The combination sensor shall use "watch-dog" circuitry to assure automatic processor reset after power disruption, transients and brown-outs.
5. The combination sensor design shall be capable of communicating to the network if one of the sensor functions becomes faulty, and will continue to operate the remaining CO₂, RH or Temp sensor nodes.
- H. The combination sensor enclosure shall be a low profile wall mount type, compatible in size for mounting with a standard single-gang electrical box or for surface mount applications.
 1. The sensors shall be installed at locations that are protected from weather and/or water.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install combination measurement devices in accordance with manufacturer's instructions at the locations indicated on the plans.
 1. A written report shall be submitted to the consulting mechanical engineer if any discrepancies are found.
- B. Install labels and nameplates to identify control components according to Section 23 33 00 or 25 35 00.
- C. Install electronic cables according to Section 25 05 00 "Common Work Results for Integrated Automation."
- D. Install low-voltage power, signal and communication cable according to Sections 25 05 13 "Conductors and Cables for Integrated Automation," 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and/or 27 15 00 "Communications Horizontal Cabling."