

Specification Number: 26 12 16.20.FL
Product Name: SUBSTATION TRANSFORMERS

SECTION 26 12 16.20.FL
SUBSTATION TRANSFORMERS

Power-Dry II™ (VPI) dry-type transformers - Vacuum-pressure impregnated (VPI) transformers are particularly suited for a wide range of commercial applications. Vacuum pressure impregnation of the windings includes dry vacuum cycle; vacuum immersion; vacuum hold cycle; pressure cycle; and oven curing. This VPI process saturates the dielectric material, which contributes to its long life and durability. The secondary windings are constructed with sheet or wire conductors and Nomex® insulation. The primary windings are wound over the secondary winding in either barrel or disc construction. These processes make the Power-Dry II transformer ideal for office buildings, hotels, and shopping malls.

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power-Dry II substation transformers.

1.02 REFERENCES

- A. IEEE C57.12.01 - Standard General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin-Encapsulated Windings
- B. ANSI C57.12.28 - Switchgear and Transformers, Pad-Mounted Equipment - Enclosure Integrity
- C. ANSI C57.12.50 - Requirements for Ventilated Dry-Type Distribution Transformers, 1-500 kVA Single-Phase and 15-500 kVA Three-Phase, with High Voltage 601-34,500 Volts, Low Voltage 120-600 Volts
- D. ANSI C57.12.51 - Requirements for Ventilated Dry-Type Power Transformers, 501 kVA and Larger Three-Phase, with High Voltage 601-34,500 Volts, Low Voltage 208Y/120-4160 Volts
- E. ANSI C57.12.55 - Conformance Standard for Transformers - Dry-Type Transformers Used in Unit Installations, Including Unit Substations
- F. IEEE C57.12.56 - Standard Test Procedure for Thermal Evaluation of Insulation Systems for Ventilated Dry-Type Power and Distribution Transformers
- G. IEEE C57.12.58 - Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil
- H. IEEE C57.12.59 - Guide for Dry-Type Transformer Through-Fault Current Duration
- I. IEEE C57.12.70 - Terminal Markings and Connections for Distribution and Power Transformers
- J. IEEE C57.12.80 - Standard Terminology for Power and Distribution Transformers
- K. IEEE C57.12.91 - Test Code for Dry-Type Distribution and Power Transformers
- L. IEEE C57.94 - Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers
- M. IEEE C57.96 - Guide for Loading Dry-Type Distribution and Power Transformers (ANSI).
- N. IEEE C57.105 - Guide for Application of Transformer Connections in Three-Phase Distribution Systems
- O. IEEE C57.124 - Recommended Practice for the Detection of Partial Discharges and the Measurement of Apparent Charge in Dry-Type Transformers
- P. CSA-C88 - Power Transformers and Reactors

1.03 SUBMITTALS

- A. Submit shop drawings indicating outline dimensions, connection and support points, weight, specified ratings and materials.
- B. Submit product data indicating standard model design tests and options.
- C. Submit manufacturer's installation instructions.

1.04 OPERATION AND MAINTENANCE DATA

- A. Include procedures for cleaning unit, and replacing components.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in distribution transformers with [three] [] years [documented] experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect dry-type transformers from moisture by using appropriate heaters as instructed by the manufacturer.

PART 2 PRODUCT

2.01 SUPPLIER

- A. Square D Company [no equal] [or approved equal].

