



CPS 3-phase 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 compliance, and utility requirements for each project.

ALL INVERTERS:

1. The winding configuration on the INVERTER side of the transformer must comply with the Transformer Winding Compatibility 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 – with the exception of the CPS 250/275kW model – but the neutral is not required in all models as indicated in the Transformer Winding Compatibility 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 it may be sized according to NEC 2017/2020 Section 705.95(B). The ground conductor (PE) is sized in accordance with Table 250.122 from NEC 2017/2020 Section 250.122.

Inverter	Transformer Winding				Neutral Connection Required
	Wye Floating <i>(See Note)</i>	Wye Grounded	Delta Floating <i>(See Note)</i>	Delta Grounded	
25kW-480V	YES	YES	YES	NO	OPTIONAL
25kW-208V	YES	YES	YES	NO	OPTIONAL
36kW	YES	YES	YES	NO	OPTIONAL
50/60kW	YES	YES	YES	NO	OPTIONAL
100/125kW	YES	YES	YES	NO	OPTIONAL
275kW	YES	NO	YES	NO	N/A

Transformer Winding Compatibility Table

Note: External AC Ground Fault detection is required by code NEC 2017/2020 Section 250.21 when CPS inverters are connected to Wye Floating or Delta Floating transformer windings. The inverter will provide DC Ground Fault detection.

SITE AC DESIGN GUIDELINES

NOTES:

1. The 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 account for the reliability of the transformer or other system parameters.
4. The transformer does not require a static shield.
5. The maximum number of CPS 25kW, 36kW, 50kW, 60kW, 100kW, and 125kW inverters that may be connected in parallel to a single transformer is 32. The maximum number of CPS 250/275kW inverters that may be connected in parallel to a single transformer is 20.
6. The recommended maximum voltage drop from the inverter to point of common coupling (to the grid) is 2% at full load – including conductor temperature considerations. A 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).