



Application Note: ACGRID
Revision: 072318

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 SCA14KTL-DO/US-208(**14kW**), CPS SCA20KTL-DO/US-480(**20kW**), SCA23KTL-DO/US-480(**23kW**), CPS SCA28KTL-DO/US-480(**28kW**), CPS SCA36KTL-DO/US(**36kW**), CPS SCA50KTL-DO/US-480(**50kW**), CPS SCA60KTL-DO/US-480(**60kW**), CPS SCH100KTL-DO/US-600(**100kW**), and CPS SCH125KTL-DO/US-600(**125kW**) inverters.

ALL INVERTERS:

1. The winding configuration on the INVERTER side of the transformer must comply with the diagrams below for ALL CPS 3-Phase String Inverters.
2. The array **must** be floating (not grounded).
3. 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).

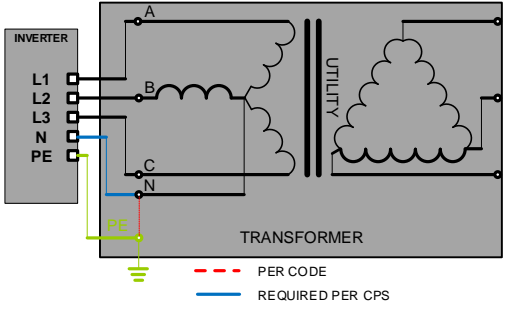
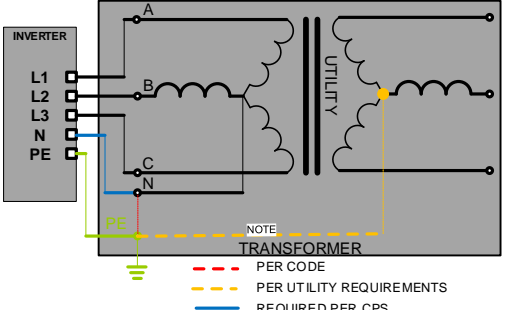
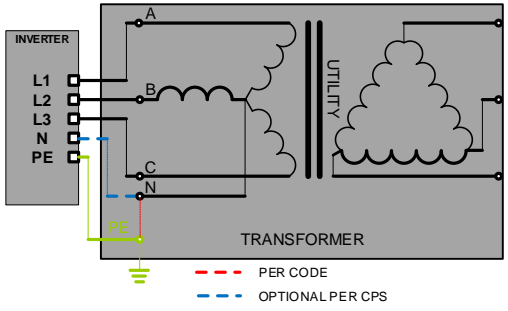
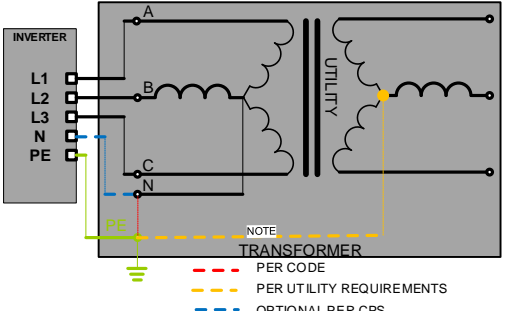
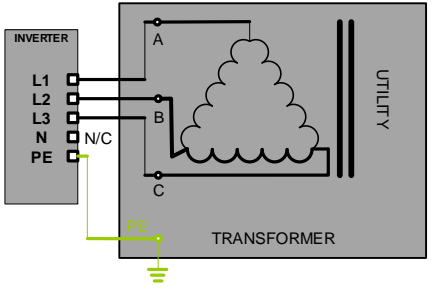
(14kW), (23kW), and (28kW) INVERTERS

These inverters are designed to be installed as 4-wire systems. As required by their UL 1741 listing, a neutral conductor from the utility-interconnect **must be terminated at the Neutral terminal** within the AC wiring box to ensure that the AC voltage sensing circuit can perform an individual phase voltage (line-to-neutral) measurement.

(20kW), (36kW), (50kW), (60kW), (100kW), and (125kW) INVERTERS

These inverters are designed to be installed as either 3-wire or 4-wire systems. Termination or connection of the neutral conductor from the utility interconnect is **optional**.

Common 3-Phase Transformer Wye Winding Configuration

Transformer Winding Configuration	Wye (Inverter) / DELTA (Utility)	Wye (Inverter) / WYE (Utility)	DELTA (Inverter)
<p>Inverter Models</p> <p>SCA14KTL-DO/US-208 SCA23KTL-DO/US-480 SCA28KTL-DO/US-480</p>	 <p>Transformer diagram showing Wye (Inverter) / DELTA (Utility) configuration. Inverter terminals L1, L2, L3, N, PE are connected to transformer terminals A, B, C, N, PE. Utility is connected to the delta secondary. Legend: Red dashed line = PER CODE, Blue solid line = REQUIRED PER CPS.</p>	 <p>Transformer diagram showing Wye (Inverter) / WYE (Utility) configuration. Inverter terminals L1, L2, L3, N, PE are connected to transformer terminals A, B, C, N, PE. Utility is connected to the wye secondary. Legend: Red dashed line = PER CODE, Yellow dashed line = PER UTILITY REQUIREMENTS, Blue solid line = REQUIRED PER CPS.</p>	<p>NOT ALLOWED</p>
<p>Inverter Models</p> <p>SCA20KTL-DO/US-480 SCA36KTL-DO/US SCA50KTL-DO/US-480 SCA60KTL-DO/US-480 SCH100KTL-DO/US-600 SCH125KTL-DO/US-600</p>	 <p>Transformer diagram showing Wye (Inverter) / WYE (Utility) configuration. Inverter terminals L1, L2, L3, N, PE are connected to transformer terminals A, B, C, N, PE. Utility is connected to the wye secondary. Legend: Red dashed line = PER CODE, Blue dashed line = OPTIONAL PER CPS.</p>	 <p>Transformer diagram showing Wye (Inverter) / WYE (Utility) configuration. Inverter terminals L1, L2, L3, N, PE are connected to transformer terminals A, B, C, N, PE. Utility is connected to the wye secondary. Legend: Red dashed line = PER CODE, Yellow dashed line = PER UTILITY REQUIREMENTS, Blue dashed line = OPTIONAL PER CPS.</p>	 <p>Transformer diagram showing DELTA (Inverter) configuration. Inverter terminals L1, L2, L3, N, PE are connected to transformer terminals A, B, C, N, PE. Utility is connected to the delta secondary. Legend: Red dashed line = PER CODE, Yellow dashed line = PER UTILITY REQUIREMENTS, Blue dashed line = OPTIONAL PER CPS.</p> <p>EXTERNAL AC GROUND FAULT DETECTION REQUIRED</p> <p>In a Delta connected system, the inverter does not detect AC Side Ground Faults. Only DC Side Ground Fault protection is provided by the inverter.</p>

NOTES:

1. 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 (HOX0).
2. Transformer short-circuit impedance (Z%) should be less than 6%.
3. The transformer VA rating should be at least 100% of the sum of the connected inverter VA ratings.
4. 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.
5. The transformer does not require a static shield.
6. The maximum number of inverters connected to a single transformer is 70 for Inverters rated 60kW and below, a maximum of 40 for the 100kW inverter, and a maximum of 32 for the 125KW Inverter.
7. 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.
8. The information in this application note supersedes the information in the Product Manual

A handwritten signature in black ink that reads "Rodeny Zhu".

Rodeny Zhu
R&D Director

A handwritten date in black ink that reads "Jul. 24 2018".

DATE