



Hammond Power
Solutions Inc.

HPS MILLENNIUM™ G

1.2kV to 5kV Class General Purpose Energy Efficient Dry-Type Medium Voltage Distribution Transformer Typical Specification

Canada

595 Southgate Drive
Guelph, Ontario
N1G 3W6
Phone: 1-888-798-8882
Fax: 1-519-822-9701

United States

1100 Lake Street
Baraboo, Wisconsin
53913-2866
Phone: 1-866-705-4684
Fax: 1-608-356-2452

E-mail: sales@hammondpowersolutions.com

www.hammondpowersolutions.com

1 **GENERAL**

1.1 SCOPE

- A This section defines dry-type, enclosed and ventilated energy efficient medium voltage transformer as indicated.
- B Transformers shall be designed, constructed and rated (where applicable) in accordance with U.S. Department of Energy, Energy Conservation Program for Commercial Equipment; Distribution Transformers Energy Conservation Standards.
 - i DOE 2016 – DOE 10 CFR Part 431 Efficiency Standards; published in the Federal Register on April 18, 2013.
 - ii NRCan (Natural Resources Canada), Energy Efficiency Act SOR/2018-201, amendment 14 effective April 30th, 2019.
 - iii Ontario Green Energy Act, revised by ON Reg.404-12 effective January 1st, 2018.

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 IEEE C57.12.01 Dry-Type Transformer For General Applications
- B CSA C9-02, C22.2 No. 47
- C NEMA ST-20 Dry-Type Transformer for General Applications
- D IEEE C57.110
- E UL 1562
- F DOE 2016 – DOE 10 CFR Part 431 Efficiency Standards; published in the Federal Register on April 18, 2013
- G Natural Resources Canada, Canada Energy Efficiency Act, Energy Efficiency Regulations, SOR/2018-201 amendment 14 effective April 30th, 2019
- H Ontario Green Energy Act revised by ON Reg.404-12 schedule 6 effective January 1st, 2018.
- I California Office of Statewide Health Planning and Development (OSHPD)

1.4 ENERGY EFFICIENCY LEVELS

- A DOE 2016 Medium Voltage Energy Efficiency levels as per DOE 10 CFR Part 431 – effective Jan. 1, 2016.
OR
- B Natural Resources Canada, Canada Energy Efficiency Act, Energy Efficiency Regulations, SOR/2018-201 amendment 14 effective April 30th, 2019.
OR
- C Ontario Green Energy Act revised by ON Reg.404-12 schedule 6 effective January 1st, 2018.

1.5 TESTING & QUALITY CONTROL

- A Production tests: each unit according to:
 - NEMA ST-20
 - CSA C9-02 & C22.2 No. 47
 - UL 1562
 - DOE 10 CFR Part 431 sub part K, NEMA TP2
- B Test each model design and submit report on request
- C Standard production tests to include:
 - Applied potential test
 - Induced voltage test
 - Impedance voltage and load loss test
 - Voltage ratio test
 - No load and excitation current test
- D Additional type test to be made available on request include:
 - Short circuit test, BIL – basic impulse insulation level test
 - Partial discharge test

- Sound level test
- Temperature rise test

1.6 SUBMITTALS

- 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, temperature rise, detailed enclosure dimensions, primary & secondary nominal voltages, primary voltage taps, no load & full load losses, impedances, unit weight, warranty, Efficiency (where applicable) per DOE 10 CFR Part 431 Efficiency Standards; published in the Federal Register on April 18, 2013 and/or NRCan 2019 and/or Ontario 404/12 (2018); for medium voltage dry-type distribution transformers.

1.7 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.

1.8 WARRANTY

- A The transformer shall carry a 1 year limited warranty.
(For details, refer to the manufacturers published warranty)

2 **PRODUCTS**

2.1 GENERAL CONSTRUCTION:

- A Single phase and three phase medium voltage distribution transformers rated at 15kVA and larger, shall be ventilated type. 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. Convection air cooled.
- 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 de-rated as per ANSI/IEEE C57.110.

