



Technical Information

Important Requirements for Medium-Voltage Transformers SUNNY TRIPOWER TL-US



Content

This document describes the requirements of medium-voltage transformers which are connected to the following SMA inverters:

- Sunny Tripower 12000TL-US / 15000TL-US / 20000TL-US / 24000TL-US

1 General Technical Properties

The transformers used must comply with the following technical specifications:

- The transformer for the inverters can be designed as a distribution transformer.
- The voltage level on the high-voltage side of the transformer must be selected according to the grid-connection point.
- The voltage on the low-voltage side must be $3 \times 277 \text{ V}/480 \text{ V}$. A neutral point is required and must lead outward as a neutral conductor.
- SMA recommends the use of a transformer with a tap changer on the high-voltage side that enables an adjustment to the voltage level of the electricity grid.
- Several inverters can be connected to one low-voltage winding on the transformer.
- If the MV transformer needs to be earthed on the medium-voltage side, the type of earthing must also be taken into account.
- The impedance voltage of the MV transformer U_k between the grid-connection point of the MV transformer and the grid-connection point of the inverter must be 6% (tolerance $\pm 10\%$)
- For thermal rating, the load curve of the transformer and the ambient conditions at the respective installation site must be taken into account.
- The maximum nominal AC current of all connected inverters must be taken into account (see the installation manual of the respective inverter).
- Potential error sources (e.g. short-circuit, earth fault or power failure) must be taken into account when selecting a transformer.
- The country-specific power frequency must be taken into account.
- The applicable country-specific standards must be taken into account.

 For further information and more accuracy in selecting a compatible transformer, contact SMA.

Contact

United States/ Estados Unidos	SMA America, LLC Rocklin, CA	+1 877-MY-SMATech (+1 877-697-6283)* +1 916 625-0870**
Canada/ Canadá	SMA Canada, Inc. Toronto	+1 877-MY-SMATech (+1 877-697-6283)***

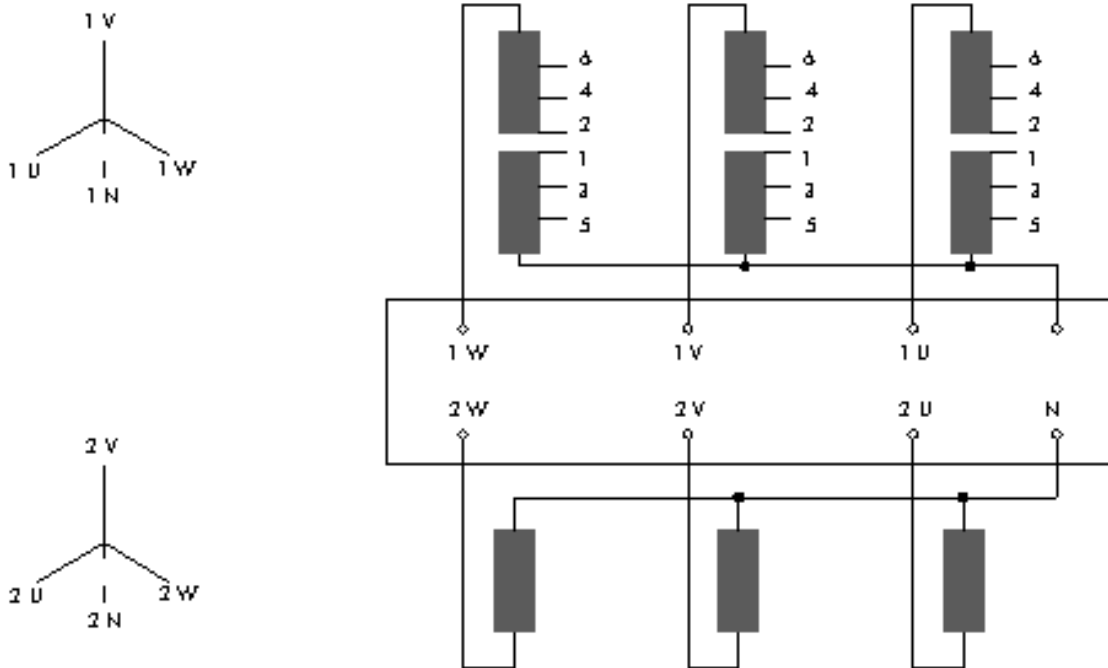
* toll free for USA, Canada and Puerto Rico / Llamada gratuita en EE. UU., Canadá y Puerto Rico