2.02 POWER-DRY II (VPI) SUBSTATION TRANSFORMERS

- A. The transformer(s) shall be the unit substation type with side-mounted [cover-mounted] primary and side-mounted [cover-mounted] secondary terminations.
- B. Primary terminations shall be designed for close coupling to [a metal enclosed air load break switch section] [a switchgear section] [an air terminal chamber to be provided with the transformer]. Secondary terminations shall be designed for close coupling to [a switchgear section] [a switchboard section] [an air terminal chamber to be provided with the transformers].
- C. Orientation shall be primary on the [left] [right] when facing the transformer front.
- D. The transformer(s) shall be rated [kVA AA] [/ kVA AA/FFA] [/ kVA AA/FA]. Primary voltage [] [delta] [wye] . Secondary voltage [] [wye] [delta], [3-wire] [4-wire], 60 Hz with two 2-1/2% full capacity above normal and two 2-1/2% full capacity below normal primary taps. Impedance shall be [%] [manufacturer's standard impedance], $\pm 7\text{-}1/2\%$. All transformers shall have an average temperature rise of [150° C] [115° C] [80° C] above a 40° C maximum, 30° C average ambient.
- E. The basic impulse levels (BIL) shall be a minimum of [60 kV for the 15 kV class] [optional 95 kV BIL available] [10 kV for the 1.2 kV class].
- F. The coils shall be wound with [aluminum] [copper] conductors.
- G. All insulating materials are to be in accordance with IEEE Standard C57.12.01 for 220° C UL insulation system.
- H. All cores to be constructed of high grade, grain-oriented, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. Core laminations shall be step-lap miter cut at the core corners to reduce hot spots, core loss, excitation current, and sound level.
- I. The coils and all clamping structure and buswork shall be assembled on the core, and then dried at atmospheric pressure in an oven through which hot air is continuously circulated. The totally assembled core and coil assembly shall be vacuum pressure impregnated in polyester varnish. The total VPI process shall apply a one (1) cycle polyester protective shield of varnish the coils and a protective shield to the bus, core and support structure. The varnish shall be cured on the core and coil assembly following an established temperature vs. time baking cycle in a hot air circulating oven. The VPI process shall effectively impregnate the entire core and coil assembly, which results in a unit, which is virtually impermeable to moisture, dust, salt air and other industrial contaminants.
- J. The transformer enclosures shall be ventilated [indoor] [outdoor] and fabricated of heavy gauge, sheet steel construction. Enclosures are to be provided with lifting provisions on the base structure and shall have jacking pads designed to be flush with the enclosure. The base is to be constructed of steel members to permit skidding or rolling in any direction. Rubber vibration isolation pads shall be installed by the manufacturer between the core and coil and the enclosure.
- K. The paint color shall be [ANSI 49] [ANSI 61].
- L. Transformer sound levels shall be warranted by the manufacturer not to exceed the values specified in IEEE Std. C57.12.01 .
- M. Metal-oxide, gapless-type distribution class lightning arresters shall [shall not] be installed by the manufacturer on the high voltage side of the transformer to provide additional protection against high voltage lightning or switching surges.
- N. Fan cooling equipment shall include 3-phase electronic winding temperature monitor controlled automatically by a Type K thermocouples placed in the low voltage air duct. The temperature monitor

must contain yellow and red indicating lights. The yellow lamp indicates fan power, while the red lamp signal that alarm and trip contacts have been activated. A 0-1 milliampere output is required for remote indication. Alarm contacts shall be provided for fans, alarm, and trip function. An audible alarm must sound when the highest phase temperature exceeds a preset point. The fans must be able to operate in either manual or automatic mode. Minimum six fans shall be provided. Fan controller must be POWERLOGIC ® system compatible. Forced air cooling system shall include: fans, control wiring, controller with test switch, current limiting fused in the power supply to the controller, indications lights, alarm silencing relay, auto/manual switch, and necessary accessories to properly control the system.

O. The transformer shall be pre-wired for TRANSPARENT READY web enabled communication [non-TRANSPARENT READY]

P. Testing - Tests shall be conducted in accordance with the provisions of IEEE C57.12.91 and shall include, as a minimum, the following tests:

1. Ratio
2. Polarity
3. Phase Rotation
4. No-Load Loss
5. Excitation Current
6. Impedance Voltage
7. Load Loss
8. Applied Potential
9. Induced Potential
10. QC Impulse Test
11. Temperature Test (typical data from previous unit is acceptable)
12. Sound Test (typical data from previous unit is acceptable)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that pads are ready to receive work.
- B. Verify field measurements are as [shown on drawings.] [instructed by manufacturer.]
- C. Verify that required utilities are available, in proper location and ready for use.
- D. Beginning of installation means installer accepts conditions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install safety labels to NEMA 260.

3.03 FIELD QUALITY CONTROL

- A. Test transformer to IEEE C57.12.91 .

3.04 ADJUSTING

- A. Adjust primary taps so that secondary voltage is within [2] [] % of rated voltage.