

SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Code of Federal Regulations (CFR): 10 CFR Part 431, DOE 2016 efficiency.
2. Institute of Electrical and Electronics Engineers (IEEE): C57.96, Guide for Loading Dry Type Transformers.
3. National Electrical Contractor's Association (NECA): 409, Recommended Practice for Installing and Maintaining Dry-Type Transformers.
4. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. ST 20, Dry-Type Transformers for General Applications.
5. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
6. UL:
 - a. 486E, Standard for Equipment Wiring Terminals for use with Aluminum and/or Copper Conductors.
 - b. 489, Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
 - c. 1561, Standard for Dry-Type, General Purpose, and Power Transformers.

1.02 SUBMITTALS

A. Action Submittals:

1. Descriptive information.
2. Dimensions and weight.
3. Transformer nameplate data, including efficiency.
4. Schematic and connection diagrams.
5. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Test Report: Sound test certification for dry type power transformers (0 volt to 600 volt, primary).

PART 2 PRODUCTS

2.01 MINI POWER CENTER

A. Manufacturers:

1. Eaton.
2. Or equal.

B. Physical Characteristics:

1. Wall-mounted, unless otherwise noted on the Drawings.
2. NEMA 250, Type 3R, Type 316 stainless steel enclosure.

C. Functional Characteristics:

1. UL 1561, NEMA ST 20, unless otherwise indicated.
2. Dry-type, self-cooled, two-winding, with copper windings, except where otherwise noted.
3. General: Transformer, primary, and secondary main circuit breakers, and secondary panelboard section.
4. Transformer:
 - a. Insulation Class and Temperature Rise: Manufacturer's standard.
 - b. Efficiency: Manufacturer's standard (DOE 2016 efficiency).
 - c. Core and Coil: Encapsulated.
 - d. Full capacity, 5 percent voltage taps, two below normal voltage.
 - e. Primary Voltage: As shown on the Drawings.
 - f. Secondary Voltage: As shown on the Drawings.
5. Panelboard: Full, UL 489, short-circuit current rated.
 - a. Type: Thermal-magnetic, quick-make, quick-break, indicating, with noninterchangeable molded case circuit breakers.
 - b. Number and Breaker Ampere Ratings: Refer to Panel Schedule.

D. Performance Characteristics:

1. Units larger than 5 kVA suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
2. Efficiency: Meet or exceed DOE 2016 efficiency requirements
3. Overload Capability: Short-term overload per IEEE C57.96.

2.02 GENERAL PURPOSE TRANSFORMER

A. Physical Characteristics:

1. Wall Bracket: For single-phase units, 15 kVA to 37-1/2 kVA, and for three-phase units, to 15 kVA.

B. Functional Characteristics:

1. UL 1561, NEMA ST 20, unless otherwise indicated.
2. Dry-type, self-cooled, two-winding, with copper windings, except where otherwise noted.
3. Insulation Class and Temperature Rise: Manufacturer's standard.
4. Core and Coil:
 - a. Encapsulated for single-phase units 1/2 kVA to 25 kVA and for three-phase units 3 kVA to 15 kVA.
 - b. Thermosetting varnish impregnated for single-phase units 37.5 kVA and above, and for three-phase units 30 kVA and above.
5. Enclosure:
 - a. Single-Phase, 3 kVA to 25 kVA: NEMA 250, Type 3R, nonventilated.
 - b. Single-Phase, 37-1/2 kVA and Above: NEMA 250, Type 2, ventilated.
 - c. Three-Phase, 3 kVA to 15 kVA: NEMA 250, Type 3R, nonventilated.
 - d. Three-Phase, 30 kVA and Above: NEMA 250, Type 2, ventilated.
 - e. Outdoor Locations: NEMA 250, Type 3R.
6. Voltage Taps:
 - a. Single-Phase, 3 kVA to 10 kVA: Four 2-1/2 percent, full capacity; two above and two below normal voltage rating.
 - b. Single-Phase, 15 kVA and Above: Four 2-1/2 percent, full capacity; two above and two below normal voltage rating.
 - c. Three-Phase, 3 kVA to 15 kVA: Four 2-1/2 percent, full capacity; two above and two below normal voltage rating.
 - d. Three-Phase, 30 kVA and Above: Four 2-1/2 percent, full capacity; two above and two below normal voltage rating.
7. Impedance: 1.9 percent minimum on units 75 kVA and larger.

C. Performance Characteristics:

1. Units larger than 5 kVA suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
2. Efficiency: Meet or exceed DOE 2016 efficiency requirements
3. Overload Capability: Short-term overload per IEEE C57.96.

2.03 POWER-LINE CONDITIONING TRANSFORMERS

A. Manufacturers and Products:

1. Eaton; PowerSure 700.
2. Or equal.

B. Physical Characteristics:

1. Input Connection:
 - a. Provide input terminals, including grounding terminals.
 - b. Provide molded case, manually operated, thermal magnetic primary circuit breaker integral to the unit: 125 percent of the rated full-load input current.

C. Functional Characteristics:

1. UL 1561, NEMA ST 20, unless otherwise indicated.
2. Dry-type, self-cooled, two-winding, with copper windings, except where otherwise noted.
3. Windings:
 - a. Copper.
 - b. Seven primary taps.
4. Magnetics:
 - a. Grain-oriented M6 grade, stress-relieved, silicon transformer steel.
 - b. Flux density 15 k Gauss, maximum.
5. Insulation: 200 degree C, Class N.
6. Temperature Rise: 115 degrees C.
7. Shielding: Not fewer than three copper shields.
8. Cooling: Natural convection. Cooling air to enter at the bottom of the enclosure and leave at the rear.
9. Control:
 - a. Microprocessor-based.
 - b. Independently controlled solid-state switches (silicon-controlled rectifiers).
 - c. Control circuits and connection to the power electronics devices to be separate transformer and its terminations.
10. Monitoring:
 - a. Phase-indicator Lights: Provide three color-coded lights, one for each phase, to be illuminated when normal output power is present on each phase.
 - b. Alert Lights: Provide indication that the output has been disabled by transformer overtemperature or by SCR thermal overload.

D. Performance Characteristics:

1. Output Voltage Regulation:
 - a. When the input voltage is between plus 10 percent and minus 23 percent of nominal, regulate output voltage within 3 percent of nominal.
 - b. Response Time: Within 1/2 cycle.
 - c. Correction Time: Correct output voltage within 1 cycle.
2. Output Impedance: 3 percent.
3. Load Regulation: Output voltage between plus and minus 2.5 percent from no load to full load.
4. Harmonic Distortion: Add no more than 1 percent total harmonic current distortion (TDH) under any linear loading.
5. Turn-on: When energized, voltage overshoot shall be no more than 5 percent for 1 cycle or less.
6. Overload Rating:
 - a. Ten-second Rating: 200 percent, minimum.
 - b. One-cycle Rating: 1,000 percent, minimum.
7. Noise Attenuation:
 - a. Common-mode Noise Attenuation: 140 dB or greater.
 - b. Transverse Noise: 3 dB down at 1,000 Hz, and 40 dB down per decade to below 50 dB with a resistive load.
8. Full-load Efficiency: 97 percent, minimum.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NEC and manufacturer's instructions.
- B. Load external vibration isolator such that no direct transformer unit metal is in direct contact with mounting surface.
- C. Provide moisture-proof, flexible conduit for electrical connections.
- D. Connect voltage taps to achieve (approximately) rated output voltage under normal plant load conditions.
- E. Provide wall brackets for single-phase units, 15 kVA to 167-1/2 kVA, and three-phase units, 15 kVA to 30 kVA.

END OF SECTION