** international / internacional

*** toll free for Canada / gratuit pour le Canada

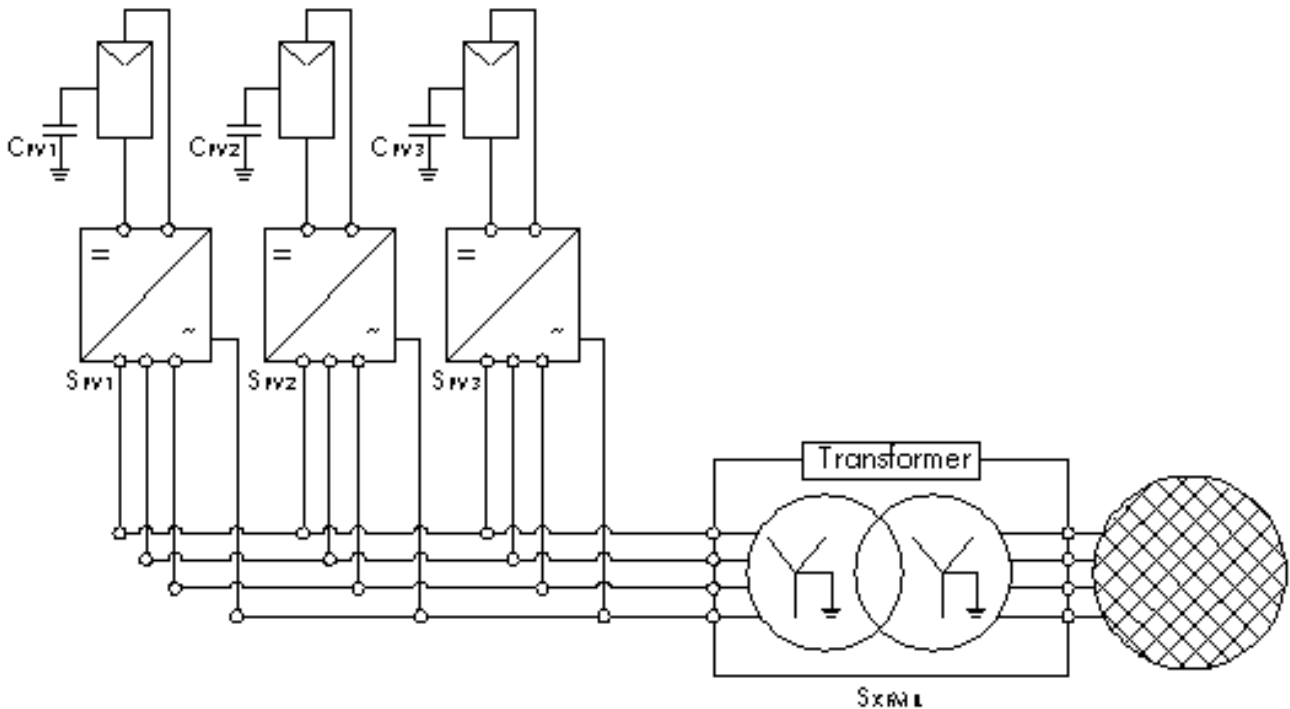
2 Compatible transformers with STP TLUS-10

SMA recommends "YNyn_" transformers with a star connection on the medium-voltage side with a neutral point that leads out and a star connection on the low-voltage side with a neutral point that leads outward (see figure below e.g. YNyn0).

