



CPS 3Phs String Inverter Compatible AC Connections

This Application Note describes the compatibility of 3-Phase transformer winding configurations, and the neutral connection requirements associated with the CPS grid-tie PV inverters. In addition, best practice and design guidelines are provided. However, it is always the responsibility of the Engineer of Record to design for Local and National Code and Utility Requirement compliance for each project.

ALL INVERTERS:

1. The winding configuration on the INVERTER side of the transformer must comply with the Table below for ALL CPS 3-Phase String Inverters.
2. The array **must** be floating (not grounded).
3. A neutral connection is provided in all inverters, but is not required in all models as indicated in the table below.
4. The function of the neutral connection is to provide a point of reference for measurement purposes that is essentially at ground potential. The neutral conductor is for control or measurement purposes only (when required – see specific inverter requirements below). No power will flow through the neutral conductor, and as such may be sized according to NEC 2017 Article 705.95(B). The ground conductor (PE) is sized to article 250.122 (Table 250.122).

Inverter	Transformer Winding				Neutral Connection Required (Note 2)
	Wye Floating	Wye Grounded	Delta Floating (Note 1)	Delta Grounded	
14kW	NO	YES	NO	NO	REQUIRED
20kW	NO	YES	NO	NO	REQUIRED
23kW	NO	YES	NO	NO	REQUIRED
25kW	YES	YES	YES	NO	OPTIONAL
28kW	NO	YES	NO	NO	REQUIRED
36kW	YES	YES	YES	NO	OPTIONAL
50/60kW	YES	YES	YES	NO	OPTIONAL
100/125kW	YES	YES	YES	NO	OPTIONAL

Note1: External Ground Fault detection for AC is required by code NEC 250.21. The inverter will provide DC Ground Fault detection.

Note2: If using the PID (Energy Balancer) a neutral is required to provide 277V power to Energy Balancer.

SITE AC DESIGN GUIDELINES

NOTES:

1. Transformer short-circuit impedance (Z%) should be less than 6%.
2. The transformer VA rating should be at least 100% of the sum of the connected inverter VA ratings.
3. CPS recommends the **transformer VA rating be selected** based on IEEE C57.159-2016 *Guide on Transformers for application in Distributed Photovoltaic (DPV) Power Generation Systems*. Another source is IEEE C57.91-1995 *Guide for Loading Mineral Oil Immersed Transformers*. It is the responsibility of the system designer to determine and take in account the reliability of the transformer or other system parameters.
4. The transformer does not require a static shield.
5. The maximum number of inverters connected to a single transformer is 32.
6. The recommended maximum voltage-drop on the Inverter to Point of Common Coupling (to the grid) is 2% at full load – including conductor temperature considerations. Voltage drop greater than 2% may require changing the transformer tap or as a last resort adjusting the **GridMaxVolt** trip point settings. In addition, the added impedance may cause inverter control issues.
7. The information in this application note supersedes the information in the Product Manual.
8. **(Applies to Inverters with a Required Neutral)** If the System Neutral is bonded to ground and the PE Ground conductor is continuous to the inverter, it is sufficient to connect the “N” terminal to PE in the inverter without installing a Neutral conductor from the source. This does not constitute a N-G bond since the “N” connection in the inverter cannot sink or source current. **If a Neutral conductor from the source is installed on the “N” terminal in the inverter, do not connect “N” terminal to PE.**
9. The nearest upstream transformer must comply with the configurations above. If the transformer is YG-yg, the Neutral on the Utility Side (H0) and Inverter Side (X0) may be connected internally and brought out as one terminal in the LV compartment and labeled (H0X0)