



## Zero Sequence Transformer

For absorption of triplen harmonics

# Section 1- General

### 1.1 Zero-Sequence Transformer to mitigate triplen harmonics

The zero sequence transformer (ZST-series) is designed to remove triplen harmonics from the neutral conductor in a 3-phase, 4-wire electrical system resulting in reduced neutral current, reduced neutral to ground voltage and reduced upstream system harmonic voltage distortion.

- 1.1.1 The transformer shall provide a low impedance path for the 3<sup>rd</sup>, 9<sup>th</sup>, 15<sup>th</sup> and 21<sup>st</sup> harmonics and other zero-sequence currents from the upstream circuit.
- 1.1.2 The transformer shall connect in parallel with a 3-phase, 4-wire system.
- 1.1.3 The transformer shall be suitable for connection at an electrical distribution panel.
- 1.1.4 The transformer shall not utilize any electronic circuitry or capacitors.

### 1.2 Electrical Ratings:

- 1.2.1 System Voltage: [208Y/120, 380Y/220, 400Y/230, 415Y/240, 480Y/277, 600Y/346].
- 1.2.2 System Frequency: [50 hertz, 60 hertz, other]
- 1.2.3 Phase Current: [15, 20, 25, 30, 40, 50, 60, 75, 100, 150, 200, 300, other] amps

# Section 2 – Basic Product Requirements

## **2.1 The zero-sequence transformer shall meet the following basic requirements:**

- 2.1.1 Neutral current carrying capacity shall be three times the phase conductor ampacity.
- 2.1.2 The transformer shall be suitable for loads having a K-factor of up to 20.
- 2.1.3 The impedance to zero sequence currents shall be less than (1%) one percent.
- 2.1.4 Fundamental frequency impedance shall be less than 0.5%.
- 2.1.5 The transformer shall be a standard catalog item for the manufacturer.
- 2.1.6 Product warranty period shall be 10 years pro-rated with typical limited liability clauses.

## **2.2 Construction:**

- 2.2.1 Three-phase, 4-wire, common core & coil assembly
- 2.2.2 Free convection cooled, no fans required.
- 2.2.3 Windings shall be aluminum, but with copper terminations.
- 2.2.4 Terminations shall be copper and must be welded to the winding conductor.
- 2.2.5 Insulation system shall be UL class H (220C).
- 2.2.6 Maximum ambient temperature shall be 40C.
- 2.2.7 Temperature rise shall be 150C [80C, 115C, other]
- 2.2.8 Construction shall be [open core & coil, Nema 1/IP20, Nema 3R/IP ,other]
- 2.2.9 Efficiency shall be 97% minimum at full load at 25C ambient temperature.
- 2.2.10 Construction shall be in accordance with UL, CSA and ANSI requirements.
- 2.2.11 Audible noise shall not exceed 45dBA at full load when properly mounted in a suitable floor standing enclosure.
- 2.2.12 Enclosure color shall be [ASA-61 grey, other].

## **2.3 Options:**

- 2.3.1 Solid copper windings with copper terminations.
- 2.3.2 Thermal switches [N.O., N.C.] installed in [center coil only, all coils].
- 2.3.3 Vibration mounting pads for enclosed transformers.
- 2.3.4 Series input reactor rated no less than 3% impedance to prevent the attraction of triplen harmonics from other electrical panels.
- 2.3.5 Enclosure style and color.

### **Section 3 - Acceptable Manufacturer**

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**3.1 The approved and acceptable Zero-Sequence Transformer is the ZST – Series as manufactured by Controlled Magnetics Inc.**