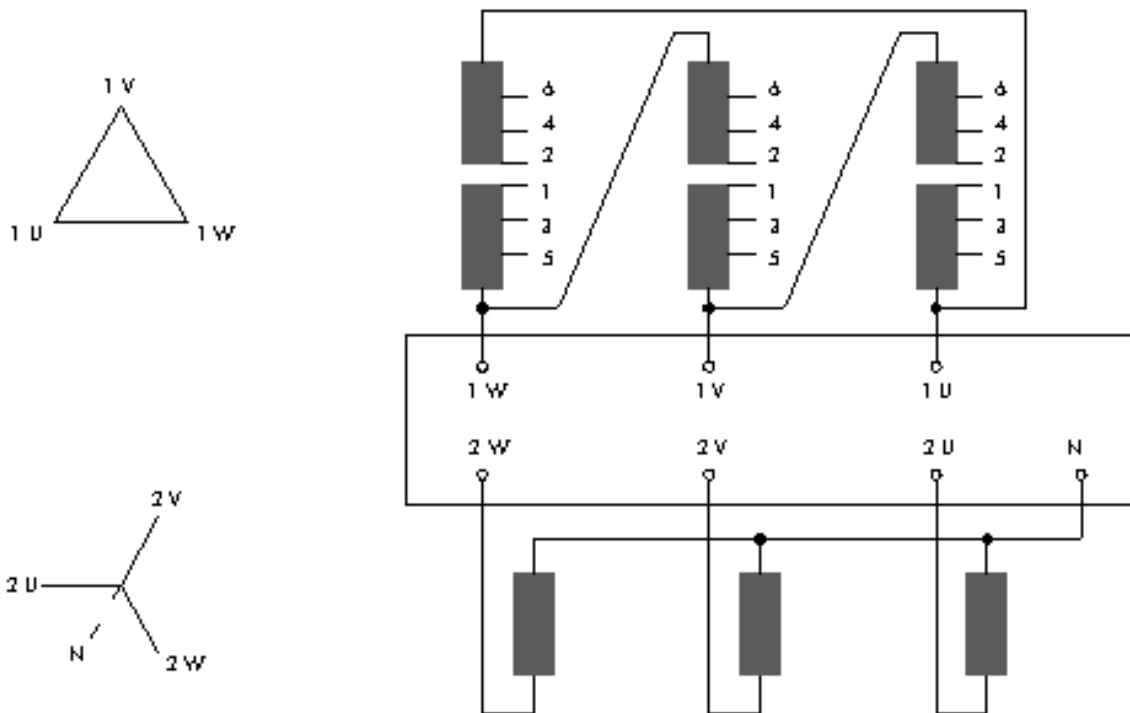


The maximum apparent power of all inverter ($S_{PV} = \sum S_{PV_i}$) connected to the low voltage side is:

- Less than or equal to 90% of the rated power of the transformer (S_{XMFR}) $S_{PV} \leq 0,9 \cdot S_{XMFR}$.