2.2 VOLTAGE AND kVA REQUIREMENTS:

- A Primary Voltage: Single Phase - [2400][4160][other] Volts
Three Phase - [2400][4160][other] Volts
- B Primary Voltage BIL Rating: [20][30][45][other]
- C Secondary Voltage: Single Phase - [120/240][other] Volts
Three Phase - [208Y/120][480Y/277][600Y/347][other] Volts
- D Secondary Voltage BIL Rating: [10][other]
- E kVA Rating: Single Phase - [15][25][37.5][50][75][100][150][167][250][333][other]
Three Phase - [15][30][45][75][112.5][150][225][300][500][750][1000][1500][other]
- F System Frequency: 60 Hertz

2.3 KEY REQUIREMENTS:

- A Standard impedance at 60Hz: Typically 4% to 6.5% [other]
 - i Transformers 750 kVA and above shall be 5.75% [4% to 6.5%][other]
- B Nameplate Rating: Linear load, 60Hz
- C Efficiencies: (where applicable)
 - i Meets or exceeds DOE 10 CFR Part 431 Efficiency Standards; published in the Federal Register on April 18, 2013 (effective January 1st, 2016)

- ii Meets and exceeds NRCan (Natural Resources Canada), Energy Efficiency Act SOR/2018-201, amendment 14 effective April 30th, 2019.
- iii Meets and exceeds Ontario Green Energy Act, revised by ON Reg.404-12 effective January 1st, 2018.
- iv Efficiencies at 50% of rated load.
- v Efficiencies are calculated under a linear load profile.
- vi 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: [2 x 2.5% FCAN and 2 x 2.5% FCBN][none][other]
- D Core construction: high grade non-aging, fully processed silicon steel laminations or better.
- E Coil conductors: aluminum [copper] 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: as per IEEE C57.12.01
- I Enclosure: Type 3R [Type 3R enhanced c/w filters][Type 4][Type 4X][Type 12] [other].
- J Enclosure Finish: ANSI 61 Grey suitable for UL50 outdoor applications [other].
- K Transformers shall terminate in mounting pads. Primary and secondary terminations are to be on the same side of the transformer mounted on separate insulated supports, with the HV terminations in the upper half of the enclosure and LV terminations in the lower half. Standard single-conductor mechanical lugs shall be included on primary, secondary and neutral customer terminations on all transformers (aluminum and copper units) up to and including 270 amp ratings. Contractors shall provide all necessary lugs not already provided with the transformer.
- L Anti-vibration pads/isolators shall be used between the transformer core and coil and the enclosure.
- M Ground Pads: standard
- N UL Listed, [CSA Certified], [CE Mark].
- O Ground core & coil assembly to enclosure with a flexible copper grounding strap or equivalent. Cannot block ventilation slots per N.E.C. 2014.
- P Neutral: Must be rated for 125% FLA for general purpose units and 200% FLA any units with a k-factor greater than 1.0
- Q Built in accordance with all applicable UL, CSA and ANSI/IEEE standards.
- R Ground core & coil assembly to enclosure with a flexible copper grounding strap or equivalent.
- S Seismic: Transformers shall be designed and seismically qualified according to the International Building Code (IBC) 2018, and the American Society of Civil Engineers ASCE 7-16 specifications, with the following seismic design parameters:
 - Spectral acceleration: S_{ds}
 - Importance Factor: I_p
 - Attachment/height ratio: z/h
 (Applicable to floor mounted units only.)
 Transformers must be approved for O.S.H.P.D in California.
- T 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.

OPTIONS:

- Electrostatic shielding
- Vibration Isolators
- Low Sound: [-3 dB][-5 dB][-8 dB]
- 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 (meeting ABS requirements)
- SPD (Surge Protection Device)

- The transformers shall be designed, constructed as 'K-rated' in accordance with UL and NEMA standards as per their temperature capability.
- .1 Secondary neutral conductor rating shall be 200% of the secondary phase conductor ampacity.

2.5 ACCEPTABLE PRODUCT AND MANUFACTURER:

- A **HPS MILLENNIUM™G** 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.

3 **EXECUTION**

3.1 INSTALLATION

- A The installing contractor shall install the Transformer per the manufacturer's recommended installation practices as found in the installation, operation, and maintenance manual in compliance with all applicable national and local codes.
- B Transformers cannot be back (reverse) fed unless specifically designed for and marked accordingly.
- C Make sure that the transformer is levelled.
- D Check for damage and loose connections.
- E Mount transformer to comply with all applicable codes.
- F Install optional vibration isolation pads between transformer enclosure and the mounting surface as needed.
- G Install seismic restraint where indicated on the drawing.
- H Coordinate all work in this section with all work of other sections.
- I Prior to putting transformer into service, verify secondary voltages and if necessary adjust primary taps..