

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fan-powered units.

1.02 RELATED REQUIREMENTS

- A. Section 23 0513 - MOTORS FOR HVAC EQUIPMENT.
- B. Section 23 0994 - Sequence of Operations for HVAC Controls.

1.03 REFERENCE STANDARDS

- A. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; 2001 (R2011).
- B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2011 with Addendum 1.
- C. NFPA 70 - National Electrical Code; 2020 Edition, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
- D. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 to 4 inch wg.
- E. Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.
- F. Project Record Documents: Record actual locations of units.
- G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Refer to Section 23 0510 - General HVAC Requirements for delivery, storage and protection requirements.
- B. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.01 FAN-POWERED SERIES UNITS

- A. Manufacturers
 - 1. Titus TQS. Straight through design.
 - 2. Other acceptable manufacturers offering equivalent products: Carrier, Krueger QFC, Metal-Aire Series 400 FCI, Tuttle&Bailey FPC, Nailor 35P, Trane Model VP.
- B. General:
 - 1. Factory-assembled and wired, AHRI 880 (I-P) rated, horizontal fan-powered terminal unit with blower, blower motor, mixing plenum, and primary air damper contained in a single unit housing.
- C. Series Units:
 - 1. General:

- a. Factory assembled and wired, AHRI 880 rated, horizontal fan powered terminal unit with blower, ECM blower motor, mixing plenum, and primary air damper contained in a single unit housing.
- D. Unit Casing:
1. Minimum 22 gage, 0.0299 inch galvanized steel.
 2. Primary Air Inlet Collar: Suitable for standard flexible duct sizes.
 3. Unit Discharge: Rectangular, suitable for flanged duct connection.
 4. Plenum Air Inlets: S slip and drive connections for duct attachment.
 5. Acceptable Liners:
 - a. Minimum 3/4 inch thick fiber free elastomeric foamed insulation meeting UL 181 erosion requirements.
 6. Access Doors: Sealed, flush type for access to internal components for service and maintenance.
- E. Airflow Sensor:
1. Factory furnished and mounted multi-point, flow ring or cross arrangement inlet averaging sensor which will provide a differential pressure signal that represents actual air flow within an accuracy of +5% regardless of inlet configuration.
 2. This accuracy shall be maintained when inlet duct varies from straight up to 90 degree elbow entrance conditions for both flexible and rigid metal duct applications. Straight inlet duct shall not be required for specified accuracy.
- F. Primary Air Damper Assembly:
1. Heavy-gage, galvanized steel or extruded aluminum construction with solid shaft rotating in bearings.
 2. Provide indicator on damper shaft or alternative method for indicating damper position over full range of 90 degrees.
 3. Incorporate low leak (2 percent) damper blades for tight airflow shutoff.
 4. Fan(s): Forward curved, centrifugal type.
 5. Fan Motor:
 - a. ECM (Electrically Commutated Motor):
 - 1) Brushless DC controlled by an integrated controller/inverter that operates the wound stator and senses rotor position to electrically commutate the stator.
 - 2) Permanent magnet type motor with near-zero rotor losses designed for synchronous rotation.
 - 3) Designed to maintain 70 percent efficiency over the entire operating range.
 - b. Speed Control: Infinitely adjustable with electronic controls.
 - c. Fan motor shaft directly connected to fan and isolated from unit casing to prevent transmission of vibration.
 6. Isolation: Fan/motor assembly isolated from unit casing on rubber isolators.
- G. Hot Water Heating Coil:
1. Coil Casing: Minimum 22 gage, 0.0299 inch galvanized steel, factory-installed on terminal unit with flanged discharge for attachment to downstream ductwork.
 2. Heavy-gage aluminum fins, mechanically bonded to tubes.
 3. Copper Tubes: 0.016 inch minimum wall thickness with male solder header connections.
 4. Coil leak tested to minimum 305 psig.
 5. Capacity: Based on 160 degree F entering water, 130 degree F leaving water and 15 percent total air volume.
 6. Provide gasketed, screw mounted access panel to allow access to coil for inspection and cleaning.
 7. Base performance data on tests run in accordance with AHRI 410.
- H. Electrical Requirements:
1. Single-point power connection.
 2. Equipment wiring to comply with requirements of NFPA 70.

- I. Controls:
 1. Digital: Factory mount DDC controller and damper actuator supplied by building automation control manufacturer within unit mounted enclosure.
 2. Wiring:
 - a. Factory mount and wire controls. Mount electrical components in control box with removable cover. Incorporate single point electrical connection to power source.
 - b. Incorporate single point electrical connection to power source.
 - c. Factory mount transformer for control voltage on electric and electronic control units.
 - d. Wiring Terminations: Wire power and controls to terminal strips. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
 - e. Disconnect Switch: Factory mount fused disconnect switch in control panel.
 3. Control Sequence: See Section 23 0994.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.
- C. Provide ceiling access doors or locate units above easily removable ceiling components.
- D. Support units individually from structure. Do not support from adjacent ductwork.
- E. Do not support from ductwork.
- F. Attach supports to unit without obstructing removable casing panels, control cabinets or other items requiring access for service.
- G. Install terminal units in a readily accessible location. Refer to definitions in Section 23 0510.
- H. Coordinate with Contractor so that other trades do not obstruct removable casing panels or other items requiring access for service.
- I. Remove existing units and install new units in same location. Provide new flex at inlet. Connect unit to existing ductwork with transitions where unit sizes vary from existing unit dimensions.
- J. Provide minimum of 5 ft of 1 inch thick lined ductwork downstream of units.

3.02 SCHEDULES

- A. Refer to Schedule on Drawings.
- B. Fan-Powered Air Terminal Unit:
 1. All CFM values based on 0.45 inches upstream static and 0.375 inches downstream resistance.
 2. Heat coil capacities based on 55 degree F EAT and 160 degree F EWT at "maximum primary" CFM.
 3. Maximum inlet velocity 2,000 FPM.

END OF SECTION