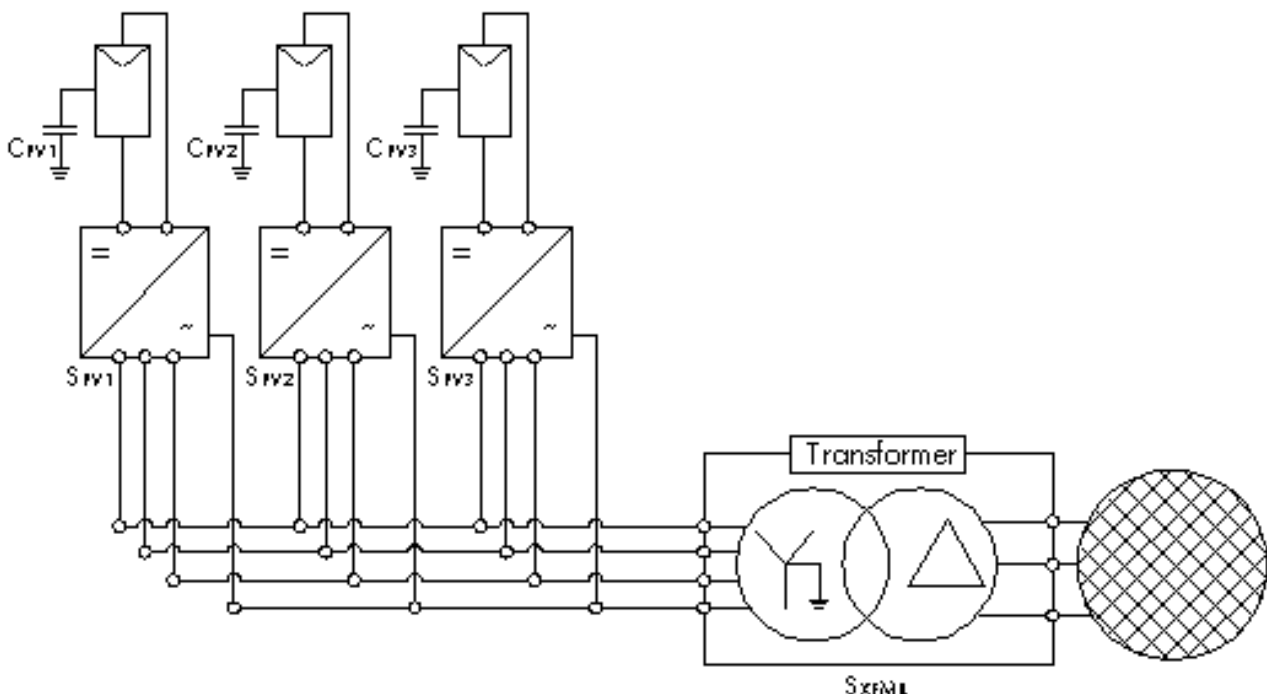


SMA recommends "Dyn_" transformers with a delta connection on the medium-voltage side and a star connection on the low-voltage side with a neutral point that leads outward (see figure below e.g. Dyn1).

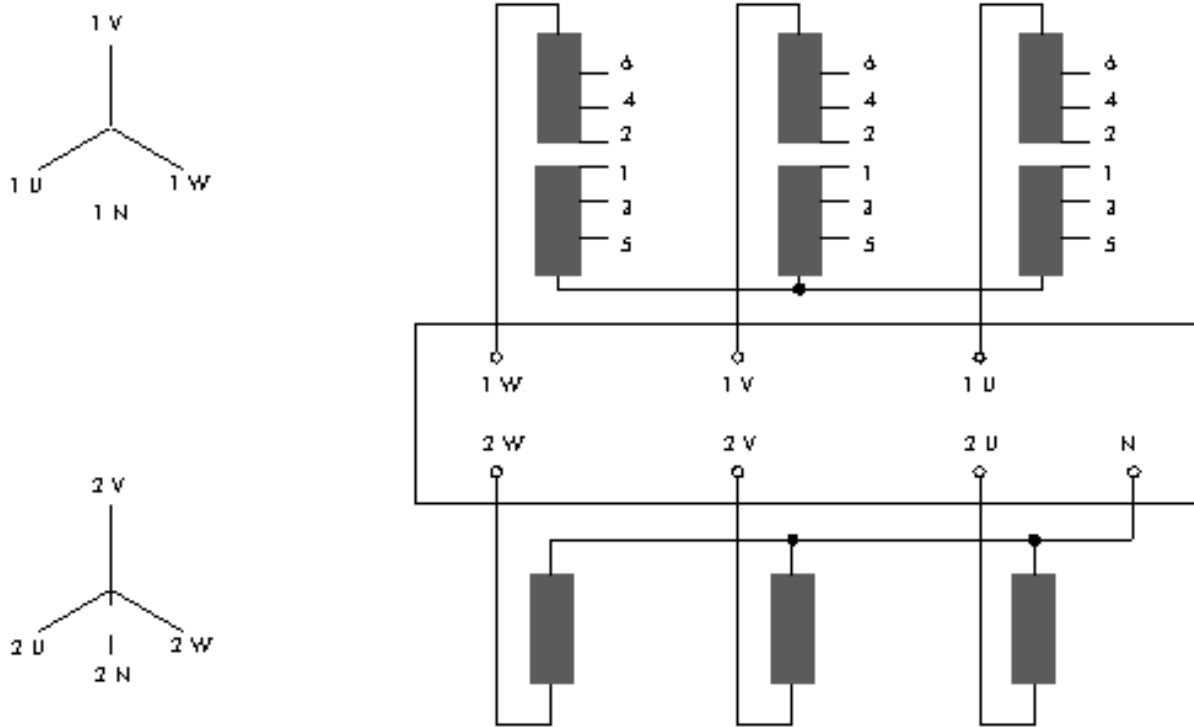


The maximum apparent power of all inverter ($S_{PV} = \sum S_{PV_i}$) connected to the low voltage side is:

- Less than or equal to 90% of the rated power of the transformer (S_{XMFR}) $S_{PV} \leq 0,9 \cdot S_{XMFR}$.

