

Wels, September 15th 2015

INFORMATION ON TESTING PROGRAM FOR CROATIA

Fronius Information on the application of the standard testing program for parallel operation of solar power plants ("PROGRAM ISPITIVANJA PARALELNOG POGONA SUNČANE ELEKTRANE PRIKLJUČNE SNAGE do 30 kW S MREŽOM").

The test document explains several requirements and tests for interconnecting a PV plant.

Fronius International highly recommends not to do any tests with disconnected neutral or where neutral gets disconnected during the test. (Test 15. and 16.) In that case defects are possible and will result in losing the guarantee.

All other evaluations and tests can be done with Fronius inverters.

Explanation:

Fronius inverters are internally protected against overvoltages. Not only with having trip limits, that measure the voltage and disconnect in case the voltage gets outside of the limits, but also protection with varistors to protect against voltage transients (surge).

Varistors are located between phase and neutral. They are designed to protect against overvoltages based on phase-to-neutral voltages.

In case neutral is not connected the potential of the neutral conductor is not controlled (Fronius Symo and Eco inverters are not supplying the neutral). The potential of the neutral is floating somewhere inside the voltage triangle spanned by the phase-to-phase voltages. With even small asymmetries (like single phase loads, e.g. fan) the neutral potential can move near a phase potential and cause phase-to-phase voltage on the other phases to neutral (See figure 2).

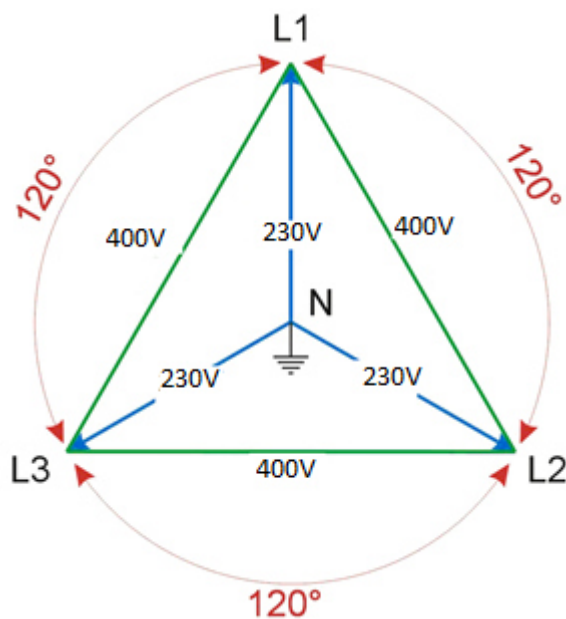


Figure 1: System with neutral connected

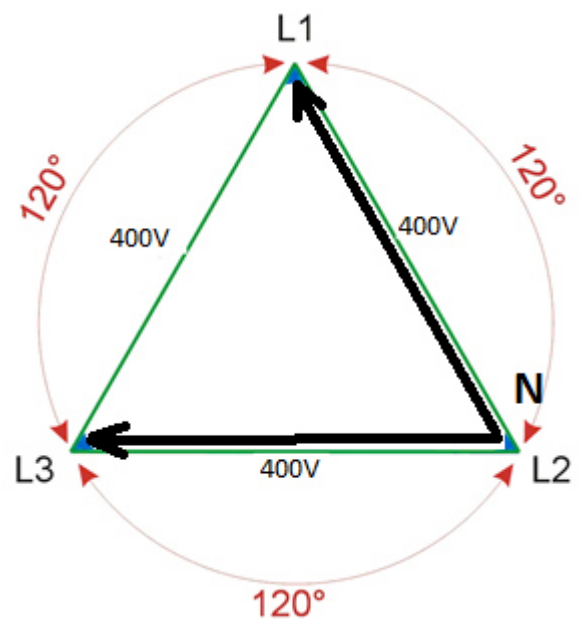


Figure 2: Possible voltages with neutral disconnected



SHIFTING THE LIMITS

The varistors between phase and neutral inside the inverters can get damaged in such a situation.

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A handwritten signature in blue ink, appearing to read "Thomas Mühlberger".

DI Thomas Mühlberger

Head of Solution Management