REVISION CONTROL			
REV.	**DESCRIPTION**	**DATE**	**APPROVED**
A	Initial Draft	11/25/2013	M.Kneizys
B	Secondary Configuration added. Added Primary Configuration for Wye with high impedance ground.	11/25/2014	M.Kneizys
C	Frequency range is updated to comply industry standards. Allowed winding configuration is changed. The core structure requirement is added.	5/3/2016	K. Price
D	Minor wording change for clarifying the requirement	6/10/2016	K. Price

SGI 500XTM and 750XTM
Isolation Transformer
Specification

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1. Purpose

The purpose of this document is to specify the minimum component requirements for the external isolation transformer required to be installed in conjunction with a Solectria SGI 500XTM or SGI 750XTM inverter. These specifications and minimum requirements are required for proper inverter operation.

2. Scope

This specification defines requirements for the external isolation transformer necessary for SGI XTM inverter applications. Requirements are specified for two scenarios; inverter paired with one transformer and two inverters sharing the same transformer.

3. External Transformer Requirements

3.1. Transformer Type

The transformer shall be three phase, self-cooled, and designed for step-up operation. Transformer shall be UL listed. Pad mount, distribution type transformers shall comply with the latest issue of IEEE/ANSI C57.12.34.

Transformer shall operate at 60Hz nominal and shall be tolerant of continuous frequencies between 57.0Hz and 62Hz.

Transformer shall be capable of operating at 1.1p.u. voltage at full load without saturation for periods of time typical of the expected generation profile. Different frequency and voltage requirements may be necessary for projects with voltage or frequency ride through requirements other than those defined in IEEE 1547-2003. Requirements outside of this standard range must be reviewed and approved by Solectria.

3.2. Transformer Rating

A single inverter isolated by one transformer shall have one primary winding and one secondary winding. The kVA rating of the transformer must at least be equal to the kVA rating of the inverter.

Two inverters isolated by one transformer shall have three windings total; one secondary winding and two primary windings. Each primary winding must have a kVA rating at least be equal to the kVA rating for the inverter this winding isolates. The secondary winding must have a kVA rating at least be equal to the sum of the kVA rating for the two inverters connected to the transformer. The two primary windings shall have the same voltage, winding configuration and BIL. The three windings shall be constructed in a Low-High-Low configuration.

3.3. Transformer Impedance

For transformers with three windings, the percent impedance between both low voltage primary windings must be greater than 7%. The percent impedance between low voltage winding #1 and the high voltage winding as well as percent impedance between low voltage winding #2 and the high voltage winding must satisfy the minimum impedance requirements in Table 1 on the following page.

For standard two winding transformers, the transformer impedance voltage Z(%) must satisfy the conditions in Table 1.

Number of 380V Windings (Inverters)	Impedance (Absolute Minimum)
1	1.8%
2	High-Low#1 4% High-Low #2 4% Low#1-Low#2 7%

Table 1 – Percent Impedance %Z

3.4. Primary Configuration

The primary winding(s) shall be completely floating or grounded through a high impedance (>1Mohms).

- 380V nominal Wye with the neutral accessible for an optional voltage sensing purpose: The neutral shall not be grounded or used for any other purpose than phase voltage sensing.

  and

- The transformer primary winding shall be electrically isolated from the secondary winding.

3.5. Core Structure

The transformer shall use four legs, five legs or shell structure in order to allow zero sequence flux to flow. A core with three legs structure shall 'NOT' be used as it will limit the open phase detection capability of the PV inverter.

3.6. Taps

The transformer shall be furnished with secondary capacity high-voltage taps with a minimum of two – 2½% taps above and below the rated nameplate voltage.

3.7. Secondary Configuration

The secondary winding configuration shall be either:

- Delta
  or
- Floating Wye
  or
- Grounded Wye

3.8. Electrostatic Shield

Transformers with three windings shall include electrostatic shielding between the low and high voltage windings. The shielding must be grounded to the transformer tank or enclosure.

3.9. Low Voltage Bushings and Terminals

The minimum quantity of connection holes must accommodate the total number of conductor terminations per phase. Pad mount distribution transformers shall be provided with spade-type bushings.

3.10. Tank Grounding

Clamp-type tank grounding connections shall be provided for pad mount distribution transformers in accordance with ANSI C57.12.34.

3.11. Submittal Drawings

Final transformer submittal drawings must be received and reviewed by Solectria prior to inverter ship date.

4. Reference Documents

4.1. Solectria Renewables References

Ref. Number	Title/Description
04-02-01	Standard Practice for Product Development and Design Control

4.2. Industry and Regulatory References

Ref. Number	Title/Description
ANSI C57.12.34	Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 5 MVA and Smaller
IEEE 1547-2003	Standard for Interconnecting Distributed Resources with Electric Power Systems

4.3. Definitions

Term/Acronym	Definition
Percent Impedance Z (%)	Percentage of the normal terminal voltage required to circulate full-load current under short circuit conditions.
Primary Winding	Transformer winding connected to the inverters.
Secondary Winding	Transformer winding connected to medium voltage distribution.
SGI	Smart Grid Inverter. An inverter which has not only the generating capability but also provides intelligent features which help to operate the power grid more effectively by controlling the reactive power or providing the additional control and communication methods.
Step-Up Operation	Power flows from low voltage primary to medium voltage secondary.
kVA	Kilovolt-Ampere; Apparent power magnitude.

Solectria Renewables is available for assistance in determining utility related requirements related to the isolation transformer and other inverter related requirements. Please contact Solectria should additional information be required.

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