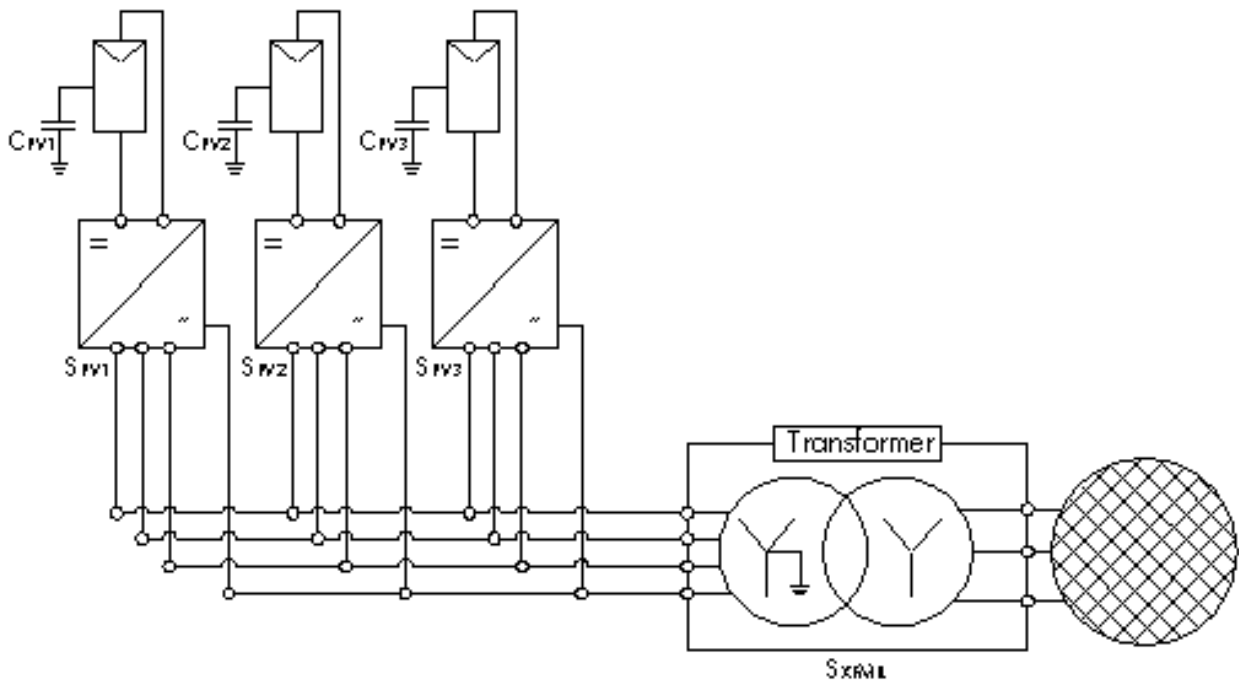


SMA only restrictively recommends "Yyn_" transformers with a star connection on the medium-voltage side and a star connection on the low-voltage side with a neutral point that leads outward (see figure below e.g. Yyn0).



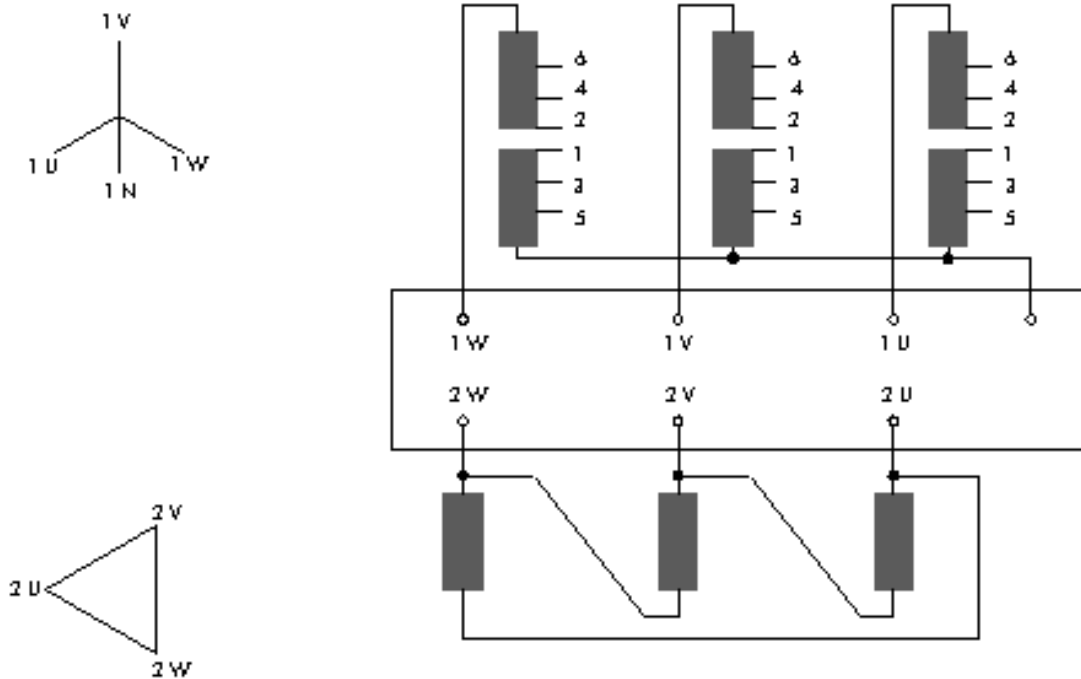
The maximum apparent power of all inverter ($S_{PV} = \sum S_{PV_i}$) connected to the low voltage side is:

