



Hammond Power  
Solutions Inc.

***HPS SENTINEL<sup>®</sup>***

**1.2kV Class  
Energy Efficient Distribution Transformer  
Typical Specification**

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## 1 **GENERAL**

### 1.1 SCOPE

- A This section defines dry-type, enclosed and ventilated low voltage low loss transformers designed constructed and rated in accordance with efficiency levels defined (where applicable) in the U.S. Department of Energy, Energy Conservation Program for Commercial Equipment; Distribution Transformers Energy Conservation Standards DOE 10 CFR Part 431; (before DOE referred to as TP1) and/or CSA C802.2 as referenced in the Canadian Energy Efficiency Regulations (SOR/94-651).

### 1.2 RELATED DOCUMENTS

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

### 1.3 REFERENCES

- A NEMA ST-20 Dry-Type Transformer For General Applications
- B IEEE C57.110 Recommended Practice for establishing transformer capability when feeding non-sinusoidal load currents.
- C DOE 10 CFR Part 431 Efficiency Standards; (before DOE referred to as TP1), CSA C802.2 as referenced in the Canadian Energy Efficiency Regulations SOR/94-651.
- D UL 1561, CSA C9 & CA 22.2 No. 47.

### 1.4 SUBMITALS

- A Submit shop drawing and product data for approval and final documentation in the quantities listed according to the Conditions of the contract. Customer name, customer location and customer order number shall identify all transmittals.
- B Product Data including kVA rating, average winding temperature rise, detailed enclosure dimensions, primary & secondary nominal voltages, primary voltage taps, no load & full load losses, impedances, unit weight, warranty.
  - i Efficiency under linear load at 15%, 25%, 35%, 50%, 65%, 75%, 100% of name plate rating.
  - ii Percentage regulation at 35% & 100% load at 80% & 100% power factor.

### 1.5 TESTING & QUALITY CONTROL:

- A Production tests: each unit according to:
  - i NEMA ST-20
  - ii CSA C9 & C22.2 No. 47
  - iii DOE 10 CFR Part 431 sub part K, NEMA TP2
- B Type Test each model design and submit report.
- C Type test to include:
  - i Induced voltage test
  - ii Power frequency withstand voltage test
  - iii Insulation resistance (Megger) test
  - iv Positive sequence impedance
  - v No load and full load losses in watts
  - vi Sound level in decibels

### 1.6 STORAGE AND HANDLING

- A Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from potential damage from weather and construction operations. Store so condensation will not form on or in the transformer housing and if necessary, apply temporary heat where required to obtain suitable service conditions.
- B Handle transformer using proper equipment for lifting and handling; use when necessary lifting eye and/or brackets provided for that purpose.

## 1.7 WARRANTY

- A The transformer shall carry a 10 year limited warranty. (For details, refer to the manufacturers published warranty)

## 2 **PRODUCTS**

### 2.1 GENERAL CONSTRUCTION:

- A Single phase transformers rated at 15kVA and larger and three phase transformers 9kVA and larger, shall be ventilated type. Convection air cooled. All three phase transformers shall be constructed with three coils and a single core. The primary side of each transformer shall, if applicable, be provided with taps that meet or exceed NEMA standards.
- B Transformers shall be designed, constructed and rated in accordance with UL, CSA, and NEMA standards. If shipping to Europe, transformer will also have to be manufactured in accordance to CE standards and carry a CE mark.
- C If transformer is to be used for non-linear load applications, the transformer shall be derated as per ANSI/IEEE C57.110.

### 2.2 VOLTAGE AND kVA REQUIREMENTS:

- A Primary Voltage: Single Phase - [208][240X480][277][416][600][other] Volts  
Three Phase - [208][240][480][600][other] Volts
- B Secondary Voltage: Single Phase - [120/240][other] Volts  
Three Phase - [208Y/120][240D][480Y/277][600Y/347][other] Volts
- C kVA Rating: Single Phase - [15][25][37.5][50][75][100][150][167][other] kVA  
Three Phase - [15][30][45][75][112.5][150][225][300][500][750][other] kVA
- D System Frequency: 60 Hertz

### 2.3 KEY REQUIREMENTS:

- A Typical impedance at 60Hz: 2.5% to 6.5% up to 225kVA, 3.0% to 7.5% greater than 225kVA.
- B Nameplate Rating: Linear load, 60Hz.
- C Efficiencies:
- i Meets efficiency levels defined (where applicable) in accordance with U.S. Department of Energy, DOE 10 CFR Part 431; (before DOE referred to as TP1) and/or the CSA C802.2 as referenced in the Canadian Energy Efficiency Regulations SOR/94-651 at 35% of rated load when measured under a linear load profile.
  - ii Efficiencies and load losses will be calculated at temperature reference of 75°C at Unity Power Factor (UPF).

