Selecting an Isometer for use with SolarEdge Inverters– Technical Note

Version History

- Version 1.0, July 2021 – Initial release

Overview

SolarEdge recommends connecting its three phase inverters to a grid with a protective ground. However, in some cases, direct connection of a three-phase inverter to an ungrounded grid without any protective/isolated equipment is required.

An ungrounded delta grid, also referred to as floating grid, is a grid for which the three phase power lines (L1, L2, L3) do not have a grounded neutral line. Such a grid is commonly used in commercial applications.

A ground fault in a floating grid cannot be detected since the return path for fault current does not exist.

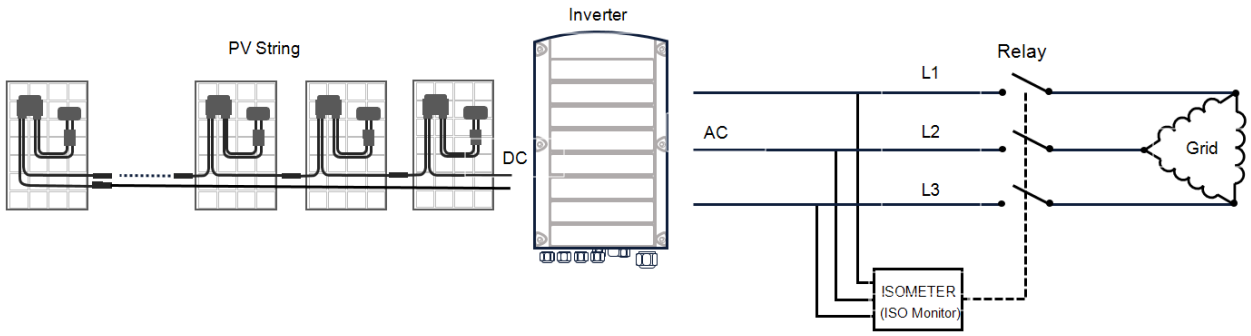

Figure 1 - Floating Grid DC/AC Solar System

To enable SolarEdge Three Phase Inverters to connect and operate in a floating grid system, the inclusion of a protective isometer with relays is required. Isometers are designed to monitor the insulation resistance of unearthed DC/AC solar PV systems (See Figure 1).

An isometer continuously monitors the impedance between each phase of the grid and the inverter. If at any point, an anomaly is detected or impedance drops below a predetermined threshold, the isometer activates a load break device that disconnects all down-stream faults.

This document presents the guidelines to be used for selecting an isometer to operate with SolarEdge inverters.

Isometer Placement

The isometer should be placed on the AC side of the inverter and should operate and monitor the AC lines before the inverter starts to produce energy and during energy production.

SolarEdge inverters monitor the DC side before the beginning of production and provide an insulation alert if the resistance drops below a specific threshold.

Capacitance

Installation capacitance can vary between 1nF/m^2, commonly found in utility scale installations, and 100nF/m^2 usually identified in rooftop installations. Table 1 details typical capacitance values for various PV field sizes.

Table 1: PV Field Size and Capacitance

PV field size	Capacitance
50kW	50 µF
100kW	40 µF
1MW	80 µF

In many locations the ground can contain varying degrees of moisture, a factor that is known to increase capacitance levels. SolarEdge suggests selecting an Isometer that can measure a capacitance of 110nF/kW as an added safety measure to account any occurrence of ground moisture. For example, for a 1MW field, use an Isometer capable of measuring 110µF.

Minimum Alarm Threshold

Table 2 lists the minimum alarm thresholds as specified in the International Electrotechnical Commission's Technical Specification 62548, *Design requirements for photovoltaic arrays*.

Table 2: System Size and Capacitance Thresholds

System size (kW)	Threshold limit (kOhms)
≤20	30
>20 and ≤30	20
>30 and ≤50	15
>50 and ≤100	10
>100 and ≤200	7
>200 and ≤400	4
>400 and ≤500	2
≥500	1

Supported Isometers

The following Isometers were tested for compliance with SolarEdge inverters. Equivalent inverters may be used.

- Bender isoPV-335+AGH
- Bender ISOPV-425 + AGH420

Isometer Selection Guidelines

Select an isometer that matches the following guidelines:

- Compatible with the connected grid characteristics: Voltage, Frequency.
- Compatible with the connected grid type: Delta/Wye.
- Compatible with the PV modules' type (mono/poly crystal or thin film) and configured accordingly.
- Compatible with the PV system's capacitance leakage. Refer to the **Capacitance** section. (For example: Bender isoPV-335+AGH supports capacitance leakage of up to 2000µF).
- Supports the installation's minimum insulation resistance.
  As a rule, for SolarEdge systems: 40MΩ per optimizer in parallel to 1MΩ Per inverter.

  For example: 2 Inverters with 25 optimizers each, on the same transformer winding:

  Insulation resistance = 1E6 || 40E6/25 || 1E6 || 40E6/25 = 307.7kΩ

  Note that calculations are done at a unit-level. Inverters can consist of up to 3 units.
- Supports triggering an alarm at first insulation fault.
- Includes a user configurable low-alarm threshold.

  For example: A threshold as low as 100Ω to reduce the incidence of false insulation faults.

  Refer to the section Minimum alarm threshold.
- Provides accurate measurement of low resistance values (<5%).
- Includes logging capabilities for comparison over time.