- Less than or equal to 10% of the rated power of the transformer (S_{XMFR}) $S_{PV} = \leq 0,1 \cdot S_{XMFR}$.



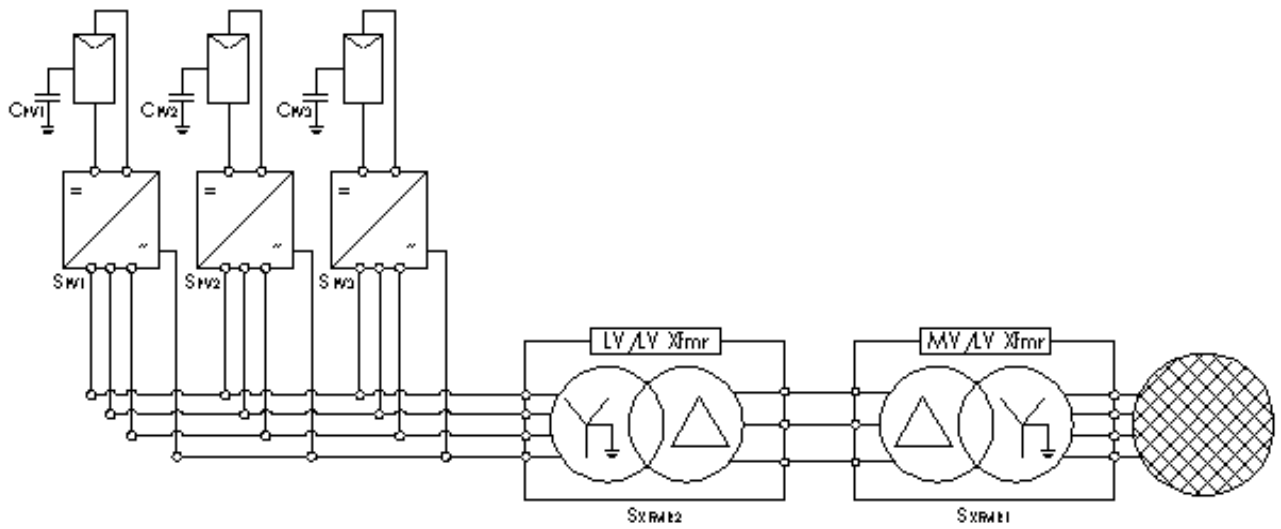
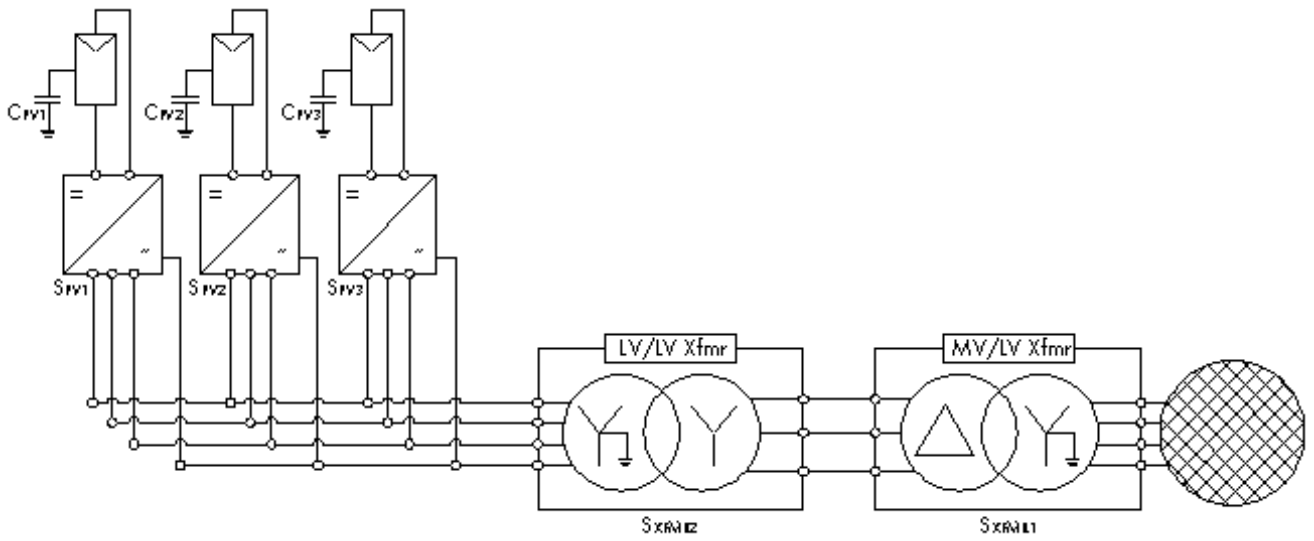
3 Incompatible transformers with STP TLUS-10

