

SECTION 23 09 13.23 SENSORS AND TRANSMITTERS, Relief Damper Sensors

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 (23 09 13 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC or even higher in 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC).

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes airflow control instrumentation for HVAC air handling, distribution systems and components.
- B. Related Sections include the following:
 - 1. Section 23 05 93 Testing, Adjusting, and Balancing for HVAC
 - 2. Section 23 07 00 HVAC Insulation
 - 3. Section 23 08 00 Commissioning of HVAC
 - 4. Section 23 09 93 Sequence of Operations for HVAC Controls
 - 5. Section 23 31 00 HVAC Ducts and Casings
 - 6. Section 23 33 00 Air Duct Accessories
 - 7. Section 23 33 13.13 Volume-Control Dampers
 - 8. Section 23 73 00 Indoor Central-Station Air-Handling Units
 - 9. Section 23 72 00 Air-to-Air Energy Recovery Equipment
 - 10. Section 23 74 00 Packaged Outdoor HVAC Equipment
 - 11. Section 23 75 00 Custom-Packaged Outdoor HVAC Equipment
 - 12. Section 25 01 30 Operation and Maintenance of Integrated Automation Instrumentation and Terminal Devices
 - 13. Section 25 01 90 Diagnostic Systems for Integrated Automation
 - 14. Section 25 14 19 Integrated Automation Terminal Control Units
 - 15. Section 25 35 00 Integrated Automation Instrumentation and Terminal Devices for HVAC
 - 16. Section 25 35 16 Integrated Automation Sensors and Transmitters
 - 17. Section 25 35 23 Integrated Automation Control Dampers
 - 18. Section 25 55 00 Integrated Automation Control of HVAC
 - 19. Section 25 95 00 Integrated Automation Control Sequences for HVAC

1.3 REFERENCES

- A. UL 873 – Temperature and Airflow Indicating Equipment

1.4 SUBMITTALS

- A. Submit product data sheets for airflow measuring devices indicating minimum placement requirements, sensor density, sensor distribution, and installed accuracy to the host control system.
 - 1. Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
- B. Submit a schedule of airflow measuring devices indicating compliance with specified accuracy at minimum and maximum airflow rates.
- C. Submit installation, operation and maintenance documentation.

1.5 SEQUENCE(S) OF OPERATION

Integrated Automation Control Sequences for HVAC

1.6 QUALIFICATIONS AND QUALITY ASSURANCE

- A. Manufacturer Qualifications: The successful firm shall have a minimum of ten years experience producing products of this type and shall have a record of successful in-service performance verified by the consulting mechanical engineer.

- B. Installer Qualifications: An experienced installer who is **[an authorized representative] [a certified installer] [an approved installer]** of the instrument manufacturer for both installation and maintenance of units required for this Project.
 - C. Instruments, Devices, and Accessories: Products described in this Section shall be listed and labeled in accordance with testing standard UL 873 – Temperature and Airflow Indicating Equipment, by a testing agency acceptable to authorities having jurisdiction and accompanied by UL approved installation instructions.
- 1.7 SYSTEM RESPONSIBILITY
- A. The contractor shall be responsible for any and all costs associated with any and all changes resulting from the use of a supplier other than the listed acceptable manufacturer.
- 1.8 WARRANTY
- A. Provide a manufacturer's parts warranty for 36 months from the date of unit shipment.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. All handling and storage procedures shall be per manufacturer's recommendations.
 - B. Airflow/temperature measuring devices shall be kept clean and dry, protected from all damage including that due to weather and construction traffic.

PART 2 PRODUCTS

2.1 PRODUCTS INCLUDED IN THIS SECTION

- A. Bidirectional bleed airflow sensors.

2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements of this Section, provide products that comply with this specification by one of the following vendors:
 1. EBTRON, Inc. Model GTx116-B Bleed Airflow Sensor (basis of design)
 2. Alternatives requesting acceptance as "equals" 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 detailed exceptions/compliance document shall be submitted to the Engineer before any approval will be considered.