### 2.4 BASIC REQUIREMENTS:

- A Insulation Class: 220°C system [200][other]
- B Temperature Rise: 150°C [130°C][115°C][80°C][other].
- C Taps: To NEMA ST 20 [1 x ± 5% (1FCAN, 1FCBN)][2 x ± 2.5% (2FCAN, 2FCBN)][2 x +2.5%, 4 x -2.5% (2FCAN, 4FCBN)][2 x - 5% (2FCBN)][none][other].
- D Core construction: high grade non-aging, fully processed silicon steel laminations or better.
- E Coil conductors: copper [aluminum] windings, with terminations brazed, welded or bolted.
- F Impregnation: vacuum impregnated core & coils.
- G Excitation current: 3% of full load current rating (max.)
- H Sound level: 3dB below NEMA ST-20.
- I Enclosure: ventilated, Type 3R [Type 3RE][other].
- J Enclosure Finish: ANSI 61 Grey suitable for UL50 outdoor applications [other].
- K Transformers shall terminate in mounting pads. Bring out primary and secondary terminations to terminals on the same side of the transformer mounted on separate insulated support. Provide mechanical lugs on primary, secondary and neutral for customer terminations. Mounting lugs will be included on all aluminum and copper units up to and including 270 amp ratings. Contractors shall provide all necessary lugs not already provided with transformer.
- L Anti-vibration pads/isolators shall be used between the transformer core and coil and the enclosure.

- M UL listed, CSA approved, [CE Mark]
- N Built to NEMA ST-20 and in accordance with all applicable UL, CSA and ANSI/IEEE standards.
- O Ground core & coil assembly to enclosure with a flexible copper grounding strap or equivalent.
- P Mounting:
  - i Ventilated units up to 750 lbs.: Suitable for wall, floor or ceiling mounting (drip plate required).
  - ii Ventilated units over 750 lbs.: Suitable for floor mounting only.
- Q Seismic: are designed and manufactured to comply with the specification, "*IBC 2006; Section 1613; Earthquake Loads*" with the site specific parameters of "*Occupancy Category III: Special Occupancy*": *IP=1.25* and "*Site Profile Type: SD= Stiff Soil*" with the seismic forces defined as "*Spectral Acceleration for Short Periods: SS= 1.0g*". (Applicable to floor mounted units only.)

#### OPTIONS:

- Electrostatic Shielding
- Vibration Isolators
- Low Sound [-5 dB][-8 dB]
- Enclosures: [Type 4][Type 4X][Type 12] other
- Over-Temperature switches wired to internal terminal strip. Temperatures specified for use with class 220°C insulation systems. Standard configuration is N.C. opening on high temperature. Optional configuration is N.O. closing on high temperature. Installation options: [one switch: 170°C or 200°C on center coil][two switches: 170°C and 200°C on center coil][six switches: one 170°C and one 200°C on each of the 3 coils]
- Strip Heaters
- Marine Duty (meet ABS requirements)
- SPD (Surge Protection Device)
- Manufacturer has the ability to guarantee EMF levels as low as 10mG on the enclosure top and four sides from a distance of 1 meter for most units and kVA ranges. (Contact manufacturer for details on pricing and availability.)

#### 1.1 ACCEPTABLE PRODUCT AND MANUFACTURER:

- A ***HPS SENTINEL®*** transformer, by: Hammond Power Solutions Inc. (Canada: 1-888-798-8882 / U.S.: 1-866-705-4684)
- B Substitutions are permitted, subject to meeting all requirements of this specification and also having written approval by engineering 10 days prior to bid closing.

## **2 EXECUTION**

#### 2.1 INSTALLATION

- A The installing contractor shall install the HPS Sentinel® Energy Efficient General Purpose Transformer per the manufacturer's recommended installation practices as found in the installation, operation, and maintenance manual and comply with all applicable codes.
- B Make sure that the transformer is level.
- C Check for damage and loose connections.
- D Mount transformer to comply with all applicable codes.
- E Install optional vibration isolation pads between transformer enclosure and the mounting surface.
- F Install seismic restraint where indicated on the drawing.
- G Coordinate all work in this section with all work of other sections.
- H Prior to energizing transformer, verify secondary voltages and if necessary adjust primary taps.