Sunny Tripower TLUS needs a neutral conductor, so transformers with delta topology in the low voltage side are not compatible for direct connection of the inverter (see figure below e.g. YNd1).



For this topology, it is necessary to install a second LV/LV transformer in order to adapt the grid topology according to the Sunny Tripower TLUS needs. This transformer has to be a galvanic separation transformer due to the different earthing topologies in both side of the LV/LV transformer.

See below two examples of this solution:



Both transformers shall have following ration of installed power

$$S_{PV} \leq 0,5 \cdot S_{XMFR_LV/LV}$$

$$S_{PV} \leq 0,5 \cdot S_{XMFR_MV/LV}$$

4 List of Standards

Standard	Revision	Description
NEMA TR 1-1993	1993 (R2000)	Transformers, Regulators and Reactors
ANSI C57.12.00	2010	IEEE Standard for Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
ANSI C57.12.34	2004	Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers (2,500 kVA and smaller) - High-Voltage: 34500 GrdY/19920 Volts and Below; Low-Voltage: 480 Volts and Below
ANSI C57.12.28	2005	IEEE Standard for Pad-Mounted Equipment-Enclosure Integrity
ANSI C57.12.70	2000 (R2006)	Standard for Terminal Markings and Connections for Distribution and Power Transformers
ANSI C57.12.80	2002	Standard for Terminology for Power and Distribution Transformers
ANSI C57.12.90	2006	Test Code for liquid-immersed distribution, power, and regulating transformers
ANSI C57.12.91	2006	Guide for Loading Mineral-Oil-Immersed Transformers
ANSI C57.12.29	-	American National Standard Pad-Mounted Equipment - Enclosure Integrity
ANSI C37.47	2008	Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fused Disconnect Switches, and Accessories
ANSI/IEEE 386	2006	Standard for separable insulated connector systems for Power Distribution Systems above 600 V
UL XPLH	-	Classification of compliance to ANSI standards
UL EOUV	-	Certification category for Dielectric Mediums
UL EOVK	-	Certification category for Transformer Fluids
ASTM A666	2003	Standard Specification for annealed or cold worked austenitic stainless steel sheet, strip, plate, and flat bar
ASTM D877	-	Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids using Disk Electrodes
ASTM D924	-	Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids
ASTM D92	-	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D6871-03	-	Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus
OECD 203	-	OECD GUIDELINE FOR TESTING OF CHEMICALS - Fish, Acute Toxicity Test
OECD 420	-	OECD GUIDELINE FOR TESTING OF CHEMICALS - Acute Oral Toxicity - Fixed Dose Procedure