2.3 RELIEF DAMPER SENSORS

- A. Provide bidirectional bleed airflow sensors where indicated on the plans.
- B. Each measuring device shall consist of one to four sensor assemblies and a single, remotely mounted, microprocessor-based transmitter. Each sensor assembly shall contain three individually wired, hermetically sealed bead-in-glass thermistors. Thermistors shall be mounted in the sensor assembly using a marine-grade, waterproof epoxy. Thermistor leads shall be protected and not exposed to the environment. The airflow rate of each sensor assembly shall be equally weighted and averaged by the transmitter prior to output. The temperature of each sensor assembly shall be velocity weighted and averaged by the transmitter prior to output. Each transmitter shall have a 16-character alpha-numeric display capable of displaying bidirectional airflow, bidirectional pressure, temperature, system status, configuration settings and diagnostics. Devices using chip-in-glass or diode-case chip thermistors are not acceptable. Devices using less than three thermistors in each sensor assembly are not acceptable. Devices using platinum wire RTDs are not acceptable. Pressure sensors are unacceptable.
 1. Provide hardware to install sensor across the relief damper. Hardware shall include two 304 stainless steel face plates with protective stainless steel screens, connecting tube and fittings.
- C. Sensor Assembly
 1. Each sensor assembly shall be manufactured of a U.L. Listed engineered thermoplastic.
 2. Each sensor assembly shall have an integral, U.L. Listed, plenum rated cable and terminal plug for connection to a remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated.
 3. The operating airflow range shall be +/- 3,000 fpm unless otherwise indicated on the plans.

4. Each sensor assembly shall be calibrated at a minimum of 10 airflow rates and have an accuracy of +/-2% of reading over the entire operating airflow range. Each sensor assembly shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).
 5. Temperature accuracy shall be +/-0.15° F over the entire operating temperature range of -20° F to 160° F.
 6. The operating humidity range for each sensor probe shall be 0-99% RH (non-condensing).
 7. Each sensor assembly shall not require matching to the transmitter in the field.
- D. Transmitters
1. The transmitter shall have an integral LCD display capable of simultaneously displaying airflow or pressure and temperature. The LCD display shall be capable of displaying individual airflow and temperature readings of each independent sensor assembly.
 2. The transmitter shall be capable of field configuration and diagnostics using an on-board pushbutton interface and LCD display.
 3. The transmitter shall have a power switch and operate on 24 VAC (isolation not required). The transmitter shall use a switching power supply fused and protected from transients and power surges. The transmitter shall use "watch-dog" circuitry to assure reset after power disruption, transients and brown-outs.
 4. All interconnecting pins, headers and connections on the main circuit board, option cards and cable receptacles shall be gold plated.
 5. The operating temperature range for the transmitter shall be -20° F to 120° F. The transmitter shall be installed at a location that is protected from weather and water.
 6. The transmitter shall be capable of communicating with other devices using one of the following interface options:
 - a. Linear analog output signals for airflow or pressure and temperature: Field selectable, fuse protected and isolated, 0-10VDC/4-20mA (4-wire)
 - b. RS-485: Field selectable BACnet-ARCNET, BACnet-MS/TP, Modbus-RTU or Johnson Controls N2-Bus
 - i) BACnet devices shall provide analog variables for airflow and temperature containing individual sensor airflow rate and temperature data.
 - c. 10 Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP, Modbus-TCP and TCP/IP
 - i) Provide dynamic link libraries and VBA functions to interface Ethernet devices to Microsoft Excel for remote monitoring of airflow and temperature using a Windows 2000 or Windows XP based PC.
 - d. LonWorks Free Topology
 7. The transmitter shall be capable of accepting an infra-red interface card for downloading airflow and temperature data or uploading transmitter configuration data using a handheld PDA (Palm or Microsoft Windows Mobile operating systems).
 - a. Provide PDA upload/download software. Download software shall be capable of displaying and saving individual sensor airflow rates, the average airflow rate, individual sensor temperatures and the average temperature received from the transmitter. Upload software shall be capable of displaying and saving all setup parameters that can be configured using the on-board pushbutton interface and LCD display.
 - b. Provide a Microsoft Excel file capable of creating balance reports from PDA data files transferred to a Windows 98 or higher based PC.
 - c. Provide a Microsoft Excel file to create configuration data files that can be transferred from a Windows 98 or higher based PC to a PDA for upload to one or more transmitters.
- E. The measuring device shall be UL listed as an entire assembly.
- F. The manufacturer's authorized representative shall review and approve placement and operating airflow rates for each measurement location indicated on the plans. A written report shall be submitted to the consulting mechanical engineer if any measurement locations do not meet the manufacturer's placement requirements.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install airflow / temperature 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."

3.2 ADJUSTING

- A. Duct and plenum devices shall not be adjusted without approval from the consulting mechanical engineer.

END OF SECTION **23 09 13.23**

Sensors and Transmitters, **Relief Damper Sensors**